Appendix 2L

Comparison of Electronic Voting and Paper Voting in Ireland

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1 Introduction: Baseline - paper voting and electronic voting compared

Whether electronic voting would mark an improvement or a disimprovement (by whatever criteria we decide to apply) depends, of course, on how it compares with the status quo. It needs to be assessed not only against a flaw-free system of voting – though this must always be the objective aimed at – but also against the present reality.

2 Procedures for voting and vote counting

2.1 Paper ballots

At present, procedures for voting at general elections are as follows (the source for this section is Department of the Environment and Local Government, 2000). Virtually all voters vote by presenting themselves at a designated polling station in their constituency – there are around 6,000 polling stations nationally. Upon arriving at the polling station, the voter is given a ballot paper, stamped with the official mark. The elector votes by writing '1' (and, if desired, '2', '3', etc) besides the names of candidates, in order of the voter's preference. The voter folds the ballot paper to conceal the way it has been filled in, and places it in a sealed ballot box. (The details of voting in other contests – presidential elections, local elections, European Parliament elections, and referendums – are essentially the same.)

At the close of polling, the ballot boxes are sealed and are sent to the returning officer for the constituency, along with a statement of the number of ballot papers issued at the polling station. The ballot boxes are stored overnight and are opened at 9 am the following day. The number of papers in each box is compared with the number of papers issued, and any discrepancy is 'reviewed' by the returning officer. The first stage of the count is the examination of each paper to ascertain its validity. Doubtful ballot papers – ones that might be considered to be spoiled votes – are adjudicated upon by the returning officer. The ballot papers are then mixed and counting begins.

Sometimes, more than one election takes place simultaneously – for example, in June 1999 there was a European Parliament election, a local election, and a referendum all on the same day. Voters were given three ballot papers, of different colours, each of which was placed in the same box. The first stage of the counting of the votes is then the physical separation of the different ballot papers. This can be complicated by the existence of different count centres for the different votes – for example, in 1999 the local election ballot papers were counted at county level while the European Parliament ballot papers were taken to one of the four Euro-constituency count centres.

It should be borne in mind that not all voters vote by physical attendance at the polling station. Some vote by post. There were 15,040 such voters on the 2000 register of electors, of whom almost 11,000 were members of the defence forces, with about 2,000 qualifying for a postal vote because of physical disability, 1,600 as members of the Garda Síochána, and 500 as diplomats or because of some other qualifying occupation. In addition, there are also 'special voters' who because of illness live in hospitals, nursing homes or similar institutions and vote there; there were around 3,000 such electors on the register in 2000.

The envelopes containing the postal and special voters' ballot papers are opened before the counting of votes begins and are placed, without examination, in a separate ballot box. This is opened at the same time as the ballot boxes from the polling stations.

It is worth noting that the process of checking the ballot papers as each successive box is emptied allows 'tallymen' and 'tallywomen' from the political parties to take a record of at least the first preference marked on each paper. This provides information that is very useful for the parties, as they are able to quantify the level of support for each candidate in each polling station. It also provides reassurance that no malpractice has occurred in the casting or counting of votes, as any significant deviation from the expected pattern would immediately be evident.

2.2 Electronic voting

Clearly, the introduction of electronic voting would affect some of the details of this process (taking the computer modules as being analogous to the ballot boxes). The treatment of the computer modules when more than one vote is held on the same day (as will occur in June 2004) needs to be spelled out, especially when the data on these modules are required to be fed into computers in two different locations.

Similarly, the treatment of votes from those who vote by post, or in locations other than the polling station, needs to be clarified. If such votes are cast in paper format and are then 'keyed in' at the count centre, this introduces an obvious source of potential error.

We can identify a number of aspects of the status quo at which to look. We will examine the potential for malpractice, errors in the counting process, invalid votes, uncertainty or inconsistency as between returning officers, and transparency and legitimacy.

3 Malpractice

Before comparing the potential for malpractice under paper and electronic voting, it is worth noting that there are, of course, various kinds of fraud, such as impersonation, that could arise under any system. We will not dwell on the kinds of malpractice whose likelihood of arising would not be materially affected by a switch from paper to electronic voting.

3.1 Paper voting

In theory, a number of types of malpractice are possible under the paper system.

