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A Dynamic Web-Based Solution Applied to Contemporary Electoral System– The Next Step for Digital India

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Abstract— In this age of digitization and advanced technology where every system is interlinked through the internet, every process is performed efficiently, with greater speed leading to accurate results with minimal human error. Especially in a prodigious country like India where every system is being progressively digitized, having a manual voting system seems archaic. This paper presents a study of the current voting system in India and deals with designing, building and testing of a new online voting system that will enable the eligible voter, in case of India, a person above 18 years of age, to participate in the electoral process, on the new platform. Candidates, who are going to contest in elections representing their respective political affiliations will be able to start and manage campaign. Election Commission Official will perform as the administrators who will administer the veracity of the voters and candidate's information. This system is simple to use and also is reliable. The proposed software is designed, developed and tested to work on internet and allows voting through World Wide Web and ATM. This system will boost the voter participation percentage in India as well as be effective in curtailing the election conducting cost. This system will also be effective in curtailing the false voting.

Keywords— Web Technologies, WWW, Internet, Web Application, Automated Voting, Online Voting, EVM, ATM, AVM, Elections, Electoral System, Digital India.

I. INTRODUCTION

"To Elect" means "To choose or make a decision". Election can be defined as the act of choosing or selecting of persons, things, courses or rights, this is a formal decision making process by which a population selects an individual to hold public office, is called Election. [1]

India is a constitutional democracy with a parliamentary system of government, and at the heart of the system is a commitment to hold regular, free and fair elections. Election s form the backbone of democracy wherein people elect their political representatives and decide the composition of the government, from parliamentary elections to the presidential polls, India goes through the electoral process at regular intervals. Elections in India are events involving political mobilisation and organisational complexity on a prodigious scale. [6]

Voting process worldwide had undergone several changes from Document based ballot voting system using paper ballots, punched cards, optical scanners to Non-Document base ballot voting system using mechanical levers, direct recording electronic voting.

In the early days India's voting was conducted using paper ballots. The EVMs were commissioned in 1989 by Election Commission of India in collaboration with Electronics Corporation of India Limited. [4] Then from 1999 general elections and state elections are being conducted using Electronic Voting Machines (EVM). [2]

Since the beginning of Indian democracy the elections are very time consuming and always an arduous job for the officials to manage the stupendous number of populous electorate and had been a subject to several disruptions such as low turnout, ballot manipulation and fraud. Absentee voting is very common problem in Indian elections. A Web Based and Automated System for conducting elections is supposed to solve the above problems.

II. PROBLEM STATEMENT

Election in India is a prodigious electoral process in the world as over 814.5 million registered voters exercised their right to vote, [5] in the 2014 General Elections, which is more than European Union and United States' voters combined. The 2014 general elections expenditure has soared to $300 billion. ([2], [3])

Ever since the rise of Internet and World Wide Web, several studies had been made to conduct the election process through Web Based and Automated systems or in other words Online Election system or ATM Based Election System. A part of the populous thinks that with the internet and web based application any election could be conducted by online and automated voting system.

This system could bring down the cost of conducting elections. It could also help in boosting up voter turnout because of convenience. Moreover, it may reduce the possibility of fraud or proxy voting.

Sometime it is problematic for the voters to reach their polling booth due to extreme weather condition during the election. People who stay in a different city or state may not be able to come and cast their vote due to expenses and trouble of transportation. Online voting could enable such peoples to cast their vote without going to the polling stations.

Furthermore, the said system would successfully address the problem of absentee voting. Currently NRI's are permitted to cast their vote in Indian elections but have to be physically present at the time of voting to do so. This proposed system will overcome this problem by allowing them to cast their vote from their current location no matter where they are at the time of election.

III. OBJECTIVE

The objective of this project is to address the limitations of the current voting system and try to alleviate the problems associated with the manual way of casting vote during elections in India, by proposing and creating a dynamic, much secure and convenient voting system using web-technologies.

