Answers to questions on Notice, NSW JSCEM 17 March 2025

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1 Kiosk-style verifiable voting

Is there an example of a computer-operated voting system somewhere in the world that is close to the mark? Where is a good location, particularly in the US, where that system is working, particularly in relation for people with particular disabilities?

Although I have conducted extensive research in voting system security, privacy and verifiability, I do not have expertise in usability or accessibility. These comments are about the security, privacy and verifiability of the systems, with the expectation that questions about usability and accessibility will be answered by others.

Also, although the specific request was to find "an example of a computer-operated voting system..." I have chosen to lay out some general principles and refrain from endorsing any particular existing product. Some products have a few good properties but other serious problems; some products seem good but are produced by companies whose conduct elsewhere makes them inappropriate for Australian elections. I have listed some example systems at the end of this section, not as an endorsement, but as sources of learning for Australia. I hope the principles will help the Committee develop legislative requirements for verifiable kiosk-style voting for voters who need assistance.

1.1 Voter-verifiability

Principle 1: The system must allow each voter to verify that their printed vote reflects their intention.

For sighted voters, this is a simple matter of giving the person an opportunity to look at the printed ballot and check it. For visually impaired voters, this means an opportunity to use a technology independent of the voting system to read their printed ballot back to them.

There must be clear instructions for what to do if the printout is not what the voter wanted.

Examples of processes that are *not* voter-verifiable are:

- printing the vote as a barcode or QR code that the voter can see but not read (the AEC's 2007 kiosk voting system did this, and some US systems still do),
- printing a human-readable paper record in a place the voter cannot see it, such as at an Electoral Commission office after the close of polls (some iVote runs and some Victorian e-voting trials did this),
- showing a screen representation of the vote, without a paper printout (the ACT's EVACS system does this).

None of these give the voter an opportunity to verify the accuracy of an indelible record of their vote.

There are obviously significant accessibility issues associated with the verification of paper records. I do not know of any Australians conducting research in this area, but there is active research in the US (see [BQL25] for example). Although the conclusions from US studies are probably not directly relevant for Australia, due to significant differences in voting processes, the methodology and main ideas could be replicated here for designing and testing systems.

1.2 Privacy

Principle 2: The system must protect the privacy of the individual vote.

There are some inevitable privacy issues associated with any electronic voting system. These affect both electronic and paper records of the vote. If an attacker compromises the computer used for voting, it learns the vote being cast. If the printouts are visually distinct from hand-marked ballots, those voters who use the kiosk can be distinguished during counting from those who do not. Both of these issues applied to iVote also, and are present in some form in any technologically-assisted voting process. Any design should be aware of them and try to mitigate them to the extent feasible.

- Printouts should, as far as feasible, not be obviously distinguishable from ballots filled in by hand.
- There must be a way for a voter with a physical disability to accept their vote and get it dropped into a ballot box in a privacy preserving manner, without requiring the help of a person who sees the vote. This requires some mechanical design.
- There must be reasonable efforts to secure the kiosk from external eavesdropping, for example by disconnecting it from the Internet and placing it in a position where others cannot see the screen during voting.

1.3 Security and Transparency

Openly available source code is valuable for transparency, because it can form the basis of a fact-based conversation about the security properties of the system. However, it is not a substitute for verifiability, because it does not guarantee that the code ran correctly on the day—hardware errors, security compromises and configuration problems can all make correct software produce wrong results.

1.4 Examples

This section offers some examples of systems deployed elsewhere in the world. I do not endorse any of these systems or their vendors, but have attempted to summarise their best features and most important shortcomings, focusing on the principles above. I have not interacted with any of these systems myself, but have endeavoured to get accurate information from experts who are familiar with them. Nevertheless, it is difficult to verify specific details. For example, I was told that the Automark BMD could be configured to allow voters to deposit their printout in a box without assistance, but I was also told that the LA VSAP system was the only system with this feature. The important message is that this feature is both important and feasible in practice.

1.4.1 Indian VVPAT

Figure 1 shows the Indian Voter-Verifiable Paper Audit Trail (VVPAT). The voter uses the electronic buttons to vote, then sees their printout in the separate VVPAT machine, then has it automatically deposited into the attached box. The VVPAT was added to the previously-unverifiable electronic voting machines by order of the Indian Supreme Court. This represents a significant improvement on the electronic-only version that preceded it. However, the electronic count is the primary one, and controversy remains over the extent to which the VVPAT must be examined in each election.[1] [2]

This example shows that a voter-verifiable paper record is necessary but not sufficient for a good electoral process—the paper record must be either counted directly, or used in a rigorous audit.

1.4.2 The Automark BMD

Figure 2 shows the Automark Ballot Marking Device (BMD), which is used in many US states. Voting instructions for the city of New York are at https://vote.nyc/page/ballot-marking-device.

