
**Information technology — Learning,
education and training — Collaborative
technology — Collaborative learning
communication —**

**Part 1:
Text-based communication**

*Technologies de l'information — Apprentissage, éducation et
formation — Technologie collaborative — Communication
d'apprentissage collaboratif —*

Partie 1: Communication à base de texte

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Published in Switzerland

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Foreword

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

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

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

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.

ISO/IEC 19780-1 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 36, *Information technology for learning, education and training*.

ISO/IEC 19780 consists of the following parts, under the general title *Information technology — Learning, education and training — Collaborative technology — Collaborative learning communication*:

— *Part 1: Text-based communication*

0 Introduction

0.1 Collaborative communication in general

Collaborative learning that is supported with information and communication technologies (ICTs) can involve the use of a range of media, including audio (e.g. IP telephony), video (e.g. video over IP), graphics (e.g. shared whiteboard) and text (e.g. chat, computer conferencing). Combinations of these media (e.g. audio telegraphics) can also be used in collaborative learning activities. ISO/IEC 19780 focuses on messages and events arising in the course of collaborative learning activities, using a range of *collaborative tools* and media types. ISO/IEC 19780 understands and defines these communicative actions and events as being sent and received by *participants* and within environments, as these are conceptualized and defined in ISO/IEC 19778.

This part of ISO/IEC 19780 focuses on *text-based* communications and messages. Future editions or parts of ISO/IEC 19780 may address communications using other media (e.g. audio or video), or communications independent of any particular medium. Experience and feedback deriving from this part of ISO/IEC 19780 and from work with evolving communication media are likely to play an important role in determining the shape and direction of this future standardization work.

In this context, “text” can be defined in terms provided by the Oxford English Dictionary: “the wording of anything expressed; the structure formed by the words in their order; the very words, phrases, and sentences as written.” *Text* is further understood here as that which can be expressed using a specified character set (here the “coded character sets” defined in ISO 10646:2003). The use of markup languages derived from the specified character set used is also admissible.

Some of the most common forms of ICT-supported collaborative learning involve the exchange of messages or *text-based expressions*. As defined here, *text-based* collaboration and communication is characterized by relatively brief messages or “small” *expression bodies* (e.g. a single word to a few paragraphs), and by relatively short time intervals between such *expressions* (seconds to days). The result is that content generated through this type of communication tends to be highly context-dependent, with any one textual *expression* often gaining its meaning from complex relationships to others. This makes the portability and potential reconstruction of these relationships and of this context of great significance.

Within the general parameters described above, the length of and time intervals between discrete communicative actions or messages can vary. Collaborative technologies and activities with the smallest intervals between messages are often labelled “synchronous”, and tend to be associated with the term “chat”. Those with longer intervals and more sizeable *expression bodies* are often labelled “asynchronous”, and tend to be associated with terms such as “discussion” or “conferencing”. In the terminology defined in ISO/IEC 19778, both synchronous (chat) and asynchronous (discussion) represent particular *collaborative services*, composed of *collaborative tools* (ICQ, Windows Messenger, etc.) which provide *collaborative functions* (e.g. instant messaging). These functions, in turn, contribute to particular *collaborative effects* (e.g. facilitating the gradual achievement of consensus).

NOTE Italicized terms in the paragraphs above and throughout this part of ISO/IEC 19780 are defined in Clause 3 or in ISO/IEC 19778-1:2008.

0.2 Text-based communication in particular

This part of ISO/IEC 19780 presents a *Data Model* for *text-based expressions*.

A *collaborative workplace* is defined as an instantiated independent entity, consisting of the *collaborative activities* of a *collaborative group* which works together by means of a *collaborative environment* (ISO/IEC 19778-1 to ISO/IEC 19778-3).

As these definitions indicate, *collaborative workplaces* are associated with two major kinds of components:

- *collaborative service* components, and
- *collaborative group* components.

This part of ISO/IEC 19780 provides a *Data Model* to accommodate the data constituted by and associated with *text-based messages* or *expressions*, which are exchanged among *collaborative group* members within a *collaborative environment*.

