

58th joint meeting of the CIDOC CRM SIG and ISO/TC46/SC4/WG9

19-22 March 2024

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Tuesday 19 March 2024

Issue 349: Belief Values

Link to the slide-deck of PF's presentation [here](#) –it summarizes the scope of the issue and the proposed solutions to the problem.

Discussion points:

- Why not use CRMInf to represent uncertainty? Making individual assertions about the probability of one particular statement is not the typical case. Usually one wants to assert the probability of a proposition set that supports logical argumentation, not assign probability values to each statement making it up, with very little evidence as to why that is the case.
- The .2 solution comes with unwarranted implications, namely that the .2 statements are explicitly uncertain, vs all other statements that are implicitly uncertain. Even for values Truth and False, there's always a possibility that the assigned values are not "correct". And calculating the probability values in terms of percentages also calls for knowing the dependencies between the statements. It's best that this is handled in terms of proposition sets and CRMInf properties that connect them to belief values instead.
- Individual statements are meaningless unless they support a piece of argumentation. .2 statements are only relevant for systems that automatically produce triples that come with confidence scores.

How to proceed:

- Determine the extent to which the solutions that make use of E13 Attribute Assignment, R1 Reliability Assessment, or CRMInf constructs are fit to represent the use cases identified. If none of the proposed solutions can do that, then one should look for new modeling constructs.
- The range of possible values registered in I6 Belief Value could be {True, False, Unknown}, but the two extra probability values assumed by PF's proposal does not have to be explicitly modelled through CRMInf.
- **Share use-cases with PF:**
 - Former National Monuments' record has free-text data (statements assigned to particular authors, including statements about the plausibility of the original statements –for instance: X said Y, but I don't believe him/it)
HW: SdS will look for it (also with a Swedish dataset that involves ongoing work)
 - Conservation data from the National Archives about inconclusive analyses can be of use, but the probability statements are not for individual assertions
HW: **DO** (summarize the discussion and provide use cases)
 - Look for contingencies with Risk Assessment (confer with AG, MA)

Issue 614: Definition of I4 Proposition Set and what an instance of I2 Belief is about

PF presented the new content model for I4 Proposition Set and Ixx Single Proposition Set and how it connects to the CRMbase model, details [here](#).

Discussion points:

- Property needs relabeling: Jxx2 is formal meaning of \Rightarrow Jxx2 is a formal interpretation of. One cannot ascribe one single meaning to an information object.
- The purpose of introducing the Ixx1 One-Proposition Set modeling construct and connecting it with both E13 Attribute Assignment and I4 Proposition Set is twofold: first to allow single statements to be the content of an instance of I2 Belief and ascribe them a truth value.
 - Difference of opinion registered wrt the necessity to introduce Ixx1 One-Proposition Set and properties to talk about single attributions and why not E13 is adequate for that in and of itself.

- The construct has not been grounded on some particular practical example; it was rather an attempt at resolving the incompatibility of the reification construct (which only supports a single statement) with knowledge graphs.
 - Nb. The scope-note for Ixx1 One-Proposition Set (see appendix) makes it clear that the E13.P140|P141: E1 and E13.P177:E55 typically shortcut over the full path will be defined in a knowledge base.
- Second, to indicate that an instance of E13 Attribute Assignment forms a particular kind of argument, i.e., one that is considered to be true. The shortcut is used, when the belief value of the singleton proposition set is true.

The SIG proceeded with reviewing the proposed definitions for I4 Proposition Set (redrafting) and Ixx1 One-Proposition Set. Details in the appendix ([I4](#), [Ixx1](#), [Jxx1](#), [Jxx2](#), [Jxx3](#), [Jxx4](#), [Jxx5](#)).

Discussion points:

Concerning I4 Proposition Set:

- The scope note does not read nicely, needs rewriting.
- The examples are helpful (in the sense that they form triples)
- KB: substitute for knowledge base

Concerning Ixx1 One-Proposition Set:

- KB: substitute for knowledge base
- The examples will need to show the equivalence with the reification construct (through E13).
- Each statement in a knowledge base forms a one-proposition set. Each of these statements can either have an attribute assignment (to mark the provenance of the statement) attached to it or not.
 - In the absence of an attribute assignment, the source of the statement is the organization that curates the knowledge base.
 - In case the maintainers of the knowledge base want to indicate the provenance of the statement (scholar x), and that they agree with its contents, then they can use the shortcut properties of CRMbase (P140 | P141 | P177), rather than explicitly mention the belief adoption process on the part of the knowledge base maintainers, whereby the particular statement was adopted as the content of their belief.
- It is not the case that every system makes an explicit reference to the provenance of each statement (in the sense of who created/ updated a given record and when). Migrating from one system to another would not necessarily mean that the maintainers of a knowledge base need to add provenance statements to all of its statements.
- If one is integrating data from another organization, again they don't need to add provenance statements to all the statements therein, but they can import them as a named graph and make them the subject of an I2 Belief.
 - What is needed is some guidelines on how to do data integration and document searchable paradata together with the data.
- Examples by AG about querying virtual reconstruction arguments (qua proposition sets) in a scientific context and reason about these proposition sets. See here for [slides](#) and [paper](#).
 - Especially the slides 21 through 25, can be used as examples for Ixx1 One-Proposition Set.
 - The example showcases the evolution of documentation (moving from simple arguments to more refined ones).

Concerning Jxx1 is encoded by:

- KB: substitute for knowledge base
- The property needs examples

Concerning Jxx2 is formal meaning of (has formal meaning):

- Relabel *Jxx2 is a formal meaning of (has a formal meaning)*
- Suggestion: remove the clause “To be overly critical about possible ambiguities would be counterproductive in practice” from the scope note.
- The property needs examples

Concerning Jxx3 that formal meaning of (has meaning belief):

- Relabel *Jxx3 that a formal meaning of (has a meaning belief)*
- The property needs examples

Concerning Jxx4 contains entity (is contained in):

- “element of one or more propositions”, refers to the domain or range class of an instance of a property in a proposition set, i.e., the subject or object of a statement in a triple.
- Examples and use cases to be provided before the property is accepted.