Some models of this device can be fitted with a box into which a voter who can not handle or see their own ballot can have it automatically deposited, without requiring human assistance. This is a

[1] https://www.scobserver.in/reports/vvpat-vote-verification-judgement-summary/
[2] https://www.scobserver.in/journal/6-vvpat/

Figure 1: The Indian Voter-Verifiable Paper Audit Trail. Photo from the Indian Electoral Commission via Wikimedia Commons https://commons.wikimedia.org/wiki/File:EVM_VVPAT.jpg

valuable feature that could be replicated in Australia. However, some deployments lack this feature and require a pollworker to handle the ballot after it is printed.

The system has also been criticised because the ballot read-back feature for voters who cannot directly read the paper ballot is part of the same system that marks the ballot. This means that a security problem or coding error could potentially affect both the marking and the verification.

1.4.3 Los Angeles VSAP

The Los Angeles County VSAP (Voting Solutions for All People) project is a ballot marking device that includes extensive accessibility features. It allows voters with disabilities to complete, verify and cast their ballot without human assistance. Photos, videos and other documentation are available at https://www.lavote.gov/vsap/home.

It also includes an interesting feature in which voters can complete an electronic version of their ballot at home using their own device, rather like the various websites that allow Australians to fill in their Senate preferences at home and bring them to the polling place. In LA, this is integrated into the voting process, so that people with the app can make their decisions at home and then transfer them electronically to the voting device in the polling place. Many voters enjoy this feature, which gives them an opportunity to make voting plans on their own device without time pressure. However, others have expressed concerns because of the risk that voters could be coerced or have their privacy invaded when they make their choices at home.

The system has also been criticised because it is used for all voters (including those who can fill in their own ballot paper) rather than being reserved for those who need assistance. Any system of this kind involves some tradeoffs, and the right decision is not the same for all voters. Although a system like VSAP might be a good choice for voters who need assistance to complete their ballot, it does not follow that the same compromises are appropriate for all voters.

Figure 2: The Automark BMD. Photo by Doug Jones, Wikimedia Commons https://commons.wikimedia.org/wiki/File:AutoMARK.jpg

1.4.4 Further reading

The state deparments of Pennsylvania and California conduct usability and accessibility tests on all voting systems seeking certification. The results are listed at https://www.pa.gov/agencies/dos/resources/voting-and-elections-resources/voting-systems.html and https://www.sos.ca.gov/elections/ovsta/voting-technology-vendors/. Many of the systems have a ballot marking device for voters with disabilities.

2 Lowering the voting age to 16

We have heard that the voting age should be lowered to 16 (sub 6, p. 1). What is your view on lowering the voting age?

I do not conduct rigorous research into voting attitudes and participation. The following answer is my personal view as a parent of teenagers and young adults, not an evidence-based scientific opinion.

I strongly support the (non-compulsory) enfranchisement of 16 and 17-year-olds. Many important political questions involve trading off current gains or savings against future losses or costs—this applies both to traditionally-left causes such as environmental protection, and traditionally-right causes such as budget deficits and public debt. Younger people bring perspectives to these tradeoffs that are justifiably different from those of older Australians, and equally deserving of representation.

The electoral influence of older Australians has substantially increased as a result of longer life expectancies. The fraction of the population that is over 65 years old is much greater now than it was when Whitlam lowered the voting age to 18.[3] The enfranchisement of 16 and 17-year-olds somewhat rebalances against this trend.

Finally, as an educator, I believe that enfranchisement could serve as a motivator to learning about Australian democracy. Many observers (including the Australian Parliament's JSCEM in a recent report[4]) have noted that civics education in Australian schools can seem dull, when the opportunity to impact the choice of political leadership should be one of the most interesting and empowering things available to 18 year olds. I have seen many times that a specific practical goal can make all the difference between a "dull and theoretical" class and a life-changing practical one. Thinking through how you will vote this year is a lot more interesting than examining the theory of how you might vote in 2 years' time. This could be part of an integrated curriculum that includes learning how to disagree in a civil fashion, discussing how to verify (political and other) information online, and all the other useful skills an engaged modern citizen needs.

[3] Australian Institute of Health and Welfare: https://viz.aihw.gov.au/t/Public/views/1_Demographicprofile/Figure1_1

[4] "From Classroom to Community" https://www.aph.gov.au/Parliamentary_Business/Committees/Joint/Electoral_Matters/Civicseducation/From_Classroom_to_Community

3 Acknowledgments

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References

[BQL25] Lynn Baumeister, Whitney Quesenbery, and Sharon Laskowski. Legibility of summary-style printed ballots. *NIST Voting Technology Series NIST VTS 100-4*, January 2025. https://doi.org/10.6028/NIST.VTS.100-4.