E-electoral Administration: Organizational Lessons Learned from the Deployment of E-voting in the UK

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ABSTRACT
Within the wider spectrum of digital democracy, e-voting systems attempt to redefine long-established electoral practices. This paper does not examine whether e-voting should become a standard voting practice, but beginning with the hypothesis that some stakeholders are willing to adopt e-voting systems, explores how electronic voting can be deployed in an effective manner resulting to an accepted outcome. The authors suggest that the traditional electoral process is re-engineered into an e-electoral process through the introduction of available e-voting technologies. Then, based on the UK e-voting experience, the issue of e-electoral administration is examined and discussed.

1. THE DIGITAL DEMOCRACY CONTEXT

In the attempt to define the digital democracy context we have come across several terms such as e-democracy, teledemocracy, cyberdemocracy as well as digital democracy. However all these refer to the use of systems provided by information and communication technologies in the service of democracy.

According to Gronlund [11], all the above terms are: "often used synonymously to refer to the use of information and communication technologies (ICTs) to connect politicians and citizens by means of information, voting, polling and discussion." Gronlund therefore defines digital democracy by referring to specific application areas of the field. He considers the formal rule by the people, a basic requirement for every digital democracy system, next to the effectiveness and the efficiency of the system. Digital democracy therefore places its applications in the service of a democratic form of government as well as the democratic aspect of any social interaction.

Hacker and Todino [13], refer to electronic democracy as something different from electronic democratisation. For them digital democracy provides the means to bypass traditional routes of participation maintaining though the same level of participation, whereas electronic democratisation is about conveying political power to those who do not have it in the existing state of democratic affairs.

Macintosh [15] refers to teledemocracy as technology driven inclusive democracy focusing on the application and impact of ICTs on civic representation and participation in the democratic process. Computer, information and social scientists are needed to develop applications, which will empower people to participate in the process of establishing priorities and policy-making and thus expand their understanding of and participation in the system of government. Macintosh, [16] (p2) defines e-democracy as: "e-democracy is concerned with the use of information and communication technologies to engage citizens support the democratic decision-making processes and strengthen representative democracy. The principal ICT mechanism is the internet accessed through an increasing variety of channels, including PCs, both in the home and in pubic locations, mobile phones, and interactive digital TV. The democratic decision making processes can be divided into two main categories: one addressing the electoral process, including e-voting, and the other addressing citizen e-participation in democratic decision-making."

A number of authors have attempted to understand the circumstances which fostered the development of digital democracy applications. Becker [4] argues that ICTs, permit higher levels of democracy, including greater participation of citizens, located at greater distances, and suggests that when these new ICTs are improved we can then expand to direct democracy [3]. As citizens acquire the technological means and are familiarised to their use, from other sectors of everyday activities such as e-commerce and e-banking, they turn to the use of new technology for their political interaction as well**.** Fotopoulos [10] argues in favour of inclusive democracy where the redistribution of power in all public arenas, such as political, social, economic and ecological, would in turn establish a strong democracy as suggested by Barbour [2].

Within the limits of contemporary representative democracy there is a lack of democracy in the form of government. The participative role of citizens in the system is limited to the electoral process, which in turn results in low citizen interest in the wider democratic process [21]. Low voter turnout in the electoral process, with an even lower turnout in the young age groups, as stated in the UK government consultation on e-democracy [12] indicates the lack of confidence in the present form of democratic affairs. The use of new technologies in different functional levels of the democratic society may improve citizens' participation and diminish the apparent democratic deficiency. However, Tsagarousianou argues that specifically designed applications for the support of democratic processes, has not led to high levels of uptake [22]. From the above

discussion, one can conclude that digital democracy derives from the socio-political need for greater citizen participation in the wider democratic process and the technical possibilities offered by ICTs.

The UK government partly justified its intention to develop an e-democracy policy based on the large uptake of new technologies, with 40% of households, 95% of businesses and 98% of schools on-line in 2002 [12]. According to the UK government policy for e-democracy [12] (p8) the focus is: "on what technology means in practice – the technology, the 'e' in 'e-democracy', is simply a tool to help make the democratic process more effective". For the UK government the wider e-democracy field can be divided into two distinct areas, the first being e-engagement while e-voting is considered to be entity of its own. Following this distinction, the next sections focus on the main interest of this paper which is e-voting.

