

International Experiences of Electronic Voting and Their Implications for New South Wales

A report prepared for the New South Wales Electoral Commission.

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Executive Summary

This report explores international experiences of electronic voting and identifies their implications for New South Wales. It does not argue for or against electronic voting. Its focus is the politics and administration of electronic votes.

Most countries across the world still rely on paper-based ballots for binding government elections. Around 20 countries have introduced significant electronic voting for at least some government elections, although a larger number have conducted electronic voting pilots of various kinds.

The experience of nine countries is examined in detail. These include Brazil and India, which have moved rapidly to universal use of electronic voting machines. Switzerland and Estonia allow ordinary citizens to vote using the internet. These four countries illustrate successful shifts to electronic voting. A fifth case study is the Netherlands, which recently reversed its movement to electronic voting.

Westminster-style political systems like Australia have been more conservative with regard to electronic voting. New Zealand and Canada have largely confined their interest in the topic to discussions. The United Kingdom has undertaken a number of trials, which resulted in the retention of paper ballots.

In the United States, the experience has been mixed. Electronic voting has increased in recent years but been controversial, with a strong push for all electronic voting to include a backup paper record.

The international evidence suggests at least eight effects of electronic voting on democracy. Four have to do with aspects of equality among voters and candidates, two with voting as a public and private activity, the seventh with scrutiny of voting administration, and the last with the timeliness of the result. The report explores these and suggests their implications for New South Wales.

Eight factors seem to affect the adoption of electronic voting. The first three are patterns of elite, interest group and mass support. The next two relate to the use of information technology in everyday life and in other aspects of elections. The sixth is the administrative capacity. The seventh is the relationship between electronic voting and existing voting. The last is the staged introduction of electronic voting. The report examines each of these factors and suggests their implications for the possibility of electronic voting in New South Wales.

Chapter 1. Introduction

1.1 The Scope of this Report

This report explores international experiences of electronic voting and identifies their major implications for elections in New South Wales. The focus of this report is on the political and administrative dimensions of electronic voting; that is, the interactions between electronic voting and voters, candidates, parties, electoral administrators and other election participants. These participants both affect, and are affected by, electronic voting. The technical issues involved in electronic voting are the subject of another report to the New South Wales Electoral Commission. They are only canvassed here insofar as they have become important elements of the politics and administration of electronic voting.

A focus on the relationships between electronic voting and the political and administrative aspects of democracy is unusual. Discussion of electronic voting is dominated by technical debates. As Michael R. Alvarez and Thad E. Hall, two experts on electronic voting from the United States, write:

The critiques of electronic voting are typically presented as an engineering problem without consideration of how other events and phenomena in society affect our views of electronic voting. Although the potential problems with electronic voting are well elucidated by the critics, they are rarely placed in within a sociopolitical context or framework, as is done in similar debates in other policy areas. (Alvarez and Hall 2008: 31)

The political and administrative dimensions of electronic voting are important and must be understood. Electronic voting is not simply a technical matter. Its development and introduction has not been driven in a deterministic way by technological advances. Countries with the technological capacity to introduce electronic voting have made varying decisions about its adoption, for a range of reasons. As Thomas M. Buchsbaum, a European expert on the topic, noted several years ago: 'No universal trend towards a definite introduction of e-voting can be detected, not even by countries where first steps were undertaken on such a way' (2004: 41).

This report does not argue for or against the adoption of electronic voting in New South Wales. It outlines the major issues involved, drawing on international evidence and debates. The focus of the report is on the political and

administrative issues that might make electronic voting a more attractive or a less attractive option for New South Wales than its current use of paper ballots.

1.2 What is Electronic Voting?

Electronic technology can be used in a range of ways during various stages of an election. In this report, as in most discussions of the topic, the focus is on how voters register their preferences. Electronic voting (sometimes called 'e-voting') refers to occasions on which a voter directly records his or her preferences using an electronic device, such as a specifically designed electronic voting machine, a computer terminal, a personal computer connected to the internet, or a telephone keypad. Electronic voting thus excludes occasions on which voters fill in paper ballots that are then counted using optical scanning machines.

The two major forms of electronic voting in use today and discussed throughout this report are (i) voting using electronic voting machines, and (ii) remote access internet voting.

Electronic voting machines are often referred to as 'direct recording equipment voting machines' or 'DREs' in the United States. 'Electronic voting machines' is the term used throughout this report. They take several forms. Some, such as the ones used in India (see 3.2 below), are designed to be stand alone, with non-removable media for recording votes. Others, such as those used in Brazil (see 3.1 below), are connected to a network. Some electronic voting machines also produce a backup paper printout. Where voters can check this paper record themselves, this feature is commonly known as a 'voter verifiable paper audit trail' or 'VVPAT' (see 5.3 below). Voting using electronic voting machines usually occurs at a polling place under the supervision of electoral officials.

Remote access internet voting (sometimes called 'i-voting') involves voters using a personal computer at their homes or in some other place (libraries, their workplaces etc) to cast a vote over an internet connection. Voters may require a special computer port to allow them to vote and may also be able to check their vote using an encrypted electronic request. Internet voting is not directly supervised by electoral officials.

1.3 Australian Background

Electronic voting has only been used in a very limited way for government elections in Australia. The ACT has used electronic voting machines since 2001

(ACT 2002). Victoria piloted electronic voting machines for vision impaired and blind voters in six polling places in 2006 (Murphy 2006). In 2007, Tasmania provided an electronic voting machine for vision impaired and blind voters in one Hobart location (Duncan 2007). Small trials of electronic voting machines for sight impaired voters, as well as internet voting among overseas military personnel, were conducted at the 2007 Federal Election (Comm JSCEM 2009a). Other states, including New South Wales (NSW JSCEM 2008), have discussed electronic voting but not acted to implement it.

Chapter 2. International Experiences of Electronic Voting: An Overview

Most countries across the world still rely on paper-based ballots for binding government elections. Around 20 countries have introduced significant electronic voting for at least some government elections (see Table 1). A larger group of countries have debated the introduction of electronic voting and some have conducted limited trials. Not all countries have followed up their initial trials with wider use of electronic voting. Ireland, for example, undertook a small trial of electronic voting machines in three electorates in 2002. After then spending €52 million (approximately A\$ 100 million) buying and storing 7,500 electronic voting machines, the Irish Government scrapped its plans for electronic voting in April 2009. This decision followed two rounds of technical and security testing between 2004 and 2006 and a growing campaign against the purchased electronic voting machines, which did not incorporate an auditable paper record (Commission on Electronic Voting 2004; ElectricNews.net 2005; Commission on Electronic Voting 2006; Tighe 2006; Seaver 2009; RTE News 2009).

Apart from noting the small number of countries that have proceeded with electronic voting, four further points can be made about the global patterns of electronic voting identified in Table 1. First, most countries that have introduced electronic voting have done so via electronic voting machines at polling places, rather than taking up remote access internet voting. Second, where internet voting has been used, it has almost always remained at the trial stage. These trials typically involve expatriate voters, military personnel, or groups of voters in particular local government areas.

Third, most countries that have introduced electronic voting have done so as a second or third track supplement to existing methods of voting, rather than moving to universal electronic voting. Fourth, Table 1 supports Michael R. Alvarez and Thad E. Hall's (2008: 72) contention that European countries have been more willing than North American countries to experiment with e-voting (see also Prosser and Krimmer 2004; Trechsel and Mendez 2005; Krimmer 2006). Nonetheless, it is also notable that a number of countries that have undertaken electronic voting experiments lie in the developing world (e.g. Brazil and India) or on Europe's socio-economic periphery (e.g. Estonia).

Table 1. Use of Electronic Voting in Binding Government Elections

Type of Voting	Countries
Electronic voting machines normally used (alone or with other methods) in at least some government elections.	Australia (ACT only)
	Belgium
	Bhutan
	Brazil
	Denmark
	Germany
	Guam
	India
	Kazakhstan
	Netherlands (until 2006)
	New Caledonia
	Paraguay
	Portugal
	Singapore
	Spain
United States of America	
Venezuela	
Remote electronic voting (used with other methods) in government elections.	Australia (trial with military personnel)
	Austria (local government trials)
	Estonia (parliamentary elections)
	France (local government trials)
	Netherlands (trial with expatriates)
	Romania (trials with military personnel)
	Spain (local government and expatriate trials)
	Switzerland (referenda in some cantons)
	United States (trials with military personnel)
United Kingdom (local government trials)	

Sources: Grose 2002; Alvarez, Hall and Trechsel 2009

The next three chapters of this report examine the electronic voting experiences of nine countries. Chapter 3 explores five countries that have moved decisively toward varieties of electronic voting. In four cases, Brazil, India, Switzerland and Estonia, this movement has been successful. The fifth case, the Netherlands, is included as an example of a country that has ended its use of electronic voting after thirty years of increasingly committed use. Chapter 4 focuses on the

experiences of three Westminster-style democracies with which Australia is more often compared—New Zealand, Canada and the United Kingdom—and notes their very cautious approach to electronic voting. Chapter 5 examines the mixed experience of electronic voting provided by the United States of America.

Chapter 3. Five Committed Moves Towards Electronic Voting

As Chapter 2 indicates, most countries have treated electronic voting with caution or scepticism, sticking resolutely to traditional paper ballots, using electronic voting as a supplement to traditional paper ballots, or limiting the use of electronic voting to trials. In this context, the five committed movements towards electronic voting described below are distinctive. The first two cases are Brazil and India, which despite being two of the world's largest and most populous democracies, moved from universal paper ballots to universal electronic voting machines in less than a decade. The next two are Switzerland and Estonia, which have allowed ordinary citizens to vote over the internet in binding government elections. These four examples deserve attention as apparently successful shifts to electronic voting. The fifth case is the Netherlands, which recently reversed its long-term movement to electronic voting in favour of a return to paper-based ballots.

3.1 Brazil

In 2002, Brazil became the first country in the world to switch to a comprehensive system of electronic machine voting. This move followed trials at the 1996 municipal elections, which covered about a third of the electorate, and the use of electronic voting machines (*urnas eletronicas*) to record two-thirds of the vote at the 1998 national elections. Since 2002, around ninety-nine percent of the electorate has voted using *urnas*. Paper ballots have been reserved for use by remote and overseas voters and as a backup where the *urnas* fail (Bustani 2001: 305; Grose 2002).

