
Information and documentation — Digital records conversion and migration process

*Information et documentation — Processus de conversion et
migration des documents d'activité numériques*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 46, *Information and documentation*, Subcommittee SC 11, *Archives/records management*.

This second edition cancels and replaces the first edition (ISO 13008:2012), which has been technically revised.

The main changes are as follows:

- the terms and definitions have been updated;
- additional drivers for conversion/migration have been added;
- conversion and migration requirements have been clarified;
- the Bibliography has been updated.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document provides guidance for the conversion of records from one format to another and the migration of records from one hardware or software configuration to another. It contains applicable records management requirements, the organizational and business framework for conducting the conversion and migration process, technology planning issues, and monitoring/controls for the process. It also identifies the steps, components and particular methodologies for each of these processes, covering such topics as workflow, testing, version control and validation.

Due to the rapid pace of technological change, and digital preservation requirements, many records in digital form will, at some point, need to be converted from one format to another, or migrated from one system to another to ensure their continued accessibility and processability.

This is not to suggest that conversion and migration are the only approaches to preserving digital records. Other methods, such as emulation, do exist or are under development. Conversion and migration are, however, two of the more prevalent methods of digital preservation. While this document does not address digital preservation per se, the conversion and migration processes can have an impact on a digital preservation strategy. How an organization chooses to set up the conversion and migration processes (which format to employ, the level of control needed and so on) largely influences its view of the record. There is no single, one-size-fits-all preservation method. However, institutions recognize the benefit of standardized procedures; many test beds and task forces have been established to explore and research conversion, migration, emulation and refreshment, among other preservation procedures, to determine what works best.

Conversion and migration represent separate approaches to preserving digital records. It is important to implement them in a managed way to prevent any degradation or loss in the authenticity, reliability, integrity and usability of the records, thus ensuring an “authoritative record” as described in ISO 15489-1:2016, 5.2.2. This document outlines the program components, planning issues, records management requirements and procedures for performing the conversion and migration of digital records so as to preserve their authenticity, reliability, integrity and usability so that they continue to act as evidence of business transactions. In cases where conversion and migration are carried out at the same time, all requirements and guidance in this document apply.

From the outset, note that it is not necessary to adopt all of the procedures recommended in this document to ensure that records management requirements are met. The decision regarding which procedures to adopt depends on such factors as the type of conversion or migration to be performed and the level of risk the organization is willing to accept. In addition, organizations would be well advised to incorporate future planning for further conversion and/or migration of records among requirements for electronic document and records management systems (EDRMS).

Before starting a conversion or migration project, individuals designated as “key” to the process need to be aware of records management requirements. The term “records management criteria/requirements” in records and information management means an adherence to a set of principles that relate to record integrity, authenticity, reliability and usability and, where appropriate, compliance with relevant legal and regulatory requirements. Adherence to these principles ensures that record content, context and structure are maintained and that a given record’s standing as evidence of business activity is not compromised. The principles apply regardless of how long the record is retained.

This document is applicable for both ad hoc conversion or migration projects as well as programs for regular and ongoing conversion or migration.

Information and documentation — Digital records conversion and migration process

1 Scope

This document specifies the planning issues, requirements and procedures for the conversion and/or migration of digital records in order to preserve the authenticity, reliability, integrity and usability of such records as evidence of business functions, processes, activities and transactions.

These procedures do not comprehensively cover:

- backup systems;
- preservation of digital records;
- functionality of trusted digital repositories;
- the process of converting analogue formats to digital formats and vice versa.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 30300, *Information and documentation — Records management — Core concepts and vocabulary*

3 Terms and definition

For the purposes of this document, the terms and definitions given in ISO 30300 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org>

3.1

access

right, opportunity, means of finding, using, or retrieving information

[SOURCE: ISO 5127: 2017, 3.11.1.01]

3.2

attribute

characteristic of an object or entity

Note 1 to entry: Adapted from ISO/IEC 11179-3:2003.

[SOURCE: ISO 23081-1:2017, 3.3]

3.3

content information

set of information that is the original target of preservation or that includes part or all of that information

[SOURCE: ISO 19165-1:2018, 3.6]

3.4

data cleansing

process used to improve data quality by detecting and correcting (or removing) defects and errors in data

[SOURCE: ISO 5127:2017, 3.1.11.21]

3.5

data object

discrete data, considered as a unit, representing an instance of a data structure that is known or assumed to be known

[SOURCE: ISO/IEC 2382:2015, 2121425]

3.6

emulation

recreation of the functionality and behaviour of an obsolete digital system, using software (called emulator) on current computer systems

Note 1 to entry: Emulation is a key digital preservation strategy.

[SOURCE: ISO 5127:2017, 3.12.1.20]

3.7

encryption

(reversible) transformation of data by a cryptographic algorithm to produce ciphertext, i.e. to hide the information content of the data

[SOURCE: ISO/IEC 18033-6:2019, 3.8]

3.8

file format

encoding of a file type that can be rendered or interpreted in a consistent, expected and meaningful way through the intervention of a particular piece of software or hardware which has been designed to handle that format

Note 1 to entry: A file may (or may not) be a container containing zero or more files of various formats. File formats may be defined by a specification, or by a reference software system. Many file formats exist in forms with minor variations and many also in more than one version. Typing of file formats should be interpreted generously rather than strictly, but sufficiently precisely to distinguish versions where such distinctions have significant interpretive consequences.

[SOURCE: PRONOM Vocabulary Specification, The National Archives UK, 2011]

3.9

migration

process of moving records from one hardware or software configuration to another without changing the format

3.10

originating

initial manifestation of something

3.11**preservation**

measures taken to maintain the useability, authenticity, reliability and integrity of records over time

Note 1 to entry: Measures include principles, policies, rules, strategies, processes and operations.

[SOURCE: ISO 30300:2020, 3.4.11]

3.12**refreshment**

digital migration where the effect is to replace a media instance with a copy that is sufficiently exact that all archival storage hardware and software continues to run as before

[SOURCE: ISO 19165-1:2018, 3.31]

3.13**replication**

digital migration where there is no change to the packaging information, the content information, and the preservation description information

Note 1 to entry: The bits used to represent these information objects are preserved in the transfer to the same or new media instance.

Note 2 to entry: Adapted from ISO 14721:2012.

3.14**representation information**

information that maps a data object into more meaningful concepts

[SOURCE: ISO 19165-1:2018, 3.34, modified — Examples have been omitted.]

