Sakshi Kasar, 2026, 14:6
ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

International Journal of Science, Engineering and Technology
An Open Access Journal

# Online Voting System Using Blockchain

**Sakshi Kasar, Ajeenkya D.Y.Patil**
**Under the guidance of Dr. Pankaj Aagarkar**
D.Y.Patil School of Engineering Pune, India
sakshikasar08@gmail.com

**Abstract- Voting is crucial for any democratic state; however, traditional voting may face certain difficulties like vote manipulation, security problems, insufficient transparency, and delayed-counting. In order to solve the mentioned challenges, this project-introduces **BlockVote** – a decentralized, secure and transparent voting system, which uses-blockchain technology. BlockVote ensures tamper-resistance and offers a decentralized platform, where-each and every vote is recorded on a blockchain. Prior to voting, each participant should pass through an authenticating procedure. Having passed it, the voter picks up a candidate, and his/her vote is transformed into a transaction. The transaction becomes encrypted and added to the blockchain in form of a new block. Each subsequent block contains hash of the previous one, thus altering and deleting-any of them becomes impossible. The use of blockchain technology makes-BlockVote a decentralized platform, which means less dependence on a central authority and minimal possibilities of fraud and manipulation. In addition, each voter's identity remains confidential while voting records become easily verifiable and transparent. BlockVote-will enable secure storage of votes, fast counting, elimination of human errors and increase of trust in the whole election process. The described system may be used not only in government elections, but also in student elections, organizational votes and online polls.**

**Keywords- Blockchain Technology, E-Voting System, Voting-Security, Distributed-Voting, Voting-Safety, Transparency, Voter Verification, Data Integrity, Tamper-Proof-Voting, Digital Voting, Blockchain Voting.**

## I. INTRODUCTION

Voting forms an integral part of the democratic process, whereby individuals have a chance to participate in the decision-making processes, electing their representatives.

Some of the common methods of voting in many countries include the use of paper ballotsand Electronic Voting

Machines (EVMs). Nevertheless, these systems encounter-several difficulties, such as lack of transparency, vote manipulation, security concerns, slow vote tallying, and centralization. All these problems have the potential to undermine the electoral process.

However, with the development of digital technologies, there have been attempts at designing electronic voting systems, which can facilitate voting processes. Even though the advantages offered by such electronic voting systems include efficiency, they are likely to be vulnerable to several shortcomings, including security risks and lack of-transparency in the case when such systems are controlled by a-centralized authority.

Therefore, there is a need for developing a more advanced system.

With the advent of blockchain technology, there has been an opportunity to design a system that will be secure, efficient, and transparent.

Blockchain technology refers to the technology of the decentralized and distributed ledger.

Once data is recorded into a blockchain, it becomes immutable and secure.

BlockVote forms an example of a project based on the blockchain, which aims at developing a system for electronic voting.

© 2026 Sakshi Kasar. his is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly credited.

BlockVote seeks to create a blockchain-based electronic voting system. In this system, each vote is recorded as a transaction in the blockchain.

## II. LITERATURE REVIEW

Blockchain-Powered E-Voting: A Novel Approach to Secure Voter Authentication, Online Voting and Election

Automation:- This paper proposes a blockchain-based online voting system that ensures secure voter authentication and transparent election automation using distributed ledger technology. [1]

Blockchain for Electronic Voting System – Review and Open Research

Challenges:- The paper reviews different blockchain voting models and discusses challenges such as scalability, privacy, and security in blockchain-based evoting systems.[2]

Blockchain-Based EVoting Systems: A Technology Review :- This research reviews blockchain-based voting technologies and explains how blockchain improves transparency, integrity, and security in election systems. [3]

Blockchain-Based Electronic Voting Systems: A Systematic Literature Review :- This paper analyses many blockchain voting research works and highlights issues such as voter privacy, 8 scalability, and data integrity in digital voting platforms. [4]

Blockchain-Based Electronic Voting Systems: A Case Study :- The study proposes a blockchain e-voting framework where votes are recorded securely and transparently using a distributed ledger architecture. [5]

A Secure End-to-End Verifiable E-Voting System :- This paper introduces a cryptographic voting system with voter authentication and protection against ballot stuffing attacks. [6]

