

ELECTRONIC RECORDS SYSTEMS IN THE ROADS & TRAFFIC AUTHORITY, NSW

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The Roads & Traffic Authority of NSW is a state-wide organisation with a large number of regional, zone and local offices. The article describes three computerised systems in the RTA, NSW, to illustrate some disposal and design problems and the various approaches taken to deal with them. It concludes with some general comments on these problems and on the implications of the current, transitional phase between paper-based systems and genuine, electronic records systems. It argues that archivists and records managers should intervene before re-creations of nineteenth century control systems are imposed on us as solutions to twenty-first century problems.

Introduction

The Roads & Traffic Authority of New South Wales is responsible for:

- the operation, maintenance and enhancement of the National Highway and State Road Network in NSW;
- the promotion of road safety and traffic regulation; and
- the licensing of drivers and registration of road vehicles.

It was established by the amalgamation of the Department of Main Roads (DMR), the Department of Motor Transport (DMT) and the Traffic Authority and began operating in January 1989.

The RTA inherited considerable computer capacity from its predecessors, primarily mainframe systems. The licence and registration system, financial systems, and the DMR's file management were run on mainframes while local area networks of PCs (performing a variety of operations) were spreading throughout the organisation. The RTA also inherited a substantial body of paper-based records the majority of which were long-term construction records from the DMR, whereas the paper records of the DMT were primarily concerned with short-lived transactions.

While the RTA is a state-wide organisation with a large number of regional, zone and local offices including 138 motor registries, it began life as a heavily centralised structure. It has since decentralised to a regional organisation, with devolution of large areas of decision-making to the Regions.

In this context of dramatic change the RTA has developed a number of new computer systems which illustrate various stages of computerisation of functions and associated recordkeeping problems. The first of these is the accounts payable system, used in both Head Office and the Regions, called CREAM. The second system is the large mainframe system recording driver licensing and vehicle registration, called DRIVES. The third system is the property information system, called PIMS, which links text and graphic (plans and maps) information for the management of the substantial amount of property the RTA owns.

CREAM

I

This mainframe system records expenditure throughout the RTA and transfers information from the expenditure records to the general ledger system on a daily basis. It manages:

- the purchasing and stock control systems;
- the accounts payable system;
- the wages system for primarily the outdoor work force;

- the hired plant and haulage systems (which are variations of the wages systems);
- the RTA's own fleet usage system; and
- aggregated financial information created as the Works Ledger which is linked to the general ledger.

CREAM is typical of its generation of computer systems which mechanised manual systems performing a high volume of relatively low-level transactions. In effect, the computer acts as a super calculator with a memory. It creates a full electronic record — transactions, dates, office, user identifications and batch number — but this is not regarded as a primary record. The paper records, which initiate action and the print-outs, which report its actions, form the primary record for accounting and audit purposes.

In part, this is required by the NSW *Public Finance and Audit Act 1983* (s.59) which stipulates that the accounts must be capable of being reproduced in written form no matter how they are recorded or stored. Consequently the system is surrounded by volumes of paper records — orders, invoices, delivery dockets, stores issue dockets, time-sheets, tax records and the print-outs.

This was the problem for which the CREAM Co-ordinators (financial systems administrators in the regions and Head Office) sought disposal advice to solve. They drew up the list of 120 system-generated reports which we then discussed to establish what action they reported and therefore what was the equivalent record in *Treasury Directions* to determine the mandatory retention period.

In fact, besides the source records, some of the print-outs are primary financial records (cash sheets, authorisation of payment reports, cheque lists, annual creditor history) and must be kept for the statutory period (six years after audit). There was no question of retaining the electronic record of transactions past the twelve months it is held on the system.

There were several reasons for this. First was that the on-line electronic record on which enquiries are made is not necessarily complete because some completed transactions can be dropped from the system before the twelve months elapses. The annual creditor history report with all accounts payable transactions is regarded as much more significant. Secondly the audit trail, which is embedded in the transaction record, is printed, albeit in two different reports, the user administration log and the transaction processor report. The user administration log reports in summary details on who used the system the previous day. The transaction processor print-out reports all transactions in batches within systems but without the user IDs.

Consequently both the user administration log and the transaction processor report are needed to track an individual transaction. There is no advantage to maintaining an additional electronic record when in practice it is the paper-based records which are retrieved to deal with enquiries one-two years after the action was completed. Formally the paper records are the primary records of the system.

