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A Novel Decentralized-based Smart Contract for Merchandise Using Blockchain Technology

Pardeep Seelwal[1], Achyutha Prasad .N[2] , Chetana Srinivas[3], Rekha V S[4]
[1]Assistant Professor
Department of Computer Science
M.N.S. Government College Bhiwani
Pardeepseelwal@gmail.com
[2]Professor
Department of Computer Science and Engineering
East West Institute of Technology
Bengaluru, Karnataka
achyuth001@gmail.com
[3]Associate Professor
Department of Computer Science and Engineering
East West Institute of Technology
Bengaluru, Karnataka
chetanasrinivas1@gmail.com
[4]Assistant Professor
Department of Computer Science and Engineering
Dayananda Sagar Academy of Technology and Management, Bengaluru, India
rekhasedam.vtu@gmail.com

Abstract— Trading systems have grown in popularity since the advent of the internet and mobile phones. In a trading system, the seller will offer a product, and a number of potential purchasers will compete for it. The highest trader will win the product. This sort of trading system's participation of a third party, usually a company or group of businesses that will create and host the website or mobile application, is one of its main negatives. Because this organization will handle all aspects of commerce, buyers and sellers must have confidence in it. The corporate entity has the ability to regulate the trading process. In this work, a novel decentralized blockchain-based smart contract for merchandise is proposed to overcome this limitation. There is no need for a third party in this invention. All trade transactions will be handled by a smart contract. This strategy guarantees that the integrity of the trading process is entirely safeguarded because blockchains are renowned for their integrity.

Keywords—Blockchain; Decentralized system; Distributed Ledger; Merchandise.

I. INTRODUCTION

Integration services have steadily transformed people's daily lives as a result of the popularity of the Internet, such as e-commerce transactions, transportation, social networking, email, mobile apps, multiplayer online gaming, Internet telephony, and other similar technologies. Online trading, also referred to as e-trading, gives traders complete autonomy [1]. Merchandising is a prominent e-commerce activity that allows merchants to trade things directly over the Internet. Trading is always dangerous, both online and offline, regardless of how you trade. There is never a guarantee that the third party is trustworthy in merchandising [2]. In the case of sealed trades, the intermediaries must pay a higher transaction cost because the third party plays a crucial role in facilitating trade between the buyers and sellers [8]. To get around this constraint, we present a unique decentralized system that assures and preserves data integrity and availability in this paper [4]. Despite the fact that security and privacy are essential issues in products, numerous solutions for security and privacy in networks have been a decentralized blockchain network eliminates the requirement for anybody to know or trust anyone else [3].

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Each network member has a copy of the same data, which is stored as a distributed ledger. Blockchain-based Merchandise allows users to transact directly for goods via the Internet [5]. In this article, we provide a blockchain-based approach with low transaction costs for creating smart contracts for open and closed payments. A blockchain is a type of digital ledger that employs encryption to record transactions and protects data from fraud, system modifications, and cyberattacks [6]. A blockchain is a network of connected computer systems that duplicates and disseminates digital records. Each participant's ledger has a record of every new transaction that takes place on the blockchain, and each block in the chain contains a number of transactions [7].A decentralized database managed by several individuals is known as distributed ledger technology (DLT). A distributed node is a blockchain system that allows users to access, verify, and send network data. Blockchain can help with transaction validation and traceability at various stages [9]. It's possible to have secure transactions, cheaper compliance expenses, and faster data transfer processing. Blockchain technology facilitates contract administration while also allowing you to authenticate [20] the provenance of your product. Being an immutable public digital ledger, transactions that have already been recorded cannot be altered [8]. Because of its encryption capabilities, blockchain is always safe. The ledger is automatically updated, and the transactions are executed promptly and transparently [7].

Since it is a decentralized system, there is no need for an intermediary fee. The authenticity of a transaction is confirmed and validated by participants. Due to all transactions being recorded in the same, decentralized ledgers, the smart contract may assure that the payment is safe, secret, non-reputable, and unalterable [9]. A smart contract is a written piece of computer code that represents their agreement. They are kept in a public database and cannot be changed since they operate on the blockchain. The blockchain processes transactions which are conducted on smart contracts. An agreement between the two is represented by computer code and is known as a smart contract. They operate on the blockchain, are kept in a public database, and cannot be altered [8]. Smart contract-enabled transactions are processed through the blockchain. The corporate operation benefits of smart contracts are particularly clear. Through corporate collaboration, contract execution is usually automated. This eliminates the requirement for intermediaries and gives everyone engaged instant access to the outcomes [12]-[14].

