ELECTION COMMISSION OF PAKISTAN

Committee on the Use of Electronic Voting Machines in Pakistan

Final Report and Recommendations

7 September 2010

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Executive Summary

The act of conducting an election is an incredibly complex task, representing an organisational challenge that is rarely fully appreciated by those outside of the election profession. Election administrators are constantly seeking ways in which this organisational challenge can be diminished. Technology can have a significant role in helping to meet the challenges of conducting an election. While many technologies can clearly assist election administrators and be adopted with little debate, the issue of using electronic voting machines has proven to be very controversial in recent years.

The term 'electronic voting machines' is actually used generally to refer to two kinds of technology – electronic voting and counting. Both technologies are very different and each one has potentially much to offer the conduct of elections. However, the recent experiences of countries using or considering the use of electronic voting machines has been very different. Some are moving towards full implementation of electronic voting machine solutions (e.g. India and the Philippines) and others choosing to remain with paper balloting (e.g. the UK and Ireland) or even move back from electronic solutions to paper balloting (e.g. the Netherlands and Germany).

The lesson to be learned from this mixed experience of electronic voting around the world is that the introduction of such technologies present new challenges and potential pitfalls for election administrators, alongside the significant benefits of using such technologies. These challenges can only be overcome if a careful and considered approach is taken to the issue of electronic voting machines, and all stakeholders are provided the opportunity to be consulted on the use of the technology. Furthermore, it is unlikely that an off-the-shelf solution will be suitable, rather technology will need to be adapted to the specific requirements if it is to truly meet the electoral needs of a country.

Recognising these challenges, the Election Commission of Pakistan has engaged in a comprehensive study into the feasibility of using electronic voting machines in Pakistan. Establishing a Committee on the Use of Electronic Voting Machines in Pakistan (EVM Committee) in November 2009, it tasked this Committee to assess the suitability of such technology in Pakistan, taking into consideration all of the relevant technical, operational, financial and legal issues. Four Working Groups were established by the EVM Committee to look at the different aspects of this study. The EVM Committee also arranged for a demonstration by leading electronic voting machine vendors of their technologies to the Election Commission of Pakistan. Three vendors made the trip to Pakistan to demonstrate their products. Political parties, civil society and international stakeholders were also invited to this demonstration, and were able to provide their opinions on the possible use of electronic voting machines.

The main findings of the EVM Committee are summarised below;

- The current system of paper balloting has many advantages, including that the system is verifiable and trusted by stakeholders, easy to understand for all, easy to recount, reliable and any fraud is more likely to be localised and on a limited scale.
- The current system of paper balloting does have a number of disadvantages, mainly relating to the size of ballot papers and printing, transportation, storage and security arrangements for paper ballots. Problems and inconsistencies related to the hand counting of paper ballots as well as the unintentional spoiling of paper ballot papers were also noted.
- It was assessed that in principle a move to an electronic voting system could help to resolve logistic issues related to ballot paper production, storage and disposal, wastage related to unused ballot papers, and the security of ballot papers. In

addition to these advantages, a reduction in the number of invalid votes cast, faster and more accurate counting, easier identification of candidates on the ballot and the need for fewer polling staff could be realised.

- The introduction of electronic voting technologies does present new challenges to election administrators including the overall transparency of the process and the trust in the process by voters and candidates, the auditability of the technology, the potential for widescale fraud, the capacity of equipment to deal with extremes of temperature and irregular power, the consequences of breakdown and the ease of use for uneducated voters.
- Taking into consideration the advantages and disadvantages of paper and electronic voting systems, a set of system requirements was developed. Any new system will need to meet these requirements if it is to provide Pakistan with a beneficial change in its system of voting and counting.
- The key system requirements identified were that; the system be an electronic voting system (removing the need for pre-printed paper ballots); a paper audit trail be available; the voting machine be able to run on an alternative power source; complex elections and multiple ballots be possible; multiple languages be displayed; and, that the system be robust, secure, easy to use and easy to maintain.
- The electronic voting machine solutions provided by 6 key international suppliers were measured up against this set of requirements. It was determined that there are electronic voting machines on the market which appear to meet the requirements identified by the EVM Committee.
- A cost analysis of the use of paper ballots compared to the electronic voting machines which meet the EVM Committee requirements indicates that the use of electronic voting machines will be more expensive than paper balloting even when calculated over the life-cycle of the voting machines.
- In fact the use of electronic voting machines is expected to be twice as expensive as continuing to use paper ballots. This is based on international procurement of electronic voting machines, and this cost could be reduced significantly if domestic production capacity for electronic voting machines could be developed.
- Regardless of the cost implications of using electronic voting machines, cost should not be the only consideration in the possible adoption of such machines. It is difficult to put a price on good democracy, and if electronic voting machines can significantly improve the quality of democracy then this is a strong argument for their adoption.
- The legal framework for elections in Pakistan does not currently allow for the introduction of electronic voting machines as the law makes many references to paper ballots, physical ballot boxes and hand counting procedures. Before electronic voting machines could be introduced in Pakistan, even for a pilot project, the legal framework would need to be amended to allow for their use.
- Legal changes are required in one Act, the Representation of the People's Act, 1976, and in a number of electoral rules. Legal amendments should be pursued so that electronic voting is possible, but not required, under the law, thus facilitating trials or the full use of electronic voting machines in the future.

These key findings were presented at the vendor demonstration, to which electoral stakeholders were invited. Political parties and civil society representatives provided broad support for the introduction of electronic voting machines in Pakistan. Importantly the stakeholders agreed that it is necessary to consider the issue of electronic voting machines very carefully and to trial the use of such machines before a full decision on their

implementation be taken. This will necessitate a longer term approach to the possible introduction of electronic voting machines, with a full assessment and implementation taking from 5-10 years.

Having concluded that the use of electronic voting machines in Pakistan is feasible, the EVM Committee has therefore recommended a number of steps to continue research into the possible use of electronic voting machines in Pakistan. These recommendations are that;

1. The use of electronic voting and counting technologies be pursued further, although a final decision on the national adoption of these technologies will remain pending.

2. The full implications of using electronic voting and counting technologies in Pakistan can only be partially assessed through the work of the EVM Committee and the consultations conducted as part of this study. Given that there are electronic voting and counting solutions that meet the needs of Pakistan, a full assessment of their suitability should be further explored through the conduct of a pilot project.

3. The electronic voting machine pilot project should be conducted during the local government elections likely to take place in 2011.

4. In order to test the use of electronic voting and counting machines, and supporting management and results tabulation systems, the pilot or pilots should be conducted in complete electoral jurisdictions. Local government elections provide a good opportunity for doing this with minimal investment in electronic voting and counting machines as the electoral constituency, the Union Council, is relatively small. One or more Union Councils should be selected to pilot the use of the selected electronic voting machine.

5. The ECP should begin the process to procure the electronic voting machines required to conduct these pilots. A Request for Quotation should be issued to the leading electronic voting machine vendors for the supply of machines for the pilot project.

6. The legislative changes required to enable the conduct of electronic voting or counting should be pursued urgently in order to facilitate the pilot project.

7. The pilot project should include comprehensive consultation with stakeholders to assess their reactions to using the electronic voting machines, and also a survey of voters to determine their experiences of using the machines.

8. After the pilot project has been conducted, and all assessments and surveys completed, the ECP should meet with stakeholders to discuss the pilot project and determine the next steps, if any, on the use of electronic voting machines in Pakistan.

9. The selected electronic voting machine supplier should be required to work with Pakistani industry in order to develop a national production capacity for electronic voting machines. This will make any electronic voting machine solution more sustainable and more affordable.

10. Local hi-tech universities and research institutions should be encouraged to conduct R&D with a view to design domestically produced electronic voting machines, meeting ECP's stringent requirements as per international standards in terms of technical and environmental specifications.

11. At the same time as the use of electronic voting machines are being further explored in Pakistan, the quality of the existing paper balloting system should be improved and the security features of the balloting papers enhanced.

Introduction

The act of conducting an election has been described as the largest and most complex logistical operation that a country ever undertakes in peace time. This complexity is not fully evident to those who participate in the election, the voters, candidates, political parties and observers. Election administrations around the world understand, however, that once an election is called they have to embark on a massive operational challenge to ensure that all aspects of the election run relatively smoothly. As can be seen from the UK 2010 General Election, even experienced election administrators in established democracies can sometimes make mistakes in this planning, and this can lead to the disenfranchisement of voters – a violation of fundamental political rights.

It is understandable therefore that election administrators should seek ways in which the operational burden and risks involved in implementing such a complex operation can be diminished. Technology is one of the tools that can be used to assist in the efficient and correct implementation of elections. Technology can be used in many different ways to assist in the implementation of elections, including the provision of reliable and fast communication mechanisms, the registration of voters, means of identifying voters, tabulation of results, publication of election information etc. Most of these technologies mentioned here are clearly beneficial in the conduct of elections and can be adopted without issue.

However, two technologies, electronic voting and electronic counting, are much more controversial. While many people talk about Electronic Voting Machines (EVMs) as if they are a homogenous technology, EVM technologies vary quite radically and in fact this general term covers two different technologies – electronic voting and electronic counting. While the traditional paper based voting system consists of a voter manually marking his or her paper ballot and this ballot being counted by hand by election officials, in e-enabled elections one or both of these processes are automated using an electronic device.

