Blockchain based Trusted Product delivery in E-commerce system

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DECLARATION

This is to certify that the thesis titled "**Blockchain based Trusted Product delivery in E-commerce system**" is the result of our study in partial fulfillment of the B.Sc. Engineering degree under the supervision of **Dr. Abu Sayed Md. Mostafizur Rahaman**, Professor, Department of Computer Science and Engineering (CSE), Jahangirnagar University, Dhaka, Bangladesh. It is also hereby declared that this thesis or any part of it has not been submitted elsewhere for the award of any degree.

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ABSTRACT

Almost everything has become common as a result of the advent of digitization and the use of the Internet. It is most frequently used in e-commerce platforms. The majority of customers prefer Internet banking, shopping, selling and purchasing, among other services. However, along with the numerous advantages and benefits that E-commerce systems pro- vide, there are also some drawbacks. The most significant issues are with security, cash transaction and theft. Additionally, delivering product properly to the buyer is another issue. In this work we propose trust in product delivery in E-commerce Supply chain using Blockchain Technology. This solves the trust issue during product delivery. Finally, the work is implemented by Ethereum, Ganache, Solidity, React, Metamask, Web3.js and MySQL.

TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1 Overview

The world has seen a lot of revolutions over the past decades owing to the blessings of the Internet. The first generation of this digital revolution gave us the Internet of information, with the goal of providing the world's inhabitants with as much diverse knowledge as possible. The second generation, enabled by blockchain technology, is delivering us the Internet of value, with the goal of making the internet trade industry more flexible and trustworthy. Blockchain is an emerging technology in the current world [1]. Today you will have a tough time finding any bank, business, accounting firm, prominent company or a government which is sleeping on cryptocurrencies and did not launch any projects or research targeted at it. Even better, with cryptocurrencies the users can mine for it and as a result the total amount of digital currency in the economy grows [2]. While bitcoin remains the most popular cryptocurrency, many others followed it - some of which are speculated to have big impacts in near future. These include Ethereum, Ripple, Litecoin, Monero, Ethereum Classic etc. all of which made possible by the application of the ingenious technology that is blockchain. Because of all these, it has become much more important now to gather some simple ideas about blockchain, to think over the facilities that blockchain provides, to investigate the problems that blockchain tends to solve and thereby to ensure the best possible utilization of this technology in the financial and non-financial sectors where it may help to make the complex situations simple [3]. The technology of blockchain is not confined to financial purposes only, it has a lot more non-financial possibilities too, e g. decentralized storage system (record data in a manner where it is almost impossible to alter), proof of existence, verification of documents, insurance and so on [4]. In January 2021, there were 47.61 million internet users in Bangladesh, and the number was growing by the day. Between 2020 and 2021, the number of internet users in Bangladesh rose by 7.7 million (+19%). In September 2021, internet penetration in Bangladesh was 28.8 percent. Between April 2020 and April 2021, the number of mobile internet connections in Bangladesh rose by 1.7 million (+1.1%) [2]. With this enormous number of internets user, the

developers are always trying to make this blockchain technology more user friendly. Blockchain works like its name. It uses a chain of blocks. When a new block is added, the preceding block's hash is used in the new block's head section. Hashing is a way of creating a specific length string based on a file or data [5]. If a single bit changes in the data, then the whole hash output will be changed. So, if anyone tries to alter the previous block's data then the hash will be changed and the link of the block will break [6]. This can be used as a digital trust medium. Still, it needs to be admitted that there would be some challenges that blockchain might have to face in near future, like its cost and efficiency, security and privacy, regulation, culture, and some understanding related issues. Nevertheless, the way blockchain is becoming popular day by day, there are possibilities that this evolving technology would be a leading one in the sectors of virtual trading world.

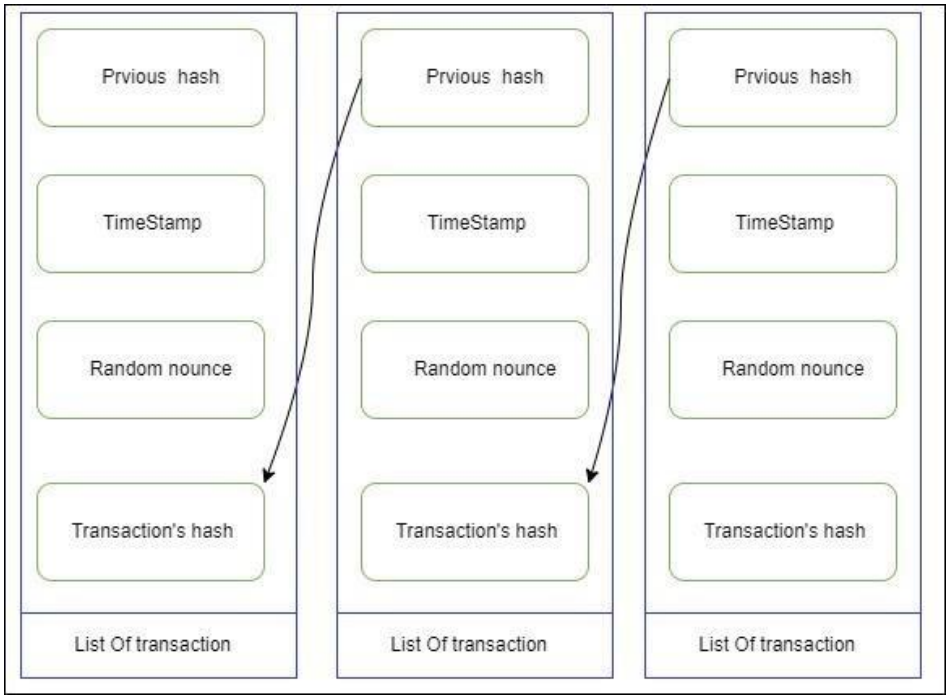


Fig.1: Blockchain illustration [7]

1.2 Motivation of the Study

Blockchain is a decentralized and cryptographically secure public ledger of all digital transactions or events shared among the parties concerned. It provides a way to effectively store the data of the users and not to change those under normal operations, thus providing a much more secure way [8]. Furthermore, by allowing transactions to settle instantaneously, this technology has the potential to improve the efficiency of stock trading. Thus, blockchain is a faster and decentralized model that has no crucial point of failure. People are now getting everything they need from the internet very quickly. Someone who wants to buy something first goes online and checks it carefully. It makes our life easier but also it raises many security concerns. Online fraud has increased recently [9]. Last year, numerous e-commerce and Facebook commerce (f-commerce) websites fooled more than 11.48 percent of e-commerce clients. In 2019, the figure was previously 7.44 percent. Using blockchain technology many cryptocurrencies came to the internet like Bitcoin and Ethereum. Ethereum is one of the most popular cryptocurrencies. Unlike bitcoin, anyone can write a smart contract and execute it in blockchain, which opens the way for decentralized apps or d-app. A decentralized app or d-app can be used in many aspects where trust is the focus point. A multi-vendor E-commerce is an ideal example. In a multi-vendor e-commerce store, many sellers join and sell their products. When e-commerce many vendors join it is tough to monitor all sellers for their product authenticity. A d-app with a smart contract can be a solution to this problem.

1.3 Problem Statement

According to research conducted by Sumit Badotra and Amit Sundas [10], in E-commerce Many internet businesses provide things at incomparable pricing. So, it seems to reason that you would want to make an online purchase using a credit card (CC). However, this time, your CC payment is declined on the Internet [11]. You're perplexed as to why you're receiving an online card payment refusal when the funds should logically be granted. They also warned that the vendor would have to deal with any malicious client who refused to pay or deny the transaction while keeping the things offered (repudiation). To resolve these challenges, he may retain the services of a financial intermediary to collect the selling profits. There is also the possibility that an order

may not be delivered. It is conceivable that your package will never reach safely, either due to a fault with the courier or theft [12].In our current project, we proposed Trust in product delivery in E-Commerce Supply Chain using Blockchain Technology. Where a user can buy things using Ethereum wallet. Another thing in this system is, until a user confirm transaction Ethereum transfer won't possible. A buyer will confirmtransaction when he/she get his/her product in hand. So that theft problem will be reduced. Also in this system a buyer cannot claim that he/she paid and does not get his/her product. If a buyer does not get his/her product then consumers can ask for refund for that product.

1.3 Research Objectives

In recent years in Bangladesh, internet users increased rapidly due to cheap internet and smartphone cost. Consumers do not need to go outside to buy products, can now buy their daily needs from the internet easily. Bangladesh's online payments have climbed from Tk 1.68 billion in 2016 to Tk 19.78 billion in 2019 [13]. It is a significant improvement for consumers and the country's economy although it has some limitations. Online frauds are rising at an alarming rate. As many people engage in online shopping, scammers took this as a chance to gain their advantage. Last year, numerous e-commerce and Facebook commerce (f-commerce) websites fooled more than 11.48 percent of e-commerce clients [2]. It will significantly damage trust in the e-commerce sector, which also impacts the economy negatively. In keeping with our goal of creating financial trust in the ecommerce supply chain in Bangladesh, we developed the following one research questions.

