

# Pilot scheme evaluation

Swindon Borough Council

22 January 2004

Part A



## Foreword

The Electoral Commission is a public body established on 30 November 2000 under the Political Parties, Elections and Referendums Act 2000 (PPERA). The Commission is independent of Government, non-partisan and directly accountable to Parliament. One of the Commission's aims is to encourage participation in the democratic process, and increase levels of electoral registration and voting.

As a result of measures introduced by PERA, the Commission has a statutory duty to evaluate any pilot electoral scheme approved by the Minister of State for Local Government and the Regions, on behalf of the Secretary of State.

In accordance with the requirements of the Representation of the People Act 2000 (RPA), the Commission's evaluations include a description of the scheme and an assessment as to:

- the scheme's success or otherwise in facilitating voting or the counting of votes, or in encouraging voting or enabling voters to make informed choices at the elections;
- whether the turnout of voters was higher than it would have been if the scheme had not applied;
- whether voters found the procedures provided for their assistance by the scheme easy to use;
- whether the procedures provided for by the scheme led to any increase in personation or other electoral offences, or in any other malpractice in connection with elections;
- whether those procedures led to any increase in expenditure, or to any savings, by the authority.

In addition to these statutory requirements, the Commission's evaluations will consider, where appropriate:

- the extent to which the pilot facilitated or otherwise encouraged participation among particular communities, including young people, ethnic minority groups and people with disabilities;
- overall levels of user awareness and comprehension of the voting method being tested, including an assessment of the effectiveness of any literature or other materials used in the promotion of the pilot;
- the attitudes and opinions of key stakeholders, including voters, with a view to determining overall levels of confidence in the voting method being tested;
- whether the pilot resulted in measurable improvements, or had any adverse impact, with respect to the provision of more efficient and effective service delivery to voters;
- whether the pilot resulted in measurable improvements to, or had any adverse impact on, the existing system of electoral administration;
- whether the pilot represented good 'value for money'.

Where appropriate, the Commission will also make recommendations as to whether changes should be made to electoral arrangements more widely through roll-out of the pilot.

The Commission is required to submit its evaluation reports to the Secretary of State and the local authorities concerned. The local authorities are required to publish the evaluation report for their area within three months of the election.

The Electoral Commission is grateful to the Deputy Returning Officer at Swindon Borough Council and all those in the authority, political parties, the local community and suppliers who provided information and assistance during the evaluation process.

## Introduction

Since 2000, Swindon Borough Council has been active in the modernising elections programme and has undertaken a number of electoral pilot schemes:

- in 2000 the council operated a pilot all-postal election in four of the wards;
- in 2002 the council carried out a multi-channel electronic voting (e-voting) pilot as part of the May local elections. This involved remote voting by Internet and telephone together with traditional voting by post and at polling stations. The pilot was widely considered to be successful. Over 15% of votes were cast electronically and the overall turnout increased by 3.5%; and
- in 2003 the council carried out a more extensive e-voting pilot involving four electronic channels (internet, telephone, interactive digital television and kiosk voting) together with traditional postal voting and voting at polling stations. Although the turnout did not increase further, the uptake of the e-voting channels did increase and 24.5% of votes were cast electronically.

Swindon Borough Council has a total of 59 councillors representing 22 wards. At the time of the election, 57 positions were filled; the by-election was held to elect two councillors, one each in Central and Western wards. The pilot by-election covered three aspects:

- early polling, through the use of mobile electronic voting kiosks in residential care facilities and within two community centres, on the day before the traditional polling day;
- the use of locally-held, non-networked electronic registers in polling stations; and
- the use of e-counting technology to count the paper ballots.

## Socio-economic description

The Borough of Swindon is located in the M4 corridor approximately 70 miles west of London. It covers an area of 23,009 hectares and includes the parliamentary constituencies of North Swindon and South Swindon.

The population of the borough is around 180,000, mostly living within the town of Swindon itself. The population is slightly younger than the national average with an average age of 37 compared to 39 nationally. The borough has a relatively small ethnic minority population with 4.7% of the population categorised as Asian, Black, Chinese or other Non-white, compared to 9.1% nationally. Some 7.6% of the population was born outside the UK.<sup>1</sup>

As a whole, Swindon is slightly more affluent than the average English district or borough and is ranked as the 207<sup>th</sup> most deprived of England's 354 districts and boroughs.<sup>2</sup> However, the 22 wards that make up the borough cover a range of affluence levels and include wards in the most affluent 10% of wards in England as well as wards in the most deprived 10%. Employment is higher than average for England and Wales (69.4% compared to 60.6%) and unemployment lower (2.5% compared to 3.4%). Crime rates are lower than the average for England.

Central ward is listed as one of the 25% most deprived wards in the UK (rank 1,667 out of 8,414, where 1 is the most deprived and 8414 is the least deprived). Western ward has a rank of 4,350.

In total, 14,482 electors were eligible to vote in the January by-election: 7,031 in Central ward and 7,451 in Western ward.

## Pilot description

The application to conduct a by-election in two wards was submitted in November 2003 and approved in December 2003. The application described four aspects of the pilot: the use of electronic registers; e-voting kiosks; e-counting technology; and the provision of a modified declaration of identity for postal voters.

## Pilot objectives

The objectives of the pilot were:

- to investigate how best to use mobile kiosks to improve the voting process; specifically, this covered how to increase turnout, reduce the opportunity for fraud and improve the service delivery to the targeted community;

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<sup>1</sup> Based on figures from the 2001 Census.

<sup>2</sup> On the basis of the rank of the National Statistics average ward scores for the year 2000.

- to investigate how the use of electronic registers in polling stations could be effectively implemented in order to reduce the time taken for voters to apply for a vote in polling stations; and
- to develop experience in the use of e-counting technology in order to deploy it in a more efficient and cost-effective manner.

The pilot also provided an opportunity to investigate the impact of reducing the number of channels available to vote. In both of the last two local elections, residents from both these wards had been able to vote remotely (for example across the internet or by telephone).

## Traditional voting arrangements

There were a total of eight polling stations at which voters could vote in the traditional manner on 22 January; each ward had a total of four polling stations.

Voters could also vote by post as normal, and applications had to be received by 5.00pm on 14 January 2004. Postal ballot papers were issued in two batches: the first batch was issued on Monday 12 January for all applications received until that point, followed by the second batch issued on Thursday 15 January for applications received during that week. All postal ballot papers had to be returned so that they were received by the Returning Officer no later than 9.00pm on 22 January 2004.

The voting process was identical to the traditional process; the only change visible to the voter was the existence of a barcode on the front, at the top, of each ballot paper indicating the number of that ballot paper. There were no additional letters or numbers on the ballot paper associated with the barcode. Despite the use of the e-counting process, ballot papers could be folded before being placed in the ballot box or envelope.

## Modified declaration of identity

Two modifications were made to the standard process for the declaration of identity: firstly, a third party signature to witness the signing of the declaration was not required; and secondly a barcode, representing the electoral registration number, was added to the declaration in addition to the ballot paper number (which was written in a human-readable form).

