

Electoral pilot scheme technical evaluation

Breckland District Council

June 2007

Introduction

This report is presented to the Electoral Commission to inform the statutory evaluation of the electoral pilot scheme in Breckland 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 Breckland 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 response to the October 2006 electoral pilot scheme prospectus, Breckland Borough Council submitted an application to pilot a series of innovations and changes to electoral procedures. Breckland requested a pilot for electronic counting of votes for combined district and parish elections.

The process would consist of e-counting for the whole district and parish elections. It would look at the following

- Carrying out an e-count for combined elections
- Design of ballot papers for all the district and parish elections
- Perception of candidates and agents as to accuracy and integrity
- Identification of fraudulent ballot papers
- Speed at which count is carried out versus a traditional count.

The pilot application also noted the following:

- Electronic counting using barcodes in addition to ballot paper numbers with the removal of 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 address this aspect since it is linked to new legislative requirements, and is not specifically defined as part of the pilot-only aspects of the scheme)
- The Count was planned to be conducted on Friday 4 May 2007, following the close of poll on Thursday 3 May 2007.
- Breckland was looking for a number of outcomes from the pilot, including, most importantly, greater accuracy, but also increased speed (manual counts normally spanned 2 'long' days, or around 20 hours), and, to a lesser degree, cost savings through being able to conduct the count in one site.

The complex nature of the manual counting of votes that is involved in a combined election encouraged Breckland Borough Council to plan and conduct an electronic counting pilot. Ultimately, the objective was for a swift, efficient and accurate count.

Breckland Borough Council identified raised awareness of the benefits of e-counting as a desired outcome, which in turn might encourage voters wishing to participate in such a pilot scheme, who might otherwise not have voted.

Greater accuracy was one of the key objectives for Breckland in conducting a pilot. Breckland has significant numbers of parish elections, which are likely to involve a larger than usual number of candidates, many running on non-party lines, and which would therefore increase the relative complexity of the count.

Breckland Borough Council was keen to improve efficiency of the count by reducing the time to count and to declare final results, resources and associated costs of a manual count, as well as improving accuracy of the results. It was estimated in the project plan that approximately 4 hours would be needed to complete the count, compared to around double that taken for a manual count.

For manual counts, due to the large geographical area covered by Breckland, two count venues had been used in the past. Breckland saw some opportunities to realise cost savings through the hire of a single count venue. However, it acknowledged that much of these savings would be absorbed due to the need to hire a single count centre over a longer period of time, in order to set up the electronic counting system. As such, this was not a primary driver in conducting an electronic count.

Pilot scheme technical description

Electronic Counting

The focus of Breckland Borough Council's pilot scheme was to use an electronic counting 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.

Breckland was involved in selecting their preferred supplier, Indra, to work with the Council on the implementation and delivery of the solution.

The innovations included in the scheme were:

- Redesign of the ballot paper, to include barcode provision, in addition to ballot paper numbers, and the removal of counterfoil provision.
- An electronic counting software solution that would capture ballot images and provide a complete solution from verification through to the final result. It would have the capability to perform an automatic adjudication of all scanned ballot papers, whilst providing facilities for manual adjudication for any paper that is unclear or outside of the standard rule set. Doubtful ballot papers would be adjudicated in front of candidates and agents as usual, and the system would provide the facility for recounts
- Provision of hardware, including commercial off-the-shelf scanners, PCs running Windows XP, and 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 Breckland Borough Council count staff (rather than by the supplier's staff).

Electronic counting of postal ballot papers

Postal ballots were presented at the count in sealed ballot boxes, and scanned at the count alongside other ballot papers for a given ward.

In addition to the barcode, postal ballots bore the Breckland mark which had been printed in thermo-chromatic ink, which would deter fraud as it could not be photocopied, and would disappear when pressed. Although it was possible to test the official mark in this way, this was not actually done, as it was assumed that the barcode allocation would detect any anomalies or fraud.

Electronic counting of all ballots papers returned from polling stations

Following the close of poll, all ballot boxes were moved to the count venue, Thetford Leisure Centre. A full e-counting system was provided, incorporating 5 scanners, PCs and server to scan all returned ballot papers.

The key stages of the count – registration, scanning, verification, first and second level adjudication of doubtful ballot papers and the final count – were to be performed electronically using the e-counting local area networked system.

A zero report was produced on the evening of 3 May, after which, the ballot boxes were registered on the system. Following the registering of each ballot box, a status report was produced. On the morning of 4 May, prior to the start of the count, a further status report was printed in order to check that the status of the system was the same as the night before. Following this, a zero count was registered, prior to the start of the count. This was not witnessed by the Commission Evaluators, nor candidates and agents.

Changes to the ballot paper to facilitate e-counting

Ballot papers were provided for electronic scanning in two sizes of paper, according to whether the ballot paper related to the parish or district election.

Some ballot papers had been torn in half. However, these numbered relatively few, and the scanner would either accept these, or would report a jam, whereby scanner operators were able to manually locate these ballots.

The reverse of the paper included details of the contest, the ballot paper number, and a corresponding barcode. The barcode provided a unique identifier, containing details of the Event, Election and Contest, as well as the reference of a distinct ballot paper within that election contest. The system can, therefore, assign ballots to a given election contest, and highlight duplicate ballots.

All district ballot papers were white, A4 size, and parish ballot papers were yellow/buff. The length of the ballot paper depended on the number of candidates, irrespective of whether the ballot was for district or parish elections. Therefore, for seats with a longer number of candidates than could feasibly fit on an A4 length, A3 length was used, which was the case for the Parish elections. All ballot papers were the same width.

Prior to the elections, Print UK had been designated as the company selected to produce the ballot papers for Breckland. However, the company failed to meet the deadlines set by Breckland, and managed only to achieve printing of the postal ballots. This impacted the timing of the acceptance test, as insufficient ballots were available on the designated date for the test. The test was conducted several days late, with test ballots printed by Indra. Indra also printed the ballots to be used on election day. Ballots were perforated and stapled into books of 100

The issue of printing ballot papers for e-counting is clearly critical to the future success of e-counting. Ballot paper requirements are more sophisticated, due to the need to incorporate barcoding within the papers.

Management of the pilot scheme

Project management

Overall management responsibility for the pilot scheme, as well as for the whole of the electoral process was undertaken by the Electoral Services Manager of Breckland Borough Council, Sue Wright, who was fully supported by Indra personnel both prior to, during and after polling and the count. Breckland was always responsible for key decision making, with Indra advising appropriately.

Both Breckland and Indra adhered to Prince II management procedures. In addition, Breckland's manager was witnessed to have a strong, capable electoral services team behind her, who also fully supported her leadership role.

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

- Detailed Project Initiation Document
- Project plan
- Security plan
- Count procedures
- Continual Risk Management assessment, including contingency measures and level of impact
- Hardware and software items list
- Information security management audit checklist
- Acceptance test procedures documentation. (there was no acceptance test certificate included as this was never produced)
- Detailed process description documents
- E-Count system user manual for Breckland Council staff.

Communication was good between all parties with regular weekly project meetings between the Indra project team and Breckland District Council. Prior to each meeting, a progress report was issued describing actions taken against key objectives and deliverables, details (in advance) of potential additional costs, risk assessments and actions taken to minimise risks and all other issues and dependencies involved in the delivery of the system. All meetings were minuted. In addition to the weekly meetings, the full Indra technical team was on-site at Breckland's offices from 16 April 2007, with team members regularly interacting with Breckland staff.

Training

Indra took responsibility for training Breckland staff on the technical electronic counting system, in terms of registering the ballot boxes, operating the scanners,

and operating the PCs for first and second level adjudication. It was undertaken as a series of sessions in the week prior to the count. The evaluator was not informed about when training sessions were to take place, and therefore did not attend. Also, information on number of staff trained and process was not provided, nor any feedback as to how staff responded to the training. At the time of writing, Ovum is still awaiting this requested information. On the actual count day, however, staff appeared at ease with the overall process, and with the operation of the scanners, which appeared straightforward and intuitive, and Indra staff provided continual support in the event of any issues that arose, e.g. around the loading process. Additionally, a representative from Kodak was present to provide support in the event of any problems with the scanners, e.g. paper jams. Overall support was considered to be at a good level.