Concerning Jxx5 contains property type (is property type in):

- Examples and use cases to be provided before the property is accepted.

Way to move forward:

- Improve the scope notes, and add examples that show the equivalence with the reification construct. Make sure to reference the example by AG.
- Add the guidelines on data integration to the introduction of CRMinf or make it a paper that is referenced by the CRMinf introduction.

Issue 663: Define Ixx Singleton Proposition Set

The SIG went through the scope notes of the properties in relation to Jxx1 One-Proposition Set (HW by MD & PF).

The properties in question are:

- **Jxx6 has domain (is domain of)**
- **Jxx7 has range (is range of)**
- **Jxx8 has property type (is property type of)**
- **Jxx9 assigned proposition (is assigned by)**

The details of the definitions can be found at the appendix ([Jxx6](#), [Jxx7](#), [Jxx8](#), [Jxx9](#)). Some comments below:

Nb. The SIG did not manage to go through the proposed FOL axioms

Jxx6 has domain (is domain of):

- The clause “This property is part of the fully developed path from E13 Attribute Assignment through *Jxx9 assigned proposition (is assigned by)*, Ixx1 One-Proposition Set, *Jxx6 has domain (is domain of)* E1 CRM Entity, which is shortcut by *P140 assigned attribute to (was attributed by)*” to be redrafted as an implication.
 - The equivalence only holds insofar as the I6 Belief Value of the instance of Ixx1 One-Proposition Set is held to be true.
 - This has to be added to the scope note, cause only in this case will the implication hold.

Jxx7 has range (is range of):

- The clause “This property is part of the fully developed path from E13 Attribute Assignment through *Jxx9 assigned proposition (is assigned by)*, Ixx1 One-Proposition Set, *Jxx7 has range (is range of)* E1 CRM Entity, which is shortcut by *P141 assigned (was assigned by)*.” to be redrafted as an implication.
 - The equivalence only holds insofar as the I6 Belief Value of the instance of Ixx1 One-Proposition Set is held to be true.
 - This has to be added to the scope note, cause only in this case will the implication hold.

Jxx8 has property type (is property type of):

- It is not clear whether the scope note refers to an instance of a property or the type of the property referred to. Needs to be made clear.
 - It has to be an instance of the property, but then the issue of how many types can one assign to the property (which links to issue 672).
 - As it now stands one can assign as many properties to an instance of E13, but MD suggested that the property quantification for P177 be made stricter (in 672).

Jxx9 assigned proposition (is assigned by):

- The clauses about the fully developed paths that the property can be a part of should explicitly mention the condition that the equivalences with P140, P141, and P177 entail that the Ixx1 One-Proposition Set is believed to be true.
- The clause “This property is a shortcut for the path from E13 Attribute Assignment through *J2 concluded that (was concluded by)*, I2 Belief, *J4 that (is subject of)*, I4 Proposition Set, *J5 holds to be* to I6 Belief Value (= “True”).” to be rendered as an inference, proviso that the belief value associated with the proposition set is “True”.

Overall discussion (in terms of how to proceed):

- **HW:** MD & PF to incorporate adjustments proposed by the SIG and then call for a vote.
- **Nb.** Make sure that there are examples illustrating how the properties should be used (and, where necessary, mark the equivalences with the CRMbase properties)
- The FOL axioms will be reviewed at the next SIG meeting, in Plovdiv.

Issue 672: Quantifiers of P140, P141, P177

The SIG reviewed the proposal by MD to change the quantification of P140, P141 from “many to many (0,n:0,n)” and P177 from “many to many, necessary (1,n:0,n)”, to “many to one, necessary (1,1:0,n)”.

CEO checked the quantifiers of their subproperties and marked the ones that need to be altered to match the “many to one, necessary (1,1:0,n)” requirement (namely P34, P35, P37, P38, P40, P42), because the semantics of a property cannot be more restrictive than the semantics of its subproperties.

- Since the quantification of P35 is (1,n:0,n), then it may exist P37(a,b) and P37(a,c) and b is not c. (if not the quantification should be (1,1:0,n). From the subproperty definition $P37(a,b) \Rightarrow P141(a,b)$ and $P37(a,c) \Rightarrow P141(a,c)$ so we can conclude that P141(a,b) and P141(a,c) which contradicts the proposed quantification (1,1:0,n) of P141.
- The scope notes would not have to be altered, as the range instances of the property are explicitly mentioned in the singular form.

Discussion points:

Especially for **P35** and **P40**, “many to one, necessary (1,1:0,n)” means that

- one cannot have one instance of **E14 Condition Assessment** that concerned multiple instances of E18 Physical Things (so one cannot group items assessed by one group assessment); rather they would have to create a super-activity consisting of multiple E14s, each for one item only.
- one cannot have one instance of **E16 Measurement** that assigned multiple dimensions to the measured thing; again, they would have to create a super-activity consisting of multiple E16s to do that.
 - This will have implications for the **S25 Relative Dimension** construct in sci.

Decision:

Bring this to MDs attention. Either disengage the subproperties from P140 and P141 to allow them less restrictive semantics, or go for the “many to one, necessary (1,1:0,n)” and configure the implications necessary for the semantics of the subproperties.

