52nd joint meeting of the CIDOC CRM SIG, 45th FRBR SIG and ISO/TC46/SC4/WG9.
8-11 February 2022
University of Oslo, Faculty of arts, Unit for digital documentation

Online (Zoom)

Participants

Achille Felicetti (Università degli Studi di Firenze & PIN, ITA); **Akihiro Kameda** (National Museum of Japanese History, JPN); **Ana Tam** (University of the Arts London, GBR); **Athina Kritsotaki** (ICS-FORTH, GRC); **Christian-Emil Ore** (University of Oslo, NOR); **Chryssoula Bekiari** (ICS-FORTH, GRC); **Daria Hookk** (Hermitage Museum, RUS); **Eleni Tsouloucha** (ICS-FORTH, GRC); **Elias Tzortzakakis** (ICS-FORTH, GRC); **Emilio Sanfilippo** (CNR, ITA); **Erin Canning** (LINCS -Linked Infrastructure for Networked Cultural Scholarship, CAN); **Francesco Beretta** (CNRS-LAHRA Université de Lyon, FRA); **George Bruseker** (Takin.solutions, BGR); **Gerald Hiebel** (University of Innsbruck, AUT); **Juliane Hamisch** (German National Museum, DEU); **Maja Žumer** (University of Ljubljana, SVN); **Manolis Peponakis** (University of West Attica, GRC); **Mark Fichtner** (Germanisches Nationalmuseum, DEU); **Martin Doerr** (ICS-FORTH, GRC); **Marta Acierno** (Sapienza-Rome University, ITA); **Mélanie Roche** (Bibliothèque Nationale de France, FRA**); Muriel van Ruymbeke** (Université de Liège, BEL); **Niels Geißler** (University of Cologne/ CCeH, DEU); **Pat Riva** (Concordia University, CAN); **Pavlos Fafalios** (ICS-FORTH, GRC); **Philippe Micon** (CHIN, CAN); **Pierre Choffé** (Logilab; FRA); **Piroska Lendvai** (Bavarian Academy of Sciences, DEU); **Puyu Wang** (Shanghai Normal University, CHN); **SanaZ Emami** (University of Tehran, IRN); **Sakiko Kawabe** (National Museum of Japanese History, JPN); **Stephen Stead** (Paverprime Ltd, GBR); **Thanasis Velios** (University of the Arts London, GBR); **Trond Aalberg** (OsloMet, NOR); **Vincent Alamercery** (LAHRA Université de Lyon, FRA)

Table of Contents

Tuesday 8th February 2022

Issue 574: Scope note/range clarification for E80 and P112

The sig reviewed the HW by TV, and voted to accept the proposed changes with minor modifications.

The vote was to:

(a) change the range of P112 diminished from E24 Physical Human Made Thing to E18 Physical Thing, on the grounds that removing a part from a natural object, does not render the latter a human made thnig instead.
Consequently, it is required to implement minor changes to:
   a. the scope note of the property P112 (to reflect the change of range)
   b. the FOL inference (it should point to E18)
   c. add an example involving a physical thing that got diminished as a result of a part removal
   d. E80: edit the range of the referred property (P112 to E18)
   e. E80: add an example of part removal that involves a natural object (i.e. not E24, but E18 instead).

(b) change the range of P110 augmented from E24 to E18 on the grounds that adding some object to a natural thing, does not render the lattern human made instead.
Consequently, it is required to implement minor changes to:
   a. the scope note of the property P110 (to reflect the change of range)
   b. the FOL inference (it should point to E18)
   c. add an example involving a physical thing that got augmented as a result of a part addition
   d. E79: edit the range of the referred property (P110 to E18)
   e. E79: add an example of part addition that involves a natural object (i.e. not E24, but E18 instead).

Discussion:

DH: Famous statue that's embedded in the ground in a park in Tallinn can be formed into an example for P110 and E79 (link here: https://www.123rf.com/photo_134443659_tallinn-estonia-january-2016-sculpture-of-a-person-resting.html)

Vote to accept the proposal above:
In favor: 12,
Against: none
Outcome: accepted. For details of the changes, see in the appendix.

Decision: the changes need to inform both CIDOC CRM v7.1.2 and CIDOC CRM v7.2.1

Decision: we need to discuss whether to add a clause in the scope note of E79 indicating that instances of Part Addition involve adding something to an object and that both added part and base object come with pre-existing identities. Should be done in a separate issue -independently of ISO issues.

NEW ISSUE: E79 Part Addition -what counts as an instance thereof?

We need to discuss whether to add a clause in the scope note of E79 indicating that instances of Part Addition involve adding something to an object and that both added part and base object come with pre-existing identities. Should be done in a separate issue -independently of ISO issues.

Issue 571: Cardinality of typed properties

MD presented HW –he reworked the Applied Form section of the introduction to ensure that:

(1) an introduction to the construct of .1 properties preceded discussing their quantification and FOL representation
(2) the FOL representation of .1 properties is understood
(3) the quantification of .1 properties is understood

Discussion:

AkK: Is it OK to represent properties of properties without ".1" in first order logic formula? e.g. in the explanation of *P3 has note* P3(x,y,z) ⇒ [P3(x,y) ∧ E55(z)]?

MD: the two statements are equivalent, but this is not explicitly stated -proposal to add a statement with a ternary predicate for a .1 property.

CEO: it is always the case that a ternary predicate implies one with a reduced arity, we should make the example.

Vote for the proposal to update the text in the section Applied form:
In favor: 9
Against: none
Outcome: passes

HW for MD to represent an example of a .1 property in FOL as ternary predicates.

Decision: text to be updated as found in the appendix

Issue 517: Does the axiom of non-reflexivity follow from the definition of transitivity?

HW by CEO. It involves a total of 32 properties whose domain and range are the same class (and are therefore possible candidates for transitivity). The documentation for the issue has been updated. There is a spreadsheet available for all possible values that the properties in question can get (with respect to transitivity, symmetry and reflexivity). Most properties either exhibit said properties or not, for all their instances. However, for some there is no default value (their instances could be either). In the text of the scope notes, we use “non-transitive/symmetric/reflexive” to mark that there is no default case with them.

HW: CEO to share through the mailing list a final version of the document with the changes in the FOL statements and the scope notes for the set of 32 properties, and call for an e-vote. Pick the definitions of these properties and mark what needs to change.

Issue 484: 7.0 preparation -missing examples

HW by CEO: examples for P174, P184, P185

- **P174 starts before the end of**
  The building of the current St. Peters in Rome (E7) *starts before the end of* the demolition of the old 4th c. St. Peters (E6, E7)
- **P184 ends before or with the end of**
  The reign/life of Harold II (E4) *ends before or with the end of* the Battle of Hastings (E7)
- **P185 ends before the end of (ends after the end of)**
  Godstow Abbey, Oxfordshire as a working abbey (E4 Period) *ends before the end of* the reign of Henry VIII (E4 Period).

Vote to accept the examples above:
In favor: 11
Against: none
Outcome: Accepted

Decision: examples for P174, P184, P185 to be added to version 7.1.2 and version 7.2.1
HW: CEO to provide examples for P176 starts before the start of (starts after the start of) by the end of the week.

Discussion re. versioning:

PM: Are the editorial changes implemented thus far (574, 571, 484) supposed to inform version 7.1.1 (the official community version) and be included in v7.2 the ISO version?

CEO: The version derived from this meeting is to be sent to ISO.

MD: P199 lacks quantification and FOL, and the discussion of the quantification can always give rise to questions regarding its semantics. So he would prefer that we send ISO a version that incorporates all changes decided in this meeting, but take out P199.

ETz: P132 also needs minor fixes (delete P9 from its subproperties) and P139 lacks an inverse even though it's not symmetric in principle.

Proposal: CIDOC CRM v7.1.2 (the version resulting from this meeting) to be submitted to ISO. It will incorporate all changes implemented in v7.2 (except for P199) and all the errata fixed in the 52nd SIG meeting. An rdf will be produced for 7.1.2 and 7.2.1 as well.

The editorial changes will inform v7.2 as well, whose number will become 7.2.1

Vote on this proposal:
In favor: 7
Against:1 (GB thinks it doesn't make sense -he has already implemented P199).

Decision: accepted.

Next CIDOC CRM SIG meetings

MA & DF have received funding in the context of a project on documenting architectural problems, to host a joint meeting with the SIG and the other group working on that project. They want to schedule this meeting for mid-November 2022. Reserve a few days for the CIDOC CRM SIG meeting proper and then a joint session where someone from the SIG gets to discuss semantic problems of interest to architects. The meeting would take place at their department (University of Rome). Their department will support all technical requirements (big rooms, with stable wifi connections etc). September in Rome instead of November (that they originally planned for) is quite alright.

MvR: December in Liege can be set. If there is no problem with having the meeting in June (instead of May or September), Liege would be happy to accommodate.

The SIG are not happy with changing the schedule. Maybe we could have an in-person meeting in Crete in May, also one in Rome in September and another in Liege in December.

Decision to be reached at the end of the meeting. Discussed again under community issues.

Regarding the form of the in-person sig meetings.

Will it be full 8-hour days or keep the 4-hour shifts?

Most SIG members do not think that travelling would be justifiable for half-day meetings. Possibility of holding hybrid meetings should be discussed in the community session.

Issue 570: FOL statements in prose –appropriate section of class/property definitions

HW by MD –proposal for a reading guide to complex FOL expressions.

The SIG went through the document prepared by MD. The comments TV had made on the document have not been discussed.

Discussion points:

- The verb “must” found in the statements is evocative of the necessity operator. But in most cases the relation expressed is that of subset, thus rendering the “must” superfluous (if not ambiguous btw a deontic and a possible interpretation)
- If “must” is to appear in the textual descriptions of the FOL statements, it should be stated in an introductory text that “must” is to be read as “it is necessarily the case that p” (for whatever lies in its scope).
- The material implications apply to every instance of a class or property, not some. This is lost by not introducing the universal quantifier to its reading.

MD: “For all”, or “each” expressions make the statements harder to read for those without a proper training. “Must” is used for the same reason, not to introduce possible world semantics but to stress the fact that it is necessary that a particular inference holds true.

GB: ask CM for an opinion on how to best render these statements (re. for all/must etc.)

TV: the shortest statements are easier to comprehend. Colors are not such a good idea because they are difficult to use correctly throughout the text, maybe a formal notation would work better. It would be necessary to update the templates after that.

Proposal: Incorporate FOL statements rendered in prose in some of the scope notes only for FOL statements that are deemed too long and extremely difficult to read. Do not re-express all FOL

statements found in the CRM in text. The colors will only be used in the guideline, not the body of the text.

Vote to incorporate the FOL axioms in prose in the CRM -but not the main definition, in an appendix.
In favor: 6
Against: 1 (TV: thinks that they should be used as a guide to understand the semantics of classes and properties, not be actively searched in another document)

Vote to include the FOL axioms in prose in the definitions of classes and properties
In favor: 2
Against: 1

Outcome: Weak support.

Decision: We should elaborate further to make a proposal (i) for the form of the textual renditions and (ii) the position of the renditions in the main body of the text vs. other document/appendix/only reading guideline in the introduction or other. Maybe form this in a questionnaire.

HW: GB, TV, MD and CM to help re-express the FOL statements in English without introducing any sort of ambiguity.

Issue 561: Scope-note of P139

HW by MD. To delete the FOL expressions for symmetry and irreflexivity, add an inverse form (missing).

Vote in favor of this proposal.
In favor: 5
Against: none
Outcome: accepted

Decision: update P139 has alternative form accordingly. Details in the appendix.

Issue 351: Modeling Principles

MD gave an overview of the issue. His proposed that the SIG acknowledge these principles as the norm to apply when modelling in the CRM and compatible models.

GB objected to that –he considers the principles a useful guideline outlining how this group has arrived at this particular conceptual model, but not a normative text that one must observe at all times. More of a rule of thumb, not a canon. He does not think that the principles define procedures that allow comparable/similar data to individually give rise to the same modelling constructs; what they do instead is impose some constraint guiding one when creating modelling constructs. That the principles don't come in a strict hierarchy, allows people engaged in conceptual modelling with the CRM and other compatible models to resolve particular problems applying that subset of the principles that is deemed more fitting in each case.