The training documentation provided to staff included the following:

- Ballot box registry
- Runners (duties of)
- Manual verification of a ballot paper or ballot box (overview of)
- Scanners control and assignment
- Scanner operators guide
- Verification guide
- Adjudication guide
- RO control guide
- Display of count progress overview

The documents were written in a straightforward, clear manner.

On the count day additional Breckland staff were brought in after problems began to occur with scanned ballots because of torn counterfoils and cross-contamination of ballot boxes (see below under Technology, Software), which was causing severe delays with progress. This began around midday. These staff did not appear to have been trained in the use of the scanners, but were instructed by Indra and subsequently seemed at ease with the technology.

All first level adjudicators seemed at ease with the use of the system, although the screens contained a lot of information, and many different places to look in order to come to a decision. In general, it was relatively easy for observers to see/understand what was going on. The main issue came when, because of the scanning problems referred to above, the general observation area became confused (with staff moving around the count area), and it was not always clear which seat was being adjudicated. Announcements around this would have helped, as would some sort of message on the display screens.

RO level adjudication appeared more complex, with more support required by Indra. Although the evaluator did not observe the training for RO adjudication, and therefore cannot comment on its effectiveness at the time, it may be beneficial to provide additional or refresher training at this level in the future.

In particular, a major issue at the Breckland count was the acceptance at RO level of an incorrectly scanned ballot box. The ballot box had been scanned once, and the number of ballots was significantly lower than it should have been. The ballots were rescanned and the correct number of ballots were recorded in this subsequent scan. However, due to manual error, the RO accepted the lower recorded number (as the values of both sets of scans were maintained on the system). This was a failing in both the system itself, for not asking the RO to reconfirm acceptance of lower scanned number, and a failing of the manual process for acceptance of a rescanned ballot box. In such a situation, the system should advise the RO that he/she should reconfirm his/her intentions. In addition, the responsibility for accepting a rescanned ballot box into the system should not reside with one person, but require re-confirmation of a second individual.

In order to address a first level adjudication bottleneck that was occurring on count day following the counterfoil and cross contamination issues that arose with the scanners, some scanner operators were reallocated to first level adjudication duties. This was a good decision in order to try and alleviate the bottleneck. However, it was unclear whether these operators had been trained on that task beforehand. There was uncertainty about which boxes to check, and which reason to give for referral to RO adjudication. Some were also seen accepting ballots incorrectly. For example, adjudicating a ballot which contained three crosses (the required number), but accepting on two (based on the system prompt).

So there was some risk of mistakes at this point, some of which are potentially very serious.

Relationship management

At all times, both prior to, and during the count itself, there was seen to be a close working relationship between Breckland Borough Council personnel and Indra. The relationship appeared to work well, with Indra responding well to requests from Breckland.

In terms of responsibilities, roles were clearly defined, both for Breckland staff and Indra staff, both in the run up to the election, and during the election and count itself.

Key individuals were:

- Keith Davis Returning Officer
- Sue Wright Electoral Manager, Breckland
- Gonzalo Quiles Project Manager, Indra
- Cristina Frutos Business Development Manager, Indra

For the count, first level escalation with Indra was clearly defined as follows:

- Scanners area Robert Seymour, Equipment Service Representative - Kodak Service & Support

- Storage areas Jane Harding, Indra
- Servers area Victoria Portillo, Indra
- Adjudication area Gonzalo Quiles

For the count, Breckland 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 technology came into play at the close of poll on Election Day when ballot box registration took place. Prior to registration, a zero report was produced. Additionally, as each ballot box was registered, a status report was produced. This process was witnessed by the RO but not by candidates or agents.

At the polling stations voters had been issued with differently coloured ballot papers to represent district or parish elections. There should have been different ballot boxes for the different election types at each polling station.

The process from ballot paper arriving at the hall to declaration was as follows:

As ballot boxes arrived at the Count Centre a zero report was produced, then they were registered, and a status report issued, and then boxes were located in a specified place, being stored alphabetically, in preparation for the count the following day. The ballot boxes were secured, and the hall locked overnight, with a member of Breckland staff providing overnight security.

On the morning of the count, a status report was produced to verify no changes from the night before, and a second zero report was produced by the system, to verify that no data was stored on the system. This was witnessed by the RO, but not by candidates or agents.

Following the zero report, ballot boxes were in turn allocated to a scanner, and runners took the boxes to the allocated scanner table and emptied. Wards were scanned in alphabetical order. For each ward, postal ballots for that ward were scanned after the normal ballot papers.

Prior to the ballot box being opened, its number was shown to observers. It was then opened, ballots removed and then inserted into the scanner. After scanning, a red printout sheet was put on top of the scanned ballots, which summarised the scan, and the ballots and sheets were secured with an elastic band. After all ballot papers in a ballot box had been scanned, they were then placed in a cardboard box and placed in a separate area of the hall, within the count area.

In terms of the counting, the system either accepted the votes from a ballot, in which case they were counted, or they were sent through to first level adjudication. An example of this might have been if a voter ticked rather than crossed a box on the ballot paper to register a vote.

First level adjudicators would then either accept the ballot paper, reject it or pass it through for level 2 (RO) adjudication.

Once all the ballots for a seat had been counted, and adjudicated on, the seat could be declared, with the system producing a printed record of the result.

Once all seats had been declared an overall result would then be declared.

Scanning

The ballot papers were not sorted but inserted into the scanner either way up (the scanner was duplex, and scanned both sides of the ballot paper), with attention being paid to stacking onto the scanner (e.g. ensuring ballot papers were smooth). Ballots were generally unfolded. Any ballots identified as folded were unfolded prior to scanning.

When scanned the papers were removed from the stack at the rear of the machine and wrapped with a red paper indicating a scanned bundle. A printout providing details of the scan was produced and attached to the bundle. The scanned bundle was placed in a separate cardboard box, which was then placed in a designated area on the floor once the full ballot box had been scanned.

If the number of scanned papers corresponded with the number on the Ballot Account the box was verified and the images were released to the system. Valid votes were sent to the Progress Control module and were counted. The doubtful images were sent to First Level Adjudication. If, however, the number of scanned papers did not correspond to the Ballot Account, the papers were rescanned. There was an accepted tolerance of + or – 10. Data from the first scan remained on the system.

If the number scanned remained the same the RO or deputy RO verified the number according to the number scanned, amending the Ballot Account. All scans and re-scans were recorded, and no scan totals were overwritten. If the re-scan showed too low a result, then this would still show as an error due to the discrepancy with the ballot account. The system failed in that it allowed manual acceptance of scans that were too low (the original scans, not the re-scans), and did not alert the user to the issue of accepting the incorrect total. Additionally, manual procedures should have required two levels of acceptance in such instances, to further protect against such errors.

A number of re-scans occurred for two of the larger Breckland wards, and due to system weaknesses and manual error, in terms of the scanners not counting ballots correctly because of the counterfoils 'overlapping' during scanning, incorrect numbers were recorded for two wards. Although all the ballot boxes were eventually scanned by early evening, the issue of the incorrect numbers and the issue of cross-contamination resulted in the e-count being suspended.

Risk and contingency management

Indra's contingency included

- Backup arrangements for the system
- Personnel back up arrangements
- Resilience and elimination of single points of failure
- Sufficiency of capacity for the expected volume and stress on the system
- Protection against electronic attacks
- Loss of power
- Plans for security of the service in case the Count Centre has to be temporarily abandoned.

Overall, risk and contingency management was, in general, considered robust and effective, however some shortfalls were noted, although these focussed around reverting to a manual count

The Risk Register, maintained by both Breckland and Indra in the run up to the election, was regularly consulted, actioned and updated. The following are examples of some of the back-up items and procedures in place:

Risk description	Risk containment plan	Risk contingency plan	Impact
Election counting staff may not be available for training at the designated time	Indra considering having staff over as back up personnel		H
Printed ballots may not arrive in time	PM to monitor progress Make effort to minimise last minute changes Ensure contingency plan – emergency route to print ballot papers	Contingency printing route Financial penalties flow down to printers	H

In addition, a number of provisions were specified, including, for example

- Regular back up of the database to be carried out at 30 minute intervals using the SQL server tools
- Shadow copy option activated on the servers
- Disaster recovery contingency, allowing for isolation of network segment containing data to ensure no insertion of data if centre has to be left in event of a 'force majeure'

- Confidentiality – contracted staff required to sign confidentiality agreements
- Presence at the count of a Kodak maintenance technician
- Installation of UPS to account for potential power loss.

