Chapter 9
"eVote – A Decentralized Voting Platform"

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https://www.google.com/search?q=Online+Voting+Systems+&tbm=isch&ved=2ahUKEwjj-Zmev7z9AhVPb94KHVABCtkQ2

9.1 Introduction

- In a democratic country, people are allowed to choose their leaders. The process of selecting the leader is called Elections.

- Elections have become an indistinguishable part of democratic government. People get to choose their leaders by voting for them. The right to vote is one of the basic rights, and all the qualified individuals must get it.

- However, in today's world, we have seen many cases where this right has been violated [6]. There have been many instances where people claim that the vote didn't go to the person or party they wanted.

- Sometimes, people who haven't voted find that someone else has voted using their ID's. Many issues are discussed and a solution to overcome all those shortcomings is proposed.

9.2 Ballot Paper

- **Ballot papers** [7,8] are used to cast votes in elections. It is a piece of paper used for voting. Each voter has one paper on which they have to write the name of the candidate.

- To ensure security, the government started using printed ballots [9]. Voters can cast their votes at polling stations. The voting with the help of ballot paper was first utilized in America [10] in 1629.

- In Philippines (until 2007), Japan and Argentina, there was a secret ballot [12] that was utilized to cast the votes.

- Another strategy for alternate applicant was to make parties with similar names or symbols that will deceive the voters. Such tactics by people, make the use of ballot paper less secure.

- **Ballot Stuffing** [15] is another way by people can cast multiple votes. It is also called " ballot- box-stuffing" in 1883, when the elections for the district of Cook, in Queensland, Australia took place.

- There was one more instance of **ballot stuffing** that occurred during the Russian Presidential Election [17], where people were recorded on camera, stuffing the ballot in favor of the President, *Vladimir Putin.*

- Earlier votes were counted manually, which can sometimes lead to false recording of the ballot.

9.3 Electronic Voting Machine

- **Electronic voting** [19] is a democratic procedure that used machines instead of ballot paper to votes and also helps to tally the number of votes. They were legally used in Estonia for first time.

- **EVMs** ended up being more effective than polling form papers. some of advantages are vote recording, information encryption, complete arrangement of vote input, transmission to workers, combination and classification of political decision results.

- The procedure of voting as calculations are done by machines. It also reduces the chances of errors that can occur during the counting of votes and the results also get published faster. Voters can't vote more than once. The process of voting is done under the supervision of controlling authority.

- The efficiency and turnaround time observed with electronic voting machines becomes necessary when they are used for larger populations.

- They were first used in India in **1998** for the elections and essential feature of registering only five votes per minute, thus reducing the risk for vote stuffing that used to happen in the ballot system. **They** replaced **ballots** throughout the country from 2001.

- As the voting system became complex and started introducing more software, different methods of electoral fraud increased. A few people tested the utilization of systems, and they formed a hypothetical perspective, cannot confirm the activities, there is an argument that tasks performed by EVMs can't be trusted.

- Numerous issues and regarding the insecure nature of the **EVMs** have been reported, one such example is, utilizing a similar default secret key. Many cases of machines making conflicting and eccentric errors were reported [24].

- Several countries like the Netherlands, Ireland, Germany, and the United Kingdom have canceled the **EVMs** due to reliability issues [27].

9.4 Online Voting Systems

- The continuous issue faced in elections is information control, security, and transparency. With the improvement of innovation, the utilization of new technologies in defeating the issues that happen becomes significant.

- Security is consistently the greatest worry when it comes to online voting [29,30]. To achieve such a secure system, they can opt for Blockchain [31].

- Blockchain is one arrangement that can be utilized to decrease the issues and it is nearly impossible to manipulate information stored in blocks of the blockchain as each block is utilizing cryptography standards.

- Blockchain is a better approach for reporting information on the web, and the information stored in it is open for anybody and everybody to see. It is implemented with the help of smart contracts [33], and can be deployed on platforms like Bitcoin and Ethereum [34,35].

- There is one more technology that will help in making the elections completely online and this technology is the Inter Planetary File System (IPFS) [36]. It is a conventional and distributed system for putting away and sharing information in record framework.

- Every file/ document uploaded on IPFS returns a hash value which is unique for every unique document. It means that no two distinct files can have identical hash values.

9.5 Proposed System and Working

- They have proposed a system that combines two states of art technologies, IPFS and Blockchain, which are merged with an interactive, user-friendly interface, created using ReactJS.

- The proposed system is more secure and transparent than the traditional methods that are in use.

- They have created a smart contract that uses the features of blockchain, and IPFS is used as a platform to store the identity of the users (eligible voters) in a decentralized manner, which can only be accessed by the entity who has hash key to that document.

9.6 The Smart Contract

- The Smart Contract that have built is deployed on Ethereum Blockchain. For testing purposes, they have deployed a contract on the network and used an injected web3 environment.

- The contract is deployed by the authority responsible for conducting the elections.
- **Figure 9.1** shows deployment page of the website. The authority enters its address and then the required description. In description, the authority then mentions the purpose of deploying the contract.
- **Figure 9.2** add identities of candidates/ parties. The parties/ candidates can be added only by the authority that has deployed the contract.
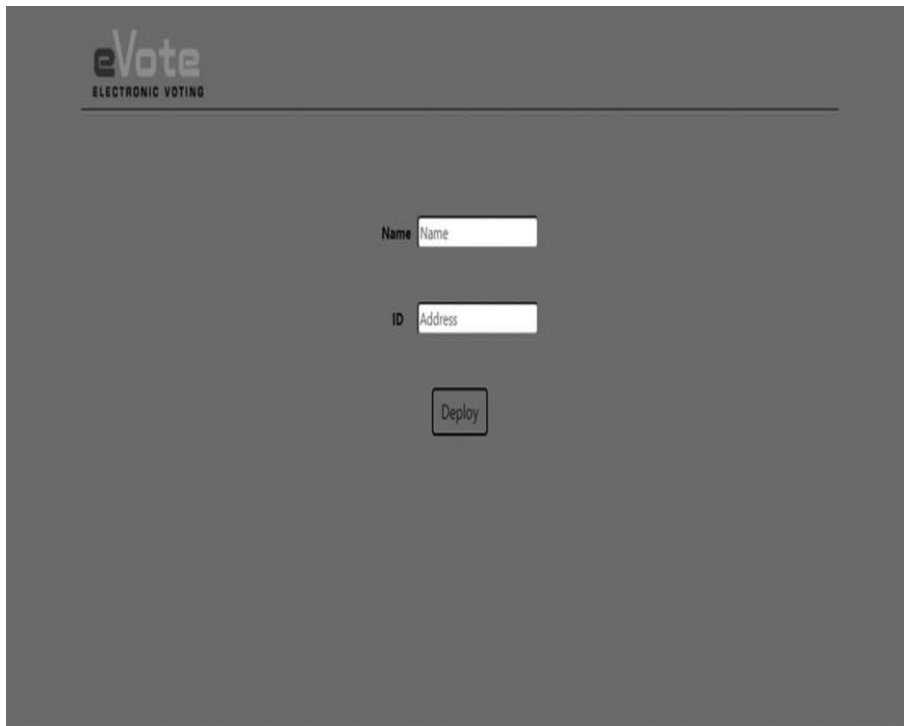
FIGURE 9.1 Smart contract deployment page
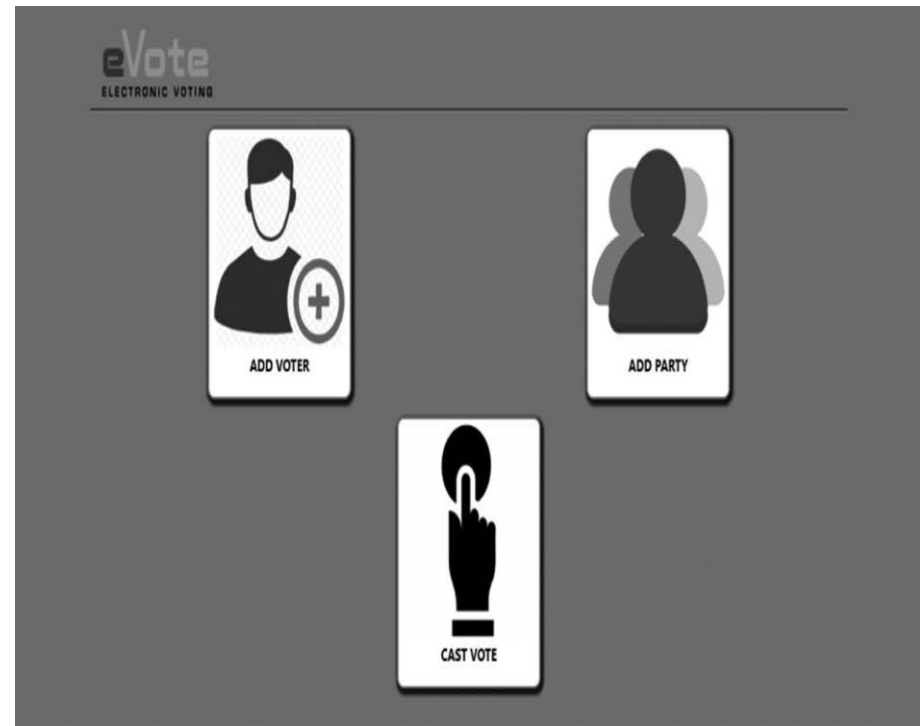
FIGURE 9.2 Page to take required action.