The inner envelope, used to contain the postal ballot, also contained the ballot number in a human-readable form. This was necessary because the ballot paper itself only had a barcode representing the ballot paper number.

## Electronic register

An electronic register was used in each polling station, including all eight traditional polling stations, the two 'fixed' early polling stations and the nine mobile polling stations within the residential care facilities.

When a voter applied for a ballot in the polling station, an electoral officer entered the voter information into the electronic register. At the same time, a second electoral officer entered the information onto a traditional paper register.

## Early voting using kiosks

In each ward, one of the four polling stations was open for early voting on 21 January 2004 between 8.00am and 6.00pm. Any eligible voter in the respective ward could vote at the nominated polling station, irrespective of whether it would be the voter's nominated polling station on the traditional polling day. Unlike the voting process on the traditional polling day, voters were required to bring their poll card; this was introduced because voters would not necessarily be voting in their usual polling stations. Electronic voting kiosks were used in both polling stations, and traditional polling booths were not provided.

Mobile voting polling stations visited nine residential care facilities: three residences in Central ward, and six residences in Western ward. The mobile polling station visited each residence for three hours, either in the morning or the afternoon. Only residents could vote at these mobile polling stations.

An electronic register was used in each polling station, as described earlier.

## E-counting

All ballot papers were transferred from the polling stations to the civic offices, where they were counted using automatic electronic counting systems. Council electoral staff opened each ballot box and scanned the ballot papers in batches. The postal votes were counted at the same time as the traditional paper ballots. The system either counted the ballot papers directly or, in case of any doubt, passed the ballot image to an electoral staff member who adjudicated the ballot. Once all ballots had been scanned, the Deputy Returning Officer added the vote totals from the e-counting system to the electronic voting totals from the kiosks and announced the result.

## Technology provider

The technology for the pilot was provided by the Athena consortium. This was headed by Anite Public Sector Limited, which was responsible for the overall management of the consortium and provided local government and security expertise. The other members of the consortium that were active in this pilot were:

- Consilia, a software development and services company, who provided electoral registration expertise; and
- Idessa, a software development and services company, who provided the e-counting solution and expertise.

The electronic registers and kiosks for this pilot were provided by Advanced Voting Solutions (AVS) Inc., a US supplier of e-voting technology.

## Project management

The overall management of the election by Swindon Borough Council was very strong and clearly benefited from substantial expertise and experience from the electoral team. Formal management techniques were not used, but the approach taken was comprehensive and suitable for the scale of the election.

The standard of the project management undertaken by the supplier was also very high. The essence of the PRINCE-2 methodology was used to manage the project, formal roles were defined and the associated formal documentation (such as the project initiation document) was produced. All personnel involved in the process clearly had a high level of electoral expertise, knew their roles and communicated well. Although some aspects of the documentation contained high-level statements only and were lacking in detail, the overall level was appropriate for the small scale of the election and size of team involved.

The management approach was dynamic and flexible where required. For example, it became clear a few weeks before the election that the number of residential care facilities requiring mobile polling stations was greater than had previously been understood. However, additional resources were identified and existing plans were changed quickly and efficiently.

There is still room for improvement in the level of documentation of a number of processes. This is not a criticism of this election, but rather reflects the pilot status of the election and indicated an area where further work is required so that best practice can be developed from the range of pilots undertaken.

## Risk management and contingency planning

A risk register was generated and maintained through the planning stages of the election. The contingency planning was extremely comprehensive, and in particular:

- a number of additional spare machines, both kiosks and electronic registers, were provided, and these were available to all teams involved in the operation of the election;
- each polling station operated a traditional paper marked register in parallel to the electronic register;
- all council staff operating the e-counting equipment had experience in manual counting and this facilitated the option to revert to manual counting if required; and
- the e-counting system itself contained substantial redundancy and hardware was duplicated (scanners, servers and workstations). There was also duplication of software, and each of the workstations/servers

comprising the e-counting system could easily be swapped and the system reconfigured as necessary.

A Business Continuity and Disaster Recovery Plan was produced. This described the actions that would be taken in the event of a disaster and covered seven scenarios. These covered the partial and total failure of software and hardware components comprising the kiosks, electronic registers and the e-counting system. Actions to be taken ranged from changing the number of teams involved in the delivery, reducing the time spent at each residential care facility, system re-configuration, extending timescales where possible and reverting to manual processes where necessary. The plan was high-level and described the overall strategy that would be taken rather than detailed plans. Nevertheless, it did confirm that the issues had been addressed and it was at an appropriate level for the scale of the pilot.

## Training

Training material was produced by Athena for the electronic registers, kiosks and e-counting equipment, and was of a good quality. Formal training sessions were provided for council staff. The technical support provided by the Athena Consortium was also good and included technical personnel from AVS in the United States to provide direct support for the kiosk machines, as well as UK support from Idessa for the e-counting solution. During the operation of the election and the count, the supplier acted in a support capacity and provided assistance when requested by council staff.

## Involvement

Eight of the most experienced presiding officers were deployed within the polling stations. In general, we observed a high degree of involvement from Swindon Borough Council in all stages of the election. This involvement was notably higher than the majority of pilots undertaken in the May 2003 elections and represents current best practice in this area.

Athena staff were responsible for configuring the kiosk and electronic register machines. Following this, council staff were responsible for:

- checking the configuration of the ballots and electoral registration information and verifying their correctness;
- opening, closing, suspending and unsuspending the kiosks and electronic registers;
- operating the kiosks and electronic registers; and
- conducting the count, including the operation of all e-counting equipment.

## Testing

Council staff played a central role in the user-acceptance testing of the equipment and the testing was thoroughly undertaken. A test set of ballots

was created with over a thousand different ballot papers. These were created by Swindon Borough Council and contained over 200 suspect or spoilt ballot papers.

The e-counting equipment was set up in the council premises on Monday 12 January with one scanner. Test runs and training exercises were performed on Tuesday 13 January and then each day up to the day of the election. The council employed job-rotation so that each member of the team could understand the roles played by others, and so could subsequently deputise in the event of staff unavailability on election night.

Acceptance testing was also undertaken for the kiosks and electronic registers, and the configuration of these was verified by the Deputy Returning Officer and another member of his staff.

The scope of the e-counting testing covered the processing of a ballot box once it had arrived at the count room. It is recommended that testing activities should be as close as possible to the activities undertaken on the election day itself, and should therefore cover activities such as the opening of a number of ballot boxes, unfolding the ballot papers, etc.

## Relationship management

The relationship between the supplier and the council was very strong and was underpinned by mutual respect and a good understanding of each other's role. This had been built up over a number of years, as the partnership had undertaken several successful e-enabled elections in the past. Regular meetings were held throughout the pilot preparation phase, and several staff members from Athena were located on-site during the lead-up and operation of the election.

The council had a good relationship with the Royal Mail who agreed to deliver direct to the council any postal votes picked up from post boxes at the last collection on polling day. The return envelopes contained a barcode, representing the postcode, which could be used by the Royal Mail for easy identification of postal votes.

All parties experience a good relationship with the Government and no problems were reported. There was good communication among the parties and the pilot was well monitored.