Whilst contingency was made to address shortfalls within the systems, and to repairs such shortfalls, there was no documentation provided on contingency management around reverting to a manual count. When it became apparent that a manual count would be required, the process and planning around this seemed unclear, with Breckland uncertain regarding possible premises, and when a manual count could actually take place.

Testing approaches

The testing was not observed by the evaluator. The acceptance test was originally scheduled for Monday, 23 April. However, due to Print UK not meeting the required deadline for delivery of the test ballots, there were insufficient ballots for testing, and a test could not be run on the day. A small scale test with approximately 250 ballots was, however, run on the day, to demonstrate the system, with the acceptance test taking place over two days – 30 April and 1 May. For the actual tests, ballots were supplied by Indra and filled in by council staff. Various incorrectly filled ballots were tested (as stringently as possible) – this was driven by the fact that the system had been showing errors earlier in the week, and had it not been shown to be able to read the test ballots properly, Breckland had intended to revert to a manual count. The test ballots were identified as being for test purposes.

Acceptance test cycles

Execution of the following test cycles were carried out.

- Complete cycle (zero report, scan and counting to allow validation of process accuracy and estimated information volume processing capacity in the required time)
- Delete all data from the database. Print zero report
- System accuracy. Scan and re-count of the ballot papers not adjudicated in the first count for the ward chosen. Analyse results. Delete all data from the database. Repeat the test. Compare results
- Delete all data from the database. Print zero report
- Audit cycle. Re-scan adjudicated ballot papers corresponding to chosen ward. Repeat adjudication process, but modifying outcome of adjudication made in the complete cycles. Compare both outcomes, to confirm the source of differences can be audited.
- Initialisation cycle. Once other test cycles are complete, system initialisation will be executed, verifying that all the information contained in the database has been deleted.

Acceptance test equipment

The full system was deployed for the acceptance tests. After the test, Indra was to issue the report on the acceptance test results, and compare them with expected results. Although a comparison was made, and found to be satisfactory, there is no documentation on the test results. A decision was then be taken by the council to proceed with the electronic count. Any changes after successful implementation of the acceptance test were to be processed following the pre-specified change control procedure. No other changes occurred, however, other than those made during the count in order to address the problems with counterfoil attachment moving the template and making it unreadable by the system.

Other deliverables requiring acceptance by the council were:

- Ballot design
- Documentation review
- Definition and approval of hardware built

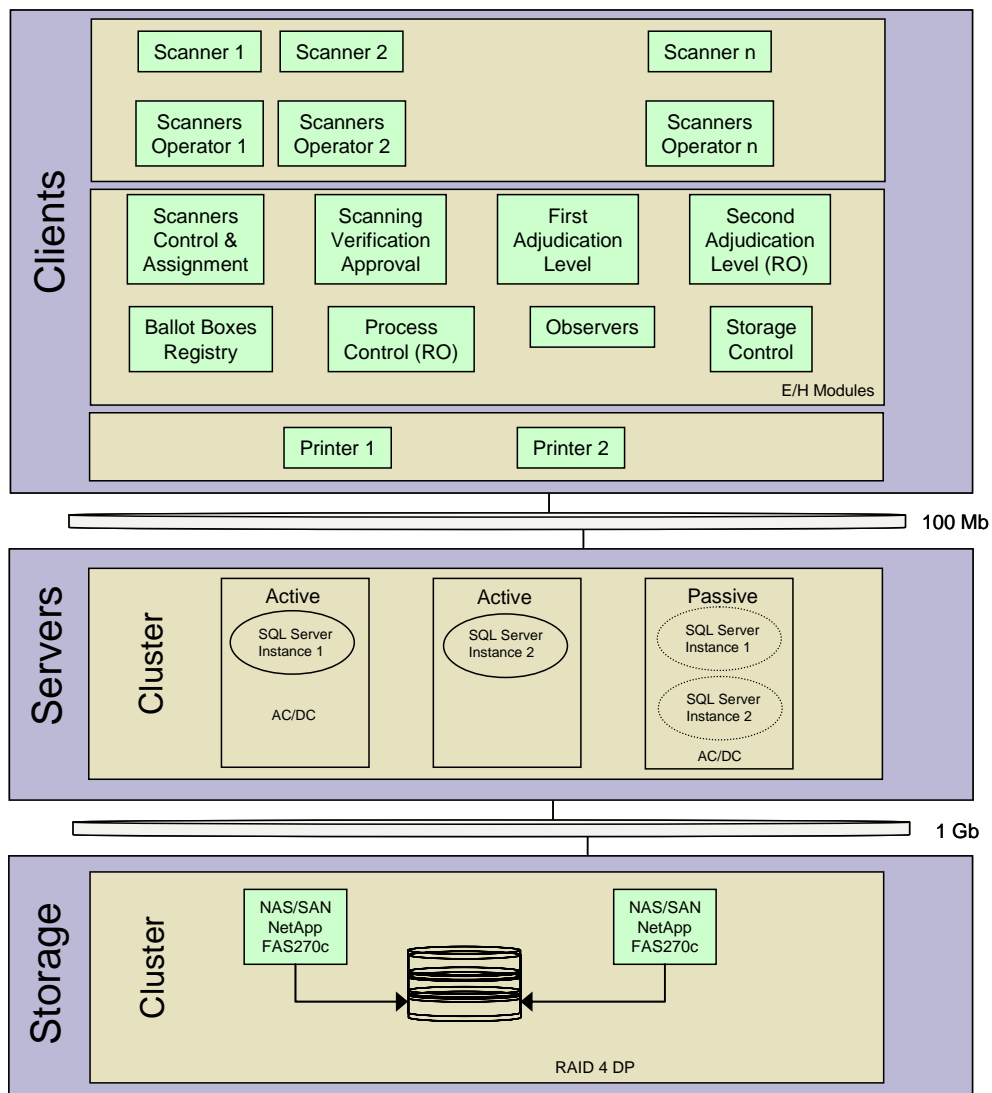
Due to the failure of Print UK to deliver, the ballots were subsequently supplied by Indra, and the acceptance test was carried out on 30 April and 1 May. The testing was stated by Breckland and Indra to be successful. Only a small number of ballots per ward were tested, however (10 to 20 for each district or parish.) There are no figures available for number of adjudications for this test.

Technology

Indra'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 diagram below shows the network architecture for the Breckland e-counting system



The following hardware was used for the count:

- Kodak i660 scanners - 5. Prior to the count, one scanner was originally designated as a back up scanner, however it was decided to utilise it during the count.
- Scanner PC – 5
- Scanner local printer – 5
- Scanner Queue Management PC – 1
- Verification PC – 1
- Verification local printer – 1
- TFT screen verification – 1
- Interpreter PC – 1 (in charge of performing Intelligent Character Recognition (ICR) and Optical Mark Recognition (OMR) tasks on the images of the scanned ballots. This process does not require manual intervention.
- Transfer/Manager PC – 1 (In charge of transferring the information interpreted by the ICR to the servers. This process does not require manual intervention.
- Ballot Box Registration PC – 1
- Ballot Box Registration local printer – 1
- TFT screen registration – 1
- Storage control PC – 1 (To receive the messages sent by the RO indicating a particular ballot batch or ballot paper within a batch that needs to be fetched for manual scrutiny)
- Storage control local printer – 1
- First level adjudication PC – 6
- TFT first level adjudication – 6
- RO adjudication PC – 3
- TFT RO adjudication – 3
- Observers PC – 4 (to present information allowing observers to follow the progress of the count)
- Process Control PC – 4
- RAM memories 512 MB – 12
- RAM memories 1 GB – 19
- Network printers – 2
- Server Dell PowerEdge 2600 – 3
- TFT screen servers – 3
- NAS/SAN – 1
- Switch 1 Gbps – 1
- Switch 100 Mbps – 3

- UPS – 2 (If a power supply failure occurs, these ensure that the supply of power to critical equipment (servers) is maintained until the building generator is triggered, and if this does not happen, they will ensure that a safe shutdown is performed thus preventing any loss of data).

