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A Proposed Smart-Card Solution for Australian Health Services: The Problems Encountered

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EXECUTIVE SUMMARY

This case study describes the experience of a state government health department in evaluating the use of smart card technology to redesign health benefits programs for the disabled in Australia. The social and political context of the system is explained in detail, and the potential benefits and risks accruing to the government, health care intermediaries and the community are examined.

Keywords: health IS; healthcare reengineering; inter-organizational networks; socio-technical approach

INTRODUCTION

In 1998, the Health and Social Services Department of an Australian State government began an investigation into the use of smart card technology in the provision of certain social services. Their goal was to develop an e-health solution to the mentally and physically disabled; one that would increase efficiency and facilitate better decision making and strategic planning within the department, while simultaneously empowering the disabled with greater flexibility in choice of service and provider. The expectation was that smart card technology could be used as the basis of a redesigned system of service provision that would improve efficiency, accuracy and financial accountability.

The potential impacts of changes to the structure of this system were wide ranging: the department contracted for the provision of services to a network of agencies, who typically subcontracted the work out to professional carers. Thousands of jobs and the viability of numerous small health care agencies would be affected, as well as the quality of life for thousands of disabled clients throughout the state. There were a number of risks inherent in this venture: the newness of the technology involved (used for this purpose); the number of stakeholders involved in the system and the complexity of

their inter-dependence; a high degree of technical and project definition uncertainty; and the high political sensitivity of the system in question.

An independent analysis of the proposed changes was concluded in 1999. The investigators examined the impact the suggested solution would have across the various stakeholder organizations. While the technological challenges in developing the system were relatively straightforward, there were significant issues identified associated with its fiscal viability, political acceptability, and social impact on the community. This case study presents these issues and the decisions faced by the department, ones common to the development of many e-health and e-government initiatives.

ORGANIZATIONAL/PROJECT BACKGROUND

The Stakeholders

The state government department involved provides a variety of health and social services. Included in its responsibilities is the assessment of eligibility of care entitlement for the disabled. In terms of structure, in 1998/9 the department included a centrally located head office and a number of regional offices. The department was, as might be expected, a traditional government bureaucracy in terms of structure and management. The department was responsible to the Minister for State Social Services and accountable through her for appropriate support to people needing disability care. Health policy was set at the ministry level, with control within the department being quite centralized.

At the time of the project, government policy encouraged the use of new technology to improve efficiency and reduce government waste.

The department provided its services through a network of intermediaries, in particular through independent (non-government) agencies that were contracted to provide care to the recipients. This network of agencies varied quite significantly in terms of their size, organization and technological infrastructure. Some were professionally organized and managed charities such as branches of the Red Cross, while others were very small organizations with few employees and minimal management overhead. Geographically, the agencies were spread across the whole state, although they were more concentrated in denser population centers. More remote geographic areas tended to have small agencies, and fewer of them. Disabled clients in regional areas therefore had limited choice in terms of service provider.

Roles of the Stakeholders

The Department:

- Evaluated individuals' eligibility to receive services;
- Contracted with provider agencies (often charities) to supply services to those people with disabilities who had been evaluated and allocated a benefit; and
- Maintained a waiting list of eligible individuals and allocated them to a suitable place as places became available within the system.

The agencies were paid in advance for services to be provided and the accounts were subsequently reconciled on the receipt of delivery data.

Carers were employed by the agencies (generally on an hourly basis) to provide the services either in a care centre or in the homes of the recipients.

The clients of the department's services were people with a range of disabilities from motor-muscular impairment to severe intellectual disability; many had multiple disabilities.

Welfare and advocacy groups were also involved, that provided support and advice to the clients, and represented them in political forums.

Project Champion

The project was first initiated within the department by Peter, a mid-level manager who saw the potential of bringing e-commerce technologies into the health sector in order to improve reporting and possibly gain cost efficiencies, and also to improve client choice of care. Peter was the driving force in getting the project off the ground, and championed the investigation of the smart-card based solution within the department.

