

## Use of Blockchain Technology in General Elections

Fatih Demircioğlu\*

### **Abstract**

*Blockchain allows you to perform operations in a clear and secure manner in the digital environment. Blockchain is a decentralized database with no singular central control. Whenever a new transaction occurs in the system or changes are made to an existing transaction, this change is checked on all entries on the network and if most of the entries in the system confirm the new transaction as authentic, it will be included in the system. If most of the records in the system do not confirm the authenticity of this new transaction, it is not recorded in the system. In the event of this decentralized system without a centralized control, the chain can operate continuously without the need for a center. Blockchain was spoken in the original Bitcoin article of Satoshi Nakamoto, published in 2008. In this article blockchain is defined as a set of data blocks that are cryptographically interlinked with one another, and a technology component that underlying the cryptocurrency although the word “blockchain” is not mentioned. Bitcoin is the first application of blockchain technology. Its success is one of the biggest reason of its widespreading. The first reaction from scholars and legislators to this dissemination is how should regulate this technology in the context of Bitcoin. Blockchain technology can be applied not only to Bitcoin but also to many other areas. This revolutionary technology has emerged as an entirely new system of data storage and management, and is inherently democratic in nature. It is not controlled by a single person or entity. The format of processing and storage of the data is decentralized and transparent. When a data block is saved, this operation is permanent and it is not possible to hack the system and changing the data is impossible. The success of this technology in cryptocurrency markets has made it possible to use it in other areas. General elections are only one of these areas. Blockchain technology has shown that a credible democracy is possible for voters as a system that removes the odds of corruption and violations of the rules that are present in the traditional voting process. Elections that based on blockchain technology has begun to be implemented in some countries. In this article, defining the outline of blockchain technology, examining the practices in general elections in various countries and identifying the advantages and disadvantages that can be encountered are aimed.*

**Key words:** Blockchain, General Elections, Bitcoin

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\* Research Assistant at Kocaeli University, International Relations Department.

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### Introduction

A blockchain is a data structure that makes it possible to create a digital ledger of data and share it among a network of independent parties. A blockchain is digitized and decentralized. Constantly growing as completed blocks are recorded and added to it in chronological order, it allows participants to keep track of transactions without central recordkeeping. Each node (a computer connected to the network) gets a copy of the blockchain, which is downloaded automatically.

A blockchain is a peer-to-peer system with no central authority managing data flow. It has a large distributed network of independent users. This means that the computers that make up the network are in more than one location.

Originally developed as the accounting method for the virtual currency Bitcoin, blockchains are appearing in a variety of commercial applications today. Currently, the technology is primarily used to verify transactions, within digital currencies though it is possible to digitize, code and insert practically any document into the blockchain. Doing so creates an indelible record that cannot be changed; furthermore, the record's authenticity can be verified by the

entire community using the blockchain instead of a single centralized authority.<sup>1</sup>

Blockchains are now recognized as the missing trust layer for the Internet. Blockchains can create trust in digital data. When information has been written into a blockchain database, it's nearly impossible to remove or change it. This capability has never existed before.

The Blockchain can be used for not only keeping track of debits and credits for a currency system like Bitcoin, but also for keeping track of any data that might involve a transaction or record of ownership in some way. Estonia is already using the Blockchain in an effort to clean up its notary system. This state teamed up with BitNation to unravel fraudulent tactics on the part of the notary public.

Another use of this technology is in general elections. Sierra Leone and Virginia State of US have used it in the first half of 2018. This article will try to examine blockchain technology and focus on advantages and disadvantages of its use in elections.<sup>2</sup>

## 1. Classifications of Blockchains

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<sup>1</sup> Tiana Laurence, **Blockchain for Dummies**, New Jersey: John Wiley & Sons., 2017, pp. 7-11.

<sup>2</sup> Jared Norton, **Blockchain: Easiest Ultimate Guide To Understand Blockchain**, <http://brightwells.d-webhost.orphans.co.uk/juc-27/blockchain-easiest-ultimate-guide-to-understand-blockchain-volume-1-blockchain-programming-smart-contracts.pdf> (last accessed on 18.06.2018), 2016, pp. 15-17.

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When the blockchain can be read by anyone all over the world, it is called a public blockchain. Anyone in the world, from anywhere and at any time, can have access to all the transactions that are being made. Not only that, the public can also participate actively in the consensus process - which is the process to determine which of the blocks can get added to the ledger and which cannot. This kind of blockchain is known to be fully decentralized. In this system, any person can influence the consensus process.

A blockchain is called a consortium blockchain when a specific number of nodes are created to control the consensus process. This kind of blockchain can be considered partially decentralized, because the right to access the network can be limited to a number of participants.

