Block Chain-Based Voting System

S.Dhivya[1], R.Gayathri[2]

[1] Associate Professor, Department of Computer Science &Engineering, Sri Shakthi Institute of Engineering &Technology, Coimbatore, Tamil Nadu, India, Email: dhivyasivanandan@gmail.com
[2] Student, Department of Computer Science &Engineering, Sri Shakthi Institute of Engineering &Technology, Coimbatore, Tamil Nadu, India, Email: gayathri12.ramesh@gmail.com

Received: 10.07.2024 Revised: 14.08.2024 Accepted: 26.09.2024

ABSTRACT
Governments frequently launch various projects, such as road construction or industrial development, targeting specific regions. During the implementation of these projects, there are always people who support or oppose the initiatives. In our project, we propose a secure and transparent framework for managing government schemes using blockchain technology. Blockchain offers a tamper-resistant and secure way to store government data, which is often vulnerable to manipulation. Our goal is to address these challenges by building a transparent and secure edge computing system for allocating government schemes. This eliminates the need for human supervision, simplifying the process for the government to track and update policies over time. To tackle this, we suggest employing blockchain to create a decentralized system that facilitates the execution of government schemes with enhanced transparency, auditability, security, and immutability. The proposed framework features a decentralized consortium architecture that combines the security and privacy benefits of a permission blockchain with the openness and transparency of a permissionless blockchain. The primary objective is to manage the government tender process efficiently and securely. The system is composed of three key entities: government officials, citizens, and the schemes themselves

Keywords: blockchain, immutability, auditability, security

1. INTRODUCTION

We are currently in an era driven by advanced technologies, with the fourth industrial revolution unfolding across various sectors, including government. Over the past few decades, numerous governments have begun adopting electronic voting systems for their elections. Estonia was the first country to implement a nationwide electronic voting system in the modern world, followed by Nigeria, where it was used to ensure an open and fair voting process. When comparing traditional voting systems to electronic ones, both share similarities in their overall functioning. However, electronic voting systems offer more reliable, secure, and transparent services than traditional ballot methods. Despite this, traditional electronic systems do not guarantee anonymity or data integrity, issues that blockchain-based e-voting systems can address. Rowena Cullen conducted a comparative analysis of democratic countries, highlighting that among 200 countries, 167 have varying levels of democracy. While blockchain may seem complex, its core principle is straightforward:Blockchain is a form of database. To grasp the concept of blockchain, it's essential to recognize that a database is an electronic system for storing information, typically organized in tables to facilitate easy searching and filtering. E-voting systems, like eVote, allow voters to securely and anonymously cast their ballots electronically. With a user-friendly interface, eVote enables voters to participate in elections in just a few simple steps. It guarantees voter authenticity, ensures the secrecy of cast votes, and promotes a smooth and accessible voting experience, ultimately leading to increased voter participation. What sets eVote apart from other systems is its focus on being auditable, easy to use, secure, and reliable.

2. LITERATURE REVIEW

2.1 Designing and Developing a Blockchain-Based E-Voting System for IoT-Driven Smart Cities

A smart city is an innovative environment established by utilizing existing resources and cutting-edge technologies in an integrated and intelligent manner. IoT devices, often referred to as smart sensors, along with 5G technology, are becoming more prevalent and are better addressing users' requirements.One prominent IoT application is e-voting, which takes technology development within smart cities to the next level. Traditionally, devices in such applications are assumed to be cooperative

and trustworthy. Furthermore, smart sensors and the latest technologies are becoming more widespread, providing more efficient and effective solutions to meet user demands. Since these devices are connected to the internet, they can be accessed and controlled anytime, from anywhere. The objective of smart cities is to optimize the use of public resources, improve services, and enhance the quality of life through advanced communication and information technologies. Additionally, for seamless data exchange between devices, powerful communication technologies like 5G and 6G are essential.

2.2 Trustworthy Electronic Voting Using Adjusted Blockchain Technology

Over time, online voting has emerged as an alternative to paper-based polling, reducing redundancies and enhancing consistency. However, a historical overview of the last two years reveals that vulnerabilities have been identified, particularly concerning security and privacy, making it less effective than anticipated. This paper proposes a framework utilizing dynamic obfuscation techniques to ensure data security. We present the concepts of block creation and block sealing, to enable the blockchain to be adaptable to different stages of the voting process. The partnership model involves code enforcement by a regulatory body (such as an electoral commission), ensuring that no unauthorized access or data breaches occur. The proposed approach in this paper focuses on the voting phase's performance, the efficiency of hashing algorithms, chain development and sealing, result aggregation, and the announcement of outcomes through a flexible blockchain protocol.