Brazilian elections are massive and complex affairs. Voting is compulsory for literate adults and voluntary for other adults. Over 100 million Brazilians vote simultaneously to elect the 513 Deputies (national lower house members), one-third or two-thirds of the 81 Senators (national upper house members), 27 state Governors and one national President. The Deputies are elected using an open list proportional representation system, in which the 27 states act as districts. Voters choose a single candidate from among the lists of candidates nominated by parties. Senators are elected for each state on a plurality (first past the post) basis. The President and governors are chosen using a run-off system (if, as occurred in 2006, no candidate wins a majority in the first vote, a second ballot is held a fortnight later, involving the two most popular candidates) (Bustani 2001; Wheatley 2006; Nicolau 2008).

Brazilian voters thus typically vote in four separate contests at each election. In each case, they are required indicate a single preference. These votes are collected using 400,000 electronic voting machines, which run on mains power or a backup battery with a 12 hour life. Poll officials set up the *urna* for each registered voter, who then types in their favoured candidates' number. The number, name and photo of the chosen candidate appear on the *urna*'s screen for confirmation or correction by the voter. Once a voter is satisfied with his or her choice, he or she presses the confirm button. Voters can register a blank vote. Votes are registered twice: once electronically and once in a printed record held in the machine. To count the vote, each *urna* is connected to a local computer, which in turn is networked to Unix computers at the national tally centre. The process can count 4,900 votes per second and the results of national elections are generally known within two hours of the close of polling (Grose 2002; Carneiro 2006).

This electronic voting system is credited with removing most electoral fraud (Nicolau 2008: 170), although there have been some technical problems. In the 2006 elections, for example, 2,500 of the 400,000 terminals had to be replaced and 90 polling locations reverted to using paper ballots (Timson 2006). The cost of the system has also drawn some domestic criticism (Lavoratti 2006).

3.2 India

India also uses simple portable electronic voting machines to collect a huge number of votes in national elections. After trials of the machines in 1999, in 2001 four states used them as the exclusive method of recording 120 million votes. By 2004, 1 million electronic voting machines were used across the country in national elections (Jeffrey 2009; *The Australian* 2004; *The Canberra Times* 2004). The April-May 2009 elections saw 417 million votes cast in 1.37 million electronic voting machines at 829,000 polling stations staffed by 3.5 million personnel. As usual, polling was staggered across four days during a three week period. The 2009 count was completed and the result known within one day (Wade 2009).

The Indian electoral system is simpler than that of Brazil. Voters are divided into 543 single member electorates for the lower house (*Lok Sabha*). Voters in each electorate choose one representative using plurality (first past the post) voting. Almost all electorates (522 out of 543) use identity cards and photographic rolls to confirm the identity of voters. The electronic voting machines are battery

operated and consist of a keyboard capable of handling up to 16 candidates connected to an electronic recording system by a cable. If there are more than 16 candidates for a seat, up to four keyboards can be connected. Electoral officials, under the scrutiny of party observers, glue the names of candidates and their party symbols next to the voting buttons on the keyboard (*The Hindu* 2009a). Braille symbols are also glued to the machine's buttons (Milton 2009). At the start of polling, the local electoral official presses the 'result' button to confirm that the machine has not already recorded votes. Voters record a vote by pressing the button next to their favoured candidate and the machine indicates a successful vote with a red light and a beeping sound. Up to five votes per minute can be recorded per machine (Blakely 2009).

At the close of polling, electoral officials press the 'close' button to lock the machines. The machines are transferred to counting centres, where the count proceeds under the scrutiny of observers. Results are faxed or emailed to the central tally room. Unlike the Brazilian *urnas*, the Indian electronic voting machines do not incorporate a paper record. If one or more of the machines fail in a district, that district must vote again (Blakely 2009; *The Hindu* 2009b; *The Times of India* 2009a).

The electronic voting machines were designed by the well-established government-owned business, the Electronic Corporation of India (ECIL), to be simple, robust and portable enough to use across India's diverse urban, rural and remote locations. Indian and international news media accounts of the 2009 election suggest that machine failures were very limited (*The Times of India* 2009a; *The Times of India* 2009b). While some parties and candidates alleged electoral corruption in 2009, these allegations centred on officials and rival parties using the machines to vote on behalf of other electors, rather than on claims that the machines themselves had been tampered with (Swamy 2009; *The Hindu* 2009c). Some experienced observers of Indian politics credit the machines with reducing corruption and eliminating the former problem of electors wasting their votes by invalidly filling out ballot papers (Spary and Wyatt 2006; Thakur 2009; Jeffrey 2009; Thompson 2009).

3.3 Switzerland

Between 1945 and 1999, average voter turnout at national elections in Switzerland was 56.6 percent, some 16 percent lower than the next lowest turnout figure among western European democracies (Ireland's 73.2 percent) and just higher than that of the United States (55.8 percent). Over the post-war

period, turnout among Swiss voters fell more rapidly than in any other western democracy (Franklin 2004: 11). Over the same period, Swiss voters were required to vote in a comparatively large number of national and regional elections, including referenda (Trechsel no date: 1).

Partly in response to this growing gap of democratic legitimacy, in 1998 the Swiss Federal Government invited three cantons (regions)—Geneva, Zurich and Nuechatel—to participate in trials of internet voting. The trials were limited to referenda. Internet voting was to become a third voting option, alongside traditional paper-based voting at polling places and postal voting, which had been introduced in 1991 (Trechsel no date: 1-2).

Geneva was quickest to respond to the invitation, with a two day internet voting trial in a small district at a January 2003 referendum. Of 741 voters, 323 opted to cast their votes via the internet. As a security test, a group of 'white hat' computer hackers were given two weeks to break down the Geneva i-voting security system. They failed to do so (Alvarez and Hall 2004: 145). From 2003, internet voting was used as an option in increasing numbers of districts throughout the Geneva canton for the two to three referendum ballots held every year. Similar successful trials were also conducted in Zurich and Neuchatel (Braun and Brandli 2006). By February 2009, Basel and Geneva had both amended their constitutions to include internet voting as a normal ballot option (State of Geneva 2009)

Voters who want to use internet voting must apply for a personal identification number (PIN) for each election. After connecting to the electoral website, they use their PIN to access their ballot. The computer hardware that records internet votes is centralised and kept under physical and electronic surveillance. Under the supervision of electoral officials, the computer is locked at the start of the internet voting period and unlocked after voting closes (Republique et Canton de Geneve no date).

Studies of voting in Swiss cantons show that while the majority of voters—typically around 70-75 percent—use postal voting, internet voting has been rapidly adopted by a significant minority (typically 20-25 percent) and by up to 68 percent of voters in one case. Voting in person at polling stations has become relatively rare (around 5 percent) (Christin and Trechsel 2004: 5; Braun and Brandli 2006: 30). Internet voting is generally evaluated positively by Swiss voters (Christin and Trechsel 2004; Braun and Brandli 2006: 31). Around 90

percent of voters who try it once continue to cast their vote via the internet at subsequent elections (Republique et Canton de Geneve 2006: 2).

3.4 Estonia

Estonia's approach to remote internet voting has been more adventurous in its scope than that of Switzerland. In 2002, after just three national elections in the post-Soviet period, the Estonian Parliament passed reforms to allow the option of remote internet voting prior to polling day and to establish mechanisms for counting internet votes along with paper-based votes. Remote internet voting was first used in the 2005 local elections, followed by the 2007 parliamentary elections and the 2009 elections for the European Parliament.

This intentional and 'systematic' approach to internet voting has been part of the Estonian Government's broader drive for liberalisation and modernisation in the post-Soviet era (Alvarez, Hall and Trechsel 2009: 498). 'E-stonia', as it is sometimes styled, has been a leader in e-government reform and paperless government. The Government has promoted internet access among citizens, with internet connections to all schools, a 'Village Road' program to spread internet use to rural areas, and access to most government services via the web. In 2006, 76 percent of citizens lodged their tax returns via the internet, while 53 percent of households had internet connections in 2007, with libraries and other public internet access points widely available (Madise, Vinkel and Maaten no date: 5-9; Madise and Martens 2006; Brewer and Trechsel 2006: 2; Vernygora 2007; Alvarez, Hall and Trechsel 2009: 500).

Estonia is geographically small and has just over 1 million voters, two-thirds of whom live in urban centres. Voting is non-compulsory. National elections occur every four years, with four-yearly local elections held in the middle of each national election cycle. In 2007, 15 parties were registered and 11 contested the national election (Solvak and Pettai 2008: 575). Although seats in the Parliament (*Riigikogu*) are allocated to parties proportionally under a relatively complex quota-based open party list method, the ballot simply requires voters to indicate a single choice (for more details, see Madise, Vinkel and Maaten no date; Solvak and Pettai 2008; Alvarez, Hall and Trechsel 2009).

Polling day is a Sunday; however, early voting occurs at polling places and by post during the nine to 13 days beforehand. Internet voting is allowed during a three day period prior to polling day. Voters who wish to cast an internet vote use a personal computer to log on to the election site via the internet. Their

identity and eligibility to vote is established by a combination of the digital signature on their national identity card and a personal identification number (PIN). The digital signature is read by inserting the card into a special port on the personal computer. Voters then enter their PIN. Once authorised, voters make their choice on screen and submit their vote. The vote is encrypted and associated with the voter's PIN for the three days allowed for internet voting. During that period, voters can change their vote (using their card and PIN) and can cast a paper ballot on polling day if they no longer want their electronic vote to count. Internet voting is not allowed on polling day (Estonian National Electoral Committee 2005; OSCE/OHIHR 2007b: 12-18; Alvarez, Hall and Trechsel 2009: 499-500).

When polling closes, electoral officials match the records of paper votes cast against the records of encrypted internet votes cast. Where a voter has cast both an electronic and paper ballot, the encrypted electronic vote is deleted to prevent double-voting. Paper and electronic votes are then counted in a physically and electronically secure environment, in the presence of a private auditing company and other observers (Estonian National Electoral Committee 2005; OSCE/OHIHR 2007b: 12-18; Alvarez, Hall and Trechsel 2009: 499-500).

Table 2. Growth of Internet Voting in Estonia, 2005-2009

Election	Overall Turnout	Internet Turnout	Internet Vote as Proportion of Total Vote	Number of Internet Voters
2005 Local Government	47.4	0.9	1.9	9,317
2007 National Parliament	61.7	3.4	5.4	30,275
2009 European Parliament	43.9	6.5	14.7	58,669

Source: calculated from figures in Estonian National Election Committee (no date).

