HISTORY, STRUCTURE, POLICIES, AND PROCESSES: UNDERSTANDING POLL MODERNIZATION LAW

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INTRODUCTION

Manual voting is the traditional way of conducting an election here in the Philippines but due to election fraud and slow results, poll automation system is seen as a better way of obtaining an efficient, effective and secured election. In order for Filipinos to understand the issue there is a need to discuss manual voting system and identify its disadvantages and the reasons on why this kind of system should be replaced by poll automation system. Identifying poll automation features would make them realize its relevance in avoiding massive election fraud.

Voting is held nationwide in schools designated as polling precincts. Traditionally, the votes are cast by writing on a ballot the names of candidates from the national to the local level, and the ballot is thereafter dropped inside a steel ballot box. Given the number of positions to be filled out and the tedious voting process—not to mention the fact that voters will have to manually write the names of their candidates—post-election controversies arise because the names of candidates are sometimes not spelled correctly which thereby lead to the votes being excluded for counting.

The multi-step process involved in manual elections is long and provides opportunities for electoral fraud such as snatching, substitution or stuffing of ballot boxes, vote padding or shaving, which is called in the vernacular as *dagdag-bawas* (roughly translated as add-subtract which means that numbers are manipulated by adding digits to the preferred candidate and at the same time subtracting digits from the actual votes tallied or from another candidate), fabrication

of election returns and canvassed results (whether at the city, municipal, provincial or national level), and deliberate voter disenfranchisement. Furthermore, it cannot be denied that the conduct of manual elections in the Philippines for the past four decades has remained largely unchanged. Philippine elections rely heavily on manual tallying and canvassing of votes thus making them vulnerable to control and manipulation by traditional politicians and those with vested interests. The cost of winning an elective post is highly expensive and the absence of mechanisms to check and limit sources of campaign funds become fertile grounds for corruption and divisiveness. Given this less than perfect situation, it is no surprise that the use of information technology (IT) to improve the electoral process is seen as an attractive proposition. Such attempts at improvement have relatively long history in the country.

REFORMING ELECTIONS THROUGH AUTOMATED ELECTIONS

As early as 1992, the Philippine government has initiated measures to modernize the electoral system through the pioneering project *Operation Modex* (Modex is a conflation of modernization and excellence), through the Commission on Elections (Comelec), then under the leadership of Chairman Christian S. Monsod. Operation Modex is a six year modernization program from 1992–1998 which primarily operated within its eight key components, namely: (1) formulation of a flexible legal framework that would allow the Comelec to operate on a broad constitutional base; (2) systematization of the present method of registration; (3) modernization of the electoral process from voting to proclamation to reduce human intervention; (4) continuing election education campaign to foster citizen involvement; (5) operationalization of a management information or IT system to establish an election data bank; (6) upgrading of facilities and equipment; (7) decentralization and reorganization of Comelec for more efficiency in the delivery of services; and (8) development and motivation of Comelec personnel to professionalize the agency and to bolster a culture of competence and integrity.[1]

In recent years, initiatives to reform the electoral system included the enactment of the following laws: R.A. 8046, establishing a pilot program modernizing the registration and vote counting process in Autonomous Region of Muslim Mindanao (ARMM), the Party-List System Act (R.A. 7491), Fair Election Act (R.A. 9006), Overseas Absentee Voting Act of 2003 (R.A. 9189), and Voter's Registration Act of 1996 (R.A. 8189). To address the inadequacies and limitations of the electoral process, R.A. 8436 or the Election Automation Act of 1997, was passed authorizing Comelec to use automated election system for vote counting and canvassing in the national and local polls. The law provided for the generation of a national computerized voters' list, establishment of a voters' identification card system and the automation of the vote counting. It was amended by R.A. 9369.

It took several years before R.A. 9369 became a law. It was passed in the House of Representatives by the effort of Rep. Teodoro L. Locsin, Jr. and in the Senate by Sen. Richard J. Gordon. Sec. 2 of R.A. 8436, as amended, defines an automated election system as the use of an appropriate technology which has been demonstrated in voting, counting, canvassing and transmitting of election results. The system can either be paper-based or a direct recording electronic (DRE) election system.

The paper-based election system and the DRE election system were pilot-tested in the 2008 ARMM elections pursuant to Comelec Resolution 8415. The paper-based election system using the Optical Mark Reader (OMR) technology was pilot-tested in Sulu, Basilan, Tawi-Tawi, Lanao del Sur and Shariff Kabunsuan. The DRE was pilot-tested in Maguindanao. Though there were pluses and minuses in the conduct of the automated elections in the six provinces, the automation was viewed positively.[2] The DRE and OMR cut short the time for voting, counting and canvassing, eliminated election protests and minimized election-related violence for within forty-eight hours, the regional governor, regional vice governor and regional assemblymen were proclaimed by the Comelec in ARMM.

After the Poll Modernization Law was passed in the Senate, Sen. Edgardo J. Angara created R.A. 9525, entitled "An Act Appropriating the Sum of Eleven Billion Three Hundred One Million Seven Hundred Ninety Thousand Pesos (₱11,301,790,000.00) as Supplemental Appropriations for an Automated Election and Other Purposes". According to Senator Angara,

> [t]hrough automation we can ensure a credible transition of power and have clean, honest and orderly 2010 elections. Setting up the country's automated and electoral system is a crucial step towards clean and honest election. While it will not be a cure-all for the country's electoral problems, automating the polls will eliminate a lot of the human intervention that has made vote-rigging possible.[3]

As the poll automation was passed in the Senate, it was agreed to choose appropriate providers for the IT infrastructure for the May 2010 automated elections through a public bidding. Smartmatic Corp., Inc. (Smartmatic for brevity) won the bidding together with its local partner, Total Information Management Corp. (TIM). However, TIM withdrew from the consortium, citing unspecified irreconcilable differences. Because of this, the Comelec threatened to file a host of criminal, civil, and administrative cases against TIM officials. Eventually, TIM agreed to proceed with the election project with its foreign partner.

IT INFRASTRUCTURE AND COMMISSIONED PROVIDERS

Pursuant to R.A. 8436, as amended, a third party is needed to provide for the technology of the automated election system. Smartmatic and TIM are the commissioned Information Technology (IT) providers for the 2010 election. Smartmatic comprises a group of companies which designs and deploys technological solutions intended to help governments fulfill, in the most efficient way, their commitments with their citizens. It is one of the largest and most advanced technology suppliers in the world with a wide and proven experience in the United States, Asia, Latin America and the Carribbean. It aims to help societies become more efficient and transparent through relevant technological innovations. It is organized around three business areas which are electronic auditable voting systems, intelligent and integrated security platforms and advanced solutions for people registration and authentication for a wide range of government applications.[4] TIM, on the other hand, is a fully Filipino-owned IT company with nationwide operations offering varied products and services. It was initially a vendor for remanufactured and refurbished IBM mainframes in 1985. Now, as the company claims, it is a multi-product and multi-services company catering to all of the IT needs of various industries.[5]

The joint venture of Smartmatic and TIM won the 11.2 billion-peso contract for the poll automation against seven other bidders, which included the following: (1) Joint Venture of Avante International, Canon Marketing Philippines, DB Wizards, Netnode Technologies and Creative Point; (2) Joint Venture of Indra Sistemas, Strategic Alliance Holdings, Inc. (SAHI) and Hart Intercivic; (3) Joint Venture of Sequoia Voting Systems, Inc., Universal Storefront Services Corporation and USSC-Sequoia Voting Solutions, Inc.; (4) Joint Venture of Smartmatic International and Total Information Management, Corp.; (5) Joint Venture of Syrex Inc., Amalgamated Motors Phils., Inc. and Avision, Inc.; (6) Joint Venture of AMA Group Holdings Corp. and Election Systems and Software International Inc. (ES & S); and (7) Joint Venture of Gilat Satellite Network Ltd., F. F. Cruz & Co., Inc. and Filipinas (Prefab Building) Systems, Inc.[6]

The bidding process started when the Comelec Special Bids and Awards Committee (SBAC) sent invitations to companies to apply for eligibility and to bid. The companies were required to submit purchased sealed applications for eligibility and bid documents for the procurement of counting machines, including the supply of ballot paper, electronic transmission services using public telecommunications networks, training, technical support, warehousing, deployment, installation, pull-out, systems integration and overall project management, for the automation of the counting transmission and canvassing of votes. Said sealed bids were then opened in the presence of SBAC, representatives of Comelec, Commission on Audit (COA), Philippine Chamber of Commerce and Industry (PCCI), Parish Pastoral Council for Responsible Voting (PPCRV), the participating bidders and the public with an Approved Budget for the Contract in the amount of ₱11,223,618,400.00, charged against the supplemental appropriations for the election modernization.[7] The Comelec then reviewed the qualifications of the bidders

after the bidding and before the contract was executed. Paragraph 5, sec. II (Instructions to Bidders) of SBAC's 2009 Invitation to Bid states the criteria of an eligible bidder:

5. Eligible Bidders

5.1. Unless otherwise indicated in the BDS [Bid Data Sheet], the following persons shall be eligible to participate in this Bidding:

(a) Duly licensed Filipino citizens/sole proprietorships;

(b) Partnerships duly organized under the laws of the Philippines and of which at least sixty percent (60%) of the interest belongs to citizens of the Philippines;

(c) Corporations duly organized under the laws of the Philippines, and of which at least sixty percent (60%) of the outstanding capital stock belongs to citizens of the Philippines;

(d) Manufacturers, suppliers and/or distributors forming themselves into a JV, i.e., a group of two (2) or more manufacturers, suppliers and/or distributors that intend to be jointly and severally responsible or liable for a particular contract: Provided, however, that Filipino ownership or interest of the joint venture concerned shall be at least sixty percent (60%); or

(e) Cooperatives duly registered with the Cooperatives Development Authority (CDA).

5.2. Unless otherwise indicated in the BDS, when the GOODS and SERVICES sought to be procured are not available from local sources as provided in this Clause, at the prescribed minimum specifications of Comelec and/or the Approved Budget for the Contract (ABC) of Comelec as certified by its Head, or when there is a need to prevent situations that defeat competition or restrain trade, Comelec may invite foreign Bidders not deemed eligible pursuant to ITB Clause 5.1.

