

SECURE E-VOTING PRINCIPLES

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Abstract: *Voting is a means to strengthen the democratic processes in modern world. E-voting is a new voting mechanism in information world. It is important that this system is in compliance with legal framework. E-voting must technically meet user requirements and more importantly security requirements. This paper aims to identify the basic legal requirements, which should be met while designing an e-voting system. This will establish faith in legal acceptance of e-voting system by ensuring that its secure. These requirements come from original way of voting using ballot box. The paper concludes that an e-voting capability should be considered dependable and can be used to replace traditional election processes as long as it operates under the established and secure framework. This is important in developing countries as elections happen at various levels all the time and this ensures fair, speedy and low cost election. These can however also be used to complement the traditional process, if masses find it difficult to replace it as there is digital divide, related to inherent distrust in the e-voting procedure. And at certain places there may be inadequate arrangements to meet certain requirements.*

Keywords – E-voting, secure voting, requirements of voting, voting acceptance

1. INTRODUCTION

The Information Society has enabled people to perform various activities in an automated and efficient way. To reduce the cost and bring transparency in administration, governments are increasingly moving to IT and automating most general operations. This helps in catering to masses especially in developing countries like India. The most important democratic process is being moved to electronic media. This is a revolutionary process but amid multiple challenges.

In this paper, e-voting refers to general elections being held with help of electronic machines. Many authorities are concerned with the compliance of electronic voting systems with the existing legal complications. The first aim of the paper is to discuss whether an e-voting scheme could meet the legal requirements. Secondly, does this mechanism meet all features of traditional voting process and thirdly, is it secure enough to be accepted by masses of the democratic republic of India as this is the sheer definition of democracy that people are the decision makers. The paper discusses designing model of such e-voting process that can be secure enough to be trustworthy of masses as well as fulfills all legal and democratic requirements. The three main usability criteria can be summarized with following parameters: efficiency, effectiveness, and satisfaction [1].

The aim of set up of Election Commission of India (ECI) was to define and control the structure of the election process in India. This is one most important body that helps preserves democracy of our country. The ECI has direct control over the supervision of the complete process of election. This is independent of any political bodies involved. With the power comes responsibility. Before proceeding to understand the principles, this paper studies the role of election commission in conducting free fair elections.

- ECI has responsibility for conducting a fair election
- It has to ensure that the political parties and their candidates who are contesting, do so ethically.
- It ensures that the parties are eligible to contest and then registers them.
- ECI has a prescribed limit on the campaign expenditure for all parties. The adherence to that needs to be monitored.
- ECI needs to have a set of rules communicated to all for conducting elections.
- Besides, ECI has to work on preparation of electoral rolls, allocation of symbols and determining the geographic distribution of constituencies

Among assigned responsibilities, it has to design the process of conducting elections in most efficient, effective and low cost manner. The developments in technological field that may have an impact on the basic guiding principles of an election should be reviewed carefully. In literature, there have been many types of e-voting that have been discussed, some can be identified as legal, technical and have user orientation. Also to be acceptable, certain conditions in the system should be met. Although there may be multiple approaches that are acceptable e-voting systems have not yet evolved into a complete sustainable system [2-3].

Efficiency being one guiding principle of voting process, is defined as the relationship between the level of effectiveness achieved and the cost incurred which is defined not just by monetary but also in terms of time. Efficiency is a usability metric that measures whether the goal was achieved without it being too costly. It is important to ask if voting took an acceptable amount of time. Effectiveness being the second objective usability metric is defined as the accuracy with which this goal is achieved. In the context of voting, accuracy means that the vote cast for a particular candidate is counted for the same candidate without error. Satisfaction of a voter is higher level objective to achieve. This includes parameters like voter confidence about accuracy in vote recording. Measurement of satisfaction can be done in modes like an external, standardized instrument, usually in the form of a questionnaire. This paper proposes the development of a generic e-voting model by incorporating practices to be followed during an election procedure.

Challenges of e-voting	Advantages of e-voting
One important challenge is to make machines and required machinery available to remote and rural areas.	Rural areas will feel connected to urban population.
Privacy and Secrecy of the vote being cast. There may be apprehensions pertaining to whether the vote is being monitored	It permits voting in a decentralized manner and small booths can be created, where tempering can be avoided.
Security and accuracy of vote being cast.	In paper ballot, it may be more feasible to temper than the machine, as any tempering may be recorded.

The key solutions that can ensure the challenges mentioned in Table1 can be overcome are: a) to adapt the existing regulatory framework to e-voting framework, b) To boost competitive model in acceptance in rural areas and give training sessions to demonstrate the working of the above. This will encourage widespread acceptance by all citizens, c) to ensure a total reliability on the factor of user privacy protection. This is about democracy in question, thus all measures must be taken and principles adhered to so that we can ensure equivalence to conventional election. It is important for election procedure to be transparent and subject to public scrutiny. In general, the Constitution requires that elections respect Equality, Secrecy and Freedom to vote. This implies that certain rights stem from that:

1. Every voter can take part in the democratic process.
2. The Laws in place for ability and eligibility to vote must be followed.
3. The means of voting should be accessible for every voter.
4. E-voting should be thought of as a way of using one's voting rights. In fact a means of voting that can provide equality, secrecy and freedom should be considered as an alternative.

2. LITERATURE REVIEW

Authors in [2] have proposed CyberVote, a system for innovative voting using cyberspace. This is a research program that is under grant by European Commission mainly. Also due to popularity of the concept and the way current world is evolving, this concept is not far from being implemented in whole. Due to the nature of the CyberVote project in which multiple activities run in subsequent mode, the activities have been broken into some tasks. First one being finding a way for user identification, Secondly bringing out the important requirements. This can also be called elicitation phase. Third one being specification and modelling task. In this specifications are prepared for the process. Then the next task involves validation and evaluation of the concept and process based on requirements. All the steps proposed are aimed at ensuring integrity, secrecy and all required criteria for a fair voting process.

