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**Information and Communications Technologies
in New Zealand:
Nine Case Studies
Case Study 2:
New Zealand Post Electoral Enrolment Centre**

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New Zealand Post Electoral Enrolment Centre

Overview

The Electoral Enrolment Centre (EEC) maintains databases of information to support the operation of elections in New Zealand. The databases contain details of all citizens eligible to vote in New Zealand current to the day before any election. The relational database has increased the accuracy of the electoral roll and the efficiency of updating details in a timely manner.

Introduction of Internet based applications and infrastructure supports a stable business model at EEC, which has remained unchanged through the automation of the data processing part of the business. It has enabled the potential for real-time updating of information and the ability to track changes. However automation has not occurred throughout the entire business. For example, data gathering using handheld devices for real-time updating and authenticating details is not feasible due to legislative constraints.

The open source platform, has reduced costs through the lack of licensing fees, reduced the risks of hold up by any major operating system provider. The infrastructure has enabled the Electoral Enrolment Centre to be well positioned for changes such as electronic voting or the addition of new applications in the future.

The Centre's website enables constituents to check and update their details on-line and print-off forms to sign and send to the Centre. This reduces compliance cost for the voter and administration cost for the Enrolment Centre.

To facilitate the introduction of technology, the organisation has maintained an innovative culture and a philosophy of people-based systems and processes. Interestingly the main drivers of the organisation have been achieved through a delicate mix of technology and people.



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The Organisation

The Electoral Enrolment Centre is a fully owned subsidiary of the state-owned postal operation New Zealand Post Limited. The sole operational function of the Centre is the maintenance of databases of information about citizens who are eligible to vote and participate in the New Zealand local and central government democratic processes, and production of the associated reports. It also maintains rolls for jury selection, health and scientific research, local government and political party candidates.

The Centre is accountable to the Chief Executive of New Zealand Post in his capacity as the Chief Registrar of Electors under the terms of the contract between the Minister of Justice and New Zealand Post for the provision of Electoral Roll services. Following an extremely unsatisfactory electoral registry performance in the 1978 general election, a Royal Commission of Inquiry recommended that the government contract out management of the Electoral Register to an agent. The Post Office, as it was known at the time, was selected as the preferred provider as it already had a state of the art technology platform and the business infrastructure to obtain ninety five percent of the required information. The Centre invested \$300,000 in 1980 to introduce a world leading computerised electoral management system. Following the break-up of the Post Office into separate banking, telecommunications and postal services in the 1980s, the Electoral Enrolment Centre was established as a fully owned subsidiary of the postal operation New Zealand Post.

The Centre's responsibilities are stipulated in statute via the Electoral Act 1993 and by the terms of the contract between the Government and New Zealand Post. The primary responsibilities include¹:

- Information for electors on enrolment;
- Enrolment of voters (opportunity and encouragement);
- Production/maintenance of electoral rolls and habitation indexes;
- Supply of electronic lists of electors & walk lists (residences with no enrolment) to parties and candidates;
- Hosting of the Elections website;
- Conduct of Maori Electoral Option;



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- Verifying, by sample, that signatures on CIR petitions are those of enrolled electors; and
- Supply of lists of qualified electors to Courts for jury rolls.

The Electoral Enrolment Centre is based in Wellington and has sixteen head-office staff and sixty-nine regional (field) staffⁱⁱ. Field staff are geographically located in each national parliamentary electorate. A Registrar of Electors manages each electorate office. The Registrars are responsible for compiling and maintaining the electoral rolls for their electorate. As well as maintaining the electoral rolls on a daily basis and conducting enrolment update campaigns prior to all major electoral events, the Registrars also work in their local communities to encourage eligible electors to enrol. This is to ensure the maximum number of eligible electors is enrolled to vote in Parliamentary, local council and district health board elections, by-elections, referenda and pollsⁱⁱⁱ.

The key performance measure of the contract between the Minister of Justice and New Zealand Post stipulates that the Centre will enrol at least 92 percent of the eligible New Zealand voting population at any point in time.

As a monopoly provider of a service, and as a division of a State-Owned Enterprise (SOE), the EEC faces neither direct competition from other providers for its product (beyond triennial reviews of its contract) nor direct scrutiny from a shareholder who receives personal financial gain from the Centre's activities. Hence, the Centre runs the risk of lapsing into the traditional state-owned monopoly problem of 'resting on its laurels', incurring greater costs than may be necessary to undertake the specified tasks, or under-investing or not investing in new technologies as soon as a participant in a competitive, private-sector equivalent might. In order to overcome these risks, as part of its agreement with parent New Zealand Post, the EEC has five key drivers against which its performance is measured and benchmarked:

- Improve enrolment;
- Reduce costs;
- Be compliant;
- Be innovative; and



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- Be professional.