5.3. Unless otherwise indicated in the BDS, citizens or organizations of a country the laws or regulations of which grant similar rights or privileges to citizens of the Philippines are eligible pursuant to R.A. 5183 and subject to C.A. 138.

> 5.4. A JV of two or more firms as partners shall comply with the following requirements:
>
> (a) the Joint Venture Agreement (JVA) shall be signed by all partners through their respective authorized representatives and duly notarized so as to be legally binding on all partners, unless otherwise indicated in the BDS;
>
> (b) one of the partners shall be authorized to be in charge; and this authorization shall be evidenced by submitting a special power of attorney signed by legally authorized signatories of all the partners;
>
> (c) the partner in-charge shall be authorized to incur liabilities, receive payments and receive instructions[.][8]

After the submission of the bids, SBAC undertook a detailed evaluation and comparison of bids which have passed the opening and preliminary examination of bids in order to determine the lowest calculated bid. Bids were evaluated on an equal footing to ensure fair competition. All bidders were required to include in their bids the cost of all taxes, and other fiscal levies and duties which were then itemized in the bid form and reflected in the detailed estimates. Sec. II, paragraph 34.4 and 34.5 of SBAC documents gives the detailed method of evaluation as stated below.

> 34.4. The Comelec's SBAC shall immediately conduct a detailed evaluation of all Bids rated "passed," using non-discretionary pass/fail criteria, which shall include consideration of the following:
>
> (a) The Bid must be complete. Except in case of partial Bids, Bids not addressing or providing all of the required items in the Schedule of Requirements including, where applicable, bill of quantities, shall be considered non-responsive and, thus, automatically disqualified. In this regard, where a required item is provided, but no price is indicated, the same shall be considered as non-responsive, but specifying a "0" (zero) for the said item would mean that it is being offered for free to the Comelec; and
>
> (b) Minor arithmetical corrections to consider computational errors, omissions and discounts shall be allowed. Any adjustment shall be calculated in monetary terms to determine the calculated prices.

> 34.5. Unless otherwise indicated in the BDS, SBAC's evaluation of Bids shall only be based on the Bid price quoted in accordance with ITB Clause 18.[9]

In Memorandum of June 01, 2009, on the Subject: Systems Evaluation Consolidated Report and Status Report on the Post-Qualification Evaluation Procedures, the SBAC Technical Working Group (TWG), stated that it was undertaking a four-day (May 27 to May 30, 2009) test evaluation of TIM- Smartmatic's proposed Precinct-Count Optical Scan – Optical Mark Reader (PCOS-OMR) project machines. Smartmatic-TIM's proposed systems and machines passed all the end-to-end demo tests using the 26-item criteria specified in the Request for Proposal (RFP) to ensure compliance with the minimum systems capabilities. The TWG also validated the eligibility, and technical and financial qualifications of the TIM-Smartmatic joint venture. Thus, of the invitation-responding consortia which obtained the bid documents, only the joint venture of Smartmatic and TIM was declared as the single complying calculated bid. On June 9, 2009, the Comelec, upon the recommendation of its SBAC, the CAC and other stakeholders, issued Resolution 8608 authorizing the SBAC to issue, subject to well-defined conditions, the notice of award and notice to proceed in favor of the winning joint venture.[10]

Legal Debacle

In *Roque et al. v. Comelec et al.*, the Concerned Citizens Movement (CCM) led by professor and lawyer Herminio Harry L. Roque, Jr., suing as taxpayers and concerned citizens, sought to nullify Comelec's award of the automation project to the joint venture of Smartmatic and TIM, and to permanently prohibit the Comelec, Smartmatic and TIM from signing and/or implementing the corresponding contract-award.

The petitioners argue that the Comelec-Smartmatic-TIM automation contract, in violation of the Constitution, constitute a wholesale abdication of the poll body's constitutional mandate for election law enforcement. The Supreme Court, speaking through Associate Justice Velasco, Jr., held that the proviso in the automation contract designating Smartmatic as the joint venture partner in charge of the technical aspect of the counting and canvassing wares does not translate to ceding control of the electoral process to Smartmatic. It bears to stress that the aforesaid designation of Smartmatic was not plucked out of thin air, as it was in fact an eligibility requirement imposed, should the bidder be a joint venture. And lest it be overlooked, the RFP released by the Comelec, which forms an integral part of the automation contract, has put all prospective bidders on notice of Comelec's intent to automate and to accept bids that would meet several needs, among which is a complete solutions provider which can provide effective overall nationwide project management service under Comelec supervision and control, to ensure effective and successful implementation of automation project.

The role of the Smartmatic-TIM tie-up is basically to supply the goods necessary for the automation project, such as but not limited to the PCOS-OMR machines, computers, electronic transmission devices and related equipment, both hardware and software, and the technical services pertaining to their operation. As lessees of the goods and the back-up equipment, the corporation and its operators would provide assistance with respect to the machines to be used by the Comelec which, at the end of the day, will be conducting the election through its personnel and deputies. Thus, the fact that Smartmatic will be in charge of the technical aspect of the counting and canvassing wares does not mean ceding control of the elections to Smartmatic, since Comelec will still control and supervise the implementation of the automation project.

CCM also averred that Comelec is violating the Poll Modernization Law by seeking to implement a nationwide computerized elections in 2010 even before pilot-testings are done in selected areas of the country; that the PCOS machines have a high margin of error as admitted by Smartmatic in its website; and that Comelec will be abdicating its role in the conduct of elections under the poll automation contract.

In dismissing the petition, the Supreme Court ruled that pilot testing is not a mandatory requirement for the choice of system and technology for the automation of the May 2010 elections.[11] It added that any doubt on the issue of whether pilot testing is required has been put to rest when Congress passed a law to appropriate ₱11.2 billion to automate the 2010 elections. As to the issue of reliability of the PCOS machines, the Court held that the PCOS meets the minimum capabilities standard required by R.A. 8436 through rigid tests done by Comelec and the reliance by CCM on Smartmatic's website on the PCOS's alleged margin of error is misplaced because that was before the site was updated.

The petitioners advance the theory, too, that the mechanism of the PCOS machines infringes the constitutional right of the people to the secrecy of the ballot because the people would be confronted with a three feet long ballot. The pertinent provision of sec. 2, Art. V of the 1987 Constitution provides that "[t]he Congress shall provide a system for securing the secrecy and sanctity of the ballot x x x." According to the magistrates, this argument does not commend itself for concurrence. Surely, the Comelec can put up such infrastructure as to insure that the voter himself will personally feed the ballot into the machine. A voter, if so minded to preserve the secrecy of his ballot, will always devise a way to do so. By the same token, one with the least regard for secrecy will likewise have a way to make his vote known.

Finally, it is argued that contract is in violation of the Anti-Dummy Law (C.A. 108, as amended) given that the winning bidder has Smartmatic, a foreign corporation, owning 40 percent of the equity in Smartmatic-TIM Corporation. Specifically, the pertinent provision of P.D. 715, further amending sec. 2-A of C.A. 108, as amended, states:

Section 1. Section 2-A of Commonwealth Act No. 108, as amended, is hereby further amended to read as follows:

"Section 2-A. *Unlawful Use, Exploitation or Enjoyment*. – Any person, corporation, or association, which, having in its name or under its control, a right, franchise, privilege, property or business, the exercise or enjoyment of which is expressly reserved by the Constitution or the laws to citizens of the Philippines or of any other specific country, or to corporations or associations *at least sixty per centum of the capital of which is owned by such citizens*, permits or allows the use, exploitation or enjoyment thereof by a person, corporation or association not possessing the requisites prescribed by the Constitution or the laws of the Philippines; or leases, or in any other way, transfers or conveys said right, franchise, privilege, property or business to a person, corporation or association not otherwise qualified under the Constitution, or the provisions of the existing laws; or in any manner permits or allows any person, not possessing the qualifications required by the Constitution, or existing laws to acquire, use, exploit or enjoy a right, franchise, privilege, property or business, the exercise and enjoyment of which are expressly reserved by the Constitution or existing laws to citizens of the Philippines or of any other specific country, to intervene in the management, operation, administration or control thereof, whether as an officer, employee or laborer therein with or without remuneration except technical personnel whose employment may be specifically authorized by the Secretary of Justice, and any person who knowingly aids, assists, or abets in the planning, consummation or perpetration of any of the acts herein above enumerated shall be punished by imprisonment for not less than five nor more than fifteen years and by a fine of not less than the value of the right, franchise or privilege enjoyed or acquired in violation of the provisions hereof but in no case less than five thousand pesos: Provided, however, that the president, managers or persons in violating the provisions of this section shall be criminally liable in lieu thereof: Provided, further, That any person, corporation or association shall, in addition to the penalty imposed herein, forfeit such right, franchise, privilege and the property provisions of this Act; and Provided, finally, That the election of aliens as members of the board of directors or governing body of corporations or associations engaging in partially nationalized activities shall be allowed in proportion to their allowable participation or share in the capital of such entities. [emphasis added]

In resolving this issue, the Court explained that the Anti-Dummy Law has been enacted to limit the enjoyment of certain economic activities to Filipino citizens or corporations. For liability for violation of the law to attach, it must be established that there is a law limiting or reserving the enjoyment or exercise of a right, franchise, privilege, or business owned by such citizens. Anent this case, there is not any constitutional or statutory provision classifying as a nationalized activity the lease or provision of goods and technical services for the automation of an election. In fact sec. 8 of R.A. 8436, as amended by sec. 10 of R.A. 9369, vests the Comelec with specific authority to acquire Automated Election System (AES) from foreign sources. Said provision provides:

> SEC. 10. Section 8 of Republic Act No. 8436 is hereby amended to read as follow:
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> "SEC. 12. *Procurement of Equipment and Materials*. – To achieve the purpose of this Act, the Commission in authorized to procure, in accordance with existing laws, by purchase, lease, rent or other forms of acquisition, supplies, equipment, materials, software, facilities, and other service, from local or foreign sources free from taxes and import duties, subject to accounting and auditing rules and regulation. With respect to the May 10, 2010 election and succeeding electoral exercises, the system procured must have demonstrated capability and been successfully used in a prior electoral exercise here or board. Participation in the 2007 pilot exercise shall not be conclusive of the system's fitness.