When a blockchain is closed off to one particular institution, it is called a fully private blockchain. It completely depends on that institution whether the blockchain will be open to the public for reading or not, but the permission to write that blockchain only belongs to that institution.

All three types of blockchains use cryptography to allow each participant on any given network to manage the ledger in a secure way without the need for a central authority to enforce the rules. The

removal of central authority from database structure is one of the most important and powerful aspects of blockchains.<sup>3</sup>

Apart from the context of visibility and editing ability, there are two other classifications of blockchain;

Blockchain 1.0 was for when blockchain was used primarily for financial transactions. With Blockchain 1.0, users were able to immediately send and receive cash from others instead of having to wait for days for each transaction to fall through. With this, the transaction fee worldwide was as low as below 1% whereas banks and financial institutions charge from 7 to 30%. Blockchain 1.0 was later extended to Blockchain 2.0 to increase the functionality of this concept.

Blockchain 2.0 was extended from the previous version to make it easier and more transparent to the public. Blockchain 2.0 is all about the contracts. Blockchain 2.0 runs on a completely new protocol, aptly known as the Blockchain 2.0 protocol. It distinguishes between the asset and the programmable infrastructure. Blockchain 2.0 also expands the technology to decentralize the market to involve even more kinds of assets.

The concept of Blockchain is ever-changing; every time a new need arises, Blockchain is remodeled to fit the requirements of the users. From Blockchain 1.0 to 2.0, newer ideas are constantly emerging,

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<sup>3</sup> Paul Vigna and Michael J. Casey, **The Truth Machine: The Blockchain and Future of Everything**, New York: St. Martin's Press. 2018, pp. 21-23.

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whenever needed. In this context, the blockchain which is for using in elections can be defined a public blockchain 2.0.<sup>4</sup>

### 2. Examples of Using Blockchain in Elections

While all of those blockchain dreams may one day come true, the use that is the most compelling is voting. The interest in blockchain technology taking over from traditional election methods has potential advantages due to the big technological upgrade from how elections are currently held. Many national elections still take place using a paper-based system, leaving open huge holes for security breaches, fraud, and corruption.

The idea of using blockchain for elections is worth more than just an experiment, however. Mobile voting using a safe and tested interface could eliminate voter fraud and boost turnout. It will make it more convenient for citizens to vote while abroad, irrespective of the distance and time. It is also a beneficial tool for the election commission to maintain transparency in the electoral process, minimize the cost of conducting elections, streamline the process of counting votes and ensure that all votes are counted.<sup>5</sup>

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<sup>4</sup> Christopher Lewis, **Blockchain: Your Comprehensive Guide To Understanding The Decentralized Future**, <https://www.goodreads.com/book/show/31552019-blockchain> (last accessed on 26.06.2018), 2016, pp. 44-47.

<sup>5</sup> Marcella Atzori, "Blockchain Technology and Decentralized Governance: Is the State Still Necessary?", <http://nzz-files-prod.s3-website-eu-west->

When elections are contested, officials hole up in a room and hand-count votes for hours — setting aside the ones they can't decipher to argue over later. On a larger scale, our election process makes it difficult to vote. Many people struggle to take the time off to make it to their polling place. Finding that polling place can sometimes be a challenge.<sup>6</sup>

There have been some use-cases already where blockchain has come to the aid of elections. Different countries and organizations have begun experimenting with the immutable distributed ledger that offers transparency and security.

Blockchain election project aiming to replace cumbersome voting technology around the world got its first test in presidential election in Sierra Leone on March 7th, 2018. Its potential benefits are impressive and it seems clear that it can be expected to see plenty of future elections using blockchain.

Representatives from the Switzerland-based project, called Agora, served as outside observers at some polling sites for the election, which was conducted using the country's traditional paper ballots. In 280 polling centers across Sierra Leone's Western District, the most populous in the country, votes cast were manually recorded. Along

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[1.amazonaws.com/files/9/3/1/blockchain+Is+the+State+Still+Necessary\\_1.18689931.pdf](https://1.amazonaws.com/files/9/3/1/blockchain+Is+the+State+Still+Necessary_1.18689931.pdf) (last accessed on 28.06.2018), 2015.

<sup>6</sup> Nazli Choucri, **Cyberpolitics in International Relations**, Massachusetts: The MIT Press, 2012.

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with other observer groups, Agora representatives were shown the cast ballots. They used their equipment to record the votes to Agora's proprietary blockchain, without voters needing to do any additional work.

