

Online Election System

A proposed system for Pakistan

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Abstract

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In the new era of advanced technology where online system boosts work speed, reduces mistakes and promote the generation of accurate results, having manual election system becomes a misfortune. A public election system constitutes the backbone of a democracy where the people has to elect their state's leader. Pakistan currently uses a manual election system, which causes several kinds of problems. Due to this paper ballot based election system, some problems are faced by voters before or during elections and others are faced by the administration before and after the voting. An online system, which involves procedures like registration of voters, vote casting, vote counting, and declaring results etc. would constitute a good solution to replace current system. The system proposed in this thesis will be helpful for the voters by using any resources like their own system or arranged by Government. Moreover, the proposed system will also decrease the risk for corruption. The system is proposed after interviewing officials of two departments, the Nation Database and Registration Authority Pakistan(NADRA) and the Election Commission of Pakistan (ECP). NADRA has an online database of the citizens of Pakistan, and is providing the Computerized National Identity Cards (CNIC) and also supporting different organizations with their online system. So, by using NADRA's system it becomes easy to register all voters of the age 18 or above, and furthermore to verify their data. From this background officials suggest that an online election system will be best system to replace the current electoral system, and in this thesis I have proposed the basic structure and functionality for such a system.

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Preface

This report is study for Master of Science mini thesis, carried out from January 2011 to March 2011 in Uppsala University, Sweden. The study is about how to introduce an Online Election System for Pakistan. The main purpose of this thesis is to suggest a design of a system which could replace current manual system and facilitate voter as well as the Election Commission of Pakistan during the elections.

In this study I tried to cover the problems confronted by voters, officials, political parties, and Government during elections and to suggest a system to ensure the security from fraud during elections and to facilitate a safe and rapid counting of votes afterwards. I designed prototypes of a part from system.

Acknowledgement

This work could not be completed without the support, co-operation and guidance of many people.

I would like to thank Mats Lind coordinator of Informatics and media department and Lars Oestreicher supervisor of this study for provided me the opportunity to work with this interesting topic, and the brilliant supervision.

I thank also the officials of National Database and Registration Authority Pakistan [NADRA] and Election Commission of Pakistan for their kind cooperation in retrieving information required for this study.

Finally, I want to thank my family and all my friends for always being there.

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1. Introduction

Democracy is an important matter in most modern societies. One of the most important activities within a democracy is the election of representatives. It is also a very delicate process that is the subject of various disturbances, such as inactive citizens, attempts of fraud etc. In this thesis I will discuss some of these problems, starting from the current democratic situation in Pakistan. I will also propose a software solution to the problem in terms of a prototype that will display the most important aspects of this problem.

1.1 Purpose

The main purpose of this study is to boost the turnout of votes. For this purpose we have to view all the aspects responsible for low turnout. Some people hesitate to vote due to weather conditions in different areas during the election, youngsters of age group 18 – 24 having no charm to cast the vote. People who are outside of their town/city don't want to come to their area for just casting the votes due to the expenses and trouble of transportation. Same situation is also for those who are on duty during the election, they don't have any interest to cast their vote during job or they don't have facility to submit their vote.

A second purpose is to make it more difficult to commit fraud and cheating during an election. In a manual system, sometimes people are registered in more than one area and can thus cast the vote multiple times. By creating an online database covering the country it will be possible to eliminate the double casting of votes. In some areas, officials of the Election Commission themselves cast votes and after the end of election they adjust these votes from the voter's list. Hence, they manipulate the result of the election. There is clearly a need of a system that could reduce the authority of officials and could sustain the true nature of voting. It would also give people options to cast an empty vote if they don't like to give the vote to any of the candidates.

People in Pakistan are well aware of available online services and, from the last few years the use of internet has increased. Youngsters have developed interest in using internet for various purposes.

After looking above factors, the decision for online voting is more natural than before. The expenditure of an election will be decreased and it will cover people of all ages. It will be a facility for the people who have different problems such as mentioned earlier.

1.2 Objective

The aim of the study is to analyze the current election system and suggest an online election system which will allow people to cast votes in a more convenient way, by using available resources which could facilitate the voters during elections.

1.3 Research Questions

In this study we will try to find out the answers of the following question:

1. Is an online voting system a better replacement of current manual system in Elections of Pakistan?
2. Why do voters hesitate to cast the vote in current system?

1.4 Background

In a democracy, the electorate expresses its will through the election of representatives. These elected representatives operate the country, on behalf of the politic body. In order for the representatives to appropriately represent and implement the demands of the people, the elections in which they are elected must be held fairly and results computed accurately.

In the last election, held in February 2007, total turnout of votes was just 44%. This is because voters face problems not only during the elections but before the elections as well. Before conducting the elections, there is a formal procedure of voter registration, which is the main challenge for the voters and for the officials of Election Commission.

Observing the history we deduce that Polling Systems based on hand rising had just a problem with security (elections were not anonymous). Instead a Paper-based Polling System has at least three problems (discussed below). The paradigm shift from Hand-based Polling System to Paper-based Polling System is caused due to population growth whereas, now, time and safety are so important that it has driven a new paradigm shift from Paper to Electronic. There is no defendable reason to stick with Paper Polling System, but there are many security reasons to encourage the use a new Electronic Polling System in order to draw up polling systems to digital era.

In Pakistan's current Paper Polling System, there are some other troubles as well apart from low turnout of votes, by looking at those problems, it is necessary to build a system which could solve those problems and speed up the election system.

1. **Speed:** Hand counting votes is time consuming especially in most populated countries like Pakistan, where many candidates are for same position and voter has to cast vote for many races.
2. **Intelligibility:** When a system based on pens, stamps, punch cards or ballot papers is used for voting in a Paper-based Polling System, the result can be ambiguous.
3. **Accessibility:** Disabled or duty-bound people do not have an easy access to the poll booth, but an easily touchable system will help them to cast their vote.
4. **Transparency:** Chances of manipulation of the results from influencing authorities will almost be finished.

