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Information technology — Metadata registries (MDR) —

Part 35:
Metamodel for model registration

Technologies de l'information — Registres de métadonnées (RM) —

Partie 35: Métamodèle pour l'enregistrement du modèle

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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.

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 document 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 or www.iec.ch/members_experts/refdocs).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC 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) or the IEC list of patent declarations received (see https://patents.iec.ch).

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. In the IEC, see www.iec.ch/understanding-standards.

This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 32, *Data management and interchange*.

This first edition of ISO/IEC 11179-35 is part of the 4th Edition modularization of ISO/IEC 11179. This document brings into ISO/IEC 11179 the ability to register models and metamodels. As such, it provides alternative facilities to those specified in ISO/IEC 19763 (see References [4] to [14]).

A list of all parts in the ISO/IEC 11179 series can be found on the ISO and IEC websites.

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 and www.iec.ch/national-committees.

Introduction

In the ISO/IEC 11179 series, the structure of a Metadata Registry is specified in the form of a conceptual data model. ISO/IEC 11179-3 specifies a metamodel for registry common facilities, which is intended to be extended by other parts of ISO/IEC 11179 for specific purposes.

This document provides a specification of the extensions to the registry metamodel specified in ISO/IEC 11179-3 to enable the registration of metadata about models and their associated metamodels. These models can be information or data models, process models, models of web services or any other type of models used in software engineering or information processing. All such models can be considered as metadata.

In Clauses 6 and 7 and Annex C, this document uses:

— **bold** font to highlight terms which represent metadata objects specified by the metamodel;

— normal font for terms which represent concepts defined in Clause 3.

EXAMPLE   **Model_Element** (7.2.2.3) is a class each instance of which models a model element.

Information technology — Metadata registries (MDR) —

Part 35:
Metamodel for model registration

1 Scope

This document provides a specification for an extension to a Metadata Registry (MDR), as specified in ISO/IEC 11179-3, in which metadata that describes models, and their associated metamodels, can be registered.

The specification in this document, together with the relevant clauses of the specification in ISO/IEC 11179-3, provides the ability to record metadata about:

a) models used in software engineering or information processing, for example, information or data models, process models, models of web services or any other type of models used to develop software systems or the processing of information;

b) the concepts associated with the various elements within the models;

c) the metamodels associated with the models;

d) the mappings identified between the models, between the metamodels, and between the models and their associated metamodels – this is achieved by using the mapping facilities specified in ISO/IEC 11179-3.

This document is applicable to the formulation of models and metamodels to be shared among people and machines, independent of the organization that produces the model or metamodel. It is not applicable to the physical instantiation of any model.

2 Normative references

The following document is 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/IEC 11179-3:2023, *Information technology — Metadata registries (MDR) — Part 3: Metamodel for registry common facilities*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 11179-3 and the following apply.

ISO and IEC maintain terminological 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
concept
unit of knowledge created by a unique combination of characteristics

Note 1 to entry: Concepts are not necessarily bound to particular natural languages. They are, however, influenced by the social or cultural background which often leads to different categorizations.

Note 2 to entry: A concept is independent of its representation.

[SOURCE: ISO/IEC 11179-3:2023, 3.2.7]

3.2
modelling language
language or notation that is used to represent some aspect of a universe of discourse

Note 1 to entry: Examples of modelling languages are languages or notations used to express ontologies or to model information requirements, processes, services, forms, roles, goals or some other set of concepts that can be modelled.

[SOURCE: ISO/IEC 19763-10:2014, 3.1.1 modified — "model" replaced by "represent", "domain of interest" replaced by "universe of discourse", and Note 1 added.]

3.3
model
representation of some aspect of a universe of discourse using a recognised *modelling language* (3.2)

Note 1 to entry: Models can be used to express a set of information requirements, processes, services, roles, goals or some other aspect of a universe of discourse.

[SOURCE: ISO/IEC 19763-1:2015, 4.1.12 modified — "normative modelling facility and model constructs" replaced by "recognised modelling language", "domain of interest" replaced by "universe of discourse", and references added.]

3.4
model element
element or component in a *model* (3.3)

Note 1 to entry: Examples of model elements are representations of an entity type in an information model, a representation of an event in a process model, a representation of a service operation in a service model, or a representation of an actor in a role and goal model.

[SOURCE: ISO/IEC 19763-10:2014, 3.1.3]

3.5
model element characteristic
individual characteristic that is used to qualify, identify, classify, quantify or in some other way express the state of a *model element* (3.4)

Note 1 to entry: The state of a model element is the aggregation of the model element characteristics of that model element.

3.6
concept annotation
use of a *concept* (3.1) to annotate a *model* (3.3) or a *model element* (3.4) in order to provide meaning to the *model* or *model element*

4   Abbreviated terms

BPMN	Business Process Model and Notation (see Reference [16])
IDEF1X	Integrated Definition 1 Extended (an information modelling language) (see Reference [15])

| UML | Unified Modeling Language (see References [2] and [3]) |

5 Conformance

5.1 Overview of conformance

Conformance rules for a Metadata Registry are specified in ISO/IEC 11179-3:2023, Clause 4. The clause "Degree of Conformance" is repeated here for convenience. The subsequent subclauses extend the rules from ISO/IEC 11179-3.

5.2 Degree of conformance

5.2.1 General

The distinction between "strictly conforming" and "conforming" implementations is necessary to address the simultaneous needs for interoperability and extensions. This document describes specifications that promote interoperability. Extensions are motivated by needs of users, vendors, institutions, and industries, and:

a) are not directly specified by this document;

b) are specified and agreed to outside this document;

c) may serve as trial usage for future editions of this document.

A strictly conforming implementation might be limited in usefulness but is maximally interoperable with respect to this document. A conforming implementation might be more useful but might be less interoperable with respect to this document.

5.2.2 Strictly conforming implementations

A strictly conforming implementation:

a) shall support all mandatory, optional and conditional classes, attributes, datatypes and associations;

b) shall not use, test, access, or probe for any extension features nor extensions to classes, attributes, datatypes or associations or a combination of thereof;

c) shall not recognize, nor act on, nor allow the production of classes, attributes, datatypes or associations or a combination thereof that are dependent on any unspecified, undefined or implementation-defined behaviour.

NOTE   The use of extensions to the metamodel might cause undefined behaviour.

5.2.3 Conforming implementations

A conforming implementation:

a) shall support all mandatory, optional and conditional classes, attributes, datatypes and associations;

b) as permitted by the implementation, may use, test, access, or probe for extension features or extensions to classes, attributes, datatypes, associations or any combination thereof;

c) may recognize, act on, or allow the production of classes, attributes, datatypes, associations or any combination thereof that are dependent on implementation-defined behaviour.

NOTE 1   All strictly conforming implementations are also conforming implementations.

NOTE 2   The use of extensions to the metamodel can cause undefined behaviour.

5.3   Conformance by feature

Conformance claims can be made to the whole of Clause 7 or to specific features within that clause. Clause 7 is dependent upon one or more clauses of ISO/IEC 11179-3, so conformance to all or part of Clause 7 shall be understood to imply conformance also to relevant provisions specified in one or more of the clauses in ISO/IEC 11179-3.

A conformance statement shall specify exactly the features supported and not supported.

5.4   Standard profiles for edition 4 registries

This document specifies the following standard profiles in addition to those specified in ISO/IEC 11179-3:2023, 4.4.2.

— **Model registry**: Implements Clause 7, in addition to all provisions of the Basic registry profile of ISO/IEC 11179-3:2023, 4.4.2;

— **Model registry with mapping**: Implements Clause 7, in addition to all provisions of the Basic registry with mapping profile of ISO/IEC 11179-3:2023, 4.4.2.

Conformance to the above profiles can be claimed using the following labels, respectively:

— ISO/IEC 11179-35:2023 Model registry;

— ISO/IEC 11179-35:2023 Model registry with mapping.

5.5   Implementation conformance statement (ICS)

An implementation claiming conformance to this document shall include an Implementation Conformance Statement stating:

a)   whether it conforms or strictly conforms;

b)   which clauses are or are not supported;

c)   what extensions, if any, are supported or used.

A standard profile may be referenced, if applicable.

EXAMPLE   Product X conforms to ISO/IEC 11179-35:2023 Model Registry with Mapping.

5.6   Obligation

Attributes and associations specified in this document are stated to be Mandatory, Conditional or Optional. The obligation is not explicitly stated but is to be inferred from the multiplicity of the attribute or association, and the presence or absence of a condition.

For the purpose of conformance:

a)   Mandatory attributes and associations shall exist and shall conform to the provisions of this document.

b)   Anything specified as Conditional within this document shall be treated as Mandatory if the associated condition is satisfied and shall otherwise be not present.

c)   Optional attributes and associations are not required to exist, but if they do exist they shall conform to the provisions of this document.

Such obligation is enforced if and only if the Registration Status of the associated registry items is Recorded or higher (ISO/IEC 11179-3:2023, 9.4.4.3 and ISO/IEC 11179-6:2023, 4.4[1]).

6   Relationship to ISO/IEC 11179-3

6.1   Metamodel for a metadata registry

A metamodel is a model that describes other models. A metamodel provides a mechanism for understanding the precise structure and components of the specified models, which are needed for the successful sharing of the models by users and software facilities.

ISO/IEC 11179-3 uses a metamodel to describe the information model of a metadata registry. The registry in turn will be used to describe and model other data, for example about enterprise, public administration or business applications. The registry metamodel is specified as a conceptual data model, i.e. one that describes how relevant information is structured in the natural world. In other words, it is how the human mind is accustomed to thinking of the information.

6.2   Specification of the metamodel

The conventions used in specifying the metamodel are described in ISO/IEC 11179-3:2023, 5.3. All the classes specified in the Model package (see Clause 7) inherit from **Item**, which is specified in the Core model region in ISO/IEC 11179-3:2023, 6.4.2.1. As instances of the **Item** class, instances of these classes may be identified, registered, administered, named, defined and classified.

6.3   Use of UML Class diagrams and textual description

This document uses both text and UML class diagrams (References [5], [6]) to describe the metamodel. Both are normative and are intended to be complementary. However, if a conflict exists between what is specified in the UML Class diagrams and what is specified in text, the text takes precedence until a correction is made to make them consistent. Further, if a conflict exists between a formal definition and other normative text, the formal definition takes precedence until a correction is made to make them consistent.

A consolidated UML class hierarchy is included as Annex A.

While the model diagrams are presented in UML notation, this document does not assume nor endorse any specific system environment, database management system, database design paradigm, system development methodology, data definition language, command language, system interface, user interface, computing platform, or any technology required for implementation.

6.4   Package dependencies
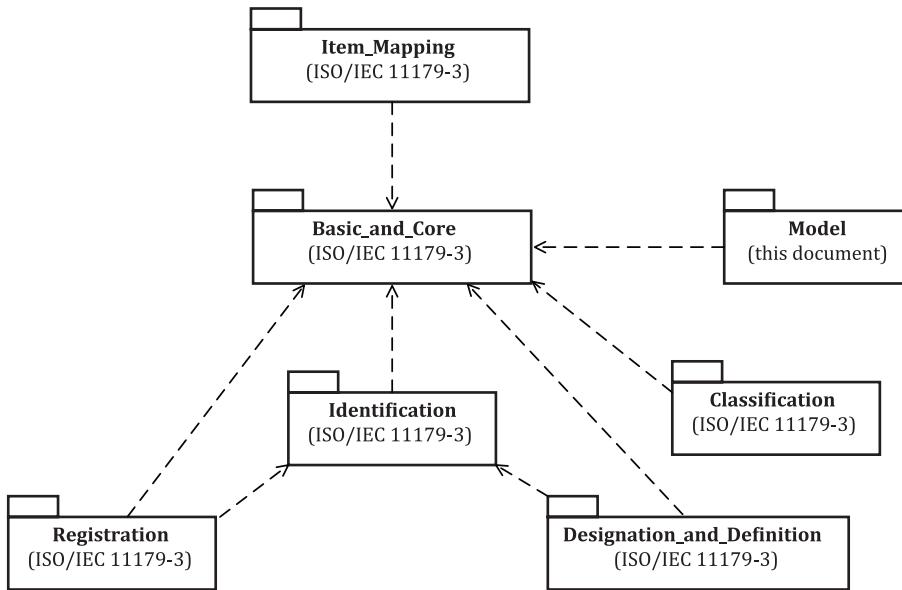
Figure 1 — Package dependencies

[Figure 1](#) illustrates the dependencies among the packages. The lines in the figure illustrate dependencies in the direction of the arrow. The Model package is specified in [Clause 7](#). The other packages shown in [Figure 1](#) are specified in IS0/IEC 11179-3. In order to implement a package that has dependencies, the packages on which it is dependent shall also be implemented. The dependencies are of three types:

a)   Subclassing from classes in another package, e.g. **Model** ([7.2.2.2](#)) and **Model_Element** ([7.2.2.3](#)) in the Model metamodel package (7) are subclassed from the **Item** class in the Basic_and_Core metamodel package in ISO/IEC 11179-3.

b)   Relationship between classes, e.g. **Registered_Item** in the Registration metamodel package in ISO/IEC 11179-3 has a relationship with **Reference_Document** in the Basic_and_Core metamodel package in ISO/IEC 11179-3.

c)   Some attributes use a predefined datatype or a class from another package as a datatype, e.g. the **contact** attribute of the **Stewardship_Record** class in the Registration metamodel package in ISO/IEC 11179-3 uses the **Contact** class of the Basic_and_Core metamodel package in ISO/IEC 11179-3 as a data type.

Conformance options are specified in [clause 5](#) and standard conformance profiles in [5.4](#).

7   Model package

7.1   Overview of the Model package

The Model package consists of a single metamodel region, the Model metamodel region.

7.2   Model metamodel region

7.2.1   Overview of the Model metamodel region

[Figure 2](#) shows the metamodel for the registration of metadata about models (including metamodels).

Note   The mappings between models and between models and their associated metamodels is achieved using the facilities specified in ISO/IEC 11179-3:2023, Clause 11.
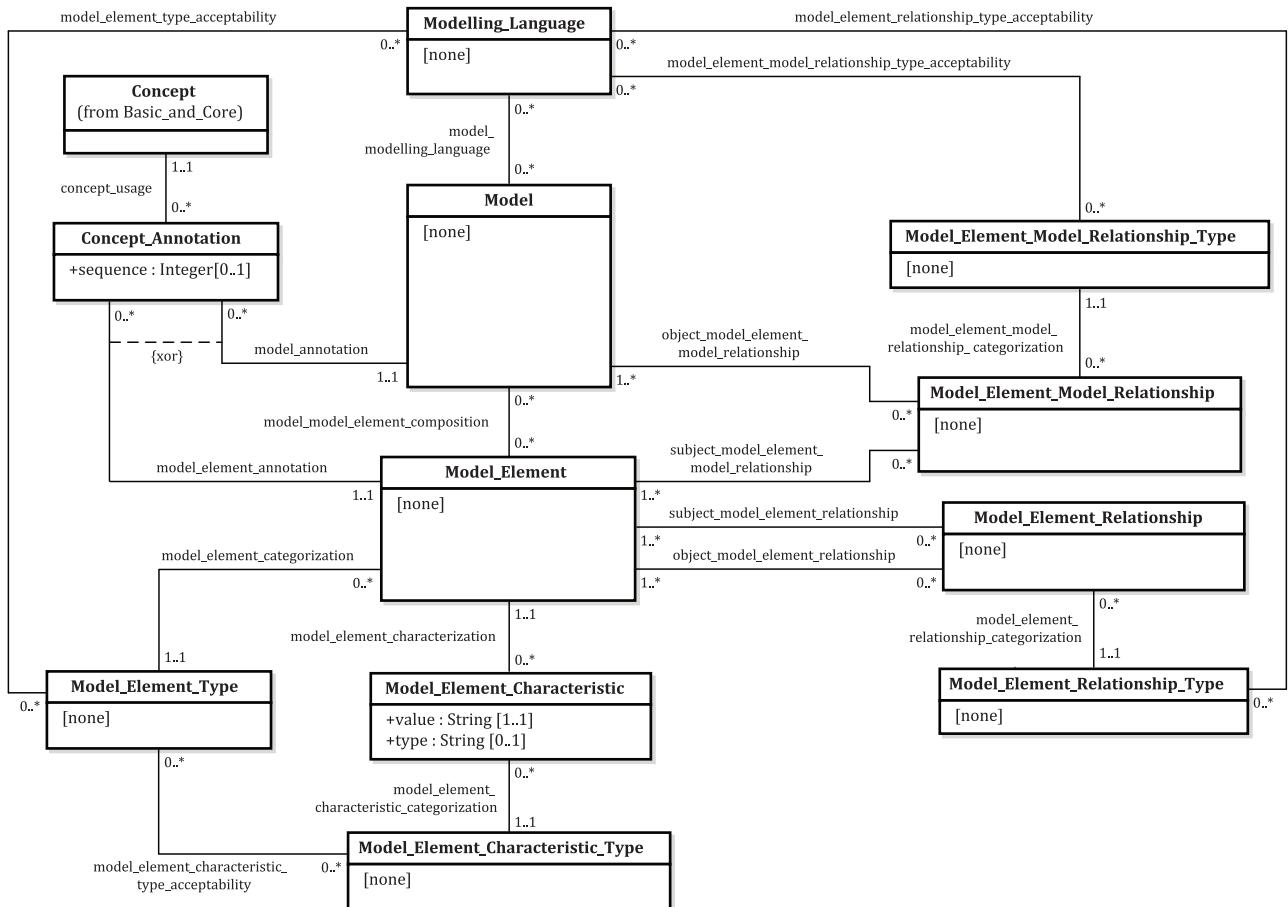
Figure 2 — Model metamodel region

The use of model registration facilities specified by this metamodel are described in Annex B.

Examples of the use of this metamodel are given in Annex C.

A description of the relationship between this metamodel and the metamodels specified in the ISO/IEC 19763 series is provided in Annex D.

7.2.2 Classes in the Model metamodel region

7.2.2.1 Modelling_Language class

7.2.2.1.1 Direct superclass

Modelling_Language is a subclass of **Item** (specified in ISO/IEC 11179-3:2023, 6.4.2.1), allowing instances to be identified, registered, administered, named, defined and classified.

7.2.2.1.2 Description of Modelling_Language

Modelling_Language is a class each instance of which models a modelling language, a language or notation that is used to model some aspect of a universe of discourse.

As specified in 7.2.2.1.5, each instance of the **Modelling_Language** class shall be named through a link to an instance of the **Designation** class (specified in ISO/IEC 11179-3:2023, 8.4.1). If further explanation is needed, the instance of the **Modelling_Language** class may also have a definition through a link to an instance of the **Definition** class (specified in ISO/IEC 11179-3:2023, 8.4.2). See Annex C for examples.

7.2.2.1.3　Associations of Modelling_Language

As a subclass of **Item**, **Modelling_Language** inherits **Item**'s associations (ISO/IEC 11179-3:2023, 6.4.2.1.2). This region adds the following associations:

— **model_modelling_language** (7.2.3.1);

— **model_element_type_acceptability** (7.2.3.15);

— **model_element_relationship_type_acceptability** (7.2.3.17);

— **model_element_model_relationship_type_acceptability** (7.2.3.18).

7.2.2.1.4　Attributes of Modelling_Language

Modelling_Language has no attributes specified in this document.

7.2.2.1.5　Constraint on Modelling_Language

An instance of the **Modelling_Language** class shall exist only if at least one instance of the **Designation** class (ISO/IEC 11179-3:2023, 8.4.1) (representing the name of the modelling language) is linked to this instance through the **item_designation** association (ISO/IEC 11179-3:2023, 8.6.4) of the parent **Item** class (ISO/IEC 11179-3:2023, 6.4.2.1).

7.2.2.2　Model class

7.2.2.2.1　Direct superclass

Model is a subclass of **Item** (specified in ISO/IEC 11179-3:2023, 6.4.2.1), allowing instances to be identified, registered, administered, named, defined and classified.

7.2.2.2.2　Description of Model

Model is a class each instance of which models a model that provides a representation of some aspect of a universe of discourse using a recognised modelling language. Models can be used to express a set of information requirements, processes, services, roles, goals or some other aspect of a universe of discourse.

As specified in 7.2.2.2.5, each instance of the **Model** class shall be named through a link to an instance of the **Designation** class (specified in ISO/IEC 11179-3:2023, 8.4.1). If further explanation is needed, the instance of the **Model** class may also have a definition through a link to an instance of the **Definition** class (specified in ISO/IEC 11179-3:2023, 8.4.2). See Annex C for examples.

7.2.2.2.3　Associations of Model

As a subclass of **Item**, **Model** inherits **Item**'s associations (ISO/IEC 11179-3:2023, 6.4.2.1.2). This region adds the following associations:

— **model_modelling_language** (7.2.3.1);

— **model_model_element_composition** (7.2.3.2);

— **model_annotation** (7.2.3.4);

— **object_model_element_model_relationship** (7.2.3.13).

7.2.2.2.4　Attributes of Model

Model has no attributes specified in this document.

7.2.2.2.5   Constraint on Model

An instance of the **Model** class shall exist only if at least one instance of the **Designation** class (ISO/IEC 11179-3:2023, 8.4.1) (representing the name of the model) is linked to this instance through the **item_designation** association (ISO/IEC 11179-3:2023, 8.6.4) of the parent **Item** class (ISO/IEC 11179-3:2023, 6.4.2.1).

7.2.2.3   Model_Element class

7.2.2.3.1   Direct superclass

Model_Element is a subclass of **Item** (specified in ISO/IEC 11179-3:2023, 6.4.2.1), allowing instances to be identified, registered, administered, named, defined and classified.

7.2.2.3.2   Description of Model_Element

Model_Element is a class each instance of which models a model element, an element or component in a model, such as a representation of an entity type in an information model, a representation of an event in a process model, a representation of a service operation in a service model, or a representation of an actor in a role and goal model.

As specified in 7.2.2.3.5, each instance of the **Model_Element** class shall be named through a link to an instance of the **Designation** class (specified in ISO/IEC 11179-3:2023, 8.4.1). If further explanation is needed, the instance of the **Model_Element** class may also have a definition through a link to an instance of the **Definition** class (specified in ISO/IEC 11179-3:2023, 8.4.2). See Annex C for examples.

7.2.2.3.3   Associations of Model_Element

As a subclass of **Item**, **Model_Element** inherits **Item**'s associations (ISO/IEC 11179-3:2023, 6.4.2.1.2). This region adds the following associations:

— **model_model_element_composition** (7.2.3.2);

— **model_element_characterization** (7.2.3.3);

— **model_element_annotation** (7.2.3.5);

— **model_element_categorization** (7.2.3.7);

— **subject_model_element_relationship** (7.2.3.9);

— **object_model_element_relationship** (7.2.3.10);

— **subject_model_element_model_relationship** (7.2.3.12).

7.2.2.3.4   Attributes of Model_Element

Model_Element has no attributes specified in this document.

7.2.2.3.5   Constraint on Model_Element

An instance of the **Model_Element** class shall exist only if at least one instance of the **Designation** class (ISO/IEC 11179-3:2023, 8.4.1) (representing the name of the model element) is linked to this instance through the **item_designation** association (ISO/IEC 11179-3:2023, 8.6.4) of the parent **Item** class (ISO/IEC 11179-3:2023, 6.4.2.1).

7.2.2.4   Model_Element_Type class

7.2.2.4.1   Direct superclass

Model_Element_Type is a subclass of **Item** (specified in ISO/IEC 11179-3:2023, 6.4.2.1), allowing instances to be identified, registered, administered, named, defined and classified.