Expressions are composed by and exchanged among *collaborative group* members within a *collaborative workplace*. *Collaborative environment* components (*collaborative services*, *tools* and *functions*) facilitate these *collaborative activities*, resulting in various *collaborative effects*. Typical effects can include, for example, "reaching a compromise on a controversial issue", "exploring arguments for and against a particular decision item", or "getting to know students in a class". The classification and definition of particular *collaborative effects* is outside of the scope of this part of ISO/IEC 19780. *Expression Data Model instantiations* are associated by reference to *collaborative group Data Model* and *collaborative environment Data Model instantiations*.

This can be illustrated through the example of a mailing list considered as a *collaborative workplace*. Such a *collaborative workplace* is instantiated as an independent entity by associating a particular list of email addresses (each address being associated with a *participant*) with a particular email service (or with specific aspects of such a service). *Collaborative group* members (being identified in the system by their email addresses) interact with each other and with the email service by composing, sending, receiving, reading and responding to email messages or *expressions*. The email service accepts emails from *collaborative group* members only, and forwards or reflects them to all other *collaborative group* members as specified in the email address list of the *collaborative group*.

Naturally, such a collaborative context, as an abstract entity, does not encompass the holders of the email addresses nor the email server, the email clients or the computers of the *participants*.

Expressions are composed, sent and received by members of the *collaborative group*. These *collaborative activities* are made possible through the email service provided through the *collaborative environment*.

Information technology — Learning, education and training — Collaborative technology — Collaborative learning communication —

Part 1: Text-based communication

1 Scope

1.1 Statement of scope

This part of ISO/IEC 19780 specifies the *Data Model* for *text-based expressions*.

It provides a standardized way of isolating and describing textual *expressions* composed and communicated by *collaborative group* members.

1.2 Excluded subjects and aspects

For the purposes of simplicity, the following media and contexts have been excluded from this part of ISO/IEC 19780.

- Communication involving media other than *text*.
- Contexts and associated requirements in which one or more *participants* are intended to receive a given *expression* are identified individually, apart from the *collaborative group* (e.g. “whispering” or “private messaging” in chat contexts).

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 19778:2008 (all parts), *Information technology — Learning, education and training — Collaborative technology — Collaborative workplace*

ISO/IEC 11404:2007, *Information technology — General-Purpose Datatypes (GPD)*

ISO/IEC 10646:2003, *Information technology — Universal Multiple-Octet Coded Character Set (UCS)*

ISO 8601:2004, *Data elements and interchange formats – Information interchange — Representation of dates and times*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 19778-1:2008 and the following apply.

NOTE The terms defined here are closely interrelated. When a term is utilized elsewhere in this part of ISO/IEC 19780 as defined in this list or as defined in ISO/IEC 19778-1, that term is *italicized*.

3.1
expression
instantiation of the *Data Model* for *text-based expressions* including the *expression body* and possible *expression attachments*

NOTE See ISO/IEC 19778-2:2008.

3.2
expression attachment
additional data associated with a given *expression*

3.3
expression body
principle message or communicative substance of the *expression* shared among *participants* in a *collaborative environment*, related through reference to the *expression Data Model instance*

3.4
text
data in the form of characters, symbols, words, phrases, paragraphs, sentences, tables, or other character arrangements, intended to convey a meaning and whose interpretation is essentially based on the reader's knowledge of some natural language or artificial language

NOTE 1 The interpretation of text in collaborative communication is also based on the communicative context.

NOTE 2 The use of tables and complex character arrangements might not always be possible in text-based collaborative communication.

4 Abbreviations and acronyms

NOTE Some of these abbreviations or acronyms represent terms defined in Clause 3.

CE	Collaborative Environment
CG	Collaborative Group
CT	Collaborative Technology
CW	Collaborative Workplace
EX	expression
ID	identifier
ITLET	Information Technology for Learning, Education and Training
Ref	Reference
URI	Uniform Resource Identifier
URL	Uniform Resource Locator (world wide web address)

5 Text-based communication data model

5.1 Overview

The *expression* entity and *Data Model* is related through reference (using ID-Refs) to the other entities constituting the *collaborative workplace* as indicated in Figure 1. Each *expression* is related in this way both to the tool with which it is sent, read and received (the *collaborative tool* and its *collaborative function*), and also to the group member who generated it (as both *participant* and *role holder*).

