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CONSULTING

Electoral pilot scheme technical evaluation

Dover District Council

June 2007

Introduction

This report is presented to the Electoral Commission to inform the statutory evaluation of the electoral pilot scheme in Dover District Council at the elections on 3 May 2007.

The Electoral Commission is required to submit its evaluation report to the Secretary of State and any of the local authorities involved in the pilot scheme, and those local authorities are required to publish the evaluation report within three months of the election. This report is the technical evaluation report presented to the Commission on 25 June 2007 to inform their statutory evaluation.

In preparing this report, Ovum has drawn on its own observation and assessment of the pilot scheme, as well as on the views expressed to us by a number of other stakeholders. We would particularly like to thank the Returning Officer, and the electoral services department of Dover District Council for their assistance in undertaking this evaluation and for supplying us with the information and data to support the technical evaluation.

Pilot objectives

In its pilot scheme application, Dover District Council noted that the proposed technical innovations aimed to:

- Raise awareness of the election amongst the general public, thus increasing turnout
- Assist in increasing the level of security through the use of technology, enhancing the integrity of the electoral process and promoting confidence in the use of the counting systems available.
- Improve efficiency in terms of the time taken to complete the count, reduction in the resources required and accuracy of the counting process, particularly with regard to a multiple count process.

The complex nature of the manual counting of votes that is involved in a combined election encouraged Dover District Council to plan, apply for and conduct an electronic counting pilot. Ultimately, the Council's objective was for a swift, efficient and accurate count, with measures of success being described as gaining confidence in the results achieved, and to be in a position to adequately defend a challenge if required.

Although the impact of electronic counting technology deployment on actual turnout is tenuous, Dover District Council did consider there was some opportunity for increasing propensity to vote through the publicity the scheme was given, encouraging voters wishing to participate in such a pilot scheme, who might otherwise not have voted.

A multiple count, where voters have the option of selecting more than one candidate, is more complex and prone to mistakes and errors of judgement than a straightforward first past the post election. It was therefore felt that confidence would be enhanced and errors reduced through the use of electronic counting technology. In addition, the logs and audit trail provided would provide a complete record of activity whereby individual operators of the system (that is, Dover staff and OPT2VOTE staff) could be identified and reconciled with particular actions.

Dover District Council was keen to improve efficiency of the count by reducing the time, resources and associated costs of a manual count, as well as improving accuracy of the results. It was estimated in the weeks before the count that approximately 4.5 hours would be needed to complete the electronic count, compared to more than 7 hours for a manual count.

Pilot scheme technical description

Dover District Council planned to pilot a series of innovations and changes to electoral procedures, incorporating:

- Electronic counting, using barcodes in addition to ballot paper numbers, and with the removal of the perforating mark
- Electronic postal vote management and matching, incorporating new legislative requirements for postal vote identifiers and marked register of postal voters (note that this evaluation report does not specifically address this aspect since it is linked to new legislative requirements, and is not defined as part of the pilot-only aspects of the scheme)

The electronic count was planned to be conducted immediately following the close of poll on Thursday 3 May 2007.

Electronic Counting

The focus of Dover District Council's pilot scheme was to use technical system that would efficiently and accurately record and count ballot papers for both district and parish elections on 3 May 2007. The requirement was for a fully auditable solution that incorporated the requirements of the Electoral Administration Act 2006.

Dover was instrumental in selecting its preferred supplier, OPT2VOTE, to work with the District Council on the implementation and delivery of the solution. Louise Cooke, the **Democratic** Services Manager, had worked previously with OPT2VOTE, and the close relationship between the two organisations was important in the planning and delivery of the scheme.

The innovations included in the scheme were:

- Redesign of the ballot paper, to include barcode provision, in addition to ballot paper numbers. Also, the traditional perforated official mark was replaced by a dot matrix 2D barcode as the official mark on the front of the ballot paper, and the words "Do not fold" were printed on the back of the paper
- An electronic counting software solution that captured ballot images and provided a complete solution from verification through to the final result. It had the capability to perform an automatic adjudication of all scanned ballot papers, whilst providing facilities for manual adjudication for any paper that was unclear or outside of the standard rule set. Doubtful ballot papers were adjudicated in front of candidates and agents as usual, and the system provided the facility for recounts
- Provision of hardware, including commercial off-the-shelf scanners, PCs running Windows XP, and a server running Windows 2003 (including back-up equipment for contingency)
- Projected displays for the delivery of information to onlookers, and to facilitate observation of adjudication

- Operation of the scanners, registration, verification and adjudication PCs by trained Dover District Council count staff (rather than by the supplier's staff).

e-counting of postal ballot papers

Although postal ballots were scanned prior to the count in order to fulfil the requirement for signature and date-of-birth verification, all postal ballots were then rescanned at the count itself for vote recording purposes. Such postal ballots were planned to be the first to be processed at the count.

Full e-counting of all ballots papers returned from polling stations

Following the close of poll, all ballot boxes were moved to the count venue, Dover Town Hall. A full e-counting system was provided, incorporating 9 scanners, PCs and server to scan all returned ballot papers. However, one parish ward needed to be counted manually due to a printing error which meant the ballot papers for this contest were too large for the scanners to take (that is, they were longer than the maximum A3 size permitted).

The key stages of the count – registration, scanning, verification, first and second level adjudication of doubtful ballot papers and the final count – were performed electronically using the e-counting local area networked system. In order to provide further protection of the server against onlookers, and facilitate access to an outer room where ballot box opening and ordering would take place, the layout of the count area was slightly changed from the full scale testing undertaken on 29 March 2007.

Changes to the ballot paper to facilitate e-counting

The counterfoil provision had been removed through the provisions of the Electoral Administration Act 2006. Ballots were perforated and stapled into books of 100.

The reverse of the paper included details of the contest, the ballot paper number, and a corresponding Code 39 barcode[1] (as distinct from the official mark 2D barcode on the front of the ballot). The Code 39 barcode provided a unique identifier, containing details of the Event, Election and Contest, as well as the reference of that distinct ballot paper within that election contest. The system can, in this way, assign ballots to a given election contest, and reject duplicate ballots.

The Order from the DCA also allowed for the words 'Do Not Fold' on the rear of the ballot, so that papers could be posted flat, and in optimum condition for scanning.

[1] Code 39 is an alphanumeric barcode. The symbol can be as long as necessary to store the encoded data. It is designed to encode 26 uppercase letters, 10 digits and 7 special characters. It can be extended to code all 128 ASCII characters by using a two character coding scheme.

These ballot boxes were similar to those used in Lewisham and Newham in May 2006.

The official mark was a dot matrix 2D square barcode in the top left corner of the paper. The system is designed to check that this barcode is both present and valid. If not, the vote would not be counted. There is no cryptographic information contained within the barcode to prevent forgeries. However, if the ballot paper were to be photocopied and returned in the ballot box for counting, the system will read the barcode and report it as a duplicate. When this occurs, the system will report the location of the relevant ballot paper in this batch, and also the location (that is, the batch number, and sequence number) of the other corresponding ballot paper. These can then be extracted and an investigation undertaken if required. The system will only ever count one of the ballot papers.

All district ballot papers were white, and parish ballot papers were yellow. Although papers were designed to be consistent in terms of fonts and sizes used, there were some discrepancies in word sizes and layout of the table grids when received back from the printer.

