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Guidelines for Ensuring the Long-Term Accessibility and Usability of Records Stored as Digital Images

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Guidelines for Ensuring the Long-Term Accessibility and Usability of Records Stored as Digital Images

Government Records Technical Information Series No. 22

INTRODUCTION

Effective August 1, 1997 the Regulations of the Commissioner of Education were changed to reconcile and combine requirements for the retention and preservation of electronic records applicable to both State agencies and local governments. The consolidated requirements are now regulation 188.20 Retention and Preservation of Electronic Records. For all intents and purposes, the rest of the regulations affecting local government and State agency records management programs remain unchanged. The motivation for changing regulations affecting electronic records was to:

- increase the ability of local governments to take full advantage of imaging technology;
- reconcile regulations applied to State agencies and local governments.

Previous regulations applicable to local governments distinguished between images of records scheduled for less than ten years and those scheduled for ten years or more. In the case of the latter, local governments were required to retain "for the life of the record" either eye-readable (paper) or near eye-readable (microform) versions of the digitally imaged records. The new regulation do not distinguish between imaged and other electronic records or between records with short retention periods and those required to be retained for more than 10 years. They simply require both State and local officials to "ensure that electronic records are not rendered unusable because of changing technology before their retention and preservation requirements are met." In the case of permanent or archival electronic records, an agency or local government, in consultation with SARA, must determine that the records will remain usable and accessible through conversion of the records to new system hardware and software and through the creation of adequate documentation..." (full text of Section 188.20 is in Appendix A).

In substance, the changes in regulation only impact digital images of local government records that were originally on paper and which are

retained for ten years or longer. The regulations do not specify how a local government or State agency is to accomplish the requirement and do not preclude them from transferring imaged records to other media or maintaining microfilm copies for long-term preservation purposes. The following sections outline guidelines for government officials who choose to maintain records with retention periods of ten years or more in imaged formats. The guidelines represent best practices in the information technology management field and reflect established State information policies and standards.

GUIDELINES

Ensuring the long term accessibility and usability of records stored as digital images is largely dependent on how digital imaging systems are designed, implemented, managed, and migrated. A common misperception is that imaged records will be available as long as the physical media used to store the images last. Preservation of media is only one element that ensures long-term accessibility to records. The key to maintaining usable imaged records for long periods is the ability to transport the records, access tools, and required system functionality between hardware platforms, software platforms, and storage media over time. The life of an imaging system is conservatively estimated at about three years, while records retention and access requirements often exceed this short lifecycle. You must apply appropriate policies, management procedures, and technology from the point at which a system is designed until it is redesigned or migrated, to ensure that long-term records are accessible for as long as they are needed. This means you must make a long-term commitment of resources to preserve the accessibility and usability of digital images.

LEGAL AND POLICY CONSIDERATIONS

Specific laws and regulations related to governmental functions may define how records are created, formatted, and maintained. These requirements, as well as legal minimum retention periods established by records retention schedules, should be identified and accounted for when contemplating imaging applications. Therefore, you are urged to consult with legal counsel and appropriate State or federal agencies when considering an imaging application.

MANAGEMENT CONSIDERATIONS

Managerial practices throughout an imaging system's life will have an important impact on your ability to access and use imaged records. These management practices are especially important for migrating imaged records to new technology environments, which will help ensure long-term retention. Below are the management considerations you need to address as systems are planned and developed, as well as those specifically related to system migration.

1. System Planning, Acquisition, and Development

Budget for change —- Imaging hardware and software is relatively inexpensive to acquire. The true costs of imaging are centered on training, support, conversion of documents to digital formats, and the continuous system upgrades needed to stay current with the latest technology. Therefore, you should annually budget between 10 to 20% of the cost of the original system for maintenance, support, and upgrade.

Select a reliable vendor with a good track record —- Vendor instability is a threat to the long-term viability of imaging systems. You must carefully assess the long-term viability of vendors and the systems they sell when acquiring imaging systems that depend heavily on support from the vendor or manufacturer. This is particularly an issue when you are dependent on the vendor for system support.