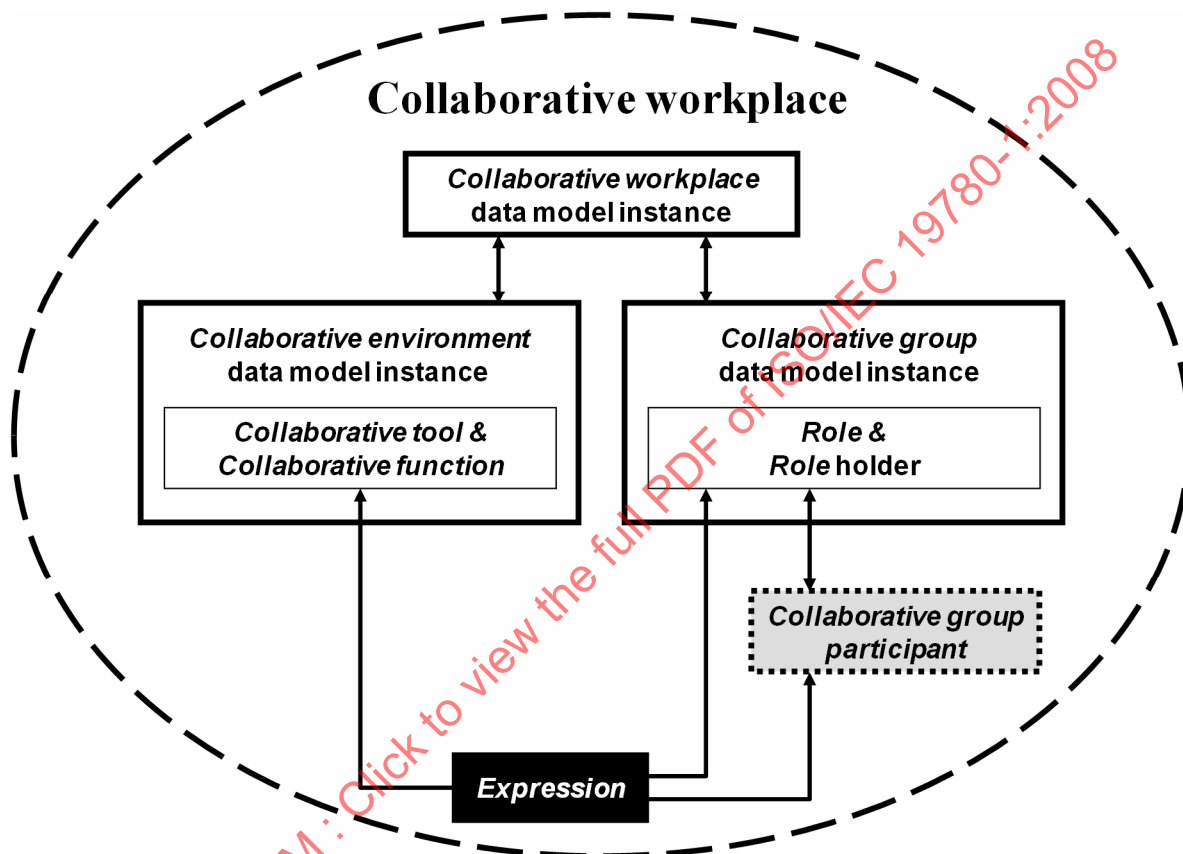


Figure 1 — *Collaborative environment, collaborative group, and expression entities located and interrelated within a collaborative workplace*

The general approach for formulating identifiers in this part of ISO/IEC 19780 is the same as that put forward in ISO/IEC 19778:2008. In order to support more than a single identifier format, both standards utilize a “source” – “value” approach for identifier *Data Elements*, in which the value of sub-element “source” specifies a URI (Uniform Resource Identifier, e.g. the URL where the specification for the identifier format is found), and the sub-element “value” carries the identifier value itself, which is compliant to the earlier format description. It is the responsibility of the users of this part of ISO/IEC 19780 to assure that their identifiers are unique at least within a particular domain or application context.