MD: disagrees with GBs statement, he maintains that the principles have a normative effect and they have served as the basis to develop the CRM (base and family models). Does not see the reason why to abandon or even relax the normative nature of the principles, especially since following them has proved successful in creating conceptual models grounded in empirical evidence.

TV: It is impossible to arrive at the principles through reading the scope note of a class or property. One must go through a number of classes/properties, and annotate them with the principles that have been

used to produce them, as an exercise. This is a way to identify a potential hierarchy of the principles – which ones are used more often etc.

MD: disagrees with quantifying on the importance of some principles over others and claims that they are all equally important. Newcomers to the SIG need to see how these principles apply throughout the CRM (maybe through a tutorial?). But first and foremost, they should be made aware of what these principles are.

FB: He also feels that the principles listed in the document are highly abstract, not self-explanatory or easy to understand. He suggested that instead of each SIG member separately engaging in the exercise of annotating the scope notes of classes and properties of the CRM individually, it would be better that the SIG prepared some examples to be shared with anyone interested. He also pointed that this discussion is highly relevant for issue 504 and suggested that we discuss it in the appropriate context (i.e. of 504).

Proposal:

- Close the document as it is now. **The document in its current form can be accessed here (under Resources/Technical Documents)**
- Then take the first part of the document (the one that showcases the overall procedure followed –i.e., the bottom-up modelling, which relies on empirical evidence and actual data that are subsequently translated into modelling constructs (**pp.10-28**) and make examples that highlight the process better.
- Discuss the principles separately with practical examples
- Discuss how to publish this text, make it more visible
- Dedicate a whole session if necessary to the principles document in the next sig.

Vote on the proposal:
In favor: 7
Against: 1
Outcome: Accepted

Decision: proceed as in the proposal.
HW: TV, GH, MD, FB to work on this issue for the next SIG.

Issue 581: Revise the "Intended Scope" of CIDOC CRM

Decision: it's self-explanatory, will be decided via e-vote.

Issue 504: Formulate the philosophical underpinnings of crm and its relation to reality and the objectivity of observations

MD offered a summary of the discussions that have taken place concerning the issue and made a proposal on how to proceed.

Proposal: Form a working group that works towards defining the foundational principles of the CRM and the general epistemological attitude necessary to assess them. Assuming a point of agreement has been reached, then proceed with identifying philosophical question of interest, assessing priorities, collecting references and finally with selecting relevant positions that support the way the model addresses the scientific attitude of the user community and the description of their subject matters. The group will further identify counter-positions that may be popular in ontology engineering but are incompatible with the methods applied for building and using the CRM.

FB: registered some objections regarding the objectivity of information, but is otherwise happy to proceed as MD suggested and wants to participate.

Volunteers to proceed in this line of work: FB, MD, AT, TV, EC, MA

Wednesday 9th February 2022

Issue 571: Cardinality of typed properties

MD added an FOL statement for a ternary predicate (for P14.1), asked CEO to take a look because he found it difficult to express the connection between the arity of P14 and that of P14.1.

> The property *P14.1 in the role of* is described as the ternary predicate symbol corresponding to property P14 carried out by (performed):
>
> P14(x,y) ⇒ E7(x)
>
> P14(x,y)⇒ E39(y)
>
> P14(x,y,z) ⇒ [P14(x,y) ∧ E55(z)]

Issue 360: LRMoo

PR walked the SIG through the sub-topics identified in the context of producing an LRMoo stable version. Subtopics discussed fall under two broad categories, namely:

(a) Review of examples
(b) Model modifications

Review of Examples

1) R35 is specified by (specifies)

Proposal to add example:

- 'Martin Doerr' as the name of co-chair of the CIDOC CRM SIG (F12) *is specified by* the statement on the title page of the Definition of the 'CIDOC Conceptual Reference Model', Version 7.1.1, April 2021 (F2).

Vote to accept:
In favor: 7
Against: none
Outcome: accepted

2) R8 combines (is combined form)

According to the examples template, each example should instantiate the property at hand exactly once (i.e. refer to exactly one instance of the domain and range classes).. Examples for R8 previously contained multiple instances of the range class, so they were split to match the example template. However, this resulted in there being 17 examples -way more than necessary.

Proposal:

- accept all examples except the 'starfish ones'and the "Guillaume de Machaut" combination of person name and town.

- Given that all the examples refer to instances of F12 Nomen rather than the more generic E89 Propositional Object, the range can change to F12.
- the last bit of the shortcut ([or E89 Propositional Object] to be deleted

Vote to accept proposal
In favor: 9
Against: none
Outcome: Accepted (details in the Appendix)

HW: PR, TA, MZ, MR to reword the scope note (use R33 as a template), add final [notes] to simplify the references to the subject or classification system.
Also consider examples where natural language terms and qualifiers form compound expressions (f.i. AAT orange(colour), orange(fruit).

3) R69 specifies physical form (is specified physical form of)

Proposal to add new example

- The ebook 'Christianity: the first three thousand years' by Diarmaid MacCulloch published by Viking in 2010 and identified by the ISBN '978-1-101-18999-3' (F3) *has physical form* EPUB for Kobo ebook reader (E55)

Vote to accept the example:
in favor: 9
Against: none
Outcome: accepted

4) **Review of examples relating to major classes (F1 Work, F2 Expression, F3 Manifestation, F5 Item) to ensure they represent typical situations and are considered relevant**.

Some examples have moved up in the model due to classes and properties having been deprecated. Are they relevant? Do they illustrate the class/property at hand?

The list of examples can be accessed in an editable format here. SIG members are invited to give feedback on the examples by the end of February.

Discussion:

TA: the examples all come from a Western background, we should probably add examples that assume different perspectives, to ensure their point comes across.

PR: They tried to keep examples that are the easiest to understand and that the LRM group can vouch for their validity.

Model modifications

F5 Item (revise scope note): shorten sentences and use straightforward examples

Vote in favor of proposed changes:
In favor: 9
Against: none
Outcome: Accepted. Details in the appendix.

F27 Work Conception/Fnn Work Creation

Problematizing for F27:

- All examples for F27 have been deduced examples –an idea will be documented insofar as it has concreted to some extent.
- LRMer has a LRM-R5 work creation class and the mapping uses F27 but the semantics of the two classes are not identical.
- F27 isA E65, but F27 also includes commissioned products that were never completed (so no creation ever took place)

Discussion:

- The first expression of a work is rarely documented, it would be extremely unlikely to find it in a system anywhere. Cannot be used to express that a work was known to have existed (F3). The examples are wrong
- Reworking examples to document periods that known works were being created (Beethoven's 9th, The Hitchhicker's Guide to the Galaxy <however it is not the kind of information documented in library records>, also private letters referring to sketches and drafts, Mary Shelley's conception of Frankenstein <occurred during her Italian tour, but did not produce the actual text until much later>, Philip Pullman's The Book of Dust <the process of writing the 3rd book is documented in a blog>, Divina Comedia is another good example)
- Commissioning as an initial date when some result or full scale model (as in architectural competitions) is presented, not when a totally open ended contract which may or may not result in anything. Commissioned works that did not produce any outputs (because they consitute breeches of contracts) are excluded from this model.

Proposal:

The Conception should not be defined as a moment of initial creation, it is more a longer time span and a process.

- It is that time span that needs to be defined carefully: it should also comprise the conception of the work.
- If the library has no evidence that the work was conceived before the work was created and there is archival reccords suggesting that the creation of the work was predated by a separate event of conceiving the work, then this knowledge should inform te library records.

HW: MD to rewrite **F27 Work Conception** and ***R16 initiated*** trying to reconcile the constructs with **Work Creation** and ***created by***: bearing in mind that F1 Work isA E89 Propositional Object and should not be confused with its first F2 Expression. Examples to be taken into account: Divina Comedia, Frankenstein, Beethoven's 9th

F28 Expression Creation

Rnn is derivative of (has derivative) [D: F2 Expression, R: F2 Expression]

Background: The scope note of F28 covers expression derivation (between expressions of the same work) and also gives a path for the derivation of a new work based on a specific expression of another work. In LRMer these are two distinct relationships: LRM-R22 for work transformation (maps to R2 *is derivative of (has derivative)*), and LRM-R24 for expression derivation (for expressions of the same work) which has no direct equivalent in LRMoo. **Should a property be created to map to LRM-R24?** This is an

important property which is much used and should not just be a path. This property has a constraint that both expressions realise the same work

Discussion:

- The relation btw the instances of F2 Expression is completely defined by the relation btw the instances of F1 Work –the extra property seems superfluous if it is to model the relation btw expressions of the same instance of F1.
- **Any relation between separate works would manifest itself through an established relation between expressions**. However, there are cases in which one needs to document the relation between two different expressions of the same work (as is the case with translations)**.** Derivations btw instances of F2 Expression can refer to translations btw versions, concordances from a given version of an F2 Expression instantiate the property
- No relation between the works of the given expressions should be inferred
- re. the quantification (many-to-many): an instance of an F2 Expressions can be the source of any number of other instances of F2 Expression. And (in translation projects, in particular, or musical scores) one can consult more than one instances of F2 Expression (many sources)
- LRM-R24 maps to Rnn is derivative of [D:F2, R:F2] when both instances of F2, *R3 realise* the same instance of F1 Work.
- LRM-R24 maps to the long path **F2 Expression(1). *P16i was used for*: F28 Expression Creation. *R17 created*: F2 Expression(2)**, when the instances of F2 Expression do not *R3 realise* the same instance of F1 Work.

Proposal: introduce the proposal (minor edits included), provide alternative mappings for LRM-R24 in LRMoo. CEO to check the wording of the long path in the scope note. Will have implications for the definition of the property (shortcut of, FOL axioms etc.)

Vote to introduce new property that maps to LRM-R24:
In favor: 6
Against: none
Outcome: accepted, will be assigned a number. Details in the appendix.

scope note of F28 Expression Creation needs redrafting

Background: F28 references F1, F2, F3 and F5 all at the same time, it needs to be more focused and systematically discriminate among said classes. Proposal for a new scope note put forth.

Proposal:

- accept the first three paragraphs as they are now (following revisions) and
- reword the two last paragraphs to express
    - the correct long path
    - that an instance of F1 Work can be the source for an F28 Expression Creation (i.e. F28 does not need to go through an instance of F2 as its source). The P16i was used for can either take as range an F1 or an F2.

Vote: note as proposed
In favor: 7
Against: 0
Outcome: paragraphs 1-3 are accepted, the rest are to be reworked (HW for PR, TA, MZ, MR). Details in the appendix.

Deprecate R18 created (was created by) [D: F28, R: F5]

Since F28 isA E12 then it must necessarily produce an F5 Item. If the P108 has produced an instance of E24 Physical Human Made Thing, which, in its turn also instantiates a F5, then R18 becomes completely superfluous.

The quantification as it is, i.e. many-to-many, necessary (1,n:0,n), is wrong, the quantification of the superproperty being stricter and expressing that for each instance of E24 Physical Human Made Thing, there must be exactly one E12 Production activity that resulted in its coming into being.

Proposal: Deprecate it, it is completely covered by the semantics of P108
Vote: to accept
In favor: 5
Against: none
Outcome: accepted

Thursday 10th February 2022

Issue 559: Scope note of O12 has dimension (is dimension of)

The SIG reviewed HW by MD (rendering the axiom of equivalence between O12 and P43 from E18 and specializations thereof in prose)

The axiom reads: In case the instance of S15 Observable Entity is more specifically an instance of E18 Physical Thing, using the property *O12 has dimension (is dimension of)* is equivalent to using the property *P43 has dimension (is dimension of).* In other words, using the one implies the other.

Vote to incorporate the above text in the scope note of O12 has dimension:
In favor: 11
Against: none
Outcome: Accepted

Decision: edit the scope note accordingly**, close issue**.

Issue 578: Property labels, minor correction

GB presented the issue (misnomer for *O19i was encountered at*) and the alternative labels proposed:

- was object encountered during
- was object encountered in
- was object encountered through
- was object encountered by

Discussion: Consistency dictates either use of “by” or “in”, but “through” seems more natural to the native speakers of English.