System logs and audit trail

The system logs all actions carried out during each stage of the count. Examples of these include:

- Who carried out registration, and at what time
- Where all ballot papers were scanned; which operator scanned them; all records are time and date stamped; batches of ballots papers are scanned in including corresponding sequence numbers
- Who carried out verification and at what time
- Adjudication

    Did a ballot require adjudication?

    What marks did the system read?

    What error was recorded against the ballot paper?

    Who adjudicated on the ballot paper?

    What was the manual decision made?

    What was the reason selected for rejected ballots?

Management of the pilot scheme

Project management

Overall management responsibility for the pilot scheme, as well as for the whole of the electoral process in Dover was undertaken by the Democratic Services Manager of Dover District Council, Louise Cooke, who was fully supported by OPT2VOTE personnel both prior to, during and after polling and the count. Dover was always responsible for key decision making, with OPT2VOTE advising appropriately.

Both Dover and OPT2VOTE adhered to Prince II management procedures, which complemented the skills of Dover's manager. In addition, this manager was witnessed to have a strong, capable electoral services team behind her, who also fully supported her leadership role. The electronic counting process in effect closely mirrored that of a manual count, and therefore Dover's team appeared comfortable and confident in their respective roles, whether as process administrators, or technology operators.

Overall, documentation was comprehensive, and up-to-date, with key items including:

- Project plan
- Risk register, including contingency measures
- Issues list
- A detailed Project Initiation Document
- E-count hardware specification
- Detailed process description document
- E-count process sheet for distribution to observers of the count
- E-count UAT Scripts and Acceptance Procedures Document and Certificate

Communication was good between all parties with regular weekly project meetings and monthly board meetings. The meetings were used to flag issues, determine actions required and to update and report on latest status. Updated minutes were provided after each meeting and prior to the next.

Training

OPT2VOTE took responsibility for training Dover staff on the technical electronic counting system. It was undertaken in a structured way at the count venue on 29 March 2007, with a presentation of the different steps from registration to adjudication (supported by appropriate documentation), followed by demonstration and hands-on operation by the staff.

Dover Town Hall was set up as for a real election situation, so that staff would get an idea of the workflow of the count as well as the technical operation. A comprehensive test was undertaken following the training which helped to consolidate what staff had learnt.

Actual operation was straightforward and generally intuitive, and did not require substantial time or effort to become familiar with.

The training documentation provided to staff included the following:

- Registration Guide
- Scanning Guide
- Verification Guide
- Adjudication Guide
- Count Guide

The documents were written in a straightforward, clear manner. Dover staff were able to take the documentation away for further reading between the training session and the count. It is, however, recommended that the Scanning Guide is updated slightly to incorporate further detail on actions to take in the event of a paper jam. For example, the OPT2VOTE Count Manager demonstrated a paper jam situation to the staff, outlining a number of possible actions that might be required, such as:

- All papers that have successfully exited the scanner prior to the jam, plus possibly one that is in the machine and which exits cleanly following maintenance, should have been successfully scanned, and can be verified. The remaining ballot papers should then be reinserted for scanning.
- Alternatively, the operator may opt to select the 'remove batch' option from the File Menu, and rescan the whole batch again before verifying.

The inclusion of such instructions in the Scanning Guide would provide additional assistance to those who may forget what their options are, as well as for reference at future electronic counting events.

A subsequent refresher training session was provided at the Town Hall on Wednesday 2 May 2007. Staff found it fairly easy to familiarise themselves quickly again with the procedure. First level adjudication was perhaps the more difficult aspect, due to the more complex interface for this aspect of the count. The operator understandably needed longer to adjust to the screen requirements than did those operators undertaking registration, scanning or verification. Observers too needed time to familiarise themselves with the interface, and track what actions the mouse was making. There is a lot of information on the screen, and many different places to look in order to come to a decision. For example, one had to examine the marks made by the voter, the 'suggested' marks made by the software system in its interpretation of the voter's mark, the reasons for the system allocating the paper as a doubtful ballot paper, and then select the appropriate option to reject the paper (which should not happen in first level adjudication), to send for RO adjudication, or whether to accept a particular mark,

then accept the paper itself. So although the process mirrors that of a manual count, there are more interactive actions required on the part of the adjudicator, who needs to be more alert as a result.

In order to address a bottleneck that was occurring on count night itself, some scanner operators were reallocated to first level adjudication duties. This was a good decision in order to alleviate the bottleneck; nevertheless, it would have been better if these operators had been more fully trained on that task beforehand.

Some were uncertain about which boxes to check, and which reason to give for referral to RO adjudication. Some were also initially seen rejecting blank ballots, which the training documentation directs should be sent for RO adjudication to be conducted in front of candidates and agents. So, although the training documentation did address this point, the deployment of staff less familiar with this particular task, who hadn't actually practiced it beforehand, gave rise to risk of mistakes. However, the presence of two members of staff per adjudication PC helped to mitigate the risk (that is, they questioned each other's actions and decisions, and quickly realised rejection was not an action they should be performing at first level adjudication).

The software application itself did not prevent ballots from being rejected at first level adjudication, and it is therefore recommended that this is addressed in future versions. Indeed, the Dover and OPT2VOTE project managers have subsequently discussed this issue, and noted a requirement to change this control in future deployments.

Relationship management

A close working relationship was witnessed between Dover District Council personnel and OPT2VOTE. Indeed two of the key representatives of both organisations, Louise Cooke of Dover and Conor McColgan of OPT2VOTE, previously worked together on a local referendum at Thanet District Council in November 2006.

Roles for personnel were clearly set out, both in the run up to the election, and during the election and count itself. Key individuals were:

Individual	**Role**	**Planned percentage of work day to be spent on the project**
Louise Cooke (DDC)	Project Board – Executive	60%
Val Rumblelow (DDC)	Project Board – Senior User	20%
Conor McColgan (O2V)	Project Manager; Count Manager	40%

During training, Dover staff were allocated specific main roles each, such as registration operator, scanning operator, verification operator, first level adjudicator and RO/Deputy RO adjudicator. As mentioned above, some staff were redeployed when bottlenecks occurred at first level adjudication.

Process management

The Count Manager was responsible for the overall workflow of the technical aspects of the count, which was generally smooth, calm and consistent (despite the bottlenecks mentioned). Dover staff respected his leadership in this role, and deferred questions to him, which he would subsequently escalate to the DDC Executive as required. All operators were familiar with the system, and also understood the bigger picture beyond their particular roles.

Putting the technical part of the process into context of the overall count, the steps followed were:

1. Ballot boxes arrived at the Town Hall, and were opened in an adjoining room to the main count hall, in view of candidates and agents. Ward and parish ballot boxes from the same polling station were to be opened at the same time. This occurred generally, except for a few occasions where it was overlooked. The contents were tidied, and sorted where cross contamination had occurred between district ballots and parish ballots.
2. If the batch was for a ward, it was transferred to the 'Awaiting Registration' area of the central racking. Parish batches were stored in the main storage area, to be processed when District batches were completed.
3. The data from the Presiding Officer's ballot account was transcribed onto a coloured control sheet, and then ballots were placed into stacks and transferred to e-count storage boxes, with the control sheet placed on top.
4. From 'Awaiting Registration', the batch was taken to a process PC to be registered, using information from the control sheet. The batch was then moved to 'Awaiting Scanning'.
5. From 'Awaiting Scanning', the batch was taken to a scanner for processing. Once complete, the ballot papers were loaded back into the storage box and moved to the 'Awaiting Verification' area
6. From 'Awaiting Verification', the batch was taken to a process PC where a check was undertaken of the number of scanned ballots on the system against those registered on the control sheet. Those not verified were placed 'On Hold' for checking. Once verified, the control sheet was signed, and the ballot papers were moved to the 'Awaiting Adjudication' area, if there were ballots remaining for adjudication. If there were none, the batch was moved to the 'Storage' area.
7. Batches in the 'Awaiting Adjudication' area remained where they were until they had been processed at first or second level adjudication by the RO and his deputies on the system.

