A BLOCKCHAIN-BASED LAND TITLING PROJECT IN THE REPUBLIC OF GEORGIA

REBUILDING PUBLIC TRUST AND LESSONS FOR FUTURE PILOT PROJECTS

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Land and property rights are at the center of development challenges. According to the World Bank, more than 70 percent of the world's population lacks a "legally registered" title to their land.[1] Only one-third of countries worldwide track property ownership digitally, which is critical for effective land management.[2] Without formal access to a land registry, people struggle to justify ownership of their own property and thus live in fear of losing their land and the source of their economic livelihood in times of crisis. Poor land management also adversely impacts society's long-term prosperity; insecure land rights have long been considered a major driver of global poverty, inequality, and political instability. Past disputes over land ownership have in fact led to social unrest and violence. According to Global Witness, a nongovernmental advocacy organization, "in 2015, more than three people were killed each week, on average, defending their land from extractive and other industries."[3]

The challenge for countries without adequate land management is not simply to build a land registry system but to create a system that is trustworthy, efficient, and free of corruption. According to Transparency International, 20 percent of land service users worldwide admitted that they have paid a bribe in order to register their property or verify land ownership information.[4] This reduces the efficiency of service delivery and undermines public trust in the

government. Moreover, corrupt officials in the opaque government system can easily leverage their positions to manipulate land title data without risk of detection.

Governments can harness Blockchain technology to address these challenges. The immutable and transparent nature of Blockchain could curb forgery of land titles, create an unmodifiable history of land transactions, and allow real-time verification of land ownership. A few countries—the Republic of Georgia, Ukraine, Brazil, the Republic of Honduras, and the United Arab Emirates, among others—have pioneered the adoption of Blockchain technology to improve their land registry and transfer processes.[5.] While there is not a single preferred framework, solutions often involve a hybrid Blockchain solution, where land information is first recorded in a private Blockchain that creates hashes, a fixed-length bit string generated from variable length input, then posted on a public Blockchain. This solution is believed to guarantee the privacy of user data and effectively leverage the immutable nature of public Blockchains.[6.] As Michael Graglia and Christopher Mellon wrote in their report, "Blockchain and Property in 2018," while land documents have to be stored somewhere, current public Blockchains are not able to handle large amounts of land data, such as deeds, titles, and maps.

To highlight a use case of a hybrid Blockchain for land registry, this paper discusses the development of a

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ABOUT THE AUTHORS

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Blockchain-based land titling system in the Republic of Georgia, a pilot project developed in collaboration with the Bitfury Group, the National Agency of the Public Registry (NAPR), and the Blockchain Trust Accelerator. By using Blockchain technology, the Georgian government aims to be a leader in governance and security and to restore public trust in institutions and government agencies.

CHALLENGES

The land registry system in the Republic of Georgia was previously managed by the Bureau of Technical Inventory and the State Department of Land Management. These two agencies had significant functional overlap, as each ran its own system of land registry that was generally opaque.[7.] This enabled government officials to illegally change land records in the system for their own benefit, as such misconduct was difficult to detect or identify.

It was not until the mid-2000s that the Republic of Georgia began to combat corruption, when President Mikheil Saakashvili's administration launched a series of reforms to reduce bureaucratic red tape and increase the transparency of government work.[8.] In 2004, the NAPR was created to replace the Bureau of Technical Inventory and the State Department of Land Management. The new agency introduced policies to simplify the land registry process, allowed more stakeholders to participate in land-related services, and facilitated legislative reforms to the processes of drafting and certifying property transactions. In addition, the NAPR created NAPReg, a digitized database that included land registry information such as property titles and satellite photos.[9.] Thanks to this database, details of land property information such as name, address, and cadastral code can easily be found. The reforms also dramatically cut the time and cost of land registration.

However, building a digital NAPR database for land titles did not fully solve the public trust crisis in government agencies, as officials could still alter land records. As Georgia's justice minister Thea Tsulukiani stated, despite the benefits of the NAPR database, "there was a general distrust towards politicians in Georgia and people felt that politicians could influence transactions. When you have shadows of distrust wandering the streets, the whole system is in question."[10.] Additionally, the centralized database was vulnerable to hackers. While improvements were made over the previous system, Georgia still had the challenge of ensuring data integrity and protecting the system from internal manipulation and external cyberattacks.

BLOCKCHAIN SOLUTION

Blockchain is a distributed ledger technology that empowers anyone with an Internet connection to transfer anything of value (currency, data, survey answers) with unmatched security and integrity. Trust is embedded in the Blockchain architecture—a decentralized, cryptographically secured database that can be seen and downloaded by everyone on the network. Because every "node" (computer) of a Blockchain maintains a full record of the transactions run through the network, there is no central point of attack or failure. A paradigm-shifting approach to security, Blockchain prevents fraud by requiring verification from every source computer before a transaction is approved.

