

# USING BLOCKCHAIN IN THE TEXTILE INDUSTRY: A CASE STUDY

Maaz bin Ahmad<sup>1</sup>, Sanjay Kumar<sup>2</sup>, Syed Hassan Ali<sup>3\*</sup>, Neha<sup>4</sup>, Palwasha<sup>5</sup>

**ABSTRACT**—The textile industry's overall retail style area is worth more than \$1.3 trillion, and the business utilizes 60 to 75 million individuals. Multiple players effectively endeavor to expand attention to the difficulties in fulfilling the orders in time. Supply networks are a noticeable player in this industry because of their size. Technological advancements like blockchain can further develop production network straightforwardness, robotization, and simplicity of correspondence among providers and brands by making data more reliable and available. Purchasers and brands would have a superior comprehension of the cycles because of the more noteworthy straightforwardness and measure of data given by these advances, prompting measures pointed toward eliminating unscrupulous producers from the material business' inventory chains. This paper enlightens the Ethereum Blockchain implementation for the textile industry's supply chain process. Step-by-step implementation details are mentioned. Solidity is used to write the smart contract. The implementation shows that blockchain can overtake the existing process of the textile industry and provides more reliability, availability, and security in the overall process.

**Keywords**— Blockchain, Data Transparency, Traceability, Security, Transactions, Ethereum, Smart Contracts

## INTRODUCTION

Technology is everywhere. Our day starts by checking the alarm clock, which ends with typing away our assignments on laptops. This world can rightly be said to be the house of technology now. Every sector has realized the growing need to not only expand their industries but also protect them from losses in the form of time management and security issues. Blockchain technology is gladly accepted to solve these rising issues as it has made data transparent, secure, and easily viewed by interested entities. One such industry that has welcomed blockchain is the evergreen textile industry, and this paper focuses on its current work and discusses why blockchain was the transformation this industry needed.

Blockchain is now being used in the education sector, automotive sector, healthcare, media, government offices, etc. This technology has, in short, simplified the management of data and the process of its privacy.

In 1769 [19], sir Richard Arkwright invented a programmed system for spinning cotton into yarn be, known as water-frames. Several pulleys and gears connected these frames to a large wooden wheel to bring water down the channel. Unfortunately, this wooden wheel was too large to fit in any worker's cottage and demanded force to move water. Thus, this resulted in textile production, which is how the textile industry eventually came into being.

The first four steps in the textile industry are: spinning cotton into yarn, fabric manufacture, wet processing, and garment manufacturing. These are not as easy as they seem to be. The process behind it is more complex. As you can see, every department requires a human force and machinery to run an industry. Every sector needs efficient and effective performance. There is also a threat to data security, critical data mishandling, etc.

### 1.1) Security in the textile industry

The way any textile industry works requires several steps to enhance and maintained several security standards. The principles assist with protecting those items, paying little heed to where they were made, are solid, safe, and of adequate quality. For this ISO, the International Organization for Standardization is a gathering of numerous businesses that work to make modern uniform norms. Generally, ISO norms cover contemplations like administrative issues and board frameworks. They survey an organization's capacity to meet client necessities and deal with rules to develop execution [11] further. In addition, QMS provided a framework for producing quality-controlled products that satisfy the consumer's demands and proficiently furnished sellers with dealing with the objectives [17]. Since the process is long and garments are made on a large scale, keeping security and privacy in every area is important to avoid ill-natured attacks.

### 1.2) Why is a security essential in the textile industry?

The first and foremost task for an industry or implementation of any work draws attention toward security. In the textile industry, steps should be taken to avoid any malicious activity leading to data mismanagement or any external or internal

<sup>1-2-3-4-5</sup> Karachi Institute of Technology and Entrepreneurship  
Karachi

Country : Pakistan,

Email: \*syed.hassan@kiet.edu.pk

attack to harm the sector. The mishandling of employees' personal information, such as wages, home addresses, and telephone numbers. The production of goods, the manufacturing process, business strategies, and the trust issues between buyer and seller requires highly secure and optimal management. Optimizing such big data is essential as information keeps adding, resulting in very large-scale data. Since the textile industry depends on labor, it appends extensively to environmental degradation, resulting in a highly complex and globally dispersed supply chain network, making it challenging to execute transparency [12]. Three significant themes examine the textile industry's role in data transparency: traceability, sustainability, distrustfulness, and relationship with the brand. Every brand needs to keep some information on the upcoming future implementation. Security requires who and to whom that individual part of the information should be shared. Who can access the data or make valid changes according to the requirements? For example, if I am responsible for the management of data, the production of goods, the finance information, etc. So, the access would be available to my team and me only in this sector. Moreover, sharing unnecessary information with everyone would test the data integrity, an open attempt to hack the information or deliberately do this would result in distrust of the industry. The idea of Industry 4.0 has supported mechanization across numerous ventures. It has all around the world impacted enterprises to foster innovations that consolidate elements like man-made reasoning, independent mechanical technology, and framework combination. Although it is an intrinsic piece of the Industry 4.0 model, the intricacy of network safety has prompted numerous modern areas are disregarding it. If an assault occurs, a viable recuperation procedure should likewise be available in the material assembling office, which has been attempted and tried by a multifunctional group that comprehends the organized countermeasures required. Expanding the idea of cyber security at the business level is tremendously valuable. If there were technologies like blockchain, it would be a whole new level of the revolutionized system. [20]. Since running an industry has a distributed system over the network for better communication and enhancement of the textile industry so the lack of failure in privacy would result in anyone misusing confidential information.

