RECOMMENDED PRACTICE

Analysis, Selection, and Implementation of Electronic Document Management Systems (EDMS)

An AIIM Recommended Practice Report prepared by the Association for Information and Image Management International

Approved
June 5, 2009

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aiim
The Enterprise Content Management Association

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Analysis, Selection, and Implementation of Electronic Document Management Systems (EDMS)

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Abstract
This industry recommended practice presents a set of procedures and activities, which should be considered and/or performed during all aspects of analyzing, selecting and implementing electronic document management systems. Using the information contained in this document will enable the organization to consider all of the recommended steps, procedures, and activities highly recommended for EDMS projects, thereby significantly improving the project results. This document has been prepared by a team of recognized industry experts following ANSI/AIIM rules and procedures associated with the creation of standards and guidelines to ensure all input is considered and incorporated where appropriate. While there are many proprietary approaches and methods used by individual companies and organizations, this best practice has been prepared and updated to provide clear and agreed-upon guidance associated with industry best practices in a vendor-neutral format. This document provides a categorization of relevant national and international standards and reports enabling users and organizations to quickly identify and locate required information for all aspects of the EDMS project.

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Foreword

At the time this AIIM Recommended Practice was approved, the Standards Board of the Association for Information and Image Management International had the following members:

Name of Representative	Organization
Stephen Levenson, Chair	U.S. District Courts
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This standard was approved by Implementation Guidelines Committee. At the time this standard was approved, the Implementation Guidelines Committee had the following members:

Name	Organization
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John Breeden	Virginia Department of Transportation
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Rick Laxman	Family Search
Joyce Sayed	County of Sonoma
Andrew Taylor	Georgia Department of Archives and History

INTRODUCTION

This document provides detailed information associated with the analysis, selection and implementation procedures associated with Electronic Document Management Systems (EDMS). The development of this document is a result of organizational requests to receive vendor-neutral industry information associated with technology standards, technical reports, and industry best practices for EDMS projects

Terms and acronyms associated with various aspects of EDMS technologies commonly change over time, as technology developers and vendors update product lines and solutions to address customer requirements. In most cases the new terms and acronyms reflect updates and changes to how these technologies are utilized, typically by incorporating additional levels of functionality and very rarely resulting in an entirely new core technology. This is important to note as the core EDMS technologies are constantly maturing and solution providers are identifying not only new approaches to addressing organizational issues and requirements, but also expanding the use of these technologies into areas previously unconsidered.

For purposes of discussion, the terms “document management” and “content management” can be considered to be synonymous. As the Electronic Content Management industry (previously referred to as the document management industry) has matured over the years the ability to store electronic information has greatly expanded from hardcopy document scanning into digital images in the early 1980's to the management of any digital or electronic document that today is referred to as electronically stored information.

It is important to note that as the various technologies associated with storing and managing electronically stored information continue to mature and change, terms and acronyms will continue to change and, at times, be used to denote something different than previously used in the past. As such, organizations are constantly challenged to keep pace with how an updated technology is currently being referenced, especially when the same core technology is referenced differently between vendors, and at times various groups of suppliers.

The first portion of this document provides detailed information describing each of these technologies, how they operate, and inter-operate.

The second portion of this document provides detailed information associated with currently available industry standards and technical reports.

The third portion of this document provides detailed information related to industry best practices associated with all the customary project phases for EDMS technology analysis, selection and implementation. These project activities are considered to be industry best-practices. It has been demonstrated over the past 10 years that organizations following all the recommended steps and activities have a much greater level of project success while greatly decreasing, and in most cases, eliminating unnecessary technologies, user licenses, etc. This is very important, especially with most organizations carefully examining all expenditures related to all aspects of technology procurements.

This document provides detailed guidance to organizations considering the use of any of those technologies that comprise EDMS (document imaging, document/library services, routing/BPM/workflow, Records Management Applications, Forms management, Enterprise Report Management, etc.). It should be noted and acknowledged that a complete records management program is critical to any organization and is integral to any complete and thorough management plan associated with electronic information regardless of whether it is referred to as a "document", "record", "audio", "video", etc. internally by the organization.

Analysis, Selection, and Implementation Guidelines Associated with Electronic Document Management Systems (EDMS)

1 Scope

The scope of this AIIM Recommended Practice is to present a set of procedures and activities, which should be considered and/or performed during all project phases from initial business analysis, through vendor selection, and technology implementation. Recognizing that the implementation of processes to manage electronically stored information requires significant participation from the affected business units along with guidance from the technical teams, records managers and organizational management, this document has been prepared taking all perspectives into account.

There is a difference between Enterprise Content Management (ECM[1]), Electronic Content Management (ECM[2]) and Electronic Document Management systems. For purposes of discussion within this document, the use of the acronyms EDMS and ECM are identical from the perspective that both require the use of core technologies along with policies, procedures, and methodologies to successfully design, implement, and manage electronically stored information.

This document provides both user and technical levels of information and guidance detailing specific recommended activities and project tasks/phases recognized throughout the EDMS industry as being the EDMS industry best practice. This best practice is related to analyzing business processes, evaluating appropriate/relevant technologies and ensuring complete technology implementation where required by the organization.

All relevant project steps, tasks, and activities contained within this document, along with compliance with relevant industry standards and guidelines should be examined and "certified" by the technical implementation team, especially when required by government codes and/or regulations.

The term electronic document management used throughout this document is intended as an "all-encompassing" term referring to capture technologies (scanning, indexing, Optical Character Recognition (OCR), forms, digital creation, etc.), management technologies (document services, workflow, and other work management tools), and storage (primarily non-alterable or Write Once Read Many) technologies. This document will provide information to users related to what technical reports, guidelines, and standards have been developed for technologies commonly available in document management systems.

Over the years, the industry has utilized various terms and acronyms to describe these core technologies including, but not limited to:

- Technology Utilization
- eCommerce
- Content Management
- B2B
- P2G
- G2G
- Knowledge Managment
- EDMS
- ECM
- ERMS
- EDRMS
- BPM
- EC3M
- WCM
- ECRM
- Etc.

[1] Enterprise Content Management s defined in AIIM TR2 and ISO 12651 as a set of tools and methods that allows an organization to obtain, organize, store and deliver information crucial to its operation. It can be broken down into five major components – capture, manage, store, preserve, and deliver content.

[2] Electronic Content Management is the same as EDMS in that it focuses on the technology aspects of the overall environment.

It is important for organizations to recognize that technology vendors commonly develop new terms and acronyms to present updated product technology and new uses for existing technologies. While these applications and/or products typically provide additional levels of functionality, they are still based on at least 1 of the following core EDMS technologies including:

- Document/Library Services
- Document Imaging
- Forms Management
- Routing/Workflow
- ERM

Additionally, it is important for organizations to recognize that many acronyms have different meanings depending on which industry and/or organization is using those terms. For example, the acronym BPM is used to describe Business Process Management, which is a process undertaken by the organization and also used to reference Business Process Modeling and currently being used by some vendors and vendor specific organizations to redefine Workflow. The use of this term is a good example of how vendors re-use terms commonly utilized by the industry for other purposes. Throughout this document and specifically in the document sections describing various implementation process and activities, the organization is reviewing how processes function and how the organization manages these business processes. From that perspective the entire lifecycle of any EDMS project can be referred to as business process management. This is not to indicate that there can be only 1 definition for any term, but organizations should carefully consider in what context the vendors/suppliers are using these redefined terms to ensure the desired/anticipated technology is implemented.

Another example is the use of ERM which is used to describe Electronic Report Management, but also used by records managers to describe Electronic Records Management. This document provides information related to those terms and acronyms recognized by the document management industry that best describe the underlying technologies enabling readers to have a foundation from which they can determine what is required by the organization regardless of the product name, or acronym used by various vendors.

This document is not intended to be an all-inclusive paper on electronic document or content management and does not attempt to influence any single technology or provide legal guidance or legal opinions. While there are storage technologies other than optical/magnetic currently available (i.e., microfilm, microfiche, and hybrid storage systems) that are not included in this report, those technologies should be reviewed if determined to be appropriate by the end user organization

1.1 Purpose

To educate and raise awareness related to planning, implementation, and management of document management systems used to create and store electronically stored information. It is intended to be from a vendor neutral perspective and includes input from various state and county agencies responsible for mandating statewide or countywide procedures, recognized industry experts, private organizations' records managers and other end-users. As many public and private organizations throughout the United States have already, or are in the process of evaluating, planning or implementing these technologies, this industry standard best practice has been developed incorporating methodologies, approaches, and considerations benefiting all types of organizations.

1.2 Objective

To define the topics and raise issues for each topic defined for the collective target audience: business units, Information Technology (IT) staff, RM staff, vendors, and/or integrators and provide clear guidance related to recommended practices and procedures through all aspects of the project lifecycle.

1.3 Audience

This document is intended for anyone responsible for or interested in planning and implementing electronic content or document management systems. There are 5 general groups of people involved in the planning and when appropriate the implementation of these technologies. These groups of people include: Information Technology resources, records managers, archivists, end-users, and management. Each of these groups of people are commonly involved in discussions related to what technology is desired along with the anticipated results. As such,

it should be recognized that these different groups of people will use different terms and acronyms to describe the information being managed and the concepts being followed. Regardless of the terms and acronyms that are used, they are all considering the same information and/or technologies while using different terms. All the various perspectives are very much valid and the organization should consider the issues and perspectives while remaining focused on the organization issues and requirements.

1.4 Exclusion

This document is not intended to be an all-inclusive report on document management and does not attempt to influence any single technology or provide legal guidance or legal opinions. While there are storage technologies other than optical/magnetic currently available (i.e., microfilm, microfiche, and hybrid storage systems) that are not included in this report, those technologies should be reviewed if determined to be appropriate by the end user organization. Technical reports and guidelines associated with these technologies are available under separate cover from AIIM International.

2 Normative references

The following normative documents contain provisions which through reference in this text, constitute provisions of this recommended best practice. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this recommended best practice are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO/DIS 10244, Document management – Business process/workflow baselining and analysis
ISO/TS 12032, *Document imaging – Statistical sampling for document images*
ISO/TR 12033, *Electronic imaging – Guidance of document image compression methods*
ISO/TR 12037:1998, *Electronic imaging – Recommendations for the expungement of information recorded on write-once optical media*
ISO 12651:1999, *Electronic imaging – Vocabulary*
ISO/DIS 12651-1, Electronic imaging - Vocabulary
ISO 12653-1:2000, *Electronic imaging – Test target for the black-and-white scanning of office documents – Part 1: Characteristics*
ISO 12653-2:2000, *Electronic imaging – Test target for the black-and-white scanning of office documents – Part 2: Method of use*
ISO/TR 12654:1997, *Electronic imaging – Recommendations for the management of electronic recording systems for recording of documents that may be required as evidence, on WORM optical disk*
ISO/TR 14105:2001, *Electronic imaging – Human and organizational issues for successful electronic image management (EIM) implementation*
ISO/TR 15801, *Electronic imaging – Information stored electronically – legal admissibility and evidential weight*
ISO 15489-1 Information and Documentation-Records Management-Part 1: General
ISO/TR 15489-2 Information and Documentation-Records Management-Part 2: Guidelines
ISO 17799 Information technology -- Security techniques -- Code of practice for information security management.

3 Terms and definitions

For the purposes of this Recommended Practice, the terms and definitions given in ISO 12651, ISO 15489 and ANSI/AIIM TR 2 apply.

4 Electronic Document Management technologies

4.1 General

Many organizations still function almost entirely in a “paper-driven” environment or a combination of both electronic and hardcopy environments. This environment is a direct result of the need of the organization to maintain information on all aspects related to business activities resulting in such a significant increase in retained information that it has become difficult for some organizations to function as effectively as they did prior to the introduction of the internet and wide acceptance of electronic communications. A very important consideration for an organization evaluating or considering EDMS technologies is to first implement the necessary foundational components and then add other functionality as required by the business units, enabling the organization to fully adopt the new technologies and modify the business processes as required without adversely impacting day-to-day operations.

To help frame the concepts within this industry best practice document, common terms used to reference these technologies should be discussed. Electronic Document Management Systems (EDMS) have become an all-encompassing term, referring to the integration of various underlying technologies including:

- Document imaging (used to convert hardcopy documents into digital format)
- Document/Library services (used to manage digitally born documents) (Note: Most EDMS systems allows users to use this technology to also manage scanned documents if desired)
- Business Process Management (BPM) / Workflow (used to automate work processes including the creation, routing, track, and management of information being processed)
- Enterprise Report Management (ERM) (used to store electronic formatted reports)
- Forms Processing (used to incorporate interactive forms and manage related forms data)
- Optical Character Recognition (OCR)/Intelligent Character Recognition (ICR) Technologies
- Various applications (also considered add-ons) such as records management applications, legacy system integration tools, etc.

These electronic document management systems provide users with greater access to electronically stored information from common user interfaces typically utilizing industry standard Internet browser technology. One of the primary reasons users prefer this level of technology is the distributed functionality and ability to maintain standard desktop configurations for other office and business related applications.

The structure of EDMS technologies can be viewed as a set of building blocks as noted below in Figure 4-1 EDMS Technology Building Blocks. The lowest level is the operating system. Database services and Storage Device Drivers are installed onto the server as the second layer. The selection of the database to be used is typically at the discretion of the organization, but has become standardized through the use of Open DataBase Connectivity (ODBC) tools, which has resulted in the database components to be almost considered a "commodity item" rather than a specialized tool.

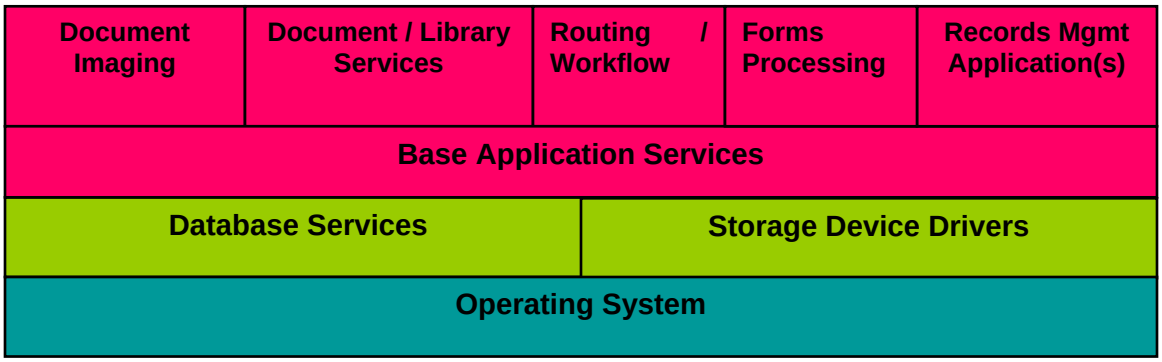


Figure 4-1 EDMS Technology Building Blocks

The third layer includes the base ECM application components and services provided by the service provider. This layer typically includes the solution configuration tools, application programming interfaces, and application components integrating the core applications components with the database services along with providing the components that integrate the storage environment with the overall solution. The

fourth layer incorporates the various core technologies of EDMS technologies Each of these core technologies (with the exception of the operating system layer) are further described in the following sections.

4.2 Database Services

There has been a significant shift from developing custom technology solutions at the database level to configuring/implementing commercially available software over the past 10 years. As the EDMS industry and associated technologies matured, end user organizations were able to shift from a "development" model to a "configuration" model for the base technological components.

This is an important consideration for any organization evaluating EDMS technologies from the perspective that almost all of today's EDMS solutions have moved away from the need to have specialized database administrators to actually discouraging organizations from changing and/or modifying the EDMS database table structures and configuration, which in many cases now result in the solution provider withdrawing solution support. While years ago, it was important for the organization to hire dedicated EDMS database administrators, this is no longer the case. Over the past 5 years, the industry has noticed that almost all EDMS solutions (with the exception of highly specialized solutions) have effectively standardized the most commonly used database platforms enabling the solution providers to offer standardized support, thereby significantly reducing the organizational cost associated with hiring database specialists solely or primarily dedicated to managing the EDMS solutions.

4.3 Storage Device Drivers

The storage device drivers or services are at the same level as the database services. The storage device drivers are used to connect the selected storage technology to the system and make the storage space available for the selected EDMS solution.

4.4 ECM Application Services

The next layer in the "building block" is considered to be the EDMS server application. Early in the development and maturity cycle of EDMS technologies, end-user organizations were required to provide database administration and resources. During the late 1980's and early 1990's, the EDMS technologies had not matured to the level approaching the Commercially Available Off the Shelf (COTS). While the EDMS technologies were maturing, end-user organizations were required to maintain the database along with the application.

