Report on Blockchain Solutions to Public Services

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Abstract

This report analyzes blockchain usage, its advantages, and significant public service participants. Also, it provides some specific blockchain applications, mainly in developing countries, intending to summarize the blockchain solutions in the public services area.

1 Introduction and backgrounds

1.1 Blockchain technology

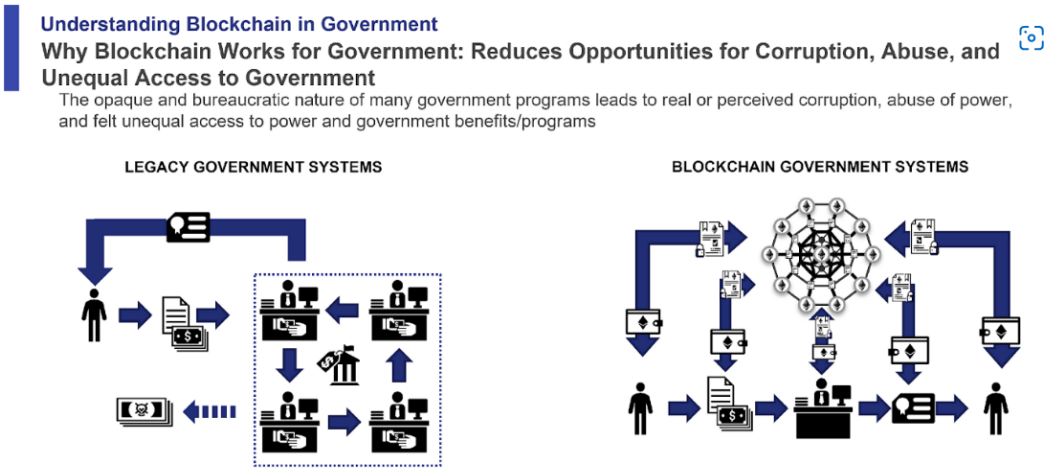
The World Economic Forum says, "Currently, most people use a trusted middleman such as a bank to make a transaction. But Blockchain networks allow consumers and suppliers to connect directly, removing the need for a third party" (Hutt, 2020).

Blockchain technology is a method of storing data in blocks linked together in the form of a chain. It acts as an open and trusted record (i.e., a list) of transactions from one party to another (or multiple parties) that is not stored by a central authority (Hanson, 2018). Therefore, transactions or events recorded in blockchain are highly reliable and secure.

1.2 Blockchain and corruption

Blockchain provides transparency to the public in both security and convenience. A blockchain is the digital ledger of transactions using tamper-proof cryptography skills, does not have a central authority, and therefore provides protection which is essential in tackling corruption (Kshetri & Voas, 2018). It is hard to change or remove data in such a system; therefore less likely to cause actual or perceived corruption and abuse of power compared with traditional government programs. The latter one is usually considered bureaucratic with one main centre. Moreover, since there's no need to pay for monitoring in blockchain, the transaction cost could be reduced.

The other reason is that blockchain can provide convenience to the whole government financial system, which means the public can have more opportunities to access financial data. For example, blockchain can present how taxation is converted into public programs. The records are accountable, traceable, and can be accessed easily. The characteristics of convenience make transparency more practicable.



Pic 1. Understanding Blockchain in Government (ConsenSys, 2021)

Except for the technology used in blockchain, some organizations also help regulate the use of blockchain, reducing the blockchain alignment crisis and increasing the practicability of blockchain in social issues. For example, Blockchain Trust Accelerator (BTA) brings together governments, technologies, civil society organizations, and philanthropists to build blockchain pilots that benefit society (*Blockchain Trust Accelerator and Emercoin Partner to Advance Social Impact Projects*, 2018). It aims to reach more rules and consensus while applying blockchain technology in the public sector, increasing government transparency better (Zambrano, Seward, and Sayo 2017).

1.3 Blockchain development in different countries

Blockchain development in the public sector in different countries is categorized into 3 phases (OECD, 2018):

Phase 1. Focus on exploration and research, and plan on strategy.

Phase 2. Focus on proof-of-concept, prototyping, and incubation.

Phase 3. In development or live.

The Silicon Valley Insights Institute analyzed the data and found that among the plans issued by governments around the world in 2018, 83 were focused on the first phase, 63 were focused on the second phase, and 54 were in the third phase. Most countries worldwide are still in the exploration and research stage of the concept of blockchain.