RQ1: How online frauds can be reduced in E-commerce sector in Bangladesh?

1.4 Contribution of the Study

Over the years, online shopping has grown and changed the retail business. This was exacerbated by the recent pandemic, which forced the public to stay at home, making internet shopping the best alternative. However, due to several new technologies and advancements in the sector, e-commerce has experienced substantial improvements [14]. Here, we proposed an ecommerce system using blockchain technology where this technology can be rightfully applied. In our current system, Financial Trust in E-Commerce Supply Chain in Bangladesh using Blockchain Technology, where a user can buy things using Ethereum wallet. Another thing in this system is,

until a user confirm transaction Ethereum transfer won't possible. A buyer will confirm transaction when he/she get his/her product in hand. So that theft problem will be reduced. Also, in this system a buyer cannot claim that he/she paid and does not get his/her product. If a buyer does not get his/her product then consumers can ask for refund for that product. As a result, we believe that this paper will be useful in gaining a fundamental understanding of our ecommerce system and providing useful information on its working horizons.

The following is a breakdown of how this study is structured. The first chapter introduces introduction. Which includes overview, Motivation of the study, Problem statement, Research Objectives and Contribution of the study. Chapter 2 is devoted to a related work, which helps in the comprehension of many topics connected to blockchain technology. Which includes Background study, Literature Review and Summary. The proposed method is described in Chapter 3. Chapter 4 discusses the implementation details. Chapter 5 and Section 6 describes Results and Discussions and Conclusion respectively. Chapter 5 also includes Objective justification, Statistical Data analysis and survey outcome, Advantages, Disadvantages, Limitations and Future Works.

CHAPTER 2

RELATED WORK

2.1 Background Study

Blockchain is a cryptographically secure distributed and decentralized database of records, or public ledger, of all transactions or digital events that have been conducted and shared among participating parties [15]. At their most basic, blockchains allow a community of users to record transactions in a shared ledger within that community, such that no transaction that has previously been recorded cannot be modified under regular functioning of the blockchain network. To be more explicit, when a new block is added to a blockchain, it is connected to the preceding block using a cryptographic hash produced from the previous block's contents. This assures that the chain is never broken and that each block is stored permanently. One of the most signifying characteristics of blockchain is that it lets the users interact or send transactions with a peer without any intermediary, and thus removing the necessity of any central administrator. While blockchain is well-known for its application in cryptocurrencies such as Litecoin, Ether, and Bitcoin, it also offers additional advantages. For example, it can enable smart contracts, sharing contracts, records, or any other sort of data [16]. As previously noted, blockchain has the ability to allow individuals to pay each other without the need for a central clearing point, which is essential for Automated Clearing House and other wire transactions. Furthermore, it has the potential to improve stock trading efficiency by letting transactions to settle quickly, whereas many conventional wire systems take three or more days to clear. This blockchain technology may be utilized for non-financial objectives in addition to financial ones [17]. Thus, blockchain provides a user friendly and secured environment with a decentralized, distributed, verifiable, programmable, immutable, divisible, and faster technology.

There are 4 types of blockchain [18]. They are

I. Public
II. Private or Managed
III. The consortium

IV. Hybrid.

Anyone can participate in a public blockchain. It is permissionless by nature and it is totally decentralized. Private or Managed blockchain is owned and controlled by an organization. Organizations can determine who can join and what a user can do. Consortium blockchain networks are controlled by multiple organizations rather than one. Hybrid blockchain uses the ideal part of public and private blockchain [18]. In hybrid blockchain data or records are kept private but their integrity can be verifiable by the public.

2.2 Literature Review

A. López Vivar, A.L. Sandoval Orozco, and L.J. Garca Villalba discuss ESAF (Ethereum Security Analysis Framework), a smart contract analysis framework that seeks to unify and simplify the effort of assessing smart contract vulnerabilities. It may be used, among other things, as a persistent security monitoring tool for a collection of target contracts as well as a typical vulnerability analysis tool [19]. Despite the lack of parallelization, the tools performed admirably in their initial ESAF testing against severe load applications (ten thousand analyses at a time). Their scans performed well during the testing, and vulnerabilities were discovered in the majority of the contracts. In terms of the effectiveness of mass scanning, the network has several limitations.

Authors of [20] builds a project shows how blockchain technology enhances efficiency and reliability in the startup funding process, and how this affects today's businesses and sectors. With the use of smart contracts and Ethereum, their system will report on any harmful attacks and provide good control over how and where money is delivered through a voting mechanism. Knezevic Dusko conducts research on the influence of the blockchain technology platform on the banking industry and other businesses. The goal of this research is to comprehend the functions, operation, and benefits of blockchain technology for business and economic transactions [21].With the help of an intermediary transporter, they proposed and implemented an Ethereum-basedsmart contact delivery system between seller and buyer in this study [22].

To assure accountability,auditability, and integrity, they create a decentralized PoD System. The authors ensures that the participating entities act honestly with the double deposit collateral. If successful delivery occurs then the entities get their respected share. In the shipping process anything fishy mechanism happens then an arbitration mechanism will solve the problem.

Another author's apply smart contact in the field of law and a contact management system [23]. They proposed a system consisting of four layers presentation, application, data access layer and smart contact's layer. Mainly the user interaction occurs with the help of presentation layer. And business logic of the system consists of the application layer. The main responsibilities of this network are deployment and transaction between the smart contracts occur in the smart contract layer. Also, they recognize three phases e-contract life cycle, formation, and execution. In this research they concluded more efficient and reduced system without the help of any intermediaries. di Angelo, M., & Salzer, G. covers this paper aims to identify smart contract analysis tools regardless of their origins and focusing on the tools themselves [24].It is designed to be a reference for anyone who want to investigate previously deployed code, build secure smart contracts, or teach a related subject. They investigate the tools' accessibility as well as their functionality. In addition, they also compare those tools characteristics in a clear and organized manner. In their research they construct few tables to comparing among those tools. In first table they contrast the tools regarding their purpose and methods. To quantify the tools' complexity, they counted the lines of code (ignoring code taken from other projects or created automatically) and identified the programming languages deployed. Table II summarizes the data. Following that, they looked at quantitative tool evaluations for tables III and IV. These are grouped into two categories: reviews written by writers who compare their own tool to others and 'independent' reviews written by authors who do not have their own tool to compare. Table V compares the available tools in relation to the security issue that they discover. They pointed out few limitations of their research, the tool collection is comprehensive at the time of writing. They also added because it's such a dynamic sector, new tools and updates will continue to emerge. Furthermore, they do not assess how well the instruments accomplish their objectives. When developing a new tool, they recommend reusing components such as disassembler, decompiler, and parser from the Ethereum Foundation (github.com/ethereum), Parity Technologies (github.com/paritytech), ConsenSys (github.com/ConsenSys), Trail of Bits (github.com/trailofbits), and the more advanced tools presented here. They conclude their survey by highlighting five tools that they find extremely impressive. Those are FSolidM, KEVM, Securify, MAIAN and Mythril. Antoniadis, Ioannis & Kontsas, Stamatis & Spinthiropoulos, Konstantinos they describe some of the applications of blockchain in marketing and marketing management, as well as how it may disrupt the marketing mix and processes, they also look at possible blockchain marketing applications and

evaluate the advantages and disadvantages of implementing this technology innovation

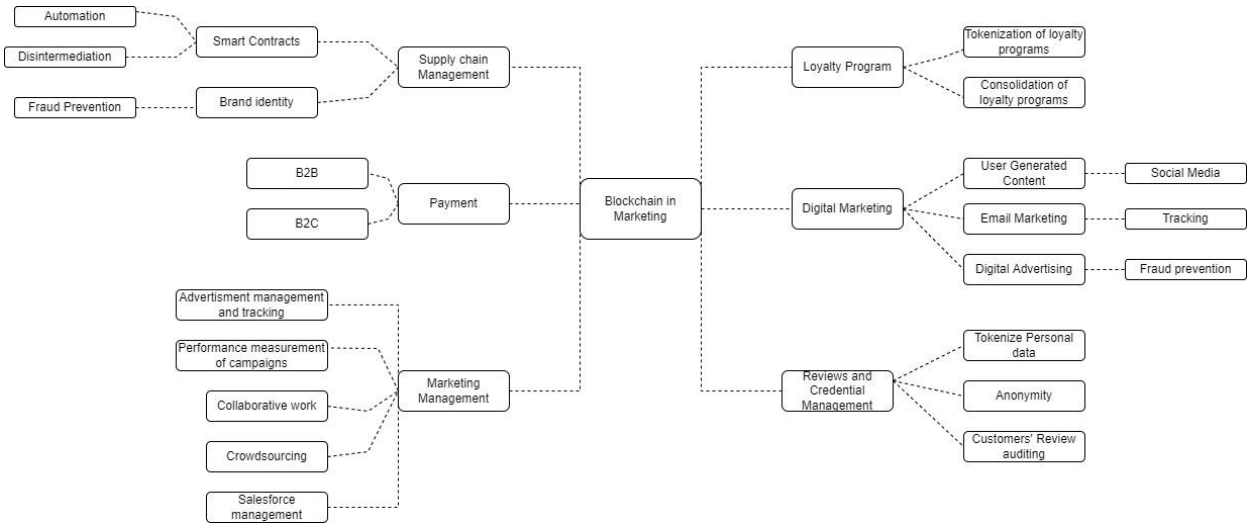


Fig.2: Potential Applications of Blockchain in Marketing (researchers' elaboration)

Researchers should also investigate the strategic impact of blockchain technology on the positioning of small and medium-sized enterprises (SMEs) in their sector as a source of strategic marketing competitive advantage, as well as the potential it has for marketing innovation and startups as we proceed into a digital age with next era of Blockchain 3.0 [25].In their study, author in [26] provide a prototype of a secure blockchain e-auction system that decreases the risk of long-distance complicated trade identities in an e-auction system that may beemployed in UAE services, notably UAE Auction. They employed smart contracts to guarantee that the required security criteria were satisfied throughout deployment. The smart contract stores essential transaction parameters such as the auctioneer's name, the start and finish hours of the auction, the current winner's name, and the current highest price.