Issue 665: Harmonize the quantification of P43 & O12 has dimension (also P179 had sales price)

The SIG reviewed the proposal by MD to adjust the quantifiers of P43 and O12 –see diagram in the [appendix](#). The model for dimensions has been extended to measure instances of E5 Event and S15 Observable Entity (not only instances of E18 Physical Things). Which worked fine, but then adding relative dimensions, which pertain to the combination of two things

Proposal:

- P43 has dimension: change quantification to “one to many (0,n:0,1)”
- P191 had duration: change quantification to “one to one, necessary (1,1:0,1)”
- P179 had sales price: change quantification to “one to one, necessary (1,1:0,1)”
 - Provide additional FOL conditions to disallow one instance of E54 Dimension to be the dimension of an E18 Physical Thing and an E96 Purchase, and an E52 Time-Span simultaneously.
- O12 has dimension: change quantification to “many to many (0,n:0,n)”
 - Provide additional condition that if a dimension pertains to multiple instances of S15 Observable Entity, then this dimension is an instance of S25 Relative Dimension.
- Assign HW to define a shortcut property (S21 Measurement. Oxx7 observed dimension: E54 Dimension; “one to one, necessary (1,1:0,1)”. The model can generalize to Observation.

Discussion points:

Debate abt whether one instance of E16 Measurement can produce exactly one instance of E54 Dimension, or more. MD thinks it’s exactly one.

Decision:

The SIG voted in favor introducing these property quantifiers and assigning HW to do the FOL constraints to their semantics.

- **HW:** MD, CEO.

Nb. The decision about P191 had duration (“one to one, necessary (1,1:0,1)”), to inform issue [664](#).

Start a new issue about prohibiting multiple objects from sharing the same instance of E54 Dimension.

[NEW ISSUE]: multiple objects cannot share the same instance of E54 Dimension

Upon discussing issue [665](#), the SIG resolved to start a new issue where to state that multiple objects cannot share the same instance of E54 Dimension through FOL axioms.

Issue 646: redraft the introduction of CRMInf

The SIG appointed GH and SdS to review the new draft intro to CRMInf (HW by MD) and the examples that have been provided (drawing on Francesca Bologna’s interpretation of Nero’s whereabouts during the Great Fire of Rome), to enhance the introduction with a use case (also produce diagrams).

- The draft intro can be found in the [appendix](#),
- the statements about Nero’s contested whereabouts during the Great Fire of Rome can be found [here](#).

HW: SdS & GH

Issue 482: CIDOC CRM interfacing risk assessment in conservation

The SIG reviewed the [presentation](#) by DF, MA, TV, and AG on the reorganization of the CRMrisk model.

Discussion points:

- concerning the relation to CRMact (for activity plans): What they are primarily interested in, is analyzing and assessing the condition state of architectural monuments, f.i., monument x has undertaken structural damage. Not about the restorations necessary to prevent it from being further destroyed. Conservation is a step further from what they are doing.
- Slide 7 of the presentation can serve as an example to enhance I6 Belief Value in the CRMInf definition.

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

Following the approval of the ISO version in November 2023, EC has been working to align the content of the Iso version with the community-maintained versions (the 7.1.x branch). The ensuing CIDOC CRM release (V7.1.3) mirrors the ISO version wrt to content, but ignores formatting and layout constraints imposed by the ISO.

The new Official Release (ISO Correspondence) has been announced on the CIDOC CRM website, but no email has been shared with the SIG list and it has not been advertised otherwise. The announcement of the release can be found [here](#).

HW: SdS, to share on social media. CEO to share the news with CIDOC.

Issue 556: Content of the minimal vocabularies for restricting the CIDOC CRM Types

The remaining pieces of HW for the issue include

- i. Consolidating the following documents and provide instructions on how to use them:
 - a. The functional role of a minimal vocabulary
 - b. Terms to be used in migration paths for deprecated classes
 - c. Type restrictions of existing classes and typed properties
 - i. **Pending:** E10, E8, E15, E58, P62.1, P67.1, P138.1:
Proposal: do not provide recommendations, also disengage these scope notes from issue 650.
- ii. Provide type restrictions for instances of E4 Period (a high-level hierarchy).

No progress for point (i), but for point (ii) AK did some HW –see here ([spreadsheet](#) containing TGN and Geonames terms lists; [explanations](#) from TGN).

Discussion points:

- The problem with gazetteers is that they conflate phenomenal places and spacetime volumes when defining types of administrative units. A certain settlement spans a spatial extent that varies in time and is the sum total of the activities of the settlers at that place. It should be construed as an E92 STV, and that causes problems for a one to one mapping with the CRM.
- Features that are fairly stable in a given time frame of reference could be listed as physical features. Otherwise they should be construed as periods or activities. Out of this list, which ones qualify for features and which ones don't? needs to be determined (assign HW).
- The HW has us sidetracked from identifying a minimal set of terms needed to restrict CRM classes and typed properties, to first creating high-level hierarchies to cover our use cases, and at last to looking at random list terms. MD had proposed some high-level terms for the 57th SIG meeting.

How to move forward – HW assignment:

- Available definitions from the TGN to be consulted
- GH & OE will work towards providing a definition of the different types of space-time phenomena used to restrict place types

Capturing intangible cultural heritage (ICH) into data: towards a standard for registering living heritage in collection management systems

Presentation by: Sergio Servellón & Evdokia Tsakiridis –Link to the slide deck [here](#).

Discussion points:

- MN had tried to model ICH for Iranian traditional music. She tried to identify the origins of the music tradition of Iran and establish some kind of “influenced” relation, but it was very difficult. She will try to document that using the model by the ICH WG, which can be found [here](#).
- ICH has identified what needs to be documented from their perspective. The ensuing model has been developed independently of the SIG, what is requested now is that the SIG validate the model and harmonize it with the Official version.
 - The SIG has agreed on an approach on creating extensions. The procedure calls for a group of professionals working on a particular discipline to generate a proposal about a new extension (its scope and use cases) until the point where it gets on a meeting agenda to either be acknowledged by the SIG as a valid extension or to harmonize it with the CRM.
 - The statement on how to work on a CRM-compatible extension will probably be finalized by the next SIG meeting.
 - For the moment, KT can share the model specification with ETz to parse and run through a visualizer.