Back up equipment

- Switch 1 Gbps – 1
- PC backup – 2
- Switch 100 Mbps – 1

Overall, the hardware seemed to work well. The scanners experienced some jams, but these were fairly minimal, and both the Indra team and the Kodak representative were on hand to address any issues with scanning. The scanning of perforated ballots, with 2 ballot papers being counted as one due to slight overlap of papers did result on several occasions in an undercount on scanned ballots. This alone would not have been such a major issue, but rather the acceptance of the lower initial scan rather than the actual rescanned total caused the repercussions later on. In Dereham Humbetoft (ballot boxes 43 and 206), the accepted scanned total of 288 ballots, against which the seat was declared, was significantly lower than the ballot paper account of 657. Similarly, with Town Dereham Central, the accepted scanned total against which the seat was declared was 687, contrasting to the ballot paper account of 1402 ballots.

There was an issue identified with the display screen that indicated which ward was being scanned. Whilst this was accurate for the most part, when boxes had to be rescanned, these took priority but were not indicated on the display screens, so there was a mismatch with what was being scanned and what was displayed. This caused some confusion amongst observers.

A further issue occurred with adjudication, with observers unclear about what was being adjudicated, there was no indication which ward was being adjudicated other than close inspection of the ballot, which was in turn difficult due to the speed at which ballots were adjudicated. The observer screens did not have any form of notice to indicate, and specific seats were not allocated to specific adjudication PCs.

There were some periods of downtime for scanner operators with nothing to do, however this related to when problems occurred with rescanning, and when the system had to be reset.

Overall, had the process run smoothly, the number of scanners seemed adequate but not excessive in that, prior to the scanners hitting the problems of counterfoils, and the adjudication hitting the problem of cross contamination, there was a steady workflow, with no apparent bottlenecks, and with scanner operators kept sufficiently busy.

Operators logged onto the process PCs entering their user name and password, which was issued on the morning of the count, and were provided to scanner and

PC operators in sealed envelopes. PCs should have been locked when left unattended although this did not always happen, particularly as problems began to occur with the scanning, and resources were diverted to the scanning area. However, the system locked out if it was not used for a while, and required re-entry of passwords for access. 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.

Process PC operation

System Zeroed

At the outset the system was zeroed. A series of reports were printed and signed off by the Returning Officer. This verified that no ballot papers or votes were held in the system. Once the zero report was accepted ballot box registration could begin.

Ballot Box Registration

Each ballot box contained a sheet for each election called the Ballot Account. On this sheet the presiding officer at the polling station indicated the number of ballot papers issued for the respective election. For each election the number of each ballot box was entered onto the system as well as the number of ballot papers in each box. The ballot box was then allocated to a scanner.

Scanning

Scanner staff were briefed at the start of the day by the Indra staff responsible for the scanning process, and they were in place by around 9:15am, ready to start the count at approximately 9.30am. Individual scanner staff had been well trained beforehand and had advice support when they needed it. There were no additional scanning station staff on hand at the start of the count to provide cover for staff breaks, if needed, however, these were 'draughted in' around lunchtime.

Staff at the observer stations and adjudication stations were also in place and well briefed.

At the start of the count day, one ballot box was taken to the first scanning station. The process of opening, retrieving the papers, showing the open, empty box to observers and the full scanning process was stepped through slowly to ensure that the process was understood and clear to all the scanning operators. Subsequently, ballot boxes were taken to the scanning stations by council staff, the seals broken and the process handed over to the scanning staff who comprised Breckland staff and who were effectively supervised.

The papers contained by an elastic band were stacked in the tray to the right of the scanning station. The operator took each batch in turn, and loaded them into the scanner tray. The operator then clicked a button on his desk top to start the

scanning process. In many cases the papers had to be squared together to help make sure that they would feed into the scanner cleanly. Papers normally fed through the scanners cleanly, but on some occasions, the scanner jammed due to torn ballots. The perforated edges also caused problems due to apparent 'overlap' between ballots (the scanner could not detect where one ballot ended and another began for ballots with badly torn counterfoils).

Scanning continued until each bundle was processed by the scanner.

The scanner captured the images of the ballot paper, back and front.

After scanning each batch of papers, they were wrapped in their red count printout and elastic band, and stacked in the tray to the right of the scanner.

At the end of the scanning process, papers and their red wrappers were stored in allocated cardboard boxes. Trained and competent council staff then stacked the ballot boxes in an ordered fashion in a pre-allocated area of the count room.

Ballot Box Verification

The goal of Ballot Box Verification was to check the number of ballot papers scanned from each box against the number expected according to the Ballot Account.

Once all the bundles for the specific election in that ward were scanned the number of ballot papers scanned for each election was checked against the number on the presiding officer's sheet. If the number was the same the ballot box was verified. If the number was different a re-scan was ordered. The scanner was re-set. In other words the system was cleared of the ballot papers previously scanned. The record of the re-scan was retained, however.

If the re-scan produced the same number as previously obtained the Returning Officer was prepared to accept the number, provided it was within 5-10 of the number given by the Polling Station staff on the Ballot Account. If the number of ballot papers scanned was greater than this, however, the Returning Officer could have ordered a manual count of papers in that box. This happened once during the pilot, due to a seat being declared based on a suspected incorrect number of ballots.

Once a ballot box was verified the images of the ballot papers were released to the system. Images of papers deemed valid were sent to the Programme Control module and counted. Ballot papers which were not deemed valid were sent instead to the First Level Adjudication module.

Thresholds

The thresholds for papers sent to adjudication were defined by Breckland District Council. The system sent to adjudication any ballot that:

- Had any mark outside the square provided for the voter to mark their vote

- Any mark in the square that did not match with the official mark (X)
- Torn ballots.

First Level Adjudication

At First Level Adjudication the adjudicator was presented with an image of the ballot paper. The image was of high quality and sufficiently clear for the adjudicator to see all the marks on the paper, valid and otherwise. The adjudicator could also flip the image to see the back of the paper including the barcode, if required. The image of the barcode was not of high quality, however, and was very difficult to read.

The expectation was that the system would be able to count the majority of the votes. Most votes sent to First Level Adjudication were dealt with either by accepting the votes, in which case the Adjudicator marked the valid votes in boxes provided on screen, or by rejecting the vote as invalid. The Adjudicator was able to accept the ballot paper, reject it or send it to Second Level Adjudication. If that rejection was disputed the ballot paper could be sent to Second Level Adjudication. The First Level Adjudicator could also decide to send votes to Second Level Adjudication.

Second Level Adjudication

Second Level Adjudication dealt with more complex issues including ballot papers where the voter's intention was unclear. It was conducted by the Returning Officer or his Deputy or a similar senior official.

Returning Officer

The Returning Officer alone could see the progress of the count. He was also the first to see the results to be declared. The Returning Officer used this information in his discussions with candidates' agents, including the intimation of the results to be declared.

Software

Indra provided a bespoke electronic counting solution based upon established modules within their e-democracy suite of applications. The solution was installed on standard Windows XP PCs, and Windows 2003 server. All operators used the Windows domain login procedure.

At the time of writing, Indra had not reported the percentage of the application was bespoke (the percentage for Bedford was 15%). Nor was a list of adaptations supplied.

All the modules were also used in electronic counting pilot in Bedford. The core of system had been used in previous elections for example in Oslo during 2003 and 2005.

The suite of applications contained ten modules:

- Control scanner
- Storage control
- Verification of ballot box
- First and second level Adjudication
- Progress control (the vote count took place in this module)
- Manual entry
- Ballot information
- Count progress
- Result declaration
- Reports

All of the modules were based on previously used modules, having been used for local elections in Oslo in 2003 and 2005. These modules will also be used later this year. The main differences between the elections in Oslo and the Breckland elections were the number of different ballot papers (which does not affect the modules software, but rather, affects the configuration), the verification (which was more sophisticated at Breckland) and the first level and RO adjudication (which, again, was more sophisticated at Breckland). The verification and adjudication modules were modified by about 20% from the original software.