2. E-VOTING

Democracy fosters the electoral process. Within the democratic form of governance elections take place repetitively. Elections mainly serve to elect representatives and more rarely to take decisions on specific issues [14]. Elections are rule- governed [1] whether the rules have formal legal status or only in-house effect. Elections can be electronically enabled by a number of possible technological applications. Electronic voting does not support a new process but rather modifies the existing voting process. Through its different applications e-voting aims to re-engineer the existing electoral process.

In the UK, HM Government policy, as stated in the e-democracy consultation undertaken in 2002, aims at an e-enabled general election some time after 2006 [12], therefore defining it a medium term target. To that effect 16 legally binding local authority e-voting pilots took place in May 2002 and 20 more followed in May 2003. One of the main aspects that enabled the deployment of e-voting pilots has been the plethora of existing e-voting technology suppliers. These e-voting pilots were the result of the inherent need to address the issue of low turnout in elections and the need to modernise elections, which have been conducted in their present form for the last hundred years. Considering all cases of the 2002 and 2003 e-voting pilots, the traditional electoral process was either complemented or substituted by a multiplicity of electronic voting processes. Voters were provided with multiple voting channels all resulting in the same outcome, the casting and counting of their vote, all governed by the same set rules. The scope of this paper is within the area of electronic voting, producing legally binding results, for public elections in a UK context, focusing on the organisational practices followed in the 2003 pilot schemes.

3. THE UK E-VOTING PILOTS

The introduction of ICT in the electoral process mainly aims at providing voters with the opportunity to cast their vote electronically. Five different e-voting technologies which serve this purpose have been piloted in the UK:

- Internet voting
- Telephone voting
- Direct Recording e-voting machines (DRE) / Kiosk voting
- SMS text message voting
- Interactive Digital Television voting

The use of e-voting technologies re-engineers the traditional electoral process. The paper ballot is substituted by the "e" digital ballot. Polling stations remain relevant only when DREs are used, while all the remaining e-voting technologies allow voting to take place remotely, outside the polling station. Therefore polling station based supervised voting is substituted by remote unsupervised voting. Furthermore the potential use of more e-voting technologies in the same election results to a multiple channel e-voting process substituting the traditional single-channel polling station voting process. However we have found it necessary to differentiate between technologies which provide an alternative electronic voting mechanism, i.e. a new e-channel for voting, and those which partially automate some stages of the electoral process but do not provide technology for actually casting an e-ballot. Examples of technologies which semi-automate certain process stages, and as such partially support or "e-enable" the voting process included:

- The use of an electronic register of voters
- The electronic counting of paper ballots
- The use of smartcards for voter identification purposes
- The use ballot boxes which feature some electronic elements

The introduction of technology in the electoral process results in the deployment of an e-electoral process, whether ICT provides e-voting or e-enables paper-ballot voting.
Two main government agents were involved in the deployment of the UK e-voting pilots:

- Central government (Office of the Deputy Prime Minister)
- Local Public Authorities (PAs)

The ODPM was the government agent who procured and funded the pilots. Commercial suppliers who could provide e-voting systems to PAs were previously approved by the ODPM through an organized supplier validation process. The result of that process, internal to the ODPM, provided an approved list of suppliers who could in turn "join up" with PAs and apply to run an e-voting pilot. In practice, however, it was the PA that applied to the ODPM, suggesting their preferred commercial supplier, but it remained at the discretion of the ODPM to allocate commercial suppliers to PAs. After the PA applications had been submitted, the ODPM had to examine them and according to their scope, approve or reject them. Approved PAs would then be allocated commercial suppliers and the ODPM actually contracted the services and products of suppliers on behalf of PAs. As the results of the e-voting pilots were legally binding in all cases, the ODPM was also in charge of preparing a special act of law which allowed and described the use of e-voting technologies in the electoral process. Due to the limited time scales followed, PAs and commercial suppliers had to initiate some project stages for the deployment of the pilots prior to the official legislation being passed by the Westminster Parliament and the sign-off of suppliers' contracts [8].
PAs were fully responsible for the administration of the pilots. However, the fact that no administrative support was centrally provided to the PAs resulted in the PAs' dependence on commercial suppliers for specialized knowledge on the systems piloted and expert advice on how to better manage the adopted ICT. As such, the role of commercial suppliers of e-voting systems assumed a high degree of significance for the successful delivery of the UK pilots.
The commercial suppliers of e-voting technology for the UK pilots were contracted by the ODPM to provide PAs with the relevant e-voting channels and the necessary hosting and infrastructure services to support them. E-voting channels provide voters with an interface to cast an e-ballot. This includes voter authentication, vote casting, and confirming that a valid

