

# “Web Base Online Election Management Systems: Technical Review”

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**Abstract:** *The implementation of advanced technologies in elections becomes more effectful, beneficial and valuable to eliminate the fraud attempts in voting, to get the accurate voting results and to raise the voter turnout. From last few decade numbers of countries are developing and improving their election management system to make it secure. But still maximum of countries are following old ballot paper system because of large population. Remaining countries are in concern about the security of online voting system. There are various types of E-Voting System that have introduced and implemented, but they have different vulnerabilities. Numbers of researchers dose a work for improving old election systems but each technique comes with different drawbacks and because of this still these techniques are struggling to get its acceptance in voting system management. In this review article we are going to analyze some earlier researchers work in same specific domain. In this a critical we are going to review some popular election management techniques like: Fingerprint Electronic Voting System based on Android Application, Web Based Secure Internet Voting System for Corporate Election and Omni Ballot platform web base online voting system.*

**Keywords:** Online Voting System, Web Base Election system, .NET Framework, Application Designing, Angular JS, Web Page Designing.

## I. INTRODUCTION

Voting is a fundamental process in a democratic system. It is a chance for the citizens of a country to have a say in the people who represent them or an issue that impacts them. Informed voting and participating in elections are one of the responsibilities of citizens of any Country. The voting process of different countries are fairly straightforward. First, an eligible citizen registers to vote, studies the candidates and issues, looks up their polling location, then casts their ballot during the election.

An electoral system or voting system is a set of rules that determine how elections and referendums are conducted and how their results are determined. Electoral systems are used in politics to elect governments, while non-political elections may take place in business, non-profit organisations and informal organisations. These rules govern all aspects of the voting process: when elections occur, who is allowed to vote, who can stand as a candidate, how ballots are marked and cast, how the ballots are counted, how votes translate into the election outcome, limits on campaign spending, and other factors that can affect the result. Political electoral systems are defined by constitutions and electoral laws, are typically conducted by election commissions, and can use multiple types of elections for different offices.

## II. HISTORY OF ELECTION SYSTEM

Elections were used as early in history as ancient Greece and ancient Rome, and throughout the Medieval period to select rulers such as the Holy Roman Emperor and the pope. As we know India earned its independence in 1947, before independence our government is ruled by England. They have started the election system in India and from that time India is following same manual voter registration and ballot paper base voting system. Where Indian government have

introduced EVM technology for Indian election in 1977. But as we know the population of India is very high and because of this we can't change whole process into a paperless system. Same like India numbers of countries are following same manual systems because of security concern. Numbers of countries use manual system because they think that online system or web base systems are not trust full, any cyber-attack can manipulate or destroy the result of online system. Hackers can manipulate the data online and our security systems still don't have that much potential to provide high security.

### 2.1 New Age Technologies

As per discussed in earlier section we have concern about the safety of online voting system but still numbers of researchers are doing research to increase the security of online or web base election management systems. As we know manual process of election management have different stages. In first stage we have to register new voters in voting list. This process is very hectic and time consuming some researchers dose a nicest work in this domain to reduce the overall timing of data collection. They have designed a web base portal to collect voter's data. By simply using this type of portals we can register our self as new voter on internet and our data is going to get feed into voting management system database.

Some of researchers have created an online voting system to conduct small scale election of different organizations like: corporate election, society elections, university elections and many more. In next section we are going to review some of the work of different researchers. Who have made their efforts to improve the existing old election management systems.



**Figure 1. New Age Technology Base Voting System**

Same like voter registration, Manual vote counting also have different problems. In manual vote counting we first have to collect the ballot papers, after that we have to relocate all the ballot boxes at single vote counting station. Which required transportation and it increases the cost of process. In next stage we have to count all the ballot papers as per voter voting and this process consume more time. To replace this system some of the countries have adopted the new electronic counting systems but still improvement is needed in this domain.

### 2.2 Benefits of Automatic Vote Counting and Voting System

While the use of manually counted paper ballots is still the most common method of voting, automated methods of voting and vote counting are becoming more accessible and effective, and more countries are opting to use them. Automated technology can be cheaper, faster, and more accurate than manual counting.

