Michigan Trial Court
Guidelines and Standards for Digital Imaging

Produced by the
Michigan Supreme Court
State Court Administrative Office
On Recommendations of the Imaging Work Group

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MICHIGAN TRIAL COURT GUIDELINES AND STANDARDS FOR DIGITAL IMAGING

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INTRODUCTION

For a number of years, courts have considered the use of digital imaging systems to decrease physical storage space of paper documents, but that is the least significant benefit of digital imaging. An imaging system is not likely to be cost justified solely on the basis of storage space reduction. It is the online access to documents and valuable information, used in conjunction with a court's case management system and various workflow processes, that is of the most benefit to courts. Because of recent technological advances, digital imaging systems offer workflow benefits and other features that justify the associated costs.

A digital imaging system can improve a court's operations and procedures by capturing, storing, retrieving, and sharing records in an electronic environment that interacts with the court's case management system and the document management system. However, there are limitations to the system. Although imaging systems have other inherent benefits, they are primarily designed to provide rapid retrieval of documents rather than for the preservation of records to meet long-term retention requirements. Potential users of imaging systems often confuse their records retention requirements with retrieval needs, although these are two separate and distinct issues. Users of such a system can typically find a document more quickly than they can find the paper or microfilm version and they can more effectively use the documents for a variety of reasons in conjunction with workflow software and e-mail. However, these digital imaging systems may not meet the requirements necessary for records retention. Courts will face many challenges in attempting to fulfill both needs in a single system. A court should become fully acquainted with both the benefits and limitations of digital imaging with regard to both records retention and records retrieval when embarking on a project to implement a digital imaging system.

Ensuring the long-term accessibility and usability of records stored as digital images is 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 lasts. Although this may be true for paper and microfilm records, imaging systems have limited stability and their long-term availability is dependent on particular hardware and software configurations. Because of the rapid pace of changes in technology, it is unlikely that a single set of imaging components will be able to satisfy retention and access requirements for any public record, especially long-term and permanent records.

A. Purpose

A digital imaging system is a type of document management system. Therefore, a digital imaging system will be most useful when it interfaces with its case management system, other document management systems, workflow procedures, and e-filing and other electronic transactions rather than being used merely as a replacement for storage of paper documents.

To that end, these guidelines and standards are provided to: 1) aid courts in developing digital imaging systems that ensure digitized court records, regardless of format, are authentic, reliable, have integrity, and are useable both during the active phase and

throughout the long-term retention period of the records, and 2) provide practical guidance to courts in capturing, storing, retrieving, and retaining digitized court records in such a manner that they are useful within a larger electronic information system.

For definitions, see Appendix A. For information about electronic information systems generally, see Appendix B.

B. Responsibility

Courts must comply with *Michigan Trial Court Case File Management Standards* established by the State Court Administrative Office (SCAO) pursuant to AO 1999-4, records standards prescribed by the Supreme Court and Michigan Court Rules 1.109 and 8.119, Michigan Compiled Law 600.1428, and various other statutory requirements for preserving, reproducing, and maintaining records. Any system that aids the courts in achieving this responsibility in an efficient and cost-effective manner should be considered.

Maintaining records exclusively in electronic format requires a serious and ongoing commitment of financial and human resources for the life of the record. This commitment includes routine and/or required software and hardware maintenance, replacement of media and system components to achieve cost effectiveness, and migration of data and images to future systems. The life of media supporting an imaging system is conservatively estimated at about three years, while records retention and access requirements often exceed this short lifecycle. Policies, management procedures, and technology must be applied from the point at which a system is designed to ensure that records are accessible for as long as they are needed.

Courts must implement reliable records management practices for the electronic environment that provide the court with procedures to: 1) ensure the legal acceptability of their electronic records, 2) reduce records access and retrieval costs through automated workflow, 3) reduce maintenance costs by migrating nonactive records to less expensive media or destroying records in accordance with the retention schedule, and 4) identify economies to manage the migration of records to successive generations of technology and systems.

C. Benefit

Sound records management practices can provide a number of benefits to the courts, such as reduced costs for storage of obsolete records, reduced resources for the retrieval of records required for business activity, and greater accountability in the expenditure of funds. An electronic information system can reduce tasks associated with manual workflow by streamlining procedures. The benefits of imaging reside primarily in the access and distribution of active information. High density storage, multiple user access, rapid retrieval, ease of distribution, ease of updating, and duplicating are among the many benefits of good imaging systems.

Multiple media may present the best solution for some record collections. A combination of various media options operating in concert may provide the most cost-effective and efficient solution. Some records are good candidates for multiple layers of redundancy. Using imaging as an example, records may be digitized to gain benefits inherent in imaging systems (quick retrieval, decentralized access, etc.) and also may be maintained as either microfilm or paper to satisfy the long-term retention and preservation needs. Records that may be suited for these types of applications are often voluminous, have high retrieval levels for a short period of time, but also have long-term retention periods, and they may be stored in a decentralized environment that requires multiple user access. An example is probate court records.

D. Documentation of the Imaging System

All documentation created for planning, implementing, and maintaining an imaging system must be maintained in accordance with the *General Records Retention and Disposal Schedule #16 – Michigan Trial Courts*. All these records are included under Operational Records (16.009). See also Section 3: System Implementation, Section C for specific details about imaging system documentation.

SECTION 1: PROJECT PLANNING

A. Is Imaging the Right Solution

The decision to implement an imaging system must be based on clear business need. Therefore, the key to the successful design, integration, and implementation of a digital imaging system is proper analysis of that need.

The State Court Administrative Office, with the assistance of an Imaging Work Group, has created these guidelines and standards to assist the courts with this analysis. They are intended to offer practical advice as courts tackle the three major phases of system development: project planning; technology assessment and selection; and system implementation. Each phase is addressed in a separate section of the guidelines. By using the guidelines and standards, courts will gain a better understanding of the opportunities, challenges, scope, and scale of a digital imaging project.

B. Legal Issues

A court must develop strategies to meet legal requirements including compliance with the approved *General Records Retention and Disposal Schedule #16 – Michigan Trial Courts*.

MCR 8.119 and the *Michigan Trial Court Case File Management Standards* require courts to comply with specified retention periods for records. Courts should adopt procedures that protect restricted records from unauthorized access, ensure the integrity of all data that the system holds, and allow public access to records consistent with these requirements, whether or not that information is maintained electronically.

C. Records Management Issues

Many records management issues must be considered when planning an imaging system. For instance, every record series has a retention and disposal schedule stating how long records must be retained. A records management plan must be in place and followed scrupulously to ensure that information is kept and remains accessible for the time period required by the retention and disposal schedule.

Procedures manuals and other system documentation should become a part of a court's approved records and disposal schedule. Addressing these concerns at the design stage and putting in place the proper procedures from the beginning will ensure routinely managed retention and disposal of records within the system.