2. Government Structure of Pakistan

In Pakistan's Government Structure, the President is the Chief of the State and the Prime Minister is Head of Government. Pakistan has a bicameral Parliament (Majlis-e-Shoora) consisting of a senate with 100 seats and a National Assembly with 342 seats.^[1]

| Senate Assembly | | | | |
|-----------------|---------------|--------------------|-----------------------|------------|
| Province/Area | General Seats | Seats reserved for | | Total |
| | | Women | Technocrats and Ulema | |
| Federal Capital | 2 | 1 | 1 | 4 |
| Punjab | 14 | 4 | 4 | 22 |
| Sindh | 14 | 4 | 4 | 22 |
| Khabar Pakhtoon | 14 | 4 | 4 | 22 |
| FATAs | 8 | - | - | 8 |
| Balochistan | 14 | 4 | 4 | 22 |
| Total | 66 | 17 | 17 | 100 |

Distribution of seats in the senate Assembly, displayed by Province^[2].

| National Assembly | | | | |
|-------------------|---------------|--------------------|-----------|-------------------|
| Province/Area | General Seats | Seats reserved for | | Total |
| | | Non-Muslims | Women | |
| Federal Capital | 2 | | | 2 |
| Punjab | 148 | | 35 | 183 |
| Sindh | 61 | | 14 | 75 |
| Khaiber Pakhtoon | 35 | 10 | 8 | 43 |
| FATAs | 12 | | - | 12 |
| Balochistan | 14 | | 3 | 17 |
| Total | 272 | 10 | 60 | 332+10=342 |

Distribution of seats of the National Assembly, displayed by Province^[3].

In the provincial government, the Governor is the representative of Federal Government in the province, and the Chief Minister is head of the Provincial Assembly^[4].

| Provincial Assemblies | | | | |
|------------------------------|---------------|--------------------|------------|------------|
| Province/Area | General Seats | Seats reserved for | | Total |
| | | Non-Muslims | Women | |
| Punjab | 297 | 8 | 35 | 183 |
| Sindh | 130 | 9 | 29 | 168 |
| Khaiber Pakhtoon | 99 | 3 | 22 | 124 |
| Balochistan | 51 | 3 | 11 | 65 |
| Total | 577 | 23 | 128 | 728 |

Distribution of seats for each Provincial Assembly^[5].

In order to decentralize authority to the Local Governments for accountability, for good governance and effective delivery of services through institutionalized participation of the people at grassroot level, elections to the local government institutions are held every 4 years^[6]

| Category-wise seats in a Union Council | | |
|---|--|-----------------|
| SI No. | Category | Number of seats |
| 1. | Nazim/ Convener / Mayor | 1 |
| 2. | Naib Nazim / Assistant Convener/ Assistant Mayor | 1 |
| 3. | General Counselor | 4 |
| 4. | Labour Counselor | 2 |
| 5. | Lady Counselor | 2 |
| 6. | Lady Labour Counselor | 2 |
| 7. | Minority Counselor | 1 |
| | Total: | 13 |

Category wise number of seats in a union council^[7].

2.1 Electoral System

The President is elected for a term of 5-years. The Electoral College consists of members of the Senate, the National and the Provincial Assemblies. The Prime Minister is elected by the National Assembly.

Senate members are elected for a term of 6 years. In the National Assembly, members are elected by plurality in single-member constituencies to serve for a 5-year term.

In the Provincial Assemblies the members are elected for a term of 5 years, and the Chief Minister is elected through the Provincial Assembly.

Elections to the local government institutions are held after every 4 years. Members of Union Council including Union Nazim (Union Mayor) and Naib Union Nazim (Assistant Union Mayor) are elected through direct elections. The Electoral College for the election of a District Mayor and the reserved seats of women, peasants and workers and Minorities in the District Council shall be all the members of Union Councils in the district including Union Mayor and Assistant Union Mayor. The Electoral College for the election of a Tehsil Mayor, Town Mayor and reserved seats of women, peasants and workers, and minorities in the Tehsil Council and Town Council shall be all the members of the Union Councils in Tehsil or, as the case in Town, including Union Mayors and Assistant Union Mayors. However, for the election to the reserved seats for Women in Zila council (City Council) proportionately divided among Tehsils or Towns shall be all members of the Union Councils in a Tehsil or Town. It is the responsibility of the Chief Election Commissioner to organize and conduct these elections.^[8]

2.2 Qualification of Voter

Every person who is 18 years old and has a National Identity card is eligible to cast a vote. He or she must have a permanent or temporary address in Pakistan. On the behalf of this address, he can cast the vote in a particular geographic area^[9].

2.3 Manual Voting System

In the current Election System the voting is manual. People go to the Polling booths allocated by the Election Commission of Pakistan in every area. The Elections for the National Assembly and the Provincial Assemblies held on the same day. Two ballot papers are issued to every person after checking the identity of the voter and Voter Number (issued by the Election Commission of Pakistan). It is necessary for each voter to register for the current election before the election on dates given by the Election Commission of Pakistan.

The data collection system is also manual and the Election Commission sends their representatives to each home before the Election. The representatives distribute registration forms at every home and after a few days they collect the forms. But there is no way to send information to voters, either which voter number is used by the Election Commission, or a confirmation of the registration. Some people cannot cast their votes due to false registrations or people making mistakes in the names in the lists or in the ID number etc.

During the Election for the National and the Provincial Assembly, each Assembly has its own ballot paper with list of candidates. In the election of the Union Council ballot papers are same for Nazim and Naib Nazim, the General and the Labour Counsellor, the Lady labour and the Lady Counselor. So everyone gets four ballot papers during the elections of the Union Council elections.

