

E-voting Using Blockchain Technology

Atharva Kedar, Paras Kamble, Roshan Kumar, Prathamesh Chavan

Department Of Information Technology,
D.Y.Patil College Of Engineering, Pune, India

Prof. Rutuja Tikait

Department Of Information Technology,
D.Y.Patil College Of Engineering, Pune, India

1) ABSTRACT:-

Democratic voting is a crucial and serious event in any country, the current voting scheme in any country is through ballot paper or by use of EVM. These processes have many drawbacks such as transparency, low voter turn-out, tampering of votes, distrust in the election body, forging of unique Id (voter id card), delay in giving out results and the most important is security issues. Security of digital voting is always the biggest concern when considering to implement a digital voting system. With such monumental decisions at stake, there can be no doubt about the system's ability to secure data and defend against potential attacks. One way the security issues can be potentially solved is through the use of blockchain technology.

Keywords—E-voting, Smart-contracts, Blockchain, Ethereum

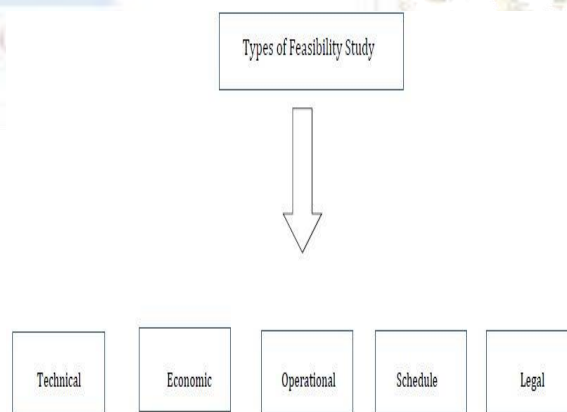
2) INTRODUCTION:-

The introduction of an e-Voting system utilizing blockchain technology revolutionizes the traditional voting process by harnessing the benefits of digitalization and decentralized ledgers. Blockchain, as a secure and transparent digital ledger, offers numerous advantages to enhance the integrity and efficiency of the e-Voting system. Firstly, the utilization of blockchain technology ensures a high level of security for the e-Voting system. By encrypting and distributing voting data across a network of computers, known as nodes, blockchain makes it extremely challenging for any malicious actor to tamper with or manipulate the voting records. Each vote is stored as a transaction block, linked to previous blocks, creating an immutable chain of information. Transparency and auditability are fundamental features provided by blockchain in the e-Voting system. Every voting transaction is recorded on the blockchain and is visible to all participants, ensuring an open and accountable voting process. This transparency reduces the risk of fraud or tampering, as any attempts to modify or falsify the records can be easily detected. Immutability is another critical aspect of blockchain technology in the e-Voting system.

Once a vote is recorded on the blockchain, it becomes nearly impossible to alter or delete without detection. The decentralized nature of the blockchain network, where multiple copies of the ledger are maintained across various nodes, prevents a single point of failure or vulnerability. This immutability adds an extra layer of trust and integrity to the e-Voting system. Anonymity and privacy are carefully addressed in the e-Voting system using blockchain. While the details of each vote are recorded on the blockchain, the identity of the voter remains anonymous. This protects the privacy of the voters and ensures that their choices cannot be linked to their personal information. Additionally, cryptographic techniques can be employed to verify the eligibility of voters without revealing their identities.

3) FEASIBILITY STUDY:-

A feasibility study is a high-level capsule version of the entire system analysis and design process. The study begins by classifying the problem definition. The purpose of feasibility study is not to solve the problem, but to determine whether the problem is worth solving. It is a preliminary study which is conducted before the real development of the project commences not keeping the factor of project's success. It creates a roadmap of what are the possible solutions if we choose a certain path. The feasibility study concentrates on the following areas:



3.1 Technical Feasibility

Evaluating the technical feasibility study is the trickiest part of a feasibility study. This is because, at this point in time, not too many detailed designs of the system, making it difficult to access issues like performance, costs on (on account of the kind of technology to be deployed) etc. A number of issues have to be considered while doing a technical analysis. Understand the different technologies involved in the proposed system before commencing the project we have to be very clear about what are the technologies that are to be required for the development of the new system. Overall, this study needs to demonstrate that the proposed system which is need to be developed is technically feasible.

This requires:

- An outline of the requirements,
- A possible system design,
- Possible choices of software to be used or developed,
- Estimates on number of users, data, etc.