One of the greatest challenges facing courts today is the continued viability of their systems and preservation of their records. To meet this challenge, courts must employ strategies that transcend rapid technology changes. The success of such strategies depends upon several factors including open-systems architecture, component upgrades, stable storage environment, stable file format, and accurate data transfer. The goal of these guidelines

and standards is to provide courts the tools they need to design digital imaging systems to ensure long-term functionality.

The Records Reproduction Act (MCL 24.401-24.406) regulates reproduction of public records by Michigan government agencies at all levels. This law requires the Michigan Department of History, Arts, and Libraries (now referred to as Records Management Services of the Department of Technology, Management and Budget) to promulgate technical standards to ensure the continued accessibility and usability of records that are digitized throughout their retention period. This document supplements the *Technical Standards for Capturing Digital Images from Paper or Microfilm*.

A court is responsible for managing its records and information and must implement appropriate policies, procedures, and business practices in order to ensure that the digital imaging system selected by the court will protect the authenticity, reliability, integrity, and usability of the records contained in the system and will address a migration path to a new system, which will provide complete protection for the full-retention period of the records stored in the system. In doing so, the court must follow those specific laws, rules, and standards that govern court records.

If an independent contractor, a consultant, or some other party outside of government produces a reproduction of a record for a court, the court shall ensure that the party acts in compliance with these guidelines and standards. A court may ensure compliance through execution of a contract that contains adequate legal safeguards.

D. Budget Issues

The total cost of a digital imaging system includes not only the initial purchase of hardware, software, and technical support, but also ongoing costs such as: 1) storage media including optical disks, hard drives, network servers, etc., 2) maintenance contracts that include preventative maintenance, hardware repairs, software upgrades, and telephone technical support (typically this expense runs about 15 percent to 20 percent of the original purchase price per year), 3) onsite technical support, and 4) labor.

Courts must also consider periodic costs that are associated with ever-changing technology such as: 1) refreshing media every three to five years depending on the media, 2) technology upgrades when necessary, 3) replacement of obsolete hardware about every three to five years, 4) migration as necessary, 5) system documentation that reflects changes as a result of upgrades and migration, and 6) training staff on new systems.

Other costs to consider are the consequences of market change. Although these costs may be difficult to quantify, they are inevitable, and courts must budget for this change.

Before selecting a vendor, a court should research the vendor's stability and reputation to ensure that the company has provided others with excellent products and services. Courts

should also ensure, as much as possible, that the company will remain in business as long as the imaging system will be in operation.

Finally, system failure is always a possibility. Courts should have a contingency plan in place to provide guidance if the system is down, whether it be for a several hours or several days. At a minimum, the plan should indicate how soon the vendor can be onsite, procedures for users while the system is down, and action to be taken by support staff.

E. Feasibility Study

Before purchasing an imaging system, courts must conduct the following analyses.

1. Needs Assessment

Conduct a needs assessment to determine the benefits that will be gained by using a digital imaging system. An understanding of the total business process is critical to a project's success. A good starting point is to define and analyze existing document workflow for each type of case. Look for problems and try to detect opportunities for improvements, particularly in the areas of document storage, retrieval, and access. The knowledge gained in the needs assessment phase will prove invaluable in the system design and product selection phase.

2. Customer Satisfaction

Consider how internal and external users will or will not benefit from the new system.

3. Alternatives Assessment

Microfilming should be among the alternatives researched. Microfilm and digital imaging each yield different, yet excellent benefits. For example, imaging is more cost effective than use of microfilm when retrieval rates are high. However, microfilm is ideal for long-term records retention and preservation and when access to records has decreased. When comparing alternatives, be certain to consider ongoing costs to determine the cost of ownership over time. It may be most beneficial to use both digital imaging and microfilming.

4. Economic Feasibility and Cost-Benefit Analysis

Determine whether expected cost savings, productivity improvements, and other benefits outweigh initial purchases and ongoing expenses, including hardware, software, network, office space, and staffing considerations.

5. Technological Feasibility Analysis

Verify that reliable hardware, software, and storage media can be acquired or developed and will integrate with existing systems. Consider the rapid rate of technological change and build it into the implementation plan.

The use of open systems and nonproprietary solutions will help ensure continued viability of the imaging system. Additionally, the use of open systems will increase the numbers of information technology (IT) professionals and consultants capable of performing work on the proposed imaging system.

6. Operational Feasibility Analysis

The goal of an operational feasibility analysis is to discover the level of willingness and ability of management and staff to operate, use, and support an imaging system.

F. Selecting a Developer/Vendor

Once a decision is made to proceed with a project, it is necessary to determine who will develop the project for the court. Sometimes, in-house IT departments are able to develop the applications. More often, however, a vendor is contracted. Choosing the best vendor is vital to the success of a project and is dependent upon matching services and products of a vendor with clearly-defined goals and expectations of the project.

1. Defining Goals and Expectations

Establish long-term goals of the project, including what the court wants to accomplish and who and what will be affected. Identifying these goals early can keep the project and vendor on track.

To find appropriate solutions, it is imperative to document the processes of the court that are to be handled within the imaging system and to state the expected results. These business practices must be conveyed to the developer(s) of the system to ensure that all needs are met.

2. Development Considerations

Consider internal resources for in-house development and ongoing support, as well as outside vendors. Also consider whether there is a turnkey solution available that will meet the court's needs or whether a custom application is more appropriate. Whether a court proceeds in-house or contracts the services of an outside vendor, the same considerations for development will apply. If an outside vendor is appropriate, a request for proposal (RFP) may be required. Listed below are some of the specific components to consider.

a. **Hardware and Network Foundations.** Determine what hardware is needed and whether it is compatible with the standards of the court's IT department. If there is to be an interface with existing functionality, consider the costs of linking multiple components. Factors to consider with regard to the capture hardware (scanner) are the functionality of the hardware outside the network (thick client, which is fully functional even when it is not connected to the network, versus thin client, which is not functional unless it is connected to the network), daily scanning workload, and various other features of the scanner (such as batch processing, simultaneous creation of microfilm and OCR, etc.).

b. **Software.** Determine whether the functionality meets the court's needs and how the software will operate with your existing systems. Questions to consider are whether the capture software will interface with an existing case management system and whether the repository that stores the images will allow workflow. Factors to consider with regard to software are the repository for images, workflow, interfaces with other programs and departments, data conversion, and security.

When evaluating the repository, verify how quickly documents will be available in the court's system and whether they will be easily accessible to the staff. The repository should allow multiple points of entry such as facsimile machines, scanners, or e-filing systems. Discussion should be held regarding the archiving of older items, ownership of the documents, and whether a vendor is permitted to sell those documents.