In electronic voting an electronic device is used to record the voting preference of the voter. In electronic counting an electronic device is used to count the ballots cast. Any combination of manual/electronic voting/counting is possible. A full 'electronic' solution will involve an electronic voting machine directly recording the preference of the voter through a display screen and electronically counting all the votes received at the end of polling, providing these results to the election officials. However, electronic solutions are available where paper ballots are marked manually by voters but counted by machine, and solutions are available where an electronic device is used to create a printed vote which is placed in the ballot box and counted by hand. So the general label of 'EVM' covers a number of different kinds of technologies, and even within these more specific technologies there are many ways of automating the same tasks.

The technological complexities offered by electronic voting and counting means that there are many options available for election administrators in considering the introduction of EVMs. The variety of technologies offered by EVMs might be one factor which has led to very different experiences of countries which have used and attempted to use EVM solutions. In the Asian region we see a strong move towards the use of EVM technologies, with India and more recently the Philippines conducting their elections using EVMs (although different kinds of solutions) and with Bangladesh, Nepal, Bhutan, Thailand and Indonesia all actively considering the introduction of EVMs. However, in the rest of the world the status is more mixed. While Brazil uses EVMs for its elections and other South American countries use EVMs to varying degrees, Ireland, the Netherlands and Germany have more recently stopped using EVMs and the United States has moved away from electronic voting solutions in favour of electronic counting solutions.

The experience of the Netherlands are particularly instructive when it comes to the pitfalls and potential costs of introducing EVM technologies. The Netherlands had been using EVMs since the 1990s and many voters had only ever voted using EVMs. But in 2008 the Netherlands decertified all of its EVMs and moved back to paper ballots due to security concerns and a lack of transparency over the operation of the machines. Similar issues led to the return to paper ballots in Ireland and Germany. In Ireland over €60M of EVMs are now lying in storage unused.

Nevertheless, EVMs have much to offer to the conduct of elections. Potentially they can significantly reduce the costs involved in holding elections by eliminating the need to print, transport, store and count ballot papers, invalid ballots can be reduced/eliminated and counting and publication of results can be achieved much faster and in an error free manner. Often the success of the failure achieved in implementing an EVM solution is less due to the technology itself than the way in which it is implemented and the way in which broad support for the use of EVM technology is obtained from important election stakeholders.

The lessons from these international experiences are, that the particular EVM solution which might be suitable for a country will depend a lot on country specific factors, that it is important to proceed carefully and ensure that the needs of the country are properly met, that key stakeholders must be included throughout the process, and that a full consideration of the requirements for and phased implementation of EVM technologies are much more likely to result in success. Ultimately the voters, candidates and political parties have to trust the electoral process, of which voting and counting are critical components, and only by pursuing a careful and inclusive approach to the introduction of EVMs will trust be possible.

Accordingly the Election Commission of Pakistan (ECP) has adopted such an approach in its consideration of the possible introduction of EVMs in Pakistan. The ECP has methodically worked through the issues to be considered in relation to the use of EVMs in Pakistan and in this report presents the findings of over 6 months of work on this issue.

Work of the EVM Committee

On 14 November 2009 the Hon'ble Chief Election Commissioner, Justice (R) Hamid Ali Mirza, established a Committee on the Use of Electronic Voting Machines in Pakistan (EVM Committee) under the Chairmanship of Joint Secretary (Elections) Syed Sher Afgan. The Hon'ble Chief Election Commissioner tasked the EVM Committee with conducting a detailed feasibility study into the potential use of EVMs in Pakistan with options and recommendations, considering all technical, operational, financial and legal aspects.

The first meeting of the EVM Committee was held on 17 December 2009, in which a comprehensive plan for the conduct of the feasibility study was discussed. The approach discussed was subsequently written into an 'Electronic Voting Machine Feasibility Study Plan'. Exploring the scope of its mandate, the EVM Committee concluded that the overall objective of the study was:

> *To conduct a feasibility study on the use of new technologies for voting and the counting of votes, to determine whether these technologies are suitable for introduction in Pakistan. The suitability of the technologies will be assessed in terms of the advantages they might offer over the current system of paper balloting and counting, the technical and operational challenges associated with their use, a financial assessment of the comparative costs of paper versus electronic voting/counting, and the legal implications of using electronic voting/counting.*

A number of steps in the conduct of this feasibility study were agreed at the first meeting of the EVM Committee on 17 December. These steps were;

1. Assessment of Strengths and Weaknesses of the Current Paper Balloting System
2. Assessment of the Benefits of New Technologies
3. Cost Analysis of Paper Balloting versus New Technologies
4. Assessment of Legal Implications of Using New Technologies
5. Vendor Demonstration of Technologies
6. Consultations with Stakeholders
7. Conclusion of Report and Recommendations

It was agreed to establish separate working groups to look at the first four steps in this process and the labours of these Working Groups started in earnest in March 2010.

Working Group I - Assessment of Strengths and Weaknesses of the Current Paper Balloting System

Working Group I was tasked with the following mandate:

- Assessing the strengths of the current paper based balloting system
- Assessing the weaknesses of the current paper based balloting system
- Determining whether the weaknesses identified can be adequately resolved while still using the current system of paper based balloting
- Identifying the improvements that would be sought in implementing any change from the current system of paper balloting

The findings of the Working Group on these issues are identified below.

Strengths of Paper Balloting

Working Group I concluded that in fact there were many important features of the current paper balloting system which represented strengths of the current system, including the following:

- **Verifiable and Trusted by all Stakeholders** – The major advantage of hand counted paper ballots is their verifiability. This produces a high level of trust in all stakeholders. Voters can verify their selection before placing ballots in a publicly observable ballot box. After all ballots are cast, they are counted openly to provide public verifiability of the final results. Hand counting has been shown to be one of the most accurate tabulation methods. For voters lacking the ability to read or mark their own ballots, privacy and verifiability are the main issues. Transporting the ballots to a separate counting location reduces verifiability, as fraud may be introduced during transit. However, if the counting is conducted at the polling site, as is practiced in Pakistan, it is a verifiable option. This is because all voters use an identical Paper Ballot in a constituency, with a tangible audit trail, helping in the reconciliation of ballot data.

  Paper ballots for all voters – absentee, non-absentee, and disabled, can be handled and counted using the same type of equipment. Polling personnel must be able to instruct voters and carry out the final ballot count.

- **Easy to Understand by Voters** – Paper ballots are familiar to everyone. The voter is given a paper ballot that contains the names of candidates and their election symbols. Hand marking a paper ballot is an easy and familiar method for all voters who are physically able. In elections in Pakistan, a voter receives a ballot with the names and symbols of all candidates for a specific office. A separate ballot for each office is issued on a specific election day. A white ballot signifies the Provincial election and a green ballot the National Assembly election. Usually volunteers from political parties and supporters of independent candidates also stand outside polling stations distributing how-to-vote cards. These cards illustrate how political parties or candidates would like voters to cast their vote.

- **Easy to Recount by Hand** – Elections are often closely contested, and the results at times can be based on a single vote. If a manual recount is required, paper ballots are easier to count, as they are simply taken out of the ballot box, folded and sorted. Another advantage is that the results of the count are easier to verify even after the election. Once counting is completed, the ballot paper marked for each candidate are placed in a separate envelope and distinct sealed bags, and archived. If the results of the election are later challenged, the bags may be reopened before a Returning Officer or Election Tribunal judge and recounted. Further, rejected ballot papers may be re-examined to determine whether they ought to have been rejected or not.

- **Reliability** – Paper ballots are either hand-marked by the voter or marked with a ballot-marking device by a special needs voter. As paper ballots do not require electricity, voters may continue to mark their ballots even in the event of a power failure.

- **Fraud is More Likely Localized and Not Widespread** – A paper ballot marked directly by the voter eliminates the possibility of digitally manipulating the official records of an election. The participation of multiple parties in the vote-counting process also enhances confidence in the vote-counting process.

- **Easy Replacement in the Event of Damaged or Spoiled Ballot** – If the ballot is damaged or spoiled, the voter is usually savvy enough to ask for a replacement and cast his vote using new ballot paper.

It will be important that the application of any electronic voting or electronic counting solution does not undermine these strengths.

Weaknesses of Paper Balloting

The Working Group also recognised that the use of paper ballots presented a number of challenges and problems to the conduct of elections, including;

- **Physical Management of Paper Ballots** – A significant amount of time and cost is necessary for the physical management of paper ballots. New ballots must be designed, printed, packaged and transported to each polling location, and marked ballots must be collected from multiple sites, transported and placed in storage. This lengthy process is repeated for each election cycle. Electronic voting has the potential to eliminate all of these paper ballot processes.

- **Storage and Security of Paper Ballots** – Before, during, and after an election, paper ballots must be stored in a secure facility and transported in safe vehicles. Associated costs include the overhead for secure storage space, secure vehicles and staff for transportation.

- **Extra Large Size of Paper Ballot** – The more candidates seeking election, the larger is the size of the paper ballot. During regional elections, in which there are generally many candidates, the voter must mark a large ballot. It is then awkward for the voter to fold the ballot and place it in the box, and equally so for the election staff to remove ballots from the box and unfold them, slowing down the count.

- **High Rate of Incorrect Marking of Ballots** – Confusing symbols or printing errors on a paper ballot can cause voters to misunderstand the ballot and potentially vote for the wrong candidate, thus increasing the rate of invalid ballots. For example, in Pakistan, due to a printing error on some ballots the symbol for “book” was misinterpreted to look like a “match box.” In the 2000 United States Presidential election, Florida's “butterfly” paper ballot was deemed confusing to some voters, causing them to vote for the wrong candidate. Poor design is not illegal, but it can subvert the principles of democracy.

