

# Procurement Tracking Using Block chain

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## Abstract:

One of the large issues in procurement is fraud, and many companies undergo deep investigation before offering employment for the proper candidate because the job is extremely sensitive as large budgets allocated to acquire goods and services for business. Procurement fraud, thus, is probably going to occur within the procurement department since they affect money, through handling vendors or material ,goods ,services, transportation, logistics, distribution of products,warehousing, or other benefits in exchange for awarding the contract,and frauds are then possible supported quid pro quo, whereby an advantage is given in exchange for awarding the contract. We focus on the procurement of raw materials. The paper reviewed how Blockchain is in a position to eradicate procurement frauds through that specialize in the usability and functionality of the technology in procurement. The study uses the experiment research method to measure procurement frauds because of the experimental variable and therefore the power of Blockchain to regulate such frauds because of the dependent variables, using the non experimental research method. The study tries to highlight the challenges and possible directions of Blockchain research in protecting procurement from any sorts of frauds that could be happening, which are impossible through the normal methods. Finally, this paper points out the longer term directions within the Blockchain technology in procurement.

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## INTRODUCTION

The challenge for the agriculture sector is to track and pay for the delivery of foods. Nowadays, the process depends on a third-party for coordinating the goods delivery. The sellers usually have an agent who ensures that the goods are delivered safely and buyers have an agent to recommend payment and audit the delivery. The involvement of multiple agents add high costs to the system and makes the entire process time-consuming. The procurement process is taken into account one among complicated one, because it relates to an organization-wide process since it involves all departments and

functional areas of an organization. Also, the procurement spends the foremost allocated budgets for business because the department acts of obtaining goods and services for business purposes, and in fact companies do not want to leave money on the table without determining a tight control over the financial scope for expenditure. Also, since buyers within the procurement department handle such huge budgets through their involving directly with suppliers it means that there's an opportunity to realize undue advantage over the competition deceitfully and to fulfill their personal objectives. To the present end, procurement fraud is taken into account as a major issue in organizations and

classified as the second most commonly-reported sort of economic crime. Throughout the years, companies have tried different methods to stop procurement frauds by implementing controls to scale back the likelihood of this occurring, but yet the phenomenon of procurement frauds remains happening and strongly damaging to businesses thanks to existing leaks within the traditional methods. However, today, new technologies in business are being developed at a breakneck pace to deal with all problems that could not be solved through the classical approaches, and Blockchain is one among them. Blockchain technology has gained much attention in recent years, and lots of literature reviewed Blockchain-based applications across multiple domains due to its usability as flawlessly as possible over the recent years, and it's being successfully applied to both financial and non-financial world applications. Moreover, blockchain technology is taken into account because it enables a distributed consensus where every online transaction for any period involving digital assets are often verified at any time within the future, and it's considered one among the key feature alongside its anonymity characteristics of the technology. In procurement, the Blockchain technology offers unique benefits which may be applied to great effect within the procurement function, especially to guard businesses against any frauds, since every transaction is formed public and hence there will be no chance of fraud happening. This paper discusses how the Blockchain could prevent any sort of frauds in procurement, like Kickbacks and Bribes, Bidding collusion, Personal interest (conflict of interest), Billing, etc. The study uses nonexperimental qualitative research for measuring procurement frauds and contracts because of the variable.

## II. Related Studies

### **Supply Chain Management:**

SCM may be a system that registers the logistics be due a product provider to a producer, SCM may be a system that registers the logistics be due a product

provider to a producer, distributor, distributor, or customer from one value chain perspective and supports all necessary information or customer from one value chain perspective and supports all necessary information for the flow for the flow to run smoothly. The importance of data sharing and delivery, mutual cooperation, and coordination of The importance of data sharing and delivery, mutual cooperation, and coordination supply chain companies has been largely emphasized. The complexity of order management of supply chain companies has been largely emphasized. SCM is additionally a system capable of rational planning, in the efficiency of the supply chain. SCM is additionally a system capable of rational planning, management, management, and coordination control of the global supply chain and logistics and helps different and coordination control of the global supply chain and logistics and helps different stakeholders to stakeholders to accurately monitor and quickly answer supply chain issues in real time. The flow accurately monitors and quickly answers supply chain issues in real time.

