

Potentials of Blockchain Technology in Streamlining Land Registries

Rajan Thapaliya

Department of Data Science, National University, San Diego, The United States

Email address:

rajanthapaliya@gmail.com

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Abstract: Disruptive technologies are currently taking the world at a storm. In all aspects of life, people are trying to cope up with the effects of these technologies while in other circumstances, focusing on research and development of enhanced ways to efficiency at work and daily activities. Land registry system is a very important element in the society, especially in regards to social and economic developments of an area. With the current traditional land registry system used in most countries, there are many issues that need to be sorted for increased efficiency. The issues may range from corruption and fraud, time-consuming registration and transfer of properties, inefficient systems in place, backlogs in deeds and contracts, and tampering of records amongst others. The objective of this paper is to analyze the issues present in the conventional land registry and explore the potentials of streamlining them using blockchain concepts. With the concepts of blockchain technology, a secure and more reliable framework is promised in the land registry system. Literature review and analysis has been extensively used to bring out the concepts in this paper. The issues in the traditional land registry are also analyzed, including the different classification of land registry systems among different governments. The blockchain concepts and the potentials of implementations are finally explained succinctly, with their advantages and disadvantages. The author concludes that there are massive advantages when compared to the disadvantages in the adoption of blockchain technology in the land registries.

Keywords: Blockchain Technology, Land Registry, Private Blockchain, Public Blockchain, Hybrid Blockchain

1. Introduction

Disruptive technologies are currently taking the world at a storm. In all aspects of life, people are trying to cope up with the effects of these technologies while in other circumstances, focusing on research and development of enhanced ways to efficiency at work and daily activities. The applications of the emerging technologies have been vast, touching on almost every sector. Blockchain has garnered a substantial attention in the recent years, with an estimation by World Bank to be over \$2.3 billion in 2023. Many governments have been conducting feasible studies to identify the applicable areas where blockchain technology could be implemented with success, including voting, taxes, healthcare, and probably, land administration [1]. The focus is to ascertain whether blockchain will streamline the land registries or it will be another case of failed experiment.

2. Land Registries

For proper development, there is always a need to have harmonized land registries. Land registries have been described as the key pillar of economic development [2]. There is need to have stabilized boundaries between and within countries for significant construction, growth and development opportunities. Land registry is efficient in dealing with fraud issues that could emerge, and also in smooth transitions when changing ownership. Besides, secure and well-documented land registries help the government in service delivery, tax collection and many other aspects of governance. While there have been consistent updates in the land registry, there are still issues that need to be resolved. Based on Themistocleous [2] research, the classification of countries on their account of openness and clarity of the land registry, there are three

categories of countries.

2.1. Category I

At the top of categories was described as the countries that have well-organized and elaborate land registries [2]. Countries such as the USA, UK, Sweden and Holland fall in this category, and are very elaborate in their land documentation. Besides, these countries are always researching and innovating different technologies for adoption in improving their quality of services. As the author described, these countries are very ready to implement the new technologies that could fasten and enhance the service delivery in the land sector such as blockchain [3]. These countries are also considered to championing secure ownership of real estate as the basic foundation of social and economic policy.

2.2. Category II

The second category consists of countries that are regarded to have less organized land registries. Countries in this category are described to facing a lot of problems in relation to the land registry and implementation of land social and economic policies. The issues may range from bureaucracy, outdated practices and systems, corruption and fraud, and complicated processes. Many countries in this category have stalled projects, can be private or public investments, with most issues being disputes between different entities. In essence, there is a lot to be done to streamline the land registries in this category, and can only be revamped by improvement to the land registries.

2.3. Category III

For this category, the problems are considered to being similar to those of category II but corruption and fraud in a big threshold. Themistocleous [2] gave an example of Ghana falling in this category. 80% of the population in Ghana do not have title deeds, with most of the land owned based on the customary agreements among the involved parties. Considering the improper land documentation in the country, there has been rampant corruption and fraud involving lands. While category II may just need improvement of the land registries, this category needs an overhaul with an adoption of working land systems.