A propriety algorithm, Read Soft Eyes and Hands was used for the Optical Character Recognition (OCR) and Intelligent Character Recognition (ICR) recognition of marks on the ballot paper. Indra applications interfaced with Kodak i600 scanners.

ReadSoft is a Swedish based global software company selling software for data capture for process and transaction management. "Eyes and Hands" is the name given by ReadSoft to their applications.

According to ReadSoft's web site, "OCR (Optical Character Recognition) is a key element of ReadSoft's automatic data capture technology. It is the OCR technology which enables our products FORMS and INVOICES to read what is written on a document. When a form or an invoice is scanned, it is made into an image which the software can process. It is from this image that ReadSoft can capture, interpret, verify and transfer information. OCR is one of the techniques in ReadSoft's interpretation engine capturing machine print, handwriting, checkboxes, barcodes etc."

They define ICR, Intelligent Character Recognition as follows:

"ICR (Intelligent Character Recognition) is a further development of the OCR (Optical Character Recognition) technology. ICR allows the software to recognize handwritten characters while OCR deals with machine print. It is the ICR

technology which allows our data capture product to read information from, for example, a mail order form where the applicant has filled in the fields by hand."

The scanning software works by taking an image of each ballot paper, then detecting marks in the voting areas and elsewhere on the ballot paper. Marks in the voting areas are validated, and only valid marks, defined as a cross, are counted as votes, the rest being referred to adjudication.

The basic stages on the electronic counting system are:

- Scanning
- Verification
- Automatic interpretation of marks and count of valid votes
- Adjudication of unclear ballots
- Calculation and declaration of results.

The system was set to maximum sensitivity with respect to what could be accepted as a valid vote (which was anything other than an accepted X). Following the initial set of scanning, prior to the problem with the ballot papers having counterfoils still attached, the number of ballots being sent for first level adjudication was 18%, with only one ballot paper being referred for second level adjudication. The final analysis showed that the number of ballots sent through to adjudication was 29.66% of the counted ballots. Of these, 6.87% (or 183 ballots) were still in the queue, with 91.8% (168 ballots) of these waiting for RO/second level adjudication. Of the completed adjudicated ballots (the remaining 93.13% or 2479 ballots), 91.49% (2268 ballots) went to first level adjudication, and 8.51% (211 ballots) to second level adjudication. Examination of some ward records showed that adjudication levels were between 10 and 20%, however, the problem with the counterfoil meant that, for some ballot boxes, very high percentages of ballots were being sent through to adjudication. The counterfoil problem occurred because, at the polling stations, instead of detaching ballot papers from a given pack of ballots by tearing across the perforation, polling station staff removed the staples from the pack instead, to separate individual ballots. As a result, the ballot paper was longer than it should have been, due to the counterfoil still being attached. When these ballots were scanned, the system was unable to read them as the attached counterfoil had caused the template to be moved.

At first level adjudication, votes could either be accepted, sent through to second level adjudication or rejected. Some votes were rejected at first level adjudication level (e.g because of too many votes cast)

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

- A – No vote cast
- B – Too many votes cast
- C – Uncertain voter intention
- D – Discernible voter identity

There was also a field where adjudicators were able to enter comments.

The main problem encountered by the image recognition software was that it could not recognise the template on ballot papers that had the counterfoil still attached. Such ballots had to be referred to second level adjudication, and had to have barcodes manually re-keyed from the scanned images, which in turn caused problems due to the resolution of the image.

Another major problem was that the system was unable to handle the high degrees of cross-contamination between ballot boxes, resulting in excessive levels of ballots requiring second level adjudication. The problem of cross contamination arose as follows. At each polling station, there were separate ballot boxes for district and parish elections, and voters should have been instructed to use the correct ballot box depending on which ballot paper they were submitting. For some wards, voters had used one box for both types of election. As each ballot box was allocated to a particular ward and election type (parish or district), when the system was presented with ballots that shouldn't have been included for a particular ballot box, it was unable to recognise these and these ballots then had to be referred for adjudication. Whilst a small amount of cross-contamination would not have presented a problem, the high volumes that occurred resulted in an excessive number of ballots being sent to adjudication. Proper direction at polling stations, plus time spent sorting the ballots prior to scanning would have helped to eliminate this problem.

Security and fraud

DCA audit

Prior to the count day, the DCA implemented a quality assurance (QA) audit process to check all aspects of system security. The QA process consisted of a telephone interview, which was not observed by the Electoral Commission, and a site visit which was observed. No penetration tests of the system were carried out by the QA auditor.

The site visit established a clear definition of Indra's and Breckland's security responsibilities. These were written into a Project Responsibilities Matrix. Indra's Security Plan produced by the supplier was cross referenced to the Project Responsibilities Matrix which met ISO 27001 requirements.

During the telephone QA interview Indra made available the first draft Security Plan.

During the site visit the following additional documents were made available.

- Updated version of the security plan taking into account the issues discussed during the Phone audit;
- The minutes of the meeting containing the Project Responsibilities Matrix (PRM);
- Traceability matrix of the security plan to ISO 27001 requirements and controls;
- The Count Procedures document.

A draft plan of the physical configuration of the counting site was not made available as updating was required to reflect the feedback from the audit.

A final plan of the physical configuration of the Count Centre was produced by Breckland. However a copy of this was not made available to the technical evaluator. The plan placed equipment, including the RO terminal, observer and cables as recommended in the QA audit including the installation of physical barriers between the observer area, the scanning/adjudication areas and the central services. The site was to have 24 hour protection by security guards and the police. Although security was a key focus of the audit, the 24 hour protection would have been in place even for a manual count.

A clear screen policy (i.e. ensuring the screen is blank when unmanned) especially in respect of the Returning Officer's screen was implemented. In addition, the PCs had an automatic lock out if they were not used for any length of time.

The QA auditor satisfied himself over plans for the safe storage of data and software and subsequent post-election erasure of systems of all cast votes before the equipment was shipped outside the UK.

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.

Issuing of passwords

Passwords were issued to all Indra and Breckland staff with access to the system.

Individual passwords were generated on the morning of the count and were valid for the day of the count only. Each password was stored in a sealed envelope. Passwords that were used prior to count day had expired.

LAN security

Equipment within the count hall was connected via a local area network (LAN). There was no external connectivity which could compromise the network. Similarly, the software resided in the same closed network only used by the project. No wireless communications were used.

Physical security

Physical security of the count area began well, with a guard presence to the hall itself (with access by written invitation only and to accredited observers), and a guard presence on the boundary between observer and count area. Breckland had originally suggested that Indra and Breckland staff would wear coloured jackets for easy recognition, however, on the count day this did not happen. After the e-count began to incur problems, physical security visibly slackened, with no guard presence on the boundary area. Although there was a continued guard presence at the hall entrance, with Breckland staff being replaced by a police presence, monitoring of who was coming in ceased a few hours into the count. Due to the extra staff being drafted in around midday to provide extra support for the count, and the continuing problem with ballot papers, the count area became generally confused, and it would have been possible to breach the boundary relatively easily.

The count hall layout was designed to protect the critical servers and scanners from onlookers, being set back several feet from the observation area. However, observers found it difficult to see the scanning area properly, as it was too far away. The barriers were effective, although, once problems began to occur with the ballot papers, it would have been relatively easy to enter the count area by going under the barriers (and as the day progressed, several Breckland staff were seen to do this). In this situation, clear, perspex screens might be more effective, permitting the scanning area to be viewed at a closer range, and providing a more secure barrier.

Drinks were not allowed in the scanning area, to protect from spillages.

Cardboard boxes located on the floor of the count area near to the scanners were used for rubbish. These boxes were very similar in appearance to those used to store scanned ballots. Whilst there wasn't any confusion between the two types of boxes, for future it would be advisable to consider a rubbish store that is easily differentiable from that used for scanned ballots.

During the development, acceptance tests and live count the servers, scanners and laptop computers were placed on an isolated Local Area Network with no external or Internet access.