AUTOMATED ELECTIONS SYSTEM AND ITS MULTI-LAYERED SECURITY MECHANISM

Automated elections system is a system that "uses appropriate technology which has been demonstrated in the voting, counting, consolidating, canvassing, and transmission of election results, and other electoral processes."[12] There are three elements under this system: people, data or information and procedure or system. The people includes the Comelec and its deputies, candidates, voters, watchers, volunteers, journalists, foreign observers, law enforcers, interested groups, accredited citizen's arm and the like. In short, it involves everyone. The data or information covers all election-related information from election laws, Comelec rules and regulations, election statistics, campaign materials and the like.[13]

Under sec. 7 of R.A. 8436, as amended by sec. 7 of R.A. 9369, the automated election system must have the following features or minimum system capabilities: adequate security against unauthorized access; accuracy in recording and reading votes as well as in the tabulation,

consolidation or canvassing, electronic transmission, and storage of results; error recovery in case of non-catastrophic failure of device; system integrity which ensures physical stability and functioning of the vote recording and counting process; provision for voter verified paper audit trail; system auditability which provides supporting documentation for verifying the correctness of reported election results; an election management system for preparing ballots and programs for use in the casting and counting of votes and to consolidate, report and display election results in the shortest time possible; accessibility to illiterates and disabled voters; vote tabulating program for election, referendum or plebiscite; accurate ballot counters; data retention provision; provide for the safekeeping, storing and archiving of physical or paper resource used in the election process; utilize or generate official ballots; provide the voter a system of verification to find out whether or not the machine has registered his choice; and configure access control for sensitive system data and functions.

In the procurement of an appropriate technology for the automated elections, the Comelec shall develop and adopt an evaluation system to ascertain that the above minimum system capabilities are met. This evaluation system shall be developed with the assistance of an Advisory Council. The Council shall be composed of the following members, who must be registered Filipino voters, of known independence, competence, probity, are nonpartisan, and do not posses any of the disqualifications applicable to a member of the Advisory Council: the Chairman of the Commission on Information and Communications Technology (CICT) who shall act as the chairman of the council; one member from the Department of Science and Technology (DOST); one member from the Department of Education (DepEd); one member representing the academe, to be selected by the chair of the Advisory Council from among the list of nominees submitted by the country's academic institutions; three members representing ICT professional organizations to be selected by the chair of the Advisory Council from among the list of nominees submitted by Philippines-based ICT professional organization, which nominees shall be individuals, at least one of whom shall be experience in managing or implementing large-scale IT projects; two members representing nongovernmental electoral reform organizations, to be selected by the chair of the Advisory Council from among the list of nominees submitted by the country's nongovernmental electoral reform organizations. A person who is affiliated with any political party or candidate for any national position, or is related to a candidate for any national position by affinity or consanguinity within the fourth civil degree, shall not be eligible for appointment or designation to the Advisory Council. Should any such situation arise at any time during the incumbency of a member, the designation or appointment of that member, shall ipso facto be terminated. Moreover, any member of the Advisory Council is prohibited from engaging, directly or indirectly, with any entity that advocates, markets, imports, produces or in any manner handles software, hardware or any equipment that may be used for election purposes for personal gain.

Sec. 9 of R.A. 9369, amending R.A. 8436, enumerates the functions as follows:

SEC. 9. New section 8,9, 10 and 11 are hereby provided to read as follows:

x x x

"SEC. 9. *Function of the Advisory Council*. – The Council shall have the following functions:

1. Recommend the most appropriate, secure, applicable and cost-effective technology to be applied in the AES, in whole or in part, at that specific form in time.

2. Participate as nonvoting members of the Bids and Awards Committee in the conduct of the bidding process for the AES. x x x

3. Participate as nonvoting members of the steering committee tasked with the implementation of the AES. x x x

4. Provide advice and assistance in the review of the systems planning, inception, development, testing, operationalization, and evaluation stages.

5. Provide advice and/or assistance in the identification, assessment and resolution of systems problems or inadequacies as may surface or resurface in the course of the bidding, acquisition, testing, operationalization, re-use, storage or disposition of the AES equipment and/or resources as the case may be.

6. Provide advice and/or assistance in the risk management of the AES especially when a contingency or disaster situation arises.

7. Prepare and submit a written report, which shall be submitted within six months from the date of the election to the oversight committee, evaluating the use of the AES.["]

There are two types of automated election system. One is the paper-based election system which has three components, namely, Election Management System (EMS), PCOS System, and Consolidation/Canvassing System (CCS). The paper-based election system is a type of automated election system that "uses paper ballots, records and counts votes, tabulates, consolidates or canvasses and transmits electronically the results of the vote count".[14] It uses the

Optical Mark Reader (OMR) or mark-sensing technology, a scanning technology in which data is inputted via marks made in predefined positions on a form and entering data into a computer system. It detects the absence or presence of a mark depending on the mark's depth (darkness) on the sheet, which then gets interpreted and translated into an output by the machine. In an election, the mark (full shade, partial shade, x mark, or check mark) is made on an oval or square beside the name of the candidate on the ballot chosen by the voter. This mark will register less light than the surrounding ballot and thereby is detected by the scanner as a vote for the candidate in the predefined position. Since most scanners use infrared light, an acceptable mark should be dark enough to absorb a high proportion of infrared light contrasted to the ballot.

The OMR consists of three units: (1) The feeding unit into which the ballot is fed and the unit which drops the ballot either in the "accept" or "reject" compartment in the ballot box; (2) the photoelectric conversion unit which basically reads the mark based on the strength of light that is reflected and which then gets converted into an electric signal; and (3) the recognition control unit which is a recognition-specialized processor or microcomputer that compared to the hard-wired logic of the past has more flexibility in the recognition process, increase in the reading methods, advancement in accuracy of reading, and simultaneous input of different types of sheets.

This type of technology is mostly used in examinations like the National Secondary Aptitude Test (NSAT) given by DepEd, the Civil Service Commission (CSC) Licensure Examination and the like where the examinee marks an answer by shading an oval or bubble next to an item in a multiple choice test.[15]

The other one is the DRE system. It is a type of automated election system that "uses electronic ballots, records votes by means of a ballot display provided with mechanical or electro-optical components that can be activated by the voter, processes data by means of a computer program records voting data and ballot images and transmits voting results electronically."[16] It consists of a computer with a touch-screen monitor, a permanent storage medium such as a write-once memory card, software, and, in some systems, a ballot printer. The voters are provided with a voting pad where the photos of candidate can be selected by pressing on the desired picture. Once the vote is final, a receipt is generated. The Board of Election Inspectors (BEI) in every precinct (consisting of three teachers designated as chairman, poll clerk and a third member, respectively, one of whom will be trained and certified by the DOST)[17] keeps the receipt just in case there are complaints raised. The main advantage of the DRE system is that it can be configured with audio and tactile signals so that a blind person can vote without a sighted person in the voting booth. Thus it is the only system known today that allows a truly secret ballot for the blind. The DRE user interface can also be configured so as to be friendly to persons with other disabilities. Moreover, DRE has the advantage of detecting voter errors and omissions, informing the voter and refusing to cast the ballot until it is error free. DRE machines

can easily be configured to handle different candidates or even different arrays of offices for different polling places and even for different voting booths in one polling place, saving much time, effort, and infuriation in places where several jurisdictions overlap in one major voting jurisdiction. They can even be set up so that the voter can choose one of a large number of languages right in the booth. However, the downside of DRE is that it leaves no audit trail, so error detection completely depends on suspicious patterns, such as a negative number of votes for a candidate or more total votes than the number of voters in the precinct. Since it does not provide an audit trail recounts are well-nigh impossible.[18]

The type of automation election that was used for the May 10 elections is the paper-based automated election system. The Comelec has decided to drop DRE and other poll computerization technologies upon the recommendation of the multi-sector Advisory Council on Poll Automation. The poll body's primary concern in choosing OMR over DRE is that the former has paper trail or paper audit. The form of OMR technology that will be utilized is the PCOS.

FEATURES OF THE PRECINCT-COUNT OPTICAL SCANNER

Under R.A. 8436, as amended, the voters should manually feed the ballot into the PCOS, a fully integrated single device. It must be capable of scanning a ballot sheet on both sides using pencil and ink marks at the speed of at least 2.75 inches per second and has a scanning resolution of at least two hundred dpi. It must also be able to capture and store in an encrypted format the digital images of the ballot for at least two thousand ballot sides and transmit results and reports to their respective designations. There must be safeguard measures for authorization and authentication of all operators and the authenticity of the ballot. It must be able to identify the fake or rejected ballots and only count not more than the specified number of registers. There must be an accuracy rating of at least 99.9995 percent of the counting of the votes. Alternative power sources such as batteries, inverters or power generators should be prepared in cases of black out to fully operate for twelve hours.[19]

SAES (Smartmatic Auditable Election System) 1800 voting machine is the type of PCOS which was used in the May 2010 elections. It is an optical scanner unit designed to register and tally the votes marked on electoral ballots with maximum security.[20] It can detect the absence or presence of a mark in predefined positions on a ballot. It has multiple audits at every stage of the process, including source code. It also has a redundant storage of electoral data. As it is automated, the counting and tallying of votes will be much quicker and more effective. Moreover, it has advanced data recovery mechanism and contains latest standards in digital security.

TESTING AND PRE-SEALING

To provide another layer of security, the automated counting machines shall, prior to deployment for the elections, be tested and certified by the Technical Evaluation Committee and undergo two to three field tests to fine tune the system, and a mock election to simulate the actual conditions in the elections. Pursuant to sec. 10 of R.A. 9369, the said committee shall be composed of representatives, one from Comelec, CICT and the DOST who shall act as chairman of the Committee.

In the last automated polls, for instance, tests were conducted many months before the elections to simulate the steps of the entire voting process—from the casting of ballots, transmission of votes to a server up to the canvassing of votes—in both indoor and outdoor settings. During the tests, ballots were accomplished by marking out the ovals opposite the alphabetically arranged names of candidates pre-printed on the ballots using black marking pens provided by Comelec, and thereafter, were fed into the counting machine. It must be noted that the automated counting machine can accommodate pencil marks, but for reasons of securing the process (as pencil marks can be erased and replaced), black markers were used. To cross-check the election returns printed by the counting machines against actual votes cast, manual counting was likewise made.