Current versions of enterprise EDMS solutions have shifted the database administrative functions back to the vendor with the end-user organization responsible for daily application maintenance and periodic server maintenance. Most enterprise EDMS solution providers provide their products with technical support including system installation, initial configuration, application updates/patches, etc. This major shift from requiring significant technical resources at the end-user level to vendor supported solutions has resulted in the extensive amount of vertical market penetration. This has been achieved through the use of standard technology components configured to address specific environments and business needs.

4.5 Core Technologies and Application Specific Modules

There are various core technologies and application specific modules that provide specific functionality including some or all of the following core technologies: document imaging, document/library services, workflow, forms processing, etc. All enterprise EDMS solutions have at least one of these core technologies and in most cases include multiple components. Furthermore, many solutions have

integrated both the document imaging and document/library services components into a single application, while other solutions simply integrate these components as required by the organization.

4.5.1 Document Imaging Technologies

Document imaging technologies enable users to scan hardcopy documents into the system and store them in digital format. These technologies enable users to index or enter "metadata" into the system and always utilize some form of storage technology to save the digital version of the document. There are four basic components to document imaging systems:

- input,
- identification (indexing),
- storage, and
- retrieval.

The **input** components typically consist of multiple single-sided (simplex) and/or double-sided (duplex) document scanners (or other input devices such as facsimile). The scanning stations are used to convert hard copy documents into a digital format for subsequent storage and management in the document imaging system. The **identification (indexing)** components allow users to identify (or index) this digital information allowing them to be retrieved at a later date and all types of information required by the end-user organization to fully track all necessary metadata). The **storage** part of the system consists of various components connected to the document management or workflow server and are used to store, retrieve and manage digital information. The **retrieval** part of the system consists of the user issuing a request for information that is then processed by the server. These requests are processed and the information is retrieved from the appropriate storage media connected to the server.

4.5.2 Document/Library services technologies

Document/Library services technologies enable organizations to manage digitally born documents. Document/Library services applications utilize applets, or thin-clients, to control the authoring, check-in/out, and/or version control of documents being developed, managed or stored. This enables collaborative development when desired along with a mechanism to store/manage digitally born document libraries. The basic capabilities of these technologies include allowing authorized users to:

- Load or import digitally born documents directly into the system,
- Enter relevant metadata associated with the document,
- Create virtual folders linking various documents together,
- Check information in/out of the repository,
- Make changes and check the modified information back into the repository,
- Manage whether original documents are updated or replaced during the update operations,
- Establish security levels for groupings of documents.

The management portion of document/library services technologies include the ability to restrict access to certain documents or groups of documents to only authorized users. Along with security controls, these technologies enable users to be granted different levels of access. For example, the author of a document might only grant read access to all users outside of a specific organization while granting "check-in/out" control to others who are working on updating the document. As the other users prepare to update the document, they would "check" the document out of the library, update the information, and then "check" the document back in.

Document/Library services technologies ensure that any other user attempting to check the document out would 1)not be allowed to check it out, and 2)would be notified that someone already has a copy being updated. Upon completion of the update cycle, the system automatically updates the version number of the document and makes it available to all authorized users.

Similar to Document Imaging, there are four basic processes associated with document/library services technologies (it should be noted that these terms may vary depending on various perspectives such as records management vs. content management vs. archival management, but the underlying functions remain the same with slightly different terminology and/or descriptions):

- import,
- identification (indexing),
- storage, and
- management/retrieval.

The **import** components typically consist of enabling users to import digitally born information into the system. This digitally born information can be any format/structure and can be loaded into the system in original or native format. Digital data does not need to be modified prior to being stored and should include all relevant indexing or metadata associated with the information. The **identification (indexing)** components allow users to identify (or index) this digital information allowing them to be retrieved at a later date and all types of information required by the end-user organization to fully track all necessary metadata). The **storage** part of the system consists of various components connected to the EDMS or workflow server and is used to store, retrieve and manage digital information. The **management/retrieval** part of the system consists of the user issuing a request for information that is then processed by the server. These requests are processed and the information is retrieved from the appropriate storage media connected to the server.

When comparing document imaging and document/library services technologies the following should be taken into account while determining which technology best meets the needs of the organization:

1. document imaging is the technology used to convert hardcopy documents into digital format,

2. once the document is in digital format, the functionality between these systems is almost identical with the exception of not being able to easily modify the scanned document as can be done with native file formats such as office applications. Etc.

3. document/library services provides a mechanism to easily track document versions while document imaging provides the base capability of simply storing a new document to the system (rather than saving it as a controlled version)

4.5.3 Workflow technologies

Another module commonly incorporated into the enterprise solution is workflow functionality. Workflow technologies can provide different levels of routing, tracking, and administration. These technologies can be grouped into 3 categories: administrative, ad-hoc, and production. Administrative workflow is typically used by organizations where the processes do not change, or change very infrequently. Ad-hoc workflow provides the ability for a user to create a "work process map" for a specific piece or type of work. Production workflow incorporates administrative workflow and ad-hoc workflow capabilities along with providing extensive tracking and logging capabilities.

When considering production workflow technologies, the organization should consider whether to employ either role-based or user-based workflow technologies. User based technologies require specific users to be assigned to specific tasks, while role-based technologies enable organizations to assign and re-assign users to groups or "roles" which are easily managed

Workflow provides for the automation of business processes and enables users to control the process logic, typically through a graphical user interface (GUI) and other tools. This ability to control the various business processes enables mission-critical, content-centric business applications to operate in an environment otherwise cumbersome to implement and manage. This has resulted in most EDMS vendors offering an integrated workflow engine or integrating the workflow engine, with various workflow products readily available throughout the industry. The difference between these two approaches is whether the product consists of only those components developed by the primary product supplier, or whether the primary product supplier has integrated specialized technologies developed by other suppliers.

In the new approach to organizational networking, workflow is becoming a major tool in the automation of processes and information posting to a web site. In these environments, workflow applications are becoming tightly integrated to legacy applications. The actual integration of workflow and other EDMS technologies has become more prevalent as different coalitions, standards committees, and EDMS vendors have completed development of various standards.

The maturity of workflow technology and the associated trends are based on the separation of the processing rules from the processing scripts or work routing. In more sophisticated workflow environments, workflow scripts are tightly integrated to specific activities making the routing, editing, approval, and submissions of content manageable at the user level. Interaction with the various thin-clients would trigger sub-processes as defined in the workflow script, resulting in the appropriate applet being downloaded and/or launched.

Workflow computing is the automation of work processes performed throughout an organization. A workflow application automates the sequence of actions, activities, or tasks used to run the process. This includes tracking the status of each occurrence of the process and providing tools to manage the process. There are four basic components to a workflow system: processes, work queues, tools, and object data.

- Processes: An automated workflow application is made up of the different tasks or activities that must be completed to achieve a business goal. The workflow engine manages these system. The workflow application works in conjunction with the engine to manage the work process.

- Work Queues: Work items are created and distributed according to preset rules and placed into work queues. Work items within these queues can also be automated . Users or groups of users are assigned to various work queues as required for processing..

- Tools: There are various tools accessed by the user including forms display, word processors, terminal emulators, legacy applications, etc. These tools are used to access existing host applications and perform office related activities as required to complete work.

- Object Data: Another term for any digital content referenced and/or used by the workflow system. The term became more prevalent after the computing technology became sufficiently sophisticated to support video, audio, and other forms of information into the workflow system. These objects become the work item to be processed during the normal course of business.

4.5.4 Records Management Applications

Another common application organizations implement is referred to as Records Management Applications (RMA). These applications provide configuration and management tools enabling organizations to implement rules associated with identifying the length of time specific types of information (regardless of whether referenced as a document, record, image, etc.) must be kept and the type of disposition that should occur at the end of that retention. There are many other functions and capabilities associated with records management applications, but it is important to recognize that without at least 1 or more of the core underlying EDMS technologies, records management applications will only provide an automated retention schedule.

Records Management Applications (RMAs) are considered to be software used by an organization to manage its records. The RMA's primary management functions are categorizing and locating records and identifying records that are due for disposition. RMA software also locates, retrieves, and disposes of the electronic records that are stored in a repository through integration with relevant core EDMS functions. Any RMA must have at least 1 core EDMS component. Without at least 1 core component the RMA would only be able to manage the policies and not the electronic (or digital) records. It should be noted that RMA functionality is a critical piece of an overall record and/or document management strategy for any organization.

Regardless of whether the organization considers the RMA as a "module" that is integrated into the EDMS foundation or the RMA as the "system" that includes core EDMS functionality, the result is the same: records management policies are implemented to manage electronic (or digital) records contained within at least one of the core EDMS components (i.e, document imaging, document/library services, etc.)

4.6 ERM technologies

Enterprise Report Management (ERM), which was previously known as Computer Output to Laser Disk or COLD, is an integrated software and hardware solution that stores and indexes formatted computer output (pages) on optical disk, magnetic disk, or magnetic tape as an alternative to paper printouts or computer output microfilm (COM). This formatted output consists of point-in-time reports, such as transaction listings of statements and invoices. Once this page output is stored on the ERM subsystem, it can be electronically retrieved, viewed, printed, faxed, and distributed to workstations and host computer terminals within organizations or throughout an enterprise.

While there are many different data types in the computing environment, the type of data which ERM technology is concerned with is typically the result of transactions (data files and database records) being formatted by the application into page-oriented form for printing on paper or computer output microfilm (COM). The structure and format of this output is known. This data is time-period focused—it is a snapshot of an internal system at a given point in time. These reports are often the basis for analysis or comparative reporting and they include the printed record received by users such as a statement or invoice. ERM systems have been designed primarily to handle this formatted output.

Essentially, the ERM process involves two procedures: recording (indexing and storing the data) and retrieving (making the data available to users). Within these two simple procedures, however, lay a myriad of complex tasks. Data must be downloaded or transferred to the ERM system server before it can be processed. The method used to transfer the data from the mainframe/host system to the ERM subsystem will vary depending on the communications capabilities currently in place. Recording consists of writing new documents to the storage media and then making them available for retrieval. Recording

speeds vary from system to system and are most critical in high volume systems. The recording process involves:

- transferring the data to the storage subsystem from the host,
- processing the pages from the transferred file (i.e., extracting index keys, compressing, and writing to optical storage), and
- adding the index records to the associated ERM database.

The retrieval process consists of the users accessing the system and selecting the appropriate report, or part of the report, for viewing. The selection of the information to be retrieved is based on information entered, by the user, into the query screen part of the viewing software. After the user selects the report, or part of the report to be viewed, the system retrieves the information, displaying it on the user's workstation.

4.7 Forms Processing

The creation and utilization of electronic forms enable organizations to collect data in a standardized format and automatically enter or load the data into an EDMS solution. Electronic forms are typically created using either a forms design package or through the use of standard HTML editors. Forms design packages typically include not only the forms design components, but also enable organizations to "tag" or identify each field on the form and relate that data to a database or application that would receive and further process the information. These forms management tools also enable organizations to validate and/or perform edit checks on the forms as they are being completed to simplify data entry.

The usage of forms within the EDM industry has become widespread and most EDMS solutions incorporate some level of forms design and/or management as a portion of the standard product offering. In many cases, the use of forms design and management tools are replacing the older style of programmed forms that was required in the 1990's. Using these tools, organizations are able to quickly develop and deploy forms driven data entry across the internet without significant development efforts.

4.8 Optical, Mark and Intelligent Character Recognition

Optical, Mark, and Intelligent Character Recognition technologies enable organizations to quickly capture information from hard-copy documents that needs to be captured during the indexing process. Optical Character Recognition (OCR), Optical Mark Recogniztion (OMR), and Intelligent Character Recognition (ICR) can greatly reduce the time required to index documents while enabling organizations to develop in-depth full-text searchable databases. The differences between OCR, OMR, and ICR is noted below:

- OCR: Technology used to capture computer generated information from documents;
- OMR: Technology used to capture "marks" or "checks" from documents,
- ICR: Technology used to capture hand-written information from documents.

The value of using these technologies is especially evident when organizations need to capture specific portions of documents that are consistent. To capture this information, the utilization of "zoning" allows specific portions of similar documents to be identified and information within that "zone" captured and further processed as required by the application. Throughout the EDMS industry it has been found that the use of these technologies can also greatly improve the quality of information being indexed, while reducing the overall staffing requirements to perform the same functions manually.

5 EDMS guidelines and standards

5.1 Introduction

Industry guidelines and standards enable organizations to follow industry accepted practices and procedures. Standards and recommended practices specified in a federal, state, or local law or regulations are required specifically in the area covered by the law or regulation. Users wishing to require adherence to a standard or recommended practice should specify them in their procurement documents and contracts since this is the only way a vendor is required to meet a standard. Users of standards should also be careful to specify exactly what requirements in a standard must be met. It is possible for a system to "meet" a standard and still not deliver the required results if the contract is not specific about the contents of the standard or recommended practice.

Following industry guidelines and standards will further improve the ability of an organization to implement the selected technologies following policies and procedures found necessary, throughout the industry, to implement highly successful systems. These guidelines and standards also enable the organizations to implement products and technologies meeting their specific needs while being able to share information with other organizations who may, or may not, have the same product installed.

Industry guidelines provide specific information to users that will enable them to gain detailed information necessary to successfully prepare for, select, and implement the desired technology. The guidelines that users should evaluate include:

- Request for Proposal (RFP) guidelines,
- recommended document preparation procedures for scanning/indexing;
- planning considerations for technology implementation;
- how to determine what information should be included during document indexing;
- legal considerations;
- forms design;
- selecting the appropriate image compression methodology to be used;
- sampling procedures to verify information being scanned and indexed; and
- Establishing quality requirements and quality control.

The industry standards include standards related to document services integration and toolkits, workflow integration and toolkits, document imaging related standards, and optical storage standards. Product suppliers must certify that their products meet the specified standard(s) to ensure that the product is, in fact, compliant with the relevant standard(s). It is important to note that as the industry creates and approves new standards and guidelines, this document will be updated to reflect those changes after the standards/guidelines have completed AIIM, ANSI and/or ISO approval processes.

5.2 Selecting the appropriate guideline or standard

It is recommended that organizations preparing to select document management and workflow products review relevant industry guidelines and determine whether the vendors being evaluated meet the appropriate standards associated with that part of the technology. Titles of relevant standards and

guidelines are provided in Annex A. Examples of various guidelines and standards for each of the technologies are documented below.

5.3 General

5.3.1 Industry guidelines

Industry guidelines should be reviewed and will assist the organization during the preparation, planning, and implementation phases of the document management project.

5.3.2 Development of a Request for proposal (RFP) document

Prior to selecting a specific product/integrator, the organization should fully document current processes, organizational and system requirements and organizational expecations. This information should be provided to those vendor(s), or integrator(s) being considered. Regardless of whether the RFP is being sent to a single vendor/integrator or multiple vendors/integrators, this document should contain sufficient levels of information enabling vendors/integrators to clearly understand all business and technical goals and operational requirements.

This is very important as many (if not most) projects that fail, fail due to either misunderstandings between organization and vendors related to what the final system should incorporate or a general lack of specific requirements that need to be met by the vendor/solution. ANSI/AIIM TR27 Request for Proposal (RFP) provides detailed information related to developing the RFP documentation.

5.3.3 Trusted system and legal considerations

Recognizing that all document management systems manage both electronic documents and records and acknowledging that not all documents become records, organizations may/should (depending on various regulations where appropriate and established) require the same level of system trustworthiness and reliability. Regardless of whether this data is called a "document", "record", or some other term used by the organization, all electronically stored information should be stored in a trusted environment when required and in compliance with the associated record retention schedule/plan.

Taking this into consideration and ensuring that all electronic information is stored and managed in a trustworthy and reliable fashion, compliance with the concepts contained within ISO 15801 and those related to records management policies contained in ISO 15489 Part 1 should be considered. This will ensure that both technical planning, design, and implementation along with records management policies and procedures result in the implementation and operation/management of a trustworthy and reliable document management system for all electronically stored information. It is important to note that a trustworthy system incorporates not only technology but also adherence to documented policies and procedures through all aspects of the design, development, and implementation project phases and be maintainable in an ongoing fashion after rollout into production.

A trusted document management system ensures that all electronically stored information can be considered to be a true and accurate copy of the original information received regardless of the original format. The trusted document management system must ensure that at least two (2) separate copies of the electronically stored information are created meeting, at a minimum, all the following conditions:

(a) The trusted document management system must utilize both hardware and media storage methodologies to prevent unauthorized additions, modifications or deletions during the approved lifecycle of the stored information; and

(b) The trusted document management system must be verifiable through independent audit processes ensuring that there is no plausible way for electronically stored information to be modified, altered, or deleted during the approved information lifecycle; and

(c) The trusted document management system must write at least one copy of the electronic document or record into electronic media that does not permit unauthorized additions, deletions, or changes to the original document and that is to be stored and maintained in a safe and separate location.