vote has been cast. Hosting and infrastructure services support the e-voting channels and update the central election platform (database) that captures, stores, verifies and tabulates the votes. For the 2003 pilots, all channels and services had to be interoperable so that different suppliers' e-voting channels or services could interconnect and exchange data. E-voting suppliers formed consortia in order to provide PAs with complete e-voting solutions. Overall there were five consortia of suppliers of e-voting channels in 2003 and two suppliers of hosting and infrastructure services [9]. All the systems provided by e-voting suppliers for the 2003 pilots had to comply with the statement of requirements issued by the ODPM [19].

For each of the 2002 and 2003 e-voting pilots a dedicated evaluation report was produced by the Electoral Commission (EC).The EC is an expert public body, independent of Government, non-partisan, and directly accountable to the UK Westminster Parliament. The EC has the statutory duty to evaluate any electoral pilot scheme approved by the relevant Secretary of State (currently the Deputy Prime Minister). The EC summarised their findings in two strategic evaluation reports, one resulting from the 2002 pilots [7] and a second based on the 2003 UK e-voting experience [8].

4. RESEARCH METHODOLOGY

This paper derives from a doctoral research concerned with the identification of the non-technical constraints in re-designing the electoral process in relation to ICTs.

The fieldwork of this doctoral program was undertaken in two stages, involving two of the local authorities which piloted electronic voting in the May 2003 UK local authority elections. The first stage of empirical work involved PA1. It included interviews and observations conducted over two days, April 30th and May 1st. The PA1 e-voting pilot was a most comprehensive and representative example of the UK pilot schemes. PA1 was among those public authorities (PAs) piloting a multiple channel e-voting process. The voting period had begun on April 25th and ended on May 1st 9.00pm to be followed by the counting of ballots at the close of polls. During this seven day period voters could cast a ballot electronically 24 hours a day using any of the four available e-voting channels: telephone voting (IVR), unsupervised internet connected voting kiosks located in public places, SMS text message voting and finally internet voting. The traditional paper ballot in polling stations was still made available to the electorate on May 1st (election day). However polling stations provided two e-enabled features; an electronic version of the electoral register, centrally managed and made available to polling station officers on election day and smart card readers to facilitate voter authentication. Voters could also cast a postal ballot if they had previously applied to the election office of the PA for this.

Field interviewing [20] involved four interviews held with key representatives of the agents involved in the delivery of the PA1 pilot.

The evidence gathered in PA1 was supplemented by documentation provided by the interviewees regarding some administrative aspects of the pilot. The use of administrative documents is suggested in the literature [24] as an accepted source of research evidence. These included:

- A detailed timetable of the election, beginning 15 February 2003 to end May 2003, containing 93 tasks for the completion of the pilot.
- Call-in records of case problems
- Contracts between partners allocating jobs/responsibilities
- The PA1 application to the Office of the Deputy Prime Minister (ODPM) to be a pilot local authority

Additionally the official evaluation report produced on the pilot by the EC was used to provide further insight to the background of the pilot. We have also collected evidence from all the EC evaluation reports on the 2003 UK e-voting pilots. This has allowed the authors to cross-reference and complement the existing body of empirical findings acquired during the fieldwork in PA1. The combined approach to data gathering taken in this doctoral programme involving interviewing, observations, and documents' analysis increases the validity of the evidence gathered [17].

Analysis was then undertaken in relation to three main subject areas: the procedural aspect of security, the administrative perspective of the e-electoral process and the trust issues identified during the deployment of the PA1 pilot.

In order to validate the initial conclusions of this threefold analysis a second stage of fieldwork was undertaken. During this stage two one-hour interviews were conducted, both some days prior to the 2004 Local Authority elections (June 10th), with staff of PA2. This placed the second stage of the fieldwork thirteen months after the first.

