



postnote

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ONLINE VOTING

Uncertainty over the 2000 US presidential election count has stimulated interest in better voting methods. These aim to increase participation, lower the costs of running elections and improve the accuracy of results. This briefing note looks at options for using new technologies in voting, focussing on the pros and cons of internet voting and the implications of such a radical change in the way that elections are conducted.

The UK Context

The British system of casting votes in elections has been relatively unchanged since the Ballot Act of 1872. Elections are conducted by Returning Officers on a constituency-by-constituency basis and have a reputation for fairness, accuracy and integrity. Registration to vote is required by law (though not always enforced). Voter turnout is relatively high in national elections, although low and falling in local and European Parliament elections (see below). Public confidence in the integrity of the voting process is high and this confers legitimacy upon elected, representative bodies. Given the confidence in existing voting arrangements, why should there be a move to change the way that votes are cast in UK elections? There are three main factors: declining turnout, constitutional innovations and new technologies.

Declining turnout

In 1950 83.6% of those eligible voted in the general election. Turnout fell to 71.3% in the last general election (1997), the lowest since 1935. In recent local elections turnout has hovered around 30% and in the last European Parliament election only 24% of those eligible voted - the lowest national turnout in the EU.

Constitutional innovations

In response to anxieties about declining public interest in local democracy, recent legislation allows local authorities to experiment with new ways of voting. Electronic counting was used for the first time in the UK in the London Mayoral election of May 2000 (although

results were delayed due to problems with the machines). In the May 2000 local elections the Home Office allowed local authorities to introduce pilot voting methods, such as voting ahead of the official polling day (15 authorities), postal ballots (11 authorities) and machine voting (3 authorities). Only postal ballots resulted in significant increases in turnout; in two of the four cases where postal votes were available on demand turnout was significantly higher. In most of the seven authorities introducing all-postal voting turnout increased by 50% or more, with the greatest increase in areas where no declaration of identity was required from voters.

The Government has also established an independent¹ Electoral Commission to review the administration of major elections, moving away from the traditionally fragmented administration of the electoral system and giving a remit to a central agency to consider and develop the electoral process.

New technologies

The dramatic impact of the internet has led to discussion of e-democracy and online voting. Some early enthusiasts declared that the internet could replace representative democracy, enabling everyone to vote on everything and anything at the push of a button. Such visions oversimplified the democratic process. Others have argued that e-voting could reduce costs and increase turnout by making voting more convenient. The possible advantages of online voting are discussed in more detail on page 3.

How ballots are run

Generally, there are six important tasks that must be carried out in any election: voters must register, be authenticated, obtain and mark their ballot papers, and deliver them to a ballot box. Then election authorities must collect and count the votes. If the election is challenged, it may be necessary to recount the ballot papers. A Box on page 2 sets out how ballots are currently run in the UK.

UK ballot procedures

Voter registration: until February 2001, the electoral register was updated yearly, using information supplied by households each autumn. A system of rolling registration has now been introduced and electoral registers will be updated monthly (although there is still an annual canvass each autumn). No form of identification is required to register.

There are three ways people can vote - in person at a polling station, by post or by proxy. Most voting currently takes place at a monitored polling station where **authentication** is handled by election officials. Identification is not required. Ballot papers are **obtained** at the polling station, **marked** by hand and placed into ballot boxes, which are **delivered** to the central count and **counted** by hand. Postal votes are now available on demand (except in Northern Ireland) - electors can ask for a postal vote for a set period, a particular election or permanently. Because votes are submitted on paper, **recounts** are easily provided for.

Use of online voting

There are three main types of electronic voting, as detailed in the Box opposite. Of these, online voting is the focus of most current attention. If such voting is to become a reality, it must address each of the steps outlined in the Box above. For instance, the **registration** process would need to include distribution of appropriate identification numbers, etc. Passwords and smart cards can be used to increase the reliability and security of voter **authentication**; however, it is difficult to prevent voters from giving away or selling their votes when authentication is carried out without human intervention. Coercion and large scale fraud may also be more of a concern than at present.