The Electoral Enrolment Centre is funded by a budget from New Zealand Post, determined by the contract with the Minister of Justice. A minimal amount of income is derived from charges for customised lists produced for clients.

Business Model

The core business function of the Electoral Enrolment Centre is to provide an elector registry service. The central asset of the Centre is its database of registered electors. All of the Centre's activities are directed towards maintaining and increasing the accuracy of the database, and hence the value of the information asset. The value of reports that are extracted from the database is contingent upon the accuracy of the database – that is, how well the database, at any point in time, represents the actual eligible voting population. The accuracy of the database will be determined by how rapidly the registrars can detect changes in eligible voter details and capture them in the registry.

Information Capture

As with any registry process, the Electoral Enrolment Centre must add newly eligible (eg those who turn 18 or gain New Zealand citizenship) voters to the database, remove voters who become ineligible (eg those who die, emigrate, are imprisoned or become legally incapacitated), and update the records of eligible voters' details as these change. Whilst it is ultimately the responsibility of the voter to notify the Centre about changes to eligibility and details, relying upon voluntary compliance alone results in very poor accuracy of the register. Hence, the Centre most often relies upon secondary information to identify circumstances that are likely to result in changes to eligibility or recorded details, and pursue these 'leads' in order to maintain as accurate a record as possible. The primary method of individuals communicating information to the Registrar is on the standard enrolment form.

Marketing and maintaining relationships with the people who provide the data is considered a very important part of the registrars' jobs. It is only through promoting the role of the Centre, distributing forms and 'keeping an eye on the ground' that



registrars can identify information that will increase the accuracy of the system. This is especially true for identifying and enrolling voters. Physical presence of Registrars in electorates is seen as a very important part of the 'on the ground' information gathering process, and something that is not easily replicated by (for example) computerised systems. Active marketing through brochures, pamphlets and advertising to encourage citizens to enrol encompasses approximately 20 percent of registrars' time. Reply envelopes sent to citizens contain coupons that request names of people that they know who may need to enrol. This acts as a 'lead' generator for the registrars. The website is also actively promoted in advertising material.

Whilst new electors can be identified and encouraged to enrol through targeted face-to-face meetings (eg at schools, citizenship ceremonies etc where enrolment forms are distributed), distribution of brochures containing the form, media advertising, the website and other profiling exercises, and deceased voters identified by matching against details supplied by the Registrar of Births, Deaths and Marriages, by far the greatest volume of work undertaken by registrars relates to identifying and changing the records of already-registered voters when core details (eg name, address) change. Of particular importance in maintaining accuracy is change of address, as this may alter the electorate in which the voter is eligible to vote. The principal sources of change information are change of address notifications supplied by individuals to New Zealand Post, and notifications of marriage from the Registrar of Births, Deaths and Marriages (indicating likely change of name and/or pending change of address).

Maintenance of Information Integrity

Each individual in the EEC database is uniquely identified by a combination of full name, date of birth and residential address. In practice, access to the data is maintained through two primary keys – individual identification (name, date of birth), and residential addresses. Maintaining Register accuracy requires ensuring that each individual is in fact eligible (that is, the individual actually exists and the claim to meet eligibility can be verified) and is registered only once. Each addition must be checked for eligibility against the records of the Registrar of Births, Deaths and Marriages, and against EEC records to ensure that no record for that individual already exists (for example, in a different electorate under a different name). Maintaining the address



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data requires liaison with local authorities and other government departments to ensure information about valid residential addresses stays accurate.

Process Detail

By far the largest number of changes (95 percent) to the database is generated by New Zealand Post change of address notifications. Approximately 4 percent are spontaneously generated (eg from forms or the website) and 1 percent from Births, Deaths and Marriages notifications.

When the EEC receives notification of additions from any of its sources, the details must first be checked for accuracy. Whilst electronic checks speed up the time taken to verify details, human judgment is needed in many instances (for example, spelling variations, translations of names between languages, legitimacy of physical addresses) to ensure the integrity of the database. Manual verification of every change is considered an important part of the system. The computerised systems are considered tools to assist staff in making decisions about which data items to change. As Centre manager Murray Wicks states, "It's people who make decisions, not the computers".