Consider using a consultant or system integrator —- Independent consultants who are experienced in designing and installing imaging systems exist in most regions of the state. They may or may not also sell hardware and software products. You can contract with consultants to produce needs assessments and feasibility studies, specifications for systems, and requests for proposals (RFPs). Some consultants will conduct vendor conferences, respond to vendor questions, assist in vendor selection, and oversee vendors' work. Systems integrators are individuals or firms that conduct needs assessments and design and implement systems using components from various manufacturers best suited to user requirements. They also provide ongoing training, support, and upgrades for the systems they design and install. Value-added resellers represent the products of one or only a few companies. They usually "customize" the products they represent, and also provide support services. It is impossible to generalize about the nature and quality of services provided by each type of vendor. However, it is safe to say that independent consultants and systems integrators are most likely to provide solutions which are based on standards and which are open rather than proprietary (see Technological Considerations below), while value-added resellers are more likely to represent proprietary systems.

2. System Management

The management of an imaging system is key to the long-term integrity and authenticity of imaged records and their acceptance in legal proceedings and audits. Not all systems merit the same degree of monitoring and control, which should be commensurate with the degree of risk and the benefits to be gained from more effective system management. You must pay special attention to any system that produces records needed in legal proceedings and audits, or one that

potentially exposes your organization to a high degree of risk. Appendix B contains Technology Policy 96-10 - Legal Acceptance of Electronically Stored Documents, developed by the New York State Office for Technology (formerly the Governor's Task Force for Information Resource Management) for State agencies. Although this policy is not binding on local governments, it does outline the best practices for maintaining imaging applications to ensure that the records they produce or maintain will be accepted in legal proceedings. We recommend that local governments adhere to this policy when managing systems that capture long-term records.

3. Migration

A migration strategy is an essential component in ensuring long-term access to usable imaged records. Such a strategy should guide the movement of records from one generation of technology to another, as well as allow the recreation of access tools and necessary functionality for records' use. As mentioned earlier, you will probably have to migrate most imaged records with a retention period of ten or more years at least twice during their lifetime. The possible approaches to migration are expanded by the use of open systems, standard-compliant technology (see below), wise budgeting that accounts for training and technology upgrades, selection of a dependable vendor, and sound management of the system. You should also:

Plan a technology strategy that will include a continuum of actions such as:

- ensuring the preservation of imaged records on existing media through careful attention to environmental storage
- maintaining the functionality of existing hardware and software through upgrades of equipment and source code
- transferring the images, index and other related data through successive versions of hardware and software
- migrating optical imaging systems to successive generations of technology, as yet undefined

Monitor technology developments and trends, modifying migration plans as needed.

TECHNOLOGICAL CONSIDERATIONS

We have discussed the importance of migrating applications and records to new technologies in order to retain imaged records over a long period. The technology choices made when systems are developed or upgraded will often determine the ease of and available options for such migrations. If possible, you should ensure that the new technology complies with the following guidelines:

Select an open system solution. An open system solution is one in which the hardware and software components are purchased from different vendors and integrated into a system by a consultant known as a systems integrator. The open systems approach provides a maximum amount of choice to the system developer and end user of the system. Software used in an open system is "portable", which means that it can be moved to a variety of hardware. The software is also "scalable", which means that a system can be sized to handle both small volumes of users and records and expanded to larger volumes. Open systems can therefore be scaled up with limited disruption to operations, including the maintenance of records.

Select standard-compliant system components. System components that are compliant with industry standards and best practices can be more easily upgraded and migrated. Appendix C contains Technology Policy 96-16A Electronic Document Management Systems - Standards established for State agencies by the Office for Technology. We recommend that local governments adhere to these standards when acquiring imaging and related technology.

Controls and system auditing tools should be available. When acquiring systems, you should ensure that they are capable of providing audit trails and system security. Effective audit trails can automatically detect who had access to the system, whether staff followed existing procedures, or whether fraud or unauthorized acts occurred or are suspected. Software is available for keystroke monitoring, time and date stamping, virus detection, and other controls that can be built into the design of systems.