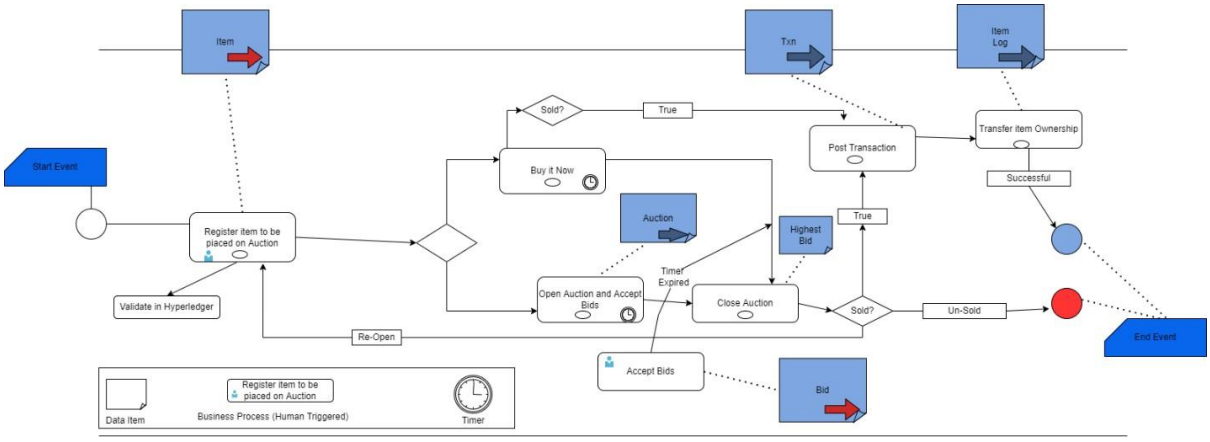


Fig.3: E-Auction flow work.

In the case of a large number of bidders participating with a single offer, the prospect of forming a coalition still exists, and randomness creation remains a major issue in blockchain technology. Those difficulties can be overcome in their design by applying a fuzzy approximation function while the bidding round is in progress. They also stated that they will continue to deploy this feature in the future to provide the required degree of security. Another topic that came up throughout the discussion was scalability, which is a major concern with most blockchain and smart contract technologies. Fuzzy approximation is the next step in their implementation, which will increase anonymity and unlikability. In this paper [27] they present security issues of IoT. They mainly Categorized Security issues in IoT and discuss about the layered architecture. They've also talked about certain IoT attacks, risks, and cutting-edge solutions. They mostly demonstrated how blockchain technology would be a crucial enabler for many IoT security challenges.

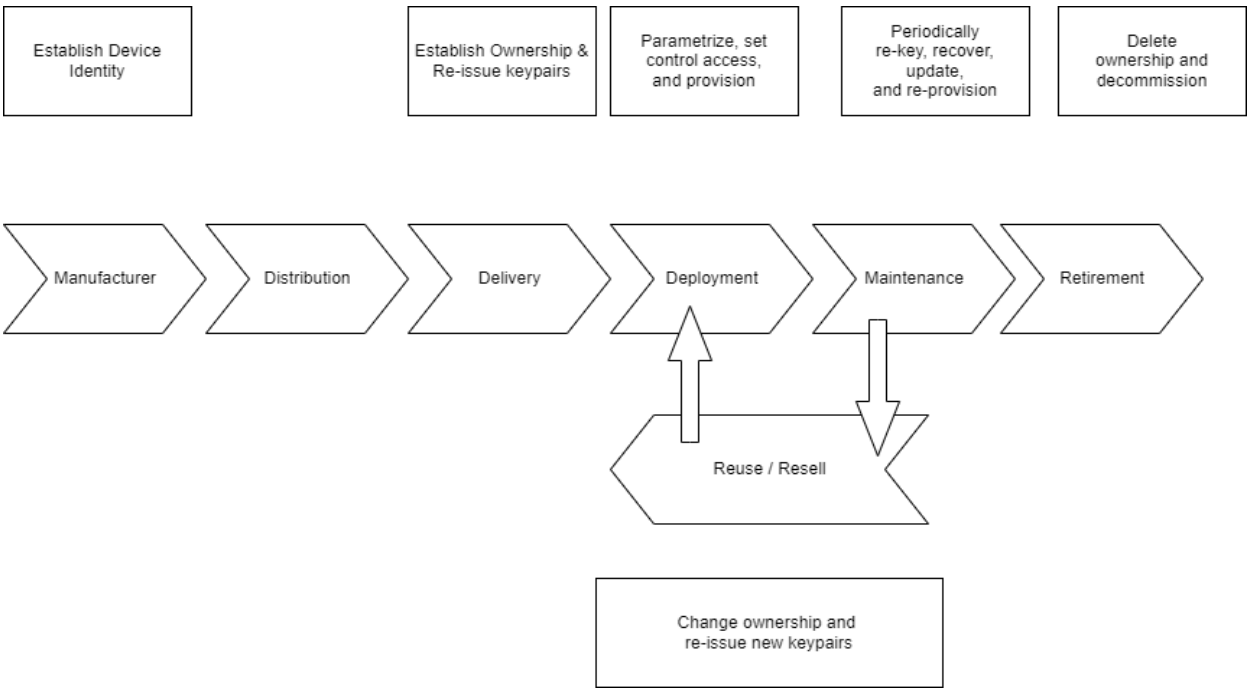


Fig.4: IoT device lifecycle security management

The agreement component relying on the digger's hashing power can be compromised, in this way permitting the assailant to have the blockchain. Also, the private keys with restricted irregularity can be taken advantage of to think twice about blockchain accounts. Successful components yet should be characterized to guarantee the security of exchanges and stay away from race assaults which might bring about twofold spending during exchanges. They also said about the future work which will be reliable, efficient, scalable for IoT security solutions.

In this study [28] they proposed a blockchain framework based on lattice cryptographic process for reducing the complexity of tracing an e-commerce product. They have introduced a rating-based consensus proof of accomplishment (PoA). The solution is verified in Ethereum network. The solution is named PRODCHAIN. The introduced application structure of blockchain in esteem (item) chain-inventory network mix is new in the bearing of appropriated inventory network Transaction time begins from the hour of accommodation to the point the outcome is generally accessible in the organization. It incorporates the engendering time and any intermediating settling time because of the agreement system set up. Exchange throughput isn't considered for a solitary

hub rather, it is noticed for the generally speaking blockchain network for every one of the hubs to appropriately submit the exchanges. Mainly the solution can change the current item advancement and utilization situation effectively and safely according to all viewpoints. The PRODCHAIN integrate value chain and supply chain with blockchain. As this cycle will be advantageous for the partners to deal with their item from advancement to client, it can likewise be considered as a production to-utilization chain.