### 1.3) Blockchain technology

Since technology came into being, everybody is adopting many ways to have more secure, digitalized, easily traceable techniques according to their requirements of business or any desired sector. The emergence of blockchain technology and its remarkable features has grabbed attention in many areas. If we focus on the definition, "A Blockchain is a shared, immutable ledger that facilitates the process of recording transactions and tracking assets in a business network." An asset, for example, care, can be tangible or intangible, like copyrights. Anything digitalized holds value as it is on a

blockchain network. It can be easily hounded upon, which reduces risks and cuts costs for involvement [14]. Blockchain offers prompt, shared, and transparent information stored in a DLT that only lawful users can access. The faster the information received, the more accurate it is. The key elements of blockchain technology are:

- Distributed ledger technology (DLT): a decentralized database that records transactions, allows simultaneous access, and validates and authenticates users on a peer-to-peer network. Its records are immutable transactions which means eliminating any duplication.
- Immutable records: Blockchain offers immutable records, meaning no one on that network can change the transaction once a record is entered. A blockchain ledger can make information permanent and unforgettable and store unaltered transaction history.
- Smart contracts: in simple words, smart contracts in blockchain are a set of rules intended to be executed automatically according to the terms of the contract. The objective of a brilliant agreement is to improve business and exchange between both unknown and distinguished parties, some of the time without the requirement for a broker.

Blockchain innovation utilizes agreement strategies. For example, it is a settlement on some choice by all individuals from a gathering instead of a larger part of a select gathering of agents. This means that transactions are only updated when the verified users validate them. Suppose they disagree so the transactions would not be able to make their way to publish a block. As the blocks are chained together, they ensure immutability [10].

### 1.4) Advantages of Blockchain

There are numerous benefits that blockchain offers. The top 5 advantages which the experts illustrated below [14]:

- Better transparency: With blockchain, any organization can go totally on a decentralized network, excluding needing a third party.
- Improved security: since Blockchain uses hashing technology, every block is linked with the previous one, improving security and easy traceability.
- Decreased costs: as Blockchain cuts the requirement for any other power in between, costs are automatically decreased.
- True traceability Blockchain strengthens the efficiency of the processes as it enables the buyers to connect with the sellers and be aware of the journey of the products. Hence eradicating any point of failure.
- Improved speed & highly efficient: a Blockchain is one of the types of DLT, so all the transactions are stored in a single ledger that everyone on that network can access with no involvement of any other force hence building

more trust [14].

### **1.5) How are transactions created in a blockchain?**

Blockchain is a structure that stores transactional records known as a block. Let us discuss how these blocks are created through a series of transactions. First, all the participants are linked to a peer-to-peer network. Any participant requests a transaction that is verified by others on that network. These transactions are stored and broadcasted on P2P networks which consist of computers called nodes. These nodes of the users create unique HASH values using SHA-256 hash code. This hash code is unique for every value. The slightest change in this value entirely changes the message, meaning any fake identity would easily be identified as a hash code and not matched. These network nodes use algorithms to determine whether the transaction made is valid and made by an authentic user only. All the users on the network verify this validation as they are bound to do it because the process of chaining and publishing the block will not be preceded. Once the transaction is entered through verification in the ledger, it cannot be altered. Examples of valid transactions include cryptocurrencies, bitcoins, etc. this then creates a block in the network, and the process continues. The very first block in the blockchain is called the genesis block. Since the blocks are linked together through the previous blocks' hash codes, any suspicious activity is easily traced.

### **1.6) A scenario in the textile industry:**

The textile industry includes exploration, planning, advancement, assembling, and circulation of materials, textures, and apparel. There is a series of processes that follows to make fabrics and clothing. Cotton is spun to make yarn production, resulting in fabric production, which is then given pre-treatment to send to the dyeing and printing department where, according to the requirement's, finished garments are being made. The goods are manufactured, and they are all set for transport, sales, and retail. But this is not as simple as it may be assumed to be. This requires very intact management because the consumer is not questioned about the products. These processes contain a series of data being updated, inserted, and efficiently maintained records. Here the main problem was data transparency, resulting in distrust between consumers and sellers. The lack of security of such big data would always give a threat to the industry. But these issues are quickly resolved if the whole process is transformed upon the blockchain. Through blockchain authenticity of the resources is verified.