As Table 2 indicates, the number and proportion of Estonian voters who use internet voting has grown rapidly in four years. In the 2005 local government elections, just 1.9 percent of those who voted used internet voting, while 14.7 percent of those who voted in the 2009 European Parliament elections did so. Internet voting has been publicly championed by the Prime Minister and Minister of Justice and is widely accepted among voters. Of the fifteen political

parties, only the Centre Party and People's Union, which did not vote in the parliamentary vote introducing internet voting, have expressed opposition to the practice. The other parties are highly supportive (Madise, Vinkel and Maaten no date: 14; OSCE/ODIHR 2007b: 9; Alvarez, Hall and Trechsel 2009). Despite concerns about attacks, corruption and technical failures, internet voting has not resulted in any legal or other challenges to Estonian election results (OSCE/ODIHR 2007b: 10). The success of internet voting led Estonian parliamentarians to adopt a law in December 2008 that will allow voting via mobile phones with certified SIM cards at the 2011 national poll (Solvak and Pettai 2008: 576; Agence France Presse 2008).

3.5 The Netherlands

Until 2006, the Netherlands was a leader in the use of electronic voting machines at polling places and the introduction of remote internet voting. Voting machines had been used in parts of the Netherlands since 1965. By 2006, 99 percent of municipalities were using electronic voting machines for national and local elections. Expatriates could vote using the internet and Dutch electoral authorities were planning to allow internet voting within the Netherlands. Electronic voting was popular. Surveys indicated that more voters trusted electronic voting machines than trusted paper ballots. Among expatriate internet voters, 99 percent liked the experience and 95 percent would use it again (OSCE/ODIHR 2007a: 5; Loeber 2008).

The Netherlands electoral system for the directly elected lower house (*Tweede Kamer*) of the national Parliament involves the use of open list proportional representation to fill 150 seats. A small quota (0.67 percent of the overall vote) is required to win a seat, with the winning candidates those who receive the most votes in their party groups. Voters are required to indicate a single choice for a candidate from one of the lists. The 8,300 Nedap electronic voting machines used across the Netherlands required voters to press a touch screen next to the candidate of their choice and then press a red button to confirm their vote. Votes were recorded electronically in each machine and the totals were printed from each machine at the close of voting. Expatriate voters using internet voting had to register four weeks prior to the poll. They received an authorisation code by mail, which allowed them to access and cast an internet ballot during the last four days before polling day (OSCE/ODIHR 2007a: 7-8, 13-14).

Dutch party politics has long been fragmented (Lijphardt 1968); in the November 2006 election, 24 parties stood for election and 10 won seats. Parties typically

include extensive lists of candidates in an effort to increase their votes (the maximum number of candidates allowed for a party is 80) (OSCE/ODIHR 2007a: 7-8, 27). The number of candidates in Dutch ballots has advantages for electronic balloting, since large paper ballots become unwieldy and are too big to be scanned easily (Loeber 2008).

The momentum towards further use of electronic voting in the Netherlands was dramatically reversed in 2006, largely following the activities of an interest group made up of computer scientist hackers called 'We Do not Trust Voting Computers' (*Wij Vertrouwen Stemcomputers Niet*), led by Rop Gonggrijp (Loeber 2008). Gonggrijp's group used freedom of information laws, access to a Nedap voting machine and their technical skills to demonstrate that, among other things, the machines were not physically or technically secure and could be manipulated to alter the results of elections without detection. The group released a detailed report a month before the 2006 election (*Wij Vertrouwen Stemcomputers Niet* 2006). Later government testing confirmed the group's claims and found that the internet voting system was similarly insecure (OSCE/ODIHR 2007a 13-14; Loeber 2008).

While some of the security problems could be easily remedied, others were more serious. In response, *Wij Vertrouwen Stemcomputers Niet* and others called for all electronic voting systems to produce verifiable paper audit trails. After the 2006 election, the question of whether or not the electronic voting system in use had been legally approved by government reached the courts. In September 2007, a Dutch judge declared that it had not (Libbenga 2007). The Netherlands Government decided not to rectify this problem by approving the use of existing electronic voting methods. It also refused to approve new applications of electronic voting, such as those planned for local water board elections in November 2008. Voting in the Netherlands has, at least for the time being, returned to paper-based ballots (Loeber 2008).

Chapter 4. Three Westminster Comparisons

The electoral systems examined to this point are not the ones against which Australia is usually benchmarked. They were chosen because they represent cases of extensive use of electronic voting. India apart, the family of Westminster-derived political systems of which Australia is a member have been more conservative in their approach to electronic voting.

4.1 New Zealand

Current plans for electronic voting in New Zealand are for pilots to be carried out between 2014 and 2020, starting with several thousand vision-impaired voters and voters with other disabilities. They would vote in advance of polling day and be able to override their electronic vote with a paper ballot (Pullar-Strecker 2008b). New Zealand allows eligible voters to enrol on-line; however, the only electronic voting for a public authority in the country to date has been for the Hawke's Bay Power Consumers Trust in 2008 (Webb 2008).

The New Zealand debate has centred on internet voting. Pressure for internet voting in New Zealand began about a decade ago, when local councils wanted to boost low voter turnout and cut the costs associated with paper ballots (*New Zealand Herald* 2001). Calls for electronic voting met with caution from the Chief Electoral Officer, who argued that electronic voting was untried, insecure and costly. New Zealand would monitor international developments (Smith 2002; Pullar-Strecker 2004).

In 2004, the Chief Electoral Officer announced an electronic voting pilot for 2008 (Pullar-Strecker 2004); however, by 2006 his successor had pushed the commencement of trials back to 2014, arguing that legislation and a broad social consensus both needed to be in place first (Pullar-Strecker 2006). Perhaps unsurprisingly, a June 2007 UMR poll sponsored by the Chief Electoral Officer of 1500 New Zealanders found the population divided, with 46 percent preferring internet voting and 39 percent paper voting (Pullar-Strecker 2008a; Pullar-Strecker 2008b).

4.2 Canada

Canada's approach to electronic voting has been similarly cautious. Following the release of the broad-ranging 1991 Report of the Royal Commission on

Electoral Reform and Party Financing, the Canadian Chief Electoral Officer began to explore the use of new technology in voting. As part of this process, Elections Canada commissioned the consulting firms KPMG and Sussex Circle to explore electronic voting via touch screen machines in kiosks, the internet and telephones. Their detailed report, *Technology and the Voting Process*, balanced positive conclusions about the potential of all three electronic voting methods against concerns such as 'security, cost, privacy and public acceptance' (KPMG/Sussex Circle 1998: 5).

Since 1998, no progress has been made on electronic voting at national level. Elections Canada has focused its attention on other issues. Under the heading of 'Accessibility', Elections Canada's current *Strategic Plan 2008-2013* indicates a desire to trial internet or phone voting at a by-election, with the approval of Parliament (Elections Canada 2008: 14).

A number of local councils in Canada have employed electronic voting, mostly using touch screen electronic voting machines to supplement paper ballots. In a large scale shift to e-voting, Quebec introduced electronic voting machines across 140 municipalities, including Montreal, in November 2005. The experiment was not repeated, after long delays at polling places and numerous technical and administrative problems, including machines breaking down and the initial double-counting of 45,000 votes (Directeur General des Elections du Quebec 2005).

In a smaller but more successful initiative, the City of Peterborough (population 75,000) became the first Canadian local council to offer 'vote anywhere' remote internet voting in November 2006, apparently without incident. Pre-registered voters used a PIN to access and complete internet ballots prior to polling day (The City of Peterborough no date; Geist 2006).

4.3 The United Kingdom

From 2000, the United Kingdom engaged in extensive review of its electoral arrangements. In part, this was driven by New Labour's general modernisation agenda, which was matched by public enthusiasm for on-line government (see, for example, The Electoral Commission 2002: 17). In part, it was a response to the precipitous drop in electoral participation at the 2001 General Election, at which only 59.4 percent of the eligible voters went to the polls. While the British Government recognised that reformed electoral methods would not be a 'magic bullet' for curing low turnout, it believed that voting using new technologies

might help increase electoral participation, particularly among younger voters (Norris 2005: 71-73).

Local and regional elections were chosen as the venues for electoral experimentation. Under the *Representation of the People Act 2000*, British local authorities can propose pilots for new election mechanisms. Those approved by the Government are overseen by the Electoral Commission. In 2002, the Minister for Local Government, Nick Raynsford, proposed that the local pilots would form an ‘ever more extensive’ program of reform, leading to an ‘e-enabled’ General Election after 2006 (BBC News 2002).

Five waves of pilot electoral schemes took place between 2000 and 2007. Three of these waves, incorporating 68 individual pilots, included variations on electronic voting in binding local elections (see Table 3). The various voting methods were tested against a range of criteria, including effects on the turnout, administrative efficiency and public support. In addition, the Electoral Commission oversaw pilots of postal voting, electronic counting of paper ballots, and variations to polling hours. The pilots covered local councils with a wide range of characteristics. Most were widely publicised well in advance of the relevant elections (The Electoral Commission 2002; Norris 2005; The Electoral Commission 2007; Alvarez and Hall 2008: 72-77).

Table 3. UK Electronic Voting Pilots, 2002-2007

Type of Electronic Voting Pilot	Pilots in Each Year			
	2002	2003	2007	Total
Electronic Voting Machines in Polling Places	7	8	1	16
Telephone Keypad Voting	3	12	4	19
Text Message (SMS) Voting	2	4	0	6
Remote Internet Voting	5	14	5	24
Interactive Television	0	3	0	3
Total	17	41	10	68

Source: The Electoral Commission 2002: 40; The Electoral Commission 2007; Alvarez and Hall 2008: 74.

The results of these pilots were mixed. On the one hand, the technology generally worked well, with few reported problems. Surveys of voters involved in the pilots found large numbers willing to use the internet and telephone keypads to vote (The Electoral Commission 2002: 17). On the other hand, pilots that used postal ballots showed the largest and most consistent increases in

turnout rates. For pilots using electronic voting, the Electoral Commission noted 'there is no strong pattern of improved turnout' (2002: 45). Turnout rose in some areas using electronic voting but fell in others (see also Norris 2005; 76-85). Moreover, postal schemes were more widely seen by voters as improving voting (58 percent), than schemes using a range of electronic voting options (47 percent) or schemes using a single electronic option (33 percent) (The Electoral Commission 2002: 65).