An individual's identity is one of their most priceless belongings. It includes details on a person's digital assets, data, and reputation. A person's digital identity has the potential to lead to new opportunities if handled properly.

II. LITERATURE REVIEW

The primary goal of this project is to develop a novel decentralized system that assures and preserves data integrity, confidentiality, and availability [2,3]. One of the most obvious goals is to reduce transaction costs and hefty fees as compared to traditional trading. Previously, typical trading features were mainly used in the investigations [1]. Unquestionably, one of the largest obstacles to trading procedures is the potential for cyberattacks. Studies indicate that trading is vulnerable to harmful attacks. Nowadays, everything is digitized, making it simpler for cyber terrorists to target traders than it was in the past when procurement teams would phone suppliers and negotiate deals[4]. Trading, whether it be traditional or digital, is predicated on pricing because there is a chance that one will choose an unwise price. Trading results in specialization and one-sided economic growth due to the operation of comparative costs, which is not advantageous for the prosperity of the nation [10]-[11]. Some online trading platforms have convoluted fee structures that may be challenging to comprehend. Unfortunately, hidden costs can affect anybody. Because the price is frequently the primary motivating factor, it creates a trade restriction. However, holding a trading deal will always cost more than conducting bilateral discussions because of greater fees that must be paid to third parties. In order to help develop a plan for the trading process, the seller would typically consult with financial, legal, and other consultants early on. The seller's overall expenses increase as a result [15]-[16] of having to negotiate with multiple traders at once. Given the number of parties involved in a trading process, the larger [19] disclosure of confidential information puts the seller at danger, particularly when a trader is a rival. Administrative tasks, such as transferring money between accounts or trading positions, could take a long time and limit trading opportunities [8]. Therefore, blockchain-based solutions may be used to avoid these issues [6]. In this paper, we offer low-cost blockchain technology that may be used to create smart contracts for public and sealed trades. This study intends to develop blockchain-based products that promote

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trust across distinct entities where trust is either non-existent or unproven [5]. It ensures data security, transparency, and traceability across the trade network, as well as creating an unalterable record of transactions through end-to-end [17]-[18] encryption.

III. THE PROPOSED METHOD

The proposed system consists of 6 modules, they are:

- Module 1: Account Access Layer: The account operations module gives our project's end-users account operational capabilities.
- Module 2: Node Implementation: The Node Operations module provides our project's end-users with unique blockchain operational capabilities.
- Module 3: Product Addition: The product addition module supplies our project's end-users with various product operational functionalities.
- Module 4: Trade Market and Participation: This module gives our project's end-users trading capabilities.
- Module 5: My Products and Win Logs: This module offers our project's end-users detailed product and trade winner information.

✓ The proposed method's major goal is to provide an effective online-based platform for clients and suppliers while eliminating the trading system's middlemen.

✓ As a result, we propose a novel decentralized system that guarantees and protects data integrity, confidentiality, and availability. The Fig. 1. represents the data flow diagram of the proposed merchandise system.