When evaluating the security of the system, a court must determine that the vendor will take measures to ensure both the system and the documents are secure and kept confidential. The vendor should be able to authenticate the documents and provide audit logs or reports that, at a minimum, indicate who has had access to the documents and whether those documents have been tampered with or altered.

c. **Upgrades.** Because technology changes rapidly, systems become outdated within a very short period. Establish how often upgrades will be made, what those upgrades will cost, and what the upgrades include. Patches or minor fixes should be offered free because they only update a certain portion of the system. New releases, however, introduce new functionality and are handled differently depending on the vendor. This should be determined early in the development and selection process to eliminate surprises and hardships later.

d. **Support.** Most users will need assistance with the new application. Determine what support will be available, including initial site visits and hours available. Vendor help desk hours should be compatible with the court's working hours. Determine how support will be delivered, such as through a toll-free line, web support, or e-mail support.

e. **Training.** Ideally, the vendor should provide training on the use of the system. The level of training should be determined within the contract, whether it is a "train-the-trainer" system or full training of all users. Decide whether the training will be at the onset of implementation only or ongoing.

3. Vendor Reliability and Stability

Vendor reliability and stability are crucial when choosing to entrust valuable documents to a third party. It is necessary to determine the length of time a company has been in business, how many employees it has, and who, specifically, the court will be dealing with on each specific task. Ask for financial information, such as an annual report or letter from the accountant stating they have adequate financing. Check references and seek opinions and reactions from other organizations that have dealt with the vendor.

SECTION 2: DIGITAL IMAGING TECHNOLOGIES

A. The Imaging System in General

Imaging is the process of converting human readable media, such as paper or microfilm, into information that can be stored and retrieved electronically. Basically, an image is a digitized picture of a document, drawing, or photograph (somewhat like a photocopy) that is viewed on a computer. An imaging system's components are interdependent. Hardware, software, compression techniques, file formats, and media all have to work together. Each component is an essential element using interfaces and drivers. A court needs a basic understanding of what each component does in order to make an informed decision to implement an imaging system.

A system is a combination of components working together. The system's architecture is its design or configuration. The best method to ensure system viability over time is to use open-systems architecture. An open architecture means the system's components use standards or specifications that have been made public by their designers. The use of standards and publicly available specifications mitigates the effect of incompatibility. Technical staff can upgrade hardware and software with minimal effect on the overall system and without significant risk of data loss. Thus, the integrity of the system is more likely ensured by using open-systems architecture.

Recommendation:

- Use open-systems architecture or require vendors of proprietary systems to provide a method to migrate to nonproprietary configurations (see Section 3, System Implementation, J, Migration).

B. Hardware

Imaging hardware performs three basic jobs. It captures, stores, and retrieves digital images. The results of the needs assessment and workflow analysis will guide the hardware decision-making process. When configuring the system, plan for peak workload. If time is a factor, configure the system's capacity to process the highest volume the court's system handles on a given day. Plan for predictable expansion. If workload increases 10 percent per year, configure the system so that it can meet those needs for the near future (three to five years).

Bear in mind the level of funding that is available for implementing a new system and how much funding will be available in the future. Prepare specifications for hardware that will require vendors to continue to support and maintain their products. Establish performance standards and incorporate them into specifications for hardware, requiring vendors to support them with a substantial performance bond. The more complex the system, the more costly it will be to implement and to maintain.

1. Capture

Typically, when people think of a digital imaging system, what immediately comes to mind is scanning. Within the scanning process are several components and considerations. Among these are scanner types, feed-method and throughput, and resolution.

Examples of capture hardware are flatbed scanners that consist of a platen glass on which documents are manually positioned for scanning, automatic document feeders that allow stacks of pages to be fed through the scanner, simplex feeders that capture one side of a page at a time, duplex feeders that capture both sides of a page in a single pass, high-speed scanners that process several hundred pages or more per hour, film readers that scan microfilm and microfiche, and facsimile machines that can be connected to the imaging system so that faxed images can be imported into the indexing and retrieval software. Also important are hardware interfaces and software drivers because both are an integral part of the capture process.

a. Scanner Types

There are two broad categories of scanners: document and graphics. As the name implies, document scanners are designed to capture typical black-and-white or gray scale documents. Conversely, graphics scanners are designed to capture color.

b. Feed Method and Throughput

The feed method is the way paper or microfilm is moved across the scanner. When selecting the appropriate feed method, an important consideration is the condition of the documents. Frail documents should not be run through an automatic document feeder. Conversely, high-volume documents should not be placed individually on a flatbed.

Throughput is the rated speed at which the scanner can process pages. For example, a scanner rated at 60 ppm should be able to process 60 pages per minute. Vendor claims of throughput are useful for comparison; however, throughput on real-world documents will vary somewhat. It is likely the scanner's throughput will be less than its rated speed.

c. Scanning Resolution

Scanning resolution is measured in dots-per-inch. This is literally a measurement of the dots per square inch of an imaged document. If you were to look at an image under a microscope, you would see that each character is made up of many, many dots. Scanners are capable of supporting resolutions from 72

to 8800 dpi. For example, if an image is captured at 600 dpi, it has 360,000 dots per square inch.

Typical office documents generally can be accurately captured using a scanning resolution of 200 dpi. More detailed documents, such as maps or drawings may require a higher resolution. Also a higher resolution, generally 300 dpi, is necessary to produce a relatively legible text file. There is a tradeoff between image quality (legibility) and storage. The higher the scanning resolution, the larger the image file.

Since the ability to capture a quality image is dependent upon the content and quality of the original document, different resolutions should be tested for a given collection of records to determine the optimum resolution necessary to satisfy the intended use.

d. Enhancement Techniques

Enhancement techniques common in scanning software such as deskew, despeckle, crop, and rotate are acceptable, so long as the content that exists in the original document is not altered.

e. Interfaces and Drivers

Interfaces connect devices, such as scanners and other peripherals, to each other and to the system software. In scanning, the interface controls how fast data is moved from the scanner to the software. The common interfaces are video, serial, parallel, and SCSI (pronounced Scuzzy, stands for Small Computer Systems Interface). Video interfaces tend to be used in proprietary systems. Through digital customization, video interfaces can enhance scanning performance. SCSI is an industry standard parallel interface. It can support very high transfer rates. Serial and non-SCSI parallel interfaces that cannot support high data transfer rates tend to be used with low-end scanners. These scanners typically have a lower throughput than those using video or SCSI interfaces.

Software drivers are another means of communication between devices and software programs. Each device and each program has a set of commands that it understands. Drivers interpret the commands from the program to the device and from the device to the program. The standard software drivers that digital imaging systems use are TWAIN (Technology Without an Interesting Name) and ISIS (Images and Scanners Interface Standard). TWAIN drivers support basic functions. ISIS drivers can be customized to take advantage of all the scanner's features. Systems using TWAIN tend to experience slower throughput than those using ISIS.

Recommendations:

- **Scanner:** Choose a scanner appropriate for the condition of the documents. Plan the scanning process for peak workload and plan for expansion as needed.

- **Interface:** Use the interface that is appropriate for the system. Fully document all customization. If proprietary interfaces are employed, budget for programming when the need to migrate occurs.

