iJRASET
International Journal For Research in Applied Science and Engineering Technology

# INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

**Volume:** 11 **Issue:** V **Month of publication:** May 2023

**DOI:** https://doi.org/10.22214/ijraset.2023.52918

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
*ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538*
*Volume 11 Issue V May 2023- Available at www.ijraset.com*

# Drug Supply Chain Using Blockchain Technology

Pranali Pawar[1], Ramani Vaidya[2], Vrushali Terekar[3], S. D. Dighe[4]
[1, 2, 3]*Students,* [4]*Assistant Professor, Department of Computer Engineering, Sinhgad Institute of Technology and Science, Pune, Maharashtra, India*

***Abstract:*** ***Developing a supply chain in the healthcare sector is quite challenging since a compromised supply chain could risk a patient's life. Lack of transparency, difficulty tracking items, distribution of out-of-date products, a lack of confidence, a lack of safety and security, and many other problems are dealt with in the healthcare industry. Numerous of these issues can be resolved using blockchain technology. The necessity to increase transparency and traceability in the supply chain has arisen as a result of growing concern over drug safety. The use of an efficient, traceable, and transparent supply chain with blockchain technology can also help avoid drug counterfeiting.***

## I. INTRODUCTION

Drug safety is one of the most important needs now-a-days as it directly affects the public's health. Many researchers have claimed, to guarantee drug safety the best solution is to build a reliable drug traceability system ranging from drug production, logistics to sales. This paper proposes and develops a block chain based smart tracking and tracing platform to provide a decentralized solution in the drug supply chain in order to address the challenges faced by centralized applications.

## II. RELATED WORK

### A. *Blockchain in Agriculture and Food Industries*

The implementation of blockchain can revolutionize the agriculture and food industry by integrating visibility, traceability, transparency, authenticity.

In 2021, Researchers Indra Eluubek kyzy, Huaming Song, Ahmadreza Vajdi, Yongli Wang and Junlong Zhou [2] proposed a practical paradigm in agricultural supply chain management. In this proposed system, the problems of trust ability, scalability, and share amount assignment have been solved.

In 2021, Researchers Tripti Paul, Sandeep Mondal, Nazrul Islam and Sandip Rakshit [3] studied the impact and performance of blockchain on the tea supply chain. Paper discussed the conceptual framework integrating Blockchain Technology into supply chain

### B. *Blockchain-based application in textile and clothing industries*

In 2021, Tarun Kumar Agrawal, Vijay Kumar, Rudrajeet Pal, Lichuan Wang and Yan Chen [4], proposed a Blockchain-based framework for supply chain traceability in textile and clothing industry. It creates a foundation for future research in multiple directions.

### C. *Blockchain in Logistics*

In 2021, Researchers Mikulas Cerny, Marian Gogola, Stanislav Kubalak and Jan Ondrus [5] studied the issues of blockchain technology and its application int the supply chain.

### D. *Blockchain in Trade*

In 2021, Researchers Gokcay Balci and Ebru Surucu-Balci [6] studied the adoption of blockchain in maritime supply chain. The paper examines barriers and salient stakeholders in international trade. The paper uncovers the structural relationships between BT adoption barriers in CIT.

## III. METHODOLOGIES

### A. *Proposed Method*

SupplySpark is a Decentralized Logistics application that stores whereabout of the product on the Blockchain. At consumer end, customer can simply scan the QR code of products and get complete information about the provenance of that product hence empowering consumers to only purchase authentic and quality products.