Some leading countries include the Netherlands, the United States, the United Kingdom, Russia, and Australia.

Pic 2. Blockchain development in different countries (OECD, 2018)

2 Major partners

2.1 Africa Blockchain Institute (ABI)

ABI is a Pan-African Institute with its headquarters in Kigali, Rwanda. It aims at promoting the understanding, adoption, use and development of blockchain technology in Africa (Attah, 2020). Specifically, it is reimagining the possibilities of Blockchain Education, extensive Evidence-Based Research, and High-End Deployment solutions for Digital Transformation in Africa (African Blockchain Institution, 2018). They partner with organizations and individuals to address their unique needs, providing options that help them reach their goals. For example, they partnered with African Leadership University (ALU) and the University of Namibia (UNAM) to promote blockchain education in Africa. And they also partnered with FADO Go, a blockchain-based e-commerce platform, to optimize technology and expand the market.

2.2 Government Blockchain Association (GBA)

GBA is a US-headquartered non-profit organization that promotes blockchain technologies by solving global public sector challenges (Attah, 2020). GBA cultivates professional workflows between technologists, public policymakers, and application specialists (Government Blockchain Association, 2022). They focus on our members to promote blockchain technology solutions to the government but do not advocate for any specific policy position.

2.3 ConsenSys

ConsenSys is a blockchain software technology company based in New York City (Wikipedia, 2022). It has many different projects in promoting blockchain technology, and specifically, it mainly focuses on the development of decentralized applications. For example, MetaMask is an Ethereum wallet application which allows users to store and transfer cryptocurrencies and tokens, as well as access and interact with decentralized applications built on the Ethereum blockchain (Wikipedia, 2022). The software is developed and supported by ConsenSys and is free to use on desktop as a browser extension or through its mobile app

3 Applications

In this part, three main applications of public services based on blockchain will be introduced, along with some corresponding examples, mainly in developing countries.

Type	**Examples**
Land titles	Bitlands Ghana, Factom in Honduras
Electoral processes	uPort in Zug
Aid and remittance	CharityCoin Model

3.1 Land titles:

3.1.1 Importance and applicability

In many countries nowadays, the land title data system is still facing many problems such as establishing ownership over land, poor maintenance of land records, high litigation, and lack of information synchronicity, possibly leading to land title data leakage.

Land title data leakage is likely to lead to severe land title fraud crises, and the problems are still controversial in judicial decisions, which means that the defrauded may not be able to rely on judicial redemption to benefit fully. The example from Canada, 2013 can show (SDS LAW Firm, 2021):

> *"The fraud artist drove through an upscale neighbourhood, noting addresses. He ran them through Ontario's Land Registry, which told him who owned the house and details of their mortgage. Next, he purchased legal forms from a stationary store and filled them in as if he had just bought the home. Where the form asked for a lawyer's signature, he forged one that he randomly picked out of the phone book. He also forged the homeowner's signature. At a land title registry office, he presented this forgery, paid the land transfer tax and the registration fee, and assumed legal title over the home. A mortgage is then taken out on the home based on these documents, and the fraud artist disappears with the cash. Now the nightmare begins for the legitimate (former) homeowner. If the property has been 'sold', the new homeowners are also in for a traumatic time. Ontario law recognizes the transaction as valid where the purchaser is unaware of the scam. An Ontario Court of Appeal decision last fall ruled that a forged power of attorney could be used to create a valid mortgage. The court ruled that once the mortgage was registered, it was binding on the innocent person even though they had no knowledge of the matter."*

Therefore, protecting the private data of land titles is of great significance. Also, compared with other personal staff titles, such as vehicle titles, the land titles are relatively less volatile and more suitable for recording on the blockchain, which can safely store data for a long time.

3.1.2 Example: Bitland in Ghana

Ghana is a western African country. Historically, land registration in Ghana has been a cumbersome process. As a result, thousands of lands remain unregistered, and land conflicts are common. According to Ghana government data, between 1986 and 2006, 42,000 land registration applications were submitted, but the registration rate was less than 30%. How to make the land transfer process more accessible, more efficient, and cost-effective for landowners and land management departments is a big challenge (Bitcoin Forum, 2016).