At the end of count day, as it was not possible to resolve the problems that had arisen with the cross contamination issue, and, more particularly, with the problems caused by the counterfoils during the day, Keith Davis, Breckland Council Chief Executive and Returning Officer announced that the electronic count would be abandoned and the count resumed on Tuesday, 8 May 2007 at Breckland's offices, the Monday being a Bank Holiday in the UK. By this point, physical security was very poor, with external doors to the sports hall being open, along with the main door, and barriers from earlier in the day having been moved, and ballot papers left sitting in the scanners. Paper ballots were eventually re-secured in the original ballot boxes.

Following the decision to stop the electronic counting, Indra printed out a report with the complete status of the system, to certify what was scanned, verified, adjudicated and declared at that time and date. That report, consisting of the status of every election and related ballot boxes was delivered to Breckland Authorities.

No formal closing of Indra's systems was observed by the RO or the evaluator, and the process for continuing with the count was unclear, including when it might happen (e.g. Friday evening, Saturday, etc), and how it might be conducted (manual versus electronic). Once the ballot boxes had been re-secured, they were removed from the hall and sent back to Breckland and stored in a fire safe room over the weekend, with the only key being held by the RO.

Post election copying of files and deletion from Indra's systems

Following the election, Breckland stated that they had the required DVDs containing copies of all the ballot papers images and that these were in secure storage. In a separate file, data on the ecount system database used during the election was held, with all information processed by the system, the scan progress for each ward and parish, the results of the declared elections, and all details of the count.

However, Breckland confirmed that it had not witnessed erasure of files from Indra's systems prior to Indra dismantling its systems and returning to Spain.

Confidentiality of votes

The confidentiality of votes was not compromised. Each ballot paper carried a unique identifier in the form of a barcode. At the polling station the elector's registration number was written against the appropriate number on a separate list of unique identifiers. This list was kept separate from the cast votes. Numbers were not written on the counterfoils of ballot papers.

The Integrity of the vote

The use of unique identifiers on the ballot papers protected the integrity of the vote. The unique identifier had to be recognised by the system for the vote to be counted. This meant it was impossible to count a vote twice or count votes spuriously scanned. The system did check to see the ballot paper number was either returned and valid through the postal vote verification system and in the case of a polling station within a valid range. However, it was possible to incorrectly enter a ballot number that was within the valid range, if the system had not yet seen the number. In theory, ballots could be incorrectly allocated and seats declared before any error was detected.

Ballot boxes were handled only by Breckland staff.

When Breckland staff were removing the counterfoils from the ballot papers, Indra staff assisted. The removal of the counterfoils was carried out in the scanner area, and the area became very busy due to an increased number of Breckland and Indra staff there. Observers stated that they could not see what was going on in the scanning area. It would have been more beneficial, in terms of visibility, transparency and integrity to have set up an area away from the scanners to deal with the removal of the counterfoils.

Once the votes scanned were verified against the number on the Ballot Account, it was not possible to introduce additional votes to the system.

Scanned bundles were wrapped in red papers indicating that they had been scanned, and included a printed summary of the scan details.

Individual papers could be retrieved and compared with on screen images if required by the RO, and this did actually happen on at least two occasions.

During the adjudication observers complained that they saw ballot papers which had lower than the maximum number of allowed votes, and which had faint marks in other boxes. One observer pointed out that, as the scanning was done in black and white, rather than greyscale, this could potentially be votes that had been made using pencil (as may have been possible in some polling stations). One such ballot paper was retrieved, however, and adjudication on it was found to be correct.

The eCounting system does detect marks made with pencil provided they are not too faint, although the use pencils to register a vote is not recommended. Indra

advised Breckland of this, and in order to avoid use of pencils, Breckland authorities supplied pens to all polling stations.

It is recommended that this be investigated further in future, to verify that votes cast using pencil are properly recorded.

Fraud

No opportunity for fraud was identified arising from the system for the electronic counting of votes. The safeguards included the use of unique identifiers for ballot papers, ballot box verification, the access log, the ability to examine every ballot on screen and on paper, if required, and to count all or part of the vote by hand.

The isolation of the LAN from any external network prevented additional votes from being introduced.

It was not possible for operators to change the scanned image or gain access to the counting algorithm.

The storage of the run time software and scanned images (in separate places) means that a court could order a specific ballot, or the whole count, to be re-run under controlled conditions to check the declared result. This result could be checked against a result obtained by a manual count.

Adjudicators could enter votes to the system on behalf of electors, based on their interpretation of the elector's intentions as viewed on the scanned image. This process was subject to close observation by agents appointed by the candidates. The scanned image could also be checked against actual paper.

Impact on the counting process

A number of key issues were identified at the count leading to a breakdown in the process, and a subsequent manual vote being undertaken. These issues included:

- Counterfoils still being attached to ballot papers, which the system could not read
- Ballot papers with removed counterfoils being difficult for the system to read (with, for example, two scanned ballots being counted as one, leading to a lower scanned total than actual. This happened on a number of occasions (e.g. for Dereham Humbletoft, two rescans took place due to the large discrepancy – ballot account of 657 compared to scanned total of 288. Similarly two re-scans for Town Dereham Central – ballot paper account of 1402 compared to a scanned total of 687). This in turn required the need for a re-scan and led to the next listed issue.
- Ability of the system/manual process to allow acceptance of rescanned ballot boxes which are clearly wrong.
- The voters were asked to use crosses (X) in the ballot paper. The system was set to maximum sensitivity with respect to what it would accept as a cross (X). A large number of ballots were sent to First Level Adjudication as the system would not accept what looked to be a good cross as a valid vote.
- Issue of cross-contamination of ballot boxes, leading to a high number of ballots being referred to adjudication.

Some of these issues are described further below.

Of the total 17,423 ballot papers that were scanned, only 8,976 were verified, and of these, 2,662 or 29.66% were sent to First Level Adjudication. The 'verified number is awaiting clarification at the time of writing, however, this may be due to scanned ballots in the system waiting to be declared at the time that the e-count was abandoned

During the count, a critical issue arose over the counterfoil provision on the ballot paper. For certain wards, a large number of ballot papers were not torn off cleanly along the perforation, or the staples had removed from the books, and ballots posted into boxes with the counterfoil still attached.

This resulted in the system being unable to read the scanned ballot properly (the template effectively moving by the height of the counterfoil). All such ballots were then referred to second level adjudication, causing a huge bottleneck. In order to address this, both Breckland staff and Indra staff spent time physically removing the counterfoils, a process which caused considerable delay and confusion, both in the count area, and in the observation area.

Whilst Indra tried to rectify the issue with the templates, which had been caused by the counterfoil still being attached to the ballot, the whole system was down for a short period.

When the templates had been configured, Indra had to wait until each scanner had finished scanning a particular box, so that the adjusted templates could be loaded (this had to be done on all scanners at the same time). This caused more significant delays than the loading of the updated templates, as three scanners finished scanning relatively quickly, so were idle whilst waiting for the other two scanners to finish (approximately half an hour).

An additional, and more serious problem, was the acceptance at RO level of incorrectly scanned ballot boxes. The ballot box had been scanned once, and the number of ballots was significantly lower than it should have been. The ballots were rescanned and the correct number of ballots were recorded in this subsequent scan. However, due to manual error, the RO accepted the lower recorded number (as the values of both sets of scans were maintained on the system). This was particularly critical as it occurred on wards that had already been declared. The error for one of the wards – Dereham Humbletoft, was identified on the day of the count, and candidates and agents asked for a manual recount. During the manual recount, all scanning and adjudication activities ceased. The manual recount found the declared ward to have been based on an incorrect number of votes (electronic count recorded 288 ballots and manual count recorded 650 ballots – a discrepancy of 368 ballots). The reason for this large discrepancy is unclear, and is unable to be properly verified. It may have been due to the counterfoil issue, which resulted in the scanners counting two ballot papers as one, however due to the size of the discrepancy, another, more probable reason is that a batch was missing from the scanning. The outcome was the same, but confidence in the system from candidates and agents diminished rapidly. A second ward which appeared to have had the same problem – Dereham Humbletoft – was identified by Breckland subsequent to the count, and a manual recount was to take place on Monday, 14 May 2007. However it was subsequently confirmed that this would not go ahead, as there is specific statute law that would prevent such a count.