## The use of technology

### Overview

This section discusses how the technology was used during the pilot. Each polling station had an electronic register, and one or more e-voting kiosks:

- five teams provided the nine mobile polling stations in the residential care facilities;
- there were two fixed early-voting polling stations; and
- there were eight traditional polling stations.

## Electronic registers

A total of 10 electronic registers were provided for the election:

- eight machines were used during the election, one for each of the traditional polling stations (seven of these machines were also used the day before to provide electronic registers for the mobile teams and fixed early-voting polling stations); and
- two spare machines were provided as a back-up in the event of any problems occurring.

The electoral register was extracted from the Electoral Management System by Consilia staff and imported into the electronic registers. Only the subset of the electorate that was eligible to vote at this election was loaded into the electronic registers. The electoral registration numbers were not loaded into the register; instead, a sequential identification number was generated by the machine for each elector.

The process for using the electronic register was as follows:

- the electoral officer typed in the first few characters of the elector's name;
- the electoral register displayed all the names that started with the selection of characters that had been entered;
- once sufficient characters had been entered that the required name could be easily located, the officer selected the elector;
- the system displayed the full name and address of the elector;
- the officer asked the voter to confirm their address, either by producing their poll card or verbally;
- if the details did not match, the process would be repeated; otherwise, the officer pressed 'OK';
- if the voting was to be performed using a kiosk, the system offered a choice of whether to display a normal-sized or magnified ballot (for visually impaired voters). The electoral officer selected the appropriate option and pressed 'OK';
- provided no ballot had already been issued to the voter, a ballot was produced:
  - if kiosk voting was used, the electoral officer would enter a blank smart card into the slot in the electronic register and press 'OK'; or
  - if traditional voting was used, the second electoral officer would enter the counterfoil number from the ballot paper into the electronic register;
- the ballot was issued to the voter:
  - if kiosk voting was used, the electoral officer would personally enter the smart into the appropriate kiosk; or

- if traditional voting was used, the paper ballot would be handed to the voter;
- this completed the process, for that voter, of applying for a vote.

If a ballot paper had already been issued to the voter, the system asked the officer if the voter had already voted:

- if the voter had not already voted (for example, he or she was returning a spoiled ballot and requesting a replacement), a replacement ballot paper could be issued and the new counterfoil number entered into the system;
- if the system had an existing record indicating that he or she had voted, but the voter stated that they had not, the system provided for the provision of a tendered ballot.

## Kiosks

A total of 20 kiosks were provided for the election:

- four kiosks were used for the two fixed polling stations (two kiosks each);
- six kiosks were used for three of the smaller mobile teams (two kiosks each);
- six kiosks were used for the two larger mobile teams (three kiosks each); and
- four additional spare kiosks were provided.

The mobile teams visited each residential care facility for three hours. This was found to be more than enough time. In some cases, all voting was completed after one hour; there is therefore scope to increase the number of facilities visited by each team in the future. In addition, the number of kiosks per team also proved to be more than sufficient, and often only one kiosk was required.

The kiosks were set up by members of the Athena Consortium. This involved entering the details of the election, the rules by which it was conducted, and details of the candidates. The kiosk configuration was subsequently checked by the council. Three types of smart card were used to control the kiosks:

- an administration card was used to configure the kiosk; this involved setting up details relating to the election, details of candidates, etc;
- a location card was used to operate the kiosk during the election; each of the following actions caused a paper report to be printed:
  - opening a unit to enable voting to commence;
  - suspending a unit after voting had finished at a location;
  - unsuspending a unit to resume voting in a new location;
  - closing a unit once all voting using a particular unit had finished;
- a ballot card was used to store the right to vote; it was programmed when the elector applied for a vote and then cleared after voting had taken place.

The following cycle of activities were undertaken on the kiosks:

- all counters were set to zero; this was performed in the council offices on Tuesday evening, and verified by the Deputy Returning Officer and one of his members of staff. The unit printed a report, which was stored by the council;
- the kiosk units were then immediately suspended using a location card; a suspension report was printed and stored with the zero report;
- the kiosk units were stored overnight in the council offices and transferred to the relevant polling station on Wednesday morning;
- each kiosk unit was opened on Wednesday morning in the relevant polling station, using a location card. The zero counts were re-checked, and the open report was printed and signed by the Presiding Officer;
- when voting was finished, each kiosk unit was suspended in the relevant polling station, using a location card. The suspension report was printed and signed by the Presiding Officer;
- for the mobile teams that visited more than one location, the kiosk units were unsuspending at the start of the afternoon session, and subsequently suspended at the end of the session;
- the kiosks were transferred to the council offices, where they were unsuspending. The unsuspending report was printed out and stored by the council;
- the kiosks were closed using the location card. The close report was printed out and stored by the council.

The process of voting using the kiosks was carried out as follows:

- the elector applied for a vote and an electoral officer configured a ballot smart card using the electronic register;
- the electoral officer inserted the ballot smart card into the slot in the kiosk unit;
- the voter selected the appropriate ballot type: either a normal or magnified display of the ballot;
- the voter selected the candidate who he or she wished to vote for and pressed 'OK';
- the system displayed the selection and offered the voter the option of confirming or changing their choice;
- when the voter confirmed their selection, the system offered the voter a choice of casting the vote, or changing the selection;
- once happy with the selection, the voter cast the vote;
- the electoral officer took the smart card to be reprogrammed for a subsequent voter.

## E-counting

The e-counting equipment was installed and configured by staff from Idessa before the count started. It was set up in one of the rooms near the council chambers.

Candidates, agents and other observers viewed the counting operations from the council chambers. A camera crew, situated behind a line marked on the floor in the main counting room, provided a video display of the counting activities; this was relayed to two large screens that were provided in the chambers. As the ballot papers were processed by the e-counting system, the image of each ballot paper was displayed on one of the screens in the chambers for a fraction of a second.

The count processes themselves were defined and operated by the council. The supplier provided technical support and advice where requested.

The council staff involved in the count were as follows:

- the Returning Officer;
- the Deputy Returning Officer;
- eight members of staff who processed the ballots: this involved opening the ballot boxes, sorting the ballots, scanning the ballots, and entering data into the control sheets; and
- two members of staff adjudicating any ballots that had not been allocated directly by the system.