- **Very Slow and Inaccurate Voting and Counting Process** – Manual counting is susceptible to human error, particularly when counting a large number of ballots. It is also a very slow process. These drawbacks, however, are eliminated with an electronic counting system.

- **Marking Errors** – Comparing two separate ballots with different formats may add extra difficulty for people with poor eyesight and learning or reading disabilities. This may result in marking errors by the voter, causing invalid votes and potential disputes at the polling station.

The Benefits of Change

The weaknesses inherent in the current system of paper balloting were used by Working Group I to map out what the anticipated benefits of a change from the current system would be. These were identified as;

- **Time** – The printing, packing and distribution of paper ballots are time consuming and costly exercises, as are the counting and tabulation of results. The time pressures of ballot production and distribution present the ECP with a significant operational challenge. A move away from paper balloting would likely reduce this operational pressure on the ECP, making logistical preparations for elections easier and less time consuming.

- **Ballot Size** – The sizeable number of candidates in some constituencies makes the paper ballot very large and unwieldy for voters, leading to confusion and difficulty in finding the voter's candidate of choice. A change from paper balloting might be better able to deal with this challenge.

- **Storage** – Used ballots and ballot boxes take up a considerable amount of space when stored after an election. A change from paper balloting would reduce this logistical challenge, and associated costs.

- **Security of Paper Ballots** – There are many points in the process of ballot production, storage and distribution where ballots can be stolen, and then re-introduced into ballot boxes. A change from the paper ballot system could deal with these ballot security issues more effectively.

- **Unused Ballots** – Pakistan produces enough paper ballots to cope with a 100% turnout in each polling station, but turnout rarely exceeds 50% overall, meaning that a significant number of ballots are printed, transported and stored without being used. This is a huge operational and financial waste. A change in the balloting system would most likely address this wastage of resources.

- **Invalid Votes** – There were 2.69% invalid votes at the 2008 General Election. This is not excessively high, but is certainly a figure that could be improved. A change from paper balloting would hopefully address this to some extent.

- **Speed and Accuracy of Counting** – The counting process takes place at the end of polling, making it a very long day for the polling staff involved in both polling and counting. This means that the staff are tired, the process takes longer than it might otherwise and errors can be made. These issues could be resolved through a change in balloting system.

- **Ballot Security Features** – Pakistan's paper ballots are printed on plain paper and have very simple designs. This makes them easy to reprint and potentially introduce into the voting/counting process at some point in order to defraud an election. Ballot papers need to be more secure, and this should be addressed in any change to the balloting system.

- **Candidate/Party Symbols in Colour** – The symbols used for candidates and/or political parties can sometimes be difficult to determine on the ballot paper. The identification of the proper candidate/party symbol would be far easier if these symbols were printed in color. This should be addressed in any change to the balloting system.

- **Disposal of Ballot Papers** – Disposal of ballot papers from previous elections is a huge logistical task for the ECP. It requires significant logistics and staff time to sort out and remove sensitive documents, and then load documents to be disposed off. A change in balloting system might lessen this considerable operational challenge.

While it may not be possible for any new system of voting and counting to achieve all of these benefits, this should be the target.

Working Group II - Assessment of the Benefits of New Technologies

Working Group II was tasked with:

- Assessing the general strengths of electronic voting and counting systems;

- Assessing the general weaknesses of electronic voting and counting systems;

- Identifying the infrastructure requirements nationally and within the Election Commission of Pakistan (ECP) that would be needed to implement an electronic voting and/or counting system, determining whether this infrastructure currently exists, and whether it would be possible, and at what cost, to create the infrastructure required; and

- Assessing the specific challenges that the ECP would face in implementing an electronic voting and/or counting system, including training of staff, voter education, cultural sensitivity, stakeholder trust, specialised staff skills required, storage and maintenance requirements, and preparation prior to elections

- Assessing the product information provided by electronic voting and counting machine suppliers to see if it might be suitable for Pakistan, and in particular to see if it might help to meet the areas for improvement identified by the working group assessing the strengths and weaknesses of the current system of paper balloting.

Electronic Voting Machines – Advantages and Disadvantages

There are many different kinds of EVMs on the market, and each one has different features, so a definitive list of advantages and disadvantages of EVMs would have to be specific to a particular voting machine. However, the Working Group identified the following general advantages and disadvantages associated with the use of EVMs:

Advantages

- **Impartiality** – EVMs follow set rules and should be independent from human influence, therefore acting in an impartial manner.

- **Standard Adjudication of Ballots** – where paper ballots are counted electronically, this ensures that the same kind of ballot marking is adjudicated in the same manner across all polling stations. This ensures consistency over which ballots are counted and which are determined to be invalid.

- **Elimination of Invalid Ballots** – where ballots are cast directly on an EVM and recorded electronically, EVM software can and should be configured to ensure that it is impossible to cast invalid ballots (although blank ballots can still be allowed).

- **Speed of Counting** – a very important advantage of using EVMs which directly record votes electronically is that results are available immediately after the polls without a lengthy counting process. Even where paper ballots are used, but electronically counted, the results are normally available a lot faster than when hand counting takes place.

- **Accuracy** – EVMs should be programmed to have the voter confirm their selection before casting the vote(s) and this serves to ensure that voters do not make mistakes in casting their votes.

- **Fraud Prevention** – EVMs can help to mitigate some of the ways in which fraud is conducted in polling stations. The Indian EVM for example only allows votes to be cast at a certain speed, thus mitigating against 'ballot stuffing'. It cannot however help deal with all aspects of fraud.

- **Accurate Tabulation** – where results are recorded electronically and transmitted to the election management body for tabulation this removes the possibility of data entry errors when entering results.

- **Cost** – one possible advantage is the cost of conducting elections. EVMs remove the need for expensive ballot printing, distribution, storage etc., but incur different kinds of costs which need to assessed over the life cycle of the EVM.

- **Problems in the Official Stamp** – the need to have an official stamp on paper ballots can cause problems if polling staff forget to stamp the ballot (thus invalidating the ballot) or if the stamp smudges on the ballot, making it look like a second mark on the ballot (also invalidating the ballot). EVMs do not suffer from this problem.

- **Increase in Turnout** – the use of EVMs may lead to an increase in turnout if electronic voting or counting helps to improve trust in the voting system or if the use of technology itself makes people more interested in participating.

- **Increased Speed of Voting** – the use of EVMs may lead to a faster voting process as there are less steps to the process, with no ballot being issued to the voter and no need to fold and place the ballot in the ballot box afterwards.

- **Complex Elections** – EVMs are generally able to deal with complex elections easily. This includes more complex electoral systems, such as preference voting and block voting, as well as holding multiple elections at the same time (for example National Assembly and Provincial Assembly elections, or the six ballots currently used for Local Government Elections).

- **Logistical Arrangements** – EVMs will likely take up less storage space and require lesser logistical arrangements to distribute and collect than paper ballots. This will also have an impact on the overall cost of the election.

- **Late Changes to the Ballot** – while any last minute changes to the ballot should be avoided, in the past Court decisions have required that last minute changes to the ballot be made. With the long lead time for designing, printing and distributing paper ballots this has sometimes not been possible. It is much easier to amend the ballot design software in affected constituencies at a later stage in the election process.

- **Access for People With Disabilities** – EVMs can be developed in such a way as to facilitate the secret casting of ballots by voters with disabilities, voters who would normally require assisted voting, which violates their right to secrecy of voting preferences.

- **Additional Candidate Identification Mechanisms** – the more advanced EVMs are capable of showing the name, symbol and even a picture of the candidates so that voters can more easily identify their preferred candidate.

- **Less Polling Staff** – with a simpler process in the polling station, no ballot to be issued and no ballot box to monitor, it may be possible to reduce the number of staff required for each polling station. It is often difficult to find staff for polling stations so this may be a significant benefit.

Disadvantages

- **Audit of Results** – a great strength of the paper balloting system is that if the results of an election are challenged then the ballots can be recounted to check the result. Many EVMs have no such possibility for auditing and checking the results of an election. This possibility for audit and checking is an important feature of building trust in the electoral process and acceptance of the results. Some EVMs do have what is called a Voter Verified Paper Audit Trail (VVPAT), which prints a copy of the electronic ballot and can be used to audit/check electronic results produced by the EVM. These are more expensive however.
- **Confusion for Illiterate/Uneducated Voters** – any change in a system can cause confusion as users of the system have to adapt to new procedures. EVMs, while simple to use for most educated voters, may be confusing for illiterate and poorly educated

voters, of which there are many in Pakistan. Despite this being a genuine concern, simpler EVM solutions have been successfully used for populations with high levels if illiteracy, as demonstrated by India.

