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Systems and software engineering — Content management for product life- cycle, user and service management documentation

*Ingénierie des systèmes et du logiciel — Gestion de contenu relatif à la
documentation du cycle de vie du produit, de l'utilisateur, et de la
gestion de service*

Recognized as an American National Standard



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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

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The main task of ISO/IEC JTC 1 is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

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ISO/IEC/IEEE 26531 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information Technology*, Subcommittee SC 7, *Systems and Software Engineering* in cooperation with the Systems and Software Engineering Standards Committee of the IEEE Computer Society, under the Partner Standards Development Organization cooperation agreement between ISO and IEEE.

Introduction

This International Standard was developed to assist users of ISO/IEC/IEEE 15288:2008, *Systems and software engineering – System life cycle processes*, ISO/IEC/IEEE 12207:2008, *Systems and software engineering – Software life cycle processes*, or ISO/IEC 20000-1:2011 (IEEE Std 20000-1-2013), *Information technology – Service management – Part 1: Service management system requirements*, in the management of the content used in product life-cycle, user, and service management documentation. The accurate description of the requirements for content management helps documentation meet the needs of its users and be efficiently produced.

This International Standard is independent of the software tools that may be used to manage documentation content and applies to both printed documentation and on-screen documentation.

Content management allows an organization to control the storage and retrieval of content objects, track content revisions, maintain a content audit trail, and enable a collaborative environment. Component content management supports the reuse of content objects among deliverables and supports multiple deliverable formats.

A consequence of content management is increased collaboration on content development across the enterprise. Technical authors, instructional designers, support staff, and others may develop a body of content together that is written once and supports many needs.

Documentation is often regarded as something done after the software has been implemented. However, for high-quality software documentation, its development should be regarded as an integral part of the software life cycle. In fact, quality documentation or information management services are important enough to require specific planning.

This International Standard is consistent with ISO/IEC/IEEE 15288, *System and Software Engineering – System life cycle processes*, and ISO/IEC/IEEE 12207, *Systems and software engineering – Software life cycle processes*, as an implementation of the Information Management Process. This standard is not a management system standard.

This International Standard is intended for use in all types of organizations, whether they have a dedicated documentation department or not. It may be used as a basis for local standards and procedures. Readers are assumed to have experience or knowledge of general processes for information management, project management, and document development.

This International Standard is intended for managing technical content which is included in:

- User information such as topic collections, manuals, guides, multimedia, user assistance displayed with software, style guides, and other content that supports the effective use of a system or software product.
- Product life cycle information such as design documents, use cases, personas, project management plans, feature requests, and testing plans.
- Service management items such as service level agreements, records, policies, procedures, and other documents.

The order of clauses in this International Standard does not imply that the content management activities should be performed in this order, nor that documentation should be developed in this order or presented to the organization in this order.

In each clause, the requirements are independent of media and document creation and management specifications.

Systems and software engineering — Content management for product life-cycle, user and service management documentation

1 Scope

This standard states requirements for efficient development and management of content produced

- throughout the life-cycle of a system and software product;
- for the provision of user documentation for systems and software;
- for the management of IT services.

This standard is independent of the tools, protocols, and systems used for content management. It does not address configuration management of software assets.

The content to be managed with this standard includes

- user information such as topic collections, manuals, guides, embedded user assistance, style guides, videos and other media, and other content that supports the effective use of a system or software product;
- product life cycle information such as design documents, use cases, personas, project management plans, feature requests, models, scripts, testing plans, test scripts, defect reports;
- service management items such as service-level agreements, records, policies, procedures, and other documents.

The purpose of this standard is to define a process for content management and the requirements of a component content management system through which content is gathered, managed, and published, including the requirements of a system that is supported by an electronic database. Such a database should support documents or topics and content units that may be assembled to produce complete documents for print, electronic output, or content collections published through electronic media. This database is defined as a Component Content Management System (CCMS), which differs from a document management system. The objective of component content management is to create content objects once and use them through linking mechanisms in multiple output formats, including but not limited to documents.

The intended users of this International Standard are managers and developers of information (technical documentation) and acquirers and suppliers of content management systems. Any organization that develops content, regardless of size, can benefit from maintaining an effective content management solution and following best practices for the development and management of technical content.