Swindon e-counting equipment

The process of performing the count was as follows:

- the Returning Officer enabled the system by placing his finger on a fingerprint recognition device, inserting a hardware token into the control workstation, and entering a username and password;
- the processing staff opened one of the ballot boxes and emptied all ballot papers onto a desk. They sorted the ballot papers manually into two piles:
  - those that were likely to be scanned cleanly without causing a problem to the e-counting system; and

- those where there was some doubt as to whether the system would be able to scan the ballot paper, or whether it would be able to identify the election or ward associated with the ballot paper;
- the processing staff placed the batches of ballot papers in the scanner;
- the ballot papers were scanned by the system;
- the pile of ballot papers that had been set aside earlier was loaded in the final batch for that ballot box; any ballot papers that were not able to be scanned were rejected for manual adjudication;
- if a ballot paper was scanned correctly but the system could not identify the election or ward, it had to be manually entered using the batch control functionality of the system;
- the (Deputy) Returning Officer started the optical character recognition (OCR) for the batch;
- the system determined whether the ballot:
  - contained a valid vote which could be positively identified;
  - required adjudication but a 'most likely' vote could be identified; or
  - required adjudication and no 'most likely' vote could be identified;
- if the ballot could be identified as containing a valid vote, it was counted;
- if the ballot required adjudication, the image was sent to one of the authentication workstations. The adjudicator entered:
  - whether the ballot was spoilt or not; and
  - the candidate that related to the voter's intention or, if spoilt, the reason for which the ballot was spoilt;
- the adjudication information was sent to the server for storage in the database;
- adjudication information was also entered directly into the system for all ballots that were not scanned;
- once a ballot box had been processed completely, another ballot box was opened and the process repeated;
- the system had been configured with the total number of ballot boxes expected; it was therefore able to display the number of ballot boxes that remained to be processed;
- when all ballots had been counted, the Returning Officer initiated the tabulation process;
- the results from the paper ballots were displayed on the screen;
- the results from the early voting (that is, the electronic kiosks) were added to the paper results manually and the overall result declared;
- once the e-counting process had been completed, the entire database was sealed and recorded onto an optical disk;
- the optical disk was taken by the Returning Officer for secure storage.

## Verification

The verification process was similar to, but slightly modified from, that used for traditional manual counting. Each Presiding Officer entered the total number of ballots issued into a report sheet for the polling station. The total number of ballot papers scanned in each batch was reported by the system and written down on a control sheet by the e-counting operators. Once all ballot papers for a polling station had been scanned, the total number of ballots received was calculated by adding the total scanned to the number of ballots that had

been manually adjudicated without scanning. This overall total was compared to the number issued by the Presiding Officer and any discrepancies (for example, due to voters taking their ballots out of the polling station without voting) were noted. There were very few discrepancies and these were of a minor nature. This method of verification was developed, and approved, by the council.

## Technical components

### Electronic registers and kiosks

Advanced Voting Solutions (AVS) Inc. provided the electronic registers (AVS WinPollbooks) and kiosks (AVS WinVote machines). Both types of unit were ruggedised laptops and used the same hardware and software components; the laptops could be configured as either electronic registers or kiosks as required. The laptops ran the Windows CE operating system.

The laptops contained a smart card reader, a 'till-receipt' style printer, a modem, a wireless LAN card and a number of ports, such as keyboard and USB ports. All these peripherals were located behind an access panel which could be physically locked with a key.

The electoral register was extracted from the Electoral Management System as a flat file in 'comma separated variable' (CSV) format. The Election Markup Language (EML) was not used as there was no requirement to interface with other suppliers.

The electronic register programmed the ballot smart card with a unique number representing the voter; this was essentially a ballot number and was not, in itself, related to the voter's electoral registration number.

Vote information was stored in three places in order to minimise the potential for voting data to be lost:

- on a USB token;
- on an internal disk within the unit; and
- on a flash memory card within the unit.

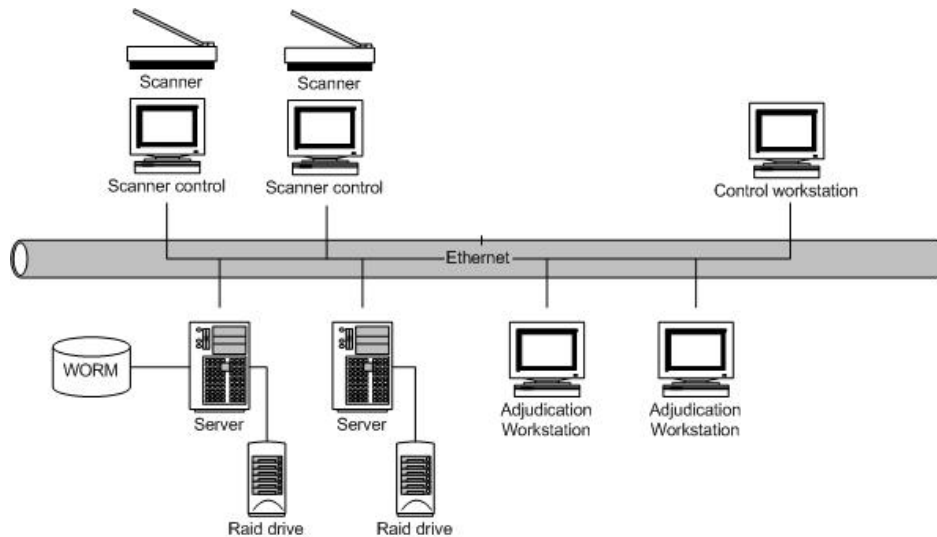
### E-counting

The e-counting system consisted of a closed network, as shown in the diagram overleaf, and consisted of the following components:

- two servers that hosted the image databases and the e-counting image recognition logic;
- two high-availability (RAID) drives (one for each of the above servers) that contained the image data within the databases;
- a write-once-read-many (WORM) optical drive on which was recorded an encrypted audit trail of the count;

- two adjudication workstations that were used to adjudicate ballots that the system did not assign directly;
- a control workstation that was used by the Deputy Returning Officer to control the e-counting system;
- two commercial-off-the-shelf (COTS) scanners; and
- two workstations with touchscreens that were used to control the scanners.

**Figure 1: Network diagram for e-counting system**



The scanners had a hopper capacity of 500–1,000 sheets, a maximum resolution of 400 dots-per-inch (dpi) and a scanning speed of up to 90 pages-per-minute at 200dpi. An uninterruptible power supply (UPS) was provided to ensure the continual availability of the network in the event of any problems with the power supply.

The software components were as follows:

- Idessa workflow software, configured to control the e-counting process;
- user interface software for the e-counting application;
- optical character recognition (OCR) software to process the ballot paper images;
- Microsoft SQL Server database software; and
- drivers to control the scanners.

The way in which the technology was used has already been discussed. The following section now discusses briefly how the system operated:

- the Returning Officer enabled the system by pressing his finger onto a fingerprint reading device, entering his username and password, and inserting a USB token containing cryptographic keys. The USB token contained two keys: a digital signature private key and an Advanced Encryption Standard (AES) encryption key;
- the ballot papers were scanned: for each ballot a TIFF image was passed to the server and stored in the SQL Server database;

- the server processed the images in the image database; this involved digital signing the images using the digital signature key on the token, and performing optical character recognition (OCR) on the whole image. The system was set up to reduce the chances of any invalid ballot papers being marked as valid; if there was any potential uncertainty (such as marks outside the areas or incompletely marked crosses), the image was flagged as requiring adjudication;
- if the ballot could be identified as containing a valid vote, the appropriate counter was incremented within the database; otherwise the image was sent to one of the authentication workstations;
- if adjudication was required, the adjudication information was also sent to the server for storage in the database. If there were any paper ballots that were not able to be scanned, the additional adjudication information was also entered in the system;
- once the e-counting process had been completed, the entire SQL Server database was recorded onto the WORM disk. All files were encrypted in a single batch, using the AES key on the USB device;
- the WORM device was given to the Returning Officer for secure storage.

