# Blockchain Technology and Land Registry

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## Abstract

*Land registries are successful when trust is ensured between all involved parties. In this paper we introduce the idea of improving the quality of land registries by using blockchain technology. With blockchain we can overcome the limitations (e.g. centralization) of the existing land registries and offer a trusted service that provides significant benefits to the participants. This paper also highlights the functionality of a blockchain land registry solution that can be adopted by the Republic of Cyprus and it suggests the implementation of a small pilot that can be used as proof of concept.*

**Keywords:** blockchain technology, land registry, Cyprus

## Land Registries and Their Limitations

Departments of lands (or land registry) are a significant pillar of economic development as they deal with construction, growth and development in all countries. Land registry authorities record property rights and promote internal confidence between people, enterprises and government. In doing so, they help countries to maintain stability within their boundaries, or economic development within the wider world.

Despite their importance, not all the countries have developed advanced land registries. Based on land registry services, we can classify countries into three main categories:

**Category I: Countries with well-organized land registries:** Cyprus and other developed countries (e.g. USA, UK, Holland, Sweden) have very well structured and organized land registry departments that seek to adopt advanced technologies to improve their quality of services. Countries of this category promote widespread and secured ownership of real estate as a foundation of social and economic policy. These countries are more open to adopt state-of-the-art technologies, like blockchain, to speed up their processes and to enhance their functionality.[2]

**Category II: Countries with less organized land registries**: Many countries in this category face numerous problems due to: (a) outdated practices and systems; (b)

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2 J. Abbott, 'Moving to our second year on Digital Street'. HM Land Registry (blog) (2018, October 9), available at https://hmlandregistry.blog.gov.uk/2018/10/09/moving-to-our-second-year-on-digital-street/.

bureaucracy; (c) complicated processes; and, in some cases, (d) corruption and fraud. An example of this is Greece, about which many articles have been written covering the limitations of the existing system.[3] The problematic operation of land registries of this category has an impact on economic development and growth. For instance, an €8 billion investment in the old Athens airport (Elliniko) has been delayed for more than four years due to various reasons including a dispute between the national forest agency, the government and the contractor.[4] As a result, this has had a huge impact on the Greek economy, especially in a period of financial crisis, capital controls, high unemployment rates, lack of investors, etc.

**Category III: Countries with no land registries or inefficient registries**: Countries in this category have the same problems as those of Category II but corruption and fraud are increased compared to Category II. In Ghana, for instance, more than 80% of landowners lack title deeds, as most land is held customarily with oral agreements between involved parties. This has increased corruption and fraud and causes tremendous problems to property owners as well as to the government.[5]

Most land registries present numerous limitations that havea negative impact on their business processes, property owners, taxpayers and the involved entities. The main limitations are summarized below:

**Difficulties to implement new business models**: It is estimated that cross-border real estate investments will grow to 50% in the next two years, and the trend to introduce new business models and technologies has been amplified. However, existing practices hold back the implementation of new business models, and this leads to a reassessment of the current status in many countries.

**Time-consuming and expensive functions:** Many land registry functions need to be redesigned and automated to allow a simpler, faster and cheaper way to integrate the processes. Transactions that take weeks to be completed can be reduced to hours or minutes and transaction costs could come down from thousands of euros per sale to a reasonable service fee. In doing so, property sales will be increased, and a wide

3 For example, S. Daley, 'Who Owns This Land? In Greece, Who Knows?' *NYTimes.com* (2013, May 27), available at https://www.nytimes.com/2013/05/27/world/europe/greeces-tangled-land-ownership-is-a-hurdle-in-recovery.html; N. Christodoulakis and S. Skouras 'Electoral misgovernance cycles: Wildfires and tax evasion in Greece'. Paper presented at the 8th Conference on Research on Economic Theory and Econometrics, Tinos (2009, July 8 - 12), available at http://www2.aueb.gr/conferences/Crete2009/papers_senior/Christodoulakis.pdf.

4 Taylor, P and Papadimas, L., 'Typically Greek, delayed land register is never-ending epic'. *Reuters.com* (2015, October 18), available at https://www.reuters.com/article/eurozone-greece-cadastre/insight-typically-greek-delayed-land-register-is-never-ending-epic-idUSL8N12E1Z520151018.

5 Sittie, R. 'Land Title Registration. The Ghanaian Experience', Paper presented at 23 International FIG Congress, 8–13 October 2006, Munich, available at https://www.fig.net/resources/proceedings/fig_proceedings/fig2006/papers/ps07/ps07_15_sittie_0848.pdf.

range of involved parties will benefit (e.g., sellers and buyers, local authorities, central government, and developers).

