

Analysis of the Strengths and Weaknesses of Online Voting Systems: the Way Forward

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Abstract: *Electronic voting promises lots of benefits to the electoral systems to include, timely delivery of elections, minimize cost for running elections, minimize coercion and votes buying in elections, eliminate double/multiple votes cast by an electorate, reduce risks and violence associated with elections, etc. It is notable that electronic voting pave ways to so many security issues like any other cyber system. This paper examines the strengths and weaknesses of electronic voting and proffers possible means through which the online voting systems can be improved upon to overcome the associated security challenges. Conclusion was also discussed.*

Keywords: *Security, end-to-end, blockchain, VOX*

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I. Introduction

Election is a system used in most democracies for the selection of officers to occupy public offices. Election varies from place to place depending on the political structure, ethnicity, social, economic and technological status of the people. However, election requires electoral body which pilots the affairs of the election. [14] states the need for election to include;

- i. It gives people the opportunity to elect their representatives
- ii. Election creates political competition among parties and candidates.
- iii. It gives opportunity to deserving and capable people to be presented.
- iv. Election is a better method than selection.
- v. It gives political parties the opportunity to form a government
- vi. It gives independent candidate the opportunity to contest election and win.
- vii. Without election, a state will experience anarchy.
- viii. Election will help a society to avoid autocracy, Monarchy or dictatorship

One of the most powerful tools used in elections in a democratic setting is voting. Voting is a process where the opinion of the masses is individually expressed, and collected to decide a candidate into an election with the highest popularity, who eventually becomes the people's choice and winner of the election. Voting is one of the longest activities carried out in a democratic country, [9].

Election is expected to be free and fair, void of any form of encumbrances. It is a civic responsibility for citizen to freely and willingly express their franchise. Unfortunately, for quest of power, the electoral processes has been bastardized leading to self imposed officers on seat of power with anti-peoples' style of leadership [5]. This has led to a lot of crises including wars, unwanted killing, destruction of properties and a lot of social vices which are inimical to human existence.

To improve on the system, technology and ICT tools were introduced into elections. This led to the emergence of electronic voting system, which was intended to minimized malpractices in election. [15] noted that the application of electronic in voting will yield;

1. Protection of right on franchise
2. Regionalization of political positions
3. Prevent electoral fraud
4. Prevent election violence

Mobile voting is an aspect of electronic voting which allow voters to cast their votes through their mobile devices. It is seen as a significant improvement on electronic voting with improves speed, security and independency of voters.

This work takes a detail look on the strengths and weakness of mobile voting with the expectation to come up with useful suggestions to better the application of mobile devices in electronic voting.

II. Literature Review

Electronic Voting

[1] defined electronic voting as the use of computers or computerized equipments to cast votes in an election. Electronic voting is one of the ways of conducting credible election. It was first used in conducting local elections in Estonia [11]. Electronic voting is voting with the aid of electronic devices such as computer network, telephone, internet, mobile devices etc. [11], electronic voting gives voters the opportunity to vote from any where they may be. It has removed the barrier of compelling voters to move from one place to the other in order to vote in an election. Electronic voting employs information technology in voting which gives voters proper awareness where an average person has correct and proper understanding of each event in the electronic processes, and also demands high level of transparency in the electoral process [13].

Electronic voting is a voting system where data and procedures are recorded, stored, and process basically as digital information [3]. [4] defines electronic voting as a voter system that involves the use of computers. Electronic voting improves voters' security, increase awareness and reliability of the voting process, improve speed and reduce the cost of running election significantly.

Mobile Voting

Mobile voting is an aspect of electronic voting which makes use of mobile devices for voting such a mobile phones at the voters end. [7], defines mobile voting as additional platform to the electronic voting system. Mobile voting is intended to improve effectiveness, efficiency and satisfaction [10]. They further stated that mobile voting will improve on the objectives of electronic voting which include;

1. Accuracy: Vote casted should not be altered; invalid votes should not be deleted from the trial tally.
2. Democracy: Only eligible voters should be able to vote, and should vote only ones, that is, no double or multiple votes should be accepted from an eligible voter.
3. Anonymity: A vote should be dissociated from the voter. Voting should be secret such that the choice of a voter should not be known to the public but his or her vote should counts.
4. Verifiability: A voter should be able to verify that his or her vote counts.
5. Mobility: A voter should not be restricted from voting based on geographical locations.
6. Usability: The system can be used by intended uses to achieve specific goals.