7.2.2.4.2   Description of Model_Element_Type

Model_Element_Type is a class each instance of which models a categorization of a particular class of model element. It provides the ability for a registration authority to control the types of model elements that may be included in a model specified in a particular modelling language.

As specified in 7.2.2.4.5, each instance of the **Model_Element_Type** class may be named through a link to an instance of the **Designation** class (specified in ISO/IEC 11179-3:2023, 8.4.1). If further explanation is needed, the instance of the **Model_Element_Type** class may also have a definition through a link to an instance of the **Definition** class (specified in ISO/IEC 11179-3:2023, 8.4.2). See Annex C for examples.

7.2.2.4.3   Associations of Model_Element_Type

As a subclass of **Item**, **Model_Element_Type** inherits **Item**'s associations (ISO/IEC 11179-3:2023, 6.4.2.1.2). This region adds the following associations:

— **model_element_categorization** (7.2.3.7);

— **model_element_type_acceptability** (7.2.3.15);

— **model_element_characteristic_type_acceptability** (7.2.3.16).

7.2.2.4.4   Attributes of Model_Element_Type

Model_Element_Type has no attributes specified in this document.

7.2.2.4.5   Constraint on Model_Element_Type

An instance of the **Model_Element_Type** class shall exist only if at least one instance of the **Designation** class (ISO/IEC 11179-3:2023, 8.4.1) (representing the name of the categorization of the model elements represented by the linked instances of the **Model_Element** class (7.2.2.3) is linked to this instance through the **item_designation** association (ISO/IEC 11179-3:2023, 8.6.4) of the parent **Item** class (ISO/IEC 11179-3:2023, 6.4.2.1).

7.2.2.5   Model_Element_Characteristic class

7.2.2.5.1   Direct superclass

Model_Element_Characteristic is a subclass of **Item** (specified in ISO/IEC 11179-3:2023, 6.4.2.1), allowing instances to be identified, registered, administered, named, defined and classified.

7.2.2.5.2   Description of Model_Element_Characteristic

Model_Element_Characteristic is a class each instance of which models a model element characteristic, an individual characteristic that is used to qualify, identify, classify, quantify or in some other way express the state of the associated model element.

As specified in 7.2.2.5.5, each instance of the **Model_Element_Characteristic** class shall be named through a link to an instance of the **Designation** class (specified in ISO/IEC 11179-3:2023, 8.4.1). If further explanation is needed, the instance of the **Model_Element_Characteristic** class may also have a definition through a link to an instance of the **Definition** class (specified in ISO/IEC 11179-3:2023, 8.4.2). See Annex C for examples.

7.2.2.5.3   Association of Model_Element_Characteristic

As a subclass of **Item**, **Model_Element_Characteristic** inherits **Item**'s associations (ISO/IEC 11179-3:2023, 6.4.2.1.2). This region adds the following associations:

— **model_element_characterization** (7.2.3.3);

— **model_element_characteristic_categorization** (7.2.3.8).

7.2.2.5.4   Attributes of Model_Element_Characteristic

Table 1 shows the attributes of the **Model_Element_Characteristic** class.

Table 1 — Attributes of the Model_Element_Characteristic class

Attribute name	Multiplicity	Datatype	Description
value	1..1	String (ISO/IEC 11179-3:2023, 6.2.11)	Definition: a statement of the value assigned to this model element characteristic. Examples: — "True" for the identifying_indicator for an identifying relationship in the IDEF1X model; — "[priority order]" for the guard_condition for one of the outputs from a UML Activity Diagram decision node that checks the status of an order.
type	0..1	String (ISO/IEC 11179-3:2023, 6.2.11)	Definition: categorization of the value assigned to this model element characteristic. Explanation: type may be used to categorize the value of this model element characteristic in some way, including but not limited to specifying the datatype of the **value** attribute.

7.2.2.5.5   Constraint on Model_Element_Characteristic

An instance of the **Model_Element_Characteristic** class shall exist only if at least one instance of the **Designation** class (ISO/IEC 11179-3:2023, 8.4.1) (representing the name of the model element characteristic) is linked to this instance through the **item_designation** association (ISO/IEC 11179-3:2023, 8.6.4) of the parent **Item** class (ISO/IEC 11179-3:2023, 6.4.2.1).

7.2.2.6   Model_Element_Characteristic_Type class

7.2.2.6.1   Direct superclass

Model_Element_Characteristic_Type is a subclass of **Item** (specified in ISO/IEC 11179-3:2023, 6.4.2.1), allowing instances to be identified, registered, administered, named, defined and classified.

7.2.2.6.2   Description of Model_Element_Characteristic_Type

Model_Element_Characteristic_Type is a class each instance of which models a categorization of a class of model element characteristics. It provides the ability for a registration authority to control the types of model element characteristics that can be specified for particular model elements within models specified in a particular modelling language.

As specified in 7.2.2.6.5, each instance of the **Model_Element_Characteristic_Type** class shall be named through a link to an instance of the **Designation** class (specified in ISO/IEC 11179-3:2023, 8.4.1). If further explanation is needed, the instance of the **Model_Element_Characteristic_Type** class may also have a definition through a link to an instance of the **Definition** class (specified in ISO/IEC 11179-3:2023, 8.4.2). See Annex C for examples.

7.2.2.6.3 Associations of Model_Element_Characteristic_Type

As a subclass of **Item**, **Model_Element_Characteristic_Type** inherits **Item**'s associations (ISO/IEC 11179-3:2023, 6.4.2.1.2). This region adds the following associations:

— **model_element_characteristic_categorization** (7.2.3.8);

— **model_element_characteristic_type_acceptability** (7.2.3.16).

7.2.2.6.4 Attribute of Model_Element_Characteristic_Type

Model_Element_Characteristic_Type has no attributes specified in this document.

7.2.2.6.5 Constraint on Model_Element_Characteristic_Type

An instance of the **Model_Element_Charactersitic_Type** class shall exist only if at least one instance of the **Designation** class (ISO/IEC 11179-3:2023, 8.4.1) [representing the name of the categorization of the model element characteristics represented by the linked instances of the **Model_Element_Characteristic** (7.2.2.5) class] is linked to this instance through the **item_designation** association (ISO/IEC 11179-3:2023, 8.6.4) of the parent **Item** class (ISO/IEC 11179-3:2023, 6.4.2.1).

7.2.2.7 Concept class

7.2.2.7.1 Direct superclass

Concept is a subclass of **Item** (specified in ISO/IEC 11179-3:2023, 6.4.2.1), allowing instances to be identified, registered, administered, named, defined and classified.

7.2.2.7.2 Description of Concept

Concept is part of the Core metamodel and is specified in ISO/IEC 11179-3:2023, 6.4.2.2. An additional association is specified in this document.

Concept is a class each instance of which models a concept, a unit of knowledge created by a unique combination of characteristics. A concept is independent of representation.

In this document, instances of the **Concept** class are used to provide annotation, through instances of the **Concept_Annotation** class (7.2.2.8), to models or model elements to provide meaning to these models and model elements, thus enhancing understanding.

7.2.2.7.3 Associations of Concept

As a subclass of **Item**, **Concept** inherits **Item**'s associations (ISO/IEC 11179-3:2023, 6.4.2.1.2). This region adds the following association:

— **concept_usage** (7.2.3.6).

7.2.2.7.4 Attributes of Concept

Concept has no additional attributes specified in this document.

7.2.2.8 Concept_Annotation class

7.2.2.8.1 Direct superclass

Concept_Annotation is a subclass of **Item** (specified in ISO/IEC 11179-3:2023, 6.4.2.1), allowing instances to be identified, registered, administered, named, defined and classified.

7.2.2.8.2   Description of Concept_Annotation

Concept_Annotation is a class each instance of which models a concept annotation, the use of a concept to annotate a model or a model element in order to provide meaning to the model or model element.

7.2.2.8.3   Associations of Concept_Annotation

As a subclass of **Item**, **Concept_Annotation** inherits **Item**'s associations (ISO/IEC 11179-3:2023, 6.4.2.1.2). This region adds the following associations:

— **model_annotation** (7.2.3.4);

— **model_element_annotation** (7.2.3.5);

— **concept_usage** (7.2.3.6).

7.2.2.8.4   Attribute of Concept_Annotation

Table 2 shows the attribute of the **Concept_Annotation** class.

Table 2 — Attribute of the Concept_Annotation class

Attribute name	Multiplicity	Datatype	Description
sequence	0..1	**Integer** (ISO/IEC 11179-3:2023, 6.2.5)	Definition: a number indicating the relative priority of this concept annotation within the set of concept annotations used to annotate the model represented by the linked instance of the **Model** class (7.2.2.2) or the model element represented by the linked instance of the **Model_Element** class (7.2.2.3).

7.2.2.8.5   Constraint on Concept_Annotation

Each instance of the **Concept_Annotation** class shall participate in either the **model_annotation** association (7.2.3.4) or the **model_element_annotation** association (7.2.3.5), but not both.

7.2.2.9   Model_Element_Relationship class

7.2.2.9.1   Direct superclass

Model_Element_Relationship is a subclass of **Item** (specified in ISO/IEC 11179-3:2023, 6.4.2.1), allowing instances to be identified, registered, administered, named, defined and classified.

7.2.2.9.2   Description of Model_Element_Relationship

Model_Element_Relationship is a class each instance of which models a relationship between two or more model elements in a model. For example, in an information model there is a relationship between an entity type and its attributes.

As the **Model_Element_Relationship** class is a subclass of the **Item** class, each instance of the **Model_Element_Relationship** class may be named through a link to an instance of the **Designation** class (specified in ISO/IEC 11179-3:2023, 8.4.1). If further explanation is needed, the instance of the **Model_Element_Relationship** class may also have a definition through a link to an instance of the **Definition** class (specified in ISO/IEC 11179-3:2023, 8.4.2). See the examples in Annex C.

7.2.2.9.3 Associations of Model_Element_Relationship

As a subclass of **Item**, **Model_Element_Relationship** inherits **Item**'s associations (ISO/IEC 11179-3:2023, 6.4.2.1.2). This region adds the following associations:

— **subject_model_element_relationship** ([7.2.3.9](#));

— **object_model_element_relationship** ([7.2.3.10](#));

— **model_element_relationship_categorization** ([7.2.3.11](#)).

7.2.2.9.4 Attributes of Model_Element_Relationship

Model_Element_Relationship has no attributes specified in this document.

7.2.2.10 Model_Element_Relationship_Type class

7.2.2.10.1 Direct superclass

Model_Element_Relationship_Type is a subclass of **Item** (specified in ISO/IEC 11179-3:2023, 6.4.2.1), allowing instances to be identified, registered, administered, named, defined and classified.

7.2.2.10.2 Description of Model_Element_Relationship_Type

Model_Element_Relationship_Type is a class each instance of which models a description of the nature of the set of relationships between model elements categorized by this instance of the **Model_Element_Relationship_Type** class.

As specified in [7.2.2.10.5](#), each instance of the **Model_Element_Relationship_Type** class shall be named through a link to an instance of the **Designation** class (specified in ISO/IEC 11179-3:2023, 8.4.1). If further explanation is needed, the instance of the **Model_Element_Relationship_Type** class may also have a definition through a link to an instance of the **Definition** class (specified in ISO/IEC 11179-3:2023, 8.4.2). See the examples in [Annex C](#).

7.2.2.10.3 Associations of Model_Element_Relationship_Type

As a subclass of **Item**, **Model_Element_Relationship_Type** inherits **Item**'s associations (ISO/IEC 11179-3:2023, 6.4.2.1.2). This region adds the following association:

— **model_element_relationship_categorization** ([7.2.3.11](#));

— **model_element_relationship_acceptability** ([7.2.3.17](#)).

7.2.2.10.4 Attributes of Model_Element_Relationship_Type

Model_Element_Relationship_Type has no attributes specified in this document.

7.2.2.10.5 Constraint on Model_Element_Relationship_Type

An instance of the **Model_Element_Relatonship_Type** class shall exist only if at least one instance of the **Designation** class (ISO/IEC 11179-3:2023, 8.4.1) (representing the name of the categorization of the relationship between a particular set of model elements as represented by the linked instances of the **Model_Element_Relationship** class ([7.2.2.9](#))) is linked to this instance through the **item_designation** association (ISO/IEC 11179-3:2023, 8.6.4) of the parent **Item** class (ISO/IEC 11179-3:2023, 6.4.2.1).

7.2.2.11 Model_Element_Model_Relationship class

7.2.2.11.1 Direct superclass

Model_Element_Model_Relationship is a subclass of **Item** (specified in ISO/IEC 11179-3:2023, 6.4.2.1), allowing instances to be identified, registered, administered, named, defined and classified.

7.2.2.11.2 Description of Model_Element_Model_Relationship

Model_Element_Model_Relationship is a class each instance of which models a relationship between one or more model elements and one or more models. Examples of relationships between model elements and models include:

— in a set of process models for a particular universe of discourse in which there is a hierarchy to the models, an activity in one model (a model element) can then become a model that is then decomposed into further activities (model elements);

— in an XML schema (a model) for a particular universe of discourse, a node in that schema (a model element) can import another XML schema (another model).

The **model_model_element_composition** association (7.2.3.2) should be used to register the composition of a model, that is, the model elements that comprise the model.

As the **Model_Element_Model_Relationship** class is a subclass of the **Item** class, each instance of the **Model_Element_Model_Relationship** class may be named through a link to an instance of the **Designation** class (specified in ISO/IEC 11179-3:2023, 8.4.1). If further explanation is needed, the instance of the **Model_Element_Model_Relationship** class may also have a definition through a link to an instance of the **Definition** class (specified in ISO/IEC 11179-3:2023, 8.4.2). See the examples in Annex C.

7.2.2.11.3 Associations of Model_Element_Model_Relationship

As a subclass of **Item**, **Model_Element_Model_Relationship** inherits **Item**'s associations (ISO/IEC 11179-3:2023, 6.4.2.1.2). This region adds the following associations:

— **subject_model_element_model_relationship** (7.2.3.12);

— **object_model_element_model_relationship** (7.2.3.13);

— **model_element_model_relationship_categorization** (7.2.3.14).

7.2.2.11.4 Attributes of Model_Element_Model_Relationship

Model_Element_Model_Relationship has no attributes specified in this document.

7.2.2.12 Model_Element_Model_Relationship_Type class

7.2.2.12.1 Direct superclass

Model_Element_Model_Relationship_Type is a subclass of **Item** (specified in ISO/IEC 11179-3:2023, 6.4.2.1), allowing instances to be identified, registered, administered, named, defined and classified.

7.2.2.12.2 Description of Model_Element_Model_Relationship_Type

Model_Element_Model_Relationship_Type is a class each instance of which models a description of the nature of the set of model element to model relationships categorized by this instance of the **Model_Element_Model_Relationship_Type** class

As specified in 7.2.2.12.5, each instance of the **Model_Element_Model_Relationship_Type** shall be named through a link to an instance of the **Designation** class (specified in ISO/IEC 11179-3:2023, 8.4.1). If further explanation is needed, the instance of the **Model_Element_Model_Relationship_Type** class may also have a definition through a link to an instance of the **Definition** class (specified in ISO/IEC 11179-3:2023, 8.4.2). See Table C.5 for an example.

7.2.2.12.3 Association of Model_Element_Model_Relationship_Type

As a subclass of **Item**, **Model_Element_Model_Relationship_Type** inherits **Item**'s associations (ISO/IEC 11179-3:2023, 6.4.2.1.2). This region adds the following association:

— **model_element_model_relationship_categorization** (7.2.3.14);

— **model_element_model_relationship_acceptability** (7.2.3.18).

7.2.2.12.4 Attributes of Model_Element_Model_Relationship_Type

Model_Element_Model_Relationship_Type has no attributes specified in this document.

7.2.2.12.5 Constraint on Model_Element_Model_Relationship_Type

An instance of the **Model_Element_Model_Relatonship_Type** class shall exist only if at least one instance of the **Designation** class (ISO/IEC 11179-3:2023, 8.4.1) [representing the name of the categorization of the relationship between a particular set of model elements and a particular set of models as represented by the linked instances of the **Model_Element_Model_Relationship** class (7.2.2.11)] is linked to this instance through the **item_designation** association (ISO/IEC 11179-3:2023, 8.6.4) of the parent **Item** class (ISO/IEC 11179-3:2023, 6.4.2.1).

7.2.3   Associations in the Model metamodel region

7.2.3.1   model_modelling_language association

The **model_modelling_language** association binds zero, one or more instances of the **Model** class (7.2.2.2) to zero, one or more instances of the **Modelling_Language** class (7.2.2.1).

The modelling language represented by the instance of the **Modelling_Language** class is the language in which the models represented by the instances of the **Model** class are expressed.

Normally, each model will be expressed in one and only one modelling language because the differences in the modelling languages will mean that any two or more models for the same universe of discourse will be different models. There can be exceptional circumstances where two or more models expressed in different modelling languages for the same universe of discourse can be identical, and can, therefore, be considered as one model.

7.2.3.2   model_model_element_composition association

The **model_model_element_composition** association binds zero, one or more instances of the **Model_Element** class (7.2.2.3) to zero, one or more instances of the **Model** class (7.2.2.2).

The model represented by the instance of the **Model** class is the model for which the model elements represented by the instances of the **Model_Element** class are specified.

The normal situation is one where each model is specified with one or more model elements and each model element is specified for one and only one model. This association allows for the following additional situations:

— where a model is registered without its model elements;

— where a model element is part of more than one model;

— where a model element is registered without the registration of the model of which it is a part.

7.2.3.3   model_element_characterization association

The **model_element_characterization** association binds zero, one or more instances of the **Model_Element_Characteristic** class (7.2.2.5) to one and only one instance of the **Model_Element** class (7.2.2.3).

The model element characteristic represented by the instance of the **Model_Element_Characteristic** class specifies some detail that is used to qualify, identify, classify, quantify or in some other way express the state of the linked model element represented by the instance of the **Model_Element** class.

7.2.3.4   model_annotation association

The **model_annotation** association binds one and only one instance of the **Model** class (7.2.2.2) to zero, one or more instances of the **Concept_Annotation** class (7.2.2.8).

The concept represented by the instance of the **Concept** class (7.2.2.7) linked to an instance of the **Concept_Annotation** class provides meaning for the model represented by the instance of the **Model** class.

7.2.3.5   model_element_annotation association

The **model_element_annotation** association binds one and only one instance of the **Model_Element** class (7.2.2.3) to zero, one or more instances of the **Concept_Annotation** class (7.2.2.8).

The concept represented by the instance of the **Concept** class (7.2.2.7) linked to an instance of the **Concept_Annotation** class provides meaning for the model element represented by the instance of the **Model_Element** class.

7.2.3.6   concept_usage association

The **concept_usage** association binds one and only one instance of the **Concept** class (7.2.2.7) to zero, one or more instances of the **Concept_Annotation** class (7.2.2.8).

The concept represented by the instance of the **Concept** class provides meaning for the model represented by the instance of the **Model** class linked to the instance of the **Concept_Annotation** class or the model element represented by the instance of the **Model_Element** class linked to the instance of the **Concept_Annotation** class.

7.2.3.7   model_element_categorization association

The **model_element_categorization** association binds zero, one or more instances of the **Model_Element** class (7.2.2.3) to one and only one instance of the **Model_Element_Type** class (7.2.2.4).

The state of the instance of the **Model_Element_Type** class describes the nature of the set of linked instances of the **Model_Element** class.

7.2.3.8   model_element_characteristic_categorization association

The **model_element_characteristic_categorization** association binds zero, one or more instances of the **Model_Element_Characteristic** class (7.2.2.5) to one and only one instance of the **Model_Element_Charactersitic_Type** class (7.2.2.6).

The state of the instance of the **Model_Element_Characteristic_Type** class describes the nature of the set of linked instances of the **Model_Element_Characteristic** class.

7.2.3.9   subject_model_element_relationship association

The **subject_model_element_relationship** association binds zero, one or more instances of the **Model_Element_Relationshi***p* class (7.2.2.9) to one or more instances of the **Model_Element** class (7.2.2.3).

The model element represented by the instance of the **Model_Element** class participating in this association is one side (the subject side) of a relationship (represented by the instance of the **Model_Element_Relationship** class) to another model element represented by the instance of the **Model_Element** class linked to the instance of the **Model_Element_Relationship** class through the **object_model_element_relationship** association (7.2.3.10).

7.2.3.10   object_model_element_relationship association

The **object_model_element_relationship** association binds zero, one or more instances of the **Model_Element_Relationship** class (7.2.2.9) to one or more instances of the **Model_Element** class (7.2.2.3).

The model element represented by the instance of the **Model_Element** class participating in this association is one side (the object side) of a relationship (represented by the instance of the **Model_Element_Relationship** class) to another model element represented by the instance of the **Model_Element** class linked to the instance of the **Model_Element_Relationship** class through the **subject_model_element_relationship** association (7.2.3.9).

7.2.3.11   model_element_relationship_categorization association

The **model_element_relationship_categorization** association binds zero, one or more instances of the **Model_Element_Relationship** class (7.2.2.9) to one and only one instance of the **Model_Element_Relationship_Type** class (7.2.2.10).

The state of the instance of the **Model_Element_Relationship_Type** class describes the nature of the set of linked instances of the **Model_Element_Relationship** class, each of which represents the relationship between two or more model elements.

7.2.3.12   subject_model_element_model_relationship association

The **subject_model_element_model_relationship** association binds zero, one or more instances of the **Model_Element_Model_Relationship** class (7.2.2.11) to one or more instances of the **Model_Element** class (7.2.2.3).

The model element represented by the instance of the **Model_Element** class participating in this association is one side (the subject side) of a relationship (represented by the instance of the **Model_Element_Model_Relationship** class) to a model represented by the instance of the **Model** class (7.2.2.2) linked to the instance of the **Model_Element_Model_Relationship** class through the **object_model_element_model_relationship** association (7.2.3.13).

7.2.3.13   object_model_element_model_relationship association

The **object_model_element_model_relationship** association binds zero, one or more instances of the **Model_Element_Model_Relationship** class (7.2.2.11) to one or more instances of the **Model** class (7.2.2.2).

The model represented by the instance of the **Model** class participating in this association is one side (the object side) of a relationship (represented by the instance of the **Model_Element_Model_Relationship** class) to a model element represented by the instance of the **Model_Element** class (7.2.2.3) linked to the instance of the **Model_Element_Model_Relationship** class through the **subject_model_element_model_relationship** association (7.2.3.12).

7.2.3.14   model_element_model_relationship_categorization association

The **model_element_model_relationship_categorization** association binds zero, one or more instances of the **Model_Element_Model_Relationship** class ([7.2.2.11](#)) to one and only one instance of the **Model_Element_Model_Relationship_Type** class ([7.2.2.12](#)).

The state of the instance of the **Model_Element_Model_Relationship_Type** class describes the nature of the set of linked instances of the **Model_Element_Model_Relationship** class, each of which represents the relationship between one or more model elements and one or more models.

7.2.3.15   model_element_type_acceptability association

The **model_element_type_acceptability** association binds zero, one or more instances of the **Model_Element_Type** class ([7.2.2.4](#)) to zero, one or more instances of the **Modelling_Language** class ([7.2.2.1](#)).

This association allows a registration authority to specify which types of model element, represented by the instances of the **Model_Element_Type** class participating in this association, are applicable for models expressed in particular modelling languages, represented by the instances of the **Modelling_Language** class participating in this association.