It can also improve the democratic process by making the counting of complex electoral systems easier to use. Technological approaches can be used to replace traditional paper ballots. Voting directly using mechanical or electronic devices, or using machine-readable ballots, can eliminate the need to count ballots manually and greatly speed up the counting process, as well as ensuring and increasing accuracy.

**Before deciding to implement a computerized voting and/or counting system, an electoral management body might consider these questions:**

- Is it difficult to recruit qualified voting station and/or counting staff?
- Have there been problems with irregular vote counts?
- Is there a need to reduce the number of election workers?
- Is the ballot becoming more complex?
- Is the vote count coming in too slowly?
- Do voters have to wait too long to cast their ballot?
- If the answer is yes to most of these questions, it may be worth studying the costs and benefits of a machine-based voting system.

**However, the following drawbacks should also be considered:**

- The cost of acquiring the hardware, software, and technical support needed for machine-based voting may be prohibitive.
- Election officials and voters will need specific training programmes on the use of the system/machine.
- Technological support will be required for every electoral event, and may come only from the system vendor, possibly from outside the country and at high cost.
- As paper ballots are no longer used in the voting process, voter's and candidate's confidence in the system may decrease.
- Absentee ballots may still need a separate voting and counting system.
- Maintenance and storage costs may be onerous.
- Voting technology is still evolving rapidly and any system purchased may be obsolete within a few years.

### III. LITERATURE REVIEW

To make the voting process very easy and efficient wireless and web technologies are used. The online- voting system has the possibility of secure, easy and safe way to capture and count the votes in the election.

The author in [1]" online voting system based on Adhaar id" uses Adhaar id as key of authentication, system is efficient in terms of time and provides security the system is great improvement over traditional system but the main problem resides in this system is that of authentication, the authentication technique used is not that efficient as biometric is not used.

The paper [2]" Secure Authentication for Online Voting System" presents non traceability and integrity of the votes, smart card has been used to avoid multiple votes casted by users, biometric is being used for authenticating voters. The author has introduced smart card for biometric identification and voter id card to be used at the time of casting vote. They are using smart card and voter id card at the time of election which is not feasible as anything can happen to those cards thus relying completely upon cards in not a good idea. And the use of various cards makes the system costly now each and every voter need to have these additional cards. Also, it may take reasonable amount of time to generate so many cards. All voting system generated priory though have met various features, which a voting system may consists but the main problem one could find in this system is that little "online" word, despite all techniques they have used to make system robust there is always a chance of malpractice when your system is online.

In [3]" online voting system powered by biometric security" the author has used personal identification number, thumb impression and secret key altogether for authentication of the voter. Techniques such as cover image creation, secret key expansion have been used for securely sending data to server and then further authenticating voters. This system is quite robust; it takes care of authentication as well as security of voter's data stored in server. The main problem with such systems is that despite using various security techniques they won't be able to manage such a huge amount of data that they may encounter during election periods their system is online and they may face congestion during casting votes.

#### IV. EXISTING SYSTEM AND THEIR ANALYSIS

The Existing System of Election is running manually. The Voter has to Visit to Booths to Vote a Candidate so there is wastage of Time. The Voter has to manually register into the Voter List. Also, Vote counting has to be done manually. All the Information of the Voter or Candidate is to be filling in manually. Voter must be present in his/her Constituency to give his/her Vote. There are Electronic Voting Machines used which Takes More Cost. The voting system previously being used by the Government is a paper-based system, in which the voter simply picks up ballots sheets from electoral officials, tick off who they would like to vote for, and then cast their votes by merely handing over the ballot sheet back to electoral official. Some of the existing systems are:

- Paper-based voting
- Direct recording electronic voting machine
- Punch card

#### **Michael A. Specter and J. Alex Halderman, Security Analysis of the Democracy Live, Online Voting System**

Democracy Live's Omni Ballot platform is a web-based system for blank ballot delivery, ballot marking, and (optionally) online voting. Three states Delaware, West Virginia, and New Jersey recently announced that they will allow certain voters to cast votes online using Omni Ballot, but, despite the well-established risks of Internet voting, the system has never been the subject of a public, independent security review. We reverse engineered the client-side portion of Omni Ballot, as used in Delaware, in order to detail the system's operation and analyze its security. We find that Omni Ballot uses a simplistic approach to Internet voting that is vulnerable to vote manipulation by malware on the voter's device and by insiders or other attackers who can compromise Democracy Live, Amazon, Google, or Cloud flare. In addition, Democracy Live, which appears to have no privacy policy, receives sensitive personally identifiable information including the voter's identity, ballot selections, and browser fingerprint that could be used to target political ads or disinformation campaigns. Even when Omni Ballot is used to mark ballots that will be printed and returned in the mail, the software sends the voter's identity and ballot choices to Democracy Live, an unnecessary security risk that jeopardizes the secret ballot. We recommend changes to make the platform safer for ballot delivery and marking. However, we conclude that using Omni Ballot for electronic ballot return represents a severe risk to election security and could allow attackers to alter election results without detection.

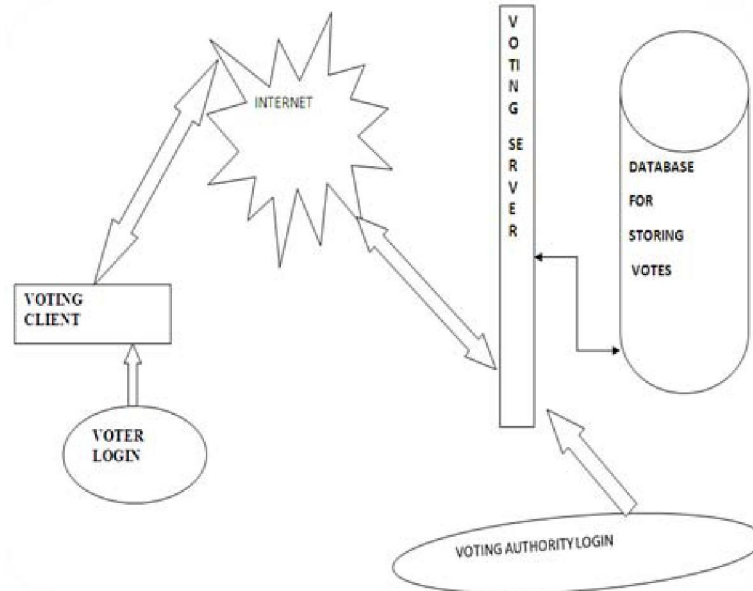
#### **Jagdish B. Chakole, P. R. Pardhi, "Web Based Secure Internet Voting System for Corporate Election**

In this paper we propose a secure internet voting system that is suitable for voting over the internet. The proposed voting system is based on digital signatures and cryptography approach and the system will be suitable for corporate company having their offices in different cities. The proposed system encompasses three distinct phases - that of registration phase, authentication phase voting phase and counting phase involving parties, the voter, voting server and voting authority.

#### V. SYSTEM ARCHITECTURE

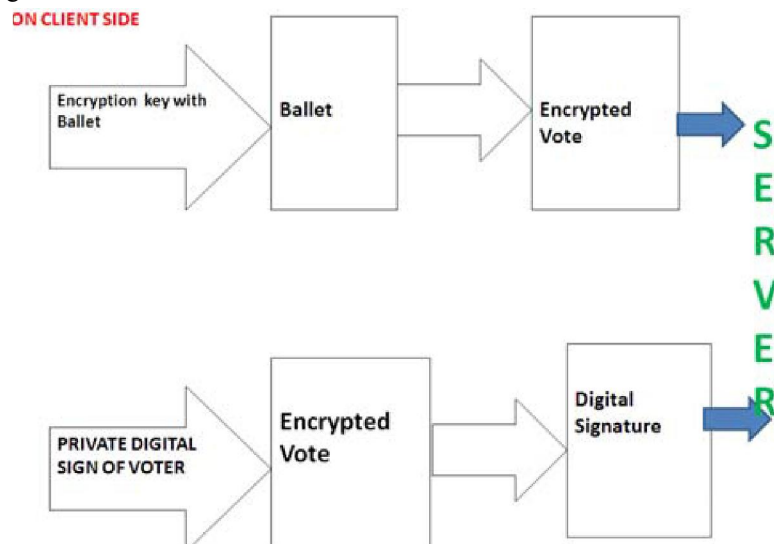
They have designed this system for an organization having their offices in different cities. Our main concern is that to provide security to casted vote, when it is travelling from voter to voting server for storing, we are focusing to provide security from intruders both passive as well as active. The passive intruder can access the casted vote of a voter and create challenge to secrecy and privacy characteristics of voting system. The active intruder may tamper the casted vote and encounter problem for integrity of casted vote. To tackle this security concern, we are using the concept of cryptography and taking advantages of digital signature. To provide security from passive intruders, we are encrypting the casted vote on client system, and then will send that to voting server with the help of internet, on server-side decryption of that vote is done before counting. We require two keys for this purpose one for encryption on voter system, which should be publicly known and second key for decryption of encrypted vote before counting on voting server, this key must be private. So, for this purpose we need a pair of asymmetric keys. To provide security from active intruder who can alter or tamper the casted vote when vote is transferring from voter to voting server, we are using digital signature. When a voter cast his/her vote after that he/she will digitally sign on that by using his/her own private digital signature, and send this to voting server, on voting server side that signature is checked by digital