WEAKNESS OF ONLINE VOTING

The weakness to the integration and total deployment of mobile technology in voting begins from awareness, policy and technology. Different countries of the world have different views of mobile technology when in relation with voting. The civilized and developed countries have what it takes to deploy mobile voting in their electoral systems technologically, while the developing and the underdeveloped countries have lots to put in place to fully deploy mobile technology in voting.

The Journal for trans-disciplinary research in South Africa mobile, listed three points where mobile voting is challenge [1];

1. Legislature: The unwillingness for government of the day to legislate on policies that support the development of mobile voting electoral systems. This is mostly in Africa where the legislators may not have seen the purported benefits of the mobile technology in voting, or may be the fear of not been able to influence the system to selfish advantage, lack of adequate ICT knowledge, or whatever. The paper reveals a strong resistance by politicians for full scale ICT transformation of governance in Africa. Namibia is the country in Africa that opted for electronic voting and subsequently used mobile voting in their general election of 2014.
2. Lack of trust in the security and the reliability of the technology used to implement mobile voting; Mobile voting is a new technology that has not gained a wide deployment in the electoral processes. Many have fears of the strength of its security in ensuring free and fair election void of any form of malpractice. In like manner, the technology for the development of mobile voting is still doubted. Considering the crop of politicians today, especially in Africa where public offices are seen as business will go all lengths to ensure that they crook any voting system and take advantage of the system. In a situation where the electorates do not have clear understanding of the security situation of the system and the technology used in deploying the mobile voting system, will surely raise doubt and discourage its support.
3. Complete control by government: The electoral system is to deliver the people's mandate. This is primarily required to curb the exercises of political office holders and enjoy the dividence of governance. For fears of having a system that may be twisted and will not deliver the peoples' mandate affects the choice for massive support for mobile voting deployment.

[15] noted that some countries turn down electronic voting system for fears of;

1. Suspicious and mistrust from opposition political parties: They noted that German, Ireland and Netherland rejected electronic voting majorly due to opposition party. A test was carried out on a single e-voting

system by NEDAP electronic voting systems developed by a Dutch company which led to the decision to turn down e-voting in their countries. The fears alleged include;

- Doubt in the accuracy and security of the e-voting machine.
- The possibility of result verification
- The constitutional use of e-voting system.

The United Kingdom experimented e-voting in 2002, 2003 and 2007, but back out due to security complain.

[2] listed the following as challenges for the implementation of electronic voting in Nigeria;

1. Difficult topographic terrain
2. Lack or pressure group in support of electronic voting system
3. Inadequate transparent mechanism which favors the existing electoral officials.
4. Lack of constitutional positions in support of e-voting
5. Poor ICT infrastructure
6. Lack of viable electoral management bodies
7. Lack of technological and managerial expertise
8. Security and reliability of the E-voting technology
9. Lack of e-voting technology
10. Tension from political environment
11. Behavioral change
12. Technology acceptance.

III. Strength Of Online Voting

Mobile voting as an aspect of electronic voting cannot be separated from electronic voting. It is an inclusion to electronic voting platform to support mobile devices in voting. Mobile or electronic voting was introduced to tackle the many problems associated with the manual voting to includes; costs of physical ballot papers, overhead cost of running the election (staffing, training, movement of materials, security, etc.), conflicts due to contacts between voters, electoral personnel, politicians and their thugs, results alteration/changing, double/multiple voting/thumb printing of ballot papers illegally, votes not counting, etc. [7].

[6] observed that manual voting leads to low and unequal voters turn out.

Electronic voting promises amelioration of the challenges associated with manual voting.