3.2 Economic Feasibility

The economic feasibility study evaluates the cost of the software development against the ultimate income or benefits gets from the developed system. There must be scopes for profit after the successful Completion of the project. The life cycle of an engineering project or product contains of several stages, namely: (i) Planning and design; (ii) Development; (iii) Operation and maintenance. It should be performed to identify the financial risk associated with the project. Various techniques like net present value (NPV), payback period, return on investment (ROI) are employed. Techno-Economic Assessment (TEA) is a cost-benefit comparison using different methods. These assessments are used for tasks such as:

- Evaluate the economic feasibility of a project.
- Investigate cash flows over the lifetime of the project.
- Evaluate the likelihood of different technology scales and applications.
- Compare the economic quality of different technology application providing the same service.

3.3 Operational Feasibility

The operational feasibility study focuses on the degree to which the proposed development project fits in with the existing business environment and objectives with regard to development schedule, delivery date, corporate culture, and existing business processes. It is also the measure of how well the solution will work in the organization after it is deployed. As we are dealing with blockchain voting system, which indirectly targets the country's or state's election process protocol, so there will be a detailed comparison between these two to check which one dominates the other. It is also the measure how people will feel about the project as in will people be accustomed to use this in a proper way or it will be too complex to deal with. There are two aspects of operational feasibility to be considered:

- Is the problem worth solving?
- How do the end user (voters in this case) and management (Election Commission) feel in this case?

3.4 Schedule Feasibility

It means that the project can be implemented in an acceptable time frame. When assessing schedule feasibility, a systems analyst must consider the interaction between time and costs. For example, speeding up a project schedule might make a project feasible, but much more expensive.

Other issues that relate to schedule feasibility include the following:

- Can the company control the factors that affect schedule feasibility?
- Has management established a firm timetable for the project?
- What conditions must be satisfied during the development of the system?
- Will an accelerated schedule pose any risks? If so, are the risks acceptable?
- Will project management techniques be available to coordinate and control the project?
- Will a project manager be appointed?

It is also the likelihood that timeframes can be met and that this is adequate to meet organization's needs.

3.5 Legal Feasibility

It determines whether the proposed system conflicts with the legal requirements, in this case as we didn't try to execute anything on the public domain, hence this project is legal feasible. It is important that the project is following the requirements needed to start a project including certificates, copyrights, business insurance, tax number, health and safety measures and many more. There are some things to consider in legal feasibility study including ethical issues and some social issues. These issues are the privacy and accountability. In this project, everything is designed keeping in mind all the legal terms and no real-world data or privacy has been breached of any person of this country to use it as a sample voter to implement this

4) SOFTWARE REQUIREMENT SPECIFICATION: -

❖ Ganache:

It is a personal blockchain for rapid Ethereum and Corda distributed application development.

❖ Truffle:

A world-class development environment, testing framework, and asset pipeline for blockchains using the Ethereum Virtual Machine (EVM), aiming to make life as a developer easier.

❖ NodeJS:

It is a JavaScript runtime built on Chrome's V8 JavaScript engine

❖ The Remix Project:

is a rich toolset that can be used for the entire journey of contract development by users of any knowledge level, and as a learning lab for teaching and experimenting with Ethereum

The e-Voting system implementation requires the use of software tools such as Ganache (Ethereum Blockchain), Truffle (ETH development framework), Node (JavaScript

Runtime), Visual Studio Code (IDE), Remix (Solidity's IDE), and Windows 10 or above (Operating System).