8. Once adjudication was completed, ballots papers in the batch were moved to the 'Storage' area, and thereafter to a secure storage area away from the count.
9. Remaining ballots in the 'On Hold' area were dealt with.
10. Once all batches of a contest had been processed, the RO moved to the server to count the votes. The results were printed out, and shown to the relevant agents, following which, the result was declared.

Two other OPT2VOTE staff were involved in the technical part of the process – one taking charge of technical support, and the other assisting the Count Manager with workflow and general queries.

One learning point for future elections would be to assess how bottlenecks might be better avoided. On the verification step, for example, only the OPT2VOTE count manager was designated to take the control sheet to the Dover staff member on the verification PC (who was then responsible for checking the figures, and verifying them via the software application), before the count manager signed the sheet, or placed the batch 'On Hold'. But he was often diverted on other technical issues. There were also a lot more ballots for adjudication than envisaged prior to the count, predominantly due to variations in print quality and the variances in ballot templates.

Also, there was a bottleneck at ballot box opening and tidying, which was taking place in the adjoining hall. This took more time than planned due to the sheer quantity of ballots received, the impact being that scanner operators often had little to do as they awaited the batches to arrive from sorting. On the technical side, Dover staff that were employed included 1 operating the registration PC, 9 operating the scanners, 1 on the verification PC (plus the registration operator who also performed this function), 2 dedicated to first level adjudication (with some of the scanner operators being redeployed on this task later), and 1 on RO adjudication, overseen by one or two assistants. A learning point is to have more personnel undertaking the tidying initially, and perhaps fewer on scanning until the majority of sorting had been undertaken.

When operators had completed scanning district ballots, the operators were not allowed to start scanning parish ballots until the former had been cleared at adjudication. Whilst this was desirable in terms of maintaining transparency, and keeping order, it was a less efficient use of resources, and frustrating for parish candidates. Eventually, parishes did start to be scanned towards the end of district adjudication at about 1.25pm when scanners had been standing idle for around 30 minutes.

It was decided a week before the count that one parish would be counted manually. An oversight by the printer meant that they had not reduced the size of image to be printed onto a ballot paper less than A3 size (the maximum size for the scanners), and as a result delivered ballots of 17 inches in length. As this was known prior to the count, plans could be made for manual counting staff to handle this parish.

Other actions were taken to enhance efficiency once parish ballots were ready for processing. In order to get parish papers to the scanners as quickly as possible, the registration operator started to fetch batches herself from the central racks, registering and taking back to put on the 'awaiting scanning' shelf. She did this on the advice of OPT2VOTE's count manager, who was otherwise engaged on other issues. This change certainly aided the efficient process, even if it was outside of the originally planned procedure.

First stage adjudication was a good idea – it meant that candidates and agents didn't see all the thousands of minor adjudications (normally picked up by counters during a manual count). But also, that Deputy ROs and the RO were more likely to be forewarned and prepared for more challenging issues, such as a folded corner on a ballot paper that obscured the voting mark. There was time for the actual paper to be retrieved and examined before final adjudication in front of candidates and agents. Unfortunately, however, the high number of first level adjudications, and the pressure to get through them meant that forewarnings were not able to be given as often as originally envisaged.

No recounts were required, and no use was made of a count-only scanner, that is, one not connected to a PC, nor hence to the image recognition software application, but which merely counted the number of papers fed through. This scanner was present in case of discrepancy between paper numbers recorded by the polling station Presiding Officer, and the scanned ballot numbers. There were a few discrepancies initially, but only because some wards and parishes got mixed up at opening stage. These discrepancies were all addressed.

Following the election, Dover's electoral services team have expressed a desire to incorporate more control within the system that will enable them to better determine what should or could be declared when, thus ensuring a steady stream of declarations for the benefit of candidates and agents. On this occasion, managing the timing of declarations of more exciting (i.e. close) contests was done manually, with the assistance of a very experienced member of Dover's team, but it is felt that the solution itself could help facilitate this by providing more information on the progress of the report. Again, the Local Authority has expressed a wish for the solution to provide a greater level of granularity of information, where things are within the workflow process, as well as a big picture overview of current status. This would also be beneficial for observers as well as the Local Authority itself.

Risk and contingency management

Overall, risk and contingency management was considered very robust and effective. The Risk Register and Issues List, maintained by both Dover and OPT2VOTE in the run up to the election, were regularly consulted, actioned and updated. The following are examples of some of the back-up items and procedures in place:

- Backup Server, kept on-site at the count in a secure location

- External Generator placed outside the building
- 20 minute UPS on the main server
- Four spare scanners (two of which to be kept at the DDC offices)
- Data was backed up at each stage (registration, verification, adjudication) and on an hourly basis to an external hard drive
- Presence at the count of a Canon engineer to maintain scanners if required
- Plan for a manual count in the event of irreparable system failure.

Nevertheless, there are always aspects that can be improved or readjusted which are highlighted by the pilot scheme process. Indeed, this is one of the benefits of a pilot to raise such issues. These include:

- The availability of a Contingency Management Plan document. Dover District Council's Order for service to be supplied by OPT2VOTE describes the requirement for a Business Continuity Plan (BCP). To date the Ovum Evaluator has not seen this plan. If it does exist, the project manager was not aware of it.
- Provide more cross operational training for Dover staff, e.g. ensure more scanner operators are familiar with first level adjudication from the outset, in the event of reallocation of responsibilities.

Testing approaches

The testing observed was seen to be rigorous and conscientiously undertaken. Process and systems operation was witnessed on a number of occasions by the Ovum evaluator, including full scale testing and training on 29 March, a demonstration of systems to the DCA's QA auditor on 23 April, and a final test and run through on 2 May prior to the Count.

At the testing and training session on 29 March, OPT2VOTE used 10,000 ballot papers that were created by OPT2VOTE personnel and temporary staff. They also hired the retired chief electoral officer of Northern Ireland to manually count these ballots as a check. This took 3 days.

In addition, a substantial number of ballot papers (2 x 1000 district ballot papers and 4 x 500 parish ballot papers) were marked up by Dover District Council, with additional ones being marked by DCA representatives, where the outcome was already known by the Dover Executive. These were put through the system, and at the end of the test, the results matched the pre-defined outcome.