3.15**source record**

document or record that has been copied, converted or migrated or will be the input for such a process

Note 1 to entry: Adapted from ISO/TR 13028:2010, 3.8

3.16**validation**

process of evaluating a system or component to ensure compliance with the functional, performance and interface requirements

[SOURCE: ISO/IEC 14776-121:2010, 3.1.108]

4 Organizational and business framework**4.1 General**

This clause addresses the drivers that often prompt the need for the conversion or migration of digital records, the issues that organizations should consider when evaluating the need for conversion or migration of their records, and the steps taken in developing a conversion and migration program. It discusses the decision making and resource allocation associated with the conversion or migration within the organizational framework, as well as the technical infrastructure that supports the conversion and migration processes and which should be used to ensure the records' authenticity and integrity for as long as they are needed.

4.2 Conversion and migration drivers

4.2.1 General

A variety of drivers can compel an organization to convert or migrate its digital records. Some records have longer retention requirements than a software application or storage medium can sustain, prompting organizations to convert or migrate their records while supporting systems are still viable. Some records might need to be converted or migrated because the corresponding media becomes contaminated. Organizations might also choose to convert or migrate records proactively on the basis of operational factors relating to record volume, access, storage efficiency, business and technology cycles, or organizational change (such as outsourcing, mergers or acquisitions). In addition, organizations might be compelled to convert or migrate records in response to regulatory or legal actions.

4.2.2 Conversion drivers

Conversion is defined as the process of changing records from one format to another. Examples of drivers that can require digital conversion include the following.

- a) **Format change:** records stored in a proprietary format are converted to an open file format, such as a conversion of a Word.doc file to PDF/A.
- b) **Format obsolescence:** for example, records stored in an obsolete but still readable word processing format are converted to a current word processing format.
- c) **Interoperability:** records are converted to a format that ensures seamless interoperability with certain IT infrastructure
- d) **Legal issues:** records are converted according to existing explicit legal or regulatory requirements concerning formats or service providers

4.2.3 Migration drivers

Migration is defined as the process of moving records from one hardware or software configuration to another without changing the format. Some examples of drivers that can require digital migration include the following.

- a) There can be a need to migrate records from one structure to another. For example, records existing in several legacy databases might be restructured into a new consolidated database (e.g. from Oracle to SQL Server).
- b) The platform in which the records were created is changing and the records need to be migrated to the new platform. For example, records might need to be moved from a Microsoft Windows platform to a UNIX platform.
- c) A migration is prudent from a business perspective (e.g. to introduce a new system with improved functionality). For example, a migration of records might be needed to support a change from a physical business presence to a web-based storefront or to move records from a shared drive to an electronic document and records management system (EDRMS). Migration also takes place when an organization moves its records to external service provider/cloud environment, or from one service provider to another.

Organizations should assess, document and manage their records. Ongoing accessibility of digital records in the context of changing technical environment and compliance with dynamic legal and regulatory requirements demand rigorous, coordinated efforts and sustained funding. Decisions related to conversion and migration should be based on analysis of the value of the organization's digital records and the impact of technology infrastructure and investments during the records' existence, as well as on knowledge about standards and best practices relating to conversion and migration of digital records.

4.3 Planning for the conversion and migration process

4.3.1 General

Records conversion and migration planning falls into the domain of the organization's information governance protocols and systems (i.e. is a joint responsibility of the stakeholders including information-related professionals and relevant business functions). As with more traditional asset (capital, facilities, human resources) management, policies and procedures regarding the acquisition, management and disposition of information assets shall be established, followed, documented and periodically audited for compliance and efficacy. Business managers (and their respective IS/IT support officers) shall know where and how their record assets are being created, managed and stored, and shall therefore be able to plan and justify the case for conversion or migration.

In a given organization, conversion or migration might take place as a one-time project or regularly as an ongoing activity in response to any of the above-mentioned situations. However, for effective preservation of digital records and their metadata, conversion or migration shall be performed as part of a well-planned and structured program. In all cases, it is preferable to plan, execute and validate the records conversion or migration process proactively, with adequate time and resources and with the least disruption to stakeholders and their respective business cycles and functions. During an unplanned event (natural or human-made), there can be a need to undertake conversion or migration under extreme and therefore less than ideal conditions, which make it more costly and disruptive.

4.3.2 Risk management

Significant costs can be associated with the conversion and migration of digital records; for example, the costs of new hardware and software, licenses, additional human resources, etc. As a result, an organization shall determine the scope of conversion or migration on the basis of the analysis of the costs, benefits and risk. Records shall be analysed to determine their value to the organization and the risk associated with their potential loss or corruption. Part of the organization's records management program should include appraisal of the records and assessment of the risks associated with them. Normally, the organization's records retention policies document these decisions. Additional guidance on risk analysis can be found in ISO/TR 18128.

An organization's records management practices are based on operational and other needs and perceptions of risks. Operational needs (e.g. fulfilling regulatory requirements, product development, providing access or documenting financial transactions) determine the strategies and levels of effort an organization undertakes to ensure the trustworthiness of a record. Risk assessment and risk mitigation, along with other techniques, are used to establish both management controls for and documentation requirements of activities. These risk assessments can also be used to establish records management controls. Risk assessments shall be conducted to establish appropriate levels of management controls prior to undertaking new initiatives.

From a records management perspective, two main risks are assessed when considering digital records:

- 1) challenges to the trustworthiness and integrity of the records (e.g. legal challenges) that can be expected over the life of the records;
- 2) loss, including loss of access to (or unauthorized destruction of) records.

Consequences are measured by the degree of loss (including reputational loss) that the organization or other stakeholders would suffer if the trustworthiness of the records cannot be verified or in the event of loss or unauthorized destruction of records.

4.3.3 When to convert or migrate

It is recommended to perform conversion or migration of records before the technology and media upon which they depend become obsolete. Depending on factors such as volume and access requirements, it can be desirable to convert or migrate the records as soon as the target or end environment is known. If the perceived value of and/or risk to the records are sufficiently low, organizations might choose to wait

until some other driver (e.g. software upgrade, system replacement, acquisition or merger) triggers the decision to convert or migrate.