Select appropriate storage media and environment. Information and images that are important to your process or government should be stored on a server (or a mainframe acting as a server) and backed up either on a different computer or on different media. In the past WORM (write once, read many times) technology has been recommended for offline storage of imaged records when long-term retention and legal admissibility is the primary consideration. However, other media may be suitable for such records. If CD-ROM is used as a storage media, it must comply with the ISO 9660 standard, which specifies how a CD-ROM disk stores information. Regardless of media selected, government agencies should:

- ❏ require the use of optical media with a pre-write shelf life of at least five years and a minimum post-write life of twenty years, based on accelerated aging test results that report on specific disk areas
- ❏ store optical media in areas with a stable room temperature (65 to 75° F) where relative humidity does not exceed 50% and does not fall below 30%

- ❑ never operate drive systems in environments with high levels of airborne particles
- ❑ periodically clean optical media to remove dust and other particulates

FOR MORE INFORMATION AND ASSISTANCE

The State Archives and Records Administration provides records management services to state and local governments, including technical advice and assistance, publications, training and presentations, and consultations with government officials concerning records and information management issues. SARA has regional offices throughout the state; each office has an expert records specialist who can visit government agencies and provide on-the-spot advice. For further information, contact your regional office, or:

Government Records Services
State Archives and Records Administration
State Education Department
10A63 Cultural Education Center
Albany, New York 12230
518-474-6926

APPENDIX A

REGULATIONS OF THE COMMISSIONER OF EDUCATION 188.20

RETENTION AND PRESERVATION OF ELECTRONIC RECORDS

188.20 Retention and preservation of electronic records.

(a) An agency or local government shall ensure that records retention requirements are incorporated into any plan and process for design, redesign, or substantial enhancement of an agency or local government information system that uses electronic data processing, electronic optical imaging, or other automated information technology, to maintain or store electronic records.

(b) An agency or local government shall ensure that electronic records are not rendered unusable because of changing technology before their retention and preservation requirements are met. In the case of permanent or archival electronic records, an agency or local government, in consultation with SARA, must determine that the records will remain usable and accessible through conversion of the records to new system hardware and software and through the creation of adequate documentation as defined in subdivision (c) of this section. If a state agency cannot accomplish such a conversion, it shall transfer the archival electronic records to the State Archives in a usable and accessible format.

(c) An agency or local government shall develop and maintain up-to-date documentation about all permanent or archival electronic records sufficient to:

(1) specify all technical characteristics necessary for reading and processing the records;

(2) identify all defined inputs and outputs from the system;

(3) define the contents of the files and records;

(4) determine restrictions on access and use;

(5) understand the purposes and functions of the system;

(6) describe update cycles or conditions and rules for adding information to the system, changing information in the system, or deleting information; and

(7) ensure the ongoing retention of records by the agency or local government or the authorized transfer of records to an archives facility.

(d) A state agency shall prepare and store in a records center and local governments shall prepare and store in a secure off-site facility backup copies of permanent or archival electronic records in order to safeguard against loss.

(e) For magnetic computer media that contain permanent or archival electronic records, an agency or local government shall institute maintenance procedures to:

(1) verify no more than 6 months prior to use that the magnetic media used to store permanent or archival electronic records is free of permanent errors;

(2) rewind under constant tension all tapes and cartridges at least every 2 years;
(3) annually test a 3 percent statistical sample of all volumes, or 10 volumes of each type, of magnetic media, whichever is larger, to identify any loss of data and to discover and correct the causes of data loss;
(4) copy immediately onto new media any permanent or archival electronic records stored on media with 10 or more permanent errors per volume;
(5) copy all permanent or archival electronic records onto new media before the media is 10 years old;
(6) prepare external labels which provide a unique identifier for each volume, the name of the organizational unit responsible, and the permanent or archival electronic records title.

APPENDIX B

James G. Natoli - Director of State Operations

Governor's Task Force on Information Resource Management Technology Policy 96-10

Subject: Legal Acceptance of Electronically Stored Documents

Date: July 23, 1996

Purpose The purpose of Technology Policy is to outline the issues that must be addressed in developing or operating an imaging system for the legal admissibility of electronically stored documents.