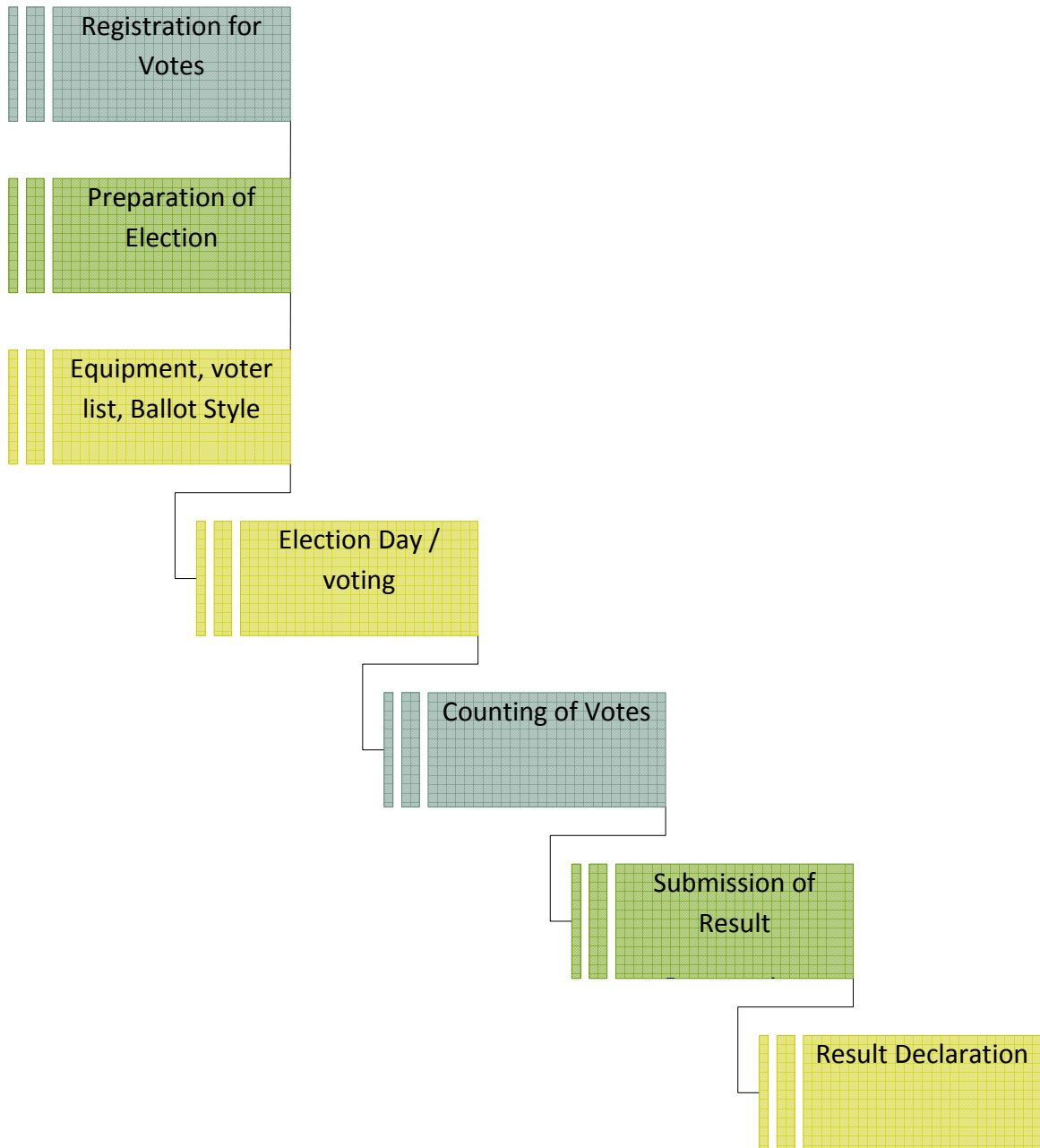


Figure 2.1: Current Manual Election System.

3. Research Instrument

To complete this study, information was gathered from major organizations in Pakistan. The National Database and Registration Authority Pakistan (NADRA) has a centralized database and is providing help to various departments for their online system. A second organization is the Election Commission of Pakistan (ECP) which is an authority who holds the elections in Pakistan.

Primary data and information resources were interviews from officials of NADRA and ECP, which are summarized in this section, below. Secondary information resources were the information available in libraries and on the web. The questionnaire given to the ECP is attached in Appendix 1 and the questionnaire given to NADRA in Appendix 2.

3.1 Interviews

Interviews are effective way to extract and obtain significant research interconnected information by interviewing a domain expert. It is best method to collect important data^[10]. To fulfill multiple objectives for study of particular subject it is necessary to conduct interviews of relevant people. Interviews can be in the form of face to face or electronically (online/telephonic). In four semi-structured interviews were conducted for this study. Semi structured interviews was selected to communicate and get maximum information for this study.

3.1.1 Purpose of Interviews

Interviews were conducted to know the problems faced by the Election Commission of Pakistan and discuss possible solutions for these problems. Personal experience of the professionals may not written in literature, they can validate finding from literature or can give some suggestions upon their experience in this field. Interviews were divided in two portions, first portion was to discover the problems of officials performing duties during the elections and in second portion we discuss different e-voting systems to get point of view of the professional about the system, which one will fulfill the requirements and increase the turnout.

3.1.2 Selection of Interview Subjects

To conduct interview it was necessary to select subject who were best to solve the problem and provide best information. To get maximum information from the department, it was necessary to select people working in operational level having direct relation with the system. In four Interviewees; two of them were officials of Election Commission of Pakistan and rest of them were from National Database and Registration Authority.

3.1.3 Study Instruments

In this study it was necessary to get information on following study instruments. Most of the questionnaires were formulated to cover these issues which are necessary to complete this study.