It is important to note that trusted document management systems incorporate not only technology, but also require adherence to organizational policies ensuring proper electronic document or record handling, processing as required by the organization (typically documented in the record retention policy and schedule) and electronic document management software or application components. (Additional information related to all trustworthiness and reliability are documented in ISO 15801.)

5.3.3.1 Expungement

It should be noted that information being expunged needs to follow specific legal rules and does not necessarily require that documents be permanently deleted, but can require that access to documents be permanently removed. Advice from legal counsel should be requested to determine whether permanent removal from accessing documents would meet expungement requirements. ISO 12037, *Electronic imaging – Recommendations for the expungement of information recorded on write-once optical media,* provides specific guidance.

5.3.3.2 Legal acceptance of records

Evidentiary issues associated with using electronic imaging systems and optical storage technologies need to be considered based upon local legal guidelines. Refer to ISO 12654, *Electronic imaging – Recommendations for the management of electronic recording systems for the recording of documents that may be required as evidence, on WORM optical disk,* for standard guidelines.

5.3.3.3 Retention requirements

Users and systems designers should consult the organization's established retention requirements set forth in their Records Management Policies and Procedures. The system being implemented should ensure that the system is able to retrieve the information throughout the required document life cycle. The storage media and its life expectancy rating must be considered, hardware and software obsolescence issues must be evaluated, and a sound migration strategy must be developed to ensure access.

Organizations that do not have current retention requirements should consider developing these documents. These documents enable organizations to manage existing records, and provide a mechanism to automate when documents are to be archived, for how long, what action to take after the retention period is passed, along with numerous other organizational advantages from a management perspective.

5.3.3.4 Redaction

The process of redaction[3)] is elaborate, expensive, and subject to judicial review. It usually involves a careful, word-by-word examination of a document, the identification of the pieces to be "removed," the

3) "Redaction" refers to a process by which parts of a document are kept from disclosure. Documents might contain pieces of information that are protected by law from being revealed, e.g., because they contain privacy identifiers or trade secrets or other privileged information. The parts might be such snippets as the name of a person, a Social Security Number, or entire paragraphs that reveal trade secrets. In many redactions the rendition of the redacted document, whether hard or soft copy, will show a black bar through the space where the redacted content was located.

necessity of showing the location of the removed pieces, the inability of the document viewer to discover the redacted content, and the supervisory review and approval of the redaction - all with the recordkeeping to prove that the redaction was appropriate and conducted according to proper procedure. Therefore, the redaction process is usually done in a highly-controlled local setting. Redaction process software could be external to the document management system.

5.3.4 Technology standards

Technology standards are developed for specific technologies and not at the "general" level. All industry related and relevant standards are listed in the appropriate technology category within this document.

5.3.5 Implementation considerations

Implementation considerations should include:

5.3.5.1 System administration

When selecting the technologies required to support the business requirements, the organization should receive and maintain detailed information related to system administration functions required to administer and control all applications, security, system server hardware, and data backup/migration. The product supplier, or system integrator should provide this information. These requirements should include:

- operating system management (updates, patches, backup, restore, etc.),
- application software (updates, patches, backup, restore, etc.),
- system security (user additions/deletions, security modifications, etc.),
- data migration (retention periods, media replacement, etc.),
- software trouble-shooting tools,
- hardware trouble-shooting tools, and
- database management utilities.

These technologies can be hosted off-site as well as on-site. The information technology (IT) group within the organization should, if desired, be provided with the tools to perform these system administrative functions. At a minimum, the product supplier, or system integrator should provide the ability for the IT group to manage the system and utilize the technical/support staff within the product supplier to resolve application and/or database issues that may be encountered along with assisting in software updates.

5.3.5.2 Security requirements

To ensure the technology supports secure access that meets the organization’s business needs, the solution must also be assessed with respect to how it supports end-to-end security as related to user authentication, document authentication, and secure network transactions over the Internet, Intranet, and Extranet as necessary. Understanding the complexity and scope of an organization’s security issues especially when dealing with the Internet will require the collaboration of multiple organizational

disciplines including legal, business operations, system administration, network administration, vendors, and external users of the system. For more information on security related requirements, organizations should review ISO 17799, *Information technology -- Security techniques -- Code of practice for information security management*.

5.3.5.3 Capacity Planning

To ensure an accurate assessment of the scope and size of the document management system, the organization should attempt to determine the capacity requirements of the expected solution. The following is a partial list of some sizing parameters to consider:

- system availability requirements
- number of form types and documents
- volume of existing forms, documents, and records
- retention requirements by document or form type
- frequency of document access
- peak daily volume of new documents processed
- volume of new cases for workflow consideration
- number of internal users (case workers, researchers, data entry operators)
- number of users (local and remote)
- number of organizations
- number of remote sites

5.3.5.4 System performance

To ensure that information is available for use by the users within anticipated time frames, it is important that specific requirements related to system performance expectations be defined. The organization should determine the anticipated response times they expect from the system for:

- number of users accessing the system simultaneously
- document retrieval from long-term storage media,
- document retrieval from online cache,
- document viewing (over the LAN, WAN, Internet),
- document printing, and
- scanning/indexing performance.

5.3.5.5 System scalability

Organizations should ensure that the solution be scalable. This scalability includes the ability to increase the number of processors in a multi-processor environment, increase the number of servers to operate in

a cooperative fashion, as well as increase the storage capabilities as required by the organization. Requirements should include:

- the ability to increase the number of system users without component replacement,
- the ability to support other technologies, i.e. OCR, form management, etc.,
- the ability to support multiple servers and standardized non-alterable write-once storage solutions in a distributed manner, and
- the ability to support symmetrical multi-processing, if required by the organization.

5.3.5.6 Fax services

The utilization of facsimile (fax) transmission services enables users to send and receive faxed documents directly at their workstation. When considering these services, organizations should evaluate the following requirements to support their specific business needs:

- Outgoing fax without document viewing: This provides the ability for users to fax documents directly from their computer without viewing each document first. The user should have the ability to select a range of documents and have them routed to the fax "server" for transmission.
- Outgoing fax after document viewing: This provides the ability for a user to fax a document during viewing. The user should have the ability to attach other documents to the outgoing fax as appropriate.
- Incoming fax processing: As incoming documents are received, the system should support the ability to receive incoming documents and automatically route the document based on configurable rules (via a system administration interface) either by incoming telephone number or through forms or OCR processing.
- Fax status reporting: The system should provide a fax reporting capability enabling users to view status and historical information related to faxes sent by the user. This historical reporting should be based on user security rights, preventing users from accessing other users' history, while supporting users with higher levels of security to access all historical records.

5.4 Document imaging

5.4.1 User guidelines

User guidelines should be reviewed for document imaging technologies to assist the organization during all project phases from the planning phases through the actual implementation. These guidelines will greatly simplify the overall process and ensure that critical aspects of preparation and implementation planning are addressed early in the project rather than forcing the project to stall until planning issues are addressed.

5.4.1.1 Planning

During the planning stages of the project, the organization will need to address various issues including planning for the implementation of document imaging and preparing the documents to be scanned.

5.4.1.2 Indexing the information

As the organization plans to implement document imaging, the organization should consider establishing relevant indexing field guidelines and procedures. These organizational guidelines should provide detailed information that should be considered when planning the indexing requirements for all current and anticipated documents to be scanned. Establishing all the necessary index values with the ability to add additional and/or other document types prior to system implementation greatly improves the value and quality of information being scanned and stored in the system.

5.4.1.3 Storage technologies

During the planning stages of the project, the organization should review guidelines related to designing and managing a trusted document management system (ISO 15801 *Electronic imaging -- Information stored electronically -- Recommendations for trustworthiness and reliability*). There are various approaches to electronically storing information including using Optical WORM for long-term preservation to Magnetic WORM for those organizations who need faster retrieval speeds and are less concerned about long-term archival issues. Another approach is to use magnetic WORM for temporary storage cache (where users can retrieve documents quickly) and optical storage for long term storage. Both sets of technologies are viable for document/record storage depending on user needs, regulatory storage requirements, etc. Users should exercise caution when using non-standardized or proprietary storage technologies. Regardless of the storage technology selected by the organization, it is very important to consider the trustworthiness and reliability of the document management system. This includes compliance with relevant government codes and regulations that require storage of the electronic information where it is not plausible that any stored information can be modified, altered, or deleted during the information lifecycle.

5.4.1.4 Image formats

The organization should ensure that all information being scanned, or electronically received is stored in an industry accepted format such as JPEG, JBIG, JPEG 2000, or PDF-A. Non-standard or proprietary file formats should not be used. Caution should be exercised if using TIFF. While TIFF is commonly used, there are multiple problems associated with the ability of the application to use non-standard headers, or tags that 1) may not be documented and/or 2) the misuse of other basic headers, or tags. Additionally, TIFF images can be modified without user knowledge though numerous freely available editing tools. Image formats such as PDF-A are non-modifiable through the file format structure along with the use of "checksums" that should be stored in the document management system as an additional method of ensuring that the file has not been altered, modified, or deleted during the information lifecycle.

Non-standard or proprietary formats include any formats used by a single vendor/source and not accepted as a standard file format at either a national or international standards level. Proprietary file formats include but is not limited to:

- File formatting that utilizes "file-wrappers" to encapsulate standard file formats within a non-standard structure,
- TIFF formats that are not fully documented by the vendor and independently verified by the organization to ensure proprietary information is not contained in any of the headers,.
- Non-standard file formats not used by multiple vendors/integrators, etc.

It is important to note that the industry has found that using PDF-A as the output format for any hardcopy conversion to electronic format eliminates many of the commonly seen problems found with TIFF formatted information including: prevents alteration, incorporates the concept of checksums, all information is fully contained, and the PDF-A format is fully standardized and supported by almost every EDMS solution provider, including all the major document imaging solutions currently available (with the exception of smaller solutions that still rely on proprietary methods and concepts).

5.4.1.5 Indexing quality control

As the system is moved into production, it will become important for the organization to develop a methodology of reviewing both index data and the actual documents to ensure that the information is available and readable. The organization should establish a documented process to ensure that all documents are properly scanned and indexed. This documentation should be followed by all personnel performing scanning and indexing, along with providing a mechanism for index data entry verification prior to document committal to the storage media and/or transmission to the business process.

5.4.1.6 Scanning quality control

Scanning quality control measures enable users/operators to ensure that the scanner is operating within anticipated tolerances. ISO 12653 (parts 1 and 2) *Electronic imaging – Test target for black-and-white scanning of office documents* provides additional information for production document scanners. Following these procedures will enable the user/operator to ascertain that the scanner is properly set up before scanning actual documents.

5.4.2 Implementation considerations

Implementation considerations should include:

5.4.2.1 Document scanning

The document scanning part of the system should provide the ability for the users to quickly digitize documents and route these documents to the person performing the indexing operation. Requirements associated with this part of the system should include:

- the ability to support both batch processing and single document scanning and indexing;
- the ability to support document re-scanning;
- the ability to support both simplex and duplex scanning;
- the capability of the scanner to scan at the resolution meeting the specific image quality requirements of the system, such as 200, 300, or 400 DPI; and
- the ability to set page breaks when batch scanning fixed and variable length documents.

5.4.2.2 Document scanning and indexing

When implementing document scanning and indexing technologies, the requirements should include detailed information related to all processing phases. If color documents are to be scanned so that the image captures the color, the scanner must be capable of doing so. Patch code and bar code hardware and software should be included if these techniques are to be used for the automation of data indexing. When using these technologies, the user should be aware that bar coding and OCR technologies typically minimize key stroking during the indexing phase but do not always negate the need for manual indexing. The level of information captured automatically will vary depending on the quality of the incoming document and the ability of the system to accurately recognize the required information.

The issue of performance is of critical importance and the organization should ensure that the selected solution provides the ability to scan and index documents within anticipated time frames. The various processes associated with document scanning and indexing includes:

- the time required to prepare the document for scanning;

- scanning the documents, ensuring all documents and all sides (for double sided documents) are captured;
- the time required to index and verify the documents;
- the time required to route the document to the end user for further processing (if workflow technologies are being used);.
- the ability to preset common fields (for indexing purposes) when scanning in batch mode; and
- the ability to support auto-indexing of documents using barcodes, OCR, or Intelligent Character Recognition (ICR).

5.4.2.3 Scanning/indexing Throughput

The system must be capable of scanning either single or double-sided documents using scanners capable of processing the daily work volume at the selected scanning site. This processing will include document preparation, scanning, and indexing. The system must also be capable of supporting low, medium, and/or high volume scanning capabilities depending on user requirements and selected scanner. The total number of scan stations and indexing stations must be determined by the organization to ensure that all work can be processed within anticipated time frames and stations are available for use when needed.

5.4.2.4 Document image compression

Image compression/decompression should support ITU Group 4, LZW, JPEG, JPEG 2000, JBIG, or other output format standards with no proprietary alterations of the algorithms. The selected compression technology should not include extraneous information unsupported by relevant industry standards. Users should be aware that when using proprietary file compression formats, the patent holder may require royalties and/or other fees to be paid on a periodic basis which are usually based on the total number of pages converted into that specific compression format. These licensing/royalty issues do not occur with non-proprietary formats.

There are various compression methodologies available. ISO TS 12033 is a guideline that provides information enabling users to select the appropriate compression technology which the vendor/integrator must support for different types of data. The different types of data may include scanned documents, line art, photographs, etc.

5.4.2.5 Post-scanning processing

Post processing may be used to provide image "clean-up" after the scanning and prior to indexing and final storage. This software generally performs de-speckling, de-skewing and other functions to improve the quality of the scanned image with limited operator intervention.

Use of image “clean-up” and other post-scanning processing should only be used to improve legibility. Caution should be exercised when using these tools, as any material modification to the image may affect the ability to authenticate the document in a legal proceeding.

5.4.2.6 Optical Mark Reader (OMR), OCR, Barcode, and ICR processing

The main objective of the available recognition technologies is to reduce the amount of manual data entry for the capture of both hand-printed and machine-printed information from digitized documents. Although the technology will never eliminate the need for manual data entry, the effective use of these technologies on targeted documents have produced remarkable benefits often evaluated in reduction of manual keystrokes. The following is a brief list of evaluation criteria to consider when analyzing the use of automated data capture:

- Is it possible to identify documents with sufficient volume to justify automated data capture processing? These are typically used with forms containing both structured and unstructured content, and with identifiable information to be extracted.

- Is it cost effective? Determine the amount of data to be captured and the cost to support a manual solution, and then compare it to an automated data capture solution.

- Is it possible to re-design the target forms for improved recognition? The use of checkboxes, patch codes, bar codes, dropout ink, and OCR fonts all provide considerable improvement in recognition accuracy rates.

- How will the documents be batched for scanning? Will the scanner accept mixed form sizes? Will the scanner use mixed form types? Is it possible to introduce a batch header sheet to streamline the scanning process?

- Identify the business rules that may be used for post-recognition processing to improve the accuracy of the information captured. For example, the capture of a unique personal identifier can be used to automatically verify the name and address information against the organization's existing database.

5.4.2.7 Quality control

When defining quality control for document scanning and indexing, the organization should include the ability for the user to be able to:

- check and validate the complete scanning and indexing process,

- facilitate the re-scanning of poor quality images,

- verify readability of each page of each document,

- verify proper indexing of each document,

- verify accurate page counts for each document, and

- verify accurate security for each document.

5.4.2.8 Query/retrieval Display Time

Query and retrieval display time is commonly of high importance to the users. The user should define the anticipated performance requirements prior to system design and hardware procurement. These performance requirements should include maximum response times anticipated during production. This should also take into account the total number of anticipated simultaneous user requests; the total number of drives; whether the information is available in an on-line, near-on-line, or off-line mode, etc.

These time periods include all time required to retrieve the appropriate optical/removable media (when necessary), reading all requested pages from storage media, storage of all requested pages on magnetic cache (if being used), and subsequent transmission of the first page to the user for viewing. When removable media (i.e., Optical WORM, CD, DVD, tape, etc.) is implemented, this response time should take into account time required to: "spin" the drive down, eject the media, retrieve new media from the storage bays, insert the media into the drive, "spin" the drive up, and retrieve information from the media.

5.4.2.9 Printing Times

The imaging system must be capable of printing user selected documents within anticipated user established time frames. This response time includes document retrieval from optical storage and transmission to the selected printer. The user should have the ability to select a document, or range of documents, to be printed, without being forced to view any of the pages prior to print submission.

5.5 Document/Library services

5.5.1 Technology standards

Technology standards should be evaluated by the organization to determine which standards are important and relevant to the overall project goals and objectives.

5.5.1.1 Open source distribution

The product vendor/supplier should certify that the organization can use open source document services software and metadata definitions (information describing the document) with their specific product. This will enable the organization to integrate other document services technologies without significant system re-development.