Wednesday 20 March 2024

CRM for Social Sciences

CRMaaa: An (unofficial) CIDOC Extension for the World of Social Facts

Presentation by Matthew Fielding (slide deck [here](#)).

CRMaaa and CRM++ a quick review

Presentation by Christian-Emil Ore (slide deck [here](#)).

Proposals:

- CRMaaa has 76 properties altogether, maybe if we make the connection btw ZE1 Institutional Fact and I4 Proposition Set and reduce the overall number of properties in CRMaaa
- CRMinf and CRMaaa almost orthogonal, but there is a basis for complementarity.

Semantic Data for Humanities and Social Sciences (SDHSS); A methodology and ecosystem of CIDOC CRM extensions for research data production and reuse

Presentation by Francesco Beretta. The slide deck [here](#). Link to paper [here](#).

Discussion points

The most pressing question is whether the SIG will be rebooting CRMsoc, or whether it will be granting one of the now “competing” CRM-compatible extensions covering social phenomena the status of an official CRM extension fit for this purpose.

- Applying the CRM to the domain of the Humanities and Social Sciences (HSS) can only be beneficial for the development of the model, leading to successful data integrations. The application of the core model in excavation archaeology has boosted its use by the archaeological community; plus, it has validated the model through data mappings and has resulted in substantially refining it. No reason why the same approach should not be followed in modelling the basic constructs needed in the domain of HSS.
- The HSS domain is vast, which would give rise to all kinds of extensions with overlapping scopes, that might even be contradictory with respect to one another, depending on the approach they take on social

reality.

The SIG cannot endorse them all as valid CRM-compatible extensions, but cannot adopt a stance as to which perspective is more valid than the others, especially if the goal of the CRM is data integration.

- If the point of the CRM is to support data integration, then any new extension to it should take into consideration existing systems and data points that support the use of the proposed conceptualizations.
- Historical projects generate lots of data, but the problem with project data is that starting to analyze them, one's perspective is essentially driven by the research question these data are used to provide answers to.
So, they don't follow a bottom-up perspective (strictly speaking).
Rather, they either observe solutions proposed by how information systems in use have been handling similar research questions/scientific problems (and the documentation around them) or they try to incorporate in their analysis foundational approaches that have been particularly influential within a scientific domain. Validation always has to come from the data though.
- But in the absence of a core ontology for the domain of HSS that is declared to be CRM compatible, each project team will end up going their own way in terms of conceptualizations. It's practically impossible for the SIG to evaluate and collectively maintain every one of them, so the burden of proof should fall on the groups working on the extensions to demonstrate via use cases and overall scope that these do form, in fact, CRM compatible extensions.
- **HW:** CEO will be reading through the documentation of SDHSS

Issue 651: CIDOC CRM ontology extension "A multicausal ontology model"

The last updated version of the documentation can be found [here](#).

A long discussion followed DO's presentation, its main points are summarized below:

- **The CRM is about cultural phenomena.** Social behavior, attitudes, artistic creation fall within its scope given that they have a bearing in bringing about cultural phenomena. As such, they fall within scope of the CRM.
- There is **substantial overlap among CRM_{soc}, CRM_{aaa}, and CRM_{influence}**. Part of it has to do with what they represent (social phenomena), and also with connecting these social phenomena to collective beliefs about them (and general assumptions about "the state of things"). This is manifest in collective intentionality, social facts, and mental attitudes, that each forms a core concept in said respective model. There is also a strong link with the concept of belief (as defined in CRM_{inf}), which should also be further explored.
 - Mental attitudes are the subject of indirect observation on the basis of attested influences, and can form the basis of an extension of the CRM.
 - Mental attitudes are relevant in order to express how we perceive the world around us and reason about it, how we shape it through our actions.
- **Weak causality** allows to pinpoint known factors of influence in the course of action followed by a person or group of persons. No claim is made about providing an exhaustive list of the factors that influenced a particular behavior. The model focuses on agency, and on tracing documented factors that have contributed to something. To the extent that a set of individual experiences (exchanges between individuals, interactions with objects, registered societal impact) is documented, it allows connections to be drawn along the lines of:
 - A met with B, and discussed C (for which there is empirical evidence).
 - A created D shortly after.

The model allows to infer that A was influenced by B and C in creating D, without making the claim that nothing else influenced A in creating D.

- **The relation of influence to individual or collective mental attitudes was heavily contested:**
 - Given that the point of departure is influence in artistic creation, construed as a similarity or contrast between patterns/styles that is manifested in works of art of individuals | groups of individuals, one can always assume a less psychological approach and only talk about the discernible patterns. In such a structuralist-oriented approach, one only needs to talk about the objectively discernible, formal properties and establish influence based on their presence or absence in contrastively | comparatively examined works of art.
 - The notion of Intertext (taken from structuralist literary studies) is extremely relevant because it detects patterns in the literary text that can be traced to patterns in literary texts predating it. It makes no assumptions about the mental state of the author when it comes to establish an influence, which is critical for teasing apart an empirically attested influence from impressionistic or subjective interpretations.
 - It's a totally empirical basis for interpreting influence, which relies on the presence of discernible patterns/features in one's artwork that had been absent from it, prior to their introduction to the works of (a) specific artists that had already deployed them in their art at the time.
 - It creates a dialogical structure among works
 - No assumptions about the mental attitude/state of the influenced artist is made in such a scenario, and this is a good thing because:
 - the output of a mental attitude (a documented course of action, the work of art, etc.) can be observed, whereas the mental attitude itself not so much.
 - It does not resort to psychological and biographical interpretations concerning the "author's intent" when they created a certain work of art.
 - Mental states/attitudes are maybe important for integration purposes. The case has yet to be made convincingly.