3. Fundamentals of Land Registry System

An effective land registry system usually consists of four principles [3, 4]. These principles are considered to be the foundation of an effective and efficient land registry system. The four principles are:

- 1) Specialty Principle/Unique Identification: in land registration, there is need for the land as an object and the person as a subject to be unambiguously identified and uniquely registered in land documentation to avoid

possible chaos and conflicts. The underlying issue in the implementation of blockchain technology in the land registry system is the non-disclosure concept of participants in the blockchain. Blockchain was built with the principle of not sharing the data of the participants, hence making the identification of the land owners a difficult cause.

- 2) Booking Principle/Initial Transition Process: for a change in the ownership rights of land, there should be a change in real rights of the immovable property to avoid legal effectuation. With the implementation of blockchain technology, all the logs will be validated in a sequence, avoiding possible clashes in the registers and any form of alteration. Essentially, blockchain can fulfil this principle effectively due to the magnitude expected for the checks on ownership, the titleholders and land rates or taxes that are unpaid at the time of transition.
- 3) Consent Principle: in any land transaction, there is need to have the consent of the real owner before transfer to the buyer. To satisfy the consent principle, there is need to address the following issues:
 - a) That the genuine owner of the land is identified correctly
 - b) That the digital signatures are readily available to all the owners/users
 - c) That there is an elaborate mechanism that can identify any form of coercion or transfer without free will
- 4) Principle of Publicity/Publicity of Records or Databases: trust is the main virtue in any other form of land registry system. The implementation of blockchain technology is focused in attaining an easily accessible and trustable land database. The databases can be available upon request or through any trusted third-party applications for the prospective customers.

4. Blockchain Technology in the Land Registry System and the Potentials

The uptake of blockchain technology globally has been at a high rate while another vast majority of the world being skeptical to it. The success of blockchain technology can be attributed to the transparency it offers, its decentralization, user-centric and provision of secured transactions and easily accessible information [3]. Blockchain technology operates in a principle of a shared record of a transaction, referred to as ledger. The ledger can be assessed by anyone, get a copy of it and even read it. The ledgers or transactions are considered to be the most secure footprint of the uniquely identifiable properties or the actual files. Once the transactions are verified, they are added to the blockchain, making this a secure mechanism to prevent fraud. With this technology, it has been proven that it is almost impossible to change or modify the data stored in older blocks without affecting the subsequent blocks. Radziwill [5] described exclusively the underlying framework for blockchain

technology. As the word ‘blockchain’ suggests, the blockchain technology is defined by a public, distributed database providing a decentralized management of transactional data. The peer to peer network, and the freedom to join or leave the network at will has given the blockchain technology an edge over other technologies.

Based on the attributes of blockchain technology already described, it can be described that it serves the same functionalities as that of a land registry system. As a digital ledger, the blockchain technology for the land registry has other capabilities inbuilt such as identifying an owner of a property at a certain time, keeping track of transactions of a piece of land, thus no multiple transactions which could cause fraud and corruption cases, and also ensuring single-ownership [6]. When compared to the classic land registration system, the blockchain technology has also the assurance of back-ups. This can be attributed to the shared databases. Further, trust in utilizing the blockchain technology can be boosted by the cryptographic proof and the decentralized database. Where there are land cases or there is need for remediation, it would be possible for the blockchain technology to reduce the costs by removing the need for intermediaries or administrators. The intermediaries may be licensed conveyancers or notaries while administrators are the registrars.

Owing to the transaction dependency, blockchain technology has proven to be tamperproof. No any non-owner of a property can be able to transfer ownership. In the classic land registry system, all the ownership checks are usually done in-person by scrutinization of the title deeds and comparisons of the information to the existing ones [7, 8]. There can be exceptions of the manual process where automated processing of the deeds is done through use of stylesheets and comparisons to the land register. This can be prone to errors, and forced transfers. In contrast, checks of ownership in the blockchain technology are done independently and are automated for the transaction rules. With the publicly available land registers and the timestamps of all the transactions done, it would also be impossible to change the records.