PA2 also piloted a multiple channel e-voting process. In fact it presented the maximum possible degree of similarities to the PA1 pilot features, more than any other public authority of the 20 involved in the 2003 UK e-voting pilots. There was however some differentiation. PA2 did not provide voters with the SMS text message voting option. Additionally, although internet connected voting kiosks were made available to voters, these were located in polling stations and therefore voters could only use them on the final day of voting (May 1st). However voting at a polling station via kiosk did not require prior voter authentication by the polling station officers. As such it provided voters with the necessary infrastructure to cast an e-ballot using the internet in a controlled and private environment [5]. Since voters in PA2 were also presented with the option of casting a paper ballot at any polling station, that meant that polling stations hosted in parallel two voting channels, traditional paper voting (after authenticating voters using the polling station accessed e-register similar to PA1) and electronic voting via internet connected voting kiosks.

The first validation interview in PA2 was held with the Returning Officer (RO) who was also the Head of Legal and Democratic Services. This interview was structured around two main themes: the procedural aspect of security of the e-electoral process and the trust issues identified between the different agents involved in the deployment of the pilot. A second interview was conducted on the same day with two PA employees who were involved in the 2003 e-voting pilot. One of them was the Head of Information and Communication, while the other interviewee was the assistant of the E-voting Project Manager. This second interview was structured around the administrative issues related to the delivery of the e-electoral process. Both interviewees were involved in the administration of the 2003 pilot and as such this interview aimed to validate the results derived from analysing the e-electoral administration aspect of the 2003 UK pilots. All three interviewees were members of the PA's internal e-voting project management team formed by the RO to manage the secure and efficient delivery of the pilot.

5. RESEARCH FINDINGS

5.1 Organisational issues

In PA2 during the 2003 pilot the number of polling stations was reduced, however there was a political need not to reduce them too much. Nevertheless the pilot scheme was characterised as a "*nightmare*" by the interviewees due to the large number of e-enabled polling stations involved. The fact that polling stations were e-enabled meant that internet connectivity had to be ensured

for the locations and premises hosting polling stations. However these were temporary premises used as polling stations for only one day including schools, churches, pubs, fish and chips shops, and even a mobile van. Therefore establishing the required broadband connectivity was not an easy task. In order to get the connections to the polling locations, the person responsible (holding the key) for each polling station was not always available when commercial supplier technicians would visit each site to install the connection. Equally it was impossible to provide a broadband connection for all polling stations as some areas of the PA2 district did not have broadband infrastructure at the time of the pilot. It was also indicated that when more e-polling stations are involved if something goes wrong then more locations have to be provided with the required support. The scalability of a scheme was related to the amount of equipment required to deploy for each polling station. The problem is not the size of the electorate but the necessary logistical support and technical infrastructure. Due to the connectivity problems faced on election day the PA eventually had to provide polling stations with a marked paper copy of the register for security reasons. The production of the marked printed version of the electoral register on short notice was not the most administratively sound measure but from a security point of view "*it was better than nothing*".

Additionally, although polling station staff training had been provided, realistically staff had not been trained for adversity. Staff were trained on the best case scenario and were never instructed on what to do if polling station connectivity was lost, nor had they received any disaster recovery training. There was supposed to be a helpline for polling station staff on election day but similar to PA1 eventually that fell apart. It was also indicated that at a polling clerk level anything electronic is "*a bit alien*" to them; "*even if they receive training they are still very nervous when it all starts to go wrong*".

5.2 Internal communication issues

Regarding the need to establish standard and alternative communication channels between the agents involved in the delivery of the e-electoral process, it was suggested that alternative channels, such a phone connection, are good to have as long as they operate as expected. In the 2003 PA2 pilot the PA had provided polling station staff with mobile phones as back up communication channels. However there were differences in the coverage of the networks while different people would use different networks. As a result it was not always possible to have network coverage for all polling stations. In such cases, when polling station staff needed to make use of their mobile phones to communicate with the election office during the final polling day due to unavailability of a land-line, they would occasionally have to leave the polling stations and go out in the street in order to be able to make a phone-call from the mobile phones provided. Alternatively one member of the polling station staff would stay out of the polling station all day in order to be able to receive communications from the election office as incoming calls were equally blocked from the absence of mobile network coverage.

The need for internal communication between PAs working with the same e-voting suppliers was also explored. This measure could be prospectively useful providing that it is implemented right from the very start of the preparation period. If all PAs working with the same suppliers had been in closer communication they could have been more forceful towards to commercial suppliers regarding their requirements.

