RECOMMENDATIONS FOR AN ELECTRONIC RECORDS MANAGEMENT SYSTEM: A CASE STUDY OF A SMALL BUSINESS

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ABSTRACT: The electronic records project underway at the University of Pittsburgh has promulgated functional requirements for record-keeping systems intended to be applicable to any setting. In fact, many components of these requirements delineate what should be “best practice” for the immediate and long-term design and management of electronic systems of all kinds regardless of their status as producers of records. As such, they indicate clearly the transferability and relevance of archival principles and practice to many facets of information technology applications. The authors have attempted to demonstrate this relevance by applying these functional requirements to the electronic files created by a graphic design company. Additionally, they recommend a balance of software and policy implementations appropriate for rationalizing the company’s management of electronic records.

Introduction

As computing technology has matured, its business uses have steadily expanded. In the 1980s, the role of computers was primarily as a tool to generate traditional paper documents and records. In the current decade, more and more of a business’s record-keeping and re-usable resources—information, graphics, and products—are created, maintained, and delivered in digital form. While this has already happened, many companies have failed to realize that important documentation of company activities, existing only digitally, is no longer captured by systems designed to handle records in paper form. As a result, digital materials with long-term value to companies are placed in jeopardy due to inadequate recognition of their status as records and a failure to implement an adequate system to manage them.

Small businesses are particularly susceptible to this problem since their traditional records management activities are frequently ad hoc in nature and, as such, have received scant attention during the transition from paper to electronic record-keeping. From a records management perspective, another increasingly
important consideration is that these digital materials are not only administrative or transactional records, nor even an information resource, but often also the primary commodity of the business. Regardless of record status, security and preservation, two areas of archival expertise, are inevitably concerns that accompany these electronic materials.

An NHPRC-funded research project underway at the University of Pittsburgh has contributed to a growing understanding of the nature of electronic record-keeping systems and the functional requirements necessary for such systems if they are to meet an organization’s evidentiary needs. Ideal “recordkeeping systems capture, maintain, and access” transactional evidence in a way that is compliant with organizational and external legal requirements, as well as with industry “best practice” standards. Such systems must be accurately documented and managed; fully implemented; and create complete, reliable, and unique records of all transactions. The content, structure, and context of records maintained by such systems should be meaningful and their longevity safeguarded by the system, which must also track all uses of and alterations to the records. Finally, records must be easily transported across systems without endangering either content, structure, or context, and must be readily retrievable in original or edited versions, or with a complete history of all transactions involving the record after the initial one in which it was created.1

David Bearman has argued that in order to provide future access to records of enduring value, “archivists must understand...the nature of record-keeping systems.”2 For many archivists, developing the appraisal skills required to determine the long-term evidential and informational value of electronic record-keeping systems with which they will come into contact may require practical experience in the evaluation of similar record-keeping systems as a necessary precursor both to understanding the technology underlying them and to assessing the long-term value and viability of the records which they produce.

This article originated as a consulting report prepared as part of a course on electronic records at the University of Michigan’s School of Information and Library Studies. It represents an attempt by the authors to apply the functional requirements promulgated by the Pittsburgh project team to a case study of a small business that works almost exclusively in a digital environment. The goals of this study were threefold: to present the company management with a document that would assess the company’s current use of electronic technologies for record keeping, to recommend ways in which their use might be more effectively structured, and to help the company begin thinking in a more proactive fashion about the issues surrounding long-term access to and disposition of these records. The study also sought to identify and characterize the complex interaction between record keeping and product development in an environment where both product and transactional record are digital. Toward this end, this study also briefly considers requirements for both a job tracking and a file management software package and for a policy framework that might help the company to standardize the creation, use, and management of its electronic records.

Whether or not the records of the company examined in this case study are of archival value is not the focus of this study. Current archival literature addresses electronic records management issues almost exclusively in large public institutions, such as state and national archives, or in corporate repositories where
archivists are or should be allied with “auditors, administrative security personnel, freedom of information and privacy officers, lawyers, and senior managers—all of whom have a responsibility for corporate memory and its management.” These environments may seem foreign, however, to many archivists working with records in smaller institutions and organizations without access to the panoply of specialized assistance and input cited above.

