

Part 5

Accuracy and Secrecy of the System

5.1 Introduction

Part 4 of this report concludes that, given the close proximity of the June elections, given the Commission's analysis of the level and comprehensiveness of testing to date, and given the very high standards that must be satisfied by a system for counting votes in public elections, it is not possible for the Commission to establish the trustworthiness and reliability of the proposed system at this time.

It follows directly from this that it is also not possible for the Commission to draw definitive conclusions about the accuracy and secrecy of the proposed system. Indeed it is at this late stage not possible for anyone to satisfy themselves on these matters in advance of the June elections.

On this ground alone, the Commission is not in a position to satisfy itself as to the accuracy and secrecy of the proposed system.

However, it may be helpful in this part to review in more detail the conclusions on the accuracy and secrecy of the proposed system that the Commission was able to arrive at on the basis of the work it carried out.

5.2 Accuracy

As stated in *Part 1* of this report, "accuracy" relates to matters concerning the demonstrable integrity and consistency of the methods for the gathering of the votes at polling stations, the methods for the translocation of the votes from polling stations to count centres, the process of disaggregating groups of votes for counting in different types of elections, and the methods for counting and distributing votes and allocating seats in each of the elections to take place in June 2004. Thus there is accuracy of the voting method and accuracy of the counting method to be considered, together with the accuracy of the systems for moving votes between different stages of the process.

As has already been noted in *Part 4*, in the context of collecting and counting votes in public elections, the degree of imperfection in these methods that can be tolerated is very low. It must also be expected that the degree of imperfection in an acceptable electronic voting system will be less than in the traditional paper voting system.

Benefits

On the basis of the work it has carried out, the Commission is of the view that the proposed system can deliver a higher level of accuracy than the traditional paper voting system in a number of important respects.

The proposed electronic system eliminates many inadvertent voter errors that clearly do occur in the traditional paper voting system. Such errors result in votes unintentionally being rendered invalid and the wishes of the voter concerned not being taken into account.

The proposed system also eliminates the need for subjective judgments by returning officers on votes of marginal validity, and the consequent possibility that different returning officers might

have made different judgements about the same ballot.

Assuming that votes cast are recorded correctly and are transferred accurately to the count program, the proposed system can generate the same election result every time the votes are counted, which clearly does not always happen under the traditional paper voting system.

The proposed system could easily be programmed to eliminate the imprecision in selecting ballots for transfer during the distribution of surpluses. By transferring every transferable vote at a weighted value (“the Gregory method”), more accurate election results would be generated than under the current system, since the views of every relevant voter would be taken into account.

Such a change would require an amendment to the statutory rules for the counting of the votes at various types of elections. However, a policy decision was made when the system was commissioned to retain the existing method of selecting votes for transfer during surplus distribution.

Issues of Concern

The principal issues of concern identified by the Commission in relation to the accuracy of the proposed system largely follow from the Commission’s conclusions about testing.

The software version proposed for use at the forthcoming elections is not as yet finalised so it is impossible for anyone to certify its accuracy.

Furthermore, as regards the system as a whole, the issues set out in *Part 4* in relation to the testing of the system make it impossible to determine its accuracy in the context of this report and the June elections.

Testing by the Commission has identified an error in the count software which could lead to incorrect distribution of surpluses. This undermines confidence in software development and testing and there is a possibility that further testing will uncover further software errors.

While eliminating the possibility of certain types of inadvertent voter error, the proposed system introduces the possibility of new types of error made by people unfamiliar with electronic voting. Public submissions were received by the Commission from people participating in the 2002 pilots who had made or observed such errors.

The results of the input-output test carried out by the Commission, involving the entry of 36,950 pre-determined votes onto 739 voting machines and a comparison of the outputs against the pre-determined inputs, suggests that the error rate attributable to human error in the use of the voting machine may be of significance in the context of postal and special votes which are cast manually by voters but which are then entered into voting machines by election officials.

A consequence of retaining the current imperfect method of determining surplus distributions (notwithstanding that the electronic system is ideally suited to handling a fully precise but more complex system of distribution) is that, although the system offers the possibility of printing out all the ballots cast at an election and therefore offers the possibility of a manual re-count, the current rules for the selection of the votes on the transfer of a surplus mean that if a manual re-count of an election were required (as in the case of an election petition), this can only be done on the basis of

the votes as mixed by the electronic system and as selected for further transfer by the system. In any other scenario, it would not be possible to achieve the same result in the manual re-count as in the original electronic count, in view of the different selections that would be made in each case.

In short, retaining the variable element in surplus distribution embodied in the current rules makes it more difficult to check the accuracy of the proposed system by way of a total manual recount.

5.3 Secrecy

The major issue in relation to secrecy that emerged in the public submissions received and in the Commission's own testing relates to a matter deemed outside the Commission's terms of reference, namely, the secrecy accorded to a voter who wishes to "spoil" a vote, or to register a completely blank ballot. Setting this aside for now, a number of other issues arose in relation to secrecy.