5.2 Expression data model specification

The table-based *Expression Data Model* representation used here corresponds to the specification provided in ISO/IEC 19778-1:2008, 5.1.

Table 1 — Expression data model

Identifier	Designation	Definition	Obligation	Multiplicity	Datatype	Examples
1	EX_ID	The identifier of this expression <i>Data Model instantiation</i> . Identifies this <i>Data Model</i> instantiation uniquely in the context of the <i>collaborative workplace</i> , in which the associated <i>expression</i> has been communicated.	<i>mandatory</i>	1	ISO/IEC 11404:2007, 10.1.5 "Character string (ISO/IEC 10646:2003)" Supported Length = 250 characters	0241
2	EX_Title	Name of subject given to this <i>expression</i> . The title of this <i>expression</i> can be inherited from a previous <i>expression</i> to which it is related.	<i>optional</i>	1	ISO/IEC 11404:2007, 10.1.5 "Character string (ISO/IEC 10646:2003)" Supported Length = 100 characters	Re: Welcome to the course
3	EX_B-Ref	Reference to the <i>body</i> of this <i>expression</i> .	<i>mandatory</i>	1		
3.1	EX_B-Ref_source	The name or URI of the identification scheme used to generate the value for the <i>expression body</i> reference. A namespace scheme.	<i>optional</i>	1	ISO/IEC 11404:2007, 10.1.5 "Character string (ISO/IEC 10646:2003)" Supported Length = 250 characters	http://refreg.org/ id=192837
3.2	EX_B-Ref_value	Value of the <i>expression body</i> reference. In exceptional cases, the <i>expression body</i> may not contain any <i>text</i> ; however, a reference to this "null" or "empty" <i>body</i> is still required. The manner in which this empty <i>body</i> is constituted is considered out of scope for this Standard.	<i>mandatory</i>	1	ISO/IEC 11404:2007, 10.1.5 "Character string (ISO/IEC 10646:2003)" Supported Length = 250 characters Permissible values shall comply with any specification or standard identified by the reference value in 3.1, EX_B-Ref_source (if provided).	8693073_ss22

Table 1 (continued)

Identifier	Designation	Definition	Obligation	Multiplicity	Datatype	Examples
4	EX_A-Ref	Reference(s) to file(s) (other than the body) which are made accessible with this expression.	optional	1..20		
4.1	EX_A-Ref_source	The name or URI of the identification scheme used to generate the value for the expression attachment reference. A namespace scheme.	optional	1	ISO/IEC 11404:2007, 10.1.5 "Character string (ISO/IEC 10646:2003)" Supported Length = 250 characters	http://refreg.org/ id=192837
4.2	EX_A-Ref_value	Value of the expression attachment reference.	mandatory	1	ISO/IEC 11404:2007, 10.1.5 "Character string (ISO/IEC 10646:2003)" Supported Length = 250 characters Permissible values shall comply with any specification or standard identified by the reference value in 4.1, EX_A-Ref_source (if provided).	xyz_768594
5	EX_Time_Date	The point in time when this expression was sent	mandatory	1	ISO 8601:2004, 4.3 "Date and time of day"	2005-03- 11T23:05:33.04 3+02:00
6	CG_Role_name	Name of the role played by the member of the collaborative group while generating and exchanging this expression. Corresponds to the Data Element ISO/IEC 19778-3:2008, 2.2.1 that is provided for this role	mandatory	1	ISO/IEC 11404:2007, 10.1.5 "Character string (ISO/IEC 10646:2003)" Supported Length = 100 characters	Moderator

Table 1 (continued)