African blockchain project Bitland aims to prevent corruption aroused from the land

title and then expand this application to other African countries. The organization mainly wants to aid in solving land ownership disputes by providing a permanent, secure, and auditable land titles data record. From 2015-2016, the organization's platform was piloted with 28 communities located in Kumasi, Ghana (Buzz, 2016).

Bitland's system also provides the efficiency and ability to reduce fraud and improve mortgage lending. Banks cannot issue mortgages on unregistered land. In Africa, about 90 per cent of rural areas are unlisted and unregistered (Buzz, 2016). Leveraging an open, decentralized, and transparent ledger will effectively unlock previously unusable lands. Building on the maturity of the project in Ghana, we hope to see Bitland's reach expand across the continent and overseas. Bitland has enormous potential to unlock capital and resources through infrastructure in more developing countries.

3.1.3 Example 2: Factom in Honduras

Honduras is a country in Central America with an approximately 10 million population (Wikipedia, 2022). Economically, the state is distinguished by uneven income distribution and widespread underemployment. Due to insufficient land information and the incomplete land registry system, the previous Honduran land market was ineffective (Dhanju, 2022).

In 2015, Factom, a technology cooperation, proposed a blockchain-based solution to upgrade the country's land registration with a permanent and time-stamped record (Dhanju, 2022). Factom successfully started a pilot project (proof-of-concept) in La Ceiba, the fourth largest city in Honduras, in mid-2015. However, the project was paused in mid-2017 and has not been restarted for political reasons.

3.2 Electoral processes:

3.2.1 Importance and applicability

In some democracies, citizens are called to vote for the election of presidential, parliamentary, or local motions very often, including activities like smoking in restaurants, funding museums, and extending local bus routes. Although this is the most democratic government in modern times, it also creates a cumbersome,

expensive, and time-consuming process to collect, calculate and summarize the voting results.

The use of blockchain will make this voting process more convenient and transparent, reduce the cost of the whole voting process, and increase the popular vote's fairness.

3.2.2 Example: uPort in Zug

Zug is the largest town and capital of the Swiss canton of Zug in Switzerland. People and governments must have secure digital interactions.

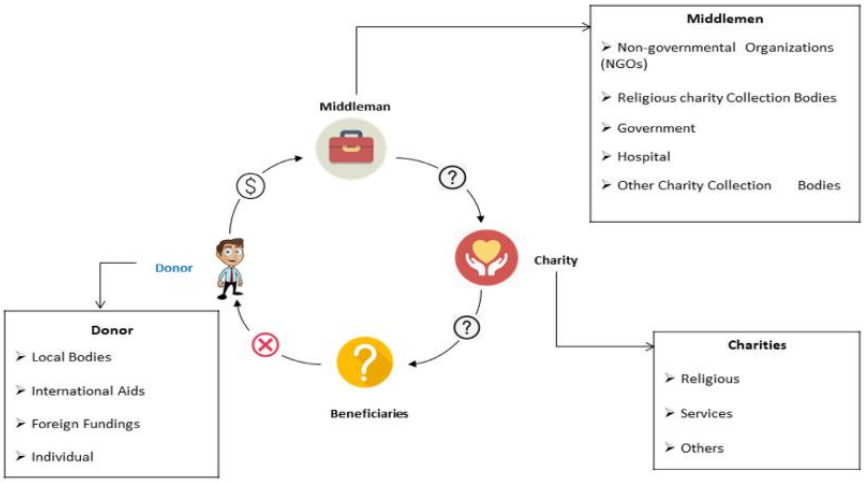
uPort, a decentralized identity platform based on the Ethereum blockchain, aims to create the "world's first live implementation of a self-sovereign government-issued identity project (ConsenSys, 2022)." Zug uses this system to implement voting. In the summer of 2017, they launched a pilot program to register resident IDs on the public Ethereum blockchain. After the pilot program, Zug officially launched the program in November 2017.

By 2018, uPort verified that 350 registered citizens successfully created a digital ID (ConsenSys, 2022). Seventy persons voted on the appearance of fireworks at a future festival. Users bypassed the time-consuming login process by logging in using their uPort account, voting, and logging out without visiting a polling booth. Without the use of intermediaries or vote-counting infrastructure, it was able to verify who voted. The pilot revealed that user-controlled identities help modernize e-voting programs, which might save the city millions in labour and production expenditures.

