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***Research Paper***

# Application of System Engineering in Election Voting System

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**Abstract**

Election System is one of the indicators of the democratic country when this country is giving equal rights to the eligible citizens to choose their leaders or to give their candidatures, to participate in the country development by criticizing the government on how thing are being done and how they want to be done (i.e. means listen the views of the citizens). An E-voting system is one of the system engineering where different technologies are applied to analyze, design and implement a dynamic system which is satisfying the user needs. In this work we are discussing on the futures of Election Management System (EMS) by mentioning some of the problems and coming up with the solutions. The system is having the strong securities in the way that the hackers cannot be able to enter our system to make any change during the registration of the voters and candidates as well as in the election period till the end of election (i.e. tabulation, store votes, and display the final election results). We are developing, designing and implementing Electronic Voting Machine composed by Hardware, Software and Network.

***Keywords***: *EVM, EMS, DRE, SMART EVM, SMART CARD Voting, Mobile Voting.*

## 1. Introduction

In this century, as the technology is amazingly growing up day by day, most of the people are using internet for their daily activities. Most of Developed countries are more stable in Information and Communication Technologies where most of the different activities or services of the Government are provided online. The citizens of those countries are able to access those services anywhere they are, by using mobile phones, computers or any other devices connected to the internet networks/ wireless networks. Some of online services are: voting, shopping, sending or receiving money (money transaction), medical care, tickets booking, complains, etc. Democracy Engineering is indicating how the system is created, designed and implemented politically so that the system is meeting the customers need. Digital Divide gives a real picture on how democracy engineering can succeed or fail due to the number of educated citizens, ICT infrastructures, economy of the country, etc. In Hardware EMS, voters are using Manual Smart Card to their votes or EMS mobile based using SMS (Short Messages Services). In Software EMS, voters are having different options to use for casting their votes, like sending SMS using their mobile phones, Internet web page based voting system, Manual GUI and Centralization**.** Implement a server based voting machine, all the voting machine (with hardware and software) will be connected to main server via Wireless LAN. Voting results are well maintained.

## 2. Motivation

Election is a way the eligible citizens of any country can use to express their feeling by electing their representative in the government or in their civic organizations. This is the one of the main indicators of a country having a democratic system. Different countries will have different ways of making elections. They may use traditional election (i.e. paper ballot system), Punch card machine, Optical Scan Machine, or electronic voting system (E-Voting System). All those methods will have some drawbacks. For example in traditional voting, the problems are: People will be in long queue, pooling stations, More papers to be used, ink(Indelible) to be used, Easy to cheat, Diffculty to count votes, More time to count votes, Easy to make errors, More time needed to publish results and More numbers of elections officers are required, etc.

In Electronic-Voting system, problems are: Hackers, Security, Network, Electricity, less number of citizens able to use computer, Infrastructure, Difficulty to trust systems, Difficult to check errors, etc.

The main motivation of E-Voting system is that, security measures are taken to secure the system, more facilities will be provided and the number of the voters will be increased. Many problems available in the traditional system can be solved by using Electronic Voting System.

## 3. Major Objectives

Our major objectives to Design and Implement an EVM system are:

- Completeness & Adherence to Voting Protocol
- Authenticity of Voters, Vote Cast & Non-traceability of Votes
- Ensure Availability & Reliability of voting system
- Minimize Costs to Government
- Simplicity of the voting system
- validity of the voting system
- Maintain Integrity of Digital Ballot against security vulnerabilities.

## 4. History of Voting Process in different countries

In a democratic country citizens are having the rights to elect the Constitution, President/ Prime Minister, Chamber of Deputies/ Senates, Local government officials, etc. The Government organizes an election then informs the citizens, type of election, and the requirements for the citizen to cast the votes. As shown in Fig1, since 1700's till date different methods are used to cast votes, from paper ballots to MobileVotingSystem.

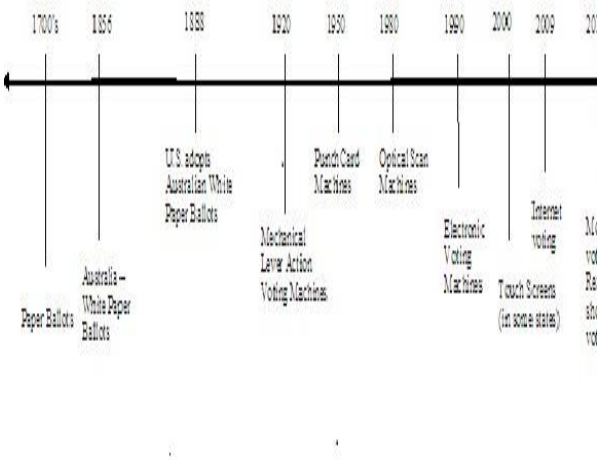


**Fig1:** History of Voting

**Electronic Polling Station Components**
589 municipalities:

- 44% of these used classic voting computers
- Flanders (2012): 6163 voting offices
- 3025 use pencil + paper
- 3138 use new voting system in 151 municipalities
- Each voting office using electronic voting has:
- 5 or 6 voting booths
- 1 voting computer per voting booth
- 1 computer for the president of the voting office