SETTING THE STAGE

Peter sold the idea to others higher up within the department, and they backed the project, which ultimately required (and received) permanent secretary-level approval. Peter was successful in gaining wide support for the project because the department had strong incentives to pursue it: the existing reporting system was outdated, and much of the data being collected were either not what was required, or in an unusable format. Without good data, the department could not be sure of how much waste, if any, was present in service delivery, nor could it plan effectively. Politically, the project fit government health policy, in terms of use of new technology to improve government services, and improved quality of choice for the disabled was clearly politically advantageous. Economically, the department faced constant pressure in terms of budget, so the potential to reduce the cost of service provision, or to increase the quality of services that could be delivered for the same cost, was highly desirable.

The department mandated of the agencies that data be reported in particular formats (the format often varied between different agencies depending on how long they had worked with the department), and the legacy data format they required often did not match the structure of the contracts. A reporting tool designed to help agencies report on their contract provision (an old DOS based program) had been developed and distributed, but it was of limited use to most agencies. Information gathered from the various agencies could not be effectively aggregated, so summary reports were created manually. Management at higher levels could not "drill down" to more detailed information when they needed it, so regional departments had to manually compile reports to address specific questions or queries when requested.

The existing system had no automated paper trail, and the recording of services happened at the point of service by the agency or carer. A new automated (real time)

system based around a smart device would allow the department to accurately keep track of the client's use of or participation in a service, as well as improve choice for the client, who could easily use their entitlement at whichever agency they preferred. Peter was enthusiastic that a new system would aid not only the department, but ultimately the agencies as well.

Technology Adoption

The department had poor data to work with, but the technological infrastructure was of high quality, and could easily handle electronic documents and standardized reports had they been available. Every employee had a PC, for instance, and the department had the resources of a full-service IT department. Smart-card technology was not in use at the time anywhere within the department, but Peter was able to commit the department to the (expected minor to medium) technology learning curve required.

Peter was not aware at the time that the agencies, in contrast, had very low levels of technology adoption. Most did not have a PC, or at best a very old (Pentium MMX class) machine. Familiarity with database technology was very low. Familiarity with spreadsheets was more common, but most agencies did not have the resources to upgrade their equipment, or the time to train workers in a new system.

Client familiarity and comfort with technology was even lower than that of the agencies. Often carers, or family members, managed financial responsibility for clients, so they had no exposure to electronic financial transactions, and many were not able to use basic technologies such as credit cards or VCRs because of physical difficulties. More surprisingly, given the overall high level of technology uptake in Australia, the carers also had low levels of technology use. Many carers still used passbooks at the bank, rather than ATM cards, and had no experience with PCs.

An additional difficulty was that many agencies, carers and clients were located in regional geographic areas, where the telecommunications infrastructure was variable. Some broadband was available, but in other areas the POTS lines would scarcely support 56k modem access. Reliable transfer of large data files was problematic.

CASE DESCRIPTION

Existing Service Provision System

The existing administrative practices involved paper-based capture of data at the point of delivery by the agencies, with electronic summaries of services provided to the department on a six-month basis. Carers in the home-care program filled in timesheets daily, and agencies kept records of attendance at scheduled activities. In theory the necessary data were delivered, but this system was acknowledged to be laborious and inaccurate with considerable problems of interoperability between agency systems and a variety of systems used by department branches. Peter was frustrated that the system was not easy to use, and often the data that were submitted did not conform to the required format and were thus unable to be read at all; data from the various providers could not be amalgamated for analysis and storage.

The implications of these problems were serious to the department: they could not be sure (and more importantly could not prove if asked) that services were being provided according to the contracts issued to the agencies, that the clients were receiving the services recorded. There was concern by members of the department that they received incomplete and inaccurate data from the agencies on service provision and that they might be paying for services that had not, in fact, been delivered. In a system where there was pressure on funding (and waiting lists for services), any such inefficiency would have a negative effect on the delivery of care. In line with government policy and legislation, the department wished to move to quality service provision centered on the client, and to empower them to find service from the providers that best met their needs. Thus, rather than being obliged to access their care services from a designated provider agency, the goal was that clients would be able to choose both services and service providers to suit their needs, a situation that would require more effective management of knowledge both about a client's needs and entitlements but also about a complex and changing array of services used. Peter saw the smart-card or a smart-device as an ideal mechanism which would enable a kind of electronic voucher system, where the device containing a client's profile and entitlements (and possibly their medical details) would allow a client to "purchase" services from their preferred carer or agency as they wished.