### **Procurement Tracking:**

Procurement activity has been well formed since the very early days of commerce, and it's made renaissance since the late 80's as a key contributor to organizational performance [23]. Procurement could also be a key activity in both private and public sector, but it's more important within the private sector, for that reason buyers within the general public sector have more knowledge than the public sector [2]. most importantly, the key feature of the procurement function in its spending. As indicated by [20], costs that spent by procurement represent quite 70% of the total cost of products and systems, while some publications indicated it between 48% and up to 90% of turnover is spent externally with the supply base [7, 19]. The huge budget that's allocated to the procurement department is to manage the function of supply like purchasing raw materials, components, finished goods or services [20]. However, the role of procurement has extended

to include involvement altogether external expenditure, organizational strategy, held responsible of cost reductions and profits generating, and plays a key to competitive advantage [22]. Buyer within the procurement department is responsible for handling all activities like identifying and procuring the goods and services that needed by his/her organization, and deals directly with a supplier through negotiations for prices and arrange for the acquisition and delivery of the products .Although buyers are required to possess strict ethical requirements for themselves and business, but they still are often vulnerable. Also, it could be because of blackmail of a buyer by a third party, or preferential treatment of a business partner. Further, buyers in a workplace may engage in several kinds of corruption, which is defined because the abuse of position for private gain within the procurement process,, which could through collusion, bribery, embezzlement and fraud, which may occur if given the prospect , incentive and/or lack of oversight. Corruption within the mentioned cases could be within the type of bribes or other advantages of various types [18]. Moreover, opportunities for frequent procurement fraud can happen through any stage within the procurement process, as all parties have a chance to understand enjoy false invoicing, bribery and kickback schemes to inventory theft and substandard goods. All organizations are prone to fraud and corruption in their procurement cycles. For example, during a study conducted by [13] in South Africa , identified a huge corruption public procurement sector. Some of the fraud includes fictitious submission and exorbitant invoices for materials and labour, also as bribes in return for work and even prompt payment. [9] in their annual report stated there are significant corruption risks from decision-making, which may distort the allocation of resources through public procurement, especially within the Organization for Economic Cooperation and Development (OECD). Furthermore, according to a report published by [11] stated that procurement fraud within the center East is one of the foremost significant kinds of fraud

faced by organizations within the region, in terms of monetary loss, reputational damage, and complexity. during a comprehensive fraud study conducted by [1], found that the procurement department is categorized because the very best risk department (74% of fraud schemes), and [21] found in their investigation that 29% of case within the united kingdom comes also from procurement fraud. As aforementioned, procurement fraud can happen in pre-stage or post-stage. as an example , in pre-stage fraud, it could happen through the premature opening of bids, altering bids, unjustifiable extension of some time limits and falsifying bid logs and documents bid rigging schemes [11]. In post-contract fraud schemes, on the other hand, it could happen in several ways, like charging unallowable costs to the buyer, concealing or misrepresenting them as allowable costs, or hiding them in accounts where it's thought that they are unlikely to be detected [11]. However, advanced technology has changed business in the evolution of solving any problems, and the supply chain has become one of the core business continues get developed in the face of technological advancements. Furthermore, the new technology has become more innovative in handling the processes to improve the business strategy through creating appropriate structures and make use of suitable instruments and advanced technology. As mentioned, procurement has undergone tremendous changes from the past couple of years, and big companies around the world have moved to adapt to cognitive procurement technologies because of their effect to maximize productivity in the procurement process and reduce costs, which is estimated to be reduced by as much as 40-60 percent [3]. Therefore, the ascender of technology and its positive impact on procurement has been projected as a procurement trend, and the main technologies that have been adapted to the procurement function are Big Data Analytics, Enterprise Resource planning, Machine Learning, Natural Language Processing, Artificial Intelligence, and Blockchain. The Blockchain technology is defined as value exchange transactions, recorded in a

distributed ledger, which are sequentially stored into blocks, and each block is linked to the previous block, which builds the chain. This creates an immutable peer-to-peer network, based on cryptography and consensus mechanisms. The Blockchain network's behaviour is possible to customize to suit different implementations [14].