- **Consequences of Fraud** – while fraud conducted using the paper balloting system is often very localized and not widespread, the possibility exists with EVMs for fraud to be implemented on a nationwide scale. EVM software could be manipulated to record vote preferences which are different from those made by the voters, or fraud and manipulation could occur in the electronic tabulation of results if such tabulation occurs directly from the EVMs.
- **Lack of Transparency** – transparency is a key component of building and maintaining trust in the electoral process. The paper balloting system is very transparent, observers can watch ballot being issued to voters, voters placing their marked ballots in the ballot box and these ballots being counted. EVMs are often considered to be 'black box', in that no one can see the working of the machine and the way in which the selected choices of voters are aggregated to produce the results that the EVM produces at the end of polling. We simply have to trust that these results accurately reflect the choices made by voters. This lack of transparency makes the possibility for checking the results produced by EVMs all the more important.
- **Cost** – EVMs range in cost from $300 for the more simple EVM solutions to approximately $5,000 per unit. With an expected 225,000 EVMs required if adopted across Pakistan, this would mean that the cost of implementing EVMs in Pakistan would range from approximately $67 – 1,125 million. This is a huge investment, although a full comparison against the costs of paper balloting needs to take into consideration the life cycle of the EVM and therefore the number of election cycles it would be expected to cover.
- **Integrity and Accuracy of Source Code** – EVMs rely on software to function. This software is essentially a set of instruction to the EVM on how it operates. As with any set of instructions, mistakes can be made and a thorough review of the source code has to be conducted before any voting machine should be used. As it takes specialized technical skills to be able to read and understand source code, an independent testing authority would need to determine whether the EVM is functioning according to its specifications before it is accredited for use in an election.
- **Tendered Votes** – there is the possibility in Pakistan for tendered votes to be cast by voters. Most EVMs do not allow this possibility, and any vote cast on the EVM will be included in the results.
- **Environmental Considerations** – Pakistan has a wide range of environmental factors which any EVM would need to be able to withstand and perform reliably under. These factors include extreme heat, cold, humidity and dust.
- **Storage of Equipment** – some EVM equipment is required to be stored under certain temperature conditions between elections. Such temperature controlled storage would be difficult and costly to find in many parts of Pakistan.
- **Power Considerations** – EVMs require a source of power, with most running on mains electricity. Chronic power shortages and the lack of electricity at all in some areas of Pakistan mean that for any EVM solution to be feasible in Pakistan it must be able to run for the entire period of polling on an alternative power source to mains electricity. This limits the EVM options available considerably.
- **Voter Education** – a considerable amount of voter education would be required to educate and prepare voters for a move to EVMs. This voter education exercise would likely be very costly.

- **Specialised IT Skills** – the maintenance and fixing of EVMs requires specialised IT skills which may be in short supply in Pakistan. These skills would not just be required centrally or even Provincially, but also out at a more local level in order to deal with possible problems closer to election day when the EVMs are distributed to the field. If these skills are in short supply then the use of EVMs may either be unsustainable in Pakistan, or may require the expensive import of foreign expertise.
- **Consequences of Breakdown** – if an EVM breaks down before or during polling and it is not possible to fix the EVM, the potential consequence of this breakdown is the disenfranchisement of the voters in that polling station. This is a serious consequence which would probably require that spare machines be available at a local level in order to cope with any breakdowns. The need for stand-by machines to cover this eventuality would increase the cost of EVMs considerably.
- **Setup Procedures for EVMs** – the procedures that need to be conducted at the beginning and end of polling may be difficult for many Presiding Officers, who may not be sufficiently technology literate to understand and implement them.
- **Trust** – the lack of transparency with EVMs means that trust is a considerable problem with electronic voting systems. Election management bodies need to ensure that trust in the electoral process is maintained, as once it is lost it is difficult to re-establish. While the introduction of EVMs does not have to lead to an erosion of trust in the electoral process, it has occurred in other countries. Election management bodies are likely to have to introduce new procedures, possibly random audit of results or publication of source code for EVMs, in order to maintain trust in the process.

New System Specifications

In addition to the areas for improvement identified by Working Group I, the strengths of the current paper based balloting system were also considered. Many of these strengths would need to be maintained in any new system of voting and counting. The areas of improvement and these strengths were then combined into a set of ballot system requirements. These system requirements are outlined below.

Electronic Voting System

When considering the potential benefits of moving from a paper balloting system many of the benefits related to the move away from printing, transporting and storing paper ballots, and a similar reduction in logistics resulting from not having ballot boxes and ballot box seals. It was determined therefore, that if Pakistan was to use new technology for voting/counting it would be most beneficial to use direct recording electronic voting technology and not through the electronic counting of paper ballots.

Paper Audit Trail

In line with emerging international standards on electronic voting, the Working Group felt that it was very important that any voting machine be auditable. In this way, in the event of a challenge to the election results in a polling station, a voter verified paper audit trail could be used for a recount. This was seen as essential for developing trust in the new system and in light of the very contentious nature of elections in Pakistan.

Alternative Power Source

Pakistan faces severe energy shortages, with load shedding at peak times meaning that as little as 4-6 hours of mains power might be available in a 24 hour period. In addition to this many rural locations, at which polling stations are established, are not even connected to the power network. Therefore EVMs would need to have independent sources of power. Ideally this would be achieved through an internal battery source, but it could be through an external battery which is widely available, such as a car battery. Such a battery source would need to power a voting machine for up to 12 hours. Small generators are not a feasible solution in this regard due to the additional cost and the unreliability of such generators.

Cope with Complex Electoral Systems
While national and provincial elections in Pakistan are first past the post elections, local government elections may use more complex electoral systems and therefore any voting machine will need to be able to deal with such systems. The EVM would also have to be able to deal with multiple ballots as National Assembly and Provincial Assembly elections are held at the same time, requiring two separate ballots, and Local Government elections currently consist of six separate ballots.

Cope with Multiple Languages
There are many regional languages in Pakistan, some of which have semi-official status and may have to be used for ballots. Therefore, any EVM will need to be able to cope with multiple languages.

Robust
Pakistan has a significant range of climates, from hot, dusty desert areas, to high, cold mountain areas in the Himalayas. As such any EVM will need to be able to cope with a wide range of temperatures, weather conditions and dust.

Easy to Maintain
The size and logistics of Pakistan mean that voting machines would not be collected into a central location for storage, but more likely to 125 or 25 locations between elections. This means that technically qualified staff would need to be present at these locations to reprogram machines with ballot designs prior to each election, and this skillset might be difficult to find in some locations.

Ease of Use
Given the varying levels of education and literacy in Pakistan, any EVM will need to be easy to use.

Secure
The security of the system is important for overall trust in the electoral process, and it would be essential to be able to demonstrably show that the voting system is as secure as reasonably possible.

The Suitability of EVMs

Having defined a set of specifications against which any balloting system would need to be measured, Working Group II next turned its attention to determining how EVMs measure up against this set of requirements. In order to accomplish this, a number of EVM suppliers were contacted to obtain the details of products which these suppliers thought might be suitable for introduction in Pakistan.

A total of 11 leading suppliers of EVM solutions were contacted by the EVM Committee to request information on their products. Of these 11 suppliers, 6 responded and provided information to the EVM Committee and 3 of these supplier also indicated a willingness to travel to Pakistan to discuss further with the EVM Committee and the ECP. Details of the suppliers contacted are below.

Table 1 – Details of the Suppliers Contacted and their Responses

EVM Supplier	Product Information Provided	Attend Vendor Demonstration
Advanced Voting Solutions (USA)		
Bharat Electronics Limited (India)		
Election Systems and Software (USA)	Yes	
Indra Systems (Spain)	Yes	Yes
Microvote Infinity (USA)		
Nedap (Netherlands)	Yes	
Populex (USA)	Yes	
Dominion Voting Systems (Canada)	Yes	Yes
Smartmatic Auditable Election Systems (USA)	Yes	Yes
SunVote (China)		
Unilect (USA)		

As outlined above, EVM product information was provided by six EVM suppliers – Dominion Voting Systems, Election Systems and Software, Indra Systems, Nedap, Populex and Smartmatic. Details of the products suggested by each of these suppliers is shown in the Table 2 overleaf.

As the Indian Election Commission is very active in promoting its EVM to neighbouring countries this product is also included in the study, and this also acts as a comparison of a cheaper and much simpler electronic voting system option. Due to the fact that Bharat Electronics Limited, the producer of this EVM, did not reply to the request for information from IFES the details included below are the most accurate that can be found through research on relevant websites about the Indian EVM.

Most of the suppliers who responded to the request for information responded with several products which could be suitable for Pakistan. These products fell into a number of categories;

- **Optical Scan Ballot Counting Systems** – these systems use paper ballots which are marked by voters by filling in a bubble or completing a line for the candidate(s) selected by the voter. The ballot scanner reads the mark(s) on the ballot and counts the votes accordingly. These ballot counting machines can either be used in each polling location or for central counts.
- **Direct Recording EVMs** – these voting machines record the choices of the voters on the memory of the machines and at the end of polling the results from the machine are either printed out or transferred to a results tabulation centre. Some of these direct recording EVMs print out a receipt of the vote, which is either kept internally in the EVM or is

provided to the voter and is placed by the voter in a ballot box. The votes in the ballot box can then be counted should there be a challenge to the result.