5.5.1.2 Development toolkits

The product/vendor supplier should certify that the system uses industry standard application programming interfaces. This will enable the organization to implement a document services system and access information stored on other document services implemented throughout the network. These toolkits simplify application development and will enable the organizations to develop a common user interface regardless of the product used to “house” the actual data.

5.5.2 Implementation considerations

Document services enable users to create, modify, and manage electronic files typically associated with various office processing applications. These capabilities include:

5.5.2.1 Version control/check-in and check-out

The organization should ensure that the product fully supports version control and check-in/out methodologies. Version control should automatically update the version number when a previously "checked-out" document is returned to the information repository. The system should prevent more than one person from checking documents out for modification and use a security model ensuring that only authorized personnel can perform these functions.

5.5.2.2 Authoring Controls

The system should provide the ability for the organization to establish authoring controls, including but not limited to allowing the "author" to determine what other types of users can access and/or modify the electronically stored information. These controls should also enable organizations to establish collaborative development of electronically stored information while ensuring full and detailed history is maintained by the system. Common use of authoring controls is the creation and management of electronic forms and/or forms that are required to be used by various control or governmental agencies.

5.5.2.3 Logical folders

The ability for the users to "logically" link a single document to multiple folders is important to prevent document duplication. The organization should ensure that the selected product supports the ability for an authorized user to create a copy of a document within a specific folder, or set of folder(s), while maintaining only one physical copy of the document within the system. The system should provide information related to which folders are "linked" through a query mechanism available to authorized users.

5.5.2.4 Group/user security

The system should provide the ability for organizations to apply security access/restrictions at both the group and user levels. Group level security should apply to all users within the defined group, while user level security should provide additional security restrictions or capabilities for specified users beyond that established for assigned groups.

5.5.2.5 Document security

The system should provide the ability for organizations to apply security at the document or file level. Only those users with appropriate security levels should have access to these documents and/or files. This security should include read, update, annotation, highlighting, “mark-up”, and creation control.

5.5.2.6 PDF/A, HTML, XML conversion

The system should provide for PDF/A, HTML, or XML data conversion as required by the organization. This conversion should enable the users to convert existing office documents into a standardized format that can be accessed through a standard web browser.

5.5.2.7 Document publishing to a web site

The system should provide the ability for an organization to update an existing web page automatically after completion of a review/approval process, or manual review and convert by the “webmaster”. This document publishing functionality should include the ability to store native file formats or utilize web templates to reformat the document into either HTML, XML, or PDF-A format.

5.6 Workflow

5.6.1 Technology standards

Technology standards have been developed by the Workflow Management Coalition (WfMC) into a Workflow Reference Model. The significant aspects of the Workflow Reference Model can be grouped into the following three categories, each building incrementally on the preceding:

(i) A common vocabulary for describing the business process and various aspects of the supporting technologies to facilitate automation. This provides the essential foundation for the subsequent detailed discussion on how a workflow system could be architected in a general sense.

(ii) A functional description of the necessary key software components in a workflow management system and how they would interact. This was developed in a “technology neutral” manner, to allow the model to be independent of any particular product architecture and implementation technology.

(iii) The definition, in functional [or abstract] terms, of the interface between various key software components that would facilitate exchange of information in a standardized way, thus

enabling interoperability between different products. Five such interfaces were identified and became the foundation for the WfMC standardization program.

It was an important principle that the Reference Model focused specifically on workflow management technology and standards. It deliberately did not attempt to define standards in other, related areas, in which other industry bodies were working; these were seen as complementary.

THE FIVE INTERFACES

Each interface was initially specified as a business level statement of objective in order to identify what the interface was intended to achieve in business terms and why a standardized approach was desirable. This was subsequently followed by a detailed, but abstract specification of how the interface operated and finally (for most interfaces) a "binding" specification covering the implementation of the interface in a particular technology.

Interface 1 was developed to support the exchange of process definition data between BPR tools, workflow systems and process definition repositories, enabling users to select the most appropriate tool for different aspects of the business process lifecycle. It was specified as a Process Definition Meta-Model, defining the process objects, their attributes & relationships, and a textual grammar for expressing the process definition structure and information content. This was subsequently re-expressed as an XML document definition [XPDL].

Interface 2 was developed to facilitate client application integration with different workflow systems, in particular to support the principle of [client] application portability and reuse with different workflow management systems. It was specified as a series of Workflow APIs [WAPI] to allow the control of process, activity and worklist handling functions. These were originally defined in "C" and subsequently re-expressed in IDL [as part of the OMG workflow management facility] and OLE. A set of "C" APIs for manipulating process definition objects and attributes was also defined.

Interface 3 was scoped to provide a common framework for 3rd parties to integrate other industry applications and services, including specific support of agent interfaces to provide a common framework for access to legacy applications. It was developed as set of five basic API calls, defined within the WAPI document to support a common mechanism for connection, disconnection and calling to a variety of agents or other third party software environments.

Interface 4 was developed to facilitate process automation across multiple heterogeneous implementation environments. It comprises an interchange protocol covering five basic operations, specified in abstract terms (initially it was defined in IDL) and with separate concrete bindings. The initial version was defined as a MIME body part for use with email; subsequent versions have been specified in XML (Wf-XML). Ongoing work has lead to version 2 of Wf-XML, layered over SOAP and ASAP.

Interface 5 enables consistent audit and administration of workflow cases across systems, through the specification of a common model for audit data, including event identification, formats & recording. As such it was originally specified in abstract terms, although a set of common APIs for access to audit data was subsequently developed. Recent work is aimed at expressing the audit data structure as a set of XML structures.

Although conceived as five individual interfaces, the separation is apparent only when viewed in the context of the stated business objective. In reality there is significant commonality of function between the various "interfaces"; for example the triggering of the initiation of a process execution is fundamentally the same action whether it is done client side (i/f 2) or server side (i/f 4). The evolution of the WAPI [API] specification started with client application interactions but expanded to include a full repertoire of API calls. Similarly, Wf-XML was developed initially for server-server interaction but has also been used successfully for client-server interactions.

A more useful and fundamental distinction is perhaps to view each interface from the perspective of process ownership and administration control. In particular, Interfaces 2 and 3 may be considered to be

"tightly bound" to the local workflow management system and reflect a local view of resource management—Interface 2 handling interaction with human resource and Interface 3 interaction with automata resource. This has two significant consequences.

In the first place the process definition is localized to the point of process enactment through the expression of the resource assignments (e.g. participants and applications). Secondly the Reference Model could make the simplifying assumption that specification of messaging between a WFMS and participants need not be contained in detail within the process definition. It becomes a function of the WFMS locally to organise the most appropriate form of interaction with the participants via local *Worklists* (web access, email, etc), according to the defined (within the process definition) *Activity* or P*rocedure.*

5.6.1.1 Workflow Development Toolkits (WfMC Interface Specifications 2 & 3)

The vendor should certify that the product supports Workflow Application Programming Interfaces (WAPI). These APIs, as described in Workflow Management Coalition (WfMC) documents, ensure the implemented product provides a consistent method to access workflow management functions particularly in cross-product implementations.

5.6.1.2 Workflow Auditing (WfMC Interface Specification 5)

The vendor should certify that the product supports the WfMC audit specification. This specification details information to be captured and managed by the workflow system during operation. This will ensure that all relevant data is associated with all functions within the workflow technology.

5.6.1.3 Workflow Interoperability (WfMC Interface Specification (WfMC Interface Specification 1)

The vendor should certify that the product supports industry interoperability standards including the usage of standard e-mail systems. These interoperability standards will enable the organization to share workflow information directly between different workflow systems without requiring specialized development.

5.6.2 Implementation considerations

Implementation considerations should include:

5.6.2.1 Workflow

Workflow technologies include various types of routing including ad-hoc, administrative, and production routing. Ad-hoc routing enables the user to define a specific process for a document to follow for that document only. Administrative routing enables users to define specific routing for a specific type of work that is always followed, regardless of the data within the work being routed. Production routing enables the users to define rules and work methods based on the document type and data contained within the work item. As the data changes, the production routing system would process the document accordingly, including the ability to support work timeouts, escalation, and work reassignment.

5.6.2.2 Role versus user

There are two approaches to defining users within a workflow environment. The first method is to define a specific user to manage a specific task or activity. The second approach is to define a role within the work task or activity and then assign as many users as necessary or appropriate. The organizations should require a "role" based system when implementing production workflow technologies.

5.6.2.3 Routing requirements

For those organizations requiring production workflow, the system should allow a user to route a document to another user. The following capabilities should be considered:

- the ability to automatically route documents into a routing queue based on document type or "type of work,"
- the ability to support multiple routing queues for each user based on the "type of work,"
- the ability to sort/retrieve documents in a routing queue in date order,
- the ability to sort/retrieve sections in a routing queue in "type of work" order,
- the ability to sort/retrieve documents in a routing queue in document type order,
- the ability to sort/retrieve documents in a routing queue for a specific person,
- the ability to change a “pre-defined” routing path,
- the ability to "pend" or "hold" items in that user’s routing queue for work at a later time,
- the ability to retrieve specified documents from the routing queue on demand,
- the ability to define which documents require additional documents prior to forwarding,
- the ability to define timeframes for when additional documents must be received,
- the ability to define action to take if specified documents are not received by specified date, and
- the ability to process defined documents as a “logical” folder.

5.6.2.4 Graphical "rule designer"

The system should support the ability for authorized users to create and modify work rules associated with the workflow system. This ability should include graphical based design and management tools that would be used to create/modify work rules within a Windows or browser based user environment.

5.6.2.5 Work monitoring

When selecting workflow technologies, the organization should evaluate whether work monitoring is required for their operation. Work monitoring tools enable the users to monitor current ongoing work in a real-time basis (typically). This work monitoring is used not only for "load-leveling" of ongoing work activities, but also to see if there are any "bottlenecks" in the overall workflow process.

5.6.2.6 Escalation procedures

For those organizations requiring production level workflow, the selected solution should include the ability to automatically route work to a different user based on a specific rule or set of rules. The solution should also include the ability for users to manually escalate work as appropriate. During this escalation procedure, the solution should have the ability to have the work item returned or permanently reassigned as determined by the user.

5.6.2.7 Error handling

As workflow items can include information not previously anticipated during the rules definition, the organization should require that the solution include the ability to handle errors within the routing of work through the workflow engine. The error handling should include the ability to pre-define a role that would receive the appropriate work items that are determined to be in error.

5.6.2.8 Time-out procedures

When workflow is implemented, there are many instances where the timeliness of completing a specific work activity, or group of activities, is important. The ability to establish timers for all work items becomes very important. The organization should require that the solution support "timer" mechanisms and that the user is able to set these time-out values for specific activities throughout the graphical work "rule designer" tool.

5.7 Electronic Records Management Applications

The following checklist gives examples of more detailed system functions that an ERM application might need to perform in order to satisfy each of the basic records management functions. There are a number of ways that each of these records management functions can be automated or implemented in ERM applications, so this checklist is meant only to be a starting-point for organizations to develop system specifications.

Users should note that these specifications are more general than other, more detailed requirements like those in the DoD 5015.2-STD. This checklist would apply not only to Records Management Applications (RMAs), which is the scope of DoD 5015.2-STD, but more broadly to any agency initiative to automate records management functions, establish records management control over electronic records, or otherwise improve existing records management systems.

Not all of these requirements will necessarily be implemented as automated "system functions" in RMAs. Some functional requirements may be implemented through non-automated organizational policies, practices, or records management procedures.

In all requirements that follow, the term "user" refers to authorized users only. Different functions are permitted to different groups of users -- administrative functions to records managers, retrieval functions to end-users, etc.

For all records systems, the RMA should:

1. Allow users to print and view all system management and control information: file plans, security assignments, disposition instructions, etc.

2. Allow users to print and view the records themselves.

For all records, the RMA should:

1. Assign unique identifiers to records and their associated metadata.

2. Capture as much metadata automatically as possible, and reliably link metadata to the records.

3. Capture metadata for records in RMAa including: creator, creating organization, author, recipients, subject matter, format, various dates (date created, date filed), a "vital records" indicator, etc.

5.7.1 Capture Records

For all RMA's, the functionality of the relevant core EDMS components should enable the organization to support on or both of the following capabilities in compliance with the records management policy(ies):

1. Allow import of records from other sources. This may involve format conversion for records that are imported from external information systems. In this case, records are physically captured and transported to a recordkeeping system.

2. Establishment of a link from the RMA to a record in an external information system in order to establish records management control. In this case, physical transport of the records from one system to another is not required.

5.7.2 Maintenance/Use

5.7.2.1 Organize Records

For all records systems, the RMA should:

1. Allow implementation of an agency-specific scheme for how records are organized.

2. Allow users to create an organization-specific file plan and link the file plan to records categories or records series identified in retention schedules. Include disposition instructions and specification of file cut off dates.

3. Allow users to select record categories (records series) from the retention schedule and assign files to these categories.

4. Allow records to be linked to other records (e.g., a redacted record with its non-redacted counterpart, a final report with its earlier draft versions).

5. Allow users to create file folders, and to add, edit and delete categories assigned to these file folders.

6. Prevent deletion of non-empty folders from the file plan.

7. Allow users to add, edit and delete records retention schedules, and to "freeze" (withhold destruction) or execute records retention schedules.

8. Execute disposition instructions (e.g., move a group of records from active to inactive status).

9. Allow users to assign a status to records that prevents their destruction.

10. Allow users to specify in the system the organizational structure, organizational locations, and staff or unit to which records management responsibility may be assigned.

11. Import information from other sources (e.g., pre-existing file plans, box indices).

12. Allow users to specify identifiers for boxes, their contents, locations, and related accession information. (*).

(*) For RMAs, which may also manage paper records.

5.7.2.2 Maintain Records Security

For all RMA's, the functionality of the relevant core EDMS components should enable the organization to support the following capabilities in compliance with the records management policy(ies):

1. Prevent over-writing of a record. (Usually, a record 'copy' is checked out of the system and a re-filed record is written as a new record or a new version of an existing record.)
2. Prevent any modification of a record's unique identifier, once it is defined.
3. Prevent deletion of indexes, categories, and other 'pointers' to records.
4. Calculate and maintain a checksum for records and their metadata, or use some similar technological means of detecting any alteration to the record or metadata.
5. Provide audit trails of all add, update, delete, and retrieval activity.
6. Maintain appropriate backup copies of records and recordkeeping systems.
7. Provide adequate recovery/rollback procedures and rebuild procedures, so that records may be recovered or restored following a system malfunction.

5.7.2.3 Manage Records Access

For all RMA's, the functionality of the relevant core EDMS components should enable the organization to support the following capabilities in compliance with the records management policy(ies):

1. Control access so that only an authorized individual is able to retrieve, view, print, copy, or edit a record or other entities (e.g., metadata, file plan) in the record keeping system.
2. Permit the identification of individual users and groups of users, and enable different access privileges to be assigned to individuals or groups. Access privileges may limit access to selected records or groups of records, and may limit access by selected individuals.
3. Maintain the integrity of redacted records and assure that redacted material is not accessible.

5.7.2.4 Facilitate Records Retrieval

For all RMA's, the functionality of the relevant core EDMS components should enable the organization to support the following capabilities in compliance with the records management policy(ies):

1. Allow searching on metadata, record content, or assigned subject categories (using a controlled vocabulary).
2. Ensure that all access privileges (permissions and restrictions) are enforced on all retrievals.
3. Allow searching based on a combination of metadata, content, and subject categories within a single query. Query results that may be a list of records and their locations, or may be the records themselves.
4. Allow retrieval of records and associated metadata, and allow retrieval of records based on defined links (e.g., between versions of the same record).
5. Provide a sufficiently powerful range of search features and options, as needed to meet various agency requirements. These might include: wild-card or exact-match searching, proximity or adjacency searching, relevance ranking of search results, use of stop-words, limits on maximum size of results set from a search, query by image content, or others.

5.7.2.5 Preserve Records

For all RMA's, the functionality of the relevant core EDMS components should enable the organization to support the following capabilities in compliance with the records management policy(ies):

1. Ensure that all records can be read and accurately interpreted throughout their useful life in that system.
2. Enable migration of records to new storage media or formats in order to avoid loss due to media decay or technology obsolescence.
3. Ensure that all captured metadata remains linked to appropriate records and is unchanged throughout the useful life of the records, including after migration to new media or technology.
4. Monitor storage capacity and utilization and alert system operators when action is needed (e.g., to increase capacity, back up system files, etc.).