Identifier	Designation	Definition	Obligation	Multiplicity	Datatype	Examples
7	CG_Role_holder_ID-Ref	Identifier reference to that role holder <i>Data Model Element instantiation</i> which is associated with the generation and exchange of this expression. ^a Corresponds to the <i>Data Element</i> ISO/IEC 19778-3:2008, 2.2.2.1 that is provided for this role holder	mandatory	1	ISO/IEC 11404:2007, 10.1.5 "Character string (ISO/IEC 10646:2003)" Supported Length = 250 characters	norm_friesen@sfu.ca
8	CW_ID-Ref	A reference to or identifier for the <i>collaborative workplace</i> that serves as the context for this expression. Corresponds to the <i>Data Element</i> ISO/IEC 19778-1:2008, 1.3.2 for the <i>collaborative workplace</i> where this expression has been generated	mandatory	1	ISO/IEC 11404:2007, 10.1.5 "Character string (ISO/IEC 10646:2003)" Supported Length = 250 characters	http://www.sfu.ca#WP2006-10-28_16-30-44.12
9	EX_Function	Indicates the <i>collaborative tool</i> and that tool's <i>collaborative function</i> as they are utilized in the generation and communication of this expression.	optional	1		
9.1	CE_Tool_name	Name of the <i>collaborative tool</i> used for generating and communicating this expression. In the context of the <i>collaborative tool</i> which generated this expression: corresponding to the appropriate <i>instantiation</i> of the <i>Data Element</i> ISO/IEC 19778-2:2008, 2.2.1	mandatory	1	ISO/IEC 11404:2007, 10.1.5 "Character string (ISO/IEC 10646:2003)" Supported Length = 100 characters	Windows Messenger

Table 1 (continued)

Identifier	Designation	Definition	Obligation	Multiplicity	Datatype	Examples
9.2	CE_Function_name	Name of the <i>collaborative function</i> used for generating and communicating this <i>expression</i> . In the context of the pair " <i>collaborative tool/collaborative function</i> " which generated this <i>expression</i> : corresponding to the appropriate instantiation of the <i>Data Element</i> ISO/IEC 19778-2:2007, 2.3.3.2.1	optional	1	ISO/IEC 11404:2007, 10.1.5 "Character string (ISO/IEC 10646:2003)" Supported Length = 100 characters	Instant messaging
10	EX_Reply-to_ID-Ref	The identifier of an <i>expression</i> (i.e. the value of element EX1 of a different <i>expression Data Model instantiation</i>) to which this <i>expression</i> is a reply. The <i>expression</i> replied to must be generated and communicated inside this <i>collaborative workplace</i> . When this <i>expression</i> is the first in a thread, the value of this element will be a "null value", a particular value as used, for example, at http://www.ukoln.ac.uk/metadata/tf-chic/soif/ .	mandatory	1	ISO/IEC 11404:2007, 10.1.5 "Character string (ISO/IEC 10646:2003)" Supported Length = 250 characters	vo78
11	EX_Relation	Specification of a relation to another <i>expression</i> (other than Reply-to) generated and communicated inside this <i>collaborative workplace</i> .	optional	1..10		
11.1	EX_Relation_ID-Ref	The identifier (i.e. the value of the associated <i>Data Element EX_ID</i>) of that <i>expression</i> (generated and communicated inside this <i>collaborative workplace</i>) to which this <i>expression</i> relates.	mandatory	1	ISO/IEC 11404:2007, 10.1.5 "Character string (ISO/IEC 10646:2003)" Supported Length = 250 characters	vo99

Table 1 (continued)

Identifier	Designation	Definition	Obligation	Multiplicity	Datatype	Examples
11.2	EX_Relation_type-source	Source of the vocabulary used to indicate the type of relation.	<i>mandatory</i>	1	ISO/IEC 11404:2007, 10.1.5 "Character string (ISO/IEC 10646:2003)" Supported Length = 250 characters	http://vocabreg.org/id=1649237
11.3	EX_Relation_type	Specification of the type of relationship.	<i>mandatory</i>	1	ISO/IEC 11404:2007, 10.1.5 "Character string (ISO/IEC 10646:2003)" Supported Length = 100 characters Permissible values shall comply with any specification or standard identified by the reference value in <i>Data Element 11.2</i> (if provided).	Counterargument
a	This reference allows also the location and provision of the parent and sibling <i>Data Model Elements</i> of the referenced role holder <i>Data Model Element instantiation</i> .					