Table 2 – Details of EVM Product Information Provided by Vendors

Solution Name	Details	System Components	Life Expectancy	Voter Capacity	Temperature Limits	Cost
Dominion Voting Systems						
Frontier Election System	Paper balloting system with electronic counting of ballots using mark-sense technology	Ballot Scanner	20 years	1,000 – 5,000	4.5 to 40 C	$3,000 - $4,000
Election Systems and Software						
DS200	Paper balloting system with electronic counting of ballots using mark-sense technology	Ballot Scanner	10 years	-	Not provided	$6,500 to $8,500
iVotronic	Touch Screen EVM	EVM	10 years	-	Not provided	$1,900 to $2,900
Ruggedized Prototype	Prototype touch screen EVM – no details provided	EVM	10 years	-	-10 to 55 C	Not provided
Indra Systems						
Point&Vote ECO	Touch Screen EVM	EVM Screen Ballot Box	12 years minimum	1,500	-10 to 50 C	$2,000
Nedap						
Improved Paper Voting System	EVM which prints a paper ballot with voter choice. Ballot is fed into ballot box, which counts the ballot as fed in. Results from the ballot box transferred to PC and printed	EVM Automated Ballot Box Polling Station Computer 800kw Generator	15 years	400 to 2000	Not provided	€12,000 for each polling station
ES3 Voting	Button operated EVM which prints a	Poll Worker Unit	15 years	-	5 – 45 C	Not

Machine	paper receipt of the vote as audit trail	Electronics Unit EVM Printer				provided
Populex						
Digital Paper Ballot System - PopulexSlate	EVM receives voter choices and prints barcoded ballot with voter choices. The EVM does not record the vote, the printed ballot is the only record	Poll Worker Computer EVM Ballot Scanner	10 years	-	Not provided	$5,250 for polling station
Hand Marked Paper Ballot System	Paper balloting system with electronic counting of ballots using mark-sense technology	Ballot Scanner	10 years	-		$15,000
Smartmatic						
SAES888	Button operated EVM with built in printer, allowing paper receipt to be stored in ballot box and printing of electronic results at the close of polls	EVM Smartcard Activator	6-10 electoral cycles	-	5 to 30 C	$1,586 for one unit
SAES4000	Navigation pad operated EVM with printer	EVM Smartcard Activator	-	-	Not provided	Not provided
SAES1800	Paper balloting system with electronic counting of ballots using mark-sense technology	Ballot Scanner	-	-	Not provided	Not provided
Bharat Electronics Limited						
Indian EVM	Button operated EVM	Ballot Unit Control Unit	-	-	Not known	$250 for one Ballot and one Control Unit

- **Digital Paper Ballot Systems** – these voting machines are used to print a ballot which details the voter choice. The voting machine does not itself record this choice, and the paper ballot it produces is fed into a ballot box which counts the vote as it is placed in the ballot box. The ballot box prints out the results at the end of polling, and if there is a challenge to the result then the paper ballots in the box can be counted.

Each of the products suggested by suppliers, as well as the Indian EVM, were measured up against these requirements to see if they met the requirement or not. In some cases insufficient information was provided by the suppliers to be able to make the assessment. This was the case for all of the last three requirements (Easy to Maintain, Easy to Use and Secure) and therefore these requirements were 'to be determined' (TBD) and will have to be clarified if the ECP feels that the EVM might be suitable for introduction in Pakistan.

The results of this analysis is presented in the Table 3 overleaf and is summarised below:

Electronic Voting System
The Optical Scan Ballot Counting Systems suggested by ES&S, Populex, Dominion and Smartmatic were rejected as they were not electronic voting systems, but electronic counting systems. All of the other systems met this requirement.

Paper Audit Trail
Of the electronic voting systems, only Indra's Point&Vote ECO, Nedap's Improved Paper Voting System and ES3 Voting Machine, Populex's PopulexSlate, and Smartmatic's SAES888 were able to produce a paper audit trail for the casting of the vote electronically. The rest of the electronic voting solutions had no way of auditing the results produced by the EVM.

Alternative Power
Of the electronic voting systems suggested, many of them did not have any alternative power source. Only the Indra's Point&Vote ECO, ES&S Ruggedized Prototype, Smartmatic SAES888 and Indian EVM have internal battery sources. The Indian EVM's battery is sufficient to conduct the entire polling operation on battery power, and it is assumed that the ES&S Ruggedized Prototype also has this capacity as it has been developed specifically to deal with this lack of power. However the Indra's Point&Vote ECO and Smatmatic SAES888's internal batteries are only capable of powering the machine for a limited time, meaning that it would not be able to power the machine for the duration of polling, as well as start up, close down procedures and a possible extension of polling.

However, several suppliers indicated that the kind and quantity of internal lithium batteries required to power an EVM, with paper audit trail capacity, for the duration of polling would add significantly to the cost of any EVM, as well as adding to the weight. In addition to this, such batteries would have to be used regularly if there were to be kept in good working order and would probably need to be replaced every 2-3 years. This would involve a significant additional cost.

Alternatives to internal batteries were recommended, and these alternatives included running the EVMs from a generator or from a car/motorbike battery. The generator solution is a very costly and an unreliable one, so was rejected by Working Group II, but the use of a car/motorbike battery does seem feasible as these batteries are relatively cheap, easy to obtain locally, and in the event of a battery failure there is a very good chance that alternative is available close by.

It was possible to confirm that of the EVM solutions recommended, the Dominion Frontier Election System, Indra Point&Vote ECO, Nedap ES3, Smartmatic SAES888 and SAES1800 were all capable of running on car/motorbike battery power for sufficient time to conduct polling in Pakistan.

Table 3 – Assessment of EVMs Against Requirements

Electronic Voting System	Paper Audit Trail	Alternative Power	Complex Electoral Systems	Multiple Languages	Robust	Easy to Maintain	Easy to Use	Secure
Dominion – Frontier Election System								
No	Yes	Propose car battery	Yes	No	Yes	TBD	TBD	TBD
Election Systems and Software – DS200								
No	Yes	No	Yes	No	Not Known	TBD*	TBD	TBD
Election Systems and Software – iVotronic								
Yes	No	No	Yes	Yes	Not Known	TBD	TBD	TBD
Election Systems and Software – Ruggedized Prototype								
Yes	No	Yes	Yes	Yes	Yes	TBD	TBD	TBD
Indra – Point&Vote ECO								
Yes	Yes	3hr internal battery and car battery option	Yes	Yes	Yes	TBD	TBD	TBD
Nedap – Improved Paper Voting System								
Yes	Yes	Propose generator	Yes	Yes	Not Known	TBD	TBD	TBD
Nedap – ES3 Voting Machine								
Yes	Yes	Propose car battery	Not Known	Not Known	Yes	TBD	TBD	TBD
Populex - PopulexSlate								
Yes	Yes	No	Yes	Yes	Not Known	TBD	TBD	TBD

*TBD: To Be Determined

Electronic Voting System	Paper Audit Trail	Alternative Power	Complex Electoral Systems	Multiple Languages	Robust	Easy to Program	Easy to Use	Secure
Populex – Hand Marked Paper Ballot System								
No	Yes	No	Yes	No	Not Known	TBD	TBD	TBD
Smartmatic – SAES888								
Yes	Yes	8 hour battery and car battery option	Yes	Yes	No	TBD	TBD	TBD
Smartmatic – SAES4000								
Yes	No	Propose car battery	Yes	Yes	Not Known	TBD	TBD	TBD
Smartmatic – SAES1800								
No	Yes	No	Yes	No	Not Known	TBD	TBD	TBD
Bharat Electronics Limited – Indian EVM								
Yes	No	Yes	No	No	Yes	Yes	Yes	No

Complex Electoral Systems
While most of the vendor information did not specifically address whether multiple ballots and more complex electoral systems could be dealt with by their EVMs, for most this is a natural feature of the systems. Only the Indian EVM was known to be unable to deal with this complexity. The Indian EVM can only deal with one ballot, and cannot deal with elections where multiple candidates are selected or where preference voting is used.

Multiple Languages
Again vendor information did not always address this issue, but it is a natural consequence of a digital screen that alternative or multiple scripts can be displayed. Therefore, for all EVMs with a digital display it was assumed that multiple languages could be displayed. It was not clear whether the Nedap ES3 Voting Machine has a digital display so it was not known whether this machine could deal with multiple languages. The Indian EVM was the other machine which was not able to deal with multiple languages.

Robust
Details of conditions that the EVM was able to operate under were only provided for some of the EVM solutions suggested by vendors. The ES&S Ruggedized Prototype, Nedap ES3 Voting Machine, and the Indian EVM were all confirmed as being able to deal with the environmental conditions existing in Pakistan. The ES&S SAES888 did not meet the temperature requirements in Pakistan, being required to be stored and operated between 5 and 30 degrees centigrade. All other systems did not indicate their temperature and dust resistance.

Easy to Maintain/Easy to Use/Secure
Insufficient information was provided by the vendors on these issues to determine whether the products met these requirements. Therefore, they are marked as 'to be determined'.

Conclusions of Working Group II's EVM Assessment

While all of the requirements identified are met by some of the EVMs, the analysis of the Working Group showed that the number of EVMs meeting all of the requirements was much fewer. The products which best meet the requirements are the following:

- **Indra Point&Vote ECO** – meeting all of the requirements if using a car/motorbike battery as a power source
- **Nedap Improved Paper Voting System** – meeting all of the requirements if using a car/motorbike battery as a power source
- **Nedap ES3 Voting Machine** - meeting all of the requirements if using a car/motorbike battery as a power source
- **Smartmatic SAES888** - meeting all of the requirements if using a car/motorbike battery as a power source
- **Smartmatic SAES1800** - meeting all of the requirements if using a car/motorbike battery as a power source

These assessments are only initial ones and based upon the information available to the Working Group. A more detailed study of EVM specifications would need to be conducted before any more to an EVM solution is decided, but the initial findings of Working Group II are that there are EVM solutions which appear to meet Pakistan's requirements and can cope with the difficult infrastructure conditions in the country.