Dover also documented its user acceptance test (UAT) requirements, which were tested and passed by 23 April. The key scripts tested had been determined by assessing the requirements of the Local Authority, as well as those of the DCA, and included:

- Verifying if the number of ballots scanned agrees with that given by the presiding officer account

- Where there are multi-seat vacancies, demonstrating the ability to prove the result against verification figures by including calculation of undervotes
- Demonstrating that the adjudication process includes all the statutory categories for rejected ballot papers; also that the system does not permit re-adjudication on doubtful ballot papers where a recount takes place
- Undertaking a controlled count of ballot papers marked by DDC
- Demonstrating the ability to retain an electronic record of all decisions made and actions taken by an operator
- Demonstrating the ability to complete electronic copies of any data at the end of a count, and delete from the system any such data
- Ensuring only authorised users for each function are permitted access to the relevant parts of the system
- Ensuring that calculation of votes cast can only be made once verification and adjudication is completed for each area; ensuring adjudication cannot take place until verification of votes is completed for the area; ensuring verification cannot be undertaken until scanning of all of that polling district, including postal votes, is completed; and ensuring registration of votes cast is not able to be higher than the number of ballot papers issued
- Showing that the system reports if a ballot paper is scanned twice to enable duplicate ballots to be excluded from the count
- Showing that measures are in place to prevent votes are not allocated to more candidates than entitled.

In addition, OPT2VOTE has undertaken a comprehensive programme of systems and software testing, for example:

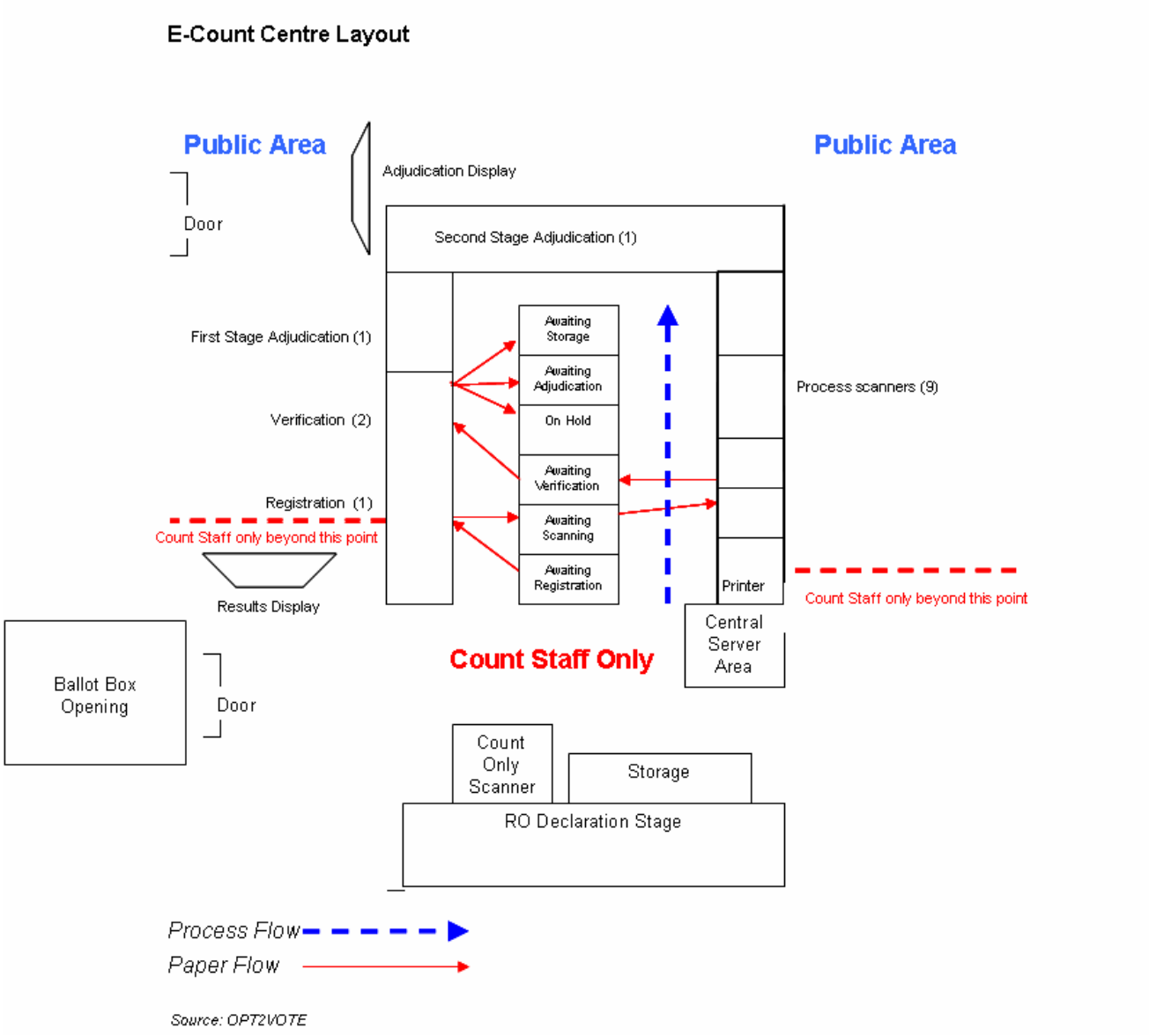
- OPT2VOTE uses the services of security expert Peter Ryan, Professor of Computing at Newcastle University. Professor Ryan consults with OPT2VOTE's development department, and reviews key processes, providing advice on how the supplier can improve services
- OPT2VOTE contracted with Sopra Newell & Budge, who provided OPT2VOTE with a Risk Management Report on the Dover electronic counting system.
- Other independent companies such as SQS perform stress testing and penetration testing on OPT2VOTE's systems.
- An additional stress test involving 52,872 ballots was undertaken during the weekend of 30 March. This took 2 hours 55 minutes, with adjudication and count completed in 3 hours and 30 minutes. The test used 7 scanners, equating to 7,553 ballot papers per scanner. 1,453 ballot papers were subject to adjudication, representing just under 3% of the ballots.
- OPT2VOTE has provided the Commission with a document detailing its Electronic Count Test Specification, dated 26 September 2006. The document outlines the testing procedure carried out by the System Test team when a release of the Electronic Count product is being handed over from the Development department to the QA Department for System Testing.

Technology

OPT2VOTE's technical solution is designed to emulate existing manual processes where possible, in order that continuity is maintained, and legislated procedures are adhered to.

Hardware and technical layout

The count layout is illustrated below.



For the count itself, nine scanners were used which comprised 8 x Canon 6080 units (60 ppm) and 1 x Canon 7580 unit (75 ppm), each taking maximum sized A3 paper, with duplex scan heads (that is, they could read papers upside down and back to front). The scanners had weight sensors, and double feed detectors, and were operated by Dover staff. The scanners are fairly heavy duty, designed for heavy loads, with a reasonably fast throughput. These models are used in other industry sectors such as insurance, transport and legal sectors in order to digitise and securely store data electronically.

One printer was allocated to the e-counting network, with a further printer available as a contingency.

The server used was a Pentium 4 Dual processor, 3GHz with 4GB memory, a 10/100 UTP network card, 4x36GB hard disk (3 x RAID 5 / 1 x hot spare), and external hard disk for data backup. The server hosted the main database and counting system. It was configured to a high level of resilience, including dual components (power supply, processor, memory, disk etc). The server was managed and operated by the OPT2VOTE manager and technician. In addition, there were two UPS units, and a 24 Port Managed Switch 100/1000 MB UTP.

Standard desktop PCs were used for registration, scanning, verification and adjudication of ballots, and comprised 13 x Pentium 4 3GHz units with 1GB memory each, 10/100 utp network cards, and 30GB hard disks. Two of these were allocated to registration and verification functions, and two to first level adjudication, and Returning Officer (RO) adjudication. The latter PC was connected to a projector so that candidates and agents could observe RO adjudication on a big screen. This worked reasonably well, with candidates perhaps being able to see better than they would a ballot paper.