© IJRASET: All Rights are Reserved | 

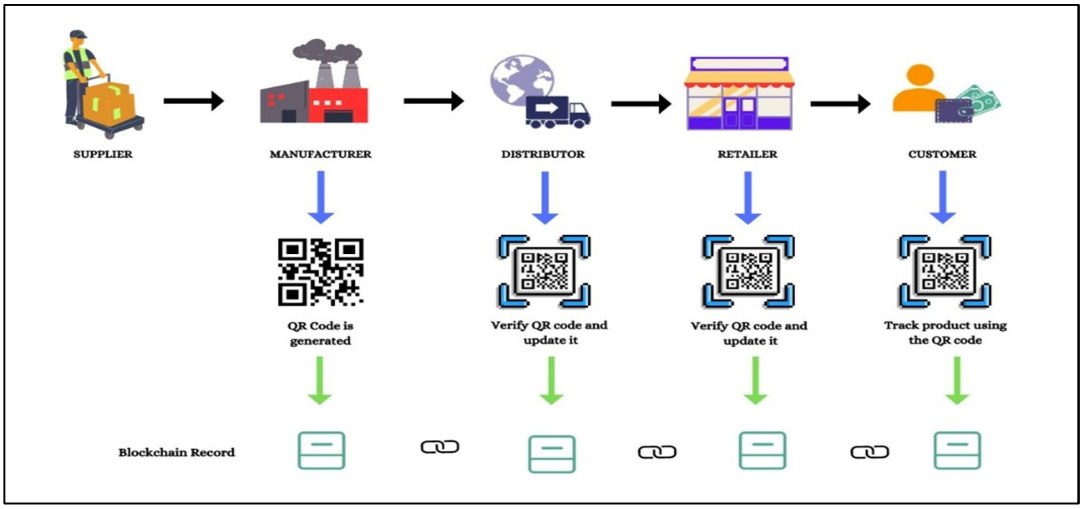



Figure 1: System Architecture

| Smart Contract: Add new Product (Only manufacturer) | |
|---|---|
| Input: New product details:<br>• ProductName | |
| Output: Product added and QR code with product information generated. | |
| 1 | If (registered) |
| 2 | If (role == manufacturer) |
| 3 | If (DrugState != created) |
| 4 | Create drugstate_by_manufacturer |
| 5 | QR code generated automatically using the Qrious library. |
| 6 | Else |
| 7 | Access denied |
| 8 | Else |
| 9 | Register onto the system |
| 10 | End |

*B. Algorithm*

| Smart Contract: Add Product State (Update information only by Retailer and Distributor) | |
|---|---|
| Input: Current entities information:<br>• Date of receiving product<br>• Location of entity<br>• QR code from previous entity | |
| Output: Updated product information | |
| 1 | If (registered) |
| 2 | If (role == Distributor) OR (role == Retailer) |
| 3 | Update DrugState |
| 4 | Else |
| 5 | Access denied |
| 6 | Else |
| 7 | Register onto the system |
| 8 | End |

© IJRASET: All Rights are Reserved | SJ Impact Factor 7.538 | ISRA Journal Impact Factor 7.894 |

| Smart Contract: Track product information | |
|---|---|
| Input: QR code | |
| Output: Information of product status | |
| 1 | If (registered) |
| 2 | Scan QR |
| 3 | Get detailed tracking information |
| 4 | Else |
| 5 | Register onto the system |
| 6 | End |

### C. *Mathematical Model*

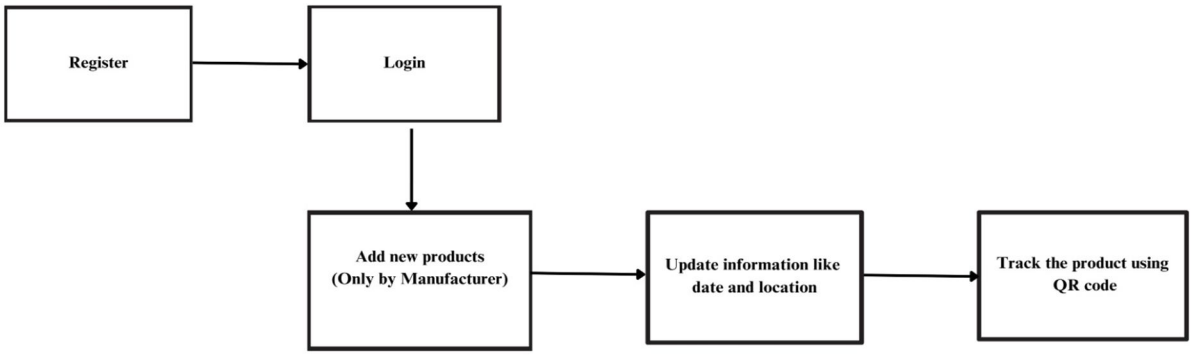



Figure 2: Mathematical model of the system.

- *Set Theory*

S = s, I, O, F, e, V
Where,
s = Start of program
I = I1
I1 = QR code
O = O1
O1 = Tracking status of product
F = F1, F2
F1 = QR Detection
F2 = Location Detection
E = End of program
V = Failures and success conditions.