Blockchain works based upon how the Bitcoins Blockchain system works with some differences. The difference is associated with types of Blockchains and how to reach consensus for those, however, it is basically information stored in decentralized blocks via the network and protected by a password, and it will be available for other actors in the network [8]

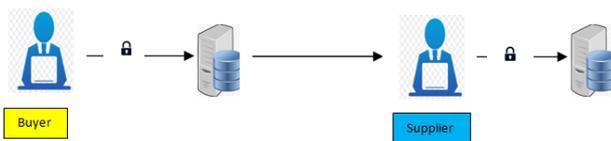


Fig 1. Typical Process between Buyer and Supplier Through Blockchain

### Need for a Blockchain based platform:

Blockchain consists of a linked chain that stores auditable data in units called blocks. Blockchain is also referred to as an "Internet of value", meaning a secure way to store and transact value — anything from currency, stocks, contracts and even votes — from one entity to a different . It is also the underlying technology powering cryptocurrencies such as Bitcoin and Ethereum(Ref [1]). A blockchain by design is cryptographically secure , it is a write once-append only, distributed and decentralized system.

### Important properties

The two main properties of Blockchain Technology which have helped it gain widespread acclaim are as follows

### Decentralization:

When bitcoin first came into the picture, the decentralization property is the one which introduced the trust and thus eliminating the intermediary from the picture. The decentralized architecture also brings the distribution of power among the nodes i.e. no single node has the authority over the network and each node will be sharing the same data as the other. This distributed replica of the same set of chained blocks over the network brings the blockchain to be called a distributed ledger. In a traditional centralized architecture, the central node holds the responsibility of adding the blocks but in our case, the onus is on the distributed nodes to somehow validate the blocks and link them to the chain, and in the context of blockchain this is done via consensus mechanisms. This process of having consensus is what makes sure that every single node on the system agrees on the state of the blockchain.

### Immutability

In the context of a blockchain, the word immutability mainly refers to the transaction data. Once data is entered it can't be tampered with. In the context of a blockchain, the cryptographic hash linking of the blocks makes sure of the immutability. Small change in the data drastically changes the value of its hash. This newly computed hash has to be matched with the already linked chain of hashes. Also, the property of decentralization makes a very important role here because if a corrupted node tries to modify the data on its local state this has to be accepted during the consensus mechanism by all the other nodes which makes it difficult to modify the data.

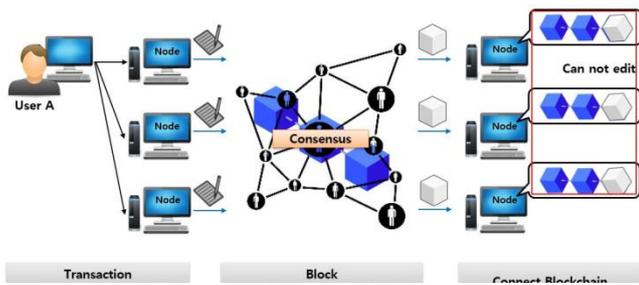


Fig 2. Block Chain

### PROPOSED SYSTEM

This chapter describes how block chain can be applied to solve the inconsistency in supply chain and the ways it can improve it through cost and time efficient management. The system will track the trajectory path of a agricultural product from initial to final moment. Along with the path appreciation or depreciation in price will be monitored. The change in ownership will be recorded. At every change of ownership location and amount also will be updated. User can also track the current position of their product. Each user will be uniquely identified by their mail-id. In the same way each product will be identified by their product id. Every movement such as product creation , participant creation and transfer of product will be recorded and updated every second. The open street map along with polyline to connect targets will give an GUI for advanced tracking.

### Open Street Map

A collaborative project to make a free editable map of the planet . The geodata underlying the map is taken into account the first output of the project. The creation and growth of OSM has been motivated by restrictions on use or availability of map data across much of the planet , and therefore the advent of cheap portable satellite navigation devices. OSM is taken into account a prominent example of volunteered geographic information.