There were two additional display screens on which it was intended to project details of the count status for each ward. This was to be activated when counting was 75% complete for that ward, and stop when counting reached 95%, so not to publicise the final result prior to the RO's declaration. No figures were to be displayed, just a visual indication of the count process. Prior to the count, this was not observed operationally by Ovum during the testing sessions. On the evening, its use was quickly withdrawn since it started displaying information based on the registered postal votes and not the overall received votes. Rather than reveal information that would not normally be available to candidates and agents, Dover and OPT2VOTE decided to stop displaying the progress information.

A few minor technical hitches were observed during the count, mostly as a result of the ballot paper printing problems suffered and described further below in the Software section. There were also a few paper jams, and the Canon engineer needed to clean the heads on one of the scanners. Also, if the system found the barcode illegible, the operator would be notified after scanning, and need to type in the barcode number manually. Such instances were, however, minimal. In testing, it was estimated that just over 0.2% of barcodes had to be input manually by operators. Whilst this information was not recorded on count night, it has been estimated by an OPT2VOTE representative observing proceedings that

approximately 1 in every 500 scanned barcodes needed to be manually input, that is, 0.2% also.

Apart from this, there were few hold-ups in the operation of the scanners. It may be argued that since there were frequent periods of downtime for scanner operators with nothing to do, the process could have been undertaken with fewer personnel and machines. However, there is also an argument that if the bottlenecks previously mentioned had not occurred, the scanner operators could have finished more quickly. Ovum's view is that the optimum solution is probably somewhere between the two, with perhaps six scanner operators being sufficient. Others could then be redeployed on ballot box opening, verification or first level adjudication.

Process PC Operation

Each PC was operated by a Council officer. The Count Manager brought batches of ballot papers and managed the flow of ballot papers throughout the e-counting process.

Operators logged onto the process PCs entering their user name and password. Prior to the count, it was planned that each user of the system would have pre-defined secure access credentials to log onto the system, and that the system would lock the access privileges configured in line with each role defined in the system. In the event, it was decided to allow operators to use their first names and select their own passwords, with the Count Manager assigning them to their specific roles. The Returning Officer and Deputy Returning Officer were the only users with the ability to access the RO adjudication and count modules in the system (although the Count Manager would also have had administrator access rights).

The process for registering a batch was as follows:

1. The batch of ballot papers was brought to the Registration PC.
2. The operator selected 'Registration' from the application screen.
3. The operator selected the appropriate ward/parish and the system listed all the polling stations in that ward or parish.
4. For that polling station, he total number of ward ballot papers and the total number of parish ballot papers from the control sheet were entered by the operator.
5. After saving, the batch was registered on the system.
6. The paper batch was moved to 'Awaiting Scanning' on the central rack.

The process of verifying a batch was as follows:

1. Following scanning, a batch of ballot papers was brought to the verification PC.
2. The operator launched the 'Verification' report from the application.

3. The application displayed the number of successfully scanned ballot papers, together with the numbers entered at registration for each polling station within that ward/parish.
4. The count manager wrote the number of successfully and unsuccessfully scanned ballots on the control sheet.
5. If there were no significant discrepancies between the figures (the allowable level set by the Returning Officer was 1 fewer for parishes and zero for wards), the batch status was set to 'Verified', the control sheet was signed, and the batch was moved to either 'Storage', or 'Awaiting Adjudication'. If there was a significant discrepancy, the sheet was not signed, but the batch status was set to 'On Hold' and the batch moved to 'On Hold' on the rack.

The standard, first level adjudication process was as follows:

1. The operator selected 'Adjudication' from the menu.
2. A list of wards/parishes requiring adjudication was shown together with the amount of ballots awaiting adjudication.
3. The operator selected a ward/parish, and the first image requiring adjudication was displayed.
4. The operator decided if the paper was acceptable (e.g. if there were ticks rather than crosses), or would select options to refer it to the RO for second level adjudication.
5. In the case of a valid vote, the operator clicked on a corresponding numbered box in a grid next to the image to register the vote as recorded. Once all votes were recorded, the 'Accept' button was clicked. A confirmation message appeared for the user to confirm their selection. Once the selection was confirmed the next image was displayed and adjudicated, or if it was the last one, the system displayed 'All Ballots have been Adjudicated'.
6. If there was any question on the adjudication, it was to be passed to the Returning Officer queue for Second Stage Adjudication. The next image would be displayed and adjudicated, or if it was the last one, the system displayed 'All Ballots have been Adjudicated'.

The Returning Officer adjudication process was as follows:

1. The process for Returning Officer adjudication was as above except that the Returning Officer or Deputy Returning Officer had more choices in the adjudication of the ballot:

   1.1 Valid votes were registered as described above.

   1.2 Ballot papers were rejected by clicking on the button that corresponded to one of the following reasons:

   - want of an official mark
   - voting for more candidates than vacancies
   - writing or mark by which voter can be identified

- unmarked or void
- Rejected in part

Only the Returning Officer process PCs could access the Returning Officer adjudication queue and this queue could only be accessed through the Returning Officer's or deputy's secure access credentials.

Software

The OPT2VOTE electronic counting application was installed on standard Windows XP PCs, and Windows 2003 server. All operators used the Windows domain login procedure.

The OPT2VOTE e-counting application is a relatively mature software application (this version being simply called e-Count 2007), using standard core EML, that required relatively little customisation for the Dover pilot scheme. Since OPT2VOTE works solely on the delivery of election solutions, the product is not commercially available. However, it is able to be tailored for use in a number of different commercial environments. All elements of the solution have been used in previous e-count projects. Enhancements have been made to all elements of the system following each project, however the core of the product including the count engine, user interface, scanning module, adjudication and count and results screen have all been used previously.

The specific customisation that was undertaken for the Dover pilot included:

- Enhancing scanning and processing so that both are completed in parallel
- A new registration option to capture the number of ballots issued to a given polling station prior to scanning
- A verification option which displayed the number of ballots actually scanned against the number registered
- Preventing first or second level adjudication from taking place until all polling stations for the contest are verified
- More information on the RO adjudication option, listing election contests available for adjudication, along with the number of ballots requiring RO adjudication
- Audit functions incorporated into the application. OPT2VOTE intend to expand on, and enhance the usage of these audit tools for future elections. At present the information can be produced by querying the database. OPT2VOTE plans to include a Management Utility to allow this to be more user friendly and include more information.

The image recognition functionality works by scanning in a template version of each ballot contest in order to identify the areas that need to be read. These areas are then highlighted as zones. When the actual ballot papers are scanned in, the software records where a change has been made in those zones identified. If the mark is an X, and if it lies within an accepted zone of the template, it will be

accepted as a valid vote. If the mark does not fulfil either or both of these criteria, the ballot will be sent for adjudication. The voting area can be determined by the RO to be any size. It can be exactly the size of the voting box, or can be re-zoned to be slightly smaller than the printed box.

25,000 types of X have been pre-programmed into the image recognition software. Mark detection itself is undertaken by a package called iRead from Charactell. This package has been integrated seamlessly into OPT2VOTE's scanning application.