2.3 Secure Digital Voting System Based on Blockchain Technology

Electronic voting, or e-voting, has been utilized in various forms since the 1970s, offering key advantages over traditional paper-based methods, including enhanced efficiency and fewer errors. Despite these benefits, challenges remain in achieving widespread adoption, particularly regarding the need to improve system resilience against potential faults. Blockchain, a revolutionary technology of the modern era, holds the promise of enhancing the robustness of e-voting systems. This paper explores how blockchain's strengths, including its cryptographic security and transparency, can be harnessed to develop a more effective and reliable voting framework.

2.4 E-Voting System Using Blockchain

Democratic voting is a critical and significant event in any nation. Currently, most countries use either ballot papers or electronic voting machines (EVMs) for elections. However, these methods come with several issues, such as lack of transparency, low voter participation, vote tampering, mistrust in the electoral body, voter ID forgery, delays in result announcements, and, most importantly, security concerns. The security of digital voting systems is a primary challenge when considering their implementation. With major decisions at stake, it is essential to ensure the system's capability to safeguard data and protect against possible attacks. One potential solution to these security challenges is the adoption of blockchain technology, which offers numerous applications for enhancing the voting process.

2.5 Block Chain Technology Beyond Bitcoin

Blockchain technology extends beyond Bitcoin, functioning as a decentralized database or public ledger that logs all transactions or digital activities carried out and shared among involved parties. Each transaction is validated through a consensus reached by the majority of participants in the network, and once added to the ledger, the information is immutable and cannot be deleted. Blockchain provides a clear and verifiable record of every transaction ever made. Although Bitcoin, a peer-to-peer digital currency, is the most recognized use case of blockchain, the technology itself has operated reliably and is now utilized in a variety of applications across both financial and non-financial industries

3. Research Methodologies

3.1 Existing System

Earlier research focused on analyzing the existing voting system in India. Ensuring the integrity of the electoral process is essential for maintaining the foundation of democracyTherefore, the election system must be secure and resilient against various forms of fraudulent activities, while also being transparent and easy to understand so that both voters and candidates can trust the results. However, history provides examples of elections being tampered with to alter their outcomes. Whether the system is electronic or based on traditional paper ballots, it must meet certain key requirements: anonymity, resistance to tampering, and consideration of human factors.

3.2 Module Description

3.2.1 Candidate

In this module, the administrator is responsible for managing candidate profiles. Initially, the admin will gather the necessary information about the candidates and then proceed to register them by inputting their details. These details will be made available on the voter site, allowing voters to view the candidates' information and cast their votes accordingly.

3.2.2 User (Voter)

Users can access the website, and if they wish to register for voting, they navigate to the registration interface and complete the form to submit a request. This request is then sent to the admin for approval.The User has to wait forthe to verification be completed by the administrator. After Verification has been done, by the user interface voterslog in using their username and password and vote for a required candidate on a particular election Date.

3.2.3 Registration

The user should provide their Entire information such as Full name, surname, email ID, password, Branch, Class, Batch, Contact no, Date of Birth, Roll-no, and Gender. The user should give the student Roll no or unique ID at the time of registration. Admin will verify and maintain the above details in the database.

3.2.4 Signature Generation

In this module, a unique signature is created for each user, which serves as their access key to personal data. The ECC (Elliptic Curve Cryptography) algorithm is utilized to generate these signatures. A secret key (Sk) is produced through the ECC hashing algorithm. ECC is a form of public-key cryptography that relies on the algebraic properties of elliptic curves over finite fields. It is also employed in various integer factorization algorithms used in cryptographic applications, such as the Lenstra elliptic curve factorization method.

3.2.5 Voting

In this module, voters log in using their username and password. Once logged in, they can cast their vote for a candidate if an election is scheduled for that day. Each vote is treated as a transaction, and the ECDSA (Elliptic Curve Digital Signature Algorithm) is used to hash the details of these transactions. The blockchain acts as a digital ledger that records past transactions. Each transaction, which represents an exchange of information between entities, is broadcast to the network. Transactions are recorded in blocks arranged in a sequential manner, where each block includes the hash of the previous block, creating a linked chain. The first block in this sequence, called the genesis block, is distinct because it lacks a hash from a preceding block and is usually embedded directly into the software.