The 2002 results were broadly replicated in 2003 and 2007. The Electoral Commission reported that in areas where electronic or telephone voting had been offered in both 2003 and 2007, usage rates among voters had dropped rather than increased over time. The Commission did note that this fall might have been caused by the introduction of pre-registration and a ban on e-voting on polling day in 2007 (The Electoral Commission 2007: 6-7). After 2003, the Commission also reduced the number of pilots of electronic voting machines at polling places and of electronic counting, since these mechanisms provided few advantages in the British system of simple first past the post counting.

The Electoral Commission found no evidence of security, fraud or privacy issues arising in the electronic voting pilots (The Electoral Commission 2002: 49-50). Most concern about these issues focused not on electronic voting but on problems with voter registration and postal vote security (The Electoral Commission 2005). Nonetheless, concerns about fraud, security and loss of privacy were raised by British information technology specialists who had observed at least some of the pilots (see, for example, Xenakis and Macintosh 2004; Open Rights Group 2007). In 2007, the Electoral Commission concluded that the short time frame allowed to set up some of the pilots had made the lack of any major problems 'fortuitous' (2007: 5).

By 2007, the Electoral Commission was calling more loudly than it had in previous years for an end to *ad hoc* voting pilots in favour of an integrated long-term strategy for electoral reform, which might include electronic voting (The Electoral Commission 2007; BBC News 2007; see also The Electoral Commission 2002: 73-75). Nick Raynsford's 2002 vision of the pilots producing their own momentum for wider electronic voting in Britain appeared to have gone unrealised. No pilots were conducted in 2008 or 2009. In his speech to the Association of Electoral Administrators Conference in February 2009, Minister for Justice Michael Wills did not mention electronic voting, let alone list it among the issues on the Government's electoral policy agenda (Wills 2009).

Chapter 5. A Complicated Case: The United States of America

Perhaps because of its position as the world's most powerful democracy, United States experiences and perceptions of electronic voting dominate international discussion and debate around the topic. Although the political system of the United States differs in many respects from that of Australia, the two political systems are regularly compared. Australian politicians and public policy makers looking for lessons and ideas often turn to United States practices. For these reasons, an examination of electronic voting in the United States rounds out the nine countries examined in some detail in this report.

5.1 The Diversity of American Voting Methods

The first point to make about United States electoral administration concerns its decentralisation. The voting methods used to elect officials are set at state and even county level. This is as true of elections for national offices, such as the Presidency and Congressional representatives, as it is of elections for state and local officials. The result is a diversity of electoral methods, not just between states but within states. In the state of Arkansas, for example, 45 counties use the new *iVotronic* touch screen electronic voting machines, three counties use older *Schouptronic* electronic voting machines, 18 counties use paper ballots that are later tallied by computer at central locations, while nine counties use optical scanners to record paper ballot votes at the polling place where votes are cast. All polling places have at least one touch screen voting machine for use by voters with disabilities such as sight impairment (Arkansas Secretary of State no date).

As Table 4 shows, the result of this decentralised approach has been that some American states have moved much further away from paper ballots and towards electronic voting than others. The top row of Table 4 shows that the largest group of states (38 percent) predominantly use paper ballots, which are typically filled out using a felt tipped pen and usually then inserted into an optical scanner for verification and counting. These methods are supplemented by devices such as paper ballot marking equipment and vote-by-phone machinery for voters with disabilities.

Table 4. Voting Methods Used in American States

Method/s	States Using
Paper ballots, optical scan, ballot marking device and/or vote-by-phone for vision impaired etc. (19 states)	Alabama, Connecticut, Idaho, Iowa, Maine, Massachusetts, Michigan, Minnesota, Montana, Nebraska, New Hampshire, New Mexico, New York, North Dakota, Oklahoma, Oregon, Rhode Island, South Dakota, Vermont.
Electronic voter machine with a voter verifiable paper audit trail plus other methods. (16 states)	Alaska, Arizona, Arkansas, California, Colorado, Hawaii, Illinois, Kansas, Mississippi, Missouri, North Carolina, Ohio, Washington, West Virginia, Wisconsin, Wyoming.
Electronic voting machine with a voter verifiable paper audit trail. (2 states)	Nevada, Utah.
Electronic voting machine without a voter verifiable paper audit trail plus other methods (7 states plus DC)	District of Columbia, Florida, Indiana, Kentucky, Pennsylvania, Tennessee, Texas, Virginia.
Electronic voting machine without a voter verifiable paper audit trail. (6 states)	Delaware, Georgia, Louisiana, Maryland, New Jersey, South Carolina.

Source: Pew Center on the States (2008).

At the other end of the spectrum, in 12 percent of the states (those grouped in the bottom row), voters rely entirely on electronic voting machines (often called ‘Direct Record Electronic’ machines, or DREs, in the United States) that do not produce a paper receipt with which voters and officials can verify votes. The remaining states fall somewhere between these points, with the largest group (32 percent) combining the use of electronic voting machines that produce a backup paper record (usually called a ‘voter verifiable paper audit trail’ or VVPAT in the United States) with paper-based ballot methods.

Unlike Brazil and India, which have comprehensively switched over to electronic voting, or New Zealand, Canada and the United Kingdom, which have retained

or paper ballots, the United States has a mixed system of voting methods. As well as reflecting its strong federal traditions, this mixed system reflects a greater historical willingness to experiment with voting technologies in the United States than in the other countries under consideration (Ansolabehere and Stewart 2005: 368-374).

In the late nineteenth and early twentieth century, the states replaced open oral and paper ballot voting with a mixture of secret paper ballots and lever voting machines. The lever voting machines, which recorded votes on gauges like those of car odometers, were not tamper proof and left no audit record. Nonetheless, they were the most widely used voting device until the mid-1980s and were still in use in parts of the State of New York in 2008 (Herrnson *et al* 2008: 8; Alvarez and Hall 2008: 15-17; Pew Center on the States 2008).

From the 1960s, states moved to computer-readable punch cards to deal with the complexity and cost of voting. By the mid-1980s, punching holes on computer-readable cards had become the most widely used voting method in the United States. As early as 1968, critics argued that punch cards were difficult to use, inaccurate, and open to fraudulent manipulation. These problems helped to produce the 2000 election controversy, in which 'hanging, dimpled and pregnant chads' on punch cards meant that large numbers of votes were unreadable in a number of states, most notably Florida (Herrnson *et al*: 2008: 1, 9-10; see also Alvarez and Hall 2008: 17-20, 60-61).

Optical scan ballots, in which voters colour in ovals next to the candidates of their choice on paper ballots that are then read by machine scanners, were introduced in the 1980s. By 2006, they had become the most widespread voting method, used by half of all voters. The 2000 election highlighted problems in the use of optical scan ballots, including varieties of informal voting in which voters had circled ovals rather than filling them in, not voted for any candidate, or voted for too many candidates (Herrnson *et al* 2008: 10; Alvarez and Hall 2008: 21-23).

5.2 The Introduction of Electronic Voting in the United States

In this context of diversity, electronic voting had already made some headway by 2000. Introduced in the mid-1970s, electronic voting machines were used by around 10 percent of voters in the late 1990s (Herrnson 2008: 10; Alvarez and Hall 2008: 21). In 1999, California established an Internet Voting Task Force to explore internet voting. The Democratic Party in Arizona conducted a successful

trial for its 2000 primary election, in which 46 percent of voters used internet voting (Solop 2001). In a less highly publicised pilot in 2000, the Department of Defense conducted an internet voting trial of 83 voters across five states (Alvarez and Hall 2008: 71, 80).

The 2000 election crisis generated support for electronic voting, since most of the technical problems the election (hanging chads, the 'butterfly' ballot, scanners that misread paper ballots, and so on) were associated with varieties of paper ballot (Alvarez and Hall 2008: 50). In public opinion polls, between sixty and seventy percent of voters indicated a willingness to use internet voting (Solop 2001: 289). After reviewing problems with their existing voting methods, states such as Georgia moved to a universal electronic machine voting system, accompanied by intense education programs for poll workers and voters (Alvarez and Hall 2008: 25, 59-60).

The shift to electronic voting machines continued when Congress passed the *Help America Vote Act 2002*, which, among other things, introduced minimum standards for electoral administration, a national certification and testing scheme for voting technology and federal funding to replace outdated equipment and systems. The Act stipulated that voting procedures must allow electors the opportunity to review their votes and that they must produce an auditable electronic or paper record of votes. By 2004, one-fifth of American voters were using electronic voting machines (Herrnson *et al* 2008: 9-12).

5.3 Post-2000 Controversies and Qualifications

Although the use of electronic voting machines continued to grow after 2004, the use of optically scanned paper votes grew more rapidly. Several states that had introduced new electronic voting machines, including California, Florida, New Mexico and Ohio, began moves to replace them with optically scanned paper ballots (electionline.org 2008). Three factors seemed to cause this shift in American attitudes toward electronic voting.

The first was a series of puzzling and controversial outcomes in districts using electronic voting machines, including losses by several Democrat incumbents in Georgia in 2002 and 18,000 missing votes in Florida's Thirteenth District in 2006. Plausible innocent explanations for such occurrences were offered; however, partisan accusations that the machines had been used to steal elections undermined trust in electronic voting (Alvarez and Hall 2008: 51; electionline.org 2008: 1-2; Herrnson *et al* 2008: 137-139). Second, in 2002 the President of Diebold,

a leading supplier of electronic voting machines, made a comment about the presidential race in Ohio that was widely interpreted as meaning that he would ensure the machines were designed to favour the Republicans (Alvarez and Hall 2008: 52).

Third, some computer scientists began to question the security of electronic voting. Among other widely reported developments, a team from John Hopkins University and Rice University analysed a version of the Diebold source operating code in July 2003 and identified a range of possible ways in which the system could be attacked (Alvarez and Hall 2008: 40-41). In February 2004, Secretary of Defense Paul Wolfowitz shut down the proposed Department of Defense Secure Electronic Registration and Voting Experiment (SERVE), an internet voting program that was to have involved up to 6 million military personnel and their dependents, who ordinarily found it difficult to vote due to their movement throughout the country and beyond. Wolfowitz was responding to public criticism of the SERVE system by four computer scientists who were members of its peer review team (Celeste, Thornburgh and Lin 2006: 41; Alvarez and Hall 2008: 71-2, 77, 80-90).