When the e-counting equipment was originally set up, only one scanner was installed. A second scanner arrived on Monday 19 January; however, this was a different model, which had not been fully tested for e-counting. An identical scanner was eventually located on Thursday afternoon; however, there was insufficient time to perform a full acceptance testing on the new configuration, and only one scanner was used for the count itself.

## Security and fraud

We have evaluated the security of this election and present here the main findings, according to the five criteria identified in The Electoral Commission report on the May 2003 UK local government election pilot schemes:<sup>3</sup>

- integrity: votes should be counted as intended; it should not be possible to add invalid votes, or modify or delete valid votes;
- confidentiality: it should not be possible to associate a vote with a voter (except with a court order), duplicate a vote or view the results before close of poll;
- enfranchisement: each eligible voter should be able to vote once, and once only; nobody else should be able to vote;
- availability: the system must be operational throughout the voting period; and
- verifiability: relevant parties should be able to check that the above properties hold.

In general, the security of this by-election was good and conformed to current best practice. In particular, there were a number of measures taken to reduce the potential risks associated with the use of technology.

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<sup>3</sup> The Electoral Commission (2003): *The shape of elections to come*.

All three systems (kiosks, electronic registers and e-counting systems) were not connected to any network, either within the council or the internet. Therefore, one key avenue of attack – external hacking of the systems via electronic means – was not available. Physical security during the election period was good and physical access to the equipment was restricted to authorised personnel. Many contingency measures were in place to ensure the availability of the voting and counting processes throughout the election period.

The kiosk units themselves were well protected from physical tampering in the polling stations. All kiosks were physically transferred to council premises before being tabulated.

The e-counting system was located in a locked room in council premises and mechanisms were in place to restrict physical access to the equipment and authenticate its use by council staff.

Our report on the May 2003 local elections concluded that ‘there is a still a long way to go before the current systems can be said to be publicly verifiable’. The report subsequently identified the need for an accreditation and certification process in order to investigate in more detail the technology used. The situation has not changed in this respect and this pilot has confirmed the need to implement such a process.

The following section presents a more detailed assessment of the technology, and makes a number of recommendations for further improvements to the security of the system.

## Electronic registers and kiosks

### **Integrity**

The electronic registers and kiosks were not connected to any network; therefore, attacks on the integrity of the election would need to be made with physical access to the units. During the election period, the physical security around the machine was good. The units were stored in a locked room in the council offices, in an area protected by smart card access control.

During the voting process, the units were well protected. Access to all ports and critical buttons was protected using a locked access panel.

One of the features available with the AVS units, not used in this election, is to simplify the election set-up process by using a wireless network. All units had been fitted with wireless networking cards, although they were disabled for this election. The reason that the cards were not removed is that the units do not function correctly unless the cards are installed. Without further testing, it is not possible to say whether the wireless cards introduced any risk.

However, it is recommended that potentially vulnerable components, such as wireless cards, are removed if they are not required for a particular election.

The authentication of operators for the units was performed using location and administration smart cards. Although the units themselves had the ability to use an additional password, this option was not used for this election.

The cards themselves were well protected, and any actions undertaken by an attacker with a forged or stolen location card would be detected in the audit trail. However, with a forged or stolen administrator card, an attacker would have much higher access. It is therefore recommended that a password is provided in addition to the use of a smart card to protect against stolen administrator cards.

We do not currently have details on the functionality, and any potential cryptography, used by the smart cards; it is, therefore, not possible to comment on whether an attacker could forge an administrator card. It is recommended that a strong form of authentication is used for the administration functionality. However, we do not believe that it was a major issue for this particular election due to the limited opportunity of an attacker to have the required unaccompanied physical access to the machines.

One potential vulnerability that can occur in kiosk voting systems relates to the interception, modification or deletion of voting result data as it is sent from the polling stations to the central counting point. For this election, this was not a large risk: no electronic transfer took place, and all kiosks were physically transferred to the council offices using trusted personnel before they were closed and tabulated.

No formal checks were made to ensure that the software configuration used within the electronic registers and kiosk was known, stable and uncompromised. The Commission understands that the units themselves do support this functionality, and that the entire software configuration, including the operating system, can be digitally signed and subsequently verified at the time of the election. It is recommended that a mechanism such as this is employed, and that this is combined with an accreditation and certification system.

## **Confidentiality**

Many of the issues discussed above, with relation to integrity, also apply to the confidentiality of the election.

The ballot card used by the voter during the voting process contained a sequential ballot number rather than the voter's electoral registration number. Therefore, no information that could directly identify a voter was held on the kiosk units. Associating an individual vote with a voter would require additional access to the electronic register in order to retrieve the voter's identity. The voters' privacy was adequately protected during the voting process by panels, built into the kiosk, that unfolded to shield the screen from the sides and from above.

The kiosks kept an audit trail of activities undertaken. The results of the election could only be viewed using a location card if the election had already been closed. These activities would show up on the audit trail that was checked when the units arrived at the council offices on Wednesday evening.

As with integrity, the area of greatest risk, **from a technical point of view**, related to the possibility of an insider who had physical and electronic access to the units. It is noted that the risk of insider tampering is also present in the traditional electoral processes, and that electoral staff are already highly trusted council officials. However, as an attacker to the electronic kiosks could potentially achieve a higher impact on the whole election, it is recommended that appropriate security controls are required within the implementation of the kiosks. These should form a component of the accreditation and certification process.

All voting material (such as kiosk files and printouts, electronic register files and printouts, signed declarations of identity, etc.) was stored, after the election, in a secure vault on council premises.

### **Enfranchisement**

As with confidentiality, many of the issues that have already been discussed are relevant to ensuring voter enfranchisement.

The smart cards used to hold the ballot were placed into the machine by an electoral officer; a malicious voter attempting to use his or her own card to make multiple votes would have been easily detected.

### **Availability**

There were many safeguards to ensure the availability of the election. Each unit stored information in three places (USB token, internal disk and internal flash memory) in order to minimise the potential for voting data to be lost.

The availability of the service itself was protected through the use of a number of spare machines that could be swapped in at short notice, and technical support was readily on hand. As a final resort, business continuity plans were in place to revert to a manual election in the event of significant problems.

### **Verifiability**

Methods that can be used to provide verifiability of the election results include performing an independent review of the systems used and implementing checks and balances to provide assurance in the validity of the results. As has been identified previously in this report, an accreditation and certification process is required in order to investigate in more detail the technology used.

There were processes put into place to verify some aspects of the use of the technology. Voting totals from the kiosks were cross-referenced with the

corresponding totals from the electronic registers and no discrepancies were found.

## E-counting

### **Integrity**

The e-counting equipment was set up on Monday 12 January in the council offices. The physical security was, in general, good. The equipment was kept in a locked room in an area where a smart card was required to gain access.

At the count itself, access to the general area where the count was held was restricted to those whose names had previously been registered with reception, and security guards controlled access using coloured passes. Two types of pass were used: one allowed access to the council chambers where the screen was located, and the other allowed further access to the room where the count itself was performed.