Online voting would also need to address **obtaining, marking, delivering, and counting ballots** via computer. Some electoral systems already use computers in these steps - for example, a punch card ballot system uses a computer for ballot counting, while an automatic teller machine (ATM)-style electronic voting system (see Box opposite) uses a computer for all four steps. An intermediate option could allow voters to download their ballot paper from the internet, mark it with a pen, submit it by postal mail, and have it counted by hand.

Some electronic voting systems result in a paper output which can be **recounted**, but systems in which votes are never recorded on paper may not lend themselves to any sort of recount. Vendors offer machines that record every button a voter presses on an ATM-style machine. These keystrokes can be examined after an election to simulate a recount. However, concerns have been raised that the machines might be manipulated so as not to record certain keystrokes. With remote internet voting, recounts in the traditional sense are not feasible. Some vendors of internet voting systems guarantee that their system cannot lose or miscount votes. But critics have suggested that only by using open-source programs (where the computer code is in the public domain so that observers can check how the program works) can there be sufficient confidence in the integrity of the process.

Types of electronic voting

Electronic voting refers to the use of computers or computerised equipment to cast votes in an election. Sometimes this term is used more specifically to refer to voting that takes place over the internet.

Machine counting

Machine-readable ballot systems require voters to mark their votes on a paper card with a pencil or marker, or remove divots from a perforated card with a stylus or mechanical hole puncher. (Such divots - 'chads' - were notorious in the 2000 US presidential election). The ballot cards may be scanned and tallied at a central computer centre or at each polling station.

Computer voting

Direct-recording electronic voting machines (DRE) require voters to use a keyboard, touch screen, or pointer to mark their vote on a computer terminal. These are immediately added to a running tally. The original DRE machines were simply electronic implementations of the traditional mechanical lever machines. Some more recent DRE models look more like ATMs or personal computers and have the ability to display photographs as well as text.

Online voting

Online voting may be conducted in a variety of ways:

- 'Poll site' internet voting systems require voters to go to staffed polling places and use computers to cast their votes. The internet is used to transfer ballots from each polling place to centralised tallying centres.
- 'Regional poll site' internet voting systems allow voters to go to any poll site in a particular city or region to cast their vote. The system keeps track of which voters have already cast their ballots, and delivers the correct ballot paper to each voter based on where he or she resides.
- 'Kiosk' internet voting systems allow voters to vote from computers in kiosks set up by the voting authority in convenient locations such as post offices and shopping malls. The kiosks are not monitored by poll workers at all times and may allow voting over a period of several days or weeks.
- 'Remote' systems allow voters to vote from any computer connected to the internet - typically at home or at work. As well as via PCs, home internet voting could be through digital TV or even mobile phones or games machines. Remote internet voting might be used to replace poll site voting entirely, or it might be used only for absentee balloting.

Online voting in non-governmental elections

Non-governmental organisations have been the first to conduct elections using personal computers connected to the internet or private networks. In the UK this has included:

- PricewaterhouseCoopers, which elected its governing body via the internet.
- a trade union, MSF, conducted an online consultative poll on its merger with the AEEU.
- the election to the Scottish Labour Party's Executive Committee and Policy Forum was conducted online.
- the Institute of Chartered Accountants has changed its rules to allow e-voting for its elections and general meetings.
- many universities have found on-line voting to be a convenient way for students to elect student government representatives.

Online voting in political elections

In August 1996, the Reform Party became the first US political party to use internet voting (along with telephone and postal mail voting) to select a Presidential candidate. Over 2,000 people voted via the internet. The first large-scale binding political election to be conducted online was the 2000 Arizona Democratic primary, in which 39,942 voters cast their votes over the internet. The apparent success of this non-public election has led to calls for e-voting to be tested in public elections. Critics² have urged caution, arguing that:

- Despite the claim that e-voting boosted turnout, fewer than half (41%) of the voters in the Arizona primary voted online - most voted via postal ballot or at a polling station; 89.5% of registered Democrats in Arizona did not vote - the 'success' of the ballot is based upon a 10.5% turnout of eligible voters.
- Non-white, unemployed, elderly and rural Arizonans were significantly less likely to vote online, so distorting the poll's representativeness.