Programs Involved

After securing approval, Peter decided to initiate the project by beginning with a feasibility study in two trial areas: the provision of in-home care for the more severely disabled, and center-based care and programs for clients able to travel to such centers.

Peter made this decision because the care system was extensive, and the degree of potential change and impact on stakeholders was significant. These two programs served 5,500 clients through 300 outlets. The two programs were "Day and Respite Care" (DARC), and "Home Based Support" (HBS). Despite their relatively small size these programs were not insignificant in terms of budget: each HBS place cost \$30,000 AUD per year to support.

DARC provided a program of activities, training and a safe environment for clients during the day. This was usually in a center but activities were often conducted elsewhere. Clients commonly attended programs with the same organization for years on end. Most DARC users were intellectually disabled and many had multiple disabilities and behavioral problems. Contracts between the department and a DARC agency were not written in respect of individual clients. Instead, blanket contracts were written to provide care places for a specified number of people for a number of months. A client was listed as a recipient of care by a particular agency, often one that specialized in his or her type of disability. If the client left the agency for any reason, s/he would go back on the waiting list if s/he decided to return. This was a major barrier preventing clients from "shopping around" or changing agencies and the department was concerned that clients should have choice and flexibility in their service providers.

HBS was typically accessed by people with mobility problems (such as paraplegia or muscular dystrophy). Many HBS clients had no intellectual or other disabilities al-

though all were seriously and irreversibly disabled. Care was provided for a designated time during the day (such as help with bathing and dressing). HBS care could also be provided outside the home such as with help with shopping. Clients could choose which agency supplied their care. Some did “shop around” but in many areas there were few agencies and thus, not much effective choice.

Peter chose a multi-disciplinary team of researchers from several Australian universities to conduct an investigation into the feasibility and merits of a smart-card based system that would address the goals and concerns of the department. The team included both systems analysts and sociologists, as well as experts in e-commerce systems and IT planning.

Tracking Service Provision

Given the funding pressures faced by the department, any efficiencies that could be gained would positively impact the delivery of care. Beyond merely correcting deficiencies in the reporting process however, Peter saw the new system as an opportunity to redesign the way services were delivered to the disabled. Rather than being obliged to access their care services from a designated provider agency, clients would be empowered to choose both services and service providers to suit their needs. This situation would require more effective management of knowledge of a client’s needs, however, and of the array of services provided.

The department was therefore seeking from the project a better mechanism to capture the provision of services. Peter envisioned a centrally accessible information system that would supply client data to the various regional offices of the department (some clients — mainly those living close to regional boundaries — accessed services through more than one regional office) and that would support their planning, performance monitoring, administration and management of contracts with the agencies. This information system would also need to be affordable, easy to use and reliable. More accurate and timely data on service provision would, Peter hoped, enable better allocation of resources, cost savings, and greater accountability from agencies.

It became apparent as the investigation proceeded that the agencies had quite different concerns. The funding they received from the department was often barely sufficient to cover the demands for their services, so they had little budgetary margin. The agencies experienced considerable difficulties complying with the department’s reporting requirements, and several complained about errors and malfunctions in the lodging of reports because of the department’s format. The lag time between data reporting and reconciliation of accounts was also problematic for them in terms of planning. The agencies reported few difficulties in maintaining data on service provision but many difficulties in reporting the data to the bureau.

The response of the agencies’ management to the proposal for an electronic data collection system was cool, and in some cases strongly opposed. They objected to the mismatch between such a highly specified system and the way it would conceptualize service delivery and the actual context in which service was delivered. In one DARC agency this problem was vividly described¹ by a long-standing member of its staff.

Although a service is defined as 'attendance', this may not reflect the real costs of providing that service, especially if it is disrupted and extra work or financial outlay is required to deal with the disruption. For example, many of our clients' disabilities mean that they have behavioural problems and can become violent. So, say we're getting a group ready to get onto a bus for an outing. One person has a behavioural incident. He hits another client and breaks a bus window. We have to send him home (he obviously can't continue on the excursion in that condition). We have to get the person he hit to a doctor which requires getting an extra staff member called in. We also have to get the window fixed. It's not out of the question that this incident may trigger other behaviours among the others who are waiting, some of whom may have to be sent home. In the scenario you're painting [of the single data entry for a service] we're trying, in the middle of this chaos, to manage swiping everyone's smart cards. The Centre has, maybe, three cancellations plus several extra costs. How does that help us deliver service or our clients to get better service?