According to Fujioka et al. [7] there are seven properties of secure voting:

- Completeness – all valid voters are counted correctly.
- Soundness – the dishonest voters cannot disrupt the voting.
- Privacy – all voters must be secret.
- Un-reusability – no voter can vote twice.
- Eligibility – no one who is not allowed to vote can vote.
- Fairness – nothing must effect the voting.
- Verifiability – no one can falsify the result of the voting.

The system under consideration would be able to prevent opportunities for fraud or for sacrificing the voter's privacy and to enable a voter to cast their vote from any location in the world. This system can easily enjoy the trust and confidence of the voters and candidates as well as enable the election commission official do their job, of managing and maintaining the election machineries, much more easily and efficiently.

Representation of the People (Amendment) Bill-2010 which allows voting rights to NRI's was passed in both Lok Sabha (Lower house of Indian parliament) with subsequent gazette notifications on 24 November 2010. [2]. But requires that the voter must be physically present at the polling station on the Election Day. It is not always possible for a NRI's to be physically present. The proposed system will enable a NRI voter to exercise her/his voting rights from anywhere in world, using the website base portal. The said system will make use of secured authentication and login process with ID and Password, which will be automatically generated by the system when the online voting access is enabled for a registered voter, and will be delivered directly to the e-mail address and through SMS to the registered email address and mobile phone numbers of the voters which, later could be changed by the voters.

Apart from using the website, as stated above, the said system will primarily replace the current voting system, by means of EVM, by introducing voting through ATM. Presently elections are conducted in parts of the country over a certain period of time, and there is a major restriction that the voter must be present at their constituency on the specific polling day. By introducing this system, the election procedure will be conducted over a certain period of time and the election commission will install an ATM like voting machine at designated and publicly accessible places, along which this system could also be used through the vast networks of around 2,00,000 bank ATMs, and around 3 million ATM worldwide. [12, 14] The authentication procedure to be used for voting through ATMs will be similar as banking procedure using a bank's ATM card. Under the scheme of "Pradhan Mantri Jan Dhan Yojana", by 20th April 2016 21.61 crores of account have been opened [13], among which in the rural banks there are 13.27 crores accounts, which clearly indicates that accessibility of ATMs will no longer be a challenge for the voters of rural India. Furthermore, the accessibility of ATMs in India has reached to the most inaccessible parts of India, as the world's highest installed ATM is located at Nathu La Pass, in India. [14] Through the proposed system any voter living far away from their home constituency, will be able to cast their vote at any time and place throughout India according to their convenience, over the span of scheduled voting days, by using the ATM of any bank, as well the voters will also be able to vote at their constituency at the dedicated polling ATM to be set up by the election commission.

IV. PREVIOUS & EXISTING TECHNIQUES

A. Paper Ballot

After nomination of candidates is complete, a list of competing candidates is prepared by the Returning officer, and ballot papers are printed with the names of the candidates (in languages set by the election commission) and the respective symbols allotted to each of the candidates. Candidates of recognised parties are allotted their Party symbols.

On entering the polling station, the voter's identity is checked against the Electoral Roll, and allotted a ballot paper. The voter casts his vote by marking the ballot paper with a rubber stamp on or near the symbol of the candidate of his choice, inside a screened compartment in the polling station. The voter then folds the ballot paper and drops it in a ballot box which is kept in full view of the Presiding Officer and polling agents of the candidates. This marking system alleviates the possibility of ballot papers surreptitiously taken out of the polling station or not being put in the ballot box.

B. Electronic Voting Machine

In 1980, M.B. Haneefa invented the first Indian voting machine, gazetted "Electronically operated vote counting machine". [11] His original design (using integrated circuits) was exhibited to the public in Government Exhibition held in six cities across Tamil Nadu. The EVM were commissioned in 1989 by Election Commission of India in collaboration with Electronics Corporation of India Limited. The EVM was first used in 1998 in the by-election at North Paravur Assembly Constituency in Kerala for a limited number of polling stations.