Systems conforming to this standard can fulfill business needs for content development and management, especially the need for a single source of authoritative information. Content objects that are unique and are maintained as independent database objects are efficient to review, approve, and update; may be combined to produce multiple deliverables; and are cost-effective to translate.

This standard is not a management system standard.

The content management process presented in clauses 6 through 11 of this International Standard is a specialization (lower-level process) of the Information Management process required in ISO/IEC/IEEE 15288:2008 and ISO/IEC/IEEE 12207:2008.

2 Conformance

This International Standard may be used as a conformance or a guidance document for projects and organizations claiming conformance to ISO/IEC/IEEE 15288:2008, *Systems and software engineering – System life cycle processes*, or ISO/IEC/IEEE 12207:2008 *Systems and software engineering – Software life cycle processes*.

Throughout this International Standard, "shall" is used to express a provision that is binding, "should" to express a recommendation among other possibilities, and "may" to indicate a course of action permissible within the limits of this International Standard.

Use of the nomenclature of this International Standard for the parts of documentation, such as topics, content units, modules, is not required to claim conformance.

This International Standard may be included or referenced in contracts or similar agreements when the parties (called the acquirer and the supplier) agree that the supplier will deliver services and systems in accordance with the standard. This International Standard may also be adopted as an in-house standard by a project or organization that decides to acquire documentation from another part of the organization in accordance with the standard.

3 Normative references

There are no Normative References applicable to this standard.

4 Terms and definitions

For the purposes of this standard, the terms and definitions given in ISO/IEC/IEEE 24765, available at www.computer.org/sevocab and the following apply.

4.1

application programming interface

software component that allows software applications to communicate with one another

4.2

branching

method of development in which a set of components is duplicated so the components may be modified in parallel and optionally synchronized at a later time

4.3

component

an object with a discrete information type that is stored in the CCMS, such as a topic, prerequisite, section, image, or video

4.4

component content management system

content management system that supports the entire document- or information-development life cycle from authoring through review and publishing, including the reuse of modular content

NOTE In case the modular content is XML-based, the individual XML elements available for management are defined by the XML schema or DTD. This standard is protocol-independent and it is not necessary to specify numerous markup languages.

4.5

component dependencies

all the components that are linked to, directly or indirectly, from a single parent component

EXAMPLE: The relationship of a source hazard statement to its insertion in a topic at time of publication.

4.6**content object**

content that is encompassed by an XML element

4.7**content type**

reusable definition of settings for storage, metadata, workflow, and behaviour that is assigned to a component

4.8**content unit**

identifiable and manageable part of larger information objects

NOTE The individual content units available for management are typically defined by an XML schema or DTD.

4.9**content management system**

system that supports authoring, storing, translating, and publishing content

cf. document management system

4.10**customization**

modification of a document type definition to add new structures or change the document type definition in a way that is not compatible with a previous structure

4.11**dependency export**

operation in which a component and all of its dependencies are exported from the CCMS as a single process

4.12**document management system**

system that supports the storage, retrieval, versioning, and manipulation of whole documents, images, and other media

cf. content management system

4.13**document type definition**

template for the structure, content, and semantics of XML documents

4.14**documentation**

any written or pictorial information describing, defining, specifying, reporting, or certifying activities, requirements, procedures, or results

[IEEE Std 829™-2008]

4.15**effectiveness**

accuracy and completeness with which users achieve specified goals

[ISO/IEC 25062:2006]

4.16**EXtensible Markup Language**

license-free and platform-independent markup language that carries rules for generating text formats that contain structured data

[ISO/IEC 19770-2:2009]

4.17

EXtensible Style Language Transformations

language for transforming XML documents into other document types such as PDF or HTML

4.18

faceted search

progressive search that allows users to narrow the results by selecting values for one or more attributes

4.19

[CCMS] framework

essential data structures, operations, and rules that form the foundation from which all other features of the CCMS are built

4.20

Hypertext Markup Language

language for creating web pages

4.21

Hypertext Transfer Protocol

application-level protocol for distributed, collaborative, hypermedia information systems

4.22

information item

separately identifiable body of information that is produced, stored, and delivered for human use

[ISO/IEC/IEEE 15289:2015]

NOTE An information item can be produced in several versions during a project life cycle.

4.23

information type

class of topics that addresses a particular user question

EXAMPLE An information type that answers the question “how do I ...” is called a task information type.