- *Success if*

• Products added successfully.
• QR code is generated.
• Products can be tracked.

- *Failure if*

• More time consumption by the system.
• Hardware failure.
• Software failure.
• Improper network connection.

- *Space Complexity*

The space complexity depends on slide-summary and desired-shot. More the hashed data means more is the space complexity.

- *Time Complexity*

If system has n records, then, the time complexity of checking the records is O (1) in best case and O(n) in worst case.
E=end of program
T = Failures and success conditions.

## IV. EXPERIMENTAL SETUP

Following are requirements for development of system:

*1)* Operating systems: Windows 10 or later/ Linux.
*2)* Compatible tools: Ganache Blockchain, Meta Mask, Solidity, Node.js
*3)* IDE : Remix VM
*4)* Database: MySQL

## V. RESULT

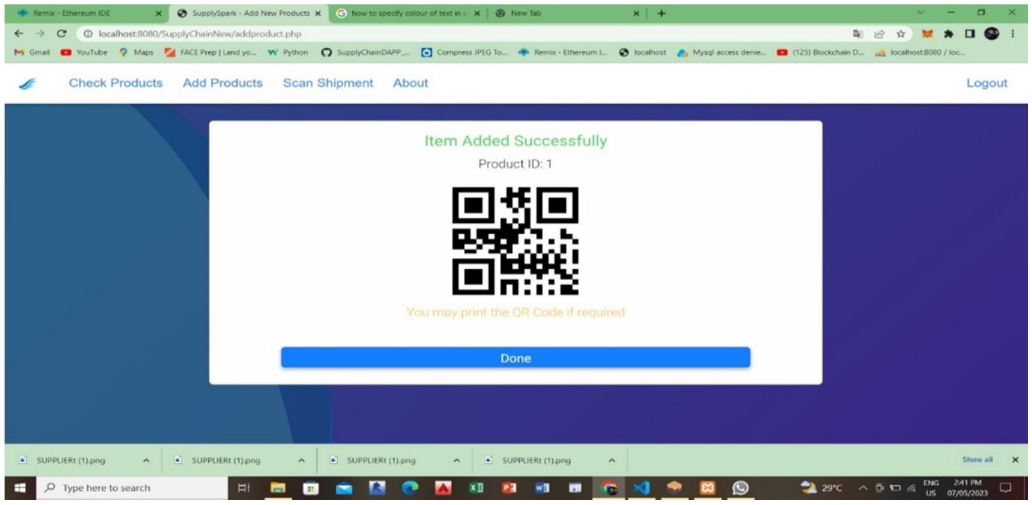



Figure 3A: Product added by Manufacturer

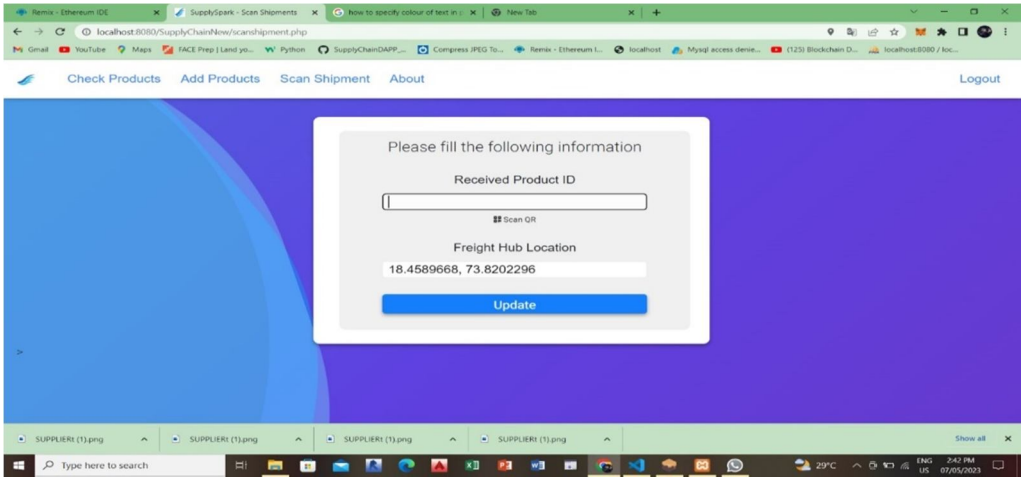



Figure 3B: Update information

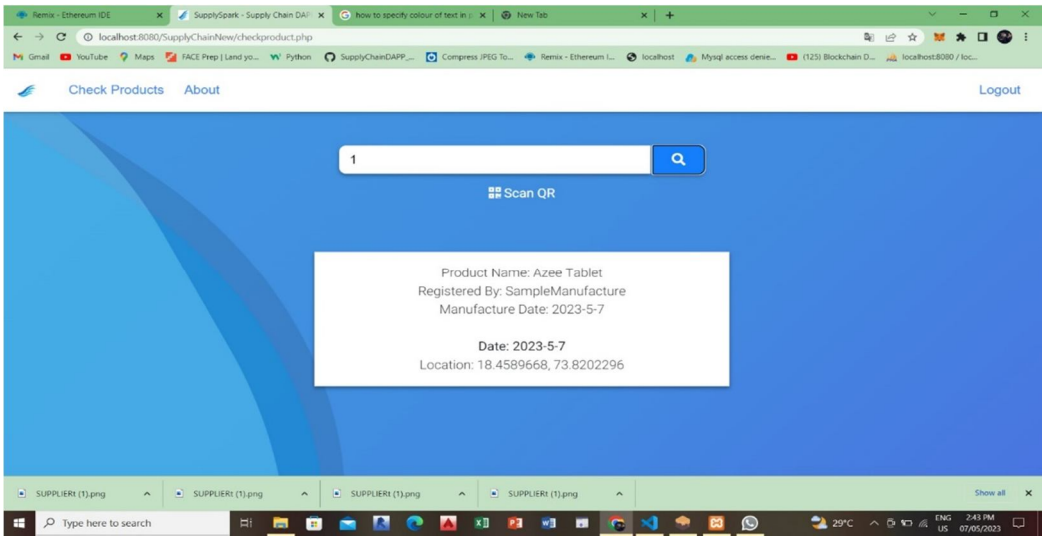



Figure3C: Information updated after scanning QR code.

## VI. CONCLUSION AND FUTURE WORK

This paper introduces a blockchain-based smart tracking and tracing platform to achieve a transparent, secured and a practical method that guarantees blockchain network performance in data storage and meets the data privacy requirements of the drug stakeholders. Smart contracts are designed and developed, which could provide a consistent solution from drug production to usage for solving the fake/poor-quality drugs issues.