Blockchain for Securing Electronic Voting Systems: A Survey :- The paper explains how blockchain technology can improve security, transparency, and reliability in digital election systems. [7]

SHARVOT: secret SHARe-based VOTing on the blockchain – Bartolucci, S., Bernat, P., Joseph, D. (2018). arXiv preprint. [8]

Anonymous voting scheme using quantum assisted blockchain – Mishra, S., Thapliyal, K., Rewanth, S. K., Parakh, A., & Pathak, A. (2022). arXiv preprint. [9]

ElectAnon: A Blockchain-Based, Anonymous, Robust and Scalable Ranked-Choice Voting Protocol – Onur, C., & Yurdakul, A. (2022). arXiv preprint. [10]

A New Era of Elections: Leveraging Blockchain for Fair and Transparent Voting – Chouhan, S., & Sharma, G. (2025). arXiv preprint. [11]

Aslam, A., Postolache, O., Oliveira, S., & Pereira, J. D. (2025).

A Systematic Literature Review and Meta-Analysis on Scalable Blockchain-Based Electronic Voting Systems. PubMed. [12]

Nakamoto, S. (2008). Bitcoin: A Peer-to-Peer Electronic Cash System.

Available at: https://bitcoin.org/bitcoin.pdf A. K. Kusi, (2022). Blockchain-Based Electronic Voting Systems: A Systematic Literature Review. SSRN Electronic Journal. [13]

U. Jafar and M. J. Ab Aziz, (2021). Blockchain for Electronic Voting System – Review and Open Research Challenges. IEEE Access.[14]

M. Hajian Berenjestanaki et al., (2023). Blockchain-Based E-Voting Systems: A Technology Review. Electronics Journal, MDPI. [15]

T. Chafiq, (2024). Blockchain-Based Electronic Voting Systems: A Case Study. ScienceDirect. [16]

| Sr. No. | Paper Title | Tool / Technology Used | Advantages | Disadvantages |
|---|---|---|---|---|
| 1 | **Blockchain-Powered E-Voting: A Novel Approach to Secure Voter Authentication, Online Voting and Election Automation** | Blockchain, Distributed Ledger, Voter Authentication | Provides secure voter verification, transparent voting, and automated election management. | The system may face scalability and implementation challenges when used for large elections. |
| 2 | **Blockchain for Electronic Voting System – Review and Open Research Challenges** | Blockchain, Cryptography, Distributed Ledger | Improves transparency and reduces the possibility of vote manipulation through decentralization. | Privacy, scalability, and security issues still need further attention. |
| 3 | **Blockchain-Based E-Voting Systems: A Technology Review** | Blockchain, Cryptography, Smart Contracts | Improves vote security, data integrity, transparency, and trust in the election process. | Implementation can be technically complex and may require significant computing resources. |
| 4 | **Blockchain-Based Electronic Voting Systems: A Systematic Literature Review** | Blockchain, Distributed Ledger, Cryptography | Reviews existing approaches and highlights the benefits of blockchain for secure voting. | Voter privacy, scalability, and usability remain important concerns. |
| 5 | **Blockchain-Based Electronic Voting Systems: A Case Study** | Blockchain, Distributed Ledger | Provides secure and transparent storage of votes and reduces dependence on a central authority. | Requires suitable blockchain infrastructure and may face scalability issues. |
| 6 | **A Secure End-to-End Verifiable E-Voting System** | Cryptography, Voter Authentication, End-to-End Verification | Allows votes to be verified and helps protect the system from ballot stuffing and unauthori | Cryptographic operations can make the system more complex for practical users. |