The main problem encountered by the image recognition software was that the quality of printed ballot papers was inconsistent from contest to contest. For example, one print batch had a different font size on the word 'CANDIDATES' compared to the template, whilst another batch of postal votes had horizontal table lines printed fractionally higher than the template. Such differences caused 'ghosting' on the scanned images, which was addressed by the technician tweaking the template on the server for that contest. It was feared that the use of yellow paper for parish ballots would cause similar issues, although in the event this seemed less of a problem. In some instances this was caused by the absence of the outer right hand border of the table column containing the marked vote. This was due to the line having been chopped off in error, or to it being too close to the edge meaning it was lying outside of the scanner's print area. The result of this was that the voting mark appeared to the system to be outside of the voting area, and therefore thrown up for adjudication. Unfortunately, there were hundreds of such ballot papers meaning first level adjudication became more onerous than it might otherwise have been. In addition, for two of the wards, OPT2VOTE needed to rescan in a revised template, a process which took 10 minutes per template.

As indicated above, anything that did not fit one of the 25,000 pre-programmed X marks was thrown up for adjudication. There appeared to be many ticks that would normally have been accepted by the counting clerk at a manual count but were forwarded to first level adjudication at Dover. The acceptance level for the voting mark can be changed to be more tolerant, or accept other marks such as ticks (or indeed, to be even stricter). OPT2VOTE generally advise that the system is set to be relatively strict, particularly for election pilots. As a result, if the system is in anyway in doubt of the voting mark, it will be returned for a manual check.

Security and fraud

DCA QA Audit

The Commission was present at the DCA's QA audit of the technical system, undertaken on 23 April. It was considered to be quite late in the day to be conducting such an audit, leaving limited time to address any major concerns, and was a major inconvenience to electoral services staff at this point of the election project schedule.

The DCA auditor considered e-counting pilots to have less specifically technical issues to address than e-voting which was being undertaken in other local authority areas.

On the whole, the audit was judged to be thorough, raising concerns where required. However, the auditor was at that time still awaiting outstanding documentation. For example, OPT2VOTE walked the auditor through the latest version of the Risk Management and Accreditation Documentation Set (RMADS), but could not promise to hand over a (still draft) copy until 27 April.

The key issue from the DCA auditor's perspective for e-counting in Dover was that of physical configuration, for example, the placement of electrics within the hall, how data for records would be protected or backed up etc.

For the most part, OPT2VOTE and the Local Authority had thought of most things (for example, procedures were in place for backing up data hourly, no food or drink was to be allowed in the hall, only Louise Cooke and her deputy were to have a key to the alarmed, secure room where equipment was stored etc.)

The main points raised by the DCA auditor for closer recommended scrutiny included having more robust documentation of all processes such as zeroing the system, contingency planning etc; secure placing of servers; a password policy; training count staff to be vigilant and to police the count area; ensuring a clean PC policy, with no unused applications visible to users or observers on the PC monitors; also making sure users logged off the desktop if they need to leave their seat for any reason.

Security and risk management countermeasures

As previously mentioned, OPT2VOTE has undertaken a comprehensive programme of systems and software testing, with a focus on security and risk management issues that could potentially impact on the pilot scheme. A Risk Management Report dated 30 April 2007 undertaken by Sopra Newell & Budge considers the impact values, identified threats, vulnerabilities and likelihood of risks to the

information system, and records a Risk Management Plan with proposed countermeasures.

The outlined security objectives were:

- To protect the information system against unauthorised disclosure of sensitive information; corruption/alteration of count information; insertion of valid data; destruction of information, and
- To protect the information system from non-availability of information processing facilities; key equipment; and key staff.

The analysis concluded that identified threat events all had low likelihood, but that three were judged to have a greater (though still low) vulnerability level: application failure, operator error, and performance problems affecting throughput. Countermeasures were proposed to address these threats, as well as those with a lower vulnerability level.

Any risk of security compromise (such as presence of malicious software, or misuse of login credentials) was judged to be very low.

Count security

Although the count hall was set up on the day before the count itself, the server and database residing on it were taken away overnight for offsite secure storage. Other equipment was left onsite. The Town Hall was securely locked and alarmed, and its position next door to the police station lowered any risk of unauthorised access.

Prior to the count, a scripted test was run on the system to check the correct tables and templates were present, and that they were correctly formatted. The Deputy RO verified that the system was empty prior to the start of registration, and a signed certificate was provided to stakeholders. However, since the server was set back from the observation area, this process was not witnessed by anyone other than Dover and OPT2VOTE staff.

Clock synchronisation for each desktop was undertaken manually, by aligning the time on each PC to each other and to a watch. Clock synchronisation was done to ensure accuracy of audit logs, which may be required for investigations or disciplinary actions at a later date. Inaccurate logs may hinder investigations and damage credibility.

The software used required that all users had to login through the application, where a defined role was allocated. For example, a scanner operator was unable to use that login to access adjudication or count facilities. The software login password was encrypted. The presence of a more rigorous password policy would, however, have been desirable. In the event, users were permitted to use their first name as a user name (case sensitive), and select their own password with no rules regarding number and type of characters to be used being defined (this was

suggested by the DCA's security auditor). For the pilot situation, this was not considered a risk, but it is recommended this is addressed for future elections.

Equipment within the count hall was connected via a local area network (LAN). There was no external connectivity which could compromise the network. Nor was the LAN connected to the results display in the adjoining room. The latter was created by Dover District Council manually inputting the results for onlookers' information.

The software was set up to prevent adjudication from commencing until scanning of a particular ward or parish had been completed and verified. The verification operator had to enable adjudication via the appropriate screen before that ward or parish could be listed for adjudication.

Once a ballot paper had been adjudicated, this was recorded by the system so that should the same ballot paper be rescanned into the system (for example, in the event of a recount), it would be classed as a duplicate paper and rejected. In this way, previously adjudicated papers would not again be raised for adjudication during a recount, as required by the DCA's Pilot Order.

Once adjudication was complete, the Returning Officer or his deputy had to physically move to the other end of the hall to perform the count itself on the server. This count facility was not enabled until the verification and adjudication process had been completed.

The software provided the facility to maintain an account log of key processes, including login, batch and barcode numbers, adjudication and counting etc. On count night itself, Dover Council staff manually checked the provisional result against the account logs to ensure the results were as they would have expected, that is, they were checking that the party they expected to hold, gain or lose seats actually did so. These were seen to be safe wards and no shift expected in the results.

Physical security of the count area was perhaps not as tight as it could have been, with no guard presence on the boundary between observer and count area. However, this was mitigated by the presence of barriers, by the fact that OPT2VOTE and Dover staff were wearing branded T-shirts for easy recognition, and by the use of senior Dover staff invigilating the area, and networking with observers. It was noted that observers did not encroach on the counting area except when invited by the RO to hear the declaration prior to public announcement.

There was a police presence in the outer room where ballot boxes were being opened.

The count hall layout was designed to protect the critical servers from onlookers, being set back several feet from the observation area. However, observers were able to lean over scanners and desktop PCs, with limited protection for those items of equipment from drinks spillages (observers had brought drinks into the hall, which was against the count rules), or accidental or malicious damage. In the

event, there were no problems with equipment caused by contact with observers. OPT2VOTE clarified that greater protection had been considered, but that on balance, transparency of the pilot scheme process was more desirable in this instance. Observers could not damage anything that was mission critical (the PCs were client machines, and the data itself resided on the server), unless a concerted effort was made to disrupt proceedings – which could also happen in a manual count.

