APPLICATION OF BLOCKCHAIN TECHNOLOGY IN PUBLIC DISTRIBUTION SYSTEM: A CONCEPT NOTE

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ABSTRACT

Public Distribution System (PDS) for distribution of food grains at reasonable prices has been effectively working on their objective with incorporation of information technology. PDS is vigorously working on alleviating the chronic lack of micronutrients among the citizens, especially the underprivileged. This supply chain managed by the government recently faces few issues of multiple intermediaries, lack of transparency and adulteration of food products. This paper presents the contextualized understanding on eradicating these problems and its effects by implementing the blockchain technology which is the budding technique of enhancing the visibility of supply chain and for maintaining a decentralized maintenance of ledger without the threat of it being tampered.

Keywords: Blockchain, Transparency, Supply Chain, and Decentralization.

INTRODUCTION

Specified intermediate firms have their duty as to promote interoperability by charting and merging companies' unique data for multiple organisations and systems, help companies integrate their information and procedures (Korpela et al., 2017). This enhances the access to customers' demand which is shared appropriately with cloud in B2B integration.

For ensuring the food security for the people under poverty line and for the underprivileged, the government has instituted PDS through a hub of Fair Price Shops (FPS). People purchasing from the PDS held the ration card initially. Later, it was replaced by smart card system. PDS provides the essential commodities of satisfactory quality at a subsidised price. "*Different households are entitled to particular quantities of certain food products and commodities. The responsibility of such distribution is taken care by the Central and State governments*" (Balani, 2013). "*When acting ineffective in performing its objectives, PDS is severely criticised with reference to the cost of distribution*" (Bhagwat and Raut, 2018). Schemes launched by the government on food security can reach the citizens through the PDS. Thus the PDS should consistently perform well. The performance of PDS can be analysed through appropriate measures like cost as defined by Planning Commission of India (2006). Curtaining the leakages from the quota allotted a particular region can also be defined as the measure of performance. The existing constraints in PDS can only be reduced by providing a wider end to end visibility for the customers who are the beneficiaries. This also reduces the constraints due to the automation of PDS through blockchain technology by integrating it with the existing smart cards, as dealt in this paper.

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Customers as Beneficiaries

System of distribution, information delivery and cost determination on the commodities are all to be shared among the participants of the blockchain who are one of the trusted parties as per the system. Lack of transparency, accountability, poor governance and poor service delivery system are the prominent issues in PDS, according to Garg and Sundar (2013). As per the report of Planning Commission of India (2006), around 57 % of food grains have not reached the people due to the transportation inefficiencies and due to the leakages in supply chain. Too many intermediaries seem to indulge in the entire supply chain including the unauthorized brokers which resulted in low efficiency of PDS. As per the PDS's objectives in the price of the commodities must be less than the market price of the state. But, due to the above said constraints the delivery price seems to be increasing. Factors to be considered while designing the blockchain technology enabled PDS are size of PDS, position of the participants in the supply chain and number of tiers in PDS.

Existing Smart Card System

Smart cards replaced ration cards with the Near Field Communication (NFC) Technology – the NFC tag is added at the point of sale, checks the client details in the card (Karan, 2018). At each FPS, this system is associated and communicated through web. The card holders can pay through their own financial balance and need not pay in cash. Administration is done through such network reducing the error of work done and effectively exchanges the data in no time.

Public portal, mobile application, SMS, call centre, e-mail and Face book facilities are being appropriately updated by the Tamil Nadu e-PDS. Information regarding the availability of stock at the warehouse, transportation of commodities from the warehouse to FPS is conducted through web. As aadhar details are linked to the smart card, the purchase of the products is sent to through SMS to the card holders which also automatized.