9.6 The Smart Contract (Cont.)

- **Figure 9.3** shows the page to add parties/ candidates. The authority has to add name and description of the candidate/ party. Users can access the details of all the parties which includes party description and vote count of that party.

- **Figure 9.4** shows the add voter page on the website. Eligible voters have to register in order to be validated by first and second controlling authority in order to get their names on the voter list.
- The controlling authorities will now work to check if the voter is a genuine person and not a fraud. The voter will be then added to the voter list. The controlling officials validate the voters after verifying the details.

FIGURE 9.3 Web Page to add parties.

FIGURE 9.4 Web Page to add voter.

9.6 The Smart Contract (Cont.)

- **Figure 9.5** shows the voting page. The result of elections can be found as soon as the voting ends by just clicking the button. This contract tries to make elections more secure and an extremely fast process.
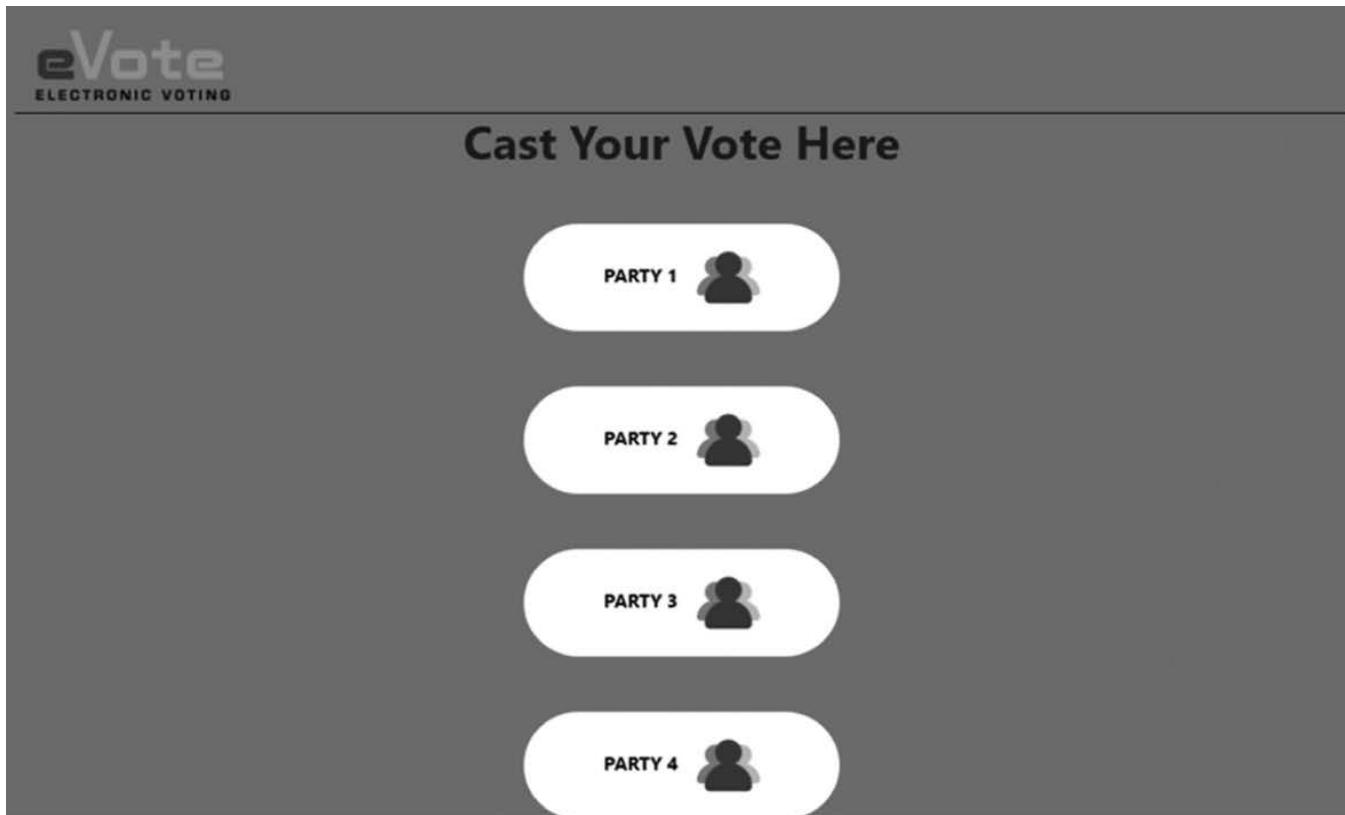

FIGURE 9.5 Voting Web Page.

9.7 The use of IPFS

- In eVote, **IPFS** plays a very significant role. First, a user registers to get validated to cast his/ her vote. An eligible voter is required to upload an identity document that is recognized by the government. This document is shared using the IPFS technology.

- When the eligible voter uploads the document on IPFS, a hash id is received, which corresponds to the address of the document. A function (" addVoter") takes the hash id generated by the IPFS upon sharing/ uploading a file.

- On a successful function call, a request to both the controlling officials is generated. Controlling authorities have the hash id of the corresponding eligible voter and check his/ her details against the information stored in the government system and takes the required action.

- whether to approve or reject the request. If the request is accepted by both the controlling officials, in that case, the corresponding voter is allowed to cast his/ her vote, using his unique hash id.

