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Blockchain a panacea for the resisters of growth– Deployment of Blockchain to Housing sector on a simulation basis

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ABSTRACT

Apple co-founder, Wozniak states that “blockchain is the next major IT revolution that is about to happen”. Blockchain has the potential to disrupt the existing reforms of any sector in the economy. Appreciating the potential the blockchain has to cause revolutionary changes in the economy a research is conducted to study the major issues relating to the blockchain. The research is divided into three parts. The first part describes the procedure followed for development of a private blockchain step-wise; Deployment of blockchain developed to the housing sector on a simulation basis is dealt in the second part while the unique benefits of blockchain deployment with particular reference to housing sector are underscored in the third part. The second and third part of the research is presented in the current research paper.

Keywords— Blockchain, Deployment, Revolutionary, Underscored, Potential

1. INTRODUCTION

Apple co-founder, Wozniak states that “blockchain is the next major IT revolution that is about to happen”. It has the potential to disrupt the existing reforms of any sector in the economy. Blockchain acts as a solution to a number of problems in the traditional procedures. Sweden has taken the lead in implementing the blockchain technology in land transfer. More than 100000 property transfers have been recorded using blockchain in the Republic of Georgia using blockchain’s distributed ledger system. The current transactions in the real estate business in India too, like any other sector, are weighed down with numerous problems leading to heavy losses not only to the parties of the transactions but also for the entire economy. There are inefficiencies in the linkages between land registration and record of rights in the current real estate sector dealings leading to lack of transparency, multiple registration of the same property, absence of tamper-proof mechanism, involvement of middlemen at multiple levels of the transaction resulting in high cost, declaration of value of the property at a price much below the sale value to evade taxes; and so on. Therefore, the use of blockchain based asset transfer will enable transparency, transferability, trustworthiness, tamper-proof, traceability and cost-effectiveness which are abbreviated as ‘T⁵C’ of the blockchain.

Digitization of land titles, recording of transactions, multiple listing of services and fractional ownership of real estate assets expect to see blockchain technology being adopted faster. The technology is also likely to legitimize the government-mandated record of real estate transactions and improve the overall transparency level in the system. In the realm of the current technological revolution, application of blockchain technology will cause disruptive change in every sector. The current research considers the housing segment of the real estate sector to show how blockchain can cause this disruption in the housing sector.

The Indian real estate sector has come a long way since the 1990’s by becoming one of the fastest growing markets in the world. Despite the positive outlook for the sector in the coming years, it is battling challenges. These challenges restrain the sector from yielding full benefits of the potential growth. Therefore, the motive of the current research is to prove that the application of blockchain will give a one-time solution to these challenges.

The research paper highlights how a privately developed blockchain could deploy to the housing sector to resolve the current challenges in the sector. Taking a simulated situation representing a village consisting of ten houses, blockchain applications demonstrates beside underscoring the unique benefits of blockchain deployment with particular reference to the housing sector.

2. REVIEW OF LITERATURE

Evolution of blockchain technology in the world

The blockchain is an underlying technology behind the Bitcoins. Over the years, Bitcoins have lost its prominence due to its involvement in funding corruption. (BNC, 2017). Blockchain technology is at its infant stage in India. However, many European

countries have already explored and experimented with the use cases of the technology and have won benefits in real time. Politicians in Greece and Honduras are looking forward to blockchain technology as a solution to solve land registry related swindles (Graglia & Mellon, 2018). From the time of its inception, transparency and efficiency are the notable features of the blockchain. (Tepper & Tepper, 2016). Due to unethical government, corrupt dictatorship, forced evacuation and the massive earthquake, which struck the place in 2010, have left the people of Haiti battling over their land, to claim for their legal title. If records were maintained on a distributed ledger like blockchain, then tracing of land legal titles would become easier. (Hedman, 2017).