Blockchain Technology

Blockchain technology is a disruptive technology that holds the immutable file of documents on transactions that makes unauthorized users unable to tamper them. It was invented by Nakamoto (2008). It gained a large set of audience only in 2015. Asymmetric encryption method of cryptography is the protocol on which the blockchain technology works. The encryption and decryption keys are different – public key for decryption and private key for encryption. These keys are the trap for the unauthorized users and with the same the authorized participants can remain sure about the safety of transactions. "*A centralized authority acting as a bookkeeper is required and so the transactions are faster depending on the number of nods that mine the data at any particular point of time*" (Apte and Petrosky, 2016). Crypto currency was the first application that adopted the blockchain technology.

Being completely automated and safe without demanding intermediaries the end user or receiver can avail all the information on entire transaction right from the beginning nod or center. "*The first block is created by the first participant who initiates the transaction and it is verified by many computers distributed around the trusted network*" (Apte and Petrosky, 2016). This verification makes it as the beginning nod for a blockchain. As the multiple transactions are carried out multiple blocks are created. Every transaction is recorded as and when performed and multiple copies of document are generated in turn creating a unique record including the whole

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transaction history. An accounting ledger is created which can neither be falsified nor be distributed without the digital signature of the majority of trusted participants. The same can be stored in multiple places in the cloud so that the copies would not be lost. Transparency, speed, accessibility and non-falsification are the milestones achieved by this system.

It would restrict the counterfeit goods entering the supply chain as it is a fail proof process. It would enable the end users to verify how, where and by whom the product is intended to purchase has been assembled.This study is extremely useful in determining the feasibility of blockchain technology in supply chain management of public distribution system. As a latest technology, blockchain is a shared resource of businesses, and the goal of businesses is to turn resources into business capabilities.There are three forms of blockchain: public chain, blockchain network, and private chain.

Depending on the multiple kinds of blockchain technology and use features, blockchain has grown over decades and may be split into four stages: The first phase of the blockchain, known as blockchain 1.0, was primarily focused on trade, mostly employing dense currencies such as Bitcoin (Swan, 2015). Cryptography allows peer-to-peer transfers with this decentralised digital money. Privacy, smart contracts, the creation of blockchain tokens, and functionality for non-local assets are all major elements of blockchain 2.0 is an expansion of blockchain 1.0. The rise of Ethereum is the popular platform at present time, although there are many more options. Blockchain 3.0 broadens the scope of blockchain to include more complicated smart contracts, allowing it to be used to all aspects of human existence outside of money. Artificial intelligence technologies is incorporated into block chain in the blockchain 4.0 phase (Salah, 2019) Figure 1.

FIGURE 1
BLOCKCHAIN TECHNOLOGY

Source: Hackius and Petersen (2017).

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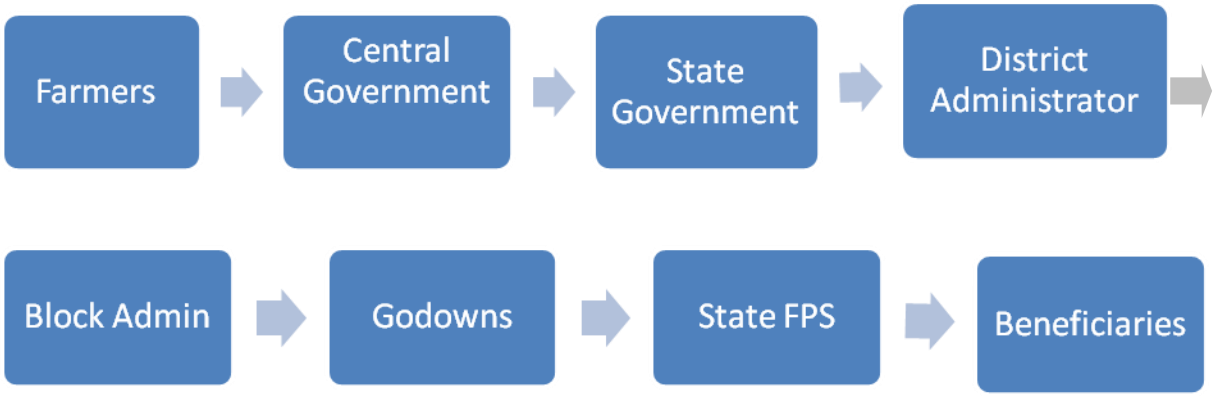

FIGURE 2
PROCESS OF PUBLIC DISTRIBUTION SYSTEM

The use cases of blockchain technology according to the findings of Hackius & Petersen (2017) Figure 2.