- Requirements to register a voter
- Problem faced by people to cast votes.
- Speed of work during all procedure.
- Accuracy of counting after elections.
- Weakness of current system

Some instruments were used in NADRA to collect information and rest of them to get information from ECP.

3.1.4 Interviewing

Each interview is conducted face to face and it took 40 – 60 minutes. Time and place for the interviews was already decided, interviews were conducted at their own places. Before interview a short explanation of study was presented. Main points were written by hand on a paper throughout the interviews. The transcribed form of interviews with Election Commission of Pakistan [ECP] can be viewed in Appendix 1 and National Database and Registration Authority [NADRA] in Appendix 2.

3.2 Results and Analysis

In this section results and analysis of literature review and interviews are presented. Finding from literature and validation of finding from systematic interviews and figure out possible solutions of the problems from experts will be discussed.

In first portion we discussed about the weakness of current system or problem faced during whole procedure.

- **Registration of voters:** during registration of voters some typing or handwriting mistakes lose number of voters to cast their votes.
- **Problem faced by people to cast votes:** on the day of the election, some people hesitate to cast vote or can't cast the vote due to different problem [discussed in section 4.1] and some people could not cast the vote due to these typing or handwriting mistakes found during the checking of identity.
- **Speed:** All election procedure is manual handwriting form and this procedure takes long to get results. Registration procedure took long time to get information from each home, day of Election is 8-10 hours procedure to allow peoples to cast votes and after election more than two days spend to get results. Some results are challenged due to counting error or other problems [discussed in section 4.1].

- **Accuracy:** It is quite impossible to make error free in the manual system where people are involved working from more than 24 hours. People are directly involved in these process are tired and could not perform efficiently which make mistakes and errors in results.

Currently some e-voting systems are already working. In my interview it was also part of discussion which one can solve the problem and fulfill the requirements. To validate the literature we discussed online election system is covering most of the requirements;

- **Registration procedure of voter:** for election system the need a system which cover the procedure of registration of people for voting. Because in current system there are different problems during the registration of voter. [discussed in section 2.3]
- **Electronic voting system:** which is helpful to cover all problems; checking of identity, attack on ballot boxes, hesitation of people to cast vote, helpful people to cast vote from any polling booth available and help full for the disable and senior citizens etc.
- **Counting system:** an efficient system count accurately and more speedily the votes to make result.

It was in our discussion why the online system is solving all aspects? Because in Pakistan one online department [NADRA] is available to support this system, because this department is currently providing online support to different organizations to run their electronic systems, Passport Issuing Authority, Vehicle Registration Authority, Banks and KIOSK etc. If any system, which covers all procedure mention above, then it will be possible to cover all problems which were discussed earlier in this section and minimum use of extra resources and maximum use of current resources; for example online computer labs available in most of the schools at the level of secondary education and KIOSK placed by NADRA.

3.3 Summary of the information publicly available.

NADRA has an online system of Computerized Identity Cards that keeps a record of data, which they obtain from each person. Data attributes are as follows:

- | | |
|----------------------------------|----------------------------|
| (1) Name of head of family | (2) Picture |
| (3) Relation with head of family | (4) ID Card Number |
| (5) Full Name | (6) Family Number |
| (7) Father's Name | (8) Mother's Name |
| (9) Wife's Name | (10) Permanent Address |
| (11) Current Address | (12) Place of Birth (city) |
| (13) Date of Birth | (14) Gender |
| (15) Marital status | (16) Religion |
| (17) Mother language | (18) Education |

- | | |
|-----------------------------|------------------------------|
| (19) Nature of Education | (20) Mark of Identification |
| (21) Disability | (22) Job |
| (23) Job description | (24) Current Residence |
| (25) Blood group | (26) Detail of children |
| (27) Union council | (28) PP area (Province Area) |
| (29) NA area (Federal Area) | |

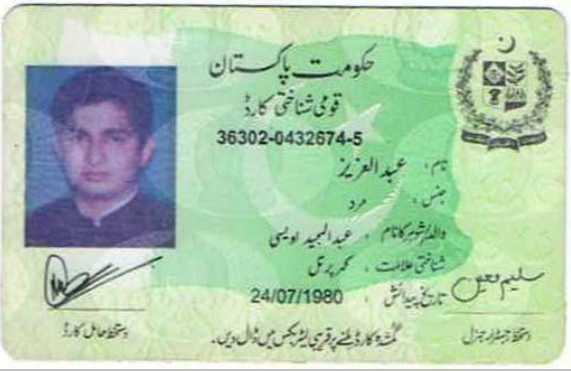
| Front Side of CNIC | Translation in English |
|--|--|
|  | <p style="text-align: center;">Government of Pakistan National Identity Card No. 36302-0432674-5</p> <p>Name: Abdul Aziz Gender: Male Name of Father: Abdul Majeed Owaisi Mark of Identification : A Mole mark on neck Date of Birth: 24/07/1980 <i>If the lost card is found put into nearest letter box</i></p> <hr/> <p>Signature of card holder Signature Registrar General</p> |

Figure 3.1: Information on the front side Computerized National Identity Card (CNIC).


| Back Side of Computerized Identity Card | Translation in English |
|---|--|
|  | <p>Family No. ED3D5S ID No. 36302-043267-5</p> <p>Current Address: House No. 1636/284, Street No. 6, Al-Khair Colony, Multan Permanent Address: same</p> <p>Expiry Date: 31/05/2011 Date of Issue: 19/08/2002 <i>In case of change in permanent address apply new card</i></p> <p style="writing-mode: vertical-rl; transform: rotate(180deg);">OID ID No. 32280713340</p> |

Figure 3.2: Information on the back side Computerized National Identity Card (CNIC).