9.8 The Interface

- Web interface that uses ReactJS as the framework. The interface consists of three parts: one for the voters and parties, the other for the authorities, and the third part for the elections.

- The voters can also check all the parties and see their agendas, and they can also check if their name is on the voter list or not.

- New voters can also request authorities to add their names to the voter list by providing the required hash code generated by IPFS for their documents. The authorities on their end receive all requests regarding adding new voters or parties.

- Authorities will then verify that request is a genuine request or not, and then only, the voter will be added to the voter list or the new party will be added to the party list. Once the time for adding new parties and voters finishes,

- Move to the second phase, where the authorities sign the commencement of elections using their signatures (hash ids), and then the voters will be allowed to cast votes for the parties.

- After a certain period, the authorities will again sign the contract to stop voting. As soon as the voting is over, authorities can call the function of results, and the results are displayed immediately on the website, where everyone can see the results. It can make the online conduct of elections more secure and quick (**Figure 9.6**).
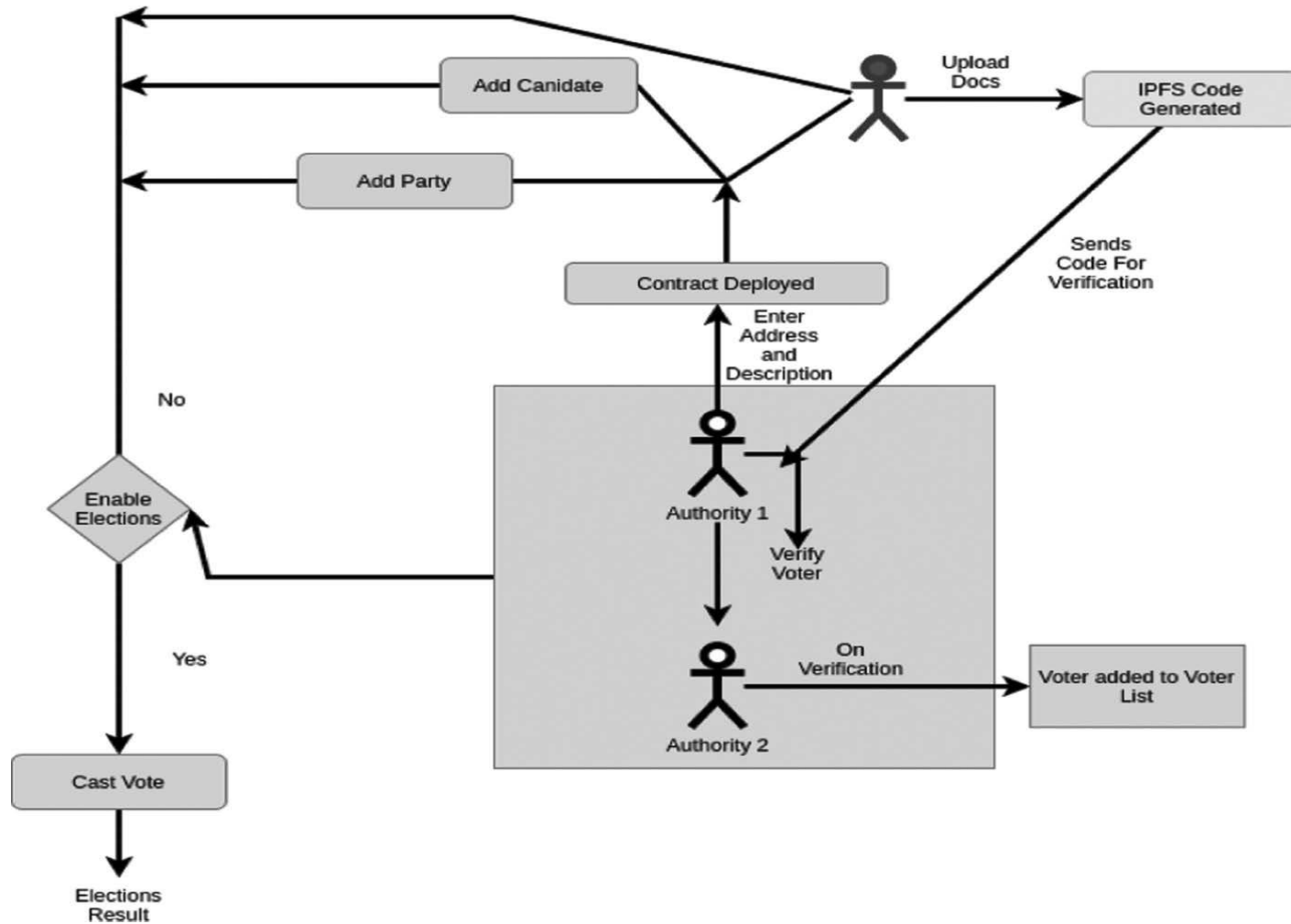
9.8 The Interface

FIGURE 9.6 Flowchart of working of the system.

9.9 Results

- To understand the view of people on current election procedures and to understand their thoughts on online voting, They surveyed seven, different states of India that is, Assam, Delhi, Jammu, Madhya Pradesh, Odisha, Rajasthan, and Uttar Pradesh.

- In their survey, considered only those who have access to the internet because they are aware of the pros and cons of the internet, and provide us better responses and thoughts on the system they have created.

Characteristics	Ballot Paper	Electronic Voting Machine(EVM)	eVote (Propose System)
Transparency	Low	Low	High
Security	Low	Moderate	High
Data Manipulation	High	Low	Not Possible
Counting Mistakes	High	Very Low	Not Possible
Vote Stuffing	High	Low	Not possible
Counting Time	High	Low	Instantaneous
Accountability	Low	Low	High
Vote from home	Not Allowed	Not Allowed	Allowed

FIGURE 9.7 Comparison of **ballot paper, EVM and e-vote**

9.9 Results

- **Figure 9.8**, it is observed, that 56.2% of the people who took part in the survey belong to the age-group of 18–30 because they are the people who have more access to internet, thus they have better knowledge about working of the internet.
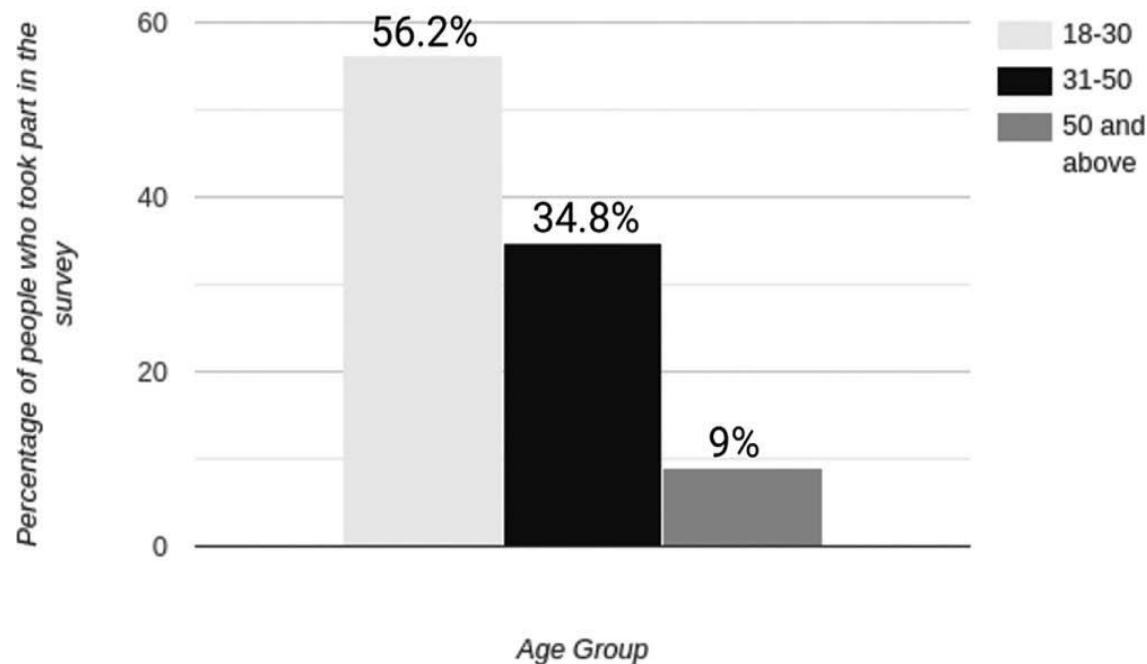
FIGURE 9.8 Age group of people who took part in the survey