EVM provide some advantages over the traditional paper ballot system such as accuracy, convenience, flexibility, privacy, verifiability, ease of counting, re-usability and mobility. [11]

EVM retains all the basic characteristics of voting by ballot papers, while making polling a lot more expedient. Being fast and much more reliable, the EVM saves considerable time, money and manpower. And, of course, helps maintain total voting secrecy without the use of ballot papers, at the end of the polling, to get the result just a button has to be pressed.

The EVM consists of two units that can be inter-linked. One a ballot unit which a voter used to exercise his vote, and the other, a control unit—used by the polling officials.

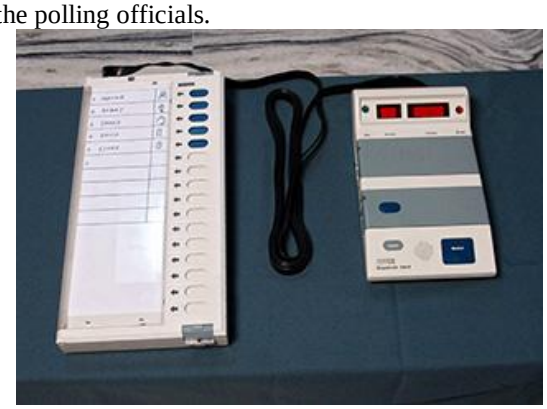

Fig. 1 EVM. Ballot Unit (Left) Control Unit (Right)

1) Ballot Unit: A simple voting device, it displays the list of candidates, a facility to incorporate party names and symbols in in-built. All the voter has to do is press the desired switch located next to the name of candidates. And thus, by connecting four ballot units the EVM can accommodate a total of 64 candidates in a single election.

2) Control Unit: Conduction of polling, display of total votes polled, sealing at the end of the poll, and finally, declaration of results – these are the various accomplishments of just one gadget: the control unit. In total control of the polling, this electronic unit gives all necessary information at a press of a few buttons. For instance, if we need to know the total number of votes, we just have to press the Total switch. Candidate-wise results can be had only at the end of the polling.

3) Procedure of Voting Through EVM: Voters are required to put their signature on Voting Register. Electoral Officer will put special indelible ink on his finger, as before. Electoral officer will hand over the slip to Presiding Officer. He will satisfy himself about the genuineness of the particulars of the voter. After all these formalities, voter will be asked to approach the Electronic Voting Machine kept in a corner covered from sides to maintain secrecy of the vote. Voting machine will contain candidates name and symbol. Against each name, there will be a red light and a blue button. Voter shall have to press the blue button against the candidate of the choice. Red light will be appearing on the pressing of blue button and sound like whistle will also be heard which will indicate that the ballot has been casted. If red light does not appear voter can press the blue button again.

C. Basic Concept of ATM

An automated teller machine(ATM) is an automated banking machine that allows the customers to complete basic transaction without the help of bank officials, by using a special type of plastic card issued by bank, called ATM card, which has a magnetic strip on its back side, which is encoded with customer's information, and the customer is also provided with personal identification number (PIN). The ATM machine have two input devices one is card reader and another is the keypad. Some ATMs even have a digital camera.

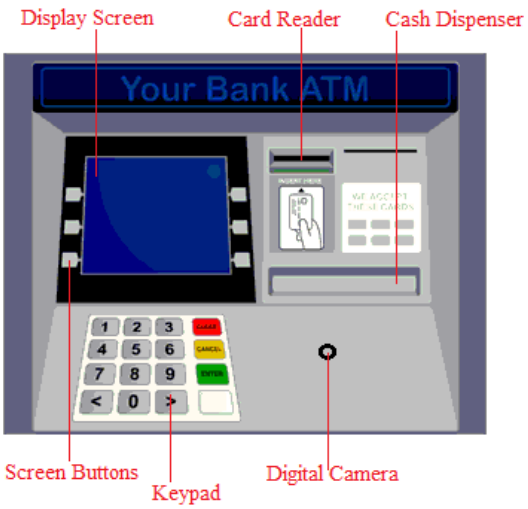

Fig. 2 Automatic Teller Machine (ATM)

