



E-voting using blockchain Comparative Analysis

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Abstract: Electronic voting (e-voting) is a digital method of casting and counting votes in an election. Blockchain, a decentralized digital ledger technology, has been suggested as a potential solution to the challenges of e-voting, such as security, transparency, and trust. This comparative analysis examines the use of blockchain technology in e-voting systems, comparing it with traditional e-voting systems and highlighting the advantages and disadvantages of each. First, we discuss the basic concepts of blockchain technology and e-voting; we analysed the advantages and disadvantages of blockchain-based e-voting compared to traditional e-voting. We also examine the challenges of implementing blockchain-based e-voting, including scalability, interoperability, and regulatory compliance. Finally, we consider the potential for blockchain-based e-voting to enhance the democratic process by increasing voter turnout, reducing fraud, and improving the integrity of elections.

Keywords: Blockchain, edge computing, network, storage, computation.

I. INTRODUCTION

We currently face three major issues: trust, autonomy, and intermediaries. For example, we must put our faith in banks to protect the money we use for transactions. We rely on these outside companies to protect our data's privacy and security. We must, therefore, have faith in these organizations that serve as middlemen in the modern world. The unquestionably brilliant innovation known as the blockchain can resolve these three significant issues. Since the applications created with blockchain technology are distributed and held by numerous parties, no one can alter or update the data in the blockchain. Stakeholders will not accept it if someone attempts to do it. thereby making bitcoin trustworthy. Because there is no single owner of the blockchain, no single entity has power over it. Anyone can join the network (depending on the type of blockchain, such as a public, private, or consortium blockchain).

Blockchain is a read-only database; once data is put there, it cannot be altered. These blockchain characteristics can be beneficial in creating a Building decentralized voting platform that would be the ideal e-voting solution over the current method. difficulties that we are currently dealing with. is a translation of the Greek word Kryptos, which implies secret or hidden. It is a method for secure contact with an unreliable third party. It is a branch of both computer science and mathematics that deals with the study and practice of concealing information. Data encryption and decoding are both involved. It also makes transmitting data securely over an insecure network possible. Decryption is the opposite of encryption and involves applying a secret to plain text to turn it into cipher text. Asymmetric and symmetric cryptography models are the two main categories.

A. E-voting

E-voting voting is an essential component of any election or decision-making procedure. It demonstrates the importance of human rights and their concern for the issue. Numerous studies are currently being conducted to create a safe and trustworthy voting system while addressing problems with anonymity, fairness, reliability, and availability. Blockchain technology aims to make voting equitable and independent of third parties.

B. VOTING DIFFICULTIES

- **Privacy:** There will be no outside interference in the election. Only the voter can detail whom they chose. The number of ballots cast for each candidate is the only information made public during an election. **Absence of Evidence:** Although anonymity and privacy can protect against electoral fraud. There is no way to verify whether votes are cast due to bribes or any other type of electoral fraud. This problem has existed since the beginning.
- **Fraud-Resistance:** Each eligible voter should only be permitted to cast a single ballot, and nobody else should be permitted to do so. The system must identify each voter's status and confirm their identity, but it must not link this data to their ability to cast a ballot.



- Ease of Use: All voters must find elections easy to use. It must be created so that even those without extensive technical training can use it.
- Scalable: A large populace can be served through elections. It must be adaptable enough to function on an extensive basis as well.
- Speed: In this computer-driven age, it is essential to ensure that results are announced shortly after the election process.
- Low cost: One of the most important factors in system architecture is cost. The System must be effective, cost-effective, and require as little maintenance as feasible.

II. LITERATURE SURVEY

The literature surveyed includes ten academic papers discussing blockchain technology's use in electronic voting (e-voting) systems.

Hellman [1] propose a secure e-voting system using the Ethereum blockchain, which allows for decentralized vote counting and anonymity of voters. Hjalmarsson [2] proposes a blockchain-based e-voting system with transparency, immutability, and audibility.

McCorry [3] propose a smart contract for boardroom voting with maximum voter privacy using the Ethereum blockchain, which enables secure and private voting. Hardwick et al. (2018) propose a decentralized e-voting protocol with voter privacy using the Ethereum blockchain, which allows for secure voting and transparency.

Yu [3] propose a platform-independent secure blockchain-based voting system that uses the PoA (proof of authority) consensus mechanism and allows for secure and transparent voting. Hanifatunnisa and Rahardjo [4] propose a blockchain-based e-voting recording system design that uses the Ethereum blockchain and allows for secure and tamper-resistant voting. Fusco [5] proposes a crypto-voting system using blockchain technology for secure and transparent voting. Srikrishnaswetha [6] propose an intelligent electronic voting machine that uses face recognition and Aadhar verification with IoT to enable secure and transparent voting.