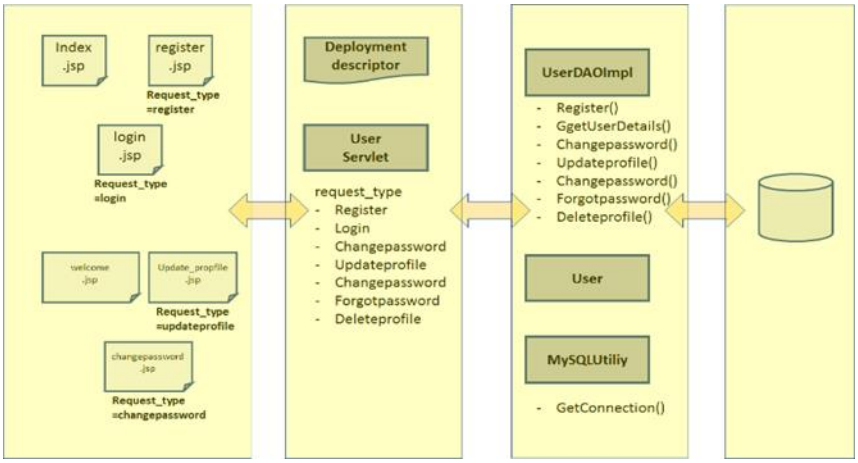

Fig. 1. Data flow diagram of the proposed system

IV. IMPLEMENTATION OF PROPOSED SOLUTION

The realization of an application, execution of a plan, idea, model, or design of the offered solution is referred to as implementation.

This step entails ensuring that the system meets user requirements, objectives, and the system's scope. The solution to the current difficulties is created during the implementation phase.

Module 1: Account Access Layer

➢ The account operations module delivers the following features to our project's end-users:

- Create a new buyer/seller account.
- Log in if you already have an account.
- Log out of the current session.

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- Edit a profile that already exists.
- For security reasons, change your password.
- Delete an account that already exists.

Module 2: Node Implementation

- We will create the blockchain network in this module by creating a set of distributed ledger nodes.
- Each node will be able to carry out a variety of tasks. Once the transaction on the blockchain has been committed and the block has been mined, you will receive the blockchain data.
- To perform block validation, compare the hash codes of the current block to the hash codes of the blocks that came before it.
- Provide read-only access to the clients on that node so they may see how many blocks and what kind of data are being stored. Once the trader has requested blockchain data, provide it.

Module 3 : Product addition

❖ In this module, the seller of the product in our portal will be given an HTML interface through which he/she can add the product that he/she is planning to sell.

❖ The seller will have to provide some basic information about the product like the name, description, and the URL to the actual product.

❖ All the above fields are mandatory to be provided by the seller.

❖ The product once is added, it will immediately be shown up in the market where the users can start Trading for it.

❖ The end-users will not be given the luxury to upload the rich quality product images due to the limitations in the cloud storage space. Instead, the sellers must be specifying the URL to the image of the product from google drive or any other hosting site.

Module 4: Trade Market and Participation

❖ The product once added by the seller, it will immediately be shown up in the market where the users can start trading for it. The user must be entering the amount in the textbox provided against the product of interest.

❖ The traded amount by the buyers along with the unique identifier for the product will be stored in the blockchain network.

❖ There will be a blockchain service class that does the operation of writing and reading to and from the blockchain network.

❖ This blockchain service class will make use of the Ledger Distribution Thread to write to numerous blockchain networks concurrently.

Module 5: My Products and Win Logs

❖ This portal enables the seller of the product to see the status of their products and the trader details for their product.

❖ At any point in time, the seller can close the trade window and declare the buyer with the highest trade as the winner.

❖ An email confirmation will be sent to both the buyer and seller once the trading window has been closed.

❖ The buyer details and the log of the total traders and their trades will always be there at this portal so that the seller can have an access to this data at any point in time.

The Fig. 2 represents the System Architecture Diagram of all the modules.

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Fig. 2. System Architecture Diagram

The arrangement of operational correspondences is a system architecture diagram. These are formal components that represent ideas and data.