Verified details are manually entered onto the database by the registrars onto fields on the computer screen that replicate the physical forms. It also requires manual approval of every change; meaning details cannot be automatically altered without verification. This standardised approach reduces the chances of error during input of data. The forms are then printed off and sent to the individuals for signature. Upon receipt, the forms are physically filed to ensure that in the worst possible cases of system failure, an absolutely accurate register can be constructed even though this would be time consuming. The requirements of the Electoral Act and the (to date) absence of a legally satisfactory electronic signature force the Centre to await confirmation with a physical signature on a form before any registration or change can be made 'live'.

The EEC web site enables partial enrolment on-line, but changes to the database can be made only when physical copies have been signed and filed at the Electoral Enrolment Centre. Individuals can also check and amend details online, providing



they can provide the full name, date of birth and some previous address details. Whilst this does not prevent all access by people other than the individual about whom the details are entered, it does limit the number of people who can amend a record. At present, a web amendment by a citizen will generate a mail-out of a pre-printed post-paid form containing the amended details for the individual to sign, limiting the opportunity for fraudulent data entering the system. Only when the signed form is received can the details be made 'live' on the database.

For routine changes identified by New Zealand Post change of address information, details entered onto the system result in the generation of a pre-populated form to be sent to the new address. For voters moving within an electorate, this can be posted immediately. When the change represents a move between electorates, as a citizen has to reside at an address for a month before they can register in that constituency, the system automatically sends the form after a month. It also generates a change alert and a "dear occupier" letter for the previous address. Both these addresses become active as the system waits to fill in details of new occupiers. New change address details are checked against the 'change alert' list to identify the arrival of new residents at the 'old' address. Where there is a match, the 'change alert' record is removed. When a registrar becomes aware of new residential addresses in the area, they are added to the address base and "dear occupier" letters sent.

If there is no response from the new address within a month of the notification being mailed, details of the address are moved into a 'walk list'. A walk list is a list, generated by the system, of addresses where there is no-one enrolled. These lists are provided to contractors who visit these addresses to obtain enrolments. If no response is received from any new residents at the 'old' address, the address can be followed up to ensure that it remains a valid residential address.

System Outputs

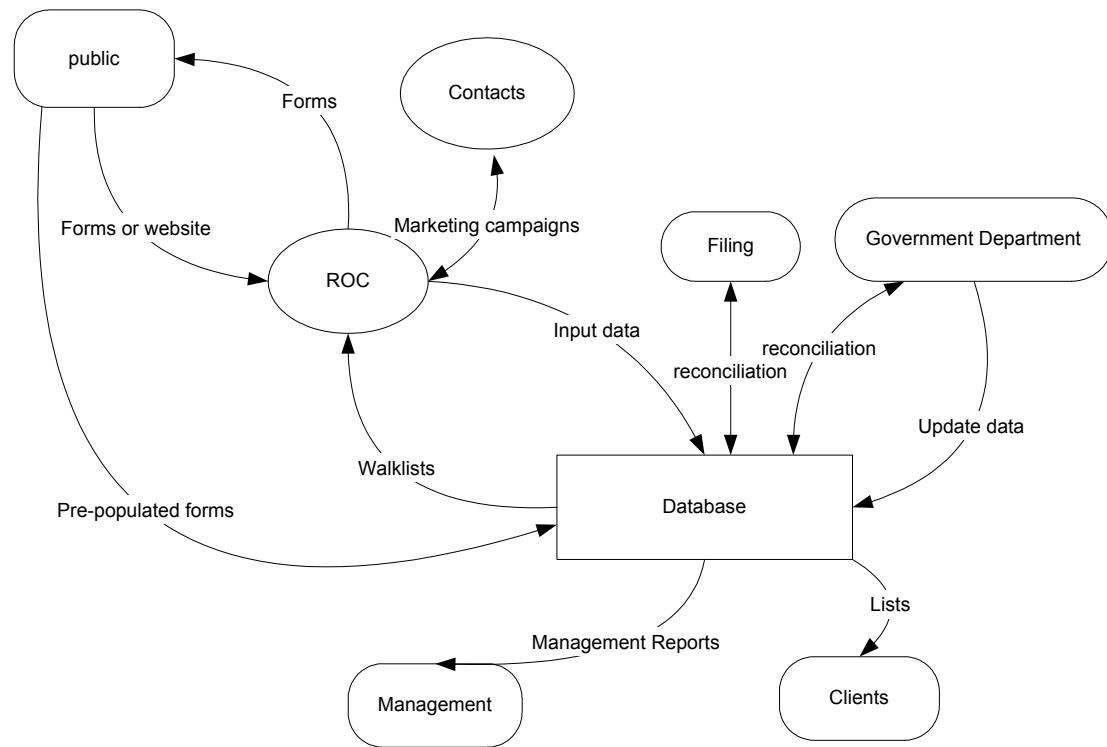
The principal outputs of the system provided to clients are lists of eligible voters, produced on request. Electoral Rolls and Habitation Indexes are produced in paper and electronic format as required for electoral purposes. Section 114 of the Electoral Act 1993 and Regulation 13 of the Electoral Regulations 1993 provide that computer



compiled lists of Parliamentary electors' details may be supplied to candidates or political parties under certain conditions. Charges are made for supply of these data^{iv}.