A series of votes took place:

(1) to indicate whether SIG members favor the change of label (*encountered **at*** seems to evoke a strong locative meeting):
in favor: 9
against: none
Outcome: It will change.

a. change *encountered **at*** with *encountered **during***
   in favor: none
   against: 9
   Outcome: rejected
b. change *encountered **at*** with *encountered **in***
   in favor: none
   against: 9
   Outcome: rejected
c. change *encountered **at*** with *encountered **through***
   in favor: 9
   against: 2
   Outcome: accepted
d. change *encountered **at*** with *encountered **by***
   in favor: 3
   against: 6
   Outcome: rejected

Decision: change the inverse property label O19i encountered at to O19i encountered through; update CRMsci accordingly. Close issue.

Issue 524: reformulate the scope notes for O19, O21

The issue was about redrafting the scope notes and labels for O19 encountered object (object encountered at) and O21 encountered at (witnessed encounter), formerly known as found object (object found at) and found at (witnessed), respectively. The scope notes and the labels were altered according to what was decided for that issue and subsequently the issue closed.

An oversight: the labels of the properties were never changed in the examples. Do we need to vote on that or not?

Decision: it's an editorial change, to be implemented without further ado.

531: Observable Entity

MD outlined the present state of the issue -proposed to split the issue in two parts: (1) finish updating S4 Observation (addition of new example -HW by AK) and (2) work on the class Sxx Observable Situation.

(A) **MD presented HW (updated the scope note of Sxx Observable Situation to address comments made by the SIG during its 51st meeting).** For a new version of the scope note and example see appendix.

Discussion: no objections content-wise, minor editorial changes by SdS and the group. What remains to be done is define the properties linking Sxx Observable Situation to S4 Observable Entity (and/or other classes).

Vote on the content of the scope note (and assign HW to SdS to proof-read the text).
In favor: 8
Against: none
Outcome: accepted

Decision: SdS to edit offline, and share the new version with the SIG list for an e-vote.

HW: SdS

Proposal: start a new issue, to continue this line of work. **Subject**: How to assign dimensions to relative positions/ to distances in space-time and other relations between observable entities.
HW: MD to elaborate on that, set the background and propose a course of action.

(B) AK presented HW for the same issue (produce a non-fictitious example for S4 Observation):

The excavation (S4) in the NE section of the central court of the Knossos palace by the Ephorate of Antiquities of Heraklion in 1997
[see definition of the class A9 Archaeological Excavation in CRMarchaeo version 1.5.0]

Reference: YPPO, TDPEAE, Epistimoniki Epitropi Knossou (2008). *Knossos, Sintirisi, Stereosi ke Anadiksi tou anaktorou ke tou archaeologikou xorou*.

Vote to add the example by AK:
In favor: 6
Against: none
Outcome: Accepted.

Overall Decision: Issue to be kept open until all HW is turned in (**HW**: GH, TV)

Issue 525: Add graphics to the CRMsci definition

AK presented HW (the updated graphs). They look OK, however S24 Sample Splitting (possibly other classes too) are not instantiated by their respective properties.

Proposal:

- Vote to accept the existing diagrams (to be added to the introduction)
- AK to double check that no agreed upon property is left out of the diagrams (and update them accordingly).
- AK to share the diagrams with TV, who will draft long captions illustrating the content of the models.
- TV will share the texts with MD to update, where necessary, and SdS to proofread
- An e-vote will start through the SIG mailing list.

Vote on the proposal:
in favor: 6
against: 0
outcome: proceed as proposed

Decision: AK to add properties for S24, TV to draft the short descriptions for the diagrams and share them with MD and SdS to review and proofread. At the end this will be put to an e-vote.

Issue 539: Examples of AP7 -reference to the excavation records from Akrotiri

HW by SdS to reformulate the example by AK.

- **Example by AK:** The layers of pumice and volcanic ash, about one metre thick, covering the ancient city of Akrotiri (A8) *was produced by* the explosion of the ancient Santorini's volcano (A4) (see Fig. 5, 8).
- **Reformulated example by Sds (following minor editing):** The layers of pumice and volcanic ash, about one metre thick, covering the ancient city of Akrotiri (A8) *was produced by* the eruption of the volcano on Santorini in 17th-15thcentury BCE (A4) (see Fig. 8). [Based on the excavation records held in the archives of the Ephorate of Antiquities of Cyclades]

Vote to accept reformulated example:
In favor:
Against: none
Outcome: accepted

Decision: update the example in the document, close the issue

Issue 478: Quantification of AP2 discarded into (was discarded by)

HW by CEO re. (1) the quantification of AP2 and (2) the addition of a new property to document the heap produced by the instance of S11 Amount of Matter that (AP2i) *was discarded* in the course of an A1 Excavation Process Unit.

AP2 quantification: make it many to many (0,n:0,n)

Proposal: change quantification from one to many (0,n:0,1) to many to many (0,n:0,n)

APxx discarded into (was discarded by)

Information about the heap could be documented through a new property APxx discarded into (was discarded by) [D: A1 Excavation Process Unit, R: S11 Amount of Matter]. Details of the definition in the appendix.

Discussion:

SdS: There are deliberate pseudo-sampling processes in excavations. F.i., the content of odd-numbered buckets and even-numbered gets discarded in different piles. The piles are used for different tests, float analysis vs sieving f.i. This is a known process, but it requires knowing which pile the substance came from in each scenario.

MD: an alternative would be to distinguish the heaps as parts of the same instance of S11 Amount of Matter, and assign types to them.

SdS: explain the quantification in the scope note by means of an example.

HW: AF to explain the quantification in the scope note.

Vote:

(1) to accept the quantification of AP2 (many to many),
(2) to introduce new property APxx discarded into (was discarded by) [D: A1 Excavation Processing Unit, R: S11 Amount of Matter] to CRMarcheo
in favor: 8
Against: none
Outcome: accepted

Overall decision:

1) Quantification many to many accepted for AP2
2) Start a new issue to discuss the new property (now AP29 discarded into) and its quantification - extend its scope note by adding a clause in it that explains why the quantification is set to many to many
HW: AF, GH, CEO

[NEW ISSUE]: AP29 discarded into (scope note extension)

A new issue where to discuss the new property (now AP29 discarded into) and its quantification -extend its scope note by adding a clause in it that explains why the quantification is set to many-to-many
HW: AF, GH, CEO

Issue 447: A7 Embedding as a Physical Feature like entity

CEO presented HW (1) scope note of A7, (2) consequences for referred properties

Proposal:

(1) New scope note to reflect that A7 isA A8
(2) Reconsider the examples
(3) Delete AP20 is embedding at (contains): E53 Place –on the grounds that it's redundant given the dual nature assumed for A7 (physical feature and place). References to locations should be made through approximations.
(4) Discuss other properties (minimal changes)

Vote on accepting the scope note
in favor: 6
against: none
Outcome: accepted

Vote to delete AP20 is embedding at (contains)
in favor: 5
against: none
Outcome: accepted

Vote to accept the examples for A7 Embedding, (but need a reference for the Mt Vesuvius):
In favor: 4,
Against: 1 (AT: considers the calcified layers problematic, i.e., they fall short re. the statement that: "Normally, an embedding is expected to have been stable from the time of generation of the first instance of A2 Stratigraphic Volume Unit that surrounds it."
She understands that while the scope note does not proscribe that the creation of an encapsulating A2 Stratigraphic Unit could have occurred gradually, she would rather if the example referred to the prototypical case, not marginal – or even exotic –ones).

Alternative proposal:
Vote to accept the examples for the Akrotiri excavation and the San Galgano's sword and then raise a new issue about the addition of more examples (where to discuss the calcification of the mummified bodies found in Pompeii)
In favor: 5
Against: none
Outcome: accepted

Overall decision:

- Accept new scope note of A7 Embedding
- Accept examples for the Akrotiri excavation and the San Galgano's sword
- Delete AP20
- Start new issue where to consider the examples of A7.

Details in the appendix.

[NEW ISSUE]: Examples for A7 Embedding

Discuss the following (and other) examples for A7 Embedding

- The calcified layers of fine ash covering body x during the eruption of Mount Vesuvius in AD79. (tentative)

Issue 419: Activity Plans

TV walked the SIG through the current state of the issue (he was assigned to draft the scope of the CRMact, which he did and circulated it through the mailing list).

Proposal: vote to accept the scope and then close this issue and move ensuing open topics of discussion to new issues. Discuss where it will go on the site

Discussion points:

- The previous decision for 419 was that CRMact will be a stand-alone extension for the time being, there might be dependencies with CRMbiz and CRMsoc, to be re-examined in the respective issues.
- Compartmentalizing family models is a good thing, it allows classes and constructs that for some reason or another no longer naturally fall within the scope of some model to still be implemented (we can still provide migration paths to them), before coming up with a definitive solution –recall FRBRoo classes that form no longer an integral part of LRMoo.
- a text illustrating the purpose of linking event templates only to types of entities, without specifying instances thereof should be added

Vote: to accept the scope as it is (as a starting point) & upload the document (Definition of CRMact; an extension of CIDOC-CRM to support activity plans –Version 0.2) on the site under a designated space (CRMact).
In favor: 9
Against: none
Outcome: Accepted.
Decision:

- generate a new space on the site for CRMact.
- **HW:** TV to share issues through the SIG mailing list, they will all refer to CRMact v0.2
- the sub-site for CRMact to be maintained by TV
  HW (CB): arrange for FORTH to create the sub-site for CRMact and grant TV access to edit it.
- **Issue closed**.

Issue 557: Which family model should classes (i) Provision and (ii) Business Obligation appear under?

AK presented HW (examples for CRMbiz Provision and Business Obligation rendered into diagrams –link here).

Proposal: to make this model an extension of its own (CRMbiz, or some other label) that serves to document business transactions.

Outline of the model's scope (what else does it cover, aside business transactions):

- material provision of things (labor, services, money, goods)
- social exchanges for material gain

- incorporate constructs from SeaLit (and other projects –f.i. Spectrum, documentation of Nazi theft, BM project for illicit trading) to draft the practical scope of the document (discuss with RS, SdS)
- museum transactions for object acquisition/exchange etc.

Vote to create this extension
In favor: 8
Against: none
Outcome: Accepted

HW: MD, SdS to shape this outline in a practical scope. Consult RS.

Decision: proposal accepted, HW for MD and SdS for the practical scope. The label to be discussed in a new issue through the SIG list.

Issue closed

[NEW ISSUE]: How to call the model for business transactions

CRMbiz or something else

Issue 580: CRMsoc redefinition of scope

Presentation of the new scope for CRMsoc: a model for social phenomena (FB). Link to the presentation here.

GB linked the presentation to the present state of CRMsoc as it stands now and what remains to be done:

- overall definition for the model has been provided and shared with the SIG prior to the meeting
- rather than grouping a number of concepts and constructs that didn't fit in the CIDOC CRM[base], they grounded the model in social psychology & social philosophy and used salient concepts therein.
- social life is a far too complex to model it bottom-up as a whole. Some constructs are proper top-down (they are grounded however in their respective scientific disciplines)

Proposal: to accept the scope as found in the text shared with the SIG and FBs presentation

Discussion:

- the new scope for CRMsoc is a very interesting domain-specific approach
- it will not be a priori declared a crm-compatible model, as it assumes a top-down approach (whereas CIDOC CRM and family models are bottom-up, data-driven approaches).
- its core concepts (f.i. intentionality/mental state, social identity) clash with basic constructs in the CRM universe
- CRMsoc can be a parallel model, the development of which is endorsed (and closely monitored) by the SIG.

No definitive decision: The general idea is that CRMsoc reuses CRM and also provides constructs for modeling social facts (that are of interest to historians and social scientists). Its status will not be of an official extension to the CIDOC CRM, but a parallel thing. Will be discussed more through the SIG list and at the next SIG meeting.

Friday, 11 February 2022

The SeaLiT Ontology; presentation by Pavlos Fafalios, Athina Kritsotaki

Link to the presentation, here.