**Too many intermediaries**: Real estate transactions rely on entities like attorneys, notaries, brokers, agents, appraisers, inspectors and government authorities, to name a few. All these stakeholders add unnecessary cost, complexity and delays in the process. A reduction of the intermediaries will automatically make the land registry processes faster, cheaper and simpler. Reducing the role of the intermediaries may have a negative impact on their business activities, but the overall benefits for citizens, the economy, society, the real estate industry and the country will be much more important.

**Centralization:** Existing transaction and record keeping systems used by land registry authorities are centralized. This often raises concerns about fault tolerance, resilience and security. Information repositories and databases are vulnerable to major security risks and disaster, as what happened in Haiti after the devastating earthquake in 2010. In that case, many countries helped Haiti to rebuild the nation, but recovery efforts were delayed due to property ownership issues. In many cases the owners of a property could not be identified as the records had been destroyed. In other cases, ownership was in dispute for the same reason. People in Haiti who wanted to sell their property could not do so, as the buyers were unsure whether the seller legally owned that property or not.

**Corruption and Fraud**: Most cases of corruption and fraud take place in Category II and Category III countries (defined above). Corruption and fraud are also related to the centralized nature of the land registry authorities. The lack of transparency 'allows' bureaucrats to change the ownership of a piece of land. Many countries still do not have title deeds but oral agreements, which makes fraud easier.

## Blockchain Technology and Its Potential

Blockchain technology is considered the 'New Internet', since it is transparent, decentralized, and user-centric, and it provides secured transactions and information that is characterized by openness.[6] The *Economist* described blockchain as the 'Trust Machine' since it replaces intermediary trust brokers to ensure privacy, security and trust. In simple terms, blockchain technology implements a shared record of transactions (ledger) where anyone can hold a copy of it and read it. Transactions refer to uniquely identifiable 'fingerprints' of the actual files (e.g., property title) and are grouped into blocks that are then verified and added to a chain of blocks (blockchain). A secure mechanism is employed to prevent fraud. Therefore, it is almost impossible to modify data stored in older blocks without changing the subsequent blocks, as

6 D. Tapscott and A. Tapscott, *Blockchain Revolution: How the Technology Behind Bitcoin is Changing Money, Business, and the World* (New York: Penguin Random House, 2016).

changing the block would change its fingerprint and invalidate the chain.[7]

Blockchain technology addresses the land registry problems reported in the previous section. A blockchain solution can provide immutable history of transactional records and thus guarantees authenticity, which has an immediate effect on increasing trust. Records are validated, permanently linked to the system, they are tamperproof and can be seen at any time by any party. With blockchain there is a single source of truth history of a property and ownership status. In other words, blockchain technology can help Departments of Land to implement new business models, change time-consuming and expensive functions, significantly reduce the number of intermediaries, and develop decentralized applications that terminate corruption and fraud.

The Information Technology (IT) strategy of the Cypriot Department of Lands and Surveys (DLS) reports that:[8]

> [O]ur vision is to transform the DLS IT environment to support a modern cadastre that will be needed for the future; this is based on an architecture that facilitates the delivery of services to citizens and interested entities, enables people to readily and confidently identify the location and extent of all rights, restrictions and responsibilities related to land and property through also the use of spatial data.

The best way for DLS to achieve its goal is by adopting a blockchain solution. Different scenarios that can support the Cypriot DLS can be implemented through blockchain. For instance, envision two citizens in Cyprus, a seller and a buyer, who negotiated and agreed on the sale of a house, and they would like to register the sale agreement with the land registry service. They can visit the local authorities to register the sale agreement as they normally do. The land registry authority will then enter the information related to the agreement into the blockchain system. The latter will take control and will place this transaction in a block with other transactions and send them for approval. Once the block is approved, it is added to the blockchain and copies of these transactions are saved in multiple computers. In the extreme case where the land registry authority is destroyed by a disaster (e.g., earthquake or fire) the information related to the property title deeds will not be destroyed, as it is saved on numerous computers around the globe. As a result, the land registry authority will be able to continue its operation, and property owners will be able to negotiate and sell their properties without problems.