- **How to proceed with the three competing models:**
 - The process that the SIG agreed on regarding launching a new extension has been followed by each of the three model maintainers, which has resulted in three available extensions to CIDOC CRM that model social phenomena. The number of competing extensions indicates that there is an active interest from the community, as well as a need for a CRM compatible social ontology.
 - They all claim to maintain compatibility with the CIDOC CRM, their scope is similar (so there's substantial overlap, despite the fact that they seem to be going their independent ways in some respects).
 - The question is: should the SIG sanction one of these three models or all of them? What happens if another extension for social phenomena is launched following the same process?
 - Things become more perplexed if one is to consider the models for (i) Activity Plans, and (ii) Provision and Obligation that also discuss social phenomena.
 - Should the SIG try and harmonize all these models (and also CRMinf)?
 - Methodologically, it makes more sense to create a lightweight construct that would connect to the CRM via very few articulation points. The CRMsoc, CRMaaa, and CRMinfluence maintainers should collaborate on proposing such a high-level model that works for all extensions.
 - GH, OE, CEO, FB were in favor of such an approach.
 - The CRM was never about creating a huge system of extensions in a hierarchical relation to it. Rather, it was about determining a core set of ontological categories.

- **Ontological commitment of the CRM:**
 - The different approaches concerning what is the best way to represent social phenomena (grounded in philosophical theories with one eye on data integration or making no theoretical claims whatsoever) ultimately digressed to an attempt at defining the ontological commitment of the CRM.
 - DO has drafted a text that he shared with the CIDOC CRM SIG Chairs and wants to get some broader feedback on.
 - The document (still in a draft form) summarizes all the papers that have been issued by the SIG discussing the scope of the CRM and what it's fit to do.
 - Unless the SIG arrives at some sort of agreement regarding the ontological commitment for the CRM, conflicts about what should be modelled using the CRM are bound to crop up every now and then.

Decisions:

- **HW:** CEO, GH, FB, GB, DO, TV (and anyone else interested) to collaborate on proposing a high-level CRM-compatible extension for social phenomena, with points of articulation to the three competing extensions.
 - Consider CRMact and CRM for Provision and Obligation as well.
 - Consider the overlap with CRMinf
 - Report on the progress made at the next SIG meeting in Plovdiv.
- DO to share the Ontological Commitment document with the SIG to get feedback for it.

[Issue 490: How to model a file](#)

The sig had no time to review the HW that MD submitted (link [here](#)), as the discussion about CRM for social sciences took up the entire session.

Decision: The SIG is to review the document and call for an evote to resolve it.

[Issue 656: Reformulate the scope note of P89 falls within](#)

MD had reformulated the scope note of P89 falls within to allow the instances of E53 Place that an instance of E4 Period P7 took place at, to fall within its spatial projection. But since he submitted the HW, more aspects to the “falls within” relation have been brought to the SIG’s attention, and the HW needs to be streamlined a bit, before it’s ready to be put to a vote.

HW: MD & CEO to do that.

[Issue 657: P32 used general technique is not a subproperty of P125 used object of type](#)

The SIG decided to not go through with discussing the issue, given the disagreement btw the two people involved in it (MD, CEO) and the fact that only one of them was present for the discussion.

How to move forward: A proposal to be formed for the 59th SIG meeting.

HW: MD, CEO

[Minimal data records for museums and collections WG \(mapping the recommendations of the WG to CIDOC CRM\)](#)

Presentation by Robert Nasarek of the work undertaken in the context of the Minimal Data Records for Museums and Collections WG for the German Digital Library.

The goal of the WG is to provide [recommendations for the minimal data fields](#) necessary for sharing data and transforming data schemes, and provide mappings to data standards. Upon realizing that mappings to CIDOC CRM

hadn't been provided for the fields of the minimal data records, they undertook the task of creating such mappings and they shared them with the SIG for feedback/constructive criticism.

For the mappings to CIDOC CRM see [here \[1,2,4\]](#)

Questions to the SIG:

1. How should the subtyping of E41 Appellation best be represented?
2. What is the relation of a technique used to produce an object to its E12 Production?
3. For data records, what is the relation between different kinds of E42 Identifier (the record identifier and the link to that record). How should this be represented unambiguously?

Discussion points – SIG's recommendations:

1. For E41 Appellation and its types:
 - a. Subtyping through: E55 Type. P2 has type: E55 Type
 - b. Subtyping the properties like they did in BM: declare for example Px has object type a subproperty of P2 has type.
2. For techniques: most likely any information about the technique involved in the production of an object will refer to types, rather than an instance of E73 Information Object that clearly states what the specific technique applied was. Best opt for P32 used general technique: E55 Type
3. For a proposal to introduce a property Pxxx has complete copy (is complete copy of), see issue ticket [490](#).

Tracing Shahnameh's Geographical Narrative: Event Modelling with CIDOC-CRM

Presentation by Massomeh Niknia –Link to the slide deck [here](#).

Discussion points:

- Feedback from the SIG regarding how to model places using CRM that correspond to phenomenal places but are referred in the text in a mythological/epic context.
- It's a border case for CIDOC CRM. One can distinguish different domains of discourse for the analysis:
 - a. Narrative (E28)
 - b. Real-world (E21, E53, ...)
- Entities (events and individuals they interact with). To the extent they are fictional (or within the narrative), one can define a subclass of E28 for Abstract Entities. The events similarly should be a separate kind, that disallows anchoring them to a particular instance of E52 Time-Span, but allows relative chronology.
- For cases that are marginal (could be either a fictional or a real one): Either separate them ad hoc, or introduce double instantiation.
- The partition, however plausible, seems a bit artificial in the sense that for mythical (and especially religious) texts, interpretation can range from constructivist to symbolic or to being taken at face value (depending on the system for interpretation).
- The distinction btw levels of analysis is not particularly clear-cut, in the sense that Ferdowsi's claim is to be writing history, but mythological features are entangled in the historical narrative. So maybe treat events and individuals in separate sections of the Shahnameh per section.

