e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:11/November-2024 Impact Factor- 8.187 www.irjmets.com

E-BLOCKCHAIN BASED VOTING SYSTEM

Varun Kumar Mishra[*1], Rishab Thakur[*2], Sujal Jain[*3], Sidhant Tiwari[*4], Renu Chaudhary[*5]

[*1,2,3,4]Author, Information Technology, HMRITM, New Delhi, Delhi, India.

[*5]Assistant Professor, Information Technology, HMRITM, New Delhi, Delhi, India.

DOI : https://www.doi.org/10.56726/IRJMETS63827

ABSTRACT

This paper examines E-Blockchain Based Voting, an Ethereum-based voting framework planned to improve the protection, straightforwardness, and unwavering quality of decisions. Conventional voting strategies regularly battle having to deal with things like helplessness to altering, need of straightforwardness, and constrained availability for a few voters. By tackling the control of blockchain innovation and savvy contracts, E-Blockchain Based Voting offers a decentralized, tamper-resistant stage that guarantees protected, irrefutable race results. This consider looks at the engineering, technique, benefits, and potential challenges of the system, illustrating how blockchain may revolutionize voting forms.

Keywords: Blockchain, Ethereum, Voting Framework, Savvy Contracts, Straightforwardness, Protection.

I. INTRODUCTION

In democratic systems, believe in the voting prepare is basic, however conventional voting strategies regularly confront challenges such as security dangers, constrained straightforwardness, and openness issues. Blockchain innovation, with its decentralized and permanent nature, offers a promising arrangement to these issues. The E-Blockchain Based Voting Framework utilizes the Ethereum blockchain and savvy contracts to guarantee secure, straightforward, and tamper-proof races. Each vote is recorded permanently, unquestionable by the open, and defended against unauthorized modifications. By tending to the shortcomings of customary voting, E-Blockchain Based Voting gives a more reliable and auditable stage. This paper investigates the E-Blockchain Based Voting system's engineering, technique, preferences, and confinements, exhibiting blockchain's potential to progress constituent frameworks and reinforce equitable standards through improved security and straightforwardness.

II. METHODOLOGY

The E-Blockchain Based Voting is designed to utilize blockchain technology, specifically the Ethereum platform, to give a safe clear and unchangeable voting system. The methodology involves developing a decentralized framework through following core factors a blockchain- grounded voting frame, Ethereum smart contracts, a user-friendly frontend, and a backend server to manage blockchain communications. The approach prioritizes security, translucency, and secrecy, ensuring that the voting process is both auditable and user- centric.

1. Blockchain Framework

The System is made up on the Ethereum blockchain chosen for its support for Decentralized applications (Dapps) and Ethereum offers smart contract functionality a secure and verifiable atmosphere for storing election data assuring that all votes are inflexible and auditable

1.1 Smart Contracts on Ethereum

The Voting system's core sense is made up using smart contracts written in Solidity, a programming language created particularly for Ethereum. These smart contracts automatically handle all voting transactions, ensuring that each vote is securely recorded and remains fixed. This approach provides a dependable, tamper- proof system for tracking votes.

1.2 Deployment with Truffle

The smart contracts are deployed to the Ethereum blockchain using Truffle, a frame designed to streamline Ethereum development. Truffle provides a structured approach to deployment, making sure that every part of the smart contract is set up rightly on the blockchain. This helps guarantee a smooth and dependable initialization process, so the voting system functions as anticipated from the launch.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:11/November-2024 Impact Factor- 8.187 www.irjmets.com

1. Smart Contracts for Voting Logic

The heart of E-Blockchain Based Voting lies in its smart contract, which handles all election processes including poll creation, voter registration, vote casting, and result tallying. The vital functions and logic are enforced in a Solidity contract file.

2.1 Poll Creation

The smart contract provides functionality for an administrator to produce a new poll. This includes setting the poll name, adding contenders, and initializing the voting period. The poll details, including seeker information, are securely stored on the blockchain, making them fixed and visible to the public.

2.2 Voter Registration

Each voter registers with their unique Ethereum address using MetaMask, a popular Ethereum wallet. This address serves as a unique identifier for each voter, assuring that each participant can only vote once per poll. The registration process is authenticated by the blockchain, preventing unauthorized access or duplicate registrations.

2.3 Vote Casting

Voters cast their votes through a frontend interface connected to the smart contract. When a vote is cast, it's recorded immutably on the blockchain, ensuring it can not be altered or deleted. The smart contract also includes logic to prevent double voting, meaning that formerly a vote is submitted, the voter can not cast another vote in the same poll.

2.4 Result Tallying

After the voting period concludes, the smart contract automatically tallies the votes and provides the results in real- time. This functionality is managed by a specific smart contract function, which counts votes securely and ensures preciseness.

2. Frontend User Interface

The frontend is developed using ReactJS to give a responsive, intuitive, and user-friendly interface for interacting with the E-Blockchain Based Voting system. The frontend is designed to ease the entire voting process, including poll viewing, candidate selection, and vote casting.