4.3.4 Conversion and migration considerations

In the digital environment, conversion and migration of an organization's records are often a routine activity on both large and small scales. Therefore, an organization shall have policies, procedures, and plans to ensure these activities are conducted in accordance with standards and business practices. Obligations and interdependencies related to records preservation shall be acknowledged and documented as early as possible in the analysis and requirements definition phase of both business process planning and technology investment planning.

When deciding whether internal or external resources, or a combination, will be involved in the (project-based) conversion and migration activities, the following factors should be taken into account.

- Skill sets: whether the organization has staff with the experience and knowledge to perform conversion and migration activities.
- Availability of human and technical resources (including security and records personnel): whether staff members with the appropriate skill sets are available during the project timeframe.
- Equipment: whether the organization has the right environment and tools to perform conversion and migration activities.
- Cost and timeline: whether the organization has the resources (budget and time) to perform conversion and migration activities.
- Capability to perform quality assurance/quality control: whether the organization has personnel with the experience and knowledge to perform quality assurance and quality control activities.
- Data sharing/data stewardship/ownership: which person(s) or business unit(s) in the organization will lead the conversion and migration activities.
- Validation: whether the organization has staff with the experience and knowledge needed to validate conversion and migration activities.
- Business cycles: which person(s) or business unit(s) in the organization will decide when conversion and migration activities should occur.
- Security and privacy: whether internal and/or external service providers can comply with all the relevant legal, regulatory and business requirements.

4.4 Establishing a conversion and migration program

4.4.1 General

Organizations that maintain digital records for such periods that necessitate regular and ongoing conversion or migration shall establish a conversion and migration program before carrying out major digital records conversions or migrations.

This implies that the requirement to convert or migrate the digital components making up the organization's records is recognized, and a governance structure with direct or delegated executive authority is in place. The corporate policies of the organization shall authorize the establishment of a conversion and migration program.

The conversion and migration program governance structure authorizes when and how conversions and migrations occur and who is to carry them out. Normally, records professionals are responsible for authorizing the conversion and migration process with assistance from IT, the owner(s) of the business and the legal staff. The conversion and migration program governance structure also authorizes whatever audit process is to be implemented and identifies who is responsible for performing it.

Setting out the authorization and business area(s) responsible is essential to establishing conversion and migration as a normal and routine business activity for an organization.

To minimize risk in larger organizations, the conversion and migration program should include authorization for:

- a limited number of events that trigger conversion or migration;
- the types of conversions and migrations to be done;
- the method of recording (and certifying if necessary) that the above activities are carried out as required.

The organization's policy or procedures document should list these authorizations.

4.4.2 Development of procedures documentation

The process of converting and migrating digital records introduces significant risks to the authenticity, integrity, reliability and usability of those records. To mitigate these risks, it is important to control the process by applying approved and documented procedures.

The approach to the development of a conversion and migration procedures documentation is at the discretion of the individual organization. There can be separate documentation that address each type of conversion and migration, or a single document with appropriate subsections for each type. At a minimum, the conversion and migration procedures documentation shall address all phases of the conversion and migration process. Conversion and migration can be executed at the same time.

The documentation shall also describe the procedures for disposition of source records or media. Source records/media shall be removed from the active environment, and shall be maintained according to the established disposition authorities. If additional types of conversions or migrations are encountered, specific documentation shall be developed for them.

All revisions to procedures shall be documented in the documentation with appropriate authorizations. Ad hoc documentation entries shall be avoided as they can destroy the credibility of the program in the event of an investigation or regulatory inquiry in which the method of conversion or migration underpins the establishment of the integrity of digital records as evidence.

Conversion and migration procedures documentation shall address all phases of the process as follows.

- Planning: the procedural steps, methods, people and other resources needed to execute a successful conversion/migration of the target digital records.
- Consider the opportunity to perform data cleansing during the migration process; this will improve data quality and eliminate redundant or obsolete information.
- Configuration of the migration/conversion software (if needed).
- Testing: the tests needed to verify that the planned procedures and methods would yield a successful conversion/migration of the records.
- Back-up: ensure back-ups are performed before performing a conversion/migration of the production environment.
- Conversion and/or migration: the procedural steps to be performed in carrying out actual conversion and/or migration of the target digital records.
- Validation: the procedural steps and methods to be used to verify that the target digital records have been successfully converted or migrated. This enables third parties to be certain that the authenticity of the records has been maintained through the use of a documented procedure to record the conversion or migration process. Quality assurance procedures shall enumerate the steps needed to ensure a controlled and secure conversion and migration process. Lastly, the content and format of error reports shall be generated once the conversion or migration is complete.

- Sign-off: the authorizations needed to verify that the conversion and migration process has been successfully performed in compliance with approved policy and procedures.
- Documentation: detailed records of the conversion and migration process during and after each conversion and migration project.

[Clause 7](#) outlines additional details of the procedures that constitute each phase of the conversion and migration process.

5 Conversion and migration requirements

5.1 General

This clause includes those issues associated with the management of the records to be converted and migrated so that complete, accurate, reliable and authentic records can be produced once the conversion and migration process has been completed.

The conversion or migration of digital records from one technology environment to another can alter the content, context or structure of the records. If this occurs, the organization might risk non-compliance with records management requirements through loss of the records' reliability and authenticity. An effective digital conversion and migration plan can be used to identify all of the characteristics of the records that should be preserved after the records have been converted or migrated.

5.2 Conversion and migration preparatory activities

The following activities shall be completed for a successful digital conversion or migration process, to ensure that conversion and migration requirements outlined in this clause can be met.

- Document all conversion and migration activities to ensure that the organization continues to possess complete, accessible and authentic records throughout their full retention period. This documentation should demonstrate that all records, including those created while the conversion/migration activities were in progress, have been converted/migrated.
- Define the target format of the records. Digital records (e.g. text documents, e-mail messages, databases, spreadsheets, web pages) and their metadata are created using the technology (hardware and software) that is available at the time of their creation. The targeted format of the records should be defined, and conversion or migration should occur as quickly as possible before the current format of the digital information becomes obsolete so that new technology can be used for the conversion or migration procedures.
- Consult a records retention and disposition schedule prior to initiating a digital conversion or migration project in order to ensure that resources are not wasted on converting or migrating digital records that are to be destroyed.
- Evaluate the extent of the process metadata. Conversion and migration process metadata are essential to prove authenticity and reliability (see [5.3](#)). A formal evaluation of the extent of the process metadata are required prior to deciding whether some or all of this metadata should be converted or migrated.
- Define what metadata and data are needed to reproduce a complete and reliable record so that this data can be protected during the conversion or migration.
- Define what metadata are needed in order to identify and use the record so that the record can be searched for and accessed after the conversion or migration.
- Establish a methodology for comparing the identified significant characteristics of records so that problems can be identified, corrected and validated.