A layered data model for an AR tours app with CIDOC CRM and geodata?

Presentation by Elisabeth Reuhl –Link to the slide deck [here](#).

Discussion points:

- Virtual museum tour data and integrations using CRM can serve as a blueprint. GH has done that wanted to know what approach they are taking with respect to indoor navigation. They're still exploring.
- Something they will consider for future implementations is crowdsourcing by students using the app.
- Adding a new wing to a building could be treated as one instance of E24 Physical Human-Made Thing (building) that underwent modification or as two instances of E24 (an old and a new one).

Linked Cultural Heritage Data? FAIR Enough!

Presentation by Ines Koch –Link to the slide deck [here](#).

Discussion points:

Next steps involve comparing CIDOC CRM with [RiC-CM](#) ontology. At the time she began working on her project, RiC-CM was not stable yet.

Towards CRM OWL

Presentation by Mark Fichtner & Elias Tzortzakakis –Link to the slide deck [here](#).

Discussion points:

- Creating a CRM OWL implementation with minimal deviations from the ECRM OWL and including them in the available CIDOC CRM encodings might cause confusion (two OWL version describing the same thing).
 - The two versions have different namespaces (Erlangen and CIDOC). All ECRM OWL statements come with owl:sameAs statements to CRM OWL.
- Regarding the property quantifiers: maybe some statement about how they are implemented in the OWL file.
- Point B4: rdfs:label:
 - ECRM owl only lists forward going identifiers for both directions of properties (despite providing both labels). The decision to do so was implemented at a time when the SIG considered the forward going properties as the base forms.

Decisions:

The SIG adopted the proposals by ETz & MF.

Insight into the ViTA-project – Mapping medieval property and agricultural levies in late medieval Tyrol –For application of CRMsoc/CRM++

Presentation by Milena Peralta Friedbourg –Link to the slide deck [here](#).

Discussion points:

- For modeling services (transport, journey, ...): The PEM handles a completely different framework, but the way that PE1 Service (IsA E7 Activity) was represented, involved teasing apart executing of a certain service from declaring oneself able and willing to execute said service. It might be an interesting thing to consider.
- Handling ambiguity wrt the referents of words in the estate registers they consulted: It could be resolved using CRMinf mechanisms.
- For documenting payments, they could always consult the SeaLit model, or CRMsoc.

Thursday 21 March 2024

Issue 363: update the list of property quantifiers

CEO gave an update on the issue: namely that the list of quantifiers and their readings has been properly defined in the introduction of the CRM. What remained to be done was to provide declarations for properties that require (at least) two instances of the domain/range classes (like O33 is relative to). After some thought, it was decided that this is a bit excessive (it could very well be that a property may require a different cardinality, let's say "3,n;x,x"), and it would be counterintuitive to add as many property quantifier declarations, as there are restrictions.

Proposal: CEO is to draft a generic statement that extends existing declarations based on requirements concerning the cardinality of domain/range instances of the properties, and submit it for an evote. The SIG agreed to that.

Concerning the ER vs UML property quantification and what is the best/easiest way to represent property quantifiers, if people wish to change them, they should raise an issue about it where to discuss it.

Decision: proceed as suggested.

Issue 492: Spatiotemporal formalization about the presence of parts

CEO did not have the time to go through this issue –he will try to prioritize this for the 59th SIG meeting.

Issue 627: Explicitly document cross-references between family models

ETz gave an outline of the current state of the issue and the repositories he has set up to monitor dependencies btw CRMbase and CRM-compatible extensions. Link to the slide deck [here](#).

Discussion points:

- Concerning CRMarchaeo:
 - based on the decisions for CRM OWL & RDFS, assuming we add the examples in comments there too, then we will have to generate another RDFS file for CRMarchaeo (the examples have been completely redone for v2.1, to match the template for examples). But it's not particularly pressing to implement this.
 - 3 properties lacking an inverse name: AP29 appears in, AP30 restricted to, AP31 is typical for that associate a type of thing with the instance(s) of E4 Period it is characteristic of. This is intentional, there is no reason to declare the inverse property for that.
- Concerning CRMtex: it uses classes from CRMinf 0.7 and FRBRoo 2.4 (so not compatible with 7.1.2). For F28 Expression Creation, this is not a problem for CRMtex, as it has carried over to LRMoo, which has resulted in a stable release. But the SIG needs to prioritize CRMinf and produce a stable form by the next meeting (or at the next meeting, at the latest).
- For referenced classes/properties of CRMbase and other extensions in the html representation: They should always point back to the version they reference. Not the official one, not the most current one.
- For draft versions of family models: Provide resolvable URIs, but indicate that the model is draft, so it should be used for consultation, not implementation purposes. Add this to the "Encodings" column as well
- Encodings column "Useful Links": rather than calling the link to gitlab "more", just call it "gitlab"

The SIG accepted the proposals by ETz. He will be implementing them and then the issue will close.

CRMsurv; An extension for survey archaeology

Presentation by Denitsa Nenova. Link to the slide deck [here](#).