Questions:

(1) Loading and unloading of a ship: is there a referenced E53 Place for them? (A place and a time, it's just not shown in the slides. They are both specializations of E7 Activity, so they inherit all properties form it)
(2) Countries are instances of E53 Place? (Yes, in the sense of a geopolitical region. The indication is taken from the flag).
(3) FastCat: is it open source? (Not yet. The goal is for it to be open-source, once it has been finalized. At the moment, FORTH is working towards making it fully configurable and applying it for all kinds of different scenarios.
(4) When inserting the data into the ResearchSpace, is it possible to directly export from 3M? (the plan is to fully automate the process of data entry and transformation through 3M into ResearchSpace. A reconciliation step will be added.)
(5) ResearchSpace: free to use? (

Discussion:

MD: this presentation illustrates the methodology of doing CRM-compatible bottom-up modeling. Could the data used for SeaLiT be used to inform the practical scope of CRMsoc –how statistical means can help derive at generalizations etc. Definitely in the practically scope of CRMbiz. Check with the project what kind (or part) of the data can be shared through the CRM site.

PF: They are working towards publishing a derived dataset.

Issue 555: RDFS Implementation and related issues

Proposal to formally close the issue on the grounds of all decisions having been implemented (see post on the list –Novermber 25th, 2021)

Vote: close the issue
In favor: 8
Against: none
Outcome: accepted

Issue closed

Issue 460: URIs management

Proposal to formally close the issue on the grounds of all decisions having been implemented (see post on the list –Novermber 25th, 2021)

Vote: close the issue
In favor: 8
Against: none
Outcome: accepted

Issue closed

Issue 566: other serializations useful to autogenerate

PF presented the current state of the issue: serializations created (N-Triples, Turtle, JSON-LD) available in the GitLab repository for FORTH and also on the official webpage of CIDOC CRM (under resources, for v7.1.1)

Proposal: Add Trig to the set of serializations (supports named graph declarations)

Vote for the proposal
In favor: 6
Against: none
Outcome: accepted.

Decision: proceed with a Trig serialization

Issue 565: Defining rules for automatically generating a JSON-LD context

PF presented the state of the issue: ETz has produced a JSON-LD, RS has provided feedback. The file can be found here.

Proposal 1: have an unversioned URL for the JSON-LD context corresponding to the last published version of CIDOC-CRM (currently 7.1.1) and versioned URLs corresponding to old versions of CIDOC-CRM (e.g., https://cidoc-crm.org/cidoc-crm/7.1.1/json-ld_context.jsonld -when another official version is released)

Vote for this proposal:
In favor: 8
Against: none
Outcome: accepted

Proposal 2: provide the file as a new "encoding" in the resources page (under the relevant version):
In favor: 8
Against: none
Outcome: accepted

Decision: have both unversioned and versioned URLs for the JSON-LD context and also list the context under the encodings available (relevant version)

Issue 567: module for PC properties

PF presented the state of the issue. ETz has checked which .1 properties did not appear in the file that had been created for v.6.2. A new .1 property was added (P189.1 has type: E55 Type), a "Read Me" comment and a change log. The name of the file is "CRMpc_v1.2rdfs" Link to the file **here**.

Discussion:

- name of the file: it is a derivative of a given version of the CRM, not an update to the last version of the rdf implementation of PC properties.
- the comment should also comprise a compatibility statement with the relevant version. Should be added for each version there is an rdf implementation.
- ideas how to word that: "Derivative of the CRM version xyz/ Compatible with the CRM version xyz"

Proposal: Provide a new PC file for each version that comes with an rdf implementation: name it accordingly, add a compatibility statement in a comment and release it on the site (under relevant version)

Vote on the proposal:
In favor: 9
Against: none
Outcome: accepted

Decision: proceed as proposed.

Issue closed (nothing left to do)

Issue 577: Official NameSpaces for CRM Extensions?

PF presented the state of the issue and the proposal to have the namespaces of compatible models under http://www.cidoc-crm.org/ (also avoid nesting namespaces). This will be implemented for published versions of extensions (assuming they have harmonized with CIDOC CRM v7.1.1). Namespaces for model extensions should look like that "http://www.cidoc-crm.org/**extensions/crmsci**" (for CRMsci f.i.)

Discussion: PR is not aware of potential conflicts with IFLA, they should know what their policy is before embedding LRM under this namespace. **MR** will attend a LIDATEC meeting in the beginning of March. She will raise the issue (namespace that LRMoo and FRBRoo will point to) and inform the SIG.

- The FR conceptual models fall under this: https://www.iflastandards.info/fr
- FRBRoo: https://www.iflastandards.info/fr/frbr/frbroo.html
- The space for the LRM models is here: https://www.iflastandards.info/lrm (So far it only features LRMer, but when ready, LRMoo will appear there with the prefix: https://www.iflastandards.info/lrm/lrmoo)

Proposal:
Have all namespaces under http://www.cidoc-crm.org/ except for FRBR/LRMoo (discuss this once MR provides feedback). No hyphens in the model names.

Vote on the proposal
in favor: 9
against: none
Outcome: accepted

Decision: as proposed
MR, PR to contact the team at FORTH (PF and ETz) inform them what the practice should be re. LRMoo and FRBRoo

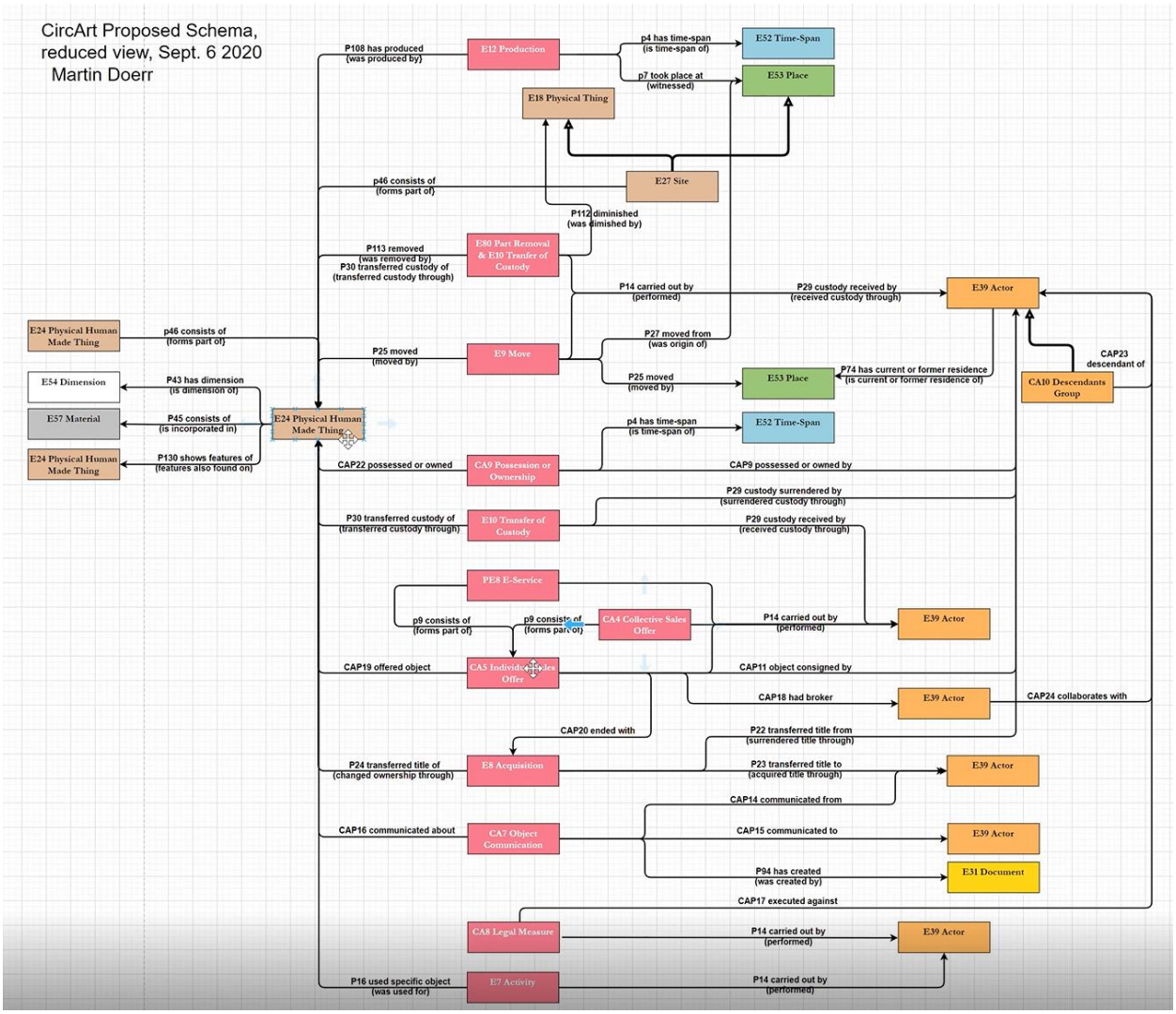
Issue 568: Incorporate changes in the model implemented by the ISO group to the versioning pipeline of the SIG

No HW assignment –assign the editorial group with supervising this procedure, guide ETz and PF wrt where the URIs will point to (whether v7.1.2 will supersede v7.1.1 as a community standard AND as an ISO standard, any parallel development that will take place with 7.1.2 because of changes implemented by the ISO group etc.)

Model for Illicit Trading of Archaeological items; presentation by Martin Doerr

Overview of the CircArt model and background of project it stemmed from.

An overview of the model can be found below:



The CircArt Project of BM dealt with Illicit trading of Egyptian Items in auctions or the internet. The empirical base for the CircArt model was webpages like liveauctioneers, bonhams, or catawiki that documented selling price, some description of the object (style, provenance, ownership) and its condition state, plus pictures of the objects at hand. Cross-referencing objects, provenance stories, ownership rights etc., can indicate whether there is illicit trading involved or whether the sellers are trustworthy or not.

The model developed incorporated guidelines and points raised by Marcel Maree and Maxence Garde from the British Museum, as well as review and refinements by Dominic Oldman.

Editorial group –function and members

CEO informed the SIG how the editorial group came into existence: at the beginning of the COVID outbreak, when we needed to produce an official version to submit to ISO for revision and organize online meetings for the SIG. The editors of the CIDOC CRM v.7.0 (Martin Doerr, Christian-Emil Ore,

George Bruseker, Stephen Stead and Thanasis Velios) formed a group, assisted by Eleni Tsouloucha. Erin Canning is the newest addition to this group. It is a very open group.

Discussion: Specific roles within the editors group, areas of expertise that still need expanding: Need to strengthen the cross-linguistic perspective. The group would like to engage PM and others as well.

Propose to approve or register disapproval re the existence of the editors' group through a vote

In favor: 9
Against: none

Decision: the group stands, anyone wanting to participate can volunteer to do so.

Issue 530: Bias in data structures

EC gave a progress report of the work undertaken by the bias group. The focus has been on the following sub-topics:

1. Identify areas of concern in the CRM (throughout the model -at different levels: from scope notes to working practices
2. Produce a statement on bias for the CRM specification document (link to DRAFT document HERE)
3. Establish criteria for examining classes and properties (link to DRAFT document HERE)
4. Create new issues for improving the model (link to DRAFT document HERE
    - Also: by reviewed area - E39, E21, E74: HERE

The group will meet again on March 14 to carry on reviewing CRM according to Functional Units

Issue 528: Guidelines and Protocols for Translating CIDOC CRM

(A) **Progress report by PM.** Link to presentation. Points of interest summarized in the following (DRAFT) documents:

- Translation order proposal
- Enhancement of the CIDOC CRM translations interface –an implementation proposal by FORTH
- Governance Guidelines
- Best practices guide

Points of discussion:

- Novel examples shouldn't be substituted for the ones already in the CRM without getting the SIG's agreement first. They form part of the definition. If a translation group finds a particular example underinformative and would like to use another instead, they should bring this issue to the SIG.
- **Regarding the translation order:** the classes and properties that appear in the introduction should probably rank higher than the ones that are not mentioned in it. Maybe another column should be implemented that considers this aspect. This has been done for the French translation but it has not been added in the shared documents.
- Introduce a "shortcut" procedure, when some part is not clear or cannot be properly translated to raise an issue with the SIG.
- **Regarding ideas/questions to be included in the governance guidelines:**
    - a very important issue is how to identify the groups undertaking translation projects and then how to support them and ensure that no duplication of effort is required.

