BLOCKCHAIN BASED SUPPLY AND DELIVERY OF SUBSIDIZED GOODS/SCHEMES

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Abstract : Latest quality scandals show the importance of quality management from a supply chain perspective. Even though many related studies have been performed targeting the supply chain quality management, the technologies used still have difficulties in resolving problems arising from the lack of trust in supply chains. The fundamental reason lies in three challenges delivered to the normal centralized trust mechanism: self-interests of supply chain members, information asymmetry in production processes, costs and limitations of quality inspections. Blockchain sure is a promising technology to overcome these problems. In this proposed project, the aim is to improve the supply chain quality management by adopting the blockchain technology and propose a framework for blockchain-based supply chain quality management. With the help of blockchain, the primary goal is to create a corruption less transaction system which is trustworthy, de-centralized and also which is tamper-proof. Today where poor individuals are not given their rights and no complete track of records is maintained, blockchain solution helps solve all the problems.

IndexTerms **- Blockchain, Food distribution system (FDS), Proof of Work (PoW), Consensus algorithm, Mining, Digital signature.**

I. INTRODUCTION

A significant extent of time is wasted under supply chain and large number of true beneficiaries are bereft of government subsidized schemes. Government subsidized items like fertilizers, housing schemes (Indira Awas and land), pension schemes, medicine, rationing items (wheat, sugar, kerosene and so on) enormous amount of time is wasted in supply chain and that results in wastage of huge number of items, delayed delivery of the items etc. Also due to other various reason in some cases subsidize items / schemes do not reach the truthful beneficiary. To address and ensure government schemes are reaching to the beneficiary in timely manner, blockchain based ecosystem can be developed in order to monitor, track and reduced supply chain time and desirable beneficiary is benefited under the government schemes.

The proposed project is made with the intention and the objectives of monitoring the supply of subsidized goods and increasing the process efficiency by tracking and providing the transparent record of motion of products in the supply chain, to the concerned authorities. Also alongside ensuring the delivery to be done to the beneficiary. However the scope of this project is not just limited to government environment, but can be extended for any type of supply chain monitoring, be it postal or retail products and for that matter any kind of delivery which requires product passing between multiple intermediate authorities in the process of delivery, ensuring the product is delivered to its rightful owner. This project and idea can be generalized to suit any such construct demanding proper supply and ensured delivery

II. LITERATURE SURVEY

The following research articles are selected for review, keeping in mind the traditional and conventional approaches of Blockchain in Food Distribution System.:

1. Si Chen et al. worked on Blockchain dealing with supply chain management system. The paper emphasized on blockchain's feature like Trust, Decentralized governance and Traceable transactions. However, the scope of the paper is limited to India and other developing countries. [1]
2. Miguel Pincheira et al. worked Blockchain focusing on the traceability feature in field of agriculture. The paper mainly focused on traceability and transparent transactions in Agro-based IOT network. However, the scope of the paper is limited to India and other developing countries. [2]
3. Guido Perboli et al. dealt with Blockchain creating a general methodology to design Blockchain methodology use cases, which are not related to monetary, business and budgeting purposes. Blockchain in non-financial applications mainly focused on the technological part and the Business Process Modelling. [3]
4. Youness Tribis et al. worked on Blockchain technology assuring immutability and integrity of data without the need of a third trusted party. It uses Systematic Mapping Study Method to examine 40 extracted primary studies from scientific DBMS. [4]
5. Arman Jabbari et al. contributed his research on Blockchain to enable supply chain impacts. Although it will require significant research advances. The potential of blockchain enabled supply is enormous. [5]

III. PROPOSED SYSTEM

There are basically two problems at hand: -

1. The supply chains
2. Ensuring the true beneficiary gets the goods

Implementing blockchains & smart contracts, it becomes possible to create a world in which contracts are embedded digitally in code and stored in public record where they are protected from deletion and manipulation. Public ledger is collection of all the transactions happening within the network. With blockchain, every agreement, task, and payment will have a digital record and signature in this world, that can be identified, validated, stored, and shared.

Everything would become computerized and transaction digital. Middlemen including lawyers, brokers, and bankers, and public administrators might no longer be necessary. Individuals, organizations, and governments would freely transact and interact with one another with no illegal actions.

Therefore, blockchains & smart contracts:

• Drastically shorten transaction costs (bureaucracy) through machine consensus and auto-enforceable code.

•Overcoming the old principal-agent dilemmas of organizations, thus providing an operating mechanism for what is referred to as "trust less trust". This means that users don't have to trust people and organizations, they just need to trust code, which is open source and which provides transparent processes.