| | | | | |
|---|---|---|---|---|
| | | | zed voting. | |
| 7 | **Blockchain for Securing Electronic Voting Systems: A Survey** | Blockchain, Cryptography, Distributed Ledger | Shows how blockchain can improve the security, transparency, and reliability of electronic voting. | Privacy, scalability, and practical deployment remain challenging. |
| 8 | **SHARVOT: Secret SHARe-Based VOTing on the Blockchain** | Blockchain, Secret Sharing, SHA, Cryptography | Provides better voter privacy and securely manages voting information. | The use of cryptographic techniques increases system complexity. |
| 9 | **Anonymous Voting Scheme Using Quantum Assisted Blockchain** | Quantum Cryptography, Blockchain | Provides strong voter anonymity and improves the security of voting transactions. | Quantum-based technology is difficult and expensive to implement in real-world systems. |
| 10 | **ElectAnon: A Blockchain-Based, Anonymous, Robust and Scalable Ranked-Choice Voting Protocol** | Blockchain, Cryptography, Ranked-Choice Voting | Supports anonymous voting and ranked-choice voting while focusing on scalability and security. | The protocol is relatively complex and may be difficult to implement on a large scale. |
| 11 | **A New Era of Elections: Leveraging Blockchain for Fair and Transparent Voting** | Blockchain, Smart Contracts | Helps improve fairness, transparency, and trust in digital elections. | Privacy, scalability, and legal or regulatory issues may affect practical implementation. |
| 12 | **A Systematic Literature Review and Meta-Analysis on Scalable Blockchain-Based Electronic Voting Systems** | Blockchain, Electronic Voting, Scalability Analysis | Identifies existing solutions and research trends for improving blockchain voting systems. | Scalability and interoperability are still open research challenges. |
| 13 | **Bitcoin: A Peer-to-Peer Electronic Cash System** | Blockchain, Proof-of-Work, Cryptographic Hashing, P2P Network | Introduced the basic blockchain concept of a decentralized and tamper-resistant ledger. | High computational requirements and energy consumption make it unsuitable for direct use in voting. |

## III. METHODOLOGY

The proposed algorithm describes the step-by-step process used in the BlockVote blockchain-based voting system to securely register voters, authenticate them, record votes, and store them on the blockchain.

**Step 1:** Start the system.
**Step 2:** Register the voter by collecting required details such as voter ID, name, and credentials.
**Step 3:** Store the voter information securely in the voter database.
**Step 4:** When the voter logs in, verify the voter credentials for authentication.
**Step 5:** Check whether the voter is eligible and confirm that the voter has not already voted.
**Step 6:** If the voter is verified, display the list of candidates to the voter.
**Step 7:** The voter selects a candidate and submits the vote.
**Step 8:** Convert the vote into a digital transaction.
**Step 9:** Encrypt the vote using cryptographic techniques to ensure security and privacy.
**Step 10:** Generate a new block containing the encrypted vote, timestamp, and hash value.
**Step 11:** Update the voting record to mark that the voter has already voted.
**Step 12:** Repeat the process for all voters.
**Step 13:** After voting ends, count the votes automatically from the blockchain.

**Step 14:** Display the final election results. Step 15: End the system.

## IV. TOOLS & TECHNIQUES

**1. User Module**

This module is responsible for managing the voter activities within the BlockVote system. It allows users to register, authenticate, and participate in the voting process securely. Users register in the system using their voter ID, name, and login credentials. Registered users can log in to the system using their username and password. After successful authentication, voters can view the list of candidates available in the election. Users can cast their vote securely through the voting interface. The system ensures that each user can vote only once during the election process. After voting, the vote is encrypted and stored securely on the blockchain.

**2. Admn Module**

The admin module is responsible for managing and monitoring the overall functioning of the BlockVote system. Admin manages voter registration and verifies voter information. Admin adds, updates, or removes candidates participating in the election. Admin controls the election process such as starting and ending the voting session. Admin monitors the blockchain records of votes for transparency and verification.

**3. Sign in Module**

This module allows users to securely create accounts and access the BlockVote system. Users enter required details such as name, voter ID, email ID, and password. The system verifies user credentials during the login process. Only authenticated users are allowed to access the voting platform. The module ensures secure login using authentication mechanisms. Once verified, users can proceed to cast their vote in the election.

**4. LogIn Module**

This module is responsible for user authentication and access control in the BlockVote system. Users enter their registered email ID or voter ID and password to log in to the system. Supports forgot password and password reset options for secure account recovery. Maintains session security and prevents unauthorized access to the voting platform. Only authenticated voters are allowed to access the voting interface and cast their vote.

**8. Voting Module**

This is the core module of the BlockVote system, responsible for managing the voting process. Displays the list of candidates participating in the election. Allows authenticated voters to select their preferred candidate. Converts the vote into a secure digital transaction. Ensures that each voter can cast only one vote. Stores the vote securely in the blockchain network.