- Some CRM-SIG members to have a more active participation wrt translation initiatives, identify issues as soon as they occur –has been done before with the Chinese, German and Greek translations
- MR volunteered to participate in the group's meetings –she has considerable experience with translating the IFLA standards, could assist in drafting the governance guidelines.

(B) **Where should translations should appear in the website**. Proposals by GB:

- Remove the translations section from the site altogether. Translations should be listed under whatever version they render in a different language (main Resources page> version number > translation in <whatever> language).
- Add a subsite for translation initiatives (like we have for members, projects etc.) where information is given on the various groups and the languages they are translating CRM into – also information on contact persons etc.

Discussion points:

- The "Translations" page needn't be deleted –there might be incomplete translations of an official version (the translation process can have interim outputs –if one is to follow the hierarchical order proposed for the translation guideline). Partial translations could be listed in that space but also be displayed under resources (and appropriate version).

Vote whether to accept that the completed translations of official versions appear in the resources section under their respective version.
In favor: 12
Against: none
Outcome: Accepted

(C) **MD produced a table of translation units for the introduction section of CIDOC CRM v7.1.1** for which he then provided equivalent (or at least comparable) parts in the introduction section of published versions predating it, and flagged all major changes among versions.

Proposal: implement an xml format which identifies translation units independently (through an identifier –section headers have changed so they are not 100% reliable) and then map it to its general super-section (in a hierarchical structure).

Diff between versions of the CIDOC CRM by Etz: https://cidoc-crm.org/html-dev/comparisons/

- Terminology should be broken down to terms –each term to become a translation unit.
- What sections have a continuing identity (f.i. Monotonicity) and can be traced throughout versions.

Overall Decisions:

- **MR** to be included in the Governance Guidelines discussion.
- completed translations of official versions appear in the resources section under their respective version
- **HW**: ETz and the team at FORTH to come up with a proposal re how unfinished versions of translations appear on the site
- **HW**: CB and the team at FORTH to come up with a proposal re the representation of official translation groups on the CRM site

- **HW**: ETz & MD to come up with a proposal for describing the parent-headers of independent translation units (to be applied to Terminology as well)

Next SIG meetings

Dates have been set for May, September, December 2022.

Several standing proposals to host the next SIG meetings by various institutions

- FORTH in May,
- MvR's (Liege) team is willing to host in June –if people are willing to reschedule. If not, they could host the meeting in December 2022.
- Initially MA's team (Rome) was considering hosting a joint meeting in November, but they can do September instead.

People are really eager to have in-person meetings again, but institutional policies regarding travelling vary.

MR: would prefer that we do not change the dates –especially not the ones in May and September, there are conflicts in her schedule. She thinks that the in person meetings are ultimately more productive in the long run.

AT, EC, TV: consider it really hard to get travel funding for meetings that can take place online. Especially when travelling from outside Europe, it would be impossible to secure this kind of institutional support, four times each year (even without COVID). Hybrid meetings should be an option.

PR: It is practically impossible to attend every in person SIG meeting if you are not based in Europe. However, the in person meetings she has attended to this point, were much more productive than the online ones. It was four full days each time, instead of four half days. There was room for smaller groups and breakout sessions. Going through bullet points on screen does not make up for that.

Proposal: In the long term we could divide sessions btw online and in-person events. The online meetings could cover lists of to do points. [+1 from MR, CB, MD]

GB: the funding for Rome has to be respected. At least one meeting should take place there.

ET: We need to consider people joining in from other parts of the world (East Asia, America) and what it means for them to have to travel to Europe two or three times a year, or what it means for them to have to sit through a meeting at 3.00 am. None of the options seems particularly inclusive, so maybe another doodle would be a solution for us to get a better grasp of what the SIG members/goers actually need. It's not a decision for a handful of people in Europe to make, it affects everyone.

SdS: he prefers to have 3 physical meetings in Heraklion, Rome and Liege (in that order). Let's decide on the pattern for physical vs. online meetings for 2023. Heraklion could be a hybrid one.

MR: volunteers to manage screen-sharing for one of the sessions.

The ICOM conferences will be discussed among the editorial group. Proposals will be shared through the SIG list.

Appendices

I) List of abbreviated names

AF	Achille Felicetti
AK	Athina Kritsotaki
AT	Ana Tam
CB	Chryssoula Bekiari
CEO	Christian-Emil Ore
CM	Carlo Meghini
DF	Donatella Fiorani
DH	Daria Hookk
DO	Dominic Oldman
EC	Erin Canning
ET	Eleni Tsouloucha
ETz	Elias Tzortzakakis
FB	Francesco Beretta
GB	George Bruseker
GH	Gerald Hiebel
MA	Marta Acierno
MD	Martin Doerr
MR	Mélanie Roche
MvR	Muriel van Ruymbeke
MZ	Maja Zumer
PF	Pavlos Fafalios
PM	Philippe Michon
PR	Pat Riva
SdS	Stephen Stead
TA	Trond Aalberg
TV	Thanasis Velios

II) Model changes

574: Scope note/range clarification for E80 and P112

P112 diminished (was diminished by) update

OLD

P112 diminished (was diminished by)

Domain:

E80 Part Removal

Range:

E24 Physical Human-Made Thing

Subproperty of:

E11 Modification. P31 has modified (was modified by): E18 Physical Thing

Quantification:

many to many, necessary (1,n:0,n)

Scope note:

This property identifies the instance E24 Physical Human-Made Thing that was diminished by an instance of E80 Part Removal.

Although an instance of E80 Part removal activity normally concerns only one instance of E24 Physical Human-Made Thing, it is possible to imagine circumstances under which more than one item might be diminished by a single instance of E80 Part Removal activity.

Examples:

- The coffin of Tut-Ankh-Amun (E22) *was diminished by* The opening of the coffin of Tut-Ankh-Amun (E80). (Carter, 2014)

In First Order Logic:

P112(x,y) ⇒ E80(x)
P112(x,y) ⇒ E24(y)
P112(x,y) ⇒ P31(x,y)

NEW

P112 diminished (was diminished by)

Domain:

E80 Part Removal

Range:

E18 Physical Thing

Subproperty of:

E11 Modification. P31 has modified (was modified by): E18 Physical Thing

Quantification:

many to many, necessary (1,n:0,n)

Scope note:

This property identifies the instance E18 Physical Thing that was diminished by an instance of E80 Part Removal.

Although an instance of E80 Part removal activity normally concerns only one instance of E18 Physical Thing, it is possible to imagine circumstances under which more than one item might be diminished by a single instance of E80 Part Removal activity.

Examples:

- The coffin of Tut-Ankh-Amun (E22) *was diminished by* The opening of the coffin of Tut-Ankh-Amun (E80). (Carter, 2014)
- The coral of the Cocos Islands (E20) *was diminished* by The removal of the Porite coral specimen by Charles Darwin (E80).

In First Order Logic:

P112(x,y) ⇒ E80(x)
P112(x,y) ⇒ E18(y)
P112(x,y) ⇒ P31(x,y)

References:

https://data.nhm.ac.uk/object/e1bfb1ab-e94e-4e0a-a13c-bc54e03f22e5

https://docs.google.com/document/d/1xgHEELikQwLBVdD84Mkka0p_rT8T9R7PhT4N3Uc7Wz8/edit

E80 Part removal update

OLD

E80 Part Removal

Subclass of:

E11 Modification

Scope note:

This class comprises the activities that result in an instance of E18 Physical Thing being decreased by the removal of a part.

Typical scenarios include the detachment of an accessory, the removal of a component or part of a composite object, or the deaccessioning of an object from a curated collection, an instance of E78 Curated Holding. If the instance of E80 Part Removal results in the total decomposition of the original object into pieces, such that the whole ceases to exist, the activity should instead be modelled as an instance of E81 Transformation, i.e., a simultaneous destruction and production. In cases where the part removed has no discernible identity prior to its removal but does have an identity subsequent to its removal, the activity should be modelled as both an instance of E80 Part Removal and E12 Production. This class of activities forms a basis for reasoning about the history, and continuity of identity over time, of objects that are removed from other objects, such as precious gemstones being extracted from different items of jewellry, or cultural artifacts being deaccessioned from different museum collections over their lifespan.

Examples:

- the removal of the engine from my car (fictitious)
- the disposal of object number 1976:234 from the collection (fictitious)

In First Order Logic:

E80(x) ⇒ E11(x)

Properties:

P112 diminished (was diminished by): E24 Physical Human-Made Thing
P113 removed (was removed by): E18 Physical Thing

NEW

E80 Part Removal

Subclass of:

E11 Modification

Scope note:

This class comprises the activities that result in an instance of E18 Physical Thing being decreased by the removal of a part.

Typical scenarios include the detachment of an accessory, the removal of a component or part of a composite object, or the deaccessioning of an object from a curated collection, an instance of E78 Curated Holding. If the instance of E80 Part Removal results in the total decomposition of the original object into pieces, such that the whole ceases to exist, the activity should instead be modelled as an instance of E81 Transformation, i.e., a simultaneous destruction and production. In cases where the part removed has no discernible identity prior to its removal but does have an identity subsequent to its removal, the activity should be modelled as both an instance of E80 Part Removal and E12 Production. This class of activities forms a basis for reasoning about the history, and continuity of identity over time, of objects that are removed from other objects, such as precious gemstones being extracted from different items of jewellry, or cultural artifacts being deaccessioned from different museum collections over their lifespan.

Examples:

- the removal of the Porite coral specimen from the Cocos Islands by Charles Darwin in April 1836
- the removal of the engine from my car (fictitious)
- the disposal of object number 1976:234 from the collection (fictitious)

In First Order Logic:

E80(x) ⇒ E11(x)

Properties:

P112 diminished (was diminished by): E18 Physical Thing
P113 removed (was removed by): E18 Physical Thing

P110 augmented (was augmented) update

OLD

P110 augmented (was augmented by)

Domain:

E79 Part Addition

Range:

E24 Physical Human-Made Thing

Subproperty of:

E11 Modification. P31 has modified (was modified by): E18 Physical Thing

Quantification:

many to many, necessary (1,n:0,n)

Scope note:

This property identifies the instance of E24 Physical Human-Made Thing that is added to (augmented) in an instance of E79 Part Addition.

Although an instance of E79 Part Addition event normally concerns only one instance of E24 Physical Human-Made Thing, it is possible to imagine circumstances under which more than one item might be added to (augmented). For example, the artist Jackson Pollock trailing paint onto multiple canvasses.

Examples:

- The final nail-insertion Event (E79) *augmented* Coffin of George VI (E22). (https://www.rct.uk/collection/2000811/the-coffin-of-king-george-vi-during-the-lying-in-state)

In First Order Logic:

P110(x,y) ⇒ E79(x)
P110(x,y) ⇒ E24(y)
P110(x,y) ⇒ P31(x,y)

NEW

P110 augmented (was augmented by)

Domain:

E79 Part Addition

Range:

E18 Physical Thing

Subproperty of:

E11 Modification. P31 has modified (was modified by): E18 Physical Thing

Quantification:

many to many, necessary (1,n:0,n)

Scope note:

This property identifies the instance of E18 Physical Thing that is added to (augmented) in an instance of E79 Part Addition.

Although an instance of E79 Part Addition event normally concerns only one instance of E24 Physical Human-Made Thing, it is possible to imagine circumstances under which more than one item might be added to (augmented). For example, the artist Jackson Pollock trailing paint onto multiple canvasses.

Examples:

- The final nail-insertion Event (E79) *augmented* Coffin of George VI (E22). (https://www.rct.uk/collection/2000811/the-coffin-of-king-george-vi-during-the-lying-in-state)
- The attachment of the bronze hand of the Alpi Marittime sculpture (E79) *augmented* the tree of the Alpi Marittime sculpture (E20). (Pennone, 1968)

In First Order Logic:

P110(x,y) ⇒ E79(x)
P110(x,y) ⇒ E18(y)
P110(x,y) ⇒ P31(x,y)

References:

https://giuseppepenone.com/en/words/maritime-alps

E79 Part Addition update

OLD

E79 Part Addition

Subclass of:

E11 Modification

Scope note:

This class comprises activities that result in an instance of E24 Physical Human-Made Thing being increased, enlarged or augmented by the addition of a part.