The business processes are represented in Figure 1.

Figure 1: Information Flow Process at the Electoral Enrolment Centre



Implementation of Information and Communication Technologies (ICTs)

The sheer size of the database necessitates the use of ICT technologies to manage the volume of data. Indeed, EEC manager Murray Wicks states that ICTs are core to the operation of the Centre, as reconstructing the rolls from paper records would be both incredibly time-consuming and significantly more error-prone. Nonetheless, the presence of paper records (ie the filed, signed registration forms) do serve a purpose as they enable independent verification of the accuracy of the data capture and processing activities of the Centre, and ensure that the Centre is not exposed to challenges of creating uncorrectable or unverifiable disenfranchisement as a result of system inaccuracies.



Innovation Focus

Given the budget-based funding of the EEC, and the performance measures expected by New Zealand Post that the Centre improve compliance, reduce costs, and be innovative, investment in continually improving and evolving ICTs has provided the most significant contribution to the organisation meeting its performance targets. New Zealand Post has historically had a culture of being an early investor in new technologies (the Post Office was selected as the first agent to undertake the Registry function because of its leadership in computer technology), and this has transferred into the EEC. Contestability of the contract with the Minister of Justice incentivises the EEC to continually search for ways to reduce costs and improve accuracy, leading to the Centre being one of the world leaders in the development of electoral registry systems. Rather than being slow to invest in ICTs, the EEC has been stimulated to seek technological solutions in order to continually improve its performance in line with the targets set by its parent. Consequently, ICT investment has been seen as the principal means of achieving cost reduction, whilst internal capability is the main driver of innovation. These two factors combine to provide improved enrolment data that ensures compliance to the legislative and contractual requirements that govern the Centre.

The specialised nature of electoral registry functions, the idiosyncrasies that characterise the electoral processes and electronic commerce and government regulations of different countries, and the vesting of the intellectual property rights to the systems in the governments that commission them, mean that 'off the shelf' systems that meet New Zealand requirements are not available. Hence, the applications utilising the EEC's ICTs have been developed internally. The Centre maintains its own technical development staff in-house. These staff are charged with identifying innovative ways in which technology can be used within the organisation's operation. In common with the trends in the ICT industry, turnover of most of these staff is frequent (average tenure is approximately three years). However, turnover at the ICT management level is not frequent (the Centre manager has been in the Centre twenty years and the ICT manager fifteen). Peter Kelly sees this as strength, as knowledge of processes is maintained in the organisation at the managerial level, whilst newcomers often contribute fresh technology ideas. Many new ICT staff are



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recruited through the Centre's graduate recruitment processes, or are semi-experienced staff looking for their second or third industry placement.

System History

Evidence of the Centre's innovation using technology is provided by its system history. Innovation has occurred in both the central computer database repositories, and in the technologies used to capture input data and provide outputs.

Following the initial Post office investments in the electoral management system (EMS) in 1980, the Centre shifted from SCS to Datacom as the preferred supplier in 1991. In 1997 EMS and ANGEL, a software application used for the entry of the electoral roll were introduced. *Elections.org.nz* website was launched in the same year. In 1998 personal computers were upgraded and in 1999 Registrars Of Electors (ROEs) were able to use a Windows based system. In 2000, an on-line enrolment and update facility was introduced onto the web site. Walk lists, a new mechanism for tracking electors generated through the database, were introduced in 2000. In 2001 continuous enrolment was introduced and ROE had access to external email for the first time. The Intranet was released in the same year. In 2003 Datacom was replaced by Catalyst and real time computer systems were introduced.

Prior to the current on-line system the Centre had Olivetti terminals to capture remote electoral information for central processing in batched operations. These were replaced by personal computers with supporting host systems before a move to Microsoft Windows based system. The system was enhanced with supporting database packages. However, updating information remained a batched process that had a lag time of twenty-four hours from the time of data entry. This triggered a need for an on-line real time system, which enabled increased accuracy, faster response times to clients and timely communication to electors. On the 15th September 2003 the current web-based system was launched.