Modern ATM technology uses a web-based interface, which is similar to what we can see on an internet web-page. Using client-server architecture, the ATM machine connects to a host server which is connected to a network, through internet. This technology works with the help of central bank server and a centralized account database.

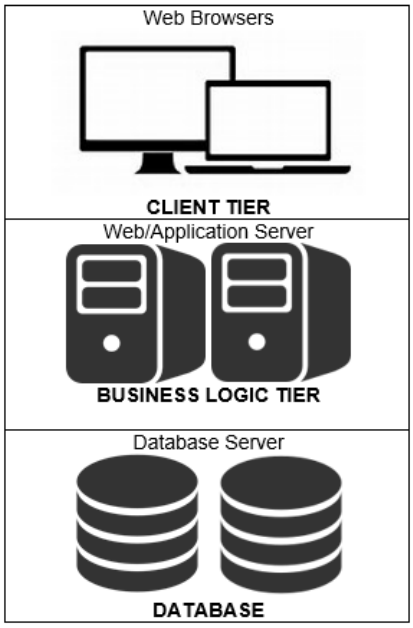

Fig. 3 A 3 Tier Client Server Architecture

The ATM is connected to an Internet Service Provider. When the customer inserts the card in the card reader, all the information about the card holder's account is being captured and the information from the card is passed on the host processor (server). Then the host processor uses this data to get the information from the card to authenticate the card holder. Once the card is authenticated, the machine asks for the customers' Personal Identification Number or PIN. As each card is paired with the unique PIN number so there is very little possibility of fraud.