This raised the question of what data to collect in an electronically based system. The service categories were not well categorized and did not relate closely to the actual activities that were performed at the DARC centers. Capturing the knowledge about attendance at DARC facilities on a daily basis was seen as relatively trivial since clients enrolled for sessions several weeks long on either a full-time or part-time basis. There were rules about attendance levels and if a client was absent for more than a few sessions, they risked forfeiting their place, which would then be allocated to another person on the waiting list. These bureau rules, designed to keep the system operating at or near capacity, presented some difficulties for the DARC agencies. A client might decide to discontinue attendance for a time, either unaware of the longer-term consequences, or because their decisions were shaped by emotional or non-rational factors (not unlike the population in general but often exacerbated by intellectual disability). Several agency staff reported cases similar to the following:

We had a young intellectually-disabled man who was quite happy at the Centre. But his father wasn't too happy about that and this got worse as the kid got older. I don't know what the father's problems might have been but he absolutely insisted that his son leave the Centre and 'grow up'. We'd known the son for years and we knew it wouldn't work for long — he required just too much care and he couldn't become what his father hoped. We told his father that he'd need a place again soon and that taking him out would put him back on the waiting list and all. But the father could not be persuaded. What could we do? Well, we didn't notify a vacancy and in the meantime we were able to include a person travelling from interstate — we identified them through contacts with colleagues. Of course, within a few months the young man did return, as we knew he had to, but he would have forfeited his place had we strictly adhered to the rules.

The financial planning implications of these issues for the agencies were serious. The professional staff in the agencies had to manage these absences knowing that the

client would need and want to return later but not within the time stipulated by bureau regulations. Conversely, clients often arrived at the DARC on days they were not scheduled to attend, because they were confused about the day or simply wanted to be there. Because of their dependency, agency staff rarely turned them away but the agency incurred some additional costs in providing for these unanticipated attendees. DARC agencies had limited control over the number of clients they provided care for and limited flexibility in adjusting their outlays for supplies and staff (who had to be engaged ahead of time and for a specified period). Agency managers juggled these contingencies in order to satisfy the care needs of their clients, the demanding budgetary constraints and the employment needs of the staff they relied on. The solution proposed by the department would potentially result in uneven and unpredictable demand, as clients moved more freely between service providers. Carers could not be hired on very short notice. This would leave the agencies with unrecoverable costs, and they already operated on thin margins. Employees within the agencies commonly stated, in fact, that they believed the proposed changes were really about decreasing department funding to the agencies even further, rather than improving reporting or increasing choice of the clients.

Peter discovered as the investigation proceeded that he had not realized the degree of impact the proposed system would have on the agencies. The department wanted a system that would collect data on a service at its point and time of delivery, accurately recording exactly what was provided and to whom. The agency wanted a system that would enable them to report accurately on the services they delivered, but the level of detail and accuracy of the system proposed exposed the difficulties in the system they were forced to cope with, while removing their ability to work around these problems. Both had the same objective: ensuring quality care for their clients, but their views on what was necessary to achieve this conflicted completely.

Trust & Motivation

The HBS program had fewer problems with clients' behavior. Its clients usually could competently conduct their own care management. Many planned ahead and saved some of their service allocation for times when they anticipated greater need. The HBS agencies typically provided them with monthly accounts. On the face of it, the HBS program seemed well suited to electronic data capture and management. The direct care providers and HBS clients were vociferous in their opposition to this change also, however, but for a different set of reasons. They both saw such a system as an undesirable attempt to monitor the care providers more closely, by getting them to "clock in".