5.7.2.6 Audit/Oversight

For all RMA's, the functionality of the relevant core EDMS components should enable the organization to support the following capabilities in compliance with the records management policy(ies):

1. Create and maintain an audit trail (also called use-history metadata) for all records activity and system functions.
2. Provide access to audit trail information in the fullest detail (e.g., each individual record access, including record identifier, time, date, and user).
3. Provide summary reports of audit trail information (e.g., number of accesses).
4. Track failed attempts of all records activity and system functions.
5. Maintain audit trail information (e.g., number of accesses, details of individual record retrievals, attempts to delete a record, etc.) so that it can be managed as a record.

5.7.3 Final Disposition of Records

5.7.3.1 Destruction

For all RMA's, the functionality of the relevant core EDMS components should enable the organization to support the following capabilities in compliance with the records management policy(ies):

1. Identify records eligible to be destroyed, based on records retention schedules and disposition instructions.
2. Delete records in a manner that they cannot be physically reconstructed or otherwise retrieved.
3. Enable a record to be kept of all record destructions, providing certifiable proof of destruction.

5.7.3.2 Transfer

For all records systems, the system should:

1. Identify records eligible to be transferred, based on records retention schedules and disposition instructions.

2. Export records and metadata (i.e., copy and subsequently remove them from the system), in a format acceptable for transfer to archives.

3. Enable a record to be kept of all record transfers, providing certifiable proof of transfer.

6 Best Practices Associated with ECM Project Phases/Activities

6.1 Change Management

The key to success in implementing EDMS lies in integrating the key elements described so far: Technology, Readiness, Operations, and Culture. The best way to accomplish this integration is through the active participation and involvement of users and management.

6.1.1 Champion User Participation

Participation from all levels of employees in the implementation process is an underlying theme of the following recommendations. At a minimum, key users (also referred to as "champion users") should be identified throughout the organization. These "champion users" are typically senior or lead users who can provide input and feedback via a bi-directional communication model enabling the EDMS team and the users throughout the organization to be involved in all appropriate aspects of the analysis, design, and implementation project phases. The benefits of employee participation are increased motivation, higher productivity, and improved quality. In one study in which resistance to work changes was lower in groups that participated in making those changes, researchers identified two key points:

a) Participation is a necessary but not sufficient means of reducing resistance.

b) Participation is ‘a feeling of involvement on the part of people, not just the mechanical act of taking part in discussions.

Organizations that have left the "champion users" out of the planning, problem solving, analysis, and redesign or that have only marginally involved employees through random conversations and presentations have been unable to tie together the four key elements: Technology, Readiness, Operations, and Culture.

One of the best ways to ensure participation is through a Champion User Team. Selected by senior management, this team should comprise representative individuals from all levels and all key job functions as well as members of the technical project staff. The goal of this group is to jointly design the new work processes and jobs to best utilize the EDMS and human resources. The formation of this team will alleviate many of the us-versus-them problems that arise when the technical staff, records management team, or end-user representatives work separately from the other portions of the business unit in designing a system. This Champion User Team should begin its work with a one-day or two-day training session that would review the following topics:

— team charter, roles, and responsibilities;

— project objectives and goals;

— change parameters established by senior management;

— methodology for work redesign that looks at both the social and technical aspects of work;

— problem-solving techniques such as brainstorming, flow charting, cause-and-effect diagraming, and the like;

— development of effective teams;

— effective team behaviours and,

— use of new technologies as support for the project.

The Champion User Team should continue to meet on a regular basis to accomplish the following tasks:

a) **User analysis:** identify users, determine the extent to which their needs are being met, and identify actions that can be taken to increase user satisfaction.

b) **Technical analysis:** document how work flows, where problems occur, and where these problems are first discovered. Also determine how imaging can impact the current workflows and which variances will be eliminated or reduced by imaging.

c) **Work redesign:** according to information already gathered, rethink new workflow designs.

d) **System design:** according to information already gathered, finalize system specifications.

e) **Organization design:** according to new workflows and system capabilities, determine structural changes that need to be made in the organization, if any.

f) **Implementation plan:** identify the steps and resources required to move from the current organization to the new image-enabled organization.

6.1.2 Change Management Program

Once the data have been gathered and analysed, a targeted change management program can be created. It is the follow-through on carrying out the change management program that will be most critical to the success of the implementation process.

The change management program should look for additional opportunities to involve key users or "champion users" in all aspects of the EDMS project. This can be done by establishing User Involvement Teams. The teams would be created to develop strategies for managing the key issues that were identified through the organizational assessment. For example, separate teams might look at issues such as communications, training, and policies and procedures. Since many of the team members may not have had opportunities to help shape their organizations, the teams — such as the Design Team — will need some initial training in team building, problem solving, and meeting management.
While each organization will develop a change management program that is unique to its own situation, three broad areas that every organization will need to address are communication, training, and job design

6.1.3 Communication

In most organizations, communication is not as good as it should be. While this is not usually detrimental to the business, lack of communication at critical times of change can lead to failure of the change effort. The following are suggestions about communicating during times of transition:

a) Fully describe the problem previously identified by end-users and management.

b) Acknowledge input from users that were interviewed and participated in the process baselining activity.

c) Identify the following:

   1) What information is difficult to find?

   2) What challenges do the users encounter with the current process?

   3) Who will benefit from technology based change?

   4) What types of non-technology based change is desired or required?

   5) What will actually change?

   6) What secondary changes will occur?

   7) What will be changing for the organization as a whole?

d) Compensate for losses. For example, in EDMS environments, many employees feel a loss of socialization with their peers or feel that the use of these technologies will increase management oversight and force users to "account for their time". While this may be an objective, how this is presented to the end-users will greatly affect their interest and willingness to participate in any type of change.

e) Communicate as much as possible. It is always better to over communicate the project goals, objectives, and status, rather than under communicate the plan and what is scheduled to occur at each point of the project.

f) Emphasize and demonstrate the active and direct support of all levels of the management team.

Some successful EDMS installations have relied on monthly or quarterly meetings, newsletters, electronic mail updates, WEB site communication pages, hot lines, and suggestion boxes. People in each organization will need to determine what will work in their environment.

6.1.4 Senior Management Participation

The most important contribution senior executives can make early in the project life cycle is to participate in a strategic planning session. The purpose of this session is to clearly articulate desired project goals and objectives and the desired organizational change. Most organizations develop a Technology Strategy which includes EDMS. Usually this is tied to a Business Strategy. The third component of this strategic triangle is the Organizational Change Strategy. In many cases, this third critical strategy is non-existent. Failure to articulate an Organizational Change Strategy can lead to failure to manage the human and organizational impact of EDMS. Trying to manage the human and organizational issues without a coherent strategy will result in an unfocused and ineffective change management effort.

Strategic Planning Session should focus on answering the following questions:

— What aspects of our business culture are effective?

— What aspects of our business culture are ineffective with regard to EDMS implementation?

— In what ways will EDMS impact our employees and key external organizations?

— What structural changes in the organization are likely to result from EDMS?

— How much change do we want in this organization? When examining the continuum of control versus commitment, where are we now with regard to management style? Where do we want to be?

— What technology based change is appropriate for the organization?

— How should the project be phased to allow adequate time for change management and organizational acceptance of the selected technologies?

— Do we simply want to automate existing processes or do we want to fundamentally change workflows?

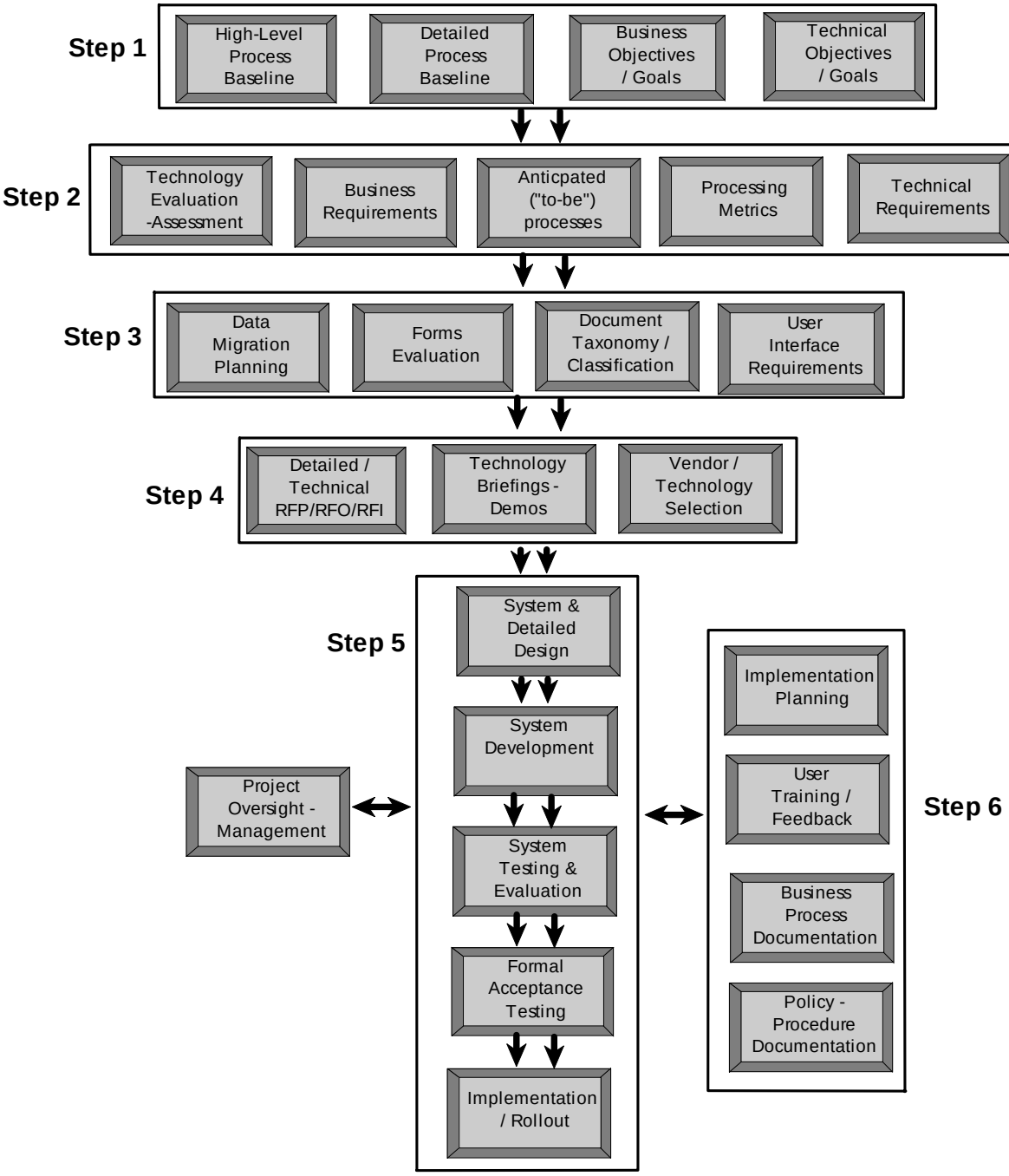
The outcome of these meetings should be clearly stated objectives for change management and a set of guidelines for change that can be used by implementation teams. For example, are there any processes or procedures that cannot be changed due to regulatory requirements? Can we eliminate certain positions; alternatively, must all job titles remain in the organization? Can we redirect resources? Do we want to increase employee participation a little bit? Alternatively, do we want to move toward self-managed work teams?

6.2 Recommended Project Steps and Activities

The following steps and activities have been organized into 6 groups to provide ECM industry accepted guidance associated with planning and implementing appropriate EDMS technologies. These steps and activities are grouped into logical project phases enabling organizations to evaluate the overall project phasing that has been found to greatly improve overall project success and experience for the organization.

Each of the following sections provides detailed information on those activities requiring completion prior to product/vendor selection. There are numerous steps and procedures associated with analyzing business requirements though the identification and selection of relevant technologies to be considered for implementation.

Shown below are those industry standard activities and project steps that should be followed by the organization when developing the project plan and schedule. This list of activities should be customized as appropriate to meet the organizational requirements and procurement procedures.



6.3 Process/procedure baselining

The purpose of process/procedure base lining is to clearly define existing processes/procedures and identify issues and problems currently encountered. This is achieved through a detailed analysis of existing processes and procedures. When performing this analysis it is important to capture and document activities including:

- how documents and information are received;

- what occurs to these documents after receipt (i.e., stamping, sorting, logging, delivery, etc.);
- how these documents are used and how many people use the same document to complete a specific activity or process;
- what happens to the document during the processing (annotation, highlighting, copying, etc.);
- after the processing is completed, where the document is stored, whether there are multiple copies, etc.; and
- how established document retention timeframes are adhered to and the process of document destruction after reaching the destruction date within the retention policy.

This information should be gathered through interviews with selected users within each processing unit. These users should include experienced users (non-management) and management personnel. It is important to note that the team gathering this information should represent the business units from a user perspective and include all processes and procedures currently being used. As the base lining process continues, users may describe processes and/or procedures that are not "officially sanctioned" in the day-to-day processing. These workaround, or alternative methods, need to be documented, as well as all other user workarounds and methodologies implemented to complete daily work activities.

Upon completion of this documentation, the users should have an opportunity to review the baseline document to ensure that all functions and activities related to their processing have been accurately captured and documented. It is very common for these documents to have multiple versions presented prior to user sign-off. This is due to the primary fact that most users do not have complete documentation at the detail level related to how the documents are managed.

There are 3 basic activities recommended throughout the ECM industry related to process baselining. These activities included the development of a high-level baseline establishing the overall structure of the business process, the detailed baseline documenting specifics of each task/procedure identified during the high-level baselining, and associated manual processing metrics.

6.3.1 High Level Baseline

The first step in documenting business processes is to develop a high-level (management view) of the manual or document based business processes. This high-level view of the major processes and activities to be examined is also referred to as a "task oriented" baseline. These high-level baselines provide information related to the tasks performed by the organization without the detailed information associated with how information enters the process, how it is managed and how the information moves to the next stage of processing.

Selected and representative users from organizational staff should be interviewed to identify all general work activities, policies, and business procedures. These processes should be documented in a “graphical” format developing the “high-level” process schematics documenting the manual, or document based processing flow throughout the organizations. These “high-level” schematics are then further “exploded” during the detailed process documentation which provides the full set of information necessary to identify all aspects of the process for analysis and evaluation. Detailed information on developing a process baseling is contained within ISO/DIS 10244 – Document Management – Business Process Baselining and Analysis.

6.3.2 Detailed Process Baselining

Upon completion of the High-Level processing schematics, those areas of the high level baseline are typically identified by managers and supervisors to be further documented during the detailed process

baselining process. Users throughout the organization are further identified to be interviewed to collect sufficient information to fully document the process at the detailed level. These interviews should include discussing how work and work-related information is received, processed, and "moved" between groups, departments, and other users.

These processing schematics should be documented using a graphical tool enabling the organization to review the processes in an interactive fashion on their computers. A read-only version of the software should be provided to any organizational resource with the need to review this documentation. Users identified during the initial project planning stages and others identified throughout the process should be interviewed to ensure that all relevant portions of the business processes are documented, showing all aspects of how the information flows, how it is tracked, logged, managed, routed, along with any other work-related activity associated with the process being documented.

During the detailed process baselining activity, processing rules and conditions are identified as decision points and document routing/hand-offs as the document moves through each identified process. "Rules and Conditions" are considered to be those decision points and hand-offs that dictate how information flows through the process. A small example showing the level of information detail gathered for EACH process including "rules and conditions" is shown below in Figure 6-2. Sample Detailed Process Schematic:

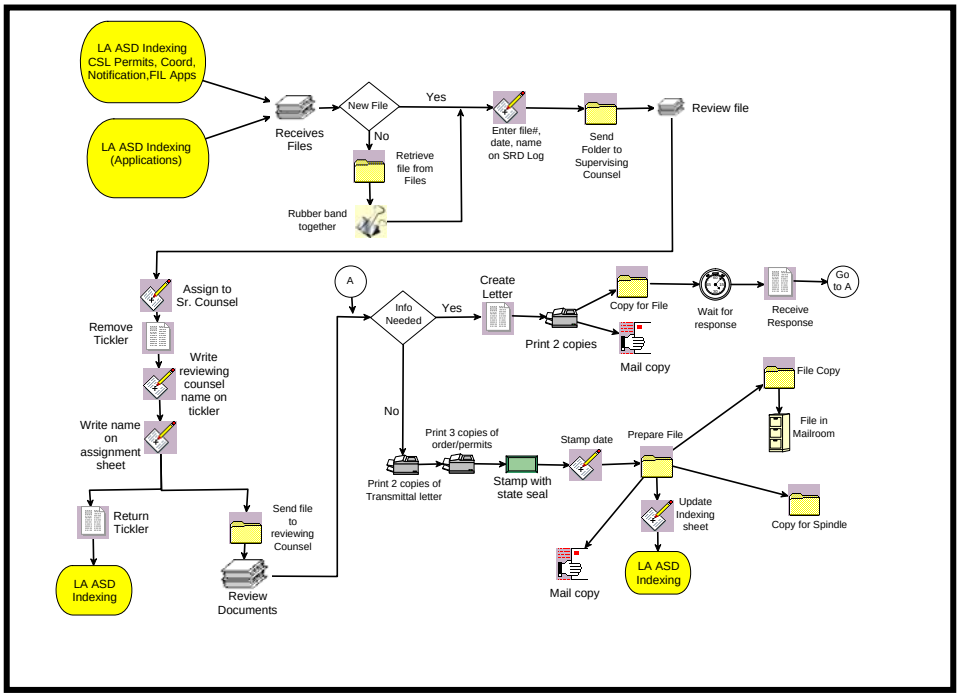


Figure 6-2: Sample Detailed Process schematic

6.3.3 Processing Metrics

A Processing Metrics Report should be developed that would include information related to personnel time currently spent on all work related "manual" activities identified through high-level and detailed schematic development. These tasks can then be further examined by organization management to identify those processes and/or activities that can potentially be replaced/enhanced with technology and those processes/activities that can be replaced/enhanced through organizational change management.