There is some limited infringement of ballot secrecy arising from the audible "beeps" made by the machine during the act of voting, both as preferences are being selected and to signal voter errors. This among other things allows limited inferences to be drawn by those outside the polling booth about the number of preferences cast. In particular, voters voting for a single candidate would be easy to identify by those in the vicinity of the machine and in this sense their ballots would not be fully secret.

There is also reduced voting secrecy for people with certain disabilities, as well as for people who are unfamiliar with or unsettled by new technology. Such people may need third-party assistance in using the voting machine, thereby infringing their ballot secrecy. While the Commission acknowledges that voters with a disability have the right to secrecy, it has been established by the courts that this right is not an absolute one⁸.

Publication of the ballot results in full but in random order, as happened after the 2002 pilots, is a very valuable aid in ensuring the accuracy of the results, since anyone is free to recount these for themselves. Nonetheless it has been submitted that this can in theory reveal deliberate and distinctive voter "signatures" of low-preference votes (highly improbable rankings of the candidates ranked 11 to 15 in a 15-candidate contest, for example), which could allow voters to identify themselves in a context of corruption or intimidation. This may be deemed improbable, but it remains a possibility.

In this context it is worth noting that, in general, the issue of the publication of the full set of votes cast highlights a conflict between the objectives of secrecy and accuracy. Publication, as noted, greatly enhances accuracy by allowing anyone to check the count process. At the same time it diminishes secrecy to the extent that a particular individual's vote might in some way be distinctive. If votes are to be published for small local areas – to replace the information hitherto available on the basis of tallies – then potential infringements of ballot secrecy become more likely. In general, however, the gains in both real and publicly perceived accuracy arising from publishing the full set of votes and making these available for recount seem likely to outweigh any potential resulting loss of secrecy.

Because the storage of votes on the ballot module is pseudo random, not truly random, it may be possible for an expert insider to overcome the randomness of the storage of votes on the ballot

⁸ *McMahon v Attorney General* [1972] IR 69, (1972) 106 ILTR 89.

module. Combined with knowledge of the order in which people voted using the voting machine in question and the knowledge of precisely how the first person to vote on the machine had cast their vote, it might be possible to deduce how everyone using the machine had voted. This also may be deemed highly improbable, but remains a theoretical possibility.

5.4 Additional Observations on Accuracy and Secrecy

The Commission was able to make other observations regarding accuracy and secrecy which are outside its strict terms of reference but which it nonetheless finds it useful to report.

Accuracy

The proposed system does not have an independent voter verifiable paper audit trail (VVPAT). A VVPAT is argued in numerous public submissions, many of these by experienced IT professionals, to have the following desirable properties:

- it increases the public perception of the accuracy of the system by reassuring voters that their vote has been correctly recorded;
- by providing an independent external check on accuracy, it creates a disincentive to manipulation of the system in attempts to generate inaccurate results;
- acting as a backup system, it enables a manual recovery of all or part of the election result in the event of a serious system failure.

The main arguments against a VVPAT are as follows:

- it almost completely duplicates the existing paper system, dissipating almost all of the advantages of electronic voting;
- it introduces a greatly enhanced risk of system failures on election day, since printers are typically the least reliable aspects of most computing systems;
- virtually all countries that have successfully deployed electronic voting have done so without, or have gone on to reduce their reliance on, VVPATs.

It is outside the terms of reference of the Commission to come to a conclusion about the arguments for and against a VVPAT. Nonetheless, since the proposed system is largely self-auditing rather than externally audited, it is clear that the standards of testing that must be applied are consequently higher. With no external check on the accuracy of the system, its accuracy can only be assured by very comprehensive and rigorous testing of the precise system actually deployed.

Secrecy

Under the proposed system, voters who wish to register an abstention by voting for no candidate cannot do so in secrecy. This arises because the “cast vote” button on the machine will not function

if no preference at all has been registered and, if a voter leaves the voting machine in this state, the voting machine operator must reset the machine before the next voter can use it.

Thus voters deliberately setting out to register no preference, or merely finding no candidate they wish to vote for once they are in front of the voting machine, are forced to reveal this to the machine operator.

It would be straightforward to remedy this, if so desired for future elections, by adding an “abstain” button to the machine, though such a change clearly could not be both implemented and satisfactorily tested in time for the June elections.

5.5 Conclusion

As noted above and in *Part 4*, the Commission’s main concerns in relation to the chosen system relate to the testing of the complete system, and to the associated administrative procedures, that would be deployed simultaneously for county council and European Parliament elections, a referendum, and in some cases also a town council election, in June 2004.

This has the direct consequence that the Commission is not in a position to satisfy itself as to the accuracy of the chosen system, given the very high standards that must be applied to the testing of a vote recording and counting system, especially one that is effectively self-auditing.

The Commission thus relies, in reaching its overall conclusion in *Part 6* regarding the proposed use of the chosen system in the June elections, on the situation in relation to testing, rather than on any particular finding about accuracy and secrecy.

Nonetheless, the issues noted above in relation to accuracy and secrecy are clearly matters of concern that those responsible for specifying, testing and deploying the system will want to address.