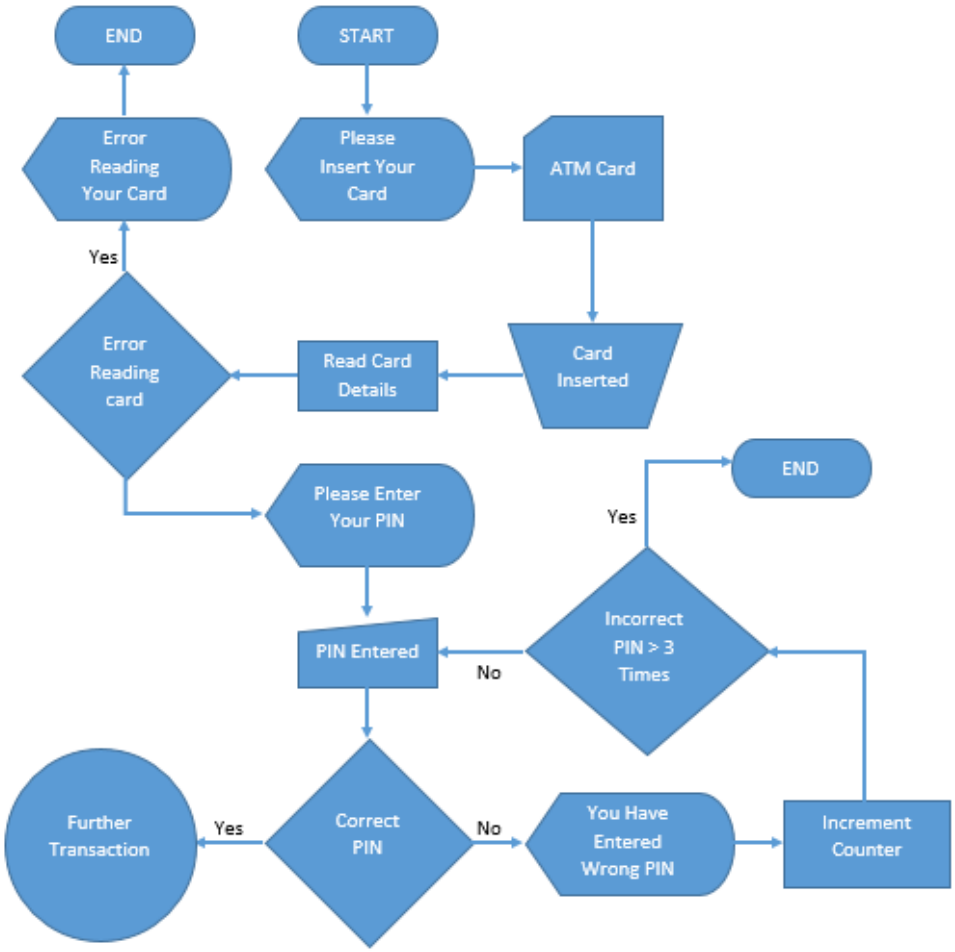

Fig. 4 Flow chart of ATM transaction

V. METHODS AND IMPLEMENTATION

A. Architecture

Using the same principles as ATM Card, the voter ID card can be fabricated. The magnetic strip of the voter card will consist all the necessary information about the particular voter along with some special information of especially abled voter or a voter with special need. Each voter will be assigned a unique identification number, paired to their Voter ID. Whenever the voter will insert the voter card in the ATM card reader and after successful authentication he/she will be automatically redirect to the voting service screen.

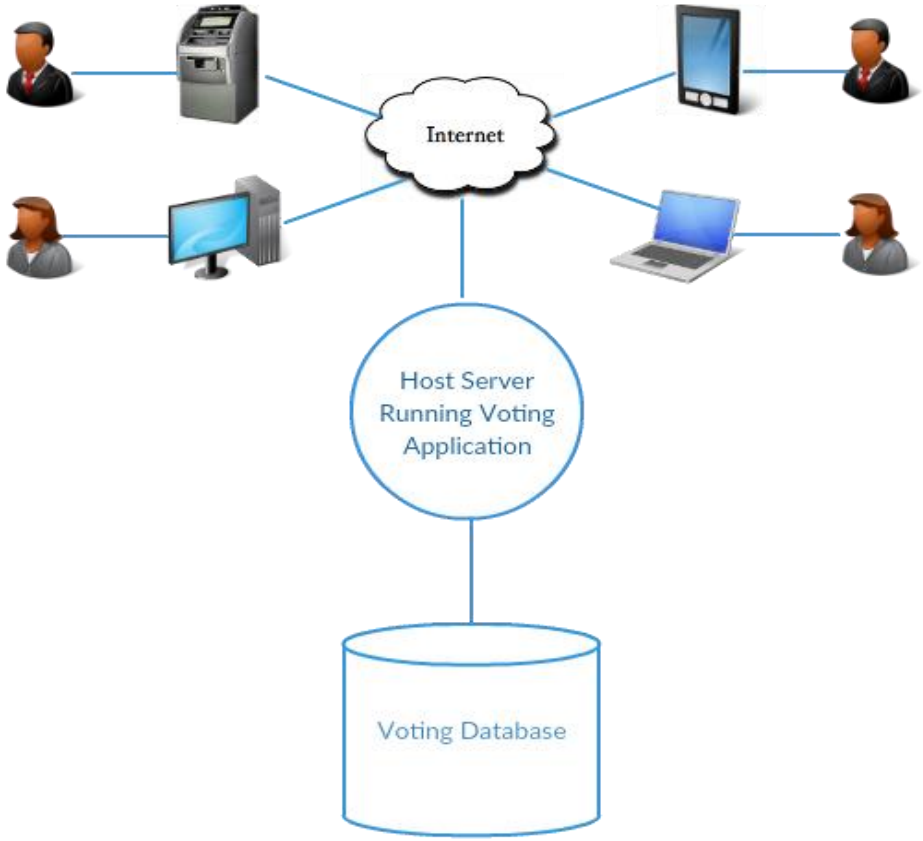

Fig. 5 Proposed System Architecture

B. Features of Proposed System

This system is for the use of every authentic voter to exercise his voting rights in a more convenient and secured manner. This system comprises a simple and self-explanatory GUI. The voting procedure of this system is performed in four step.