9.9 Results

- **Figure 9.9**, it is concluded that the survey is not gender biased.
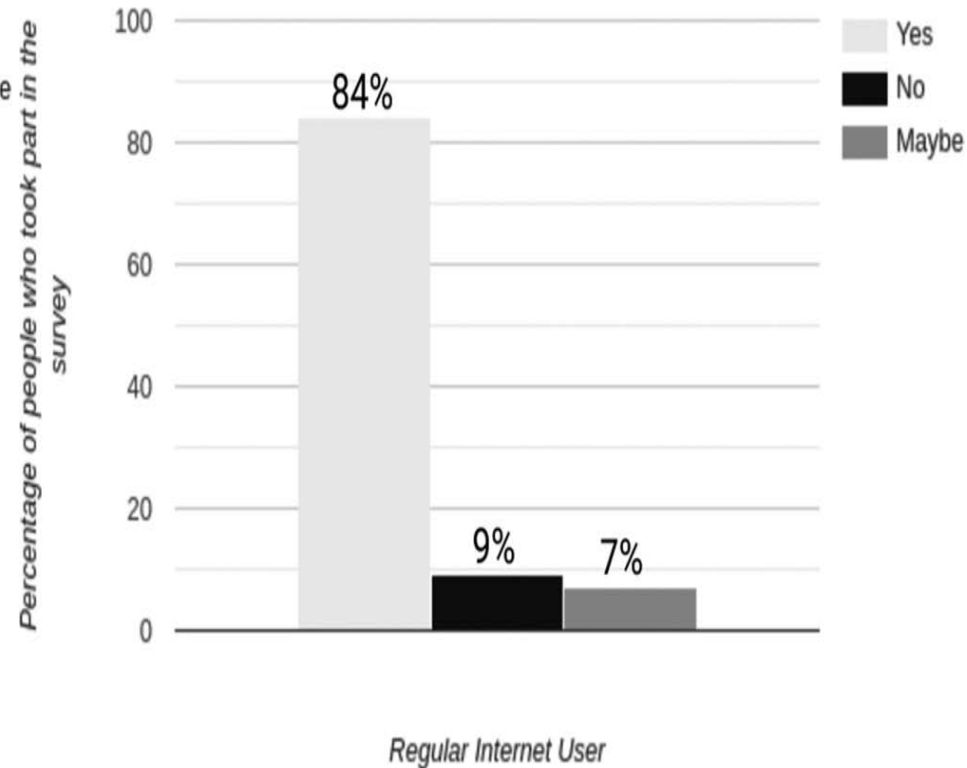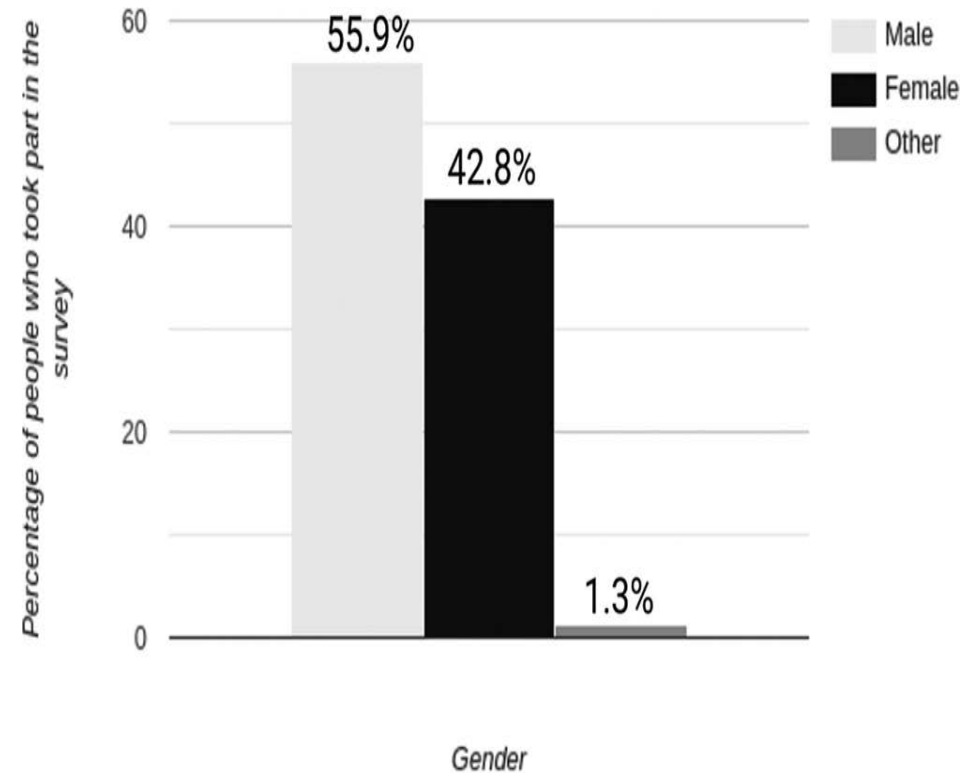- **Figure 9.10** shows that 84% of the users have daily access to the internet.

FIGURE 9.9 Gender ratio of people who took part in the survey.   **FIGURE 9.10** Number of people who are regular internet user

9.9 Results

- **Figure 9.11** shows that over 82% of the people who took part in the survey are regular voters. Thus, they can infer that they are aware of the elections and its procedure.