[1] noted that South Africa can leverage on the opportunity offered by electronic voting to curb tedious, non-secure and time consuming features associated with manual voting. They further opine that electronic voting will employ mechanisms to inform, consult and broadly engage citizens in the use of ICT in political process.

The electoral institute of South Africa reports No. 12, 2009 reports that ballot paper are costly leading to drawback of paper based electoral system. Mobile voting system is employed to deal with issues of electoral fraud, and improve on voters turn out among Youth [17].

[1], and [7] listed the following as strength in Electronic voting;

1. Reduce cost of voting
2. Voting in any language convenient to the voter
3. Tackling social, technical, political, legal and economic issues associated with elections.
4. Serves as enabler and a convenient way in involving citizens in political decision.
5. Mobile voting is cheaper to implement in voting
6. It simplifies and eases access to the integration of persons and institutions in political process.
7. Input to political decision-making can be improved with mobile voting, thereby increasing their democratic participation.
8. Electronic voting eliminates queue during voters' registration and voting.
9. Voter has no geographical restricted from voting.
10. Provides simple avenues for the illiterate and disable to vote.
11. Reduces manpower requirements and pulling places.
12. Provides efficient and fast means for votes counting
13. Restores voters confidence
14. Eliminates or reduces double/multiple voting maximally.
15. Provides secure means to transmit election results
16. Provides efficient avenues for voter education
17. Relays messages associated to election fast.

IV. Way Forward

Mobile voting has been identified with many challenges. This has been the reason why many countries find it difficult to fully implement mobile voting in their elections. Jake Brown, Executive Director, Cyber Policies Initiatives, CEO, Cambridge Global Admins observed that the DEF CON method of sending ballots over email like the military does, is incredibly insecure (Keeping Votes Secure)

Andre McGregor former Cyber Special Agent, FBI, a principal ShiftState Security noted that, mobile voting has incredible security challenge [12].

In the phase of all the security challenges with online voting, electronic voting remains the sure hope for free and fair elections for true democratic settings. Andre McGregor posits that the risks associated with online voting can be mitigated with mature engineering using effective security tools that are already built in or added to today's smart phone technologies [16]. The work of Nicole Goodman 2007 suggested that keeping vote secure and VOX raised glue will be a measure to improve on online voting security to guarantee better voting systems.

According to [16], the following are ways to improve on mobile voting as to have secure mobile voting systems;

1. The need for contextual appropriate authentication credentials that meet security standards
2. The need for integration of end-to-end verification in voting systems.
3. The incorporation of blockchain in online voting
4. Testing and implementation of online voting systems should be slow, while research and active collaboration with outside experts should be constant.
5. Technology and legislation on online voting should be a continuous process.
6. Emphasis should be placed on standards, especially as relates to security.
7. There should be adequate awareness on technical knowledge of election by engaging with experts, and developing an in-house technical unit.
8. Electors and candidates should be educated adequately on online voting.
9. A security framework that includes end-to-end verifiability, regular security audits should be carry out by independent experts, and appropriate authentication method should be legislated and enforce.
10. Evaluation of online framework for online voting prior to a trial should be developed.
11. The use of cryptography and identity verification framework should be integrated in online voting.
12. Security anonymity and transparency framework should be used for online voting systems
13. Biometric techniques should be used as one of the means for authentication and verification in the blockchain.

V. Conclusion

Online voting promises timely, effective, and efficient free and fair elections, which is the core requirement in true democratic elections. However, it is noted of its lots of security challenges. With the introduction of today's mobile phone technologies with fascinating features to include biometrics authentication technology, mobile voting will mitigate security challenges with online voting to bearable minimum.

Blockchain with end-to-end verification also has a window opportunity to securing online voting. The inclusion of cryptography, security anonymity and transparency of voters will as well enhance the security of mobile voting systems to serve better for all forms of elections.

Legislation and exposure to scrutiny by external experts will help to curb online voting frauds.

It is therefore, beneficial to improve on online voting systems in its design to accommodate good security features that will proof it from frauds, and enable for the harvesting of the plenty benefits associated with the systems.

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