5.3 Multiple agent co-ordination

In exploring the necessity for a co-ordinating agent when many different agents are involved in delivering intersecting e-voting processes, it was acknowledged that the experience gained from the e-voting project manager during the 2002 PA2 pilot proved useful in administering the 2003 pilot. However the PA still relied on the supplier to provide project management services. Nevertheless a totally external co-ordinator not affiliated to any of the agents directly involved in the delivery of the pilot "*would not know enough about how a PA works*". The co-ordination of multiple agents caused the most problems in the 2003 pilot. Working with multiple sub-contracted agents for electoral purposes was something new to PA staff. The traditionally responsible PA department for the administration of elections, the election office, would be capable of administrating e-voting on its own, if that becomes a routine process with reliable infrastructure. However it was suggested that currently the election office would be understaffed to deliver such a project.

5.4 Administrative responsibilities and resulting dependencies

The need to clearly define agent tasks, roles, and responsibilities was made quite evident during the 2003 PA2 pilot. Additionally, there was no time available for one agent to verify the completion of a task by a previous agent. As an example it was mentioned that in some polling stations the necessary hardware was only supposed to be delivered on the day before the election day due to security reasons. Discussing the rotation of staff roles instead of separating their responsibilities, it was suggested that there were not enough resources to allow for that back up.

As a result, PAs could face three kinds of dependencies: internal (developed between the involved PA departments), external (between PAs and their commercial suppliers), and inherited (to the PA by the commercial suppliers deriving from their sub-contractors). Such dependencies were identified in the context of the 2003 PA2 pilot but external and inherited dependencies were effectively the same, as the PA could not control either of those dependencies. The existence of some sub-contractors was never made known to the PA and the extent of dependencies was increased due to the last minute confirmation of the pilots by the ODPM. The interviewees also verified the need for a task-dependency register to indicate points where the provision of one agent's responsibility is necessary for the next agent's completion of tasks. In the project plan these points were defined as critical milestones.

5.5 The reliance of PAs on commercial suppliers

A PA should be legally in charge of their suppliers based on their contractual agreement. However it was admitted that a PA would not have the technical and administrative expertise, nor the experience needed to manage the suppliers effectively. One interviewee replied: "*the thought of managing big commercial suppliers is quite frightening*". To a large extent when a supplier provides a PA with a project plan the PA should not have to rely on trust that the supplier will actually follow that plan but rather expect the supplier to deliver accordingly out of professionalism. It was mentioned that when large suppliers with a good reputation promise a service the PA has to believe that "*they know their business and will deliver it*". The PA would have no way of knowing whether a supplier can indeed deliver the promised service. All a PA could do is check once that service has not been delivered if there any way that the PA could provide it instead. The best solution would be to rely of suppliers for the provision of technology but maintain the control of the electoral process.

5.6 The collaborative delivery of the e-electoral process

As such the collaborative delivery approach (outsourcing the tasks and services which are beyond the PA's knowledge and ability to provide, keeping control of everything else) was suggested as opposed to fully outsourced services where there is

not much a PA can do. However fully outsourced services would not be feasible due to the political nature of the electoral process and therefore the collaborative delivery approach has to be adopted. The example of the political issues involved when choosing the location of polling stations (with some candidates demanding that specific polling stations are made available due to their geographical proximity to their political supporters) makes this need for the collaborative delivery of e-elections evident. Equally, communication issues could arise between local stakeholders and commercial suppliers if left to interact directly without the intervention of the PA between them acting as a linking agent.

5.7 A paper voting channel as a basic back-up procedure for e-voting

Loosing voters, who would have voted if not prevented by malfunctions in the e-electoral process, could become a major problem when affecting large number of voters, undermining the validity of the result of the electoral process as a whole, even if only one of the voting channels was problematic. They acknowledged that if the paper ballot voting was not made available during the 2003 pilot the election would be problematic. Back-up procedures, such as the paper version of the electoral register need to remain available until the new e-process is well established. Alternatively the polling station accessed e-register combined to paper ballot voting, backed up by a paper version of the electoral register would be a good option for future pilots.