Ayed [7][8] proposes a conceptual secure blockchain-based e-voting system that uses blockchain technology for security, transparency, and anonymity. Faour [9][10] proposes a transparent voting platform based on a permissioned blockchain, which allows for secure, transparent, and tamper-resistant voting. [11] Meter, Christian. "Design of distributed voting systems." arXiv preprint arXiv:1702.02566 (2017). This article proposes a distributed voting system design that ensures the voting process's confidentiality, integrity, and availability. To secure the process, the system uses public and private key cryptography, zero-knowledge proofs, and homomorphic encryption. However, the author does not implement the proposed design. [12] Dagher, Gaby G., Praneeth Babu Marella, Matea Milojkovic, and Jordan Mohler. "BroncoVote: Secure Voting System Using Ethereum's Blockchain." (2018). The authors propose BroncoVote, a secure voting system based on the Ethereum blockchain. The system allows voters to cast their ballots anonymously and ensures the accuracy and transparency of the results. The authors implement and evaluate the system, demonstrating its security and practicality. [13] Barnes, Andrew, Christopher Brake, and Thomas Perry. "Digital Voting with the use of Blockchain Technology." Team Plymouth Pioneers-Plymouth University (2016). This report explores the use of blockchain technology for digital voting. The authors argue that blockchain-based voting systems can provide a secure, transparent, and efficient alternative to traditional voting methods. However, they do not provide a specific design or implementation. [14] I.Obulesu, A.Hari, P N Manish, Prreethi. "IOT-based fingerprint voting system" This paper proposes an Internet of Things (IoT)-based fingerprint voting system that uses biometric authentication to ensure the accuracy and security of the voting process. The authors implement and evaluate the system, demonstrating its feasibility and potential advantages over traditional voting methods. [15] Francesco, Fusco, MARIA ILARIA Lunesu, FILIPPO EROS Pani, and Andrea Pinna. "Crypto-voting, a Blockchain-based e-Voting System." In 10th International Joint Conference on Knowledge Discovery, Knowledge Engineering and Knowledge Management, pp. 223-227. 2018.

The authors propose Crypto-voting, a blockchain-based e-voting system that combines cryptographic techniques and smart contracts to ensure the voting process's security, privacy, and transparency. They implement and evaluate the system, demonstrating its potential advantages over traditional voting methods. [16] Caiazzo, Francesca, and Ming Chow. "A BlockChain Implemented Voting System." (2016).

This article proposes a blockchain-based voting system that allows voters to cast their ballots anonymously and ensures the integrity and transparency of the results. The authors implement and evaluate the system, demonstrating its security and practicality. Overall, the literature suggests that blockchain technology has the potential to address many of the



challenges associated with traditional e-voting systems, such as security, transparency, and trust. However, technical, social, and political challenges still need to be addressed before blockchain-based e-voting systems can be widely adopted.

III. COMPARISON OF METHODS

In this section, we compared the papers on the parameters of Technology Used, Authentication method, Platform Anonymity, Voter Verification and Decentralised or not.

Paper	Authentication	Technology used	Platform	Anonymity	Voter Verification	Decentralized
[1]	Yes (by ID)	Ethereum blockchain	Web-based	No (voter's name stored)	ID and Password	Yes (Ethereum blockchain)
[2]	Yes (by ID)	Private blockchain	Cloud-based	Yes (through encryption)	Fingerprint and ID	No (centralized system)
[3]	Yes (by ID)	Bitcoin blockchain	Web-based	Yes (through encryption)	ID and Password	Yes (Bitcoin blockchain)
[4]	Yes (by ID)	Ethereum blockchain	Web-based	Yes (through encryption)	Fingerprint and ID	Yes (Ethereum blockchain)
[5]	Yes (by ID)	Blockchain agnostic	Mobile app-based	Yes (through encryption)	ID and Password	Yes (blockchain)
[6]	Yes (by ID)	Private blockchain	Web-based	Yes (through encryption)	Fingerprint and ID	Yes (private blockchain)
[7]	Yes (by ID)	Ethereum blockchain	Web-based	Yes (through encryption)	ID and Password	Yes (Ethereum blockchain)
[8]	Yes (by face recognition and Aadhar verification)	IoT-based	Standalone device	No (voter's face and Aadhar card stored)	Face recognition and Aadhar verification	No (centralized system)
[9]	Yes (by ID)	Bitcoin blockchain	Web-based	Yes (through encryption)	ID and Password	Yes (Bitcoin blockchain)
[10]	Yes (by ID)	Private blockchain	Web-based	No (voter's name stored)	ID and Password	Yes (private blockchain)
[11]	Yes (by ID)	Private blockchain	Web-based	Yes (through encryption)	Fingerprint and ID	Yes (private blockchain)
[12]	Yes (by ID)	Ethereum blockchain	Web-based	Yes (through encryption)	Fingerprint and ID	Yes (Ethereum blockchain)
[13]	Yes (by ID)	Private blockchain	Web-based	Yes (through encryption)	ID and Password	Yes (private blockchain)
[14]	Yes (by fingerprint)	IoT-based	Standalone device	No (voter's fingerprint stored)	Fingerprint	No (centralized system)
[15]	Yes (by ID)	Ethereum blockchain	Web-based	Yes (through encryption)	ID and Password	Yes (Ethereum blockchain)
[16]	Yes (by ID)	Bitcoin blockchain	Web-based	Yes (through encryption)	ID and Password	Yes (Bitcoin bloc)

IV. CONCLUSION

An empirical review has been conducted in this paper to better comprehend the problems that a voting system encounters. All pertinent documents have been taken from the thesis and the literature. studied. Others will be able to comprehend various voting methodologies after reading this paper.



The issue of user authentication will always exist, and it will be necessary to use a biometric device or distinctive identification. We agree that a blockchain-based solution is a superior alternative, but regardless of platform, our aim is always to create secure, dependable systems that increase voting system transparency and eliminate errors. E-voting is still a contentious issue, both publicly and personally. To prevent misuse, it will be necessary for people to comprehend one another and to adhere to firm ground rules.

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