The Criticalness of Transparency in Automated Elections

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Abstract. The May 2010 automated elections, as a step towards modernizing democracy, was characterized by highly-observable computerization errors, lack of transparency, security, and accuracy in both computerized procedures and accompanying manual procedures, failure to make the source code of the election computer programs (configuration program, voting and counting program, and canvassing programs) available for public review as mandated by law (Republic Act 9369), and utter lack of competence in computerization of elections of both the government Commission on Elections (Comelec), and the system integrator Smartmatic International, which Comelec hired to help manage the computerized aspects of elections. From the point of view of the Freedom of Information provision of the Constitution, the May 2010 automated elections was a failure, and can be more aptly described as public voting and secret counting, instead of secret voting and public counting.

1 The 2010 National & Local Elections in the Philippines

The May 10, 2010 elections in the Philippines was a synchronized election of national and local officials. At the national level, a voter can choose one president, one vice president, twelve senators, and one party list. At the local level, a voter can choose one district congressman, one provincial governor, one provincial vice governor, several members of sangguniang panlalawigan (provincial board), one municipal mayor or city mayor, one municipal vice mayor or city vice mayor, and several members of sangguniang pambayan (municipal board) or sangguniang panglunsod (city board).

There were 10 candidates for president, 8 candidates for vice president, 61 candidates for senators, and 187 candidates for party list. There were a total of 229 congressional districts, 82 provinces, 1494 municipalities and 143 cities. In District 1 of Antipolo City, in Rizal Province, there were 8 candidates for congressmen, 7 candidates for provincial governor, 3 candidates for provincial vice governor and 3 candidates for sangguniang panlalawigan, 5 candidates for city mayor, 5 candidates for city vice mayor, and 43 candidates for sangguniang panglunsod. In Antipolo, the paper ballot contained 340 candidates' names in all, together with as many ovals to the left of each name, which ovals the voter

shades to indicate his chosen candidates. The ballot had to be printed on a special paper size of 8.5 inches by 25.0 inches in order to fit that many names and ovals on two faces of the ballot.

There are as many different ballot designs as there are localities (municipalities, cities, and districts of highly urbanized cities), since each locality has a unique set of local candidates. There are about 1,600 different ballot designs, one for each locality. The names of candidates for the national positions are the same for all localities. However, each locality has a unique set of candidates for local positions.

In the period 2007-2010, voters were beginning to realize that such a complicated election could benefit from automation. The Comelec has decided that voting has to be manual, using paper ballots, so that these ballots can be used for manual audits after election, and to settle electoral protests. But the rest of the stages in the election process has to be computerized, such as ballot scanning, assignment of votes to candidates, canvassing, transmission of results, and consolidation. Computerizing these stages will minimize cheating and terrorizing of election personnel, aside from making the whole process faster.

2 The Philippine Automated Election System (AES) of 2010

Batas Pambansa 881 (National Law 881) prescribes in detail how manual voting should be conducted in the manner of "secret voting", and also prescribes in detail how manual counting of votes, and manual canvassing and consolidation should be done "in public" by the Board of Election Inspectors (BEI), in the full view of representatives of political parties, election watchers like the National Movement for Free Elections (NAMFREL) or the Parish Pastoral Council for Responsible Voting (PPCRV), and the press, in the spirit of "full transparency". The new Automated Election Laws, Republic Act 8436 and Republic Act 9369 (RA-9369) empower the Comelec to select appropriate technology for automating elections. However, RA-9369 specifies minimum hardware and software system capabilities that ensure that the selected AES is operating properly, securely, and accurately, to produce a correct count that is reflective of the will of the people.

2.1 Comelec Chose Smartmatic International

Comelec conducted public bidding to select the provider of AES technology for the elections of May 10, 2010 during the period May-July, 2009. At the beginning all nine bidders were disqualified for failure to submit the necessary bid requirements. In subsequent re-qualification rounds only Smartmatic International was able to qualify, but its selection was much criticized because of Comelec's "relaxation" of the bidding rules, and for Comelec's "bending over" to accommodate the inadequacies of Smartmatic's AES technology.