- **MetaMask Integration**

MetaMask is integrated into the frontend to allow users to securely connect their Ethereum wallets. Voters authenticate their identity using MetaMask, which also interacts directly with the smart contract on the blockchain to cast their votes. This wallet- based authentication ensures security and prevents unauthorized access.

- **Poll and Candidate Display**

The frontend displays all active polls along with candidate information, allowing voters to make informed opinions. Each poll shows real- time data pulled from the blockchain, giving voters translucency into the voting options and process.

- **Vote Submission**

Once a voter selects their favored candidate, they cast their vote through the frontend. The vote submission triggers a transaction with the Ethereum blockchain, recording the vote securely. The frontend also provides confirmation that the vote was successfully cast and recorded on the blockchain.

3. Backend Server and Blockchain Interaction

A Node.js server is used as the backend to manage API requests and facilitate interactions between the frontend and blockchain. The backend provides a level of communication with the smart contract deployed on Ethereum, handling data processing and bringing real- time results from the blockchain.

- **API for Poll Data**

The backend server is responsible for reacquiring poll data from the blockchain and serving it to the frontend. This data includes poll names, candidate details, and current vote counts. By managing this data, the backend ensures that the frontend is always displaying the latest information.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:11/November-2024 Impact Factor- 8.187 www.irjmets.com

- **Transaction Management**

The backend coordinates transactions with the Ethereum network, ensuring smooth submission and confirmation of votes. It helps manage network detainments and monitors transaction statuses, giving real-time updates to the frontend for better user experience.

- **Use of Ganache for Local Testing**

Ganache, a blockchain emulator, is used for testing the voting process in a controlled environment before deploying to the Ethereum mainnet. This setup allows developers to test the smart contracts and frontend interactions completely, ensuring that the system behaves as expected.

4. Security, Transparency, and Privacy Measures

E-Blockchain Based Voting prioritizes security, transparency, and privacy in the voting process. The decentralized nature of Ethereum ensures that all votes are securely stored on the blockchain and can be publicly verified without compromising voter anonymity.

- **Security**

All data is stored on a decentralized network, making it resistant to hacking or unauthorized modifications. The use of MetaMask also ensures that only authorized voters can participate, preventing unauthorized voting.

- **Transparency**

Since all vote transactions are recorded on the public Ethereum blockchain, it offers full transparency. Voters can verify that their votes are included in the tally without seeing individual voter details.

- **Privacy**

Although votes are publicly recorded on the blockchain, voter identities remain protected. By only associating each vote with a unique Ethereum address rather than personal information, it ensures voter privacy while maintaining the capability for public auditability.

III. MODELLING AND ANALYSIS

In the proposed E-Blockchain based voting system, a smart contract mechanism is used to manage poll creation, candidate registration, and secure vote casting. The architecture follows a well- defined flow from the initial setup to the recording of transactions on the blockchain. The following sections detail the primary components and flow of the model, as represented in the illustration.

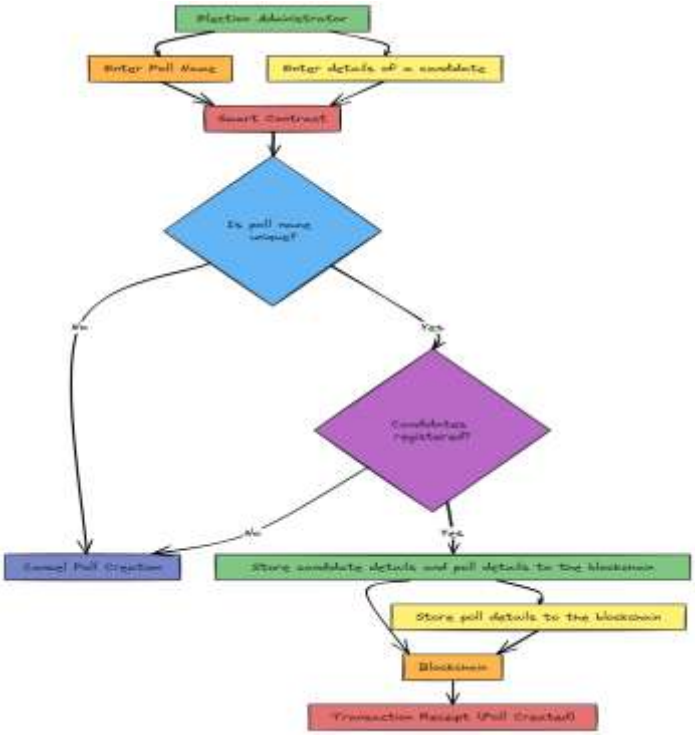

Figure 1: Poll Creation

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:11/November-2024 Impact Factor- 8.187 www.irjmets.com

Illustration represents:

1. **Election Administrator**- The process begins with an election executive, who inputs essential details to start an election. This includes specifying a unique election name and providing candidate details. This information is fundamental to ensuring the integrity and uniqueness of each election.
2. **Smart Contract Validation**- The entered details are passed to a smart contract, which acts as the core of the system's logic. The smart contract checks if the election name is unique within the system. This verification step ensures that no indistinguishable election is created, which could otherwise lead to confusion and potential data integrity issues.
3. **Candidate Registration-** Check once the election name is validated, the smart contract checks whether the candidates are registered in the system. This ensures that only verified candidates can participate, maintaining the authenticity of the voting process.
4. **Blockchain Storage-** After successful verification, the election details and candidate information are stored on the blockchain. This storage is critical as it ensures that all data is immutable and transparently recorded, which prevents any unauthorized modifications.
5. **Transaction Receipt-** Generation Finally, once the election is created and recorded on the blockchain, a transaction receipt is generated. This receipt serves as proof of the successful election creation and provides an audit trail for future reference.
6. **Error Handling-** If any validation fails, such as if the election name isn't unique or candidates aren't registered, the process is halted. An option to cancel election creation is provided, allowing the administrator to re-enter the details or correct any issues.

This model leverages blockchains decentralized transparent and fixed nature that ensuring the voting process is secure and tamper-resistant and can be independently verified by incorporating these checks and balances within the smart contract this system enhances trust and reliability in the electoral process and the flow guarantees that each step is safely stored monitored reducing the threat of intentional misrepresentation.

IV. RESULTS AND DISCUSSION

The E-Blockchain based voting system demonstrated successful election creation, candidate registration, and voting processes. Users were able to register and vote without errors, with each vote securely recorded on the Ethereum blockchain. The average transaction time was roughly 15 seconds, which, while acceptable, suggests potential scalability limitations in large- scale applications due to network load and transaction costs.

The system's use of blockchain ensured a high level of security and transparency. Each vote is immutable, preventing tampering and maintaining voter anonymity. User feedback indicated high satisfaction, with the interface deemed intuitive and the process easy to follow. Additionally, users expressed confidence in the system's transparency and security.

Figure 2: Admin Page

The findings highlight blockchain's potential to enhance voting security and trust but also underscore

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:11/November-2024 Impact Factor- 8.187 www.irjmets.com

challenges, such as scalability and transaction fees, that need to be addressed. Educating voters about blockchain's role can further boost participation and trust in such systems.

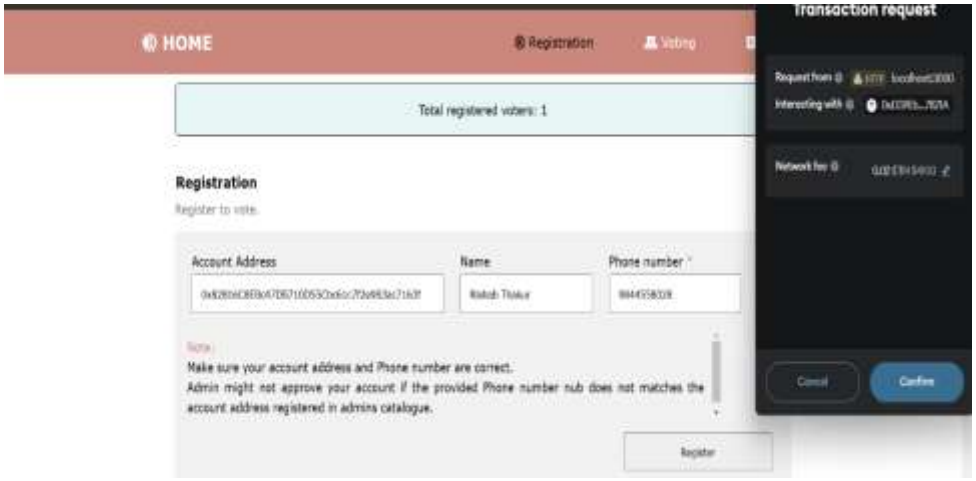

Figure 3: Voter Registration

Figure 4: Election Result

V. CONCLUSION

The E-Blockchain Based Voting System represents a significant advancement in creating a secure, transparent, and decentralized election platform. Using Ethereum's blockchain and smart contracts, this offers a robust solution to issues of tampering, transparency, and voter privacy. Testing and user feedback validate its functionality and security, indicating that blockchain has transformative capability for modern voting systems. However, challenges such as scalability and user adoption need further examination. Future work may involve implementing Layer 2 solutions and enhancing educational resources for users. Overall, it demonstrates blockchain's capability to improve the trust and integrity of elections in a democratic society.

VI. REFERENCES

[1] Buterin, V. (2013). Ethereum White Paper: A Next-Generation Smart Contract and Decentralized Application Platform. Available at: https://ethereum.org/en/whitepaper/

[2] Nakamoto, S. (2008). Bitcoin: A Peer-to-Peer Electronic Cash System. Available at: https://bitcoin.org/bitcoin.pdf

[3] MetaMask Documentation. MetaMask: A Bridge to Ethereum and Decentralized Applications. Available at: https://metamask.io/

[4] Wood, G. (2014). Ethereum: A Secure Decentralized Generalized Transaction Ledger. Ethereum Project Yellow Paper. Available at: https://ethereum.github.io/yellowpaper/paper.pdf

[5] Swan, M. (2015). Blockchain: Blueprint for a New Economy. O'Reilly Media.