In the UK, Bristol City Council allowed residents to vote by phone, internet or post on the level of council tax for 2001/02. 3,063 votes (2.7%) were cast over the internet. Croydon Council also held a similar referendum, where 2,693 votes (3.4%) were cast over the internet.

International plans

Several countries are now planning to experiment with internet voting:

- In New Zealand a taskforce has concluded that internet technology would probably boost the number of voters, speed the count and reduce costs - poll-site internet voting (see Box on page 2) might be introduced for the 2005 election.
- In Japan, the Centre for Political Public Relations³ has experimented with poll site internet voting in the 2001 gubernatorial election in Hiroshima.
- A Swedish commission on voting has set out technical criteria for internet voting, which it suggests should be tested first in non-public elections.
- Switzerland has set up a major inquiry into the potential benefits of online voting.
- Estonia has agreed to introduce e-voting in one constituency in its 2002 local elections, to be followed by e-voting in the 2003 parliamentary elections if it is judged a success.

Advantages of online voting

Proponents of online voting have argued that it could increase voter turnout. However, this is by no means certain. Only a minority of the UK population has home internet access (35%), and many of those who do not vote are unlikely to have ready access to computers. Home internet uptake has been rapid (faster than TV in the 1950s) and the proposed switch-off of analogue TV by the end of the decade could result in near-universal access to interactive services via digital TV. But how far such an increase in ease of voting would feed through into greater turnout is unclear.

Supporters also cite a number of other advantages:

- Convenience. People are increasingly using the internet for transactions, and through its UK Online project, the Government aims to deliver all its services to citizens online by 2005. Online voting would add to the convenience of being a citizen.
- It may particularly appeal to younger voters (among whom voter turnout has tended to be particularly low).
- Online voting systems can identify if voters attempt to vote for the wrong number of candidates and notify them accordingly (this was a problem with punch cards in Florida in the 2000 elections).
- Online voting could allow more information to be displayed about candidates and their policies. But this would conflict with existing laws about not campaigning in the immediate vicinity of a polling place and would need to be strictly supervised.
- It could reduce expenses involved in setting up and staffing poll sites. However, new voting arrangements would, at least at first, be in addition to existing systems. This would entail large additional costs and several years of government investment.

Concerns about online voting

Security

While internet voting - especially remote internet voting - is appealing for the reasons given above, several recent studies suggest that there are considerable security risks.

In 1999, the California Secretary of State convened a task force of experts to make recommendations about the feasibility of internet voting in California.⁴ The task force delivered their report in January 2000, concluding "*additional technical innovations are necessary before remote Internet voting can be widely implemented as a useful tool to improve participation in the elections process in California.*" It recommends that internet voting be introduced in four stages, over a period of many years. The first stage, poll site internet voting, might be feasible in the near future. The later stages - regional poll site, kiosk, and remote internet voting - should not be deployed until the associated security concerns can be addressed. The main technical and security concerns identified by the California task force are detailed in the Box on page 4.

Other reports on electronic voting released over the past year have also concluded that more research is needed before internet voting can be secure.^{5,6} Among the key issues are the difficulty of securing personal computers against viruses and the vulnerability of the internet to denial of service attacks (see Box on page 4). There is also a need for better audit and test procedures to ensure that machine or internet voting accurately records each ballot. Most recently a US National Science Foundation sponsored workshop report concluded, "*Remote Internet voting systems pose significant risk to the integrity of the voting process, and should not be fielded for use in public elections until substantial technical and social science issues are addressed.*"