1. Easy paper work processing
2. Identifying counterfeit products
3. Facilitate origin tracking
4. Operate with Internet of Things.

The blockchain technology in PDS will be of greater help to the price monitoring cell, in specific, to the price watch committee. Data collected by the statistical inspectors from the district headquarters and the significant market centres are completely automatized without the threat of the data being falsified. The e-PDS system is to be embedded with this technology, so that every beneficiary of PDS can also experience the transparency of procurement, transportation, inspection information and in turn the PDs would become the most trustworthy connecting the entire state. The point of sale device at every FPS is connected and automatic demand forecast data can be generated with the knowledge of every participant. The need of adding the beneficiary as a participant is to empower them with authentic information.

Need for continuous monitoring of the entire supply chain can be significantly reduce that is reducing the man hours on inspection. A supportive regulatory framework and policy with respect to blockchain technology will enhance its feasibility of implementation. Reducing man hours at the FPS is the key of this implementation. The part time shop schemes of FPS in villages which are located for away from the permanent FPS are implemented by the government which creates uncertainty in demands. The controlled and momentarily distribution can happen with the help of this technology.

Limitations and Scope of Further Research

As the blockchain technology is still in infancy in India, the practical implications of the implementation in PDS remain unexplored in the current study. But this research would form a path for future researches on constraints on implementation, coordinated knowledge gaining on blockchain technology, response from the beneficiaries, problems on learning to use and most importantly performance metrics of blockchain enabled PDS.

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Conclusion

Blockchain technology in supply chain management has paved the path for its idea of application in PDS of Tamil Nadu. As emphasized earlier, the restrictions on attaining the objective of poverty alleviation is found to be solved by implementing this trust worthy system. The existing smart card system of PDS has brought empowerment of customers to some extent. On applying the blockchain the people would gain the awareness of entire supply chain transactions from which it becomes evident that they receive the right product at right time.

REFERENCES

Apte, S., & Petrovsky, N. (2016). Will blockchain technology revolutionize excipient supply chain management?. *Journal of Excipients and Food Chemicals*, *7*(3), 910.

Balani, S. (2013). Functioning of the public distribution system, an analytical report. *PRS Legislative Research*. Published.

Bhagwat, R.O., &Raut, D.N. (2018). Impact assessment of supply chain constraints over performance of public distribution system. *International Journal of Indian Culture and Business Management*, *16*(1), 19–38.

Garg, S., & Diatha, K.S. (2013). A mobile solution for an inclusive public distribution system in India.

Hackius, N., & Petersen, M. (2017) Blockchain in logistics and supply chain: trick or treat? *In Digitalization in Supply Chain Management and Logistics: Smart and Digital Solutions for an Industry 4.0 Environment. Proceedings of the Hamburg International Conference of Logistics (HICL), 23*, 3–18.

Karan, P., Nalawade, K., Sawant, R., &Tripathi, K.K. (2018). Smart card based distribution system using NFC technology. *Smart Card Based Distribution System Using NFC Technology*. Published.

Korpela, K., Hallikas, J., & Dahlberg, T. (2017). Digital supply chain transformation toward blockchain integration. *In Proceedings of the 50th Hawaii International Conference on System Sciences.* Published.

Nakamoto, S. (2008). Bitcoin: A Peer-to-Peer Electronic Cash System. *Decentralized Business Review*. Published.

Planning Commission. (2006). *Planning commission- annual report 2005–06*.

Salah, K., Rehman, M.H.U., Nizamuddin, N., & Al-Fuqaha, A. (2019). Blockchain for AI: Review and open research challenges. *IEEE Access*, *7*, 10127-10149.

Swan, M. (2015). Blockchain: Blueprint for a New Economy.–O'Reill Media. Inc., Sebastopol.

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