Secondly, information collected from the Election Commission of Pakistan i.e. what they need to register a voter;

- (1) Voter Number (issued by ECP)
- (2) Name
- (3) Father's Name
- (4) ID Card Number
- (5) Address

Analyzing the information shows that NADRA has all the information required by the Election Commission of Pakistan, and provides a Computerized ID card with a bar-code. So, if the Election Commission only registers the CNIC online with collaboration of NADRA then everyone can easily register his vote on the website.

3.3 Literature Studies

To offer an online election system, it was necessary to study the current computerized voting system or voting machines working in different countries. Many developed countries USA, Australia have already adopted an online Election system.^{[11][12]}

3.3.1 Electronic voting

Technology can include punched cards, optical scan voting systems and specialized voting kiosks (including self-contained direct-recording electronic voting systems, or DRE). It can also involve transmission of ballots and votes via telephones, private computer networks, or via the Internet.

Electronic voting helps voters to cast votes in an election through computerized equipment. Sometimes this term is used to take votes over Internet.

3.3.1.1 Machine counting

Machine-readable ballot systems provides help to the voters to mark their votes on a paper card with marker and remove divots from a perforated card with a stylus or mechanical hole puncher.^[13]

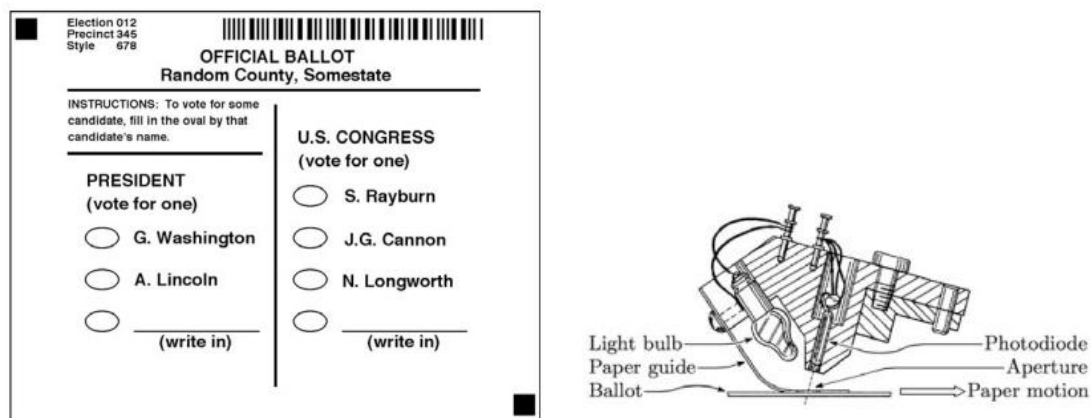


Figure 3.3: Machine readable ballot paper and counting machine

3.3.1.2 Computer voting

Electronic voting machines (DRE) looking like an ATM's or personal computer used to cast votes, which provides help to vote through a keyboard, a touch screen, or a pointer to mark their votes. ^[14]



Figure 3.4: touch screen & other electronic voting machine

3.3.1.3 Online voting

Online voting may be conducted in a variety of ways:

- *'Poll site' internet* voting systems that require voters to go to staffed polling places and use computers to cast their votes. The internet is used to transfer the ballots from each polling place to centralized tallying centers.
- *'Regional poll site' internet* voting systems that allow voters to go to any poll site in a particular city or region to cast their vote. The system keeps track of which voters have already cast their ballots, and delivers the correct ballot paper to each voter based on where one resides.
- *'KIOSK' internet* voting systems that allow voters to vote from computers in KIOSKS set up by the voting authority in convenient locations such as post offices and shopping malls. The KIOSKS are not monitored by poll workers all the time and may allow voting over a period of several days or weeks.
- *'Remote'* systems that allow voters to vote from any computer connected to the internet - typically at home or at work. As well as via PCs, home internet voting could be through digital TV or even mobile phones or games machines. Remote internet voting might be used to replace poll site voting entirely, or it might be used only for absentee balloting. ^[15]

