Blockchain-based Online Voting System for Ensuring Secure and Transparent Election

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Abstract:- The voting system is the medium of selecting the appropriate person for any type of election. In the traditional voting system, ballot paper was used to collect the vote from the voters. The voters have to go to the Centre to give their votes and many people are required to work as voting agents in the Centre to organize and manage the election. So, the traditional voting system required many types of costs to organize an election. Many other problems were raised in the traditional voting system like hijacking the voting machine, giving the vote of another person, manipulating voting data, etc. Many of these problems are solved by using EVM (Electronic Voting Machine). But the voters have to go to the voting center to provide their votes but the old-aged voters or the voters who are unable to walk are not able to provide their voted in this system. This problem can be solved by implementing a secure electronic or online based voting system. The Blockchain is a very popular technology now for storing data securely. The simple model of implementing a secure online based voting system by using blockchain technology has been shown in this paper which will be able to provide many facilities for all types of voters making the voting system more secure and faster.

Keywords:- *Blockchain, E-Voting, Online Voting, Secure Voting.*

I. INTRODUCTION

Blockchain technology has the potential to revolutionize online voting systems and ensure secure and transparent elections. Many countries, including Russia, Bangladesh, and China, are already utilizing blockchain technology for various purposes, such as handling land records and cyber threat mitigation systems [1]. In many underdeveloped countries, blockchain-based voting systems have the potential to bring transparency and accountability to the election process [2]. The absence of transparency and audibility is a major challenge in traditional voting systems, but blockchain-based voting systems can bring a solution to this problem. With a blockchain-based voting system, voters can find direct access to the system, and the mining process can ensure transparency and restrict any fraudulent activities during the election process [3][4]. Additionally, Smart contracts have revolutionized how services such as electronic voting systems operate and provide a more transparent and accountable service to the users [5]. Furthermore, blockchain-based cyber threat mitigation systems can be implemented in conjunction with online voting systems to maintain the authenticity of the system [6]. Therefore, implementing a blockchain-based online voting system can bring transparency and accountability to the election process.

II. E-VOTING SYSTEM

Electronic voting systems have become an increasingly popular alternative to traditional paper-based voting systems. The e-voting system aims to maintain the desirable characteristics of traditional elections while improving their security, usability, and cost-effectiveness [7][8]. Online voting has the potential to decrease organizational costs and increase voter turnout, but there is still skepticism regarding its security and reliability [7]. Blockchain technology has emerged as a potential replacement for traditional electronic voting solutions with distributed, non-repudiation, and security protection characteristics [7]. Decentralized nodes based on blockchain technology are used to produce electronic voting systems mainly because of their end-to-end verification advantages [7]. However, e-voting systems, including Direct Routing Electronic (DRE) voting, have a limitation in not providing end-to-end verifiability requirements [9]. Technical concerns arise in e-voting systems, such as the security of governance processes, the security of e-voting software against application-level threats, and protection mechanisms for secure tamper-proof auditing [9]. The trustworthiness of voting processes is a major concern in e-voting systems [9]. E-voting systems can achieve better scalability for large elections and can be designed to provide support to visually impaired users [8]. The study compares traditional and digital voting mechanisms [8]. Traditional paper-based elections are considered more secure due to historical experience, but recent criticisms of Internet voting have focused on risks and ignored benefits [10]. Ultimately, both electronic/Internet and paper voting systems have vulnerabilities, and a comparison of different dimensions is necessary to determine which system is best suited for specific situations [10].