4.24

Levenshtein distance

measure of the difference between two character sequences based on the minimum number of single character edits (insertion, deletion, or substitution) needed to convert one word to the other

4.25

link

part of a computer program, often a single instruction or address, that passes control and parameters between separate modules of the program

4.26

object

encapsulation of content units in a CCMS

4.27

publishing pipeline

series of defined processing steps that are connected to transform content from its source format into a final deliverable format

4.28

regular expression (Regex)

string of characters that allows patterns to be used to match search results

NOTE Patterns may dictate that matches must start or end with specific sequences of characters or allow the use of wildcards to match any characters in a sequence.

EXAMPLE

`^admin*` - Find all matches that start with 'admin' and contain any sequence of characters afterwards

`\d{5}$` - Find all matches that end with the number 5

`^[0-9()-]+$` - Find matches that contain a 10-digit phone number

4.29**semantic label**

tag that describes the content rather than its format

EXAMPLE A semantic label such as prerequisite describes the content as a pre-requisite to the following task information. In contrast, a format label simply describes the content as a paragraph or a list.

4.30**specialization**

specification of targeted document type definitions that share the common output transformations and design rules developed for more general types and domains

4.31**structured authoring**

development of content elements including metadata in specified templates

NOTE In structured authoring, content elements are labeled according to the nature of the content they contain. Structured authoring also permits quasi-semantic labeling, such as Heading1 or NestedList, to indicate the hierarchical position and function of a content element.

4.32**taxonomy**

scheme that partitions a body of knowledge and defines the relationships among the parts

4.33**topic**

standalone item of information that answers a single user question

4.34**XML Schema definition**

XML-based language that specifies a set of rules and structure for the creation of XML documents

[ISO/IEC 19770-2:2009]

5 Abbreviated terms

API Application Programming Interface

BMP Bitmap image file

CCMS Component Content Management System

DITA Darwin Information Typing Architecture

DMS Document Management System

DTD Document Type Definition

ECMS Enterprise Content Management System

GIF Graphics Interchange Format

HTML Hypertext Markup Language
HTTP Hypertext Transfer Protocol
JPEG Joint Photographic Expert Group
LCMS Learning Content Management System
QTFF QuickTime File Format (abbreviated as.mov)
MP3/MP4 See MPEG
MPEG Moving Picture Experts Group
PDF Portable Document Format
PNG Portable Networks Graphics
SCMS Source Control Content Management System
SME Subject Matter Expert
WAV Waveform Audio File Format
WMV Windows Media Video
XLIFF XML Localisation Interchange File Format
XML Extensible Markup Language
XSLT EXtensible Style Language Transformations

6 Content management process

This clause describes the activities of a process through which content is managed from initiation through approval and publishing.

Content management activities described in this standard are as follows:

- Project Initiation
 - Developing a business case for managing content
 - Defining requirements for a CCMS
- Project Plan
 - Information model
 - Authoring guidelines
 - Reuse strategy
 - Metadata schema
 - Workflow specification
 - Schedule of activities, deliverables, and responsibilities
 - Training plan
 - Stylesheet development

- Pilot project specification
- Organization rollout
- Information Development
 - Content conversion
 - Content authoring
- Management and control
 - Quality management
 - Review and approval
 - Search and retrieval
 - Localization and translation
 - Content deletion
 - Content archiving
- Publication
 - Release management
 - Publication of content

These can be represented as shown in Figure 1.

The details of each activity in the content management process are discussed in separate clauses.

NOTE ISO 21500, Guidance on project management, can be consulted for managing a content management project.