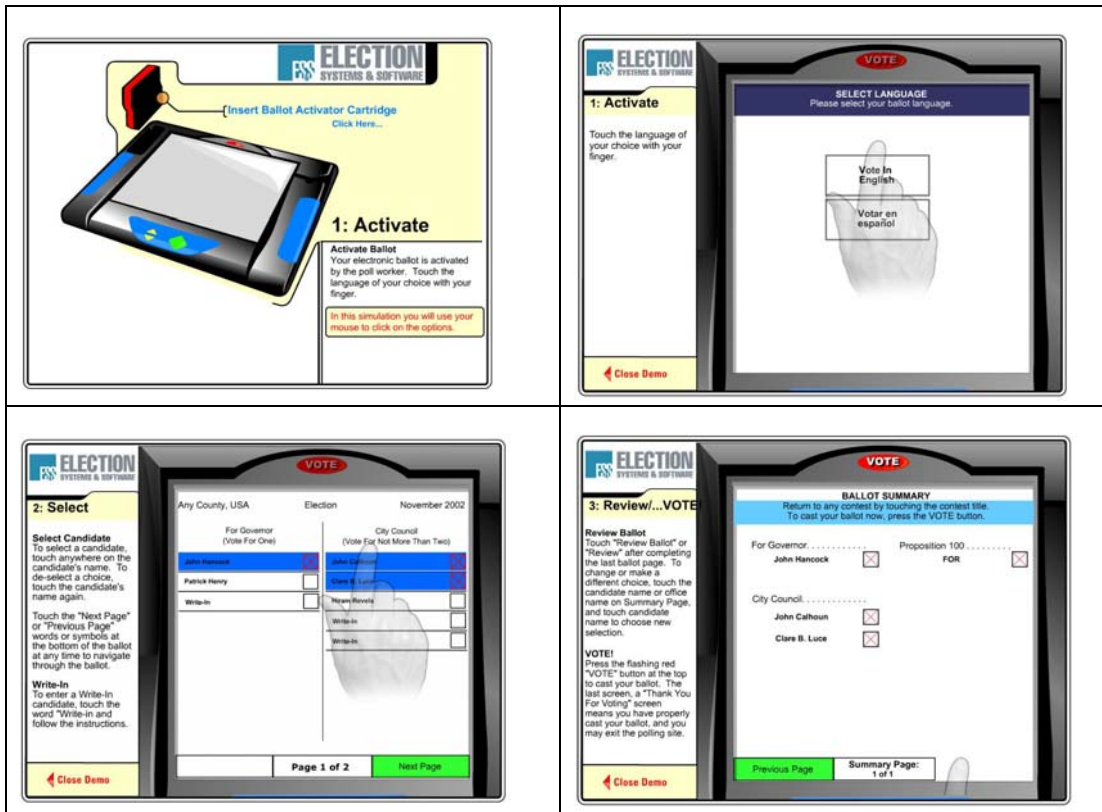


Figure 3.5: steps to cast a vote in voting machine

The dramatic impact of the internet has led to discussions about the relation between e-democracy and online voting. Some early enthusiasts declared that the internet could replace representative democracy, enabling everyone to vote on everything and anything at the push of a button^[16]. Such visions oversimplify the democratic process. Others have argued that e-voting could reduce costs and increase turnout by making voting more convenient^[17].

4. Finding and Recommendation

4.1 Finding (Limitation in current system)

In the democratic world political parties face different problems one of the problems is decreasing turnout of voters. Every party is taking interest in increasing its share of the votes and for this purpose they provide good facilities to voters for casting the vote. But factors mentioned before reduce the cast of votes. A main problem is that every voter needs to go to his own area and cast at Election Booth, which is allocated for him by ECP.

There is no special facility for senior citizens or disabled people to come to the Polling Booths and cast the votes. Every person has to come in the same way to cast the vote and people hesitate to cast the votes due to these problems under difficult weather conditions.

Another element which creates hesitation for a voter to come out is the pressure from the members of the political parties. In Pakistan people in some regions are under great pressure from their landlords or from the heads of family, and during casting of votes; representatives of these parties create problems for voters.

Fraud in elections is another factor, which creates another kind of problems. Some people are registered in more than one area, and due to unavailability of a centralized election system, they are able to cast more than one vote with the same ID card. Manual counting is also another factor where some staff can change counting either deliberately or by a mistake, which affects the result and can be used to manipulate the distribution of the mandate of the nation. As discussed in the section Purpose in the Introduction chapter, different issues cause people not to come out for casting votes.

To overcome these problems it is necessary to design a centralized system which covers these factors. A secure and efficient electronic system will cover such problems as the counting of votes and the casting of multiple votes. Everyone can go anywhere to vote, because the system will automatically allot them their area and will display the candidates for their area. More people will take Interest in casting votes because they feel free to cast their vote from their convenient location without any problem and difficulty.

4.2 Recommendations

After evaluating different electoral systems in the literature and some current in practice systems in various countries, it is necessary to look closer at which one can be considered to be best among them and furthermore which one could meet the basic requirements of the present

system in Pakistan. If we look at the safety requirements, one is to control the duplication of voter registration, another to facilitate the voters; and the third to eliminate counting mistakes.

Different electronic electoral systems, for example DRE, are implemented in many countries, but we chose the online system instead of other existing system, because for polling we can use electronic voting machine which is one of the solutions so far for casting the votes, but it has also introduced a new kind of insecurity aspect, an insecurity that partly also resides with the user. Can we be sure that the software has recorded the correct ballot? Can we be sure that none could vote more than one time? These questions are useful to emphasize some of the most important sets of problems that literature has depicted^[18, 19]:

- Insertion of Corrupt Software
- Calibration of the Machine
- Shut off Voting Machine Features Intended to assist Voters
- Actions by corrupt Poll Workers or Others at the Polling Place to affect Votes
- Vote-Buying Schemes
- Attacks on Ballots
- Unauthorized privilege escalation
- Incorrect use of Cryptography

Besides insecurity aspects, electronic voting machines/systems have more or less removed 3 important problem sets like:

- Counting Errors
- Communication Errors
- Written Mistake

But there are still other problems remaining, like registration of voters, and lack of interest of electorates to cast their vote. So, we need to design a more complete package of solutions to the type of problems that prevail in Pakistan. The suggested online voting system will provide us with all solutions like the registration of voters, casting of a vote, the voter's security, the counting of votes, the speed of result declaration, and above all, the transparency of the elections. Such a proposed system will be a secure system that will restrict the influence of unauthorized powers on the election.

4.2.1 Current IT Resources

Most organizations and institutes already have an advanced IT structure and NADRA is one of them. NADRA has mobile teams with online systems used to collect data from various areas of Pakistan where most of Pakistanis are not educated and can't reach NADRA's offices. On the other hand NADRA provides Kiosks which are used as an online medium to pay bills and purchase things. Moreover, NADRA is also providing the Computerized National Identity Cards

with barcodes and using this database, machine readable passports are now being issued to the citizens.

4.2.2 Secure Databases

To secure the database of an online election system, It is necessary to design a secure network. A picture of such a network is below, where a group of front web-servers is providing web service to end-users, the KIOSK, the Election Commission Offices and the Polling Booths etc. For securing the Election Commission Network web-servers should be behind a firewall. These web-servers will be communicating with storage and database servers having calculation options, which are connected with backup servers and extra resource servers of NADRA holding the correct record of each ID card holder.