If remote Internet voting is eventually adopted, then the system at present requires that this is modeled prior to the absentee ballot process. This process is a requirement in the state of California. This process is important to know authentic voters in advance. Although to model Internet ballot will increase complexity but to tie voters from existing paper registration system, this is the only way. Security being an important aspect of the process, measures for the most important democratic process cannot be hard to implement. Also, having a cumbersome process for accessibility is unacceptable if technology is to be made popular. Thus a balance between security, accessibility and ease of use need to be attained before preparing strategy for Internet voting systems. This means a secure and secret e-ballot needs transmission over internet. A machine for vote refers to computer hardware to allow to cast vote over internet. The implementation is proposed in couple of phases. In the first one, a supervised electronic voting in parallel to traditional polling takes place. This phase is just aimed at verifying and understanding parameters that are anomalous to traditional ones. There is no advantage of e-voting just testing vote integrity. In second phase, voters will be able to cast e-vote and voters will be authenticated with both data, the one collected in manual manner and other one electronic procedure [3,4].

This paper discusses issues with e-voting. An issue arising is whether participation in the election through e-voting should be subject to the proof of special conditions, as is the case with postal voting. The evolution towards the Information Society has a significant impact on the ability of a citizen to exercise his rights. It advocates use of e-voting as hybrid model of both e-voting capability in addition to the traditional voting system. Eligibility and authentication may be ensured with the help of the registration based on voter eligibility and identification at the time of registration[5-6].

The challenges posed by e-voting are threats to integrity and confidentiality. An example is if an employee votes from a workplace, system administrator may be able to monitor it. This can also further lead to forced voting, thus vote must not be traced by another entity. This threat is posed due to inequality in the relations and boss and employer having capability to put pressure on employee. Thus new guidelines need to be enforced for evoting that vote can be cast at certain congenial places. Also screen shouldn't be visible to anyone else while casting vote for which design system needs to be created so that no part is highlighted while casting vote but the voter still be able to know whom he has cast his vote. Also any advertising needs to be disabled at the time of casting vote so that voter can exercise his rights freely. The free expression of the preferences of the voter should be ensured [8-10].

3. PROPOSED PRINCIPLES

It is essential for any voting means to accurately incorporate into the model, the constitution principles. Thus we list all the basic principles in table 1 to be followed which modelling a new means along with the requirements of the constitution against those principles. These principles in essence ensure fair elections where universal adult franchise is respected and those who are eligible abide by the laws.

Table 1.

Constitutional Requirement	Vote Designing Principles
Generalism	Similar to traditional form in criterias like eligibility age etc.
Freedom	No invalid voting; no forced votes
Equality	Candidate equality despite diversity; equal weight of each vote.
Secrecy	Transparent system; vote secrecy is maintained like in traditional means.
Democracy	Verifiable and reliable in terms of voting.

When voting via electronic machines is employed, still having a means to identify the candidate as well as ensuring he is eligible to vote will permit meeting 1st principle. Thus means of voting must still have a central place where all voters go to vote and all the eligibility criteria are checked. These procedures do not conflict with the model as these are traditional means and well verified and capable of preventing any fraud. On the other hand, a total internet-based voting could be vulnerable to an identity theft. Having to maintain a voter list as part of traditional practice permits right candidate to vote. Also verifying those identities on the centre, ensures that there is no identity theft.

Another principle is freedom. This principle requires that the election process take place without any candidate being forced to vote for a particular candidate. The e-voting using machines doesn't replace the traditional concept of freedom in voting, so there is no conflict there. The third principle is Equality. The requirement of equality can be split into two parts: one is equality regarding the participating political parties and candidates and second one is equality regarding the voting rights of each voter. Another principle of equality has to ensure fair and equal chance to all candidates. This means the machine has to ensure that look and feel and symbols of all candidate is as per norms. Another element of equality among the integrity of all votes is equally maintained and counted. A valid vote must remain unaltered and all participating candidates should have the opportunity for equal access to the elements of the voting procedure to ensure its proper functioning. Equality also requires that each vote must all carry equal weights. Another aspect of equal accessibility means that voting system be independent of a voter education, physical condition (to accommodate physically disabled voters). An e-voting system should ensure that the one voter - one vote principle is respected, that is only eligible voters can vote only once, on paper or using machine. The system should avoid, duplicability of the vote or reuse of the vote. Secrecy and freedom are related principles. It should be a one way function. In democratic elections a vote should not be linked to a voter. In traditional voting systems secrecy is physically protected, and using the voting machine in the similar scenario will help. The last principle being, democracy. A democratic e-voting system should at least meet the requirements of a traditional election system. Some additional requirements in regard to upkeeping the democratic procedure, properties such as transparency, accountability, security, accuracy and legitimacy of the system have to be ensured. The system in place should allow its verification by voters, by election officials, parties and independent observers. An additional requirement of an e-voting system is Accountability. This means it covers responsibility of the logging and monitoring of all operations related to e-voting. Reliability and security requirements are important and derived from the democratic need to ensure that the outcome of the election reflects correctly the voter's will.

4. Conclusion

Transparency is a hard requirement to achieve but with right awareness campaigns, this motive can be achieved. Introduction of technology in voting, itself is a step towards transparency. Therefore, in e-voting a balance is strive between trust technology and people. Having electronic ballot machine is a mid path between traditional and electronic voting. A successful implementation and acceptance will be a futuristic step to achieving fully electronic voting system.

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