- Identify records that are relational or linked and establish whether existing relationships or links can be compromised by the conversion or migration. Establish safeguards to protect these links during the conversion or migration.
- Document any attributes of the record that should not be converted to the new format, or migrated to the new system, and state the reason.
- Determine whether the appearance of the record contributes to its meaning as a digital record (considering such things as formatting, colours, fonts, etc.). If appearance is integral to the meaning, the plan should address how to maintain it. Once conversion or migration is complete, document any changes to the appearance of the record.
- Ensure that processes applied to the new format will yield results that are expected compared to the same or similar processes applied in the originating format.
- Document any loss or corruption resulting from a conversion or migration process. Digital information can be lost or corrupted prior to the conversion or migration. If this happens, document the damage. A conversion and migration plan should aim to reduce the risk of further degradation of the content, context and structure of the records to an absolute minimum.
- Consider physical and logical security when conversion or migration is undertaken. Physical security means access control to IT suites; logical security means access control to the platform in which the conversion or migration is being undertaken. The conversion and migration process should not affect existing access rights to the data.
- Perform all conversion and migration process testing on a sample copy of the records. In case problems arise, do not undertake any irreversible activities. When performing conversion or migration activities, make sure the source file is not deleted until the result is verified, and any jurisdictional legislative and policy requirements are met.

5.3 Conversion/migration process metadata

5.3.1 General

Metadata documenting the conversion and/or migration process provide the information that allows one to demonstrate that a record, having gone through the conversion or migration process, continues to be authentic and reliable. Therefore, the creation, maintenance and preservation of this information is extremely important.

For the purposes of documenting the processes of conversion and migration, the event history metadata are crucial. During conversion/migration, the existing event history metadata shall be migrated with the record in order to ensure the ability to make assertions on the authenticity of the record. Every conversion or migration process shall create event history metadata for every individual record converted or migrated.

Relationships documented in metadata shall be maintained during conversion/migration. Relationships of particular concern can be:

- internal relationships, i.e. within the document, such as a document containing a linked spreadsheet or images;
- functional relationships, for example between records documenting related aspects of the business;
- aggregational relationships, for example documents aggregated to files/folders;
- structural relationships, for example between records and creating agents, or business;
- systematic relationships between records and control tools, such as business classification schemes, disposition authorities, access and security controls, and mandates (these control tools contain contextual information that informs the meaning of the record).

Conversion and migration processes shall ensure that the metadata about the records continues to be persistently linked to the converted or migrated record.

5.3.2 Conversion and migration process metadata implementation issues

As noted in 5.3.1, process metadata about the conversion and migration actions provide the information that allows one to demonstrate that a record, having gone through the conversion or migration process, continues to be authentic and reliable. Therefore, the creation, maintenance and preservation of this information are extremely important.

As records can go through multiple conversions, each conversion or migration shall create its own accompanying volume of event history. In this scenario, the metadata linked to the records will exponentially increase to document each conversion and/or migration the records undergo. The authenticity, reliability, integrity and usability of the records depend on the validity of each successive set of event history metadata.

Sometimes the value of the metadata elements within a record changes as a result of the conversion or migration process. If this occurs, every change in the metadata value shall be recorded in the event history metadata accompanying the record, in order to ensure that the records can be understood.

Compound documents and relationships between records also present issues at the time of conversion and/or migration. Assuming the related record is needed for the authenticity and reliability of a record, relations between the two records shall be permanent.

6 Conversion and migration technology planning

6.1 General

This clause addresses the technology planning for the conversion and migration process. It is not intended to provide a comprehensive guide to technology planning and acquisition, but rather it identifies those key infrastructure issues and technology elements that ensure a successful conversion/migration project.

For the purpose of using generic terms, the description of the project refers to two systems:

- a) the existing records system, on which the records are currently kept;
- b) the new system, which can be:
 - in the case of conversion of format, the existing system in which specific capabilities for handling a different records format are either activated or added;
 - in the case of migration to another storage solution, the existing system in which new storage devices are either activated or added;
 - in the case of migration from one records system to another, a completely different records system.

Technology planning involves assessment of current technological capabilities as well as specification development for new hardware and software that can be needed to successfully manage the conversion/migration process and operate the new system. New hardware and software can be needed for handling a different records format in the existing system, managing different storage devices, or migrating the records from one records system to another. In addition, technology planning shall address the organization's infrastructure and the sustainability of that infrastructure to support file formats, access and integrity.

If organizations do not already have technology development tools in place, records professionals and others assigned the responsibility of technology planning can find it helpful to develop such tools. For examples, planning templates, a methodology for identifying requirements and linking resources, and a traceability matrix (a document that cross references related items throughout a

technology development process). Individuals conducting the planning process shall also consider any organizational business operation rules that can apply.

6.2 Business requirements

An understanding of the requirements given in this subclause will be crucial for the specification development process and for ensuring that the technology planning process meets existing organizational policies and procedures for such activities.

- Identify and define the business needs and benefits of the anticipated conversion/migration project.
- Identify the legal and regulatory requirements.
- Ensure that all stakeholders, including users of the records system, have been contacted and sufficiently involved in the project.
- Ensure that all personnel with assigned duties in the conversion/migration project are given their tasks and their participation is secured and documented.
- Comply with non-technical requirements for hardware/software acquisition within the organization, i.e. project management objectives and timelines, price and contractual issues, purchasing procedures (e.g. request for proposal, bid development). These requirements can vary with the type of organization.
- Ensure that, if the conversion or migration process is carried out by an outside service provider, all business needs of the organization, technology compatibility issues, security issues, customization needs, testing, validation, training and provision of other services are thoroughly specified in the contractual agreement.
- Capture requirements and analysis of business needs in terms that can be measured and tested.
- Translate business requirements into a set of functional requirements.
- Evaluate and review the conversion/migration project at various stages to ensure that it will support the business needs and requirements of the organization.
- Address and incorporate training and education requirements.
- Plan for testing and parallel operation of existing and new systems. This can include providing access to both systems through user access applications or providing parallel interfaces to both systems for any IT application requiring it.
- Ensure a proven rollback plan/back-up strategy has been developed.
- Maintain the replaced system for as long as required in order to provide for a rollback plan in the event of failure of the conversion/migration process.
- Address and define quality control needs and objectives.
- Provide for a post-implementation review audit of the conversion/migration procedures and documentation in order to ensure compliance with business governance needs. This can include the need to provide industry-specific certification requirements.