This enables the organization to evaluate how much time is spent managing the current workload along with anticipated time after new/updated technology implementation. Time associated with processes/activities documented in the schematics should be identified and documented to identify items similar to:

- Time spent logging receipt of documents
- Time spent copying, filing, locating documents
- Time spent manually managing digital documents from creation through storage
- Time spent manually routing and tracking documents as they are processed
- Number of personnel performing associated major processes/activities
- Classification of documents and associated document volumes
- Estimated number of multiple copies of identical documents throughout the organization

As accurate time related information is typically difficult for users to gather, it is common for an organization to follow a very conservative approach, evaluating how much "work" time is spent on these activities on a daily or weekly basis and then review the information prior to inclusion in this documentation, while comparing the received information with overall times for the processes and other aspects of organizational work related activities.

6.4 Anticipated processes/procedures

Upon completion of the base lining process, this information is evaluated to determine where non-technology based and technology based changes could be implemented.

Examples of non-technology-based change typically include reduction in document copies, the revision of outdated procedures, elimination of redundant procedures, and duplication of processes/procedures between organizations. During the non-technology change review, end-user organizations should consider the impact on existing operations when updating/changing processes/procedures.

Examples of technology based change typically include automated logging of document receipt, automated routing for processing, and detailed history related to work activities associated with each work item or document. Additional examples of technology based change is related to which technologies are determined to be of benefit to the organization and how those technologies would be implemented resulting in a different method of conducting business.

The level of detail associated with the new or anticipated processes should take into account how legacy systems would be updated, modified and/or replaced. It is very typical to have a high number of personal databases, spreadsheets, and other tracking/data tracking activities that can be consolidated into the ECM system. It is also very common to have new processes and procedures established to not only manage digitally born information, but to support electronic distribution of this information to users within the organization and to users external to the organization through the use of electronic transmission.

6.5 Technology Requirements definition

After identifying the relevant technology based changes required by the organization, solution requirements should be documented providing detailed information to potential solution vendors. This document should clearly define anticipated user and system functionality in sufficient detail to enable a

potential solution vendor to understand the business problem/issue being addressed and desired results after solution implementation.

When developing the solution requirements, organizations should consider documenting desired and/or required document management functionality and capabilities identified throughout this document.

6.6 Document Classification and Indexing Model

An important aspect of any ECM effort is to establish an enterprise wide document classification and indexing methodology. This effort should include meeting with all appropriate staff identified by the organization as being representative of how the ECM solution would be used to discuss existing document classifications and to prepare a full classification plan that can be implemented by the selected solution integrator/software provider. It is important to note that when implementing an enterprise foundation the resultant document classification and indexing methodology should:

- be flexible and able to be updated as required by the organization without adversely affecting documents already stored by the solution;
- fully addresses records retention issues and schedules;
- enable staff to easily locate and retrieve documents;
- support the ability to implement document security;
- provide logical information groupings; and
- support the use of "virtual folders" where staff can search and organize documents during the retrieval process without forcing document replication or copying.

This classification should be fully compliant with the organization records retention schedules and link to the records management classification and structure. This will enable the business side of the organization to further manage the business documents and records as required by the records management team.

6.7 Business Objectives and Requirements

The business objectives, functional requirements and expectations should be clearly defined. The business/functional requirement documentation should include both technology driven and non-technology driven requirements and detailed information related to:

- Business objectives of the project;
- Business functional requirements; and
- Business expectations.

This document should contain specific information related to current and near-future business needs and requirements identified through the business baseline activities, and interviews with business, technical, and management team members of the organization.

Additionally, the definition of critical success factors (CSF) associated with how the resultant solution would be evaluated to determine overall achievement of these objectives and requirements should be clearly defined. Critical success factors are those items considered to be either a business or technical requirement for the organization. The CSF's should enable the organization and the vendor to identify those areas of critical importance related to the successful implementation of the desired technologies.

Common examples of critical success factors from both a business and technical perspective include:

Business related goals

- Improved service: Users need the ability to quickly access and review information managed by the document imaging and workflow system.

- Ability to track and monitor work activities: The system should enable the users to track all ongoing work including the ability to re-assign work from one user to another. This tracking capability will enable the organization to implement workload leveling when appropriate.

- Centralized historical information between organizations: The system should enable the organization to maintain centralized history related to all activities associated with the client/constituent. This history centralization should include both system generated activities (i.e., date scanned, date routed, etc.) and user generated information such as notes taken during telephone conversations. The users should only have access to information allowed by their security access. The system should restrict access to information required by higher levels of security.

- Increased efficiency of available resources: The organization should be able to use the selected technologies to support ongoing business activities. The selected technology should enable users to decrease time spent on paper and file handling activities including stamping, stapling, copying, delivering, and filing documents, and increase time in the areas of work processing.

- Satisfy organizational and/or government regulations pertaining to document retention: The use of electronic data storage must adhere to any laws and/or regulations covering the storage, retention, and retrieval of information on electronic storage media.

- Decreased storage costs: The solution must provide the ability to use optical storage technology to reduce the overall cost of storage and retrieval of all “hardcopy” information.

- Decreased costs for manual document management: The cost for manual document management should be reduced along with an increase in the ability to provide improved service at a lower cost per request.

- Simplified user access to application, work-order, and other data: The overall solution must enable the users to quickly select and access the desired information without using highly complex user interfaces or tools. The user interface needs to be easy-to-use by the various system users.

Technical Goals:

- Scalability: The system must be fully scalable, allowing for an increase of the number of users and volumes of data without replacing primary system components. This scalability must be in the areas of increased memory, disk storage, optical storage, CPU speed and size, etc.

- Migration path: A clearly defined migration path must be fully supported by the proposed solution. This migration path must provide for the integration of new document management technologies to ensure proper integration without adversely affecting the proposed solution and/or data managed by the existing system(s).

- Modularity: The various client-based applications must be modular allowing for implementation of additional functionality without adversely affecting the overall system solution. This includes the ability to add routing; "virtual" file folders, high-volume printing, automated fax services, workload distribution, monitoring, etc.

- Browser based access: The system must fully support browser based technology where the various web servers will provide all the necessary mechanisms to store and retrieve information requested by the user, system level security for both users and data, and associated system management functions. All applications must be fully integrated to prevent redundant hardware and software on both the workstation and web server platforms.

- Use industry standard components (no proprietary architectures allowed): The associated components within the solution must be commonly available throughout the document imaging and workflow industries, be fully supported by the selected product supplier, and have full user and/or development documentation and libraries.

6.8 Technology evaluation guidelines

When evaluating appropriate technologies required or deemed necessary to meet business and technical goals, the organization should consider several factors associated with the technology. The evaluation of the appropriate technology should include:

- COLD/ERM: When evaluating COLD/ERM technologies, the organization should review the downloading, indexing, and storage processing requirements. Additionally, the organization should consider the complexity of configuring the system to support new and/or modified report formats and indexing requirements. The ability of the technology to support simplified user access to data via a "query" screen and the ability to "cut and paste" information from a retrieved report or page to a standard office application should be considered. When evaluating COLD/ERM technologies, the organization should ensure that the system is capable of loading and indexing the daily work volume without impacting the users. This functionality of "loading" should include automated indexing based on templates defined by authorized users.

- Document imaging: When evaluating these technologies, it is helpful for the organization to perform "site visits" to other organizations similar in size and processing, who have implemented the solution being considered. The purpose of these site visits is to gather information related to issues/problems encountered by other users that potentially have not been identified or addressed by the organization. During these site visits, all aspects of document scanning, indexing, and verification should be discussed. Overall system performance should be reviewed along with ease of use and processing accuracy and organizational satisfaction with the product/solution and the product/solution provider.

- Document services: These services enable users to manage electronic information independent of the tool used to create the information (i.e., word processing, spreadsheets, facsimile documents, etc.). Document services typically enable users to check documents "in" and "out" of information repositories; support document version control; and support document, group, and file level security rules. When evaluating these technologies, the organization should consider whether the product supports these functions along with being integrated with web publishing components (described below).

- Workflow: When the organization determines that workflow technologies are required, it must decide whether ad-hoc, administrative, or production level technologies are required. For ad-hoc and administrative routing/workflow requirements, the organization should evaluate whether the product includes simplified authoring tools (for non-complex routing procedures) which can be used in a graphical environment along with monitoring capabilities. The monitoring capabilities should enable authorized users access to work queues or "baskets". These administrative and monitoring tools should further enable the authorized user to re-route work items and establish basic escalation and "time-out" procedures. These escalation and 'time-out" procedures enable the users to establish a specific amount of time which a work item can remain at any specific

activity, or establish a total amount of time to elapse prior to automatically sending the work to a specific person or role. When the organization determines that production level workflow technologies are required, the escalation and "time-out" requirements should be included, but additional functionality should be considered. This additional functionality should include the ability for authorized users to build complex workflow rules and support load-leveling functionality and real-time work queue or "basket" monitoring.

- Automated Data Capture: In many situations, the inclusion of OCR/ICR technologies can be justified solely on the reduction of manual data entry costs associated with indexing and capture of specific content from scanned documents. As there are many data capture products available that can be integrated with most document management systems, the organization should pay particular attention to the expected benefits and the ability to measure these benefits during the evaluation. When evaluating OCR/ICR/Barcoding technologies, the identification of the following information may assist the organization in determining the expected cost benefits in comparison to manual data entry:

    - Color of original documents and variety of documents or form types to be identified automatically;
    - volume of hand-printed and machine-printed information to capture;
    - volume of fields per form or document;
    - volume of characters per field;
    - field type (numeric, alpha, alphanumeric);
    - extent of document preparation (pre-sorted documents, mixed form types);
    - extent of forms re-design (dropout, bar-code, OMR); and/or
    - identification of business rules to validate or enhance the recognition result.

- Forms Processing: When the organization determines that forms processing and management are required, the organization should consider both the forms creation and forms processing tools. The forms creation tools should enable the authorized user to develop new forms and modify existing forms for use within a browser based application. These form design tools should include the ability to create fill-in boxes, checklists, pull-down selections, free-form text input, and digital signature attachment to the form during transmission. The forms management technologies should also enable the users to manage forms using version control and support the ability to either store the submitted data with the form or store the data with the version number of the form. This information should be stored in the application database for further management and/or storage.

- Web publishing components: When the organization requires publishing documents to a web server, the system should support the ability for authorized users to create templates associated with specific classes or types of documents. These templates should be used by the web publishing system to convert submitted documents to either HTML or XML format including graphic and table conversion as required. The system should provide a mechanism for authorized users to either configure the system to automatically publish these converted documents directly to the web server or send the converted document to a webmaster for review and website updating.

6.9 Forms Review and Design Considerations

Most organizations utilize both electronic and hard copy forms. These forms should be reviewed to identify where hardcopy forms could be converted to an electronic format, and electronic forms should be reviewed to identify components that can be automated along with identifying components that should stored/retrieved from legacy and ECM systems.

When reviewing electronic and hardcopy forms, the organization should consider:

- Does the form need to an exact replica of the original hard copy version?
- Does the form need to be printed and completed manually by outside personnel and then re-entered into the system?
- Can the form be pre-printed with information for use by outside personnel (i.e. name, address, other fields completed from information already on file, etc.)
- Can the form include barcodes or other "coded" information that would support automated indexing after return of the completed document by outside personnel?
- Can the fields be streamlined and have components removed (i.e. received by, route to, date received, etc.)?
- Can the form be provided electronically or does it need to be in hardcopy format?

As organizations review forms, additional considerations, such as whether to use forms creation applications designed primarily for web base applications or forms creation applications designed primarily for ECM environments, should be considered. The use of electronic forms can greatly streamline organizational effectiveness and reduce duplicative data entry related to using hardcopy forms and/or forms that are completed manually and then scanned/indexed.

Organizations should consider the process that will be required to create the form, deliver the form to the users, and accept the form and/or information after being completed by the user(s).

6.10 Legacy Data/Document Conversion Methodology Considerations

Legacy data is commonly loaded into the new EDMS systems including documents converted into a digital format and digitally born data. Issues associated with digitally born data loading or related to what versions should be loaded and how to establish common and accurate metadata. It is important to recognize that not all digitally born data will be stored in the system or stored in the system in the native format due to age and/or format/structure of the data. For example, documents stored on a network drive or mainframe storage system may be in old or proprietary formats that require specialized formats/software no longer available or no longer easily accessible. These types of digital data should be converted to a industry standard format such as PDF/A, HTML, or XML (or JPG. if image/map data).

For documents in hardcopy format, there are three different approaches to existing file/data conversion in use throughout the document management/workflow industries: full back file, partial back file, and as-needed. The organization should review and determine which approach best meets the previously defined business and technical goals. The approach selected by the organization will become extremely important if there are existing documents/files that need to be converted along with new and ongoing document receipt. Full back file and partial back file conversions typically require the selection of an outside "conversion" organization capable of processing large volumes of documents within a short time frame. The determination of whether to use an outside conversion organization or to convert using internal resources should be based on the volume of information to be scanned, the complexity of the

required indexing, and the required expediency of the conversion. The various approaches that should be considered by the organization include:

6.10.1 Full back file conversion

When selecting a full back file conversion, the organizational goal would be to have all existing hard copy documents available for use within the system in an electronic format. This conversion methodology is used when existing documents must be converted to meet business and/or technical goals. This methodology is typically very expensive and time consuming. The costs associated with full back file conversions are based on the volume of documents being converted, and the total number of "keystrokes" needed to index each document which is calculated by the total number of characters. When calculating the total number of characters, the organization should determine the level of accuracy required. For conversions where the conversion organization will only enter the information once (minimal data verification), the accuracy is typically not high enough to directly import the information into the document-imaging part of the system. It is recommended that a verification process (commonly achieved through "double keying") be implemented, which increases the cost of conversion from an industry average of $0.10 per page to $0.20 per page.

6.10.2 Partial back file conversion

This conversion methodology is similar to the full back file conversion except that the organization selects specific documents requiring conversion such as by document age or date. Other than reducing the total number of documents requiring conversion, all considerations outlined within the full back file methodology apply.

6.10.3 As-needed conversion

This conversion methodology would allow the organization to convert documents only when required to complete an activity or process when new work is initiated. This conversion effort typically does not require the utilization of an outsourcing organization. To perform this type of conversion, the system should have a common "list" of where all documents are located, including both hard copy and electronic copies. The purpose of this list is to enable the users to quickly locate documents and determine whether they are available in the document imaging system or whether they are in hard copy format and require conversion. As new work items are received, the system should notify the user (or scan/index operator) that other documents are in hard copy format and need to be retrieved, scanned, and indexed, prior to routing to the user(s) for processing.

6.11 Procurement Document Preparation

The procurement document provides detailed information on all aspects of the project. It is critical to include detailed technical requirements in any procurement document including information on existing and anticipated operations, along with documenting data volumes, indexing requirements, and routing requirements, etc. The technical requirements should include all necessary information allowing solution/product suppliers/integrators to respond in sufficient detail for the organization to be able to select the best product/supplier meeting the enterprise goals of the organization.