Pursuant to Resolution 8785, there will be a final testing and sealing procedure at least three days before the election day whereby the public will again accomplish test ballots. These ballots will be counted manually and election returns showing the results will be prepared. Then the same set of ballots will be counted by the PCOS machines and the results will be compared with that of the manual counting. If the results are the same the participants will certify the veracity of the results by signing on the printed elections returns. Once the public is satisfied with the accuracy, the machine will be turned off and sealed without any network or transmission connection. The public will then be allowed to secure the machines and the polling places. The next time the PCOS machines will be opened will be on election day, in the presence of the different watchers and BEI.[21]

SOURCE CODE AUDITS: CAN SOURCE CODES BE MALICIOUSLY ALTERED?

The framers of R.A. 9369, realizing that the process of computerized counting of vote marks on paper ballots will be done internally and in “secret” by the computer, provided an alternative that may be acceptable as a substitute to public counting: source code review. *Source code review* is the process of auditing the source code—which is a human readable version of the computer programs running, for example, on the PCOS and BOC [Board of Canvassers]

computers—to verify that the proper security controls are present, that they work as intended, and that they have been invoked in all the right places. In particular, the source codes of the AES technology selected for implementation refer to the following three items: (1) the source code of the ballot scanning and vote counting computer program (source code of SAES 1800) that runs on the PCOS computers; (2) the source code of the vote consolidation and canvassing program (source code of Real-Time Election System version 2.0) that runs on the CCS BOC computers; and (3) the source code of the Election Management System (EMS) that customizes the PCOS for use in the Philippines, and for use in specific municipalities and cities.[22]

If the source code of the program running on the PCOS computer can be reviewed by the community, then it is possible to know how ballots are scanned, how vote marks are interpreted, how votes are assigned to the selected candidates, how votes are tallied, what data are saved for backup later, how the precinct election return file is generated, how it is digitally signed by the BEI, how the transmission to the municipal canvassing computer and other destinations is carried out, what details are placed in the audit logs and whether these details are sufficient, whether the counting machines are vulnerable to third-party instructions to introduce codes designed to manipulate vote counts or vote consolidation, etc. With source code review conducted by experts, the computerized counting of votes, although carried out in secret by the PCOS computer, will be revealed and so the computerized counting will be acceptable as if it were public counting.

Sec. 10 of R.A. 8436, as amended by sec. 12 of R.A. 9369, states the urgency of source code review of the election programs as follows: “Once an AES technology is selected for implementation, the Commission shall promptly make the source code of that technology available and open to any interested political party or groups which may conduct their own review thereof.” Prescinding from sec. 9 of R.A. 9369, amending R.A. 8436, it shall be the duty of Comelec’s Technical Evaluation Committee to supervise the source code review for the automated elections. Said provision provides:

> **SEC. 9. New section 8, 9, 10 and 11 are hereby provided to read as follows:**
>
> x x x
>
> “SEC. 11. *Functions of the Technical Evaluation Committee*. – The Committee shall certify, through an established international certification entity to be chosen by the Commission from the recommendations of the Advisory Council, not later than three months before the date of the electoral exercises, categorically stating that the AES, including its hardware and software components, is operating properly, securely, and accurately, in

accordance with the provisions of this Act based, among others, on the following documented results:

1. The successful conduct of a field testing process followed by a mock election event in one or more cities/municipalities;

2. The successful completion of audit on the accuracy, functionality and security controls of the AES software;

3. The successful completion of a source code review;

4. A certification that the source code is kept in escrow with the *Bangko Sentral ng Pilipinas*;

5. A certification that the source code reviewed is one and the same as that used by the equipment;

6. The development, provisioning, and operationalization of a continuity plan to cover risks to the AES at all points in the process such that a failure of elections, whether at voting, counting or consolidation, may be avoided.

For purposes of the 2007 elections, the certification shall be done not later than eight weeks prior to the date of the elections.

"If the Commission decides to proceed with the use of the AES without the Committee's certification, it must submit its reason in writing, to the Oversight Committee, no less than thirty (30) days prior to the electoral exercise where the AES will be used.

"The Committee may avail itself of the expertise and service of resource persons who are of known independence, competence and probity, are no partisan, and who do not possess any of the disqualification applicable to a member of the Advisory Council as provided herein. The resource persons shall also be subject to the same prohibitions and penalties as the members of the Advisory Council.

"The Committee shall closely coordinate with the steering committee of the Commission tasked with the implementation of the AES in the identification

> and agreement of the project deliverables and timelines, and in the formulation of the acceptance criteria for each deliverable."

In the Roque case, the Supreme Court gave us an idea of how a source code review should be conducted. Associate Justice Antonio T. Carpio, pronounced, "[t]he Comelec has to supply the political parties the source code for review. They have to take them home so that they can study them."[23] Carpio knows how difficult it is to do a source code review, and that the correct way to do this is to allow the political parties to take the source code home, so that their programmers can take the code apart to understand what it is doing, study the code as individuals and in programmer groups, discuss the code with the political leaders, discuss the code in their organizations and special interest groups, discuss the code as widely as possible. This is the only way by which people can be convinced that the selected technology will do the right job, so that the people will accept the secret counting that the PCOS will do. The Comelec has commissioned an independent firm, SysTest Labs (based in Colorado, USA), to provide all code review and testing of the system's security, telecommunications, error notification, auditing and recovery, as well as its functions under various load and stress situations from October 2009 to February 2010. Yet, notwithstanding the dissenting opinion of the distinguished magistrate, the Comelec, besides the abovewritten international firm, wants only the political parties and some interested groups to do the source code review under conditions and terms agreed upon between Comelec and Smartmatic, telling people that Comelec has to respect the Intellectual Property Rights (IPR) of Smartmatic. Under the guidelines for the conduct of the source code review, interested parties must submit with the Project Management Office (PMO) a letter of intent to join the source code review, including the credentials of the reviewers and the methodologies they propose to use. Once the application is approved, the party would sign a non-disclosure agreement with Comelec stating they would issue a report on the software review.[24] To prevent leakage of the automation software, a read-only copy of the source code will be provided on secured Comelec workstations in a secured facility.

The contract signed by Comelec and Smartmatic specifies in Art. 7.2 that "[t]he system software, hardware, and source code, including documentation will be open for inspection at any time in a controlled environment under guidelines formulated and agreed by both parties." Art. 9.5 also states that "[t]he PROVIDER (Smartmatic) and Comelec shall promptly make the source code of the Project available and open to any interested political party or groups which may conduct their own review thereof x x x in accordance with the provisions of Art. 7.2 above".[25] Dr. Pablo R. Manalastas, senior fellow and IT consultant of Center for People Empowerment and Governance (CENPEG), however, laments that because of the invocation by the provider of its proprietary rights, political parties and interested groups are effectively mulled to meticulously examine the source codes of the program embedded in the machines to be used in the automated elections in breach of the aforequoted sec. 10 of R.A. 8436. He writes, "I must violently disagree to a source code review under controlled environment, because that is not in the spirit of an

'*interested political party or group conducting its own review thereof.*'"[26] In addition, for Manalastas the act of doing a source code review of the automated elections program will not subject the automated elections system to alterations causing widespread fraud at a grand scale, so that there is no need to worry about the possibility of security being compromised as a consequence of making the source codes publicly available. For, he posits, to alter the program running on any computer, one must have physical or network access to the computer, and the computer must be alterable—but it is well-nigh impossible to alter the programming of the PCOS computer. Only Smartmatic and Comelec will have physical possession of the PCOS machines before election, which they will keep under serially-labeled lock and key, so physical access is out of the story. The PCOS computer will connect to the Internet at the close of polls on election day, and for a few minutes only, in order to transmit its precinct election return to the canvassing computers, so network access is extremely difficult. Manalastas opines that it is virtually a tough undertaking for a criminal computer hacker, who has reviewed the source codes, to gain access to the PCOS machine for the purpose of altering its programming, unless it would be an inside job between Smartmatic and Comelec.[27]

Verily, the source code review is a critical phase for ensuring the integrity of the automated elections system. It is a significant method for identifying possible security flaws in the counting machines. Moreover, it gives us an idea of what the machine is actually doing. This is important to see how the machine transmits data it has collected and where does it send it to. An understanding of the source will lead us to an understanding of how this machine does what it does and not just to conform to what we expect. Yet the source code review that we have is not as open for peer evaluation as it ideally should be due to proprietary, and perhaps security, concerns. Overall, the procedure falls short of transparency and therefore it is incumbent upon the Comelec to deputize technology providers for succeeding elections that will permit the unrestricted availability of source codes for inspection by all interested parties.[28]

VOTING, COUNTING, CANVASSING, TRANSMISSION, AND RANDOM MANUAL AUDITS

The Comelec resolved to adopt a paper-based automated election. This means that machine-readable ballots shall be used for the elections which shall be counted electronically by the machine. Pursuant to sec. 206 of B.P. 881, as amended by sec. 35 of R.A. 9369, the counting shall be done in public and without interruption:

> SEC. 35. Section 206 of Batas Pambansa Blg. 881 is hereby amended to read as follows:

> "SEC. 206. *Counting to be Public and Without Interruption*. – As soon as the voting is finished, the board of election inspectors shall publicly count in the polling place the votes cast and ascertain the results. The Board may rearrange the physical set up of the polling place for the counting or perform any other activity with respect to the transition from voting to counting. However, it may do so only in the presence of the watchers and within close view of the public. At all times, the ballot boxes and all election documents and paraphernalia shall be within close view of the watchers and the public.
>
> "The board of election inspectors shall not adjourn or postpone or delay the count until it has been fully completed, unless otherwise ordered by the Commission.
>
> "The Commission, in the interest of free, orderly, and honest election, may authorize the board of election inspectors to count the votes and to accomplish the election returns and other forms prescribed under this Code in any other place within a public building in the same municipality or city on account of imminent danger of widespread violence or similar causes of comparable magnitude: Provided, That the transfer shall be recommended in writing by the board of election inspectors by unanimous vote and endorsed in writing by the majority of watchers present: Provided, further, That the said public building shall not be located within the perimeter of or inside a military or police camp, reservation, headquarters, detachment or field office nor within the premises of a prison or detention bureau or any law enforcement or investigation agency.
>
> "Any violation of this section, or its pertinent portion, shall constitute an election offense and shall be penalized in accordance with Batas Pambansa Blg. 881."