The passes were not individually numbered as it was a small event, and only a very small number had access to counting equipment itself. However, one member of the press gained access to the count having found or stolen a pass. He got past the security presence but was immediately recognised as being unauthorised by council staff and ejected. It is recommended that individualised passes are used, even for small counts, as they can help to ensure that users are accountable for the safekeeping of their passes.

The e-counting system was implemented using a standalone network that was not connected to any other network. The system was therefore not vulnerable to network attacks, such as those occurring via the internet.

All ballot paper images were digitally signed prior to their storage in the database; the intention here was to protect the images from direct tampering. This is a good feature that can provide additional assurance in the security of the e-counting solution. However, there are improvements that can be made to further enhance the security. As the digital signature keys were loaded from the USB token into the servers for the signature process, an attacker with access to the machines could also have had access to the signature keys, and so could have re-signed any altered images. Furthermore, it was unclear whether any verification of these signatures took place. It is recommended that a secure token with cryptographic functionality is used to perform this signature and that the subsequent verification of these signatures is documented and contained within the election audit trail.

### **Confidentiality**

All data from the e-counting system, along with voting information from the electronic registers and kiosks, was encrypted in a single batch as it was transferred to the WORM disk. Encryption was performed using the Advanced Encryption Standard (AES); this is a strong encryption algorithm and is sufficient to protect the confidentiality of the archive, provided that it is

implemented correctly and access to the keys is suitably restricted. The WORM disk and the keys were subsequently stored in a secure vault within the council offices along with other voting material, such as the video record of the counting process.

While the approach taken provided a good archive of the e-counting technical operations, a stronger audit trail could be created by writing events to the WORM drive as they occur, rather than as a batch at the end of the process. This would protect against an attacker altering the audit trail to cover his or her tracks.

### **Enfranchisement**

The e-counting technology used in this election was not voter-facing and therefore had no effect on the enfranchisement issues of this election.

### **Availability**

As with the provision of electronic kiosks, there were many safeguards to ensure the availability of the election. Most of the components were duplicated to protect against individual component failure. In addition to this, the servers and workstations used to implement the e-counting system contained identical software; the actual functions undertaken by a particular platform were controlled by a USB key. This meant that the system could be easily reconfigured if necessary. As a final resort, business continuity plans were in place to revert to a manual count in the event of significant problems.

There were a number of short power interruptions on the final day of polling, caused by bad weather. The network was well protected with an uninterruptible power supply (UPS) and was not affected by these power supply fluctuations.

### **Verifiability**

As with the electronic registers and kiosks, there were some issues with the verifiability of the technology. As has been identified previously in this report, an accreditation and certification process is required in order to investigate in more detail the technology used.

There were processes put into place to verify some aspects of the use of the technology:

- each Presiding Officer in the polling stations filled in a control sheet detailing how many ballot papers had been issued. A corresponding sheet was completed for the postal votes;
- after scanning, the system reported how many papers had been scanned in each batch. These totals were entered manually into a control sheet for the ballot box;
- the total number of ballots scanned was compared to the number of ballot papers issued;

- minor discrepancies were noted (for example, if voters had taken away ballot papers without voting). These were not significant.

## Independent quality assurance

As with the elections in May 2003, technical experts were contracted by the Government to provide assurance regarding the technical robustness and security of the solution.

This assurance was achieved by analysing the project management and overview technical documentation, holding discussions with technical staff from the suppliers and witnessing the testing of the technology.

Unlike the quality assurance activities undertaken in May 2003, direct security testing of the systems (also known as penetration testing or ethical hacking) was not performed.

The Commission believes that, in general, the level of quality assurance activities performed was appropriate for this election. However, the Commission believes that the overall assurance achieved could be much higher if the activities were performed in the context of an accreditation and certification process that had already investigated the technical solutions in detail. In particular, it is recommended that some form of security testing is undertaken to test that the implemented electronic security measures work appropriately.

## Fraud

In the first week of February, letters were sent out to each postal voter so that they could confirm that they did in fact vote by post and that they signed the declaration of identity. A total of 92% of the postal voters responded; the responses did not provide evidence that any fraud had taken place.

The use of mobile kiosks for the residential care facilities rather than, for example, postal voting, decreased the risk that completed votes could have been directly handled by the candidates or their staff.

The Commission is not aware of any allegations of fraud relating to this election.

## Impact on the voting process

Election staff reported that the electronic registers were easy to use and no problems were experienced. As the electronic registers were used in addition to traditional paper marked registers, there was no corresponding increase in efficiency associated with using the electronic registers. Election staff reported that using the electronic register actually took slightly longer, on average, than using the paper register due to the need to type in several letters of the elector's name. Often this would be sufficient to identify easily the elector, but

there were occasions when additional letters needed to be typed (for example, when many people had the same or similar surnames), which resulted in time delays.

It was suggested that having the ability to enter a voter's electoral registration number from the poll card, as well as the ability to type in the surname, would be a useful additional feature to increase the efficiency of the process.

As this was a relatively small-scale election, the application for a ballot paper did not cause a bottleneck and no problems were observed.

## Impact on counting

No recount was required for either of the wards in this by-election. If a recount had been necessary, the system supported two methods for performing a recount:

- a logical recount in which the ballots would not be re-scanned, but rather the result would be recalculated based on the already processed images; and
- a full recount in which all ballot papers would be re-scanned and re-processed.

Alternatively, a full manual recount could be performed.

The results of the Central ward election were announced at 10.50pm; the results of the Western ward election were announced at 11.25pm. These announcements were later than had been expected by many of those attending the count.

A significant amount of time was taken to manually handle, pre-sort and enter the ballots into the scanner. This was due to the fact that the ballots were folded and need to be unfolded before they could be scanned, and because each ballot paper had to be manually checked before placing it in the pile for scanning. This checking was performed because acceptance testing had determined that the system procedures for dealing with batch errors were difficult to use.

In particular, problems were caused if the voter had damaged or defaced the barcode on the front of the ballot paper; this occurred on a number of ballot papers. It is noted here that the Commission has recommended that the law should be amended to allow barcodes to be used to replace serial numbers on ballot papers; ballot stationery should clearly describe the role of the barcode, which should always be placed on the back of the ballot paper.

As discussed earlier, only one scanner was available for use. This did not cause any significant delays to the process, as due to the ballot handling processes, the scanning process itself was not a bottleneck – the scanner was in use less than 20% of the time. The council took the decision to count the wards in sequence. The Commission believes that this was the right

decision to take as it aligned most closely with the procedures that had already been tested. However, a more scalable approach would be required for larger counts.

Thresholds were set at deliberately cautious levels to ensure that votes were not incorrectly assigned by the system. Again, the Commission believes that this was the right approach to take, as it is important to ensure the accuracy of the count. However, as a result of this, there were a large number of ballot papers that were apparently well formed that still required adjudication. It is expected that further piloting will help to refine this balance.

In addition, there were an unusually large number of ballot papers in one of the wards that required manual intervention. This was not a function of the e-counting, and these ballot papers would have also required adjudication if a manual counting process had been used. Processing these ballot papers caused a considerable delay to the count.