Ab out 20.000 voting computers in total, on average 300 voters per voting computer [Danny De Cock K.U.Leuven ESAT/COSIC, Electronic Voting in Belgium: Past, Today and Future, Dec, 2012]. Combination of a touch-based Electronic Voting Machine (17"touchscreen), a bar code printer, a scanner and an opaque ballot box (e-urn). The presidents equipment is started using the USB received from the Ministry of Interior (or, in the case of local elections, its equivalent at a Regional level).
Voting Booth + Barcode voting ballots:

- Use chip card Reader (i.e. Barcode reader) to activate voting computer
- Use touch screen Machine to mark candidates using inductive pen
- Print voting ballot

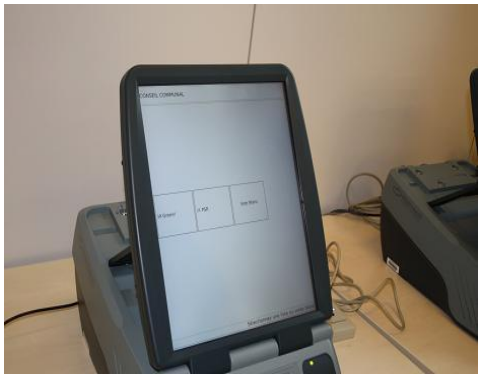

**Fig 2:** EVM in Belgium [3]

The machine prints out a voting paper containing two parts (a machine-readable part, and a human-readable part). [3]

## 5. SMART EVM

Authentication is an essential parameter in any process. Objective of authentication is to provide the integrity of the system thereby resisting invalid voters or illegal voters affecting the system. In order to achieve this, we have introduced a unique authentication mechanism in E-voting system as shown in figure 3 and 4 with block diagram.

### 5.1 Software Architecture of the System

The Architecture of E-voting system is depicted in the figure 5.

- The entire operation of the election is controlled by Administrator /GovtAgency.
- It performs various operations such as scheduling the election as per the requirement such as local election, assembly election or parliament election.
- Registration of voters and candidates, and result announcement which are crucial for free and fair election

### 5.2 Methodology

- The experiments work is carried out on Test bed Designed on the Java environment.
- The authentication process provides great efficiency, speed and robustness.

## 6. Conclusions

We are analysing, designing and implementing Electronic Voting System with a minimum requirement to satisfy customers and our system is having different options a voter can choose any one among of them. A new authentication Process making use of the user device as well as user confidential credential and also a secured encryption of the final result are performed in order to avoid the manipulation of result.