Typical scenarios include the attachment of an accessory, the integration of a component, the addition of an element to an aggregate object, or the accessioning of an object into a curated instance of E78 Curated Holding. Objects to which parts are added are, by definition, human-made, since the addition of a part implies a human activity. Following the addition of parts, the resulting human-made assemblages are treated objectively as single identifiable wholes, made up of constituent or component parts bound together either physically (for example the engine becoming a part of the car), or by sharing a common purpose (such as the 32 chess pieces that make up a chess set). This class of activities forms a basis for reasoning about the history and continuity of identity of objects that are integrated into other objects over time, such as precious gemstones being repeatedly incorporated into different items of jewellery, or cultural artifacts being added to different museum instances of E78 Curated Holding over their lifespan.

Examples:

- the setting of the Koh-I-Noor diamond into the crown of Queen Elizabeth the Queen Mother (Dalrymple, 2017)
- the addition of the painting “Room in Brooklyn” by Edward Hopper to the collection of the Museum of Fine Arts, Boston

In First Order Logic:

E79(x) ⇒ E11(x)

Properties:

P110 augmented (was augmented by): E24 Physical Human-Made Thing
P111 added (was added by): E18 Physical Thing

NEW

E79 Part Addition

Subclass of:

E11 Modification

Scope note:

This class comprises activities that result in an instance of E18 Physical Thing being increased, enlarged or augmented by the addition of a part.

Typical scenarios include the attachment of an accessory, the integration of a component, the addition of an element to an aggregate object, or the accessioning of an object into a curated instance of E78 Curated Holding. Objects to which parts are added are, by definition, human-made, since the addition of a part implies a human activity. Following the addition of parts, the resulting human-made assemblages are treated objectively as single identifiable wholes, made up of constituent or component parts bound together either physically (for example the engine becoming a part of the car), or by sharing a common purpose (such as the 32 chess pieces that make up a chess set). This class of activities forms a basis for reasoning about the history and continuity of identity of objects that are integrated into other objects over time, such as precious

gemstones being repeatedly incorporated into different items of jewellery, or cultural artifacts being added to different museum instances of E78 Curated Holding over their lifespan.

Examples:

- the setting of the Koh-I-Noor diamond into the crown of Queen Elizabeth the Queen Mother (Dalrymple, 2017)
- the addition of the painting “Room in Brooklyn” by Edward Hopper to the collection of the Museum of Fine Arts, Boston
- the attachment of the bronze hand on the tree forming the Alpi Marittime (Pennone, 1968)

In First Order Logic:

E79(x) ⇒ E11(x)

Properties:

P110 augmented (was augmented by): E18 Physical Thing
P111 added (was added by): E18 Physical Thing

References:

https://giuseppepenone.com/en/words/maritime-alps

561: Scope-note of P139

Change the definition of P139 has alternative form

OLD

P139 has alternative form

Domain:

E41 Appellation

Range:

E41 Appellation

Quantification:

many to many (0,n:0,n)

Scope note:

This property associates an instance of E41 Appellation with another instance of E41 Appellation that constitutes a derivative or variant of the former and that may also be used for identifying items identified by the former, in suitable contexts, independent from the particular item to be identified. This property should not be confused with additional variants of names used characteristically for a single, particular item, such as individual nicknames. It is an asymmetric relationship, where the range expresses the derivative, if such a direction can be established. Otherwise, the relationship is symmetric. The relationship is not transitive.

Multiple names assigned to an object, which do not apply to all things identified with the specific instance of E41 Appellation, should be modelled as repeated values of *P1 is identified by (identifies)* of this object.

P139.1 has type allows the type of derivation to be refined, for instance “transliteration from Latin 1 to ASCII”.

Examples:

- "Martin Doerr" (E41) *has alternative form* "Martin Dörr" (E41) *has type* Alternate spelling (E55).

- "Гончарова, Наталья Сергеевна" (E41) *has alternative form* "Gončarova, Natal´â Sergeevna" (E41) *has type* ISO 9:1995 transliteration (E55).
- "Αθήνα" (E41) *has alternative form* "Athina" (E41) *has type* transcription (E55).

In First Order Logic:

P139(x,y) ⇒ E41(x)
P139(x,y) ⇒ E41(y)
P139(x,y,z) ⇒ [P139(x,y) ∧ E55(z)]
P139(x,y) ⇒ P139(y,x)
¬P139(x,x)

Properties:

P139.1 has type: E55 Type

NEW

P139 has alternative form (is alternative form of)

Domain:

E41 Appellation

Range:

E41 Appellation

Quantification:

many to many (0,n:0,n)

Scope note:

This property associates an instance of E41 Appellation with another instance of E41 Appellation that constitutes a derivative or variant of the former and that may also be used for identifying items identified by the former, in suitable contexts, independent from the particular item to be identified. This property should not be confused with additional variants of names used characteristically for a single, particular item, such as individual nicknames. It is a directed relationship, where the range expresses the derivative or variant and the domain the source of derivation or original form of variation, if such a direction can be established. Otherwise, the relationship is symmetric. The relationship is not transitive.

Multiple names assigned to an object, which do not apply to all things identified with the specific instance of E41 Appellation, should be modelled as repeated values of *P1 is identified by (identifies)* of this object.

P139.1 has type allows the type of derivation to be refined, for instance "transliteration from Latin 1 to ASCII".

Examples:

- "Martin Doerr" (E41) *has alternative form* "Martin Dörr" (E41) *has type* Alternate spelling (E55).
- "Гончарова, Наталья Сергеевна" (E41) *has alternative form* "Gončarova, Natal´â Sergeevna" (E41) *has type* ISO 9:1995 transliteration (E55).
- "Αθήνα" (E41) *has alternative form* "Athina" (E41) *has type* transcription (E55).

In First Order Logic:

P139(x,y) ⇒ E41(x)
P139(x,y) ⇒ E41(y)
P139(x,y,z) ⇒ [P139(x,y) ∧ E55(z)]

Properties:

P139.1 has type: E55 Type

360: LRMoo

R8 combines (is combined to form)

the examples that will be included in the

Examples:

- 'The Adoration of the Shepherds (Coventry)' as a controlled access point for the work (F12) *combines* 'The Adoration of the Shepherds' as the preferred title of the work (F12).
- 'The Adoration of the Shepherds (Coventry)' as a controlled access point for the work (F12) *combines* 'Coventry' as a term that refers to a place (F12).
- 'Guillaume, de Machaut, ca. 1300-1377' as a controlled access point for the French composer and poet (F12) *combines* 'ca. 1300-1377' as a term that refers to a time-span (F12).
- 'Guillaume, de Machaut, ca. 1300-1377' as a controlled access point for the French composer and poet (F12) *combines* 'Guillaume de Machaut' as the name for a person (F12).
- 'Univerza v Ljubljani. Oddelek za bibliotekarstvo' as a controlled access point for a corporate body (F12) combines 'Univerza v Ljubljani' as a controlled access point for the parent corporate body (F12).
- 'Univerza v Ljubljani. Oddelek za bibliotekarstvo' as a controlled access point for a corporate body (F12) combines 'Oddelek za bibliotekarstvo' the preferred name that refers to a subordinate corporate body (F12).
- ISBN-10 '978-002-002-0' as an identifier for the publication entitled 'Nigeria's international economic relations' (F12) combines '978' as a code indicating the Nigerian ISBN Agency (F12).
- ISBN-10 '978-002-002-0' as an identifier for the publication entitled 'Nigeria's international economic relations' (F12) combines '002' as a code indicating the Nigerian Institute of International Affairs (F12).
- ISBN-10 '978-002-002-0' as an identifier for the publication entitled 'Nigeria's international economic relations' (F12) combines '002' as a code for the publication entitled 'Nigeria's international economic relations' (F12).
- 'History -- France -- 14th century' as a controlled subject term for the concept expressed according to the order and syntax prescribed in the Library of Congress Subject Headings (LCSH) subject headings language (F12) combines 'History' as the preferred term for the concept in LCSH (F12).
- 'History -- France -- 14th century' as a controlled subject term for the concept expressed according to the order and syntax prescribed in the Library of Congress Subject Headings (LCSH) subject headings language (F12) combines 'France' as the preferred term for the country in LCSH (F12).
- 'History -- France -- 14th century' as a controlled subject term for the concept expressed according to the order and syntax prescribed in the Library of Congress Subject Headings (LCSH) subject headings language (F12) combines '14th century' as the preferred term for the time-span in LCSH (F12).
- '595.7096' as a classification number for insects in Africa in the 23rd edition of the Dewey Decimal Classification (DDC23) (F12) combines '595.7' as the classification number for the taxonomic class Insecta (insects) in DDC23 (F12).
- '595.7096' as a classification number for insects in Africa in the 23rd edition of the Dewey Decimal Classification (DDC23) (F12) combines '096' as the notation corresponding to the continent Africa in DDC23 (F12).

F5 Item (scope note edits)

OLD

F5 Item

Subclass of: E24 Physical Human-Made Thing

Scope note: This class comprises physical objects (printed books, scores, CDs, DVDs, CD-ROMS, etc.) that were produced by (P186i) an industrial process involving a given instance of F3 Manifestation. As a result, all the instances of F5 Item associated with a given instance of F3 Manifestation are expected to carry the content defined in that instance of F3 Manifestation, although some or even all of them may happen to carry a content that significantly differs from it, due to either an accident in the course of industrial production, or subsequent physical modification or degradation.

An instance of F5 Item that consists of a physical object or set of objects with clear physical boundaries is also an instance of E22 Human-Made Object. An instance of F5 Item that is stored on a part of a larger physical support (such as an electronic file among others on a disc) can also be considered to be an instance of E25 Human-Made Feature.

The notion of F5 Item is only relevant with regard to the production process, from a bibliographic point of view. Cultural heritage institutions' holdings are a distinct notion: a holding certainly can be equal to an instance of F5 Item, but it also can be either "bigger" than one (e.g., when two instances of F5 Item are bound together (in the case of printed books), or physically united in any other way, or when an instance of F5 Item is enhanced through the addition of manuscript annotations, or any material that was not intended by the publisher, such as press clippings, dried flowers, etc.), or "smaller" than one (e.g., when a one volume instance of F5 Item (in the case of printed books) is interleaved and rebound as two volumes, or when pages were torn away from it, or when one CD from a two-CD set is missing, etc.). From an operational point of view, cultural heritage institutions do *not* deal with instances of F5 Item, but with storage units. However, it was not deemed necessary to declare an additional class for the notion of Storage Unit. Storage units can be easily accounted for through the E19 Physical Object class from CIDOC CRM, and the relationships between storage units and instances of F5 Item through the *P46 is composed of (forms part of)* property from CIDOC CRM. If needed, an instance of E19 Physical Object can be typed as a storage unit through the *P2 has type (is type of)* property.

NEW

Subclass of: E24 Physical Human-Made Thing

Scope note: This class comprises physical objects (printed books, scores, CDs, DVDs, CD-ROMS, etc.) that were produced by (P186i) an industrial process involving a given instance of F3 Manifestation. As a result, all the instances of F5 Item associated with a given instance of F3 Manifestation are expected to carry the content defined in that instance of F3 Manifestation, although some or even all of them may happen to carry a content that significantly differs from it, due to either an accident in the course of industrial production, or subsequent physical modification or degradation.

An instance of F5 Item that consists of a physical object or set of objects with clear physical boundaries is also an instance of E22 Human-Made Object. An instance of F5 Item that is stored on a part of a larger physical support (such as an electronic file among others on a disc) can also be considered to be an instance of E25 Human-Made Feature.

The notion of F5 Item is only relevant with regard to the production process, from a bibliographic point of view. Cultural heritage institutions' holdings are a distinct notion: a holding certainly can be equal to an instance of F5 Item, but it also can be either "bigger" than one (e.g., when two

instances of F5 Item are bound together (in the case of printed books)), or "smaller" than one (e.g., for incomplete holdings, such as when only one CD from a two-CD set is held). From an operational point of view, cultural heritage institutions typically do *not* deal with instances of F5 Item, but with storage units, although for libraries in most cases this is not significant because each item corresponds with a single storage unit. When this is not the case, the linkage between items and storage units can be easily accounted for through the E19 Physical Object class from CIDOC CRM, and the relationships between storage units and instances of F5 Item recorded through the *P46 is composed of (forms part of)* property from CIDOC CRM. If needed, an instance of E19 Physical Object can be typed as a storage unit through the *P2 has type (is type of)* property.