The Comelec has decreased the existing 320,415 voting precincts to 76,340 clustered precincts. Before each precinct has an average of two hundred voters. For those with fewer voters, Comelec allowed the clustering of up to seven precincts. Under the new voting system, a maximum of one thousand voters are expected to cast their votes within twelve hours (from 7 a.m. to 7:00 p.m.), as opposed to only a maximum of two hundred voters casting their ballots in nine hours under the old system.[29]

At the start of election day, the BEI, who according to law shall have exclusive access to the administrative menu of the counting machines, shall, in the presence of the public, turn on the PCOS machines by positioning their iButton security key intended for the digital signature

into a security key receptacle in the machine. There shall be one iButton security key for the chairman of the BEI for use in operating the PCOS, and another for each member of the BEI which shall be used to digitally sign the election returns.[30] The digital signature encoded in the key will ensure that transmitted votes are valid and were sent by a duly authorized member of the BEI plus allow authorities to trace back who exactly was transmitting from specific locations and machines. The BEI will have to insert a compact flash (CF) card into the PCOS machine to configure the machine to scan a specific ballot image per municipality. The CF card is encrypted and read-only, thus no illicit "cheating program" can be executed or introduced and no preset election results can be stored into it. The machine would then prompt the BEI for three unique passwords assigned for a particular machine. In the last automated elections, the three passwords per BEI team composed of chairman and two members were generated by Smartmatic and were distributed to all BEIs and BOCs a few days before the elections; they were kept under tight security controls to avoid leakage. (There were a total of about 246, 600 pairs of 2048-bit private and public keys for all precinct counting machines nationwide.)[31] A public key infrastructure (PKI) enables users of a basically unsecure public network, such as the Internet, to securely and privately exchange data through the use of a public and a private cryptographic key pair that is acquired and shared through a trusted authority. An initialization report is printed to be reviewed by the BEIs and poll watchers. Once everybody is satisfied that zero votes have been tallied, the voting can then begin.

In the event that a member of the BEI loses her or his key the technicians at the municipal or city level will encrypt a new key to replace the missing one. The old key will be disabled and can no longer be used for any machine. Upon initializing, the machine shall print a zero report to show that there are no pre-existing votes/ballots in it.[32] Also, in order to forestall the possibility that third parties may fill out more than one ballot, thus resulting to multiple voting, the poll body has allotted in every precinct the exact number of ballots for each registered voters therein, so that if a certain precinct has four hundred registered voters only four hundred ballots will be deployed to such precinct—one ballot per registered voter—and only four hundred ballots will be read by the counting machine for the counting machines that will be used to read the filled out ballots are programmed to receive only a specific number of ballots.[33] Moreover, all ballots are "precinct-specific," which means that a voter cannot use her or his ballot in another precinct. For each PCOS machine is configured to read a specific ballot image because each municipality would have a different set of names for local candidates. Hence, each municipality's ballot image is different from other municipalities. This means that there are also different ballots for each of the 1,600 cities and municipalities nationwide. After the voting process, all unused ballots will be torn in half lengthwise to preclude third parties from maliciously using them to further their vested interests.

The ballots have additional security features to ensure that they cannot, by any stretch, be faked. First, there are position identifiers/markers on the left and right sides of the ballot which

help locate the ovals for proper counting and evaluation. Second, each ballot has a unique two-dimensional bar code. Ballots are encoded to work with just one specific machine through a bar code system. Once the machine reads a ballot's bar code, any attempt to insert a duplicate ballot with the same code will be rejected. Third, each ballot is specially stamped with color-shifting, ultraviolet (UV) ink and Comelec security seal which is not readily discernible. This would dispel the possibility of photocopied ballots which obviously will not have the UV ink mark.[34]

In the last automated polls, the BEIs were issued portable handheld UV detection lamps to be used in sweeping over ballots to check for the UV ink and other security marks embedded in the ballot. This was supposedly done just before the voter feeds the ballot into the PCOS machine. The poll body was prompted to resort to this measure after UV marks were misaligned by one to two millimeters owing to the high-speed printing of the ballots, making it difficult for the PCOS machine to read security markings.[35] Specifically, the rush to print ballots in time for the May 10 elections made the markings overlap with other printed characters forcing the Comelec to disable the PCOS machines' UV reading capability that is supposed to automatically verify the authenticity of the ballots inserted in the machine. Arguably, however, the detection lamps were either hardly used or used selectively on election day or were not distributed to some voting areas at all.

After the voter's name is verified on the list of registered voters, the voter is given a ballot, a secrecy folder (for vote anonymity) and a felt tip pen. The size of the ballot for non-ARMM precincts is 8 ½ inches by twenty-six inches, lately trimmed down to twenty-five inches. The ARMM ballots, on the other hand, are twenty-seven inches long, two inches longer than usual because it carries instructions that have Arabic translations. The ballots are printed back-to-back with the alphabetically arranged pre-printed names of the candidates. The ballots can accommodate three hundred candidates, one hundred fifty names per side of ballot. The national candidates will be found on the front, while the local candidates will be on the back. The names of the local candidates would be unique for every local legislative district in the country since voters in each area would be choosing provincial officials with eighty different sets and city or municipal officials with one thousand six hundred thirty one different sets. The voter makes a mark on the circle (or "bubble") beside the name of the candidate he will vote for using a felt tip pen provided by the BEI. For contests requiring more than one vote (e.g. councilors and senators), the voter can vote less than the required number of candidates but cannot vote more than the required number otherwise all his votes in that specific contest will not be counted or will be invalidated. The voter must be careful not to make a mark on the security features of the ballot (such as bar codes, for instance) as the machine could reject his ballot. He should also be careful not to crumple it too much, wet or smudge it as the machine can reject his ballot.

After filling out the ballot, the voter shall feed it into the PCOS machine. The ballot is scanned by the machine on both sides simultaneously and stored in its memory module. This

same image would be appended later with a human-readable report of how the machine interpreted the marks on the ballot. Through this built-in security feature of the machine it becomes possible to review ballot images which is particularly helpful in cases of eventual audits or manual recounts.

It must be noted that the congratulatory note to the voter flashed on the PCOS screen that his votes have been read by the PCOS will serve as the voter's verifiable audit trail, in compliance with sec. 7 of R.A. 8436, as amended by R.A. 9369, which provides:

> **SEC. 7. Section 7 of Republic Act No. 8436 is hereby amended to read as follows:**
>
> **"SEC. 6. *Minimum System Capabilities*. – The automated election system must at least have the following functional capabilities:**
>
> x x x
>
> (n) Provide the voter a system of verification to find out whether or not the machine has registered his choice[.]

The PCOS machine has a built-in audit paper trail function in the form of printed receipts— similar to what one gets from transactions in Automated Teller Machines (ATM) — to verify if it has correctly interpreted the shades that a voter placed in the ovals next to the names of her or his chosen candidates on her or his ballot. But in the last automated elections the poll body disabled this function to save time during the voting process and to prevent voter intimidation and selling.

In case a ballot is rejected, the voter will only be allowed to feed her or his ballot to the PCOS machine for a limited number of times as discussed hereunder. Afterwards, it will be confiscated and no replacement ballot shall be issued. The PCOS unit will display three different types of messages when a ballot is rejected. When the poll machine displays the words "ambiguous mark," the voter will be allowed to review her or his ballot to ensure that the ovals opposite to the names of the candidate are fully shaded. If the unit displays the words "misread ballot," the voter will be allowed to re-feed the ballot in four different orientations. If the PCOS says "invalid ballot," the BEI will verify if the ballot really belongs to the precinct. If it does, the voter will likewise be allowed to re-feed the ballot four times.[36]

After scanning the ballot, the machine will spit out the filled up ballot either into the accepted-ballot compartment or rejected-ballot compartment of the ballot box underneath the machine which is made up of polyethylene or hard plastic and which has a translucent window to make the ballots cast unreadable to protect its secrecy, and a padlock to keep the ballots secure.

From ballot boxes with transparent windows in past elections, ostensibly to detect ballot stuffing, the Comelec has shifted to dark plastic supposedly to avoid exposing to light the sensitive UV markings on the ballots. The BEI shall monitor the PCOS LCD screen to make sure that the ballot was successfully accepted. Afterwards, the ballot secrecy folder and marking pen shall be returned to the chairman of the BEI.

Thereupon, the base and the cuticle of the right forefinger nail of the voter will be stained with indelible ink by the chairman of the BEI to make sure she or he will vote only once as provided by law; the voter will also be asked to put a thumbmark beside her or his name on the Election Day Computerized Voter's List (EDCVL).[37] Thus, if stained, it shall be a conclusive presumption that a voter has already cast his vote. As such the voter shall be directed to leave the polling place after being informed of the reason therefor. The ink contains violet pigment for instant recognition, and silver nitrate which is supposed to stain the nail and its surrounding area. It dries up in more or less sixty seconds. Ideally, the stain should remain for a few days and should not be rubbed off easily using detergents, alcohol, and the like. It is beyond dispute that this was not the case in past elections. But the Comelec has assured the public that it will order its supplier to increase the silver nitrate content of the stain inks for use in succeeding automated elections so that the stains will be much harder to remove and thereby the scrupulous practice of multiple voting will be prevented.

