Chapter 22
Developing a Secure Integrated E–Voting System

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ABSTRACT

The electoral system is paramount to the survival of democracy all over the world. Current happenings around the world, particularly in the developing world where poor conduct of elections had left a number of countries devastated are of great concern to world leaders. Therefore, efforts are ongoing to introduce a voting system that is transparent, convenient and reliable. This chapter presents an overview of an integrated electronic voting (e-Voting) system comprising: the electronic voting machine (EVM), Internet voting (i-Voting) and mobile voting (m-Voting). Similarly, issues of interoperability of the integrated system are discussed as well as the needed security measures. It is however recommended that emphasis be directed at EVM for use within the country while others are restricted to special cases of remote voting for citizens living abroad or living with certain deformities.

INTRODUCTION

In democratic societies, voting is a prominent tool for collecting and reflecting peoples' opinions. Traditionally, voting is conducted in centralized or distributed places called polling booths (Yang et al., 2006). Before the Election Day, the entire voting population is delineated into reasonable sizes of not more than 500 people per location and polling booths situated in each location across the country. At the booths, votes are cast by each eligible voter under the supervision of electoral officers with party representatives in attendance. At the close of the Election Day, votes are counted manually and the result taken to the collation centres where they are transferred to the state/regional headquarters for announcement. The rapid and extensive developments of Information and Communications Technologies (ICTs) have transformed the contemporary industrialized societies

into a network of societies called Global village. With the increasing penetration of the society by ICTs, their applications in public administration (e-Government) and in democratic decision making process (e-Democracy) have brought about meaningful developments over the conventional systems (Ayo *et al*, 2007).

The term ICT embraces all electronic devices such as the wired and wireless networks including the Internet. Hence ICT offers various platforms of implementation like the Internet (i-Government, i-Business, i-Voting etc); the wireless or mobile platform (m-Government, m-Business, m-Voting etc); and the wired platform (e-Government, e-Business, e-Voting etc). However it must be noted that all the platforms are electronic in nature but for specificity, they can be so categorized (Pierre *et al*, 2006).

Electronic voting (e-Voting) is one of such areas where the impact of ICT is sought globally, particularly in the developing nations of the world, to help ameliorate some of the problems plaguing the electoral processes. Electronic voting refers to the use of electronic devices to vote in referendums and election. Traditional voting systems were developed to ensure strict compliance with the principles of democratic elections and referendums. These principles include (ACE Encyclopaedia, 2008):

1. Freedom to vote.
2. Secrecy of vote.
3. Non-modification of the votes cast.
4. Lack of intimidation during elections.

Therefore, a basic precondition for e-Election is the feasibility of implementing the voting system without undermining the basic principles as listed above. However, besides the needs for simplicity and ease of use of e-Voting systems, they must demonstrate at least some measure of security offered by the traditional voting systems.

Consequently, the following issues are considered as the minimum requirements for e-Voting systems. Any e-Voting system must ensure that (ACE Encyclopaedia, 2008):

1. Only eligible voters have the right to vote.
2. Every vote cast is counted but once.
3. Every voter is free to make his/her decisions without intimidation or coercion.
4. The secrecy of vote is maintained throughout the voting process.
5. Every eligible voter has access to vote without prejudice to educational level, location and disability.
6. The entire voting process is very transparent.

EVOLUTION OF E-VOTING

The history of the voting techniques is dated back as far as the 19th century. The various systems are arranged as follows.

Paper Ballots

This is the foremost method of voting and it is still in use in virtually all nations of the world. Voters mark boxes next to the names of candidates or next to the party logos, and place them in a ballot box. The ballots are counted manually. Their drawback is that counting is laborious and subject to human errors (Jan, 2001).

Mechanical Lever Machines

This system offers a way of reducing ballot tampering by eliminating document ballots. That became possible with the introduction of the lever voting machine in 1892 (Eric, 2003). Voters cast ballots by pulling down levers that correspond to each candidate. The machines prevent voting for more than one candidate (David, et al, 2003).

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