David Reiss, a professor of law and Business Entrepreneurship argues that blockchain is a reliable, cheaper and more efficient means of maintaining land records. However, a report by Vermont Legislature argued that the blockchain system cannot be used to address the accuracy of titles but can only clarify the authenticity of the title. The report further adds to the discussion that if a bad data is given as an input with accurate protocols, then the network accepts the data and adds it to the blockchain. In the words of Bates, "blockchain is not a panacea, but it is the best tool we have to fight corruption and inefficiency". A study by Goldman Sachs proves that implantation of blockchain technology in real estate sector could lead to an annual cost savings of \$ 2.4 billion.

3. ADOPTION OF BLOCKCHAIN TECHNOLOGY IN SWEDEN

Sweden is the first country to take steps to convert all its land registry transactions into blockchain transaction. Sweden's land registration authority called 'Lantmateriet'. In its first phase, the committee has proved that \$106 million could have been saved by way of eliminating paperwork. At its second phase, the team concentrated on the creation of smart contracts that will automate and execute transactions in a blockchain when certain conditions are satisfied. 'Lantmateriet' uses private blockchain which envisions, how the buyer, seller, government and tax authorities can be linked in a transaction from beginning till end digitally, thus eliminating all paperwork and ensuring transparency. In the purview of the existing system, high property prices make it quite attractive for fraudsters to forge documents to transfer somebody else's property into their name. (Deloitte, 2016)

4. NATIONAL PERSPECTIVE

The emerging technology has played a vital role in the transformation of the Indian real estate sector. The problem with the existing system in India is that most of it is physical records and maintained offline. However, there have been many efforts by the government to digitize transactions; they are still subject to mutability and lack of transparency. (Zeonlab, 2017) The distributed and secure nature enables for auto-validation and verification among the peers in the network. The government can achieve several positive impacts in multiple dimensions by implementing this technology in the real estate sector. Benefits include cost and complexity reduction, increased transaction and processing speed, reduced administrative burden and transaction costs and so on. (Government of Karnataka, 2018).

5. STATEMENT OF THE PROBLEM

A blockchain is a singly linked list of blocks, with each block containing a number of transactions. It provides a decentralized, immutable data store that can be used across a network of users, creates assets and acts as a shared black book that records all transactions. Each transaction entering the blockchain can be easily queried, affording greater transparency and trust to all parties involved. With the original creator being anonymous, the true motivations behind blockchain creation are arguably unknown. However, the application of blockchain technology (BCT) appears to be a more than adequate solution to many problematic situations faced by various sectors of the economy. Nonetheless, blockchain technology is remaining as an unearthed and far-reaching mystery to many. In this context, the present research paper applies a privately developed blockchain to a simulated village scenario in the context of land/property registration scenario.

6. OBJECTIVES OF THE RESEARCH

Under the tag "blockchain lets us agree on state of the system even if we don't trust each other", the present research paper aims at:

- Depicting the procedure involved in deploying the blockchain technology in the housing sector with reference to land registration
- Underscoring the unique benefits of blockchain deployment with particular reference to the housing sector.

The methodology followed for achieving the objectives: The methodology adopted for achieving the objective is described below:

A simulated village consisting of 10 houses' is created. Applying the blockchain customarily developed, few of the transactions involving sale and purchase of property is shown, stepwise.

7. THE OUTCOME OF THE RESEARCH

7.1 Depicting how blockchain technology is applied for land/property registration

Blockchain requires mass adoption by the users and a regulation such as mandatory digitization of real estate assets with a strict deadline like the linkage of Aadhar card with multiple services. Blockchain technology makes it practically impossible to alter or reverse any information once it is added to the blockchain system. The use of the technology will legitimize the government-mandated record of real estate transactions and improve the overall transparency level in the system. Blockchain technology converts records of transactions into records of rights by linking both the parties to the transaction and providing the buyer with the historical record of ownership. The following discussion details how the blockchain technology can be applied for land registry procedure, with the help of a simulated village.