The emergence of blockchain technology has brought innovative possibilities to Supply Chain Quality Management (SCQM).

Blockchain demonstrates the characteristics such as: -
1.Trust machine
2.De-centralized governance
3.Traceable transactions

SCM is in the process of being upgraded to the point where the customer gets what they deserve, when they demand and wherever they demand it. In this modern age, it is now an environment of "Survival of the Fastest".
•Issues of distrust -> unchanged information
•Traceable records -> standardized norms and agreements (Public Ledger).
•By automatic executions of quality management contracts, it is possible to create an intelligent system.

Blockchain technology transforms the traditional centralized system to a multi-centred or decentralized system that enables different interest groups to share power in the same IT system. This system also improves the qualities of products and services in supply chains by contracts.

In the current scenario, government sends ration to go-downs variably i.e. they don't have a fixed time to transport the goods. In a particular month, on a random day a particular ration would be deployed at a shop. It is tedious for the shopkeeper to keep track of how much goods arrived at what time and how many goods have to be given to the beneficiaries. This is where blockchain comes into picture. Blockchain provides every beneficiary with a public ledger wherein records are maintained as per how much ration is to be allocated to the person mentioned in the ration card. Once any transaction is done, the record is updated and also all these records are tamperproof and can be seen transparently by both the beneficiary and the shopkeeper.

This system guarantees a corruptionless transaction. A system wherein the rations which were not collected by the beneficiaries is collected back by the government and supplied again so that neither the goods are wasted nor the goods fall in hands of people who already have ration in surplus. The shopkeepers need not call the beneficiaries at the arrival of goods, the beneficiaries will be notified on their smartphone that the goods have arrived and are ready to be collected. This will save time and energy of the shopkeepers to take the initiative of calling the beneficiaries and notifying them about the same.

Thus talking about our 2 problems, for the supply chains, with the help of blockchain we can ensure and record the proper delivery from the start to end in the SCM, account for any losses (in transportation) or surplus in the process and thus will become able to take the necessary steps to manage the surplus (leftover ration) and deficit of the rations, overall improving the supply chain. Secondly the user's record will be maintained in the most transparent and non- repudiation manner hence possibility of corruption is curbed completely ensuring the actual beneficiary gets their due delivery or benefit of the respective schemes related to FDS by the government

IV. SYSTEM ARCHITECTURE

A System architecture is the root model which indicates the idea about the structure, behavior and characteristics of a system and the architecture description on the other hand formally describes and represent the system, organized in a way that holds reasoning about its structures and behaviors. Figure 1. System Architecture depicts the workflow of the proposed system.

In the architecture shown, there are 4 levels and the transactions take place at all the 4 levels, initially starting with the transaction between the farmers and the go-downs for the approved total amount of the subsidized ration and goods by the government under the FDS scheme. The government will also generate and assign the public & private key pair to against the mobile no. of the person approved to avail this scheme, this database (with the public key only) will uniquely identify the beneficiary and will be shared with the local and regional shopkeepers responsible for distribution of goods. The private key and the benefits for that approved person will be automatically be updated on the user's end. The proposed system will interweave the blockchain (for record keeping) along with the flow of goods from farmers to beneficiaries. After the initial transaction, the go-downs will distribute the rations as and when required by the shopkeepers, this transaction will also be recorded on the blockchain. When the goods will arrive at the shop, a notification to the beneficiaries will be sent regarding the same. Finally at the final level i.e. the user, the user when reaching the shop will receive the goods and rations and a bill will be generated which will be digitally signed by the shopkeeper and sent to the user's mobile and the user will then accept the bill (digitally signing it), an acceptance acknowledgement will be sent to the shopkeeper completing the transaction, the shopkeeper can confirm it from the authorized user as he has the database of public keys of all the users. The data will be accordingly be updated on the user's as well as the shopkeeper's device. The blockchain will reside at the government authorized go-down centers. In brief, the most interactive part is the mobile app through which the user performs the transaction of the goods and rations. Each transaction is then stored on respective shopkeeper's device in an encrypted format. After a threshold count of the transactions, the shopkeeper's device will create a block and upload the blocks to the government authorized go-downs. This process will be performed by all the shopkeeper's devices on their connected go-downs. In the network of the go-downs, the blockchain of our system resides. Every time a go-down system is booted, it will synchronize with all the other nodes on the blockchain network to first verify its chain authenticity and secondly make any new updates to its copy of the records