Rnn is derivative of (has derivative) –new property maps to LRM-R24

Rnn is derivative of (has derivative)

Domain:	F2 Expression
Range:	F2 Expression
Subproperty of:	E70 Thing. P130 shows features of (features are also found on): E70 Thing
Shortcut of	?
Quantification:	(0,n:0,n)

This property associates an instance of F2 Expression with another instance of F2 Expression (which realises the same instance of F1 Work) which was its source or one of its sources. This property is transitive. This property can be viewed as a shortcut of a longer path: F2 Expression (1). *P16i was used for*: F28 Expression Creation. *R17 created*: F2 Expression (2).
The property Rnn.1 *has type* of this property allows for specifying the kind of derivation, such as translation, revision, etc.

F28 Expression Creation –scope note revising

OLD

Subclass of:	E12 Production
	E65 Creation
	F56 Externalization Event
Superclass of:	F29 Recording Event
	F30 Manifestation Creation

Scope note: This class comprises activities that result in instances of F2 Expression coming into existence. This class characterises the externalisation of an F1 Work. The creation of an instance of F1 Work is considered to occur at the time of creation (F28) of its first F2 Expression.

Although F2 Expression is an abstract entity, a conceptual object, the creation of an expression inevitably also affects the physical world: when you scribble the first draft of a poem on a sheet of paper, you produce an instance of F3 Manifestation. F28 Expression Creation is a subclass of E12 Production because the recording of the expression causes a physical modification of the E18 Physical Thing that serves as the carrier. The work becomes manifest by being expressed on a physical carrier other than the creator's brain. The spatio-temporal circumstances under which the expression is created are necessarily the same spatio-temporal circumstances under which the first instance of F3 Manifestation is produced.

It is possible to use the *P2 has type (is type of)* property in order to specify that the creation of a given expression of a given work played a particular role with regard to the overall bibliographic history of that work (e.g., that it was the creation of the progenitor expression on which all other expressions of the same work are based; or that it was the creation of the critical edition that served as the basis for canonical references to the work).

An instance of F28 Expression Creation may use as source material a specific existing instance of F2 Expression. The property P16 *used specific object (was used for)* can be used to specify the source expression for the derivation. In cases such as a translation or a revised edition, etc., a new instance of F2 Expression of the same F1 Work, a derived expression, is created. In the situation where an expression of one instance of F1 Work serves as source material for the creation of the first expression of a new instance of F1 Work, the relationship is indicated using the property *R2 is derivative of (has derivative)* between the two instances of F1 Work. Path: F1 Work(1). *R3 is realised in:* F2 Expression(1). *P16i was used for:* F28 Expression Creation. *R17 created*: F2 Expression(2). *R3i realises*: F1 Work(2). *R2 is derivative of*: F1 Work(1)

Properties**:**
R17 created (was created by): F2 Expression
R18 created (was created by): F5 Item
R19 created a realisation of (was realised through): F1 Work

NEW

Subclass of:
E12 Production
E65 Creation
F56 Externalization Event

Superclass of:
F29 Recording Event
F30 Manifestation Creation

Scope note:

This class comprises activities that result in instances of F2 Expression coming into existence. An instance of F2 Expression is considered to be created when it is captured on a carrier other than the creator's brain.

The *P2 has type (is type of)* property can be used to specify the type of the instance of F28 Expression Creation (i.e., activities such as translating, revising, or arranging music are types of creation process). The type of the process is distinct from the type of result even though the typology frequently used for instances of the resulting F2 Expressions may imply the category of the instance of the F28 Expression Creation process.

Although F2 Expression is an abstract entity, a conceptual object, the creation of an expression inevitably also affects the physical world: when you scribble the first draft of a poem on a sheet of paper, you produce an instance of F3 Manifestation and an instance of F5 Item. F28 Expression Creation is a subclass of E12 Production because the recording of the expression causes a physical modification of the E18 Physical Thing that serves as the carrier. The creation of an instance of F2 Expression coincides with the creation of the first instance of F3 Manifestation that *R4 embodies (is embodied in)* this instance of F2 Expression.

An instance of F28 Expression Creation may use as source material one or more specific instances of F2 Expression. When the source is documented this is also expressed by the property *Rnn is derivative of (has derivative).*

In the situation where an expression of one instance of F1 Work serves as source material for the creation of the first expression of a new instance of F1 Work, the relationship between the works is indicated using the property R2 is derivative of (has derivative) between the two instances of F1 Work. Path: F1 Work(1). R3 is realised in: F2 Expression(1). P16i was used for: F28 Expression Creation. R17 created: F2 Expression(2). R3i realises: F1 Work(2). R2 is derivative of: F1 Work(1)

Properties: R17 created (was created by): F2 Expression
R18 created (was created by): F5 Item
R19 created a realisation of (was realised through): F1 Work

559: Scope note of O12 has dimension (is dimension of)

OLD

O12 has dimension (is dimension of)

Domain: S15 Observable Entity
Range: E54 Dimension
Quantification: one to many, dependent (0,n:1,1)

Scope note: This property associates an instance of S15 Observable Entity with an instance of E54 Dimension that the observable entity has.
It offers no information about how and when an E54 Dimension was established.

Examples:

- The earthquake of Mexico city in 2017 (E7) *has dimension* magnitude 6.2 Richter (Mindock, 2017, http://www.independent.co.uk/news/world/americas/mexico-earthquake-today-latest-mexico-city-magnitude-6-tremordamage-a7963211.html).
- The landslide that was activated in Parnitha in 1999 after the earthquake (E26), *has dimension* crest length > 70 (InGeoCloudS - INspiredGEOdata CLOUD Services D2.2 2012; D2.3 2013)[1]

In First Order Logic:

$O12(x,y) \supset S15(x)$
$O12(x,y) \supset E54(y)$
$[O12(x,y) \wedge E18(x)] \Rightarrow P43(x,y)$
$[P43(x,y) \wedge E18(x)] \Rightarrow O12(x,y)$

NEW

O12 has dimension (is dimension of)

Domain: S15 Observable Entity
Range: E54 Dimension
Quantification: one to many, dependent (0,n:1,1)

Scope note: This property associates an instance of S15 Observable Entity with an instance of E54 Dimension that the observable entity has.
It offers no information about how and when an E54 Dimension was established.
In case the instance of S15 Observable Entity is more specifically an instance of E18 Physical Thing, using the property *O12 has dimension (is dimension of)* is equivalent to using the property *P43 has dimension (is dimension of).* In other words, using the one implies the other.

Examples:

- The earthquake of Mexico city in 2017 (E7) *has dimension* magnitude 6.2 Richter (Mindock, 2017, http://www.independent.co.uk/news/world/americas/mexico-earthquake-today-latest-mexico-city-magnitude-6-tremordamage-a7963211.html).
- The landslide that was activated in Parnitha in 1999 after the earthquake (E26), *has dimension* crest length > 70 (InGeoCloudS - INspiredGEOdata CLOUD Services D2.2 2012; D2.3 2013)[2]

[1] Fictitious example
[2] Fictitious example

In First Order Logic:

$O12(x,y) \supset S15(x)$
$O12(x,y) \supset E54(y)$
$[O12(x,y) \wedge E18(x)] \Rightarrow P43(x,y)$
$[P43(x,y) \wedge E18(x)] \Rightarrow O12(x,y)$

531: Observable Entity

Observable Situation

Scope note: An Observable Situation can be perceived as the focus of an observer, by human senses or enhanced or mediated by technical instruments, on a constellation, an interaction or a dynamic behavior of instances of S15 Observable Entity or sections of these instances within a particular time-span and spatial extent in the past. The observer may themselves be directly involved, or be receiving respective signals from these instances. The focus of the observer determines the model they overlay on the observed reality in order to describe it in terms of distinct properties and value ranges of parameters. The latter selection and projection from reality constitutes the content of a particular observable situation. Multiple observers may select different models, details and value systems to the same spatiotemporal area (i.e., views they pay attention to). Consequently, the observed situations may differ, but should, in principle, be compatible with a common reality in their overlaps

(categorical) Examples:

- Sun rising over the horizon at a particular spot.
- A car passing by another car.
- A lightning.
- An air temperature and wind speed at a certain point and time.
- People being in a city, a house.
- Someone showing symptoms of sickness.
- A vegetation cover of a field.
- Someone eating.
- Two mountains being at a certain distance.
- Cars in a starting position for a race.
- The direction a compass needle shows at a particular spot.

478: Quantification of AP2 discarded into (was discarded by)

AP29 discarded into (was discarded by)

Domain: A1 Excavation Processing Unit
Range: S11 Amount of Matter
Subproperty of:

Quantification: many to many (0,n:0,n)

Scope note: This property identifies the S11 Amount of Matter (e.g. a heap) into which material from an A1 Excavation Processing Unit is discarded.

Examples:

The Excavation Processing Unit excavating the Stratigraphic Volume Unit (2)[illustration 4] (A1) *discarded into* the waste heap of the excavation (S11)

Properties:

447: A7 Embedding

OLD definition

A7 Embedding

Subclass of: E3 Condition State
Superclass of:
Scope Note: This class comprises the states of instances of E18 Physical Things of being partially or completely embedded at a particular position with relative stability in one or more A2 Stratigraphic Volume Units. Normally, an embedding is expected to have been stable from the time of generation of the first A2 Stratigraphic Volume Unit that surrounds it. However, it may also be due to later intrusion. As an empirical fact, the expert may only be able to decide that a particular embedding is not recent, i.e. has been persisting for longer than the activity that encountered it. This class can be used to document the fact of embedding generally with respect to the surrounding matter or, more specifically, with respect to a more precise position within this matter. It further allows for specifying temporal bounds for which a particular embedding has existed, as specified by the evidence.
Examples:
The individual fallen slabs (E19) that were discovered (S19) during the excavation process of Room 5 (A1) of the West House in Akrotiri, Thera, were embedded (A7) in an almost vertical position (E55) within deposit (A8) on the ground floor (E53) (Fig. 10). [Μιχαηλίδου 2001, pp. 68-70].

In First Order Logic:
A7(x) ⊃ E3(x)

Properties:
AP17 is found by (found): S19 Encounter Event
AP18 is embedding of (is embedded): E18 Physical Thing
AP19 is embedding in (contains embedding): A2 Stratigraphic Volume Unit
AP20 is embedding at (contains): E53 Place

NEW definition

A7 Embedding

Subclass of: A8 Stratigraphic Unit
Superclass of:
Scope Note: This class comprises instances of A8 Stratigraphic Unit partially or completely embedding one or more instances of E20 Physical Thing and at a particular position with relative stability in one or more instances of A2 Stratigraphic Volume Units. Normally, an embedding is expected to have been stable from the time of generation of the first instance of A2 Stratigraphic Volume Unit that surrounds it. However, it may also be due to later intrusion. As an empirical fact, the expert may only be able to decide that a particular embedding is not recent, i.e. has been persisting for longer than the activity that encountered it. This class can be used to document the fact of embedding generally with respect to the surrounding matter or, more specifically, with respect to a more precise position within this matter.
Examples:
The individual fallen slabs (E19) that were discovered (S19) during the excavation process of Room 5 (A1) of the West House in Akrotiri, Thera, were embedded (A7) in an almost vertical position (E55) within deposit (A8) on the ground floor (E53) (Fig. 10). [Μιχαηλίδου 2001, pp. 68-70]

San Galgano's sword embedded at the Hermitage of Monte Siepi, [He retired around 1170 to live as a hermit. as a symbol of peace he embedded his sword in a stone, which can still be seen today] (https://en.wikipedia.org/wiki/Galgano_Guidotti)

In First Order Logic:
A7(x) ⊃ A8(x)

Properties:
AP17 is found by (found): S19 Encounter Event

AP18 is embedding of (is embedded): E18 Physical Thing
AP19 is embedding in (contains embedding): A2 Stratigraphic Volume Unit

III) Applied form section of version 7.1.2

571: Cardinality of typed properties

this is the new Applied Form section

Applied Form

The CIDOC CRM is an ontology in the sense used in computer science. It has been expressed as an object-oriented semantic model, in the hope that this formulation will be comprehensible to both documentation experts and information scientists alike, while at the same time being readily converted to machine-readable formats such as RDF Schema or OWL. A CRM conformant documentation system can be implemented using RDF Schema or OWL, but also in Relational or Object-Oriented schema. CIDOC CRM instances can be encoded in RDF, JSON LD, XML, OWL and others.