7.2 Simulated sample village

In this village, all the real assets are digitized and linked to their Aadhar cards and other multiple services. Mr. A proposes to sell his property to Mr. B. Both of them live in the same smart village. The buyer, Mr. A approaches the government department with

the seller Mr. B. The government department writes a smart contract and deploys the contract using ethereum. Ethereum is an open source software platform based on blockchain technology that enables developers to build and deploy decentralized applications. Ethereum is a distributed public blockchain network. Ethereum blockchain focuses on running the programming code of any decentralized application. Miners are people who validate the transaction using specialized computational powers. Miners also verify if the buyer has sufficient balance in his Ether account in order to pay for the transaction. In the ethereum blockchain, miners work to earn Ether, a type of crypto token that fuels the network. Application developers to pay for transaction fees and services on the ethereum network also use ether. Ether is then the fuel of ethereum, and it is associated with a wallet and address file that is unique to each account. However, each user may have multiple accounts, so although one unique account belongs to a single user, it can't be known how many other IDs link back to that same user.

In this village, the transaction between A and B is made known to everyone else through the decentralized database. Government governs the entire transaction. Thus, there is a peer-to-peer transfer-taking place, which is made known to all the clients who are associated with the technology implementation through the client software. The following figure relates to the simulated smart village represented for deploying the blockchain technology:

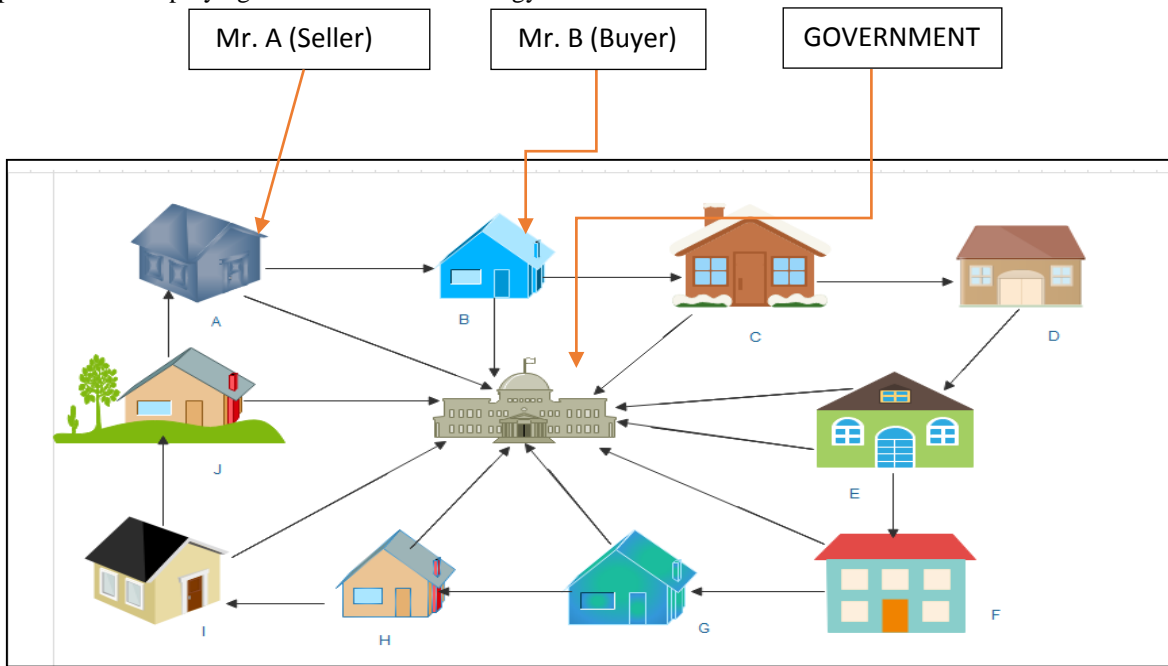


Fig. 1: Sample smart village

7.3 Smart Contract

In this simulated village, the seller (A) approaches the government for the property transfer. The government through a development authority enables to deploy the smart contract. In order to write and execute the smart contract, the user must pay a price called ‘gas’. This price is paid for the use of memory, electricity, computation, and storage. The limit of the amount of the ‘gas’ is fixed based on the speed of the transaction. Higher the requirement of the speed higher is the amount of gas. The Remix web browser fixed the maximum limit of the ‘gas’ at 3000000. This default limit of gas can be changed to the required amount as is needed to suit the transaction. If the ether balance is insufficient to execute the contract then a message pops alerting the insufficiency of gas.