This document should also include detailed information related to the acceptance testing criteria used to validate components and solutions implemented by the selected vendors/suppliers. At a minimum, the software procurement documentation should include information on the following topics:

- Business requirements

- Technical Requirements
- Software vendor experience requirements
- Identification of standards with which the vendor products must comply;
- Description of how the organization will conduct acceptance testing;
- Requirements of User Acceptance Testing documentation to be prepared by the selected solution vendor or product supplier;
- Software vendor project management requirements;
- Description of records management capability requirements;
- Staff orientation and training requirements; and
- Requirements for vendor supplied technical support

6.12 Solution/Product Evaluation Guidelines

When evaluating solutions/products, the organization should consider several factors associated with the product and technology. Areas that should be considered include:

- Product maturity: The organization should evaluate the level of product maturity. This evaluation should include determining how long the product has been generally available, whether the product is in an early release stage (i.e., is this a new version which has not yet been fully implemented by the user community?), or whether the selected product has been in production for at least one year. All products are continually being updated to provide new functionality, "bug" fixes, and adherence to new standards and technologies. It is important for the organization to consider the maturity of each part of the selected solution when determining the overall risk factors associated with implementing these technologies.

- Adherence to relevant industry standard/guideline: When reviewing various products and technologies, the organization should consider whether the selected product(s) adhere to the appropriate standards and/or guidelines.

- Ability to meet key objectives and critical success factors: Each organization should evaluate whether the selected product meets all, or a part, of the previously defined critical success factors. It is important that the organization select the most appropriate solution to address the previously defined business and technical requirements, rather than being forced to modify business/technical goals to meet the capabilities of the selected product. For those areas where the selected technology does not meet the stated requirements, the organization should evaluate and determine the potential risk associated with changing the requirements. Changes to requirements may be in order due to technology not being mature, the requirement being a future item, the requirement not being critical to the success of the organization, etc.

- Level of available technical support both during implementation and after: When selecting the product/technology, the organization should review the level of technical support available both during and after technology implementation. The organization should determine whether the primary product supplier provides all support (with the exception of 3rd party development) related to the installed product or whether technical support is only available through a reseller or "partner" and determine which level of support best meets the needs of the organization.

- Product Scalability: The evaluation of any technology component should include the consideration of the expected scalability of the solution based on its ability to meet future increases in processing volumes and expanded user base.

- Availability of system documentation, including help facilities.

- System Security: Due to the importance that security issues have throughout the enterprise, the organization should evaluate security features in compliance with the organization's internal policies and requirements. Often the ability of the product to leverage the security features of the native operating system provides a measure of protection that will alleviate concerns over proprietary implementations. The organization may also want to evaluate and weigh product features that support managed network services over use of applications using open sessions or "captured sessions" that provide limited security.

- System Availability: Although system availability issues are often overlooked, many government agencies now expect a defined level of availability for the entire solution. The organization should identify particular features of the product that directly contribute to system availability and identify those single points of failure in the solution that can cause a complete outage. This evaluation should be performed within the context of the risks associated with not having the solution available during normal business hours.

- Cost of Ownership: To determine the cost of ownership of a given solution, the organization should also consider features that address basic system administrative tasks including configuration management, software distribution, addition of new users, auditing, error reporting, disaster recovery and restoration, performance measurement utilities, and management reports. Determine whether the product requires additional software and/or hardware to maintain a test, training, and development environment.

- Reference Site Benchmarks: When available, performance benchmarks from a known reference site of similar size are invaluable in determining the solution's ability to meet the expected volume of work. Evaluate the product based on its ability to meet the peak processing loads from the reference site.

Along with these items, it is highly recommended that the review team consider how well the proposed solution/product meets the business and technical requirements along with whether the solution will adequately address the business objectives and functional needs and expectations.

It is common for organizations to include members of all aspects of the organization throughout the procurement document review process including the review vendor/integrator responses. This should include members of the records management team, business management team, legal team, and the technical support organization.

6.13 Project Planning and execution

After the vendor/integrator has been selected, the project planning typically occurs with the establishment of dates associated with detailed technical design, user interface definition/customization, report definition, etc. This phase of the project can take a significant amount of time, but should not be rushed. There are various approaches used in the industry to address the issue that unless the users have experience working with these technologies, there are aspects and functions that will be difficult to envision.

Taking this into account, the project plan should consider what type of design, development, and review process will be implemented ensuring that the resultant system meets the user needs while recognizing the need to have end-user input to ensure successful change management. The first approach is for the integrator/vendor to create an initial design, or prototype, and have the users "test" the system to gain a better understanding of how they can use the selected technologies. The process of updating the prototype and user testing continues in this project model until the system fully meets the needs of the organization. While this ensures a system that fully meets the needs of the users during initial rollout, there are several problems associated with this to be considered including the potential for project/cost

over-runs and project timelines being greatly or significantly altered and/or expanded from original expectations. The second approach is for the integrator/vendor to prepare a phased design and rollout plan that encompasses both prototype design and user review/feedback during each project phase or component to be designed/implemented.

The organization should decide the best way for the organizational members of the design team to learn how the selected technologies work, the best approach to ensure user acceptance of the new technology(ies), all while keeping within project budget and timeframes.

6.14 System, Unit Testing, and Project Monitoring

During the development and configuration phase of the project, it is imperative that the system be fully and properly tested. It is critical to the success of any EDMS project that full testing is performed by the vendor/integrator prior to end-user review/participation. Without this thorough testing, the potential for user frustration with the system being non-functional and/or "not ready" is significant and can have a negative impact on other change management activities and expectations.

This testing and project monitoring should be executed by different members of the project team with participation as recommended in the following table:

Integrator/Vendor Testing	Organizational Technical Testing	Organizational Business Unit Testing
Unit/Module testing – As each unit/module is developed, the integrator/vendor should fully test all aspects while in the test environment	Updated on progress of unit/module testing to monitor project progress	Updated on issues and design considerations to ensure system meets end user needs and requirements
System Testing – As the system is configured on the test environment or platform, the integrator/vendor should fully test ALL aspects of the system	Updated on progress of system testing to monitor project progress	Updated on project progress while continuing to prepare for implementation while addressing organizational change related issues
	Full System Testing – After the integrator/vendor has successfully completed their testing, the organizational technical team should perform detailed system testing to ensure compliance with organizational expectations and functional/technical requirements	
		End User Testing – After the organizational technical team has successfully completed all system testing, selected end-users should test the system from the business perspective to ensure all functions operate as anticipated

6.15 Acceptance testing criteria

It is recommended that the associated tests to be used to validate the system be based on the concept that a team representing all parties would be formed. This team, including product suppliers, end-users, and project management, should be present and work together throughout the various phases of the testing. There are other methods that can be considered to perform acceptance testing including the product supplier developing and performing the acceptance tests or the users developing and performing the tests.

To ensure that each part of the system is properly tested and that all parts of the system being implemented meet or exceed system designs (with agreed upon modifications), both the organization and the implementation team should participate in the acceptance testing and sign-off's. Those components being validated and verified include:

- verifying all system functionality is operational,
- verification system backup and recovery procedures operate properly, and
- verifying system design specifications are met including agreed upon modifications.

This testing should be used to ensure that:

- the implemented system either meets or exceeds the system design documentation, and
- all users can access and use the system.

Listed below are the guidelines that should be used during the system and user testing time periods.

1. The organization should maintain a journal of events for the duration of the acceptance test and report any hardware/software deficiencies to the product supplier.
2. No hardware or software modifications should be allowed without the approval of the project director(s)/sponsor and/or project manager. The organization should provide a reasonable but limited amount of time for overcoming problems encountered during the acceptance test.
3. Suspension of the acceptance test should occur only by mutual agreement or if the organization determines that the solution is not ready for testing. If this should occur, a re-test date should be scheduled when the product supplier is able to update the necessary components identified as deficient.
4. At the end of the acceptance test, the project manager should review the list of deficiencies, if any, and make a determination to:
    a. Accept the system based on the acceptance test results with the deficiency list, in which case the items on the list must be corrected by a mutually agreed upon date.
    b. Reject the system based on the acceptance test results, in which case the items on the deficiency list must be corrected prior to a re-test, and another site acceptance test scheduled.

6.16 Rollout planning

When the organization completes the acceptance testing, the planning of the technology rollout should include evaluating current and planned organizational activities including other projects, ongoing work activities, and any change management issues that may affect the overall implementation. The organization should consider whether to integrate the system into a production mode, using a phased

approach, following a “process” model or a “unit” model. The “process” model incorporates rolling out the application to all users associated with either a specific activity or group of activities. The “unit” model incorporates rolling out the application on a complete unit basis. If the organization is implementing either document imaging or document services, the rollout plan should be based on a unit basis. When the organization is implementing workflow technologies, the organization should consider rolling out the application following the process model to ensure that all users have access to the electronic information. If the organization implements the workflow technology on a unit basis, caution should be exercised to ensure that users outside the selected organization/unit will have access to the hard copy documents in order to continue/finish the work process. This is important as once the organization begins managing and processing work in an electronic environment, the hard copy documents (previously scanned) would not be readily available.

An important aspect of rollout planning is related to user training. Organizations should ensure that sufficient and detailed end-user and administrative training has been provided prior to system rollout. This training should enable the users to fully utilize the system after rollout.

6.17 Business practices documentation

Prior to the system being moved into full production, it is highly recommended that the organization prepare a business practices, or policy, document. This document further enables the organization to authenticate, or certify, that information contained within the digital system is accurate, reliable, and trustworthy. Information should include, but is not limited to, a:

- description of how information will be scanned, indexed, and verified;
- description of how the system will be secured from unauthorized access;
- description of how documents will be secured from unauthorized modification or alternation;
- description of how authorized modification of documents will be managed, including audit trail information and the ability to retrieve any previous document version required to be maintained;
- description of how notes and annotations (if any) will be stored and managed, if they are a part of the business record;
- description of how these policies and procedures will be followed, and
- description of how the system will adhere to the published records retention schedule.

All personnel using the system should follow this document. As changes to the system are implemented, this document should also be updated to reflect system modifications. Changes to this document should be clearly marked to denote when the change took effect and what areas were affected.

Annex A
(informative)

Guidelines and standards

A.1 General

This section of the document provides detailed information on those guidelines and standards that are recommended. As these guidelines and standards are reviewed, the user should determine which guideline(s) and/or standard(s) would be beneficial to the organization. Copies of all referenced guidelines and standards are available through AIIM International.

These guidelines and standards have been organized into 5 sections including:

- General Standards and Guidelines
- Document management industry guidelines
- Document services industry standards
- Workflow industry standards
- Document imaging industry standards
- Storage and archival standards

A.2 General Standards and guidelines

ISO/DIS 10244, Document management – Business process/workflow baselining and analysis

This International Standard specifies detailed information associated with those activities organizations should perform when documenting existing work or business processes (business process baselining), defining the level of information required to be gathered by the organization, methods of documenting the work or business processes, and the procedures organizations should follow when evaluating or analyzing those work/business processes that have been documented.

ISO/TR 12037, *Recommendations for the expungement of information recorded on write-once optical media*

This Technical Report applies to the removal of information recorded on write-once optical media systems when expungement is ordered by the court or administrative authority. Expungement requires specific removal actions to occur.

This report establishes procedures for both information removal and documentation of the actions taken during removal. Following the recommendations contained in this Technical Report will ensure that the expungements are performed consistently.

ISO/TR 14105 *Human and organizational issues for successful electronic image management (EIM) implementation*

This Technical Report provides a framework for understanding and maximizing the human factors associated with successful implementation of Electronic Image Management (EIM) systems.

It focuses on cognitive, physical, organizational, and human factors as they apply to usability criteria for imaging technologies development, selection, and implementation. It provides a fundamental framework for understanding the basic issues and concepts of organizational factors, human factors, and ergonomics for EIM systems. The principles of sociotechnical systems theory are applied to the introduction of EIM into an organization. The principles of human factors and ergonomics are applied to usability criteria for the development and selection of EIM equipment, to environmental and implementation issues, and to training for long-term productivity benefits.

ISO 15801 - Information stored electronically -- Recommendations for trustworthiness and reliability

ISO 15801 describes the implementation and operation of information management systems which store information electronically and where the issues of trustworthiness, reliability, authenticity and integrity are important. The whole life cycle of a stored electronic document is covered, from initial capture to eventual destruction.

This document is for use with any information management system, including traditional document imaging, workflow and COLD/ERM technologies, and using any type of electronic storage medium including WORM and rewritable technologies.

ISO 15801 does not cover processes used to evaluate the authenticity of information prior to it being stored or imported into the system. However, it can be used to demonstrate that output from the system is a true reproduction of the original document.

ISO 15836, Information and documentation – The Dublin Core metadata element set

This International Standard defines the elements typically used in the context of an application profile which constrains or specifies their use in accordance with requirements and policies.

ANSI/NISO Z39.85, The Dublin Core Metadata Element Set

Metadata is structured information that describes, explains, locates, or otherwise makes it easier to retrieve, use or manage an information resource.

ISO/PDTR 11864, Document management – Guidelines for the creation of a metadata crosswalk system

This technical report provides users with a guide to create an online metadata crosswalk. Metadata elements addressed in the report will include those used in document management processes.

ISO 19005-1 – Document management – Electronic document file format for long-term preservation – Part 1: Use of PDF 1.4 (PDF/A-1)

This International Standard specifies how to use the Portable Document Format (PDF) 1.4 for long-term preservation of electronic documents. It is applicable to documents containing combinations of character, raster, and vector data.

ISO 2788, Documentation – Guidelines for the establishment and development of monolingual thesauri

These guidelines are intended to ensure consistent practice within a single indexing agency or between different agencies.

ISO 5964, Documentation – Guidelines for the establishment and development of multilingual thesauri

This is a companion document to ISO 2788.

ANSI/AIIM TR2 — Glossary of Document Technologies
This glossary has been prepared to standardize the use of and meaning of terms associated with micrographics, electronic imaging, workflow, and related telecommunications/Internet and to provide an accurate, understandable guide for both the beginner and expert. The total number of terms included has been substantially increased, although many obsolete terms from the previous edition have been eliminated. In addition, the definitions for the terms retained in this edition have been reviewed and revised as necessary to more clearly reflect present-day terminology.

AIIM TR21 — Recommendations for the Identifying Information to be Placed on Write-Once-Read-Many (WORM) and Rewritable Optical Disk (OD) Cartridge Label(s) and Optical Disk Cartridge Packaging (Shipping Containers)
This technical report outlines recommended information that should be placed on optical disk cartridges and optical disk cartridge packaging (on a physical label or other printed surface) for the purpose of identifying the optical disk. It applies to all sizes of optical disk cartridges that can store user-recordable information. This technical report does not attempt to specify the types of container(s) or protection needed for packaging optical disks. This report is meant to give guidance to the manufacturer, supplier, and user by providing labeling and identification related recommendations.

AIIM TR25 — The Use of Optical Disks for Public Records
This technical report was funded by a grant from the National Historic Records and Publications Commission. It is intended for federal, state, and local government agencies and related entities with records management responsibilities. In recent years, a number of government agencies have considered using electronic document imaging systems and optical disk technology for records management applications. This report provides guidelines for the planning, implementation, and operation of such systems in applications involving long-term and permanent public records.

ANSI/AIIM TR31-2004 – Legal Acceptance of Records Produced by Information Technology Systems

This report is a 2004 composite of material published in 1992-1994 as ANSI/AIIM TR31-1992 (Part 1), ANSI/AIIM TR31-1993 (Part 2), and ANSI/AIIM TR31-1994 (Part 3). The reports gave performance guidelines and a self-assessment checklist to help ensure the admissibility and trustworthiness of the printouts. In combining the material the portions dealing with problems in state laws at that time and advocating changes to the laws were dropped, while the portions dealing with fundamental legal principles and expectations were consolidated. The three-part organization was retained. Part I gives an overview of evidence law. Part II presents a performance guideline for the legal acceptance of records produced by IT systems. Part III offers a self-assessment for accomplishment of the performance guideline. Although the report is oriented heavily towards information recorded initially on paper and then entered into an IT system, much of the material applies also to system environments that are entirely digital.

AIIM TR32-1994 — Paper Forms Design Optimization for Electronic Image Management (EIM)
The purpose of this technical report is to provide information on characteristics of printed forms that will make them readily accepted in various EIM applications. This document covers forms characteristics that affect scanning. It also addresses forms layout, recognition technology, scanner performance, and data processing and the effect on data capture and data storage. This technical report is not intended to address forms removal technologies or the design of electronic forms.

AIIM TR33-1998 — Selecting an Appropriate Image Compression Method to Match User Requirements
The purpose of this technical report is to provide practical methods for analyzing user requirements for image compression in order to select an appropriate and optimal image compression scheme which matches user requirements. For example, an EIM system configured for scanning, storing, and delivering halftone, line art, text, and continuous tone images will have different image compression requirements as

compared to an application involving only text. This technical report is designed to provide guidance in selecting applicable compression algorithms for each among a wide range of source documents.

ANSI/AIIM TR34-1996 — Sampling Procedures for Inspection by Attributes of Images in Electronic Image Management (EIM) and Micrographics Systems
This technical report contains procedures that may be used to select and apply sampling inspecting plans to determine if a lot or batch of electronic or micrographic images meets specified quality requirements. Its purpose is to do the following:

- provide guidance to the user when selecting a sampling procedure that will meet risk requirements, and
- enable the user to develop a sampling plan for individual images in a scientific manner.