At the end of the voting day, the BEI members will close the elections by accessing the administrative menu on the counting machine through which they shall again key in their pins. This is where the "close function" of the PCOS machines sets in for the purpose of preventing additional ballots from being inserted. After the close function, the PCOS will start counting and consolidating all the votes it had scanned. Unlike in the manual process, counting process by the PCOS happens instantly. After counting is done, the PCOS then automatically prints eight copies of the election returns at the precinct level certified by the BEIs and poll watchers, together with a statistic report and an audit trail for easier checking should there be contestation. Thereafter, the BEIs will then connect a modem to the machine to access internet signal. They will then input their secret keys onto the electronic ER to digitally sign it, encrypt and transmit it electronically to the city/municipal canvassing center, to a server for dominant majority and minority parties, citizens arm, and Kapisanan ng mga Brodkaster sa Pilipinas (KBP), and the Comelec central back-up server.[38] And finally from the provincial server the Statement of Votes (SOV) from the province will be transmitted to the national canvassing servers, the dominant parties, citizens' arm, and KBP server, and the Comelec central back-up server. But before sending the results, the BEI shall ensure that the machine's transmission cable is properly connected to the modem. They shall wait for a message confirming that transmission of the report to the next canvassing level has begun. If the transmission fails, the BEI shall press "Skip" so data will be sent to another server. The counting machines shall also print thirty copies of the election returns which shall be sealed and placed in the proper envelopes for distribution, as

provided in sec. 18 of R.A. 8436, as amended by sec. 19 of R.A. 9369. Parties authorized to receive the electronic results may request for additional copies at their own expense.

After the voting, counting and transmission are complete, the BEI shall press the shutdown button of the PCOS machine. The BEI will announce the total votes of each candidate, and post the copy in the precinct. Then the BEI shall place inside the ballot box the sealed envelopes containing the election returns, minutes, and half-torn and rejected ballots. To allay fears that chicanery might occur, the ballot box will be locked with four locks, one of which is self-locking and is serially numbered. The keys to the three other padlocks, on the other hand, will be placed in separate envelopes that are to be sealed and signed by the BEI. The machine shall be handed down to a technician while the ballot boxes shall be returned to the treasurer's office for safe keeping and security purposes. Meanwhile, the remaining twenty-two other copies will be automatically printed and physically distributed to authorized recipients in the manner prescribed by law after the transmission process discussed below.[39] The copies shall also show the date of the election, the polling place, the barangay and the city or municipality in which it was held, the total number of ballots found in the compartment for valid ballots, the total number of valid ballots withdrawn from the compartment for spoiled ballots because they were erroneously placed therein, the total number of excess ballots, the total number of marked or void ballots, and the total numbers of votes obtained by each candidate, writing out the said number in words and figures and, at the end thereof, the BEI shall certify that the contents are correct.[40]

At the close of the polls, the City Board of Canvassers/Municipal Board of Canvassers (CBOC/MBOC) will log on to their respective systems through computers set up in the canvassing center and, using the security keys (in which unique digital signatures are encoded), begin canvassing and monitoring transmission of results from cities/municipalities. For this purpose, the CBOC/MBOC shall create a Computerized Vote Consolidation (CVC) Board composed of three members (i.e. board supervisor, deputy supervisor or auditor and a third member) who shall electronically consolidate the votes in all the polling centers (the schools) within their respective jurisdiction based on the election returns submitted by the BEI in a particular polling center. It must be noted that the CBOC/MBOC shall have one computerized consolidation center and CVC Board for every polling center with at least fifty precincts, and two-team members who shall serve as readers and encoders.[41]

When results from all precincts are in, the CBOC/MBOC shall print thirty copies of the Certificate of Canvass (COC) which shall likewise be stored in thirty read-only CDs (compact discs), to be supported by SOV, and the Certificate of Canvass and Proclamation (COCP) for distribution to authorized recipients listed as provided in sec. 22 of R.A. 8436, as amended by sec. 21 of R.A. 9369. The electronically transmitted SOV of a particular polling center shall be the official basis of the canvassing by the respective BOCs without prejudice to consulting the

printed and digitally stored result. The same results electronically consolidated by the CBOC/MBOC as discussed above shall also be simultaneously electronically uploaded to a secured Comelec-designated website. Electronic files of reports shall be saved, digitally signed and sent to the next canvassing level, i.e. Provincial Board of Canvassers (PBOC). Only then can the CBOC/MBOC proclaim the winners for mayor, vice mayor and sangguniang bayan members. All objections in the nature of manifest errors shall be immediately resolved by the BOC by consulting the electronically transmitted results, the digitally transmitted results and the printed copies of the results, using preponderance as the quantum of evidence required in resolving the same. The objections allowed include tampering of ballot box and election return, incorrect reading by the reader, incorrect recording by the encoder, and incorrect consolidation and addition.

The PBOC consists of a chairman who is a provincial election supervisor, a vice chairman who is a provincial prosecutor, and a secretary who is a provincial superintendent of schools. Its tasks are to canvass the votes by consolidating the electronically transmitted results or the results contained in the data storage devices submitted by the CBOC/MBOC, and to issue Provincial Certificate of Canvass (PCOC) and SOV by city or municipality. The PBOC shall produce fourteen copies of the PCOC and transmit the same as follows: Congress; Comelec; PBOC chairman; citizen's arm (PPCRV); another one for Congress (the provisions of sec. 22 of R.A. 8436, as amended by sec. 21 of R.A. 9369, mentions Congress twice); posted on a wall within the premises of the canvassing center; dominant majority party; dominant minority party; two accredited major national parties representing the majority and minority, excluding the dominant majority and minority parties; three national broadcast or print media entities as determined by Comelec; and lastly, another citizen's arm or in the absence thereof, to a non-partisan group or organization enlisted by Comelec. The PCOCs shall each be supported by SOV by city or municipality. Again, parties authorized to receive the results may request for additional copies at their own expense

The Comelec as members of the National Board of Canvassers (NBOC) for senate and party-list elections will begin canvassing immediately after the end of voting by logging on to the National Canvassing System using security keys. Once logged on, they can monitor the progress of the transmission of results. When results from all provinces are in, they can print, sign, and put their thumbprints on the eight copies of SOV, COC, and COCP for senators and party-lists groups, which will then be sent to authorized recipients. The NBOC shall save, sign, and encrypt electronic copies of the reports and send them to the central backup server. Based on the COCPs, the NBOC can proclaim the winning senators and party-list groups.

The Senate and the House of Representatives in joint public session shall compose the NBOC for president and vice-president. The certificate of canvass for president and vice-president duly certified by the BOC of each province or city, shall be electronically transmitted

to the Congress, directed to the president of the Senate. Upon receipt of the certificates of canvass, the President of the Senate shall, not later than thirty days after the day of the election, open all the certificates in the presence of the Senate and the House of Representatives in joint public session and the Congress upon determination of the authenticity and the due execution thereof in the manner provided by law, canvass all PCOCs and City/District Certificates of Canvass (CCOC/DCOC), issue the National Certificate of Canvass (NCOC) and proclaim winners of presidential and vice-presidential elections.[42]

The water becomes murky at the transmission phase discussed above as several IT experts contend that during the transmission process, when the PCOS shall briefly connect to the Internet, malicious attackers may hack into the system and therefore rig the entire results of the voting. According to a policy critique of the CENPEG, "it is possible to download a malicious code into every PCOS instructing the machine to alter the data during . . . the transmission of results."[43]

Such fear is unfounded for as we have explained above, hacking or rigging the election results stored in the PCOS is impossible considering that there are many passwords and security codes that lock the machines. When the votes have been counted the BEI shall connect an external modem to the PCOS via the Ethernet port to transmit the precinct results via canvassing/consolidation machines (CCMs), which will consolidate the results from all precincts within the city or municipality, to the city or municipal canvassing center, the provincial canvassing center, the Comelec central backup server, and servers designated for the KBP, the watchdogs, and other groups as specified in sec. 18 of R.A. 8436, as amended by sec. 19 of R.A. 9369. In other words, the automated elections system has multiple trusted originals of the election results, so even granting *ex gratia arguendo* that the municipal server and the municipal server reports, for instance, are hacked there are other trusted originals against which the discrepancy may be compared.[44] But assuredly, it is well-nigh impossible to pry into the system for, besides the data being encrypted as discussed below, the software for the centralized canvassing system is password-protected, disabling modifications and changes in it.

It must be noted that the machines are only connected once at the end of the voting day, and then disconnected after transmission. The transmission process takes less than two to five minutes. Prior to transmitting the election returns, the PCOS digitally signs the files using the SHA 256 algorithm and encrypts them using the AES 128 algorithm.[45] This kind of data encryption is actually used by banks to maintain a 24/7 security to their automated teller machines.[46] A 128-bit encryption means that there are 2^{128} possible combinations that could access the data inside the machine. In layman's term, it will be almost impossible for a hacker to penetrate the system since that number of combinations cannot be processed within two to five minutes. Suffice it to say that in such a brief period, even supposing a remote controller gets access to the canvassing computers, all that she or he can do is to funk up the way addition is

being done at that level; she or he would not be able to affect the building block of the final election results—the election returns—and a faithful canvass will still be achievable via the multiple parallel transmissions made from the precinct. There are 76,340 clustered precincts nationwide; hacking the results of just one precinct, will take fifty years to decode, according to IT professionals, as the 128-bit encryption means the possibility of a successful hacking occurs only once for every 340 undecillion attempts, equivalent to 340 times 10^{36}. And even then, again, a hacker would be able to hack into only one machine because it is standalone, meaning it is not connected to other machines; each machine has its own security codes. Hacking into the central servers is virtually impossible and the servers cannot be fed hacked data as it only accepts data from specific PCOS machines. The Comelec-designated website, which will display the election results from the automated elections system, are also clad with security features, and mirror or backup sites have been set up, so that if anything goes wrong with any of the election websites another website can immediately be put up to take its place. It bears stressing that with the system using ultra-safe encryption algorithms to store and transmit each vote from the voting machine to the tabulation centers, as well as other backup security nets, tampering of votes will be prevented and the integrity of the elections would be higher.

After the electronic transmission of the results is over, the Random Manual Audit (RMA) teams, under the supervision of the Comelec TWG, will conduct random manual audits of ballot boxes from five clustered precincts, which are randomly selected using a *tambiolo* with numbered balls, in each of the 299 legislative districts in the country (hence there will be 1,145 out of 76,340 precincts nationwide which will be subjected to random manual audit) in order to check the results produced by the poll counting machines against the manually counted ballots, as prescribed under Resolution 8837.[47] The positions that will be manually counted for the audit include the president, vice president, district representative, governor and mayor.