➢ *The Pros and Cons of Online Voting: A Comprehensive Analysis of its Benefits and Drawbacks.*

Online voting is a controversial issue with both advantages and disadvantages. One of the advantages of online voting is that it provides a convenient way for people to participate in the voting process, which could lead to increased voter turnout. The use of blockchain technology is another advantage that could enhance the security and transparency of the voting process [11]. However, potential

online disadvantages include the possibility of limited sample size, geographic limitations, and security concerns. These limitations can lead to convenience sampling with biased results and everyone not having access to the technology required to vote [12]. In addition, the limitations of quantitative research methods should be considered when analyzing electronic voting trends and perspectives, which often take snapshots of a phenomenon without delving into in-depth details [13]. Further, it is essential to understand both the benefits and drawbacks of online voting to determine its suitability in various industries [14]. To this end, a comparative analysis of different online voting models can provide insights into their strengths and limitations [19]. Moreover, an in-depth review of the findings of voting research can provide valuable insights into the strengths and limitations of current deliberation [15]. Finally, the framework can be used to gain a more in-depth understanding of the factors limiting online voting, which can help policymakers make informed decisions about its implementation [16].

➢ *The Technical and Societal Challenges of Implementing an E-voting System: A Critical Review.*

Implementing e-voting is a complex undertaking that requires navigating numerous technical and societal challenges. Despite the complexity, the pace of e-voting implementation continues to increase, often at the expense of addressing socio-cultural, organizational, and political aspects of implementation. The socio-technical aspects of e-voting technologies encompass a wide range of issues, such as logistics, organizational complexity, and user navigation. Some users have difficulty navigating through the voting process due to issues such as complexity of use, image perception, and difficulty finding desired information on the site [17][18]. However, research shows that simple and easy-to-navigate e-voting systems can increase voter turnout, especially if users have a positive perception of usability and user experience (UX) [19]. The context of implementation and use of ICT-based systems is also vital in determining attitudes towards e-voting systems, including their complexity and perceived usefulness (PU) [20]. Political, social, legal, and technological issues related to e-voting must be taken into account during the implementation process. Regional pilots may be less complex to organize than national implementations [21]. Therefore, it is essential to address technical and societal challenges during e-voting implementation to ensure its success.

III. PROPOSED E-VOTING SYSTEM

The proposed system will be implemented by collecting the votes from the voters based on a particular area through a secure mobile app that will use blockchain technology to store the voting information securely.

➢ *The following benefits can be Achieved by Implementing the Proposed System.*

- *Voters can give their votes from home.*
- *Voting results can be achieved faster than traditional systems.*
- *Less human power will require to complete the election by reducing the tasks of the voting agent.*
- *No opportunity to give the vote of others.*
- *Voters will be able to check the current voting result from their devices at any time.*
- *All voters of a family will be able to give their votes by using a single device.*
- *The voting result will be generated by collecting the voting data of all areas securely.*
- *The voting result will be generated through the app. So no human interaction will require to count the votes and no chance to change the voting result manually.*
- *The voting system will be transparent for everyone.*
- *The following user will use the app to complete the election through the online voting system. Three types of user registrations will be done in this system.*

- *Voting Agent*

This user will help those voters to give their votes who have no mobile device to access the app.

- *Voting Candidate*

This user will be able to see the numbers of votes he/she gets through the app.