A Blockchain is a type of Distributed Ledger Technology (DLT), that allows immutable changes and keeps a record of transactions more securely due to decentralization and smart contracts. The trust issues between buyers and sellers are decreased as buyers can now check and be satisfied that whatever they are buying has a history to look upon. Blockchain has also resulted in effective management and production of goods hence timesaving. In this case, RFID

(Radio Frequency Identification Tags) has played an important role in the supply chain. As data is now automatically filled whenever a production is made. This makes work easy and efficient as respective labels and barcodes are generated for the goods [16]. Blockchain also allows traceability of any fake transactions being made.

### **1.7) Assessment of Blockchain in the textile industry**

Introducing Blockchain to the textile industry has shown a booming success. It has been widely accepted and is now known for needing an hour. Like any other business, the textile industry also needs solid communication between the buyer and the seller. Blockchain makes this communication traceable and manageable, as there is little to no chance of cheating or hacking now [12]. Another problem that has been solved is the threat of theft or forging of ideas by rival companies/industries. Hence, blockchain has helped protect the authenticity of these industries; no undue credits are given to fake resources, and the consumers can also buy authentic products and do not fall under any scam. This has built a surface of trust which was somehow missing, especially where work needed to be done online. It should also be noted that earlier, as one industry was made up of different sectors, which are most of the time located in different parts of the country, data used to be distributed and was not represented under one entity Blockchain has removed this hassle for it has connected this supply chain with a real-time flow of data and all the required information is now shared with the respected people in one go. Consumers can also ease their growing concern by viewing the data that answers their desired questions, such as the type of cloth, the place where it was made, and who designed it. So, the outcome is that authentication and trust have become the main slogan for many textile industries, and it is not compromised under any condition. The process has become easy to operate, transparent, and does not give any concession regarding the system's security.

### **1.8) Adding Blockchain to the textile industry:**

The world with blockchain technology makes us realize how difficult it had been to trace the orders, rely on online shopping, and the whole textile industry process from apparel manufacturing to its final destination. One of the main advantages of adding blockchain to the textile industry is that it has reduced delays and error chances to a maximum extent. Recently, this has become easy with the help of an app where QR codes extract information about the garment. Earlier, when data was not readily available and transferred to all concerned members of the team (for example, the manufacturers, retailers, and sellers), the transparency of the process was missing, the coherency was lacking, and this led to time management issues due to many delays, clashes between workers, and hindrance in the supply chain itself. Apart from these problems, one more issue was the lack of transparency which was the reason behind the mistrust of

many buyers. This is also decreased as the transparency factor has multiplied, and buyers can easily find out the garment's material, where it was weaned, and the people behind its manufacturing and designing. This has boosted both buyers' trust and garments' selling quantity [7]. Records are now being stored, and information can be smoothly retrieved with the help of sensors and RFID tags. RIFD has become a historic change that has made the production process easy to handle and secured data to a higher degree than ever. This technology can automatically fill the data whenever a production order is made; it prints the required label and barcodes. It can also record the storage information, tell the real time needed to receive the order, and automatically generate reports for packaging. No wonder the production process has increased, and the efficiency doubled. Time management has also become easy as fewer errors are made, and every required piece of information is just one click away. This technology has also helped make sales less labour-intensive, as the smart closet rack system manages very well. This technology has improved the customer's experience and is a one-stop solution to many problems.

#### **Organization:**

The rest of the paper will be organized as follows: Section II focuses on the related work. Methodology and implementation details are discussed in section III, followed by an analysis and discussion of the proposed system in section IV. Finally, section V concludes the paper.

#### **RELATED WORK**

Kamalendu et al. [16] mainly discussed how the apparel businesses recognized the new challenges in IoT (internet of things) to capture the fragmented data from different parts of the textile and cloth manufacturers. Antonio et al. [12] inspected the products that are more environmentally and socially friendly. This means that there is an increasing demand but at the cost of economics, due to which transparency is very important. Sheikh et al. [10] explored how since the emergence of blockchain technology, Tsan et al. [7] disclosed how blockchain applications could be precedence over environmentally friendly quality products in the fashion industry. Ludvig [13] innovated how different company start-ups applying blockchain to a supply chain can create entrepreneurial value products that will enhance the value for the company, its consumers, and suppliers. Bill et al. [1] emphasized how blockchain can overcome the complexities of circular supply chain management. The area focuses on the reusability of materials in the fashion industry to enable a circular supply chain. Peter et al. [16] intended on the increasing demand for blockchain in the scientific and industrial sectors. Blockchain offers immutable and distributed features, so how will it benefit organizations? Tiina Nyman [15], in her thesis work, draws attention to how some industries are still struggling with unethical suppliers and a lack of transparency in supply chains. Luis et al. [13]

proposed how textile waste significantly impacts the environment. One way to reduce this is to approach the circular supply chain using blockchain technology. Giulio et al. [4] also insisted upon the problem of traditional supply chain faces that they have failed to produce reasonable and high-quality products. Blockchain can produce reduced costs and enhanced quality products, increasing the supply chain's reliability.