Sceptical computer scientists and other activists opposed to electronic voting formed organisations such as Blackboxvoting.org and verifiedvoting.org to share information, lobby politicians, provide public testimony at hearings and respond to media inquiries. Public discussion of electronic voting increasingly became dominated by issues of risk, fraud and security (Alvarez and Hall 2004: 23-26; Alvarez and Hall 2008: 62-70).

These controversies had three further outcomes for electronic voting in the United States. First, the SERVE shutdown largely pushed internet voting from the electoral reform agenda. Some small experiments continued. In 2004, 46,000 voters in the Michigan Democratic Party primary election cast internet ballots (Von Sternberg and Wagner 2004). In 2008, registered Democrats living outside the United States used internet voting, among other means, to elect 22 primary delegates (Sylvers 2008). Some overseas and military voters also had the option of receiving and submitting ballots in congressional and state elections via email or fax; however, a 2006 survey study showed that only three percent of those who could use these methods actually did so (United States Electoral Assistance Commission 2006: 17). Although United States legislators often predict that internet voting will be used in future elections, they tend to see it as too risky at present (see, for example, Toland 2005; Ammons 2006).

Second, the vociferous campaign against electronic voting forced manufacturers and policy makers to focus their attention on security measures. The increasing development and use of electronic voting systems that incorporate voter verifiable paper audit trails (VVPATs) has been the main result (see, for example, Mercuri 2007; Herrnson *et al* 2008: 111-120).

Third, computer scientists and political scientists who saw potential merit in electronic voting began conducting increasingly sophisticated and fine-grained testing of different types of voting procedures. Starting from the hypotheses that not all electronic voting systems are the same, that security is not the only issue at stake in elections and that some electronic voting systems may perform some tasks better than their non-electronic alternatives, they set out to discover which aspects of particular balloting systems performed better or worse under different circumstances (see, for example, Celeste, Thornburgh and Lin eds. 2006; Alvarez and Hall 2008: 156-189; Herrnson *et al* 2008)

Chapter 6. Implications of International Experiences for NSW: Voting and Democracy

The international experiences of electronic voting canvassed in this report suggest two sets of issues for further consideration. The first set is made up of the various effects that electronic voting has on politics, and particularly on democratic participation by voters and candidates for office. The second set of issues concerns the factors that make the adoption or rejection of electronic voting more likely.

At least eight effects on voting and democracy can be identified. The first four have to do with aspects of equality between voters and candidates, the next two with voting as a public and private activity, the seventh with scrutiny of voting administration, and the final one with the timeliness of the result. This chapter explores each of these effects and suggests their implications for New South Wales.

6.1 Equality and Voter Turnout

International Experience

A common hope among legislators who introduce internet voting as a supplement to other forms of voting is that its convenience will lead to increased voter turnout. The same hope is not usually attached to electronic voting machines in polling places. Despite this hope, internet voting does not boost turnout consistently or significantly. Most voters who use the internet would have voted anyway (The Electoral Commission 2002: 33; Norris 2005; Breuer and Trechsel 2006: 10; Trechsel no date: 14-17).

Even if turnout is not raised overall, electronic voting may raise the turnout among particular kinds of voters, affecting the equality of electoral participation across groups. Some critics fear that this effect will increase electoral inequality, since the 'digital divide' may mean that more educated and wealthier voters with greater access to home computers and internet connections will be more over-represented among voters than usual. The survey evidence across a number of countries does show that internet voting is more likely to be used by people who are middle class, educated, urban and male (Solop 2001: 291; The Electoral Commission 2002: 17; Madise, Vinkel and Maaten no date: 31-34; Pullar-Strecker 2008a). These differences disappear once computer literacy is controlled for

(Trechsel no date: 14-17; Breuer and Trechsel 2006: 19-20; Trechsel *et al* 2007: 42-55); however, the point remains that unless successful efforts are made to spread computer literacy more evenly across societies, electronic voting will generally not reduce socio-economic inequalities in electoral participation.

The one exception here is age. Young people tend to be under-represented among electors in general but over-represented among electronic voters, bringing their rates of participation into line with those of older age groups (Solop 2001: 291; The Electoral Commission 2002: 17, 45-6; Christin and Trechsel 2004: 11; Breuer and Trechsel 2006: 19-20; Trechsel *et al* 2007: 42-55; Pullar-Strecker 2008a). This may be an important effect, since comparative research suggests that a key factor in whether voters participate in elections throughout their lives is whether they began voting in early adulthood (Franklin 2004).

Implications for New South Wales

Turnout issues are largely resolved in New South Wales, as in the rest of Australia, by compulsory enrolment and voting, along with associated information and education campaigns. Lower proportions of young Australians vote than older Australians; however, this is largely a result of difficulties getting young Australians to enrol, rather than getting those who are enrolled to vote (see, for example, Edwards 2007). The ease and attractiveness of internet voting is unlikely, in itself, to affect rates of enrolment among young Australians.

Internet voting may increase turnout among voters living far from polling places in rural and remote areas of New South Wales, who currently experience difficulties lodging postal votes due to intermittent mail services. In addition, an increasing number of voters are outside their electorates on polling day (Comm JSCEM 2009b: 173-218). Internet voting, or electronic voting machines programmed to contain the ballot details for any electorate (see Alvarez and Hall 2008: 27), would make it easier for these voters to cast an early or absentee ballot.

6.2 Equality of Voter Information

International Experience

Another dimension of voter equality is the information on which voters base their decisions. Internet voting is typically undertaken over days or weeks. Some commentators argue that because of this, internet voters cast their votes on the basis of incomplete political information (Norman Ornstein, cited in Alvarez

and Hall 2004: 112). Internet voters cannot, for example, respond to a damaging fact about a candidate or party revealed in the last day of a campaign.

Several points can be made about these observations. First, they do not apply where all or almost all voting takes place using electronic voting machines on a single polling day (as, for example, in Brazil). Second, in some electoral systems, such as India, voting already occurred over a period of weeks before the introduction of electronic voting. Third, even in non-electronic systems in which many people vote on one day, significant groups have often already cast their votes by post.

Fourth, the evidence from Estonia and Switzerland suggests that most internet voters are unconcerned about this issue, since they vote well ahead of the electronic voting deadline, rather than waiting until the last possible hour in case of late campaign developments (Christin and Trechsel 2004: 19; Madise, Vinkel and Maaten no date: 38-9; Estonian National Electoral Committee 2007). Fifth, failsafe mechanisms can be built into internet voting in case of decisive last-minute revelations. The Estonian system, for example, allows voters to cast a paper ballot on polling day that over-rides their earlier internet vote.

Implications for New South Wales

Compared with some other countries discussed in this report, New South Wales has a strong tradition of voting on a single polling day. At the same time, a growing minority of Australians cast their votes by post or at early voting polling places before polling day. At the 2007 Federal Election, for example, 13.68 percent of voters did so, mostly by postal voting. New South Wales voters (13.36 percent) were close to the national average (AEC 2008; see also Comm JSCEM 2009b: 183). Survey research shows that Australian political culture is marked by relatively strong voter loyalty to a particular party. Although this party identification has weakened in recent years, its continuing presence means that most Australians know how they will vote well before polling day (Smith 2001: 46-71).

These factors suggest that the opportunity to vote via the internet for a period before polling day would be well received by a significant minority of New South Wales voters and would have minimal effects on election outcomes. Due to its speed, internet voting may in fact give some voters, particularly those in rural and remote New South Wales, more time than they currently have to consider and lodge their votes.

6.3 Equality of Recording Voters' Intentions

International Experience

A third area of equality concerns the ability of voters to have their intentions accurately recorded on the ballot. The two significant problems here are voters who unintentionally cast informal votes and voters who cast a vote for candidates or parties other than the ones for whom they intended to vote. Wherever these problems occur, they are important for democracy; however, they become more serious if they systematically affect the votes of particular groups of voters. In the United States, for example, they are more likely to occur among rural, African-American, less educated and poorer voters (Stewart 2004).

International research shows that these problems occur with all types of ballot systems; however, some ballot systems seem to work better than others. Moreover, some versions of every particular ballot system—paper, paper scan, electronic, and so on—seem to work better than other versions of that system. Ballot design is important for voter equality.

Almost all of the research on these problems comes from the United States, where it was spurred by the 2000 election fiasco. The research shows that electronic voting machines do reduce voter errors compared with paper ballots, punch cards and lever machines. Optically scanned paper ballots tend to perform as well as, if not better than, electronic voting machines in reducing voter errors (Stewart 2004; Ansolabehere and Stewart 2005; Alvarez and Hall 2008; Hall 2009a).

Experimental testing of electronic voting machines with samples of voters, followed up with questionnaires and interviews, show that the physical design of electronic voting machines and the presentation of the ballot on the machines affect the number of errors made by voters. The design of some machines, for example, makes it more difficult for voters to change a voting decision, or to recognise that their vote has been finalised. Machines can incorporate features such as zooming, 'fish-eye' presentation, or audio confirmation, which help older and vision-impaired citizens to vote more accurately. Interestingly, adding a paper record to electronic voting machines may not add to the accuracy of voting. Overall, electronic voting machines appear to perform very well in accurately recording the intentions of voters (Herrnson *et al* 2008).

Implications for New South Wales

The complexity of preferential ballots used in Australia, including the optional preferential ballots used in New South Wales, has long presented problems for voter equality. Australian ballots are mostly more complex than those of the international comparators discussed above, which often require voters to indicate a single choice. Although United States ballots typically use first-past-the-post voting, they are arguably more complex than Australian ballots, or as complex in different ways. This is because United States elections typically require voters to indicate choices in simultaneous contests for a wide range of different government offices and referendum propositions.

Australia lacks the type of research conducted in the United States; however, analysis of New South Wales informal voting suggests similar patterns of voter inaccuracy to those in America. It is higher among voters who are poorer, less educated and from non-English speaking backgrounds. Informal voting also increases with the number of candidates and where different voting methods are used for different houses (see, for example, Green 2008). Measures to simplify ballots to reduce informal votes, such as voting 'above the line' in proportional representation contests, mean that many voters effectively surrender control over the direction of their vote to political parties (C. Hughes 2001: 149; also 156).

Electronic voting could play a role in reducing these problems and producing greater voter equality in New South Wales. Electronic voting machines and internet voting systems can both be designed to cope with the complexity of New South Wales ballots. They can be designed to warn voters when they have not filled out a ballot formally. They can be designed to show voters the flow of their preferences, even when voters choose to vote 'above the line'. They can require voters to review their choices and confirm them before final submission of their ballots. They can present instructions in a number of languages. They can be designed to help voters with disabilities cast and review their votes more accurately. Most of these features have been included in the Australian Capital Territory's electronic voting system (ACT Electoral Commission no date).