6.3 General administrative planning

Administrative planning requires the development of tools and resources to ensure a smooth transition to the new system. Potential service providers shall be prepared to provide the same documentation and to indicate how they will do it. Even if the conversion/migration project will be managed completely in-house, attention to these administrative planning documents ensures that the transition from one system to another will be completed on schedule with all obligations met.

The administrative planning of the conversion/migration project includes personnel resources, time and competencies. The documents given in the following list should be created, except in cases of in-house projects, when some might not be necessary (e.g. qualifications of service providers, contracts and agreements).

- Project management plan.
- Roles and responsibilities. Identify all internal and external personnel involved in the project and identify their expected roles.
- Terminology list.
- Delivery and installation schedule.
- Test plan of the conversion/migration in the new system.
- Maintenance plan during the conversion/migration.
- Training plan for the use of the converted/migrated records.
- Procedures documentation.
- Conversion/migration documentation. Documentation includes any manuals, software guidance, table structure, mapping tools, operations procedures, hardware configuration and types of equipment required. It includes software and hardware to perform the conversion/migration, monitor the progress of the conversion/migration, report new system performance, log transactions and manage user access.
- Qualifications and experience of the service provider (s). If using an outside service provider, request a list of references or recent projects.
- Contracts and licence agreements.

6.4 Technology planning requirements

6.4.1 General

The capabilities and operation of the current system shall be assessed and described. It can be very helpful to gather information about the current system to aid the project team in addressing the technology requirements as part of a requirements document which defines exactly what the conversion/migration solution needs to do. Document the results of the assessment and distribute them to the project team and management.

The assessment process should address the following areas.

- Detailed description of the current system.
- Compliance with organizational requirements for technology acquisition.
- Functional needs and capabilities of the current system.
- Data structures and elements.
- Identification (including location) of the actual records to be converted/migrated:
 - check whether the records are within their retention period (they do not require conversion/migration if they are due for destruction in the near future).
- Methodology for the conversion/migration. The methodology should ensure:
 - maintenance of the integrity of the records;
 - that each record is completely converted/migrated;

- that the authenticity of the converted/migrated records can be demonstrated;
- that all necessary metadata/audit trails are retained (and converted/migrated where necessary).
- Ensuring that all approving stakeholders, including the person responsible for the records within the business, have approved the methodology and will validate at the appropriate time the conversion/migration of the records into the new system.
- Review and documenting of any risks associated with the conversion/migration.
- Quality control.
- Security and privacy.

6.4.2 Challenges posed by records created by new and emerging technologies

The following lists some of the challenges posed by records created by new and emerging technologies:

- Developers of new and emerging technologies can be focused on short-term business effectiveness and efficiency and might pay much attention to traditional paper-based paradigms of records management or to long-term preservation and usability issues. As a result, new complex types of digital objects continue to appear, mostly represented in proprietary formats and requiring specialized proprietary software or hardware for access and processing. These objects are used in business activities and function as records. They can have uncommon attributes, such as immutable-by-design (blockchain), highly structured (databases, XML and CAD-files etc.), distributed and decentralized; be non-static, interactive and demonstrate certain behaviour.
- Fast pace of changes results in the fluidity of emerging formats and structures, and frequent version changes of the corresponding software. Some technologies happen to be short-lived, and within a short timeframe service provider and user support for them can vanish. In general, technological innovations result in more frequent and more risky conversions and migrations.
- Innovative features of the records produced by the new and emerging technologies can complicate their conversion and migration from legal point of view. Proving authenticity and integrity of the migrated records can be challenging, especially in the cases when there is no designated custodian or storage location.

An organization that implements or considers implementing new and emerging technologies in its business processes, should plan in advance and allocate necessary resources for conversion and migration of records produced by these technologies, and for decommissioning of the corresponding information systems. The organization should also establish processes for proper documentation of the new and emerging technologies and for timely identification of the information assets created by or based on these technologies, as well as for monitoring of their obsolescence.

6.4.3 New and emerging technologies as enablers of conversion and migration

Some innovative technologies can become enablers of transformational changes in conversion and migration strategies, policies and processes. For example, AI can help in evaluating risks of obsolescence, finding conversion and migration paths and reliably verifying integrity of the migrated records. Blockchain and distributed ledger technologies can be instrumental in establishing trust into converted or migrated records.

6.5 External conversion and migration services

Conversion and migration projects often require specialized competencies, hardware, software (including licenses) and other resources. Timely execution of large-scale conversion projects can also present a challenge. Additional complexity results from the requirements to preserve admissibility, legal and probative value of converted records in compliance with the laws and regulations of applicable jurisdictions.

As a result, quality in-house conversion can be either unfeasible or too costly, especially for medium-sized and small organizations, even in the case of common office formats. Possible alternative is outsourcing of conversion and migration to third parties.

In several areas (e.g. CAD files, electronic medical records) there already exists well-established market of outsourced conversion and migration services.

Organizations should also identify possible external conversion and migration service providers and services as a part of their business continuity/disaster recovery/organisational resilience strategy.

Relevant guidance and recommendation documents include but are not limited to:

- ISO/TR 22428-1;
- ISO 17068;
- ISO 37500;
- ISO/IEC 27017;
- ISO/IEC 27036-4;
- ISO/IEC TR 22678;
- ISO/IEC 19086.

7 Conversion and migration procedures

7.1 General

The purpose of this clause is to apply the conversion and migration requirements established in [Clause 5](#). The conversion and migration procedures are composed of four key steps: planning, testing, conversion/migration and validation

Each organization or institution is unique and has differing needs and objectives for establishing a conversion and migration program. Further, not all records within an organization will necessarily require the application of all conversion and migration procedures and requirements outlined in this document in order to fulfil records management requirements. These requirements and procedures are meant to serve as a guide and a template. It is up to the organization's records professionals and legal staff to understand its records management requirements, and to determine to what level to apply the requirements described in this document.

7.2 Procedures

7.2.1 General

This clause specifies the requirements for conversion and migration by linking them to the procedures involved. These procedures become the controls, which ensure the maintenance of authenticity, reliability, integrity and usability of the records to be converted or migrated.

