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The Hon. Tony Smith MP  
Chair  
Joint Standing Committee on Electoral Matters  
House of Representatives  
PO Box 6021  
Parliament House  
CANBERRA ACT 2600

Via e-mail ([em@aph.gov.au](mailto:em@aph.gov.au))

Dear Mr Smith,

Thank you for the opportunity to provide input into the Joint Standing Committee on Electoral Matters' inquiry into the conduct of the 2013 Federal Election and related matters.

We understand the committee has expressed some major concerns about the conduct of the election, in particular the loss of 1370 ballots in the Western Australian Senate election.

This loss has not only cost taxpayers \$20M to conduct a replacement election in Western Australia, it has also potentially tainted the trust Australians have in the democratic process.

We also understand that process irregularities in Fairfax (where scrutineers challenged the validity of a large number of votes) and in Indi, where the process was significantly slowed, are of major concern to the Committee.

We contend that these difficulties cannot be completely negated using our current system of voting. A purely paper-based system in which a voter indicates their intent by handwriting is at risk of the loss of ballots and confusion about whether a voter's intention is clear.

A purely electronic system is also at risk of compromise as was demonstrated by the activities of action group *Wij vertrouwen stemcomputers niet* (WVSN), in relation to the 2006 Dutch General Election.

CGI proposes that a **mixed paper-based and electronic voting system** would overcome difficulties with both purely paper-based and exclusively electronic voting.

We understand that any system which replaces the current system of paper-based voting must have these features as a minimum:

- The entire system must be absolutely trustable;
- Disputes over the validity of votes (i.e. discussions about whether the intention of the voter is clear) must be minimised;



- The vast majority of votes must be counted on election night with a great deal of certainty, and
- There must be some certainty about who has voted and who has not.

**We propose a solution** which meets all those objectives.

A mixed paper-based and electronic voting system would ensure there was an immediate “double check” of votes cast at a particular polling place or pre-polling booth; this would speed up the count and short-cut discussions about the validity of votes.

This system would also negate any “donkey vote” advantage as each candidate is randomly placed on each ballot paper.

Without detailing the full security suite surrounding a system such as this, we have outlined broadly below how the voting system could work.

- Electronic Voting Machines (EVMs) and ballots are delivered to polling places early on Election Day by armed security guards. This minimises the possibility for outside interaction with the machines and ballots.
- Each of the ballots delivered to the booth contains a unique identifier and each ballot present at the booth is preloaded into a database on the EVM.
- At 7:59am the Returning Officer for each polling place inserts an encrypted USB key and enters a Personal Identification Number (PIN) activating each of the machines at each polling place.
- Voters present, as they would normally, to an Assistant Returning Officer to check their name off an electoral roll. If the Committee was convinced of the need, the roll could be placed on an electronic database which would trigger a notification if a voter attempted to vote more than once.
- The voter would then be given ballots for the House of Representatives and the Senate which appeared blank, except for a unique identifier encoded by a barcode and appropriate watermarks. The number encoded in the barcode would be an exceptionally intricate one, which is difficult to create without knowledge of a secret key.

There is no record kept of which voter received each ballot, ensuring the secrecy of the ballot.

- The voter inserts their ballot into the machine, which checks it against an internal database to verify the ballot was sent to the polling place at which it will be cast and it hasn't yet been cast at that election. This system ensures that it is extremely improbable a counterfeit ballot could be cast.
- The voting machine then creates a random code which represents the order in which the candidates will be displayed on the screen.



Each code represents one permutation of the order of candidates; in the case of six candidates contesting the ballot there would be 6667 codes representing each possibility.

- The voter then expresses his or her intention and votes on a touch screen; their vote will not be accepted by the machine until the vote is valid. This eliminates the possibility of invalid votes and confusion about different electoral systems at play.

For instance, we understand there are a higher number of voters only expressing a first preference in jurisdictions where that is a valid vote under state legislation.

- Data surrounding this transaction is stored internally on the device and is also separated into two streams. One stream contains a link between the ballot's unique identifier and the ballot order displayed on the screen, the second contains the link between the ballot's unique identifier and the order in which the candidates were numbered on the screen.
- The data is then sent via two encrypted Virtual Private Networks (VPNs) to two central databases.
- Without both pieces of data it is impossible to ascertain the vote which has been cast.
- Once the process is complete the ballot is printed out and the voter is asked to verify the vote was what they intended.
- On the paper ballot the candidates are not shown in the order in which they were on the screen, but the order in which they have been selected by the voter; their first choice is displayed first, their second, second and so forth. The order of candidates has been re-ordered to assist with manual counting later.
- Once the voter has indicated that the paper ballot was how they intended to vote they are asked to cast their vote in the ballot box.
- If the ballot is not what the voter intended they would be asked to return to an Assistant Returning Officer who would invalidate the paper vote and nullify the electronic vote cast.
- At 6:01pm the Returning Officer inserts an encrypted USB and enters a Personal Identification Number (PIN) to the machines which completes voting and closes down the system.
- The Australian Electoral Commissioner (or delegate) is then able to link the database containing the ballot's unique identifier and the ballot order displayed on the screen with the database containing the link between the ballot's unique identifier and the order in which the candidates were numbered.

This allows the votes to be electronically tabulated.



- At the same time the Returning Officer at each polling place collects the data stored in the EVM and verifies with the Divisional Returning Officer that the vote totals at the booth match the central figures.

This step ensures that any attack on the security of either the EVMs or the VPNs would be fruitless as there would always be a correct electronic total.

- While this process is underway the Assistant Returning Officers begin counting the paper-based ballots. As the ballots are all printed and validly constituted the counting process is much quicker and easier. There is also an option for counting the votes through optical character recognition (OCR).
- Once counting of the paper ballots is complete, that figure is reported to the Divisional Returning Officer who will verify that the figures match the central electronic figures.

If the figures do not match the Assistant Returning Officers will be asked to recount the ballots. Only when the two figures match will the electronic figures be released publicly and aggregated.

In circumstances where those figures are irreconcilable after three counts and the paper ballot count agrees three times, the paper figure is taken as the correct figure.

- As all metadata is available in this system it is possible to conduct an audit verifying that each ballot was correctly and validly cast.
- Of course this system relies on constant electricity and constant internet service.

In areas where constant electricity cannot be relied upon we would propose to keep the current system of paper based voting.

In areas where constant internet service is not guaranteed the voting information would only be stored on the machines and not sent via encrypted VPNs to a central database.

This system outlined in this brief submission allows for a voting mechanism in which Australians can have confidence.

It includes multiple redundancies to maximise the benefits of both electronic and paper based voting including:

- Ensuring that voters' voices are heard;
- A speedy and confident counting process; and
- Confidence that votes will not be lost.



## About CGI

CGI is a global IT and business process services provider with 68,000 professionals operating in 40 countries across the Americas, Europe and Asia Pacific. By delivering high-quality business consulting, systems integration and outsourcing services, we help clients to leverage current investments while adopting new technology and business strategies that achieve top and bottom line results.

CGI has a long history of supporting electoral commissions in Australia, having built election management systems for the Victorian Electoral Commission and the New South Wales Electoral Commission. CGI also has experience in electronic voting through assisting the New South Wales Electoral Commission to implement their iVote system.

It would be our pleasure to assist further in the consideration of these issues.

We thank the Federal Government for engaging with all sectors of the community in this inquiry and for the opportunity to provide this submission.

Please contact us if you have any questions or would like additional information.

Yours faithfully,

Scott Ayer<sup>1</sup>  
Senior Vice President  
Australia BU Lead