5) IMPLIMENTATION:-



Fig: Home Page

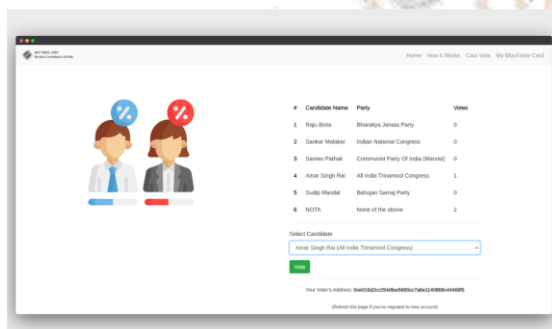


Fig: Casting the Vote

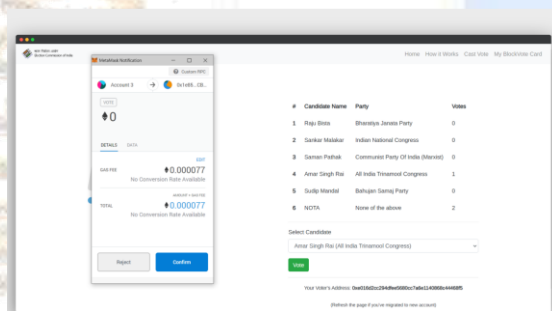


Fig: Confirming the transaction to cast vote

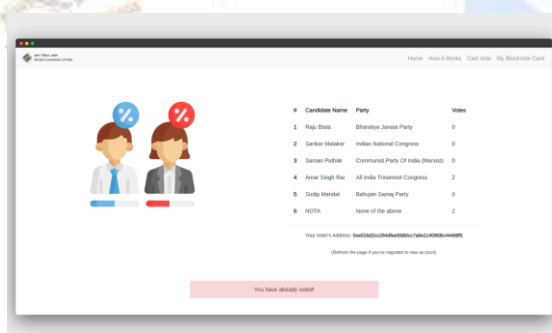


Fig: Already Voted Prompt

6) TESTING:-

This project uses Mocha as the testing framework to unit test and integration test all of our test cases for the application. Following strategies are used:

(i)Unit Testing:

This is the first and the most important level of testing. Its need begins from the moment a programmer develops a unit of code. Every unit is tested for various scenarios. Detecting and fixing

bugs during early stages of the Software Lifecycle helps reduce costly fixes later on. It is much more economical to find and eliminate the bugs during early stages of application building process. Hence, Unit Testing is the most important of all the testing levels. As the software project progresses ahead it becomes more and more costly to find and fix the bugs.

7) FUTURE SCOPE AND APPLICATIONS:-

The future scope of e-voting systems using blockchain technology is promising and holds systems. Here are some aspects of the future scope of e-voting using blockchain:

1.Enhanced security and transparency: Blockchain technology can provide a decentralized and immutable ledger that enhances the security and transparency of the voting process. Each vote can be securely recorded on the blockchain, making it tamper-proof and resistant to manipulation. The transparency of the blockchain also enables independent auditing and verification of the voting results.

2.Increased trust and voter confidence: The use of blockchain in e-voting can help build trust and confidence among voters by providing a verifiable and transparent system. Voters can independently verify their votes and ensure they are accurately recorded, reducing concerns about fraud or tampering.

Steps for Unit Testing are:-

Step 1: Creation of a Test Plan

Step 2: Creation of Test Cases and the Test Data

Step 3: Creation of scripts to run the test cases wherever applicable

Step 4: Execution of the test cases, once the code is ready

Step 5: Fixing of the bugs if present and re testing of the code

Step 6: Repetition of the test cycle until the Unit is free from all types of bugs.

(ii)Integration Testing:

Integration strategy stands for how individual modules will be combined during Integration testing. The individual modules can be combined in one go, or they can be joined one by one. A decision on how to put the pieces potential for addressing some of the key challenges associated with traditional electronic voting

8) CONCLUSION:-

In this project, we introduced a blockchain-based electronic voting system that utilizes smart contracts to enable secure and cost-efficient elections while guaranteeing voters' privacy. Blockchain technology offers a new possibility to overcome the limitations and adoption barriers of electronic voting systems which ensures election security and integrity and lays the ground for transparency. Using an Ethereum private blockchain, it is possible to send hundreds of

transactions per second onto the blockchain, utilizing every aspect of the smart contract to ease the load on the blockchain. the utilization of blockchain technology in e-voting systems offers significant advantages for the electoral process. E-voting using blockchain technology offers several key benefits for the voting process.

9) REFERENCES :-

- [1]EPRA International Journal of Research and Development (IJRD), Peer Reviewed Journal, 2021.
- [2]S. K. Shah, M. R. Islam, S. K. Das, and M. A. Islam, "Securing e-voting system using blockchain technology," 2020 4th International Conference on Computer Science, Engineering and Information Technology (CCSEIT), 2020.
- [3]S. Saini and A. Singh, "Blockchain-based secure e-voting system," 2021 International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC), 2021.
- [4]M. A. Adnan, S. Ahmed, and S. Naseem, "Blockchain-based e-voting system," 2018 International Conference on Computing, Mathematics and Engineering Technologies (iCoMET), 2018.