Discussion points:

- CRMsurv can serve as the basis for extending not only CRMarchaeo, but also CRMsci (as it enriches the modeling of Observation). In that sense, it connects to issues [579](#) (the observation parameters part)
- For U5 Digitization Process Unit: Its scope needs refining
 - Its difference from D2 Digitization Process is that it forms an Encounter Event that results in using specialized equipment, whereby to digitally record it.
 - It seems to be more of a measurement than a digitization process. Could be declared a subclass of S21 Measurement instead.
 - It is not clear what the relation of U5 and S19 is: is the U5 part of the S19 or is the S19 a part of the U5?
- New classes subtyping E55 Type instead of providing a hierarchy, because the terms used are project-specific and not universally agreed upon.
 - GH: used BBT to create shallow-hierarchies for types.

CRMarchaeo update

Presentation by Christian-Emil Ore. Link to the slide deck [here](#).

Discussion points:

Parsing the final document, ETz has identified some pending issues that he has documented in the designated gitlab for CRMarchaeo (see [here](#)). The CRMarchaeo editors need to take care of them before he releases the rdfs and other encodings.

Decision:

The typos identified by ETz will be incorporated in a new stable release (2.1.1).

Issue 676: Harmonizing CRMbase logically with CRMgeo

A summary of the suggested changes to CRMgeo v1.2 to harmonize it with CIDOC CRM v7.1.2 can be found [here](#). The SIG reviewed the proposal by MD to impose restrictions on CRMbase concerning the use of P168 place is identified by, P169 defines spacetime volume, P170 defines time –namely to disallow them to be used for interpreting instances of E53 Place, E92 Spacetime Volume, and E52 Timespan as phenomenal, respectively. Using these properties with the restrictions proposed, allows for a declarative interpretation, without having to define declarative places/timespans/spacetime volumes in CRMbase and also maintains compatible semantics with CRMgeo.

Proposal:

Add the following FOL axioms to P168, P169, P170:

P168:

- $P168(x,y) \Rightarrow P1i(x,y)$
- $P168(x,y) \Rightarrow (\neg \exists z) [E92(z) \wedge P161(z,x) \wedge (P169(u,z)]$
- $P168(x,y) \Rightarrow (\neg \exists z) [E4(z) \wedge P161(z,x)$

P169:

- $P169(x,y) \Rightarrow (\neg \exists z)[E18(z) \wedge P196(y,z)]$
- $P169(x,y) \Rightarrow \neg E4(y)$

P170:

- $P170(x,y) \Rightarrow (\neg \exists z)[E2(z) \wedge P4(z,y)]$

Keep or deprecate respective CRMgeo properties? Q10 defines place, Q14 defines time, Q16 defines spacetime volume

Discussion points:

- Migration paths for deprecated classes/properties have not been declared yet, once the model is stable GH & MD will make sure to provide them.
- If the distinction btw declarative and phenomenal places/timespans/spacetime volumes is implemented in CRMbase too (instead of only in CRMgeo), entails that the scope notes of the three properties in question will have to be adapted to express the partition.

Decisions:

- The SIG voted in favor of MD's proposal (add the FOL axioms for P168, P169 & P170 and redraft the scope notes accordingly).
- MD & GH prefer to not deprecate Q10, Q14, Q16 from CRMgeo. They will be kept in.

Application for membership at the SIG

The SIG approved the application for membership at the CIDOC CRM SIG of Tobias Hodel, head of the Digital Humanities department at the University of Bern, to be represented by his colleague Stephen Hart.

More info about the DH Department at the University of Bern can be found [here](#)

Planning the 59th CIDOC CRM SIG meeting

GB shared some information about how to get to Plovdiv and about the venue where the meeting will be hosted. The document can be found [here](#).

Issue 457: harmonization of graphical documentation about CRM

PM presented the guidelines for creating standardized diagrams for the CIDOC CRM & extensions. The document can be found [here](#). The point of discussing the guidelines proposed therein, is to establish that everyone agrees to the color coding, the size of the fonts and the items listed.

The libraries that CHIN has implemented can be downloaded here ([+property quantifiers](#), [-property quantifiers](#)).

- **Nb:** classes for primitive values are not defined in the libraries, seeing as they're not defined in the rdfs file that is taken as the basis for creating these diagrams.
- The libraries can be extended to CRM compatible models.

The idea is to reuse implementation, whenever possible, so the SIG was presented with:

- the three schemes in draw.io that have been proposed so far (by PM for CHIN, GB for SARI and other projects, and OM for the online version of the CRM game). They can be found [here](#). They also contain property quantifications, and properties without quantification to be used for instances of properties.
- the printed version of the 3 schemes. The printed version of the schemes can be found [here](#).
- the original color scheme used in the cardboard CRM game, which can be found [here](#)

PM asked for the SIG's feedback concerning:

- adding prefixes in the diagrams,
- create collapsible list objects for instances or not (his take is that such an approach would not allow representing multiple instantiation)

Discussion points:

- Regarding prefixes: not necessary, can be implemented locally in different systems.
- The diagrams in the Use and Learn section will have to be updated for version 7.1.3 (Official, ISO Compatible). If the issue gets resolved in the near future, the diagrams could be remade sooner than later.
- For instances, the list view is easier (just by clicking off the "collapsible" feature). It's much easier to create rdfs structures from examples. This could be done by a reduplication of the library that the SIG will have decided upon.

Decision:

StH, PM, and KN to come up with a final proposal taking into considerations the discussion at the SIG.

It will probably be along the lines of:

- GB: E2, E52, E92
- PM: E28, E39, E41, E53, E55
- OM: E18

Once the SIG has agreed on the color scheme, the same group will continue working on extensions.

Issue 628: Update the modelling constructs found under The Model\Use&Learn\Functional Overview

Given that the SIG did not resolve issue 457, issue 628 got postponed. However, it needs to be addressed soon. The SIG agreed to review the issues identified by CEO and ETs in the existing diagrams (in terms of what needs adjusting).

A summary of the things that must be checked can be found [here](#).