First, in theory a ballot box might be 'stuffed' by the insertion of non-legitimate papers bearing support for a particular candidate. This would, though, be extremely difficult, especially since all the added papers would need to be stamped with the official mark in order to be treated as valid. It could hardly be done while the ballot box was in operation, as this would be noticed by the party agents at the polling station. It could, in theory, be done at some stage between the closing of the polling station and the opening of the ballot boxes in the count centre the next morning. This would, though, require a series of improbable assumptions. It would require the seal on the ballot box to be broken and then re-fixed without this being detectable by anyone else. In addition, the paper recording the number of ballot papers issued would have to be altered, since otherwise this number would be far smaller than the number of papers in the 'stuffed' box – or else the same number of ballot papers already in the box would have to be removed. While this is not a completely impossible scenario, the most relevant fact is that it has never, so far as we know, been alleged or suggested that anything untoward has happened to a ballot box at any election over the past 80 years.

Second, the present system does not make it impossible for voters to be intimidated into casting their vote in a certain way, or for voters to sell their votes. This could be done by one voter going into a polling station, receiving a ballot paper, and then leaving with it (either not putting anything in the ballot box or placing some other piece of paper in the box to give the impression of having used the genuine ballot paper). The blank ballot paper would then be handed to a local political 'boss', who would fill it out and hand it to another voter. This voter would be instructed to take it into the polling station, ask for a ballot paper, go into the private compartment and pretend to fill out the paper, place the paper completed by the 'boss' in the ballot box, and leave with the blank paper, which would be given to the boss for the process to be repeated as often as desired. We are not aware of any allegations that this has ever happened.

3.2 Electronic voting

The scope for malpractice under electronic voting is examined fully elsewhere in this report. It is worth making the point here, though, that the 'paper trail' suggestion – that the machine print a copy of each voter's ballot paper so that the voter can verify that their vote has been recorded as they cast it – would be open to the second problem noted above if the paper copy is given to the voter. The voter could then be vulnerable to being pressured to prove that he or she has voted in a particular way by showing someone the paper record of how they voted.

4 Errors and imprecisions in the counting process

4.1 Paper voting

With a large number of pieces of paper to count, counting errors are almost inevitable. Individual papers may be placed in the wrong candidate's pile, or what is thought to be a bundle of 50 votes may actually contain a few votes more than or less than 50. In most cases this does not make any difference to the outcome, but sometimes it does. This is most evident in very close finishes when recounts are called. Almost invariably, a recount will produce an outcome that is not identical to the original count, either because the counters have made more mistakes, or fewer mistakes, or different mistakes, or because votes that were deemed valid the first time round are now declared to be invalid by the returning officer. Sometimes the recount gives the last seat to a different candidate.

For example, in Cork South-Central at the 2002 election the original count gave the last seat to Kathy Sinnott (Ind) by 3 votes ahead of John Dennehy (FF). The recount gave the seat to Dennehy by 2 votes, and there followed a further recount, with Dennehy finally being declared elected 6 votes ahead of Sinnott. The recounts were still in progress five days after polling day, and both sides brought teams of barristers to the count to scrutinise the votes. Similarly, in the Wicklow constituency the recounting was not over until 25 May, eight days after polling day.

Although it is not exactly an error, it is worth discussing a source of imprecision in the counting process, which arises on the distribution of a surplus. If the number of votes to be transferred is smaller than the 'package' from which the votes are taken, which is always the case with a first count surplus and is often the case with later-count surpluses as well, then there is a need for one of two procedures. Either some selection of ballot papers must be made, or each ballot paper must be transferred at a fraction of its original value. Without going into the full technical details, the basic position is that the latter procedure (known as the 'Gregory method') is preferable and more precise since it avoids the risk that the sample of papers picked for transfer will be atypical of all the papers

from which they were selected. There are indeed several variants of the Gregory method, such as 'inclusive Gregory' and 'weighted inclusive Gregory'.

However, this 'better' procedure is also more complicated, since it requires keeping a record of fractional values, and for this reason it is not employed at Dáil elections (though it is used at Seanad elections and in Northern Ireland). Instead, a sample of papers is chosen, and this raises the possibility that, had a different sample been chosen, the outcomes of some constituency contests over the years might have been different (see Gallagher and Unwin, 1986, for a fuller discussion).