Concerns identified by the California Internet Voting Task Force

- **Voter Authentication** - It is difficult to ensure that the person voting is really who they say they are when they are voting remotely over the internet. Passwords and digital signatures can help, but they can be shared among voters. The use of biometric devices (for example finger print scanners) may address this problem, but these devices are not widely deployed and could raise privacy issues. There is currently no universally available form of digital identification. The task force recommended that voter registration be done in person (not remotely), even if voter authentication is eventually done remotely.
- **Technical Problems** - In several of the online elections conducted to date there have been periods of time when voters were unable to access the election web site. Most of these problems seem to have been caused by too many voters trying to access the election servers at once. Denial of service attacks created by hackers, power outages, internet connectivity outages and other technical problems could also cause voters to be disenfranchised during an online election. Some of these problems can be mitigated by holding the election over more than one day, but concerns remain.
- **Ballot Secrecy** - Remote internet voting raises concerns about whether ballot secrecy can be maintained when voters are voting on employers' computers or on computers that may be infected by viruses. As with absentee voting (such as postal votes), remote internet voting raises concerns about other people watching as voters mark their ballot papers.
- **Ballot Integrity** - It is important that electronic votes are delivered to the ballot box and tallied as the voter intended. Ballot papers must not be altered or lost, and extra ballot papers must not be counted. Simultaneously providing for secrecy and integrity in an electronic voting system is a challenging problem.
- **Reliable Vote Transport and Storage** - Votes must be reliably transported to the electronic ballot box and stored in a way that they cannot be altered or lost. In a poll site system, votes might be stored on both the poll site computers as well as in the central ballot box.
- **Prevention of Multiple Voting** - The system must be designed so that each voter can vote only once.
- **Defence Against Attacks on Internet Voting Machines or Election Computer Systems** - The computers used at poll sites or kiosks must be secured so that they cannot be tampered with or infected with viruses. The same concerns apply to computers used to collect and count electronic ballots, as well as those that keep track of voter registration information.

Social issues

Ultimately, the case for online voting does not depend on technical potential. Elections are political events and proposed changes must be evaluated on the basis of democratic and administrative criteria, including:

- *Levels of public access to the internet.* While fewer than half the UK population has home access to the internet it would be undemocratic to allow more convenient access to voting to the minority who have access. Online voting will become democratically acceptable only when most eligible voters have easy access to the internet, possibly via digital TV.
- *Making the internet accessible.* As well as basic access, online voting would need to be accessible to non-English speaking voters, those with little or no knowledge of computers, the less literate and the

disabled. In short, it will not be satisfactory to create an online voting system that can be used only by the technically proficient or standard computer user.

- *Respecting political culture.* People have confidence in elections at present: they know what is likely to happen when and expect a stable outcome. The current system is visible, easily understood and followed. Some of the elements of online voting could be disruptive to voting customs, such as going to the polling station or watching votes being counted. If online voting is introduced the public must feel full confidence in the new arrangements, and be convinced that a vote sent online is as secure as one marked on paper.

The next ten years

Opportunities exist for research and experimentation in the field of e-voting. The UK Electoral Reform Society has established a Commission on Electronic Voting and Counting which is conducting research into the claims made on behalf of e-voting. It will report by the end of 2001, setting out the criteria that Government should apply in any future e-voting trials. Meanwhile, internet voting will continue to be used in non-public elections, with companies competing to offer their technologies.

Two developments could have key effects:

- modernisation of the electoral register, to allow registers to be linked and accessed nationally.
- introduction of digital TV, which would open up homes to online access and could provide a more controllable environment for e-voting than personal computers.

The Electoral Commission has a remit to consider the way that elections are conducted in the UK. In the next few years they are likely to come under pressure to look at online voting and to recommend that the Home Office allow trials of available technologies, perhaps in local authority pilot schemes. Any introduction of online voting would need to be gradual, with demonstration projects to determine the best technical solution, familiarise the public with these new methods and ensure that such innovations would be secure against legal challenge.

Endnotes

- 1 The Electoral Commission reports to the Speaker's Committee, rather than to a Government minister.
- 2 Such as Alvarez & Nagle, Coleman, and the Voter Integrity Project.
- 3 www.seiji-koho.co.jp
- 4 California Internet Voting Task Force Report on the Feasibility of Internet Voting, Jan 2000. <http://www.ss.ca.gov/executive/ivote/>.
- 5 Security Considerations for Remote Electronic Voting over the Internet. <http://avirubin.com/e-voting.security.html>.
- 6 Report of the National Workshop on Internet Voting: Issues and Research Agenda, March 2001. <http://www.netvoting.org>.

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