In the HBS program (as with DARC) there was evidence of considerable unofficial flexibility to meet the clients' needs. Direct care providers reported that they would provide additional, uncharged service to clients when circumstances required this. Agency managers frowned on this practice and departmental staff seemed largely unaware of it, but the relationships between care providers and care recipients were often valued by both of them and a degree of give and take seemed to suit both. There were a number of other programs in the social services area that had implemented electronic systems

for keeping track of service (the measure was minutes of service provision). These programs provided domiciliary support to a broader clientele and were reported (by the department) to work well. But the HBS care providers found this system offensive and one stated she would not work in such a system, even though the pay was higher, because she did not want to forfeit the degree of autonomy she had in her job. Some clients also rejected electronic recording — often cast by them as “monitoring” — as being inconsistent with the relationships of trust that had developed between them and their care providers. The effective operation of the system depended to a significant extent on the dedication and sense of vocation of the direct care providers. An intrusive, disciplinary data collection system would do serious damage if it disrupted that dedication and the agencies were well aware of this. As an agency representative put it:

Our carers are chosen for their professionalism. The HBS focus is about assisting people whose daily living is compromised and it is especially important to maintain the individual's dignity. If such staff are not treated with respect by the agency, they will not continue the work. It takes a very special person to get up at 6 a.m., drive for half an hour in the dark to wipe someone's bum for a modest wage. If they're given decent wages, trust and their professionalism is recognised, they will provide good service and deal with the agency honestly. There is a difference [between this and] other home-help schemes that provide short pieces of assistance such as those run by local government.

Data Granularity

Issues with data granularity were also identified. Much of the service information provided to the department was extremely coarse-grained (for example, some providers were required to acquit their entire budgets on a bi-annual cycle), while other parts of the system were very fine-grained (other providers were expected to provide data on service provision in small, specific time chunks). At issue in both cases was whether the given level of granularity was appropriate. In general, the department was pushing for finer levels of granularity of service data collection in all cases, whereas the providers preferred a coarser grained focus that would give them greater flexibility in management. The clients' focus, in contrast, was on access to services and with building and maintaining access to the patchwork of services that could support their lives in the community. The granularity issue for them was important only insofar as they could ensure adequate support; otherwise, it was irrelevant at best and intrusive at worst.

A more fine-grained data collection system would create problems for both DARC and HBS agencies, they argued. They believed a more precise system would have the dual effect of reducing the level of service to clients, and creating a situation in which a DARC center could only lose: they lost when clients did not attend, and additional service (to those who attended for extra sessions) could not be recognized, as it would exceed their allocated benefit. It would erode their ability to manage the complexities associated with providing care to people whose lives cannot easily fit into the logic of bureaucratic order. Given the very thin margins on which they operated, the agencies argued that their very viability as organizations was threatened. In other e-commerce

situations, such as electronic markets, dis-intermediation is followed by re-intermediation as more efficient channels are forged. It was not clear that this would be possible in this domain however, and the political ramifications of such change would be severe. Peter was increasingly aware that the consequences of mishandling any change would be significant.

Cost & Usability of the Technology

In addition to the data collection issues, there were significant usability issues associated with the proposed electronic data collection systems, especially for intellectually disabled clients. As a data storage *device* a smart card was straightforward. As a device to be understood, remembered, carried and used by clients, however, it presented a serious challenge. Many of the direct care providers (often not highly educated) and very many clients (often intellectually disabled) did not understand or use such devices as magnetic strip cards or credit cards. At that time, at least, the training costs for introducing such a system would have been high. Further, one DARC center reported that the daily loss rate of (non-electronic) ID cards issued to clients attending a program outside the center approached 100%. Replacement costs for electronic devices at even a fraction of that rate would have been prohibitive. Alternative devices (such as chips embedded in jewelry) were seen as unacceptable because they were socially stigmatizing.

Efficiency & Empowerment, or Dis-Intermediation, Reduced Quality of Care & Increased Cost of Health Provision?

By increasing the level of detail and accuracy of data collected, and changing the system so that clients might freely select a service provider on an instance-by-instance basis, if desired, the department would be effectively centralizing decision making and imposing stricter bureaucratic management (management by regulation) on the service provision system. Peter had no problem with the agencies disapproving of a new system as long as it increased the quality of services provided to the clients - the department's charge was to serve the community after all - but would the proposed system bring this about, or end up weakening (or even destroying) the system instead?

Increased choice of service provider should benefit and empower the individual clients (subject to alternative providers being available), but what if it increased their burden instead? Without increased funding (unlikely), the clients (or their families) would need to take on the job of researching possible services and service providers; otherwise they would gain little.

