BS ISO 14641-1:2012

BSI Standards Publication

# Electronic archiving

## Part 1: Specifications concerning the design and the operation of an information system for electronic information preservation

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## National foreword

This British Standard is the UK implementation of ISO 14641-1:2012.

The UK participation in its preparation was entrusted to Technical Committee IDT/1/3, Document Management Applications - General issues.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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# INTERNATIONAL STANDARD

# ISO 14641-1

First edition
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## Electronic archiving —

## Part 1:
## Specifications concerning the design and the operation of an information system for electronic information preservation

*Archivage électronique — Partie 1: Spécifications relatives à la conception et au fonctionnement d'un système d'informations pour la conservation d'informations électroniques*

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 14641-1 was prepared by Technical Committee ISO/TC 171, *Document management applications*, Subcommittee SC 3, *General issues*.

ISO 14641 consists of the following parts, under the general title *Electronic archiving*:

— *Part 1: Specifications concerning the design and the operation of an information system for electronic information preservation*

Future parts will address trusted content, data-level-controls and the testability of document integrity and authenticity control elements within document management systems.

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# Introduction

Electronic documents are an essential part of everyday business, whether the sources are incoming communications or output from organizations. It is important that electronic documents be stored appropriately, either fully or in part, in secure information systems designed for operations and archiving, in order to meet business, legal or regulatory requirements.

The objectives of secure information systems are to resolve organizational issues such as:

a) optimization of long-term electronic document preservation, archiving and integrity;

b) provision of information search facilities;

c) ensuring ease of access and use of electronic documents.

This part of ISO 14641 is intended to provide a reference framework for organizations. It describes the methods and techniques to be used for the implementation of an electronic information system for managing documents within an archive. In conjunction with related archival policies of organizations, it describes criteria for system design and specifications for operational processes.

These specifications are intended to ensure that all documents to be managed by the information system are captured, stored, retrieved and accessed in a way that guarantees that the archived document is an authentic rendition of the original document for the duration of preservation. An authentic rendition means that the rendered document corresponds to the source document as it was at the time of input in the information system in respect of criteria of fidelity and integrity, and that this state is maintained for the duration of preservation.

This part of ISO 14641 takes into account the use of three possible archiving media: physical WORM, logical WORM and rewritable media. Archival integrity is ensured on physical and logical WORM media by the inherent properties of WORM solutions. On rewritable media, integrity is ensured using encryption-like techniques, in particular with checksum calculation or hash function, date and time stamp or digital signature. In all cases, it is necessary to comply with related procedures.

Depending on the types of documents to be archived, other specialized standards can be relevant and used to complement the recommendations in this part of ISO 14641.

This part of ISO 14641 provides a specific and complementary definition of issues addressed in other standards or specifications concerning the management of electronic information. Its content is intended to address execution issues raised in several other documents. These include:

— ISO/TR 15801, *Document management — Information stored electronically — Recommendations for trustworthiness and reliability*,

— ISO 15489 (all parts), *Information and documentation — Records management*,

— MoReq2, *Model Requirements for the Management of Electronic Records*,

which detail specifications for organizing and controlling the lifecycle of archived information for purposes of evidence and operational history; and

— ISO 14721, *Space data and information transfer systems — Open archival information system — Reference model*,

which describes the characteristics of an open system for the preservation of digital data.

Annexes A, B and C are informative and complementary.


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# Electronic archiving —

## Part 1:
## Specifications concerning the design and the operation of an information system for electronic information preservation

## 1 Scope

This part of ISO 14641 provides a set of technical specifications and organizational policies to be implemented for the capture, storage and access of electronic documents. This ensures legibility, integrity and traceability of the documents for the duration of their preservation.

This part of ISO 14641 is applicable to electronic documents resulting from:

— the scanning of original paper or microform documents;

— the conversion of analogue audio or video content;

— the “native” creation by an information system application; or

— other sources that create digital content such as two- or three- dimensional maps, drawings or designs, digital audio/video, and digital medical images.

This part of ISO 14641 is not applicable to information systems in which users have the ability to substitute or alter documents after capture.

This part of ISO 14641 is intended for the following users.

a) Organizations implementing information systems in which:

   1) electronic documents created from scan captures are kept in an environment that ensures fidelity with regard to the original and long-term preservation;

   2) digitally born documents are kept in an environment that ensures the content integrity of the information and document legibility;

   3) traceability is ensured for all operations relating to the electronic documents.

b) Organizations providing information technology services and software publishers seeking to develop information systems that ensure the fidelity and integrity of electronic documents.

c) Organizations providing third-party document archiving services.

## 2 Normative references

The following referenced documents are indispensable for the application 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 2859 (all parts), *Sampling procedures for inspection by attributes*

ISO 8601, *Data elements and interchange formats — Information interchange — Representation of dates and times*

ISO/TR 12033, *Document management — Electronic imaging — Guidance for the selection of document image compression methods*

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ISO 12653-1, *Electronic imaging — Test target for the black-and-white scanning of office documents — Part 1: Characteristics*

ISO 12653-2, *Electronic imaging — Test target for the black-and-white scanning of office documents — Part 2: Method of use*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12653-1 and ISO 12653-2 and the following apply.