7.2.3.16   model_element_characteristic_type_acceptability association

The **model_element_characteristic_type_acceptability** association binds zero, one or more instances of the **Model_Element_Characteristic_Type** class ([7.2.2.6](#)) to zero, one or more instances of the **Model_Element_Type** class ([7.2.2.4](#)).

This association allows a Registration Authority to specify which types of model element characteristic, represented by the instances of the **Model_Element_Characteristic_Type** class participating in this association, are applicable for particular types of model elements, represented by the instances of the **Model_Element_Type** class participating in this association.

7.2.3.17   model_element_relationship_type_acceptability association

The **model_element_relationship_type_acceptability** association binds zero, one or more instances of the **Model_Element_Relationship_Type** class ([7.2.2.10](#)) to zero, one or more instances of the **Modelling_Language** class ([7.2.2.1](#)).

This association allows a Registration Authority to specify which categories of relationships between model elements in the same model, represented by the instances of the **Model_Element_Relationship_Type** class participating in this association, are applicable for particular types of modelling languages, represented by the instances of the **Modelling_Language** class participating in this association.

7.2.3.18   model_element_model_relationship_type_acceptability association

The **model_element_model_relationship_type_acceptability** association binds zero, one or more instances of the **Model_Element_Model_Relationship_Type** class ([7.2.2.12](#)) to zero, one or more instances of the **Modelling_Language** class ([7.2.2.1](#)).

This association allows a Registration Authority to specify which categories of relationships between model elements and models, represented by the instances of the **Model_Element_Model_Relationship_Type** class participating in this association, are applicable for particular types of modelling languages, represented by the instances of the **Modelling_Language** class participating in this association.

Annex A
(informative)

Consolidated Class Hierarchy

Figure A.1 shows all classes specified in this document, or referenced from ISO/IEC 11179-3, that participate in a class hierarchy.
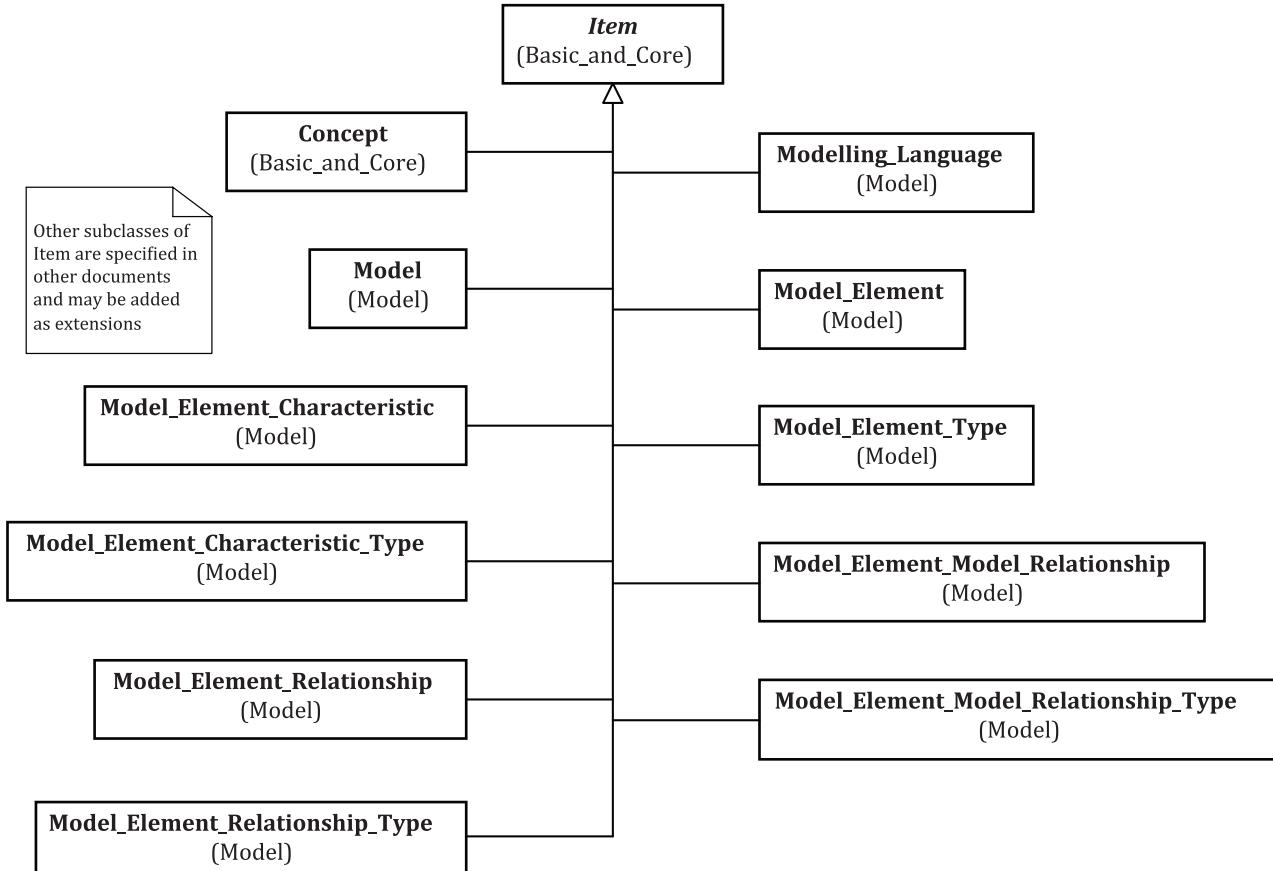
Figure A.1 — Consolidated Class Hierarchy

NOTE   Standards or implementations which extend the metamodel in this document can extend this class hierarchy.

Annex B
(informative)

Use of the model registration facilities

The purpose of the facilities specified in this document is to create a model registry by extending the registry common facilities specified in ISO/IEC 11179-3.

Before any model can be registered using the facilities specified in this document, the appropriate metamodel for the notation used in the model shall first be registered. This is achieved using the same facilities specified in this document. For example, before an information or data model expressed using the UML Class Diagram notation can be registered, the metamodel for the UML Class diagrams notation must first be registered. Similarly, before an information or data model expressed using the IDEF1X notation can be registered, the metamodel for the IDEF1X notation must first be registered. Once a metamodel has been registered, many models using the same notation can be registered without reregistering the metamodel.

The mapping facilities specified in ISO/IEC 11179-3:2023, Clause 11 can then be used to specify and register which elements of the model are instances of the appropriate elements of the metamodel. For example, in the UML Class Diagram the model element that is the "Individual" object class is mapped as an instance of the model element in the metamodel known as "Class". Similarly, in the IDEF1X model the model element that is the "Person" entity is mapped as an instance of the model element in the metamodel known as "Entity".

Mappings between metamodels and between models that are useful for interoperability can then be specified and registered.

Figure B.1 illustrates this procedure.
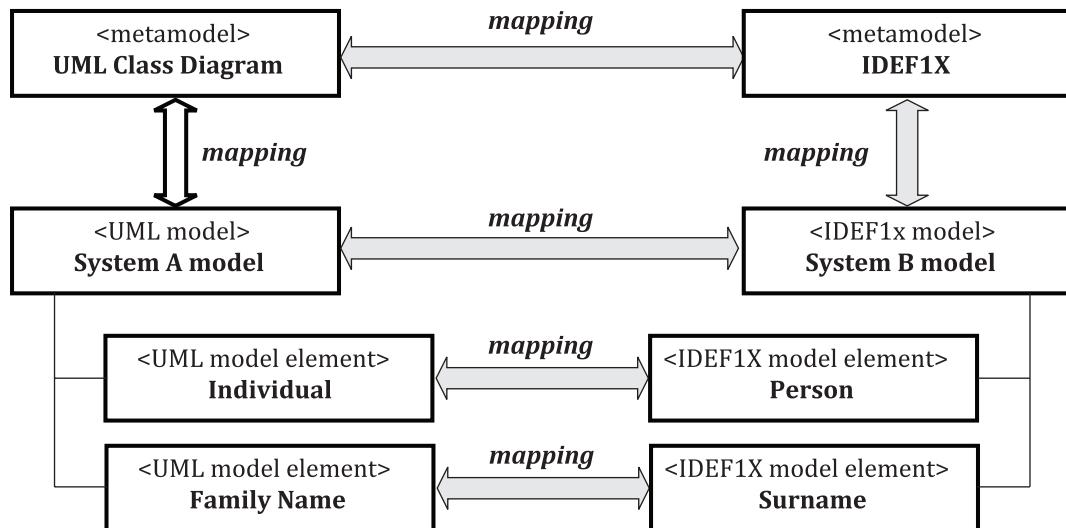
Figure B.1 — Registration of models and metamodels

The first stage is to register the mappings between the metamodels. For example, a "Class" in a UML Class Diagram is mapped as semantically similar to an "Entity" in an IDEF1X model, an "Attribute" in the UML Class Diagram is mapped as semantically equivalent to an "Attribute" in the IDEF1X model, and an "Association" in the UML Class Diagram is mapped as semantically similar to a "Relationship" in the IDEF1X model.

The set of mappings between each pair of metamodels should only need to be specified and registered once. Most enterprises will be using only a limited range of modelling notations, so will only need to register a small number of metamodels and metamodel mappings.

After the models have been registered and mapped to their respective metamodels, the next stage is to specify and register the mappings between the models. For example, the "Individual" class in the UML Class Diagram for System A (a model element) is mapped as semantically equivalent to the "Person" entity in the IDEF1X model System B (another model element), and the "Family Name" attribute in the "Individual" class in the System A UML Class Diagram (model element) is mapped as semantically equivalent to the "Surname" attribute in the "Person" entity in the System B IDEF1X model (model element).

If the metamodel for an SQL Schema has also been registered, the mappings between the conceptual or logical model and the implementation of that model within an SQL schema can be registered making future maintenance of the schema easier. For example, the "Individual" class in the UML Class Diagram (model element) is mapped as instantiated as the "Individual" table in the SQL schema (model element) and the "Family Name" attribute in the "Individual" class in the UML Class Diagram (model element) is mapped as instantiated as the "Last Name" column in the "Individual" table in the SQL schema (model element).

Annex C
(informative)

Examples of model registration

C.1   Overview of examples

This annex provides five examples of the use of the facilities specified in Clause 7 to register models:

— the registration of a process model expressed using BPMN (see C.2);

— the registration of an information model expressed as a UML Class Diagram (see C.3);

— the registration of a form design (see C.4);

— the registration of a JSON Schema (see Reference [17]) based on a UML Class Diagram (see C.5);

— the registration of the metamodel for the Ellis-Barker entity-relationship notation (see C.6).

C.2   BPMN example

C.2.1   Overview of example

Figure C.1 shows the BPMN model for a process to create a repair order that is to be handled online.
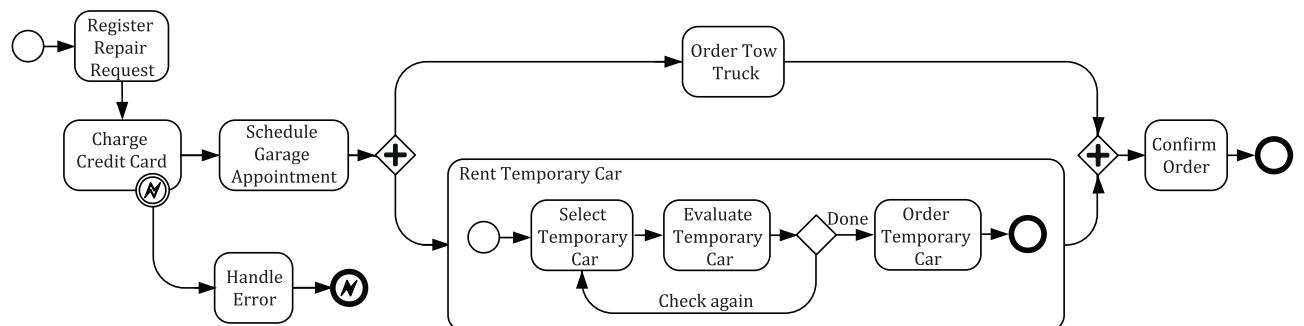
Figure C.1 — Create Repair Order example in BPMN

This "Create Repair Order" process consists of a set of sub-processes. The process will start when a repair request is registered. The credit card will then be charged for the payment for the car repair. If the credit card is declined, the "Handle Error" process will be invoked to return an error and terminate the whole process prematurely: if the credit card is accepted, the customer will be able to schedule a garage appointment.

The customer may now select one or both of two options. One of these uses the "Order Tow Truck" process, if required, to order a tow truck to move the broken-down car. The other option uses the "Rent Temporary Car" process to order a replacement car while the broken-down car is repaired. The "Rent Temporary Car" process is decomposed into three sub-processes: "Select Temporary Car", "Evaluate Temporary Car", and "Order Temporary Car". "Select Temporary Car" and "Evaluate Temporary Car", which evaluates whether the selected car meets the customer's needs or not, will be executed repeatedly until an appropriate car is chosen. "Order Temporary Car "then executes.

The "Create Repair Order" process completes when the customer confirms the order.

To model the "Rent Temporary Car" sub-process (which is decomposed into processes for selecting, evaluating and ordering a temporary car) the BPMN Expanded Sub-Process is used. Within BPMN, an Expanded Sub-Process is used to expose the decomposed flow details of the sub-process within the context of its parent process.

C.2.2   Details of the instances of classes for this example

Table C.1 represents the instances of the **Modelling_Language** class for the "Create Repair Order" process.

Table C.1 — Modelling_Language class for the BPMN example

Identifier	Designation
C.2.ML.01	'BPMN'

Table C.2 represents the instances of the **Model** class for the "Create Repair Order" process.

Table C.2 — Model class for the BPMN example

Identifier	Designation	Modelling_Language.identifier
C.2.M.01	'Create Repair Order'	C.2.ML.01
C.2.M.02	'Rent Temporary Car'	C.2.ML.01

Table C.3 represents the instances of the **Model_Element_Type** class for the "Create Repair Order" process.

Table C.3 — Model_Element_Type class for the BPMN example

Identifier	Designation	Definition
C.2.MET.01	'Start Event'	'An event that triggers the process'
C.2.MET.02	'Stop Event'	'An event that terminates the process'
C.2.MET.03	'Process'	'An activity within an overall process'
C.2.MET.04	'Decision'	'A node which indicates that there is a choice of actions available'
C.2.MET.05	'Guard Condition'	'A statement on a flow following a decision that indicates the condition that would cause this flow to be followed'
C.2.MET.06	'Split'	'A start point for a set of parallel activities'
C.2.MET.07	'Join	'An end point for a set of parallel activities'

Table C.4 represents the instances of the **Model_Element** class for the "Create Repair Order" process.

Table C.4 — Model_Element class for the BPMN example

Identifier	Designation	Model.identifier	Model_Element_Type. identifier
C.2.ME.01	'Start trigger for the Create Repair Order process'	C.2.M.01	C.2.MET.01
C.2.ME.02	'Register Repair Request'	C.2.M.01	C.2.MET.03
C.2.ME.03	'Charge Credit Card'	C.2.M.01	C.2.MET.03
C.2.ME.04	'Exception on Charge Credit Card'	C.2.M.01	C.2.MET.06
C.2.ME.05	'Handle Error'	C.2.M.01	C.2.MET.03
C.2.ME.06	'Stop after Handle Error'	C.2.M.01	C.2.MET.02
C.2.ME.07	'Schedule Garage Appointment'	C.2.M.01	C.2.MET.03

Table C.4 *(continued)*

Identifier	Designation	Model.identifier	Model_Element_Type. identifier
C.2.ME.08	'Split after Schedule Garage Appointment'	C.2.M.01	C.2.MET.06
C.2.ME.09	'Order Tow Truck'	C.2.M.01	C.2.MET.03
C.2.ME.10	'Rent Temporary Car'	C.2.M.01	C.2.MET.03
C.2.ME.11	'Join before Confirm Order'	C.2.M.01	C.2.MET.07
C.2.ME.12	'Confirm Order'	C.2.M.01	C.2.MET.03
C.2.ME.13	'Stop for the Create Repair Order process'	C.2.M.01	C.2.MET.02
C.2.ME.14	'Start trigger for the Rent Temporary Car sub-process'	C.2.M.02	C.2.MET.01
C.2.ME.15	'Select Temporary Car'	C.2.M.02	C.2.MET.03
C.2.ME.16	'Evaluate Temporary Car'	C.2.M.02	C.2.MET.03
C.2.ME.17	'Decision after Evaluate Temporary Car'	C.2.M.02	C.2.MET.04
C.2.ME.18	'Done'	C.2.M.02	C.2.MET.05
C.2.ME.19	'Check Again	C.2.M.02	C.2.MET.05
C.2.ME.20	'Order Temporary Car'	C.2.M.02	C.2.MET.03
C.2.ME.21	'Stop for the Rent Temporary Car sub-process'	C.2.M.02	C.2.MET.02

Table C.5 represents the instances of the **Model_Element_Characteristic_Type** class for the "Create Repair Order" process.

Table C.5 — Model_Element_Characteristic_Type class for the BPMN example

Identifier	Designation	Definition
C.2.MECT.01	'Process Name'	'The name of a process in verb-noun format'
C.2.MECT.02	'Condition'	'A statement of the condition that must exist before this flow is followed'

Table C.6 represents the instances of the **Model_Element_Characteristic** class for the "Create Repair Order" process.

Table C.6 — Model_Element_Characteristic class for the BPMN example

Identifier	Model_Element. identifier	Model_Element_ Characteristic_Type. identifier	Value
C.2.MEC.01	C.2.ME.02	C.2.MECT.01	'Register Repair Request'
C.2.MEC.02	C.2.ME.03	C.2.MECT.01	'Charge Credit Card'
C.2.MEC.03	C.2.ME.05	C.2.MECT.01	'Handle Error'
C.2.MEC.04	C.2.ME.07	C.2.MECT.01	'Schedule Garage Appointment'
C.2.MEC.05	C.2.ME.09	C.2.MECT.01	'Order Tow Truck'
C.2.MEC.06	C.2.ME.10	C.2.MECT.01	'Rent Temporary Car'
C.2.MEC.07	C.2.ME.12	C.2.MECT.01	'Confirm Order'
C.2.MEC.08	C.2.ME.15	C.2.MECT.01	'Select Temporary Car'
C.2.MEC.09	C.2.ME.16	C.2.MECT.01	'Evaluate Temporary Car'
C.2.MEC.10	C.2.ME.18	C.2.MECT.02	'Done'
C.2.MEC.11	C.2.ME.19	C.2.MECT.02	'Check Again
C.2.MEC.12	C.2.ME.20	C.2.MECT.01	'Order Temporary Car'

Table C.7 represents the instances of the **Model_Element_Model_Relationship_Type** class for the "Create Repair Order" process.

Table C.7 — Model_Element_Model_Relationship_Type class for the BPMN example

Identifier	Designation	Definition
C.2.MEMRT.01	'Model element decomposition'	'The decomposition of the subject model element is specified in the object model'

Table C.8 represents the instances of the **Model_Element_Model_Relationship** class for the "Create Repair Order" process.

Table C.8 — Model_Element_Model_Relationship class for the BPMN example

Identifier	Subject_Model_Element.identifier	Object_Model.identifier	Model_Element_Model_Relationship_Type. identifier
C.2.MEMR.01	C.2.ME.10	C.2.M.02	C.2.MEMRT.01

Table C.9 represents the instances of the **Model_Element_Relationship_Type** class for the "Create Repair Order" process.

Table C.9 — Model_Element_Relationship_Type class for the BPMN example

Identifier	Designation
C.2.MERT.01	'Is followed in sequence by'
C.2.MERT.02	'Processing causes exception'

Table C.10 represents the instances of the **Model_Element_Relationship** class for the "Create Repair Order" process.

Table C.10 — Model_Element_Relationship class for the BPMN example

Identifier	Subject_Model_Element. identifier	Object_Model_Element. identifier	Model_Element_ Relationship_Type. identifier
C.2.MER.01	C.2.ME.01	C.2.ME.02	C.2.MERT.01
C.2.MER.02	C.2.ME.02	C.2.ME.03	C.2.MERT.01
C.2.MER.03	C.2.ME.03	C.2.ME.04	C.2.MERT.02
C.2.MER.04	C.2.ME.04	C.2.ME.05	C.2.MERT.01
C.2.MER.05	C.2.ME.05	C.2.ME.06	C.2.MERT.01
C.2.MER.06	C.2.ME.03	C.2.ME.07	C.2.MERT.01
C.2.MER.07	C.2.ME.07	C.2.ME.08	C.2.MERT.01
C.2.MER.08	C.2.ME.08	C.2.ME.09, C.2.ME.10	C.2.MERT.01
C.2.MER.09	C.2.ME.09, C.2.ME.10	C.2.ME.11	C.2.MERT.01
C.2.MER.10	C.2.ME.11	C.2.ME.12	C.2.MERT.01
C.2.MER.11	C.2.ME.12	C.2.ME.13	C.2.MERT.01
C.2.MER.12	C.2.ME.14	C.2.ME.15	C.2.MERT.01
C.2.MER.13	C.2.ME.15	C.2.ME.16	C.2.MERT.01
C.2.MER.14	C.2.ME.16	C.2.ME.17	C.2.MERT.01
C.2.MER.15	C.2.ME.17	C.2.ME.18	C.2.MERT.01
C.2.MER.16	C.2.ME.17	C.2.ME.19	C.2.MERT.01
C.2.MER.17	C.2.ME.19	C.2.ME.15	C.2.MERT.01
C.2.MER.18	C.2.ME.18	C.2.ME.20	C.2.MERT.01

Table C.10 *(continued)*

Identifier	Subject_Model_Element. identifier	Object_Model_Element. identifier	Model_Element_ Relationship_Type. identifier
C.2.MER.19	C.2.ME.20	C.2.ME.21	C.2.MERT.01

C.3   UML Class Diagram example

C.3.1   Overview of example

Figure C.2 shows the information model for a sales order processing scenario expressed using the UML Class Diagram notation.
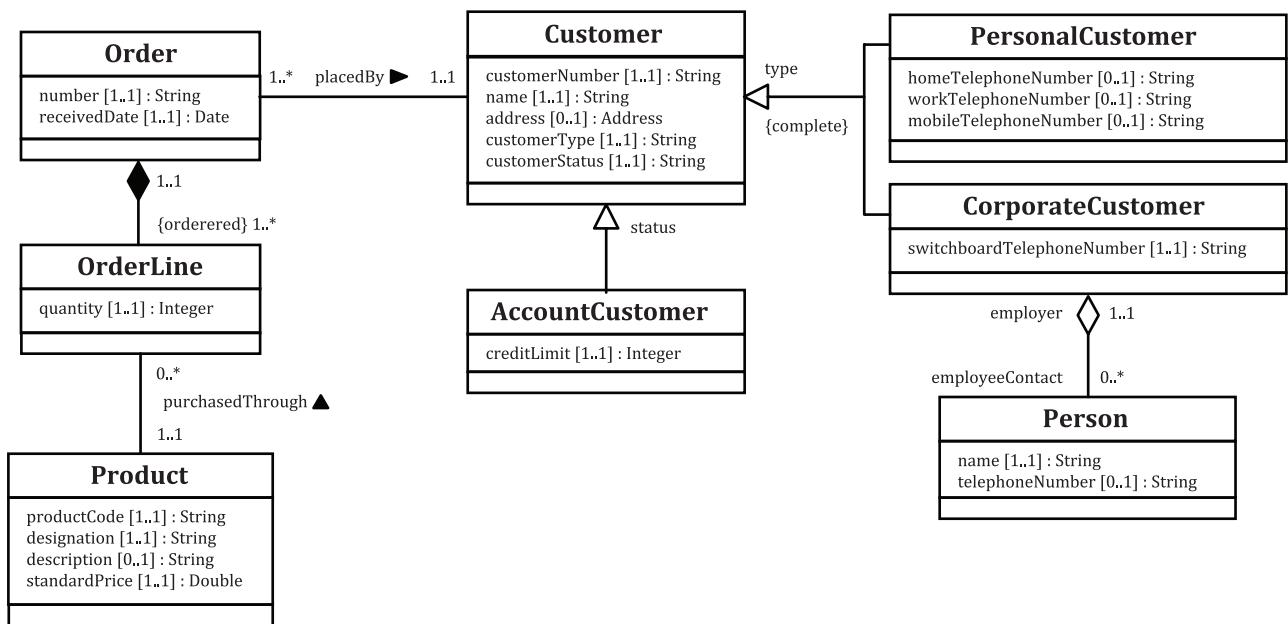
Figure C.2 — Sales order processing example expressed as a UML Class Diagram

In this example, a customer is an organization (a corporate customer) or an individual (a personal customer) who has placed at least one order. Each sales order comprises one or more 'order lines' each of which is an order for a particular product. Corporate customers or personal customers can also be account customers with an agreed credit limit.

