

5. Innovative Technology and its Impact on Electoral Processes

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The application of technology to elections and the complexity of the technology used vary from country to country. They depend on the ability of governments to finance innovations and keep them up to standard given the speed of technological development. While the most complex technology is used in Western countries, countries in transition which have large populations, such as India and Brazil, have been most successful in introducing cost-effective new technologies on an extensive scale.

A wide range of technology has been developed and introduced in elections in recent years. The Administration and Cost of Elections (ACE) Project provides the most comprehensive overview (<http://www.aceproject.org>).

Only a limited number of technical innovations are currently being used on a wide scale or have the potential to be introduced in coming years. These are:

- *electronic voting/counting systems*, specifically machine-readable (optical scanning) voting/tabulation systems and direct recording electronic (DRE) systems; and
- *remote electronic voting*, for example, via the Internet, text messages or telephone.

Electronic voting/counting has already been introduced in a wide range of elections, while remote electronic voting has so far only been used in some localized experiments and is still being tested.

Electronic Voting and Counting Systems

Only in Brazil and India have electronic voting machines (EVMs) been introduced nationwide. They are partly used in Belgium, Canada, Germany, the Netherlands and the United States. Electronic vote counting is used everywhere in Brazil and Germany; Belgium, Bosnia and Herzegovina, Canada, India, the Netherlands, Norway, Palau, Switzerland, Turkey, the United Kingdom and the United States use it only partly. (For more information see <<http://www.aceproject.org>>; and <<http://www.idea.int>>.) In the UK and other Western countries an increasing number of companies, unions and membership organizations have started to introduce electronic voting for their internal elections.

Electronic voting and counting have worked well in practice and have been generally accepted by voters. The Netherlands was among the first countries to introduce an electronic voting system on a national scale, starting in 1974. By the general election in May 2002, 95 per cent of all Dutch local authorities provided electronic voting machines (see the web site of the Netherlands Ministry of the Interior and Kingdom Relations, <<http://www.minbzk.nl>>).

Brazil has developed the most modern and sophisticated electronic voting system in the world and has proved that it can work in a country of continental size, using low-cost technology. Introduced in 1996, its electronic voting system covered all 110 million voters in 5,656 municipalities for the first time for the October 2002 elections. The majority of the Brazilian public and politicians support the reform. The United Nations Electoral Assistance Division (UNEAD) is currently examining Brazil's electronic voting system to see if it can be applied in other UN member countries (see the web site of the State Electoral Tribunal, <<http://www.tse.gov.br>>).

India is another country which faces demanding election logistics. This is mainly due to the size of the population, the number of polling stations and polling staff required, and the large number of candidates in first-past-the-post districts. India introduced EVMs in November 1998 and extended their use nation-wide in 2004. In the parliamentary elections in 1999, EVMs were used for over 60 million voters. The difficult October 2002 elections in Jammu and Kashmir were held entirely with EVMs. The Indian Election Commission ensured success through massive training and awareness campaigns. The innovations are an 'unqualified success' and have been well received by parties, candidates and staff, according to the Indian Government. More than 95 per cent of the voters welcomed the use of EVMs in 1999 (Centre for the Study of Developing Societies 1999).

Electronic voting and counting systems have now been tried and tested in a number of countries and it can be

argued that the advantages of introducing such technology generally outweigh the disadvantages.

Above all, electronic systems can help to overcome logistical challenges in election processes. They leave elections less vulnerable to poor management and ensure correct reporting of the results and prompt returns. This is especially true for countries that are geographically large and have a large voting population. Brazil and India have shown that it is possible to use new technology on a large scale to process election results very fast. In the October 2002 elections in Brazil, some 360,000 kiosk-style electronic machines were operated by 2 million staff, who tallied the results electronically within minutes after the polls closed. Data was transferred on secure diskettes or via satellite telephone to central tallying stations. These in turn transmitted data electronically over secure lines to tabulating machines in the capital, Brasilia, where the results were calculated within hours. During the same elections, only 1 per cent of polling stations had problems with the new technology.

In the United States, recent studies such as the Caltech-MIT Voting Technology Project found that optical scanning had yielded the best results in US elections between 1989 and 2000. The project recommends that the US states replace punch cards, lever machines and older electronic machines with optical scanned ballot systems and tested electronic voting systems (California Institute of Technology and Massachusetts Institute of Technology 2001).

Electronic systems also serve the voter by making the polling process easier and more transparent because they have a number of user-friendly features. In Brazil, for example, the system displays each candidate's photograph, gives voters the possibility to cast their vote in an electoral district other than the assigned one, and is easy for illiterate and visually impaired voters to use.

This said, there is a discussion about the security of electronic voting and counting systems. Critics of the recent Brazilian elections have pointed out the risks for data storage. They argue that machines can fail to produce results at the end of the day and that the fully digitized system is lacking a back-up in the shape of physical records. However, the experiences of most countries have shown that data storage is usually reliable and accurate.

Some doubt also remains about the scope for controlling and protecting electronic systems against fraud. The Caltech-MIT report warns about risks such as a loss of openness, the presence of 'many eyes' observing, the risk that control over an automated process can be abused, the lack of true auditability, and the lack of public control, but it goes on to say that there are technical solutions for such problems.