- **Figure 9.12** shows that around 82% of the people have voted in the last elections, and since they have voted recently.
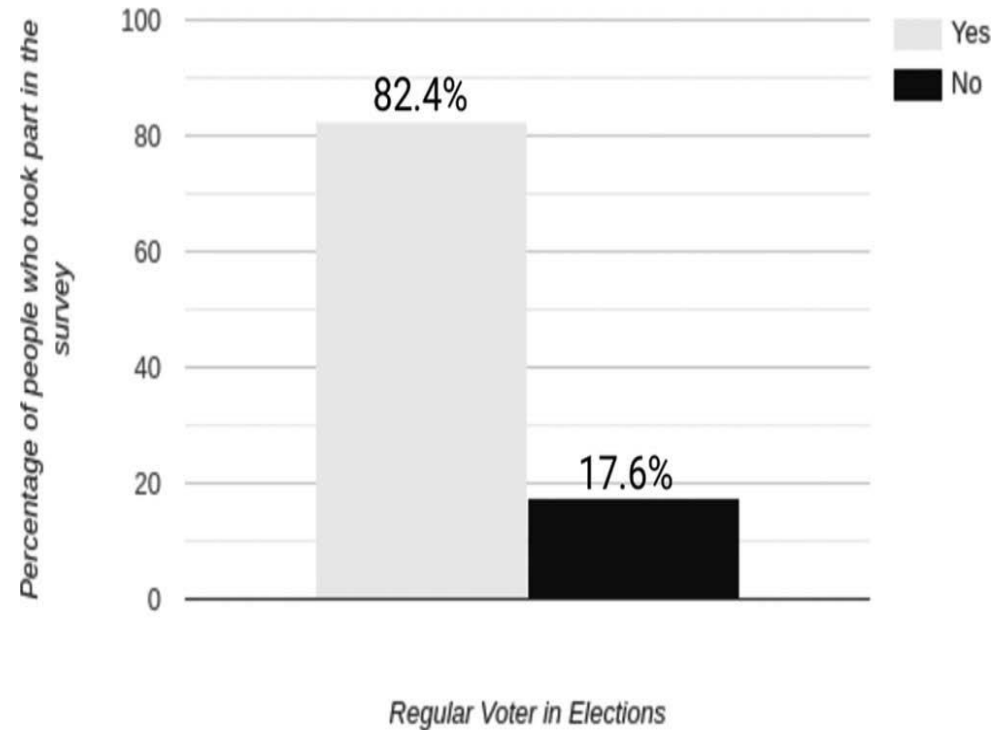
FIGURE 9.11 Number of people who vote regularly in elections.
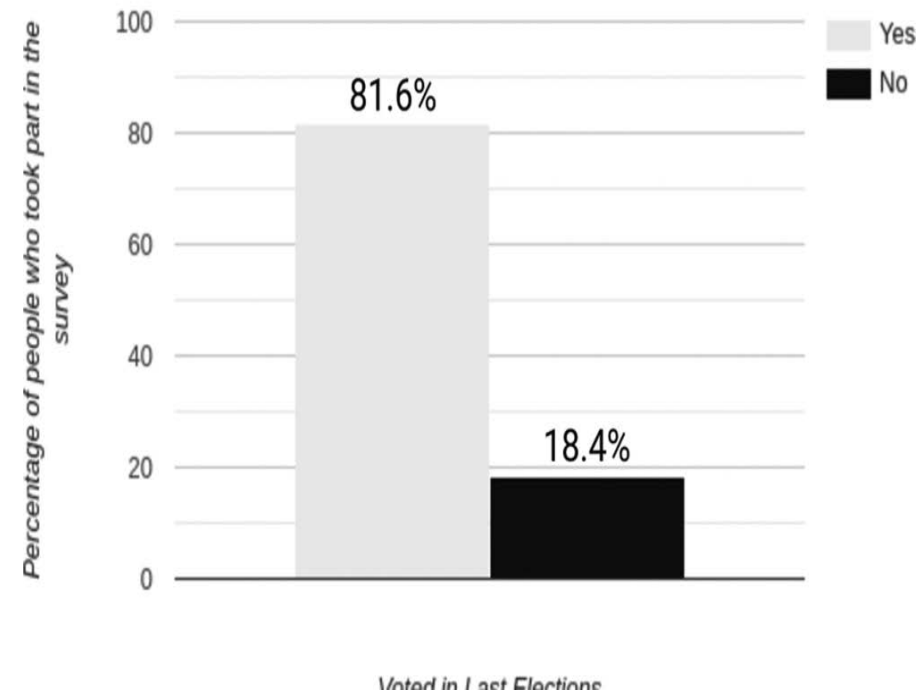
FIGURE 9.12 Number of people voted in the last elections.

9.9 Results

- **Figure 9.13** shows that around 91% of the people believe that the internet.
- **Figure 9.14** shows more than 60% of people accept the fact that internet has helped them in taking a political decision that has helped them in choosing the candidates they have voted for in the elections.
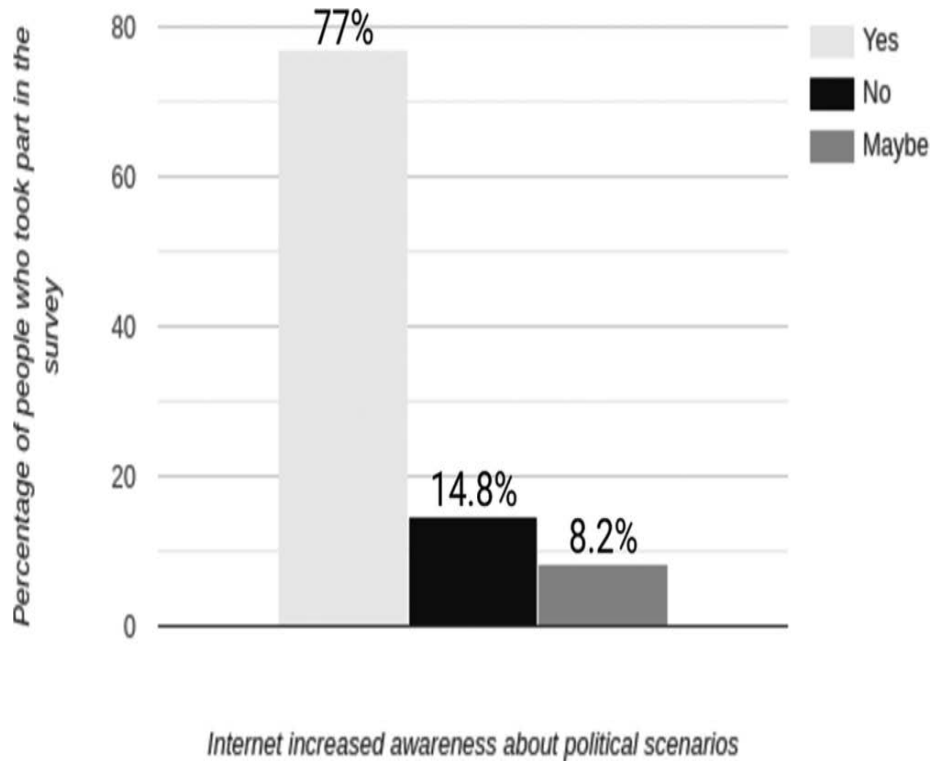
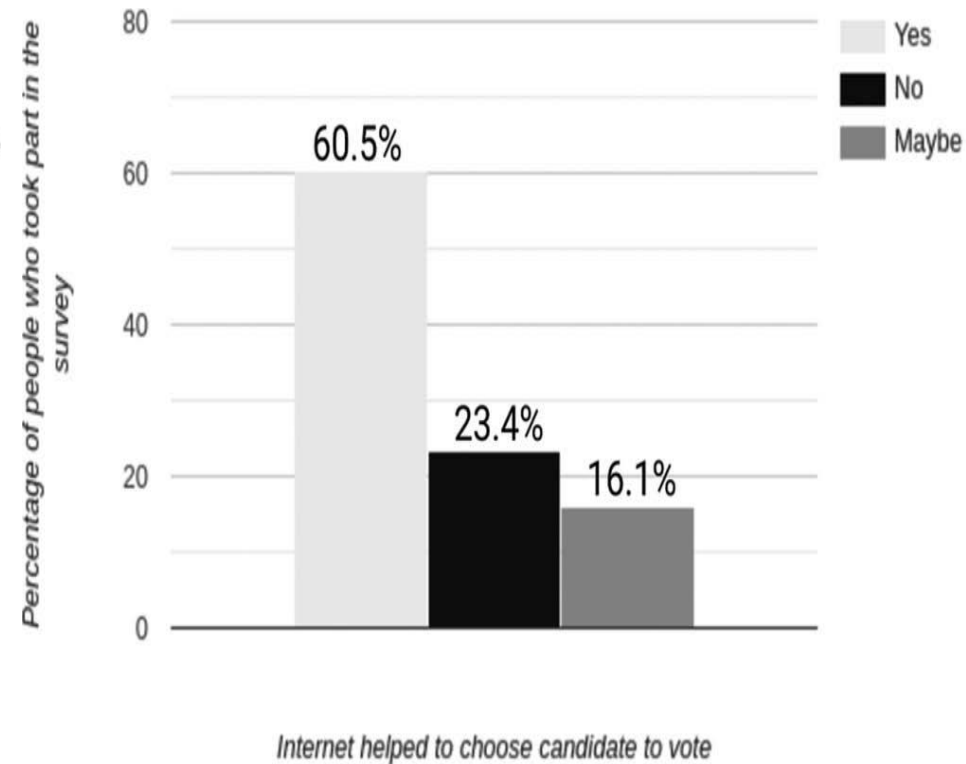FIGURE 9.13 Ques: Has internet made you aware of political scenarios?