Mandated Standards:

- **Section 13. Scanners and Scanning:** (1) Except for regular computer enhancement routines used to improve the legibility of a scanned record, an agency shall not use an imaging system that is capable of altering a public record as scanned. Recorded text or characters in original records shall not be edited. (2) An agency shall periodically evaluate scanner quality. For more information on performing scanner quality evaluations, an agency may refer to ANSI/AIIM MS44-1998 (R1993) - Recommended Practice for Quality Control of Image Scanners. [Michigan Department of History, Arts, and Libraries, *Technical Standards for Capturing Digital Images from Paper or Microfilm*.]

- **Section 7. Resolution:** (1) The minimum resolution level for standard business documents is 200 DPI/PPI. The minimum resolution level for line art, including but not limited to engineering drawings, and for those records intended for optical character recognition processing, is 300 DPI/PPI. For records that are designated to be transferred to the state archives in digital form, an agency may use higher resolution. The agency may contact the state archives to ascertain the appropriate resolution for records identified for permanent preservation or for transfer to the state archives. (2) The use of a lower resolution level may be justified when it is determined through testing that the desired results of the capture process cannot meet the agency's business needs using a recommended format with a higher resolution level. Images shall exhibit a degree of legibility and readability comparable to the source document. [Michigan Department of History, Arts, and Libraries, *Technical Standards for Capturing Digital Images from Paper or Microfilm*.]

- **Section 8. Enhancement Techniques:** An agency may employ a digitized record enhancement technique which is commonly used in scanning software, including but not limited to deskew, despeckle, crop, and rotate. An agency may not use an enhancement technique which alters content that exists in an original record. [Michigan Department of History, Arts, and Libraries, *Technical Standards for Capturing Digital Images from Paper or Microfilm*.]

2. Storage

Storage systems can be broken into three categories: online; near line; and offline. Which type of storage system you select will depend upon how fast and how often you must access the images. Online storage means the image file can be displayed in a matter of seconds. Either the file is stored on a hard disk or the media is in a system drive. Near-line storage means the image file can be retrieved by the system and loaded into a drive to be read. Offline storage means the image file resides on media (such as microfilm, optical disks, and data tapes) that requires human intervention to load into a system drive.

Recommendation:

- Consider retrieval-time requirements when selecting storage options. Depending on your access requirements, you may want to consider a hybrid system – online access for active records, near line for semiactive, and offline for inactive. Documents should remain in the judiciary's possession or control on an internally-supported system.

3. Retrieval

Once the image is stored, it must be retrieved for viewing and/or printing. The monitor and printer must be able to render the image as accurately as possible. Performance of these devices has dramatically improved and costs have dropped considerably in recent years.

a. Monitors

The resolution at which your monitor can display an image is measured in picture elements or pixels. A pixel is a single point in a graphic image. The relationship between scanning dpi and display and print resolution is not one-to-one. Display quality largely depends on the monitor's resolution, that is, how many pixels it can display. The higher the display resolution, the more colors the monitor can display. Bear in mind, however, the display color may not be important for the task. Another important consideration is the viewable display size. Image viewing on small monitors is undesirable; eyestrain and frustration set in early. If users will retrieve and view images often throughout the day, a large monitor is recommended and justified. If they will retrieve images sporadically, a mid-size monitor may be acceptable.

b. Video/Graphics Adapter

The video adapter is a card that plugs into the computer. Monitors are analog devices, and, therefore require an adapter to translate digital information into an

analog signal. You can spend hundreds of dollars on a high-quality monitor but it will only generate an image as good as the video adapter.

c. Printers

Two broad categories of printers are laser and ink jet. Laser printers fuse toner onto paper to produce images. Ink-jet printers use wet ink. The ink has to be placed in specified locations which means the jets have to pass over the page multiple times to produce the image. Laser printers generally produce higher resolution images faster than ink-jet printers. No matter what type of printer is used, the print process can be extremely slow because uncompressed image files are so large. A print accelerator board can speed up the process dramatically. The accelerator board is installed in the printer. The board instructs the imaging system to send the image file to it in a compressed format. The board then decompresses the image and prepares it for printing.

Recommendations:

- **Monitor:** Select a monitor capable of high-resolution display. Select at least a 19" monitor for frequent retrievals. Select at least a 21" monitor for continuous retrievals.
- **Adapter:** Carefully review monitor specifications and system compatibility.
- **Printer:** Consider print resolution and throughput requirements when choosing a printer.

C. Software

Two broad software categories are the computer's operating systems (OS) and various applications. The computer's operating system performs basic input and output functions. The OS provides a platform on top of which applications, such as digital imaging systems, can run. There are innumerable software application choices. Application programs must be written specifically to run on a particular OS. Which OS is used depends on the system hardware, which includes both network servers and user workstations. This can be an issue when future migrations occur.

Application software must perform certain tasks such as scanning, indexing, database management, and image retrieval. The scanning function is required to operate the scanner and translate the image captured by the scanner into a graphics file format capable of being stored. Indexing information is necessary to identify the image and is stored in a database. The database management system (DBMS) catalogs the location of the stored image on the storage media and adds that information to the index information created by the indexing application. Whatever DBMS is procured, it should understand structured query language (SQL). Finally, the image retrieval application must be capable of retrieving an image by

querying the database for its location, calling the image to a monitor or a printer, and converting the file into a format that particular device can use.

When purchasing software, the court should select a system with an open design rather than a proprietary design. An open system provides the most flexibility when choosing equipment and will support interconnection, information systems integration, and information sharing. The court should prepare software specifications that require vendors to: 1) continue to support and maintain their products, 2) use standard rather than proprietary compression algorithms to make future migrations of data more certain and reliable, and 3) supply programs or provide services to periodically test the reliability of the system. The court should also establish performance standards and incorporate them into specifications for software, requiring vendors to support them with a substantial performance bond.

Recommendation:

- Choose the operating system and applications that satisfy the system's requirements. Your existing network infrastructure may influence the decision-making process.

D. Compression

Image files are larger than text files. A two-page document created and stored as a word processing file might be 20 kilobytes; the same document, printed, scanned, and stored uncompressed might be as large as one megabyte. Because image files are so large, they are usually compressed to reduce the required storage space and to allow faster transmission over the network. However, the image files must be decompressed for viewing and/or printing. Although proprietary techniques for compression exist, their use is not recommended for retention or preservation because the proprietary techniques will severely limit the ability to migrate to newer technologies.

Ideally, compression should be "lossless," where the data are compressed by efficient coding of the information in the image and where the reconstructed image contains the same amount of information.

"Lossy compression" algorithms compress images by selectively removing information from the image. These algorithms are designed to remove statistically redundant information, as well as perceptually irrelevant or unimportant information, leaving only useful information. The decompression process results in the production of the image with reduced information.