The relational database uses an open source platform that enables customisation with various interfaces and enables the Centre to develop and maintain its own system without being constrained by vendor requirements. It reduces costs, as there are no license fees, and reduces the risk of the Centre being 'held up' by proprietary vendors



in relation to operating system maintenance and update. In Peter Kelly's words, "when an election is called, the database has to perform – [the Centre] can't afford to be held hostage by a vendor seeking to extract monopoly premiums". The cost of this decision is, however, the requirement to keep skilled open source developers on staff. This is not seen as a problem as the Centre must maintain its own systems development staff for applications in any case.

The new system also has the ability to support electronic voting if this is required and has capacity to add new applications. This new infrastructure has been deliberately normalised and maintained as a general-purpose technology to enable interfaces with other infrastructure. Maintenance of voter data is a significant security issue, but Peter and Murray acknowledge that these have been accommodated in the design of the system. For example, on the website, name, date of birth and house number prompts are required. There is no prompt for street name, which acts as a security check.

The implementation of the web-based relational database has streamlined the process for providing more accurate and timely data to clients. It enables staff to view historical changes against names and addresses in various constituencies and hence track changes.

The system was designed to support the business rather than be the core of the business. There is recognition that "a computer cannot decide if two people are the same" and that there is some degree of judgment required by field staff. The front end of the system mimics the format of the physical forms that are used by the business. A stable business model enables technology to be used as a support mechanism.

Restructuring to Accommodate ICT

Human Capital

Typical of many ICT projects, the ICT investments made by the Centre have resulted in a change in both the number of staff and the types of staff employed.



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The most obvious complementary investment that the organisation has made with the introduction of technology is the increase in information technology staff numbers. Over a period of ten years IT staff numbers have increased from three to six, which excludes maintenance of the operating system, which is outsourced. Comparatively, over the same period, corporate staff numbers have increased from fourteen to sixteen whilst field staff have decreased from ninety-seven to sixty-nine. Thus, ICT staff has risen from 3 percent to 7 percent of the Centre's workforce at a time when the total workforce has fallen by a quarter. The relative cost of the physical operation of the ICTs (that is, computers, software, operating systems) as a percentage of total costs has averaged around 4 percent over the period. This reflects the fact that computer capability has been increasing and costs dropping. However, the share of salaries expended on ICT staff relative to field staff reflects the growing importance of ICT staff to the success of the Centre. Innovative staff, both ICT and field staff, are rewarded for their contributions. Murray Wicks acknowledges that his staff are "good people with good ideas".

The EEC places a very high priority on the quality of its ICT staff. Whilst the typical new entrant to the ICT team is a new or recent graduate, and training in the firm's systems and culture is necessary, Murray Wicks says that the induction costs are small compared to the innovation value that the new staff bring in the form of new ideas and new learning. Peter Kelly confirms that the emphasis placed upon team culture, a learning-based and innovative environment and the balance of experienced and new staff in the ICT group ensures that appropriate skills, information and ideas are transferred between team members. The Centre has encountered no difficulties in recruiting staff with the requisite skills.

Training and Change Management

Whilst ICT staff have the responsibility for operation of computers and the development of systems, the organisational culture of the systems supporting the field staff in their work guides the valuation of the Centre's human capital. The operation of the ICTs, once specified, is routine. Human skills, particularly maintaining relationships via which information can be distilled and judgment, are the most important resources. These are the areas that contribute towards information accuracy. This is the responsibility of the field staff, who are required to be adaptable.



The Electoral Enrolment Centre uses an 80/20 mix of administration and marketing competencies in fieldwork recruitment. The number of field staff employed by the Centre is dictated by physical presence required in each electorate rather than any aspects of technology. The Electoral Act requires ease of access for voters, and as stated above, this requires maintaining remote electorate-based offices. As the ICTs support the work of field workers, these staff must be trained in using the systems. This is achieved through a phased approach to training and involving staff in the development stage of new applications.

Prior to the introduction of the relational database, staff were required to attend a two-day workshop followed by on the job training a week prior to the launch date. The database was operational from the planned date although there were bugs in the program that were rectified as identified. The problems were prioritised and managed in a structured manner. The effective downtime was a period of two weeks whilst staff were trained and became proficient with the new system.

Transition was facilitated by newsletters that were sent to staff who were not part of the development team and the availability of a duplicate system on the intranet that enabled staff to familiarise themselves with the proposed format of the new database.

Buy-in for the new on-line based system was achieved through general recognition by staff that improvements in the process were required. Field staff were encouraged to generate solutions. An environment where staff are encouraged to contribute to all levels of business has enabled a culture where innovation and efficiency are valued.