To ensure voting equality, electronic voting machines should allow voters to cast a deliberately informal vote with the same level of secrecy as casting a formal vote. In Brazil, where voting is compulsory for most voters, a simple method of deliberately voting informal is allowed by the electronic voting machines (see 3.1 above). The same is true in Australia of the ACT's electronic voting system (ACT Electoral Commission 2002: 10). One of the criticisms of the abandoned Irish

voting machines was that voters could not cast an informal vote on them without getting polling officials to submit their vote (Commission on Electronic Voting 2004: 68-69).

6.4 Equality between Candidates

International Experience

This issue relates to the previous one. The way candidates are presented in any ballot system may advantage some and disadvantage others. Electronic ballots are no different in this regard. Some international electoral systems deliberately repeat inequalities in their paper ballots on their electronic ballots. In the Netherlands, for example, parties were presented in the order of their past parliamentary strength, from strongest to weakest, on both paper and electronic ballots (OSCE/ODIHR 2007a: 8).

The international research into the effects of electronic ballot design on candidate equality is patchy; however, some anomalies in United States electoral results have been attributed to electronic ballot design that disadvantaged particular candidates (Herrnson *et al* 2008: 137-139; Alvarez and Hall 2008: 27). Analysis of Estonian election results, comparing internet with postal and polling place voting, indicates no bias in internet voting towards parties of the right or the left (Alvarez, Hall and Trechsel 2009: 501-2).

Implications for New South Wales

This is likely to be a contentious aspect of any move to electronic voting in New South Wales, since parties and candidates are sensitive to perceived electoral disadvantages. The available Australian evidence, from ACT Legislative Assembly elections, suggests that a party's position on the electronic ballot does not influence the size of its vote (ACT Electoral Commission 2002: 11-12). Electronic voting has the potential to make the resolution of some problems of candidate inequality easier for electoral administrators. Features used to minimise the effect of 'donkey voting', such as the 'Robson rotation' of the order of candidates, can be built into electronic ballots more easily than into the production of printed ballot papers (P. Green 2000; Hughes 2001: 150).

6.5 Voting as a Public Event

International Experience

The idea that voting should involve the public act of attending a polling place retains an attraction for some people. Electronic voting at polling places is still public in this sense; however, internet or mobile phone voting from an office, home or car is not. An American study suggests that this loss of the public dimension of voting disturbs some people, although they find it hard to explain why (Stromer-Galley 2003). Another American study has suggested reviving festivals on polling days, finding that public festivities boost voter turnout (Addonizio, Green and Glaser 2007).

Against these arguments, Thad E. Hall has noted that voting in the United States is increasingly a private affair. In 2008, for example, 37 percent of American votes were cast before polling day, half of them via mail (Hall 2009: 1). A number of European countries, including those that have moved to internet voting, seem comfortable with private voting by post over time in addition to public voting on one day (see 3.3 above).

Implications for New South Wales

In New South Wales, voting is predominantly still perceived as a public event. James Warden, citing the novelist David Malouf, describes Australian elections as '...a genuine but unrecognised national festival of colourful, ardent, yet peaceful activity centred on the act of citizenship, sustained by cups of tea, cake stalls, and school fetes, culminating in the excitement of the race call' (Warden 1998: 211). On the other hand, as noted earlier (see 6.2), increasing numbers of New South Wales voters are opting out of the election festival or are unable to participate in it. The introduction of electronic voting at polling places would not increase this trend but internet voting almost certainly would. Change from public event to private voting is likely to continue to be gradual, rather than dramatic. It may also be less noticed now than in the past, since Saturday has become a full or half day off paid work for fewer workers.

6.6 Voting as a Private Activity

International Experiences

The *physical* privacy of the act of electronic voting has been relatively easily achieved in countries as diverse as Brazil, India and the United States through placing the machines in voting booths, kiosks or curtained areas (see YouTube 2008; YouTube 2009; Pew Center on the States 2008). Ensuring the *electronic* privacy of the vote has caused separate concerns. Electronic voting in the Netherlands was terminated partly because the We Do Not Trust Voting Machines group proved that it was possible to use fairly basic scanning equipment to identify how someone had voted on Nedap machines from a distance of 30 metres (Wij Vertrouwen Stemcomputers Niet 2006; Loeber 2008). In a similar way, the fear that votes could be traced electronically back to specific individuals underlies some American opposition to remote internet voting (Alvarez and Hall 2004: 89-90, 111).

Some countries have voting traditions that reduce the likelihood of remote internet voting ensuring a privately cast vote. The practice of 'family voting', in which members of a family vote together for the same party or candidate, is one such tradition. Privacy for individuals wishing to vote against their family's wishes is harder to ensure on a computer at home than at a polling place. That was one reason why Estonian legislators allowed voters to over-ride their electronic vote at a polling place (Garrone 2005: 116-117; Breuer and Trechsel 2006: 23).

Another concern related to the privacy of internet voting is the possibility of increased voter fraud. Because internet voting occurs in a more private context than voting at a polling place, the risk of detection is lessened. Critics of these concerns make three points. First, in this regard, internet voting is similar to already accepted forms of remote voting, such as postal voting (Alvarez and Hall 2004: 76-123; Alvarez and Hall 2008: 84-89). Second, internet voting systems can be made secure while retaining privacy through the use of electronic signatures, as occurs in Estonia (Estonian National Electoral Committee 2005). Third, there has been no evidence of increased voter fraud where internet voting has been employed, such as in the United Kingdom pilots or in Estonia (The Electoral Council 2002: 35; OSCE/ODIHR 2007: 24).

Electronic voting also increases the privacy of voting for some groups of voters who previously could vote only by revealing their preferences to others. Trials

of electronic voting in the United Kingdom, for example, were welcomed by blind and vision-impaired voters, who were able to use the technology to vote directly (The Electoral Commission 2002: 63-64). Since 2002, polling places across the United States have expanded the use of electronic voting technology to provide a voting experience for people with disabilities that equals the privacy experienced by other voters (Pew Center on the States 2008).

Implications for New South Wales

Any expansion of electronic voting in New South Wales would require privacy issues to be adequately addressed. Physical privacy for voters using electronic voting machines at polling places would be little more difficult to arrange than for voters using paper ballots. The privacy of remote access internet voting is more difficult to ensure, since it is unsupervised. Commentators often argue that the public nature of voting in Australia helps to guard against electoral fraud (see, for example, Hughes 2001: 150-1). Moreover, the abandonment of the Australia Card proposal in the 1980s (see Hughes 2001: 155) means that Australia lacks the kind of identity card system used to help protect the on-line privacy of voters in Estonia.

On the other hand, New South Wales has strong traditions of individual voting and little evidence of fraud in government elections. Although allegations of electoral fraud are regularly made in Australia (see, for example, McGrath 2001; McGrath 2003), they lack substance (see, for example, Hughes 1998; Hughes and Costar 2006). Little or no fraud has been uncovered in the use of postal voting for government elections. The review of the 2007 Federal Election by the Joint Standing Committee on Electoral Matters recommended several measures to make voting by post easier (Comm JSCEM 2009b: 76, 80). The direction of Australian reforms seems to be to allow Australians to protect the privacy of their own remote votes.

Finally, the limited trials of electronic voting at the 2007 Federal Election were praised by blind and sight-impaired Australians, who welcomed the independence and privacy provided by electronic voting. About 300,000 Australians are sight-impaired and 20,000 are totally blind (HREOC 2008: 9). Of the 13 individual submissions and eight organisational submissions made to the Joint Standing Committee on Electoral Matters regarding the 2007 trials, only one (from the Royal Society for the Blind of South Australia) suggested a preference for remote internet voting over electronic voting at polling places (see Comm JSCEM 2008; see also NSW JSCEM 2008: 37-42).

6.7 Scrutiny of Vote Handling and Counting

International Experience

One of the main criticisms of electronic voting—whether by electronic voting machines or remote access internet connection—is that it is impossible to scrutinise or audit votes when they are processed and counted by computers. This is important for democracy because the results of elections need to be accurately determined and shown to be accurately determined in case of challenge. Election outcomes ought not to be affected by counting errors or fraudulent counting.

Much of the international debate on electronic voting centres on the possibilities of counting problems caused by programming errors or by malicious computer hacking. Computer systems are ‘black boxes’ that do not allow for external scrutiny. If computer programs produce errors, no amount of electronic recounting will leave anyone the wiser (see, for example, Open Rights Group 2007; Mercuri 2007).

Of course, voters cannot follow the progress of their individual votes in paper-based systems to ensure that they are handled and counted properly. Instead, they rely on two elements to ensure that their vote is counted; first, a process of handling and counting ballots that is open to independent observation; and second, the careful storage of paper ballots that can be recounted if necessary. These elements are not always in place in electoral systems using paper ballots, which can be lost, stolen or destroyed (Electoral Commission 2002: 5); however, they set the standard against which electronic vote handling is often judged.

The weight placed on this standard varies from country to country. In Estonia, the administration and count of the internet vote was open to observers; however, no representatives of political parties or other non-government organisations bothered to attend (OSCE/ODIHR 2007: 19-20). The OSCE/ODIHR report on the 2007 Estonian election noted the risk of ‘external attacks or internal malfeasance’ in the system of internet vote administration and recommended that Estonian authorities ‘reconsider’ its use (OSCE/ODIHR 2007: 1-2). The Estonian Government has not taken up this recommendation.

At the other extreme, the Netherlands Government abandoned electronic voting as soon as serious potential flaws in the Dutch system of handling and counting

electronic votes were exposed, rather than looking for solutions. In the United Kingdom, political parties generally supported electronic voting pilots but were concerned about the 'loss of transparency' in handling electronic votes (Electoral Commission 2002: 6; 68-69). In the United States, the strong push for electronic voting with voter verifiable paper audit trails (VVPAT) has gained ground because of a fear of electronic votes being miscounted. Although VVPAT systems have problems of their own and are not the only way to improve electronic vote counting (Alvarez and Hall 2009; 48-49), they offer the promise of a physical recount if errors or fraud are suspected in the electronic count (see, for example, Moynihan 2004).