Mandated Standard:

- **Section 5. Compression Method Standard:** (1) Compression methods may be used to reduce the amount of data needed to store or transmit a representation of a specific image. (2) If an agency uses a compression method to compress data,

the lossless compression method T-4 (formerly known as group III) or the lossless compression method T-6 (formerly known as group IV), developed by the International Telecommunication Union - Telecommunication Standardization Sector, "ITU-T," shall be used. (3) Lossy compression may be justified only when the retention value of the records is short term or when it is determined through testing that the desired results of the capture process cannot meet the agency's business needs using a recommended format with lossless compression. (4) The selection of a compression scheme is application specific. The characteristics of the record, the tasks the system is designed to perform, and the user requirements to be satisfied shall be taken into account when selecting a compression scheme. [Michigan Department of History, Arts, and Libraries, *Technical Standards for Capturing Digital Images from Paper or Microfilm*.]

E. File Formats

The file format tells the computer how the information in the file is stored. The most common file formats are tagged image file format (TIFF), portable document format (PDF), and joint photographic experts group (JPEG). Vendors may develop proprietary formats for a variety of reasons and with various benefits.

TIFF and PDF are the most commonly used formats for digital imaging systems. JPEG is most commonly used for photographs and typically uses a lossy file compression.

A file format is necessary to transfer compressed images between systems. An image file format contains a header with a description of the image attributes and a body containing the compressed image. TIFF has been standardized for electronic interchange, and is the most commonly used interchange format. TIFF supports the most commonly used compression algorithms including T4, T6, JPEG, and JBIG.

Mandated Standard:

- **Section 6. File Format Standard:** (1) A file format with lossless compression shall be used, so long as the format has the capability of conversion of its images to TIFF without a significant loss of information. (2) The use of a file format with lossy compression may be justified when the retention life of a record is short term or if the agency determines through testing that the desired results of the capture process cannot meet the agency's business needs using a recommended format with lossless compression. [Michigan Department of History, Arts, and Libraries, *Technical Standards for Capturing Digital Images from Paper or Microfilm*.]

F. Media

When designing a storage solution as part of a digital imaging system, the court must consider several factors including retrieval-time requirements, records retention and

preservation, and costs over time. The Records Reproduction Act allows for the use of a variety of media types. See MCL 24.401 *et seq*.

Ensuring long-term accessibility and usability of records stored as digital images is 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 lasts. Although this may be the case for paper and microfilm, imaging systems have limited stability and depend on particular hardware and software configurations. Because of the rapid pace of technology change, it is unlikely that a single set of imaging components will be able to satisfy retention and access requirements for any public record, especially long-term and permanent records, unless the records are continually migrated into updated versions of the software and hardware. This is not a major problem for records that have shorter retention periods, but records that have long-term storage requirements may better be maintained with multiple layers of redundancy.

A combination of various media options operating in concert may provide the most cost-effective and efficient solution. Therefore, an imaging system should offer simultaneous imaging and microfilming capabilities.

Recommendation:

- The imaging system should be designed to implement different retention periods for various documents within a given case without the need to migrate data to new hardware and software.

Mandated Standard:

- **Section 14. Media Standard:** An agency may use any media suitable for the storage of digital images as identified in the act, if the images are managed in a system which has an appropriate level of certainty for the recovery and security of the images and related index attributes. [Michigan Department of History, Arts, and Libraries, *Technical Standards for Capturing Digital Images from Paper or Microfilm*.]

SECTION 3: SYSTEM IMPLEMENTATION

Implementing an imaging system requires careful planning of resources and of the imaging system. The court should have in place a plan and budget to allow updating and operation of the imaging system. The court should identify legal issues regarding access to and integrity of the records in the imaging system. Additionally, the court should have a plan in place for records storage and migration.

A. Staffing

Successful implementation of an imaging system requires cooperation of many different internal and external resources. Internally, staff must be hired or trained to operate and maintain an imaging system. At a minimum, the court will need a system administrator and/or project leader and staff to operate the imaging system, which includes scanning and indexing, quality control, and other processing needs.

The system administrator or project leader must have a sound working knowledge of the organization and the records it creates and must also acquire the skills and knowledge necessary for the design, maintenance, and daily operation of the system.

Imaging system staff must have a respectable working relationship with the staff who provide support for the court's imaging application and who can provide advice regarding system compatibility, data integrity, and system upgrades.

The system vendor must be able to provide training, maintenance, and ongoing support in operating the court's imaging system. Both imaging staff and technical support staff must have an effective working relationship with the vendor's technical support staff to ensure the system's smooth operation.

B. Legal Issues Revisited

Statutes and court rules define how records are created and maintained and will affect a court's decisions with regard to its implementation of a digital imaging system. A court needs to develop strategies to meet these legal requirements including compliance with the approved *General Records Retention and Disposal Schedule #16 – Michigan Trial Courts*.

MCR 8.119 and the *Michigan Trial Court Case File Management Standards* require that data be maintained for specified periods of retention and, unless the information is specifically restricted, for public access. Courts should adopt procedures that protect restricted records from unauthorized access, ensure the integrity of all data that the system holds, and allow public access to records consistent with these requirements.

Whether imaged or not, the ability to rely on records as evidence for legal, audit, and other purposes depends on establishing their authenticity and reliability. The court must be able to prove that a recordkeeping system is used as part of the normal course of business. This

can be accomplished by documenting the specifications of the imaging system, training staff in the operation of the system, ensuring the integrity of the records, and conducting random audits.

C. Imaging System Documentation

To maintain an effective operation and ensure retrieval of data from the electronic records system as the operating environment changes over time, there must be full documentation of system administration and standard operating procedures. See also **Documentation of the Imaging System** in the Introduction on page 3.

1. System Administration

Document all system equipment specifications (including hardware, software, brand names, version numbers and dates of installation, upgrades, replacements, and conversions). Document the contact information for manufacturers and vendors. Develop technical operations manuals (data structures and content, file layout and data dictionaries, enhancement algorithms, etc.).

2. Standard Operating Procedures

Develop standard operating procedures to define all aspects of the imaging system. Depending upon how the capture process and the organization is structured, procedural documentation may be contained in one or more formats. Procedures should include at least the following and describe how to: a) test and clean equipment, b) prepare documents, c) capture images, d) back up data and images, e) provide access and security, f) administer and maintain the system, and g) leave audit trails.

When developing the general standard operating procedures for document preparation and image capture, define the necessary tasks, scanner settings, and product deliverables for each record type being scanned. These include: a) a description of the current environment, b) a description of the desired result, c) document preparation requirements and instructions, d) documented results of the quality control sample, e) index attributes, f) scanner settings, g) file format and compression method, h) resolution, i) and quality control processes.

D. Training

Training manuals should be developed and maintained and uniform training procedures put in place to ensure that the court's imaging staff is properly trained in operating the system. Courts should maintain written documentation showing: 1) who has been trained in the system, 2) that those individuals follow the normal recordkeeping practices established by the court, and 3) that those individuals have the necessary skills to operate the imaging system. The court's human resources department may be able to help develop training

records and guidelines. Training documentation should be kept with the imaging system documentation; see **Documentation of the Imaging System** in the Introduction on page 3.