Field staff have been the group most affected by the technology changes in the organisation. The size of this group has reduced thirty percent over the past ten years, as automated systems have replaced manual ones. However, the staff are more skilled and are maintaining a more accurate register than ever before. Despite the reduction in staff numbers, better performance is being achieved, indicating a significant improvement in the efficiency of utilisation of human capital as a result of the new ICT systems.



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Benefits of the Technology

In addition to the performance measures identified above, in terms of reduction in staff counts, ICTs have enabled the EEC to record a reduction in the real costs per enrolment (a combination of hardware and personnel costs) of twenty percent in the last twenty years. As ICT operation costs have remained at a constant 4 percent of total costs over the past ten years, it is indisputable that the Centre's investment in ICTs has resulted in a significant productivity improvement. 30 percent fewer staff numbers, for significantly reduced costs per enrolment, are processing more enrolments.

ICTs have also enabled the Centre to improve the accuracy of data held. The EEC recorded 98.2 percent accuracy (verified by an independent audit, comparing paper record details with system ones) at the last parliamentary elections. It is contracted to enrol at least 92 percent of the population and achieved a 94.1 percent enrolment level at the last parliamentary elections (also verified by independent audit using sampling techniques). These make it the sixth most accurate electoral enrolment register in the world, led only by Scandinavian countries.

From an operational perspective, Murray Wicks also assesses the relative performance of the system by the amount of rework that is required – that is, the number of entries on the database that have to be altered because of inaccurate input. As rework is staff-intensive, any reduction in rework reduces costs as well as increasing accuracy. Hence reducing rework is sought from system improvements. The latest system has already reduced the amount of rework required.

It is noted that web-based data capture will reduce data capture costs and may also reduce inaccuracies and rework as it is the citizen who inputs details rather than the EEC staff. However, use of the web is as yet too small to quantify any benefits from this entry method.

The system has also delivered a number of significant benefits, which are difficult to measure, but provide real benefit to the Centre, its clients, and citizens. More accurate data and faster turnaround in report creation and data exchange are now



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possible. In 1980, additions to the roll closed one calendar month prior to the election. In 2002, additions were received up until twenty-four hours prior to the Election Day. The real time capability of the recently installed system theoretically enables details to be added or amended right up to the Election Day. The web-based communication between head office and the field officers (email, intranet etc) has vastly improved internal communications.

Limitations of the System

Murray and Peter acknowledge that the design of the system has been compromised by legislative requirements. Whilst the system offers the capability for electronic capture of data from input systems, real time updates and the elimination of paper stores of the signed registration forms, in practice the requirement for physical signature verification and storage means that in the meantime the two-stage pre-populated form process must continue. Although the Centre is exempt from the proposed Electronic Transactions Act, and the E-Government authentication bill will allow the use of electronic signatures making it possible to have fully electronic capture and verification of enrolment data (with the attendant reductions in cost of paper processing and mailing), the provisions of the Privacy Act imposes limitations that prevent the EEC from reducing costs and further increasing register accuracy. The Privacy Act, which controls the use of personal information, requires that information transferred across government agencies cannot be updated using real-time database techniques. Thus, although the 'front office' activities can be quickly, cheaply and effectively maintained using state of the art technologies, the quality of the information on the databases is compromised by the forced legislative lag. Legislation is thus trailing the capabilities of technology, making it difficult for the Centre to extract the full range of innovative potential that ICTs offer.

Process Requirements

The principal limitations faced by the EEC management relate primarily to policy, legislation and process 'brakes' placed upon the speed with which they can implement changes. Whilst delays in the implementation of the Electronic Transactions Act and the E-Government processes and the provisions of the Privacy Act have already been identified as problematical, Murray Wicks and Peter Kelly also believe that a lack of



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understanding amongst policy-makers of the ways in which the Centre uses information has led to legislative process requirements that are unnecessarily increasing the costs of operating the Registry and reducing its accuracy below what they believe their systems can achieve.