Working Group III – Cost Analysis of Paper Balloting versus New Technologies

Working Group III was tasked with conducting an analysis of the costs involved in the use of paper ballots in order to estimate a cost per election for national assembly, provincial assembly and local government elections. The analysis included the following costs, as well as any others relevant costs identified by the technical group;

- The cost of printing ballots
- The cost of transportation of ballots
- The cost of storage of ballots, prior to election day and subsequent to election day
- The cost additional ballot boxes that might be required for any future elections
- The cost of ballot box seals
- The cost of staff allocated to the counting of ballots

Working Group III was also tasked to compare the costs involved with paper balloting against the estimated costs involved in the use of EVMs in Pakistan. As there were many different and differently priced EVMs available, Working Group II recommended two of the most suitable EVMs for comparison. The Indian voting machine was also included in this comparison as a point of reference. In conducting this cost comparison it was attempted to estimate the following costs associated with the use of EVMs;

- The initial cost of procuring and delivering the electronic voting and/or counting system
- The costs of additional equipment required to operate the electronic voting and/or counting system (for example, generator, batteries, printing paper, ballots etc)
- Storage costs
- Transportation costs, depending on where equipment is stored
- Maintenance costs
- The cost of specialized staff or service support agreements that are required to be employed by the Election Commission of Pakistan in order to maintain and reprogram equipment for each election

The expected life of the electronic voting/counting system was used to conduct a cost analysis of;

- The cost of utilizing the electronic voting/counting equipment over the number of elections that the equipment would be expected to last
- The cost of continuing to use a paper based balloting system over the same period of time

Cost Analysis of the Existing Paper Balloting System

Conducting elections is an exacting task. Finances are needed for the printing of ballots, transportation and storage costs amongst other things. In Pakistan, ballot printing is done by the Printing Corporation of Pakistan Press (PCPP) as per specifications set by the Election Commission of Pakistan (ECP). The PCPP is a reputable security printing corporation with extensive experience in the production of ballots, particularly the design and printing of ballots. The corporation has its own production and finishing facility and guarantees timely delivery of ballot orders.

Generally, the PCPP is tasked with mass production of ballots including: printing, finishing, sorting, labeling, packing, and palletizing. The PCPP also ensures that the ballot papers are serially numbered to guard against rigging. The ECP, however, oversees shipment to the proper destinations. The PCPP is well-equipped and ready to print ballots when requested by the ECP. The PCPP is required to produce different types of ballots for the following election: National Assembly, Provincial Assembly, and Local Government Elections. Each electoral level has an independent scope and unique requirements. Additionally, each constituency may have different contests, and the ballots must reflect these prerequisites. Ballots are printed in Islamabad, Lahore and Karachi, and their distribution is the responsibility of the ECP. Prior to ballot printing, the ECP, aware of potential geographical challenges, sets an early date for the ballots to reach the Returning Officer of each constituency.

In addition, the ballot boxes and voting screen compartments are also important components of paper balloting system. The expected life cycle of translucent ballot boxes is generally 10 years and voting screen compartments to 5 years; such that translucent ballot boxes can be used for in two General Elections and two Local Government Elections; and the voting screen compartments can be used in one General Elections and one Local Government Elections.

The most significant finances in the current paper balloting system are required for printing ballots, ballot boxes and voting screens. All costs associated with the paper balloting systems were identified and quantified. The tables below describe the fixed and recurring costs both for the general elections and Local government Elections.

Table 4 – Initial Fixed Cost of Paper Balloting (Translucent Ballot Boxes and Voting Screens)

S/No	Description	Life Expectancy	No of Election Cycles	No of Units	Unit Cost		Total Life Cycle Cost (In Millions)	
					Pak Rs	US $	Pak Rs	US $
1.	Translucent Ballot Boxes	10 Years	4	430,000	850.00	10.00	365.50	4.30
2.	Voting Screens Compartments	5 Years	2	350,000	340.00	4.00	119.00	1.40
	Total Cost						**484.50**	**5.70**

Note: 1. Current estimated costs are based on a 10% inflationary rate (compound)
2. All costs are estimated in Pak Rupee and US Dollars (@ Rs 85.00 = $1.00)
3. All costs include all taxes/duties, currently 16%

Table 5 – Initial Fixed Cost of Paper Balloting System for Each Election Cycle

S/No	Description	No of Election Cycles	Total Life Cycle Cost (In Millions)		Total Cost per Election Cycle (In Millions)	
			Pak Rs	US $	Pak Rs	US $
1.	Translucent Ballot Boxes	4	365.50	4.30	91.38	1.08
2.	Voting Screens Compartments	2	119.00	1.40	59.50	0.70
	Total Cost				**150.88**	**1.78**

Table 6 – Recurring Costs of Paper Balloting (Each General Election)

S/No	Cost Heads	Expenses 2008 General Election (in Millions)		Current Estimated Cost (in Millions)	
		Pak Rs	US $	Pak Rs	US $
1.	Printing of Ballot Papers	488.82	5.75	591.47	6.96
2.	Transportation of Ballot Boxes (430,000) and Voting Screens (350,000)	18.28	0.22	22.12	0.26
3.	Cost of Additional Ballot Boxes (7%)	25.59	0.30	30.96	0.36
4.	Voting Screens (7%)	0.83	0.01	1.01	0.01
5.	Voting Seals	20.00	0.24	24.20	0.28
6.	Stamp Pads	12.43	0.15	15.04	0.18
7.	Cloth Bags	8.34	0.10	10.10	0.12
8.	Marking Aids and Rubber Stamps	5.61	0.07	6.79	0.08
9.	Envelopes	45.29	0.53	54.80	0.64
10.	Indelible Ink	19.44	0.23	23.52	0.28
11.	Storage of Ballot Boxes and Voting Screens	12.50	0.15	15.13	0.18
12.	Election Allowance	402.97	4.74	487.59	5.74
	Total	**1060.10**	**12.49**	**1282.73**	**15.09**

Table 7 – Recurring costs of Paper Balloting (Each Local Government Election)

S/No	Cost Heads	Expenditure 2005 LG Election (in Millions)		Current Estimated Cost (in Millions)	
		Pak Rs	US $	Pak Rs	US $
1.	Printing of Ballot Papers	216.00	2.54	347.77	4.09
2.	Transportation of Ballot Boxes (430,000) and Voting Screens (350,000)	57.37	0.67	92.37	1.09
3.	Cost of Additional Ballot Boxes (7%)	25.59	0.30	30.96	0.36

S/No	Cost Heads	Expenditure 2005 LG Election (in Millions)		Current Estimated Cost (in Millions)	
		Pak Rs	US $	Pak Rs	US $
4.	Voting Screens (7%)	0.83	0.01	1.01	0.01
5.	Voting Seals	20.00	0.24	32.20	0.38
6.	Stamp pads	9.95	0.12	16.01	0.19
7.	Cloth bags	5.49	0.06	8.84	0.10
8.	Marking Aids and Rubber Stamps	4.69	0.05	7.55	0.09
9.	Envelopes	9.50	0.11	15.30	0.18
10.	Indelible Ink	11.47	0.14	18.47	0.22
11.	Storage of Ballot Boxes and Voting Screens	12.50	0.15	20.13	0.24
12.	Election Allowance	523.97	6.16	843.59	9.92
	Total	**897.36**	**10.55**	**1434.20**	**16.87**

Note: If Local Government Elections are held on party basis, the cost of printing paper ballots will increase substantially.

Putting these figure together the overall costs associated with paper balloting in a General Election are $16.87M and $18.65M for Local Government Elections.

Cost Analysis of Electronic Voting and Counting Systems

Working Group II identified three electronic voting and counting systems to be used by Working Group III for cost comparison purposes. The EVMs expected life cycle is set to 20 years based upon the information provided by the vendors. Thus the acquired EVMs can be used in at least four General Elections (held after every 5 years) and five Local Government Elections (held after every 4 years).

Table 8 – Cost of Acquiring EVMs

S/No	Solution Name	Life Expectancy	No of Election Cycles	No of Units	Unit Cost		Total Life Cycle Cost (In Millions)	
					Pak Rs	US $	Pak Rs	US $
Cost of EVMs								
1.	Indian EVM/Bharat Technologies Limited	20 Years	9	400,000	32,300	380	12,920	152
2.	Smartmatic SAES888	20 years	9	200,000	106,250	1,250	21,250	250

S/No	Solution Name	Life Expectancy	No of Election Cycles	No of Units	Unit Cost		Total Life Cycle Cost (In Millions)	
					Pak Rs	US $	Pak Rs	US $
3.	Nedap ES3	20 years	9	200,000	265,625	3,125	53,125	625
Cost of EVM Stands/Racks								
4.	Stands/Racks for EVMs	20 years	9	200,000	1,275	15	255	3

Note: 1. Cost calculated for 200,000 EVMs - one EVM per polling booth = 170,174 + 17% increase (7% increase in polling booths and 10% extra EVMs for emergency poll)

2. Cost of the Indian EVM manufactured by Bharat Technologies Limited, comprising one control unit (approx. US$ 140) and two ballot units (US$ 120 each) is US$ 380. Two ballot units can accommodate 32 candidates, which would be sufficient on average across Pakistan. For the purpose of this study, two separate machines are budgeted as one machine would be required to conduct the National Assembly Election and another machine would be required for the Provincial Assembly Election. Therefore, 400,000 Indian EVMs would be required, compared with 200,000 EVMs of other designs. For the Local Government Elections, the Indian EVM would not be suitable as the six different ballots would require six separate machines.

Table 9 – Cost of EVMs for Each Election Cycle

S/No	Solution Name	No of Election Cycles	Total Life Cycle Cost For 200,000 EVMs (In Millions)		Total Cost per Election Cycle For 200,000 EVMs (In Millions)	
			Pak Rs	US $	Pak Rs	US $
Cost of EVMs						
1.	Indian EVM/Bharat Technologies Limited	9	12,920	152	1,435.60	16.89
2.	Smartmatic SAES888	9	21,250.00	250.00	2,361.11	27.78
3.	Nedap ES3	9	53,125.00	625.00	5,902.78	69.44
Cost of EVM Stands/Racks						
4.	Stands/Racks for EVMs	9	255.00	3.00	28.33	0.33

Note: For the Indian EVM 400,000 units are required, as outline in the previous note.