C.3.2   Details of the instances of classes for this example

Table C.11 represents the instances of the **Modelling_Language** class for the Sales Order Processing information model.

Table C.11 — Modelling_Language class for the UML Class Diagram example

Identifier	Designation
C.3.ML.01	'UML Class Diagram notation'

Table C.12 represents the instances of the **Model** class for the Sales Order Processing information model.

Table C.12 — Model class for the UML Class Diagram example

Identifier	Designation	Modelling_Language.identifier
C.3.M.01	'Sales Order Processing'	C.3.ML.01

Table C.13 represents the instances of the **Concept** class for the Sales Order Processing information model.

Table C.13 — Concept class for the UML Class Diagram example

Identifier	Designation
C.3.C.01	'Organization'
C.3.C.02	'Individual'
C.3.C.03	'Sales Transaction'

Table C.14 represents the instances of the **Concept_Annotation** class for the Sales Order Processing information model.

Table C.14 — Concept_Annotation class for the UML Class Diagram example

Identifier	Concept. identifier	Model. identifier	Model_Element. identifier	Sequence
C.3.CA.01	C.3.C.01	--	C.3.ME.13	--
C.3.CA.02	C.3.C.02	--	C.3.ME.09	--
C.3.CA.03	C.3.C.02	--	C.3.ME.15	--
C.3.CA.04	C.3.C.03	--	C.3.ME.18	--

Table C.15 represents the instances of the **Model_Element_Type** class for the Sales Order Processing information model.

Table C.15 — Model_Element_Type class for the UML Class Diagram example

Identifier	Designation	Definition
C.3.MET.01	'Object Class'	--
C.3.MET.02	'Attribute'	--
C.3.MET.03	'Association'	--
C.3.MET.04	'Association End'	'The point where an association, or group of constrained associations, meet an object class'
C.3.MET.05	'Specialization'	'A superclass-subclass hierarchy'

Table C.16 represents the instances of the **Model_Element** class for the Sales Order Processing information model.

Table C.16 — Model_Element class for the UML Class Diagram example

Identifier	Designation	Model. identifier	Model_Element_Type. identifier
C.3.ME.01	'Customer'	C.3.M.01	C.3.MET.01
C.3.ME.02	'customerNumber'	C.3.M.01	C.3.MET.02
C.3.ME.03	'name'	C.3.M.01	C.3.MET.02
C.3.ME.04	'address'	C.3.M.01	C.3.MET.02
C.3.ME.05	'customerType'	C.3.M.01	C.3.MET.02
C.3.ME.06	'customerStatus'	C.3.M.01	C.3.MET.02
C.3.ME.07	'AccountCustomer'	C.3.M.01	C.3.MET.01

Table C.16 *(continued)*

Identifier	Designation	Model. identifier	Model_Element_Type. identifier
C.3.ME.08	'creditLimit'	C.3.M.01	C.3.MET.02
C.3.ME.09	'PersonalCustomer'	C.3.M.01	C.3.MET.01
C.3.ME.10	'homeTelephoneNumber'	C.3.M.01	C.3.MET.02
C.3.ME.11	'workTelephoneNumber'	C.3.M.01	C.3.MET.02
C.3.ME.12	'mobileTelephoneNumber'	C.3.M.01	C.3.MET.02
C.3.ME.13	'CorporateCustomer'	C.3.M.01	C.3.MET.01
C.3.ME.14	'switchboardTelephoneNumber'	C.3.M.01	C.3.MET.02
C.3.ME.15	'Person'	C.3.M.01	C.3.MET.01
C.3.ME.16	'name'	C.3.M.01	C.3.MET.02
C.3.ME.17	'telephoneNumber'	C.3.M.01	C.3.MET.02
C.3.ME.18	'Order'	C.3.M.01	C.3.MET.01
C.3.ME.19	'number'	C.3.M.01	C.3.MET.02
C.3.ME.20	'receivedDate'	C.3.M.01	C.3.MET.02
C.3.ME.21	'OrderLine'	C.3.M.01	C.3.MET.01
C.3.ME.22	'quantity'	C.3.M.01	C.3.MET.02
C.3.ME.23	'Product'	C.3.M.01	C.3.MET.01
C.3.ME.24	'productCode'	C.3.M.01	C.3.MET.02
C.3.ME.25	'designation'	C.3.M.01	C.3.MET.02
C.3.ME.26	'description'	C.3.M.01	C.3.MET.02
C.3.ME.27	'standardPrice'	C.3.M.01	C.3.MET.02
C.3.ME.28	'placedBy'	C.3.M.01	C.3.MET.03
C.3.ME.29	'Order in placedBy'	C.3.M.01	C.3.MET.04
C.3.ME.30	'Customer in placedBy'	C.3.M.01	C.3.MET.04
C.3.ME.31	'Order to OrderLine'	C.3.M.01	C.3.MET.03
C.3.ME.32	'Order in Order to OrderLine'	C.3.M.01	C.3.MET.04
C.3.ME.33	'OrderLine in Order to OrderLine'	C.3.M.01	C.3.MET.04
C.3.ME.34	'purchasedThrough'	C.3.M.01	C.3.MET.03
C.3.ME.35	'OrderLine in purchasedThrough'	C.3.M.01	C.3.MET.04
C.3.ME.36	'Product in purchasedThrough'	C.3.M.01	C.3.MET.04
C.3.ME.37	'employer to employeeContact'	C.3.M.01	C.3.MET.03
C.3.ME.38	'CorporateCustomer in employer to employeeContact'	C.3.M.01	C.3.MET.04
C.3.ME.39	'Person in employer to employeeContact'	C.3.M.01	C.3.MET.04
C.3.ME.40	'status'	C.3.M.01	C.3.MET.05
C.3.ME.41	'type'	C.3.M.01	C.3.MET.05

Table C.17 represents the instances of the **Model_Element_Characteristic_Type** class for the Sales Order Processing information model.

Table C.17 — Model_Element_Characteristic_Type class for the UML Class Diagram example

Identifier	Designation	Definition
C.3.MECT.01	'Name'	--
C.3.MECT.02	'Multiplicity lower bound'	--
C.3.MECT.03	'Multiplicity upper bound'	--
C.3.MECT.04	'Datatype'	--

Table C.17 *(continued)*

Identifier	Designation	Definition
C.3.MECT.05	'Direction'	'The direction in which an association name is to be read'
C.3.MECT.06	'Composition'	'Indicated by a black diamond'
C.3.MECT.07	'Annotation'	--
C.3.MECT.08	'Role Name'	--
C.3.MECT.09	'Aggregation'	'Indicated by a white diamond'
C.3.MECT.10	'Disjoint or Overlapping'	'Part of the specification of a specialization hierarchy – default is overlapping'
C.3.MECT.11	'Incomplete or Complete'	'Part of the specification of a specialization hierarchy – default is incomplete
C.3.MECT.12	'Static or Dynamic'	'Part of the specification of a specialization hierarchy – default is dynamic

Table C.18 represents the instances of the **Model_Element_Characteristic** class for the Sales Order Processing information model.

Table C.18 — Model_Element_Characteristic class for the UML Class Diagram example

Identifier	Model_Element. identifier	Model_Element_ Characteristic_Type. identifier	Value
C.3.MEC.001	C.3.ME.01	C.3.MECT.01	'Customer'
C.3.MEC.002	C.3.ME.02	C.3.MECT.01	'customerNumber'
C.3.MEC.003	C.3.ME.02	C.3.MECT.02	'1'
C.3.MEC.004	C.3.ME.02	C.3.MECT.03	'1'
C.3.MEC.005	C.3.ME.02	C.3.MECT.04	'String'
C.3.MEC.006	C.3.ME.03	C.3.MECT.01	'name'
C.3.MEC.007	C.3.ME.03	C.3.MECT.02	'1'
C.3.MEC.008	C.3.ME.03	C.3.MECT.03	'1'
C.3.MEC.009	C.3.ME.03	C.3.MECT.04	'String'
C.3.MEC.010	C.3.ME.04	C.3.MECT.01	'address'
C.3.MEC.011	C.3.ME.04	C.3.MECT.02	'0'
C.3.MEC.012	C.3.ME.04	C.3.MECT.03	'1'
C.3.MEC.013	C.3.ME.04	C.3.MECT.04	'Address'
C.3.MEC.014	C.3.ME.05	C.3.MECT.01	'customerType'
C.3.MEC.015	C.3.ME.05	C.3.MECT.02	'1'
C.3.MEC.016	C.3.ME.05	C.3.MECT.03	'1'
C.3.MEC.017	C.3.ME.05	C.3.MECT.04	'String'
C.3.MEC.018	C.3.ME.06	C.3.MECT.01	'customerStatus'
C.3.MEC.019	C.3.ME.06	C.3.MECT.02	'1'
C.3.MEC.020	C.3.ME.06	C.3.MECT.03	'1'
C.3.MEC.021	C.3.ME.06	C.3.MECT.04	'String'
C.3.MEC.022	C.3.ME.07	C.3.MECT.01	'AccountCustomer
C.3.MEC.023	C.3.ME.08	C.3.MECT.01	'creditLimit'
C.3.MEC.024	C.3.ME.08	C.3.MECT.02	'1'
C.3.MEC.025	C.3.ME.08	C.3.MECT.03	'1'
C.3.MEC.026	C.3.ME.08	C.3.MECT.04	'Integer'

Table C.18 *(continued)*

Identifier	Model_Element. identifier	Model_Element_ Characteristic_Type. identifier	Value
C.3.MEC.027	C.3.ME.09	C.3.MECT.01	'PersonalCustomer'
C.3.MEC.028	C.3.ME.10	C.3.MECT.01	'homeTelephoneNumber'
C.3.MEC.029	C.3.ME.10	C.3.MECT.02	'0'
C.3.MEC.030	C.3.ME.10	C.3.MECT.03	'1'
C.3.MEC.031	C.3.ME.10	C.3.MECT.04	'String'
C.3.MEC.032	C.3.ME.11	C.3.MECT.01	'workTelephoneNumber'
C.3.MEC.033	C.3.ME.11	C.3.MECT.02	'0'
C.3.MEC.034	C.3.ME.11	C.3.MECT.03	'1'
C.3.MEC.035	C.3.ME.11	C.3.MECT.04	'String'
C.3.MEC.036	C.3.ME.12	C.3.MECT.01	'mobileTelephoneNumber'
C.3.MEC.037	C.3.ME.12	C.3.MECT.02	'0'
C.3.MEC.038	C.3.ME.12	C.3.MECT.03	'1'
C.3.MEC.039	C.3.ME.12	C.3.MECT.04	'String'
C.3.MEC.040	C.3.ME.13	C.3.MECT.01	'CorporateCustomer'
C.3.MEC.041	C.3.ME.14	C.3.MECT.01	'switchboardTelephoneNumber'
C.3.MEC.042	C.3.ME.14	C.3.MECT.02	'1'
C.3.MEC.043	C.3.ME.14	C.3.MECT.03	'1'
C.3.MEC.044	C.3.ME.14	C.3.MECT.04	'String'
C.3.MEC.045	C.3.ME.15	C.3.MECT.01	'Person'
C.3.MEC.046	C.3.ME.16	C.3.MECT.01	'name'
C.3.MEC.047	C.3.ME.16	C.3.MECT.02	'1'
C.3.MEC.048	C.3.ME.16	C.3.MECT.03	'1'
C.3.MEC.049	C.3.ME.16	C.3.MECT.04	'String'
C.3.MEC.050	C.3.ME.17	C.3.MECT.01	'telephoneNumber'
C.3.MEC.051	C.3.ME.17	C.3.MECT.02	'0'
C.3.MEC.052	C.3.ME.17	C.3.MECT.03	'1'
C.3.MEC.053	C.3.ME.17	C.3.MECT.04	'String'
C.3.MEC.054	C.3.ME.18	C.3.MECT.01	'Order'
C.3.MEC.055	C.3.ME.19	C.3.MECT.01	'number'
C.3.MEC.056	C.3.ME.19	C.3.MECT.02	'1'
C.3.MEC.057	C.3.ME.19	C.3.MECT.03	'1'
C.3.MEC.058	C.3.ME.19	C.3.MECT.04	'String'
C.3.MEC.059	C.3.ME.20	C.3.MECT.01	'receivedDate'
C.3.MEC.060	C.3.ME.20	C.3.MECT.02	'1'
C.3.MEC.061	C.3.ME.20	C.3.MECT.03	'1'
C.3.MEC.062	C.3.ME.20	C.3.MECT.04	'Date'
C.3.MEC.063	C.3.ME.21	C.3.MECT.01	'OrderLine'
C.3.MEC.064	C.3.ME.22	C.3.MECT.01	'quantity'
C.3.MEC.065	C.3.ME.22	C.3.MECT.02	'1'
C.3.MEC.066	C.3.ME.22	C.3.MECT.03	'1'
C.3.MEC.067	C.3.ME.22	C.3.MECT.04	'Integer'
C.3.MEC.068	C.3.ME.23	C.3.MECT.01	'Product

Table C.18 *(continued)*

Identifier	Model_Element. identifier	Model_Element_ Characteristic_Type. identifier	Value
C.3.MEC.069	C.3.ME.24	C.3.MECT.01	'productCode'
C.3.MEC.070	C.3.ME.24	C.3.MECT.02	'1'
C.3.MEC.071	C.3.ME.24	C.3.MECT.03	'1'
C.3.MEC.072	C.3.ME.24	C.3.MECT.04	'String'
C.3.MEC.073	C.3.ME.25	C.3.MECT.01	'designation'
C.3.MEC.074	C.3.ME.25	C.3.MECT.02	'1'
C.3.MEC.075	C.3.ME.25	C.3.MECT.03	'1'
C.3.MEC.076	C.3.ME.25	C.3.MECT.04	'String'
C.3.MEC.077	C.3.ME.26	C.3.MECT.01	'description'
C.3.MEC.078	C.3.ME.26	C.3.MECT.02	'0'
C.3.MEC.079	C.3.ME.26	C.3.MECT.03	'1'
C.3.MEC.080	C.3.ME.26	C.3.MECT.04	'String'
C.3.MEC.081	C.3.ME.27	C.3.MECT.01	'standardPrice'
C.3.MEC.082	C.3.ME.27	C.3.MECT.02	'1'
C.3.MEC.083	C.3.ME.27	C.3.MECT.03	'1'
C.3.MEC.084	C.3.ME.27	C.3.MECT.04	'Double'
C.3.MEC.085	C.3.ME.28	C.3.MECT.01	'placedBy'
C.3.MEC.086	C.3.ME.28	C.3.MECT.05	'towards Customer'
C.3.MEC.087	C.3.ME.29	C.3.MECT.02	'1'
C.3.MEC.088	C.3.ME.29	C.3.MECT.03	'many'
C.3.MEC.089	C.3.ME.30	C.3.MECT.02	'1'
C.3.MEC.090	C.3.ME.30	C.3.MECT.03	'1'
C.3.MEC.091	C.3.ME.32	C.3.MECT.06	'Yes'
C.3.MEC.092	C.3.ME.32	C.3.MECT.02	'1'
C.3.MEC.093	C.3.ME.32	C.3.MECT.03	'1'
C.3.MEC.094	C.3.ME.33	C.3.MECT.07	'{ordered}'
C.3.MEC.095	C.3.ME.33	C.3.MECT.02	'1'
C.3.MEC.096	C.3.ME.33	C.3.MECT.03	'many'
C.3.MEC.097	C.3.ME.34	C.3.MECT.01	'purchasedThrough'
C.3.MEC.098	C.3.ME.34	C.3.MECT.05	'towards OrderLine'
C.3.MEC.099	C.3.ME.35	C.3.MECT.02	'0'
C.3.MEC.100	C.3.ME.35	C.3.MECT.03	'many'
C.3.MEC.101	C.3.ME.36	C.3.MECT.02	'1'
C.3.MEC.102	C.3.ME.36	C.3.MECT.03	'1'
C.3.MEC.103	C.3.ME.38	C.3.MECT.08	'employer'
C.3.MEC.104	C.3.ME.38	C.3.MECT.09	'Yes'
C.3.MEC.105	C.3.ME.38	C.3.MECT.02	'1'
C.3.MEC.106	C.3.ME.38	C.3.MECT.03	'1'
C.3.MEC.107	C.3.ME.39	C.3.MECT.08	'employeeContact'
C.3.MEC.108	C.3.ME.39	C.3.MECT.02	'0'
C.3.MEC.109	C.3.ME.39	C.3.MECT.03	'many'
C.3.MEC.110	C.3.ME.40	C.3.MECT.01	'status'

Table C.18 (continued)

Identifier	Model_Element. identifier	Model_Element_ Characteristic_Type. identifier	Value
C.3.MEC.111	C.3.ME.40	C.3.MECT.10	'Disjoint'
C.3.MEC.112	C.3.ME.40	C.3.MECT.11	'Incomplete'
C.3.MEC.113	C.3.ME.40	C.3.MECT.12	'Static'
C.3.MEC.114	C.3.ME.41	C.3.MECT.01	'type'
C.3.MEC.115	C.3.ME.41	C.3.MECT.10	'Disjoint'
C.3.MEC.116	C.3.ME.41	C.3.MECT.11	'Complete'
C.3.MEC.117	C.3.ME.41	C.3.MECT.12	'Static'

Table C.19 represents the instances of the **Model_Element_Relationship_Type** class for the Sales Order Processing information model.

Table C.19 — Model_Element_Relationship_Type class for the UML Class Diagram example

Identifier	Designation
C.3.MERT.01	'(Attribute) Is specified for (Object Class)'
C.3.MERT.02	'(Association End) attached to (Object Class)'
C.3.MERT.03	'(Association End) part of (Association)'
C.3.MERT.04	'(Object Class) superclass in (Specialization)'
C.3.MERT.05	'(Object Class) subclass in (Specialization)'

Table C.20 represents the instances of the **Model_Element_Relationship** class for the Sales Order Processing information model.

Table C.20 — Model_Element_Relationship class for the UML Class Diagram example

Identifier	Subject_Model_Element. identifier	Object_Model_Element. identifier	Model_Element_ Relationship_Type. identifier
C.3.MER.01	C.3.ME.02	C.3.ME.01	C.3.MERT.01
C.3.MER.02	C.3.ME.03	C.3.ME.01	C.3.MERT.01
C.3.MER.03	C.3.ME.04	C.3.ME.01	C.3.MERT.01
C.3.MER.04	C.3.ME.05	C.3.ME.01	C.3.MERT.01
C.3.MER.05	C.3.ME.06	C.3.ME.01	C.3.MERT.01
C.3.MER.06	C.3.ME.08	C.3.ME.07	C.3.MERT.01
C.3.MER.07	C.3.ME.10	C.3.ME.09	C.3.MERT.01
C.3.MER.08	C.3.ME.11	C.3.ME.09	C.3.MERT.01
C.3.MER.09	C.3.ME.12	C.3.ME.09	C.3.MERT.01
C.3.MER.10	C.3.ME.14	C.3.ME.13	C.3.MERT.01
C.3.MER.11	C.3.ME.16	C.3.ME.15	C.3.MERT.01
C.3.MER.12	C.3.ME.17	C.3.ME.15	C.3.MERT.01
C.3.MER.13	C.3.ME.19	C.3.ME.18	C.3.MERT.01
C.3.MER.14	C.3.ME.20	C.3.ME.18	C.3.MERT.01
C.3.MER.15	C.3.ME.22	C.3.ME.21	C.3.MERT.01
C.3.MER.16	C.3.ME.24	C.3.ME.23	C.3.MERT.01
C.3.MER.17	C.3.ME.25	C.3.ME.23	C.3.MERT.01
C.3.MER.18	C.3.ME.26	C.3.ME.23	C.3.MERT.01

Table C.20 *(continued)*

Identifier	Subject_Model_Element. identifier	Object_Model_Element. identifier	Model_Element_ Relationship_Type. identifier
C.3.MER.19	C.3.ME.27	C.3.ME.23	C.3.MERT.01
C.3.MER.20	C.3.ME.29	C.3.ME.18	C.3.MERT.02
C.3.MER.21	C.3.ME.29	C.3.ME.28	C.3.MERT.03
C.3.MER.22	C.3.ME.30	C.3.ME.01	C.3.MERT.02
C.3.MER.23	C.3.ME.30	C.3.ME.28	C.3.MERT.03
C.3.MER.24	C.3.ME.32	C.3.ME.18	C.3.MERT.02
C.3.MER.25	C.3.ME.32	C.3.ME.31	C.3.MERT.03
C.3.MER.26	C.3.ME.33	C.3.ME.21	C.3.MERT.02
C.3.MER.27	C.3.ME.33	C.3.ME.31	C.3.MERT.03
C.3.MER.28	C.3.ME.35	C.3.ME.21	C.3.MERT.02
C.3.MER.29	C.3.ME.35	C.3.ME.34	C.3.MERT.03
C.3.MER.30	C.3.ME.36	C.3.ME.23	C.3.MERT.02
C.3.MER.31	C.3.ME.36	C.3.ME.34	C.3.MERT.03
C.3.MER.32	C.3.ME.38	C.3.ME.13	C.3.MERT.02
C.3.MER.33	C.3.ME.38	C.3.ME.37	C.3.MERT.03
C.3.MER.34	C.3.ME.39	C.3.ME.15	C.3.MERT.02
C.3.MER.35	C.3.ME.39	C.3.ME.37	C.3.MERT.03
C.3.MER.36	C.3.ME.01	C.3.ME.40	C.3.MERT.04
C.3.MER.37	C.3.ME.07	C.3.ME.40	C.3.MERT.05
C.3.MER.38	C.3.ME.01	C.3.ME.41	C.3.MERT.04
C.3.MER.39	C.3.ME.09	C.3.ME.41	C.3.MERT.05
C.3.MER.40	C.3.ME.13	C.3.ME.41	C.3.MERT.05

C.4   Form Design example

C.4.1   Overview of example

Figure C.3 shows the form design for a form to be completed by a new employee on the first day of their employment.

Figure C.3 — Example form design

The metamodel specified in ISO/IEC TS 19763-13:2016[13] is used for the registration of this example. This metamodel is shown at Figure C.4.