**9. Blockchain Storage Module**

This module is responsible for securely storing votes in the blockchain ledger. Converts the vote into a blockchain transaction. Uses cryptographic hashing (SHA-256) to secure the voting data. Links each block with the previous block to form a secure chain. Ensures that once a vote is stored, it cannot be modified or deleted.

**10. Result Management Module**

This module manages the calculation and display of election results. Collects vote data stored in the blockchain network. Automatically counts votes without manual intervention. Displays the total votes received by each candidate. Generates transparent and accurate election results.

**11. Admin Dashboard Module**

This module is accessible only to administrators and provides control over the election system.

- Admin can add, update, or remove candidates.
- Admin manages voter registration and verification.
- Admin starts or ends the voting session.
- Admin monitors blockchain voting records for transparency.
- Admin can view final election results and generate reports.

**12. Profile Management Module**

Each voter has a personal profile within the system.

- Allows users to view and update personal details.

- Enables users to change login credentials or password.
- Stores voter information securely in the database.
- Maintains the voting status to prevent duplicate voting.

## V. RESULT

Code and Output section discusses the programming process and the way the BlockVote system outputs results after execution of the code. The BlockVote system uses programming to facilitate voter registration, authentication, casting of votes, storage of blocks in the blockchain and output of results. This section aims at demonstrating how the whole system operates from the inside and the contribution made by different modules in the functioning of the system. The implementation has used Python programming language, HTML/CSS/JavaScript interface and SQLite/MySQL database.

**Voter Registration Code**

The voter registration section provides a way for new users to register into the BlockVote program. At this point, the voter inputs their personal information such as name, voter ID, and password. Such information is then stored in the system database. The Python program uses the SQLite library to connect to the database and add the voter information in the voter table. It means that every voter is registered uniquely into the system. When the code works as expected, the system shows that the voter is now registered.

**Description of the Process**

- The system connects to the database initially.
- It takes input data such as name of the voter, voter ID number, and password.
- The system writes data to the database table.
- The database stores voter information.
- The system gives a confirmation message showing registration success.

**Output**

The output of this code will be a message like "Voter Registered Successfully." This means the voter account has been registered, and the user can log into the system.

**Voter Login Code**

The login function helps authenticate voters before they are allowed to use the voting system. This function determines whether the voter ID and password entered by the user correspond to the credentials stored in the database. This Python code extracts voter details from the database and validates the provided credentials. If the provided credentials are right, the system permits the voter to log in. If the provided credentials are wrong, an error message is displayed.

**Description of the Process**

- The user provides his/her voter ID and password.
- The system connects to the database.
- The system looks for a corresponding credential in the voter table.
- Login is successful if the provided credentials match.
- If not, then access is denied.

**Output**

If the login credentials are valid, then the system outputs "Login Successful". Otherwise,"Invalid Credentials" is outputted.

**Code for Casting Vote**

The code for vote casting helps the registered voters in choosing the candidate of their choice and casting their vote. After casting the vote, it gets stored in the voting database as well as in the blockchain database.

The above code is used for inserting the data regarding the votes in the vote table, including the voter ID and the chosen candidate. However, the system makes sure that every voter casts his/her vote only once.

**Description of the Process**

- Voter logs into the system.
- Candidates' list gets displayed on the screen.
- Voter chooses a candidate.
- System stores the vote in the database.

- Vote gets marked as done to avoid double-voting.

**Output**
Upon casting the vote, the system shows the message "Vote Cast Successfully."

**Code to Count Votes**
The code to count votes determines the total number of votes that have been won by each candidate. This piece of code fetches the vote information from the database and counts the votes through database queries. The software automatically counts the votes and produces the election result.

**Description of the Process**
- Fetch vote information from the vote table.
- Group the votes by candidate names.
- Count the number of votes for each candidate.
- Display the total number of votes as the election result.

**Output**
The output provides the total number of votes that have been obtained by each candidate, for instance, Candidate A: 45 votes

**Candidate B: 38 votes and so on.**
**Blockchain Block Creation Algorithm**
One of the critical modules of the BlockVote project is the blockchain implementation. In this module, votes are transformed into transactions, which are then saved into blocks. Each block holds voting information, timestamp and hash value. Hash value is generated using SHA-256 cryptographic hash function to ensure that the data within the block cannot be modified. Additionally, each block also holds the hash of the previous block, creating a chain of blocks known as the blockchain.