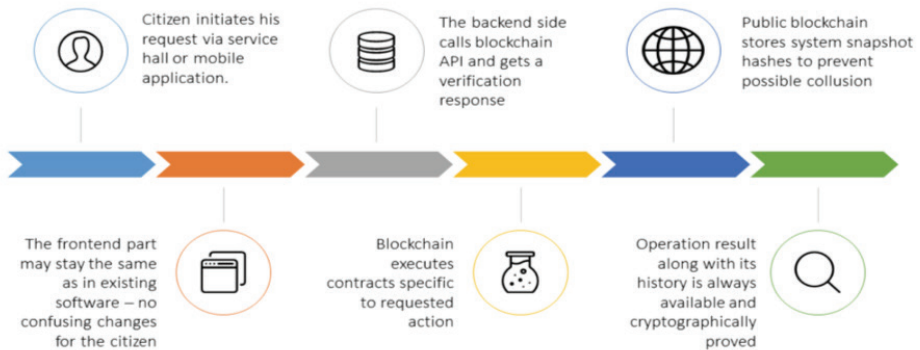The Georgian government has shown strong interest in adopting Blockchain

Figure 1. Blockchain-Based Land Titling Project Workflow Chart

technology as part of its effort to restore public trust in government agencies. Papuna Ugrekhelidze, former chairman of the NAPR, said in a 2016 statement that, "by building a Blockchain-based property registry and taking full advantage of the security provided by the Blockchain technology, the Republic of Georgia can show the world that we are a modern, transparent and corruption-free country that can lead the world in changing the way land titling is done and pave the way to additional prosperity for all."[11.]

PROJECT DEVELOPMENT

Following a series of discussions about Blockchain technology between the technical provider, Bitfury, and the Republic of Georgia, the two parties formed a partnership in April 2016 to create a one-year pilot project to move the country's land registry system to a Blockchain platform. Headquartered in Amsterdam, Bitfury is a full-scale Blockchain technology company that started out as one of the earliest Bitcoin mining companies. It has transitioned into a Blockchain software and hardware service provider. Hernando de Soto, a renowned Peruvian economist, serves as an advisor and supporter of the Georgia pilot project.

There are several key reasons why Bitfury and Georgia entered into this partnership. First, Bitfury had already established strong ties with the Republic of Georgia; by the time the cooperation memo was signed, Bitfury had opened three data centers in the country. But, more importantly, Georgia has been able to maintain an accurate account of land titles in its current NAPR database, which is crucial for the success of a Blockchain project. The quality of data determines the success of the project. In fact, the World Bank has recognized the Republic of Georgia for the quality of its land registry service. According to the World Bank's report, "Doing Business 2016," the Republic of Georgia was ranked third among 189 countries in ease of property registration.[12.] The report showed that it took only one day to register property in Georgia and the registry cost accounted for merely 0.1 percent of the total property value.[13.] The Republic of Georgia's land registry efficiency far exceeds that of developed countries such as the United States and Germany, where it took on average 15.2 and 39 days, respectively, to register properties.[14.]
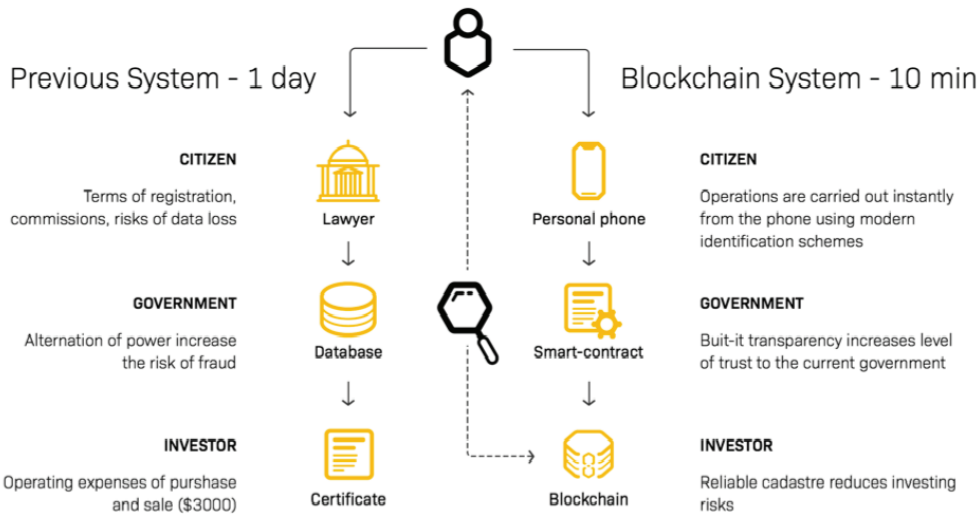
Figure 2. Blockchain-Based Land Titling System in the Republic of Georgia

Source: Bitfury Group

Since it was announced in 2016, the Georgia land titling pilot project has had two phases.