Blockchain will change the way the supply ecosystem operates and can facilitate increased transparency alongside reducing the costs and risks associated with it. Blockchain technology in the supply chain will eliminate the threat of duplicate orders, invoice fraud, company counterfeiting and unaccounted spending.

## REFERENCES

[1] Xinlai Liu, Ali Vatankhah Barenji, Zhi Li, Benoit Montreuil, George Q. Huang, “Blockchain-based smart tracking and tracing platform for drug supply chain”, Computers & Industrial Engineering, Volume 161, 2021,107669, ISSN 0360-8352

[2] Indra Eluubek kyzy, Huaming Song, Ahmadreza Vajdi, Yongli Wang, Junlong Zhou, “Blockchain for consortium: A practical paradigm in agricultural supply chain system”, Expert Systems with Applications,Volume 184, 2021, 115425, ISSN 0957-4174

[3] Tripti Paul, Sandeep Mondal, Nazrul Islam, Sandip Rakshit, ”The impact of blockchain technology on the teasupply chain and its sustainable performance”, Technological Forecasting and Social Change, Volume 173,2021, 121163, ISSN 00401625

[4] Tarun Kumar Agrawal, Vijay Kumar, Rudrajeet Pal, Lichuan Wang, Yan Chen, “Blockchain-based framework for supply chain traceability: A case example of textile and clothing industry”, Computers & Industrial Engineering, Volume 154, 2021, 107130, ISSN 0360-8352