More specifically, the CIDOC CRM is expressed in terms of the primitives of semantic data modelling. As such, it consists of:

- *classes*, which represent general notions in the domain of discourse, such as the CIDOC CRM class E21 Person which represents the notion of person;
- *properties*, which represent the binary relations that link the individuals in the domain of discourse, such as the CIDOC CRM property P152 has parent linking a person to one of the person's parent.
- *properties of properties*, such as the property *P14.1 in the role of*, of the CIDOC CRM property P14 carried out by (see also section "About Types").
  They do not appear in the property hierarchy list, but are included as part of their base property declaration and are referred to in the class declarations. They all have the implicit quantification "many to many" (see also section "Property Quantifiers")

Although the definition of the CIDOC CRM provided here is complete, it is an intentionally compact and concise presentation of the CIDOC CRM's 81 classes and 160 unique properties. It does not attempt to articulate the inheritance of properties by subclasses throughout the class hierarchy (this would require the declaration of several thousand properties, as opposed to 160). However, this definition does contain all of the information necessary to infer and automatically generate a full declaration of all properties, including inherited properties.

Naming Conventions

The following naming conventions have been applied throughout the CIDOC CRM:

- Classes are identified by numbers preceded by the letter "E" (historically classes were sometimes referred to as "Entities"), and are named using noun phrases (nominal groups) using title case (initial capitals). For example, E63 Beginning of Existence.
- Properties are identified by numbers preceded by the letter "P," and are named in both directions using verbal phrases in lower case. Properties with the character of states are named in the present tense, such as "has type", whereas properties related to events are named in past tense, such as "carried out." For example, *P126 employed (was employed in)*.
- Property names should be read in their non-parenthetical form for the domain-to-range direction, and in parenthetical form for the range-to-domain direction. Reading a property in range-to-domain direction is equivalent to the inverse of that property. Following a current notational practice in OWL knowledge representation language, we represent inverse properties in this text by adding a letter "i" following the identification number and the parenthetical form of the full property name, such as *P59i is located on or within*, which is the inverse of *P59 has section (is located on or within)*.

- Properties with a range that is a subclass of E59 Primitive Value (such as E1 CRM Entity. *P3 has note:* E62 String, for example) have no parenthetical name form, because reading the property name in the range-to-domain direction is not regarded as meaningful.
- Properties that have identical domain and range are either symmetric or transitive. Instantiating a symmetric property implies that the same relation holds for both the domain-to-range and the range-to-domain directions. An example of this is E53 Place. *P122 borders with:* E53 Place. The names of symmetric properties have no parenthetical form, because reading in the range-to-domain direction is the same as the domain-to-range reading. Transitive asymmetric properties, such as E4 Period. *P9 consist of (forms part of):* E4 Period, have a parenthetical form that relates to the meaning of the inverse direction.
- The choice of the domain of properties, and hence the order of their names, are established in accordance with the following priority list:
  - Temporal Entity and its subclasses
  - Thing and its subclasses
  - Actor and its subclasses
  - Other
- Properties of properties are identified by "P", followed by the number of the base property extended with ".1" and are named in one direction using a verbal phrase in lower case in the present tense. For example: the property *P62.1 mode of depiction* of the property *P62 depicts (is depicted by)*

Inheritance and Transitivity

CIDOC CRM is formulated as a class system with inheritance. A property P with domain A and range B will also be a property between any possible subclasses of A and of B. In many cases there will be a common subclass C of both A and B. In these cases, when the property is restricted to C, that is, with C as domain and range, the restricted property could be transitive. For instance, an E73 Information Object can be incorporated into an E90 Symbolic Object and thus an information object can be incorporated in another information object.

In the definition of CIDOC CRM the transitive properties are explicitly marked as such in the scope notes. All unmarked properties should be considered as not transitive.

Shortcuts

Some properties are declared as shortcuts of longer, more comprehensively articulated paths that connect the same domain and range classes as the shortcut property via one or more intermediate classes. For example, the property E18 Physical Thing. *P52 has current owner (is current owner of)*: E39 Actor, is a shortcut for a fully articulated path from E18 Physical Thing through E8 Acquisition to E39 Actor. An instance of the fully-articulated path always implies an instance of the shortcut property. However, the inverse may not be true; an instance of the fully-articulated path cannot always be inferred from an instance of the shortcut property inside the frame of the actual KB

The class E13 Attribute Assignment allows for the documentation of how the assignment of any property came about, and whose opinion it was, even in cases of properties not explicitly characterized as "shortcuts".

About the logical expressions used in the CIDOC CRM

The present CIDOC CRM specifications are annotated with logical axioms, providing an additional formal expression of the CIDOC CRM ontology. This section briefly introduces the assumptions that are at the basis of the logical expression of the CIDOC CRM (for a fully detailed account of the logical expression of semantic data modelling, see (Reiter,1984)).

In terms of semantic data modelling, classes and properties are used to express ontological knowledge by means of various kinds of constraints, such as sub-class/sub-property links, e.g., E21 Person is a sub-class of E20 Biological Object, or domain/range constraints, e.g., the domain of *P152 has parent* is class E21 Person.

In contrast, first-order logic-based knowledge representation relies on a language for formally encoding an ontology. This language can be directly put in correspondence with semantic data modelling in a straightforward way:

- classes are named by *unary predicate symbols*; conventionally, we use E21 as the unary predicate symbol corresponding to class E21 Person;
- properties are named by *binary predicate symbols*; conventionally, we use P152 as the binary predicate symbol corresponding to property *P152 has parent.*
- properties of properties, ".1 properties" are named by *ternary predicate symbols*; conventionally, we use P14.1 as the ternary predicate symbol corresponding to property *P14.1 in the role of.*

Ontology is expressed in logic by means of *logical axioms*, which correspond to the constraints of semantic modelling. In the definition of classes and properties of the CIDOC CRM the axioms are placed under the heading 'In first order logic'. There are several options for writing statements in first order logic. In this document we use a standard compact notation widely used in text books and scientific papers. The definition is given in the table below.

Table 1: Symbolic Operators in First Order Logic Representation

Symbol	Name	reads	Truth value
Operators			
∧	conjunction	and	(φ ∧ ψ) is true if and only if both φ and ψ are true
∨	disjunction	or	(φ ∨ ψ) is true if and only if at least one of either φ or ψ is true
¬	negation	not	¬φ is true if and only if φ is false
⇒	implication	implies, if … then ...	(φ ⇒ ψ) is true if and only if it is not the case that φ is true and ψ is false
⇔	equivalence	is equivalent to, if … and only if …	φ ⇔ ψ is true if and only if both φ and ψ are true or both φ and ψ are false
Quantifiers			
∃	existential quantifier	exists, there exists at least one	
∀	Universal quantifier	forall, for all	

For instance, the above sub-class link between E21 Person and E20 Biological Object can be formulated in first order logic as the axiom:

(∀x) [E21(x) ⇒E20(x)]

(reading: for all individuals x, if x is a E21 then x is an E20).

In the definitions of classes and properties in this document the universal quantifier(s) are omitted for simplicity, so the above axiom is simply written:

E21(x) ⇒E20(x)

Likewise, the above domain constraint on property *P152 has parent* can be formulated in first order logic as the axiom:

P152(x,y) ⇒E21(x)

(reading: for all individuals x and y, if x is a P152 of y, then x is an E21).

These basic considerations should be used by the reader to understand the logical axioms that are used into the definition of the classes and properties. Further information about the first order formulation of CIDOC CRM can be found in (Meghini & Doerr, 2018)

Property Quantifiers

Quantifiers for properties are provided for the purpose of semantic clarification only, and should **not** be treated as implementation recommendations. The CIDOC CRM has been designed to accommodate alternative opinions and incomplete information, and therefore **all** properties should be implemented as optional and repeatable for their domain and range ("many to many (0,n:0,n)"). Therefore, the term "cardinality constraints" is avoided here, as it typically pertains to implementations.

The following table lists all possible property quantifiers occurring in this document by their notation, together with an explanation in plain words. In order to provide optimal clarity, two widely accepted notations are used redundantly in this document, a verbal and a numeric one. The verbal notation uses phrases such as "one to many", and the numeric one, expressions such as "(0,n:0,1)". While the terms "one", "many" and "necessary" are quite intuitive, the term "dependent" denotes a situation where a range instance cannot exist without an instance of the respective property. In other words, the property is "necessary" for its range. (Meghini, C. & Doerr, M., 2018)

many to many (0,n:0,n)	Unconstrained: An individual domain instance and range instance of this property can have zero, one or more instances of this property. In other words, this property is optional and repeatable for its domain and range.
one to many (0,n:0,1)	An individual domain instance of this property can have zero, one or more instances of this property, but an individual range instance cannot be referenced by more than one instance of this property. In other words, this property is optional for its domain and range, but repeatable for its domain only. In some contexts, this situation is called a "fan-out".
many to one (0,1:0,n)	An individual domain instance of this property can have zero or one instance of this property, but an individual range instance can be referenced by zero, one or more instances of this property. In other words, this property is optional for its domain and range, but repeatable for its range only. In some contexts, this situation is called a "fan-in".
many to many, necessary (1,n:0,n)	An individual domain instance of this property can have one or more instances of this property, but an individual range instance can have zero, one or more instances of this property. In other words, this property is necessary and repeatable for its domain, and optional and repeatable for its range.
one to many, necessary (1,n:0,1)	An individual domain instance of this property can have one or more instances of this property, but an individual range instance cannot be referenced by more than one instance of this property. In other words, this property is necessary and repeatable for its domain, and optional but not repeatable for its range. In some contexts, this situation is called a "fan-out".
many to one, necessary (1,1:0,n)	An individual domain instance of this property must have exactly one instance of this property, but an individual range instance can be referenced by zero, one or more instances of this property. In other words, this property is necessary and not repeatable for its domain, and optional and repeatable for its range. In some contexts, this situation is called a "fan-in".
one to many, dependent (0,n:1,1)	An individual domain instance of this property can have zero, one or more instances of this property, but an individual range instance must be referenced by exactly one instance of this property. In other words, this property is optional and repeatable for its domain, but necessary and not repeatable for its range. In some contexts, this situation is called a "fan-out".

one to many, necessary, dependent (1,n:1,1)	An individual domain instance of this property can have one or more instances of this property, but an individual range instance must be referenced by exactly one instance of this property. In other words, this property is necessary and repeatable for its domain, and necessary but not repeatable for its range. In some contexts, this situation is called a "fan-out".
many to one, necessary, dependent (1,1:1,n)	An individual domain instance of this property must have exactly one instance of this property, but an individual range instance can be referenced by one or more instances of this property. In other words, this property is necessary and not repeatable for its domain, and necessary and repeatable for its range. In some contexts, this situation is called a "fan-in".
one to one (1,1:1,1)	An individual domain instance and range instance of this property must have exactly one instance of this property. In other words, this property is necessary and not repeatable for its domain and for its range.

The CIDOC CRM defines some dependencies between properties and the classes that are their domains or ranges. These can be one or both of the following:

- the property is necessary for the domain
- the property is necessary for the range, or, in other words, the range is dependent on the property.

The possible kinds of dependencies are defined in the table above. Note that if a dependent property is not specified for an instance of the respective domain or range, it means that the property exists, but the value on one side of the property is unknown. In the case of optional properties, the methodology proposed by the CIDOC CRM does not distinguish between a value being unknown or the property not being applicable at all. For example, one may know that an object has an owner, but the owner is unknown. In a CIDOC CRM instance this case cannot be distinguished from the fact that the object has no owner at all. Of course, such details can always be specified by a textual note.

Note that the quantification of all properties of properties, ".1" properties, is "many-to-many" and, therefore, does not appear explicitly in their definitions.