FIGURE 9.14 Ques: Has internet helped you to choose which candidate to vote?

9.9 Results

- **Figure 9.15** shows that over 80% people are not satisfied with the money that is being spent, and this ensures that online voting can overcome this part and can increase voters' satisfaction.
- **From Figure 9.16,** it is observed that over 71% of the voters are not satisfied with the time taken to cast a vote through EVMs and ballot paper system.
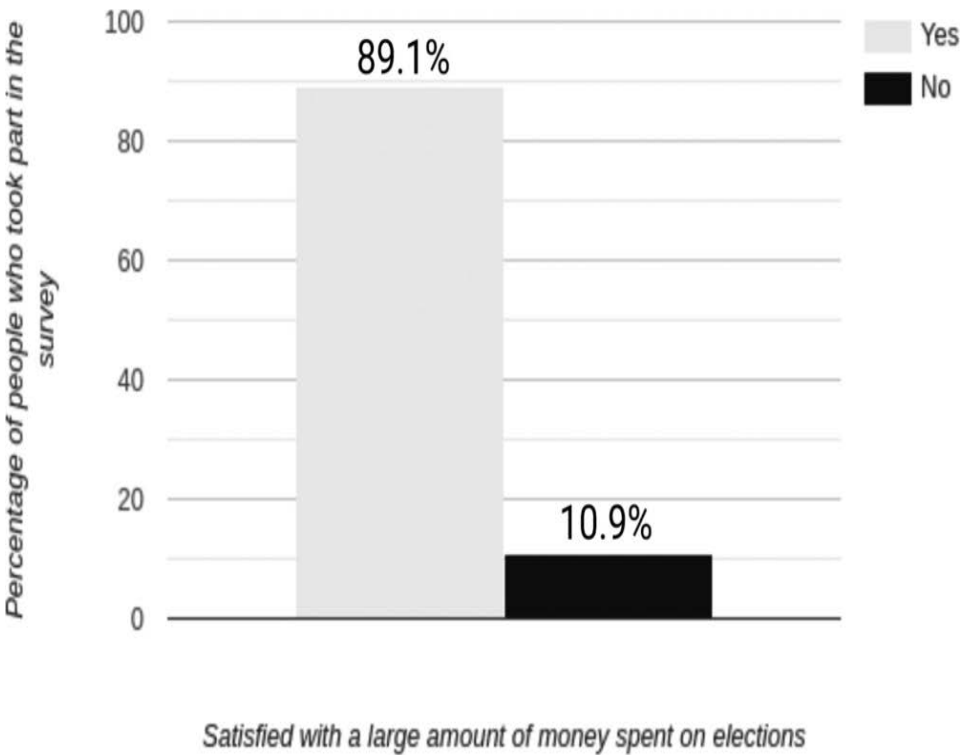

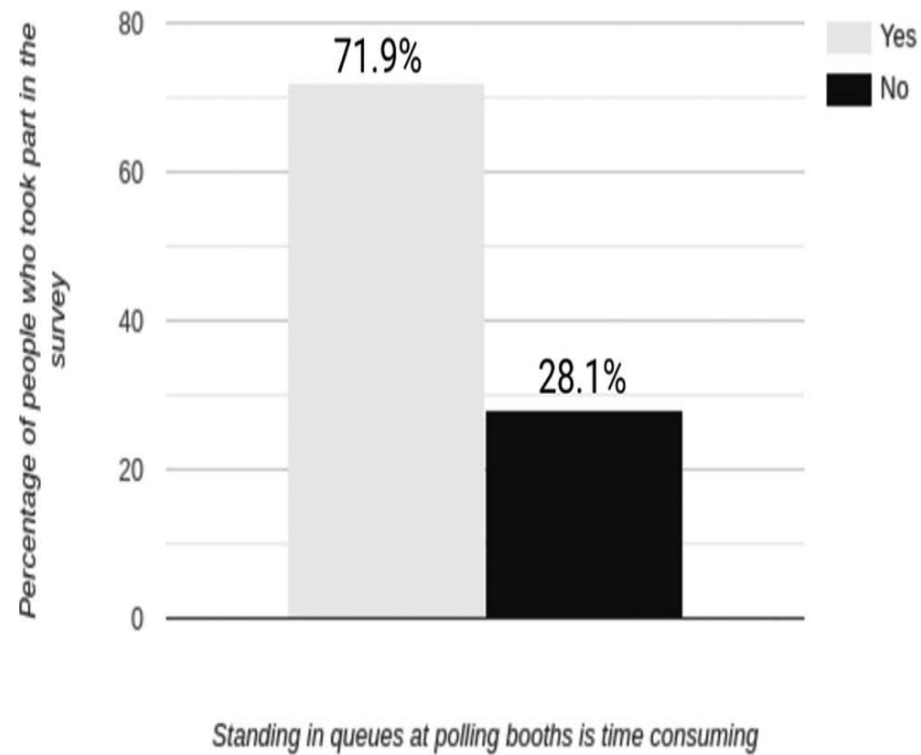**FIGURE 9.15** Ques: Are you satisfied with a large amount of money spent to conduct elections?

FIGURE 9.16 Ques: Do you think that it is t ime-consuming to stand in queues at polling booths?