1) Authentication: to check if the voter is a genuine voter. The voters will be issued personal identification credentials which they will provide in this stage and the system will match the provided credential with the credential in the system and allow access if the credentials matches or reject access if the credentials does not match.

2) Verification: to check if the voter is eligible to vote, that means to check if the voting has started or not for the voter's constituency or if the voter has not already casted his/ her vote.

3) Voting: this is the main stage where the voter finally registers their vote. The list of contesting candidates from the voter's constituency will be listed and the voter will select a candidate and vote for the same.

4) Conformation: after the voter successfully casts their vote the system will display a feedback message on the screen to notify the voter that the registration of their vote is completed successfully.

Other operations of the proposed system include vote counting, election management which will be performed only by the election commission officials. Beside that Candidate can upload their Details which, without saying will be moderated by the election commission official (the admin), and start a campaign and also view other candidates details and campaigns.

C. Procedure to Cast Vote

The procedure of voting and the nature of interface of the system will be similar for both the system, namely, website portal and ATM, after authentication process the screen will direct the voter to a language selection option. After selecting the preferred language, if the voter's constituencies voting is not open or if the voter had already voted, a message will be displayed, and verification process to check if the voting is open and the voter had not yet voted, is complete. Next, the candidate list will be displayed from which the voter can choose his candidate, and cast their vote. After the voting process is successful, a confirmation message will be displayed. Only difference between the web based system and ATM based system is the authentication process, for the web based system secured authentication will be

used where the user will be issued a voter login ID and a secured password, which he can modify as per his choice, for the ATM based system magnetic card and PIN based authentication will be used. Current voter cards will be replaced by magnetic, electronically readable voter card which will be used in place of ATM card and the Personal Identification Number will be issued to every voter which also they can change at their preference and convenience. For the website based portal the user will login to the system with the unique login ID and password and for the ATM based system the voter will have to insert or swipe the voter card into the card reader of the voting kiosk or an ATM and then have to enter their PIN.