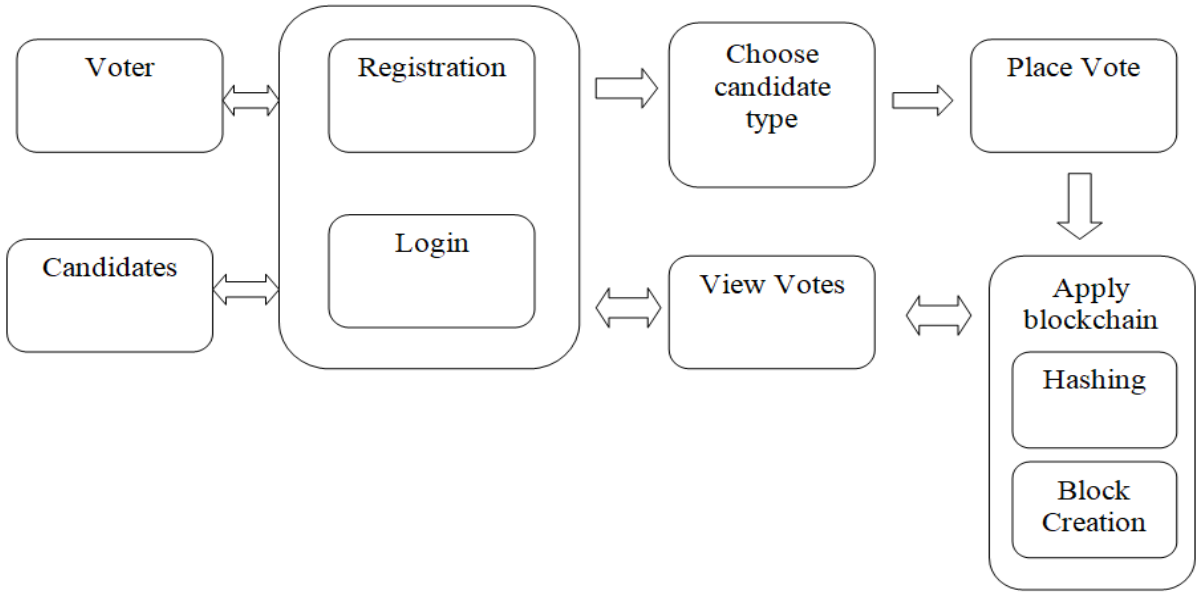


Fig 1.1: System Architecture

3.2.6 Results

The administrator has access to complete information regarding voters, various candidates, and the results declared by them. The computation of the election results is carried out automatically, and the candidate with the highest number of votes will be declared the winner.

4. System Analysis

4.1 About the Software

4.1.1 Java (programming language)

InJava programming, source code is first created in plain text files that have a .java extension. These source files are then compiled into .class files using the Javac compiler. Unlike .class files, which lack processor-specific code, they contain bytecodes — the machine language of the Java Virtual Machine (Java VM). The Java launcher tool then runs your application utilizing an instance of the Java Virtual Machine.

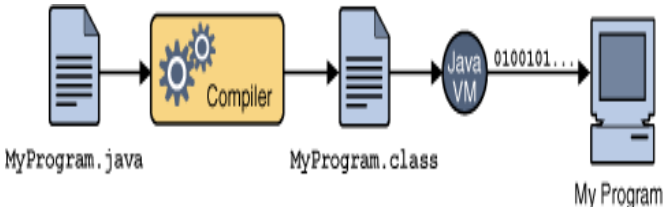


Fig 4.1: An overview of the software development process

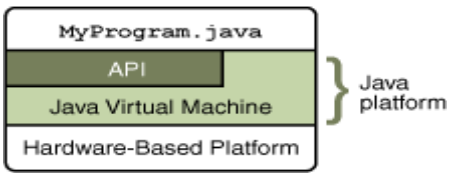
4.1.2 The Java Platform

A platform refers to the hardware or software environment where a program operates. Typically, platforms are a combination of the operating system and the underlying hardware. However, the Java platform is distinct because it is a software-only platform that operates on top of existing hardware-based platforms.

The Java platform has two components:

- The Java Virtual Machine: This forms the core of the Java platform and is designed to run on various hardware platforms.
- The Java Application Programming Interface(API): This is a vast collection of pre-built software components that offer a wide range of functionalities. The API is organized into libraries of related classes and interfaces, known as packages.