There could also be negative implications if an electronic system is not used throughout a whole country or a whole electoral area, or if it is not standardized. In the Netherlands, including Amsterdam, the largest city, some municipalities have not been able to find sufficient funds to automate their elections. This has the effect that results for some electoral districts come in later than others'. Some experts suggest that reform of election technology in the United States can only be successful if state legislation is standardized nationwide, allowing a more streamlined voting system.

Remote Electronic Voting

Remote electronic voting could be the next major innovation in the electoral process but is still in the test phase. This includes voting via the Internet, text messaging (SMS) and the telephone. There is considerable discussion about how to guarantee system security.

A number of research projects are analysing these issues, including:

- *True-Vote*, which is testing public key cryptography as a security feature (<<http://www.true-vote.net/HTML/project.html>>);
- *CyberVote*, which is analysing Internet voting via personal and palm computers and mobile telephones (<<http://www.eucybervote.org>>);
- *E-Poll*, which is examining the legal and security issues of e-voting (<<http://www.e-poll-project.net/objectives>>); and
- *the RTD* (Framework Programme for Research and Technological Development and Demonstration) Project, which is managed by the Information Society Directorate-General of the European Commission and is currently testing web-based voting systems for large-scale elections (<<http://www.sics.se/arc/evote.html>>).

Some countries are already testing remote electronic voting in official elections, including elections for trade unions and other public institutions. Germany aims to introduce Internet voting in 2006 but live tests have already been launched by the University of Osnabrück, where the official election to the student parliament in 2000 was conducted entirely over the Internet (see the project overview at <<http://www.internetwahlen.de>>).

The United Kingdom implemented the most diverse tests of a wide range of new technologies in electoral pilot schemes at the local elections held in England on 2 May 2002. Several innovations were tested in 30 municipalities. They aimed at increasing voter participation, introducing new voting methods, improving the efficiency of vote counting and providing better voter information.

The technologies included remote electronic voting from any computer, voting via touch-screen kiosks or personal computers in polling stations or other public areas such as libraries and shopping centres, and voting using the Internet, text messaging or the telephone (see the web site of the UK Electoral Commission, <<http://www.electoralcommission.gov.uk>>; and chapter 6).

Another set of substantial tests for remote electronic voting is under way in the Netherlands where the government is conducting a Remote E-voting Project aimed at giving voters several options in order to make voting less dependent on particular locations. The project aims to test and develop digital technology such as electronic identity cards in the June 2004 elections, which would allow voters to vote anywhere in their municipality (for details, see <<http://www.minbzb.nl>>, and the pre-assessment report by the University of Twente—Arts, Leenes and Svensson 2001).

Switzerland launched an experiment in Geneva in 2003 and expects to repeat it elsewhere. Australia, Canada, Estonia, Iceland, New Zealand and Romania are considering remote electronic voting as an option in all or some of their elections but not all have made concrete plans (Arts, Leenes and Svensson 2001).

There is a substantial debate about the feasibility of Internet voting. Most experts argue that its introduction will greatly facilitate polling and that its adoption is a matter of course in the face of current technological developments and voter expectations. The UK Electoral Commission reports that the technical innovations in the May 2002 elections were well received by voters, who found electronic voting 'easy, convenient and quick to use' (UK Electoral Commission 2002). The project also had support from election staff and candidates. However, there are serious questions about the security of such a system, and a great deal of research is centring on this issue. The Caltech-MIT report argues that Internet voting 'poses serious security risks' because individuals such as hackers are able to interfere in election processes, with serious implications (California Institute of Technology and Massachusetts Institute of Technology 2001).

Some experts believe that security issues are more a perceived than a real threat and recommend that public confidence be built actively. The True-Vote project named trust in the Internet as the main problem with remote electronic voting, particularly confidence in the protection of personal information and assurance of the identity of the party the voter deals with during the online transaction. Similarly, the UK Electoral Commission argues that for electronic voting in general 'the central issue is not security per se, but voter confidence'. Although the commission has not observed any negative impact of its 2002 Internet voting pilots, it believes that

Part I: Current Issues in Voter Turnout

public concern about the possibility of fraud could reduce trust in the process, and argues that it is necessary to develop technical criteria and inform voters in order to provide reassurance. It holds that a remote electronic system could even increase the security of elections (e.g. through voter identification) and enhance accessibility (e.g. by providing online voter information in minority languages).

Suppliers of New Innovations

A number of private firms are involved in inventing, developing, manufacturing, marketing and maintaining

voting equipment and election supplies. Most are based in the United States and the UK, and to a lesser extent in Australia, Canada and the European Union countries.

There are several web-based resources with information on vendors and their services. The most comprehensive is the International Foundation for Election Systems' *IFES Buyer's Guide* (<<http://www.ifesbuyersguide.org>>), which provides up-to-date and impartial information on market developments. The Centre for Voting and Democracy publishes a citizen's guide to voting equipment, including information and analyses (<<http://www.fairvote.org>>).

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