There was a secondary consideration, the format for maintaining some of these records. Print-outs such as the transaction processor report are voluminous. However when it was proposed to keep them on floppy disc, not printed on paper, the auditors raised the objection that the floppy disc records could be altered. Although it was argued that this difficulty could be overcome by strict procedures, the matter has not been resolved.

II

Although CREAM has been operating only since 1989 it is about to be replaced by an enhanced version, effectively a new system. It was hoped that the enhanced version would overcome some of the problems of the old, particularly the volumes of reports. To this end the CREAM Co-ordinators suggested that the Corporate Archivist should be involved in the discussions establishing the requirements of the new version. This has been an interesting exercise illustrating some of the problems of archivists' intervening in the information technologists' domain.

The new system will operate on-line, no longer on a semi-batch basis. There will be no need for reporting transactions in a massive print-out, instead the electronic record will be the base transaction record, with the audit trail embedded in it. Since the electronic record is the primary transaction record, it will have to be maintained for six years after audit. There will still be paper-based records (invoices, vouchers, cash sheets) including some generated by the system itself in the course of performing the activity. The new system will hold on-line two years' worth of transactions, a distinct improvement on the old.

One difficulty has arisen because of the term 'archiving'. To IT specialists, archiving means simply removing data from the on-line system or copying for back-up purposes, not disposal of data. Having established that the issue was disposal, the second problem was explaining that some input into the design of the database was required to ensure the primary financial records of the transactions met audit and legal requirements. Appropriate disposal arrangements for the new system can only be determined on the basis of what sort of record will be created, on the handling of the audit trail, on how authorisation of electronic transactions will be recorded. To the Special CREAM Enhancement Project (SCEP) team of consultants who are designing

the replacement system these concerns seem a long way removed from 'archiving'.

The discussion with the SCEP consultants has been dominated by technical considerations about the best means of maintaining the 'archival data' for the six years required. CD ROM (Compact Disc Read-Only Memory) found favour early in the piece which seems a gold-plated solution for storing accounting records. It is understood that not only the data would have to be stored but it would need to be monitored to ensure it could be retrieved in the future through up-grades of the system. The apparently simpler and cheaper solution of COM (Computer Output to Microform) is meeting user resistance, primarily because people dislike using microfilm readers. Another alternative is down-loading to data tapes which are achieving extraordinary compression rates, but a strict procedural regime to ensure the security and continued accessibility would need to be put in place. The matter is still under investigation.

The conversion strategy requires copying of the entire CREAM database for the current financial year to bring over to the new system. It is then proposed to close off CREAM. It has been pointed out that it may still be necessary to refer to the old system, so both the database and an enquiry facility need to be preserved on the mainframe for twelve months. In fact, providing there are no problems with the data copying, there will be little reference to the old CREAM system. Officers will continue to do as they do now, go through the paper records if they really need to find an invoice or a cash sheet.

DRIVES

DRIVES is the RTA's on-line driver licence and vehicle registration system. It operates in 138 motor registries throughout NSW processing upwards of 50 000 transactions, issuing or renewing licences or registering vehicles and receiving approximately \$5.5 million in revenue per day. There are 3.5 million licence records and 3.9 million vehicle registration records in the DRIVES database.

A typical DRIVES transaction consists of two parts:

1. renewing or issuing a driver's licence or registering a vehicle for the customer;
2. invoicing the customer and receipting the payment.

The customer tenders certain (paper) documents for proof of identity, status of licence, evidence of compulsory third party insurance etc., which are retained by the motor registry for checking if necessary. The only paper record of the receipt of payment (actually the registration sticker for vehicles or the licence) is handed to the customer. The RTA's record of both the receipt and the valid licence or registration is

registration is purely electronic. The advantage of DRIVES to the customer is that the licence or registration record is up-dated on the spot in her/his presence and the business completed immediately.

The paper documentation is forwarded to Head Office for microfilming and the paper destroyed. No decision can be made about the retention of the microfilms until some decision about the retention of the records in DRIVES has been made. The retention periods for DRIVES' electronic record necessarily are tied to both the expiry period of the vehicle registration or driver's licence and to the financial records' requirements.

There has been no deletion or retirement of data from the system since commencement (fully operational from July 1992, licencing operation began in September 1991). Consequently the database is seventy gigabytes in size and growing, so that the issue of disposal is now pressing. In part, the reason no transactional record has been deleted is that data protection has been a major issue in the design of the system, because the information held in DRIVES is personal and highly significant to the individual customer.