4.2 Electronic voting

Electronic voting – assuming all votes are correctly recorded and counted, issues that are dealt with elsewhere in this report – would eliminate this source of errors and delays in determining the result.

In addition, implementation of one or other variant of the Gregory method, eliminating the element of chance introduced by random selection of papers to transfer, is easy – though, in fact, current regulations will mean that random selection will continue to be used even if electronic voting is employed in June 2004.

5 Invalid votes

5.1 Paper voting

When the ballot boxes are opened at the start of a count the first step is to identify and remove from the count invalid votes. These are often known as 'spoiled votes', though since that term seems to imply a conscious purpose on the part of the voter it is not really applicable to all invalid votes.

Table 1 shows the number of invalid votes at a number of recent contests. It shows that, on average, slightly over 1 per cent of votes cast at general and local elections are invalid. We might expect the figure for referendums to be lower since, after all, the voter is required simply to put an 'X' in one of two boxes in order to cast a valid vote. However, in fact it is higher and, moreover, it varies more. Particularly notable are the high figures for the Amsterdam Treaty referendum in 1998 and the referendum on giving constitutional recognition to local government in 1999.

Table 1: Invalid votes at recent general elections, local elections and referendums

	N	%
General election 1987	16,241	0.9
General election 1989	20,779	1.2
General election 1992	26,498	1.5
General election 1997	17,947	1.0
General election 2002	20,707	1.1
Local election 1985	18,170	1.3
Local election 1991	12,987	0.9
Local election 1999	20,916	1.5

Amsterdam referendum 1998	33,228	3.6
GFA referendum 1998	17,064	1.1
Local government referendum 1999	109,066	7.6
Nice referendum 2001	14,887	1.5
Death penalty referendum 2001	14,480	1.4
ICC referendum 2001	17,819	1.8
Abortion referendum 2002	6,649	0.5
Nice referendum 2002	5,409	0.4

Note: Percentage figures refer to invalid votes as a percentage of all votes cast.

The question of invalid votes has surfaced in the debate over electronic voting. Some argue that there is a right to 'spoil' a ballot paper and that this facility is availed of by a significant number of electors, who will be deprived of this possibility if electronic voting is adopted. (It should be noted that, under current plans, a voter would still be able to leave his or her ballot paper blank – but this will be known to the polling clerk and so the ballot privacy of such voters will be lost.) Others maintain that most invalid votes are invalidated unintentionally and that electronic voting would have the advantage of saving these voters from themselves by making sure that the votes they cast are valid ones.

In order to reach a conclusion on this, we need further information on why invalid votes are deemed to be invalid. Although such data are not published, a record is kept of this information for some contests at least, and this has been made available by the Department of the Environment, Heritage and Local Government (Department of the Environment and Local Government, nd).

Essentially there are four main reasons why a vote might be deemed invalid:

(a) It does not bear the official mark;
(b) It does not bear any clear indication of a first preference for any candidate (or an option at a referendum);
(c) It bears an indication of a first preference for more than one candidate (or an option at a referendum); and
(d) It contains writing or some mark that, in the opinion of the returning officer, is calculated to identify the elector.

Invalid votes in category (a) are, typically, ones that the voter intended to be valid but which are invalidated through forces beyond the voter's control (the exceptions would be the 1 per cent or so that, on the law of averages, would have been deemed invalid anyway for one of the other reasons).

Those in category (b) are typically papers that are left completely blank but are nonetheless put in the ballot box by the voter. These, then, are deliberately left incomplete and hence invalid by the voter – although a few may be invalid because the voter did not know how to indicate a choice for a candidate or an option. This may explain the high number of invalid votes at the Amsterdam (1998) and local government (1999) referendums: in each case, those votes took place on the same day as more high-profile votes (the Good Friday Agreement referendum in 1998 and the local and European Parliament elections in 1999). Some electors who cast a valid vote in the more high profile contest may not have wished to vote in the other one and placed their ballot box in the ballot box unmarked.