Secure Delete Process

OPT2VOTE's process is designed to ensure that any electoral assets (including information assets) are retained in a secure manner for the duration of the statutory period following completion of the election. All information assets were returned to the Deputy Returning Officer in the agreed format, i.e. one copy on DVD and one on Memory Stick. Unfortunately, the server did not have a DVD-Recordable drive since this requirement had not been flagged. The data was therefore transferred via memory stick to the technician's laptop, and thereafter burnt onto DVD. This meant once the data was stored on the removable media, it had to be deleted from two units, the server and the laptop.

The procedure undertaken varied slightly from that set out in OPT2VOTE's process document, in that the data was handed over to the Deputy Returning Officer after it had been deleted from the system, including laptops as they too were running SQL Server, using a delete database function within SQL Server (although the files had been checked for integrity on the removable media through a restore and redelete process). A certificate of deletion was seen by Ovum and given to Dover District Council.

Should any issues arise whilst data is stored by Dover, the Local Authority may contact OPT2VOTE as part of the contract, where the supplier can (with relevant permission) re-install the Local Authority's copy of the data if required and provide the necessary documentation. To ensure that this information can be operational OPT2VOTE will keep registered copies of the software used on site during the election.

After the designated archive period (12 months), OPT2VOTE has offered to dispose of any media securely and safely when no longer required should Dover wish them to do so. Alternatively Dover may choose to use their own secure media disposal processes. The primary means for electronic media reuse or disposal is zeroing (overwriting), degaussing, or physical destruction, as applicable to the medium. In general, other electronic media (DVD, CD, diskette, zip drive etc.,) will be physically destroyed or rendered unreadable

Impact on the counting process

Count process

The count process was well planned and executed with only a few areas for improvement as noted above. Dover and OPT2VOTE had taken learning from previous pilot schemes that served to make event more effective. For example, Dover produced a description of the process that could be handed out to observers, and provided a team of senior staff to network with those observers, ensuring they understood what was going on, and answering questions.

There was plenty of room in the count hall itself as a result of the decision to open ballot boxes in the adjoining room. The latter, however, was probably more cramped as a result.

Count staff were confident and assured, with the main comments made being related to not having enough to do at certain points of the process. For example, scanner operators were often seen sitting, waiting for a batch to be delivered for scanning. This part of the process was quicker than other elements such as box opening and adjudication, leading to substantial downtime by the scanner operators. Also, the registration and verification PC operator had periods with nothing to do, as she waited for the Count Manager responsible for bringing her batches to register as he addressed other issues, such as the count process itself for the district wards. Ultimately, for parish registration, and on the instruction of the Count Manager (as she was seen to be highly competent), the registration operator began collecting batches from the central rack herself, registering them, then returning the batch to the part of the rack allocated for awaiting scanning.

On the whole, the workflow was considered satisfactory and effective on the night.

Scanning of ballots

The ballots did not come out of the ballot boxes already neatly arranged for easy scanning.The box openers were employed to tidy papers as far as possible, unfold any folded ones, and separate district from parish papers if they had become mixed. However, the main problem encountered by scanners was the postal votes. These were more likely to be folded, creased, torn etc, and provided the scanner operators with an initial challenge with regard to paper jams and double feeds. Once the postal ballots were dealt with, however, scanning appeared a much more efficient process.

The scanners were set up as specified for the pilot to only accept one of 25,000 Xs as a vote. This, together with the printer problems previously described led to a total of 17.3% of the ballots scanned being sent for first level adjudication. As a result, scanning staff were redeployed to assist with the large numbers of first level adjudications. Although the quality of print was the primary cause, there were also a large number of ticks seen passing through to adjudication. There is an argument

in future elections to allow the technology to accept ticks as well as crosses if the Returning Officer so wishes.

Other problems encountered, such as two of the scanners observed failing to record the ballot image, were addressed by the OPT2VOTE technician by readjusting the server configuration for that batch and that scanner. This ensured that the image detection software would only pick up the voters' marks, and not the variations in print quality which led the software to interpret as marks outside the voting area. There is an ongoing need to consider the threshold between the software being set too aggressively and detecting print variations as well as voter marks, versus not being set sensitively enough, and not detecting anything. There are a number of potential approaches that OPT2VOTE could take going forward in this regard. For example, they will explore the feasibility of adopting the same approach for print variations as they have for crosses, that is, they could run the blank ballots through the system before the count, so that the system could build up a library of acceptable ballots (as with the library of 25,000 crosses). OPT2VOTE intend to undertake more detailed research, development and stringent testing to see which might be the best suited approach to counteract any potential print inconsistencies.

First level adjudication

As reported above, 17.3% of ballots were passed to first level adjudication. Observers outside the count area did not witness these adjudications. On the whole, they were undertaken diligently. Senior Dover staff dedicated to adjudication did this alone, and other staff who had been redeployed from scanning did this in pairs. There were some uncertainties initially on the part of the latter due to the unfamiliar interface, but after a short while, operators became more confident and adept. As mentioned above, there needs to be additional contingency training for this task, and clearer instructions on when to accept, and when to pass for RO adjudication. It is preferable that the software application does not allow rejection at first level adjudication, to counter any potential human error.

Whilst the system did log actions, and would provide an audit trail if required, no real use was made of that facility during the count itself. It is felt by Ovum, as well as by the Local Authority, that more could be made of this functionality in real time, such as providing information on adjudications as they progress.

RO adjudications

RO adjudication worked well, with work in progress being projected onto a large screen for observers to see clearly. However, it was felt that the process may have been a bit too quick for some observers, with adjudication decisions being made and the next doubtful being displayed before they could respond to the first one. Indeed, at one point, there was a software error that prevented the adjudicator from selecting a reason for rejection and continuing with the next ballot. This was addressed by the Count Manager through closing and restarting the application.

However, there was some confusion as to what had happened to that last ballot, which did not reappear. Had it been accepted or not? Following the election, it was confirmed that the ballot had been accepted, but this was unclear at the time. No negative feedback has to date been received in this respect, but speed of the process might be an issue worth considering for future.

1.4% of ballot papers were sent for RO adjudication (of which 96% were rejected), and this part of the process was therefore relatively quick. The first result declaration was made at 12.46am, with the last parish just after 4.00am. Although the count finished about 2 hours later than anticipated, it was nevertheless considered a good achievement by Dover and OPT2VOTE.

Visibility of the count

The progress display screen in the end was taken out of service, since it started displaying information based on the registered postal votes and not the overall received votes. Rather than reveal information that would not normally be available to candidates and agents, Dover and OPT2VOTE decided to stop displaying the progress information. It is still considered a good idea to have some kind of progress display for candidates, in order to improve transparency and increase interest. Some observers who crowded round various scanning machines seemed to be enjoying themselves, and not feeling too left out of the process. Others, however, felt that although they could visibly see the ballots being scanned, they did not know which ward was being scanned where. The Local Authority had intended to have physical, movable signage indicating where such wards were being dealt with, but found it difficult to implement on the night, with the process being too quick to keep up with, necessitating continually changing the signs. This is a learning point for future elections that the Local Authority plans to address.

The results display system in the adjoining room was operated by Dover staff. The results had to be transcribed from the OPT2VOTE system by hand to be displayed on the Dover system, since the two were not integrated. This point was raised by the DCA's QA auditor, who was content to keep the two systems separate. Although such set-up ensures additional security, where results are not electronically tampered with before display, a standalone system that is not connected to the outside world is less prone to attack. Subject to stringent confirmations being demanded by the system regarding the accuracy of the data being transferred, it is felt that greater efficiency could be achieved simply by connecting the two in-house systems.