Smartmatic's expertise is DRE (digital recording electronics) voting equipment. To conform to Comelec's requirement for PCOS (precinct count optical scan) technology that uses voter-marked paper ballots, Smartmatic licensed the Democracy Suite PCOS ballot scanning back-end computer, and the Democracy Suite EMS (election management system) from Dominion Voting Systems of Canada. It did not license the the Democracy Suite Ballot Marking Front-End, now called Imagecast Evolution. Evolution is an interactive DRE-like computer that allows the voter to make selections of candidates using a touch-screen interface, and then prints the voter's ballot already computer-marked with the voter's choices. It is clear that paper ballots printed and marked by the Evolution computer are superior to pre-printed ballots manually marked by voters, in terms of being read more accurately by the PCOS ballot-scanning back-end. This is because there are as many styles of manually marking paper ballots as there are voters, since each voter has a marking style of his own, specially when voters are not acquainted with the marking style that the PCOS will accept. Requiring people to mark ballots using a style that the PCOS will accept is a classic example of forcing people to adjust to technology, instead of designing technology to adjust to people. And this is a basic flaw in Smartmatic's design of Philippine election of 2010.

2.2 Smartmatic's Automation Errors & Election Management Errors

The source code problem. Smartmatic did not license the source code of the EMS and PCOS programs from Dominion. Furthermore, its binary license did not include the right to make any changes to the EMS or PCOS programs. Any proposal for changes have to be requested from Dominion, who has the sole right and responsibility to make the requested changes. This is the reason why Smartmatic could not allow independent review of the source code of the EMS and PCOS by political parties and interested groups, as required by RA-9369 – Smartmatic did not have a license to review the source code of Dominion, and it did not have a right to let third parties review the source code.

Blunders galore! Smartmatic is a vendor of DRE equipment, and so its first implementation of PCOS technology, in which it has no expertise, in the election of May 10, 2010 was a painful learning experience for Smartmatic, characterized by many obvious and inexcusable blunders, which blunders were financed by Filipino tax money to the tune of PHP14.2 billion. We describe below some of these blunders.

1. Ballot face vs PCOS config data. The names and positions of candidates on the ballot must be accurately specified to the PCOS computer, for each one of the 1,600 different localities. Comelec was constantly modifying the list of candidates in each locality, as the courts were deciding the cases involving inclusion or exclusion of candidates names on the ballots for the locality. But Smartmatic, being inexperienced in the PCOS technology, did not make the

corresponding changes to the PCOS configuration-input data that were required by the changes in the list of candidates. This mismatch between ballot-face and CF-card configuration-input data for 1,600 PCOS computers nationwide was discovered on May 3, 2010, only seven days before election day on May 10. It is obvious that seven days is not enough to correct the configuration-input data for 1,600 different ballot designs for the 76,000 PCOS computers already delivered to the 1,600 localities, many of which are far-flung barrios in the country. It is not surprising if a number of these PCOS computers used the wrong data, and so produced wrong counts, a classic illustration of the garbage-in-garbage-out dictum in computerization practice.

2. No voter verifiable audit trail. One feature that is included in the section on "minimum system capabilities" in RA-9369 is that the PCOS shall "Provide the voter a system of verification to find out whether or not the machine has registered his choice". This is the famous VVPAT/VVVAT/VVAAT – voter verifiable [printed/video/audio] audit trail, that provides the voter some confidence that the PCOS computer has actually read and interpreted his votes correctly. Without this feedback, the voter does not know what happened to his vote. But Comelec disabled this PCOS feature during the May 2010 elections, using the excuse that voting will take too much time. This is sad – one of many acts of Comelec to circumvent the law.

3. No digital signing by BEI. RA-9369 specifies that the precinct election returns (ER) digitally-signed and electronically transmitted shall be used as the basis for canvassing and proclamation of winners. Further, Comelec's "Request for Proposals (Terms of Reference) to Bidders of AES-2010" (RFP/TOR) specifies that the Board of Election Inspectors (BEI) shall digitally sign and encrypt the internal copy of the ER, prior to electronic transmission. Smartmatic insisted that the PCOS has the capability to digitally signed the ER prior to transmission, using the machine's signing keys, but that is not what RA-9369 and the RFP/TOR requires. In order for the PCOS to enable digital signing of the ER by the BEI, it has to have installed an SSL library, a suitable `sign` program, library support for authentication of signers (signatories), and support for key management of the BEIs' public keys. Furthermore, the digital signing procedure has to ensure that the private key of the signer is never compromised, at any time in the digital signing process. There are two ways to do this. (1) The PCOS can employ appropriate signing hardware, like a smart card reader, so that the BEI's smart card can do the signing, without the need to copy the BEI's private key out of the smart card. (2) The PCOS program can erase the BEI's private key from its memory, as soon as the private has been used to compute the digital signature – but the vendor of the equipment has to prove to the world, in a public source code review, that the PCOS program actually does this erasing. It appears that the PCOS, as of this date, does not yet have the support structures mentioned above, and so can not allow digital signing by the BEI. Digital signing by the BEI was not employed in the May 2010 elections, and as a result, no one is really sure of the authenticity of the data transmitted by

the PCOS computers at the precincts to the CCS (canvassing and consolidation system) computers at the municipalities.

