

Design and Development of Internet Voting System

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Abstract: *The explosion in the use of information technology and the widespread use of the Internet makes information and communication technologies to get their inevitable benefits. Some of these benefits are accuracy, speed, cost saving, etc. Election and voting are one of the cases which have recently tended to be performed electronically. Web services, due to their PROS, may have a key role in usage and deployment of e-voting systems. The voting system is the backbone of every democracy and organization. The voting system has experienced many efficient changes in the past few decades. There are various voting techniques used such as Paper Ballot Voting System, E-Voting System also known as Electronic Voting System, Internet Voting System. In this paper, we have put some trends of various voting systems and their scopes. The primary goal of this research is to make the voting system multipurpose and make it work multiplatform on any system.*

Keywords: E-Voting System, Internet Voting System Paper, Ballot Voting System

I. INTRODUCTION

Voting is an extremely hard and tiring process since the voters should individually go to voting places. This will decrease the rate of attendance of people in elections. Voting through mail can be suitable, especially for those who live or work in faraway places. Still, this method is time consuming and difficult because the casting ballots, gathering and tallying the votes are done manually. Internet voting or e-voting can solve this problem. Existing studies have pointed out that e-voting will increase public attendance in elections. As the number of service-oriented applications is increasing, the importance of dependability of them increases, too. [1]

A successful voting system can only be carried out when the masses are involved in the voting process. To make this a reality the voting system should be accessible to the voters without making them stand in a long queue outside the voting booth. Over the years many systems and ideas have been implemented and imitated to achieve a voting system. The main goal of this idea proposed is to encourage more people to vote remotely wherever they are, whichever smartphone they are using to reduce the time consumption and make it more flexible and possible for the people.

II. RELATED WORK

2.1 Existing Voting Systems

A. Paper Ballot System

A voting ballot system which was used in most parts of the globe for many decades. In this system, the voters cast their votes on a paper and stamp. The users cast their votes at a voting booth.

B. E-Voting System

Subsequently, the E-Voting System came into prominence and replaced the conventional Paper Ballot system. An E-voting system is a type of voting system in which voters cast their secret vote using the electronic ballot. [2]

Many countries have made several attempts to replace the traditional paper-based voting system with modern voting technology. Literature suggests that these improvements started as early as in 1892, then the introduction of optical-scan machines and punch card systems for voting. The next evolution saw the introduction of Telephone, and Internet voting systems. Very few countries have tried to implement e-voting and country like Estonia has implemented e-voting at a

large scale. A vast number of countries have either piloted or implemented e-voting (fully or partially) but very few have been successful.

The table below lists some of the countries who have implemented e-voting. [3]

Country	Voting Population	Election type	Year introduced	No of elections in use	Problems
Estonia	9 000	All levels	2005	6	None
Geneva	185 526	All levels	2001	8	None
India	770m	State	2001	4	None
Spain	300 000	Municipal	2002	1	None
Brazil	140m	All levels	1996	4	None
Namibia	1.2m	National	2014	1	None
Belgium	3.2m	General & municipal	1994	1	Failed
Ireland	4.5m	State	2002	2	Failed
Australia	218 000	ACT federal	2001	1	None
Philippines	52m	State	2010	1	None
UK	1.5m	Local govt	2000	2	None
Canada	98 000	Municipal	2002	1	None

Figure 1: E-voting systems implemented around the world.

C. Internet Voting

It is also known as remote e-voting and is the latest e-voting system introduced. In this system, the voter can directly vote on an application using a web browser from any part of the globe.

Some criticize Internet Voting from the position that traditional voting does not share the same vulnerabilities. While in some cases this is true, in far more cases it is not: traditional voting is extremely insecure and not at all conducive to open, transparent elections. Traditional voting ballots are never made public, so there is no guarantee that the tally is exact. Whether by corruption or incompetence, both paper ballots and stationary voting machines can have their results compromised. Internet Voting, on the other hand, can publish the ballots in a privacy maintaining way, revealing the election results, and allowing voters to know with absolute certainty that their vote is counted. It can run as free software, allowing the public to audit the code and expose attacks. It can restrict access to sensitive data to comparatively few people, allowing for security professionals to preside over the election instead of thousands of poll workers.

III. E-VOTING SYSTEM OVERVIEW

3.1 Scope and Limitations of Voting Systems

A. Paper Ballot Voting System

PROS

- **Ease:** Paper Ballot Voting System is the most common and easiest way for the voters to cast their votes. Uneducated people can also vote with ease.
- **Less Costly:** As there is no external device and resources involved it is cost effective only the human resources are needed as the voters do not have to pay anything.
- **Portable:** This voting system can be carried out easily at any place with the help of the workforce.

CONS

- **More Time Consuming:** It is a very sluggish process. As voters must stand in a long queue and only Single voter is allowed to vote at one time.
- **Less Secure:** The voting booth can be hijacked by political parties. This is known as election frauds which are seen in many cases.
- **Low Evaluation Speed:** As this is a Paper Ballot voting system it takes time to manually count all the votes.