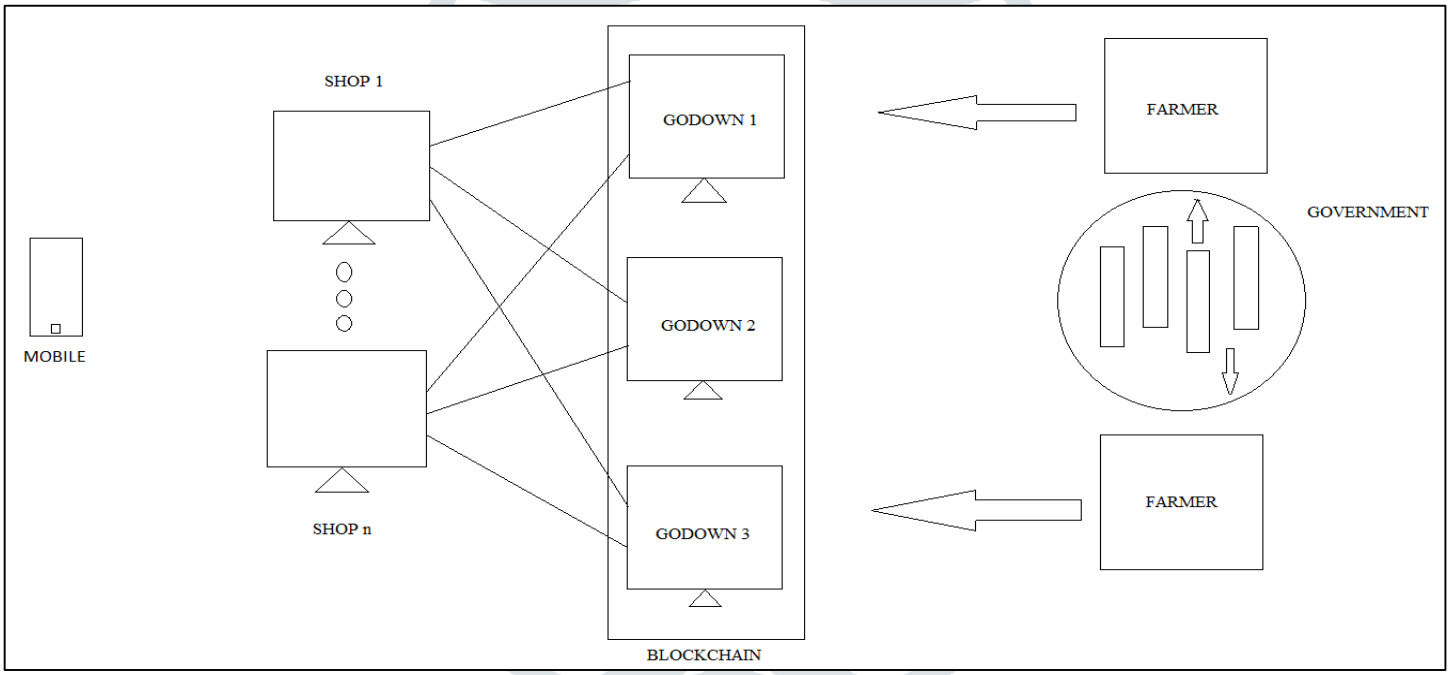

Fig 1. System Architecture

V. RESULT AND DISCUSSION

The results and discussions section present the practical aspect of the project. Result helps understand the project more effectively. It helps us to understand the proper flow of system, functionalities etc. Results are shown in the form of snapshots. Phase one of project deals with android development, so the portal system of blockchain network is implemented with help of android. For a beneficiary to get his/her subsidized goods he/she needs to register on an app wherein on login a blockchain network will be initiated. A slide show runs in the background when a user starts the application. The screenshots of some slides are displayed

Figure 2. Home Screen

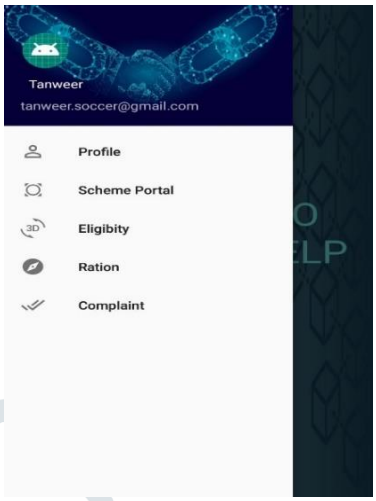

Figure 3. Interaction Surface

The Figure 3. Interaction Interface is the snapshot of digital wallet of a user who is connected on a blockchain network. Here he will get to know the transactions which are happening and will be able to verify his/her transactions.

Figure 4. Blockchain

The Figure 3. Blockchain is the blockchain developed behind the scene to maintain the records. It shows the sample 3 transactions with goods transacted for and date, also using proof of work indicated by the variable difficulty.

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