The transparency of the count was an issue for some candidates and agents, who were concerned that they did not have physical access to the room in which the counting equipment was held. Although the screens provided a useful view of the counting process, candidates expressed concern that they were not afforded adequate opportunity to scrutinise the entire count process. The fact that each ballot paper flashed up on the screens, albeit briefly, was an innovative aspect of this election. Many candidates did not make systematic use of this feature; one candidate, however, performed an approximate manual count based on the screen images. How well this approach would scale for larger elections is an area that requires further investigation.

## Impact on turnout

The e-counting and e-register components of the pilot are for administrative efficiency and do not affect turnout.

The use of electronic kiosks could potentially affect the turnout. The turnout for the election as a whole was 21.5% (19.4% in Central ward and 23.5% in Western ward). This compares to figures of:

- 23.1% and 26.3% respectively for these wards in the May 2003 elections, which also featured remote electronic voting;
- 18.5% and 22.5% respectively for these wards in the last non-electronic election (held in May 2000); and
- 20.6%, which was achieved at the last by-election held in Swindon; this occurred in January 2003 and used traditional methods of voting.

From the above figures we conclude that the turnout at this by-election was comparable to a traditional election and was not significantly affected, either positively or negatively, by the nature of the pilot.

The use of mobile polling stations in the residential care facilities resulted in a turnout for this community of 57%. This figure contrasts strongly with the overall turnout figure of 21.5%. Although we do not have corresponding turnout figures for this community at previous elections, it is likely that lowering the barriers for voting in this way has had a considerable impact on turnout.

The early polling in fixed locations achieved a turnout of 0.9% of the electorate. This amounts to 4.3% of the total votes cast, and as such is higher than that achieved using early voting in the May 2003 elections. However, the usage of untargeted kiosks such as these is still significantly less than that achieved using remote voting channels, and there is no evidence that it had an effect on the overall turnout figures.

## Public awareness and feedback

### Publicity

A number of activities were undertaken to promote the pilot. As this was a by-election, the campaign was less intensive than had been undertaken for the May 2003 elections. However, the campaign did include two press releases and a series of interviews with local daily and weekly newspapers, local radio and local television. Interviews with the media started before Christmas and continued through January right up to polling day. A local radio station conducted a live broadcast at the count itself.

There were inaccuracies in some of the local press articles; for example, one article reported that the technology used in the election was the same as had caused problems in elections in the United States. This was not the case.

All electors were sent a variety of leaflets explaining the pilot and giving details of how, when and where to vote.

### Feedback from the public

The information sent out to voters was clear and comprehensive. The voting pack sent to voters who had registered for a postal vote included:

- a sheet in 18 languages providing a telephone number to call for assistance with completing the postal vote; and
- a sheet explaining how to complete the postal vote, covering marking the ballot, placing the ballot in the inner envelope, signing the declaration of identity, placing it and the inner envelope in the outer envelope, and posting it.

In general, the electorate appeared to be impressed with the technology and were pleased to see the council using leading-edge technology.

The council undertook a number of surveys to get feedback from voters and non-voters. The response rates from the surveys are shown in the table below.

**Table 1: Swindon Council survey response rates**

Survey	Issued	Returned	Percentage
Polling station	2,443	1,444	59%
Non-voters	793	133	17%
Postal	322	268	83%
Early	137	103	75%
Residential facilities	189	133	70%

The survey revealed that the public found the voting methods easy to use:

- in total, 93% of postal voters found the paperwork that accompanied the postal voting very easy, or quite easy, to understand; less than 1% of voters found the paperwork quite difficult to understand;
- in total, 91% of early voters found the kiosk very easy, or quite easy, to understand; 5% found it quite difficult, or very difficult, to understand;
- in total, 83% of voters in the residential care facilities found the kiosk very easy, or quite easy, to understand; 13% found it quite difficult, or very difficult, to understand.

Public awareness of the early voting facilities was, in general, quite high: a total of 81% of postal voters, 73% of polling station voters and 47% of non-voters were aware of the early voting arrangements.

The public were asked whether they thought there was a need for additional channels such as the internet or telephone voting. In total, 48% of voters thought that there was a need, while 30% of voters thought that there was no need for additional channels. This compared to 56% and 21% respectively for non-voters.

The public were also asked whether they thought that the marked register, showing who had and had not voted, should be provided to candidates after the election. In total, 34% thought that it should, and 62% thought that it should not be provided.

It is interesting to note that the age distribution for the members of public who returned responses to the survey, while potentially indicative of the age profile of voters, was not representative of the general population: 2% of respondents were aged between 18 and 24, 8% between 25 and 34, 12% between 35 and 44, 25% between 45 and 59, and 52% aged 60 or over.

## Feedback from candidates and agents

The majority of politicians liked the idea of taking the mobile polling stations around the residential care facilities and would like this to be done for a full

election. However, this was not the universal view, and some thought that this innovation would distort the result of the election.

The count itself took longer than many had expected and some discontent was expressed verbally at the count by candidates and their agents. The majority of candidates and agents also expressed discontent, verbally, that they were not able to have physical access to the operation of the count.

Many candidates and agents thought that presenting the images of the ballot papers on the large screens was excellent, and enabled everyone at the count to see every ballot paper; this is something that they would not see at a traditional count.

The Liberal Democrat agent was not satisfied with the count and has written a report on the conduct of the count. In particular, he objected strongly to the following:

- the counting agents were not physically present at the count;
- the use of video screens was not considered an acceptable substitute, and was not catered for in the order; and
- the Returning Officer provided insufficient information during the proceedings.

## Accessibility

The e-counting and e-register components of the pilot are for administrative efficiency and do not affect accessibility.

As part of the evaluation of the May 2003 pilots, Scope were commissioned to review the accessibility issues relating to the use of e-voting. We have used in this report the kiosk accessibility issues highlighted in this review as a framework for evaluation, namely:

- location issues relating to the physical accessibility of the polling station where the kiosks were located;
- design issues relating to the flexibility in positioning the kiosk within the polling station;
- usability issues relating to the difficulty experienced by some voters in using the touch screens;
- support issues relating to the degree of support and assistance available to those voters that needed it; and
- smart card issues relating to the difficulty experienced by some voters in manipulating the smart cards.

The fact that the polling stations were mobile, and visited the residential care facilities, had a positive effect on accessibility: the residents were able to vote in a location with which they were already familiar.

The kiosks themselves, consisting of ruggedised laptops, were very portable and could therefore be re-located if necessary to support particular needs. The angle of the screen could also be moved if necessary.

The kiosks used 'touch screen' technology and, therefore, the related issues identified in the Scope report also applied here. However, the kiosks did have support for 'large print' ballots and the sizes of the 'buttons' on the screen was made as large as possible. We were not made aware of any voters who were unable to vote due to the touch screen technology.

Support was on hand during the voting process, and the Presiding Officer provided assistance during the voting process on a number of occasions, standing to one side and behind the protection screen so as not to compromise the confidentiality of the vote. Election staff were given guidance on how best to assist voters with visual impairments.