Table 10 – Recurring Costs Associated with EVMs (Each General Election)

S/No	Cost Heads	Total Cost (Current Rates) (In Millions)	
		Pak Rs	US $
1.	Batteries and Chargers	100.00	1.18
2.	Printing Paper	40.00	0.47

3.	Indelible Ink	23.52	0.28
4.	Cloth Bags	2.50	0.03
5.	Envelops	18.27	0.21
6.	Storage Cost of EVMs and Stands	45.00	0.53
7.	Transportation of EVMs and EVM Stands	22.12	0.26
8.	Specialized Staff/Technicians	15.00	0.18
9.	Election Allowance (with 30% staff reduction using EVMs)	341.32	4.02
	Total	**607.73**	**7.16**

Table 11 – Recurring Costs Associated with EVMs (Each Local Government Election)

The costs associated with using EVMs for Local Government Elections differ because there is a smaller electorate for these elections, which excludes Islamabad Capital Territory, Federally Administered Tribal Areas and Cantonments. These areas represent approximately 5% of the overall population that is eligible to participate in General Elections, and therefore the costs associated with Local Government elections are 5% less than those associated with General Election costs.

S/No	Cost Heads	Total Cost (Current Rates) (In Millions)	
		Pak Rs	US $
1.	Batteries and Chargers	95.00	1.12
2.	Printing Paper	38.00	0.45
3.	Indelible Ink	22.34	0.27
4.	Cloth Bags	2.38	0.03
5.	Envelops	17.36	0.20
6.	Storage Cost of EVMs and Stands	42.75	0.50
7.	Transportation of EVMs and EVM Stands	21.01	0.25
8.	Specialized Staff	15.00	0.17
9.	Election Allowance (with 30% staff reduction using EVMs)	324.25	3.82
	Total	**578.09**	**6.81**

Cost Comparison of Paper Balloting System versus EVMs

As outlined previously, the EVMs expected life cycle is set to 20 years based upon the information provided by the vendors. The acquired EVMs will be used in at least four General Elections (held after every 5 years) and five Local Government Elections (held after every 4 years). In case of paper balloting system the expected life cycle of translucent ballot boxes is set to 10 years and voting screen compartments to 5 years; meaning thereby that translucent ballot boxes will be used in two General Elections and two Local Government Elections, whereas the voting screen compartments will be used only in one General Election and one Local Government Election.

For the purpose of this study, the EVM "Smartmatic SAES888" has been chosen based up its compliance with the requirements identified by Working Group II and its cost competitiveness. The cost comparison of the paper balloting system versus electronic voting and counting systems is based on both the initial costs and recurring costs involved in the two systems. The cost comparison of both the systems normalized to one cycle of General Election and one cycle of Local Government Election is summarized in the below table.

Table 12 – Cost Comparison Paper Balloting System versus EVMs

Election Cycle	Paper Balloting System		Electronic Voting and Counting System	
	Pak Rs	US $	Pak Rs	US $
General Election				
Fixed Cost	150.88	1.78	2,389.44	28.11
Recurring Cost	1,282.73	15.09	607.73	7.16
Total Cost	**1433.61**	**16.87**	**2,997.17**	**35.27**
Local Government Election				
Fixed Cost	150.88	1.78	2,389.44	28.11
Recurring Cost	1,434.2	16.87	578.09	6.81
Total Cost	**1,585.08**	**18.65**	**2,967.53**	**34.92**
Combined Cost for one General Election and one Local Government Election				
Fixed Cost	301.76	3.56	4,778.88	56.22
Recurring Cost	2,716.93	31.96	1,185.82	13.97
Total Cost	**3,018.69**	**35.52**	**5,964.7**	**70.19**

The initial one-time procurement cost of EVMs is much higher compared to the cost of the paper balloting system. Even if the initial procurement cost is evenly distributed over the life cycle of the product (set to 20 years), the cost of the electronic voting and counting system remains high. However, it is important to note that the recurring costs associated with EVMs are significantly less than the paper balloting system. Thus, as mentioned earlier, it is important to keep in mind the life cycle of the EVMs and the expected number of General and Local Government Elections to be conducted during this period. The Working Group

concluded that the EVMs will prove to be the more expensive option, almost double the cost of paper balloting, even after considering the expected life spans of the EVMs (20 years).

When deciding which system to use, this cost comparison should not however be the sole deciding factor. Rather the tangible and intangible benefits associated with the paper balloting system and EVMs should be considered carefully. A passionate cost-benefit analysis is extremely important for a developing country like Pakistan, since the adoption of new technology will require significant resources and investment.

Conclusions of Working Group III's Financial Analysis

Working Group-III, established under the ECP's EVM Committee, carefully calculated the costs (both the fixed and recurring) associated with the existing paper balloting system and EVMs for conducting General Elections (National Assembly and Provincial Assemblies) and Local Government Elections. The expected life cycle of fixed costs was determined for cost comparison for both the elections. The Working Group took into account not only the initial fixed cost of procuring and delivering the EVMs, but also associated costs such as acquiring additional/ancillary equipment and accessories, storage, transportation, training and maintenance.

A cost analysis was conducted comparing the cost of using the electronic voting and counting technology over the number of electoral cycles it is expected to last during EVMs life cycle and the cost of continued use of the existing paper balloting system over the same period of time. The Working Group concluded that the use of EVMs would prove to be significantly more expensive when compared to the existing system of paper balloting, even after considering the expected life spans of the EVMs. In fact the comparative cost of using EVMs is almost double the cost of paper balloting system.

Despite this, the decision on whether to use EVMs in Pakistan should not be based solely in financial considerations. If the use of EVMs could significantly contribute to better democracy in Pakistan then they may still be recommended. However, the financial aspect need to be considered in any such decision to recommend the use of EVMs in Pakistan, and the Working Group has helped to identify the monetary aspects both of using paper balloting and of any transition to EVMs.

It should also be noted that the costs of EVMs could be reduced through negotiations with EVM vendors, and also through domestic production of the machines. The Working Group recommended that partnerships should be forged with local hi-tech universities and research institutions, in order to carry out research and development with a view to designing Pakistani EVMs meeting the ECP's requirements. Efforts should be made to support the indigenous development of electronic voting and counting systems, in collaboration with leading international EVM manufacturers, as a potentially more affordable solution for Pakistan.

Working Group IV – Assessment of the Legal Implications of Using EVMs

Working Group IV was tasked with identifying parts of the current legal framework for elections in Pakistan that would need to be amended in order to allow for the use of an electronic voting or counting system.

In considering this task the Working Group first assessed the current legal framework for elections in Pakistan. It next identified provisions of the current legal framework that would be required to be modified prior to introducing new technologies. Both existing provisions and proposed amendments, suiting respectively paper balloting and EVMs were measured against the required international standards relevant to electoral process.

Finally the Working Group examined the fact that in Pakistan, the existing electoral law does not contain a provision for EVMs. Hence the Working Group proposed to draft suitable amendments in existing electoral legal provisions, which would be necessary if it is decided to introduce EVMs in the country.

Electronic Voting Machines – Proposed Amendments in the Legal Framework

An electoral legal framework enshrines the main principles regarding the rights of citizens in elections/referendums: universal, equal, free, direct and secret suffrage. It is, therefore, essential that adoption of EVMs should not influence these general principles of voting. At the same time, there is a need to provide a sound legal basis for the introduction of EVMs in the electoral process. In Pakistan the existing electoral law does not contain any provision for the use of EVMs. Hence the Working Group proposed to draft suggested amendments in the Representation of the People Act, 1976 and the rules made thereunder for ushering in new technologies in its electoral systems.

Two options which came under discussion. One option was to recommend deletion of existing legal provisions catering for paper balloting and substitute them with suitable amendments to accommodate introduction of EVMs. The other was to retain existing legal provisions and to give legal protection to the introduction of EVMs by adding appropriate legislation wherever required. The Working Group went for the second option and decided that existing legal provisions may be kept intact and recommended suitable amendments in the Representation of the People Act, 1976 to give legal cover to introduction of voting or counting machines.

Accordingly the Working Group identified the following provisions in the existing legal framework to be amended to allow introduction of electronic voting system (amendments to the rules can be suggested subsequently after primary law is amended).

Legal provisions that would need amendments for the introduction of EVMs

The Representation of the People Act, 1976

Section 27: Stopping of the Poll

Section 28: Election by secret ballot

Section 30: Ballot boxes

Section 33: Voting Procedure

Section 34: Tendered Ballot paper

Section 35: Challenge of electors

Section 36: Spoilt ballot papers

Section 37: Voting after close of poll

Section 38: Proceedings at the close of poll

Section 39: Consolidation of results

Section 82A: Capturing of polling station and polling booth, etc

Section 83: Illegal Practices

Section 87: Tampering with papers

Legal Framework Assessment Conclusions

The establishment of a clear legal framework for elections is essential to the legitimacy of the electoral process. The current legal framework for elections in Pakistan makes clear references to the process of voting and counting being conducted by a paper based, manual process. Should a decision be taken to use EVMs in Pakistan, then there would need to be a change in the legal framework to facilitate this. Such a change should not require the use of EVMs, but should permit their use.