B. E-Voting System

PROS

- Flexibility: Since the system works on electronic devices with few changes to the design these devices can be used for various ballot formats.
- Cost Effective: It is reasonable as the E-Voting system is a one-time investment. Later expenses can be recovered.
- Fast Computational Speed: As this is an E-Voting System the results would be declared prompt as soon as the voting is over.

CONS

- Vulnerable: As there can be any external threat to the system.
- More Power Utilization: As these is electronic device thus requires more electricity. There are places which lack electricity so over their E-Voting System is not a good option as the electronic device battery exhaust fast.
- Expensive: E-Voting System is an expensive device.

C. Internet Voting System

PROS

- Mobility: As this system works on the Internet it can be accessed from any part of the globe.
- Swift: This system works faster because at the same time multiple voters can vote. The voters can vote using an application on theirs thus not making them stand in a queue.
- Reutilize: The system can be reutilized again with nominal changes in the system

CONS

- Complexity: The user interface is complex thereby making it difficult for the user to understand the concept of internet voting.
- High Cost: Internet Voting System is more expensive than other voting systems. The system is costly because there are hardware and software requirements which need to be fulfilled.
- Security Issues: As this system works on the internet there is a chance of the system getting exposed to vulnerabilities such as the attack on the system by hackers.

3.2 Implementation

A. Background

E-voting refers to a voting process which is done using electronic tools. In an Internet voting system, a voter can cast his/her vote from home or working place. The benefits of Internet voting include accuracy, speed in tallying, cost efficiency and avoiding public traffic. Internet voting systems have six main stages, which are shown in Figure below.

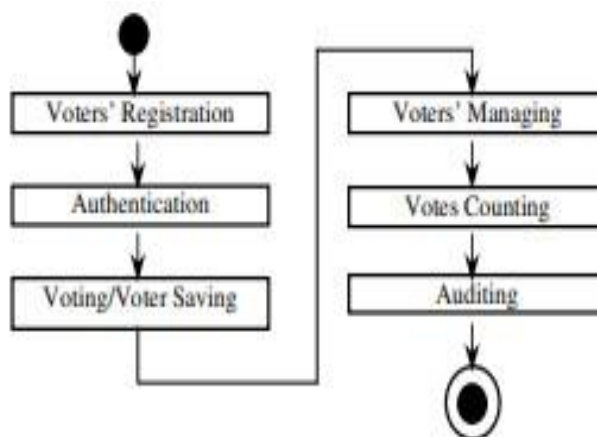


Fig 2. Main Stages of Internet Voting

IV. DESIGN OF THE VOTING SYSTEM

The system consists of three phases: -

1. Creation of Voting Ballot.
2. Voting Phase.
3. Result Declaration Phase

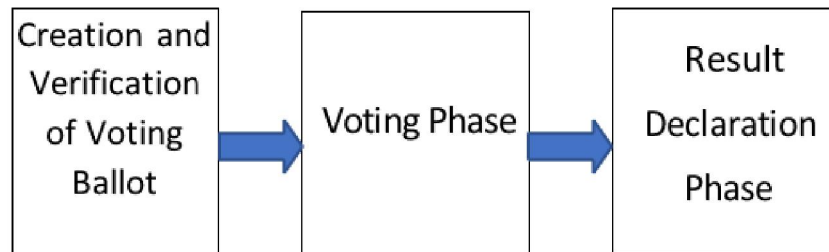


Fig 3. Phases of Internet Voting

V. SCENARIO FOR A POSSIBLE ATTACK

5.1 Weakness of Internet Voting

During our research, we uncovered many potential vulnerabilities that Internet Voting poses. The act of putting information onto the internet inherently exposes it to attack in a way that localized storage does not; attacks can originate from anywhere, at any time. Many critics use this to say that Internet Voting is inherently insecure and can never be made useful, but most vulnerabilities can be negated or mitigated with proper implementation, and in many cases traditional voting experiences the same vulnerability; often worse than Internet Voting does. It should be mentioned that to be considered the superior system, Internet Voting does not have to be free of flaws; it just must be better than traditional methods.

A. Attacks on the Server

A single overlooked problem can bring down an entire system. Shell injection, password guessing, etc. all allow an attack to be made by obtaining privileges the attacker should not have. This is a very real vulnerability, but it can be mitigated with proper management and careful attention to security. Further, attacking the source of ballots is hardly unique to Internet Voting. Traditional polling locations are often comically insecure, with boxes of ballots being kept in the trunks of cars or underneath unguarded tables, protected by nothing more secure than packing tape. Meanwhile, ballot readers usually run proprietary firmware that can be cracked and changed, and the machines are often stored in officials' garages or in school gyms where attackers can easily gain access. Compare that to Internet Voting, where open-source code can allow for thorough security audits.

B. Attacks on the Client

Voters can be lied to with altered interfaces, fake websites, or malicious tech support. Voters can have their credentials stolen through network snooping, social engineering, or simple breaking and entering. Meanwhile, the vulnerability to social engineering and malware can be counteracted with education. By informing voters of the dangers and how to protect against them, the risk of attack can fall dramatically. Of final note is vote selling: a very real danger posed by remote, credential-based voting. A malicious individual offers voters money for their voting credentials, then votes as them. Many voters do not care about elections, and the more unscrupulous among them could potentially sell their vote. Practical solutions include tying authentication to the self in an unsellable way, with biometrics, or making the credentials something sensitive that a voter will not want to reveal to the sort of person who buys votes, like a social security number. Neither one is a perfect solution, however, and they pose their own problems.