#### **METHODOLOGY**

The proposed approach is implemented in this section, defining the textile industry supply chain process implemented through the blockchain network. We used the Ethereum blockchain to monitor whether the original product was delivered to the consumer as the industry manufactured it. Steps for implementing the Ethereum blockchain technology are proposed, and two types of testing, the smart contract approach, are carried out in the following.

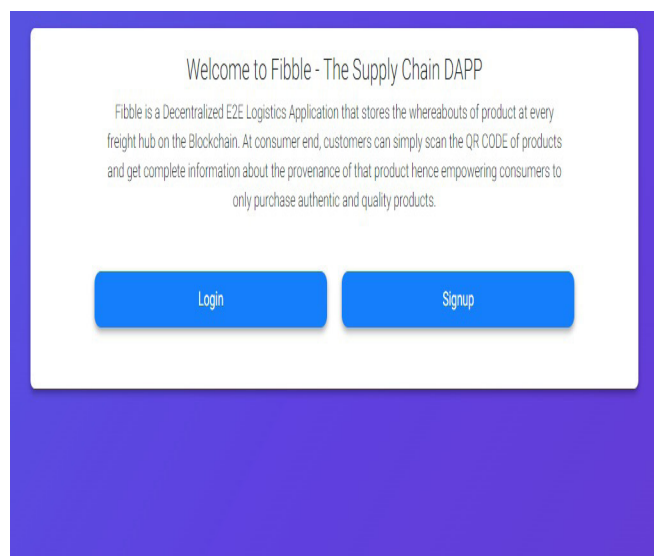


Figure 3.1 login/signup view

#### **Implementation Steps:**

The textile industry blockchain is implemented to authenticate and track back the fabrics manufactured by the industry, send them to shipment, and then deliver them to the end consumer. We developed this whole supply chain on the Blockchain so both manufacturer and consumer can authenticate the product which was manufactured by the industry and the same product delivered to the consumer so there will be no change or tempering between both manufacturers and consumer can authenticate the product location and shipment by using product tracking id or just scan QR code which will be imposed on products packaging we followed these steps to implement Blockchain.

- 1) Download and install Ganache (The Ethereum blockchain is used to conduct tests, issue commands, and inspect state while maintaining control over the blockchain's operation.
- (2) Download and install meta mask (The Ethereum

blockchain is accessed through a wallet. allows users to communicate with decentralized applications and access their Ethereum wallet. (dApp)

3) Create a meta mask account [figure 3.2].

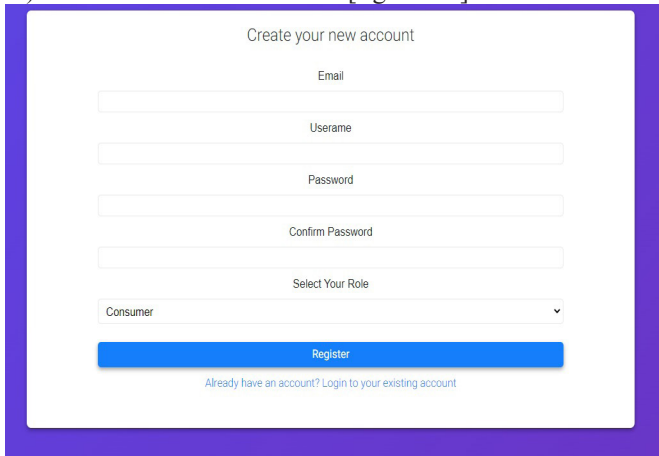


Figure 3.2 New Account Registration

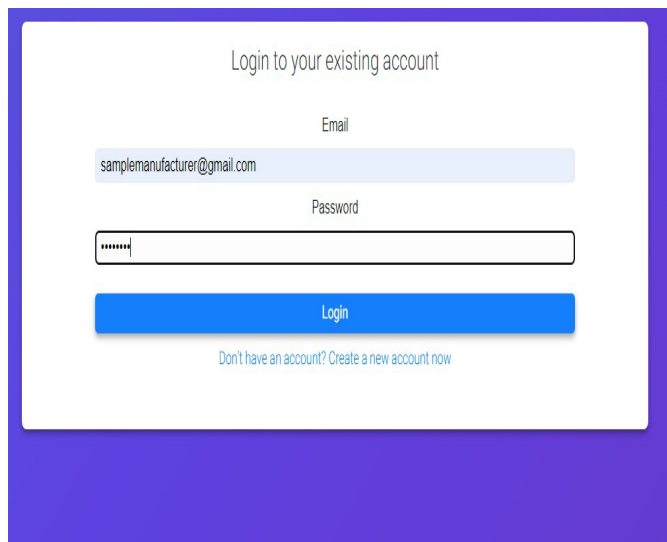


Figure 3.3 Existing Account Login

4) Run Ganache.

5) In metamask, add a network to connect ganache with it using localhost and RPC server URL

6) Go to Metamask > Accounts > Import Account.