Information technology has been heavily applied in many small businesses to allow them to compete in digital service industries. This case study provides, its authors hope, an example of how archivists working with such businesses might begin to address electronic records management issues on a small, practically applicable, and comprehensible scale. The authors found that the management of the company that was the subject of this case study were eager partners in this consideration of record-keeping practices. Through similar opportunities, perhaps, more archivists could engage meaningfully in the dialogue concerning the creation, management, and long-term retention and use of corporate assets in digital format.

Case Study

Sun Graphics and Publications (SG&P), the organization whose records were examined in this study, was founded in 1974 by brothers Ralph and Carl Volk as a graphic design studio. In the 1980s, they were early adopters of desktop publishing technologies and in 1988, they formed a new division, ImageSet, to function as a service bureau that would produce high resolution pages of paper and film for other companies who could not afford the $80,000 cost of an imagesetter. Today, the company’s services cover the complete spectrum of graphic art production. They generally do business as ImageSet and the authors will use that name to refer to the overall organization throughout this article.

The management of the company, after a period of rapid expansion which included investments in both hardware and personnel, recognized the need for a re-evaluation of record-keeping practices. The management is eager to utilize information technology to facilitate record keeping, but wanted someone from outside the organization to take an initial look at existing record-keeping practices and needs, and to suggest an initial plan of action through which the company could work toward the integration of record keeping with production in a digital environment.

The functional divisions within the organization include design, input, and output services. Images are brought into the system either as original work by the electronic art and design studio, or via digital photography or scanning. Completed jobs are delivered to customers through high-resolution output to film, paper, slides, transparencies, or to a Heidelberg digital press, where the image is transferred directly from a computer file to plates mounted on the press cylinders.

Much of the business performed by ImageSet can be characterized by a high volume of transactions and/or a high degree of complexity. In a sense they are engaged in a manufacturing process in which the end product is printed visual communication. Because the company is a full service organization and serves a variety of clients, it differs from the typical manufacturing facility, which will have a fixed process for a limited set of end products. Jobs may enter ImageSet
in any one of the functional groups described above. A job may utilize only one group’s services before completion, or it may utilize the services of several or all of ImageSet’s component groups, each job taking a slightly different path through the organization than the last.

**Information Gathering**

To gain knowledge about the current record-keeping and job organization strategies utilized by ImageSet management and employees and the problems they identified, the authors began this project with a series of interviews. The following individuals were interviewed because they played key management and technical roles within the company: the Chief Operating Officer, the production manager and two graphic designers for the design studio, the output services manager, the color systems specialist, and the digital photographer and head of color services.

In the interviews with management team members, the authors explained their goals and then sought answers to the following questions:

- What types of information does ImageSet need to track for each job it undertakes?
- How is that information currently tracked?
- For how long do ImageSet employees need to access specific job-related information?
- What types of information not already tracked would management like to capture?

When the authors interviewed employees in the various other facets of the business, they sought the following information:

- How do employees currently organize and manage their files and track the time spent on each job?
- What file naming conventions do they use?
- What problems do they have with their current system and what changes might they find useful?

**Summary of Key Problems**

Three broad areas came up repeatedly in these interviews: time and billing, job tracking, and file management and back-up. The following is a brief description of these problems.

**Time and Billing**

Jobs can enter and leave the workflow at ImageSet at any point in the process flow illustrated in Figure 1. Jobs can be billable by the hour or on a per-item basis, depending on the type of service being performed. Per-item jobs are currently not tracked electronically and billing information is transferred from the work order to the client invoice by an order entry operator. Per-hour billable services are currently tracked using a beta version of a job management software package. Employee time spent on a job is recorded by the software; however, changes to the time stamps—to account for time spent on non-billable work while a particular job file was open or perhaps that an employee had forgotten to clock out with the job management software when finished with a par-
**Figure 1**

**INPUT**
- Digital Photography
- Scanning: Line Art, Halftone, Color

**MODIFICATION**
- Photo Manipulation
- Color Balance

**OUTPUT**
- Intermediate Digital Proof
- Film
- Digital Press
- Traditional Proof

**DESIGN & LAYOUT**
- Design Studio OR Production Client
- Design Client

**Legend**
- Process Flow
  - internal
  - external (requires approval)
- Transactional Boundary
  - internal
  - external (requires approval)
ticular task—must be made by hand on a printout, which is then used by an
order entry operator to invoice the client.