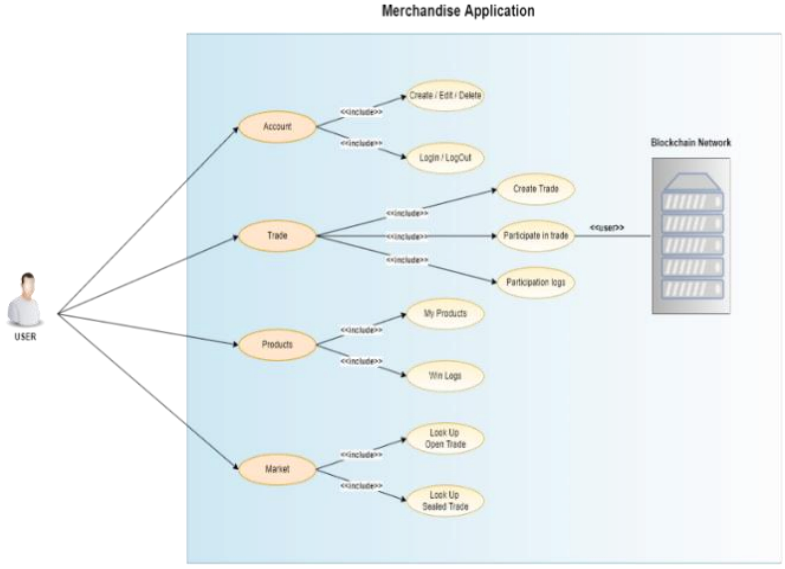

Fig. 3. Use Case Diagram of the proposed system

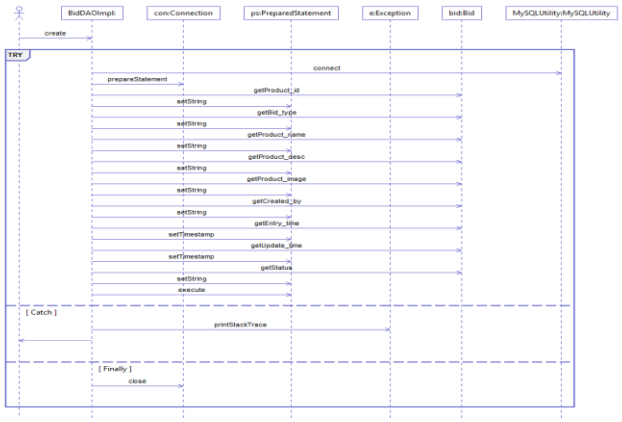

Fig. 4. Initial Sequence Diagram

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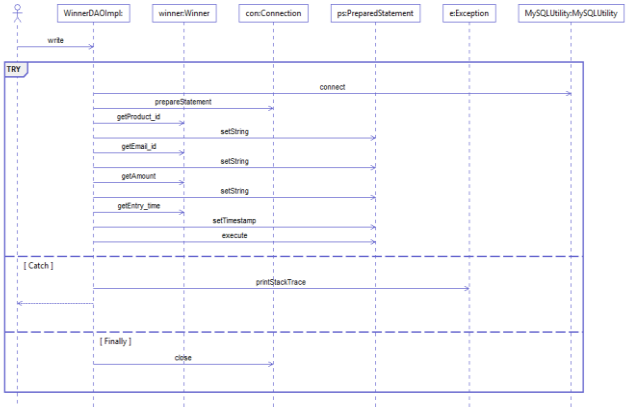

Fig. 5. Final Sequence Diagram

The Fig. 3 represents the Use Case Diagram of the Merchandise Application. Fig. 4 and Fig. 5 represents the sequence diagrams of the working modules.

V. RESULT ANALYSIS

Our systems' various forms of repercussions have all been described and discussed. The decentralized blockchain-based smart contract for merchandise systems, on the other hand, can be accessed via the internet. As a result, the following screenshots depict the various activities that may be conducted as well as the various functions that our merchandise application provides benefits to the end-users in real-time.

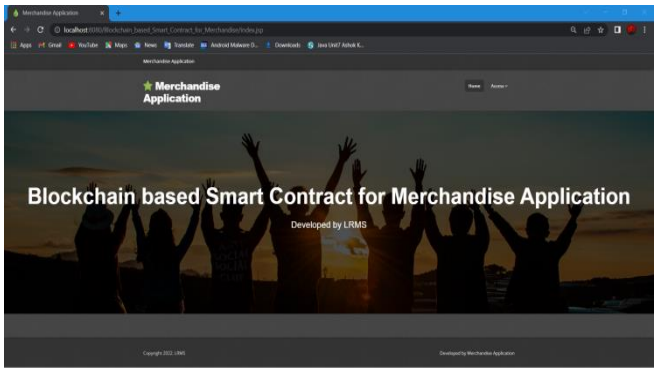

Fig. 6. Home Page - The Initial page of the Website.

