
**Enterprise integration — Constructs
for enterprise modelling**

Entreprise intégrée — Constructions pour la modélisation d'entreprise



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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 19440 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 310, *Advanced manufacturing technologies*, in collaboration with Technical Committee ISO/TC 184, *Industrial automation systems and integration*, Subcommittee SC 5, *Architecture, communications and integration frameworks*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Introduction

0.1 Background

This International Standard defines the generic concepts that are required to enable the creation of enterprise models for industrial businesses and to provide support for the use of frameworks by industrial enterprises. This International Standard builds upon ISO 19439 by defining and detailing a set of conformant user-oriented modelling language constructs, which provide common semantics and enable the unification of models developed by different stakeholders in the various phases of model development. Such models are aimed at model-based support of operational decision-making and can be employed for model-based operation monitoring and control.

The modelling language constructs defined in this International Standard can be specialized or organized or both into structures for specific purposes, for example for an industry sector or for a particular kind of enterprise concern such as maintenance. In turn, such structures and generic modelling language constructs can be used for developing particular models for a particular enterprise. Annex B contains further background, the rationale and benefit statements for this International Standard.

The general requirements that determine the characteristics of the core constructs necessary for computer-supported modelling of enterprises are

- the provision of an explicit model of Business Processes, with their dynamics, functions, information, resources, organization and responsibilities,
- sufficient detailing and qualification of enterprise components to allow the creation of a model for a specific enterprise,
- support for management of change, and
- end-user-oriented representation to enable operational use.

An illustrative example shown in Annex E demonstrates the use of the modelling language constructs.

Annex B provides a rationale for construct-based enterprise modelling and sets out the background to this International Standard and the framework for enterprise models on which it is based (see ISO 19349). The three dimensions of this framework are described in 0.2, 0.3 and 0.4 below.

Contributions to this International Standard have been received from members of the IFAC/IFIP Task Force on Enterprise Integration, the CIMOSA consortium and the European ATHENA research project.

NOTE Figures C.1 to C.6, D.1 to D.3 and D.5 to D.12 are computer-generated. Figures D.4 and E.1 to E.5 are line drawings.

0.2 Dimension of enterprise model views

ISO 19439 and ISO 15704 use enterprise model views (often shortened to “model views”) to provide a selective perception of an Enterprise that emphasizes some particular aspect of the matter under consideration and disregards others. Specifically, they identify four enterprise model views (Function, Information, Resource, Organization) that are to be addressed in a framework, architecture or methodology to allow the modelling of the major aspects of an enterprise. Additionally, as stated in ISO 15704:2000, A.3.1.5.3.2, “other ... views may be defined if needed ... and supported by the engineering tools”, e.g. economic views, decision views, purpose views and implementation views. In this case, the constructs defined in this International Standard can be augmented by additional attributes to support these other views, or

relevant new constructs might have to be defined. Therefore, the specifications of modelling language constructs have to accommodate their intended usage and representation in one or several particular model views. Automated tools are required to ensure consistency of construct instances that can appear in more than one view.

0.3 Dimension of enterprise model phase

The life cycle of models and model components is addressed by the dimension of the enterprise model phase in ISO 19439. This dimension is concerned with the development and evolution of the model of the domain to be modelled, starting from the identification of the enterprise domain and progressing to a processable model and the decommissioning thereof. Therefore, the specifications of modelling language constructs have to accommodate their intended usage and representation in a particular model phase. Attributes of modelling language constructs need to be adaptable and selectable for the different model phases according to the envisioned needs.

0.4 Dimension of genericity

Relative to the dimension of genericity defined in ISO 19439, constructs reside at the generic level and can be used at the partial and particular levels. At the partial level some attribute values can remain undefined for partial instances (e.g. inputs/outputs for Events for Domains and inputs/outputs for Business Processes). Such missing entries have then to be completed at the particular level.

Enterprise integration — Constructs for enterprise modelling

1 Scope

This International Standard specifies the characteristics of the core constructs necessary for computer-supported modelling of enterprises conforming to ISO 19439.

This International Standard focuses on, but is not restricted to, the computer integration of the information aspects of manufacturing, including the management and control technology and the required human tasks. It does not specify how these core constructs for model-based operations are to be implemented and, in particular, it does not include the control language needed to specify and execute (internal) activity behaviour, nor the mapping between functional operations and capabilities.

NOTE Computer-supported modelling of enterprises can form a precursor to computer integration or human-system intermediation.

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/IEC 14977, *Information technology — Syntactic metalanguage — Extended BNF*¹⁾

ISO 19439:2006, *Enterprise integration — Framework for enterprise modelling*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply. Terms defined in ISO/IEC 15288:2002, ISO 15531-1:2004, ISO 15704:2000 and ISO 19439:2006 and used in this International Standard are repeated below for convenience.

NOTE The names of terms representing constructs are capitalized throughout this International Standard to aid the reader in distinguishing them from general usages of the same term, specifically in order to distinguish the constructs Capability, Domain, Enterprise Activity, Event and Resource from general usage of capability, domain (or enterprise domain), enterprise activity, event and resource. These constructs are defined in 3.1 and specified in Clause 6.

3.1.1

aggregation

process of, or result of, combining modelling language constructs and other model components into a whole entity

1) ISO/IEC 14977 is a freely available International Standard that can be downloaded free of charge from http://isotc.iso.org/livelink/livelink/fetch/2000/2489/1/ttf_Home/PubliclyAvailableStandards.htm.