For example, paperless registration is feasible using web- and email-based communication. Whereas the Singaporean government has mandated a move to a compulsory electronic enrolment system as part of the state's e-government initiative, in New Zealand multiple systems must be maintained to ensure that all citizens can attend to registration processes in ways that they choose. This imposes process duplication costs on the EEC (eg forms and web page). Until changes are made to the Electoral Act, the Centre is also required to maintain the paper forms as the principal item of record, even though an electronic audit trail could serve the same purpose. This criterion consequently imposes a significant printing, postage (twice for each change) and paper storage and retrieval cost upon the Centre, and increases the time taken to update the master records, at an accuracy cost to clients using output data, which could be eliminated for those citizens who were happy to use a web-based system. As it stands, there is very little effective cost reduction from the web-based system, as each entry results in the production of a form, the processing of which contributes the greatest cost. This same criterion even limits the ability for the Centre to use electronic replication of forms (eg scan, microfiche). Although paper storage is cheap, retrieval of the data is costly. Electronic means of storage would make a significant difference to the costs of retrieval of forms for verification and audit purposes.

Likewise, although the Electoral Enrolment Centre has access to other government databases for data matching, the Privacy Act limits the use of this function to one-off events that use update dates to match the most recent data. Technology has allowed a proactive data gathering function through identifying active addresses on the current database system but it does not allow dynamic updates through other agencies.

Unless these issues are addressed, no matter how willing the citizenry is to adopt new ways of updating electoral data, inefficiencies remain.



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Analysis of the Electoral Enrolment Centre's ICT Implementations

The Electoral Enrolment Centre's systems and processes represent what is essentially a very straightforward registry system. The electronic databases required to store and access the data are very straightforward. Core ICT system changes have been effected more in order to keep the database software and hardware technology up with current best practice at each investment point rather than necessarily implementing changes merely for the sake of capturing the benefits offered by a new technology. This is typical of computerisation in a mature and stable business model, where once the core system is established, system upgrades become iterative improvements on a well-established model.

System stability has been reinforced by the relative stability of the legislative environment in which the Registry operates. Indeed, what the case study illustrates is that technology has moved the capability of the Registry beyond the provisions of the legislation, and that the rigidity of the legislation is now imposing costs and inefficiencies on the system despite what ICTs can offer. Whereas a private sector Centre can make a strategic decision to refocus systems to capture the benefits offered by decreasing technology costs and increasing capabilities, the legislative constraints limit the ability of EEC management to make process changes. Even though innovations can be identified, management is subject to the need to communicate these potential innovations into policy action, incurring the costs of advocacy and limitations in the speed of political processes in implementing changes. The ultimate losers are taxpayers, who do not enjoy the cost savings as early as they might, and system users who use data that is less accurate than it might otherwise have been.

Nonetheless, in their latest system redevelopment, EEC management has gone beyond the impositions of legislation to design a system that is capable of utilising these features, in anticipation of future changes. And even though the core systems have not changed, management has continually sought to utilise new processes and technologies in the one area where they can apply some strategic investment – at the point of data identification and capture. Thus, innovation has been applied both to the human systems involved in promoting improved registration rates and data integrity



(eg investment in human capital to market the register and maintain relationships), and electronic systems to support these activities (eg website development, electronic data matching).

The consequence, even if not deliberately planned, is the concurrent investment in human capital and development of human systems alongside the electronic ones that Brynjolfsson and Hitt identify yields the greatest potential for productivity improvements. However, the commitment present in the EEC philosophy of the organisational team, and the role of ICTs as supports to the organisational team, rather than the core of the organisation's function, have undoubtedly contributed to the successes of the system identified in the quantified and unquantifiable productivity improvements and system benefits catalogued above.

Lessons for other Registry Systems

As a registry system is an information product, and one well suited to substitution by computerised database systems, there are many standardised database packages available to process data. However, the computer systems and database software are only tools to assist data management. These systems do not substitute for effective information identification and data capture processes. Efficient manipulation of information once captured does not of itself compensate for the quality of data contained in the system. In any registry system, there will always be a trade-off between costs of operating the system and the quality of the data. The EEC system shows that the processes associated with the capture and verification of the data may be most significant contributors of cost, and not necessarily conducive to substitution by electronic processes. And even if they are conducive to substitution, regulations (either legislation or the rules of the organisation for whom the Registry is maintained) may compromise the ability to alter processes to take advantage of the benefits technology offers.

However, once these factors have been accounted for, the EEC case shows that investment in the complementary systems for identification and capture of the data will be the difference in a 'value for budget' system and one which does not deliver as much with technology and its budget as possible. The EEC system is currently being



audited on a 'value for money' basis against registry systems worldwide. Whilst the results are not yet available, the signs are positive that the EEC has achieved internationally high data quality rankings whilst reducing the cost per enrolment. This tends to indicate that the system enhancements are trending in a positive direction. It is the authors' belief, guided by the findings of Brynjolfsson and Hitt, that the balance of attention between human systems development and computer systems development is a factor in this performance, and one that offers an insight for other developers of registry systems.

