

E-VOTING: FEATURES

E-voting systems are fundamentally different from other online operations. Due to the requirement to protect the secrecy of the vote, they have to avoid any connection between the voter's identity and the vote cast. This is in itself a challenge as standard ICT systems are inherently built for tracking and monitoring transactions that happen on them. More importantly, breaking the link between voter and vote means that the examination of an e-voting system after an election cannot prove directly that every vote was indeed counted and tallied as cast. This is why indirect proofs of the validity of the electronic results, such as paper trails (VVPAT, Voter Verified Paper Audit Trail in India) or system certification, in combination with stringent quality control and security procedures, are exceptionally important. Without such mechanisms, manipulated or incorrect results produced by an e-voting system could remain undetected for a long time.

Features

Internally, electronic voting systems have many functions, including encryption, randomization, communication and security systems. The noted features of e-voting are:

Electronic voter lists and voter authentication: Part of an electronic voting system can be an electronic voter list, covering either a single polling station or the entire country. This list can be used to authenticate eligible voters and to record that they have cast their vote.

Poll worker interfaces: Special functionalities that are only available to poll workers, for example, resetting the vote count at the opening of the polling station, closing polling, printing and transmission of results.

Interfaces for Casting Votes: These include touch screens, optical mark recognition (OMR) ballot papers that are fed into a scanner, touch-sensitive tablets, push buttons, web pages or special client software for Internet voting.

Special interfaces for handicapped voters: These include Braille or audio input devices for the blind, easier access for voters with physical disabilities, and simpler interfaces for illiterate voters.

Interfaces for the Results Output: For voting machines this is often a printer. However, some machines only use digital displays. Once voting is closed this interface can be used to display or print the results that were recorded by the voting machine. If results are printed the printouts can be used as physical evidence of the results produced by the voting machine, and copies can be distributed to stakeholders present at the polling station and can also be posted for public display.

Printers for Printing a Voter-Verifiable Receipt for each Vote: The voter-verified audit paper trail, VVPAT.

Result Transmission System: Many voting machines can transmit results to central counting systems, for example via the Internet, telephone, mobile phone or satellite connection. In the absence of communication links, the results can also be transported physically, using electronic storage media such as memory cards.

Result Tabulation Systems, Usually Located at Result Processing Centres: At the end of election day, they receive electronic results from polling stations and automatically tabulate the results for the various competitions and districts.

Result Publication Systems: Preliminary and final results can be published in many different ways including on websites, CDs, and geographic visualization systems, and if required on all

levels of detail down to single polling stations. The more detailed the published results are, the more transparent the election.

Confirmation Code Systems: Some e-voting solutions allow for control codes that are intended to allow individual verification of each vote by the relevant voter.

The Types of E-Voting Systems

Technically, most e-voting systems fall into one of the following four types.

Direct Recording Electronic (DRE) Voting Machines: DREs can come with or without a paper trail (VVPAT, or voter-verified paper audit trail). VVPATs are intended to provide physical evidence of the votes cast.

OMR Systems: They are based on scanners that can recognize the voters' choice on special machine-readable ballot papers. OMR systems can be either central count systems (where ballot papers are scanned and counted in special counting centres) or precinct count optical scanning (PCOS) systems (where scanning and counting happens in the polling station, directly as voters feed their ballot paper into the voting machine).

Electronic Ballot Printers (EBPs): They are devices similar to a DRE machine that produce a machine-readable paper or electronic token containing the voter's choice. This token is fed into a separate ballot scanner which does the automatic vote count.

Internet Voting Systems: Here votes are transferred via the Internet to a central counting server. Votes can be cast either from public computers or from voting kiosks in polling stations or—more commonly—from any Internet-connected computer accessible to a voter.

(The general term voting machine (VM) is often used to refer to DRE and PCOS systems as well as to voting kiosks for Internet voting.)

Strengths Associated With E-Voting

- Faster vote count and tabulation.
- More accurate results as human error is excluded.
- Efficient handling of complicated electoral systems formula that require laborious counting procedures.
- Improved presentation of complicated ballot papers.
- Increased convenience for voters.
- Potentially increased participation and turnout, particularly with the use of Internet voting.
- More attuned to the needs of an increasingly mobile society.
- Prevention of fraud in polling stations and during the transmission and tabulation of results by reducing human intervention.
- Increased accessibility, for example by audio ballot papers for blind voters, with Internet voting as well for housebound voters and voters from abroad.
- Possibility of multilingual user interfaces that can serve a multilingual electorate better than paper ballots.
- Reduction of spoilt ballot papers as voting systems can warn voters about any invalid votes (although consideration should be given to ensuring that voters are able to cast a blank vote should they so choose).
- Potential long-term cost savings through savings in poll worker time, and reduced costs for the production and distribution of ballot papers.

- Cost savings by using Internet voting: global reach with very little logistical overhead. No shipment costs, no delays in sending out material and receiving it back.
- Compared to postal voting, Internet voting can reduce the incidence of vote-selling and family voting by allowing multiple voting where only the last vote counts and prevent manipulation with mail-in deadlines through direct control of voting times.

Weaknesses Associated with E-Voting

- Lack of transparency.
- Limited openness and understanding of the system for non-experts.
- Lack of agreed standards for e-voting systems.
- System certification required, but no widely agreed standards for certification.
- Potential violation of the secrecy of the vote, especially in systems that perform both voter authentication and vote casting.
- Risk of manipulation by insiders with privileged access to the system or by hackers from outside.
- Possibility of fraud through large- scale manipulation by a small group of insiders.
- Increased costs for both purchasing and maintaining e-voting systems.
- Increased infrastructure and environmental requirements, for example, with regard to power supply, communication technology, temperature, humidity.
- Increased security requirements for protecting the voting system during and between elections including during transport, storage and maintenance.
- Reduced level of control by the election administration because of high vendor- and/or technology- dependence.
- Limited recount possibilities.
- Need for additional voter education campaigns.
- Possible conflict with the existing legal framework.
- Possible lack of public trust in e-voting-based elections as a result of the weaknesses above.