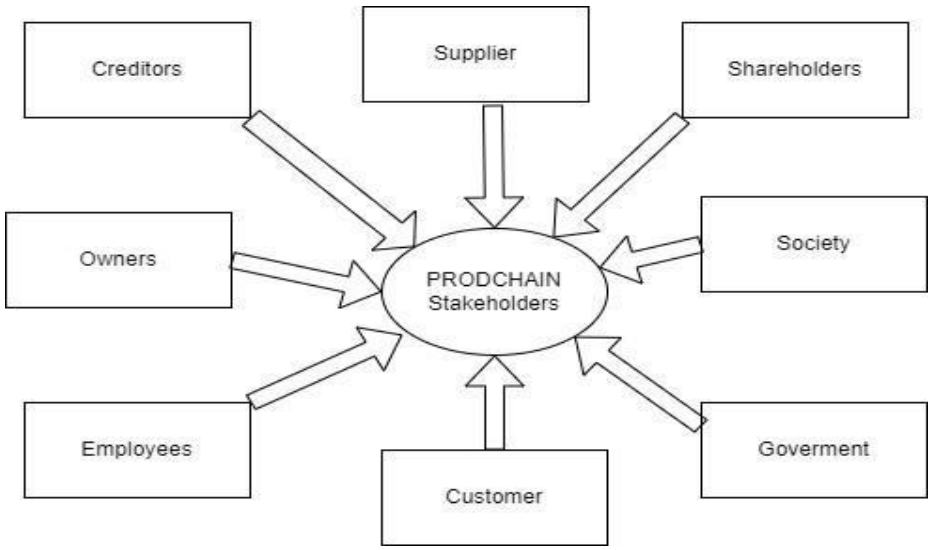
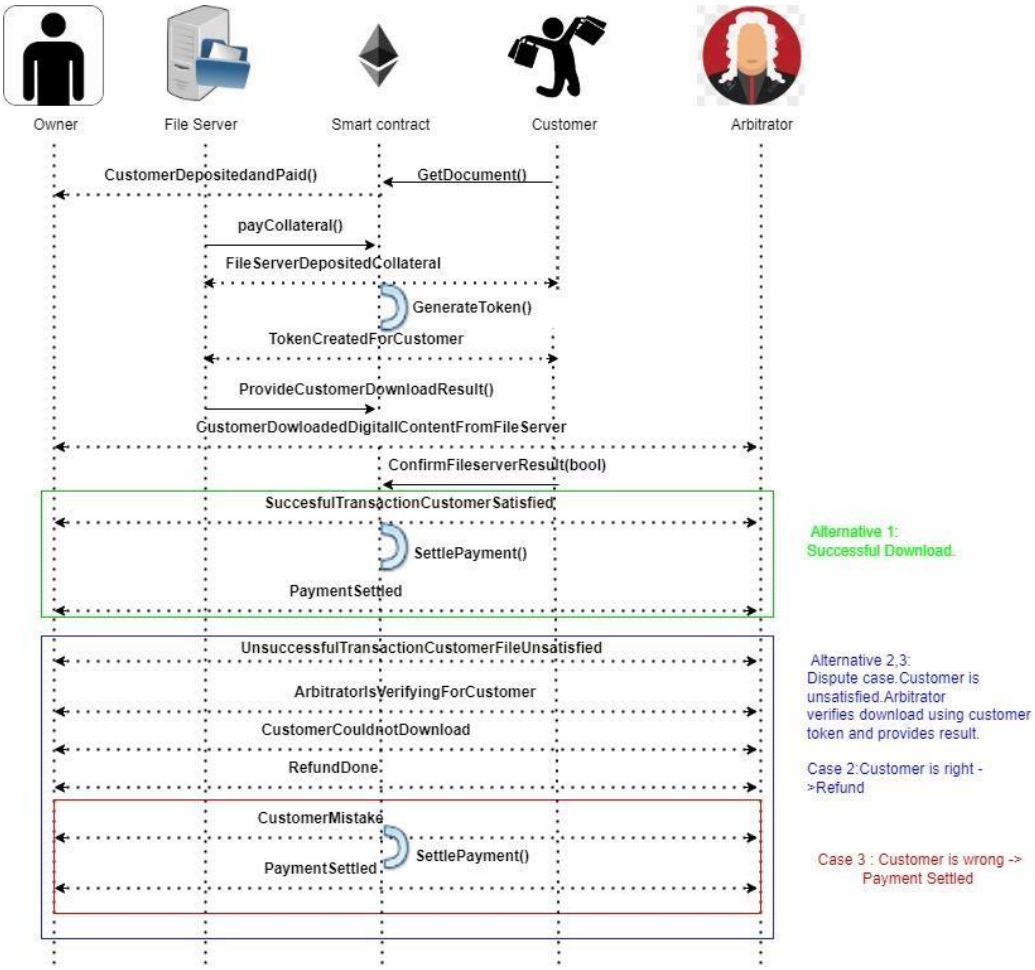


Fig.5: Prodchain Stakeholders

All the stakeholders should register in the PRODCHAIN process to view, validate, initialize the product block. The registration procedure also aids stakeholders in activating their wallet, which consists of a pseudo-identity and a public-private key combination. When stakeholders provide their identifying information and/or business license, the registration procedure begins. In this paper [29] they presented a blockchain based solution and a framework for digital assets. The proposed system is unique enough to manage the sale and delivery of digital assets. They havealso used some penalty criteria to act the participant of the network honestly. They used the decentralized IPFS system to make sure the agreement between different entities. They use the function Generate Token () to generate a unique token to ensure customers paid collateral and interaction in the system. The produced token once made is utilized by the client for verification while speaking with the document server to get to the advanced substance. The message sent

between the client and document server is connected with a signature. When the contract receives a request form the customer it acts that the customer agreed the conditions and also deposit the amount needed. The Token that is generated, everyone can see it in the network. the server enables the off-chain workflow using the token. And the off-chain workflow notifies all in the network



and if the customer is happy with the product, then the payment is settled.

Fig.6: Function calling and successful, Unsuccessful transaction scenario

2.1 Summary

Previous research is discussed in the literature review section for this study. In background study section what is blockchain and types of blockchain is discussed. In addition, earlier work on blockchain is explored and analyzed in this paper.

CHAPTER 3

PROPOSED METHOD

We implemented a system in E-commerce Supply chain in Bangladesh using blockchain technology which ensure product delivery. The concept of our model is to deploy an Ethereum-based smart contract to handle connections between Sellers and buyers in a secure and effective way.The proposed model of our work is shown in figure 2.1

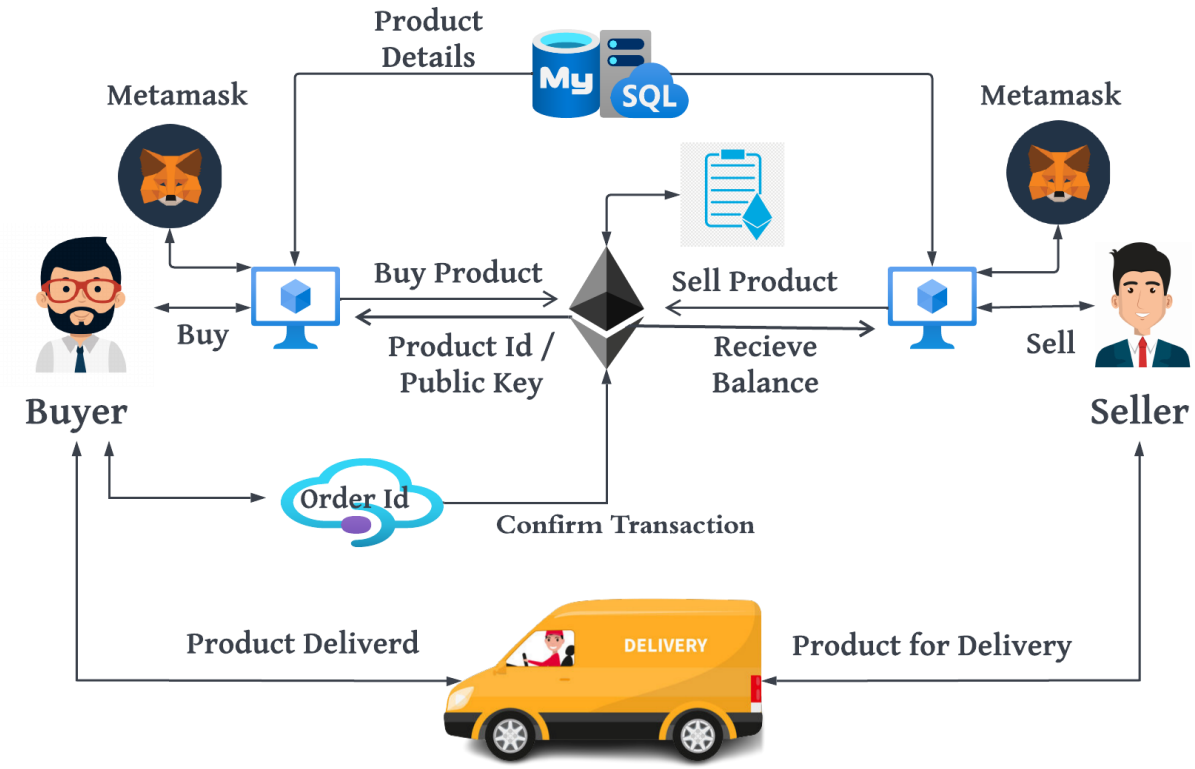


Fig.7: Ensure Product Delivery in E-Commerce Supply Chain in Bangladesh

Here, a buyer and seller's Ethereum wallet connected in browser through metamsk. Product details will be stored in MySQL database. In this project a seller will add a product which he/she intend to sell. After adding product seller and all the buyers will see that product price and details. If buyer want to purchase that product, he/she had to click on buy now option. After that same

equivalent of that product price and gas fee will be deducted from buyer account. But seller won't receive that money until a buyer confirm his/her purchase. That amount of Ethereum stored in smart contract. So, we added courier service where a seller will provide that product to courier service and when buyer gets his product, he/she will confirm his/her purchase and seller will get the moneyfor that product.