E. Indexing and Labeling

Maintain documentation relating to the coding system and index for as long as it relates to any labeled storage medium that utilizes that coding system. The documentation should be kept with the imaging system documentation; see **Documentation of the Imaging System** in the Introduction on page 3.

1. Indexing

Retrieval of images is entirely dependent upon effective indexing and is vital to the success of the application. A variety of indexing methods can be employed. Indexing for each application will depend upon the characteristics of the record, the system requirements, and end-user retrieval requirements. Indexes may take many forms, including databases, spreadsheets, full-text OCR, and file-naming conventions that help locate and present an image or series of images. Operating procedures should include an index check for accuracy at the time the index is created.

To ensure that the value of the information in the record is maintained and can be retrieved from an electronic record, three elements must be present: a) content, which refers to the subject matter of the record, b) structure, which focuses on the use of fonts, headings, spacing, etc., as part of the meaning of the content, and c) context, which refers to the relation of one record to other records.

The content, structure, and context a system captures in the index and label component is commonly referred to as metadata. Metadata is essentially "data about data." It describes an information resource. It is important to capture the image metadata to allow future users to discover the context in which the record was produced and to permit the owner of the record to manage it. At a minimum, the metadata captured should include: a) the title of the document, b) the creator or author, c) the date the document or image was created, d) a unique identifier such as a coding system for different document types, e) format that includes the operating system, software configurations, and versions, f) a statement that clearly represents the concept and essential nature of the record, g) whether special authority is needed to access the information and who has that authority, h) the data type (written document, photograph, etc.), i) keywords, and j) comments for additional information.

Also, when information will be maintained and accessed over a number of years, the indexes must be developed and documented with future users in mind, including other courts. For example, when cases are transferred to another court (whether trial or appellate) that court will need not only the images, but the index associated with those images.

In systems where the imaging system interfaces with the case management system, courts may want to research the capability of exporting the register of actions (ROA) from the case management system so that the links between the image and the ROA are preserved for use in another environment.

2. Labeling

It is essential to label disks, tapes, and similar storage media with care because it is impossible to determine content merely by visual inspection. Accurate labeling is even more critical when the information and its index are on different media. At a minimum, the label should include: a) identifiers, including the creator, date created, and division where created, b) hardware, operating system, and software required to access a document, c) encoding standard and version, d) level of security or restricted access, and e) retention dates of the information on the media.

If the disk or other format is too small to include all the information on the label, then establish a coding system that can be linked back to an index that holds all of the vital information.

Mandated Standard:

- **Section 10. Indexing Standard:** (1) An agency may use any functional method to index digitized records, if the method adequately addresses all characteristics of the stored images, the requirements of the storage system, and end-user retrieval requirements. (2) Acceptable indexes include but are not limited to databases, spreadsheets, full-text optical character recognition systems, document profiles, and file-naming conventions. [Michigan Department of History, Arts, and Libraries, *Technical Standards for Capturing Digital Images from Paper or Microfilm*.]

F. Records Integrity and Quality Control

1. Records Integrity

Imaging systems must produce consistent results for the records they create and identical outcomes for all data processes. This refers to both the physical and intellectual integrity of the information.

Maintaining the physical integrity is concerned with two issues. First is the actual condition of the media storage device. Questions such as whether the media has deteriorated, been scratched, or exposed to extreme temperatures need to be answered. Second is the reliability of the record after compression or migration. After such events, it should be determined whether the appearance of the document has been altered in a way that could be misleading.

The intellectual integrity of a record is based upon the authenticity or truthfulness of the information within the record. A system should be in place for electronic records that validates access procedures and documents modifications to the records over time. To establish the integrity of the records, standards should be in place to ensure that: a) the identity of a record's creator is verified, b) permission to read, write, and delete files is appropriately restricted, c) periodic system audits are conducted, d) data transmission includes data error checking and correction, and e) data are regularly backed up.

2. Quality Control and Assurance

Quality control and quality assurance are critical elements in the imaging process and should be addressed in the standard operating procedures (see Imgaing System Documentation, C on page 20). There is a significant difference between 1) the quality control steps provided during the capture process that are designed to detect and correct errors and 2) quality assurance, which is designed to verify the validity and accuracy of the overall delivered product.

a. Quality Control

Quality control is defined as those steps incorporated into the production process designed specifically to reduce error. Quality criteria may include overall legibility, the smallest detail legibility captured, the completeness of detail, the dimensional accuracy compared with the original, the scanner generated speckle, the completeness of overall image area, the density of solid black areas, color fidelity, image skew, image rotation, image cropping, index data accuracy, and image and index format compliance.

After the quality criteria for various attributes have been defined for the production process, procedures should be established to ensure that these criteria are met. These procedures should be documented in the statement of work/job statement.

b. Quality Assurance

The technical standards require the court to adopt written quality assurance procedures for inspecting the digital images that are produced. Quality assurance must be conducted before any original documents are destroyed. Courts should have a quality assurance process in place for each type of record being scanned.

Quality assurance is the process by which the total product is examined to ensure that the quality criteria initially established in the preproduction test have been met. The purpose of this quality assurance process is to establish sampling plans and procedures to inspect the individual attributes of the created product.

Upon receipt of an image product, the court should verify that the imaged documents match the expectations defined by the sample set. Verification is needed to ensure that the attributes agreed upon at the onset of the project are successfully delivered.

There are three categories of information that must be established before the scanning process that can be derived from the preproduction test; the specific attributes of the work product that are critical to the end users, the acceptability level expressed as a percentage, and a batch size expressed as a number of items that are contained within the batch.

From this information an inspection model can be developed that will, within the limits of the acceptability level, assure the court that the delivered work product has met the established standard. The specific attributes that need to be defined are those elements of the image that are determined to be critical to the overall success of the conversion process. In a production environment, it is not sufficient to simply say, "This is a good image." Objective criteria that define what a good image is must be established so that the production process can routinely and reliably produce the defined "good image." Attributes must be defined objectively. Subjective attributes cannot be measured reliably. Be careful to select attributes that are critical to the desired output.

The end-user quality assurance process must be performed in a timely manner in order to conform within agreed upon acceptance terms. **Quality assurance should be performed before the original documents are destroyed.**

For more information regarding establishing a statistical sampling model refer to ANSI/AIIM TR34-1996 – *Sampling Procedures for Inspection by Attributes of Images in Electronic Image Management (EIM) and Micrographics Systems.*

Mandated Standard:

- **Section 11. Quality Control Standard: (**1) An agency shall assemble a sample set of source documents or records equivalent in characteristics to the source documents for the purposes of evaluating scanner results against defined quality criteria prior to production. (2) An agency shall establish quality control criteria based upon the results of the preproduction quality sample. The production process shall take account of the quality control criteria. (3) An agency shall produce a new sample for quality if the conditions or attributes of documents to be digitized change or if the equipment used to scan the documents changes. [Michigan Department of History, Arts, and Libraries, *Technical Standards for Capturing Digital Images from Paper or Microfilm*.]