This system for tracking employee time spent on a job and translating that
into a client invoice does not appear to be problematic to the employees with
whom the authors spoke. The authors wish to note, however, that it appears to
represent a wasted opportunity to harvest data if information collected digitally
about employee time spent on a job is not able to be incorporated digitally into
the final client invoice without first going through an intervening paper format
order entry stage.

It is also important to note here that all employees who do work that is bill-
able to clients at hourly rates stressed the importance of being able to go back
over their digital time-tracking records and account for time not actually billable
to the client or for any other discrepancies that might appear on those records.
One of the problems with the current job management software identified by
one design studio employee is the inability to manipulate this information digi-
tally for previous days. This necessitates the current use of paper printouts in
the step before invoicing.

**Job Tracking**

The current system for tracking jobs through the work flow at ImageSet is
completely reliant on a paper work order, which also serves as a vehicle for
cross-functional communication between the various facets of the company
regarding the job. The work order and any associated paper documents and
proofs are placed in a job folder, which represents the sole means of determin-
ing with any certainty the progress on a particular job. From a program perspec-
tive, however, it is important to note that part of this reliance on paper is
unavoidable, since images associated with various jobs have to be printed out
for approval by the client at various times in the job process.

In addition to the job folder, a FileMaker Pro database is used to generate a
paper queue three times daily for jobs in the output phase of production. Job
folders are placed in slots in a central area according to position in this queue
and individual employees acknowledge working on a job by initialing on that
queue. Because the inputting that generates the queue is done by order entry
operators, quite a bit of lag time exists between a change in job status and the
reflection of that change on the next printed queue.

Only one employee with whom the authors spoke expressed explicit frustra-
tion with the current system. His position, as production manager for the output
services group, requires him to keep tabs on a number of production operators
and the jobs on which they are working. Under the current system he must con-
sult the operator’s initials on the paper queue and then physically track each job
to determine its status. Although the authors did not interview any client service
representatives for this study, these representatives would likewise have to track
down a job physically in order to respond to a client query about the status of a
work in progress.

The previously discussed job management software used by ImageSet does
not have the capability of tracking jobs across functional boundaries within the
company, something that would facilitate digital tracking of a particular job
from any computer terminal.
**File Management**

There is no current company standardization for the management of an individual employee's job files and interviewees expressed a great number of concerns in this area. A moderate degree of organizational consistency exists among individual employees in organizing job-associated files into client folders while work on a job is in progress. File naming conventions, an area in which there is much less consistency, were cited as a problem and include identification of a file, as well as its association with a particular job and the software package used to create it. Enough consistency does exist to allow employees within a group generally to have easy access to another employee's job-related files if necessary. The authors were told of occasions, albeit infrequent, when Color Central, the software application that replaces a low-resolution sample file with its high-resolution equivalent for final output, incorporated the wrong image file because the name of the correct file was used more than once.

Naming conventions have to be meaningful to the people who use them, an important point made by several ImageSet employees. A related problem expressed by one employee was that too much information crammed into a file name makes it useless for both finding and sorting. In the authors' opinion enough commonalities in the current file-naming practices of those employees who were interviewed exist so that satisfactory standardized conventions should not be difficult to create.

Manipulation and tracking of fonts, especially those supplied by the client, were another file management problem identified during the interviews. Because fonts take up a large amount of electronic storage space and because no central font server exists from which an operator can access fonts when assembling a particular job's components, these fonts must be kept on the individual hard drives of each employee working on the job, or with the individual job file if the font has been supplied by the client. This makes access by other employees and management of font files chaotic at times.