4.2 Screenshot



The API and Java Virtual Machine insulate the program from the underlying hardware.

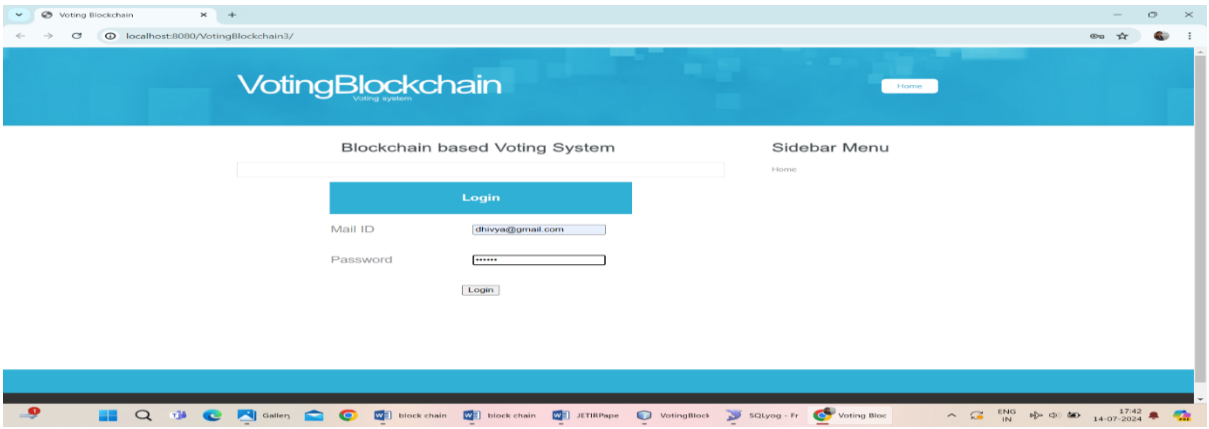


Fig 4.1: Login For Staff ID

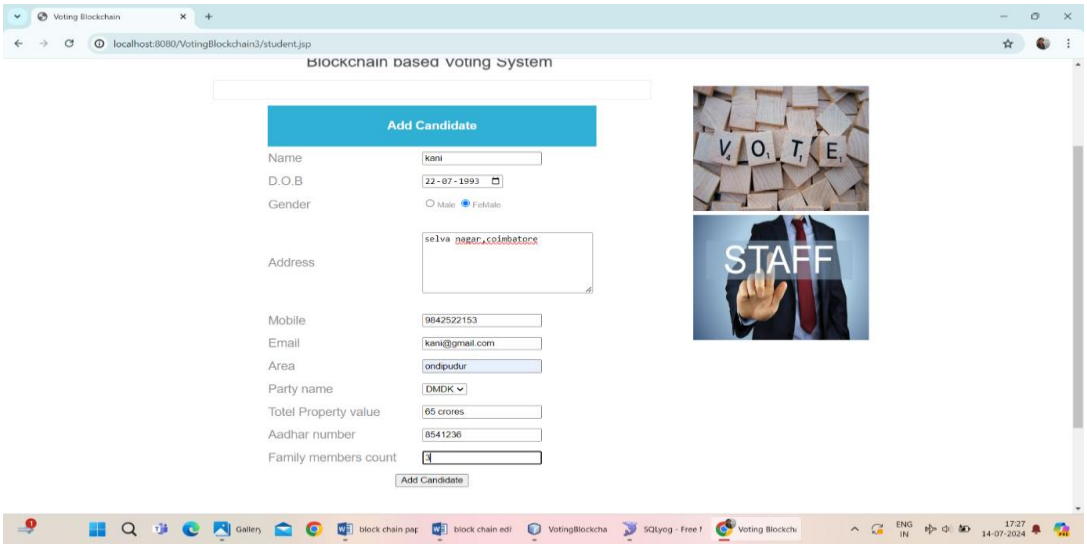


Fig 4.2: Add Candidate Form

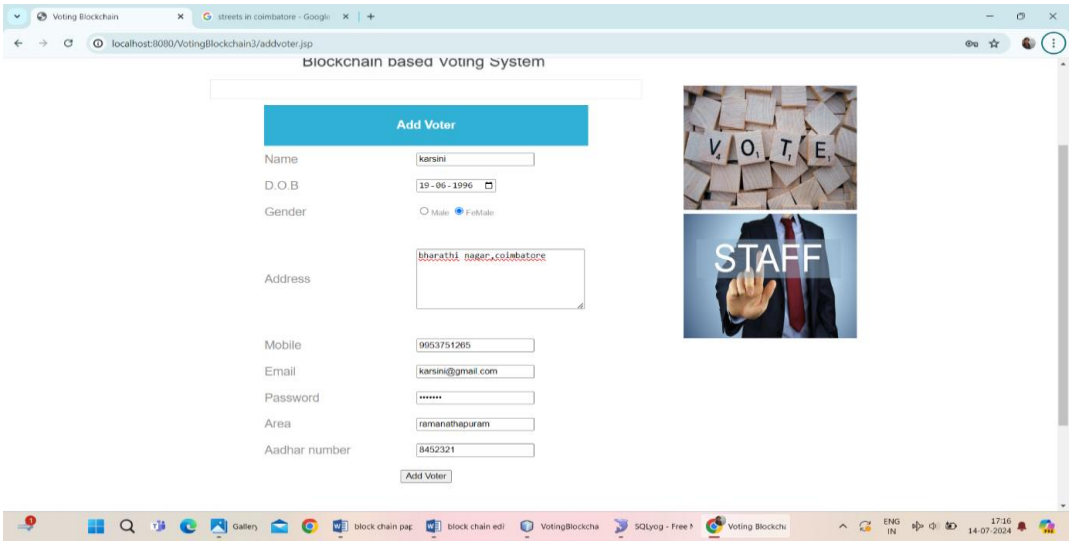


Fig 4.3: Add Voter Form

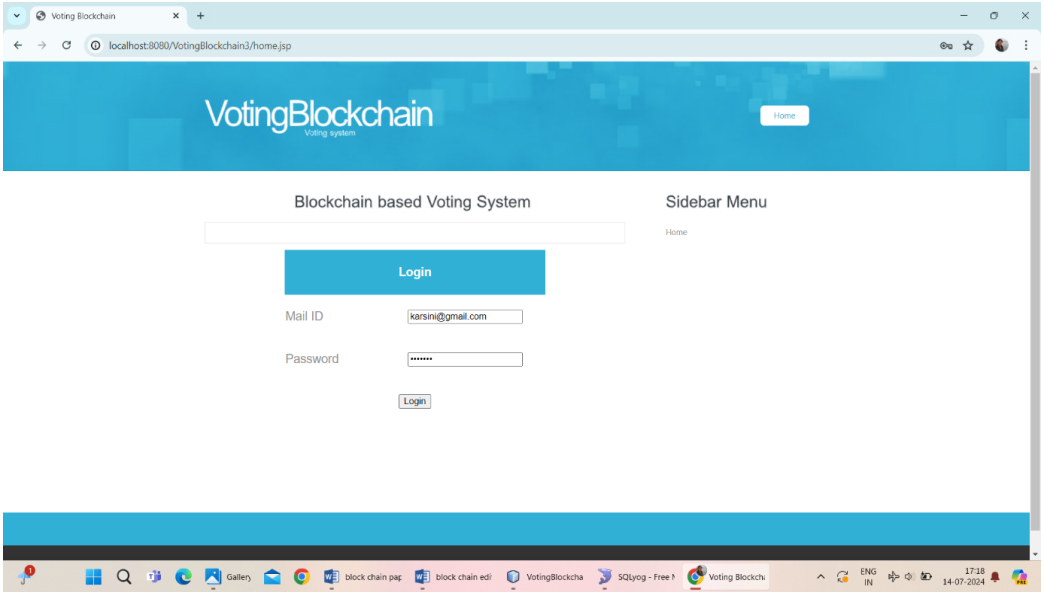


Fig 4.4: Login Voter ID

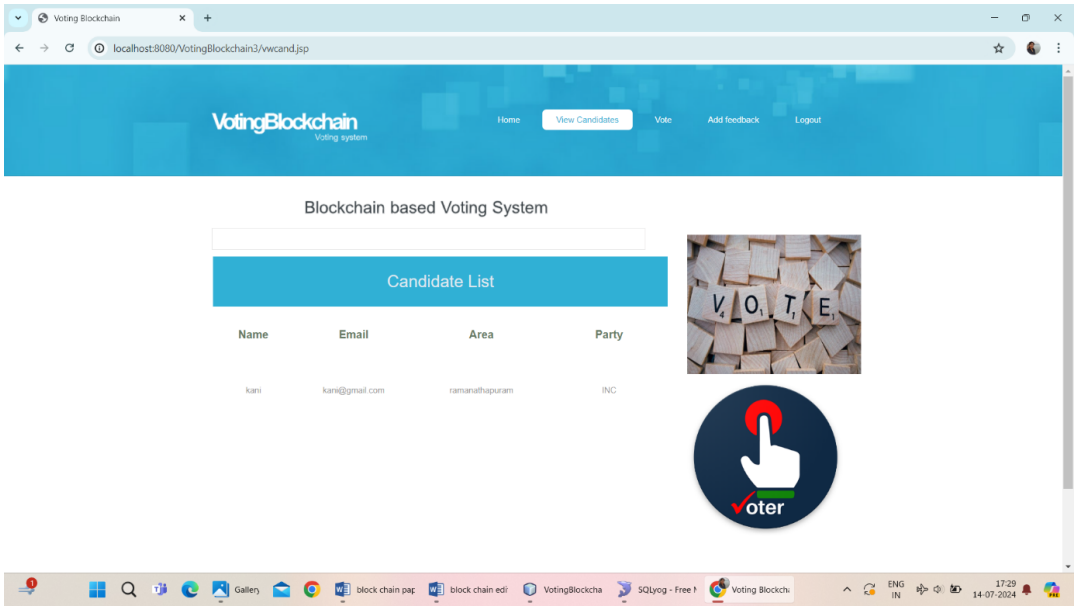


Fig 4.5: View Candidate List

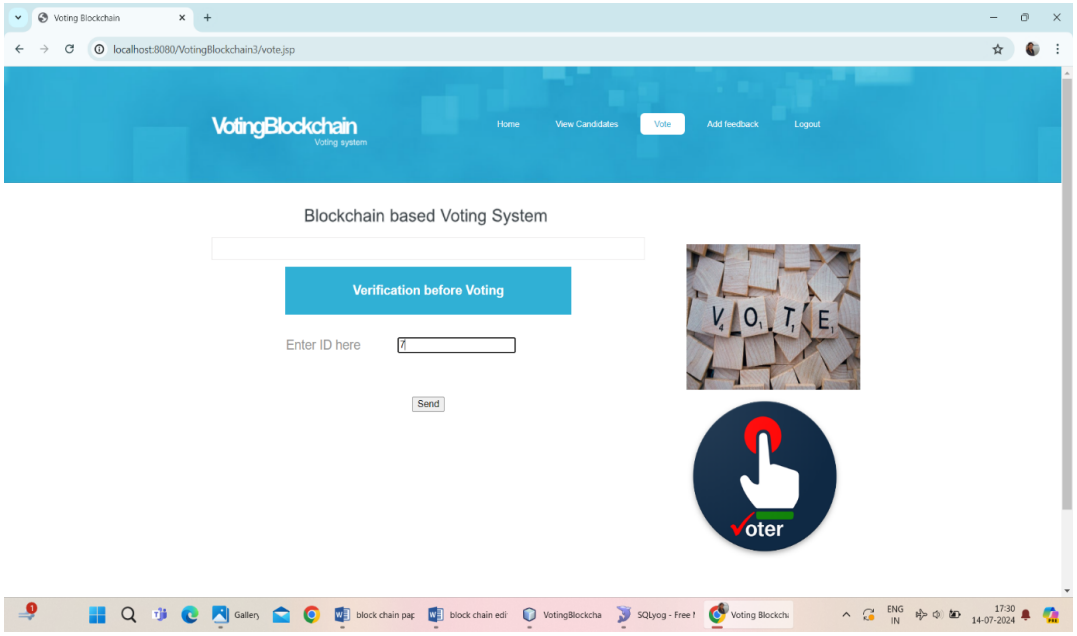


Fig 4.6: Verification Before Voting