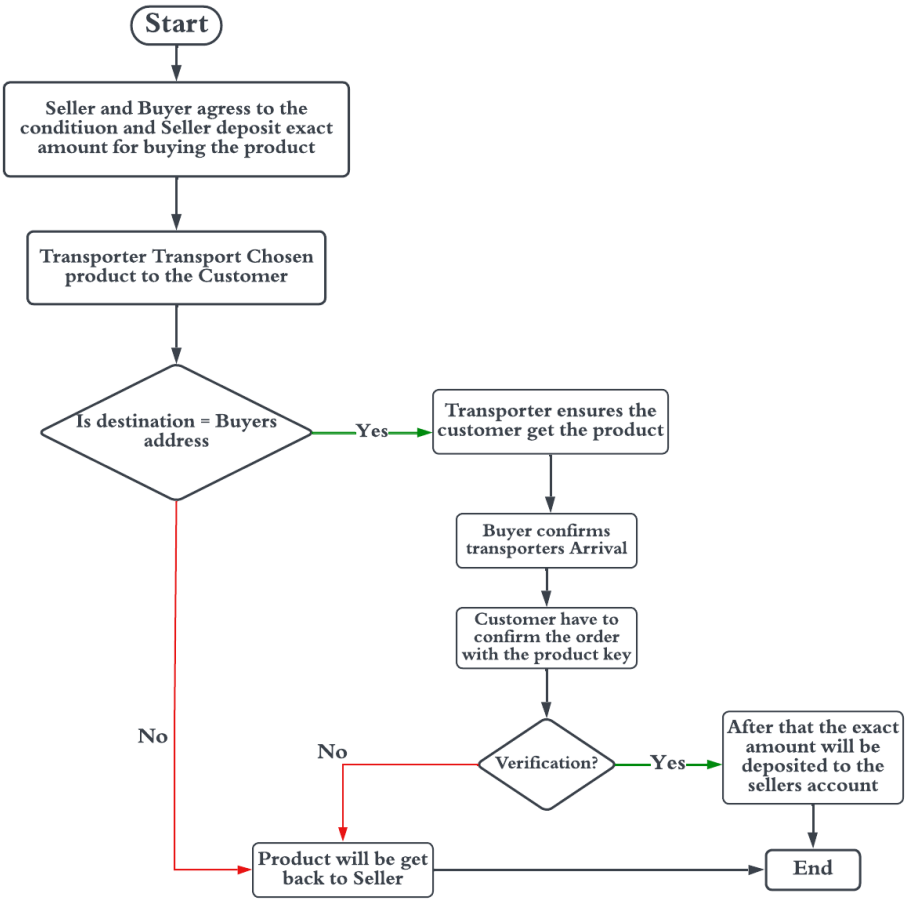
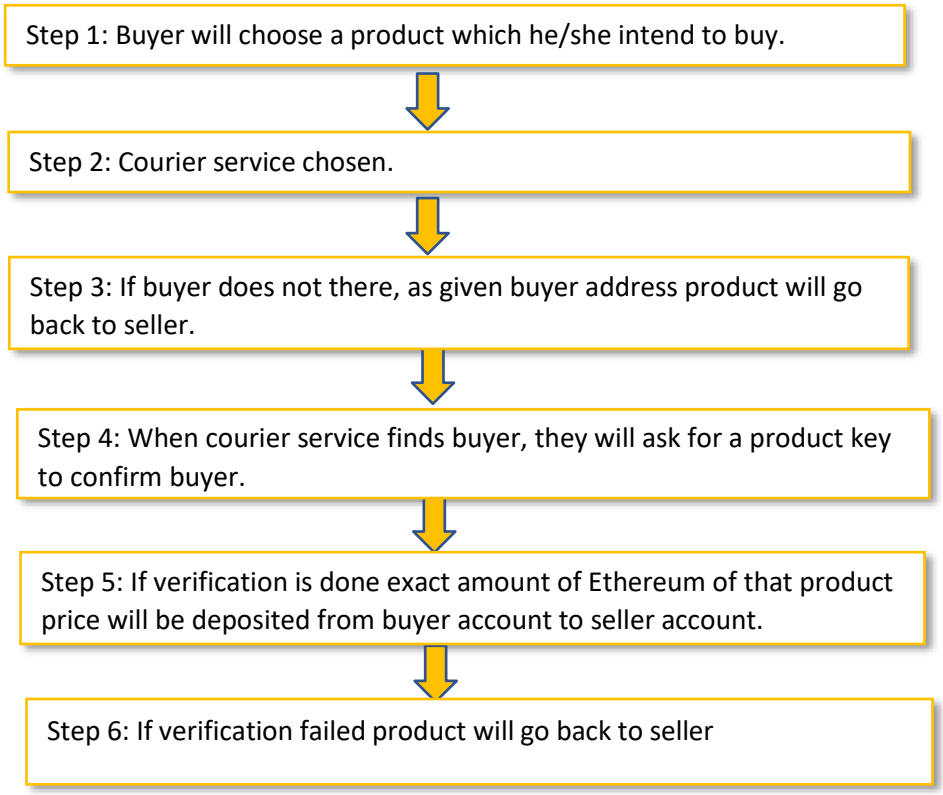


Fig.8: Flow of the syste

The system's flow is as follows:



Solidity, a programming language for smart contracts, is used to create them. Solidity complier is used to build it and deploy it on the Ethereum network. All transactions are carried out via Metamask.

3.1 Functionalities

I. Add Product: With their Metamask account, users can add products. A prompt will appear, asking the user to fill out a form with product details.

II. Buy Product: A user will see available things to buy on the home page. The user will be taken to the product information page after clicking on a product. The user will view all of the product's details on the product page. When he clicks the buy button, a metamask prompt will appear, asking him to confirm the transaction. The data will be saved in a blockchain smart contract once the user confirms.

III. Confirm Delivery: By navigating to the confirmation delivery page, the user can confirm the delivery. The user will click confirm after filling out the order id. Metamask will then ask the user to confirm. The seller will be paid once the user confirms the delivery.

IV. Refund: The user will receive an order id after placing an order, which will be required to confirm the delivery or refund procedure.

CHAPTER 4

IMPLEMENTATION DETAILS

In this research build a blockchain based E-commerce system which will reduce fraud. There are 3 entities in our app they are Buyer, Seller, Courier. There are 4 function and they are Add Product, Buy, Confirm Delivery, Refund. There Details are listed below:To solve the problem addressed in the problem statement we used Web3 technology such as the truffle framework, Ethereum network, solidity, etc. Ethereum is a decentralized network of computers where we can run smart contracts. The smart contract is persistent in the network so that no one can edit, alter or temper the contract. To create a smart contract, we used solidity programming language. The Ethereum team creates this language. To write code we used Remix IDE on the Ethereum website.

Market.sol

```
contract Test{
    struct Unit{
        uint256 orderID;
        address seller;
        address buyer;
        uint256 value;
        uint time;
        bool recieved;
        bool refunded;
    }

    mapping(uint256=>Unit) public products;

    function addUnit(uint256 _orderID,address _seller) payable public{
        require(products[_orderID].orderID==0, "This order is alreday placed");
        products[_orderID]=Unit(_orderID,_seller,msg.sender,msg.value,block.timestamp,false,false);
    }

    function refund(uint256 _id) public{
        require(msg.sender==products[_id].buyer, "This producct is not brought by you");
        require(block.timestamp>products[_id].time+10, "You have to wait before refund");
        require(products[_id].recieved==false, "You have Recieved the Product");
        require(products[_id].refunded==false, "You have already Taken Refund");
        products[_id].refunded==true;
        payable(msg.sender).transfer(products[_id].value);
    }

    function deliveryConfirm(uint _orderID) public {
        require(msg.sender==products[_orderID].buyer, "Only Buyer can confirm the delivery");
        require(products[_orderID].recieved==false, "You have already Recieved the Product");
        require(products[_orderID].refunded==false, "You have already Taken Refund");
        products[_orderID].recieved=true;
        payable(products[_orderID].seller).transfer(products[_orderID].value);
    }
}
```

Fig.9: Smart contract in this project

We considered a product a unit. This Code will manage the unit list and its status. When a buyer buys a product the contract's "addUnit" will trigger and add the unit to the list and the money will stay in the smart contract.

i. Login: User can login to web app by metamask which is a free cryptocurrency wallet. When user visit web app metamusk will ask user to connect his account to web app. After connecting metamask user can see the home page of web app and our web app will get account details of users. If user declined the access, then the web app will not able to interact with the user's account.

Fig.10: Metamask asking user to connect wallet

Fig.11: Logged in user home page

ii. Add Product: Users can add product with their metamask account. A prompt will be

opened and user will fill the form with information about the product. Then the information will be stored in a SQL server along with sellers account address.