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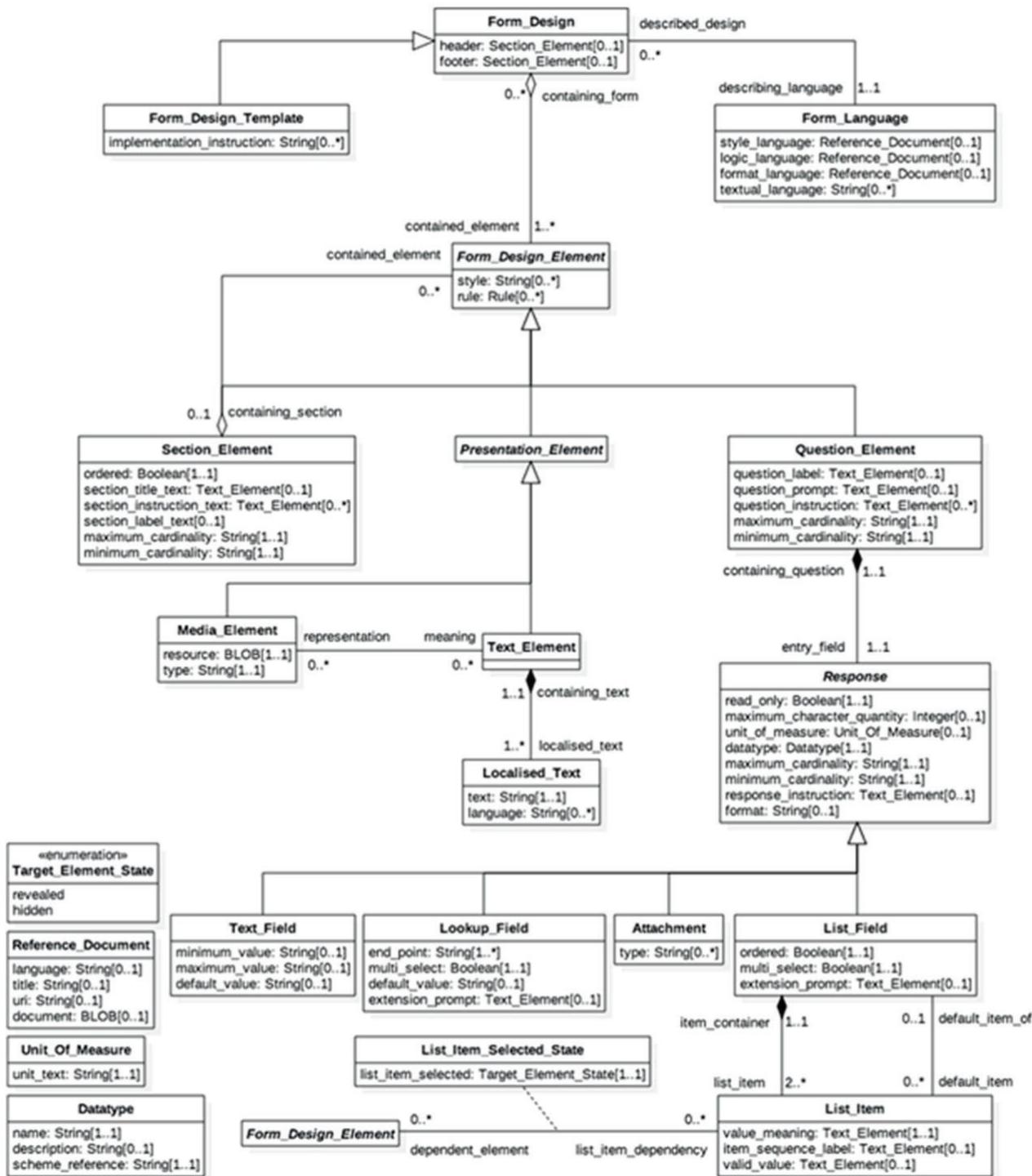
Figure C.4 — Form design metamodel (from ISO/IEC TS 19763-13:2016)

C.4.2 Details of the instances of classes for this example

Table C.21 represents the instances of the **Model** class for the "New Employee Form" form design.

Table C.21 — Model class for the Form Design example

Identifier	Designation	Modelling_Language.identifier
C.4.M.01	'New Employee Form'	[none]

Table C.22 represents the instances of the **Model_Element_Type** class for the "New Employee Form" form design.

Table C.22 — Model_Element_Type class for the Form Design example

Identifier	Designation
C.4.MET.01	'Datatype'
C.4.MET.02	'List Field Response'
C.4.MET.03	'List Item'
C.4.MET.04	'Localised Text'
C.4.MET.05	'Media Presentation Element'
C.4.MET.06	'Question Element'
C.4.MET.07	'Section Element'
C.4.MET.08	'Text Field Response'
C.4.MET.09	'Text Presentation Element'
C.4.MET.10	'Unit of Measure'

Table C.23 represents the instances of the **Model_Element** class for the "New Employee Form" form design.

Table C.23 — Model_Element class for the Form Design example

Identifier	Designation	Model. identifier	Model_ Element_Type. identifier
C.4.ME.01	'Form Header'	C.4.M.01	C.4.MET.07
C.4.ME.02	'Form Header Logo'	C.4.M.01	C.4.MET.05
C.4.ME.03	'Form Title'	C.4.M.01	C.4.MET.07
C.4.ME.04	'About you'	C.4.M.01	C.4.MET.07
C.4.ME.05	'Full name'	C.4.M.01	C.4.MET.06
C.4.ME.06	'Full name prompt'	C.4.M.01	C.4.MET.09
C.4.ME.07	'Full name prompt text'	C.4.M.01	C.4.MET.04
C.4.ME.08	'Full name response'	C.4.M.01	C.4.MET.08
C.4.ME.09	'Full name response datatype'	C.4.M.01	C.4.MET.01
C.4.ME.10	'Home address'	C.4.M.01	C.4.MET.06
C.4.ME.11	'Home address prompt'	C.4.M.01	C.4.MET.09
C.4.ME.12	'Home address prompt text'	C.4.M.01	C.4.MET.04
C.4.ME.13	'Home address response'	C.4.M.01	C.4.MET.08
C.4.ME.14	'Home address response datatype'	C.4.M.01	C.4.MET.01
C.4.ME.15	'Telephone number'	C.4.M.01	C.4.MET.06
C.4.ME.16	'Telephone number prompt'	C.4.M.01	C.4.MET.09
C.4.ME.17	'Telephone number prompt text'	C.4.M.01	C.4.MET.04
C.4.ME.18	'Telephone number response'	C.4.M.01	C.4.MET.08
C.4.ME.19	'Telephone number response datatype'	C.4.M.01	C.4.MET.01
C.4.ME.20	'NI number'	C.4.M.01	C.4.MET.06
C.4.ME.21	'NI number prompt'	C.4.M.01	C.4.MET.09
C.4.ME.22	'NI number prompt text'	C.4.M.01	C.4.MET.04
C.4.ME.23	'NI number response'	C.4.M.01	C.4.MET.08
C.4.ME.24	'NI number response datatype'	C.4.M.01	C.4.MET.01

Table C.23 *(continued)*

Identifier	Designation	Model. identifier	Model_ Element_Type. identifier
C.4.ME.25	'Allergies'	C.4.M.01	C.4.MET.06
C.4.ME.26	'Allergies label'	C.4.M.01	C.4.MET.09
C.4.ME.27	'Allergies label text'	C.4.M.01	C.4.MET.04
C.4.ME.28	'Allergies response'	C.4.M.01	C.4.MET.02
C.4.ME.29	'Allergies response datatype'	C.4.M.01	C.4.MET.01
C.4.ME.30	'Allergies response item gluten'	C.4.M.01	C.4.MET.03
C.4.ME.31	'Allergies response item gluten value meaning'	C.4.M.01	C.4.MET.09
C.4.ME.32	'Allergies response item gluten value meaning text'	C.4.M.01	C.4.MET.04
C.4.ME.33	'Allergies response item peanut'	C.4.M.01	C.4.MET.03
C.4.ME.34	'Allergies response item peanut value meaning'	C.4.M.01	C.4.MET.09
C.4.ME.35	'Allergies response item peanut value meaning text'	C.4.M.01	C.4.MET.04
C.4.ME.36	'Allergies response item lactose'	C.4.M.01	C.4.MET.03
C.4.ME.37	'Allergies response item lactose value meaning'	C.4.M.01	C.4.MET.09
C.4.ME.38	'Allergies response item lactose value meaning text'	C.4.M.01	C.4.MET.04
C.4.ME.39	'Allergies response item tree nut'	C.4.M.01	C.4.MET.03
C.4.ME.40	'Allergies response item tree nut value meaning'	C.4.M.01	C.4.MET.09
C.4.ME.41	'Allergies response item tree nut value meaning text'	C.4.M.01	C.4.MET.04
C.4.ME.42	'Allergies response item shellfish'	C.4.M.01	C.4.MET.03
C.4.ME.43	'Allergies response item shellfish value meaning'	C.4.M.01	C.4.MET.09
C.4.ME.44	'Allergies response item shellfish value meaning text'	C.4.M.01	C.4.MET.04
C.4.ME.45	'Allergies response item eggs'	C.4.M.01	C.4.MET.03
C.4.ME.46	'Allergies response item eggs value meaning'	C.4.M.01	C.4.MET.09
C.4.ME.47	'Allergies response item eggs value meaning text'	C.4.M.01	C.4.MET.04
C.4.ME.48	'Height'	C.4.M.01	C.4.MET.06
C.4.ME.49	'Height prompt'	C.4.M.01	C.4.MET.09
C.4.ME.50	'Height prompt text'	C.4.M.01	C.4.MET.04
C.4.ME.51	'Height response'	C.4.M.01	C.4.MET.08
C.4.ME.52	'Height response unit of measure'	C.4.M.01	C.4.MET.10
C.4.ME.53	'Height response datatype'	C.4.M.01	C.4.MET.01
C.4.ME.54	'Next of Kin'	C.4.M.01	C.4.MET.07
C.4.ME.55	'NOK Full name'	C.4.M.01	C.4.MET.06
C.4.ME.56	'NOK Full name prompt'	C.4.M.01	C.4.MET.09
C.4.ME.57	'NOK Full name prompt text'	C.4.M.01	C.4.MET.04
C.4.ME.58	'NOK Full name response'	C.4.M.01	C.4.MET.08
C.4.ME.59	'NOK Full name response datatype'	C.4.M.01	C.4.MET.01
C.4.ME.60	'NOK Home address'	C.4.M.01	C.4.MET.06
C.4.ME.61	'NOK Home address prompt'	C.4.M.01	C.4.MET.09
C.4.ME.62	'NOK Home address prompt text'	C.4.M.01	C.4.MET.04
C.4.ME.63	'NOK Home address response'	C.4.M.01	C.4.MET.08
C.4.ME.64	'NOK Home address response datatype'	C.4.M.01	C.4.MET.01
C.4.ME.65	'NOK Telephone number'	C.4.M.01	C.4.MET.06
C.4.ME.66	'NOK Telephone number prompt'	C.4.M.01	C.4.MET.09

Table C.23 *(continued)*

Identifier	Designation	Model. identifier	Model_ Element_Type. identifier
C.4.ME.67	'NOK Telephone number prompt text'	C.4.M.01	C.4.MET.04
C.4.ME.68	'NOK Telephone number response'	C.4.M.01	C.4.MET.08
C.4.ME.69	'NOK Telephone number response datatype'	C.4.M.01	C.4.MET.01
C.4.ME.70	'NOK Relationship'	C.4.M.01	C.4.MET.06
C.4.ME.71	'NOK Relationship prompt'	C.4.M.01	C.4.MET.09
C.4.ME.72	'NOK Relationship prompt text'	C.4.M.01	C.4.MET.04
C.4.ME.73	'NOK Relationship response'	C.4.M.01	C.4.MET.08
C.4.ME.74	'NOK Relationship response datatype'	C.4.M.01	C.4.MET.01
C.4.ME.75	'Form Footer	C.4.M.01	C.4.MET.07
C.4.ME.76	'Footer Signature'	C.4.M.01	C.4.MET.06
C.4.ME.77	'Footer Signature prompt'	C.4.M.01	C.4.MET.09
C.4.ME.78	'Footer Signature prompt text'	C.4.M.01	C.4.MET.04
C.4.ME.79	'Footer Signature response'	C.4.M.01	C.4.MET.08
C.4.ME.80	'Footer Signature response datatype'	C.4.M.01	C.4.MET.01
C.4.ME.81	'Footer Date'	C.4.M.01	C.4.MET.06
C.4.ME.82	'Footer Date prompt'	C.4.M.01	C.4.MET.09
C.4.ME.83	'Footer Date prompt text'	C.4.M.01	C.4.MET.04
C.4.ME.84	'Footer Date response'	C.4.M.01	C.4.MET.08
C.4.ME.85	'Footer Date response datatype'	C.4.M.01	C.4.MET.01

Table C.24 represents the instances of the **Model_Element_Characteristic_Type** class for the "New Employee Form" form design.

Table C.24 — Model_Element_Characteristic_Type class for the Form Design example

Identifier	Designation
C.4.MECT.01	'Maximum cardinality'
C.4.MECT.02	'Minimum cardinality'
C.4.MECT.03	'Multi select'
C.4.MECT.04	'Name'
C.4.MECT.05	'Ordered'
C.4.MECT.06	'Read only'
C.4.MECT.07	'Resource'
C.4.MECT.08	'Scheme reference'
C.4.MECT.09	'Section label text'
C.4.MECT.10	'Text'
C.4.MECT.11	'Type'
C.4.MECT.12	'Unit text''

Table C.25 represents the instances of the **Model_Element_Characteristic_Type_Acceptability** class for the "New Employee Form" form design.

Table C.25 — Model_Element_Characteristic_Type_Acceptability class for the Form Design example

Identifier	Model_Element_ Characteristic_Type. identifier	Model_Element_ Type.identifier
C.4.MECTA.01	C.4.MECT.01	C.4.MET.02
C.4.MECTA.02	C.4.MECT.01	C.4.MET.06
C.4.MECTA.03	C.4.MECT.01	C.4.MET.07
C.4.MECTA.04	C.4.MECT.01	C.4.MET.08
C.4.MECTA.05	C.4.MECT.02	C.4.MET.02
C.4.MECTA.06	C.4.MECT.02	C.4.MET.06
C.4.MECTA.07	C.4.MECT.02	C.4.MET.07
C.4.MECTA.08	C.4.MECT.02	C.4.MET.08
C.4.MECTA.09	C.4.MECT.03	C.4.MET.02
C.4.MECTA.10	C.4.MECT.04	C.4.MET.01
C.4.MECTA.11	C.4.MECT.05	C.4.MET.02
C.4.MECTA.12	C.4.MECT.05	C.4.MET.07
C.4.MECTA.13	C.4.MECT.06	C.4.MET.02
C.4.MECTA.14	C.4.MECT.06	C.4.MET.08
C.4.MECTA.15	C.4.MECT.07	C.4.MET.05
C.4.MECTA.16	C.4.MECT.08	C.4.MET.01
C.4.MECTA.17	C.4.MECT.10	C.4.MET.04
C.4.MECTA.18	C.4.MECT.11	C.4.MET.05
C.4.MECTA.19	C.4.MECT.12	C.4.MET.10

Table C.26 represents the instances of the **Model_Element_Characteristic** class for the "New Employee Form" form design.

Table C.26 — Model_Element_Characteristic class for the Form Design example

Identifier	Model_Element. identifier	Model_Element_ Characteristic_Type. identifier	Value
C.4.MEC.001	C.4.ME.01	C.4.MECT.05	'Ordered'
C.4.MEC.002	C.4.ME.01	C.4.MECT.01	'1'
C.4.MEC.003	C.4.ME.01	C.4.MECT.02	'1'
C.4.MEC.004	C.4.ME.02	C.4.MECT.07	{Reference to the "Ratchet Labs plc" logo}
C.4.MEC.005	C.4.ME.02	C.4.MECT.11	'Logo'
C.4.MEC.006	C.4.ME.03	C.4.MECT.05	'Ordered'
C.4.MEC.007	C.4.ME.03	C.4.MECT.09	'New Employee Form'
C.4.MEC.008	C.4.ME.03	C.4.MECT.01	'1'
C.4.MEC.009	C.4.ME.03	C.4.MECT.02	'1'
C.4.MEC.010	C.4.ME.04	C.4.MECT.05	'Ordered'
C.4.MEC.011	C.4.ME.04	C.4.MECT.09	'About you'
C.4.MEC.012	C.4.ME.04	C.4.MECT.01	'1'
C.4.MEC.013	C.4.ME.04	C.4.MECT.02	'1'
C.4.MEC.014	C.4.ME.05	C.4.MECT.01	'1'
C.4.MEC.015	C.4.ME.05	C.4.MECT.02	'1'
C.4.MEC.016	C.4.ME.05	C.4.MECT.10	'Full Name'

Table C.26 *(continued)*

Identifier	Model_Element. identifier	Model_Element_ Characteristic_Type. identifier	Value
C.4.MEC.017	C.4.ME.08	C.4.MECT.06	'FALSE'
C.4.MEC.018	C.4.ME.08	C.4.MECT.01	'1'
C.4.MEC.019	C.4.ME.08	C.4.MECT.02	'1'
C.4.MEC.020	C.4.ME.09	C.4.MECT.04	'Character'
C.4.MEC.021	C.4.ME.09	C.4.MECT.08	'ISO/IEC 9075-2'
C.4.MEC.022	C.4.ME.10	C.4.MECT.01	'1'
C.4.MEC.023	C.4.ME.10	C.4.MECT.02	'1'
C.4.MEC.024	C.4.ME.12	C.4.MECT.10	'Home Address'
C.4.MEC.025	C.4.ME.13	C.4.MECT.06	'FALSE'
C.4.MEC.026	C.4.ME.13	C.4.MECT.01	'1'
C.4.MEC.027	C.4.ME.13	C.4.MECT.02	'1'
C.4.MEC.028	C.4.ME.14	C.4.MECT.04	'Character'
C.4.MEC.029	C.4.ME.14	C.4.MECT.08	'ISO/IEC 9075-2'
C.4.MEC.030	C.4.ME.15	C.4.MECT.01	'1'
C.4.MEC.031	C.4.ME.15	C.4.MECT.02	'1'
C.4.MEC.032	C.4.ME.17	C.4.MECT.10	'Telephone Number'
C.4.MEC.033	C.4.ME.18	C.4.MECT.06	'FALSE'
C.4.MEC.034	C.4.ME.18	C.4.MECT.01	'1'
C.4.MEC.035	C.4.ME.18	C.4.MECT.02	'1'
C.4.MEC.036	C.4.ME.19	C.4.MECT.04	'Character'
C.4.MEC.037	C.4.ME.19	C.4.MECT.08	'ISO/IEC 9075-2'
C.4.MEC.038	C.4.ME.20	C.4.MECT.01	'1'
C.4.MEC.039	C.4.ME.20	C.4.MECT.02	'1'
C.4.MEC.040	C.4.ME.22	C.4.MECT.10	'National Insurance Number'
C.4.MEC.041	C.4.ME.23	C.4.MECT.06	'FALSE'
C.4.MEC.042	C.4.ME.23	C.4.MECT.01	'1'
C.4.MEC.043	C.4.ME.23	C.4.MECT.02	'1'
C.4.MEC.044	C.4.ME.24	C.4.MECT.04	'Character'
C.4.MEC.045	C.4.ME.24	C.4.MECT.08	'ISO/IEC 9075-2'
C.4.MEC.046	C.4.ME.25	C.4.MECT.01	'1'
C.4.MEC.047	C.4.ME.25	C.4.MECT.02	'1'
C.4.MEC.048	C.4.ME.27	C.4.MECT.10	'Allergies'
C.4.MEC.049	C.4.ME.28	C.4.MECT.06	'FALSE'
C.4.MEC.050	C.4.ME.28	C.4.MECT.01	'1'
C.4.MEC.051	C.4.ME.28	C.4.MECT.02	'1'
C.4.MEC.052	C.4.ME.28	C.4.MECT.05	'FALSE'
C.4.MEC.053	C.4.ME.28	C.4.MECT.03	'TRUE'
C.4.MEC.054	C.4.ME.29	C.4.MECT.04	'Boolean'
C.4.MEC.055	C.4.ME.29	C.4.MECT.08	'ISO/IEC 9075-2'
C.4.MEC.056	C.4.ME.32	C.4.MECT.10	'gluten'
C.4.MEC.057	C.4.ME.35	C.4.MECT.10	'peanut'
C.4.MEC.058	C.4.ME.38	C.4.MECT.10	'lactose'

Table C.26 *(continued)*

Identifier	Model_Element. identifier	Model_Element_ Characteristic_Type. identifier	Value
C.4.MEC.059	C.4.ME.41	C.4.MECT.10	'tree nut'
C.4.MEC.060	C.4.ME.44	C.4.MECT.10	'shellfish'
C.4.MEC.061	C.4.ME.47	C.4.MECT.10	'eggs'
C.4.MEC.062	C.4.ME.48	C.4.MECT.01	'1'
C.4.MEC.063	C.4.ME.48	C.4.MECT.02	'1'
C.4.MEC.064	C.4.ME.50	C.4.MECT.10	'Height (metres)'
C.4.MEC.065	C.4.ME.51	C.4.MECT.06	'FALSE'
C.4.MEC.066	C.4.ME.51	C.4.MECT.01	'1'
C.4.MEC.067	C.4.ME.51	C.4.MECT.02	'1'
C.4.MEC.068	C.4.ME.52	C.4.MECT.12	'metres'
C.4.MEC.069	C.4.ME.53	C.4.MECT.04	'Numeric'
C.4.MEC.070	C.4.ME.53	C.4.MECT.08	'ISO/IEC 9075-2'
C.4.MEC.071	C.4.ME.54	C.4.MECT.05	'TRUE'
C.4.MEC.072	C.4.ME.54	C.4.MECT.09	'Next of Kin'
C.4.MEC.073	C.4.ME.54	C.4.MECT.01	'1'
C.4.MEC.074	C.4.ME.54	C.4.MECT.02	'1'
C.4.MEC.075	C.4.ME.55	C.4.MECT.01	'1'
C.4.MEC.076	C.4.ME.55	C.4.MECT.02	'1'
C.4.MEC.077	C.4.ME.57	C.4.MECT.10	'Full Name'
C.4.MEC.078	C.4.ME.58	C.4.MECT.06	'FALSE'
C.4.MEC.079	C.4.ME.58	C.4.MECT.01	'1'
C.4.MEC.080	C.4.ME.58	C.4.MECT.02	'1'
C.4.MEC.081	C.4.ME.59	C.4.MECT.04	'Character'
C.4.MEC.082	C.4.ME.59	C.4.MECT.08	'ISO/IEC 9075-2'
C.4.MEC.083	C.4.ME.60	C.4.MECT.01	'1'
C.4.MEC.084	C.4.ME.60	C.4.MECT.02	'1'
C.4.MEC.085	C.4.ME.62	C.4.MECT.10	'Home Address'
C.4.MEC.086	C.4.ME.63	C.4.MECT.06	'FALSE'
C.4.MEC.087	C.4.ME.63	C.4.MECT.01	'1'
C.4.MEC.088	C.4.ME.63	C.4.MECT.02	'1'
C.4.MEC.089	C.4.ME.64	C.4.MECT.04	'Character'
C.4.MEC.090	C.4.ME.64	C.4.MECT.08	'ISO/IEC 9075-2'
C.4.MEC.091	C.4.ME.65	C.4.MECT.01	'1'
C.4.MEC.092	C.4.ME.65	C.4.MECT.02	'1'
C.4.MEC.093	C.4.ME.67	C.4.MECT.10	'Telephone Number'
C.4.MEC.094	C.4.ME.68	C.4.MECT.06	'FALSE'
C.4.MEC.095	C.4.ME.68	C.4.MECT.01	'1'
C.4.MEC.096	C.4.ME.68	C.4.MECT.02	'1'
C.4.MEC.097	C.4.ME.69	C.4.MECT.04	'Character'
C.4.MEC.098	C.4.ME.69	C.4.MECT.08	'ISO/IEC 9075-2'
C.4.MEC.099	C.4.ME.70	C.4.MECT.01	'1'
C.4.MEC.100	C.4.ME.70	C.4.MECT.02	'1'

Table C.26 *(continued)*

Identifier	Model_Element. identifier	Model_Element_ Characteristic_Type. identifier	Value
C.4.MEC.101	C.4.ME.72	C.4.MECT.10	'Relationship'
C.4.MEC.102	C.4.ME.73	C.4.MECT.06	'FALSE'
C.4.MEC.103	C.4.ME.73	C.4.MECT.01	'1'
C.4.MEC.104	C.4.ME.73	C.4.MECT.02	'1'
C.4.MEC.105	C.4.ME.74	C.4.MECT.04	'Character'
C.4.MEC.106	C.4.ME.74	C.4.MECT.08	'ISO/IEC 9075-2'
C.4.MEC.107	C.4.ME.75	C.4.MECT.05	'Ordered'
C.4.MEC.108	C.4.ME.75	C.4.MECT.09	'About you'
C.4.MEC.109	C.4.ME.75	C.4.MECT.01	'1'
C.4.MEC.110	C.4.ME.75	C.4.MECT.02	'1'
C.4.MEC.111	C.4.ME.76	C.4.MECT.01	'1'
C.4.MEC.112	C.4.ME.76	C.4.MECT.02	'1'
C.4.MEC.113	C.4.ME.78	C.4.MECT.10	'Signature'
C.4.MEC.114	C.4.ME.79	C.4.MECT.06	'FALSE'
C.4.MEC.115	C.4.ME.79	C.4.MECT.01	'1'
C.4.MEC.116	C.4.ME.79	C.4.MECT.02	'1'
C.4.MEC.117	C.4.ME.80	C.4.MECT.04	'Character'
C.4.MEC.118	C.4.ME.80	C.4.MECT.08	'ISO/IEC 9075-2'
C.4.MEC.119	C.4.ME.81	C.4.MECT.01	'1'
C.4.MEC.120	C.4.ME.81	C.4.MECT.02	'1'
C.4.MEC.121	C.4.ME.83	C.4.MECT.10	'Relationship'
C.4.MEC.122	C.4.ME.84	C.4.MECT.06	'FALSE'
C.4.MEC.123	C.4.ME.84	C.4.MECT.01	'1'
C.4.MEC.124	C.4.ME.84	C.4.MECT.02	'1'
C.4.MEC.125	C.4.ME.85	C.4.MECT.04	'Character'
C.4.MEC.126	C.4.ME.85	C.4.MECT.08	'ISO/IEC 9075-2'

Table C.27 represents the instances of the **Model_Element_Relationship_Type** class for the "New Employee Form" form design.