Implications for New South Wales

New South Wales, like other Australian jurisdictions, has a strong tradition of scrutiny of paper ballot counts, particularly by the major parties (Hughes 2001: 153). Recounts of paper ballots allow for the results of close contests to be verified (Hughes 2001: 152-3). In this sense, New South Wales is likely to be closer to the United States, the United Kingdom and the Netherlands than to Estonia. On the other hand, proportional representation ballots, such as those used for the NSW Legislative Council, are notoriously difficult to count manually. The move to electronic voting (without VVPAT) in the ACT was prompted partly by manual counting errors. The ACT system also includes methods for electronic recounting of votes that are viewed as satisfactory alternatives to paper recounting (ACT Electoral Commission 2002: 20).

6.8 Timely Determination of the Result

International Experience

Slow counting of votes following an election can lead to uncertainty and confusion among political parties and the wider public, particularly in close contests. Where electronic voting is widely or universally used, the results of elections can be quickly determined. Brazil, with over 100 million voters, produces election results in two hours. In India, with over 400 million voters, results were known within one day. Estonian results are known within one hour of the close of polls. Electronic voting also produced quick results for the multi-party Dutch elections.

Implications for New South Wales

Elections in New South Wales sometimes produce very close results. The results of the 1976, 1991 and 1995 state elections were not clear for some days, leading to uncertainty about the composition of the government and the conditions under which it would govern. NSW Legislative Council elections, like elections using proportional representation in other Australian jurisdictions, often require a count lasting weeks. Electronic voting would reduce these problems; however, they would do so only if all or almost all votes were cast electronically (P. Green 2000: 104-105).

Chapter 7. Implications of International Experiences for NSW: Why is Electronic Voting Adopted or Rejected?

The survey of countries in Chapters 2 to 5 indicates that eight factors encourage or inhibit the adoption of electronic voting. The first three are patterns of elite, interest group and mass support. The next two relate to the use of information technology in everyday life and in other aspects of elections. The sixth is the capacity of electoral administrators. The seventh is the relationship between electronic voting and existing modes of voting. The last is the staged introduction of electronic voting. This chapter explores each of these factors and suggests their implications for the possibility of electronic voting in New South Wales.

7.1 Elite Level Political Support

International Experience

Government elites often associate the introduction of electronic voting with attempts to project their countries as dynamic and modernising. If other areas of life in these countries are undergoing technological transformation, then why not voting? Irish Prime Minister Bertie Ahern, for example, proclaimed in 2006 that his country would be a 'laughing stock' if it did not abandon voting with 'stupid old [old] pencils' in favour of e-voting (Seaver 2009). A few years earlier, the Brazilian Ambassador to Australia, Antonio Dayrell de Lima, contrasted Brazil's new voting technology with the 'medieval' technologies used in parts of the United States (quoted in Gose 2002). India, Estonia and the United Kingdom are other cases where the projected link between electronic voting and more general modernisation has been strong (see 3.2, 3.4 and 4.3). As the Irish and United Kingdom examples suggest, however, the modernising ambitions of governments are not enough to guarantee the successful introduction of electronic voting.

The United States experience suggests that the introduction of electronic voting is made more difficult where pre-existing electoral issues sharply divide governing elites along partisan lines. In the aftermath of the 2000 election, Democrats associated the use of electronic voting machines with Republican electoral advantage, helping to undermine trust in the technology and the outcomes of elections in which it was used (Hall 2009b).

Implications for New South Wales

The ACT's adoption of electronic voting may be an example of political elites projecting a modernising image, in this case after the granting of self-government (*The Canberra Times* 2009). Governments in jurisdictions such as New South Wales have shown little serious interest in electronic voting, even where they have projected their aspirations in terms such as 'the clever state' (see, for example, Rees 2009). None of the political parties who made submissions to the Commonwealth Parliament's JSCEM inquiry into the 2007 Federal Election (including the Labor Party, the Liberal Party, the National Party, the Greens Party and the Australian Democrats) raised the issue of electronic voting (see Comm JSCEM 2008). In New South Wales, the National Party supported internet voting in 2008 as a means of allowing remote and rural voters to vote easily (NSW JSCEM 2008: 42-43).

It is unclear how much elite political support for electronic voting might emerge in Australia and how it might divide political elites along partisan or other lines. Cost seemed to be the major factor behind the JSCEM's 2009 recommendation to end electronic voting trials for sight-impaired voters and military personnel (Comm JSCEM 2009b).

7.2 Patterns of Interest Group Activity

International Experience

The course of electronic voting in different countries has been affected by the activities of interest groups. The two conflicting sets of groups that tend to dominate interactions over electronic voting are the producers of electronic voting software and hardware and independent experts in computer science and information technology. Where these two groups dominate, debate over electronic voting becomes reduced to debate over issues of risk in the technology. Their positions become entrenched, with producer groups promoting their products and their technical critics focusing in a highly selective way on examples of electronic voting failure. This pattern can be found in the United States, Ireland, the Netherlands and the United Kingdom.

A third set of interest groups that sometimes gains purchase in policy debates are those representing people with disabilities such as blindness and sight impairment, who tend to support the introduction of electronic voting. With a few exceptions, political science-based groups, including those with expertise in

elections, e-government and on-line citizenship, have tended to ignore the debates on electronic voting (see, for example, the lack of attention given to the issue in major publications on electoral administration by the Stockholm-based International Institute for Democracy and Electoral Assistance, such as Reynolds *et al* 2005; Ellis *et al* 2006).

Activity by Interest Groups: Implications for New South Wales

Emerging evidence, such as that provided by the submissions to the Commonwealth Parliament's JSCEM inquiry into the 2007 Federal Election, suggests that a similar pattern of interest group activity and policy debate around electronic voting may develop in New South Wales. Software and hardware providers (Software Improvements, Registries Ltd and Everyone Counts Inc., which provided the technology for the 2007 ADF trial) presented positive views in submissions to the Commonwealth Parliament's JSCEM, while two academic computer scientists (Computing Research and Education Association of Australia; Roland Wen, School of Computer Science and Engineering, University of New South Wales), took a more sceptical view, based on some of the same examples and evidence as used in overseas debates.

Advocacy groups for blind and sight-impaired Australians made a number of submissions favourable to electronic voting to the Commonwealth Parliament's JSCEM inquiry (see Comm JSCEM 2008). Similar groups also gave evidence favouring electronic voting to the NSW Parliament's JSCEM inquiry into the 2007 New South Wales election (NSW JSCEM 2008: 42-43).

Political scientists and political activists ignored electronic voting in their submissions to the Commonwealth Parliament's JSCEM inquiry. The university-based Democratic Audit of Australia and the activist group Get Up! both raised the use of computer technology for other electoral purposes, such as maintaining rolls and the disclosure of donations and funding, but neither mentioned electronic voting (see Comm JSCEM 2008).

7.3 Mass Support

International Experience

Ultimately, the success of electronic voting relies on convincing people to take it up. The evidence on mass attitudes towards electronic voting is patchy but generally positive. In Estonia and Switzerland, where internet voting has been

available for around five years, willingness to vote remotely using the internet has been confined to a minority of voters, although it is a growing minority in Estonia and a solid one-fifth to one-quarter of the electorate in parts of Switzerland (see 3.3 and 3.4).

Surveys in Canada, New Zealand and the United Kingdom all suggest that reasonably large minorities of voters would take up internet voting in those jurisdictions (KPMG/Sussex Circle 1998: 30-32; The Electoral Commission 2002: 17; Pullar-Strecker 2008a; Pullar-Strecker 2008b). In the United States, where electronic voting has proved controversial, public preferences for paper versus electronic ballots are evenly divided (51 versus 46 percent in 2005) (Alvarez and Hall 2008: 142). In Estonia and Switzerland, the legitimacy of internet voting is widely accepted, whether or not people use it themselves. Around three-quarters of those surveyed in a 2004 Swiss study were favourable to internet voting supplementing other methods, as were two-thirds to three-quarters of Estonians in 2004 and 2005 (Christin and Trechsel 2004: 21-23; Madise, Vinkel and Maaten no date: 29-30).

It is impossible to be certain that these figures will increase in future, or by how much. Nonetheless, since the use of, and support for, internet voting is positively associated with general computer and internet use, and general computer and internet use is increasing in most societies, it is reasonable to expect that mass support for internet voting will increase.

Implications for New South Wales

Almost no research has been conducted on mass attitudes to internet voting anywhere in Australia. The one piece of evidence comes from a 2005 survey on the use of the internet for political purposes among Australian voters (Gibson, Lusoli and Ward 2008). This study found that voting at federal elections was the most unpopular of seven potential political uses for the internet, with 45 percent wanting to see this happen. Having the opportunity for on-line comment to parliamentarians on legislation (74 percent) and on-line access to all government services (76 percent) were the most popular ideas (Gibson, Lusoli and Ward 2008: 122).

Three comments can be made about this finding. First, the wording of the survey item ('Having voting in federal elections via the internet') may well have been interpreted by respondents to mean that internet voting would be compulsory, rather than an option (see ACSPRI Australian National University

2005: 7). Second, the more popular options already exist in large part, whereas internet voting remains an idea for the future. Familiarity may be the main difference in responses here. Third, bearing in mind the first two comments, 45 percent represents fairly good baseline support for internet voting in Australia. More extensive research on public attitudes to electronic voting would be an important early step in any move for its introduction in New South Wales.

Table 5 summarises the pattern of coverage of news items and opinion pieces on electronic voting in major Australian metropolitan newspapers between 2000 and 2009.

Table 5. Australian Newspaper Coverage of Electronic Voting, 2000-2009

Year	Number of articles	Articles about Australia (Jurisdiction most often mentioned in brackets)	Articles about other countries (Country most often mentioned in brackets)	Articles in Sydney newspapers
2000	24	16 (10 ACT)	8 (6 USA)	4 (3 DT; 1 SMH)
2001	37	33 (29 ACT)	4 (1 Estonia; 3 general)	1 (1 SMH)
2002	18	14 (5 ACT)	4 (2 UK)	1 (1 SMH)
2003	7	5 (2 ACT)	2 (1 USA; 1 Brazil)	0
2004	54	27 (16 ACT)	27 (20 USA; 6 India)	9 (9 SMH)
2005	24	20 (5 ACT)	4 (3 USA)	3 (2 DT; 1 SMH)
2006	27	19 (7 Vic)	8 (6 USA)	2 (1 DT; 1 SMH)
2007	20	15 (13 Commonwealth)	5 (1 each for UK, New Zealand, South Africa, Fiji and Bhutan)	2 (2 SMH)
2008	18	8 (6 ACT)	10 (5 USA; 5 New Zealand)	2 (2 SMH)
2009*	13	1 (1 Commonwealth)	12 (12 India)	1 (1 SMH)
Total	242	158 (73 ACT)	84 (41 USA)	24 (18 SMH; 6 DT)

*January to June only.