The above was a failing in both the system itself, for not asking the RO to reconfirm acceptance of lower scanned number (confirmation is requested by the system but the difference in the number of ballots is not highlighted), and a failing of the manual process for acceptance of a rescanned ballot box. In such a situation, the system should advise the RO that he/she to reconfirm his/her intentions. Nor should the system allow a seat to be declared based on such a large discrepancy. In addition, the responsibility for accepting a rescanned ballot box into the system should not reside with one person, but require re-confirmation of a second individual.

A further problem occurred with cross-contamination of ballots across ballot boxes, resulting in ballots not being identified, and requiring RO level manual entry, which resulted in a very large backlog. The problem was further compounded by the difficulty in reading the barcodes to be manually entered, due to poor quality of the image. Whilst some provision was made in the system for cross-contamination, Indra did not anticipate the problem to be so big. Proper provision should be made

for the issue of cross-contamination (when one ballot box is used for both district and parish ballots, instead of two separate ballot boxes), both within the system and also prior to scanning into the system (through initial, manual checks).

When barcodes had to be manually entered, such as in the case of the system not reading a ballot paper correctly, the resolution of the scan was very poor, making it very difficult to read the actual ballot paper barcode number. Often several attempts had to be made before being able to enter the number correctly (a correct number had to be within range and not already 'seen' by the system). This also gave rise to the possibility of error (with the wrong barcodes being entered). Whilst the system would pick up these wrong entries eventually (as there cannot be two identical barcodes entered), there would then be a further bottleneck whilst confirmation was sought to confirm the correct code, and whilst the remaining ballot was properly allocated. There is also a possibility that votes can be incorrectly allocated, as first level adjudicators would not necessarily scrutinise individual ballot images in terms of the seat and the candidate list.

The Electoral Services Manager was responsible for the overall workflow, which began very smoothly. However as problems began to occur, the count site became somewhat confused. Communication to candidates and agents about progress was somewhat poor, with many complaining that they did not know what was going on.

The key problems that arose had a significant impact on the counting process, and ultimately resulted in the electronic count being abandoned on the evening of 4 May 2007.

Example report from Indra's system

Ward / Parish	Total Ballot Boxes	Difference between Registered and																Not identified	Other
		Registered	Scanning	Scanned	Verified	Counted	In Process	Counted	Declared	Announced	Total Scanned	Total Verified	First Level	RO	Total Counted	% Pending	D		
All Saints	5	5	0	5	5	5	0	0	1	1	760	760					0,00		
Attleborough - Burgh & Haverscroft	3	3	0	3	3	3	0	0	1	1	1591	1018					0,00		
Queens	4	4	0	4	4	4	0	0	1	1	1404	1404					0,00		
Conifer	7	7	0	7	7	7	0	0	1	1	632	632					0,00		
Dereham - Central	2	2	0	2	2	2	0	0	1	1	1477	1401					0,00		
Dereham - Humbletoft	2	2	0	2	2	2	0	0	1	1	1039	288					0,00		
Dereham - Neatherd	3	3	0	3	3	3	0	0	1	1	1221	1159					0,00		
Dereham - Toftwood	3	3	0	3	3	3	0	0	1	1	2327	1169					0,00		
East Giltcross	4	4	0	4	4	4	0	0			551	551					0,00		
Eynsford	6	6	0	6	6	6	0	0	1	1	1396	748					0,00		
Harling and Heathlands	8	8	0	8	8	8	0	0	1	1	1137	1082					0,00		
Hermitage	9	9	0	9	9	9	0	0	1	1	767	740					0,00		
Launditch	8	8	0	8	8	8	0	0	1	1	784	784					0,00		
Shipdham	2	2	0	2	2	2	0	0	1	1	539	492					0,00		
Springvale and Scarning	6	6	0	6	6	5	1	1			1283	1173	4		1169	0,34	0	4	0
Swaffham	3	3	0	3	1	1	0	2			3969	399			399		0,00		
Swanton Morley	4	4	0	4	4	4	0	0	1	1	791	685					0,00		
Templar	5	5	0	5	5	5	0	0	1	1	663	636					0,00		
Thetford Abbey	4	4	0	4	4	2	2	2			864	764	2	10	754	1,57	0	1	0
Thetford Castle	2	2	0	2	2	0	2	2			563	563	3	2	561	0,89	0	0	0
Thetford Guildhall	5	5	0	4	1	0	1	5			2758	305	9		305	2,95			
Thetford Saxon	4	4	0	3	3	0	3	4			2469	567	13	218	349	40,74	0	0	211
Two Rivers	5	5	0	5	3	0	3	5			1563	395	395		0	100,00			
Upper Wensum	7	7	0	7	6	4	2	3			1264	395	1	30	365	7,85	0	0	0
Upper Yare	6	6	0	2	0	0	0	6			410	0			0				
Watton	3	3	0	2	0	0	0	3			428	0			0				
Weeting	4	4	1	1	0	0	0	4			373	0			0				
West Giltcross	5	5	0	3	1	0	1	5			282	81	81		0	100,00	0	0	81
Town Of Attleborough-Queens Ward	3	3	0	3	3	1	2	2			1854	1266	3		1263	0,24	0	3	0
Parish Of Beachamwell	2	2	0	2	2	2	0	0	1	1	137	137			137		0,00		
Parish Of Croxton	2	2	0	2	0	0	0	2			166	0			0				
Town Of Dereham-Humbletoft Ward	2	2	0	2	2	2	0	0	1	1	660	653			653		0,00		
Town Of Dereham-Neatherd Ward	3	3	0	3	3	0	3	3			1946	1186	15		1171	1,26	0	15	0
Town Of Dereham-Toftwood Ward	3	3	0	3	3	2	1	1			1320	1154	2		1152	0,17	0	2	0
Town Of Dereham-Central Ward	2	2	0	2	2	2	0	0	1	1	1918	687			687		0,00		
Parish Of Elsing	2	2	0	2	2	2	0	0	1	1	125	125			125		0,00		
Parish Of Great Cressingham	2	2	0	2	2	2	0	0	1	1	92	92			92		0,00		
Parish Of Mattishall	2	2	0	2	0	0	0	2			1107	0			0				
Parish Of Merton	2	2	0	2	2	1	1	1			49	49	2		49		4,08		
Parish Of North Elmham	2	2	0	2	0	0	0	2			478	0			0				
Parish Of Old Buckenham	2	2	0	2	2	2	0	0	1	1	366	366			366		0,00		
Parish Of Ovington	2	2	0	2	2	1	1	1			108	108	1		107	0,93	0	1	0
Parish Of Shropham	2	2	0	2	2	1	1	1			145	145	1	3	142	2,76	0	3	0
Town Of Swaffham	9	9	0	8	7	7	0	2			1865	407			407		0,00		
Town Of Thetford-Abbey Ward	4	4	0	4	4	1	3	3			923	923	107		816	11,59	0	84	1
Town Of Thetford-Castle Ward	2	2	0	2	2	0	2	2			566	566	1	22	544	4,06	0	0	21
Town Of Thetford-Guildhall Ward	5	5	0	5	1	0	1	5			1695	305	1		304	0,33	0	0	0
Town Of Thetford-Saxon Ward	4	4	0	4	3	0	3	4			1325	807	8	14	793	2,73	0	0	11
Parish Of Weeting With Broomhill	2	2	0	2	0	0	0	2			578	0			0				
Total Ward/Parish = 50	188	188	1	175	146	113	33	75	21	21	50728	27167	40	908	26259	3,49	0	113	325

Source: Indra

Cost and value for money

A cost analysis was prepared by Breckland for the DCA, as below. At the time of writing we are still awaiting details of Breckland's claim for the pilot to the MoJ. Breckland has indicated that it will be paying Indra the full amount for the work.