Those in category (c) are more difficult to assign. We might assume that, typically, these are votes

that the voter intended to be valid but became invalid because the voter filled in the ballot paper incorrectly, placing a '1' beside the name of more than one candidate or an 'X' beside both options in a referendum. Alternatively, the voter might have marked only one '1' or 'X' but done this carelessly so that it is not unambiguously clear which name or option the mark is intended to be beside. The latter votes are unintentionally invalid, though in the case of those with more than one '1' or 'X' it may be that some are deliberately rendered invalid; at referendums in particular it seems unlikely that any voter would imagine that placing an 'X' beside both options can produce a meaningful vote.

Votes in category (d) can be assumed to be, in the main, ones deliberately made invalid by the voter, typically by writing something. It may be, of course, that some of these votes were intended to be valid ones and that the voter was unaware that their writing or mark(s) would have the effect of rendering the vote invalid.

Table 2 shows the distribution of invalid votes across these categories at some recent elections and referendums. (It is not clear how votes that are invalid for more than one reason are classified; we may assume that there are very few such votes.) It shows that only a small minority of these votes come into category (a) (invalid against the wishes of the voter) or category (d) (nearly all intentionally made invalid by the voter). Over 88 per cent come into category (b) or (c) and as such cannot be unambiguously interpreted as deliberate or accidental invalid votes. We suggested above, though, that most of those in category (b) might have deliberately left their paper blank, while those in category (c) include some who did this because they did not know how to cast a valid vote, some who marked their ballot paper imprecisely, and some who deliberately marked a first choice for more than one option.

Table 2: Categories of invalid votes at some recent general elections, local elections and referendums

		Total spoiled votes	**——Category of spoiled vote——** a	b	c	d
General election 2002	N	20,707	1,866	9,477	8,036	1,354
	%	100.0	9.0	45.6	38.8	6.5
Local election 1985	N	18,170	1,036	8,840	6,734	1,557
	%	100.0	5.7	48.6	37.1	8.6
Local election 1991	N	12,987	886	4,710	6,753	634
	%	100.0	6.8	36.3	52.0	4.9
Local election 1999	N	20,916	2,148	9,262	8,758	749
	%	100.0	10.3	44.3	41.9	3.6
Amsterdam referendum 1998	N	33,228	352	15,026	16,212	1,638
	%	100.0	1.1	45.2	48.8	4.9
GFA referendum 1998	N	17,064	348	3,087	13,266	363
	%	100.0	2.0	18.1	77.7	2.1

Abortion referendum 2002	N	6,649	563	868	4,227	990
	%	100.0	8.5	13.1	63.6	14.9
Nice referendum 2002	N	5,409	481	481	3,913	532
	%	100.0	8.9	8.9	72.4	9.8
Total all elections / refs	N	135,130	7,680	51,751	67,899	7,817
	%	100.0	5.7	38.3	50.2	5.8

Category a: no official mark;
Category b: no expression of first preference / option marked;
Category c: more than one, or unclear, first preference / option marked;
Category d: writing on ballot paper.
Note: Raw figures are reconstituted from percentages and do not always add precisely.
Source: Department of the Environment and Local Government, nd.

Thus we might, very tentatively, estimate that around half of those whose votes are invalid (those in category (a), and most of those in category (c)) had intended to cast a valid vote and would be 'rescued' by electronic voting. The other half had not intended to cast a valid vote, but very few of these (only those in category (d), and perhaps a few in category (c)) were explicitly availing of the facility to spoil their ballot. The introduction of electronic voting, then, would benefit about half of these voters and would make no difference to most of the rest, leaving only a small proportion without an opportunity they would wish to avail of. It is worth noting that the Minister for the Environment has expressly stated that the system is designed to facilitate those who wish to cast valid votes, not those who wish to cast invalid votes, and that he does not recognise any 'right' to cast an invalid ballot.

6 Uncertainty / inconsistency between returning officers

6.1 Paper voting

One of the reasons why recounts throw up different figures from the original count is because votes that were initially regarded as valid are now declared invalid after being challenged. This highlights the element of subjective judgement involved in deciding whether a given vote is valid or not. For example, if a ballot paper contains nothing except a tick beside the name of one candidate, one returning officer might regard this as a clear expression of the voter's intention while another might regard it as invalid. Similarly, if the number '1' overlaps two candidates' boxes, but with 90 per cent of it in one's box and 10 per cent in another's (or 80–20, 70–30 etc), two returning officers might form different opinions as to whether the voter's choice was clear. The relevant legislation, indeed, uses the phrase 'in the opinion of the returning officer', emphasising that an element of subjective judgement is unavoidable.