Table C.27 — Model_Element_Relationship_Type class for the Form Design example

Identifier	Designation
C.4.MERT.01	'(Form Design Element) Is contained within (Section Element)'
C.4.MERT.02	'(Localised Text) Is for (Text Presentation Element)'
C.4.MERT.03	'(Text Presentation Element) Is prompt for (Question Element)'
C.4.MERT.04	'(Text Presentation Element) Is label for (Question Element)'
C.4.MERT.05	'(Datatype) Is datatype for (Question Element Response)'
C.4.MERT.06	'(Response) Is response for (Question Element)'
C.4.MERT.07	'(List Item) Is contained within (List Field Question Element)'
C.4.MERT.08	'(Text Presentation Element) Is value meaning for (List Item)'
C.4.MERT.09	'(Unit of Measure) Is unit of measure for (Question Element Response)'

Table C.28 represents the instances of the **Model_Element_Relationship** class for the "New Employee Form" form design.

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Table C.28 — Model_Element_Relationship class for the Form Design example

Identifier	Subject_Model_Element. identifier	Object_Model_Element. identifier	Model_Element_ Relationship_Type. identifier
C.4.MER.01	C.4.ME.02	C.4.ME.01	C.4.MERT.01
C.4.MER.02	C.4.ME.05	C.4.ME.04	C.4.MERT.01
C.4.MER.03	C.4.ME.06	C.4.ME.05	C.4.MERT.03
C.4.MER.04	C.4.ME.07	C.4.ME.06	C.4.MERT.02
C.4.MER.05	C.4.ME.08	C.4.ME.05	C.4.MERT.06
C.4.MER.06	C.4.ME.09	C.4.ME.08	C.4.MERT.05
C.4.MER.07	C.4.ME.10	C.4.ME.04	C.4.MERT.01
C.3.MER.08	C.4.ME.11	C.4.ME.10	C.4.MERT.03
C.4.MER.09	C.4.ME.12	C.4.ME.11	C.4.MERT.02
C.4.MER.10	C.4.ME.13	C.4.ME.10	C.4.MERT.06
C.4.MER.11	C.4.ME.14	C.4.ME.13	C.4.MERT.05
C.4.MER.12	C.4.ME.15	C.4.ME.04	C.4.MERT.01
C.3.MER.13	C.4.ME.16	C.4.ME.15	C.4.MERT.03
C.4.MER.14	C.4.ME.17	C.4.ME.16	C.4.MERT.02
C.4.MER.15	C.4.ME.18	C.4.ME.15	C.4.MERT.06
C.4.MER.16	C.4.ME.19	C.4.ME.18	C.4.MERT.05
C.4.MER.17	C.4.ME.20	C.4.ME.04	C.4.MERT.01
C.4.MER.18	C.4.ME.21	C.4.ME.20	C.4.MERT.03
C.4.MER.19	C.4.ME.22	C.4.ME.21	C.4.MERT.02
C.4.MER.20	C.4.ME.23	C.4.ME.20	C.4.MERT.06
C.4.MER.21	C.4.ME.24	C.4.ME.23	C.4.MERT.05
C.4.MER.22	C.4.ME.25	C.4.ME.04	C.4.MERT.01
C.4.MER.23	C.4.ME.26	C.4.ME.25	C.4.MERT.04
C.4.MER.24	C.4.ME.27	C.4.ME.26	C.4.MERT.02
C.4.MER.25	C.4.ME.28	C.4.ME.25	C.4.MERT.06
C.4.MER.26	C.4.ME.29	C.4.ME.28	C.4.MERT.05
C.4.MER.27	C.4.ME.30	C.4.ME.28	C.4.MERT.07
C.4.MER.28	C.4.ME.31	C.4.ME.30	C.4.MERT.08
C.4.MER.29	C.4.ME.32	C.4.ME.31	C.4.MERT.02
C.4.MER.30	C.4.ME.33	C.4.ME.28	C.4.MERT.07
C.4.MER.31	C.4.ME.34	C.4.ME.33	C.4.MERT.08
C.4.MER.32	C.4.ME.35	C.4.ME.34	C.4.MERT.02
C.4.MER.33	C.4.ME.36	C.4.ME.28	C.4.MERT.07
C.4.MER.34	C.4.ME.37	C.4.ME.36	C.4.MERT.08
C.4.MER.35	C.4.ME.38	C.4.ME.37	C.4.MERT.02
C.4.MER.36	C.4.ME.39	C.4.ME.28	C.4.MERT.07
C.4.MER.37	C.4.ME.40	C.4.ME.39	C.4.MERT.08
C.4.MER.38	C.4.ME.41	C.4.ME.40	C.4.MERT.02
C.4.MER.39	C.4.ME.42	C.4.ME.28	C.4.MERT.07
C.4.MER.40	C.4.ME.43	C.4.ME.42	C.4.MERT.08
C.4.MER.41	C.4.ME.44	C.4.ME.43	C.4.MERT.02
C.4.MER.42	C.4.ME.45	C.4.ME.28	C.4.MERT.07

Table C.28 *(continued)*

Identifier	Subject_Model_Element. identifier	Object_Model_Element. identifier	Model_Element_ Relationship_Type. identifier
C.4.MER.43	C.4.ME.46	C.4.ME.45	C.4.MERT.08
C.4.MER.44	C.4.ME.47	C.4.ME.46	C.4.MERT.02
C.4.MER.45	C.4.ME.48	C.4.ME.04	C.4.MERT.01
C.4.MER.46	C.4.ME.49	C.4.ME.48	C.4.MERT.03
C.4.MER.47	C.4.ME.50	C.4.ME.49	C.4.MERT.02
C.4.MER.48	C.4.ME.51	C.4.ME.48	C.4.MERT.06
C.4.MER.49	C.4.ME.52	C.4.ME.51	C.4.MERT.09
C.4.MER.50	C.4.ME.53	C.4.ME.51	C.4.MERT.05
C.4.MER.51	C.4.ME.55	C.4.ME.54	C.4.MERT.01
C.4.MER.52	C.4.ME.56	C.4.ME.55	C.4.MERT.03
C.4.MER.53	C.4.ME.57	C.4.ME.56	C.4.MERT.02
C.4.MER.54	C.4.ME.58	C.4.ME.55	C.4.MERT.06
C.4.MER.55	C.4.ME.59	C.4.ME.58	C.4.MERT.05
C.4.MER.56	C.4.ME.60	C.4.ME.54	C.4.MERT.01
C.4.MER.57	C.4.ME.61	C.4.ME.60	C.4.MERT.03
C.4.MER.58	C.4.ME.62	C.4.ME.61	C.4.MERT.02
C.4.MER.59	C.4.ME.63	C.4.ME.60	C.4.MERT.06
C.4.MER.60	C.4.ME.64	C.4.ME.63	C.4.MERT.05
C.4.MER.61	C.4.ME.65	C.4.ME.54	C.4.MERT.01
C.4.MER.62	C.4.ME.66	C.4.ME.65	C.4.MERT.03
C.4.MERT.02	C.4.ME.67	C.4.ME.66	C.4.MERT.02
C.4.MER.64	C.4.ME.68	C.4.ME.65	C.4.MERT.06
C.4.MER.65	C.4.ME.69	C.4.ME.68	C.4.MERT.05
C.4.MER.66	C.4.ME.70	C.4.ME.54	C.4.MERT.01
C.4.MER.67	C.4.ME.71	C.4.ME.70	C.4.MERT.03
C.4.MER.68	C.4.ME.72	C.4.ME.71	C.4.MERT.02
C.4.MER.69	C.4.ME.73	C.4.ME.70	C.4.MERT.06
C.4.MER.70	C.4.ME.74	C.4.ME.73	C.4.MERT.05
C.4.MER.71	C.4.ME.76	C.4.ME.75	C.4.MERT.01
C.4.MER.72	C.4.ME.77	C.4.ME.76	C.4.MERT.03
C.4.MER.73	C.4.ME.78	C.4.ME.77	C.4.MERT.02
C.4.MER.74	C.4.ME.79	C.4.ME.76	C.4.MERT.06
C.4.MER.75	C.4.ME.80	C.4.ME.79	C.4.MERT.05
C.4.MER.76	C.4.ME.81	C.4.ME.75	C.4.MERT.01
C.4.MER.77	C.4.ME.82	C.4.ME.81	C.4.MERT.03
C.4.MER.78	C.4.ME.83	C.4.ME.82	C.4.MERT.02
C.4.MER.79	C.4.ME.84	C.4.ME.81	C.4.MERT.06
C.4.MER.80	C.4.ME.85	C.4.ME.84	C.4.MERT.05

C.5   JSON Schema example

C.5.1   Overview of example

This example is based on a student registration scenario which is shown as a UML class diagram at Figure C.5.
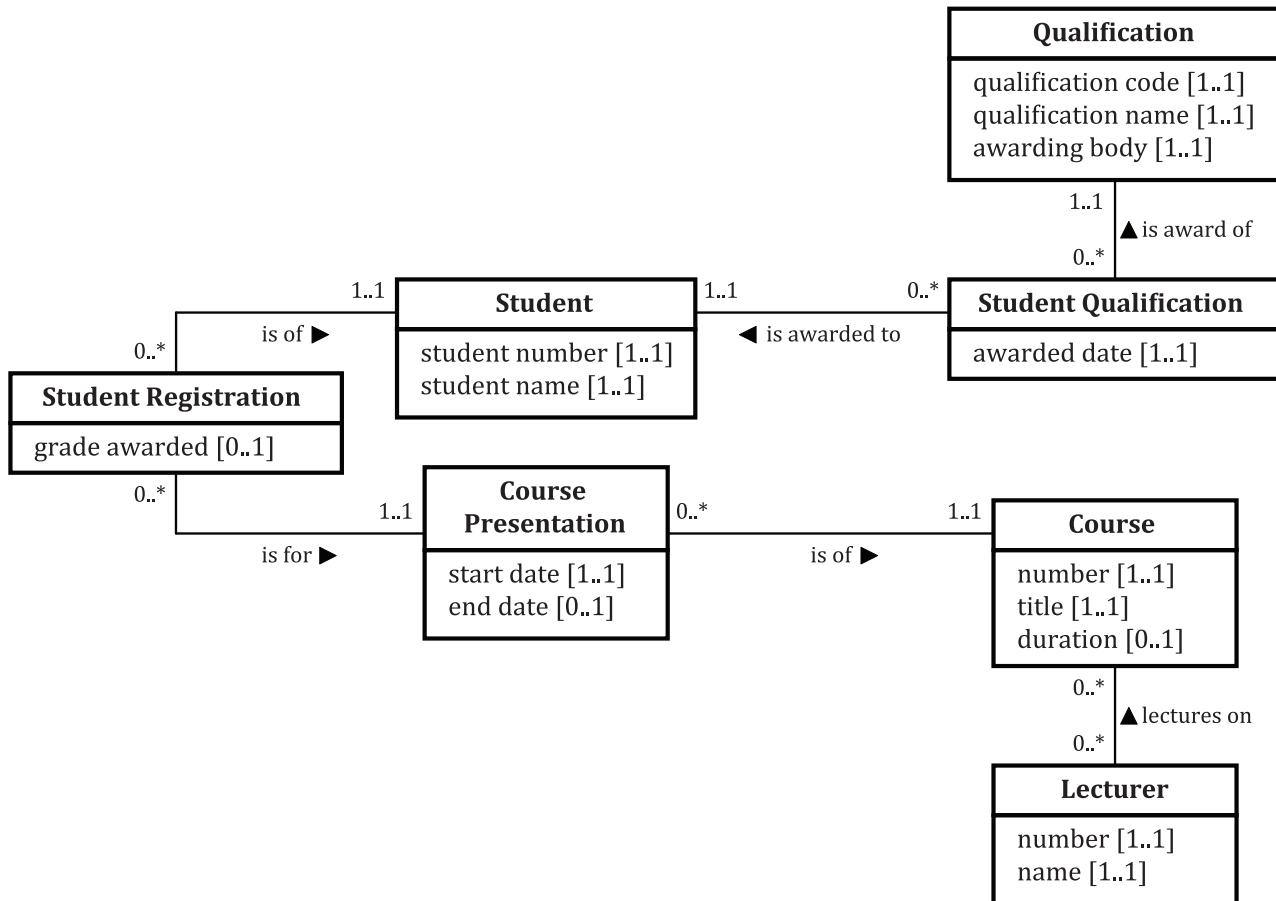
Figure C.5 — UML class diagram for the student registration scenario

The JSON Schema for this scenario is at Figure C.6.

```
{
    "$schema": "http://json-schema.org/schema#",
    "$id": "http://mydomain.ac.uk/schemas/course-presentation.json",
    "title": "course presentation JSON Schema",
    "type": "object",
    "properties": {
        "course": {"$ref": "#/definitions/course"},
        "start-date": {"type": "string"},
        "end-date": {"type": "string"},
        "registrations": {
            "type": "array",
            "items": [{"$ref": "#/definitions/student-registration"}]
        }},
```

Figure C.6 — JSON schema for the student registration scenario (1 of 3)

```
        "required": [
            "course",
            "start-date"
        ]
,    "definitions": {
    "student-registration": {
        "type": "object",
        "properties": {
            "student" : {"$ref": "#/definitions/student"},
            "grade-awarded": {"$ref": "#/definitions/grade"}
        },
        "required": ["student"]
    },
    "course": {
        "type": "object",
        "properties": {
            "number": {"type": "string"},
            "title": {"type": "string"},
            "duration": {"type": "string"},
            "course-lecturer": {
                "type": "array",
                "items": [{"$ref": "#/definitions/lecturer"}]
            }
        },
        "required": [
            "number",
            "title"
        ]
    },
    "grade": {
        "type": "string",
        "enum": [
            "a",
            "b",
            "c",
            "d",
            "e"
        ]
    },
    "lecturer": {
        "type": "object",
        "properties": {
            "number": {"type": "string"},
            "name": {"type": "string"}
        },           "required": [
            "number",
            "name"
        ]
    },
    "student": {
        "type": "object",
        "properties": {
            "student-number": {"type": "string"},
            "student-name": {"type": "string"},
            "student-qualifications": {
                "type": "array",
                "items": [{"$ref": "#/definitions/award"}]
            }
        },
```

Figure C.6 — JSON schema for the student registration scenario (2 of 3)

```
                "required": [
                    "student-number",
                    "student-name"
                ]
            },
            "award": {
                "type": "object",
                "properties": {
                    "qualification" : {"$ref": "#/definitions/qualification"},
                    "award-date": {"type": "string"}
                },
                "additional-properties": "false",
                "required": [
                    "qualification",
                    "award-date"
                ]
            },
            "qualification": {
                "type": "object",
                "properties": {
                    "qualification-code": {"type": "string"},
                    "qualification-name": {"type": "string"},
                    "awarding-body": {"type": "string"}
                },
                "required": [
                    "qualification-code",
                    "qualification-name",
                    "awarding-body"
                ]
            }
        }
    }
}
```

Figure C.6 — JSON schema for the student registration scenario (3 of 3)

C.5.2   Details of the instances of classes for this example

Table C.29 represents the instances of the **Modelling_Language** class for the "Student Registration" JSON Schema.

Table C.29 — Modelling_Language class for the JSON Schema example

Identifier	Designation
C.5.ML.01	'http://json-schema.org/schema#'

Table C.30 represents the instances of the **Model** class for the "Student Registration" JSON Schema

Table C.30 — Model class for the JSON Schema example

Identifier	Designation	Context*	Modelling_Language. identifier
C.5.M.01	'http://mydomain.ac.uk/schemas/course -presentation.json'	'course presentation JSON Schema'	C.5.ML.01
Note*: The registration of a 'Context' is achieved using the facilities of the Designation and Definition package specified in clause 8 of ISO/IEC 11179-3.			

Table C.31 represents the instances of the **Model_Element_Type** class for the "Student Registration" JSON Schema.

Table C.31 — Model_Element_Type class for the JSON Schema example

Identifier	Designation
C.5.MET.01	'object'
C.5.MET.02	'property'
C.5.MET.03	'property-array'

Table C.32 represents the instances of the **Model_Element** class for the "Student Registration" JSON Schema.

Table C.32 — Model_Element class for the JSON Schema example

Identifier	Designation	Model. identifier	Model_Element_Type. identifier
C.5.ME.01	'course-presentation'C.5.M.01	C.5.M.01	C.5.MET.01
C.5.ME.02	'course-presentation.course'	C.5.M.01	C.5.MET.03
C.5.ME.03	'course-presentation.start-date'	C.5.M.01	C.5.MET.02
C.5.ME.04	'course-presentation.end-date'	C.5.M.01	C.5.MET.02
C.5.ME.05	'course-presentation.registrations'	C.5.M.01	C.5.MET.03
C.5.ME.06	'student-registration'	C.5.M.01	C.5.MET.01
C.5.ME.07	'student-registration.student'	C.5.M.01	C.5.MET.02
C.5.ME.08	'student-registration.grade-awarded'	C.5.M.01	C.5.MET.02
C.5.ME.09	'course'	C.5.M.01	C.5.MET.01
C.5.ME.10	'course.number'	C.5.M.01	C.5.MET.02
C.5.ME.11	'course.title'	C.5.M.01	C.5.MET.02
C.5.ME.12	'course.duration'	C.5.M.01	C.5.MET.02
C.5.ME.13	'course.course-lecturer'	C.5.M.01	C.5.MET.03
C.5.ME.14	'grade'	C.5.M.01	C.5.MET.01
C.5.ME.15	'lecturer'	C.5.M.01	C.5.MET.01
C.5.ME.16	'lecturer.number'	C.5.M.01	C.5.MET.02
C.5.ME.17	'lecturer.name'	C.5.M.01	C.5.MET.02
C.5.ME.18	'student'	C.5.M.01	C.5.MET.01
C.5.ME.19	'student.student-number'	C.5.M.01	C.5.MET.02
C.5.ME.20	'student.student-name'	C.5.M.01	C.5.MET.02
C.5.ME.21	'student.student-qualifications'	C.5.M.01	C.5.MET.03
C.5.ME.22	'award'	C.5.M.01	C.5.MET.01
C.5.ME.23	'award.qualification'	C.5.M.01	C.5.MET.03
C.5.ME.24	'award.award-date'	C.5.M.01	C.5.MET.02
C.5.ME.25	'qualification'	C.5.M.01	C.5.MET.01
C.5.ME.26	'qualification.qualification-code'	C.5.M.01	C.5.MET.02
C.5.ME.27	'qualification.qualification-name'	C.5.M.01	C.5.MET.02
C.5.ME.28	'qualification.awarding-body'	C.5.M.01	C.5.MET.02

Table C.33 represents the instances of the **Model_Element_Characteristic_Type** class for the "Student Registration" JSON Schema.

Table C.33 — Model_Element_Characteristic_Type class for the JSON Schema example

Identifier	Designation
C.5.MECT.01	'additional-properties'
C.5.MECT.02	'datatype'
C.5.MECT.03	'enumeration'
C.5.MECT.04	'required'
C.5.MECT.05	'title'

Table C.34 represents the instances of the **Model_Element_Characteristic** class for the "Student Registration" JSON Schema.