PHASE ONE

The first phase of the project started in April 2016 and lasted for one year. The goal of the first phase was to apply Blockchain technology to Georgia's land registry system. It should be noted that this project did not set out to build a brand new Blockchain-based land title registry system for the Republic of Georgia. What Bitfury created was a Blockchain-based timestamping layer on top of the NAPR's existing digital land registry system.

According to the *Harvard Business Review,* a team of seven people from Bitfury and the NAPR worked on the project, with the NAPR in charge of deciding the system content. Figure 1 shows how the Blockchain-based land registry system worked in the Republic of Georgia. The user interface was not modified after the Blockchain technology was implemented; users log into the same NAPR system to register their land certificates with the government. Changes were made primarily to the backend of the system, where certificates are timestamped and hashed in the Bitcoin Blockchain, one of the largest and most secure public Blockchains.

According to Bitfury, one of the most significant benefits of timestamping is to "add immutability and allow the owner of the document to prove to anyone that the receipt existed no later than the time of timestamping, and that it was authorized by NAPR."[15] In addition, to minimize the amount of data written onto the Blockchain and further improve privacy, Bitfury uses a special data structure, Merkel Tree, to pool and aggregate hashes. During the process, the NAPR is responsible for adding the Blockchain Application Programming Interface call in its registry software and providing guidelines for stakeholders who need to check it.

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In general, citizens, investors, and government agencies could all benefit from an efficient and transparent Blockchain-based land titling system that includes the steps the NAPR took with timestamping. A sample system is shown in Figure 2.

PHASE TWO

Impressed by the efficiency and transparency of Phase One, the Georgian government decided to expand the project and signed a memorandum in February 2017 to initiate Phase Two. While Bitfury and the Republic of Georgia's government are still finalizing the design of Phase Two, Blockchain technology is expected to be integrated further in order to improve the process of land sales and transfers.

Former NAPR chair Ugrekhelidze has stated that, with Blockchain technology, Georgian citizens will be able to access their property information on the NAPR website and put it up for sale. The nodes of the network will verify that the buyer has sufficient funds and that the seller owns the property before the transaction is concluded. With the new technology, all land sales and transfer information will be accessible to the public and it will not be easily altered by government agencies. To realize this vision, Bitfury suggests using Exonum, a private Blockchain framework the company developed that anchors data to the Bitcoin Blockchain. Anchoring is the process of storing a fingerprint (a hash) of a system to a public source. Bitfury explains that "anchoring removes the need to trust the administrator(s) of an Exonum Blockchain unconditionally; at the same time, it keeps sensitive data private."[16.] Exonum was still being tested as of September 2018, while Bitfury has begun discussions with other agencies

interested in participating in Phase Two of the Georgia project.[17.]

CONCLUSION

According to *Forbes,* the Georgia pilot project marks the first time a national government used the Bitcoin Blockchain to record land titles.[18.] The project has significantly improved the government's efficiency and helped restore public trust in national agencies. As of 2018, a total of 1.5 million land titles in the Republic of Georgia were published on the Blockchain, which ensures the security and immutability of the data.[19.] In November 2017, Bitfury presented its findings from the Georgia Land-Titling Project to students at Harvard Business School.[20.]

The success of the Georgia project was the result of two crucial elements—education and data quality. For a Blockchain-based project to succeed, all stakeholders must be educated about Blockchain technology and the challenges it can address. Tomicah Tillemann, founder of the Blockchain Trust Accelerator, said of the Georgia project that "education and public engagement are as crucial as the technical side of the work. Technology is not going to take care of itself. People and the government need to know why they are using this technology and what problem it can solve."[21.] Throughout the project, the NAPR helped the Georgian people understand how Blockchain technology can ensure the immutability of land title data without sacrificing privacy.

More importantly, the existence of high-quality data helped guarantee the validity of the project. Without accurate data, the power of a Blockchain-based solution for a land registry would have been greatly limited, as poor-quality information posted on the Blockchain would make third-party verification of

land titles difficult. The high quality of the NAPR data was a consequence of the political reforms pursued by the Republic of Georgia before the project. This speaks to an important truth of Blockchain-based solutions for governments: while the technology can ensure the security and immutability of information, it cannot be a substitute for the institutional infrastructure that is essential for ensuring the quality of data.

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