signature verifier of that voter which is publicly known. For this purpose, each voter should have a private digital signature and a public digital signature verifier, for this we are using a pair of asymmetric keys for each registered voter. As figure 2



**Figure 2: Design of Web based internet voting System Consist of voting sever, voting client, voter and voting authority. A registered voter connects to voting server by using his login identification and password. Voting client and voting server communicate by internet.**

As figure 3 shows computation on client side, when a voter wishes to cast vote he first request for ballet to server, server send ballet with public encryption key. Voter encrypts casted vote using this key, then voter digitally sign on encrypted vote by using his private key. And send both to the server. On server side, voting server verifies digital signature of voter by applying decryption on voter signature using public signature verifier of voter. If signature is valid vote is store for counting otherwise vote is discarded.



**Figure 3: Voting Client-side computing**

**“Fingerprint Electronic Voting System based on Android Application” Muhammad Basit Farogh, M. Ghufan Khan, Umair, M. Nabeel Khan, Jawad Ahmed**

This paper proposed a new prototype that deals with the design, development and security of a Fingerprint Electronic Voting System based on Android Application. The proposed voting system allows the voter to scan the fingerprint for examining the authentication by matching with the pre-stored fingerprint template in database by using an algorithm. Once the voter completes the verification process, the application automatically allows a voter to cast his vote using friendly graphical user interface design. The vote counting process will be done automatically after the completion of voting time and that makes the voting process efficient, fast, and secure.

**5.1 Definition of Terms:**

**E- Voting:**

E-Voting also known as Electronic Voting, it is basically a voting procedure that allows a voter to cast their vote electronically through different machines and devices in an easy and secure manner. E-voting can eliminate fake votes, speed up the electoral process, increase accessibility and make voting more appropriate for citizens.

**VVPAT Machines:**

VVPAT (Voter Verified Paper Audit Trail) machine also known as VPR (Verified Paper Record) machine used as an electronic voting device. It provides physical evidence of votes that cast in the form of paper receipts. Those receipts are readable by both the voter and machine, and later use for verification and calculation purpose.

**Biometric Verification:**

Biometric Verification is an Identification process used to authenticate a person through its fingerprints and other biological traits such as Human Eye, Voice Recognition, Face recognition etc.

**NADRA:**

NADRA known as National Database and Registration Authority is a government agency works under the interior ministry of Pakistan. It manages data of all citizens of Pakistan and also responsible for issuing NIC's (National Identity Card) to the national citizens.

**Background of the research:**

E-voting is a proactive area of research which is updated year by year by new methodologies, functionalities and new approaches. E-voting can be done through different voting machines like electronic ballot printers, VVPAT machines and internet applications etc. It is first time implemented in 1960's when punch card systems were introduced. Advance E-voting is implemented in many countries like (Belgium, Brazil, America, India etc.). Many countries even Pakistan is also considering and soon introducing Electronic Voting with the focus of improving many aspects of election process.