4. Test data transmitted as actual data. Because of the "ballot face vs PCOS configuration-input data" error mentioned in (1), a number of CF cards containing newly corrected configuration-input data for the PCOS computers arrived late at the precincts. As a consequence, the testing of the computer set-up was done on election day itself, instead of three days before election day. The test was done with 10 sample ballots. After testing, the test-ER was transmitted and accepted at the municipal CCS as actual election data. At the end of the election period, at the end of the day, when all voters who have queued up to vote have already finished voting, the PCOS prepared the actual ER and transmitted to the municipal CCS, but the CCS rejected the actual ER, since an earlier transmission was already made and accepted. About 371 of these actual ER were rejected because of an earlier tansmission of test-ER, resulting in the disenfranchisement of about 185,500 voters.

5. Transmission failures. All 76,000 precinct ERs were expected to be transmitted to the municipal CCS computers and to the Comelec central CCS computer, in order to provide for redundancy. Of this, about 8,939 ERs did not reach the Comelec central CCS due to failures of communication provided by the country's mobile providers, Smart, Globe, and others. We suspect that the same number of ERs did not reach the municipal CCS computers, probably disenfranchising 4.5 million voters.

6. Comelec tabulation errors. There were 67,162 precinct ERs that were "successfully" transmitted to the Comelec central CCS computer and these ERs contain complete or partial data. Of this number, 25,530 precinct ERs have missing data in one-, two-, or three-elective positions. For example in the case of clustered precinct no. 271 in Antipolo City, there are no results for the positions of party list, vice-governor, and sangguniang panlalawigan. Data are missing in different positions among these 25,530 precinct ERs. We suspect that these missing data are due to transmission errors that are flagged as transmission "successes", despite the missing data, since they do not result in complete transmission failure. This is a sign of errors in programming of the PCOS-to-CCS transmission and CCS tabulation functions.

3 Lack of Transparency

Both Smartmatic and Comelec, acting alone or as a partnership, showed lack of transparency in many steps in the computerization of the May 2010 election. The many cases where the partners showed horrible opaqueness include the following.

1. Failure to allow political parties and interested groups to do source code review of the election computer programs independent of the partnership, resulting in many bugs that eluded the testing done by SysTest Labs, bugs that could have been cured by independent source code review.

2. Failure to publish the results of the SysTest Labs source code review and testing, resulting in the public's acceptance of the Smartmatic's AES, despite SysTest Labs' lukewarm and conditional endorsement of the tested AES. In fact, the test results were never made public, and where released only to a limited number of interested parties and only upon order of the Supreme Court.

3. Failure to make public the procedures used during the post-election RMA (random manual audit), and failure to promptly release the results of the RMA to the public. In fact, the RMA results were released after much delay and many months after the completion of the RMA, making the public suspect that the RMA results were being "doctored".

4 Conclusion: Criticalness of Transparency in Automated Elections

While the counting and canvassing of votes in a manual election can be made in full view of the public, and so truly transparent, there is no equivalent "public counting" in the case of automated elections. In lieu of public counting, there should be a public display and public scrutiny of the computer programs that are used to do the counting, which is done in secret by the PCOS computer. Also there should be public display and public scrutiny of all input data and output data formats that will be used in elections. For example the political parties and election watch groups should be included in the review of input documents for the PCOS, such as the verification of correctness of the match between the names and positions of the real candidates on the ballots, and the names and positions of the same candidates in the configuration-input data for the PCOS. This match must be established in full view of the public, before the public can put its trust in the system. This is not necessary in other countries, where the ballot contains only two names. But in the Philippines, where it is usual for a ballot to contain 370 names, this match must be established publicly. It is like telling the public the "plan" for doing the PCOS count. Plain paper ballots without the security features can be used during the review, so as not to divulge the security secrets in ballot printing.