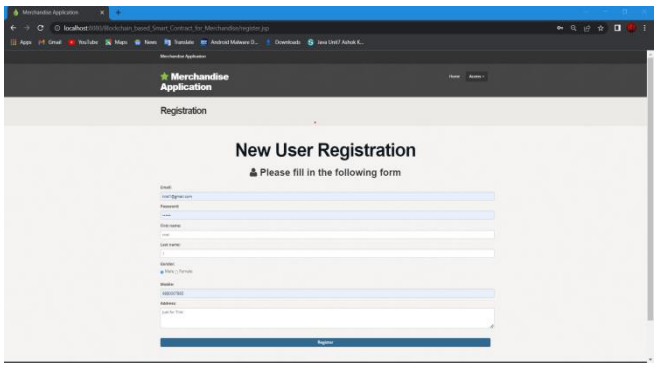

Fig. 7. Register Page

The Fig. 7 represents the users and organizations can independently sign up and receive access to your system via a signup page.

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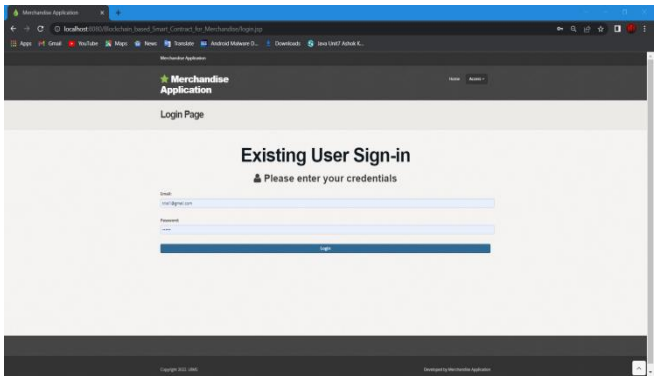

Fig 8: Login Page

Fig. 8 represents the website's entrance page, where users must routinely input a username and password combination in order to be identified and authenticated.

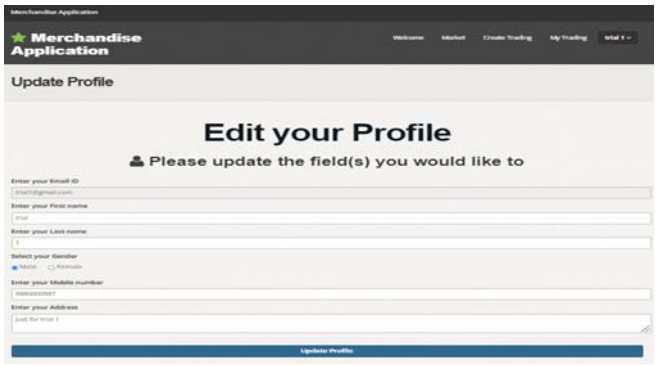

Fig 9: Edit Profile Page

Fig. 9 indicates that the users can update their profile anytime.

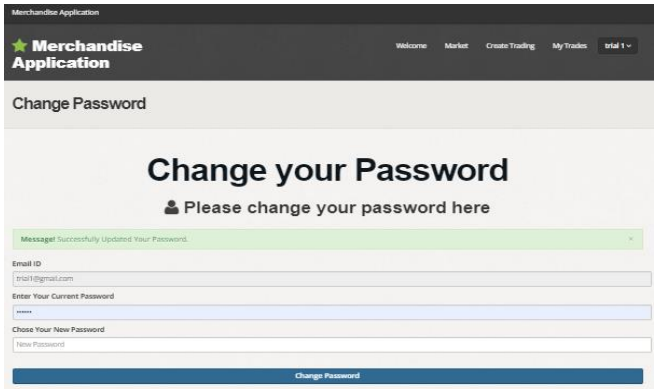

Fig 10: Change Password Page

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Fig. 10 specifies that the users can change their password anytime for security purposes.