Source: Factiva.com search of articles and opinion pieces in major Australian national and metropolitan newspapers containing the terms 'electronic vote', 'electronic voting', 'e-vote', 'e-voting', 'internet vote', 'internet voting', 'i-vote', or 'i-voting' in the context of government elections

The table reveals two points. First, there has been very little Australian newspaper coverage and discussion about electronic voting. On average, only 25 items per year have been published *across all Australian newspapers* in a nine and a half year period. The final column on Table 5 shows that only 24 articles on electronic voting, or just 2.5 per year, have appeared in the major Sydney newspapers, *The Sydney Morning Herald* and *The Daily Telegraph*.

Second, and perhaps more surprisingly, newspaper coverage has not been dominated by controversies from the United States. Two-thirds of the items (65 percent) focus on Australia, with nearly a third (30 percent) covering the ACT, mostly in a neutral or positive way. The United States was the most common focus in coverage of international experiences of electronic voting, particularly during its period of electoral rancour in 2004; however, the more positive experience of Indian electronic voting also received comparatively extensive coverage, particularly in 2009.

These patterns of news coverage suggest that most Australian voters have not yet had the chance to develop firm views about electronic voting. Legislators who wish to initiate public discussion of internet voting in New South Wales, or indeed in any Australian jurisdictions other than the ACT, will not be doing so against a background of informed or entrenched public opinion.

7.4 Computers and the Internet in Everyday Life

International Experience

The extent to which adoption of electronic voting is perceived by voters as a natural step partly relates to the availability and use of computers and the internet more generally in society. This seems to be particularly true of internet voting. Remote internet voting leaves voters more reliant on their own resources and capabilities than does supervised voting at polling places where electronic voting machines are provided. Although the technology necessary for internet voting can be provided publicly in places such as libraries; however, the Swiss and Estonian experiences show that internet voters overwhelmingly vote from their home computers (Trechsel et al 2007: 28).

Further, the major underlying difference between voters who choose to vote on the internet and those who choose paper-based voting is familiarity with information technology. People who use computers in their everyday lives and feel confident using them are more likely than others to vote via the internet

(Christin and Trechsel 2004: 21-23). Internet voters are also more likely than other voters to use the internet for other political purposes, such as finding political information and downloading government forms (Trechsel et al 2007: 20-23; Alvarez, Hall and Trechsel 2009: 502-3).

Implications for New South Wales

The rates of domestic internet access in New South Wales, as in the rest of Australia, are growing and are comparatively high by international standards. In 2006, 64 percent of New South Wales households had internet access and around two-thirds of those had broadband access. On the whole, Australians have high rates of internet use for communication, shopping, education, and business. Internet usage varies with factors such as age and location but a majority of all but the oldest (65 years and over) and most geographically remote Australians have internet access (Australian Bureau of Statistics 2008a; Australian Bureau of Statistics 2008b).

By international standards, Australians are also comparatively experienced in using the internet for a range of interactions with government agencies and political processes (Dunleavy *et al* 2008; Gibson, Lusoli and Ward 2008). Moreover, internet voting is increasingly used for elections by a wide range of Australian business and non-government organisations (see, for example, Durkin 2007). The 2001 NRMA board election was one of the earliest uses of electronic voting for a large Australian organisation (A. Hughes 2001).

These features of internet use suggest that any move to internet voting in New South Wales would be matched by a competent and receptive segment within the wider electorate.

7.5 Information Technology and Elections in General

International Experience

The introduction of electronic voting is sometimes seen as integrating the act of voting and the counting of votes with other aspects of elections that are already administered using information technology (see, for example, P. Green 2000: 102). These aspects include voter enrolment, maintenance of electoral rolls, handling of voter inquiries, drawing of electoral boundaries, candidate nomination, applications for postal ballots, counting of electronically scanned ballots and announcement of election results. For all of the countries examined

in this report, electronic voting was an element of a wider and sometimes longer-term shift towards electronic electoral administration (see, for example, Alvarez and Hall 2008: 8).

At the same time, international experience shows that the use of information technology in more and more areas of electoral administration does not necessarily lead to the adoption of electronic voting. The United Kingdom, Canada and New Zealand are three cases where electronic voting has not been adopted, despite electoral authorities moving to increased use of information technology for other electoral tasks.

Implications for New South Wales

New South Wales electoral administration has seen increased use of information technology, more or less in line with other Australian jurisdictions. As the evidence presented in this report suggests, however, decisions about whether or not to adopt electronic voting are not ones that have been determined by a desire for technical integration of electoral administration.

7.6 The Capacity of Electoral Administrators

International Experience

Another factor, closely related to the previous one, is the demonstrated technical competence of electoral authorities. One of the major concerns expressed about electronic voting is that it transfers control over voting from public electoral authorities to private companies who manufacture voting machines and provide voting software. Some critics argue that these technology companies will have political interests of own. Even in the absence of such interests, some critics fear that electoral authorities will be unable to understand properly electronic voting processes and to respond to problems effectively (Moynihan 2004). Examples such as Quebec and the Netherlands provide grist for this mill (see above).

On a less dramatic level, the electronic voting experience of individual voters at polling places is affected by the number of functioning electronic voting machines available and the number, knowledge and skills of electoral officials on hand (Selker 2004; Hall 2009a). A large number of small but negative incidents may have just as much impact on perceptions of electronic voting as a large negative incident.

The broad point here is that the success of any transition to electronic voting is affected by the technical resources and competence of electoral authorities. In some cases, such as India, authorities have been able to illustrate this competence by their control over the development of hardware or software (see 3.2). In other cases, such as the United Kingdom and United States (see 4.3 and 5.3), the introduction of electronic voting has been compromised by poorly trained electoral personnel using commercially provided technology that they did not properly understand.

Implications for New South Wales

The NSW Electoral Commission is widely seen as a professional and highly competent body. The 2008 comments of the NSW Joint Standing Committee on Electoral Matters are typical in this regard:

The general consensus among stakeholders and Inquiry respondents was that the NSWEC's administration of the 2007 NSW election was competent and professional. No significant problems were raised with the Committee in relation to the conduct of the election, which overall appears to have run smoothly. (NSW JSCEM 2008: 4)

Any move to electronic voting in New South Wales would need to be undertaken in such a way as to preserve the Electoral Commission's high reputation. Electoral officials would have to demonstrate at least as sound a level of understanding and oversight of electronic voting as they do for other forms of ballots. This would require the development of new resources, provision of training for existing personnel, the employment of technical experts with relevant expertise and sufficient lead-time for personnel to gain familiarity with new voting technology.

7.7 Similarities between Electronic Voting and Existing Modes of Voting

International Experience

International experience suggests that similarities between paper voting and electronic voting may make a transition to electronic voting seem more natural for voters. Thus, for example, internet voting shares two important features with postal voting. The first is that voting takes place remotely, in the absence of polling officials. The second is that voters are free to vote over a period of days, rather than on a single polling day (Alvarez, Hall and Trechsel 2009: 497).

In electoral systems where large numbers of people already cast postal votes, internet voting may not seem a major step. The Swiss, for example, view internet voting as a fairly straightforward extension of postal voting (State of Geneva 2009), a view that is shared in some American states that have not introduced internet voting but which rely heavily on postal voting (Ammons 2006). Estonian electoral authorities explicitly compare their system of encrypted internet voting with the double envelope system used to ensure the privacy of postal votes (National Election Committee 2005: 8; Madise, Vinkel and Maaten no date: 22-3).

Familiarity may also partly or completely inhibit any shift to electronic voting. The familiarity of seeing a paper ballot seems to underlie the preference of some United States voters for electronic voting machines that produce a paper record over those that do not (Hernnson *et al* 2008).

Implications for New South Wales

The introduction of electronic voting would inevitably involve novelty and unfamiliarity for many New South Wales voters. At the same time, electronic voting machine ballot displays that mimic key elements of paper ballots have been successfully introduced in the ACT (ACT Electoral Commission no date). Moreover, the increased use of postal votes (see 6.2 and 6.6) means that some elements of internet voting (remote access, voting before polling day and the need for security measures) will be familiar to growing numbers of New South Wales voters.

7.8 Introduction of Electronic Voting in Stages

International Experience

Electronic voting has never been introduced in one stage. Even where it has been introduced more or less universally in under a decade, as in India and Brazil (see 3.1 and 3.2), electronic voting has begun with small pilots and then been expanded.

The important steps in this process involve initial publicity and education programs, small pilots with defined groups of voters, careful technical and political science research and feedback on the pilots, gaining the support of key stakeholders, and the progressive expansion of the number of voters for whom electronic voting is available. The point at which this expansion ends is normally

the point at which all voters in a jurisdiction are either required to vote electronically, or have the option to vote electronically. Voting with electronic voting machines allows for universal electronic voting (Brazil, India, some states in America); voting via the internet realistically means that electronic voting must remain optional (Estonia, cantons in Switzerland) (see also Trechsel, Mendez and Kies 2003: 10; Buchsbaum 2004: 40-41).

The international evidence suggests two traps in this process. One is government moving too fast from the initial electronic voting pilots to the ultimately wasteful purchasing of technically and politically deficient technology (the Irish or Dutch trap). The other is lost momentum, in which successful pilots do not lead to the expansion of electronic voting but become increasingly pointless ends in themselves (the United Kingdom trap).

Implications for New South Wales

If a decision were made to trial electronic voting, New South Wales would be well placed to act on such a decision. The NSW Electoral Commission could oversee the relevant publicity, education and technical elements. There are a number of possible options for initial controlled electronic voting pilots (for example, among voters in a by-election whose outcome will not affect the composition of the government, pre-registered voters in a small number of localities, pre-registered voters absent from their electorates on polling day, or pre-registered voters with disabilities).

Relevant expertise for political science and information technology research on these electronic voting pilots exists in the state's universities. Some key stakeholders, such as disability groups and the National Party, have already shown an interest in electronic voting trials. Computer and internet use are widespread in the community. This report suggests that the basic elements that have been used to test the feasibility of electronic voting internationally would be available in New South Wales.

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