Costs – Work Order

1	Project Management	£33,637
	a. Project manager.....	£10,091
	b. Requirement definition	£3,364
	c. Review meetings	£3,364
	d. Project documentation.....	£6,727
	e. Business Continuity arrangements	£6,727
	f. Post elections audits & reports.....	3,364
2	Software.....	£17,935
	g. Election Management System.....	£4,484
	h. Elections Adjudication System	£3,587
	i. Scanning software	£2,690
	j. Workflow Monitoring and control	£5,381
	k. Results tallying and reporting Results display system	£1,794
3	Hardware & Installation.....	£35,780
	l. Hardware: 4 scanners, servers, LAN elements workstations, printers	£26,835
	m. Delivery & installation (hardware & software	£5,367
	n. Removal	£3,578
4	Training Programme.....	£11,051
	o. Definition & design of courses	£2,210
	p. Training materials & documentation	£1,105
	q. Demonstrations & support	£1,658
	r. Courses & hands-on sessions: staff, supervisors, adjudicators, scanner operators, administrative staff	£6,078
5	Support & Operation	£39,020
	s. System tests.....	£9,755

t. Acceptance testing	£9,755
u. General test	£9,755
v. On-site operational & technical support	£9,755
6 Ballots	£11,408
w. Ballot design	£6,845
x. Testing & QA on printed ballot papers	£4,563
TOTAL	£148,831

e-counting costs – additional costs for Breckland

Count Venue – 1 – 5 May inclusive

Main Hall	£1,244.44
Storage	£ 492.00
	£174.90
Small Hall	£715.50
Squash Court	£324.45
Count Centre Parkwood Staffing	£459.00
Catering	£201.50
Equipment Hire	£153.00
Hire of Barrier Equipment	£100.00
Security Staff (3May night)	£250.00
Staffing (4 May)	£3,009.00
Staffing 8 th May (restart of abandoned count)	£2,672.00
Total costs for Breckland (not including Indra costs)	£9,795.79

Specific costs which were covered by Indra (included in Indra total, above, but not split out)

Costs attributable directly to Indra paid for by Breckland Council

Hire of Plasma Screens (3days)	£300.00
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MTL Cabling works ¹	£14,237.00
ProMove ²	£1,234.84
Subtotal	£15,771.84

Traditional Count – cost

The typical cost of a traditional manual count would have been as follows:

Count Venue (x2days)

Dereham	£700.00
Thetford	£1,397.70
Staff Costs (est.)	£25,763.00
2 days (night and day count)	
Total	£27,860.70

Cost per elector and per ballot

Breckland has an electorate of 80,790. Taking the cost of service provided by Indra (£148,831) with other costs such as hire of hall, barrier equipment, staffing etc. ((£9,795.79), the cost per elector therefore equates to £1.96. The total number of ballots cast was 13,633 for parishes, and 26,447 for districts, total 40,080. Cost therefore equates to £3.96 per ballot cast.

¹MTL is company that provided LAN cabling both at Elizabeth House, whilst Indra were on site, and also at the count site

² Promove was responsible for unloading the equipment at Elizabeth House and the count site, and for transport

Conclusions and findings

Ovum's conclusions in relation to the electoral pilot scheme in Breckland are as follows:

When working properly, the system does facilitate the counting of votes:

Whilst the system did facilitate the counting of votes, there were a number of significant failings within the system and with the process overall that challenged the integrity of the process. Subject to satisfactory resolution of these issues, then vote counting could potentially run smoothly and quickly, and provide a high degree of accuracy. In its present form, however, this is not the case.

There is no evidence to suggest that turnout of voters was higher than it would otherwise have been: Turnout for the town/parish elections was 30%, and for the district was 33%. Turnout on the previous council (district) elections was 34%.

Procedures were generally easy to use, with the exception of the counterfoil and cross-contamination issue. Voters appear to have found both polling station and postal voting procedures easy to use, judging from the small number of rejected ballots. The ballot papers looked like those used in previous elections except that the face of the paper showed the four crosses used to locate each ballot in the scanner and the reverse of the paper showed a bar code and unique identification number. The two arising issues are more as a result of procedures within the polling station than as a result of voter behaviour.

There was no apparent increase in personation or other malpractice, however, the miscount of wards has serious repercussions. Whilst there was no apparent increase in personation or other malpractice, there was the issue of the two wards being declared based on only a subset of the votes cast. One of these, Dereham Humbletoft, underwent a manual re-count on the day and, whilst the declared outcome remained the same, there was a significant difference in the number of votes recorded by the system and the actual number registered. For the second of these, Dereham Toftwood, this was only identified after the count had been completed, and a manual count was not permitted for legal reasons. It has not been verified, therefore, whether the result would have differed from that declared.

Neither cost nor time saving was achieved, due to failure of the pilot.

However, a successful pilot may have achieved both.

Learning and issues arising

There are a number of learning points arising from the Breckland pilot. These can be summarised as follows:

Ballots should be sorted before starting the scanning process, and sufficient personnel should be allocated to this task. They need to be unfolded and organised

such that the scanner operator only feeds those batches through the scanner. This will address issues such as cross-contamination, and will save time in the long run

Ballot papers need to be thoroughly tested, particularly with respect to the presence of counterfoils. Ideally, counterfoils should be avoided, or alternatively, smooth removal undertaken before the start of the count. Other methods of padding the ballots should be explored, and tested. For example, glue may be an option. However, it may leave dirt on scanner lamps.

Procedures need to be in place to address cross-contamination. If two elections types (e.g. parish and district) take place at the same time, either:

- all ballots should go in the same ballot box and the system organised to take account of this, or:
- polling station staff should be clearly instructed about which ballot boxes voters should be using, AND
- a manual sorting of ballots should take place prior to scanning, to ensure that levels of cross contamination are as low as possible.

Bottlenecks that occurred with re-scanning, which effectively held back the scanning of remaining ballot boxes should be addressed. This might be done through assigning certain scanners to certain wards. If a re-scan occurs in one ward, it should not prevent other boxes for other wards being scanned. A number of seats could have been declared a lot more quickly had it been possible to identify and select which ballots for a particular seat needed to be adjudicated (at both levels), so that seats that only required a small number of ballots to be adjudicated could be declared more quickly. The speed of declarations increasingly frustrated observers, as did the apparent lack of activity in the count area when system and ballot paper problems were being addressed.

Better communication with observers would be beneficial. Whilst the set up of the first level adjudication was very transparent, allowing observers a close view of ballots being adjudicated, it was conducted in the order that ballots were presented, and as such, observers did not know which wards were being adjudicated (the ballots were typically on screen for a few seconds only). This gave a disjointed feel to the process and a learning point would be to have PCs designated to specific wards, and for some communication to observers what is being adjudicated.

The verification stage needs a mechanism to account for mistakes when verifying a ballot box. If a ballot box is incorrectly verified the system counts the ballots verified which may not be coincident with the real number of ballots in the box. The mechanism should be both system driven (e.g. with a flag to highlight the issue) and manual, with acceptance by two people required in order to proceed. Threshold allowable differences might also be built into the system.

Further testing of scanner and system performance should be undertaken to assess the scanning of ballot papers filled in with pencil. Whilst this was not a verified issue, it was mentioned by a candidate and needs further examination. If pencil marks are not properly recognised by the system (greyscale

vs black and white), then there is potential for some votes cast not to be counted, due to non-visibility of the vote (X).

Further testing of the scanner and system performance needs to be undertaken to assess the quality of the scanned image, in particular the barcode image, which was very difficult to read during the pilot, and which caused delays whilst adjudicators tried to determine what was the correct barcode.

Displays for observers should properly reflect the ballot box being scanned, and take account of re-scans. When ballot boxes were being scanned, the display monitors would indicate that contest correctly. However, when ballot boxes had to be re-scanned, these automatically took priority over other ballot boxes waiting to be scanned. This re-scanning wasn't indicated on the monitors, so to observers, they were unclear about what was being dealt with, as there was no apparent tally with what was on the display monitor.

Adjudication area needs to be better set up/more open. Adjudication area should be reviewed to provide more clarity for observers in terms of which wards are being adjudicated on.

Scanning/count areas should be more visible to observers, without prejudicing the security of the count.

Physical security should be consistent throughout the count, and adjusted accordingly in the event of issues arising. In particular, the security of the count area should be maintained.

Clear contingency plans should be in place in the event that a manual count (either partial, to verify a particular ward, or full) needs to be undertaken. A final issue was observed towards the end of the day, where there was no clear contingency plan apparent once Breckland decided to abandon the electronic count. For example, there was no alternative location that had been identified as a stand-by location. Additionally, it was unclear when the count should resume, e.g. later that evening, the next day or the following week, or whether it would be possible to resume the electronic count