5.8 Discussing the factors of difficulty in deploying e-voting

Similar to PA1, it was suggested that every extra e-voting channel increases the work load of the electoral administrators. Additionally no efficiencies were indicated when paper ballots are maintained along with e-ballots since there is still a need to perform the traditional counting process. Some e-voting channels are more demanding than others. Telephone (IVR) voting was identified as being more difficult to update, given that new recordings need to be made for each election. On the contrary once an internet voting system performs as expected it would be relatively simple to adjust for the requirement of each election from one year to the next. In relevance to e-voting (totally electronic), e-enabled (paper ballot) voting is more challenging to provide given the problems faced with setting up the e-polling stations [23]. The 2003 PA2 experience also proved that providing e-voting in parallel to paper ballot voting from polling stations was an excessive approach. The PA did not have the necessary infrastructure to handle such a scheme in the first place, while the polling station e-voting option was not really used. The interviewees stressed that "*voters do not want to go to a polling station to vote electronically*" as they could go so in many other facilities such as libraries; "*people go to polling stations because they want to put a cross on a piece of paper*".

6. DISCUSSION AND CONCLUSIONS

6.1 Administrative activities

The deployment of e-elections requires the completion of numerous administrative activities. Some of the main e-electoral administrative activities include the electronic management of candidate nomination and voter registration, the management and dissemination of remote voting authentication credentials and replacement credentials, the production and dissemination of specialised poll cards to support remote voting, the management of e-enabled polling stations which includes the provision and installation of the required hardware, software and internet connection, the training of polling station and election office personnel on the use of any new e-elements, the tabulation of multi-channel voting results to produce the overall electoral outcome, and finally the provision of any further support needed to achieve the successful delivery of an e-election. These high-level administrative activities depend on the combination of e-enabling or e-voting technologies and can be divided into detailed low-level administrative tasks.

When polling station voting is maintained then the administrative tasks deriving from the introduction of any e-electoral elements are supplementary to the administrative tasks required to support the traditional polling station voting channel. E-electoral administration tasks can therefore be distinguished between existing tasks (i.e. those supporting polling station voting, e.g. printing paper ballots), e-tasks (i.e. those supporting e-enabled or electronic voting, e.g. generating remote voting authentication credentials) and common integrated tasks supporting the multiple channel e-voting process in general (e.g. the preparation, printing and dissemination of the specialized poll cards needed to support multiple channel e-voting). Part of the research data provided to the authors directly by the PA e-voting manager interviewed in PA1 was the e-voting project plan followed. This project plan included 20 high-level administrative activities, detailed into 66 lower-level administrative tasks. Out of the 20 e-administrative activities, 6 could be characterized as common integrated activities, supporting the generic multiple channel voting process (e.g. Presiding Officer Preparation). Accordingly, out of the 66 tasks included, 12 would fall under the common integrated task category (e.g. polling station staff selection).

The importance of e-electoral administration was made apparent from the study of the 2003 UK e-voting experience, given the risks generated for the successful delivery of the pilots by the inadequate organisational and logistical support provided. Administrative problems in e-enabled or electronic voting, resulting in process risks, are related to the one-off use of voting locations (e.g. polling stations) for the purpose of voting, and every extra part of hardware equipment used. Additionally, the type and quality of internet connection used, and the technical support provided, can determine the effectiveness of the e-electoral process provided to the electorate. Back-up procedures, such as the paper ballot version of the electoral process, need to be made available, at least until the new e-electoral process is well established.

6.2 Communication and co-ordination of multiple agents

The issue of multiple agents being involved in the delivery of such schemes is an organisational issue which proper human resource management could resolve.

There is a need to establish standard communication channels between all the agents involved in the delivery and management of the e-electoral process. A central administration centre should be set up so that any un-resolved problems are escalated to the e-voting management team and appropriate advice is provided to election office and polling station staff. The management team should include both experienced electoral administrators as well as e-voting suppliers' expert personnel. Internal communication channels between local authorities and commercial suppliers could be supported by an e-mail system with the use of common e-mail lists for responding to problems, therefore pro-actively informing on potential issues that other agents might face in a latter stage, thus supplementing direct personal communication. External communication between the electorate and the local authorities could be supported by a response center staffed by election office employees and backed up by commercial suppliers' specialized response centers.