Overview The State, through the Governor's Task Force on Information Resource Management and others, supports the reduction of paper documents stored by agencies, authorities, boards, and commissions. Digital imaging is being considered by many State agencies as a means to not only reduce the volume of records being stored, but, more importantly, to provide better service to customers and make operations more efficient. A digital image system is a system whereby documents are stored electronically — as digitized images — in lieu of paper storage.

Many agencies are, unfortunately, reluctant to pursue this relatively new technology. This stems from the perception that the documents produced from an image system are not legally admissible; thereby, forcing agencies to maintain vast stores of paper documents. By and large, this is not supported in research. Through the use of prudent planning, imaging systems can be integrated into agency operations to provide quick, easily accessible documentation relating to agency operations. These documents can be made admissible as evidence in courts of law pursuant to CPLR 4518. In most cases if evidence meets the standards of CPLR 4518, it will be acceptable in administrative hearings, however, agencies should investigate the specific requirements or procedures in which they are engaged.

There are a number of considerations in implementing an imaging system to insure that the system meets agency needs and allows them to eliminate the need to retain paper documents. These issues are outlined below. In addition, the Task Force will be issuing a listing of people who are available to provide assistance on the legal issues

pertaining to this subject. Finally, the Task Force will be developing legislation to eliminate statutory limitations, where appropriate, that inhibit the use of technology including imaging technology.

General Guidelines To insure the reliability and accuracy of the image systems and processes, agencies should have the following measures in place:

- ❏ Policies and procedures defining proper development, maintenance and use of the system.
- ❏ Periodic training, regular retraining, and support programs that insure staff understand the policies and procedures.
- ❏ Controls that monitor the accuracy and authenticity of data, the reliability of hardware and software, and the integrity and security of the system.

Moreover, agencies using, or intending to use, digital imaging technology should adhere to the following general guidelines:

- ❏ The imaging system should be integrated into the normal course of business activities.
- ❏ Records should be produced in a timely manner, or produced after the fact where the time lapse between an event and the creation of a record has no effect on content.
- ❏ The system should be verified to insure it accurately reproduces all originals so that any information which is readable and recognizable in the original, can be recognized on the digital image.
- ❏ If the image is compressed, standard compression and decompression algorithms should be used to insure long term readability and trustworthiness.
- ❏ Provisions and safeguards should be used to prevent alteration of digital images.

Checklist The following checklist outlines the issues that need to be addressed when formulating or operating an image system for the legal admissibility of hard copy produced documents. It is not designed to be all encompassing but should provide the general guidance necessary to assist program and legal staff in designing/running such a system.

General

- ❏ Research the legal statutes, rules, regulations, and contracts governing your agency's records creation, maintenance, retention and destruction.
- ❏ Determine if there any statutes, rules, regulations or contracts in place which specifically prohibit the usage of digital imaging by your agency.
- ❏ If required, propose legislation required to modify outdated statutes.

- ❑ Insure that the proposed imaging system provides information to fulfill the requirements of State and Federal Law.
- ❑ Insure that the imaging process or system can be shown to be trustworthy in producing accurate results.
- ❑ Provide formal instruction and training in system operation and maintenance, including image input, process, and retrieval.
- ❑ Document that procedures are being followed.
- ❑ Insure that the system creates or compiles records in the normal course of business to support the described function or activity.
- ❑ Insure that the system preserves information over time in identical or functionally equivalent form to the original information.
- ❑ Designate the best qualified person or persons that can credibly attest to the process' accuracy and reliability.

Accessibility

- ❑ Maintain records for inspection and audit for the full period required by law. (The period will vary by record type and use. Insure that established retention periods are done in accordance with the guidelines promulgated by SARA.)
- ❑ Keep records in an understandable form and insure that they can be made accessible within a reasonable amount of time.
- ❑ Organize the records in a manner to facilitate retrieval.
- ❑ Determine if special equipment has to be provided to read the records.
- ❑ Secure the required approved disposition authorization for all records associated with the system from the State Archives and Records Administration.