Not all digital records in an organization will merit the full application of these controls. The organization shall determine the controls that the particular records may or may not merit during the conversion or migration project.

A conversion/migration project shall ensure the following in relation to the converted/migrated records:

- completeness of content;
- integrity;

- authenticity;
- completeness and accuracy of metadata (all required metadata should be included and accurately populated, for example, the date of creation of the record is not to be replaced by the date of conversion/migration or the originating creator is not to be replaced by the operator conducting the conversion/migration);
- transparency of implementation (this control can be critical if the records are required for litigation purposes);
- fulfilment of additional requirements, such as retention requirements or requirements covering the admissibility of digital records.

7.2.2 Guidance on selecting appropriate procedures

Each procedure outlined in this clause is designed to establish an element of control aimed at preserving the integrity, authenticity, reliability and usability of records as evidence of business transactions following a conversion or migration procedure. As noted previously, an organization need not follow all of the procedures outlined in this document. Most organizations have to strike a difficult balance between following all the procedures (i.e. “perfect maintenance”) and such limiting factors as cost and time. The procedures an organization should follow, and the level of control they establish, depend on the organization’s own estimation of the risk/return ratio, that is, the cost of losing the records’ integrity, or losing them altogether, versus the cost of converting them following the procedures outlined in this document. A number of factors, such as the retention requirement of the records, whether they are likely to be required as evidence in litigation, and the type of conversion or migration being undertaken, should have a bearing on how the risk/return ratio is calculated. [Table 1](#) summarizes the main decision points to consider when choosing the extent to which the procedures described in this clause should be followed. The intention is to assist an organization in striking the right risk/return balance.

7.2.3 Maintaining the records’ characteristics

Conversion projects typically involve a change of file format, thus enabling the records to be used in newer systems. With migration projects, the file format of the digital record is not changed in any way. The digital record should be copied or moved without change to the file format. For procedural aspects related to maintaining the records’ characteristics, see [Table 1](#).

In order to demonstrate that a conversion or migration project has been successful, the following steps should be taken:

- confirm that the file format has not changed (migration projects);
- ensure that all the necessary information is included in the converted or migrated records;
- where there are differences in the presentation of the information (such as differing fonts and/or page layouts), ensure that the integrity of the new presentation can be demonstrated;
- identify any conversion/migration errors and document those instances;
- confirm that all records have been converted or migrated (or identify those that have not been converted/migrated);
- update the records metadata to include details of the conversion or migration process;
- create a record of the conversion or migration process, including an audit report.

It may be appropriate to keep samples of records before and after conversion or migration, along with samples of extracts (such as prints or image files) that can be used to demonstrate the continuing authenticity, integrity, usability and reliability of the records.

Table 1 — Conversion/migration procedures decision points

Procedure	Key issues	Comments
Planning: all steps	What is the level of planning needed given the context of the project?	The amount of planning that needs to be done depends on the nature of the records, the amount of information that is already available about them, and the complexity and type of conversion or migration.
Testing: all steps	Is maintenance of integrity, authenticity, reliability and usability of the records of high importance?	The continuing relevance of the records, or whether they are likely to be required for legal or compliance purposes, can establish the degree to which their integrity, authenticity, reliability and usability are important to an organization. If less important than other factors, such as cost or business flexibility, the testing phase can be skipped in favour of moving directly to conversion or migration.
Testing step 1: planning	What are the size/scope and type of the conversion or migration?	Smaller conversion or migration projects and those that are less complex, e.g. refreshment versus other types of conversions or migrations, should require less planning.
Testing step 2: configuration of the test environment	Is the technology infrastructure already in place?	The level of work involved should vary with the type of conversion or migration being undertaken and the degree to which the technology infrastructure is already in place.
Testing step 3: testing	What is the type and complexity of conversion or migration?	The level of work involved should vary with the type of conversion or migration being undertaken.
Testing step 4: assessment of test results	What is the type and complexity of conversion or migration?	The level of work involved should vary with the type of conversion or migration being undertaken.
Testing step 5: reporting of test results	What is the retention status (value) of the records? Are they of high legal/compliance value?	Careful documentation is essential for establishing the integrity of records, particularly those that might need to be produced as evidence in court. If the records are unlikely to be required as evidence in courts of law, documentation is of less importance in the conversion or migration process.
Conversion/migration step 1: preparing for the conversion or migration	What are the size, scope, and type of the conversion or migration? To what extent has preparation already been done as part of other phases?	The level of work involved should vary with the size and scope of the conversion project and the type of conversion being undertaken. Permission for IT resources could already have been obtained at the testing phase.
Conversion/migration step 2: defining records for conversion or migration	Is sufficient information for undertaking conversion or migration already available (e.g. gathered during planning or testing)?	The level of work involved should vary with the size and scope of the project and the type of conversion or migration being undertaken. Much of the necessary data could already have been gathered during testing.
Conversion/migration step 3: configuring the conversion or migration environment	Is the technology infrastructure already in place?	This step should not be necessary if the technology infrastructure pre-exists or has been set up during the testing phase.
Conversion/migration step 4: conducting conversion or migration	Recommended for all conversions/migrations.	The level of work involved should vary with the size and scope of the project and the type of conversion or migration being undertaken.

Table 1 (continued)

Procedure	Key issues	Comments
Conversion/migration step 5: error checking and correction	Is maintenance of integrity, authenticity, reliability and usability of the records of high importance? What are the size, scope and type of the conversion or migration?	The retention status of the records, or whether they are likely to be required for legal or compliance purposes, can establish the degree to which their integrity, authenticity, reliability and usability are important to an organization. The level of work involved should vary with the size and scope of the project and the type of conversion or migration being undertaken.
Validating: all steps	Are the records likely to be required in legal proceedings?	Review and verification of the conversion and migration process is essential for establishing the integrity of records that are likely to be needed as evidence in court. If the records are likely to be required in legal proceedings, independent validation of the conversion/migration can be considered.
Authorization: all steps	Are the records of continuing importance to the organization?	This step is recommended for all conversions and migrations; however, the level and formality should vary with the long term retention requirements of the records. Records that can be required as evidence in court should require formal sign-off.