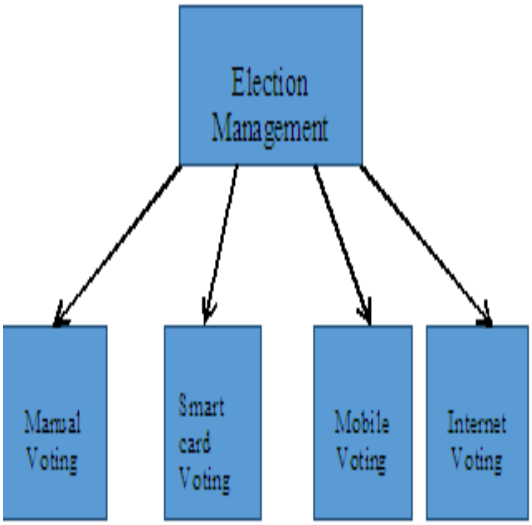


Figure 3. Proposed Election Management

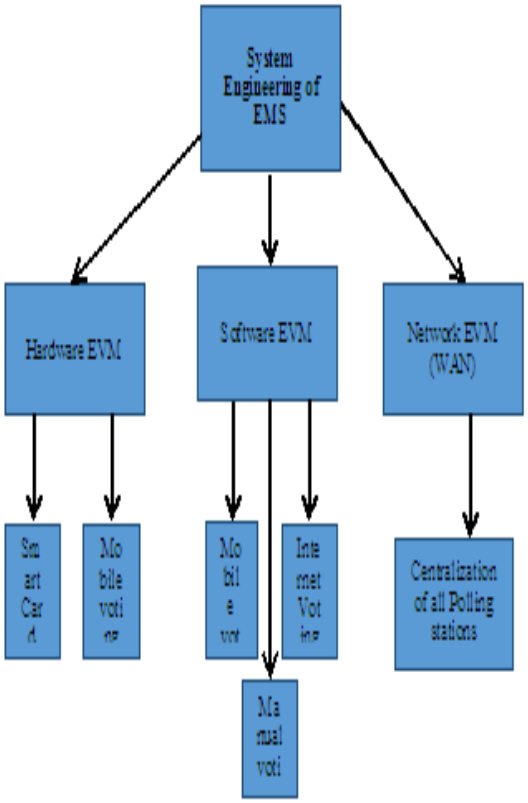


**Figure 4:** System Engineering of Proposed EMS

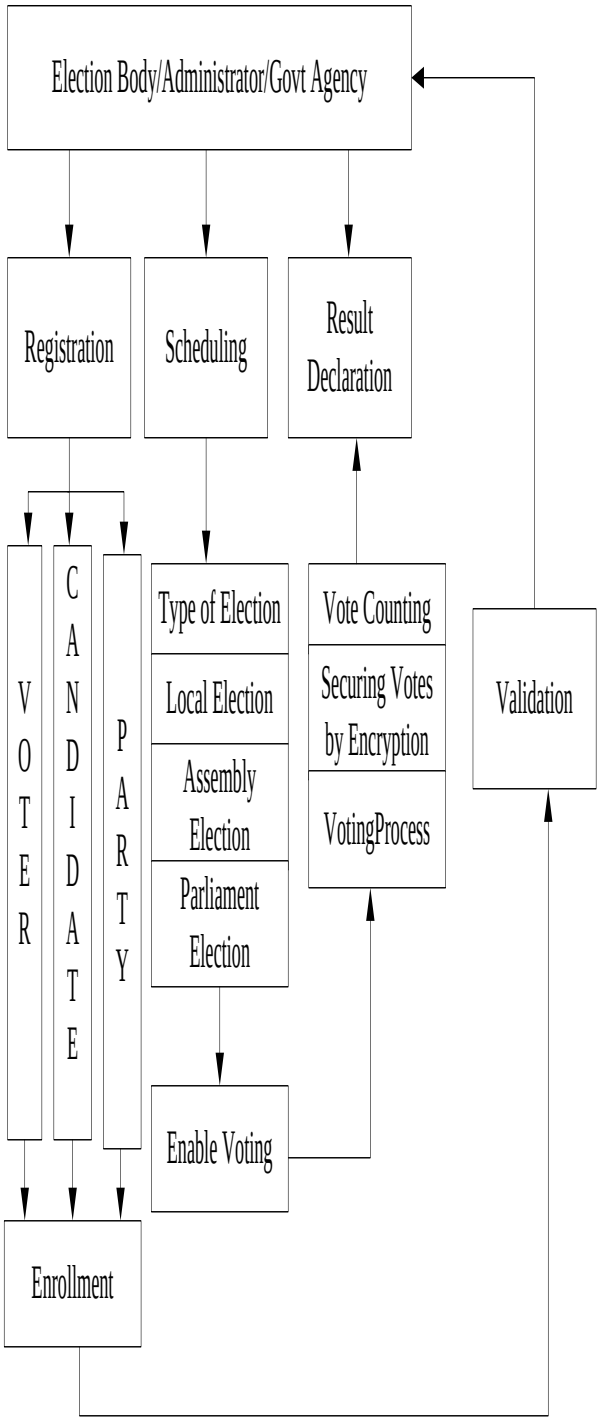


**Figure 5:** System Architecture

**Figure A:** User name and password of anAdministrator of the System


**Figure B:** Voter Identification

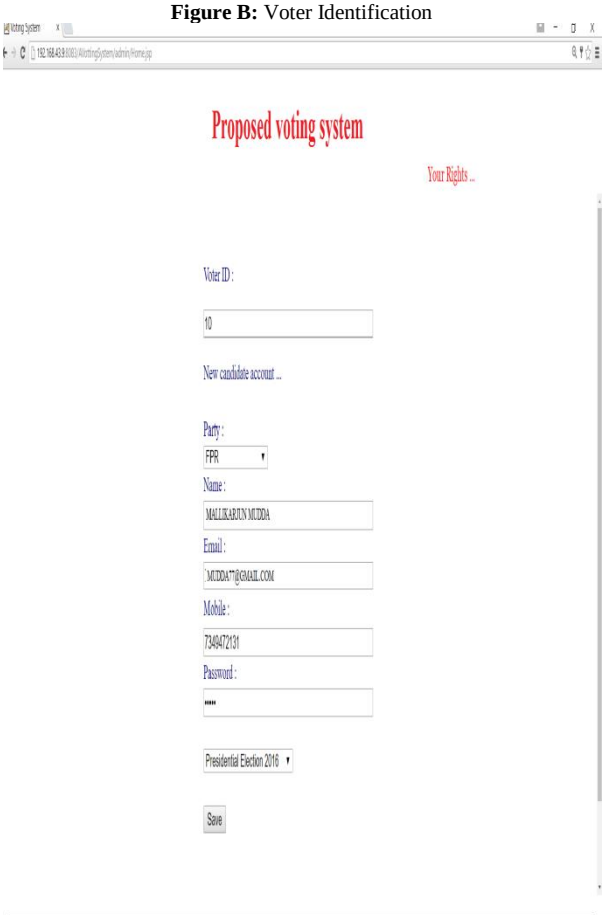


**Figure C**

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