Procedures

- ❑ Procedures must be in place that provide detailed information on the imaging system records (herein after "records") throughout their entire life cycle. Such procedures include:
  - The steps leading up to the storage of records;
  - Plans for redressing tampering and deterioration;
  - The steps involved in the retrieval and destruction of records;
  - Plans for conversion to new technology, if required;
  - The steps which insure consistent quality control, problem resolution and other activities that might otherwise be subject to inconsistent action or misinterpretation;
  - Staff roles and responsibilities;
  - Staff maintenance of operation logs and run schedules to document reliability of the system; and
  - Adequate facilities, policies and procedures to insure that records stored off-line will be accessible, useable, and understandable for as long as they are needed.

- Tested, written procedures must be in place:
  - To monitor, control, and verify accuracy of imaged records by:
    - Designing, implementing, and documenting quality control;
    - Identifying all input and output documents in the system documentation;
    - Attesting to the accuracy and validity of records at the time they are created or updated; and
    - Developing and following systematic steps for data entry.
  - To insure timeliness of imaged records' input, processing, and output by:
    - Retaining any specially written program used to extract data from a system; and
    - Producing labels for media containing electronic records that identify the exact title, creating program unit, date, purpose, source and destination of records.
  - To document any problems and resolution of problems by:
    - Documenting any delays in data entry by keeping records of the date the original source documents were created and the date the data were entered, and keep records of any unusual delays in producing output.
  - Implementation of a new system may require transfer of volumes of old records kept as filed originals, copies or stored on some incompatible medium such as magnetic tape (backfile conversion). Transfers of this type are not "in the normal course of business" and care must be taken to establish a procedure and keep records to document the procedure followed in transferring these records to the news media.

Documentation

- Procedural documentation should include the following:
  - Overview of the purpose and uses of the system;
  - Policies and procedures for system operation and maintenance, quality control, security, testing, records retention; and
  - Software/hardware specifications and operation.
- The resulting documentation must be:
  - Accurate, up-to-date and maintained by knowledgeable staff;
  - Readily available and accessible;
  - Clear and understandable to external users as well as current and future employees who may be asked to testify on its behalf;
  - Current and immediately available if needed for court proceedings or other purposes; and
  - Retained pursuant to the SARA Retention Schedule.
- Document system support in operation logs and help desk (trouble) reports.

- ❑ Include the distribution of written procedures, the course material used, attendance records, remedial or refresher training programs, certification of training, etc.

Security

- ❑ Limit system access and update privileges to appropriate persons and prevent unauthorized modification of imaged records.
- ❑ Divide staff responsibilities to insure that individuals with an interest in contents of records are not responsible for administering tasks where the integrity of a system can be compromised.
- ❑ Record who used the system, what they did during use, and the results of the use.
- ❑ Maintain disaster preparedness plans and security back-up procedures.

Audit

- ❑ Conduct regular audits of the system and address their findings.
- ❑ Record statistically valid sample results pertaining to accuracy and remedial procedures.
- ❑ When/If unauthorized acts are detected, track all changes to data (creation, modification and deletion of records) in the system, including date, time, and source of change.

For additional information, please refer to:

- "Guidelines for the Legal Acceptance of Public Records in an Emerging Electronic Environment" (SARA); and
- The attached resource listing.

Resource Listing
Staff Willing to Advise on Legal
Questions Relating to Imaging

Name	Agency	Phone
Peter Favretto	Department of Law	518-474-1697
Brian Collins	Workers' Compensation Board	518-474-9588
Will Pelgrin	Office of the Task Force	518-473-5622
Alan Kowlowitz	State Archives and Records Administration	518-474-6771

APPENDIX C

James G. Natoli - Director of State Operations

Governor's Task Force on Information Resource Management Technology Policy 96-16A

Subject: Electronic Document Management Systems - Standards

Date: January 3, 1997

Purpose

The purpose of these standards is to provide general guidance to agencies in the area of image enabled Electronic Document Management Systems (EDMS).

Policy

The attached standards represent the State's Preferred Standards for EDMS technology, and elaborates on the information provided in Technology Policy 96-16 concerning Electronic Documents Management. The attached standards will be updated as needed, to reflect the changing technology marketplace.