Version control was identified as a significant problem on large, collaborative projects in the design studio. ImageSet has neither a standardized way of indicating progressive iterations of a file, nor a method of flagging the final, client-approved version. Consecutive numeric extensions to file names seem to be the general practice for version iteration, but when different versions end up stored temporarily on different hard drives it can be difficult to determine where the most current resides.

Finally, the integration of paper and electronic files, all providing important information about various aspects of jobs, is a real problem for ImageSet. With no file drawer purging policy in place, removal of inactive files is done only when a drawer gets too full and someone has the time to do it. Apparently, records purged from the file drawers are placed in boxes and stored somewhere else, though none of the employees asked knew exactly where.

**Back-ups**

Back-ups are performed at various levels in the organization. Many employees locally back-up their hard drive files onto SyQuest cartridges or floppy discs. Each evening a program is run to back-up all networked computers. When jobs are completed, they are "archived," by which it is meant that all files associated with a job are copied onto a DAT tape, generally one reserved
for the jobs of a particular client. These tapes are then stored in a rack in the
compny kitchen/break room area.

During the interviews, the authors encountered a wide variety of needs and
understandings of both the daily back-up process and the longer-term storage of
completed jobs, indicating dramatically the lack of a company policy concern-
ing what one assumes should be a crucial element of its records management.
While one employee deals with gigabytes of files on a daily basis and backs
them up because of the potential amount of work to be lost if a system problem
arises, another employee duplicates the daily system back-up with localized
media because the system back-up does not seem trustworthy.

The authors also discovered that the person to whom all other interviewees
pointed as being unofficially responsible for backing up their files on the server
had recently stopped doing that back-up because he no longer has time.
ImageSet suffers from a clear lack of both authority and records management
rationale behind their system back-up program. Related to this problem, there
seems to be no provision for storing back-up tapes off site, which in many ways
defeats any purpose (e.g. disaster recovery) that these tapes might serve beyond
saving data in the event of the failure of the system or one of its components.

Since each employee is responsible for "archiving" or arranging to have
"archived" to DAT tape completed jobs on which they are working and no poli-
cies exist to guide this process, no standardized method exists for ensuring that
this DAT tape archive of completed jobs is in fact complete, labeled in some
meaningful way, or accessible for future use. The longest period of time during
which any of the interviewees could envision the possible reuse of one of these
DAT tapes was two years. The authors suggest that there is very little awareness
among the employees interviewed about legal or administrative needs which
might require record retention for a period of time extending beyond the possi-
bility of having to redo a job for a client.

In summary, key issues found during the interview process were:
• Failure to harvest important electronic data.
• Co-existence of paper and electronic tracking systems.
• Lack of company standards for file naming conventions and version control.
• Inadequate security mechanisms.
• No conception of longer-term fiscal, legal, and administrative needs for exist-
ing electronically captured data.

Recommendations

In the process of compiling this report the authors identified the following
ways in which a comprehensive electronic records management program could
benefit the organization:
• Managing risk and liability. Better tracking of the evidence of work per-
formed and of client acceptance at each stage in the process will facilitate risk
management in legal, tax, and accounting matters. A comprehensive electron-
ic records management program will also contribute to greater security of
files.
• Administration. Time and billing will be easier to document and knowledge
of where jobs are in the work flow at any point in time will be easier to
obtain.
• Management. Electronic record-keeping will provide greater ability to perform data analysis in order to track efficiency and throughput.

• File management. Utilization of metadata about files will aid in the ability to locate those files, provide version control and a more secure back-up and "archiving" procedure, as well as facilitate their management as potentially re-usable resources.

The following recommendations were made to ImageSet by the authors to assist the company in assessing its records management needs and, possibly, in establishing a comprehensive electronic records management (ERM) program.