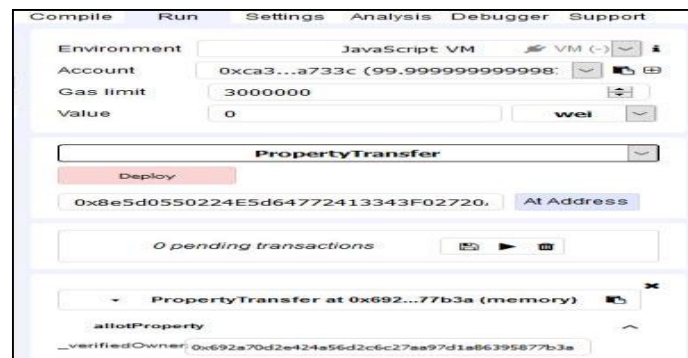


Fig. 2: depiction of Remix browser showing gas limit and environment

7.4 Remix Browser and Ropsten testnet

When there is a real transfer of ether from one account to another, the ‘Main ethereum Network’ is used. When the transfer of ether takes place, the seller after getting the requisite amount can convert the ether into INR or USD from reputed institutions like Zebpay. The equivalent value of 1 ether to the corresponding value in INR, according to the exchange rates as of 16th June 2018 is 34,079.23 rupees. For the current simulated scenario, using the Ropsten test network ether is transferred from B’s account to A’s account.

7.5 Blocks to blockchain

In this simulated situation, there are ten houses involved along with the government. Any transfer between A to B is broadcast to everyone in the network through the ethereum peer-to-peer client software. The miner will mine the transaction. Mining is the process by which the miners solve a cryptographically complicated math puzzle. The result will give a hash function, which converts the input, seller and buyers addresses into a cryptographic hash function. This process of converting the input into cryptographic hash algorithms and placing the transactions into the blocks is called mining. Once the mining is over, the owners/residents like C, D, E, F, G, H, I and J will be sent a soft copy of the transaction that took place between A and B. The transaction is then validated and verified and a consensus is obtained. This consensus mechanism is technically called “Proof-of-Work”. “Consensus” is the mechanism of arriving at common resolution by all the participants in the blockchain network. Thus, here the remaining eight houses are the participants in the network who will give their consent regarding the transaction that has taken place between A and B. Suppose on a later date, A refuses to accept the fact that B has paid money for the property, it is the participants in the network who can act as witnesses to the transaction. This act of witness is possible only due to the decentralized peer-to-peer network.

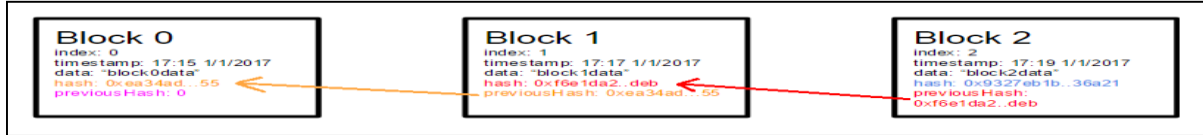


Fig. 3: Blocks to blockchain

Once the consensus is achieved, the transaction gets added to the block. The hash of the first block is by default ‘000’. The block hash of the current block gets added to the succeeding block as is shown below: This discourages tampering from taking place in the block.

Suppose, A wants to resell the same property to Z who is not a part of the network then, A has to alter the transaction that has taken place with B to sell the same to Z. But if A tries to alter the transaction in the block, then the hash of the block will automatically change. If the hash of one block changes, then the entire sequence of succeeding blocks’ hash will change. In such a case, A will have to alter all the hash of all succeeding blocks which is impossible to achieve.

After the transactions are mined and validated, they are added to the existing block. The individual block capacity is 1MB. Every such block loaded with transaction is chained to the other blocks in the blockchain forming a chain of blocks.

The scope of alteration is impossible because every 14 seconds a block is successfully mined. This would result in having 31.5 million seconds in a year and 2.25 million (31.5/14) blocks being mined every year. Thus it is impossible to alter 2.25 million blocks simultaneously. Also, A would require 50% of the computation power which the miners used for mining. Thus it is not possible to tamper with the blockchain transaction.