Lessons for Policy

The EEC case study raises some questions about the extent of commitment of the New Zealand government to timely implementation of legislation enabling firstly electronic transactions (especially electronic signatures), and secondly the continued requirement for paper data storage of details for the purposes of the Electoral Act. Likewise, the necessity for a twenty-four hour delay in updating between databases servicing crown activities in an environment of real-time online databases needs to be questioned. Delays in addressing these issues are forcing costs to be incurred which technology is capable of reducing. The government itself is incurring the costs in this instance, as the cost of the contract between the Ministry of Justice and New Zealand Post is higher as a consequence. The EEC is but one system affected by these requirements. Without doubt there are many other systems with electronic components that are similarly disadvantaged. More attention given to the implementation of these legislative reforms would benefit such systems.

The case also highlights the need for Government to address its role as both a regulator and a customer or owner of such services. Fragmentation of the systems amongst many departments, and contracts that move the operation of such systems into the non-government sector mask the size of the problem. Whilst the inefficiencies of each individual system may be small, collectively the potential benefits are much larger. And whereas the private sector can make strategic adjustments and associated investments quickly, government decisions often lag. As many of the systems operated by Government, like the EEC, do not face competition and hence commercial pressures to implement new technologies quickly in order to accumulate



the benefits, Government must provide other mechanisms to induce their timely introduction. New Zealand Post has utilised a variety of cost reduction and performance improvement incentives based upon budgets and improving accuracy to encourage EEC to be innovative in its use of technology. By the benchmarks available (based upon cost reduction, productivity improvement and ‘value for money’, trading off quality against cost), these appear to be quite successful. The potential exists for government to use these same types of incentives and performance benchmarking techniques as both the purchaser of services from third parties, and internally within government departments, to induce similar efficiency gains and performance improvements based upon use of new technology.

Welfare Effects

The benefits of improvements to registry systems, and government-based registry systems in particular, arising from the use of ICTs, do not necessarily appear in national statistics. Improved accuracy (quality) of reports is not well captured in national accounts. In many cases the outputs are either not traded (eg the registry must produce reports as part of the total contract remuneration) or the prices paid are set by statutory processes or the costs of physically producing outputs, leaving no room for users of the outputs to place different values on reports of differing accuracy. Even though EEC is recording very significant improvements in the accuracy of the register, the macro-economic statistics do not capture any change in the price of the outputs. This contrasts with the services of a register for which the outputs are paid – for example, the Domain Name register that maintains the list matching firms’ internet domain names and the physical Internet Protocol (IP) addresses of the computers on which the web sites are hosted.

This factor masks a larger problem in recording the productivity improvements engendered from government investment in ICTs. Whilst government investment in ICT capital is recorded in the New Zealand national stock, the outputs it is used to produce are far more likely to form part of the non-traded sector of the economy. If the products which the ICTs are used to produce are not traded, then the values of inputs used to create the products (including the ICT investments) are counted as costs, but the changing output values from improved product quality are not recorded as



increases in benefits in the national GDP. As a significant component of the government's activity involves the collection, storage, processing and transmission of information underpinned by use of ICTs, a significant proportion of the output 'value' created by the government's share of ICT investment goes uncaptured in GDP figures.

Whilst the 'unmeasured benefit' problem is not confined solely to the government sector (it is a factor in the service sector generally – Bosworth and Triplett, 1998), the absence of any prices to signal the value customers place upon the product and product quality changes arising from the use of ICTs in the government sector is especially problematic. The larger the government's share of the economy, and especially the larger the government's share of the ICT-intensive sectors of the economy for which product prices are not struck (for example, health and education), then the larger the extent of the 'unmeasured benefit' problem is. As government's share of GDP in New Zealand is approaching 40%, the potential for this effect would appear to be quite large. This does not mean that the benefits from ICTs are not being *accrued* – they are. Rather, it identifies that significant benefits may be not well *captured* in New Zealand accounts due to the nature of the New Zealand methods of accounting for government-provided services, whereas these factors may be partially or more completely reflected in the GDP of comparator countries where different charging regimes apply. This makes direct comparisons between countries at the gross macroeconomic level problematic.

ⁱ <http://www.elections.org.nz/elections/conts/responsibilities.html>

ⁱⁱ Staff numbers vary during election times.

ⁱⁱⁱ <http://www.elections.org.nz/elections/conts/index.html#1>

^{iv} Guide to Electoral Enrolment and the Availability of Lists of Parliamentary Electors' Details for Candidates or Political Parties p 11.

Available on http://www.aceproject.org/main/samples/vr/vry_nze1.pdf



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