

This is a preview of "ISO 15704:2019". [Click here to purchase the full version from the ANSI store.](#)

Second edition  
2019-12

---

---

## **Enterprise modelling and architecture — Requirements for enterprise-referencing architectures and methodologies**

*Modélisation et architecture d'entreprise — Exigences pour les  
architectures et les méthodologies de référencement d'entreprise*



Reference number  
ISO 15704:2019(E)

© ISO 2019

This is a preview of "ISO 15704:2019". [Click here to purchase the full version from the ANSI store.](#)



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2019

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
CP 401 • Ch. de Blandonnet 8  
CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Fax: +41 22 749 09 47  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

Published in Switzerland

This is a preview of "ISO 15704:2019". [Click here to purchase the full version from the ANSI store.](#)

## Contents

	Page
<b>Foreword</b> .....	<b>v</b>
<b>Introduction</b> .....	<b>vi</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>1</b>
<b>4 Abbreviated terms</b> .....	<b>5</b>
<b>5 Requirements for enterprise-referencing architectures and models</b> .....	<b>6</b>
5.1 General requirements.....	6
5.2 Applicability and coverage of enterprise architecture.....	7
5.2.1 Kinds of enterprise.....	7
5.2.2 Characterizing enterprise architecture.....	7
5.2.3 Enterprise engineering and architecting methodology.....	7
5.2.4 Enterprise design.....	8
5.2.5 Enterprise operation.....	8
5.3 Essential concepts for enterprise-referencing architecture.....	8
5.3.1 Span of conceptual orientation.....	8
5.3.2 Human oriented.....	8
5.3.3 Process oriented.....	8
5.3.4 Interoperation oriented.....	8
5.3.5 Decision oriented.....	8
5.3.6 Realization oriented.....	9
5.3.7 Technology oriented.....	9
5.3.8 Environment oriented.....	9
5.3.9 Lifetime oriented.....	9
5.3.10 Stakeholder oriented.....	10
5.3.11 Viewpoint oriented.....	10
5.3.12 Model oriented.....	11
5.3.13 Model view oriented.....	12
5.3.14 Enterprise interoperation oriented.....	13
5.3.15 Verification and validation oriented.....	13
<b>6 Components of enterprise-referencing architectures</b> .....	<b>13</b>
6.1 Enterprise-referencing models.....	13
6.1.1 Purpose of enterprise-referencing models.....	13
6.1.2 Kinds of enterprise-referencing models.....	14
6.2 Modelling languages.....	16
6.2.1 Requirements for modelling languages and constructs.....	16
6.2.2 Expressiveness.....	16
6.2.3 Semantics and syntax of an enterprise-referencing model.....	16
6.2.4 Names, labels and glossary.....	17
6.2.5 Elements of interoperation.....	17
6.3 Models as representations.....	18
6.3.1 Representing enterprise characteristics.....	18
6.3.2 Concepts of internal structure.....	18
6.3.3 Compatibility of structuring approaches.....	18
6.3.4 Concepts of enterprise-referencing behaviour.....	19
6.3.5 Short-term and long-term behavioural change.....	19
6.3.6 Representation of behaviour.....	20
6.3.7 Concepts of hierarchy.....	20
6.3.8 Recursion in decomposition.....	21
6.3.9 Iteration.....	22
6.3.10 Availability and format of model information.....	22
6.3.11 Management of constituent parts.....	23

This is a preview of "ISO 15704:2019". [Click here to purchase the full version from the ANSI store.](#)

6.4	Impact of genericity.....	23
6.4.1	Generic enterprise elements.....	23
6.4.2	Partial enterprise models.....	23
6.4.3	Particular enterprise models.....	23
6.5	Enterprise perspectives and viewpoints.....	24
6.5.1	Primary concern perspectives.....	24
6.5.2	Additional concern perspectives.....	26
6.6	Enterprise-referencing modelling framework.....	26
6.7	Tools.....	27
6.8	Modules.....	27
6.9	Enterprise operational systems.....	27
6.10	Representation.....	27
<b>Annex A (informative) Key principles of enterprise integration and interoperation.....</b>		<b>28</b>
<b>Annex B (informative) Generalized Enterprise Reference Architecture and Methodology (GERAM).....</b>		<b>32</b>
<b>Annex C (informative) Relationship of this document with other International Standards related to architecture for enterprise systems.....</b>		<b>67</b>
<b>Bibliography.....</b>		<b>70</b>

This is a preview of "ISO 15704:2019". [Click here to purchase the full version from the ANSI store.](#)

## 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](http://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](http://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](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 184, *Automation systems and integration*, Subcommittee SC 5, *Interoperability, integration, and architecture for enterprise systems and automation applications*.

This second edition cancels and replaces the first edition (ISO 15704:2000), which has been technically revised. It also incorporates the Amendment ISO 15704:2000/Amd.1:2005.

The main changes compared to the previous edition are as follows:

- alignment of terminology for consistency with other standards developed by ISO/TC 184/SC 5;
- incorporation of the rules and guidelines for modelling from ISO 14258 to express enterprise-referencing architecture methodologies;
- revision of content related to recursive structure and iterative methods;
- redrafting of life history concept to address enterprise change management;
- discussion of modelling dimensions necessary for user views, including the extent of detail and composite models that span dimensions;
- harmonization with ISO/IEC/IEEE 42010 and other International Standards related to architecture for enterprise systems;
- inclusion of discussion concerning the relationship of this document with other International Standards related to architecture for enterprise systems (ISO/IEC 10746, IEC 62264, ISO 15745);
- updating of Annex B on Generalized Enterprise Reference Architecture and Methodology (GERAM) in accordance with GERAM 1.6.3.