Second objective: Underscoring the unique benefits of application of blockchain technology: The benefits of application of blockchain to any sector in the economy with particular reference to its deployment in the housing sector are abbreviated as ‘**T⁵C**’. This abbreviation stands for Transparency, Trustworthy, Traceability, Transferability, Tamperproof, and Cost-effectiveness, as depicted in the figure below. Each of these benefits will be elaborately discussed in the following paragraphs.

8. UNIQUE BENEFITS (T⁵C) OF BLOCKCHAIN DEPLOYMENT

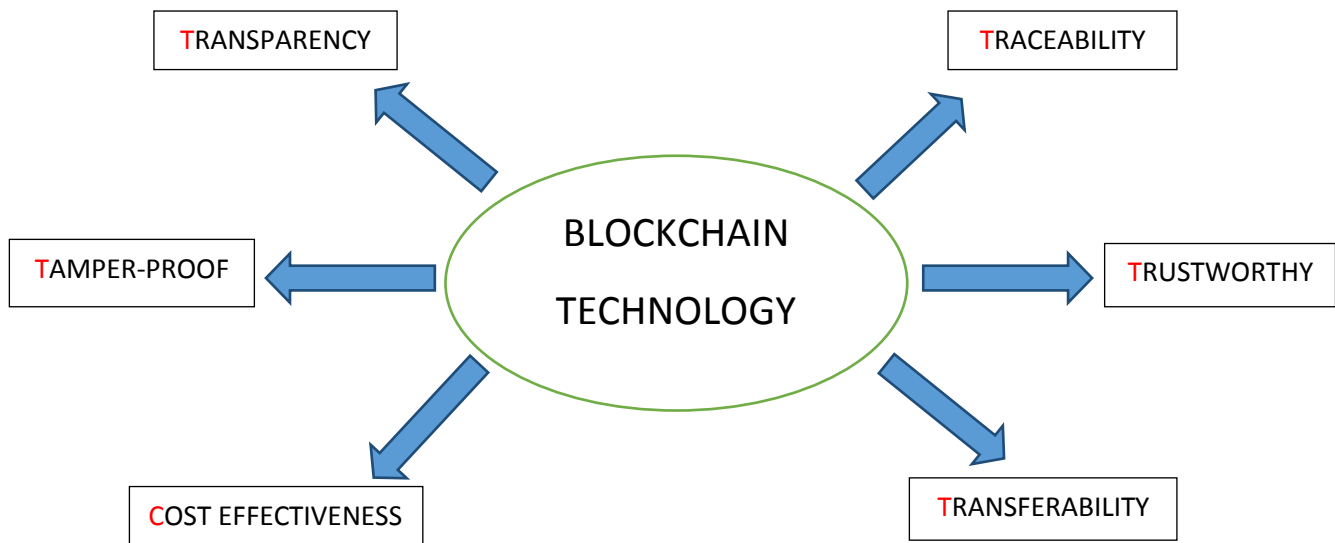


Fig. 4: Benefits of blockchain deployment

8.1 Transparency

Transparency plays a key role in any transaction. Data stored in the blockchain are available to all. There are public permission blockchain and permissionless blockchain. The data stored in the public permissionless blockchain gives the right to everyone to

add transactions to the blocks and have access to the blocks. The best example of a permissionless blockchain is Bitcoin. But in the case of the public permission blockchain, the right is given only to a few people who are a part of the institution governing the transaction. A membership is required to participate and it is usually a closed group of known participants who form a private blockchain. This simulated village uses public permissionless blockchain as such the right to add blocks is restricted only to the government. Since the transfer of property from A to B is communicated to all the members in the village, the system is transparent. Since the system is transparent, it prevents resale of the same property by A to anybody else in future and thus ensures the clean title. Thus this technology renders ample amount of transparency by facilitating automatic blockchain audit by peers.