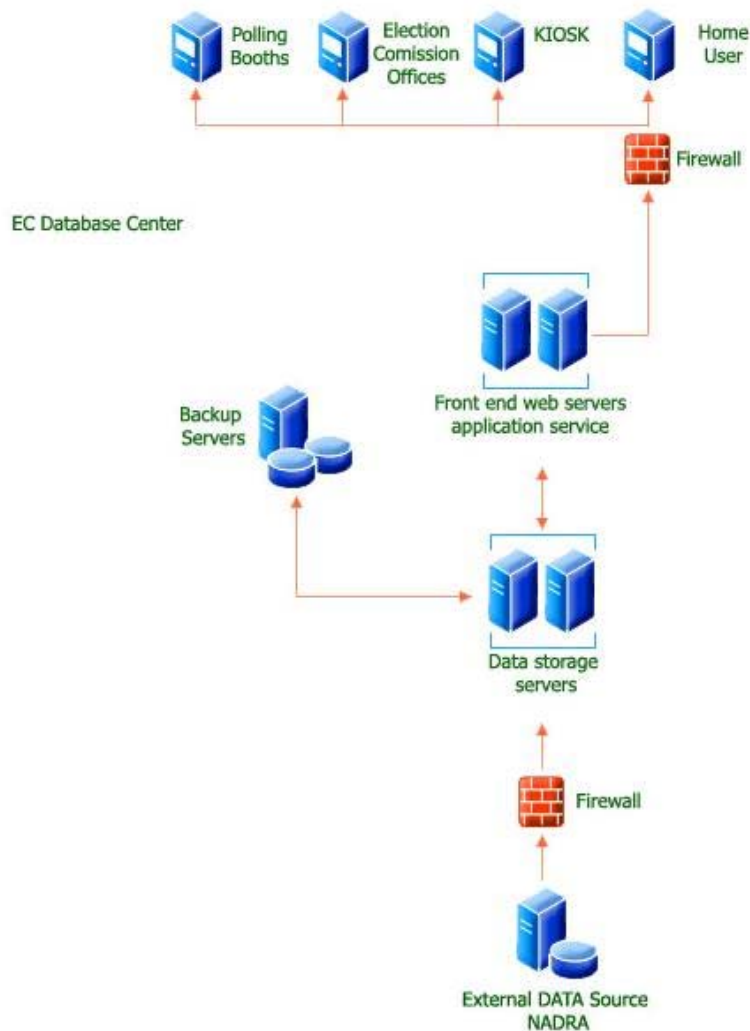


Figure 4.1: Purpose Secure Database system

This system will be more efficient than any other system, because here we have centralized database which is more secure for record saving and to verify the identification of each voter. Servers are communicating with NADRA's database.

The online system provides different options for voters to cast the vote. People can vote from their home PC, from the NADRA KIOSK, from the Polling Booths arranged by the Election Commission and there is no restriction of area. Anyone can cast the vote for candidates of his area to any polling booth in the country.

4.2.3 Designing Prototype

For an online system an interactive design will be more helpful for each voter. The end user will feel more at ease with an easy system rather than running a more complex system. Some prototypes are designed which are quite easy for the voters to cast the vote.

In further studies there is an option to design the system for polling booths and election officials' site and KIOSK etc, and registration site as well.

Following are the steps after the registration of a voter, these steps just cover the casting of votes.



Figure 4.2: first page: The Login Page of the proposed online election system

4.2.3.1 First Page: Login to your account

First page of the online election system is the login page. This step is after the registration of voter on the Election system. It is not possible to log on before registration on this software.

Is the login procedure is made in the simplest way possible. The login interface just has two required fields: the national identity card number, and the password given to the person after registration.



Figure 4.3: Second page: selection of Language

4.2.3.2 Second Page: Selection of Language

The second step is to select language; here we have option to select a language (Urdu/English) of Pakistan. After selecting any language next pages will be displayed in the same language as selected.



Figure 4.4: Third page: selection of candidates of National Assembly

4.2.3.3 Third Page: Select candidates of National Assembly

Third page is the list of candidates available for National Assembly of area of voter. The beauty of this system is that every voter only has a list of candidates of his area. This means he can't erroneously vote for a candidate of other area.

The highlighting of only one single candidate during the selection process is also a better way to reduce the number of possible problems, because in the current manual system some people stamp on more than one candidate and they don't know that they are making an illegal vote, and thereby are just wasting their vote, since it will not be counted.



Figure 4.5: Fourth page: selection of candidates of Provincial Assembly

4.2.3.4 Fourth Page: Vote for candidates of Provincial Assembly

When voting for the candidates in the Provincial Assembly we have the two same pages with the different Provincial Assemblies, which means that every voter will see their own Provincial page (see figure 4.5).

Pakistan has five provinces and people of each province will only see their own province during their login. The display of candidates and options is similar to the corresponding page of the National Assembly. It has been given the same style as the page for selection of candidates of national assembly page, with same options, radio buttons and other. Next and Previous buttons will facilitate voters to go back or to the next choice.



Figure 4.6: Last page: submission of vote

4.2.3.5 Last Page: Submit vote

On the last page (figure 4.6) we can see the final selection for National & Province Assembly. If someone wants to change the selection, they just have to click on the “Previous” button. After the final submission in the voting session the system will not allow him or her to change the selection again.

5 Discussion

It is necessary to see the benefits and errors of every system, but the most necessary issue is the correctness of the requirements. In earlier sections we discussed different problems of the current paper-based polling system in Pakistan, and we suggested replacing this with an online system to solve these issues and increase the speed of the process of election system. Now the discussion is: Why would an online system be the best solution for the current issues?

In various countries the voting system has already been converted to E-voting or computerized voting. Different approaches were implemented to increase voter turnout, facilitating voters and decreasing the number of fraud attempts. The proposed online system will provide a secure and as error free election system as possible with an interactive design with different languages, which will make it possible for many people to cast the vote.

The use of a voting machine is a solution for some problem like Ballot paper, speed of elections, counting accuracy etc. Punch cards have some inherent benefits like counting speeds etc. However, online systems will also provide a high counting speed, as well as help peoples to vote from any location, within their own city or even out of the country. In the introduction section it was discussed before that democracy needs people to actively come and show their will, and currently in Pakistan only 44% people are casting their votes. So, the main focus of this study is to cover the problems faced by the people during the elections and to suggest a design that would solve these issues. If this system is put into action, it is likely that a much larger number of the population would like to show their will for candidates.