D. DFD

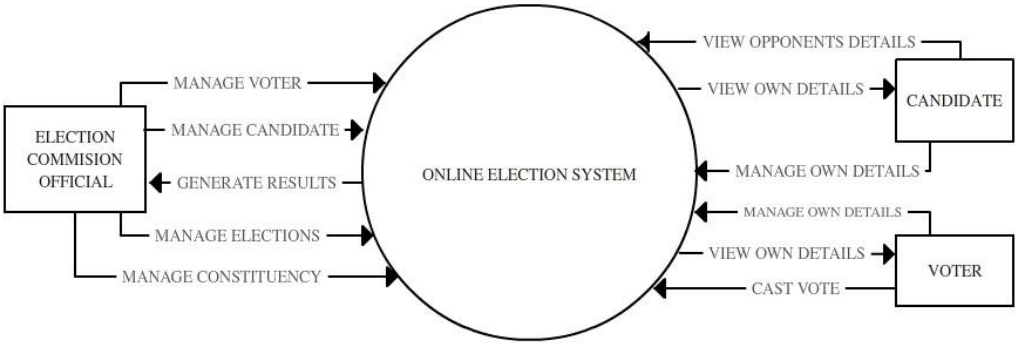

Fig. 6 Context Level DFD

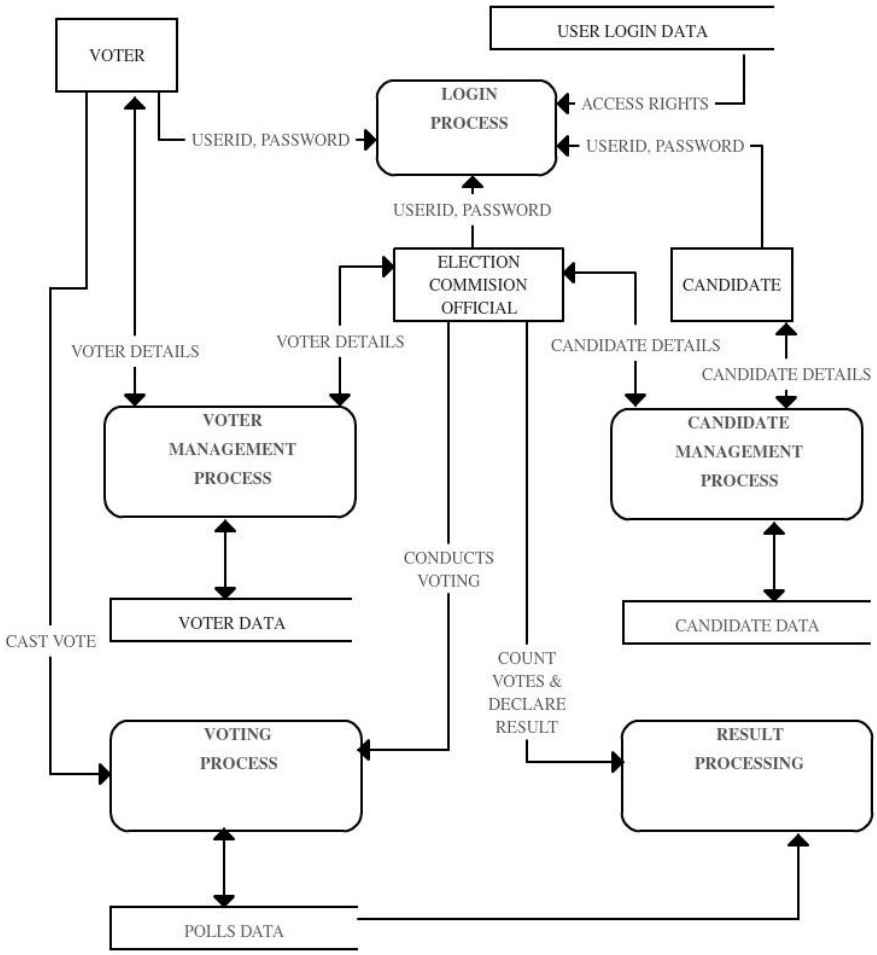

Fig. 6 Level 1 DFD

VI. CONCLUSIONS

The proposed system will enable voters to cast their vote through World Wide Web using internet without having to go to polling booth. Proxy vote or double voting is not possible. The system is fast to access, is highly secure with easy maintenance of all information of voting and is highly efficient and flexible. By implementing this system, the voter participation will increase dramatically. The proposed system will be effective in reducing or removing unwanted human errors. Apart from the systems reliability. Online voting is a sublime procedure that will free the voters from geographical proximity. For example, a voter who is a Cruise ship captain by profession, will be able to cast his vote, while he is on duty on a ship sailing in mid sea or a NRI voter can also cast his vote from where they are. [8] With the

online voting system made operational the cost of conducting elections could also be brought down to a large extent. As more and more people will be voting from their individual place lesser people will crowd at polling booths and thus simpler and lesser election machineries are needed.

Like any other web based application this system is also prone to security attacks. Unless high security protocols are implemented for the authentication the system will be vulnerable to attacks such as hacking to manipulate results. With several encryption and cryptographic processes and security protocol the appropriate and feasible technology implementation is necessary. The next stage of my study is to analyse and implement the necessary security protocols.

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