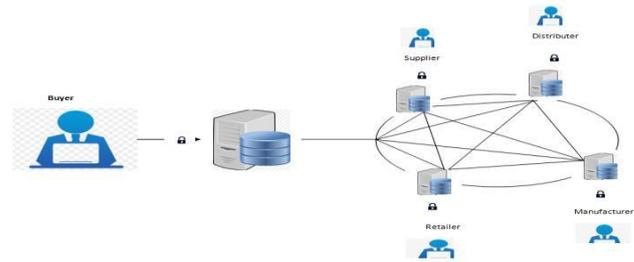


Fig. 3 Networking between Players within Blockchain in Procurement

As Fig.3 illustrated, a typical decentralized distributed system that is employed by the most stakeholders through Blockchain when conducting the method of collecting, storing, and managing information securely of every product throughout its life cycle, and every one information and records are shared among them. The most stakeholders as shown within the figure are buyer, distributor, manufacturer, supplier, and retailer, and every of them has access into the Blockchain network and that they have a unique digital profile containing the key information posted during the life cycle process at each stage. Each actor has access to the network of Blockchain through a interface and allowed to key product data. When the info is entered into the system, it runs on the Blockchain that permits programmable code to be executed through the Blockchain, and become available to all or any actors who run the system software with an accurate authentication within the network. Also, each actor can have access to form a change within the entered data counting on their type and position within the network, and that is supported the set of rules within the Blockchain. Such rules define how the actors within the network are to interact with the system, and the way the info are going to be shared among the network, which cannot be changed by the actors and thus guarantee integrity and therefore the conditions for the validity of knowledge . Once the rules are stored within the Blockchain, they function exactly as defined and can't be altered without broadcasting to all or any nodes and verification by the key actor. Unlike the normal network, actors

within the Blockchain can trust one another which should prevent any sort of frauds, since actors will know all details about the merchandise being processed. After summarizing how the Blockchain works, the next step is to experiment the power of the technology to stop any sort of frauds in procurement. First of all, it's important to repeat again that independent variables in our experiment are frauds that are considered a worldwide phenomenon related to the procurement processes, which aren't possible to be manipulated by the author. The study objective is to live the effects of such independent variables on the dependent variable which is that the controlling tool of Blockchain in preventing any sort of procurement frauds.

### III. EXPERIMENTS

This chapter describes the working model based on the proposed solution in chapter 4. It also directs us towards the running algorithm along with code flow.

#### Working environment

Hyperledger composer technology isn't however quite matured and plenty of releases of the technology are happening simply within the span of a few months. For the aim of this paper, Hyperledger composer version 1.4 has been used.

#### Technical Details:

- operative System: Ubuntu sixteen.04 LTS

Hyperledger composer includes a list of prerequisite softwares that requires it to be put in before beginning a network. throughout the course of this project, we have a tendency to find that not all versions of the prerequisites are compatible with one another thus we have a tendency to list the versions of the softwares employed in this project :

1. Operating System : Ubuntu 18.04 LTS
2. Node.js v 8.17.0
3. Python v 2.7.17
4. Composer-cli v 0.20

5. Composer-rest-server-v-0.20
6. Generator-hyperledger-composer v 0.20
7. Yo
8. Composer-playground v 0.20
9. Open Street Map
10. Javascript [ES6]

All the necessary elements of the Hyperledger cloth like Peer, CouchDB, Ordering service are packaged into manual laborer pictures. Hyperledger cloth Samples provided by the community has the script to fetch all the connected manual laborer pictures from the manual laborer Hub and additionally the platform additionally binaries later employed in the network also are found within the Bin directory of the material Samples.

#### Participant

Participants are the key players in the application, who can be a product owner, product issuer, product retailer and others. Having many roles in the participant domain, all can come under the same umbrella. Users can add many participants in the application, which they can take any role in. Let's say a "Barney" is added as a participant in the product. If Barney gives a package to someone else, he plays the role of issuer. Consider the same participant is getting a package from someone, he plays the role of 'new owner'. Participants are uniquely identified by their email id, which is given by the participant while adding a participant. In the module of participants, the list of participants are listed in the tabular manner after retrieving the data from the hyperledger blockchain by traversing through the blocks with the help of previous hash stored in the current block and the data is listed in the front end. An add participant button is visible for the user to add more participants(Ref [6]).