It was already discussed [in section 3.2, 4.2] that after requirement analysis it is necessary to investigate which system is a fully implementable solution of current system. The main problems to consider are: registration of voters, elections, counting, frauds during election and speed of results etc.

Most of the population of Pakistan has no private facility of computer and Internet. So, we need to consider other options such as: the information KIOSK, which is already placed in many places by NADRA. The use of Internet-cafes is another option for people to cast vote, although this requires extra security measures to guarantee the secret voting. But there are still some areas where people do neither have the facility of a computer, an Internet Café, or a NADRA KIOSK. In these cases public government owned online polling booths will be helpful to cast the vote. So, it does not mean that after the introduction of the online system it becomes the duty of people to cast vote by their own personal resources. The polling staff, which is already used for manual system needs to be trained to register the people and help them in the voting process.

The rules for registration of voters are; they have to be 18 years old and a citizen of Pakistan. The same rules apply for getting an identity card of Pakistan. So, it is suggested that every ID card holder should be registered automatically to the Election commission of Pakistan when they receive the ID card. Then there will be no need of getting the same data again from each voter. Every card holder can get his password from the helpline of the Election commission or from an official website. The current system at the NADRA Kiosk uses thumbs print recognition as a password, but people also have the option to set a personal password on their login.

If some people could not be registered due to occurring problems then they have option to go online to get their password and to cast their vote or go to a polling booth, where officials will register them and allow them to vote. If people are facilitated this way, then it is also likely that more people will come for casting the votes.

6 Conclusion

In order to get better results in this study I tried to understand the paper-based polling system in Pakistan and not the least the drawbacks of the system. I studied different voting system with their advantages and disadvantages. The system proposed in this thesis will not just convert the current manual system to an electronic equivalent but will be possible to run in parallel with the current system and thus make it easier for the people who are not able to cast their votes due to different reasons as related above. This online system will be helpful for casting votes by different electronic ways. People will be able to cast votes through their home PC, through polling booths, NADRA Kiosks, and Net-cafes. This multitude of opportunities will make voting more accessible, and thereby hopefully create more attraction for those people who do not cast their votes today.

This study covers proposed system, designed phase of online voting. To complete the all portion of the system it is necessary to designed all phases with their relations; KIOSK software, online registration and database connected with NADRA.

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Appendex-1

Questionnaire: Election Commission Office of Pakistan

1. Which kinds of Elections held in Pakistan?
2. What is time period for Each Election?
3. Division of Area for each Assembly, numbers of positions in every area?
4. Which kind of information do you required for Candidate to register in Election?
5. Which kind of information does you required registering a Voter?
6. They way registration of voter or collection of information from voter before every election?
7. Full way of Election (Registration of Voter, casting vote and counting of votes)?
8. Which kind of problems do you faced during Election Procedure?
9. Do you think any electronic system can replace the current system?
10. After looking on different e-voting system which one is best for Pakistan in this situation?
11. Is there any system or resources which are helpful to design a purposed system?
12. Why Online Voting system is the only choice for Pakistan?
13. How much is it helpful in current situation for Election system in Pakistan?

Transcribed form of interview

In this discussion he briefs me the current system. I got Information regarding Elections for different Governments running in Pakistan; National Assembly, Senate, Provincial Assembly, local Governments etc. He told me the way to collection information and making voter list.

He told me about; why it is necessary to use a computerized system to control the fraud during elections, problems faced by the Election Commission.

He categorize the system in three parts; (1) Registration of Voters, (2) voting (3) Announcing Results. Now which kind of problem they faced during in these different parts are;

- (1) Registration of Voters:** mistakes of typing during Registration of voters, collection of data from each home of the country. Mostly people get their Voter card after

registration from different parties' offices, there is no way to get information regarding their votes from Election Commission of Pakistan directly

(2) Voting: Manual voting system make problem some people how to cast a vote, like some time they just stamps middle of the candidates or stamps more than one candidate and just waist their vote. Some people don't want to go for vote due to weather conditions or any other personal problems.

(3) Announcing Result: There is lot of chances of fraud or mistakes in the counting of votes. Some officers are under pressure of any Political party and can change the result.

We analyze the requirements and the resources. We discussed different system presently working in different countries, like in Australia, USA, UK and India. In this discussion we also think which system can easily replace or work with this current system. It was also in our discussion, we have to use current resources with minimum expenditure.

There are different e-voting system like; machine counting, electronic voting machine, online voting machine. After discussion with different e-voting system working in different countries, we find out the online system is best for Pakistan.

They need a system, which fulfill the all requirements; many people are not registered or registered with wrong data which creates problem for people to cast votes. On the day of election some people are hesitating to cast vote due to different problems or cast vote under pressure of any political party, land lord or head of family. If our purposed system covers these problem like; registration of voters, vote for any party in your area from any polling booth of the country.

During discussion we took an overview on current resources in Pakistan which can be used for our system, Election Commission of Pakistan higher Government servants to conduct the elections, different Colleges, Schools, Universities or offices are used to make Polling booths.

Their suggestion an online election system after analyzing the requirements [mentioned in section 3.2]

Appendex-2

Questionnaire: National Database and Registration Authority, (NADRA) Pakistan

1. How much information required applying a Computerized National Identity card?
2. Which field from information displayed in the ID card?
3. How you secure your database?
4. Which kinds of services offering by your department?

Transcribed form of interview

In our interview they give me a brief introduction of their system, and services provided to different organization for their online systems.

They give me information about requirements of registration of a person for National Identity card, shape of National Identity card. Snaps of Computerized National Identity Card (CNIC) and details of information are mentioned in section 3.3