**“Online Voting System” Manohara A.B., NIVEDITA G, Nihal R, Sadhana D, Chowdamma N**

The Online Voting System is a web-based application. The system has a centralized database to keep records of all the Voters and Candidates and Final Results. This Online Voting System is based on SMS sending to voters, to confirmation of Vote. This web-based system is time saving, work load reduced information available at time and it provide security for the data. During the election, the election commission of India has introduced a new method of polling by online voting system (OVS). The election commission will maintain this website. This is a simple, safe and secure method that takes minimum of time.

The word VOTE means to choose from a list, to elect or to determine. The main goal of voting (in a scenario involving the citizens of a given country) is to come up with leaders of the people's choice. Most countries, India not an exception have problems when it comes to voting. Some of the problems involved include rigging votes during election, insecure or inaccessible polling stations, inadequate polling materials and also inexperienced personnel.

The objective of the system is a replacement of the traditional system that is in existence. This smart system reduces the time for voting and also the system is reliable, and faster. In this system the voter username and password will be sent

through SMS. The voter cast their vote enter the confirmation OTP sent their mobile number. Database maintained by this system usually contains the Voters information, Candidate information, The final Result of total votes.

In this paper they have proposed a web application for voting process that is Online Voting System through SMS. The online voting system will manage the voter's details, Candidate details. The main feature of the project includes voters' information and candidate information, voter can login and use his/her voting rights. The system can manage the information data very efficiently. The proposed system is more reliable, faster, accurate and easy to handle compared to existing manual system. It helps to computerize everything and reducing the errors as compare to manual voting system.

## 5.2 Software Requirements

- Operating System: Windows
- Scripting Language: JSP
- Back-End: MYSQL.
- Front-End: HTML5 and CSS3
- Supporting Tools: NetBeans IDE, JQUERY
- Type: Web Application.
- Server: TOMCAT 8.0(cross platform, Apache, MYSQL, JSP)
- Java Version: J2SDK1.5

## VI. DISCUSSION

It is compulsory to see the errors and benefits of each system, but the most important concern is the correctness of the necessary requirements. In second section we examine the different problems of the different voting system, and few researchers proposed a new idea of voting which is useful to overcome maximum problems and also increase the rate or speed of the election process. Now instantly the discussion is: Why would an offline system is the better solution for the common issues?

Different countries have already converted from paper voting to computerized voting or electronic voting. Different measures, techniques and technology were introduced to increase or raise the voter turnout, and decrease the number of fake and fraud attempts. The use of a Tablet device, thumb scanner, web base application and electronic counters as a voting machine is a solution for many problems like speed of election process, Ballot paper elimination and counting accuracy etc. In the introduction chapter we discussed that democracy needs people to come and show their determination and in India only 55% to 70% people are casted their votes in last few elections. So, the main intension of this research is to overcome on these problems faced by the voter during the elections and find out the best system that would solve these problems.

## VII. CONCLUSION

In correlation to the research all of the objectives and goals of the voting areas has been achieved positively. On the research of various voting systems, we analyzed the security risk that could harm the integrity and confidentiality of the voting process. By doing this survey we can conclude that the numbers of researchers made a positive effort to improve manual and old election and voting management system. Each technique reviewed in this review article have its own benefits and drawbacks. By doing this review we can conclude that according to the need we can choose exact system for eliminating old manual voting and election management system as per our requirement.

## VIII. ACKNOWLEDGMENT

We are deeply grateful to all those who contributed to the success of this review research paper. First and foremost, we would like to thank our primary supervisor **Prof. Dr. A. P. Jadhao**, for their guidance, support, and encouragement throughout the entire process. Their mentorship and expertise were invaluable in helping us to shape the direction of our review research and to bring our ideas to fruition.

I would also like to thank the organizations and individuals who provided me a support for this review research, including **Dr. Rajendra Gode Institute of Engineering and Technology, Amravati, Maharashtra, India**. Without their generous contributions, this review research would not have been possible.

Overall, this research would not have been possible without the support and contributions of so many people. We are deeply grateful to all of those who helped to make this project a reality, and we hope that our findings will make a meaningful contribution to the field.

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