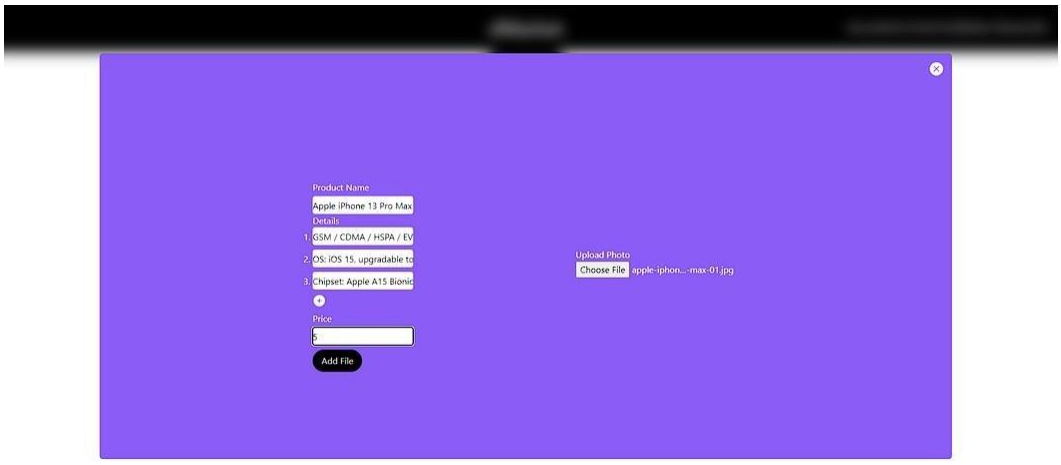


Fig.12: Add Product Module

iii. Home Page: In home page a user will see available products to buy. The Product list will be fetched from SQL database. After clicking a product, the user will see product information page.

Fig.13: Home Page Module

iv. Product Page: In product page user will see product's full information. If he clicks buy button a metamask prompt will be opened and will ask for to confirm the transaction.

If user confirm the order the data about order and buyer, seller account address will be saved in blockchain smart contract. After successfully saving to smart contract and SQL database user will get an order ID, which will be later used to confirm or claimrefund.

Fig.14: Buy Product Module

v. Order ID: After placing order user will get an order id which will be used for confirm the delivery or refund process. After confirming the order specific amount ETH will be deducted from user wallet.

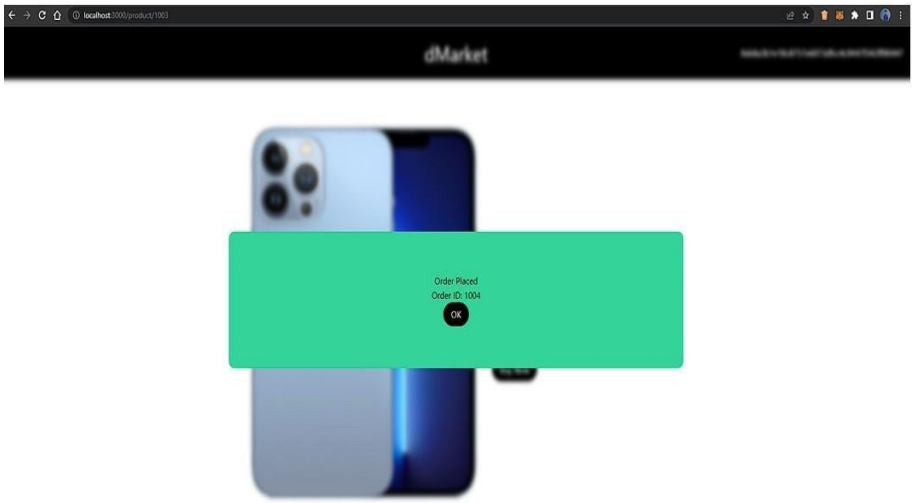


Fig.15: Order confirmation Module

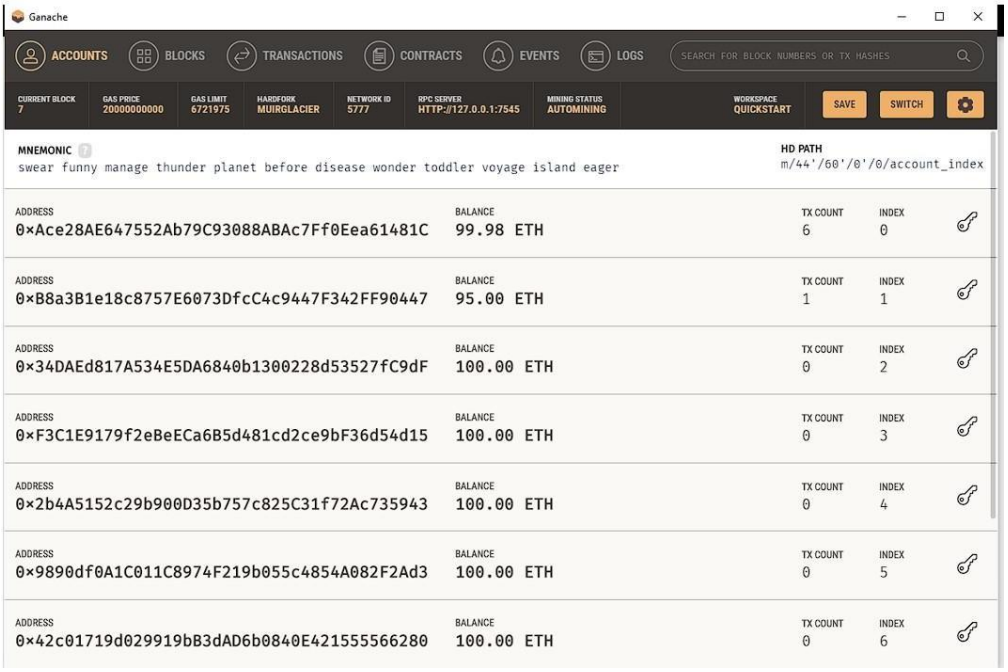


Fig.16: Updated balance

vi. Delivery Confirm: User can confirm the delivery by going to confirm delivery page. After filling the order id user will click confirm. After that metamask will ask user to confirm. If user confirm the delivery the seller will receive money.

Fig.17: Confirm Delivery Module

By any chance other than buyer anyone knows the product ID and try to confirm it. He / She cannotconfirm the delivery. Because in smart contract seller and buyers' data will be saved for further Confirmation.

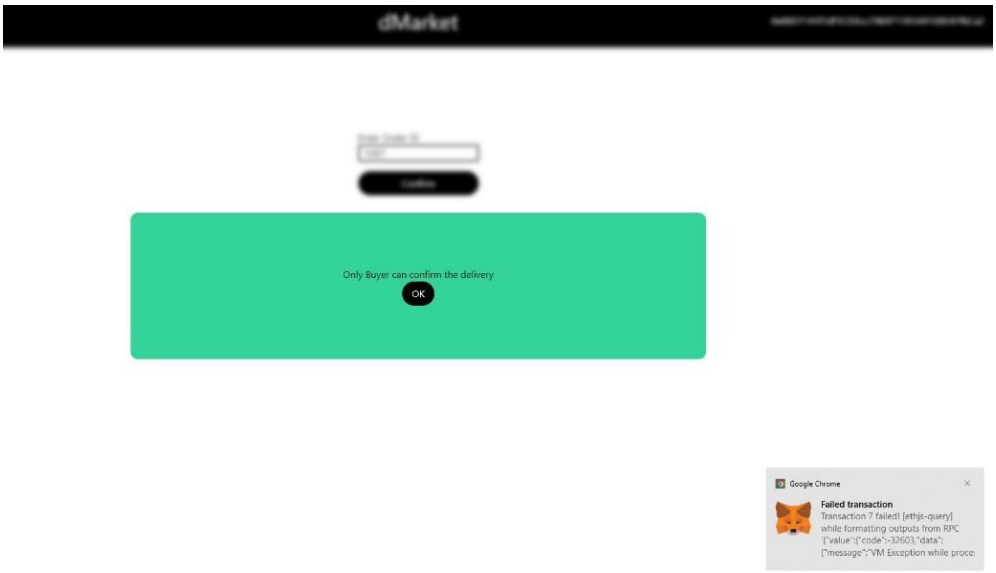


Fig.18: Fraud buyer check Module

Buyer cannot confirm delivery multiple time. When a buyer gets his/her product, he/she will confirm that delivery. But after confirmation if he/she try to confirm that product again using same product id a message will pop-up.