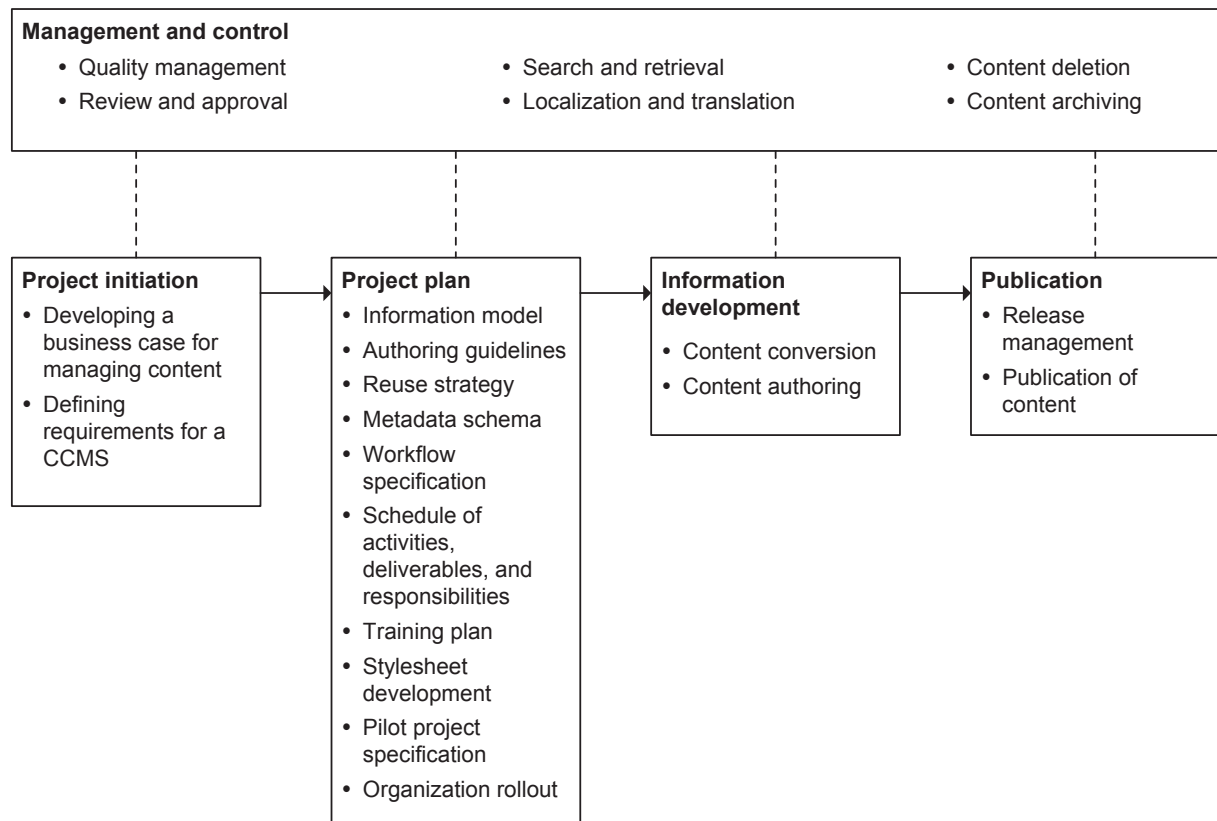


Figure 1 — Content Management process and activities

7 Content management project initiation

7.1 Developing a business case

The organization shall develop a business case to support the development and implementation of a content management solution.

In developing a business case for content management, an organization shall evaluate the needs of the organization, as follows:

- Analyze the current state.
- Identify potential customer benefits.
- Identify cost reduction opportunities.
- Calculate acquisition and implementation costs, including both technology and personnel costs.
- Calculate the Return on Investment.
- State the risks of the project.

The development of a business case may be necessary to obtain support and funding for a content management solution. Establishing the business benefits of content management in an organization includes carefully evaluating both immediate and long-term gains and evaluating enterprise and departmental solutions. Understanding the present situation assists in developing a vision of why and how that situation should be changed.

Content management allows an organization to control the storage and retrieval of content objects, track content revisions, maintain a content audit trail, and enable a collaborative environment. Component content management supports the reuse of content objects among deliverables and supports multiple deliverable formats.

A consequence of content management is increased collaboration on content development across the enterprise. Technical authors, instructional designers, support staff, and others may develop a body of content together that is written once and supports multiple needs.

By implementing a CCMS and activities to support that system, organizations can experience the following benefits:

- Standardized methods for creating content
- Standardized levels of content quality
- Avoidance of duplicated or near-duplicated content
- Reduced maintenance of content objects
- Greatly improved access and successful search to content objects with appropriate permissions
- Improved ability to find content objects
- Reduced storage and maintenance requirements through consolidation of content in a unified system
- Traceability of review and approval cycles and change management
- Reduced development costs in source and target languages

- Ability to mitigate legal and compliance risk through a single source of authoritative content
- Ability to deliver content in multiple formats according to current and future standards

For more detailed information about developing a business case, see Annex A.