Cost and value for money

The cost for the technical parts of the e-counting pilot scheme is estimated to be £166,300, according to the contract signed between Dover District Council and OPT2VOTE, plus the cost of a mobile emergency electricity generator, and minus the quoted cost of OPT2VOTE staff to operate the scanners. This equates to £2.00 per elector, or £3.65 per actual vote cast in both district and parish elections.

Such costs are still relatively high when compared to a manual count. There is potentially scope for further cost savings. For example, if Dover District Council were to purchase the scanners, rather than leasing them, then they could potentially offset the cost against other uses to which they could be put throughout the year, but such savings are unlikely to be significant. Also, it is questionable how much use could be made of that equipment for other purposes. The annual site licence for the Election Management System itself is a substantial cost, and unlikely to decline substantially in the short term. On-site technical support would still be required, as would training.

There were a total of 14 people undertaking scanning, registration and verification duties, plus the three Deputy Returning Officers. There were 3 count supervisors checking boxes against ballot accounts, controling the flow of boxes into the hall. There were 19 count assistants who were flattening ballot papers and preparing them for scanning. Some of these 19 were undertaking the manual count of the one parish using the grass skirt manual count methods. There were an additional 4 people tidying ballot boxes, and bringing them into the count hall.

In general, there was a fair bit of multitasking taking place so it was difficult for DDC to be very precise with the numbers for each role.

For a manual count, it was estimated that there would be at least 90 individuals involved in opening and counting, with 8-10 count supervisors, those undertaking registration, adjudication etc. So well over 100 in total Dover estimate this would of cost some £13,000 in labour costs.

A significant reduction for future elections using electronic counting is unlikely, although, it is estimated that perhaps six or seven scanner operators could have been just as effective as nine. Further analysis could determine if it is more cost effective to have even fewer staff and a longer count or more staff and a shorter count.

Economies of scale may be achieved if several councils are able to contract with the supplier as a single body, although this has implications for project management, where decisions need to be made on the effectiveness of having one supplier project manager for several councils, or a project manager each.

Conclusions and findings

Conclusions

Ovum's conclusions in relation to the technical aspects of the electoral pilot scheme in Dover are as follows:

The pilot scheme facilitated the counting of votes, rather than voting itself: The pilot scheme had no discernable effect on the facilitation of voting. The differences on the ballot papers were not seen as a barrier to voters, and, apart from postal votes, it is understood the majority adhered to the instructions not to fold the paper; however some concerns were expressed by voters that not folding the ballot paper in the polling station exposed their voting preferences. Although the count itself took longer than anticipated for an electronic count, this was still estimated to be shorter than a manual count would have been by approximately 2 hours. The pilot scheme was therefore considered a success, demonstrating the efficiency provided by the technology, and providing a simpler, more accurate count than would otherwise have been the case. Following the election, a Dover representative is quoted as saying: "Not only was e-counting a success but there was a 5% increase in voter turnout over the 2003 election. The use of this technology helped us to deliver accurate results in a shorter time."

Procedures were found to be easy to use by voters: There was minimal change from the normal procedure of voting, apart from being requested not to fold the ballot paper. If they did, however, this did not cause a significant problem for scanners which were robust enough to take creased paper.

The potential risk of personation or other offences or malpractice was minimal: The system set-up (a standalone network), testing, risk and security management analysis, and project management procedures all served to deliver a robust and transparent pilot, where confidence in the integrity of its delivery and its results was high.

The use of e-counting technology provided limited cost savings: Although the e-counting pilot demonstrated some cost savings in the reduction of count staff required, than for a manual count (estimated in Dover's application to be a saving of about £10,000), this does not offset the cost of implementing electronic counting. At £3.65 per ballot paper issued, the price is still relatively high – and although some further decline is expected in future schemes, it is nevertheless a cost that will need to be borne by participating Councils should e-counting move into mainstream use – something which Dover District Council said it would not be able to afford without DCA funding.

Learning and issues arising

Detailed understanding of UK process is critical: Substantial testing and risk management analysis gave greater confidence in the system, aided by good contingency planning. OPT2VOTE's understanding of UK election process, too, was felt to have contributed significantly to the pilot's outcome.

Project management and relationship management were outstanding: Overall, Dover District Council and OPT2VOTE executed a well-managed, successful pilot scheme that demonstrated the key benefits of electronic counting technology in an election environment. The project management and relationship management were outstanding, with tight communication between all parties being fundamental to the pilot's success.

You can never have too much documentation. Dover and OPT2VOTE had a fairly detailed set of documentation, but further material, readily available to auditors and other stakeholders (such as the RMADs document, contingency plan etc) would further enhance the trust of those stakeholders in the scheme.

Even greater consideration around contingency planning is recommended. Again, this was good at Dover, but still issues such as bottlenecks arose that were unexpected. For example, the high level of adjudications: to address this, a broader programme of training in cross function roles is recommended, or planning to have an alternative resource dealing with administrative registration and verification aspects of the count, rather than the very busy Count Manager.

Greater time is required to test finalised ballot papers. A key problem was with the variances in quality or templates of print batches. The software image recognition technology is dependent on consistency, and if this is lacking, it can have a serious impact on the efficiency of the count. Although it is difficult to receive such ballots for testing too far in advance of the election (since final lists of candidates may not have been determined), nevertheless there needs to be some way of ensuring a quicker print turnaround time, or a more accurate print job to more precise specifications in the first place. To have to manually adjudicate hundreds of ballot papers merely because of a missing column line on the ballot was seen to have wasted a huge amount of time unnecessarily.

Don't go too fast. RO adjudication was highly visible to onlookers, but perhaps a bit too quick. One of the purposes of an electronic count is to improve speed, but not at the expense of transparency. It is worth considering how to slow this aspect down slightly. Also, the user interface for RO adjudication was relatively complex. Ways might be considered of simplifying this interface without losing the valuable functionality.

Implement a standard password policy. Although Dover District Council has a password policy, the one used on the night was modified that day (on the recommendation of the DCA Audit) and so varied from the planned approach.

Explore further the balance between legislation and software thresholds. The facilitation of a broader range of voter marks to be accepted (such as ticks)

following agreement of the Returning Officer is desirable. Also, there is an ongoing need to consider the threshold between the software being set too aggressively and detecting print variations as well as voter marks, versus not being set sensitively enough, and not detecting anything.

Extensive testing of the progress display equipment prior to the live event. The project team needs to consider different ways of getting such information to observers, particularly candidates and agents. This could also be through manual means such as better signage.

Consider ways of greater protection of equipment. Protecting hardware such as scanners and PCs from onlookers without impacting on transparency needs to be balanced. For example, the use of clear Perspex screens in front of scanners might be an option.

Produce a comprehensive, standardised count night/day checklist. A standard checklist means that electoral services departments and suppliers alike can ensure all necessary procedures have been adhered to. For example, that agents have been invited to witness zeroing; that an hourly check that security measures are still in place is carried out, or that there are not drinks being consumed in the hall; that hourly updates have been given to observers; that the data has been copied to removable media at the end of the count and witnessed by appropriate staff, and that the system has been cleared down effectively and securely. Such detail on the checklist will not only ensure process has been adequately covered (it is easy to forget things in a stressful environment), but also provides a guide to other Local Authorities looking to conduct their own pilot schemes in the future.