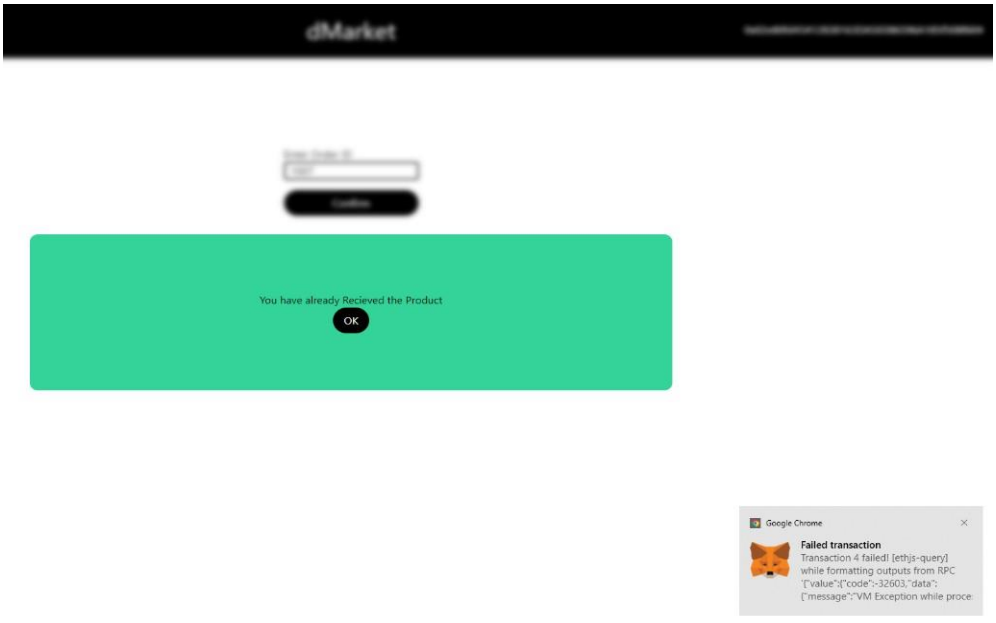


Fig.19: Multiple time Confirmation Module

To prevent abuse there are some functionalities such as if other user who is not buyer if try to confirm the order then the smart contract will revert the transaction. Only Buyer can confirm the order. If buyer try to confirm multiple time the app will prevent.

CHAPTER 5

RESULTS AND DISCUSSION

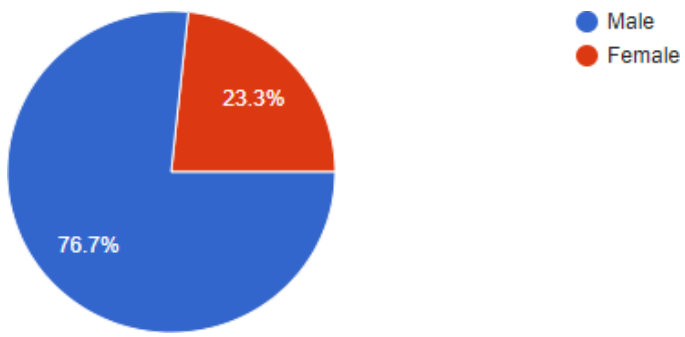
5.1 Objective Justification

Here we justify the research question 1. The model's concept is to deploy an Ethereum-based smart contract to handle connections between Sellers and buyers in a secure and effective way. In this project a seller will add a product which he/she intend to sell. After adding product seller and all the buyers will see that product price and details. If buyer want to purchase that product, he/she had to click on buy now option. After that same equivalent of that product price and gas fee will be deducted from buyer account. But seller won't receive that money until a buyer confirm his/her purchase. So, we add courier service where a seller will provide that product to courier service and when buyer gets his product, he/she will confirm his/her purchase and seller will get the money for that product.

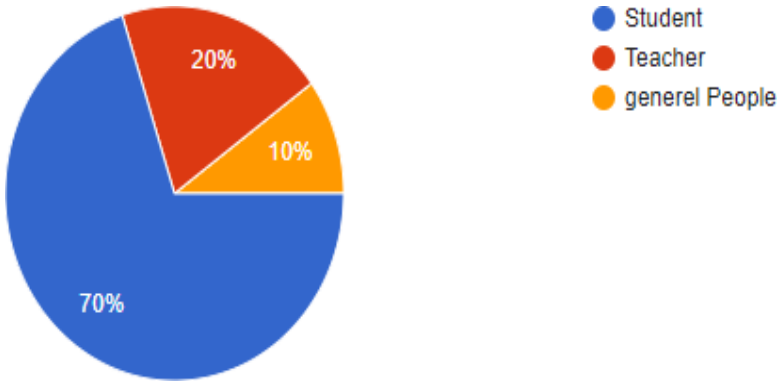
5.2 Statistical Data Analysis and Survey Outcome

With the advancement of technology people's life are getting easy day by day. In this fast-growing world every one want comfort and security in their life. For this, now-a-days people fulfil their need through online platform. Everyone is doing their shopping and other necessary need through online. So, E commerce is getting very much popular these days. Beside that as everyone is getting the advancement of the e commerce system in all aspect of life, some of us facing serious issues.
In the traditional E commerce system, there are absolutely some good features to satisfies the customer. But in this system, there are some issues that is very much problematic in recent time. Theft problem, security issue, Qualityless product, Product delivery timing is not well structured or maintain through the traditional E commerce system. So, in our proposed system we have introduced a Ethereum based smart contract system through this the traditional E commerce problem will be reduced in a systematic manner.

So, to validate our system We surveyed between traditional E commerce system and our proposed system from different types of people. Around 200 people participated in our online based survey. The people who have participated in our survey, 76.7% of them are male.

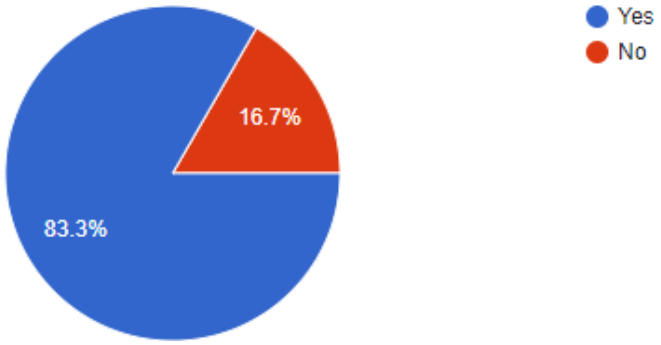


In our online based survey different types of people from all over the world participated. Most of them are students. Around 70 % people are students, 20% teacher and rest of the participant are general people.



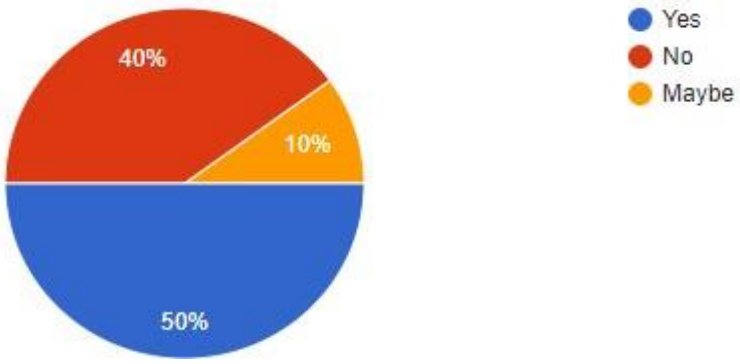
In this survey about 83.3% have the prior knowledge about the Blockchain.

Do you have any prior knowledge about Blockchain/Cryptocurrency?



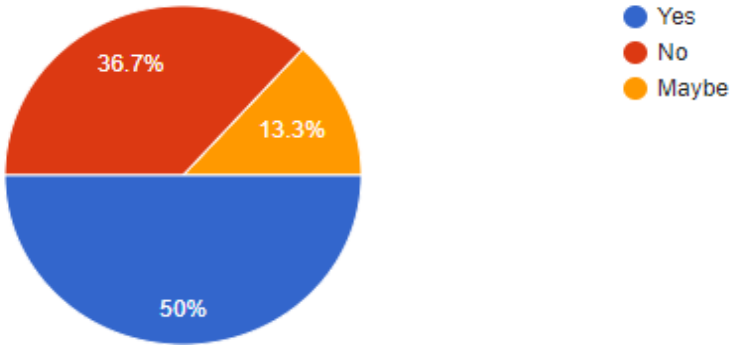
As an emerging technology, Cryptocurrency is very much popular throughout the internet world. And this digital currency is being used in all kind of transaction throughout the universe. Around 50% of the surveyed people think that Cryptocurrency is a reliable medium of exchange in E Commerce Supply Chain. And 40% of the people think that Cryptocurrency is not a reliable medium of exchange in E Commerce Supply Chain and 10 % people are confused about this digital currency in E commerce.

Do you think that Cryptocurrency is a reliable medium of exchange in E Commerce Supply Chain ?



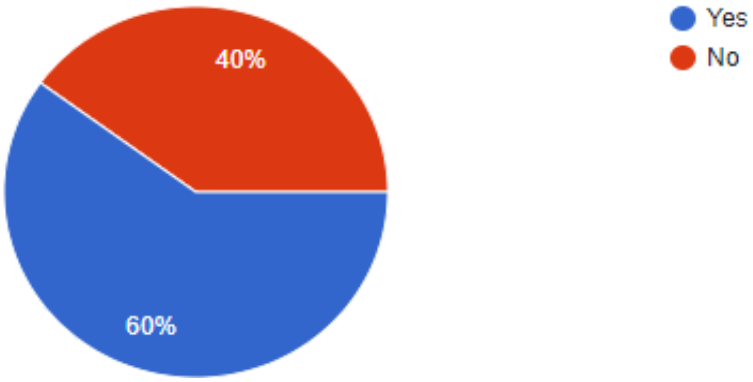
Some people think that there are control and governance for this emerging technology and some are against it. 50% people think that there is control in this technology while 36.7% are against it.