- *Voter*

The users will give votes to the voting candidate and be able to see the current voting result. The voting agent and the voting candidate can be a voter.
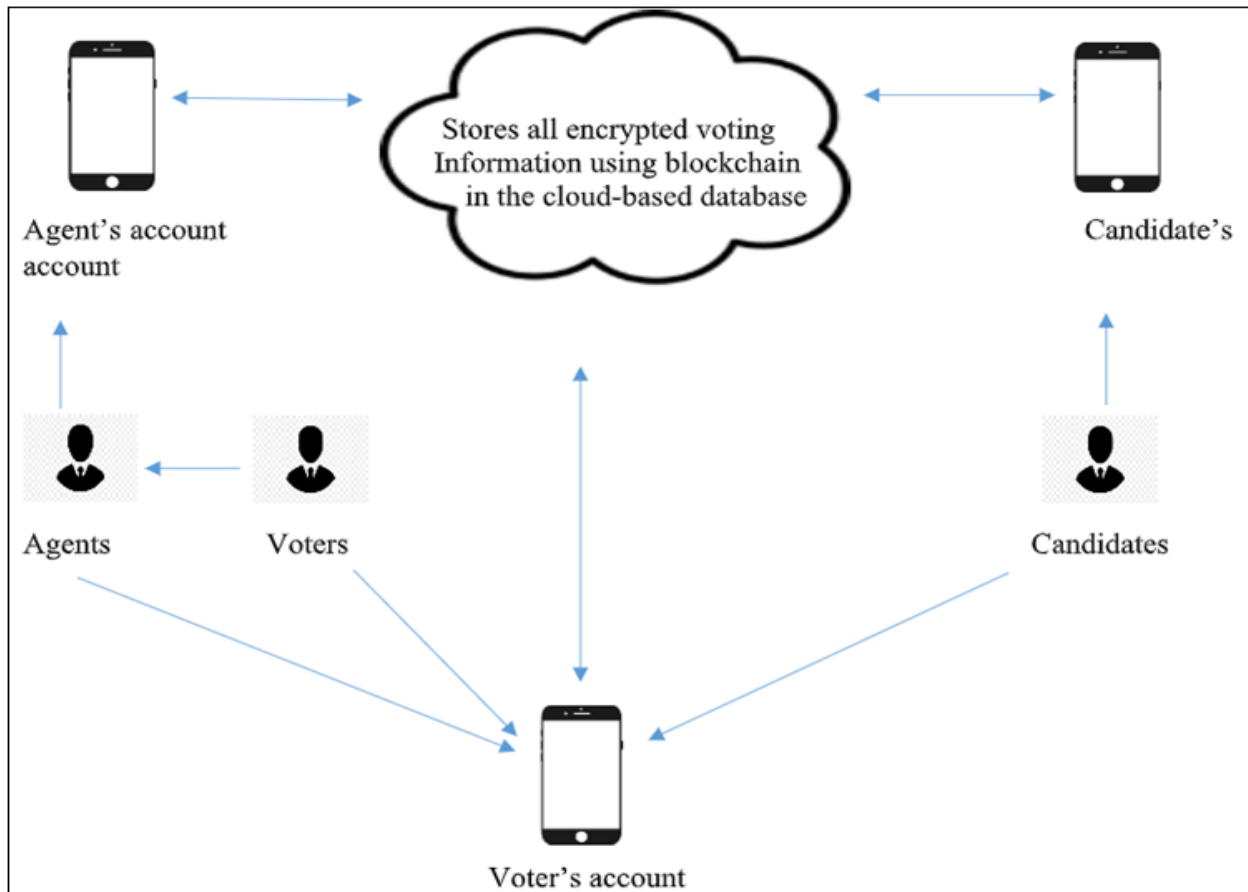
The proposed system is shown in the following diagram.

Fig 1 Online Voting System using Blockchain

Every user has to create a user account with the National ID before working with this app. All types of users of the app will create the general voter account. The voting agent will create another account to monitor the area-based voting system and help those voters who are unable to give a vote by using their own devices. The candidates will create another account as the voting candidate to monitor his/her current voting status.

All types of submitted valid data by three types of users will be encrypted by using blockchain technology and stored in the cloud-based database. The area-based result will be merged by the app to find out the result of the election of the particular state or district. Next, all these results will be merged to find out the final election result of the country.

IV. LIMITATION OF THE PROPOSED E-VOTING SYSTEM

➢ *The Proposed System has Some Limitations which are Mentioned below.*

- *Proper training will require all types of users to access the app properly.*
- *A high-speed internet connection will require to run the system.*
- *Internet connection problems may appear in the rural area of developing countries. In that case, the voting system may become slower.*

- *Multiple backups of the database will require to store for recovering from the accidental crash of the database where all voting information will store.*
- *The proper investment will require to develop the system and use the cloud-based database for running the system smoothly.*
- *All the limitations can be solved easily by taking proper actions.*

V. CONCLUSION

The way of implementing a very simple, secure, and transparent online-based e-voting system by using blockchain and a cloud-based database has been proposed in this paper to make the voting system more convenient and acceptable for the voters of the country. The system will minimize the need for many resources that require in the traditional voting system.

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