The provision of alternative networks of communication could facilitate the management of problems and the necessity for feedback and problem escalation mechanisms between the agents involved in the delivery of the pilot. This could in some cases be

achieved by the informal knowledge process [6]. Informal communication can supplement other more official forms of coordination such as mutual adjustment, supervision, standardization of processes, outputs, skills and norms [18]. There is an evident need for a co-ordinating agent when many different agents are involved in the delivery of intersecting e-voting procedures. The overall observation experience left the authors with the notion that many of the problems faced, resulted from the fact that commercial competitors were obliged by the ODPM to work together without appointing a co-ordinating agent to manage all the different agents involved in the difficult process of organising a multiple channel election. Furthermore, co-operating commercial agents may be biased in favour of some e-voting channels, according to the e-voting technology they own and vend. This approach could result in additional co-ordination problems in delivering multiple channel e-voting.

6.3 Allocation of collaborative administrative responsibilities and the resulting dependencies

The e-electoral process, due to its democratic nature, cannot be fully outsourced to commercial suppliers. As such, the administration of e-elections needs to be jointly provided by the traditional electoral administrators (i.e. PA staff) and the contracted suppliers of technological elements. However, this is only a high-level distinction of the agents involved in the delivery of an e-election. As it has been indicated in previous sections of this chapter, commercial suppliers formed consortia of collaborating partners and were further supplemented by additional sub-contractors. Equally, PAs were involved with more of their internal departments. Nevertheless, the allocation of administrative activities between agents was conducted on the basis of a two-sided distinction of high-level responsibilities between PAs and the consortia of suppliers. Part of the research data that we analyzed was a document, provided by one of the commercial supplier interviewees, which described all the administrative activities required for the completion of the observed pilot scheme and allocated each activity as being the responsibility of either the PA or the commercial consortium involved. It was not made clear however which PA department in particular was responsible for the completion of the resulting administrative tasks, or which partner or sub-contractor of the consortium was related to each of the consortium's administrative activities in specific. As a result there was no clarity of agent roles and confusion was generated regarding each agent's obligations towards the remaining agents. There is an obvious need for detailed allocation of tasks and responsibilities when many different agents are involved in the delivery of intersecting e-voting processes.

The necessity for detailed allocation of tasks is even further extended by the fact that the completion of some agents' tasks depends on the adequate performance of other agents. The dependencies identified in the collaborative delivery of the e-electoral process were either task dependencies or resource dependencies [25], [26]. In task dependencies, an agent depends on some other agent for the performance of a task (e.g. the commercial suppliers depend on the PA for the completion of the candidate nomination stage). In resource dependencies, one agent depends on some other agent for the provision of a resource (e.g. PA depending on commercial suppliers for the provision of the necessary hardware). Dependencies, whether task or resource, could also be internal or external. External dependencies were developed between the consortium and the PA. If any member of the consortium depended on any PA department and vice versa, that would fall under the external dependencies category. The two examples provided previously are both external dependency examples. Internal dependencies were those developed either between the commercial partners who formed the consortia or between the different PA departments contributing to the administration of a pilot scheme. An example of internal dependency is the resource dependency developed between the main supplier and their sub-contractor who was responsible for the delivery of laptops for the 2003 PA1 pilot. Internal dependencies, developed between commercial suppliers, were more problematic than those developed between PA departments. Eventually however, the inadequacies deriving from the suppliers' internal dependencies were inherited by the external dependencies developed between PAs and the consortia of suppliers. A consortium as a whole would be unable to fulfil some of their obligations towards a PA as a result of the inadequacies deriving from their internal dependencies.

Problems in e-voting may result in relation to every intersection of administrative processes with the roles of human agents. As such, the detailed description of individual human agent roles and responsibilities can provide the required clarity to the administration of the e-electoral process, so that each human agent knows who is responsible for what. A similar approach would demonstrate to all the agents involved the necessity of their adequate and prompt performance. Systematic staff training in the administration of the new methods of voting is also required to support the operation of the e-electoral process.

The lessons learned from the deployment of e-voting in the UK can serve as a set of guidelines for the future design and deployment of e-voting schemes. From a generic point of view, loosing voters who would have voted if not prevented by administrative inadequacies in the e-electoral process could become a major political issue when affecting a large part of the electorate. This fact could in turn undermine the validity of the result of the e-electoral process as a whole, even if only one of the voting channels were problematic.

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