**3.1**
**access**
processes of retrieving and displaying (playing) electronic documents for operational, evidential or historical purposes

**3.2**
**archive(s)**
set of documents produced or received, whatever their date, format or storage media, by any individual, organization, public or private service, in the course of their activity

**3.3**
**archival policy**
legal, functional, operational, technical and security requirements of an internal or external information system

NOTE Annexes A and B give principles of an archival policy and of a declaration of archival practices.

**3.4**
**archive lifecycle log**
log which records audit trail data related to the document lifecycle archiving process

**3.5**
**archive restitution**
return and transfer of archived documents to their originator, or to a duly appointed person or organization

**3.6**
**archival system profile**
set of properties that applies to a class of archives that share common characteristics in terms of confidentiality, retention and disposal schedules, and access rights (e.g. create, read, modify, delete)

**3.7**
**ACU**
**attestation creation unit**
hardware and/or software devices for the delivery of electronic attestations

NOTE Attestations include a unit identifier and the related archival service identifier.

**3.8**
**audiovisual**
communication techniques combining sound and image

**3.9**
**audit trail**
aggregate of the information necessary to provide a historical record of all significant events associated with stored information and the information system

**3.10**
**data**
digital form of information which can be accessed, read and/or processed


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**3.11**
**date and time stamp**
sequence of characters denoting the date and/or time at which a certain event occurred

**3.12**
**deposit**
set of documents sharing the same archival system profile

**3.13**
**digital archival**
set of actions aiming to identify, capture, classify, preserve, retrieve, display and provide access to documents for informational or historical purposes, or for the duration required to meet legal obligations

**3.14**
**digital document**
digital representation of content that is stored and managed electronically

NOTE Association of content, logical structure and display attributes, retrievable by a device capable of rendering a human-readable (or machine-readable) object. A document can be digitally born (creation) at source or converted from an analogue document.

**3.15**
**digital fingerprint**
bit sequence generated from a digital document using an algorithm that uniquely identifies the original document

NOTE Any digital document modification will produce a different fingerprint.

**3.16**
**digital seal**
method for ensuring the integrity of a document including hash functions, digital signatures and, optionally, a date and time stamp

**3.17**
**digital signature**
data which, when appended to a digital document, enable the user of the document to authenticate its origin and integrity

**3.18**
**digitization**
conversion of an analogue document (paper, microform, film, analogue audio or audiovisual tapes) to digital format for the purpose of preservation or processing

**3.19**
**digitized document**
result of digitization of information initially stored on physical media (paper, microform, and film, analogue audio or audiovisual tapes)

**3.20**
**document fidelity**
property of an archived document which renders all the information contained in the original source document

NOTE This notion is applicable to any change of form, including digitization or format conversion.

**3.21**
**durability**
attribute of a document which remains readable during its entire lifecycle

**3.22**
**electronic information system**
system designed to receive, preserve, access and transfer archives in an electronic form

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**3.23**
**electronic attestation**
information produced to provide evidence that an action or an electronic transaction has occurred

**3.24**
**events log**
log which records audit trail data related to the system operations

**3.25**
**format conversion**
operation converting a digital document to a different electronic format

NOTE This operation preserves the fidelity of the document.

**3.26**
**hash function**
mathematical algorithm used for turning some kinds of data into a relatively small integer

**3.27**
**integrity**
attribute of a document whose content is completed and unaltered

**3.28**
**legibility**
attribute of an archived document which allows access to all the information it contains

NOTE This could be facilitated by certain metadata associated with the document.

**3.29**
**lossy compression**
compression algorithm which loses some of the original information during compression

NOTE The resulting decompressed object is only an approximation of the original.

**3.30**
**media migration**
act of transferring a document from one medium to another, particularly with regard to managing media obsolescence

**3.31**
**metadata**
data describing the context, content and structure of a document and their management over time

**3.32**
**replication**
process which consists of copying information between redundant resources, notably software or hardware components, to improve reliability, fault-tolerance or accessibility

**3.33**
**time source**
internal or external component of an information system providing a reliable and objective time reference suited to requirements

**3.34**
**time-stamp token**
data object that binds a representation of data to a particular time (expressed in UTC), thereby providing evidence that the data existed at that time


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**3.35**
**transferability**
ability to recover an authentic digital archive (information, data, objects and all related metadata from one information system) in order to transfer it to another information system by means of a procedure specified in advance

NOTE This issue is of particular importance when information is stored by a third-party archive service provider.

**3.36**
**trusted third-party archive service provider**
third-party individual or organization in charge of archives preservation

# 4 General characteristics and levels of requirements

## 4.1 Characteristics

In order that an organization might apply a recognized specifications framework for the storage, use, archiving, retrieval and display of electronic documents, both technical and organizational measures need to be taken to ensure document integrity and long-term preservation.