5. Governance of Blockchain Technology in Land Registry

In any execution of technologies or fiscal implementations in the society, many governments are usually interested on the regulation for effective and efficient service delivery. After coming into consensus that blockchain technology is the best solution for land registry matters, there would be need to identify ways to guard or secure such systems with. The pertinent issues that would need to be answered include [2, 7, 8]:

- 1) The responsible individuals or parties in the creation and rights of land registry blockchain. This can be through community or institute such as Kadaster.
- 2) The format to which to implement the technology; can

be private, public or hybrid.

5.1. Private Blockchain and the Potentials

Implementation in this type of private blockchains can take three forms: private land register blockchain, private blockchain and use of private blockchain within the Kadaster. The implementation of a private land registry blockchain uses a one entity such as the Kadaster in recording of the transactions. This, however, contradicts the underlying framework of blockchain technology, which is the use of shared databases for enhanced trust [8]. In this type, there is significantly a poor number of nodes over the other formats. With this feature, it is easy to adjust the validation rules, hence an advantage over the others. Also, consensus among the owners and buyers or prospective customers is very fast since it is the only technology using the technology, making the system very flexible.

In the case of private blockchain, there is no full public and controlled network for securing the proof of work or proof of stake. Modification rights, advanced controlled access permissions and permission to read different elements in the private blockchain can be catered for in such systems. Here, writing permissions are restricted to a single organization (Kadaster). The reading permissions can be controlled by the administrators, either public or private. Land registers are usually public documents. The need to implement reading permissions may not be necessary as they can be made all public. The main advantage of using private blockchain is the possibility to reverse transactions or even change the rules of a blockchain. In the real world, this phenomenon could be applicable where there is a cessation of an apartment rights or where ownership has been revoked, hence a need to re-transfer.

The last implementation within private blockchain format would on the use of private blockchain within a Kadaster. While the previous two implementations have identified advantages, this implementation does not really offer any advantage but downsides. First, it brings the need to design a new blockchain system for registration and implement it, complicating the system further. Owing to the large amount of transactions done daily in uploading and verification, there would be need of substantive amount of computing power for mining. This system has the susceptibility of hacking still, just as the classic land registry system.

Overall, the use of private blockchain has its own advantages as well as disadvantages over public blockchain and traditional land registry system. In comparison to the transaction costs in the public blockchain, the transaction costs are cheaper since they are needed to be verified by fewer nodes. To the traditional land registry system, it is unclear which system has lower costs. The added advantage over the traditional land registry system is the cryptographic auditability. However, this has been argued that it can be implemented in the traditional way through an effective implementation of audit trail during the registration process and verification.

5.2. Public Blockchain and the Potentials

Land registry system can utilize the public blockchain concept, where everyone globally can read the content of the blockchain. Through the implementation of the public blockchain, all the land registries, either locally (in the originating country) or internationally, can be harmonized [7]. It is possible for the land registries documents to have differing information. With public blockchain, all the land contracts or contracts can be availed worldwide. Reading rights can also be stipulated based on the system. Everyone worldwide has an equal chance to contribute in the determination of the creation of blocks during the consensus period.