7) Open Ganache, copy the private key from the ganache user account, and connect it with metamask

8) To execute smart contracts, create the smart contract using solidity on the remix Ethereum-based platform. We created a smart contract to implement a textile industry supply chain in which manufacturers can add products and label them for shipment using a QR code generated automatically upon manufacturing on any fabric or item.

Then we labelled it with shipment location so the consumer can track where his ordered item is right now by simply scanning the QR code and all the details related to the products

will be shown to users. Users can trackback till the manufacturer date. And scan the shipment of it. The manufacturer will keep continuing produce new items and the product id or QR will automatically be placed.

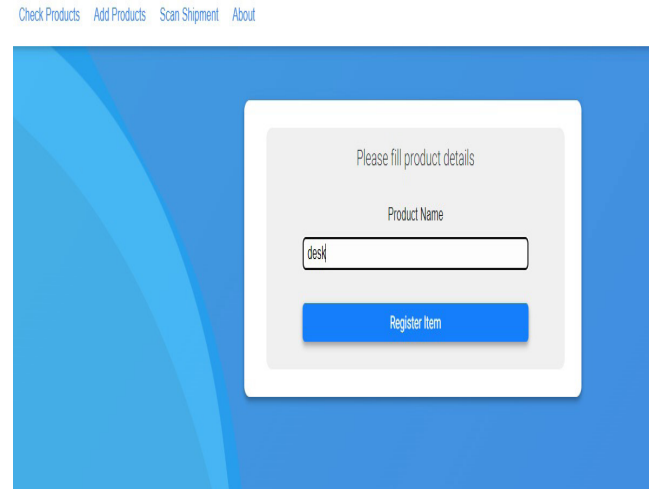


Figure 3.4 Product Information Registrations

9) Then we saved it, compiled the smart contract, and deployed it on Remix Ethereum using injected web3 environment (option to use metamask at this point, MetaMask controls which network you are connecting to, like localhost or any other network).

10) Copy the contract address and ABI to connect it with our front-end application (ABI is a JSON array that defines the contract interface).

11) Start the local server.