9.9 Results

- **Figure 9.17,** it can be inferred that more than 63% of people do not find traditional voting systems to be transparent.
- **Figure 9.18,** over 81% of people are in favor of having an option of online elections.
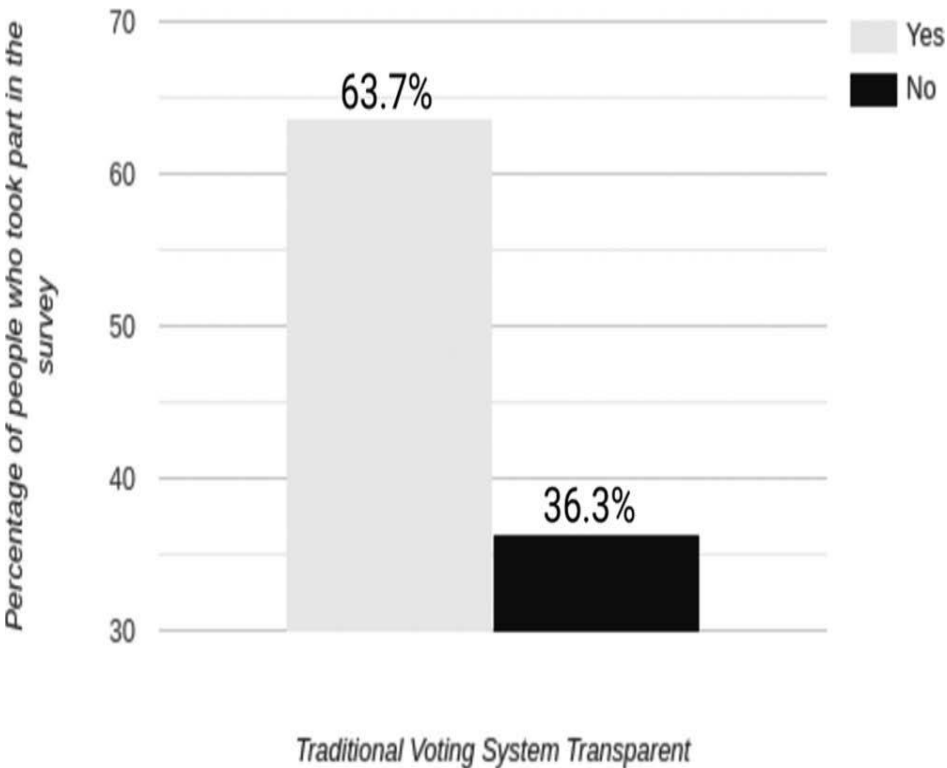
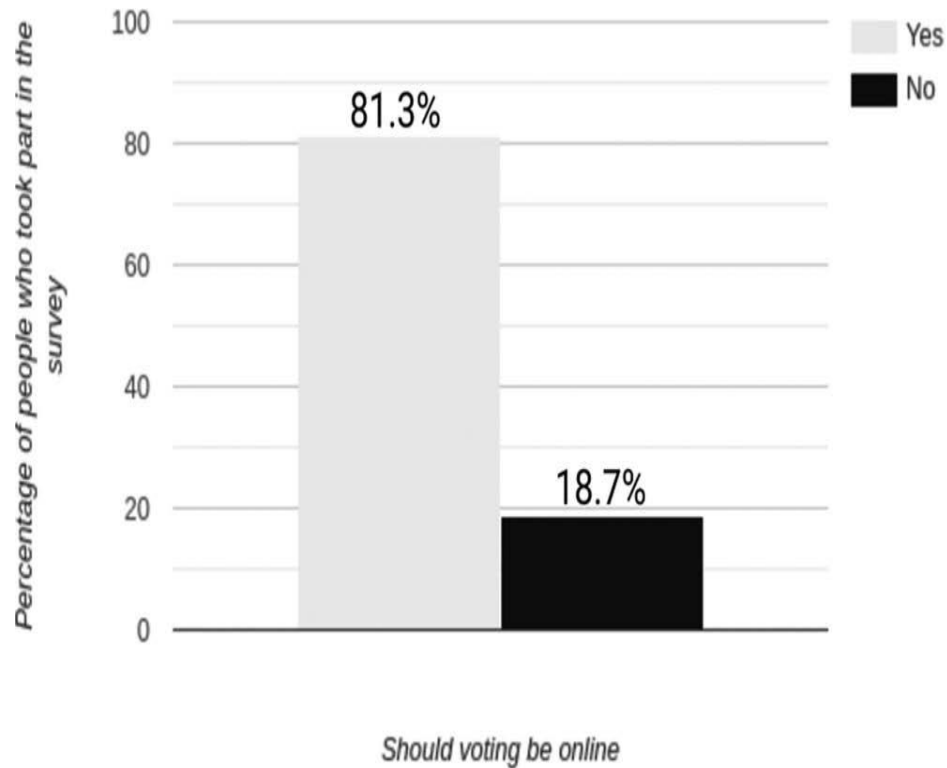**FIGURE 9.17** Is traditional voting system transparent?

FIGURE 9.18 Ques: Do you think there should be an option of being able to vote online in elections?

9.9 Results

- **Figure 9.19** shows that around 90% of people believe that online voting will increase vote count.
- **Figure 9.20** shows that over 71% people believe that online voting can be a secure medium.

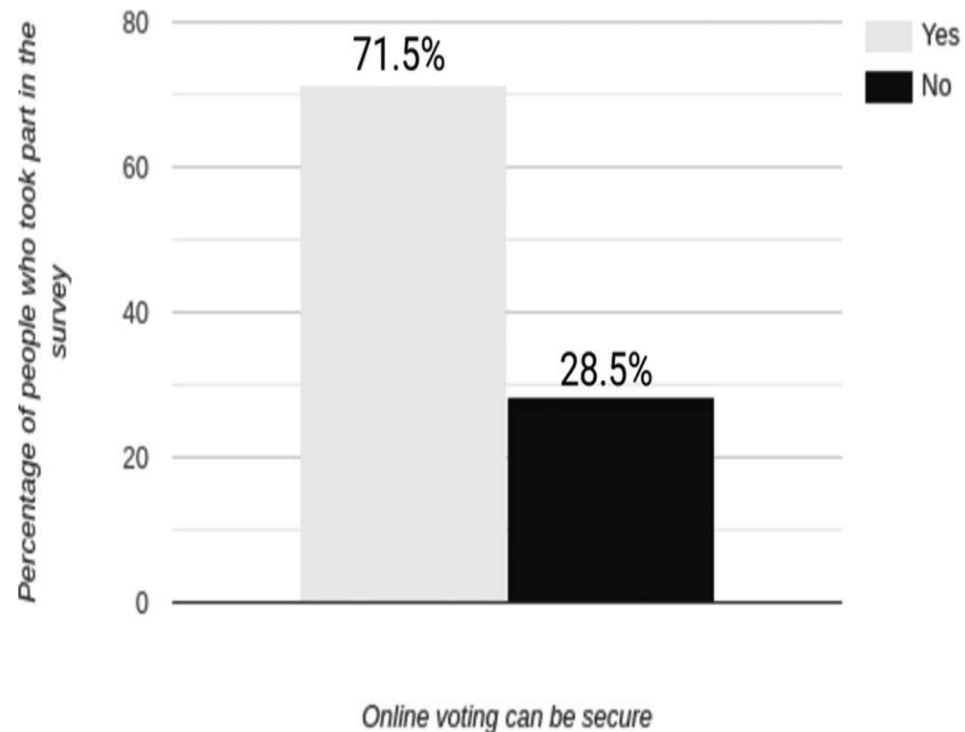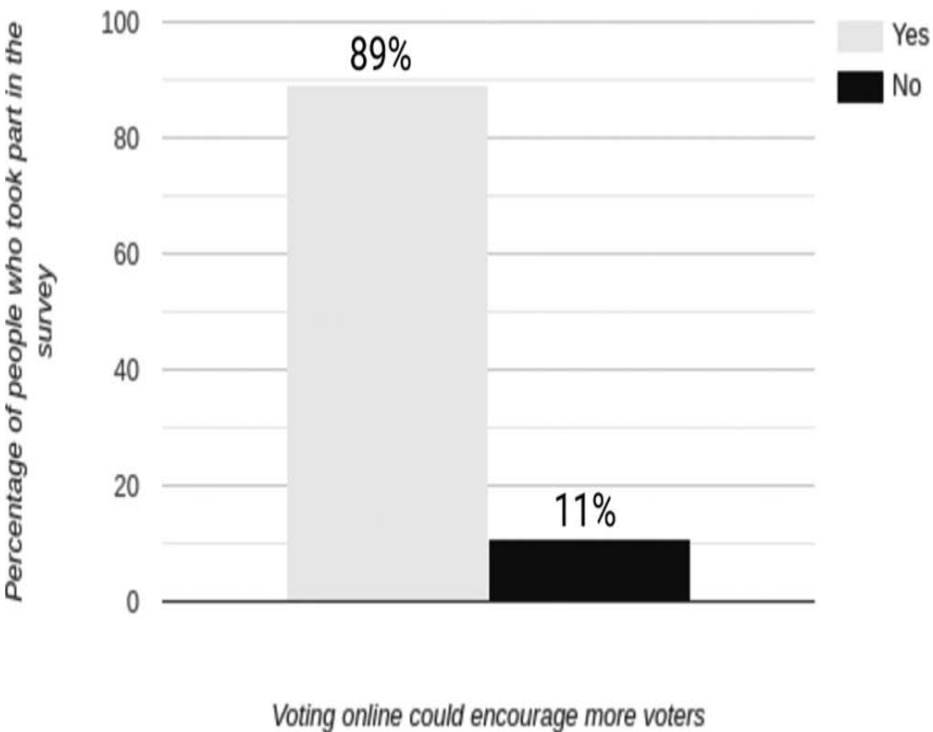**FIGURE 9.19** Ques: Can online voting encourage more voters to vote?