- **Section 12. Quality Assurance Standard: (**1) An agency shall adopt written quality assurance procedures for inspection of digital images that are produced. (2) Quality

assurance shall be conducted before the original documents are destroyed. (3) For more information regarding quality assurance an agency may refer to ANSI/AIIM TR34-1996 - *Sampling Procedures for Inspection by Attributes of Images in Electronic Image Management (EIM) and Micrographics Systems.* [Michigan Department of History, Arts, and Libraries, *Technical Standards for Capturing Digital Images from Paper or Microfilm*.]

G. Auditing

The court must conduct periodic and random audits of the imaging system to ensure that the system is operating within established records management guidelines and that the data remain viable. Before beginning an imaging project, management should establish both acceptable error limits and procedures for correcting systems that do not meet those limits. The documentation of an audit should be kept with the imaging system documentation; see **Documentation of the Imaging System** in the Introduction on page 3.

The imaging system must maintain reference tables containing information and rules governing the identification of authorized users, as well as contextual information on the authorization and deauthorization of users.

H. Backup and Storage

Full, frequent, and regular backing up of electronic records and indexes is a critical operating procedure to ensure data protection and information "trustworthiness." Storage of these backups should be **off-site** in a secure, fire-safe facility.

Because the environmental tolerances for storage of electronic media vary greatly, the manufacturer's specifications should be followed. These specifications should include information relating to ideal temperature, humidity, and storage orientation. Both the working and security storage locations should adhere to these specifications. If the specified storage conditions cannot be met, ensure that the environmental conditions of the storage location are stable.

Recommendations:

- **Backup:** At a minimum, the entire digital imaging repository and any associated components should be backed up on a weekly basis. The court may want to move the weekly backup off-site. Daily changes made to the digital image repository should be backed up incrementally. Note that backup is not the same as redundancy.

- **Storage:** The court should establish internal policies and procedures regarding the storage of digital images.

I. Risk Management and Disaster Recovery

As part of the initial planning phase, a comprehensive disaster management plan should be developed. The plan should include standard backup and recovery procedures, as well as quality control and storage procedures such as those mentioned previously. In the case of a disaster, maintaining off-site copies of records may be the only answer for recovering data. A test of both the prevention and data recovery guidelines should be conducted on a regular basis.

J. Migration

In addition to policies and procedures for physical storage of media, it is vital that strategies be in place for migration of records. Electronic media are less stable than paper. Because rapid changes in computer technology are constant, a conversion strategy for retaining and retrieving stored information should include migration strategies.

Migration is the process of transferring digital information from one generation of hardware and software to the next. Currently, migration is the best practical means for retaining and retrieving data over time. Migrations must be carefully planned, executed, and audited to ensure against data loss. Although migration is a time-consuming and expensive process, with proper strategies in place, the costs can be minimized.

An additional factor that must be considered for a migration strategy is arranging for the rights to copyrighted software. Courts must negotiate with vendors for the rights to the data and the ability to migrate necessary software components to access the data.

K. Retention and Preservation

The court is responsible for managing its records and information and shall implement appropriate policies, procedures, and business practices in order to ensure that a digital recordkeeping system selected by the court will: 1) protect the authenticity, reliability, integrity, and usability of the records contained in the system, and 2) will address a migration path to a new system that will provide complete protection for the full retention period of the records stored in the system. In addition to the images, courts must maintain records of the business transactions associated with the creation, receipt, movement, storage, and retrieval of these images.

Courts are required by law to retain and to make available certain types of records for a determined period of time. No records may be destroyed unless they are on the approved *General Records Retention and Disposal Schedule #16 – Michigan Trial Courts*. Each record series has a defined retention period, which periods are further defined as short-term (from creation up to ten years) and long-term (ten years and longer). After a record has met its retention period, the court should determine the disposition of the record in accordance with the approved *General Records Retention and Disposal Schedule #16 – Michigan Trial Courts*.

If a policy decision is made that records will be disposed at the end of their retention period, it is important that a plan for disposal is in place before implementing the imaging system. Under this policy, standards must be developed to ensure records are completely destroyed when the retention periods have been met.

Preservation in the digital world means ensuring continuing access to high quality, eye-readable original source documents. Permanent records will require a well-developed migration strategy and the most diligent efforts to keep them accessible. As much contextual information as possible must be captured to ensure the historical meaning of the image is not distorted. When a court is required to transfer records to state archives pursuant to the approved *General Records Retention and Disposal Schedule #16 – Michigan Trial Courts*, issues such as the organization, indexing, format, resolution, compression algorithm, and storage media of digital images must be considered. Courts may contact the state archives for information and technical assistance to ask questions about the suitability of an electronic format or technique for archival storage.

Mandated Standard:

- **Section 3. Archival Records Standard:** Issues that affect the long-term and permanent preservation of the records include, but are not limited to, organization, indexing, format, resolution, compression algorithm, and storage media. An agency with a question about the suitability of an electronic format or technique for archival storage may contact the state archives for information and technical assistance. [Michigan Department of History, Arts, and Libraries, *Technical Standards for Capturing Digital Images from Paper or Microfilm.*]

L. Access

A clear recordkeeping system is necessary to 1) provide for clear identification of the record, 2) permit easy and timely retrieval of individual records and record series, and 3) retain the records in a useable format.

The technical ability to provide access must be balanced against the court's legal obligations concerning the digital images. Pursuant to MCR 8.119(H), a court may provide access to the public information in a register of actions through a publicly accessible website, however, all other public information it its case records may be provided through electronic means only upon request. Therefore, a court should carefully plan for public access to its digital records.

In addition, statutory and court rule requirements create obligations that each court must meet in providing public access to documents. See Administrative Order No. 2006-2, Privacy Policy and Access to Court Records (which references 2004 PA 454, the Social Security Number Privacy Act), SCAO Administrative Memorandum 2006-4, Privacy Policy and Access to Records, at

http://courts.mi.gov/Administration/SCAO/Resources/Documents/Administrative-Memoranda/2006-04.pdf, and the chart concerning nonpublic and limited-access court records available at http://courts.mi.gov/Administration/SCAO/Resources/Documents/standards/cf_chart.pdf.

Mandated Standard:

- Images of documents from case files shall not be posted to a publicly accessible website. A court may provide access to the public information in a register of actions through a publicly accessible website.

CONCLUSION

The procedures found in *Michigan Trial Court Guidelines and Standards for Digital Imaging* provide an introduction to some of the many issues a court will face when planning, selecting, and implementing an imaging system. These guidelines and standards are intended to be used as a starting point for courts to begin the decision-making process. Because of the number of issues involved, no single set of guidelines or standards will be able to answer all questions. Regardless of the issues a court will face, project planning is the key to successfully selecting and implementing an imaging system. Courts and court staff should direct questions to Trial Court Services.