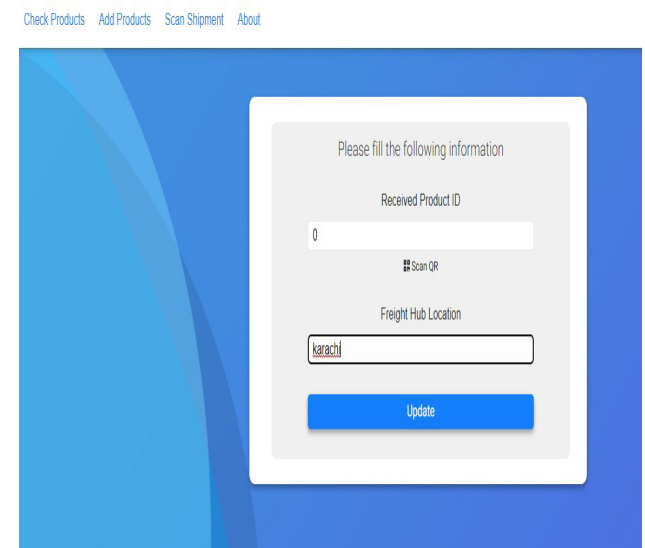


Figure 3.5 Product Details for Registration

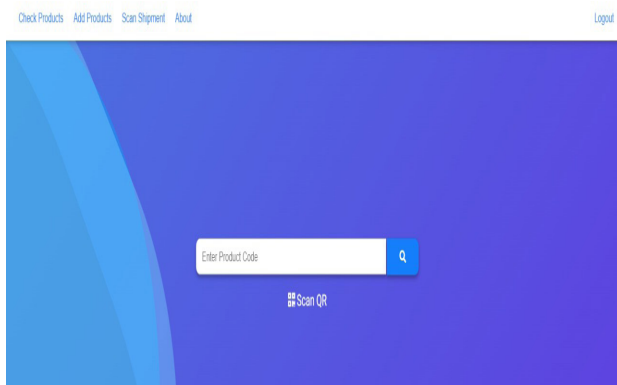


Figure 3.6 Scan QR Code

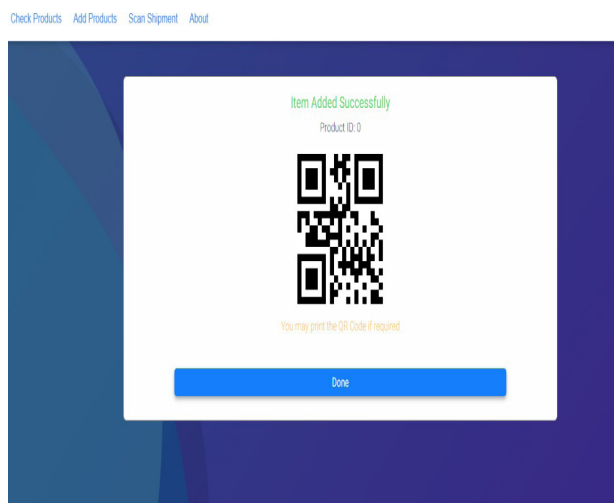


Figure 3.7 Product Details Stored

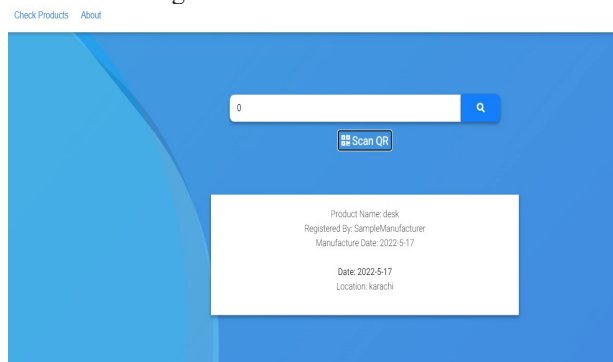


Figure 3.8 Product Information Displayed

**PSEUDO CODE:**

**Algorithm on Working:**

1. Define pragma solidity version
2. Initialize smart Contract SupplyChain
3. Initialize Struct of Events and Products with related fields
4. Create function NewItem accepts parameters text and date
- Return True/False**
5. Initialize new product with item created by Manufacturer
6. If item already exist:
  - break
  - Else:**
    7. create new Item with name and location
8. Create function Scan Shipment
9. initialize location to null
10. Assigned new location to item location then generate QR Code
11. Save the QR code to scan later to track product location
12. **Return** Product Info
13. Create function Search Product with parameters product Id
- Return** product Details
14. Show the related products Details by uploading QR Code
15. Concat the current Date with product Shipment then showed to user
16. **If** product exist:
  - Scan the shipment
  - If** shipment exist:
    - show product details with time stamp
  - Else:**
    - Allocate new shipping location
- Else:**
  - Product not exist
  - Break
17. **Return** Output

Figure 3.9 Algorithm Implemented

12) Execute SQL query to store user databases

13) Our front-end application is now running and connected to Ethereum.

**Start Test Blockchain:**

We test the blockchain by compiling smart contracts and deploying them on the Ethereum blockchain network. First, it checks the network connected to the blockchain, and ganache manages the user account and its balances. Then if any transaction happens, it first checks the user account balance while deploying the contract to the blockchain network if there is enough balance, then it accepts otherwise, it will reject

There are two types of tests unit tests and integration tests. While unit tests focus on each function individually, integration tests focus on how several code components interact as defined in a smart contract.

We use the truffle suite to implement our testing and performance of blockchain network as our application is full stack. There will be two test solidity tests and a JavaScript test.

**Nodes:**

When the industry starts manufacturing, the nodes will develop first. The node will be created when a new user prompts up on the blockchain network then there will be the production of new products. New nodes will create upon each transaction is happening. Any transaction happens like the user purchasing any item or supplier developing a new item and then delivering it to the shipment. New nodes will be created for the customer. The user can track back to the end node to the genesis node to authenticate his product quality and assurance if there is any change in any node, then all the nodes will be updated. Let’s say someone is trying to change the product id on a particular node, which will automatically change on every node. It will detect so there are no chances of tempering the data.

**Transaction Happen:**

The manufacturer produces a new item and labels the QR code to it. Transaction will happen, and a new block will create on the network. There will be a fee deduction from the manufacturer’s wallet for mining the new block, and then it labels the tracking id to the product and send it to shipment. There will be charges for mining a new block on the network, and so on. This will continue when their new node is created. When a user tries to purchase any item, product costs, and transaction fees will be deducted from his/her wallet, which is managed by ganache. The smart contract will execute and run its test depending on the requesting function.

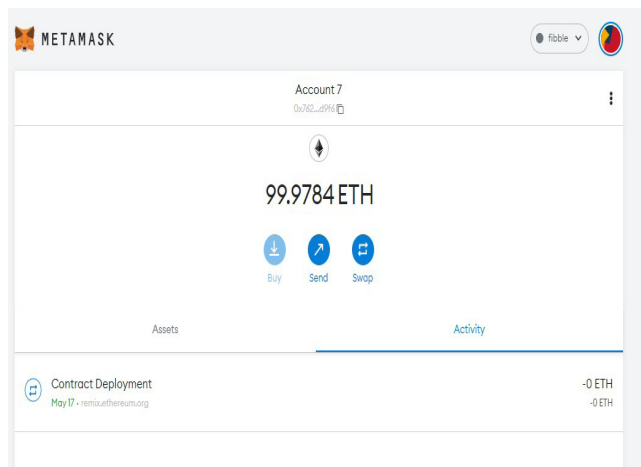


Figure 3.10 Wallet Managed by Ganache

The comparison and analysis of state-of-the-art Blockchain based approaches for the textile industry are presented in Table 1.

TABLE 1

State-of-art blockchain-based approaches to secure textile industries.