#### Products

Products are the physical real world package that is being transferred to make it reach the right owner. To know the whereabouts of the product, the current

product owner can track it down at any time and the real time data is stored in the hyperledger blockchain which is a decentralized network. Products can be added by any participants that are registered with the application.

Product Id should be given by the participants which should be unique to identify a product in the cluster of data. The location parameters like latitude and longitude should be given by the user to know about the location of the product. When the products module is loaded, the browser asks the user to either allow or deny knowing location. If a user allows then the fields latitude and longitude of current location are auto filled in the form, and the user can also modify and feed the fields manually. If a user denies the location permission, then a user has to give latitude and longitude manually. In the module of Products, the list of products are listed in the tabular manner after retrieving the data from the hyperledger blockchain by traversing through the blocks with the help of previous hash stored in the current block and the data is listed in the front end.

### **Move product**

Move product module speaks about performing a transaction of a product which is to be moved to the new owner. The product id which is a unique value used to identify the product should be given by the participant who is performing a transaction. The current owner of the product will be the issuer in this scenario. The owner will be the new owner of the product in the same scenario. The participant should give the details of the owner and issuer very carefully. Each and every participant like owners and issuer has a unique email id which is used to identify the participants correctly. The participant should update the new owner field as the participant email id who is going to receive the product. The latitude and longitude are location parameters which should be filled by the participant to perform a transaction of the product. Once the location parameters are set, participants can perform a transaction by submitting the form. The transaction details will be posted in the hyperledger blockchain as a new block with the data of updated owner and

issuer. It can be verified in the transactions module which retrieves the transactions that happened recently.(Ref [8])

### **Transactions**

Transactions module retrieves all the transactions that happened from the hyperledger blockchain block by block. Transactions are stored in a decentralized network maintained by Hyperledger. These stored transactions can be made visible to the users by a get api call from the transactions. The response of the api call contains the data of all transactions made in the order of LIFO(Last In First Out). These data are extracted from the response JSON and constructed in the tabular manner for the user in the front end.

### **Map**

Map module of the application is to acknowledge the user to know the location of the product in real time. This module gets a product id from the participant to uniquely identify a product. After getting the id from the participant, the pointer on the map is redirected to the current location of the product. OpenStreetMap may be a collaborative project to make a free editable map of the planet . The geodata underlying the map is taken into account the first output of the project. OpenStreetMap is open data: you are liberal to use it for any purpose as long as you credit OpenStreetMap and its contributors. If you alter or repose on the info in certain ways, you'll distribute the result only under an equivalent licence.

### **Algorithm**

1. Open the terminal or cmd.
2. Create business card with directory name  
composer archive create -t dir -n .
3. Install the business card composer network  
install -c PeerAdmin@fabricnetwork -a tutorial-network@0.0.1.bna.
4. Deploy the business card composer network  
start --networkName tutorial-network --networkVersion 0.0.1 -A admin -S adminpw -c PeerAdmin@fabric-network.

5. Import the card in your network composer  
card import -f admin@tutorial-network.card.
6. Check for the existence of card composer  
network ping -c admin@tutorial-network.
7. Start the REST server composer-rest-server -  
c admin@tutorial-network -p.
8. Open the browser and access the  
**localhost:<port>**

### FRONT-END working

The user interface is created with advanced version of Java script [ES6] that will productively render DOM with out any delay. The home page contains dashboard that displays the transaction chart regarding the growth of transaction in last week. The dashboard page will also display the recent 5 transactions. User can add product in the product page under add product tab. New user can also be added under participant page under add participant tab. Transfer of product can be done under Move Product page. Product page, Participant page, Transactions page will display the table of information about Product, Participant and Transactions respectively.