If successful, the clients would have greater flexibility, the department would be able to more accurately report on the services they were providing, to gain political benefit from its improvement of service delivery, and set in place the foundation of a system that would allow growth and response to future requirements (such as HIPAA in the USA, for instance). If unsuccessful, the revised system would prevent agencies from managing and organizing their workforce effectively, and consequently, through

increased manpower costs, raise the cost of service delivery. The most extreme result could be agencies leaving the sector entirely. The carers, who often provided services in excess of those funded because of dedication to their clients, would potentially be disenfranchised by a new system that more closely monitored their activities. The clients would receive reduced choice and quality of services: the complete opposite of the common objective of every party involved.

CURRENT CHALLENGES

The situation facing the department currently has changed very little. The technological infrastructure of the state in regional areas has improved, and smart-card costs (cards, readers, etc.) have come down, so the technical feasibility and cost of the proposed solution if implemented today would be significantly improved. The technological issues were never the real problem associated with the proposed system, however, and the truly difficult challenges inherent in the approach remain the same:

- The limited (even inadequate) funding for the programs was being stretched by the goodwill of the participants. Making the system more transparent in terms of funding, and more accountable, without losing the goodwill of those involved is a difficult challenge, as risky today as it was then. The outcome in that situation, rather than more efficiency and lower costs, would be lower productivity and higher costs, as carers stop putting in more than they are being compensated for. The underlying problem here is one faced by any organization or system where peoples' sense of vocation helps to control costs (schools, hospitals, police, etc.): the changes suggested by the department involved a fundamental shift in control philosophy, from a vocational, ethical imperative or control mechanism to a highly regulatory approach. The debate over networks versus hierarchies and how to address these conflicts are timeless. While these issues are more apparent in a public social system, commercial e-commerce systems also face these issues.
- Health related care and services to the disabled (as with any public service offered by government) are highly political issues, not only internally, but externally. The department would face exactly the same risk today in terms of changes to the system: a (measurably) successful new system demonstrates their effectiveness and justifies their existence and budget, and will bring political support. A change perceived as unsuccessful (as judged not necessarily by the stakeholders, but by the general public, and the media) brings disfavor and increased budgetary pressure.
- In increasing the options for the disabled in terms of services, the department also needed to consider who should be responsible for keeping the clients informed of their options. Allowing clients to choose from a suite of services without guidance placed an increased burden of case management on the clients themselves. Providing clients with additional assistance would raise costs.

Peter was faced with a very difficult decision: what should he recommend to the department? The potential benefits of the changes were large, as were the consequences if it failed. Could the problems identified in the course of the investigation be overcome

... or at least managed? The independent investigators engaged by the department assessed the issues involved for all stakeholders and made their recommendations to Peter. Peter reviewed their conclusions, and in conjunction with the department drew his own. What do you believe their recommendations were? What would you have done?

ENDNOTES

- ¹ All the quotations provided here have been constructed from handwritten notes of one or more team members taken during interviews. They do not have the accuracy of a verbatim transcription but are correct in both content (what they describe) and in flavour (the speakers' emotive emphasis).

Danielle Fowler is an assistant professor at the University of Baltimore. One of the major foci of her research is the development and deployment of e-commerce systems in socio-organisational settings. Her research and consultancy work is behaviourally oriented, and she has published internationally on a range of e-commerce issues including the identification of non-traditional e-commerce applications in small and medium enterprises, e-health and electronic service delivery, and smart-card technologies.

Paul Swatman is professor of computer and information science at the University of South Australia, having recently returned to Australia after three years as professor and dean of Information Systems at the Stuttgart Institute of Management and Technology. Paul conducts research in three principal domains — requirements engineering methodology, electronic commerce and social informatics — in all of which areas he has compiled an extensive publication record. He takes particular pleasure in this instance, not only from having drawn on all three of his major research areas, but from having brought the results to the classroom.

Tanya Castleman is professor of information systems at Deakin University and head of the Deakin Business School, Deakin University, Melbourne, Australia. She is a member of Deakin's Centre for Business Research. The focus of her research is the organisational, social and community aspects of information and communication technologies, especially the Internet and e-commerce. Her research is practically-oriented and she has conducted a broad range of research and consultancy projects. Tanya has published internationally on issues including: the adoption and implementation of e-commerce by small and medium enterprises, employment implications of e-commerce applications, the Internet and regional sustainability, ICT in health and human service delivery and government electronic service delivery.