7.3 Conversion/migration project planning

7.3.1 General

A clearly defined conversion and migration plan is extremely important, as it can mean the difference between a successful project (i.e. one that maintains the availability and integrity of the target records) and an unsuccessful project which can result in the compromising of records' authenticity, integrity, reliability and usability or in the ultimate loss of the record. To increase the chances of success, the conversion or migration plan shall not be carried out in isolation, and shall consider input from records professionals and IT and business representatives.

Regardless of whether a conversion or migration project is a one-time exercise or is carried out as part of an ongoing program, the following steps should be taken:

7.3.2 Step 1: Understand the source records and their organizational environment

It is important to gain a thorough understanding of the records to be converted or migrated in order to formulate an effective plan. One aspect of understanding the source records involves understanding their importance to the organization. To do so, answer the following questions.

- What is the authorized retention period for the source records? If there is no authorized retention period, one shall be established.
- Will staff need immediate access to the records, or can they be stored offline?
- Are the records required for business continuity purposes?

Another key aspect of understanding the source records entails determining their technical structure; for example, which parts of the records represent "content information" versus "representation information." This can be done through a series of steps, as follows.

- a) For content information, identify bits constituting the data.
- b) Identify the representation information that, in some way, addresses all the bits of the content data and converts them into more meaningful information.

- c) For the representation information identified, examine its content to identify whether it requires other representation information. If it does, obtain the required representation information. Repeat this step until no additional representation information is identified.
- d) The content information consists of the content data and each of the representation information identified in b) to c).

7.3.3 Step 2: Choose the desired state of the target records

To provide a clear picture of the work to be done, create a model of the structure of the target state desired for the records undergoing conversion or migration. This can involve conducting some research to make appropriate choices regarding format (conversion) or media (migration).

7.3.4 Step 3: Choose/develop the conversion or migration method and activities

Once the current and target states of the source records have been identified, choose or develop a method of converting or migrating the records from their current state to their target state, together with identifying or developing the appropriate tools and/or software needed to achieve the conversion or migration objectives. Questions to consider when choosing or developing the conversion or migration method include the following.

- Will descriptive information about the records (e.g. a finding aid or index) have to be updated as part of the process?
 - Will the records have to be decompressed or unencrypted prior to conversion or migration?
 - Will conversion or migration into the target state require compression of the records?
 - What will be the conversion or migration pathway?
 - Will data need to be extracted for the conversion or migration? If so, how? Many commonly available programs have tools for exporting data in standard formats such as CSV, PDF, JPG and TIFF. Alternatively, the target application can have translators or wholesale importers of flat files. There are also conversion and migration extraction tools that claim to be able to move data from any source to another.
 - Will data cleansing need to be carried out as part of the process? In some cases (e.g. HTML), the originating format of the source data can present a conversion or migration challenge because it reflects how the old system operated. These formats can require that formatting information be removed, tags stripped, lines rewritten, and poorly written code cleaned up, usually through a service provider -approved or custom script. During the actual conversion or migration, the organization should consider whether to carry out data clean-up or to load data into the target system without cleansing. This can be particularly necessary with conversions or migrations involving records stored in older content management systems, which often store longer pieces of content as separate pages, while newer systems store the whole document as one object, splitting it up at the display stage. A conversion or migration project may choose to clean up these records by converting or migrating them into a single digital object, or it may leave the data as is and build transformation rules into the target system. If the data cleansing process is undertaken, it should be carefully documented to avoid jeopardizing the data integrity.
- NOTE In many instances, conversion and migration cannot be separated. In other words, merely moving from one hardware platform to another cannot be sufficient to retain the integrity of the records, and some conversion actions can be required.
- Will the records have to undergo multiple conversions or migrations? Records can undergo a multiple conversion or migration process at the same time, for example, a record content (transformation) coinciding with a replication, or moving records from online storage to removable media. In such cases, it is advisable to handle the conversions or migrations separately.

7.3.5 Step 4: Choose/develop a method of testing the conversion/migration method and activities

Testing the chosen conversion or migration method is critical to ensure that no data are lost, corrupted or unexpectedly altered during the process. During the planning phase, choose an appropriate testing methodology and document the procedures required to execute it as part of the conversion/migration process.

See [7.4](#) for additional requirements with respect to testing conversions/migrations.

7.3.6 Step 5: Choose/develop a method of validating the conversion/migration and activities

Validation of the conversion or migration in order to ensure that the process has worked according to plan is essential for establishing the continued trustworthiness of digital records. The next step is to develop a plan for effectively validating the process. The validation plan should include actions to address any remediation work (i.e. to recover lost or corrupted data), should such work be required.

To ensure the integrity of the validation results, the person or team responsible for actually performing the conversion or migration and the person or team responsible for validating the process should be different. Conduct an audit of a sample of the converted data, representative of the entire scope of the conversion, and of any errors or corrections made to the new platform. If necessary, establish new procedures.

See [7.6](#) for additional requirements with respect to validating conversions/migrations.

7.3.7 Step 6: Decide on disposal of the source records

Organizations should decide if source records shall be disposed of once they have been converted or migrated. The approach should be based on the organization's business and legal context, its mandate, and the importance of the records to the organization.

If a decision is made to dispose of source records, disposal should take place as part of "business as usual" practices and should follow a set of well-defined procedures. ISO 15489-1, which provides detailed guidance on good practice with respect to records disposal, should be used to design the procedures to be followed.

7.3.8 Step 7: Identify the required resources

Having worked out a detailed plan for testing, converting/migrating, and validating, the person or team responsible for the project should identify the resources (people, equipment, and budget) required to complete the exercise.

Once the specific individuals who will participate in and support the phases of the process have been identified, obtain any special permissions or access rights they will require to carry out their assigned tasks.

As appropriate, conduct an evaluation of the cost of doing a conversion or migration in-house or on an outsourced basis. One factor to consider when exploring outsourced arrangements is whether the data can leave a facility or should remain on-site. Discuss and document worst-case scenarios of data being lost during conversion or migration using either method. Evaluate the expertise of existing staff. It can turn out that the conversion or migration has to be outsourced if in-house staff with the requisite knowledge and/or skills are not available.

Having thoroughly explored all available options for completing the conversion or migration, the responsible person should consider whether the cost of conversion outweighs the cost of not being able to access the information in the future. In addition, a risk assessment and legislative requirements should be considered in deciding whether to complete a conversion or migration project.

7.3.9 Step 8: Document the conversion/migration process

Track and document the entire process. For small or limited scope projects, the process may be documented in a spreadsheet. Conversions and migrations undertaken as part of a routine program may be better tracked and documented using a database application.