8.2 Traceability

Blockchain promises reliability and resiliency of all transactions entered in the ledger. The blockchain is designed in such a way that anybody in the network can trace the provenance of the asset, the lease agreement or mortgage of any property. The ethereum client software uses strong cryptographic techniques that verify data integrity and provenance. The transaction is recorded sequentially in a chronological order which enables in verifying the title of the property. It also paves way for the creation of an indelible public record and an automated audit trail. Thus the buyer B can verify the date of purchase of an asset by A and any mortgage attached thereof to the asset.

8.3 Trustworthy

Autonomy or decentralization is the key feature of blockchain technology. Since the entire process of property transfer is fully automated, there emerges a trust among the participants in the network. It is trustworthy, secure and ensures security because the entire community of network participants validate the integrity and authenticity of the data. Moreover, the ability to initiate a transaction and the right to move funds are solely vested in the hands of the seller of the asset and not on the owner of the database. The recent scams like that of Punjab National Bank have induced an element of fear and negative inhibitions in the minds of people about the security of their money. Thus the blockchain has the potential to streamline the land records and asset registries into traceable and trustworthy with a parallel element of a record of ownership to a record of rights.

8.4 Tamper-proof

The blockchain technology gives an unalterable ledger in real times. The distributed ledger protocol absolutely prevents human intervention from tampering the data stored in the blockchain. The miners verify each and every transaction and once it conforms to specification, the miners add the transaction to the block. Once the transaction is added into the block, it becomes impossible to edit or alter it. Thus the blockchain is an immutable ledger of digital transactions. In this simulated village, the transaction that took place between A and B is entered into block 2. If the seller (A) wants to resell the same property to C, then he cannot alter the data in block 2. A new smart contract will be deployed specifying the sale of property by A to C. Since blockchain follows a consensus mechanism, a copy of every transaction will be sent to every node in the network. In such a case, the resale of the same property will come into the light to all the members of the network. Thus A has to alter all the nodes pertaining to the entire village and the government simultaneously. Thus A can neither alter block 2 nor can he resell the property to C without the consent of everyone. Hacking in blockchain is impossible because there are multiple copies of the same transaction in every computer using the blockchain management software. In this simulated village, every house in the village will have a copy of the transaction between A and B along with the government. Ultimately the blockchain software is built in such a way that alteration or counterfeiting transactions of an existing record is not possible without detection. Thus the blockchain technology protects the interests of innocent people from huge land sharks.

8.5 Transferability

The technology aids in easy transferability of property from one person to another across the globe. Property transfer can take place within the blink of the eye with the proper track of ownership and authenticated documentation. Blockchain will not replace the government in land registry procedures but it will make land registration simple and corruption resistant. Since the transfer takes place between the respective buyer and seller through the digitized model of the transaction without any intermediary settlement is swift and reconciliation and settlement process takes place within a few seconds.

8.6 Cost-effectiveness

The cost of deploying the smart contract consumes a cost known as 'gas'. This cost acts as a reward mechanism for the miners who employ their energy, memory, storage, and electricity in order to solve the complicated math algorithm. When we take the instance of the traditional property transfer procedures, the buyer has to shell out an enormous amount of money to satisfy the needs of the middlemen or broker. Also, the buyer has to spend on the procurement of stamp papers and sale deed. Since there are no middlemen involved in the process of transfer in the blockchain, the cost to the buyer is drastically less compared to the traditional registry. Thus the blockchain system of recording property transfer is cost effective as it requires only a minimal charge for miners fee. Moreover, maintenance of the distributed ledger system is much cheaper than that of traditional public registries of the government. The headcount of the back office employees can drastically reduce as all the process of registration is fully automated through blockchain, which further reduces administrative overhead. Also, costs associated with verifying the authenticity of property documents and title deeds by banks in order to lend loans to customers will also reduce. Thus using this technology renders cost-effectiveness to government, customers and also to public institutions like banks and insurance sectors.

9. CONCLUSION

With its key features of disintermediation and immutability, blockchain is going to disrupt the World. The unique process of solution makes the blockchain the resolver of many existing ailments all the sectors are facing in the economy. The distinctive features like safety and security to the data presented in the ledger, transparency and tamperproof, have made many countries adopt the blockchain technology in various sectors.

However, the successful implementation of blockchain technology requires mass adoption by the users and tailoring of new laws to ensure proper execution.

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