Vendor Demonstration and Stakeholder Consultations

The EVM Committee felt that it an important component of its assessment of the feasibility of using EVMs in Pakistan could only be achieved through direct, face-to-face discussions with established vendors of electronic voting and counting technologies. Therefore a demonstration of electronic voting and counting technologies was planned, with EVM vendors being invited to Islamabad. It was also decided that the opportunity presented by this visit should be used to bring election stakeholders into the feasibility study process, and to include these stakeholders in the presentations by the EVM vendors.

As a result the ECP organized a two day event at which the challenges and opportunities presented by voting and counting technologies were presented, EVM vendors were provided the opportunity to present the solutions that they felt were most suitable for Pakistan, and stakeholders were able to view EVM solutions and ask questions of the vendors. The event was held at the Marriott Hotel, with the first day hosting representatives from the political parties in Pakistan, and the second day hosting representatives from civil society, technology based academic departments and international stakeholders.

All of the leading EVM vendors were invited to present to the ECP, and three took the opportunity to travel to Islamabad to attend the demonstration – Smartmatic, Indra and Dominion Voting. Each made a comprehensive presentation to the participants of their respective technologies. A range of different technologies were presented by these vendors, including optical scan paper ballot systems, direct recording electronic (DRE) voting systems, and DREs with a voter verified paper audit trail. Participants were able to ask questions of the vendors, before an open viewing session of the machines took place. The EVM Committee also held individual meetings with each of the vendor to discuss their proposed solutions for Pakistan.

Despite a very challenging list of system requirements being identified by the EVM Committee, it was clear from the demonstration event that there are EVM products on the market which will meet the needs of Pakistan. While these products cannot compare with the low cost of the Indian EVM, which is often used as the benchmark in discussions in Pakistan, the Indian solution does not meet the requirements of Pakistan – having no paper audit trail and not being able to deal with multiple ballots. More advanced EVM solutions meeting all of the requirements of Pakistan will be more expensive.

The EVM Vendor Demonstration was well attended by political party and civil society representatives, and all seemed in agreement that Pakistan should pursue an EVM solution. There is a concern that external stakeholders have too high expectations that the adoption of EVMs will solve all or most of the electoral challenges facing Pakistan and that they do not understand the challenges presented by these technologies. It will be important to manage the expectations of stakeholders in this regard.

Importantly, the participants agreed that it is necessary to consider the issue of voting and counting technologies very carefully and to conduct pilot projects to properly assess the suitability of EVMs in Pakistan. In order to make EVMs affordable and sustainable it was seen as important that any solution involve the development of domestic capacity to produce and maintain Pakistan's eventual EVM system. In reality this will mean that it is likely to take

between 5 and 10 years to introduce EVMS in Pakistan, if the pilot projects go well and money is found for the initial investment in EVMs.

EVM Committee Conclusions

The EVM Committee has taken note of the diligent work of the various working groups established under the Committee, and reaches the following conclusions;

Paper Balloting

- The current system of paper balloting has a number of strengths, including that the system is inherently transparent, is widely trusted by voters and electoral participants, and is easy to use for voters.
- The system of paper balloting also has considerable weaknesses, including the physical management of paper ballots, the security of paper ballots, and the speed and accuracy of the counting process.
- The weaknesses of the paper balloting system indicate a clear requirement for change. Such change would aim to realise improvements in the logistics of elections, the security of ballots, the wastage involved in unused ballots, the levels of invalid votes, and the speed and accuracy of vote counting.
- This change could, to some extent, be addressed through improvements in the existing paper balloting system but most changes would be impossible to realise with this system.

Electronic Voting and Counting

- There are many different kinds of electronic voting and counting machines available, and each one has its own particular strengths and weaknesses. Despite this, some general advantages and disadvantages can be identified with these technologies.
- Electronic voting and counting machines in general have the advantage of being faster, more accurate and impartial in nature when it comes to voting and counting, as well as being logistically easier to deal with, facilitating a reduction in polling staff and being able to deal easily with multiple and complex elections.
- Electronic voting and counting machines are, however, generally less transparent and understandable to the voters, potentially leading to a lack of trust in the machines, they also often rely upon an infrastructure (communications and power infrastructure) that may not exist in developing countries, they may have a limited ability to deal with extreme environmental factors, and are more susceptible to failure than a manual paper based system.
- Information from a range of electronic voting and counting products was obtained and each of these products were measured up against a list of Pakistan specific requirements which any new system would have to meet. While these technical and operational requirements were very demanding, it is clear that there are EVM products on the market that meet them.
- Accordingly, from a technical perspective, the introduction of EVMs in Pakistan is feasible and has many benefits to offer if designed and implemented effectively.

Financial Considerations

- Of the electronic voting and counting products reviewed during the EVM Committee's work, the cheapest product which meets all of the requirements established by the EVM Committee has an initial cost of $1,250 per unit. With approximately 200,000 units required, this would entail an initial investment in EVMs of $250M.
- This initial investment in EVMs needs to be considered over the life-cycle of the EVM, taking into consideration all of the electoral events which the machine would be used for. Even taking the cost of the EVM over its full life-cycle, when compared to the cost of paper balloting over the same period the cost per election is approximately twice as much with using EVMs.

- However, this is an initial cost of the EVMs provided by the supplier and with such a large order it would likely be possible to reduce the per unit cost significantly
- The production costs of EVMs could also be reduced significantly if they were domestically produced.
- While this financial analysis suggests that the cost of using EVMs compared to paper ballots would be considerably higher, it should be made clear that the decision on whether to adopt EVMs is not a purely financial one. The use of EVMs could lead to significant improvements in the quality of democracy in Pakistan, and these improvements are difficult to quantify financially.

Legal Considerations

- The current legal framework for elections in Pakistan does not support the use of electronic voting and counting machines. The current law makes many references to physical ballots, ballot boxes and the manual process of voting and counting.
- In order for the ECP to consider the use of electronic voting and counting machines, even in small scale pilot projects, the law would need to be amended. These changes would be required in the Representation of the Peoples Act, 1976, in which 12 articles would need amendment.
- These changes should be drafted in such a way that both manual, paper based and electronic voting and counting procedures could be used in the future, with no commitment to using either one. In this way the use of electronic voting and counting machines would be facilitated, but not required by the amendments, leaving the ECP with the option to use such technologies if desired.

Stakeholder Support

- The consultations that the ECP and EVM Committee conducted with political parties and civil society demonstrated that there is considerable support from these electoral stakeholders in using electronic voting and counting solutions in Pakistan.
- There is a concern that electronic voting and counting machines were seen as the solution to all of the problems related to elections in Pakistan, ranging from electoral fraud and manipulation to electoral violence and fake degrees. It is clear that this technology can only help address some of the electoral challenges facing Pakistan, and stakeholder expectations will need to be managed in this regard. More precisely, the stakeholders must understand that the EVMs are not panacea for all electoral frauds, disputes and complaints.

General Conclusions

- It is clear from the experiences of other countries that using electronic voting and counting technologies presents many new challenges for a country, the electoral stakeholders and for the election management body. Trust in the process and also in the EMB (ECP) is vital to the success of the process and the legitimacy of the elections held. Therefore it is essential to ensure that if inducted, electronic voting and counting machines are introduced gradually in a phased program in an open, transparent and consultative manner, taking into consideration the concerns of various stakeholders.
- Should the use of electronic voting and counting technologies be approved, this approach will necessitate a considered and phased adoption of such technologies, with careful assessment of the technologies and consultation with stakeholders at each stage.

Recommendations and Next Steps

As a result of this feasibility study, the EVM Committee makes the following recommendations that;

1. The use of electronic voting and counting technologies be pursued further, although a final decision on the national adoption of these technologies will remain pending.

2. The full implications of using electronic voting and counting technologies in Pakistan can only be partially assessed through the work of the EVM Committee and the consultations conducted as part of this study. Given that there are electronic voting and counting solutions that meet the needs of Pakistan, a full assessment of their suitability should be further explored through the conduct of a pilot project.

3. The EVM pilot project should be conducted during the local government elections likely to take place in 2011.

4. In order to test the use of electronic voting and counting machines, and supporting management and results tabulation systems, the pilot or pilots should be conducted in complete electoral jurisdictions. Local government elections provide a good opportunity for doing this with minimal investment in electronic voting and counting machines as the electoral constituency, the Union Council, is relatively small. One or more Union Councils should be selected to pilot the use of the selected electronic voting machine.

5. The ECP should begin the process to procure the EVMs required to conduct these pilots. A Request for Quotation should be issued to the leading EVM vendors for the supply of machines for the pilot project.

6. The legislative changes required to enable the conduct of electronic voting or counting should be pursued urgently in order to facilitate the pilot project.

7. The pilot project should include comprehensive consultation with stakeholders to assess their reactions to using the electronic voting machines, and also a survey of voters to determine their experiences of using the machines.

8. After the pilot project has been conducted, and all assessments and surveys completed, the ECP should meet with stakeholders to discuss the pilot project and determine the next steps, if any, on the use of electronic voting machines in Pakistan.

9. The selected electronic voting machine supplier should be required to work with Pakistani industry in order to develop a national production capacity for EVMs. This will make any EVM solution more sustainable and more affordable.

10. Local hi-tech universities and research institutions should be encouraged to conduct R&D with a view to design domestically produced EVMs, meeting ECP's stringent requirements as per international standards in terms of technical and environmental specifications.

11. At the same time as the use of electronic voting machines are being further explored in Pakistan, the quality of the existing paper balloting system should be improved and the security features of the balloting papers enhanced.