Identifying ImageSet’s Records

When this project began, the authors believed that ImageSet maintained the majority of company records electronically. This was due in part to the pre-conception that the electronic files with which the company works constitute records. The original impetus for this study, and a significant portion of the initial interaction of the authors with the company concerned issues regarding file management. In the course of the project, however, the authors determined that the electronic files themselves either did not constitute a complete record, or were not part of the administrative record at all. The transactions that occur with regard to those files constitute the core of ImageSet’s business and thus are also an essential component of the company’s records. The authors concluded that it is the combination of the electronic job files and the transactional data resulting from work on these files by various ImageSet employees throughout the course of a particular job which constitute a record. In the case of the electronic imaging group, it is not the files, but the high-resolution output—to paper, film, slides, transparencies, and other media—that constitutes the end product. In this instance, the transactional metadata combined with this output, or evidence of the output, constitute the record.5

In the past, information surrounding the time and billing transactions at ImageSet has been captured on paper, requiring order entry operators to transfer the data into an electronic form for incorporation into the customer’s invoice. Recently, the company began beta testing software which allows the creation of an electronic record from these transactions. This software was found to be inadequate in several ways: it did not allow changes to be made to records in order to correct mistakes or to change the status of work from billable to non-billable in the case of a cost overrun; and it lacked the ability to track the files associated with the job. The authors believe that this latter point is critical since, as identified above, both the transactional metadata and the files constitute the record, making it important to have a system which can track both.

There are four types of records which an integrated ERM program at ImageSet needs to identify and track:

Client Interaction. (initiation of job, intermediate approval, and final acceptance). These transactions are important for legal purposes to document the client’s intention for work to proceed. Currently captured on paper, due to a signature requirement, an electronic indication of approval might allow workflow to continue unimpeded.

Time Transactions. These transactions track employee involvement in design, production, and image editing work. In rare cases the output department will also bill for time if a set amount of time is exceeded.
Per-Item Transactions. Scanning, output, and proofing are all billed on a per-item basis.

Movement Through Production Cycle. Used primarily for administrative purposes; jobs must be trackable in parts, since larger jobs may end simultaneously in multiple departments.

Whenever a file is moved some record should also be kept, especially if it is migrated to tape for long-term storage. It is important to note that most of these records are currently maintained in some form; however, because of the way in which the company developed, they are kept differently in the various departments. The above explication of general types should serve as a basis for developing a means of creating records uniformly regardless of the department in which creation occurs. It also demonstrates that in the electronic environment records should be viewed in the context of the function or process which creates them, not the organizational structure. Figure 1 depicts various stages in the workflow. As shown, transactional records would be generated in association with processes represented by each box as well as by movement between the different processes. Transactions which require customer approval are indicated by dashed lines.

Functional Requirements of Records

Figure 2 identifies areas of intersection between the records required by ImageSet and the Pittsburgh functional requirements.

Functional Description of ERM Software

It has almost become a truism to state that archivists and records managers need to become involved in the design of electronic record-keeping systems architecture. Some archival programs, most notably the World Bank and the National Archives of Canada, have even ventured into software development for document management. The following is a description which specifies a model for job management software that would manage the electronic records and fulfill the functional requirements described in Figure 2. The two primary components, job manager and file manager, that ImageSet would require of comprehensive job management software are outlined below.

The job management component encompasses the functionality of the software currently being beta tested by ImageSet; however, it also goes beyond that functionality in several important ways. The job manager is essentially a database which stores information about a job. Basic information such as the job number, the client, due date and budget estimates is entered at the start of the job. A link is also created between this basic information and each record created in the process of completing the job. How this link is created is dependent on the software used to develop the system, but at a minimum it implies some type of relational or object-oriented database.

The job manager should provide data entry facilities which allow each employee to create a record of work done on files. As mentioned in Figure 2, these records must be easily created and must be revisable.