Table C.34 — Model_Element_Characteristic class for the JSON Schema example

Identifier	Model_Element. identifier	Model_Element_ Characteristic_Type. identifier	Value
C.5.MEC.01	C.5.ME.01	C.5.MECT.05	'course-presentation'
C.5.MEC.02	C.5.ME.02	C.5.MECT.05	'course'
C.5.MEC.03	C.5.ME.02	C.5.MECT.04	'TRUE'
C.5.MEC.04	C.5.ME.03	C.5.MECT.05	'start-date'
C.5.MEC.05	C.5.ME.03	C.5.MECT.02	'string'
C.5.MEC.06	C.5.ME.03	C.5.MECT.04	'TRUE'
C.5.MEC.07	C.5.ME.04	C.5.MECT.05	'end-date'
C.5.MEC.08	C.5.ME.04	C.5.MECT.02	'string'
C.5.MEC.09	C.5.ME.05	C.5.MECT.05	'registrations'
C.5.MEC.10	C.5.ME.06	C.5.MECT.05	'student-registration'
C.5.MEC.11	C.5.ME.07	C.5.MECT.05	'student'
C.5.MEC.12	C.5.ME.07	C.5.MECT.04	'TRUE'
C.5.MEC.13	C.5.ME.08	C.5.MECT.05	'grade-awarded'
C.5.MEC.14	C.5.ME.09	C.5.MECT.05	'course'
C.5.MEC.15	C.5.ME.10	C.5.MECT.05	'number'
C.5.MEC.16	C.5.ME.10	C.5.MECT.02	'string'
C.5.MEC.17	C.5.ME.10	C.5.MECT.04	'TRUE'
C.5.MEC.18	C.5.ME.11	C.5.MECT.05	'title'
C.5.MEC.19	C.5.ME.11	C.5.MECT.02	'string'
C.5.MEC.20	C.5.ME.11	C.5.MECT.04	'TRUE'
C.5.MEC.21	C.5.ME.12	C.5.MECT.05	'duration'
C.5.MEC.22	C.5.ME.12	C.5.MECT.02	'string'
C.5.MEC.23	C.5.ME.13	C.5.MECT.05	'course-lecturer'
C.5.MEC.24	C.5.ME.14	C.5.MECT.05	'grade'
C.5.MEC.25	C.5.ME.14	C.5.MECT.02	'string'
C.5.MEC.26	C.5.ME.14	C.5.MECT.03	'in ("a", "b", "c", "d", "e")
C.5.MEC.27	C.5.ME.15	C.5.MECT.05	'lecturer'
C.5.MEC.28	C.5.ME.16	C.5.MECT.05	'number'

Table C.34 *(continued)*

Identifier	Model_Element. identifier	Model_Element_ Characteristic_Type. identifier	Value
C.5.MEC.29	C.5.ME.16	C.5.MECT.02	'string'
C.5.MEC.30	C.5.ME.16	C.5.MECT.04	'TRUE'
C.5.MEC.31	C.5.ME.17	C.5.MECT.05	'name'
C.5.MEC.32	C.5.ME.17	C.5.MECT.02	'string'
C.5.MEC.33	C.5.ME.17	C.5.MECT.04	'TRUE'
C.5.MEC.34	C.5.ME.18	C.5.MECT.05	'student'
C.5.MEC.35	C.5.ME.19	C.5.MECT.05	'student-number'
C.5.MEC.36	C.5.ME.19	C.5.MECT.02	'string'
C.5.MEC.37	C.5.ME.19	C.5.MECT.04	'TRUE'
C.5.MEC.38	C.5.ME.20	C.5.MECT.05	'student-name'
C.5.MEC.39	C.5.ME.20	C.5.MECT.02	'string'
C.5.MEC.40	C.5.ME.20	C.5.MECT.04	'TRUE'
C.5.MEC.41	C.5.ME.21	C.5.MECT.05	'student-qualifications'
C.5.MEC.42	C.5.ME.22	C.5.MECT.05	'award'
C.5.MEC.43	C.5.ME.22	C.5.MECT.01	'false'
C.5.MEC.44	C.5.ME.23	C.5.MECT.05	'qualification'
C.5.MEC.45	C.5.ME.23	C.5.MECT.04	'TRUE'
C.5.MEC.46	C.5.ME.24	C.5.MECT.05	'award-date'
C.5.MEC.47	C.5.ME.24	C.5.MECT.02	'string'
C.5.MEC.48	C.5.ME.24	C.5.MECT.04	'TRUE'
C.5.MEC.49	C.5.ME.25	C.5.MECT.05	'qualification'
C.5.MEC.50	C.5.ME.26	C.5.MECT.05	'qualification-code'
C.5.MEC.51	C.5.ME.26	C.5.MECT.02	'string'
C.5.MEC.52	C.5.ME.26	C.5.MECT.04	'TRUE'
C.5.MEC.53	C.5.ME.27	C.5.MECT.05	'qualification-name'
C.5.MEC.54	C.5.ME.27	C.5.MECT.02	'string'
C.5.MEC.55	C.5.ME.27	C.5.MECT.04	'TRUE'
C.5.MEC.56	C.5.ME.28	C.5.MECT.05	'awarding-body'
C.5.MEC.57	C.5.ME.28	C.5.MECT.02	'string'
C.5.MEC.58	C.5.ME.28	C.5.MECT.04	'TRUE'

Table C.35 represents the instances of the **Model_Element_Relationship_Type** class for the "Student Registration" JSON Schema.

Table C.35 — Model_Element_Relationship_Type class for the JSON Schema example

Identifier	Designation
C.5.MERT.01	'(Property) Is of (Object)'
C.5.MERT.02	'(Object) Is referenced as (Property)'

Table C.36 represents the instances of the **Model_Element_Relationship** class for the "Student Registration" JSON Schema.

Table C.36 — Model_Element_Relationship class for the JSON Schema example

Identifier	Subject_Model_Element. identifier	Object_Model_Element. identifier	Model_Element_ Relationship_Type. identifier
C.5.MER.01	C.5.ME.02	C.5.ME.01	C.5.MERT.01
C.5.MER.02	C.5.ME.03	C.5.ME.01	C.5.MERT.01
C.5.ME.01	C.5.ME.04	C.5.ME.01	C.5.MERT.01
C.5.MER.04	C.5.ME.05	C.5.ME.01	C.5.MERT.01
C.5.MER.05	C.5.ME.06	C.5.ME.05	C.5.MERT.02
C.5.MER.06	C.5.ME.07	C.5.ME.06	C.5.MERT.01
C.5.MER.07	C.5.ME.08	C.5.ME.06	C.5.MERT.01
C.5.MER.08	C.5.ME.09	C.5.ME.02	C.5.MERT.02
C.5.MER.09	C.5.ME.10	C.5.ME.09	C.5.MERT.01
C.5.MER.10	C.5.ME.11	C.5.ME.09	C.5.MERT.01
C.5.MER.11	C.5.ME.12	C.5.ME.09	C.5.MERT.01
C.5.MER.12	C.5.ME.13	C.5.ME.09	C.5.MERT.01
C.5.MER.13	C.5.ME.14	C.5.ME.08	C.5.MERT.02
C.5.MER.14	C.5.ME.15	C.5.ME.13	C.5.MERT.02
C.5.MER.15	C.5.ME.18	C.5.ME.07	C.5.MERT.02
C.5.MER.16	C.5.ME.19	C.5.ME.18	C.5.MERT.01
C.5.MER.17	C.5.ME.20	C.5.ME.18	C.5.MERT.01
C.5.MER.18	C.5.ME.21	C.5.ME.18	C.5.MERT.01
C.5.MER.19	C.5.ME.22	C.5.ME.21	C.5.MERT.02
C.5.MER.20	C.5.ME.23	C.5.ME.22	C.5.MERT.01
C.5.MER.21	C.5.ME.24	C.5.ME.22	C.5.MERT.01
C.5.MER.22	C.5.ME.25	C.5.ME.24	C.5.MERT.02
C.5.MER.23	C.5.ME.26	C.5.ME.25	C.5.MERT.01
C.5.MER.24	C.5.ME.27	C.5.ME.25	C.5.MERT.01
C.5.MER.25	C.5.ME.28	C.5.ME.25	C.5.MERT.01

C.6   Ellis-Barker metamodel example

C.6.1   Overview of example

Figure C.7 shows the metamodel for the Ellis-Barker entity-relationship modelling notation. This metamodel is itself drawn using the Ellis-Barker notation.
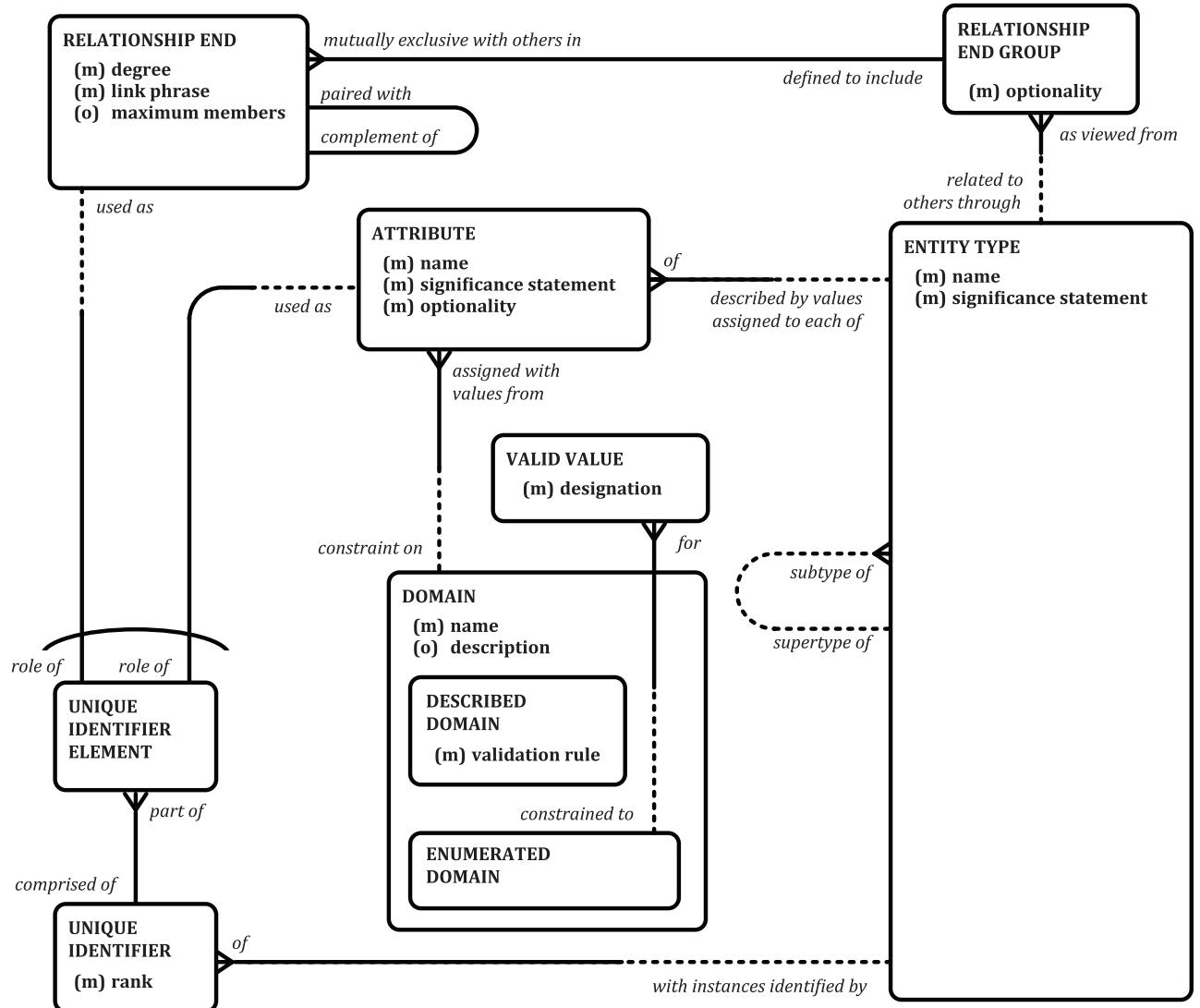
**Figure C.7 — Metamodel for the Ellis-Barker entity-relationship notation**

C.6.2   Details of the instances of classes for this example

Table C.37 represents the instances of the **Modelling_Language** class for the Ellis-Barker metamodel.

Table C.37 — Modelling_Language class for the Ellis-Barker metamodel example

Identifier	Designation	Definition
C.6.ML.01	'Ellis Barker entity-relationship notation'	'An entity-relationship notation developed by Harry Ellis and Richard Barker with the aim of minimising contact with the user community.'

Table C.38 represents the instances of the **Model** class for the Ellis-Barker metamodel.

Table C.38 — Model class for the Ellis-Barker metamodel example

Identifier	Designation	Modelling_Language.identifier
C.6.M.01	'Metamodel for the Ellis Barker notation'	C.6.ML.01

Table C.39 represents the instances of the **Model_Element_Type** class for the Ellis-Barker metamodel.

Table C.39 — Model_Element_Type class the Ellis-Barker metamodel example

Identifier	Designation
C.6.MET.01	'Entity Type''
C.6.MET.02	'Attribute'
C.6.MET.03	'Relationship End Group'
C.6.MET.04	'Relationship End'

Table C.40 represents the instances of the **Model_Element** class for the Ellis-Barker metamodel.

Table C.40 — Model_Element class for the Ellis-Barker metamodel example

Identifier	Designation	Model. identifier	Model_Element_Type. identifier
C.6.ME.01	'Entity Type'	C.6.M.01	C.6.MET.01
C.6.ME.02	'Entity Type name'	C.6.M.01	C.6.MET.02
C.6.ME.03	'Entity Type significance statement'	C.6.M.01	C.6.MET.02
C.6.ME.04	'Attribute'	C.6.M.01	C.6.MET.01
C.6.ME.05	'Attribute name'	C.6.M.01	C.6.MET.02
C.6.ME.06	'Attribute significance statement'	C.6.M.01	C.6.MET.02
C.6.ME.07	'Attribute optionality'	C.6.M.01	C.6.MET.02
C.6.ME.08	'Domain'	C.6.M.01	C.6.MET.01
C.6.ME.09	'Domain name'	C.6.M.01	C.6.MET.02
C.6.ME.10	'Domain description'	C.6.M.01	C.6.MET.02
C.6.ME.11	'Described Domain'	C.6.M.01	C.6.MET.01
C.6.ME.12	'Described Domain validation rule'	C.6.M.01	C.6.MET.02
C.6.ME.13	'Enumerated Domain'	C.6.M.01	C.6.MET.01
C.6.ME.14	'Valid Value'	C.6.M.01	C.6.MET.01
C.6.ME.15	'Valid Value designation'	C.6.M.01	C.6.MET.02
C.6.ME.16	'Relationship End Group'	C.6.M.01	C.6.MET.01
C.6.ME.17	'Relationship End Group optionality'	C.6.M.01	C.6.MET.02
C.6.ME.18	'Relationship End'	C.6.M.01	C.6.MET.01
C.6.ME.19	'Relationship End degree'	C.6.M.01	C.6.MET.02
C.6.ME.20	'Relationship End link phrase'	C.6.M.01	C.6.MET.02

Table C.40 *(continued)*

Identifier	Designation	Model. identifier	Model_Element_Type. identifier
C.6.ME.21	'Relationship End maximum members'	C.6.M.01	C.6.MET.02
C.6.ME.22	'Unique Identifier'	C.6.M.01	C.6.MET.01
C.6.ME.23	'Unique Identifier rank'	C.6.M.01	C.6.MET.02
C.6.ME.24	'Unique Identifier Element''	C.6.M.01	C.6.MET.01
C.6.ME.25	'Relationship End Group for Entity Type described by values assigned to each of Attribute'	C.6.M.01	C.6.MET.03
C.6.ME.26	'Relationship End for Entity Type described by values assigned to each of Attribute'	C.6.M.01	C.6.MET.04
C.6.ME.27	'Relationship End Group for Entity Type related to others through Relationship End Group'	C.6.M.01	C.6.MET.03
C.6.ME.28	'Relationship End for Entity Type related to others through Relationship End Group'	C.6.M.01	C.6.MET.04
C.6.ME.29	'Relationship End Group for Entity Type with in-stances identified by Unique Identifier'	C.6.M.01	C.6.MET.03
C.6.ME.30	'Relationship End for Entity Type with instances identified by Unique Identifier'	C.6.M.01	C.6.MET.04
C.6.ME.31	'Relationship End Group for Entity Type subtype of Entity Type'	C.6.M.01	C.6.MET.03
C.6.ME.32	'Relationship End for Entity Type subtype of Entity Type'	C.6.M.01	C.6.MET.04
C.6.ME.33	'Relationship End Group for Entity Type supertype of Entity Type'	C.6.M.01	C.6.MET.03
C.6.ME.34	'Relationship End for Entity Type supertype of Entity Type'	C.6.M.01	C.6.MET.04
C.6.ME.35	'Relationship End Group for Relationship End Group as viewed from Entity Type'	C.6.M.01	C.6.MET.03
C.6.ME.36	'Relationship End for Relationship End Group as viewed from Entity Type'	C.6.M.01	C.6.MET.04
C.6.ME.37	'Relationship End Group for Relationship End Group defined to include Relationship End'	C.6.M.01	C.6.MET.03
C.6.ME.38	'Relationship End for Relationship End Group de-fined to include Relationship End'	C.6.M.01	C.6.MET.04
C.6.ME.39	'Relationship End Group for Relationship End mutu-ally exclusive with others in Relationship End Group'	C.6.M.01	C.6.MET.03
C.6.ME.40	'Relationship End for Relationship End mutually exclusive with others in Relationship End Group'	C.6.M.01	C.6.MET.04
C.6.ME.41	'Relationship End Group for Relationship End paired with Relationship End'	C.6.M.01	C.6.MET.03
C.6.ME.42	'Relationship End for Relationship End paired with Relationship End'	C.6.M.01	C.6.MET.04
C.6.ME.43	'Relationship End Group for Relationship End com-plement of Relationship End'	C.6.M.01	C.6.MET.03
C.6.ME.44	'Relationship End for Relationship End complement of Relationship End'	C.6.M.01	C.6.MET.04
C.6.ME.45	'Relationship End Group for Attribute of Entity Type'	C.6.M.01	C.6.MET.03
C.6.ME.46	'Relationship End for Attribute of Entity Type'	C.6.M.01	C.6.MET.04
C.6.ME.47	'Relationship End Group for Attribute assigned with values from Domain'	C.6.M.01	C.6.MET.03

Table C.40 *(continued)*

Identifier	Designation	Model. identifier	Model_Element_Type. identifier
C.6.ME.48	'Relationship End for Attribute assigned with values from Domain'	C.6.M.01	C.6.MET.04
C.6.ME.49	'Relationship End Group for Attribute used as Unique Identifier Element'	C.6.M.01	C.6.MET.03
C.6.ME.50	'Relationship End for Attribute used as Unique Identifier Element'	C.6.M.01	C.6.MET.04
C.6.ME.51	'Relationship End Group for Relationship End used as Unique Identifier Element'	C.6.M.01	C.6.MET.03
C.6.ME.52	'Relationship End for Relationship End used as Unique Identifier Element'	C.6.M.01	C.6.MET.04
C.6.ME.53	'Relationship End Group for Domain constraint on Attribute'	C.6.M.01	C.6.MET.03
C.6.ME.54	'Relationship End for Domain constraint on Attribute'	C.6.M.01	C.6.MET.04
C.6.ME.55	'Relationship End Group for Enumerated Domain constrained to Valid Value'	C.6.M.01	C.6.MET.03
C.6.ME.56	'Relationship End for Enumerated Domain constrained to Valid Value'	C.6.M.01	C.6.MET.04
C.6.ME.57	'Relationship End Group for Valid Value for Enumerated Domain'	C.6.M.01	C.6.MET.03
C.6.ME.58	'Relationship End for Valid Value for Enumerated Domain'	C.6.M.01	C.6.MET.04
C.6.ME.59	'Relationship End Group for Unique Identifier of Entity Type'	C.6.M.01	C.6.MET.03
C.6.ME.60	'Relationship End for Unique Identifier of Entity Type'	C.6.M.01	C.6.MET.04
C.6.ME.61	'Relationship End Group for Unique Identifier comprised of Unique Identifier Element'	C.6.M.01	C.6.MET.03
C.6.ME.62	'Relationship End for Unique Identifier comprised of Unique Identifier Element'	C.6.M.01	C.6.MET.04
C.6.ME.63	'Relationship End Group for Unique Identifier Element part of Unique Identifier'	C.6.M.01	C.6.MET.03
C.6.ME.64	'Relationship End Group for Unique Identifier Element part of Unique Identifier'	C.6.M.01	C.6.MET.04
C.6.ME.65	'Relationship End Group for Unique Identifier Element role of Relationship End or Attribute'	C.6.M.01	C.6.MET.03
C.6.ME.66	'Relationship End for Unique Identifier Element role of Relationship End'	C.6.M.01	C.6.MET.04
C.6.ME.67	'Relationship End for Unique Identifier Element role of Attribute'	C.6.M.01	C.6.MET.04

Table C.41 represents the instances of the **Model_Element_Characteristic_Type** class for the Ellis-Barker metamodel

Table C.41 — Model_Element_Characteristic_Type class for the Ellis-Barker metamodel example

Identifier	Designation	Definition
C.6.MECT.01	'name'	--
C.6.MECT.02	'significance statement'	'A statement as to why this Entity Type or attribute is included in the model'

Table C.41 *(continued)*

Identifier	Designation	Definition
C.6.MECT.03	'optionality'	'Either "mandatory" or "optional". For a Relationship End Group. "mandatory" is read as "must be" and "optional" is read as "may be".'
C.6.MECT.04	'assigned with values from Domain'	--
C.6.MECT.05	'degree'	'Valid values are "one or more" and "one and only one".'
C.6.MECT.06	'link phrase'	--

Table C.42 represents the instances of the **Model_Element_Characteristic** class for the Ellis-Barker metamodel.