Agora's blockchain implementation doesn't rely on a bitcoin-style mining system for security, since access to the chain is limited to Agora personnel and election officials and authorized auditors, and other properties of the underlying algorithms also help make it more energy efficient than cryptocurrency blockchains.<sup>7</sup>

The use of blockchain in the public sector reached another milestone when West Virginia became the first U.S. state to allow internet voting by blockchain in primary elections on May 8th, 2018. This was not a full blockchain election, as it was only available to a select group of voters, such as military members. However, the response was again positive as experimenting with the use of blockchain in voting continues to be ramped up.

While the voter participation through this platform was estimated to be small, the intention of the administrators was to test the technology in a pilot project with no immediate plans to implement it at a larger scale.

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<sup>7</sup> Nicolas Courtois, "On The Longest Chain Rule and Programmed Self-Destruction of Crypto Currencies", <https://arxiv.org/abs/1405.0534> (last accessed on 27.06.2018), 2014.

Under the technology that was used in the West Virginia elections, a voter's identity is verified using biometric tools like a thumbprint scan before voting on a mobile device. Each vote forms part of a chain of votes, where it is mathematically proven by the third party participant. Using blockchain, all data of the election process can be recorded on a publicly verifiable ledger while maintaining the anonymity of voters, with results available instantly.

Still, some elections experts are skeptical of any blockchain-based voting system. They don't think that blockchain is the answer to the complicated questions that are presented by voting. They argue that paper ballots can already be scanned electronically to quickly generate results, but they can also be audited as needed if any questions arise. Besides they are skeptical about that blockchain can solve questions of authenticating voters or distributing results. They substantiate their thesis with the argument that voting with internet-connected devices also raises issues of potential malware or denial of service attacks.<sup>8</sup>

In spite of skepticism and concerns, blockchain elections were starting to surface, and there appeared to be interest in the possibility of organizations as big as national governments turning to the technology for their possible use. It can be easily said that most countries will use some form of digital voting in future, in this context blockchain is the

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<sup>8</sup> Vitalik Buterin, "Bitcoin Isn't Quantum-Safe And How We Can Fix It When Needed", *Bitcoin Magazine*, <https://bitcoinmagazine.com/articles/bitcoin-is-not-quantum-safe-and-how-we-can-fix-1375242150> (last accessed on 28.06.2018), 2013.

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only technology that has been created which can provide an end-to-end verifiable and fully-transparent voting solution for this future.

### Conclusion

Centralized vertical authority has become the main organizational model in society, simply because there has not been a better alternative so far.<sup>9</sup> For the first time in history, citizens can now reach consensus and coordination at global level through cryptographically verified peer-to-peer procedures, without the intermediation of a third party. The blockchain technology ushers in a new era of decentralization on large-scale, in which human factor is minimized and trust shifts from the human agents of a central organization to an open source code. In such distributed architecture, “code is law”: the protocol is open-source and it can be review by anyone; the network is not owned nor controlled by any single entity; data are simultaneously kept by all nodes, thus ensuring proper redundancy. Neutrality of the code, distributed consensus and auditability of transactions can significantly reduce or overcome frictions and failures inherent in

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<sup>9</sup> Anthony G. Willhelm, **Democracy in Digital Age, Challenges to Political Life in Cyberspace**, London: Routledge, 2000.

decision-making process of centralized organizations. (e.g. lack of transparency, corruption, coercion, etc.)<sup>10</sup>

Blockchain technology can be the key to ensuring the integrity of the democratic process. It is still very much in the embryonic stages of its disruption across many aspects of society, it has a long way to go. However, there are some real strides in finance - banks are building blockchains, corporations are decentralizing, and similar advances are being made in politics and voting.

Blockchain technology certainly has many different use-cases, with some more advanced in terms of their potential, and many differing in their time-to-market. However, blockchain's growth and sophistication in spaces such as finance and elections would lead to a global blockchain infrastructure being laid down.

Blockchain can underpin a tamper-proof ledger of information that the public could access without security concerns. Its combination of anonymous use and decentralized data storage has encouraged a bevy of start-ups to examine blockchain as a way to make voting fair, accountable, and secure.

Online voting imposes extremely stringent requirements on the security of every aspect of voting. Blockchain technology can be the missing link in the architecture of a viable online voting system.

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<sup>10</sup> Quinn DuPont and Bill Maurer, "Ledgers and Law in the Blockchain", <https://www.weusecoins.com/assets/pdf/library/Ledgers%20and%20Law%20in%20the%20Blockchain.pdf> (last accessed on 25.06.2018), 2015.

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Blockchain isn't a miracle cure that will fix democracy but it's not entirely useless, either. The fact that major corporations, banks, and now governments - both in terms of regulation, and for elections - are looking deeply into the blockchain means that there is a big future building for it. If it can be shown to be a success in electing a country's leader, helping enact democratic needs and ensuring that democracy is enacted fairly, then there's not much else that can stop it.

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