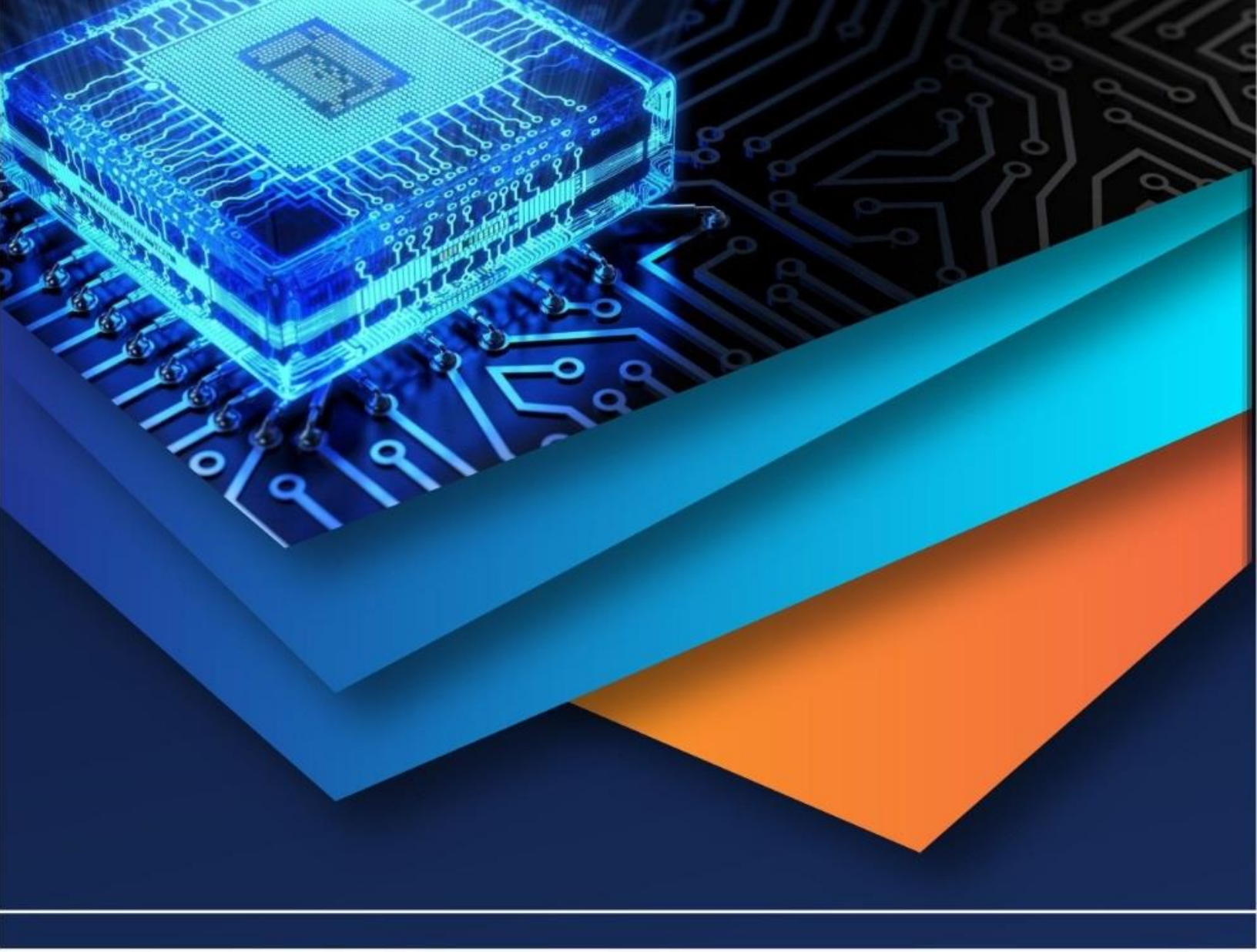
[5] Mikulas Cerny, Marian Gogola, Stanislav Kubalak, Jan Ondrus, “Blockchain technology as a new driver in supply chain”, ScienceDirect, Volume 55, 2021, Pages 299-306

[6] Gokcay Balci, Ebru Surucu-Balci, “Blockchain adoption in the maritime supply chain: Examining barriers and salient stakeholders in containerized international trade”, Transportation Research Part E: Logistics and Transportation Review, Volume 156, December 2021, 102539

[7] Pratyush Kumar Patro,Raja Jayaraman, Khaled Salah, (Senior Member, Ieee), Ibrar Yaqoob, “Blockchain-Based Traceability for the Fishery Supply Chain”, IEEE, Volume 10, 2022, Pages 81134-81154

[8] Rita Azzia,Rima Kilany Chamouna, Maria Sokhn, “The power of a blockchain-based supply chain”, Volume135, September 2019, Pages 582-592

© IJRASET: All Rights are Reserved | 



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

# INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)