APPENDIX A

DEFINITIONS

An **authentic** record is one that can be proven to be what it professes to be, to have been created or sent by the person claiming to have created or sent it, and to have been created or sent at that time. To ensure the authenticity of records, state agencies and local governments should implement and document policies and procedures which control the creation, receipt, transmission, maintenance, and disposition of records. This will ensure that record creators are authorized and identified, and that records are protected against unauthorized addition, deletion, alteration, use, and concealment.

A **reliable** record is one whose contents can be trusted to be a full and accurate representation of the transactions, activities, or facts to which they attest and can be depended upon in the course of subsequent transactions or activities. Records should be created at the time of the transaction or incident to which they relate, or soon afterward, by individuals who have direct knowledge of the facts or by instruments routinely used within the normal course of business to conduct the transaction.

The **integrity** of a record refers to its being complete and unaltered. It is necessary that a record be protected against unauthorized alteration. Records management policies and procedures should specify what additions or annotations may be made to a record after it is created, under what circumstances additions or annotations may be authorized, and who is authorized to make them. Any authorized annotation, addition, or deletion to a record should be explicitly indicated and traceable.

A **useable** record is one that can be located, retrieved, presented, and interpreted. It should be capable of subsequent presentation as directly connected to the business activity or transaction that produced it. The contextual linkages of records should carry the information needed for an understanding of the transactions that created and used them. It should be possible to identify a record within the context of broader business activities and functions. The links between records that document a sequence of activities should be maintained. The records must be accessible for the duration of the retention period.

Michigan Department of History, Arts, and Libraries, Technical Standards for Capturing Digital Images from Paper or Microfilm.

Section 2. Definitions

(1) As used in the standards, the following definitions apply:

(a) “Act” means the records reproduction act, 1992 PA 116, MCL 24.401 et seq.

(b) “Agency” means a governmental entity or a governmental official acting in his or her official capacity, including but not limited to a state officer, employee, department, bureau, center, division, board, commission, council, authority, or other independent or dependent subunit of the executive branch of state government; an agency, board, commission, or council in the legislative branch of state government; the judiciary; and a county, city, village, intercounty, intercity, or regional governing body, council, school district, special district, or other municipal

corporation, or a board, department, commission, council, or other independent or dependent subunit of a municipal corporation.

(c) “Department” means the department of history, arts, and libraries.

(d) “DPI” and “PPI” mean and refer to dots per inch and pixels per inch, respectively. The terms may be used interchangeably.

(e) “Lossless compression method” means a compression method by which data are compressed by efficient coding of the information in the image and where the reconstructed image contains the same amount of information as the original data.

(f) “Lossy compression” means a compression method by which data are compressed by efficient coding of the information in the image and where the reconstructed image is only an approximation of the original data.

(g) “Quality assurance” means the process by which the total product is examined to ensure that the quality criteria initially established in the pre-production test have been met.

(h) “Quality control” means and consists of those steps that are incorporated into the production process and are designed specifically to reduce error.

(i) “Standards” means the technical standards adopted in this set of technical standards.

(j) “State archives” means the state archives of Michigan.

(k) “Tagged image file format” or “TIFF” is a standard image file format recommended by the American National Standards Institute, “ANSI”, and the Association of Image and Information Management, “AIIM”.

APPENDIX B

REFERENCES

1. Michigan's Records Management Services
http://www.michigan.gov/dtmb/0,5552,7-150-9141_21738---,00.html

2. National Standards and Recommended Practices

The following national standards and recommended practices issued by the American National Standards Institute (ANSI), the Association for Information and Image Management (AIIM), the National Association of Photographic Manufacturers (NAPM), and the International Association for Standards (ISO) may contain additional information that will assist state agencies and local government with complying with Michigan law. These publications are available from the Association for Information and Image Management, 1100 Wayne Ave., Suite 1100, Silver Spring, MD 20910-5699, http://www.ansi.org/.

ANSI/AIIM MS6-1981 (R1993) (R1999) – Microfilm Packaging Labeling

ANSI/AIIM MS8-1988 (R1998) – Image Mark (Blip) Used in Image Mark Retrieval Systems

ANSI/AIIM MS14-1988 (R1996) – Specifications for 16 and 35 mm Roll Microfilm

ANSI/AIIM MS23-1998 – Practice for Operational Procedures / Inspection and Quality Control of First-Generation Silver-Gelatin Microfilm of Documents

ANSI/AIIM MS45-1990 – Recommended Practice for Inspection of Stored Silver Gelatin Microforms for Evidence of Deterioration

ANSI/AIIM TR2-1998 – Glossary of Document Technologies

ANSI/AIIM TR34-1996 – Sampling Procedures for Inspection by Attributes of Images in Electronic Image Management (EIM) and Micrographics Systems

ANSI/NAPM IT9.17-1993 – Photography-Determination of Residual Thiosulfate and Other Related Chemicals in Processing Photographic Materials-Methods Using Iodine-Amylose, Methylene Blue and Silver Sulfide

ISO 15489-1:2001 – Information and Documentation – Records Management – Part 1 – General

ISO 15489-2:2001 – Information and Documentation – Records Management – Part 2 – Guidelines

ISO 18901:2002 – Imaging materials – Processed silver-gelatin type black-and-white films – Specifications for stability

ISO 18911:2000 – Photography – Processed safety photographic films – Storage practices (formerly ANSI/NAPM IT9.11-1993)

3. **NCSC: Records/Document Management Resource Guide: Electronic Court Records**
   http://www.ncsc.org/Topics/Technology/Records-Document-Management/Resource-Guide.aspx

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   http://www.ncsc.org/services-and-experts/technology-tools/technology-vendors.aspx

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4. Delaware Department of State, *Model Guidelines for Electronic Records* (Revised December 1, 2003), available from the Delaware Public Archives.

5. Michigan Department of History, Arts, and Libraries, *Best Practices for Reproducing Public Records* (2005), available from Records Management Services.

6. Michigan Department of History, Arts, and Libraries, *Technical Standards for Capturing Digital Images from Paper or Microfilm* (August 15, 2005), available from Records Management Services.

7. Minnesota Office of Technology, *Electronic Records Management Guidelines, Digital Imaging* (March 2004), available from St. Paul: Minnesota Historical Society.

8. Missouri Records Management Guidelines, *Digital Imaging Systems* (February 22, 2001), available from the State Records Commission.

9. New York State Archives, *Imaging Production Guidelines* (2006), available from the State Archives and Records Administration, Government Record Services.

10. South Carolina Department of Archives and History, *Public Records Stored as Digital Images: Policy Statement and Recommended Practices,* Public Records Information Leaflet No. 13, (2003), available from the Archives and Records Management Division.

11. State of Nebraska, *Electronic Imaging Guideilnes* (March 2003), available from the State Records Administrator.

12. The University of the State of New York, *Guidelines for Ensuring the Long-Term Accessibility and Usability of Records Stored as Digital Images,* Government Records Technical Information Series No. 22 (1998), available from the State Archives and Records Administration.