Do you think latest regulations and governance for having control over this E Commerce technology are well enough?



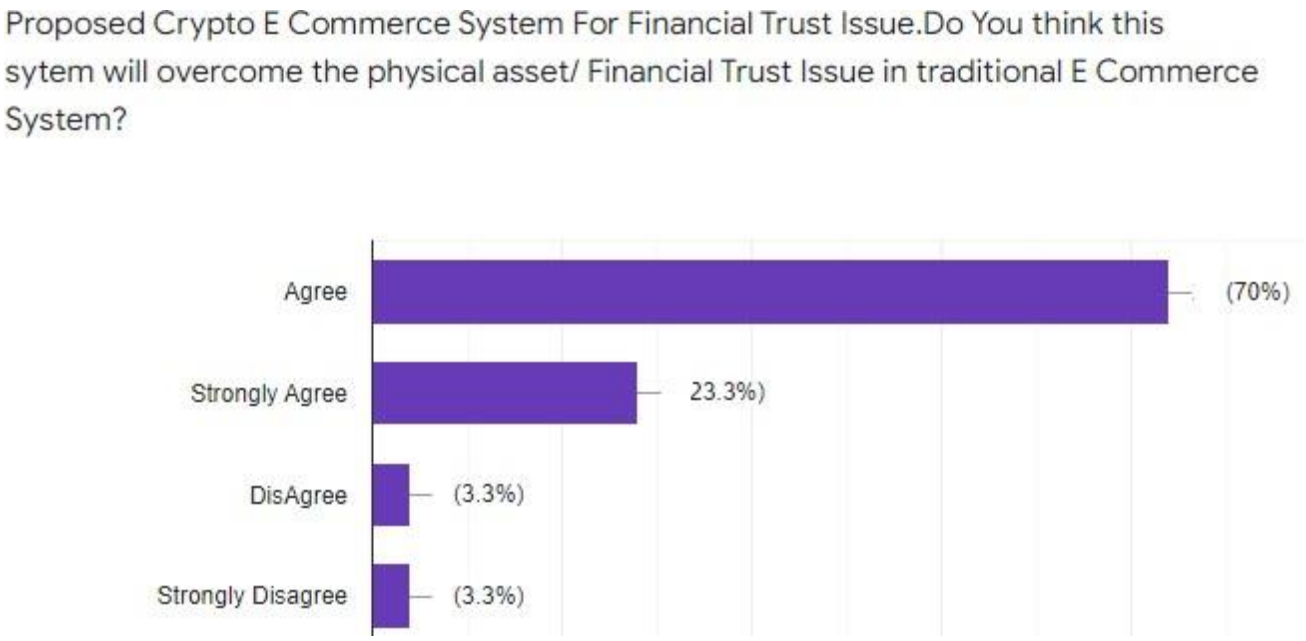
By this survey-based analysis we came to know that 60% people face theft or fraud issue from any traditional E Commerce System.

Do you face any theft or fraud issue from any traditional E Commerce System?



For our proposed system around 70% think that Proposed Crypto E Commerce System for

Financial Trust Issue will overcome the physical asset/ Financial Trust Issue in E Commerce System.



We have used bellow mention link to complete our survey between the traditional e-commerce system and our proposed system through online. So, by doing this we try to validate our system and give an overview of the system to the people. We try to present our system through this link and collect feed backs.

Survey from Link: https://docs.google.com/forms/d/e/1FAIpQLSevzTOX0942QtKUywqIer-aJil4gCiJZ55gc5rBqZ_821bJpg/viewform

5.3 Advantages

Supply Chain is the main concern of a business in this fast-growing world. So, it is very difficult to trace and secure the transaction between the actors of the business system. In this business growing world the actors are bind to trust each other for different kind of purposes. But trust issue is very much difficult and sometimes loss consuming in the business sector. Blockchain is the technology that have the ability to ensure the tracking and securing any system with its very much important features. One of the very critical demands of firms in the current computerized transition process is the acceptance of blockchain innovation in their organizations. Blockchain is a system that allows for the safe, synchronized, decentralized, and distributed recording of digital transactions without the use of a third party. Supply chains that use blockchain technology attempt to enhance traceability protocols in order to improve the quality and safety of internal operations, save costs, save time, be more competitive, and enrich the consumer experience by giving qualitative information about products.

In our proposed system we have introduced a on chain mechanism for insuring the physical asset trust issue in supply chain mechanism. In our proposed system after buying any product the given physical asset for the product will be hold in our system and after successful delivery Ethereum will automatically transfer to the seller account. By using the system, a trust issue between the seller and buyer will be much less than traditional system. The smart contract is written in that purpose that all the physical asset problem will be solved and no third-party involvement is needed in the system. After buying any product the contract will automatically generate a private key (product Id) for the insuring successful delivery. This on chain private key will be temper proof and cryptography hashed that no one can alter the key [30]. This system will insure the blockchains fundamental piler of security with not altered solution. With the help of our proposed system the cost relevant to the third-party supply issue problem will be solved easily. And for this asset holding technique the seller is abide to meet the quality of their sell product and will ensure the proper delivery of the product.

5.4 Disadvantages

Despite of the outstanding impact of blockchain technology in e-commerce, still it has some complexities, controversies as well as new dependencies. Focusing on the current situation of e-commerce, in near future there may be some key challenges that next generation have to face. Firstly, it comes to understanding awareness though it is a newly invented technology, many people still don't know about it, let alone applying it in their respective areas of work and enjoy the benefits of it. That's why being one of the trusted, secured, efficient, decentralized and inexpensive technology, still people have confusions about it [31]. Secondly, as expected, such amazing speed, level of efficiency doesn't come so cheaply as it works on peers to peer transactions. It also entails substantial implementation expenses for businesses, which inhibits its widespread adoption and deployment. Though it's significantly enhancing the productivity at huge rate, still it needs a certain 'critical mass' of connections. Again, our e-commerce system generated private keys to deliver product to the buyer seller receive their money, in the event of this create keys, which has been observed on several instances, losing them makes it nearly difficult to retrieve these keys, posing a concern, primarily, for all holders of cryptographic values. Storage is also a big issue to maintain this e-commerce system [32]. As the number of users increases, so will the number of processes mobilized into the blocks to be stored, requiring more space, ultimately exceeding the capacity of the hard drives. As our e-commerce blockchain system is a complete digitalized system and doesn't depend on any individual or any organization physically, so it must have some rule and regulations. Surprisingly, still many people even Government of many countries (in Bangladesh also) still don't want to introduce or install bitcoin, let alone other packages of blockchain [33]. Again, it's because of the lack of awareness, fear of adapting to new changes and most importantly transparency in the regulations part of this system. It is currently undergoing ongoing change and assumption, and as a result, it has presented and will continue to offer certain issues throughout its growth. It is important to be aware of these limitations prior to the trend of widespread adoption of our e-commerce system.

5.5 Limitations

Blockchain is a very much strong and protective technology nowadays. It almost says that it is alterable. But with the advancement of technology as the technologies have so much advantage it is not so much impossible to misguide any system. As our proposed system have so much advantages, also have some limitations. In our Ethereum based smart contact have to depend on the transporter's honesty. In our system a transporter delivers the product to the buyer and have to ensure that the buyer puts the product id (public key) to the system. As the public key is the main concern for the system to transect the ether to the seller account. So, buyer and transporter have to act honest. If the buyer and transporter doesn't act honest the system will have face some issues in its cycle.

5.6 Future Work

Very few technologies have been covered by the media, analysed by the experts and asked about by the community in the recent years as much as the e-commerce blockchain technology. Though this technology has gone through several developments and improvements in the last of couple of years since its inception, it has yet to resolve some major issues like scalability, interoperability, sustainability etc [34]. As in our proposed smart contract solution we have introduced a Pow delivery system with the intent to give solution to the sustainability and theft issue. As the system will reduce the traceability problem and hacking issue from the ill instantaneous person. But it is a fact that no system is fully protected from ill intension. As the Database of the system is more important for receiving and retrieving critical data of buyer and seller, we have used MySQL. As MySQL is secure and open source to hand the database it is more preferable and user friendly. But to secure the system at its most IPFS can be included.

CHAPTER 6

CONCLUSION

Blockchain is an emerging technology. Blockchain is spreading rapidly in many sectors. In E-commerce sector blockchains growth is rapid. In our proposed solution we have introduced a new supply chain management system through blockchain technology. In this proposed system we have implemented a trustworthy platform where no one can temper the transaction and easily can get ordered product with no damage of cost between this transaction. If a buyer wants to buy a product in this system, they can buy an easily by depositing the needed amount of ether. The main fact of this system is that if the buyer didn't get the actual product within the allocated time the deposited amount will be back by the system to the buyer's account. After getting the product buyer can easily reject the product in this same amount will be deposited. After getting the product the buyer has to verify with a private key in the system and then the amount will be transferred in the seller's account. Through this system the trustworthy relation between a buyer and seller will get a new direction. This system will solve the supply chain major issue of trust

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