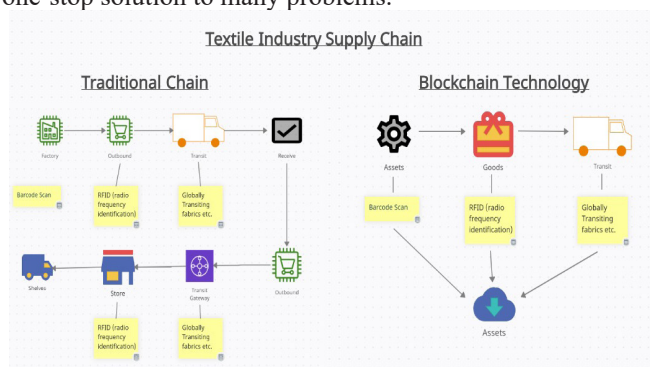
Author	Year	Objective	1	2	3	4	5	6	Pros	Cons
Kamalendu et al [8]	2020	To develop a business in view of IoT using blockchain	✓	✓	✗	✗	✓	✗	- Provided RFID which is an efficient process. - Enhanced communication between buyers and sellers	-Risk of credential security
Giulio et al [4]	2021	To make realize that traditional supply chains hold many issues	✓	✗	✗	✗	✓	✗	- Focused on how reliable and better-quality products can be made with reasonable cost	-Only qualitative analysis
Luis et al [13]	2021	To adopt circular Blockchain to minimize textile waste	✓	✓	✓	✓	✗	✓	- Provided great solutions for the recycling of materials	-highlighted a single issue
Antonio et al [12]	2021	Emphasizes social and environmental products using blockchain	✗	✗	✗	✓	✓	✓	- Emphasized more transparency which will resolve trust issues between buyers and sellers	-lack enhancement of traceability
Tina Nyman [15]	2019	Highlights the problem of how industries are still suffering from a lack of transparency	✓	✗	✗	✗	✓	✓	- Focused issues upon the multi-tier levels and contributed more o transparency on them	-qualitative analysis approach only
Peter et al [16]	2019	To develop scientific and industrial sectors with increasing demand blockchain	✓	✓	✗	✗	✓	✓	- Provided use for larger use of real-world attempts Blockchain	-Framework was required
Bill et al [19]	-	To overcome the complexities of circular supply chain through Blockchain	✓	✓	✗	✓	✓	✓	- Made implementations of effective use of resources, highlighting circular supply chain aspects	-limited to fashion sector
Sheikh et al [10]	2021	Demonstrated how industries can enhance security using Blockchain	✓	✓	✓	✓	✓	✓	- Taking advantage of the decentralization and privacy protocols blockchain offer to an industrial level, increased security	-scalability and key management
Ludvig[11]	2018	How Blockchain can create entrepreneurial value products	✓	✓	✓	✗	✓	✓	- Benefits start-ups with blockchain technology digitalization	- theoretically proven
Prof Tsan [7]	2020	Precedence of environmentally friendly products using Blockchain	✓	✓	✓	✗	✗	✓	- enabled traceability. - sharing of data with credibility and trust	-restricted information

1: Architecture 2: Access control policy 3: Algorithm 4: Traceability 5: Framework 6: Performance evaluation

**ANALYSIS & DISCUSSION**

Figure 4.1 shows two scenarios of the textile industry, the traditional one and the other after blockchain is implemented. We will first discuss the traditional method and why there was the need to transfer the entire system, and the advantages of using blockchain technology. The textile industry undergoes many stages to manufacture a product. The conversion of fibre into yarn, yarn into fabric, and so on. Since so many processes go around, the need for the consumer’s satisfaction and fulfilling the requirement of the buyers is the first and foremost task. After spinning, when the fibre is converted into yarn, it goes under the weaving process, where fabric manufacturing is performed. After that, the fabric is resized, dyed, etc., according to the market’s demands. The garment is then finally manufactured and is bought by whole sellers who further sell them to retailers and then finally to consumers. But this is not as simple as we have described. Fraudulent activity can be performed between these stages and processes whole sellers or retailers might manipulate the garments and differ in the quality, which is not manufactured by the textile industry. So, to overcome this type of several disadvantages, blockchain technology offers data transparency, which means that the consumer can ultimately track down the whole procedure. He will be able to recognize whether the industry originally assures the quality. RFID (Radio Frequency Identification) has played a vital role in this sector as it automatically generates a barcode and reduces time spent on manufacturing. Previously the processes were very time-

consuming and identifying where and what went wrong was not effortless. What blockchain offers is that it's a type of DLT (Distributed Ledger Technology) completely decentralized, records transactions in the ledger, and validates and authenticates users on a peer-to-peer network. Blockchain allowed data transparency, immutable records, and the concept of smart contracts. It improved efficiency, decreased costs as there is no need for a third party, developed trust between buyers and sellers, and improved security. Blockchain makes communication traceable between buyer and seller, as consumers can now ease their growing concern by viewing the data that answers their desired questions; hence, the outcome is authentic. One of the main advantages of adding blockchain to the textile industry is that it has reduced delays and error chances to a maximum extent. Earlier, when data was not easily available and transferred to all concerned members of the team (for example, the manufacturers, retailers, and sellers), the transparency of the process was missing, the coherency was lacking, and this led to time management issues due to many delays, clashes between workers, and hindrance in the supply chain itself. This technology has also helped make sales less labour-intensive, as the smart closet rack system manages very well. This technology has improved the customer's experience and is a one-stop solution to many problems.