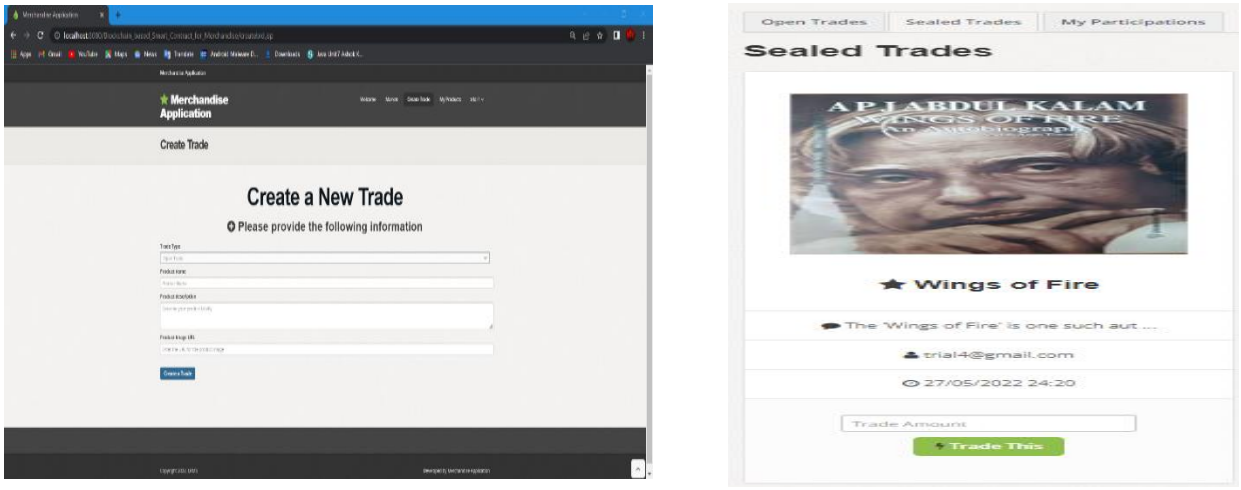

Fig 11: New Trade Page – Create a New Trade page for users.

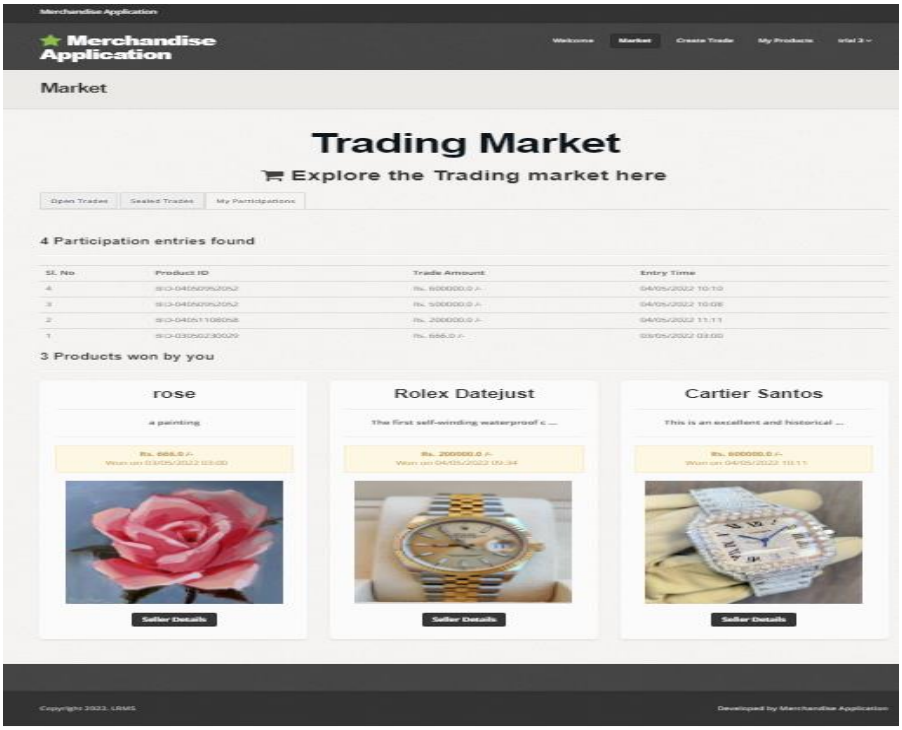

Fig. 12. Market Page

My Participations and market page for users seen in Fig. 12

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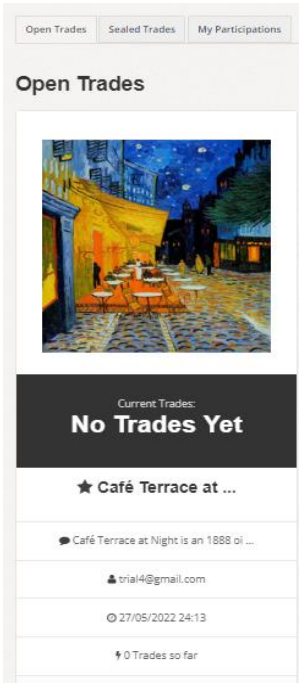

Fig 13: Open Trade Window

Fig 14: Current Trade Window

The Fig. 13 to Fig. 15 specifies the trading window regions.