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7 D. Tapscott, 'How the blockchain is changing money and business', filmed June 2016 in Banff, Canada, TED video, 18:50, available at https://www.ted.com/talks/don_tapscott_how_the_blockchain_is_changing_money_and_business, accessed on 5 March 2018. M. Lansiti and K. Lakhani, 'The Truth About Blockchain'. *Harvard Business Review*, (2017, January–February), available at https://hbr.org/2017/01/the-truth-aboutblockchain.

8 Cyprus Department of Lands and Surveys, 'Vision'. DLS.moi.gov.cy (2016), available at http://portal.dls.moi.gov.cy/en-us/thedepartment/Pages/Vision%20and%20Mission.aspx.

## Benefits of Blockchain Application in Land Registry

Land registries worldwide are interested in blockchain technology, as it has the capacity to revolutionize land transfers and it can manage regulatory obligations, asset transfers and financial transactions. Blockchain can be considered as the future of land registries due to the important benefits it offers and includes among others the following:

- increases transparency
- provides trusted and accurate property data
- secures the ownership of all registered properties
- reduces cost
- speeds up processes – they can now be completed in a few hours instead of weeks/months
- provides strong audit-ability for transactions with a time stamp
- offers a distributed system to help disaster recovery
- reduces paperwork,
- allows people to trade properties remotely
- benefits many participants (e.g. taxpayers, government, insurance companies)
- assists to build smart cities
- eliminates potential fraud
- achieves simpler, faster and cheaper land registry services

Last but not least, Goldman Sachs estimated that blockchain could lead to an annual savings of up to USD 2 to 4 billion in the real estate title insurance market alone.

## Examples from Early Adopters

Blockchain technology has attracted the attention of land registry authorities around the globe, and numerous applications have been adopted since 2016. Below is a list of important attempts from the early adopters:

### *Adopters from Category I:*

**Dubai**: Dubai has a vision strategy to become world leader in adopting blockchain technology in the public domain by 2020. Its strategy aims to record all government transactions on the blockchain, and this will result in an estimated EUR 1.2-billion savings per annum, from the documents processing only. Part of this strategy is the 'blockchainization' of land registry. In 2016, Dubai designed a blockchain solution that records each step of the history of a property, from its conception to its sale to a client (Smart Dubai, 2016).

**Illinois**: In 2017, Cook County in Illinois participated in a pilot project to investigate blockchain adoption barriers in land registry as well as the potential benefits

from overcoming these barriers. To better explore these issues, Cook County built a blockchain solution which has proved successful. The state of Illinois is planning to use this solution as a model in the widespread adoption of blockchain by land registries throughout the state.

**Sweden**: It was estimated that a blockchain land registry could save Swedish taxpayers over EUR 100 million per annum by speeding up transactions, reducing fraud and eliminating paperwork. Based on this estimation, Sweden's land registry authority launched, in June 2016, an application to record land property transactions. The application was successful, and the authority is now extending the functionality of this application.

**UK – HM land registry:** Currently the UK land registry is working on a ground-breaking research and development project that combines new business models with property, financial and law technologies to explore how land registry will be simpler, faster and cheaper. In doing so, UK land registry has developed an on-going project called Digital Street to explore the disruptive innovation effect of blockchain technology in land registration.

**Adopters from Category II:**

**Republic of Georgia:** In 2016, the government of Georgia launched an application to register land title deeds on a private blockchain and then to make those transactions verifiable using a public blockchain (bitcoin blockchain). This is the first time in history where bitcoin blockchain is used by a national government to secure and validate official actions.

**Ukraine**: Ukraine's farmland registry has been vulnerable to fraud, which has led to conflicts over ownership and has held the economy back. The Ukrainian government is confident that the establishment of a comprehensive, transparent and secure blockchain farmland registry solution will help it to lift a ban on the sale of farmland and boost the economy.

**Adopters from Category III:**

**Ghana:** According to Ghana's land commission, 80% percent of landowner's lack title deeds as most land is customarily held with oral agreements. Blockchain technology has been used to address this problem and to produce secure digital land registries.

**Honduras:** Due to corruption, land title fraud is common in Honduras. For many years ill-intentioned public employees could penetrate the register and illegitimately change property ownership. The application of a blockchain land registry solution has eliminated land title fraud and guarantees seamless protection of property titles and

maximized security.