#### 4.1 Block Diagram of Traditional and Blockchain-based Textile Industry

#### CONCLUSION

Blockchain extends innumerable benefits regarding how to make data unshakable. It has intensified in many fields, including the textile industry, making work easier, faster, and more dependable. A smart contract is written in solidity for the supply-chain process of this industry. This paper presents a practical approach to deploying blockchain in the textile industry. A test Ethereum blockchain is created using ganache and remix platform. The analysis shows that blockchain can easily and efficiently be deployed in the textile industry and secures the overall process.

#### REFERENCES

[1] Ayan, B., Güner, E., & Son-Turan, S. (2022). Blockchain Technology and Sustainability in Supply Chains and a

Closer Look at Different Industries: A Mixed Method Approach. *Logistics*, 6(4), 85.

- [2] Agrawal, T. K., Kumar, V., Pal, R., Wang, L., & Chen, Y. (2021). Blockchain-based framework for supply chain traceability: A case example of textile and clothing industry. *Computers & industrial engineering*, 154, 107130.
- [3] Blomqvist, L. (2018). Blockchain and Entrepreneurial Value Creation in the Textile Industry.
- [4] Caldarelli, G., Zardini, A., & Rossignoli, C. (2021). Blockchain adoption in the fashion sustainable supply chain: Pragmatically addressing barriers. *Journal of Organizational Change Management*.
- [5] da Cruz, A. M. R., & Cruz, E. F. (2020). Blockchain-based Traceability Platforms as a Tool for Sustainability. In *ICEIS (2)* (pp. 330-337).
- [6] Guo, H., & Yu, X. (2022). A Survey on Blockchain Technology and its security. *Blockchain: research and applications*, 3(2), 100067.
- [7] Guo, S., Sun, X., & Lam, H. K. (2020). Applications of blockchain technology in sustainable fashion supply chains: Operational transparency and environmental efforts. *IEEE Transactions on Engineering Management*.
- [8] Gonczol, P., Katsikouli, P., Herskind, L., & Dragoni, N. (2020). Blockchain implementations and use cases for supply chains-a survey. *Ieee Access*, 8, 11856-11871.
- [9] Hader, M., Tchoffa, D., El Mhamedi, A., Ghodous, P., Dolgui, A., & Abouabdellah, A. (2022). Applying integrated Blockchain and Big Data technologies to improve supply chain traceability and information sharing in the textile sector. *Journal of Industrial Information Integration*, 28, 100345.
- [10] Idrees, S. M., Nowořtawski, M., Jameel, R., & Mourya, A. K. (2021). Security aspects of blockchain technology intended for industrial applications. *Electronics*, 10(8), 951
- [11] "ISO Textile Testing Standards." Study.com. April 5, 2018. <https://study.com/academy/lesson/iso-textile-testing-standards.html>
- [12] Lee, I., & Mangalaraj, G. (2022). Big data analytics in supply chain management: a systematic literature review and research directions. *Big Data and Cognitive Computing*, 6(1), 17.



- [13] Lieder, M., Asif, F. M., Rashid, A., Mihelič, A., & Kotnik, S. (2017). Towards circular economy implementation in manufacturing systems using a multi-method simulation approach to link design and business strategy. *The International Journal of Advanced Manufacturing Technology*, 93, 1953-1970
- [14] Nakamoto, S., & Bitcoin, A. (2008). A peer-to-peer electronic cash system. *Bitcoin*.–URL: <https://bitcoin.org/bitcoin.pdf>, 4(2).
- [15] Nyman, T. (2019). Increased transparency and prevention of unethical actions in the textile industry's supply chain through blockchain.
- [16] Pal, K. (2020). Internet of things and blockchain technology in apparel manufacturing supply chain data management. *Procedia Computer Science*, 170, 450-457.
- [17] “Quality Management System in Garments Manufacturing” [www.ordnur.com/apparel/quality-management-system-garments-manufacturing/](http://www.ordnur.com/apparel/quality-management-system-garments-manufacturing/)
- [18] Senthil Rathi, B., & Senthil Kumar, P. (2022). The Future of Blockchain for Wastewater Treatment in the Textiles Industry. In *Blockchain Technologies in the Textile and Fashion Industry* (pp. 109-123). Singapore: Springer Nature Singapore.
- [19] “Sir Richard Arkwright” [www.britannica.com/biography/Richard-Arkwright](http://www.britannica.com/biography/Richard-Arkwright)
- [20] Vaidya, S., Ambad, P., & Bhosle, S. (2018). Industry 4.0—a glimpse. *Procedia manufacturing*, 20, 233-238.