Content management, if well controlled and managed, increases staff productivity and reduces development and publishing costs. Productivity increases are achieved by implementing processes that support structured authoring and content reuse. Structured authoring implies that content is authored according to specified templates, depending upon the type of content to be developed. Content reuse implies that content objects are stored and maintained uniquely, decreasing the cost of updating and translating the same content multiple times.

Content reuse also implies that a content object is a single source of authoritative content, ensuring that the same information and the exact message appears in every instance of output, decreasing the liability associated with incorrect information. Development costs are reduced because existing content is available to authors through search and retrieval, implying that specific information is created and updated only once. Publishing costs are reduced because content objects may be published in more than one format through the use of automated publishing routines.

If content is developed using XML Document Type Definitions (DTDs) or schemas, the cost of formatting that content in multiple languages is eliminated once appropriate style sheets are in place. For those organizations that are required by regulatory bodies or by customer requirements to publish content in multiple languages, CCMSs and processes enable significantly decreased time and cost. CCMSs that enable rigorous linking between content objects also support links between source and target language content objects. Once a body of content has been translated, CCMSs establish links between source and target language content objects so that only new or revised content need be translated. Previously translated content need not be sent again for translation, reducing not only translation costs but also administrative costs in handling already translated content.

7.2 Defining requirements for a CCMS

The business case identifies concerns to be addressed in the explicit definition of requirements for a CCMS.

7.2.1 Requirements definition

The development of a detailed requirements definition enables an organization not only to specify its requirements internally but also carefully evaluate competing products. A well-structured requirements definition focuses on four key areas:

- Output
- Storage and retrieval
- Assembly and linking
- Authoring and workflow

Clause 12 presents the CCMS requirements.

7.2.2 Output requirements

Output requirements shall specify the content delivery mechanisms that make information available to the user community, both internally and externally.

Translation requirements, including the languages and character sets (fonts) required, shall be specified.

An organization may need to target different versions of information to different groups, based on internal needs, market segments, specific customers, and others. Information may need to encompass multiple

versions of a collection of products, where much of the information is shared and some of the information is varied depending on product type or model. Information may be output in multiple media, including print, PDF, embedded user assistance, tablet, electronic applications (apps), e-learning, and others. Information may vary depending on the location or language of the users.

Output requirements should include the potential use of topic- and publication-specific metadata to enable faceted search mechanisms.

Requirements for automatically creating translation packages for transmittal to localization service providers should be specified, including the use of the XLIFF standard (see OASIS standards names) for the transmission of unified data files for translation.

NOTE: The OASIS XML Localization Interchange File Format (XLIFF) provides such a specification at https://www.oasis-open.org/committees/tc_home.php?wg_abbrev=xliif

7.2.3 Storage and retrieval requirements

In preparing storage and retrieval requirements, organizations shall identify how each group using the CCMS will access its content. Storage requirements shall include the ability to maintain links between content objects.

Requirements shall be stated for the storage and retrieval of translated content, especially the requirement to maintain synchronicity between source and target languages to reduce translation costs.

Retrieval requirements shall specify how the CCMS enables internal users to search for and find information.

Various CCMSs support either folder-like structures for navigation to content or search mechanisms that enable users to identify specific content using metadata-enabled search.

Organizations may need to store multiple content types, including images, video, and voice, and entire document constructs as well as storage of individual components that will be assembled into larger constructs on output.

Search mechanisms may be focused on full-text search, metadata-based faceted search, XML-element enabled search, or a combination of these mechanisms.

7.2.4 Assembly and linking requirements

In preparing assembly and linking requirements, organizations shall specify how they expect to collect components of content for assembling into final deliverables, including producing full and partial draft content for reviews.

In an XML environment, linking requirements are especially important because final deliverables are produced through elaborate linking mechanisms. Topics may be assembled into chapters and sections of large documents. Reusable content, such as warranty statements, hazard statements, and others may be stored once and included in multiple instances in final document assemblies. Individual words and phrases may be stored separately so that they may be updated as needed before final assemblies. Each of these situations requires a robust linking mechanism.

7.2.5 Authoring and workflow requirements

Organizations shall specify how an audit trail of changes and comments shall be maintained throughout the information lifecycle.

Organizations shall specify the elements of their information lifecycle management process, including importing legacy content, enabling authoring by both full-time professional authors and casual contributors, supporting simultaneous review by groups of reviewers and electronic signature of approvers, assembling content into larger deliverables, releasing approved content for publication, and archiving deliverables at end-of-life.