## Moving Forward

The Cyprus Department of Lands and Surveys (DLS) should immediately move forward to run pilot projects in the area of blockchain land registry in order to test this new technology and assess its potential and impact. A starting point for a pilot project may be an application that will support functions to:

**Register existing** ownership rights on the blockchain;

**Create new** ownership rights on the blockchain;

**Transfer** ownership rights on the blockchain and **digitalize** the whole process.

Such a blockchain land registry solution may facilitate the automation of ownership rights transfer, as explained above, with direct impact on time and costs involved. Such enablers should significantly impact investment liquidity, transparency and tradability. In removing bureaucratic barriers and delays for citizens and investors alike, and by carrying out direct property rights transfer in a secure and tamperproof manner, via an entirely digital platform, allows for investment opportunities to be cultivated, leading to new revenue streams and global outlook. Blockchain and AI technology stand to help improve bureaucratic, legal, and governance aspects of the property market in the most efficient and future proof manner possible, creating new opportunities for novel business models.

## Concluding Remarks

Although real estate is an important pillar of modern economy, most land registry services have many significant limitations that need to be addressed. Blockchain technology can be considered as a promising solution for land registry services. Blockchain operates in a decentralized manner and results in trusted, transparent, immutable and secured solutions that overcome most of the limitations of existing land registry services. Early blockchain land registry adopters, like Sweden, Dubai, Ghana and others, report excellent results such as cost savings, better quality of service, and the elimination of fraud and corruption. Blockchain is not an illusion but a real solution, and in this paper, we propose a blockchain-based land registry system for the Republic of Cyprus. Since we are still in the early stages of adopting this technology, numerous actions need to be taken to speed up its acceptance. Thus, a pilot system that can be used as a proof of concept will be highly beneficial for the Republic of Cyprus. The pilot will highlight the impact that blockchain will have on land registry, will help to explore the potential benefits that will be delivered to the involved entities, and will emphasize the necessity for implementing such a system.

## References

Abbott, J. (2018, October 9) 'Moving to our second year on Digital Street'. *HM Land Registry* (blog). Available at https://hmlandregistry.blog.gov.uk/2018/10/09/moving-to-our-second-year-on-digital-street/, accessed 1 November 2018.

Christodoulakis N. and Skouras S. (2009) 'Electoral misgovernance cycles: Wildfires and tax evasion in Greece'. Paper presented at the 8th Conference on Research on Economic Theory and Econometrics, Tinos, 8 – 12 July 2009. Available at http://www2.aueb.gr/conferences/Crete2009/papers_senior/Christodoulakis.pdf, accessed 23 October 2018.

Cyprus Department of Lands and Surveys (2016) 'Vision'. Department of Lands and Surveys. Available at http://portal.dls.moi.gov.cy/en-us/thedepartment/Pages/Vision%20and%20Mission.aspx, accessed 15 October 2018.

Daley, S. (2013, May 27) 'Who Owns This Land? In Greece, Who Knows?' *NYTimes.com*. Available at https://www.nytimes.com/2013/05/27/world/europe/greeces-tangled-land-ownership-is-a-hurdle-in-recovery.html, accessed 23 October 2018.

Lansiti, M. and Lakhani, K. (2017) 'The Truth About Blockchain'. *Harvard Business Review*, January–February 2017. Available at https://hbr.org/2017/01/the-truth-aboutblockchain.

McKinsey & Company (2016, May) 'How blockchains could change the world'. McKinsey.com. Available at https://www.mckinsey.com/industries/high-tech/our-insights/how-blockchains-could-change-the-world, accessed 5 June 2017.

Sittie, R. (2006) 'Land Title Registration. The Ghanaian Experience', Paper presented at 23 International FIG Congress, 8–13 October 2006, Munich. Available at https://www.fig.net/resources/proceedings/fig_proceedings/fig2006/papers/ps07/ps07_15_sittie_0848.pdf, accessed 14 October 2018.

Smart Dubai (2016) *Dubai Blockchain Strategy*. Available at https://scgn.smartdubai.ae/pdf/dubai-blockchain-strategy.pdf**.**

Tapscott, D. (2016, June) *How the blockchain is changing money and business*. Filmed in Banff, Canada, 18.50. Available at https://www.ted.com/talks/don_tapscott_how_the_blockchain_is_changing_money_and_business, accessed 5 March 2018.

Tapscott, D. and Tapscott, A. (2016) *Blockchain Revolution: How the Technology Behind Bitcoin is Changing Money, Business, and the World*. New York: Penguin Random House.

Taylor, P and Papadimas, L. (2015, October 18) 'Typically Greek, delayed land register is never-ending epic'. *Reuters.com*. Available at https://www.reuters.com/article/eurozone-greece-cadastre/insight-typically-greek-delayed-land-register-is-never-ending-epic-idUSL8N12E1Z520151018, accessed 14 October 2018.