This component should also have a framework which allows job management software to predict or specify the steps a job should take. This framework must
<table>
<thead>
<tr>
<th>Client Interaction/Approvals</th>
<th>Time and Billing</th>
<th>Movement between Processes</th>
<th>Back-up/Archival Status</th>
<th>File as records</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comprehensive</td>
<td>This is now accomplished via paper, but a service rep should be able to act as surrogate to indicate to the system that approval has been obtained</td>
<td>Must be easy to use in order to ensure that a record is created for all time spent working on a job including time not spent at a computer</td>
<td>Essential in order to build trust by employees that system is properly backing up their work</td>
<td></td>
</tr>
<tr>
<td>Identifiable</td>
<td>Must establish a policy for how to define boundary of each transaction, both within and between components of the company</td>
<td>Must be able to account for part of a job crossing a functional boundary</td>
<td>A unit should consist of a job and all its accompanying files</td>
<td>All files identified as constituting a record should be included</td>
</tr>
<tr>
<td>Complete</td>
<td>Use of established billing code facilitates this</td>
<td>System back ups must be thorough and reliable</td>
<td></td>
<td>Must include all components linked to a particular file</td>
</tr>
<tr>
<td>Authentic</td>
<td>A link for legal reasons, to the client’s signature on paper must be maintained</td>
<td>Could be accomplished by requiring system login before granting file access</td>
<td>Desirable, but not critical for accountability</td>
<td></td>
</tr>
<tr>
<td>Preserved</td>
<td>Current system for maintaining invoicing should be applied here</td>
<td>System integrity cannot be compromised by inputting error corrections</td>
<td>Maintenance back-up catalog is essential</td>
<td>They currently keep older software versions</td>
</tr>
<tr>
<td>Removable</td>
<td></td>
<td></td>
<td></td>
<td>Old versions of files and files not used in final output should be deleted</td>
</tr>
<tr>
<td>Exportable</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accessible</td>
<td></td>
<td></td>
<td>Since hardware compression can be specific to a particular drive manufacturer, software compression only should be used</td>
<td></td>
</tr>
<tr>
<td>Redactable</td>
<td>Important to be able to account for time spent which is unbillable due to underestimates, etc</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 2
Analysis of ImageSet’s Record Requirements in Relation to the Pittsburgh Functional Requirements for Records
be easily overridden, but can form the foundation of automatic behavior, thus greatly reducing the amount of communication needed. For example, when one transaction is complete and it is necessary for the job to move to another department the job management software adds an entry to an electronic queue which alerts someone in the next department to take action.

The software performing the file management component should be fully integrated with that performing the job management, and should perform the following key activities:

• knowing where the current version of file is located
• ensuring that files are being backed up properly
• making the location of files transparent to the people working on them

The file manager addresses these issues by acting as a gatekeeper to the files. Although a security system may be implemented to restrict access to some files, the majority of files are easily obtained. The software merely keeps track of who works on what file, when and where. Additionally, it maintains a list of files associated with a job, and presents the user with a virtual view of the files connected with a job—that is, all the files associated with a job are viewable in one place, regardless of where they are stored. The user should not have to know where a particular file is stored.

Because of limitations in the capacity of transmission hardware, working on files over a network is inefficient and a mechanism should exist to transfer a file from a remote server to a local hard drive. Preferably the file manager automatically migrates the file back to its original location on the server once it has been edited. The original version on the server remains unchanged except that the software changes its name to indicate that it is an older version. The new version is added back using the original name, reducing the potential confusion associated with version control. Users no longer have to worry about dealing with multiple files, each a different version of the same piece of work. To the users there is only one file which may have multiple versions, typically hidden from sight, but accessible through the file manager if needed.

The file manager should have an appraisal function, allowing the user to indicate that a particular version is of long-term value. An example would be one of several finished concepts or a file representing a stage of completion which immediately precedes a place where multiple alternatives are to be explored. Otherwise, there should be a default number of previous versions which are kept and the older files should be deleted. If possible, the file manager should know how files are interrelated and should be able to track imported copies, maintained links, or the fact that one file contains another. This system should also simplify the mechanism for moving jobs from one department to another since the files themselves do not need to move. Instead, the job manager should alert the department of the pending work.

The above describes work with files which are modified. Another category of files contains files which should not be modified, typically consisting of logos and various art associated with a particular client and ideally managed as a reusable resource. These files should be kept separate and copies made for incorporation into individual jobs, keeping the original unchanged.
Records Policy Framework

Before ImageSet can develop policies to oversee the management of any of its records, a clear understanding should exist regarding the reasons why retention of these records is important to the company, as well as an informed decision about how long records need to be retained.