Once a DRIVES transaction has been completed it cannot be deleted from the system. A payment transaction can be reversed but both the original transaction and the amendment are recorded. In all cases amendments create additional records, they do not overwrite existing records. A full audit trail is embedded in the system, so every transaction, whether creating a new record or amending an existing one, is recorded against a user (RTA officer) identification number.

A two-fold archival strategy is proposed. The first phase will establish a near on-line storage facility to which large volumes of non-current data will progressively be removed. The second phase will remove classes of records to off-line storage for varying retention periods before destruction.

The lifespan of DRIVES' transaction records varies from one year for most vehicle registrations to five years for gold drivers' licences. The record of the receipts has a six year retention period under *Treasury Directions*. As well there are tables of supporting data such as name and customer number, address, vehicle details such as plate number or engine number which can change independently from the renewal details. The latter data form a base record which will have a relatively long life-span on-line in DRIVES.

Many computerised personnel or financial systems make a distinction between current year transactions which drop off after a designated period of time and the staff or creditor information which is retained. This is simple enough in systems where the lifespan of all transactions is uniform. The disposal difficulty for DRIVES as a

recordkeeping system is that the recurring transactions have different lifespans, e.g. vehicle registration lasts one year while a gold driver's licence is current for five years. To preserve the integrity of the licence and registration records the archival strategy for DRIVES needs to determine retention periods both for the recurring transactions with their varying lifespans, and for the supporting database and its amendments.

To indicate some of the difficulties, take the case of the change of address data. This was one class of data which we thought could be removed to near on-line storage and all but the last two changes destroyed after (say) one year. The auditors pointed out that gold licences last for five years and there is up to two years' grace to renew, so this may not preserve information necessary for ordinary purposes nor for detection of fraud. In other words, the change of address data cannot be dealt with as a discrete disposal class because of the links to transactions with varying retention periods. We concluded that a better approach was to flag the gold licence records for five years retention or more while other licences or registration renewal records could be removed to near on-line storage or destroyed much earlier.

This represents a shift from viewing all transaction records in an electronic system to be of equal value to distinguishing between them in the way that archivists have traditionally sentenced case files. It also means that the disposal arrangements for the supporting database and records of amendments to it cannot be separated from the arrangements for the primary transactions. While it may be possible to identify such classes of data for the first phase of removal to near on-line storage, this may not be practicable for the DRIVES users. The way they view the records is based on the primary transaction.

The disposal program for DRIVES will need to distinguish between the receipts record, the primary transactions and the base information, some of which may even be regarded as a permanent record. The basic information about drivers or vehicles may have long term research value. In fact certain data — e.g. name, date of birth, date licence was first issued — have to be maintained in DRIVES for the length of time a driver holds a licence, which can be a very long time because there is no automatic trigger to remove a driver's record from the system. The aim of the archiving strategy is to identify the various records with their appropriate retention periods, keeping the long-term quantity to a minimum. The execution will depend on correctly identifying the links between the records so what is removed off-line can be retrieved as needed. To do this the archiving strategy team will need to re-analyse how the system operates to ensure all the normal access points (e.g. customer number, or registration plate number) are incorporated into the index for the off-line records.

PIMS (Property Information & Management System)

The RTA owns large amounts of land in the form of the state road network and adjoining properties intended for road building or widening. Information relating to the Authority's property interests had been stored in a traditional charting system and a substantial number of files.

The new Property Information & Management System (now operating) combines graphic and text databases to manage both the chart-based and text information. It replaces the roll and flat plans and the text in various property registers and indexes to the file records.

Property Services in Head Office over some years had developed a computerised property database (known as the Property Register) to consolidate key information and to improve access to the paper-based records of the file system. It incorporated activities such as tracking the progress of acquisition of properties, the rental of RTA properties, and their disposal, as well providing ready reference to primary information about properties owned by the Authority. The Property Register was also used to access the plans as well as files.

The plans themselves are primary reference points for information about land acquired, required, surplus, sold, affected by reserves, realignment schemes, boundaries and the approvals and survey information relating to such schemes. While the function of acquisition was centrally controlled by Head Office, the shortcomings of the plans were tolerable. The problems were the deteriorating state of the plans themselves, plus the limit of only one person at a time being able to use them. Devolution of several of the property activities to the regions added the problem of multiple access to the plans being needed and made the currency of the plan data a more critical issue.