6.2 Electronic voting

Electronic voting would remove this source of uncertainty and possible inconsistency, as it is impossible to cast an invalid vote electronically and hence there is no need for any subjective judgement.

7 Transparency and legitimacy

7.1 Paper voting

The process of casting and counting votes is entirely transparent under paper voting. The whereabouts of the ballot paper from the moment it is placed in the ballot box until the opening of the ballot boxes is known. As already described, the votes are counted in full view of the public. The result is a system of casting and counting votes whose legitimacy has never been disputed. No matter how disappointed any voter or candidate may be by the result of an election or referendum, it has simply never been suggested that the result was anything other than genuine or that malpractice was involved in producing the declared result.

While people in Ireland take it for granted that this is the way things are, it should not be forgotten that the legitimacy of the current system is a very valuable property. Many people who cast their votes in elections around the world simply do not have this confidence in the way elections are conducted in their country.

In this context, the role of the 'tallymen' and 'tallywomen', which we mentioned earlier, should not be overlooked. Because, thanks to their endeavours, we know not just the overall constituency result but also the figures for individual polling stations (each covering just a few hundred votes), any malpractice – in the form of an outlandishly high or low vote for a particular candidate in a particular area – would soon be spotted.

7.2 Electronic voting

Clearly, this is an aspect of electronic voting that has to be carefully considered. It is important that any such system does not merely satisfy the experts that it is technically sound – it needs also to be trusted by the voters. At present, we do not have firm evidence on the views of the voters, which can be obtained only through the kind of carefully designed survey work that has not been undertaken to date. It is evident that some voters are concerned about this aspect of electronic voting, but we have no way of telling how widespread or deep these concerns are.

8 Summary

We could summarise the performance of paper and electronic voting on these criteria in the table below. It is apparent that each type of voting has advantages in certain areas and disadvantages in others.

	Paper	Electronic
Malpractice	++	?
Minor counting errors	– –	++?
Major counting errors	+	++?
Elimination of element of chance in distribution of surpluses	–	++
Provides opportunity to cast blank or invalid vote or register protest	++	– –

Prevents voter unintentionally casting invalid vote	–	++
Prevents inconsistency in exercise of subjective judgement	–	++
Transparency and legitimacy	++	–?

++ = very good
+ = good
– = poor
– – = very poor

Paper voting is superior in three respects:

1) First, the possibility of serious malpractice is known to be extremely low, to the point of being negligible, under paper voting; it is not known exactly how to evaluate this possibility under electronic voting;
2) Second, paper voting provides voters with the opportunity to cast an invalid vote, either by writing something on the ballot paper, by marking the paper in an unclear manner, or by leaving the paper blank. Under electronic voting the first two options are removed; leaving the ballot blank can be done, but only in a manner that reveals to the polling clerk the fact the voter has done this; and
3) Third, the paper voting system has achieved virtually universal legitimacy in the eyes of the electorate, partly because of the transparency of the voting and counting processes; at present, at least, it is clear that a significant number of people, whether reasonably or otherwise, do not fully trust electronic voting.

Electronic voting, too, is superior in three respects.

1) First, it provides the opportunity to remove the element of randomness in the distribution of surplus votes (even though the current plan is to retain this element, in 2004 at least); under paper voting, this would or will remain;
2) Second, electronic voting prevents a voter unintentionally casting an invalid vote; paper voting does not; and
3) Third, electronic voting removes the need for returning officers to exercise subjective judgement in adjudicating on individual ballots papers; paper voting does not.

On the other two criteria, major and minor counting errors, we cannot be certain which method is better. We know the extent of the problem under paper voting: minor errors are inevitable, but major errors are virtually impossible. Under electronic voting, if the system works perfectly, both types of error will be eliminated, and thus electronic voting will be superior on these two criteria. The difficulty, of course, lies in the question of whether we can be certain that electronic voting will indeed work perfectly.

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