Based on the interviews conducted by the authors, little understanding exists of why, beyond needing to reuse a particular image from a completed job, one might wish to access those records. Perhaps ImageSet has not yet encountered long-term legal or fiscal problems requiring access to records of completed jobs, but the potential for this kind of access should be considered as the basis for a sound records management policy.

An important consideration to build into any records management policy is the relationship between paper and electronic records. Presently at ImageSet, the digital files that are "archived" are only part of the record of a particular job and the transactional records currently recorded on paper should somehow be linked to those digital files to ensure completeness of the record.

The company seems to rely on its relatively small size and the cheapness of some digital storage media as a justification for indiscriminately saving everything. One of the dangers inherent in this approach to the keeping of inactive records is that the necessary links between paper and electronic record components might not be accessible when the company faces a need to recreate what today constitutes an ImageSet record. Many reasons exist why this might be so, but chief among them is a failure to standardize the naming and location information about various record components. The current system relies heavily on the memory of a few people who have been with the company for a long time, which is not a sound premise on which to organize a records management program. In order to insure the creation of viable electronic records which will both protect the interests of and serve the needs of ImageSet, the authors suggest the following kinds of policies be implemented.

Back-ups

- A designated person and alternates should be assigned to perform daily back-ups.
- Back-up tapes should be labeled and organized in a consistent and logical manner that makes them easily identifiable to those who need to use them.
- Because of unforeseen danger to the ImageSet physical plant and, also, because of the vital nature of some of its records, there should be at least three sets of back-up tapes, at least one of which should be stored off site.
- The set of three back-up tapes should be rotated on a regular basis to assure even wear and the continued viability of the tape medium.
- All staff involved in the back-up operation should be trained and retrained as changes in procedures warrant it.
- A manual or standard operating procedure should be developed for back-ups.
- Catalog file synchronization and any other technical considerations of the back-up program which endanger the viability of the back-up should be understood by all staff trained in the back-up procedures.
- Back-up tapes should be routinely and randomly tested to insure that the information they contain remains viable.
Archives

- ImageSet management should decide whether or not an enduring archive of company records would be of some benefit.
- A manager should be designated as responsible for policy development and coordination in this area.
- Consideration of issues concerning legal, fiscal, historical, public relations, and/or client-related requirements should inform any decision to retain records on a long-term basis.
- If indefinite retention of all or part of its records is not deemed necessary, ImageSet management should determine the longest period, for any of the reasons mentioned above, during which the company might need or want to access records of completed jobs.
- Characteristics of the medium on which both paper and electronic records are stored should be considered to insure that they will be accessible for the period specified above.
- Determination should be made as to what inter-media links are required to re-access the records referred to above.
- Those links should be established and maintained during the required retention period.
- Policies should be developed to insure migration of digitally stored records in a usable form should advances in technology require this during the retention period specified above.

Conclusion

This case study provided an opportunity for the authors to attempt to apply the functional requirements for electronic evidence promulgated by a research team at the University of Pittsburgh to a small business that has invested heavily in electronic technologies. Very briefly, those requirements were found to provide helpful and flexible guidelines for the examination and assessment of the state of the record-keeping strategies of that small business.

It was difficult to translate motivations for record-keeping from the ones highlighted by the Pittsburgh team to ones that the managers and employees of a small business would recognize and understand. Although a small business manager might easily appreciate the issues which the Pittsburgh research team has raised, when balancing financial resources and immediate needs some of the functional requirements' complexity may be sacrificed for expediency.

It is not clear, therefore, if these functional requirements need to be taken as a unit, or if they can, in relevant combinations, simply be used to inform the development of record-keeping systems. Regardless, certainly a need exists for the implementation of small business systems utilizing the guidelines promulgated by the Pittsburgh team so that more can be learned about successful ways of managing records in a variety of settings.
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NOTES

4. Bearman, in a footnote in Electronic Evidence, p. 69, argues for the adoption of the term archive as a verb both because, as in this case study, archivists must communicate with customers in electronic records environments who often use it that way, and because it implies active involvement of archivists in systems development, implementation, and administration.
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