FIGURE 9.20 Ques: Do you think online voting can be secure?

9.9 Results

- **Figure 9.21** shows that when given an option to choose between online voting and traditional voting, people are more interested in voting online.
- **Figure 9.22** shows that around 46% of people are willing to use the system, whereas 34% are unsure for now.
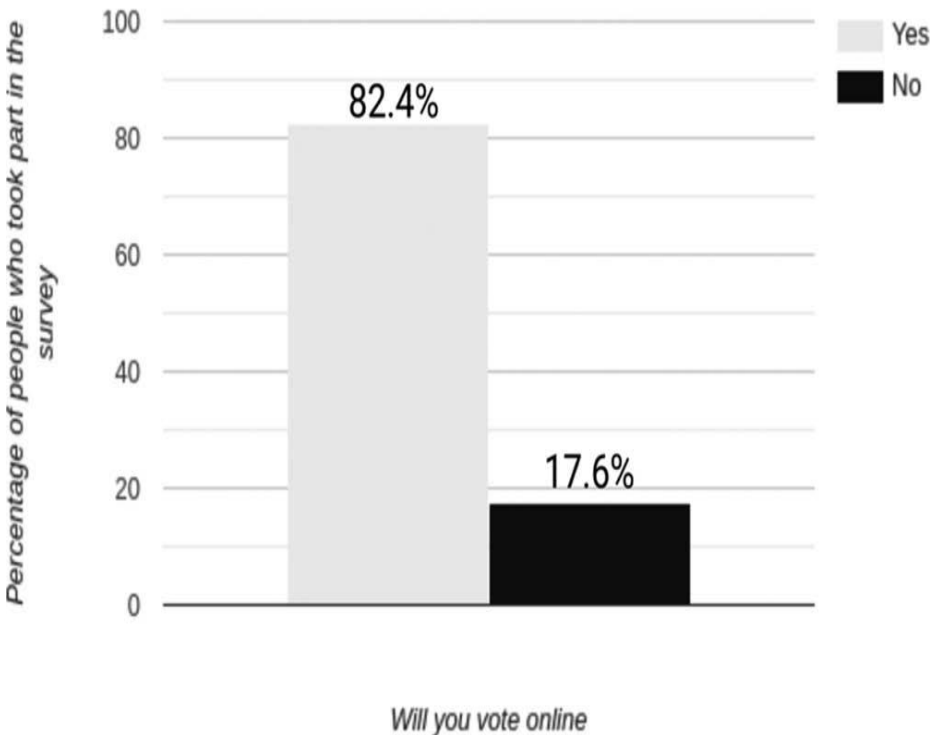

FIGURE 9.21 Ques: If there is also an option of online voting in the next elections, then
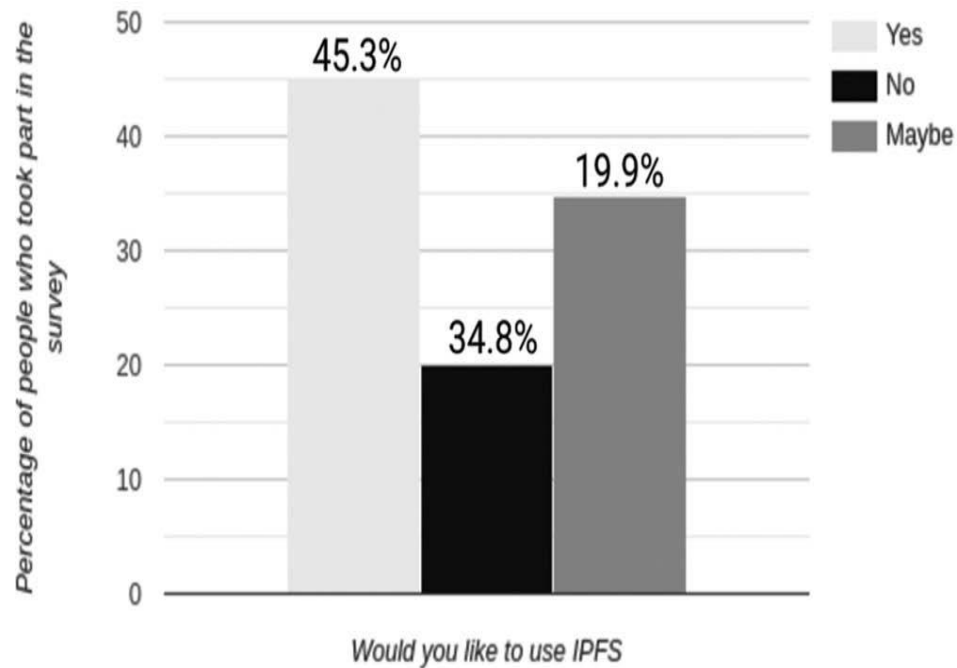which mode will you choose?

FIGURE 9.22 Ques: Would you like to save your voter id data on a platform (IPFS) where
only you can access it and you can give permission to others to access it?

9.10 Conclusion

- The system proposed in the paper combines two state- of- the-art technologies, Blockchain and IPFS, to overcome the flaws of traditional techniques that are in practice and also resolve the issues of transparency and security.

- The users of the system are themselves accountable for their actions. Thus, there is no scope that someone can manipulate data, they can conclude the system can save the literal values of the " Right to Vote" of people.

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Thank You

For your Attention!

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