Audit rules state that in case the number of ballots that will be subjected to the audit exceeds the number of votes found in the Minutes of Voting and Counting certified by the BEI, the resolution requires for an investigation for "any possible reasons" of the discrepancy, such as spoiled or rejected ballots. But in the event that no probable reason is identified, "all the ballots shall be returned in the ballot box and thoroughly mixed by the (BEI) Chairman." The BEI chair will then "randomly take out from the ballot box the number of ballots equal to the excess and place them in the RMA envelopes for excess ballots."[48]

It must be noted that the Poll Modernization Law stipulates the conduct of manual audit in a single precinct per legislative district only as sec. 29 of said law mandates:

SEC. 24. A new Section 29 is hereby provided to reads as follows:

> "**SEC. 29.** ***Random Manual Audit***. – Where the AES is used, there shall be a random manual audit in *one precinct per congressional district* randomly chosen by the Commission in each province and city. Any difference between the automated and manual count will result in the determination of root cause and initiate a manual count for those precincts affected by the computer or procedural error." [emphasis added]

But in response to request by electoral reform groups like Automated Election System Watch (AES Watch), CENPEG and Consortium on Electoral Reforms (CER) for Comelec to conduct a wider manual audit of ballots before the proclamation of election winners, inasmuch as a limited one would cast doubt on the results of the automated polls, the poll body has expanded the coverage of random manual audit of ballots from a single precinct for every congressional district to five per district.

It bears stressing that the purpose of the audits is to compare results of the counting machine versus the manual count. This redundancy check should appease those who are fear-mongering that the integrity of the elections may have been compromised by pre-programmed or computer-manipulated voting results. Ultimately, it will corroborate the stability and integrity of the system.

CONTINUITY PLAN AND ANALOGOUS CONTINGENCY MEASURES

What if problems and technical glitches surface on the election day? Are there backup strategies prepared by Comelec to address them? The legislature through sec. 9 of R.A. 8436, as amended by sec. 11 of R.A. 9369, has authorized Comelec to put up a continuity plan, which is a set of instructions given to the BEI, in case of system failure or any other analogous situations. Said provision provides:

> **SEC. 11. Section 9 of Republic Act No. 8436 is hereby amended to read as follows:**
>
> **"SEC.13.** ***Continuity Plan.*** – The AES shall be so designed to include a continuity plan in case of a systems breakdown or any such eventuality which shall result in the delay, obstruction or nonperformance of the electoral process. Activation of such continuity and contingency measures shall be undertaken in the presence of representatives of political parties and citizen's arm of the Commission who shall be notified by the election officer of such activation.

> "All political parties and party-lists shall be furnished copies of said continuity plan at their official addresses as submitted to the Commission. The list shall be published in at least two newspaper of national of circulation and shall be posted at the website of the Commission at least fifteen (15) days prior to the electoral activity concerned."

The Comelec has identified four principal types of systems breakdown of the counting machines, each with corresponding general troubleshooting guidelines: (1) PCOS fails to scan; (2) PCOS able to scan but fails to print; (3) PCOS able to print ER but fails to transmit; and (4) consolidation/canvassing system (CCS) able to receive transmission but fails to consolidate. In the first and second cases, the BEI shall wait for spare PCOS, or in default, wait for other PCOS from another precinct, to complete its process before it is reconfigured for scanning of ballots. The CF card of defective PCOS will then be used and the replacement PCOS will count and consolidate the votes cast, and thereafter, print the election returns. If the spare PCOS still fails or if no PCOS from another precinct is available, manual counting shall be done. In the third case, defective PCOS shall be connected to a functioning transmission facility in the nearest precinct or polling center. The removable storage device of defective PCOS will likewise be used and the functioning facility will transmit precinct results. If this fails, the PCOS shall be physically transported to the canvassing center in the presence of watchers, security escorts, and other interested groups. In the last scenario, the CF card of defective CCS shall be transferred to any available and functioning CCS which will consolidate the results. If this fails, data from Comelec central backup server shall be printed and sent to affected BOC or to a special BOC which shall be constituted to take the place of affected BOC.[49]

The poll body has spare machines in case the PCOS machines conk out on the election day. If the spare machines run out the procedure outlined above will be observed. There will be a technical person certified by DOST and Comelec who will be designated per precinct to validate all equipment and assist the BEI in the installation and the dismantling of the machines, and to troubleshoot the bugs in poll machines.[50] To obviate the possibility of being used as avenues for retail cheating, the technicians are required to issue an affidavit that they are not related to any candidate up to the fourth degree. Technicians are likewise tasked to answer questions and assist voters on correct procedures, but to remove doubts that they might be used to influence voters they can only go near a PCOS machine if asked by the voter, or if the voting machine needs fixing; otherwise, they are not allowed to talk or touch, write or press anything.

Relatedly, transmission of election results, except in case of systems breakdown of the poll counting machines, should not be a serious problem. This is because the Comelec *en banc* had created a Technical Working Group for Transmission composed of representatives from the National Telecommunications Commission (NTC), Telecommunications Office (TELOF), telecommunications carriers such as PLDT/Smart, Globe/Innove, Digitel/Sun, including

provincial telephone companies and cable TV internet providers, to guarantee that there will be internet access from at least two to three carriers per polling precinct nationwide. In the remote island precincts where the carriers may find difficulty in extending their service coverage and backup, mobile satellite technology will be used. If this fails or is unavailing, the guidelines on systems breakdown discussed above should be followed.

The Comelec deputized the National Electrification Administration (NEA), National Power Corporation (NAPOCOR), and local electrification cooperatives, including their respective heads or chief operating officers to ensure stable and continuous supply to poll precincts during the election period for use in the casting and counting of votes, transmission and consolidation of results, and proclamation of winning candidates in the country's succeeding automated elections, and authorized them to cut off supply to other sectors such as industries and large commercial establishments during the election period should the need arise and to allocate power savings for distribution to critical election areas like ballot distribution and retrieval centers, voting, and counting places at the precinct level, and at the canvassing and transmission centers.[51] But in case power outages will still hit the country on election day there are always portable generators provided by, *inter alia*, poll watchers and political parties during elections. Telecommunications carriers also have, as standard practice, two standby power generator sets in their stations or facilities which, per agreement with Comelec, may be used in such eventualities. These generators can produce enough power to run the PCOS. If that is unavailing, there are spare batteries to power up PCOS which are available at strategic locations from the technical support staff of Comelec and Smartmatic; batteries are also available in commercial retail stores. At any rate, the PCOS has a battery-life of twelve to sixteen hours, thus the elections may still be conducted under a blackout and even in the absence of alternative sources of energy. Ultimately, power-failure on the election day should not lead to election failure. If at all, it should only result to failure of automated elections. For should the counting machines, despite all precautions and contingency measures in place, still fail in the precinct level, manual elections must be resorted to.[52]

EPILOGUE

Poll automation has been perceived as the answer to eliminate the discrepancies from counting of votes to the proclamation of the victors. But, doom may be hand on hand with this glory. Many speculations continue to arise as the government tries to instill into us that cheating is impossible with this method. However, many Filipinos are afraid and hesitant with this system. An automated election, for a fact, cannot fully prevent cheating—at best, it can prevent the multiple voting and flying voting because of the security features embedded in the system. It is also a fact that there is no system that is tamper proof. But the poll body has put up reasonable forms of check and balance to preclude any anomaly in the electoral process: paper audit trail of ballots, protection of software source code, testing and sealing of the technologies, data

encryption of digitally signed election returns and COCs, random manual audit and the like. The handling by the poll body of the elections has relaxed and contributed to the relative confidence that voters had with regard to the AES. However, a review is called for regarding the management and administration of the whole AES.

It bears stressing that the Comelec's capacity to raise the level of political discourse and educate citizens regarding their right to vote should be enhanced. This will be done through conduct of continuing citizen and voter education through partnership with civil society groups and other government institutions. The electorate must be empowered with information that would help them vote intelligently. The challenge is to develop the people's appreciation of their vote as a means to reform the government and receive better services from it. Part of this challenge is the need to raise the awareness of the electorate on relevant issues and the corresponding platforms of the candidates, if the country is to shift from the politics of personality to the politics of party programs.

ENDNOTES

[1] Commission on Elections, "Operation Modex," http://www.comelec.gov.ph/modernization/modex.html.

[2] Comelec Advisory Council, "Post-election Report on the Use of Automated Election System (AES) in the 2008 ARMM Elections," http://www.cenpeg.org/2010%20ELECTIONS/CAC%20EVALUATION%20REPORT%20ARMM%20Election%202008-11-16.pdf, 21-23.

[3] "Eliminate Human Intervention, Ensure Credible Transition of Power – Angara." http://www.senate.gov.ph/press_release/2009/0914_angara1.asp.

[4] Commission on Elections, "Smartmatic–TIM JV," http://www.comelec.gov.ph/modernization/2010_natl_local/smartmatic_tim_jv.html.

[5] Ibid.

[6] Commission on Elections, "Bidding process: List of participating bidders," http://www.comelec.gov.ph/modernization/2010_natl_local/participating_bidders.html.

[7] Commission on Elections, "SBAC bid bulletin: Invitation to Apply for eligibility and to bid," http://www.comelec.gov.ph/modernization/2010_natl_local/SBAC/sealed_app_for_eligibility_and_bid_for_counting_machines.html.

[8] Ibid.

[9] Ibid.

[10] Commission on Elections, "Notice to award," http://www.comelec.gov.ph/modernization/2010_natl_local/SBAC/winning_bidder/notice_of_award.html.

[11] Contra Dissenting Opinion of Associate Justice Carpio. The latter maintained that the parameters for the initial limited use of an automated election system under sec. 5 of R.A. 8436, as amended, are the AES is used in at least two highly urbanized cities and two provinces each in Luzon, Visayas and Mindanao, as selected by the Comelec. The automated elections in the ARMM held last 11 August 2008, according to him, did not satisfy these parameters because they were held in southern Mindanao only, involving six provinces and two cities, as mandated by law.

[12] R.A. 8436, § 2, as amended by R.A. 9369, § 2.

[13] Commission on Elections, "Modernization of the electoral process: Features of the new system," http://www.comelec.gov.ph/modernization/features.html.

[14] R.A. 8436, § 2, as amended by R.A. 9369, § 2.