First the decision was taken to replace the paper-based plans with a dynamic, computerised graphic database. Then it was decided to create system links to the text database (Property Register) so users could move smoothly from graphical information to text data and vice versa. This eliminates the need to get out of one application to go to the other, so the ownership details (for example) can be looked up at the same time and on the same screen as the boundary of the particular road scheme.

The plans are scanned to produce black and white raster images into a CADD application which provides an editing facility so the graphical information can be updated. After scanning, the colour coding (indicating the ownership of the land) is added in a vector layer. There is a second vector layer for adding further information, including text, to the original, raster image. Various symbols are placed at the edges of plans with a link to the adjoining plan, so the user can move seamlessly

from one plan to another. There is also a zoom facility which can move from State level down to an individual lot by pointing and clicking.

Editing access is restricted, changes requiring verification at system administrator level before they can be saved to replace the current data. Edited changes within one region or office are updated immediately but not transmitted to the rest of the network until the next day. Backing up is done daily for each day of the month and monthly and the monthly tapes are kept for twelve months. Amendments can only be checked against previous images for the past thirty days. Beyond that one can only compare one month's image against another's. While there is a log of user access for the purpose of amending the database, there is only a record that the database has changed, not what the change was.¹ In other words the audit trail of amendments to the graphic database is not complete.

If one user is already amending a plan when a second user retrieves the image, a message comes up warning the second user that the image shown is not current and gives the name, location and phone number of the first user. A conference facility enables users in two locations to look at the same image so annotations made by one officer can appear on the image in real time on the other officer's workstation.

The text database is linked by system address on the plan (and vice versa). It was based on the Head Office Property Register with the addition of local databases from regional and zone offices. The required screen from the text database appears as a form on top of part of the plan image on screen. Because the text database is so easy to refer to while looking at the plan on screen, the amount of annotations on the plans themselves has been reduced, improving the clarity of the images.

The text database is updated from the file records, e.g. when purchase of land is settled, the details of the date of settlement and price are entered into the system from the settlement papers on file. A log of the amendments to the text is maintained, consisting of a before and after view of the data, the date of the change, and the user ID. The latter is maintained as part of the database, called the establishment database, recording the user name and staff number and office location. It is maintained to enable the system administrators to segregate access to the system so users from any one office may only see and amend records relating to their (geographical) area of responsibility.

The immediate result from PIMS has been a considerable improvement in the accuracy of information as discrepancies, duplications and out-of-date records were cleared up as the local databases (text and plans) were consolidated with the central text database. So the problems of a multiplicity of local databases which

could not communicate, of paper-based plans of deteriorating accuracy and dubious currency, and of space and time occupied with maintaining the plans database, have been solved in one elegant computer system. The system is still developing as new activities, such as management of enquiries about property affected by road proposals, are added. Archiving protocols for removal of enquiry data from on-line will be built into the new modules.

There are some technical problems with the amount of data which the network can easily carry as the individual plans can be as large as eight megabytes of data. Scanning and adding the vector information is time-consuming and it is estimated that it will take three years to complete the loading of the 1950 plans. Then there is the question of disposal of the old plans and the status of the electronic record which is PIMS.

PIMS is not a substitute for the file records of acquisition, tenancy, disposal of land and declaration as road. It seems that the critical record will continue to be the approved route of the new road or widening with the nominated parcels of land for acquisition which is held on the Project file (paper). The transactions of acquisition, tenancy or disposal are largely recorded elsewhere on individual files.

PIMS is used for ready reference in the same way an equivalent, paper-based, Property Register was once used. It is a current information system with no present need for maintaining a history. It is not recording transactions, even its amendments are not records in the Bearman sense² although the log of amendments to the text database provides basic context information. Its primary requirement is accuracy as it will be the first point of reference because it is easy and indeed, fun to use. Control of access to preserve the integrity of the system is therefore a major consideration.

The (NSW) *Public Finance and Audit Act 1983* requires statutory authorities like the RTA to present an annual summary of land owned and its value, in part the function of PIMS. At present there is a requirement that any such record must be capable of being reproduced in written form. At some future date this will change.

It is also clear that in future original plans of road schemes will be created and approved in PIMS. The system will need to expand to recording such property transactions, in which case it will be necessary to add a complete audit trail to the graphic database. PIMS has already laid the basis for a genuine electronic transaction record in its premise that access to the system and access to authorise amendments stand equivalent to signatures in paper-based systems.