AIIM TR40-1995 — Suggested Index Fields for Documents in Electronic Image (EIM) Environments
The purpose of this technical report is to describe fields of attribute information that are often used with electronic imaging systems. This information may take the form of a collection of database fields or a structured computer record that refers to an image record on an electronic, digital image medium. Such a collection of database fields includes a necessary and sufficient description of the image record to control subsequent storage, retrieval, and archive management related actions with that image record. The information contained in the fields described in this document is similar to that typically used in a text management system. It is designed to be informative to a user if it is displayed in an image query response. System designers could elect to use some or all of the fields described in this technical report in addition to fields that are specific to the application they are designing.

ANSI/AIIM TR41-2006 – Optical Disk Storage Technology, Management, and Standards
This technical report provides information on the various technologies, management, implementation strategies, and industry standards for optical based subsystems. This information and the corresponding techniques described have been provided to enable optical disk system users, as well as other imaging system users, to become knowledgeable in the various techniques currently in use throughout the imaging industry

A.3 Document services industry standards

When reviewing document services technologies you should determine whether or not these products meet the recommended industry standards. A vendor/supplier will be able to tell you if they are certified for the following industry standards.

A.3.1 Document Management Alliance (DMA)

The DMA specification defined software component interfaces that enable uniform search and access to documents stored in multi-vendor document management systems. The DMA organization included more than 60 user and vendor companies working together as a task force to define interoperability specifications that meet the requirements of enterprise document management systems.

A.3.2 DMWare

DMWare is the open-source distribution and development clearinghouse. The subject matter of DMWare, based on the work of the Document Management Alliance (DMA) and of the Open Document Management API (ODMA) coalition, is public, openly contributed document management software, documentation, and metadata definitions.

A.3.3 Open Document Management API (ODMA)

ODMA specifies a set of interfaces that applications can use to initiate actions within a document management system. The API is intended to be relatively easy for application vendors to incorporate into updates of existing applications. It should not require major restructuring of an application to integrate it with ODMA.

NOTE This version of ODMA does not specify how document management systems may initiate actions within the applications.

A.4 Workflow industry standards

WfMC — Application Programming Interface (Interface 2 & 3)
The purpose of this document is to specify standard workflow management Application Programming Interfaces (API) which can be supported by workflow management (WFM) products. These API calls provide for a consistent method of access to WFM function in cross-product WFM engines. The API set is named Workflow Application Programming Interfaces (WAPI).

WfMC — Audit Data Specification
The purpose of this document is to specify what information needs to be captured and recorded from the various events occurring during a workflow enactment. This document does not define how the data is stored, but what information is to be gathered and made available for analysis. The information will be called Common Workflow Audit Data (CWAD).

WfMC — Interoperability, Internet, e-mail MIME Binding
This document maps to the WfMC standard, Interoperability Abstract Specification, which provides an abstract specification that defines the functionality necessary to achieve a defined level of interoperability between two or more workflow engines. This document defines a binding that gives concrete type definitions and message formats for the realizations of the abstract specification, using Internet e-mail with MIME encoding as the transport mechanism.

A.5 Document imaging industry standards

ISO/DIS 12651-1:1999, *Electronic document management – Vocabulary – Part 1: Electronic document imaging*
This International Standard is intended to facilitate communication in the field of electronic imaging. It presents, in two languages, terms and definitions of selected concepts relevant to this field of information technologies and identifies relationships among the entries.

In order to facilitate their translation into other languages, the definitions are drafted so as to avoid, as far as possible, any peculiarity attached to a language.

ANSI/AIIM TR15 — Planning Considerations, Addressing Preparation of Documents for Image Capture
The purpose of this technical report is to provide information to organizations considering image capture as a means of converting an existing record collection. This technical report identifies possible issues that can be encountered when preparing documents for image capture. Moreover, the purpose of this report is to provide the insight necessary for quality document preparation.

ISO 12653-1:2000, *Electronic imaging – Test target for the black-and-white scanning of office documents – Part 1: Characteristics*
This part of ISO 12653 specifies a test target for use in assessing the consistency of quality of performance over time of flat-bed and rotary black-and-white reflection scanners used in electronic image management systems. The test target is designed:

to allow routine checks of the system's performance;

to establish the performance limits of the system.

This part of ISO 12653 is applicable to assessing the output quality of black-and-white scanners used for black-and-white or color office documents, with or without half-tone or color.

It is not applicable to color scanners or scanners used for the scanning of transparent or translucent documents.

ISO 12653-2:2000, *Electronic imaging – Test target for the black-and-white scanning of office documents – Part 2: Method of use*
This part of ISO 12653 specifies test methods for evaluating the consistency of the output quality over time from the black-and-white reflection scanning of office documents using the test target specified in ISO 12653-1 and other targets.

It is applicable to assessing the output quality of black-and-white scanners used for black-and-white or color office documents, with or without half-tone or color.

It does not apply to color scanners or scanners used for the scanning of transparent or translucent documents.

ISO/TR 12654:1997, *Electronic imaging – Recommendations for the management of electronic recording systems for recording of documents that may be required as evidence, on WORM optical disk*
This Technical Report makes recommendations to be followed in establishing procedures for the capture and storage of electronic images of documents that will ensure the preservation and integrity of the information recorded on the documents.

This Technical Report applies to optical storage systems that use only media of a non-reversible Write-Once-Read-Many (WORM) type including compact disk (CD-ROM) to store electronic images of documents. It does not apply to systems that allow an image to be erased or altered after capture.

ISO 10196:2003, *Document imaging application – Recommendations for the creation of original documents*
ISO 10196:2003 provides guidance on the creation of printed documents so that they may be easily reproduced as microforms or scanned images.

Although studies were based more specifically on the Latin alphabet, the general principles may be used as guidelines for the production of documents using other alphabets or ideograms.

ISO 10196:2003 does not apply to technical drawings for which requirements are given in ISO 5457 and ISO 6428. It also does not apply to special micrographics or scanning-related applications (scanning of bank cheques or bar codes).

ISO/TS 12033, *Guidance of document image compression methods*
This Technical Specification provides information to enable a user or EIM integrator to make an informed decision on selecting compression methods for digital images of business documents. It is designed to

provide technical guidance to analyze the type of documents and which compression methods are most suitable for particular documents in order to optimize their storage and use.

For the user, this Technical Specification provides information on image compression methods incorporated in hardware or software in order to help this user during the selection of equipment in which the methods are embedded.

For the equipment or software designer, it provides planning information.

This Technical Specification is applicable only to still images in bit-map mode. It only takes into account compression algorithms based on well-tested mathematical work.

ANSI/AIIM MS52-1991 — Recommended Practice for the Requirements and Characteristics of Original Documents Intended for Optical Scanning
This standard describes the physical characteristics of paper documents which facilitate black-and-white optical scanning and the characteristics which make scanning either difficult or impossible. It provides general recommendations for the design of documents in order to make these documents easier to scan. This standard does not cover specific scanning applications, such as scanning of checks, scanning of engineering drawings, or scanning of bar codes, which are the subject of other standards. It does not address the technical details for OCR, which are the subject of other standards. Moreover, oversized documents and tiling techniques are not specifically addressed in this standard, although many of the same principles apply.

ANSI/AIIM MS53-1993 — Recommended Practice; File Format for Storage and Exchange of Image; Bi-Level Image File Format: Part 1
The purpose of this standard is to standardize a self-contained file format for the transfer of bi-level image files in environments other than facsimile telecommunications. The image file format is similar to a Document Application Profile (DAP) and supports the transfer of encoded bi-level raster scan images in environments. This standard covers bi-level images that are coded using CCITT T.4 (Group 3) and T.6 (Group 4), as well as bit-mapped images (having no compression). The file format is media independent.

ANSI/AIIM MS55-1994 — Recommended Practice for the Identification and Indexing of Page Components (Zones) for Automated Processing in an EIM Environment
This document identifies a media and application independent structure and indexing scheme that will allow necessary and sufficient description of document pages and zones (rectangular sub areas) within a page. These zones can then be processed automatically in the most appropriate fashion, regardless of the nature of data outside the identified zone(s). In particular, this standard recommended practice defines a document page so that the following processes can be applied to its electronic image record:

- data compression specifically suitable to the nature of the data within the zone (e.g., JPEG compression, vs. T.6 compression used in Group 4 Fax);
- optical mark recognition;
- optical character recognition;
- intelligent character recognition;
- handprint character recognition;
- raster-to-vector conversion for computer aided design (CAD) or geographic information system (GIS) applications;
- signature capture and recognition (CSR); and
- any other form of compression, image manipulation or pattern recognition technology, or algorithm(s) that may rely on specific data capture or storage methods.

A.6 Storage and Archival Standards

The Storage and Archival section is divided into various storage technologies. The storage technologies included in this section are:

Technical Reports
Magnetic WORM
Blue Laser Optical Storage
Red Laser Optical Storage

A.6.1 Storage and Archival Technical Reports

ANSI/AIIM TR41- 2006 – Optical Disk Storage Technology, Management and Standards
This technical report provides information on the various technologies, management, implementation strategies, and industry standards for optical based subsystems. This information and the corresponding techniques described have been provided to enable optical disk system users, as well as other imaging system users, to become knowledgeable in the various techniques currently in use throughout the imaging industry

A.6.2 Magnetic WORM Storage and archival standards

As of 2009 no national (ANSI, AIIM) or international (ISO) storage or archival standards have been published.

A.6.3 130mm Blue Laser Optical Storage and archival standards

ISO/IEC 17345:2006 – Information technology -- Data Interchange on 130 mm Rewritable and Write Once Read Many Ultra Density Optical (UDO) Disk Cartridges -- Capacity: 30 Gbytes per Cartridge -- First Generation

Specifies the mechanical, physical, and optical characteristics of a 130 mm optical disk cartridge (ODC) that employs thermo-optical Phase Change effects to enable data interchange between such disks.

It specifies two types:

- Type RW (Rewritable) provides for data to be written, read and erased many times over the recording surfaces of the disk.
- Type WORM (Write Once Read Many) provides for data, once written, to be read a multiplicity of times. This type uses a Write Once Read Many times recording material (written marks cannot be erased and attempted modifications of the written marks are detectable). Multisession (incremental write operations) recording may be performed on Type WORM disks.

ISO/IEC 11976 - Data Interchange on 130 mm Rewritable and Write Once Read Many Ultra Density Optical (UDO) Disk Cartridges – Capacity: 60 Gbytes per Cartridge – Second Generation

This ECMAtandard specifies the mechanical, physical, and optical characteristics of a 130 mm optical disk cartridge (ODC) that employs thermo-optical Phase Change effects to enable data interchange between such disks.

This ECMA Standard specifies two types:

— Type RW (Rewritable) provides for data to be written, read and erased many times over the recording surfaces of the disk.
— Type WORM (Write Once Read Many) provides for data, once written, to be read a multiplicity of times. This type shall use a Write Once Read Many times recording material (written marks cannot be erased and attempted modifications of the written marks are detectable). Multisession (incremental write operations) recording may be performed on Type WORM disks. The disk will be two-sided with a nominal capacity of 30,0 Gbytes per side and the cartridge (two sides) will provide a nominal capacity of 60,0 Gbytes.

This ECMA Standard specifies
— the conditions for conformance testing and the Reference Drive;
— the environments in which the cartridges are to be operated and stored;
— the mechanical, physical and dimensional characteristics of the cartridge so as to provide mechanical interchangeability between data processing systems;
— the format of the information on the disk, both embossed and user-written, including the physical disposition of the tracks and sectors, the error correction codes, the modulation methods used;
— the characteristics of the embossed information on the disk;
— the thermo-optical characteristics of the disk, enabling processing systems to write data onto the disk;
— the minimum quality of user-written data on the disk, enabling data processing systems to read data from the disk.

This ECMA Standard provides for interchange between optical disk drives. Together with a standard for volume and file structure, it provides for full data interchange between data processing systems.

A.6.4 Red Laser Optical Storage and archival standards

ISO 10995 Information technology -- Digitally recorded media for information interchange and storage -- Test method for the estimation of the archival lifetime of optical media

ISO/IEC 10089: 1991 130-mm Rewritable Optical Disk Cartridge for Information Interchange
This International Standard specifies

— definitions of the essential concepts;

— the environment in which the characteristics are to be tested;

— the environments in which the cartridge are to be operated and stored;

— the mechanical, physical and dimensional characteristics of the case and of the optical disk;

— the magneto-optical characteristics and the recording characteristics for recording the information, for reading the information and for erasing it many times, so as to provide physical interchangeability between data processing systems;

— two formats for the physical disposition of the tracks and sectors, the error correction codes, the modulation methods used for recording and the quality of the recorded signals.

ISO/IEC 13549-1993 — Data Interchange on 130 mm Optical Disk Cartridges — Capacity: 1,3 Gigabytes Per Cartridge
Specifies the conditions for conformance testing; the environments in which the cartridges are to be operated and stored; the mechanical, physical and dimensional characteristics of the case and of the cartridges; the format of the information on the disk, both embossed and user-written; the characteristics of the embossed information on the disk; the magneto-optical characteristics of the disk, enabling processing systems to write data onto the disk; the minimum quality of user-written data on the disk, enabling data processing systems to read data from the disk.

ISO/IEC 11560:1992 — Information interchange on 130 mm optical disk cartridges using the magneto-optical effect, for write once, read multiple functionality
Specifies definitions of the essential concepts, the environment in which the characteristics are to be tested, the environments in which the cartridge is to be operated and stored, the mechanical, physical and dimensional characteristics of the case and of the optical disk, the magneto-optical characteristics and the recording characteristics, so as to provide physical interchangeability between data processing systems, the format for the physical disposition of the tracks and sectors, the error correction codes, the modulation method used for recording and the quality of the recorded signals.

ISO/IEC 14517:1996 — 130 mm optical disk cartridges for information interchange — Capacity: 2,6 Gbytes per cartridge
Defines a series of related 130 mm optical disk cartridges (ODCs). Gives the conditions for conformance testing and the Reference Drive, mechanical, physical and dimensional characteristics, the format of the information, the magneto-optical characteristics and the minimum quality of user-written data.

ISO/IEC 15286:1999 — 130 mm optical disk cartridges for information interchange — Capacity: 5,2 Gbytes per cartridge
This International Standard specifies the characteristics of a series of related 130 mm optical disk cartridges (ODCs) by using a number of Type designations.

A disk has two sides, called Side A and Side B. Each side can have a nominal capacity of 2,6 Gbytes.

Type R/W provides for data to be written, read and erased many times over the recording surface of the corresponding disk side, using the thermo-magnetic and magneto-optical effects.

Type P-ROM provides for a part of the disk surface to be pre-recorded and reproduced by stamping or other means. This part of the disk is read without recourse to the magneto-optical effect. All parts which are not pre-recorded provide for data to meet the requirements of Type R/W.

Type O-ROM provides for the whole of the disk surface to be pre-recorded and reproduced by stamping or other means. The corresponding disk sides are read without recourse to the magneto-optical effect.

Type DOW provides for data to be written and read many times over the recording surface of the corresponding disk side, using the direct overwrite thermo-magnetic and magneto-optical effects requiring a single external magnetic field.

Type P-DOW provides for a part of the disk surface to be pre-recorded and reproduced by stamping or other means. This part of the disk is read without recourse to the magneto-optical effect. All parts which are not pre-recorded provide for data to meet the requirements of Type DOW.

Type WO provides write once, read multiple functionality using the thermo-magnetic and magneto-optical effects.

Type WO-DOW provides write once, read multiple functionality using the direct overwrite thermo-magnetic and magneto-optical effects.

In addition, for each Type, this International Standard provides for cartridges containing a disk with a sector size of 512 bytes, cartridges containing a disk with a sector size of 1 024 bytes and cartridges containing a disk with a sector size of 2 048 bytes. All sectors of a disk are the same size.

This International Standard specifies

— the conditions for conformance testing and the Reference Drive;

— the environments in which the cartridges are to be operated and stored;

— the mechanical, physical and dimensional characteristics of the cartridge, so as to provide mechanical interchangeability between data processing systems;

— the format of the information on the disk, both embossed and user-written, including the physical disposition of the tracks and sectors, the error correction codes, the modulation methods used;

— the characteristics of the embossed information on the disk;

— the magneto-optical characteristics of the disk, enabling processing systems to write data onto the disk;

— the minimum quality of user-written data on the disk, enabling data processing systems to read data from the disk.

This International Standard provides for interchange between optical disk drives. Together with a Standard for volume and file structure it provides for full data interchange between data processing systems.

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