5.3 Supplemental information for the expression data model

5.3.1 Data element EX_ID

The *expression* identifier serves as a label for an *expression*, allowing (among other things) for the inter-linking of related *expressions* within a particular *collaborative workplace*.

NOTE As every *expression* is an entity internal to a particular *collaborative workplace*, *expression* identifiers do not use a "source-value" approach (like the *collaborative workplace* identifiers do). However, *expression* identifiers should be unambiguous within the context of the *collaborative workplace* within which they are generated and communicated. Precisely how this is done is outside the scope of this part of ISO/IEC 19780.

5.3.2 Data element EX_Title

Name given to the *expression*.

NOTE This name is typically intended for human use. In many cases, the title of an *expression* may be inherited from a previous *expression* to which it is related.

5.3.3 Aggregating element EX_B-Ref

Enables reference to the *expression body*.

In order to support more than a single identifier reference format, a "source-value" approach has been applied in this *Data Element* structure. Accordingly, the value of the sub-element "source" specifies a URI (Uniform Resource Identifier, e.g. a URL) in which the specification of the identifier reference format is provided. This same sub-element can also be used to identify a base address for a folder system that provides associated information.

5.3.4 Data element EX_B-Ref_source

This *Data Element* specifies a URI providing information indicating the type of identifier used to reference the *expression body*. The URI provided serves multiple purposes:

- The URI identifies a particular source from which reference values, unambiguous within the application context, can be derived.
- The URI can also provide access to information regarding the format of the admissible body identifier reference values for *expression* bodies. These regulations generally specify how such identifier references are constructed (within the limits of their datatype). Typically, such a specification may restrict the permitted character set, may specify particular characters with special meaning (e.g. separators between distinct fields of the character string), and may restrict the length or the number of characters supported for the character string.

NOTE 1 The precise format of such "source" specifications is outside of the scope of this part of ISO/IEC 19780. In particular, this part of ISO/IEC 19780 is neutral on the question as to whether such specifications are intended for automated use or (also) for human reading and interpretation.

NOTE 2 This *Data Element* is *optional* (not *mandatory*) in order to allow simple applications of this *Data Model*, in which the uniqueness of identifier references within the *collaborative workplace* is ensured through other means.

5.3.5 Data element EX_B-Ref_value

This *Data Element* represents the reference to the body of the *expression*. This identifier shall be unique at least within the technical context in which this *Data Model instantiation* is utilized.

5.3.6 Aggregating element EX_A-Ref

Enables reference to the *expression attachment* associated with the given *expression*.

In order to support more than a single identifier reference format, a "source-value" approach has been applied in this *Data Element* structure. Accordingly, the value of the sub-element "source" specifies a URI (Uniform Resource Identifier, e.g. a URL) in which the format of the identifier reference is specified. This same sub-element can also identify a base address for a folder system that provides associated *expression attachments*. The sub-element "value" is the URI or identifier reference itself, corresponding to the format specified through "source."

5.3.7 Data element EX_A-Ref_source

This *Data Element* specifies a URI providing information indicating the type of identifier used to reference the *expression body*. The URI provided serves multiple purposes:

- The URI identifies a particular source from which reference values, unambiguous within the application context, can be derived;
- The URI can also provide access to the information regarding the format of the admissible identifier reference values. These regulations generally specify how such identifier references are constructed (within the limits of their datatype). Typically, such specifications may restrict the permitted character set, may specify particular characters with special meaning (e.g. separators between distinct fields of the character string), and may (for *Data Model instantiations* only) restrict the length or the number of characters supported for the character string.

NOTE 1 The precise format of such "source" specifications is outside of the scope of this part of ISO/IEC 19780. In particular, this part of ISO/IEC 19780 is neutral on the issue as to whether such specifications are intended for automated use or (also) for human reading and interpretation.