5.2 Strengths Of Internet Voting

For all its drawbacks, Internet Voting has many PROS as well. As previously mentioned, when properly done Internet Voting is more secure against traditional voting, and it has many outright superiorities too. These include transparent

results, strong credentials, the potential for competent authorities, and better convenience. These are things that traditional voting cannot match.

A. Transparent Results

In traditional elections, voters must simply accept the final tally. There is no way for voters to audit the results and know for sure that their vote has been counted. When conducted under poor management, traditional elections often misplace or miscount votes, sometimes in enormous quantity. Internet Voting can remove all the uncertainty and chaos involved in tallying votes.

B. Strength of Credentials

In traditional elections, the credentials that must be presented to vote are often insecure and easily forged, Drivers licenses are famously counterfeited in masses by teenagers looking for alcohol, voter registration cards are often nothing more secure than a postcard, and even in nationwide government elections, it is common for the only credentials necessary to gain entry to the voting booth are a valid name and address. This opens the door to potentially critical security holes in an election's results as people not eligible to vote are counted anyway and malicious voters make circuit tours of polling locations, voting for everyone. Internet Voting, with secure authentication systems, enforces that only eligible voters may vote and that they may vote only once. This more than anything else reduces the impact of vote buying; while it is true that some votes cast in an Internet Voting system may not be legitimate, the elimination of multiple or unauthorized voting could act as an offset and could easily result in a net decrease in illegitimate votes.

C. Convenience

While by no means as important as the above, it should not go unmentioned that voting from a computer instead of a polling location is more convenient. Aside from simple comfort, this has been shown to increase voter turnout at the local level. While nation-scale elections are unaffected, public interest being high enough for civic-minded people to endure voting booths, the convenience of E-Voting prompts many potential voters to take part in less publicized elections when they might otherwise be unwilling to do so.[4]

VI. CONCLUSION

Internet voting is not perfect, and it does not guarantee perfectly secure elections. However, it does have the potential to deliver much more security than archaic methods of voting and supplies its unique PROS as well. When carried out competently, using a protocol that properly takes advantage of the power of Internet Voting, an election of any size or weight can be carried out on the internet with the results published and available to everyone in a secure, private way. Our research has led to the conclusion that Internet Voting is a clearly superior method by which to carry out elections; its myriad of PROS outweighs its relative drawbacks. As with any modern technology it is still being developed and our yet-evolving protocol and implementation have and will continue to contribute to this.

REFERENCES

- [1]. Omid, Amir, and Mohammad Abdollahi Azgomi. "An architecture for e-voting systems based on dependable web services." *2009 International Conference on Innovations in Information Technology (IIT)*. IEEE, 2009.
- [2]. Usmani, Z. A., et al. "Multi-purpose platform independent online voting system." *2017 International Conference on Innovations in Information, Embedded and Communication Systems (ICIIECS)*. IEEE, 2017.
- [3]. Mpekoa, Noluntu, and Darelle van Greunen. "E-voting experiences: A case of Namibia and Estonia." *2017 IST-Africa Week Conference (IST-Africa)*. IEEE, 2017.
- [4]. Butterfield, Kevin, and Xukai Zou. "Analysis and implementation of internet based remote voting." *2014 IEEE 11th International Conference on Mobile Ad Hoc and Sensor Systems*. IEEE, 2014.
- [5]. Zou, Xukai, et al. "Assurable, transparent, and mutual restraining e-voting involving multiple conflicting parties." *IEEE INFOCOM 2014-IEEE Conference on Computer Communications*. IEEE, 2014.
- [6]. Armen, Chris, and Ralph Morelli. "Teaching about the risks of electronic voting technology." *Proceedings of*

- the 10th annual SIGCSE conference on innovation and technology in computer science education*. 2005.
- [7]. Patil, Mayur, et al. "A Survey on Voting system techniques." *International Journal of Advanced Research in Computer Science and Software Engineering* 3.1 (2013): 114-117.
 - [8]. Achieng, Mourine, and EphiasRuhode. "The adoption and challenges of electronic voting technologies within the South African context." *arXiv preprint arXiv:1312.2406* (2013).
 - [9]. Prosser, Alexander, and Robert Krimmer. "The dimensions of electronic voting—Technology, law, politics and society." *Electronic voting in Europe-Technology, law, politics and society, workshop of the ESF TED programme together with GI and OCG*. Gesellschaft für Informatik eV, 2004.
 - [10]. A. Das, "Usability of electronic voting system in India and innovatory approach", *International Journal of Applied Science and Engineering Research*, 2015, 4(5), 633-642.
 - [11]. Baskonus, Haci Mehmet. "New complex and hyperbolic function solutions to the generalized double combined Sinh-Cosh-Gordon equation." *AIP Conference Proceedings*. Vol. 1798. No. 1. AIP Publishing LLC, 2017.