**Description of the Process**
- The voting data is retrieved from the voting module.
- The system combines voting data, timestamp, and previous block hash.
- The SHA-256 hash is created for the block.
- The new block is added to the blockchain network.
- The blockchain now holds the vote information.

**Output**
The system produces block hash as follows: Block Created Successfully Block Hash: 0009f1a23bcf4d6e9c1f23abf98e… This hash makes sure that the vote information cannot be modified.

## VI. CONCLUSION

To conclude, the BlockVote system shows how blockchain technology could make the traditional voting system turn into a more advanced and secure one. First of all, traditional methods of voting face several difficulties that could cause distrust in the election process and the results of elections. They include vote manipulation, transparency issues, manual mistakes, and lengthy vote counting procedure. These problems could be solved thanks to blockchain technology used in the BlockVote system that stores all votes in a secure and immutable distributed ledger. The voting results are saved as blocks linked to each other using the technique of cryptographic hashing. Moreover, there are some mechanisms in this system for the secure authentication of voters, which allows only those who have the right to take part in elections. At the same time, the automation of vote counting process helps in achieving faster and more precise election result generation. Thanks to the use of modern technologies such as blockchain, cryptography, and web development, the BlockVote system can help to improve election transparency and security.

## REFERENCES

1. SHARVOT: secret SHARe-based VOTing on the blockchain – Bartolucci, S., Bernat, P., Joseph, D. (2018). arXiv preprint.
2. Anonymous voting scheme using quantum assisted blockchain – Mishra, S., Thapliyal, K., Rewanth, S. K., Parakh, A., & Pathak, A. (2022). arXiv preprint.
3. ElectAnon: A Blockchain-Based, Anonymous, Robust and Scalable Ranked-Choice Voting

Protocol – Onur, C., & Yurdakul, A. (2022). arXiv preprint.
4. A New Era of Elections: Leveraging Blockchain for Fair and Transparent Voting – Chouhan, S., & Sharma, G. (2025). arXiv preprint.
5. Aslam, A., Postolache, O., Oliveira, S., & Pereira, J. D. (2025). A Systematic Literature Review and
6. Meta-Analysis on Scalable Blockchain-Based Electronic Voting Systems. PubMed.
7. Nakamoto, S. (2008). Bitcoin: A Peer-to-Peer Electronic Cash System. Available at: https://bitcoin.org/bitcoin.pdf
8. A. K. Kusi, (2022). Blockchain-Based Electronic Voting Systems: A Systematic Literature Review. SSRN Electronic Journal.
9. U. Jafar and M. J. Ab Aziz, (2021). Blockchain for Electronic Voting System – Review and Open Research Challenges. IEEE Access.
10. M. Hajian Berenjestanaki et al., (2023). Blockchain-Based E-Voting Systems: A Technology Review. Electronics Journal, MDPI.
11. T. Chafiq, (2024). Blockchain-Based Electronic Voting Systems: A Case Study. ScienceDirect.
12. https://bitcoin.org/bitcoin.pdf
13. https://pmc.ncbi.nlm.nih.gov/articles/PMC8434 61 4/
14. https://indjst.org/articles/blockchain-powered-e-vo ting-a-novel-approach-to-securevoter-authenticati on-online-voting-and-election-automation
15. https://www.mdpi.com/2079-9292/13/1/17
16. https://www.sciencedirect.com/science/article/p ii/ S2666603024000046
17. https://www.researchgate.net/publication/3908 331 95_Secure_voting_system_using_blo ckchain_technology
18. https://www.researchgate.net/publication/3745 053 81_Decentralized_and_Automated_ Online_Voting_System_using_Blockchain_Techn ology
19. https://www.sciencedirect.com/science/article/p ii/ S2665917422002549
20. https://scholarworks.boisestate.edu/cs_facpubs/ 17 0/
21. https://ethereum.org https://www.python.org
22. https://www.w3schools.com
23. https://www.geeksforgeeks.org/blockchain-technol ogy-introduction/