NOTE 2 This *Data Element* is *optional* (not *mandatory*) in order to allow simple applications of this *Data Model*, in which the uniqueness of identifier references within the *collaborative workplace* is ensured through other means.

5.3.8 Data element EX_A-Ref_value

This *Data Element* represents the reference to the *expression attachment*

5.3.9 Data element EX_Time_Date

The point in time when the *expression* was sent.

5.3.10 Data element CG_Role_name

Name given to the role played by the *role* holder while generating and exchanging the *expression*.

NOTE This name acts as the identifier for the collaborative *role* within the *collaborative workplace* (see ISO/IEC 19788 Parts 1-3).

5.3.11 Data element CG_Role_holder_IDRef

An identifier of the *participant* who is associated with the *role* holder who generated and exchanged the *expression*.

NOTE Any *participant* may have more than a single *participant* identifier. If a *participant* has several identifiers, it is advisable to utilize only one within a particular *collaborative workplace*.

5.3.12 Data element CW_ID-Ref

This *Data Element* references the associated *collaborative workplace Data Model instantiation*.

NOTE As every *expression* is internal to (is associated with) a particular *collaborative workplace*, this identifier reference corresponds to the identifier value of the associated *collaborative workplace*. A separate "source" of this identifier value need not be specified; it is assumed that the *expression* will be identified through the same identification scheme as is used to assign the *collaborative workplace* identifier.

5.3.13 Aggregating element EX_Function

This *Aggregating Element* identifies the *collaborative tool* and *collaborative function* used in generating and exchanging the *expression*.

5.3.14 Data element CE_Tool_name

Name given to the *collaborative tool* corresponding to the *collaborative function* used to generate and exchange the *expression*.

NOTE This name acts as an identifier for the *collaborative tool*. Both the *collaborative tool* and *collaborative function* are identified or specified within the *collaborative workplace* using only their names (see ISO/IEC 19788 Parts 1-3).

5.3.15 Data element CE_Function_name

Name given to the *collaborative function* used to generate and exchange the *expression*.

NOTE This name acts as an identifier for the *collaborative function* of a particular *collaborative tool*. Both of these entities (*collaborative function* and *tool*) are identified or specified within the *collaborative workplace* using only their names (see ISO/IEC 19788 Parts 1-3).

5.3.16 Data element EX_Reply-to_ID-Ref

This identifier reference is used to identify another *expression* to which the current *expression* relates as a reply, response or answer.

This single-purpose *expression* identifier serves the purpose of identifying other *expressions* that are generally related to the current *expression*. This relation may be more clearly structural or temporal than explicitly semantic in nature.

5.3.17 Data element EX_Relation

This *Aggregating Element* enables the specification of various kinds of relationships (other than reply) between *expressions*.

5.3.18 Data element EX_Relation_ID-Ref

This multiple-purpose *expression* identifier reference enables the specification of relationships and relationship types (other than reply) between *expressions*.

5.3.19 Data element EX_Relation_type-source

This *Data Element* specifies the URI of a vocabulary used to express one or more types of relations between *expressions*.

5.3.20 Data element EX_Relation_type

This *Data Element* provides the value used to designate the type of relationship between the current *expression* and a second, previous *expression*.

6 Conformance

These conformance specifications regard solely the conformance of *Data Model instantiations* (in contrast to, e.g., conformance specifications regarding applications which may use such *Data Model instantiations*; see ISO/IEC 19778-1:2008 for definitions of *Data Model* and related terms).

For any *Data Model instantiation* that conforms to this part of ISO/IEC 19780 the following requirements shall be met:

- The *Data Model instantiation* shall at least provide one or more *Data Model Element instantiations* of any *Data Element* in the *Data Model* where any of its ancestor *Data Model Elements* has either the *Data Model Element obligation status* value "mandatory" or "conditionally mandatory" with the respective condition met. Where more than one *Data Model Element instantiation* is provided for a *Data Element*, this multiple occurrence shall correspond to the specified *Data Model Element multiplicity* attribute for this *Data Element*;

NOTE 1 This rule specifies which *Data Elements* must appear in a *Data Model instantiation*.