Some comments and conclusions

The management and disposal issues arising from these three systems

demonstrate that we are in a transitional phase between paper-based systems and electronic ones. The legislative and regulatory framework has not caught up with the technological developments. Nor have sets of conventions and forms for electronic systems been developed and accepted beyond individual institutions. Although financial systems were some of the first to be computerised nearly two decades ago, there are still no publicly established standards for audit or fiscal purposes for such systems. There has been some progress on conventions for exchange of electronic documents for EDI transactions but this has been confined to the area of purchasing in the public sector or very large corporations such as BHP.

Despite the existence of a NSW Government EDI Co-ordinating Committee and work undertaken by the NSW Office of Public Management in the area of information technology,³ there has been little progress in establishing legal or fiscal standards for purely electronic, financial records. On the other hand, the definitions in the new NSW Evidence Bill (not yet introduced into Parliament) are so broad, particularly for public records, that virtually any system in a public office will produce documents acceptable in court. In the absence of generally accepted guidelines the fallback position of providing for paper reporting has been adopted. Hence the continuing reliance placed on the paper surrounding a system like the RTA's CREAM and its successor.

Another reason for the continuing reliance on paper is the issue of signatures. It is still not accepted that password access to an electronic system and recording users' IDs, together, are equivalent to signatures in paper-based systems; one instance that basic conventions for electronic systems have not yet been adopted. Accepting the record of access by an authorised officer as a signature is effectively the premise of DRIVES as an electronic record of receipts of public money. However we have not been successful in determining from the NSW regulatory authorities what details or protocols would meet State legal or fiscal requirements.

Instead the system designers have worked closely with the organisation's auditors to ensure that adequate audit trails are built into the new systems. The reliance placed on a separate report of all transactions for the audit trail is symptomatic of the transitional phase. In the first computerised financial systems, audit trails generally took the form of a paper report of all transactions, a paper safety net. While they may not now be printed, the record of all users' access against the transaction record tends to be maintained as an separate record within the system for the system administrators' use.

The RTA auditors consider that the audit trail should not be maintained as a separate record in this manner because of the

possibility of users being able to avoid recording their access to the system. Instead they argue the record of who used the system, what part and when, should be embedded in the primary transactional record itself. They are right because the record of who performed what transaction and when should be part of the record. The user ID is the electronic equivalent to signatures in paper systems. In this sense what we are still calling the audit trail performs the function of initials, dates and file movement records in paper systems. Given that computer systems can record times and dates automatically, without reference to the user, they can be more accurate and secure than paper systems. However as long as people do not trust the computerised system's security and integrity, they will want to keep a paper record of some kind as a safety net.

A similar desire for a safety net lies behind the proliferation of electronic document management systems developed in response to fears about the amount of data held on office PCs. The obvious safety net is printing important documents and managing them with good recordkeeping — even proper file systems. The trend is supposed to be not to print but to manage the documents electronically with elaborate control systems involving compulsory naming and indexing procedures. In fact what such systems are doing is re-creating nineteenth century folio registration and indexing systems. Apart from the quantity of information being generated to manage the information, we should remember the reasons these systems were superseded.

Primarily folio registration systems were replaced with file systems because tracing the response to inwards correspondence and subsequent action was too cumbersome for twentieth century administration. Rather than re-learn such lessons empirically, for the time being, let us follow the admirable advice of the Australian Archives pamphlet, *When it's Gone it's Gone!!!*, and if it is significant, print it. The concepts of links between documents, based on the transactions they are recording, have not yet been developed for electronic document management systems, partly because they are derived from word-processing practices. Word-processing document management is conceptually no more advanced than nineteenth-century letterbooks, another example of the conventions and procedures lagging behind the technological developments.

So the nexus between the electronic system and paper records remains for the time being. In some systems like PIMS the electronic system is not yet the record, in the sense of performing or recording transactions. Instead it is a very sophisticated index to a substantial paper system. In the future when it is used to create plans of road schemes and record their approval, the 'who, what, when' contextual information (the 'audit trail') will need to be integrated into the

graphical record. It is unlikely in the medium term that PIMS will replace the files generated by the property acquisition and sale function, so future disposal of records will need to consider both paper and electronic systems.