Smart cards were placed in the slot in the kiosks by the Presiding Officer and therefore any accessibility issues relating to the use of the smart card were not present.

Although the kiosks had the potential to provide an audio interface, via headphones, this was not implemented for this election. The Commission would like to see future pilots of this technology trial this feature.

## Impact on campaigns

There was a good deal of active campaigning from all parties for this by-election. This was partly due to the fact that the results of the election could potentially affect the overall control of the council.

The candidates were informed about the pilot nature of the election in December 2003 and subsequently sent an information pack on 6 January 2004. The majority of the candidates had already been involved in an e-voting pilot, either in May 2002 or May 2003.

## Cost

The estimated additional costs to the local authority are £5,800 (total cost of £14,300 compared to an estimated cost of £8,500 for a traditional election). This can be broken down as follows:

- £500 for the extra management required from electoral administration staff;
- £1,700 for the additional fee-paid staff;
- £1,000 for training costs;
- £700 for additional printing costs for literature explaining the operation of the pilot;
- £1,400 for publicity costs, covering the printing and distribution of promotional leaflets; and

- £500 for the additional polling stations.

In addition, the supplier and the ODPM bore additional costs. The provision of hardware, software, and associated maintenance and support was funded by ODPM; the total cost of this was £47,500. Essentially this covered the hiring of the kiosks and electronic registers and included a contribution to the professional services used to support the pilot.

The total extra cost for this pilot election was therefore £53,300, which equates to an extra cost per elector of £3.68.

At the present time, the e-voting sector is young, and there are no off-the-shelf products for e-voting. This is the starting point from which the pilots are conducted, and it is therefore important to examine the cost-effectiveness from three viewpoints. Firstly, the relative cost-effectiveness of this particular pilot solution can be assessed by comparing the costs incurred to the costs of similar service in today's marketplace, and by assessing both the value provided to this election and the broader knowledge that can be fed back into the pilots programme. Secondly, the cost-effectiveness of the use of technology can be assessed by comparing the costs and benefits with traditional electoral processes and systems. Thirdly, the cost-effectiveness of the use of the technology in the long term can be estimated.

From the first point of view, this pilot represents good value for money compared to many of the previous pilots undertaken. This was the first deployment of this particular e-counting solution and, as such, was vulnerable to the risk of disproportionate costs in order to offset the development costs of the supplier. However, this risk was not manifested and a large part of the costs, particularly in the provision of hardware and software for the e-counting component but also in other areas, were borne by the supplier. The pilot was well-managed and a number of useful lessons have been learned that are reported in this evaluation report; in particular, the Commission is pleased to see the high degree of involvement from Swindon Borough Council in all stages of the election.

From the second point of view, the pilot did not represent good value for money as there was no measurable improvement in the overall turnout, the issuing of ballot papers in the polling stations or the time taken to conduct the count. While there was clearly an improvement in the service to those voters who voted on the day before the traditional polling day, this could have been achieved through traditional means at a significantly reduced cost.

From the third point of view, there is clearly still some way to go before the technology can be routinely employed at costs approaching those of traditional elections, and it is not possible to make an overall judgement at this point. However, a number of observations can be made:

- the hiring of kiosks is unlikely to be cost-effective in the long-term as hiring costs for a single election are typically a substantial proportion of the purchase costs;

- due to the pilot nature of this election, a significant level of professional services was required – however, progress is being made in this area and the high degree of council involvement has already been noted in this report; and
- increased use of commercial-off-the-shelf (COTS) technology in the future should help to bring down the cost further.

## Conclusions

The pilot was well-managed and a number of useful lessons have been learned; in particular, the Commission is pleased to see the high degree of involvement from Swindon Borough Council in all stages of the election. However, there is still a need for the Government to produce a roadmap which will provide a framework within which progress can be made and measured, and will maximise the benefits from individual pilot schemes.

Based on the findings of this evaluation, we have the following recommendations for areas which would benefit from further exploration in future pilots:

- the use of audio to improve the accessibility of kiosks for the hard of hearing;
- methods to improve the transparency and verifiability of the counting process, particularly to ensure that candidates and their agents are able to physically observe the counting process within an appropriate proximity;
- the use of large screens for displaying the operation of the count, and in particular, the ballot papers themselves (which should be used to enhance, rather than replace, existing methods involving direct observation);
- e-counting methods where the barcode is contained on the back of the ballot paper;
- methods to make the e-counting process more efficient, particularly for larger counts, without sacrificing transparency and efficiency;
- methods to make the use of e-counting technology more efficient (such as through optimisation of algorithms, thresholds and procedures to deal with corrupt ballot papers), without sacrificing the accuracy and reliability of the count;
- methods to improve the impact of electronic registers (through allowing greater flexibility in the range of locations in which voters can cast their votes) and methods to increase the speed with which they can be used to identify voters; and
- methods to verify the software configuration of voting kiosks, particularly when used in association with an accreditation and certification process.

In terms of the five statutory evaluation criteria, the Commission's conclusions are as follows:

- the scheme was successful in facilitating voting for those members of the electorate who lived in residential care facilities, with turnout among this community reaching 57% and satisfaction levels high. The scheme was

also partially successful in facilitating the counting of votes; the count for the Western ward was achieved in 30 minutes;

- many of the elements of the pilot scheme related to the efficiency of the conduct of the election rather than relating directly to the turnout of voters. The Commission has not found any evidence that the use of kiosks in this pilot election significantly affected the overall turnout figures. However, it is likely that the targeted use of kiosks for early voting in residential care facilities has increased turnout for this particular community;
- voters found the process of voting using the electronic kiosks easy to use: 93% of voters in polling stations found the kiosks easy to use, while less than 1% of voters found them difficult to use;
- the Commission is not aware of any allegations of fraud relating to this election;
- the majority of the additional cost for this by-election pilot was borne by the supplier and the ODPM, and therefore did not impact greatly on the costs to the local authority.

In addition to these statutory requirements, the Commission's conclusions regarding the additional evaluation criteria are as follows:

- it is likely that the use of kiosks for early voting in residential care facilities has increased turnout for this particular community;
- given that this was a by-election and not a whole-council election, the overall levels of user awareness and comprehension of the voting method being tested was good;
- voters found the voting kiosks easy to use and, in general, welcomed the introduction of new technology in the electoral process. The opinion of the candidates and agents on the e-counting process, and the use of video screens to display the ballots, was divided. A significant number felt that the process provided opportunities not present in the traditional counting process, and further piloting is required to explore the issues further;
- the use of kiosks for early voting in residential care facilities has resulted in measurable improvements to the provision of more efficient and effective service delivery to this section of the community;
- the use of electronic registers in polling stations, as implemented in this pilot election, has had no significant improvement to, or adverse impact on, the existing system of applying for a vote;
- in terms of assessing the costs in context with the pilot status, this election represented good value for money compared to many of the previous pilots undertaken; the pilot was well-managed and a number of useful lessons have been learned which are reported in this evaluation report. In the context of the implementation of a wider roll-out, there is clearly some way still to go before the technology can be routinely employed at costs approaching those of traditional elections. However, the high involvement of council staff represents progress in this area.

The Electoral Commission

April 2004