- The *Data Model instantiation* shall not contain any *instantiation* of a *Data Element* where the *Data Model Element obligation status* value is "conditionally optional" with the respective condition not met.

NOTE 2 This rule specifies which *Data Elements* of the *Data Model* are not allowed in a *Data Model instantiation*.

- The *Data Model instantiation* shall not contain any instantiated *Data Element* which does not correspond to any of the *Data Elements* and their attribute values of the *Data Model* specified in this part of ISO/IEC 19780.

NOTE 3 This rule forbids any *instantiations* of *Data Elements* that do not conform to the *Data Model* (being not specified at all, or exceeding multiplicity ranges). At the same time, this rule allows the *instantiation* of all the "effectively" (subject to instantiated or implied ancestor *Aggregating Elements*, and the *Data Model Element obligation status* value of the respective *Data Element*) optional *Data Elements*.

- For any *instantiation* of a *Data Element* in a *Data Model instantiation*, both the *Data Model Element identifier* and the value for this *Data Element* shall be provided, where the value of the *instantiation* of the *Data Element* shall correspond to the specified *Data Model Element datatype* attribute for this *Data Element*;

NOTE 4 This rule specifies that the *Data Model Element identifier* and a correct *Data Element* value are required for any instantiated *Data Element*.

- For any *instantiation* of an *Aggregating Element* in a *Data Model instantiation*, the *Data Model Element identifier* shall be provided;

NOTE 5 This rule specifies that the *Data Model Element identifier* is required for every instantiated *Aggregating Element*. No values exist for instantiated *Aggregating Elements*.

- The *Data Model instantiation* shall allow the complete and unambiguous reconstruction of a tree structure for this *Data Model instantiation* that corresponds to the *Data Model* specified in this part of ISO/IEC 19780.

NOTE 6 This rule specifies the requirement of being able to assign the correct tree structure location to any instantiated *Data Model Element*. This rule implies also the instantiation of *Aggregating Elements* with multiple occurrence. *Aggregating Elements* with single occurrence can be reconstructed based on the instantiations of their descendant *Data Model Elements*.

Annex A (informative)

Use cases

A.1 Purpose of providing use cases

These use cases are provided to illustrate how the *Data Model* described in this part of ISO/IEC 19780 might work in real-world situations.

These two use cases illustrate some requirements for data portability that this part of ISO/IEC 19780 addresses. These use cases involve the portability of data associated with *expressions* (in addition to data associated with *collaborative environments*, *workplaces* and *tools*.).

A.2 Use case: Instructor evaluates collaborative data

Actors:

Instructor: Evaluates all *collaborative activity* occurring in *collaborative environment*. This evaluation takes place multiple times during a course or semester.

Preconditions:

Instructor is able to access *collaborative workplace* and tool data

Basic Flow:

- 1) Instructor accesses *collaborative workplace*
- 2) Instructor extracts data in vendor-independent format

Post-conditions:

Instructor is able to import and analyze data using latent semantic analysis or network analysis tools.

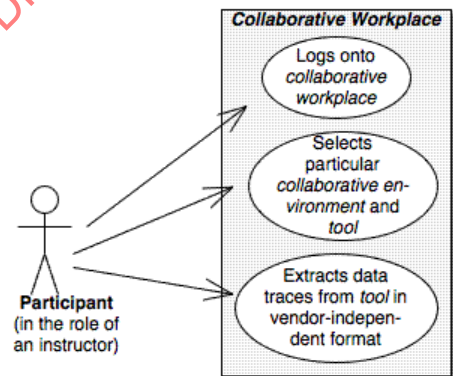


Figure A.1 — Use case 1 (with instructor)

A.3 Use case: Student ports data to multiple systems

Actors:

Student: is required to monitor and participate in activity occurring in multiple *collaborative services*

Preconditions:

Student is able to access *collaborative workplace*

Student is able to access (and create) *expressions* and associated data