The standards were arrived through review of industry's emerging directions and in consultation with system specialists employing this technology in State agencies and private industry.

Component	Preferred Standard/Recommended Best Practice
Image File Format	TIFF Version 6.0
Compression • For Documents • For Pictures • For Video • For Fingerprint Images • For Audio	• Consultative Committee International Telephone and Telegraph (CCITT) Group 3 and 4 [CCITT is now known as International Telecommunication Union-Technical (ITU-T)] • Joint Photographics Expert Group (JPEG) • Moving Pictures Experts Group (MPEG) MPEG-1 and MPEG2 • WSQ (FBI Standard) • Refer to Technology Policy 96-16
Architectural Recommendation	Purchase or develop Open System Solutions
The Network • Communications Protocol	• TCP/IP

Desk Top System/Client The predominant desk top computers in use in the business/office environment are based on Intel architecture and run a Windows operating system. Modern desktop applications and operating systems require more processing power (measured in MHZ) and more memory (measured in MB) to operate effectively. Inadequate memory results in a remarkable loss of performance and productivity.	• An evaluation of the market immediately prior to acquisition, as well as special needs should help to determine what to purchase. As of the close of 1996, a Pentium (class) Processor running at 133 MHZ with 32 MB of memory is the system of choice for the standard desktop environment. • Because of the potential for lower support costs, Thin Client architecture is being evaluated as a standard for use in installations where the applications are dedicated or predefined.
Desktop Operating System	• Windows 3.11, Windows 95, Windows N/T, OS/2 (Macintosh, and UNIX only for special requirements)
Video Monitors • Monitors used in imaging applications need to be large. Normally more than one window is on screen. Typically an 8 1/2 by 11 document is displayed alongside a word processing or application window. Production image applications should display an 8 1/2 by 11 document as full size.	• Large color screens, high quality • Minimum 17” • Monitors with extensive image viewing function should be a Minimum of 19” • Side by side document viewing may require 20” or 21” Monitors *NOTE: be aware that comparability problems may exist when used with Legacy applications • Minimum of 120 DPI resolution • Dot Pitch no greater than .28 • Fast Refresh Rate of 70 Hz or better; at high resolution (1024) - 768 or greater • Non Interlaced (NI)
Video Adapters • Video adapters accelerate the performance of a computer. • High resolution, large screen displays require adequate memory to buffer changing views.	To support EDMS display requirements: • Video adapters should utilize an accelerator chip set; • Video adapters should have a minimum of 2 MB of video memory. 4 MB to 8 MB are common for graphic applications; • Video adapters must be matched to the monitor (resolution supported, color palette, refresh rate) and the computer itself (bus, drivers, speed and operating system support); • For best product integration, video adapters should be configured and installed by the vendor that manufactures or assembles the system.
Scanners	• TWAIN • Image and Scanner Interface Specifications (ISIS)

Storage	• Stored on a server (or Mainframe acting as a Server) • WORM (Write Once, Read Many) technology should be used when data permanence is a primary consideration for retaining data. • If CD-ROM is used as a storage media, it must comply with ISO 96 60 Standard which specifies how a CD-ROM disk stores information.
Legal Admissibility Standards	• Refer to Legal Acceptance of Electronically Stored Documents in Technology Policy 96-10 • Guidelines for the Legal Acceptance of Public Records in an Emerging Electronic Environment (State Archives and Records Administration)
Data Base Software	• Open Data Base Connectivity (ODBC) Compliance
Standards Bodies and Reference	• American National Standards Institute (ANSI) • International Organization for Standardization (ISO) • International Telecommunications Union (ITU) • International Electrotechnical Commission (IEC) • ISO/IEC JTC
Reference Organizations	• Association of Information and Image Management (AIIM) • Document Management Alliance (DMA) • Institute for Electronic and Electronics Engineers (IEEE) • National Information Standards Organization (NISO) • National Institute of Standards and Technology (NIST)
Bar Code Standard	• refer to Technology Policy 96-16
OCR-ICR	• Application Specific
Multimedia Digital Motion Pictures	• AVI • MPEG