3.3 Aid and remittances:

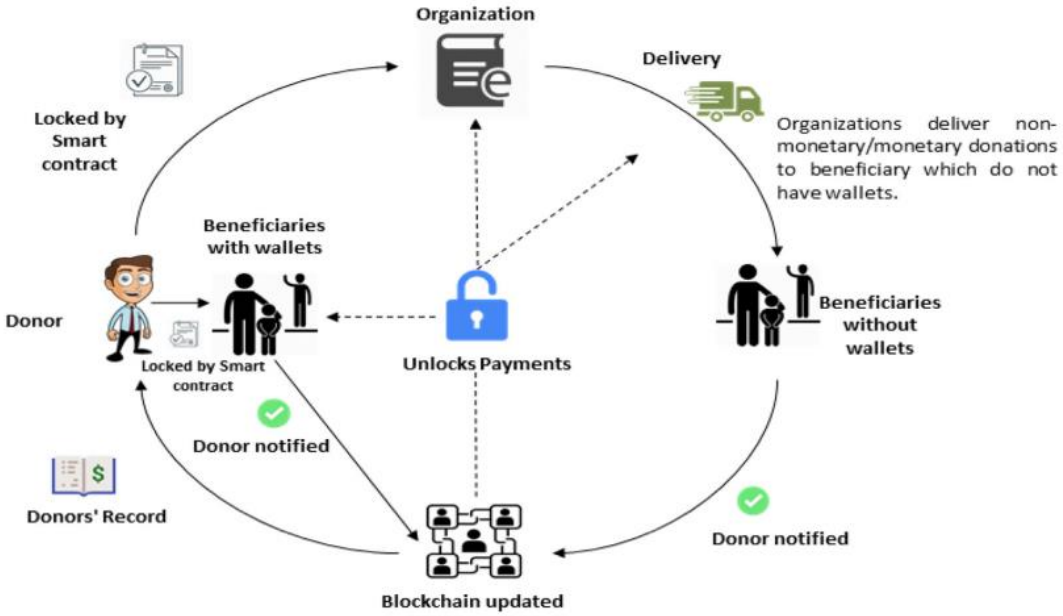
Whether charitable organizations' fund operation is fair will affect the trust of the whole society in public welfare organizations and then affect the development of social charity work. Therefore, it should be more open and transparent than the general financial system.

Professor Muhammad Shoaib Farooq from the University of Management and Technology, Pakistan, presented a blockchain-based charity management platform to provide a transparent, secure, auditable, and efficient system. The proposed platform comprehensively covers the charity collection process using crypto wallets, Initial Coin Offering (ICO), an economic model, and introducing CharityCoin (CC) as a digital currency. Furthermore, smart contracts for pertinent use cases have also been provided, including exchanging fiat currency for CC, buying and selling CC, transferring CC to organizations and individuals, and calling for donations. Finally, the performance evaluation shows that the proposed architecture scales well for large data sizes (Farooq et al., 2020).



Pic 3. Traditional Charity System (Farooq et al., 2020)

Compared with the traditional system with a middleman to transfer the donations (Pic 3), the new blockchain-based system (Pic 4) relies on a smart contract to perform all the donations, with the premise that both the donor and the beneficiaries have electronic wallets. However, this system also takes the difficulty and impracticability of all the beneficiaries having electronic wallets. Therefore, it categorizes the beneficiaries into two categories: for those with wallets, the contract will be directly conducted through the smart contract, and all the donations are in the form of digital currency (CharityCoin, CC). For those without wallets, an organization is still needed to help transfer the donations to those beneficiaries after receiving the digital currency donation by the smart contract. However, stricter proof should be uploaded by the organization to show that the amount of donations is indeed transferred to the beneficiaries, and those proofs will be kept in the blockchain with transparency and security.



Blockchain-based Charity System (Farooq et al., 2020)

This model can be used in non-government-organization charities and government welfare projects, which are secure, auditable, and trustworthy to donors, beneficiaries, and legal entities. It can also help to increase the social credibility of charities, attract more donations, solve more social problems, and hence make social charities enter a positive cycle.

4 Summary

This report focuses on the blockchain solution to public service problems. It introduces blockchain technology, how blockchain can help tackle corruption and the development of blockchain public usage in different countries. It also mentions some significant partners in this area and lists three main applications with examples: Land Titles, Electoral Processes, and Aid and Remittance.

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