All conversion/migration processes should be documented in process metadata persistently linked to the record itself.

7.3.10 Step 9: Document and obtain approval for the conversion/migration plan

The responsible officer or team should document all elements of the conversion or migration plan. The plan should specify:

- the target of the conversion/migration (i.e. the digital records to be converted/migrated);
- the trigger or rationale for the conversion/migration;
- the current state of the target records;
- the planned state of the target records;
- the method and technologies to be used to convert or migrate the records;
- the persons and/or groups responsible for performing the conversion or migration;
- the method to be used to test the conversion or migration method;
- the method to be used to validate the conversion or migration and the party responsible for validation;
- the disposition of the source target records;
- the authorization required to sign off on completion of the conversion or migration;
- the documents to be retained in relation to the conversion or migration process and their method of retention and period of retention;
- the time-lines for deliverables of key conversion or migration process milestones (e.g. start/end date of the process).

Obtain approval of the conversion or migration plan from the authorized person or body.

7.4 Testing

7.4.1 General

The purpose of testing is to develop a process that transfers the existing file (migration) or transforms the existing file format into the target file format (conversion) without the loss of data or access to it; and without loss of authenticity, reliability, integrity and usability. Testing requires:

- knowledge of the existing file format (conversion), or knowledge of the initial hardware or software configuration (migration);
- a determination of the target file format (conversion) or a determination of the target hardware or software configuration (migration);
- a strategy for making that change or move;
- a means of confirming the degree of success. For example:

Testing of processing (is the conversion/migration done correctly)

Testing of integration (the way in which software components cooperate in a migration or conversion tool)

Testing of completeness (is all data migrated / converted)

Testing of operations (does the software do what it should do)

Specific knowledge of whatever is to be converted/migrated is necessary in order to find tools and define procedures to govern the actual conversion or migration, as well as to establish criteria for acceptable outcomes. Such knowledge will also help assess the resources required (e.g. file servers or staff time) for implementing the conversion or migration.

In many ways, testing a conversion or migration is like conducting a laboratory experiment. It has a purpose and objective, it requires some equipment, it has procedures in a clear sequence, and its results are documented. Above all, it should be repeatable.

7.4.2 Step 1: Plan the test

Begin to establish the baseline for the test by recording the existing state of the records. Include information about what will be converted or migrated, such as details on what will stay the same and what will change. Indicate the purpose for the conversion or migration (e.g. to recover/maintain record accessibility by converting an obsolete format or migrating records to new media). Unless the conversion or migration is regularly scheduled, document the reason it is being undertaken at this time.

Describe the target state for the test by recording the desired outcome for the conversion or migration. This will focus only on what is designated to change from the existing state. Also, indicate whatever requirements the records will be expected to fulfil in their target state. This description sets out the anticipated result of the conversion or migration.

Record the strategy that will be implemented to achieve the conversion or migration. Focus on the available resources and include a description of hardware and software as well as requirements for the staff administering the test. In effect, this step should list the materials used and procedures followed within the “experiment”. If hardware and software need to be selected, include the reasons for their selection here. If the test will be performed on a representative sample of the total body of data that are to be converted or migrated, record the method by which the sample is derived.

Finally, set out how the outcome of the test conversion or migration will be examined. This examination should relate directly to the results anticipated when the test was set up. The examination should be undertaken to allow unanticipated results to be discovered and reported. For example, an examination can reveal that the choice of converting or migrated emails using an offline system (the selection of an offline system being based on a need for security) has resulted in a conversion failure of certain emails that have embedded HTML code to “call in” graphics.

7.4.3 Step 2: Configure the test environment

Ensure that the required operators are trained and that the infrastructure, equipment and tools are prepared to conduct the testing. Create a test file on which the tests will be run.

7.4.4 Step 3: Conduct the test

Execute the test conversion as planned. Run tests only on a copy of the source target record in a test file, not on the actual data.

If the execution deviates from the plan, record these deviations. Record the results of the test and the analysis of the results in a report.

7.4.5 Step 4: Assess test results

Focus the assessment of results on whether the test achieved the results anticipated. Determine whether any unanticipated results have affected the desired outcome of the conversion or migration.

That is, the test can have achieved the results anticipated, but additional, unanticipated results can render the process undesirable.

7.4.6 Step 5: Report results

If the test is deemed a success, the results report becomes part of the context for the records that are to be converted or migrated as it documents a key event in the existence of those records. Retain it for at least as long as the converted or migrated records are retained, or for the time period specified for records retention of results reports in your jurisdiction. If the test shows that the anticipated result is not satisfactorily achieved, retain the report to document either a revision of the anticipated result or a change in strategy.

The report should form part of the background for the next plan, whether the test produced satisfactory results or not. If the test was not satisfactory, the report provides background information for the testing of a revised conversion or migration methodology. If the test was satisfactory, the report sets out the basis for validating the actual conversion or migration. For example, the test can meet the anticipated results but it can also illustrate that certain errors are generated. If an error occurs, a rollback operation can be applied.

This knowledge ensures that the validation phase will include the correction of those errors.

7.5 Conversion/migration

7.5.1 General

Actual conversion or migration of the source records should proceed according to the overall plan, with any revisions that have been made following analysis of the test results.

7.5.2 Step 1: Prepare for the conversion/migration

Obtain all permissions to allocate the resources needed to perform the conversion or migration.

Ensure the source records are duplicated prior to commencing the process. These duplicates provide a set to use in the event of the conversion or migration resulting in the loss or corruption of the records.

Perform any “data cleansing” identified in the planning stage (see [7.3.4](#)).

7.5.3 Step 2: Define the records for conversion/migration

A detailed definition of the content and format of computer files constituting the records and their relationships is crucial to the successful completion of conversions or migrations, so that reliable information about the records is available if a conversion or migration is later necessary. It is also useful for protecting the records’ qualities as evidence of business transactions.

All digital records exist as objects. It is critical that all the objects or components that make up the record be identified and gathered together for conversion or migration. Note that digital records exist in a one-to-one, a one-to-many, or a many-to-one relationship with the objects of components. That is, it is possible to have:

- a) a single record that relates to a single object (e.g. a letter might exist as a single digital text file);
- b) a single record comprising many objects (e.g. a web page containing text and four images might consist of five objects);
- c) many records in a single object (e.g. a database is an object that can contain many records).