The advantages of public blockchain are vast. There is the impossibility of the developers or any other intruders into the chain to add or initiate different blocks, thus no fraudulent transactions. In the current land registry systems in many countries, there are many inefficiencies which can be addressed by the public blockchain. Those issues may include the high costs of acquisition of properties due to formalization practices, bureaucracies which may take many years in some countries, inefficient policies geared towards equal rights for all people in the society and other governance issues. Even with the modern land registry systems put in place, it is still uncertain that those issues can be resolved. Thus, many countries are pondering on the potential implementation of blockchain especially where there is bipartisanism among different political or government actors. The bias can even extend to the surveyors, notaries or conveyancers, and the registrars [9]. With blockchain, it would be very possible and realizable for every transaction directly into the blockchain once created. However, the real challenge in many of the countries, especially the less developed ones, would be the identification of the real owners of those properties, their rights, restrictions and responsibilities [9, 10]. The geographical boundaries can also be quite a problem, thus ascertaining and documenting them would need so much information and input. Notably, blockchain technology may not offer solutions to entrenched corruption and failings to a larger extent. However, implementing it would be a massive success to starting from the record phase to avoid similar repetition of the problems in the future.

5.3. Hybrid Blockchain and the Potentials

A hybrid land register blockchain can be simply attributed to a combined use of private, public or classic land registry system. This type of blockchain system has been implemented currently in the banking sector where groups of banks usually upload transactions to the blockchain to confirm and settle inter-payment banking services. For the land registry system, notaries or conveyancers can work together with the registrars in the land registry blockchain. An example would be the conveyancers or notaries uploading the transactions, then the registrars verifying and approving them. Similar to the private blockchain, the

principle of distributed trust through distributed ledger may be frustrated where the blockchain has some restrictions from the public [11]. Besides, the miners, who will consist of the licensed conveyancers and notaries, could have bias either intentionally or unintentionally, and influence the rules for determining the transaction validity.

In implementing the hybrid blockchain system, there could be roles of the different stakeholders in the current land registry system such as the registrar, notaries or conveyancers, bailiffs or other parties uploading the documents to the land register. For efficiency, there is need to consider critically these roles. Where the transfer of ownership, seizure or mortgage deeds are part of the transactions to be uploaded by these stakeholders, there would be need for the registrar to consider their capabilities and skills in depth analysis to avoid possible issues in the future in this process.

The stakeholders can also be a case of where the conveyancers or the notaries are tasked with the uploading of the transactions while the registrars' node (s) are to approve the transactions in the block. Similarly, the registrars could work in conjunction with the notaries or the licensed conveyancers to create a system that runs the blockchain. In this case, the risk of attack could significantly reduce since there would rules on how to form a block. However, if the individual notaries or conveyancers, and registrars are attacked, including their computers, their credibility would be reduced but to a lesser extent since the attackers cannot read the entire blockchain [12]. Also, if the nodes are fewer, the risks also increase, and vice versa.

The advantages of the hybrid may include the increased efficiency when there is need to intervene manually [12, 13]. This will reduce the block times by allowing the use of consensus algorithms. However, there would be need to stipulate the approval rights of the licensed conveyancers or the notaries as in the case of the public blockchains. Comparing to the bitcoin blockchain, miners are usually rewarded for successful mining but, in this case, it would be different since lands or properties in the land registry system are transferred. The possibility of reward is therefore forfeited, as described by *rights in rem*. Another advantage is that the transaction costs are lower when compared to public blockchain due to the fewer nodes required for verification of the transactions.

6. Conclusion

In this paper, a review of the potentials of the implementation of the blockchain technology in the land registry system has been exclusively presented. Owing to the vulnerability of the traditional system, this analysis provides the advantages that the blockchain technology could fix at every stage in the land acquisition. The issues related to the traditional system could include too much paperwork, which may increase costs, the vast storage needed for record keeping and the vulnerability to destruction or attacks. The inefficiency of the system which favors the chances of

corruption and fraud, and back logs may significantly affect land development fiscal policies, as well as the social policies. To eradicate these issues and increase the economic growth, blockchain technology can be very effective. As discussed in this paper, the implementation formats can be analyzed, and the proposed system to be used should be economical, more reliable and require less of human resources. The blockchain technology can be described entirely to be promising for the land registry system, with high scalability. For future studies, it would be prudent if the blockchain frameworks and algorithm are implemented in the real environment to provide the real situation for further simulation.

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