In this context, an electronic information system shall implement a pre-defined archival policy; a description of the general principles of such a policy is described in Annex A.

It is important to recognize that information systems will capture electronic documents that are being submitted for long-term storage and use. The term “capture” in this sense reflects the receipt and processing of information to be managed by the information system. Where hardcopy documents need to be stored and managed in electronic form, these documents shall be scanned and indexed prior to their capture in the information system.

This part of ISO 14641 is applicable only to unalterable captured documents. Related document reference data in the file system or database shall not be erasable, changeable or able to be replaced by new data.

Procedures and security requirements shall be implemented in order to:

a) control the process of archiving;

b) prevent and/or detect modifications made to documents or to the data necessary for their retrieval and display;

c) ensure the integrity of audit trail data (including the log of the system events).

An electronic information system shall feature characteristics of:

1) suitability for long-term preservation;

2) integrity;

3) security;

4) traceability.

This part of ISO 14641 outlines:

— specifications for procedures relative to the processing, preservation, access and restitution of scanned or digitally born information, and requirements for the security of the information system;

— procedures relative to the digitization of analogue documents;

— procedures relative to the capture of documents, their preservation, access and restitution;

— procedures relative to the potential disposal of documents;

— rules relative to applicable procedures concerning operators;

— description of the resulting attestations of these operations;

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— specifications concerning materials, equipment and software implementations;

— conditions of system audits and related procedures;

— characteristics applicable to the use of trusted third parties;

— characteristics applicable to the use of subcontractors.

The technical description manual, attestations produced and logs detailing the lifecycle of archives or system events shall be kept in the same conditions as the archives themselves.

## 4.2 Levels of requirements

Different organizations might have distinct and individual approaches to risks and requirements for information systems used for the preservation of electronic documents.

Table 1 outlines degrees of levels of these requirements. It summarizes general characteristics and practical methods for implementation at the level of requirement preferred by the organization, with regard to the nature of documents to be preserved and potential risks incurred.

Additional requirements may be selected based on specific needs and acceptable levels of risk.

The conformity of an information system with this part of ISO 14641 shall be evaluated in relation to the level of requirements selected by the organization.

**Table 1 — Requirements of information systems**

| Characteristic | Minimal requirements | Additional requirements |
|---|---|---|
| **Suitability for long-term preservation** | Use of standardized or industry-standard and publicly available file formats | Format conversion<br>Document scanning |
| | Metadata description of document | Standard metadata format |
| | Migration of media | |
| | Format conversion | Control and conversion of formats at time of capture<br>Format obsolescence alert<br>Planned and traceable format conversion |
| | System change management | |
| **Integrity** | Guaranteed by storage on media:<br>— physical WORM<br>— logical WORM on fixed media with<br>— events log<br>— techniques and procedures for detection and prevention of substitutions of input<br>— logical WORM on removable media (see rewritable/erasable media)<br>— rewritable/erasable media (normal security level) | Strong security level<br>Advanced security level<br>Strong security level<br>Advanced security level |
| | Capture process of archives | |
| | Alerts prior to destruction of archives | |
| | Description of the process of destruction of archives | Definition of change procedures for preservation periods<br>Post-destruction preservation of metadata and audit trail |


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**Table 1** *(continued)*

| Characteristic | Minimal requirements | Additional requirements |
|---|---|---|
| **Security** | Identification of persons and processes accessing archives | Strong authentication |
| | Backup copies of archives | Use of different types and forms of media<br>Protection from risks of flood, fire, etc. |
| | Controlled archiving operations (identification and traceability) | Strong authentication<br>Retrieval in formats other than input formats |
| | Continuity of access to archives | |
| **Traceability** | Date and time stamp | Date and time stamp from trusted third party |
| | Maintenance of a technical file (archival policy, general conditions of services, operations procedures, lifecycle of document) | Adjustment to the organizational processes of the customer and related attestations |
| | Maintenance of an audit trail of archives lifecycle and events log | Digital signature and date and time stamp of attestations of operations and events, in units or batches<br>Definition of the granularity of the batches of events to which a digital signature applies<br>Frequency of archiving of audit trails and logs |

# 5 General specifications

## 5.1 General

The design and operation of the information system shall allow implementation of procedures guaranteeing the requirements selected from 4.2.

## 5.2 Technical description manual

A technical description manual of the information system shall be created and retained. It shall contain at least:

a) a list of hardware components of the information system with all serial numbers affixed by manufacturers, the key features of these components, date(s) of production, compliance with related safety standards;

b) for a network system, its typology and topography, as well as a description of the connections and security equipment;

c) a data architecture model of information objects and their relationships, with regard to their use in support of the general objectives of the information system;

d) a list of software products and related documentation, identification of installed versions and dates of installation of these versions;

e) a list of customized software applications with their design/architecture file, their source code or proof of their deposit in custody;

f) a description of the interactions between the diverse components of the information system;

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