### IV. RESULTS AND DISCUSSION

In a blockchain-based system the price system provides consumers with transparent reliable price information. SCM, Companies can tracing understand consumers' tastes, and consumers can obtain and reliable price information. Companies can understand consumers' tastes, and consumers obtain price information, which inspires consumption. Permission management for blockchains can allow price nodes information, encourages blockchains to operate and exchange data. consumption. The blockchain Permission maintains a management record of transaction information nodes to operate and exchange data. The blockchain maintains a record transaction available to businesses, consumers, and wholesalers. Companies that of run SCM can upload information from existing data

stores to the blockchain to make that use of existing system information. available to businesses, consumers, and wholesalers. Companies run SCM can upload information can also accessed from portable devices through an Android application. Since the built-in from Data existing data be stores to the blockchain to make use of an existing system information. Data can also store price information in a distributed manner, if a point is attacked, its information can the be accessed from the portable devices through an Android application. Since the built-in system stores are recovered by comparison with surrounding nodes. However, for individual nodes, the local price information during a distributed manner, if to some extent is attacked, its information are often recovered by the system administrator and must guarantee appropriate security standards. The seller's name are often kept in comparison with surrounding nodes. However, for individual nodes, the local supervisor private, but a sort of price fixing are often created, as an example by repeatedly trading with a selected must guarantee appropriate security standards. The seller's name are often kept private, but a sort of provider or repeating the trade. within the case of blockchains, information are often fully verified; auditing Price fixing are often created as an example by repeatedly trading with a selected provider or repeating the the data is feasible in order that participants within the ecosystem can verify all information through consensus. trade. case prototypes, of blockchains, information can be fully verified; auditing the data is possible so that In the initial the existing Ethernet been used, which can affect the system. participants in risk the ecosystem can verify all information Hence, this has been addressed by Ethereum's policy through change. consensus. In principle, Blockchain is an advanced technology with extremely security platform, because transactions are digitally signed and cryptocurrencies with full assurance that can record transactions between two parties efficiently and during a verifiable and permanent way. Moreover, the Blockchain is a replacement paradigm wont to track past actions and performance and can

reconcile any flaws through business processes, which is difficult to realize through the normal methods that would take tons of your time and are susceptible to error. to the present end, as procurement fraud is taken into account a difficult area for several organizations to tackle due to difficult to detect irregularities supported the normal methods, it had been noticed thus procurement fraud is rife in recent years according to several works of literature. for instance, as stated by [15], " the value of fraud to the UK's private sector is on the brink of £144 billion per annum. Of this, an estimated £127 billion is linked to procurement". Moreover, procurement fraud is not a topic that will be ignored while no organization likes to distrust their procurement team or maybe their suppliers, but they can not allow to be defrauded by them, especially if there's a weak control in the procurement systems. In addition to control systems, the existence of a third party within the procurement process cycle is the main reason to prevent corruption, and most sorts of procurement fraud listed in Fig 2, are due to the involvement of a third party that could have an honest relationship with either buyer or supplier who is suspected of offering either of them with some illegal advantages. For example, a buyer may be offered a gift or hospitality from a third party with an expectation that a business advantage is going to be provided by his/her organization reciprocally, and that of course is not easy to detect. For these reasons, Blockchain technology is the best alternative mitigation strategy, method, and tool to face such major challenges in the procurement process cycle. As mentioned earlier, Blockchain is a secure peer to see software with no third party involvement and all the transactions are archived and performed on a secure digital ledger, and it is decentralized where the parties can directly partake in the transactions with full transparency and almost zero chance of fraud, and fact with immutability (no party can change the info once it's written on the Blockchain). However, if any parameters regarding the PO are decided to change immediately, it cannot be during the interaction. In other words, if the buyer wanted

to change the delivery date, quantity, method of transportation, etc., during the interaction with the supplier, the method might delay until the info is updated within the Blockchain. At the top, it is often claimed that there's a high possibility of preventing procurement fraud (IV) by implementing the Blockchain technology (DV) in the procurement process.

## V.CONCLUSION

The main purpose of this project is to integrate blockchain technology to the current business process of Supply Chain Management to reduce fraud works and securely store data. For this literature study is done on the existing business process and during this study problems associated with the existing process are encountered. We then made an argument about why we think blockchain technology is the best possible solution. we have established the fact that HyperLedger can be used to integrate blockchain technology into existing enterprise solutions. Although we have made an application to overcome the security related issues in the existing process of SCM.

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