Table C.42 — Model_Element_Characteristic class for the Ellis-Barker metamodel example

Identifier	Model_Element. identifier	Model_Element_ Characteristic_Type. identifier	Value
C.6.MEC.001	C.6.ME.01	C.6.MECT.01	'ENTITY TYPE'
C.6.MEC.002	C.6.ME.01	C.6.MECT.02	'A concept or thing of significance about which information may need to held in support of business operations'
C.6.MEC.003	C.6.ME.02	C.6.MECT.01	'name'
C.6.MEC.004	C.6.ME.02	C.6.MECT.02	'Every Entity Type must have a name so that it can be identified'
C.6.MEC.005	C.6.ME.02	C.6.MECT.03	'mandatory'
C.6.MEC.006	C.6.ME.02	C.6.MECT.04	'free text Described Domain'
C.6.MEC.007	C.6.ME.03	C.6.MECT.01	'significance statement'
C.6.MEC.008	C.6.ME.03	C.6.MECT.02	'Every Entity Type must have a significance statement so that the reason for its inclusion in the model is explained'
C.6.MEC.009	C.6.ME.03	C.6.MECT.03	'mandatory'
C.6.MEC.010	C.6.ME.03	C.6.MECT.04	'free text Described Domain'
C.6.MEC.011	C.6.ME.04	C.6.MECT.01	'ATTRIBUTE'
C.6.MEC.012	C.6.ME.04	C.6.MECT.02	'A characteristic that is used to qualify, identify, classify, quantify or in some other way express the state of the related entity type'
C.6.MEC.013	C.6.ME.05	C.6.MECT.01	'name'
C.6.MEC.014	C.6.ME.05	C.6.MECT.02	'Every Attribute must have a name that is unique within the set of Attributes for the Entity Type so that it can be identified'
C.6.MEC.015	C.6.ME.05	C.6.MECT.03	'mandatory'
C.6.MEC.016	C.6.ME.05	C.6.MECT.04	'free text Described Domain'
C.6.MEC.017	C.6.ME.06	C.6.MECT.01	'significance statement'
C.6.MEC.018	C.6.ME.06	C.6.MECT.02	'Every Attribute must have a significance statement so that the reason for its inclusion in the model is explained'
C.6.MEC.019	C.6.ME.06	C.6.MECT.03	'mandatory'
C.6.MEC.020	C.6.ME.06	C.6.MECT.04	'free text Described Domain'
C.6.MEC.021	C.6.ME.07	C.6.MECT.01	'optionality'

Table C.42 *(continued)*

Identifier	Model_Element. identifier	Model_Element_ Characteristic_Type. identifier	Value
C.6.MEC.022	C.6.ME.07	C.6.MECT.02	'The optionality of an attribute indicates whether a value for the attribute must be recorded (mandatory) or not (optional)'
C.6.MEC.023	C.6.ME.07	C.6.MECT.03	'mandatory'
C.6.MEC.024	C.6.ME.07	C.6.MECT.04	'attribute optionality Enumerated Domain {"mandatory", "optional"}'
C.6.MEC.025	C.6.ME.08	C.6.MECT.01	'DOMAIN'
C.6.MEC.026	C.6.ME.08	C.6.MECT.02	'A set of features that characterize one or more Attributes'
C.6.MEC.027	C.6.ME.09	C.6.MECT.01	'name'
C.6.MEC.028	C.6.ME.09	C.6.MECT.02	'Every Domain must have a name so that it can be identified'
C.6.MEC.029	C.6.ME.09	C.6.MECT.03	'mandatory'
C.6.MEC.030	C.6.ME.09	C.6.MECT.04	'free text Described Domain'
C.6.MEC.031	C.6.ME.10	C.6.MECT.01	'description'
C.6.MEC.032	C.6.ME.10	C.6.MECT.02	'A statement providing any additional information that will contribute to the use of the Domain'
C.6.MEC.033	C.6.ME.10	C.6.MECT.03	'optional'
C.6.MEC.034	C.6.ME.10	C.6.MECT.04	'free text Described Domain'
C.6.MEC.035	C.6.ME.11	C.6.MECT.01	'DESCRIBED DOMAIN'
C.6.MEC.036	C.6.ME.11	C.6.MECT.02	'A subset of Domain where the features that characterize one or more Attributes are specified using a validation rule'
C.6.MEC.037	C.6.ME.12	C.6.MECT.01	'validation rule'
C.6.MEC.038	C.6.ME.12	C.6.MECT.02	'A rule that specifies how values of the described domain are constructed'
C.6.MEC.039	C.6.ME.12	C.6.MECT.03	'mandatory'
C.6.MEC.040	C.6.ME.12	C.6.MECT.04	'free text Described Domain'
C.6.MEC.041	C.6.ME.13	C.6.MECT.01	'ENUMERATED DOMAIN'
C.6.MEC.042	C.6.ME.13	C.6.MECT.02	'A subset of Domain where the features that characterize one or more Attributes are specified as a fixed set of valid values'
C.6.MEC.043	C.6.ME.14	C.6.MECT.01	'VALID VALUE'
C.6.MEC.044	C.6.ME.14	C.6.MECT.02	'A value assigned to aan Enumerated Do-main'
C.6.MEC.045	C.6.ME.15	C.6.MECT.01	'designation'
C.6.MEC.046	C.6.ME.15	C.6.MECT.02	'A specification of the actual value for this Valid Value'
C.6.MEC.047	C.6.ME.15	C.6.MECT.03	'mandatory'
C.6.MEC.048	C.6.ME.15	C.6.MECT.04	'free text Described Domain'
C.6.MEC.049	C.6.ME.16	C.6.MECT.01	'RELATIONSHIP END GROUP'

Table C.42 *(continued)*

Identifier	Model_Element. identifier	Model_Element_ Characteristic_Type. identifier	Value
C.6.MEC.050	C.6.ME.16	C.6.MECT.02	'Statement that links one or more Relationship Ends to their host Entity Type such that they are mutually exclusive. If the group is mandatory ("must be") then just one of these Relationship Ends must be represented by for each instance of the Entity Type. If the group is optional ("may be") each instance may have just one of these or none at all. The most common case is where the group comprises just one Relationship End which must be represented if the group is mandatory.'
C.6.MEC.051	C.6.ME.17	C.6.MECT.01	'optionality'
C.6.MEC.052	C.6.ME.17	C.6.MECT.02	'An indication as to whether all of the Relationship Ends in this Relationship End Group are mandatory or optional''
C.6.MEC.053	C.6.ME.17	C.6.MECT.03	'mandatory'
C.6.MEC.054	C.6.ME.17	C.6.MECT.04	'relationship end group optionality Enumerated Domain {"must be", "may be"}'
C.6.MEC.055	C.6.ME.18	C.6.MECT.01	'RELATIONSHIP END'
C.6.MEC.056	C.6.ME.18	C.6.MECT.02	'Part of the definition of a relationship as seen from the host Entity Type.'
C.6.MEC.057	C.6.ME.19	C.6.MECT.01	'degree'
C.6.MEC.058	C.6.ME.19	C.6.MECT.02	'An indication as to whether many or only one instance of the related Entity Type may be involved in the relationship at any one time.'
C.6.MEC.059	C.6.ME.19	C.6.MECT.03	'mandatory'
C.6.MEC.060	C.6.ME.19	C.6.MECT.04	'relationship end degree Enumerated Domain {"one or many", "one and only one"}'
C.6.MEC.061	C.6.ME.20	C.6.MECT.01	'link phrase'
C.6.MEC.062	C.6.ME.20	C.6.MECT.02	'A form of words which helps to express the relationship as a sentence. This sentence is formed by combining the link phrase with the names of both host and related Entity Types together with the optionality of the Relationship End Group of which this Relationship End is a member and the degree of this Relationship End'
C.6.MEC.063	C.6.ME.20	C.6.MECT.03	'mandatory'
C.6.MEC.064	C.6.ME.20	C.6.MECT.04	'free text Described Domain'
C.6.MEC.065	C.6.ME.21	C.6.MECT.01	'maximum members'
C.6.MEC.066	C.6.ME.21	C.6.MECT.02	'A statement of the maximum number of instances of the related Entity Type (if any) that may participate in the relationship'
C.6.MEC.067	C.6.ME.21	C.6.MECT.03	'optional'
C.6.MEC.068	C.6.ME.21	C.6.MECT.04	'number Described Domain'
C.6.MEC.069	C.6.ME.22	C.6.MECT.01	'UNIQUE IDENTIFIER'

Table C.42 *(continued)*

Identifier	Model_Element. identifier	Model_Element_ Characteristic_Type. identifier	Value
C.6.MEC.070	C.6.ME.22	C.6.MECT.02	'A statement of the combination of Attributes or Relationship Ends, or both, that in combination can uniquely identify instances of the host Entity Type.'
C.6.MEC.071	C.6.ME.23	C.6.MECT.01	'rank'
C.6.MEC.072	C.6.ME.23	C.6.MECT.02	'A statement of the priority of this Unique Identifier within the set Unique Identifiers specified for the host Entity Type.'
C.6.MEC.073	C.6.ME.23	C.6.MECT.03	'mandatory'
C.6.MEC.074	C.6.ME.23	C.6.MECT.04	'number Described Domain'
C.6.MEC.075	C.6.ME.24	C.6.MECT.01	'UNIQUE IDENTIFIER ELEMENT'
C.6.MEC.076	C.6.ME.24	C.6.MECT.02	'The use of an Attribute or a Relationship End as part of the related Unique Identifier.'
C.6.MEC.077	C.6.ME.25	C.6.MECT.03	'may be'
C.6.MEC.078	C.6.ME.26	C.6.MECT.05	'one or more'
C.6.MEC.079	C.6.ME.26	C.6.MECT.06	'described by values assigned to each of'
C.6.MEC.080	C.6.ME.27	C.6.MECT.03	'may be'
C.6.MEC.081	C.6.ME.28	C.6.MECT.05	'one or more'
C.6.MEC.082	C.6.ME.28	C.6.MECT.06	'related to others through'
C.6.MEC.083	C.6.ME.29	C.6.MECT.03	'may be'
C.6.MEC.084	C.6.ME.30	C.6.MECT.05	'one or more'
C.6.MEC.085	C.6.ME.30	C.6.MECT.06	'with instances identified by'
C.6.MEC.086	C.6.ME.31	C.6.MECT.03	'may be'
C.6.MEC.087	C.6.ME.32	C.6.MECT.05	'one and only one'
C.6.MEC.088	C.6.ME.32	C.6.MECT.06	'subtype of'
C.6.MEC.089	C.6.ME.33	C.6.MECT.03	'may be'
C.6.MEC.090	C.6.ME.34	C.6.MECT.05	'one or more'
C.6.MEC.091	C.6.ME.34	C.6.MECT.06	'supertype of'
C.6.MEC.092	C.6.ME.35	C.6.MECT.03	'must be'
C.6.MEC.093	C.6.ME.36	C.6.MECT.05	'one and only one'
C.6.MEC.094	C.6.ME.36	C.6.MECT.06	'as viewed from'
C.6.MEC.095	C.6.ME.37	C.6.MECT.03	'must be'
C.6.MEC.096	C.6.ME.38	C.6.MECT.05	'one or more'
C.6.MEC.097	C.6.ME.38	C.6.MECT.06	'defined to include'
C.6.MEC.098	C.6.ME.39	C.6.MECT.03	'must be'
C.6.ME.40	C.6.ME.40	C.6.MECT.05	'one and only one'
C.6.MEC.100	C.6.ME.40	C.6.MECT.06	'mutually exclusive with others in'
C.6.MEC.101	C.6.ME.41	C.6.MECT.03	'must be'
C.6.MEC.102	C.6.ME.42	C.6.MECT.05	'one and only one'
C.6.MEC.103	C.6.ME.42	C.6.MECT.06	'paired with'
C.6.MEC.104	C.6.ME.43	C.6.MECT.03	'must be'
C.6.MEC.105	C.6.ME.44	C.6.MECT.05	'one and only one'
C.6.MEC.106	C.6.ME.44	C.6.MECT.06	'complement of'
C.6.MEC.107	C.6.ME.45	C.6.MECT.03	'must be'

Table C.42 *(continued)*

Identifier	Model_Element. identifier	Model_Element_ Characteristic_Type. identifier	Value
C.6.MEC.108	C.6.ME.46	C.6.MECT.05	'one and only one'
C.6.MEC.109	C.6.ME.46	C.6.MECT.06	'of'
C.6.MEC.110	C.6.ME.47	C.6.MECT.03	'must be'
C.6.MEC.111	C.6.ME.48	C.6.MECT.05	'one and only one'
C.6.MEC.112	C.6.ME.48	C.6.MECT.06	'assigned with values from'
C.6.MEC.113	C.6.ME.49	C.6.MECT.03	'may be'
C.6.MEC.114	C.6.ME.50	C.6.MECT.05	'one and only one'
C.6.MEC.115	C.6.ME.50	C.6.MECT.06	'used as'
C.6.MEC.116	C.6.ME.51	C.6.MECT.03	'may be'
C.6.MEC.117	C.6.ME.52	C.6.MECT.05	'one and only one'
C.6.MEC.118	C.6.ME.52	C.6.MECT.06	'used as'
C.6.MEC.119	C.6.ME.53	C.6.MECT.03	'may be'
C.6.MEC.120	C.6.ME.54	C.6.MECT.05	'one or more'
C.6.MEC.121	C.6.ME.54	C.6.MECT.06	'constraint on'
C.6.MEC.122	C.6.ME.55	C.6.MECT.03	'may be'
C.6.MEC.123	C.6.ME.56	C.6.MECT.05	'one or more'
C.6.MEC.124	C.6.ME.56	C.6.MECT.06	'constrained to'
C.6.MEC.125	C.6.ME.57	C.6.MECT.03	'must be'
C.6.MEC.126	C.6.ME.58	C.6.MECT.05	'one and only one'
C.6.MEC.127	C.6.ME.58	C.6.MECT.06	'for'
C.6.MEC.128	C.6.ME.59	C.6.MECT.03	'must be'
C.6.MEC.129	C.6.ME.60	C.6.MECT.05	'one and only one'
C.6.MEC.130	C.6.ME.60	C.6.MECT.06	'of'
C.6.MEC.131	C.6.ME.61	C.6.MECT.03	'must be'
C.6.MEC.132	C.6.ME.62	C.6.MECT.05	'one or more'
C.6.MEC.133	C.6.ME.62	C.6.MECT.06	'comprised of'
C.6.MEC.134	C.6.ME.63	C.6.MECT.03	'must be'
C.6.MEC.135	C.6.ME.64	C.6.MECT.05	'one and only one'
C.6.MEC.136	C.6.ME.64	C.6.MECT.06	'part of'
C.6.MEC.137	C.6.ME.65	C.6.MECT.03	'must be'
C.6.MEC.138	C.6.ME.66	C.6.MECT.05	'one and only one'
C.6.MEC.139	C.6.ME.66	C.6.MECT.06	'role of'
C.6.ME.67	C.6.ME.67	C.6.MECT.05	'one and only one'
C.6.MEC.141	C.6.ME.67	C.6.MECT.06	'role of'

Table C.43 represents the instances of the **Model_Element_Relationship_Type** class for the Ellis-Barker metamodel.

Table C.43 — Model_Element_Relationship_Type class for the Ellis-Barker metamodel example

Identifier	Designation
C.6.MERT.01	'(Attribute) Is specified for (Entity Type)'
C.6.MERT.02	'(Entity Type) Is subtype of (Entity Type)'
C.6.MERT.03	'(Relationship End Group) Is viewed from (Entity Type)'

Table C.43 *(continued)*

Identifier	Designation
C.6.MERT.04	'(Relationship End) Is mutually exclusive with others in (Relationship End Group)'
C.6.MERT.05	'(Relationship End) Is paired with (Relationship End)'

Table C.44 represents the instances of the **Model_Element_Relationship** class for the Ellis-Barker metamodel.

Table C.44 — Model_Element_Relationship class for the Ellis-Barker metamodel example

Identifier	Subject_Model_Element. identifier	Object_Model_Element. identifier	Model_Element_ Relationship_Type. identifier
C.6.MER.01	C.6.ME.02	C.6.ME.01	C.6.MERT.01
C.6.MER.02	C.6.ME.03	C.6.ME.01	C.6.MERT.01
C.6.MER.03	C.6.ME.05	C.6.ME.04	C.6.MERT.01
C.6.MER.04	C.6.ME.06	C.6.ME.04	C.6.MERT.01
C.6.MER.05	C.6.ME.07	C.6.ME.04	C.6.MERT.01
C.6.MER.06	C.6.ME.09	C.6.ME.08	C.6.MERT.01
C.6.MER.07	C.6.ME.10	C.6.ME.08	C.6.MERT.01
C.6.MER.08	C.6.ME.12	C.6.ME.11	C.6.MERT.01
C.6.MER.09	C.6.ME.15	C.6.ME.14	C.6.MERT.01
C.6.MER.10	C.6.ME.17	C.6.ME.16	C.6.MERT.01
C.6.MER.11	C.6.ME.19	C.6.ME.18	C.6.MERT.01
C.6.MER.12	C.6.ME.20	C.6.ME.18	C.6.MERT.01
C.6.MER.13	C.6.ME.21	C.6.ME.18	C.6.MERT.01
C.6.MER.14	C.6.ME.23	C.6.ME.22	C.6.MERT.01
C.6.MER.15	C.6.ME.11	C.6.ME.08	C.6.MECT.02
C.6.MER.16	C.6.ME.13	C.6.ME.08	C.6.MECT.02
C.6.MER.17	C.6.ME.25	C.6.ME.01	C.6.MECT.03
C.6.MER.18	C.6.ME.26	C.6.ME.25	C.6.MECT.04
C.6.MER.19	C.6.ME.26	C.6.ME.46	C.6.MERT.05
C.6.MER.20	C.6.ME.46	C.6.ME.45	C.6.MECT.04
C.6.MER.21	C.6.ME.45	C.6.ME.04	C.6.MECT.03
C.6.MER.22	C.6.ME.27	C.6.ME.01	C.6.MECT.03
C.6.MER.23	C.6.ME.28	C.6.ME.27	C.6.MECT.04
C.6.MER.24	C.6.ME.28	C.6.ME.36	C.6.MERT.05
C.6.MER.25	C.6.ME.36	C.6.ME.35	C.6.MECT.04
C.6.MER.26	C.6.ME.35	C.6.ME.16	C.6.MECT.03
C.6.MER.27	C.6.ME.29	C.6.ME.01	C.6.MECT.03
C.6.MER.28	C.6.ME.30	C.6.ME.29	C.6.MECT.04
C.6.MER.29	C.6.ME.30	C.6.ME.60	C.6.MERT.05
C.6.MER.30	C.6.ME.60	C.6.ME.59	C.6.MECT.04
C.6.MER.31	C.6.ME.59	C.6.ME.22	C.6.MECT.03
C.6.MER.32	C.6.ME.31	C.6.ME.01	C.6.MECT.03
C.6.MER.33	C.6.ME.32	C.6.ME.31	C.6.MECT.04
C.6.MER.34	C.6.ME.32	C.6.ME.34	C.6.MERT.05

Table C.44 (continued)

Identifier	Subject_Model_Element. identifier	Object_Model_Element. identifier	Model_Element_ Relationship_Type. identifier
C.6.MER.35	C.6.ME.34	C.6.ME.33	C.6.MECT.04
C.6.MER.36	C.6.ME.33	C.6.ME.01	C.6.MECT.03
C.6.MER.37	C.6.ME.37	C.6.ME.16	C.6.MECT.03
C.6.MER.38	C.6.ME.38	C.6.ME.37	C.6.MECT.04
C.6.MER.39	C.6.ME.38	C.6.ME.40	C.6.MERT.05
C.6.MER.40	C.6.ME.40	C.6.ME.39	C.6.MECT.04
C.6.MER.41	C.6.ME.39	C.6.ME.18	C.6.MECT.03
C.6.MER.42	C.6.ME.41	C.6.ME.18	C.6.MECT.03
C.6.MER.43	C.6.ME.42	C.6.ME.41	C.6.MECT.04
C.6.MER.44	C.6.ME.42	C.6.ME.44	C.6.MERT.05
C.6.MER.45	C.6.ME.44	C.6.ME.43	C.6.MECT.04
C.6.MER.46	C.6.ME.43	C.6.ME.18	C.6.MECT.03
C.6.MER.47	C.6.ME.47	C.6.ME.04	C.6.MECT.03
C.6.MER.48	C.6.ME.48	C.6.ME.47	C.6.MECT.04
C.6.MER.49	C.6.ME.48	C.6.ME.54	C.6.MERT.05
C.6.MER.50	C.6.ME.54	C.6.ME.53	C.6.MECT.04
C.6.MER.51	C.6.ME.53	C.6.ME.08	C.6.MECT.03
C.6.MER.52	C.6.ME.55	C.6.ME.13	C.6.MECT.03
C.6.MER.53	C.6.ME.56	C.6.ME.55	C.6.MECT.04
C.6.MER.54	C.6.ME.56	C.6.ME.58	C.6.MERT.05
C.6.MER.55	C.6.ME.58	C.6.ME.57	C.6.MECT.04
C.6.MER.56	C.6.ME.57	C.6.ME.14	C.6.MECT.03
C.6.MER.57	C.6.ME.61	C.6.ME.22	C.6.MECT.03
C.6.MER.58	C.6.ME.62	C.6.ME.61	C.6.MECT.04
C.6.MER.59	C.6.ME.62	C.6.ME.64	C.6.MERT.05
C.6.MER.60	C.6.ME.64	C.6.ME.63	C.6.MECT.04
C.6.MER.61	C.6.ME.63	C.6.ME.24	C.6.MECT.03
C.6.MER.62	C.6.ME.65	C.6.ME.24	C.6.MECT.03
C.6.MER.63	C.6.ME.66	C.6.ME.65	C.6.MECT.04
C.6.MER.64	C.6.ME.66	C.6.ME.52	C.6.MERT.05
C.6.MER.65	C.6.ME.52	C.6.ME.51	C.6.MECT.04
C.6.MER.66	C.6.ME.51	C.6.ME.18	C.6.MECT.03
C.6.MER.67	C.6.ME.67	C.6.ME.65	C.6.MECT.04
C.6.MER.68	C.6.ME.67	C.6.ME.50	C.6.MERT.05
C.6.MER.69	C.6.ME.50	C.6.ME.49	C.6.MECT.04
C.6.MER.70	C.6.ME.49	C.6.ME.04	C.6.MECT.03

Annex D
(informative)

Relationship to ISO/IEC 19763

ISO/IEC 19763 also specified facilities that extended a metadata registry to provide for the registration of models. The model registry used the common facilities specified in ISO/IEC 11179-3.

ISO/IEC 19763-10 provided the core model and facilities for basic mapping. Mapping facilities are now specified in ISO/IEC 11179-3:2023, Clause 11 and, as such, supersede the facilities specified in ISO/IEC 19763-10.

The significant remaining parts of ISO/IEC 19763 are:

— ISO/IEC 19763-1[4] (the framework);

— ISO/IEC 19763-3[5] (a metamodel for registration of ontologies);

— ISO/IEC 19763-5[6] (a metamodel for registration of process models);

— ISO/IEC 19763-7[8] (a metamodel for registration of service models);

— ISO/IEC 19763-8[9] (a metamodel for registration of role and goal models);

— ISO/IEC 19763-12[12] (a metamodel for registration of information models);

— ISO/IEC 19763-13[13] (a metamodel for registration of form designs);

— ISO/IEC 19763-16[14] (a metamodel for registration of document models).

Each part specifies a metamodel for a different model type. Each of these metamodels are 'generic' in that they are intended to cover all models of that model type. All classes in each of these metamodels are subclasses of one of the classes ("Modelling_Language", "Model", and "Model_Element") specified in the core model in part 10.

For example, ISO/IEC 19763-5 enabled the registration of process models expressed using, amongst others, the notations for the Business Process Model and Notation (BPMN), the Unified Modeling Language (UML) Activity Diagrams, and the Event-driven Process Chain (EPC). ISO/IEC 19763-12 enabled the registration of information or data models expressed using, amongst others, the notations for the Express-G, UML Class Diagram, IDEF1X, and Information Engineering modelling languages, and for SQL schema definitions. ISO/IEC 19763-16 is based on the schema languages for XML, and JSON but covers other document modelling languages.

In the development of the metamodels specified in these parts, therefore, there was always a 'trade-off' between the completeness of the metamodel and the need to be able to handle conflicting concepts between notations within the metamodel.

The metamodels specified in ISO/IEC 19763-5, ISO/IEC 19763-7 and ISO/IEC 19763-8 together form the Role and Goal, Process and Service (RPGS) facility. A separate part (ISO/IEC TR 19763-9) was published as a Technical Report to explain how the facilities specified in ISO/IEC 19763-5, ISO/IEC 19763-7 and ISO/IEC 19763-8, along with part 3, can be used to help users select models or services that support their needs.

A separate part (ISO/IEC 19763-6) provides a metamodel for a "Registry of Registries", allowing the registration of information that describes the administrative aspects, a summary of the contents and the technical access method of each of a number of registries, Although the primary scope of this "Registry of Registries" was the model registries specified in the various parts of ISO/IEC 19763, details of any registry can be registered using this metamodel.

If a specific metamodel for a model that needs to be registered is not available, the appropriate metamodel from those specified in ISO/IEC 19763-3, ISO/IEC 19763-5, ISO/IEC 19763-7, ISO/IEC 19763-8, ISO/IEC 19763-12, ISO/IEC 19763-13 and ISO/IEC 19763-16 can be registered using the facilities specified in this document and, hence, used as the basis for registering the model.

Bibliography

[1]   ISO/IEC 11179-6:2023, *Information technology — Metadata registries (MDR) y — Part 6: Registration*

[2]   ISO/IEC 19505-1:2012, *Information technology — Object Management Group Unified Modeling Language (OMG UML) — Part 1: Infrastructure*

[3]   ISO/IEC 19505-2:2012, *Information technology — Object Management Group Unified Modeling Language (OMG UML) — Part 2: Superstructure*

[4]   ISO/IEC 19763-1, *Information technology — Metamodel framework for interoperability (MFI) — Part 1: Framework*

[5]   ISO/IEC 19763-3, *Information technology — Metamodel framework for interoperability (MFI) — Part 3: Metamodel for ontology registration*

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