[15] Commission on Elections, "Modernization of electoral process: Kinds of technologies considered," http://www.comelec.gov.ph/modernization/technologies.html.

[16] R.A. 8436, § 2, as amended by R.A. 9369, § 2.

[17] The BEI shall be public school teachers. At least one member shall be an IT-capable person who is trained or certified by DOST to use the automated election system. See Res. 8739, § 1.

In addition to the three-man BEI team, the Comelec will add up to three support staff who will handle the book of voters for the additional precincts in the cluster. Clustered precincts composed of three polling precincts shall be entitled to one additional support staff; four precincts with two support staffs; and those with five to seven clustered precincts with three. See Res. 8739, § 9.

[18] Ernie Dieterich, "Direct Recording Electronic Voting Systems," http://www.leagueissues.org/tutorial.html. See also Jarrett Blanc, "Electronic Voting," *Challenging the Norms and Standards of Election Administration* (Washington, D.C: International Foundation for Electoral Systems, 2007), 11–16.

[19] Commission on Elections, "Project Specifications, Component 1-B," http://www.comelec.gov.ph/modernization/2010_natl_local/2010_Election_automation_project.html.

[20] Smartmatic International Corporation, "Technology: SAES1800 Voting Machine," http://www.smartmatic.com/index.php?id=19&tx_ttnews[tt_news]=948&cHash=6e5b3ae755.

[21] See Res. 8785, § 4–6.

[22] Financial Proposal of Smartmatic-TIM Consortium to Comelec, dated May 4, 2009. The source codes are for the following machine executables: Component 1-A Item 1.1.1 EMS Application, Component 1-B Item 1.1.2 PCOS Firmware Voting Application 1.29, and Component 1-C Item 1.1.3 CCS Application.

[23] Dissenting Opinion of Carpio, J., Roque *et al. v.* Comelec *et al*.

[24] In *Guingona et al. v. Comelec* (G.R. No. 191846, May 6, 2010, http://sc.judiciary.gov.ph/jurisprudence/2010/may2010/191846.htm), the Supreme Court granted the petitioners' special civil action for mandamus to compel the respondent Comelec to disclose, *inter alia*, the content of the source code of the PCOS machines for review by interested parties as mandated by R.A. 9369, citing the petitioners' constitutionally guaranteed right to information on matters of public concern.

[25] Commission on Elections, "Contract for the Provisions of an Automated Election System for the May 10, 2010 Synchronized National and Local Elections, July 14, 2009," http://www.comelec.gov.ph/modernization/2010_natl_local/SBAC/contract/contract_article7.html.

[26] See Pablo Manalastas, "Election 2010: Public Counting & Code Review," http://www.aes2010.net/index.php?option=com_content&view=article&id=61:election-2010-public-counting-a-code-review&catid=60:doc-manas-blog&Itemid=101. [emphasis in the original]

[27] Ibid.

[28] In order to ensure that the approved source code is that which is actually installed in the PCOS machines it was suggested in the Automated Election System (AES) 2010, a policy study of the University of the Philippines' College of Law which aims to probe into the viability of the AES which will use the Comelec PCOS-OMR technology, that the software of the counting machines must be subjected to a program integrity verification through which the so-called hash (one line of numerical value) will verify that the approved program is installed in each PCOS machine. Accordingly, the group submits that the BEI, political parties and poll watchers must be provided with the hash value for transparency. On election day, the hash value of the program installed in each PCOS machine should also be printed during the initialization stage. If the values are different from the value of the approved program, this means that the wrong, malicious program was installed in the machine.

[29] See Res. 8647.

[30] Sec. 40(f) of Res. 8786 directs the BEI to press "No" when the automated counting machine asks them to "digitally sign the transmission files with a BEI signature key". It must be noted, however, that the instruction did not mean that there would be no digital signatures in the transmission of the votes. The instructions simply removed one step in the transmission process in order to minimize human intervention and further protect the results of the vote. Aside from this, the Comelec had not required BEI members to have individual signatures because of the possibility that results might not be transmitted if a BEI member had not shown up, among other reasons.

The voting machine has a digital signature in itself which is also corroborated in the card and the password that is provided to the BEIs. The Comelec deemed that the use of the iButton security key, which is used to start up the machine, as sufficient compliance with sec. 18 of R.A. 8436, as amended by sec. 19 R.A. 9369 because the results would not have been transmitted without this. Said sec. 18 provides that "[t]he election returns transmitted electronically and digitally signed shall be considered as official election results and shall be used as the basis for the canvassing of votes and the proclamation of a candidate." Sec. 20 also requires that "[t]he certificates of canvass transmitted electronically and digitally signed shall be considered as official election results and shall be used as the basis for the proclamation of a winning candidate."

The law only requires that the election returns be electronically transmitted and digitally signed. The provision cited does not say that it is the BEI that should digitally sign the election results.

[31] Smartmatic's financial proposal, Item 1.2.1.4.

Smartmatic's Bid Bulletin No. 10 (20090415) provides: "The digital signature shall be assigned by the winning bidder to all members of the BEI and the BOC (whether city, municipal, provincial, district). For the NBOCs, the digital signatures shall be assigned to all members of the Commission and to the Senate President and the House Speaker. The digital signature shall be issued by a certificate authority nominated by the winning bidder and approved by the Comelec."

[32] Res. 8739, § 35. Also called zero vote document, the zero report is basically an election return showing zero votes for each candidate in each contest. This is the automated version of publicly inverting the ballot box in the manual process in order to show that the box has not been previously stuffed with pre-filled-out ballots. The report would then be signed by the BEI and the watchers.

[33] Res. 8698 provides that "[r]ejected ballots will be returned to the voter, who will in turn give the same to the BEI. The voter will not be issued a replacement ballot." Thus, if a voter's ballot becomes spoiled due to erroneous marking, smudges, poor calibration or alignment of the PCOS machine itself, or other reasons, no replacement ballot will be issued resulting in the

voter's disenfranchisement. The intent of Comelec is to deter the sinister possibility that extra ballots may be used for cheating.

In addition, pursuant to sec. 37 of Res. 8786 prospective voters who will be unable to vote in their precincts due to a ballot shortage will be given a certification from the BEI. The certification will allow these voters to cast their ballots in another precinct which still has spare ballots. Voters will be accompanied to the next precinct belonging to the same district where they may cast their vote.

[34] Ultraviolet markings are often used in paper money and high-security documents like passports to make it difficult to generate a fake or counterfeit document. Cashiers would usually use a UV lamp that will make light blue or violet markings visible in the document. These lamps, sometimes called blacklights, are needed to make the markings glow.

[35] Poll inspectors at precinct level read ballots using handheld UV lamps to verify their authenticity, instead of using the PCOS machines in the country's first automated polls last May 10. This is because the UV ink in the bar code on millions of ballots for the May elections was not dense enough to be detected by the computers programmed to authenticate them. Moreover, the machines could not read the UV ink marks since it overlaps with the ink for the names of the candidates on the ballot papers. Since there was no time to adjust the placement of the security marks on the ballots, buy a new kind of ink, or configure the machines, the PMO has decided to do away with the built-in UV reader on the PCOS machines. The poll body opted to deactivate the UV ink detection security feature of the PCOS machines and supplement the computers with manually operated ultraviolet ink readers, the kind used to check for counterfeit bank notes.

[36] Res. 8786, § 38.

[37] Res. 8786, § 36.

[38] See Res. 8803, § 2.

[39] Sec. 18 of R.A. 8436, as amended by sec. 19 of R.A. 9369 provides that the thirty printed copies of the election returns shall be distributed to the CBOC/MBOC, Congress, Comelec, citizen's arm (PPCRV), dominant majority party, dominant minority party, ballot box, PBOC, ten accredited major national parties (excluding the dominant majority and dominant minority parties), two accredited major local parties, four national broadcast or print media entities as may be determined by Comelec, two local broadcast or print media entities as may be determined by Comelec, and lastly, four major citizen's arms, including the accredited citizen's arm, and other non-partisan groups or organizations enlisted by Comelec.

[40] Sec. of 212 of B.P. 881, as amended by sec. 32 of R.A. 9369.

[41] R.A. 8436, § 21, as amended by R.A. 9369, § 20.

[42] R.A. 8436, § 24, as amended by R.A. 9369, § 23.

[43] Center for People Empowerment in Governance, "Comelec's PCOS-OMR System Rejects Public Counting, Enhances Wholesale Cheating," http://www.cenpeg.org/POL%20PARTIES%20AND%20ELECTIONS/MAY2009/CENPEG%20Policy%20Study%20AUTOMATED%20ELECTIONS%20May%2007%202009.pdf, 8.

[44] It must be noted that the municipal canvassing server canvasses all the results from the precincts under its jurisdiction. Once all the results are canvassed, the MBOC can generate and print out the Municipal Certificate of Canvass (MCOC) as well as the SOV. This process is repeated, transmitting the results and printing the necessary reports in the Provincial and National Canvassing Stations. Because of the stiff audit procedures and counter-measures for the elections any perforations of the results, either by insiders from Comelec or Smartmatic or outside malicious attackers, can easily be traced.

[45] Pablo Manalastas, "Safeguarding the 2010 Elections with Digital Signatures," http://www.cenpeg.org/POL%20PARTIES%20AND%20ELECTIONS/APRIL%202009/MANALASTAS%20Safeguarding%202010%20Polls%20April%202009.pdf. Manalastas explains that cryptography is used by individuals to digitally sign computer documents (files), and to encrypt computer files that can be decrypted only by the intended recipient. Relatedly, he notes that R.A. 8792, otherwise known as the E-Commerce Act, has prescribed a way for computer files to have numerical data added to the end of the file (suffix data) that is legally acceptable as a signature.

[46] Sarmiento, "The Law on Nationwide Poll Automation," 4.

[47] See in particular art. I, § 1 and 7 of Res. 8837.

[48] Ibid., art. II, § 9.

[49] See Res. 8839.

[50] See Res. 8738.

[51] See Res. 8715, § 2.

[52] Ibid.

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———, comp. *Election debacle: Disenfranchising the Voters, Mangling the Party-list System; A Reader on the Philippine Elections*. Quezon City: Center for People Empowerment in Governance, 2007.

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