Fig. 15. Sealed Trade Page

Fig 16: Close Trading Window

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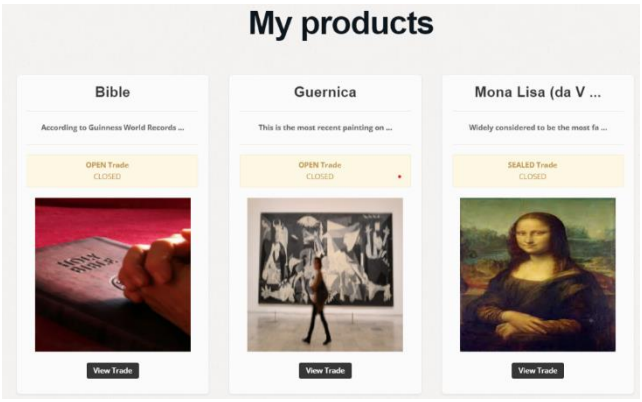

Fig 17: Winner Details Window

Fig. 16 and Fig. 17 Details of the Button to close the Window and the Winner.

Fig 18: Blockchain Window

The Distributed Ledger logs of all the transactions of trades carried out in the merchandise as in Fig. 18.

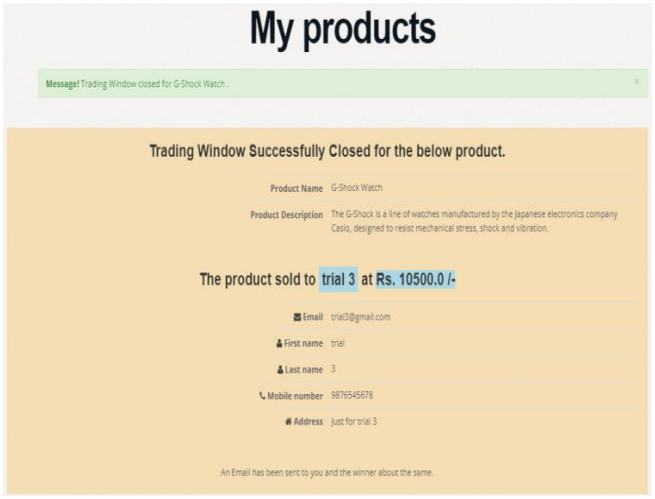

Fig. 19 Trading Window

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As seen in Fig. 19, My products window represents, when a user is declared as the winner for any of the products.

VI CONCLUSION & FUTURE WORK

The Decentralized Blockchain-based Smart Contract for Merchandise is a useful online platform for clients and suppliers to explain the concept to newcomers. This blockchain-based approach assures seal confidentiality, non-repudiation, and immutability. Users can trade at their preferred price on this trading platform. The platform uses blockchain to store transactions and trade history, making it decentralized, transparent, and reliable. The smart contract has made it possible to conduct secure automated trading operations. As a result, blockchain technology is employed to eliminate the trading system's intermediary. Because the smart contract handles the responsibilities of the intermediary, the transaction fees paid to the middleman are eliminated. As a result, people with disabilities can work in this industry. They can use this internet platform to sell or buy their stuff. They are not required to move around. Everything is controlled by a computer or smartphone. This project can also be run on the cloud infrastructure using its platform. We can use the Digital Ocean Cloud service provider for this purpose. They can use the internet to obtain interactive multimedia information and receive adequate services at home. This will benefit the general public. They can develop careers for themselves with the right guidance and incentive. In future work, we want to scale our product to a huge number of users and develop an effective algorithm for distributing the load among them

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