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](http://www.iso.org/members.html).

## Introduction

### 0.1 Rationale for enterprise architectures and models

Industrial and information age enterprises create and modify manufacturing and business operations to improve performance in local and global markets. In operation they deploy a variety of resources including people, information systems, automated machinery and business services. Individually and collectively these resources provide the functional capabilities required to perform manufacturing and business processes and their constituent activities. The arrangement, targeting and interworking of resources need to accomplish the enterprise mission, which requires suitable business rules and organizational structures that enable the enterprise to provide products and services in conformance with agreed upon criteria.

Enterprises operate under uncertain and changing market and environmental conditions that make ongoing enterprise engineering beneficial. Enterprises cooperate within a heterogeneous environment with multiple constituents using different models and systems. In addition, most enterprises operate within the context of another enterprise with which it interoperates, as with a supply chain or the parent company. It follows that enterprise personnel have a variety of responsibilities in the conception and ongoing development of the mission, business rules, manufacturing and business processes, organizational structures, and supporting resources and services. Because of the complexity involved in enterprise engineering, invariably it becomes necessary to deploy means of assessing, structuring, coordinating and supporting these engineering activities, including means for collaboration support and interoperation.

Generalized enterprise-referencing architecture concerns and components of enterprise modelling constitute a reference base that provides a generally applicable means of arranging and coordinating enterprise engineering and associated technology development and deployment projects. By adopting and adapting such a reference base, enterprise personnel can cooperate in progressing enterprise engineering projects, improving the enterprise, improving stakeholder's communications and utilizing enterprise resources. By adopting appropriate tool sets, enterprise personnel can reuse in a practical way explicit enterprise designs and models to realize the benefits of enterprise engineering on a continual basis and realize further improvements in enterprise operation.

Such a reference base needs to include capabilities that:

- capture concerns of mission fulfilment stakeholders (manufacturing, transport, service delivery, etc.) and of business stakeholders;
- describe suitable solutions to identified problems within the enterprise;
- model the whole life history of an enterprise integration project from its initial concept through development, operation and finally decommissioning or obsolescence; and
- encompass the people, processes, resources and organizations involved in performing, managing, and controlling the enterprise mission.

From an enterprise engineering perspective, the following distinction is drawn:

- enterprise architecture refers to the arrangement of physical components, logical relationships, and human interactions involved in the development, implementation and operation for a programme such as enterprise integration or other enterprise related programme, usually including a set of projects; and
- system architecture refers to the arrangement of physical components and logical relations of a system that is a constituent of an enterprise; for example, the computer-control-system part of an overall enterprise or product.

This document does not present or adopt specific methodologies for creating or using enterprise architectures or models. The focus is on establishing a reference base capable of supporting specific enterprise programmes, rather than a design intended to fulfil the stated requirements.

This is a preview of "ISO 15704:2019". [Click here to purchase the full version from the ANSI store.](#)

This document identifies an extensive collection of potential artefacts for expressing an enterprise-referencing architecture and its associated methodologies. Not all of these artefacts will be applicable, necessary or even desirable for all architecting efforts. The identification of these artefacts assures that this document meets the needs of the widest possible number of enterprise-referencing architecture and methodology situations. Users of this document need to assess not only the value of generating an identified artefact but also the value of maintaining that artefact under the changing circumstances of the referenced enterprise.

## 0.2 Rationale for this document

Well-designed standards in the domain of enterprise integration and modelling provide a point of reference for enterprise architects and designers, thereby significantly reducing the risk of investing in islands of integration. Where an island does exist, these standards assist the architect or designer to create the translation necessary for the island to interact within an established context. A standard for enterprise-referencing models enhances interoperability by establishing the elements that are required in a model intended to support enterprise architecture.

This document defines concepts, rules and requirements for architecture descriptions that refer to an enterprise, most often articulated as models, with the intent to guide and constrain other standards or implementations that do or will exist on the topic. To realize this intent, this document specifies the concepts to use when producing an enterprise-referencing architecture (see [Clause 5](#)) and when constructing enterprise-referencing models (see [Clause 6](#)). This document provides a reference base, guidelines and constraints for enterprise architecture and models to anyone engaged in enterprise activities where models are utilized.

## 0.3 Benefits of this document

The requirements of the reference base for enterprise-referencing architecture and models in this document allow assessment of an enterprise architecture framework or other approach as well as associated methodology and languages for completeness with respect to current and future purpose of the architecture effort. This document will help guide development programmes.

When conforming implementation designs have the same technology areas and nomenclature, or can map to them readily, the information from one enterprise or process is more readily sharable with information of another enterprise or process.

The benefit will be most relevant to any group charged with improving an enterprise infrastructure or its processes. Such a group will find it necessary to either select or create a reference architecture of its own with terminology that pertains specifically to the company, industry, and culture involved. This document will help guide that selection or creation.

This document expects users that are:

- enterprise planners, builders, modifiers, and analysts using the requirements to check completeness of their activity;
- enterprise-referencing model builders using the requirements to assure consistency between models to enable model interoperability; and
- developers of standards for enterprise representation using the requirements to assure consistency between their standards and this document.

**NOTE** While the requirements specified herein cover a broad range of enterprise considerations, many users find it advantageous to structure the topics considered into a specific framework for their own work. Such a framework is a methodological choice of the user and goes beyond the scope of this document. [Annex B](#) discusses a framework consistent with this document and other International Standards provide further framework guidance.