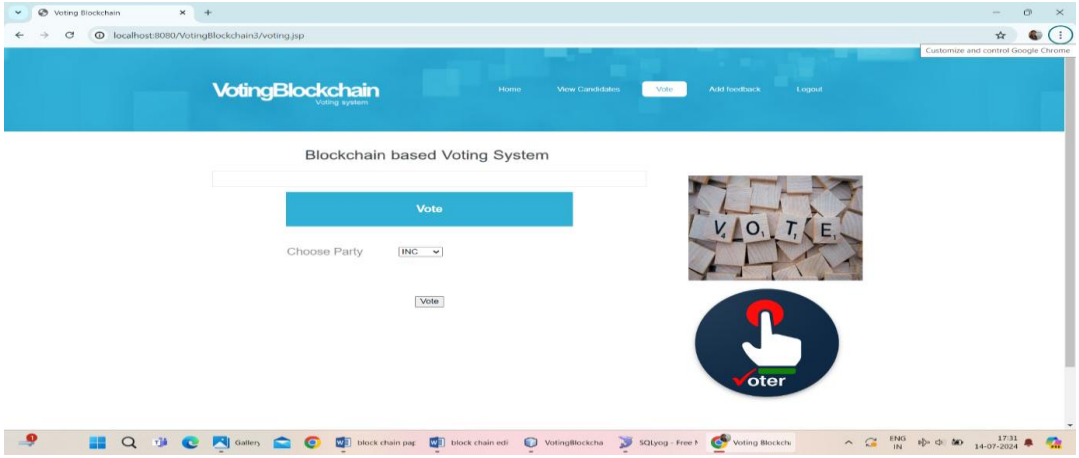


Fig 4.7: Choose Party For Voting

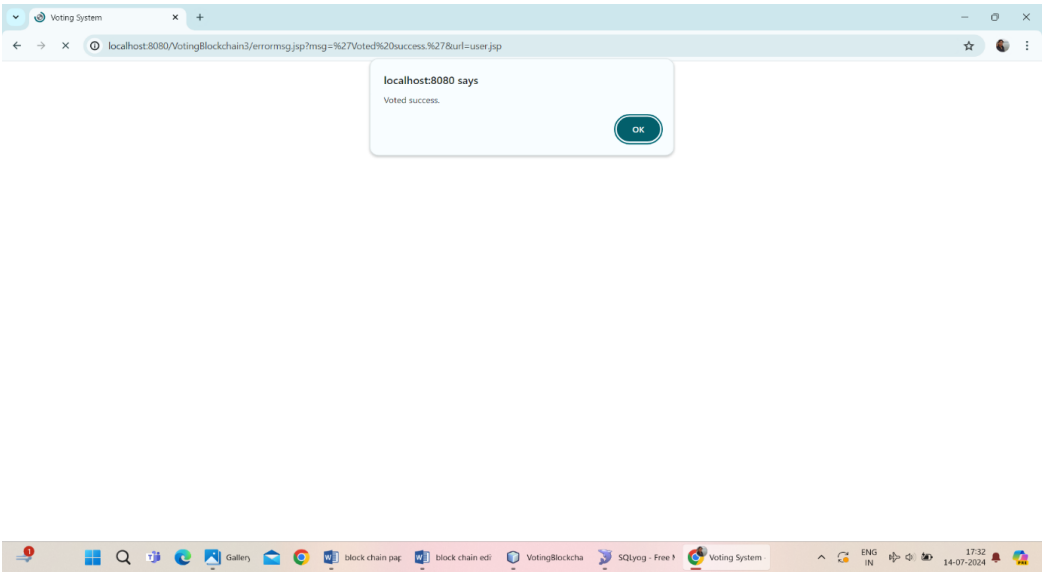


Fig 4.8: Voted Successfully

5. CONCLUSION

By implementing this project, we have launched a new national online e-voting system for our nation, incorporating technology and the Internetinto everyday life, we have been able to provide an advanced e-voting system for voters both domestically and abroad.

Top 4 Reasons to Transition to the Online E-Voting Platform:

1Economical and Efficient: The online system provides significant savings compared to traditional paper-based elections. It eliminates expenses related to creating, printing, and mailing paper ballots, as everything is managed electronically. Online voting reduces paper usage and minimizes the workload for both the organization and the voters.

2. Advanced Capabilities: The Online E-Voting Platform offers advanced features like digital ballots, checklists, automated vote counting, tabulation, and reporting. These functionalities areautomated, removing the need for in-house personnel to handle these tasks. Additionally, the system allows administrators to set rules for ballots, preventing invalid votes and eliminating the need for manual checks during counting.

5.2 Future Improvements

In the future, an SMS inquiry feature can be implemented, allowing users to receive result updates during the counting process. To obtain these SMS notifications, users must register their mobile numbers on the website

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