There are other reasons for the endurance of paper records related to electronic systems. One technical problem for disposal of electronic financial records is that legal retention periods can extend past the life span of the system itself. This has happened to a financial system located in a section which has been closed. The in-house system has been closed off and its records are being converted to COM. They will continue to be used, not least because they are the main means of access to other paper records such as time sheets which will not be due for destruction for some years. There is little alternative in such cases to dumping the records onto paper or microform. In the future migration of records to other systems, on an enquiry only basis, will be a more common solution. In the interim even computer print-out paper has a longer life span than data-tapes.

DRIVES is still the exception in that almost no paper records are generated by the system and the transactional record is purely electronic. Disposal of its records requires little consideration of relationships to paper records but the technical issues loom large. The archiving strategy outlined above will involve some, possibly elaborate, design work to flag transactional records for different retention periods.

The role of the Corporate Archivist has been to point out the variety of retention periods inherent in the business needs of the system and to indicate the possible research value of a portion of the record which the NSW Archives Authority may determine should be retained. Whatever disposal arrangements the RTA develops must be submitted to the Authority for approval. Should the Authority determine that a portion of the system's records has permanent value, some negotiation with the Authority about how to implement the archival strategy will be necessary. While it is theoretically desirable to separate the technical questions of format and storage systems from identification of the disposal value of the records, in the real world they are not distinct.

Few of the systems I have encountered present the difficulties of DRIVES, primarily because few of them have truly been electronic record systems. Most of the systems have been transitional systems, relying on printing the significant reports or recording authorisation of action on paper. The fact that the legal framework lags behind the technology has made it easier to duck the question and settle for maintaining the paper. The types of computerised systems where

disposal issues arose first, financial, personnel, file management systems, also encouraged appraisal on a simple series basis only.

The way that 'archiving' of data from computerised systems has generally been undertaken has been in chronological slices — all data one-two years old is removed in one sweep. This is what is proposed for the RTA's new financial system. Alternatively it has been based on the number of transactions, e.g. a history of only the last five transactions is maintained and the earliest one drops off when the sixth transaction is completed. This approach is derived from the kinds of systems and functions which were first computerised — financial, personnel, rates systems in local government. Such systems created simple record series, i.e. series with a single disposal class. A simple chronological approach to destruction on an annual basis was adequate. The same approach carried over into the computerised versions of the systems.

Now that electronic systems are performing more complex tasks and generating more complicated records, a rather more sophisticated approach to disposal is needed. Fortunately the technical tools in systems design these days can deliver a more precise disposal program which differentiates between transactions and should enable us to preserve the small quantity of records worthy of long-term retention. In DRIVES we should be able to flag the various transactions to enable them to be collected by the system for bulk removal to off-line storage at different disposal dates.⁴ What can be done to preserve and make available for public access any part of DRIVES' records identified as permanent does invoke technical questions, not to mention cost issues.

Recognising that electronic systems can create complex records requiring sentencing, not simply determining retention periods for annual accumulations of data, means that disposal must be considered as part of the business needs analysis for systems. Effectively disposal is incorporated into the analysis but only from the technical point of view, not from the records management view. Dominance of the technical at the expense of the functional and recordkeeping aspects is characteristic of the transitional phase. The IT experts are making the running on the development and design side of new systems while the thinking of records managers and archivists is still dominated by the precepts of paper-based and manual systems.

No doubt some of these precepts would improve the systems and save costly remedial action but at the moment it appears that records managers and archivists are running to catch up. My experience as an in-house archivist suggests that dialogue with the system users as well as the IT system designers is critical in order to bring the weight of the functionality of the system to bear on the technology, not the other way round. In the process awareness of the nature of records and an understanding of the need to record transactions illuminate a quite

different aspect of electronic systems from that perceived by users and designers alike. This different aspect must be considered if the business needs the new systems are supposed to be serving are indeed to be served. This strikes me as simply another version of the traditional role of archivists, preserving the evidence.

ENDNOTES

1. The log of user access is maintained in the Oracle database which sits on top of and manages the graphic database. This is a separate database from the text database.
2. For example, see David Bearman, 'Archival Data Management to Achieve Organizational Accountability for Electronic Records', *Archives and Manuscripts* vol. 21, no. 1, 1993.
3. For example, the Office of Public Management has prepared *Statements of Best Practice* on management of information technology and information systems to enable them to be collected by the system for bulk removal to off-line storage. The final decision about what format and which storage system is purely a technical consideration.
4. Another very recent development in the RTA proposes as an archiving strategy, identifying transaction records as units in electronic financial systems, flagging them as completed or not, and using this as the basis for removing them from the on-line system and for ultimate disposal.