SemCMD an Arches instance to support the implementation of the Parthenos model
Presentation by Matthew Fielding. The slide deck can be found [here](#).

CIDOC CRM Translation Projects

CIDOC CRM v7.1.2 French translation; The project and its resources
Presentation by Philippe Michon and Stephen Hart. The slide deck can be found [here](#).

The translation of v7.1.3 will be probably be ready within a few months.

Translating CIDOC CRM in French; an update
Presentation by Anais Guillem and Raphaëlle Krummeich. The slide deck can be found [here](#).

Discussion points:

Concerning the differences between the two French translation projects:

- They followed very different approaches. For CHIN, it was a matter of quickly translating the CRM in order to be able to continue using it for their projects, due to an externally imposed need: any documentation standard used had to be expressed in French as well as in English. For the European French translation WG, it was a communally driven effort, which also aims at promoting and teaching the CRM.
- Both translations are in International French.

Issue 360: LRMoo

PR gave an update. The slide-deck of her presentation can be found [here](#).

Proposals:

For the CIDOC CRM site:

- Change the title of the tile from FRBRoo to LRMoo, and the URL should also change to LRMoo. There is no point with keeping a designated place for FRBRoo now that its status is going to be “Deprecated” by IFLA.
 - By looking at the Resources, the reader would be able to find FRBRoo and also track down its history.
- The home page text and the text on the Short Intro need to be updated. Add a reference to how the model evolved.

IFLA will have to reboot the PRESSoo WG. PR will let the SIG know when this happens.

Decisions:

- **HW:** PR to redraft the homepage text, share it with ETs.
- **HW:** PR to draft a text for a tweet to advertise the release of the new CRM-compatible IFLA standard, to be shared with SdS. Newsletters too.
- **HW:** FORTH to take care of the sub-site for LRMoo

Schedule the 60th CIDOC CRM SIG meeting (Spring 2025)

The SIG decided to hold its 60th meeting at the University of Bern, either at the last week of March or the first week of April 2025.

SH will confirm the exact dates with the DH Department at the University of Bern and inform the SIG.

Schedule the 61st CIDOC CRM SIG meeting (Autumn 2025)

The SIG decided to hold its 61st meeting at FORTH, at the end of September 2025 (the week starting on 29 September, through 2 October 2025).

Friday 22 March 2024

Issue 664: redefine the scope note and FOL of P191 had duration

The quantification aspect of the issue was resolved by [665](#) –the property quantifiers are set to “one to one, necessary (1,1:0,1)”.

The issue is thereby resolved, as the quantification originally proposed in the issue thread, does not correspond to the decision that the SIG reached.

The addition of the example from SeaLiT for P191 is considered an editorial issue.

- The time-span of the voyage of the ship Andriana, from 9/3/1908 to 19/4/1908, (E52) *had duration* 1 month and 10 days (E54).

Issue 670: Replace fictitious example (P11)

The SIG admitted the newly drafted example for P11 had participant (HW by DH).

New example:

- The Beatles (E74) *participated in* Harry Benson photographing the Beatles in Paris, in 1964 (E7).

Reference: Mitsui, Evan (16 November 2013). "[Harry Benson's photos of the Beatles sparked career](#)". CBC News. Accessed 4 December 2023.

It will replace:

Maria (E21) *participated in* Photographing of Maria (E7). (fictitious)

Issue 667: Hierarchical dependencies between extensions or through CRMbase?

Following the decision to deprecate **P116 starts (is started by)** from CRMbase and its admission into CRMarchaeo, **J2 concluded that** was left without a superproperty in CRMbase.

The migration path for the deprecated P116, involved declaring it a subproperty of P175, P175i AND P185.

The question whether to declare J2 a subproperty of AP24 or the set of properties that formed the migration path for P116 arose upon updating CRMInf.

It was considered an editorial change for the CRMInf editors to take care of, and the latter option was adopted.

Decision: Issue closed, it raises a moot point given the editorial decision in CRMInf.

Issue 563: Adoption and governance

Decision: The issue has been left open, it is currently led by CHIN, but any progress in it will be dependent on PMs workload.

Issue 471: Graphical examples

In contrast to issue 457, with which it substantially overlaps, the aim of 471 was to create a style-guide (in black and white), before the SIG started discussing the color-scheme used to represent CRM classes. The things debated over had to do with how to represent (direct vs indirect) ISA relationships, the direction of the diagrams, what software to use for the diagrams, etc.

Now that these things have all been trivially resolved, the issue can close.

Decision: Issue closed.

Issue 634: What is required for expressing current knowledge?

Thus far, there has been no HW assignment for this issue.

In principle, there is a general discontent for the “has|is current xxx” properties.

They require a lot of curating and present a simplistic view of the world (to the extent that there have been proposals to underrepresent them –if at all –in the graphical overview of the CRM).

Decision: Issue closed

Issue 439: Approximate dimensions

During the 57th SIG meeting, it was proposed that unless the HW owners (MD, RS) put forth a decidable solution for this issue ahead of the 58th meeting, it would close.

From the point of view of Museums, approximating dimensions was not particularly relevant, and in view of that both RS and MD were in favor of closing the issue.

Decision: Issue closed

Issue 429: Pxx has language

During the 57th SIG meeting, it was proposed that unless the HW owners (TV, PR, GB, MR) put forth a decidable solution for this issue ahead of the 58th meeting, it would close.

The point of the issue was to provide a way to associate a person with a language they were documented to speak/ write in /use it to interact in whatever context. Instead of creating artificial E74 Groups (“people who corresponded in French as a second language”) that users of a language would have to join, the group working on the issue proposed a “Pxxx has ability/aptitude” property instead.

Given that the WG has not come forth with a proposal and any evidence supporting it, the issue can close.

Decision: Issue closed.

Appendices

I: List of abbreviated names

PF	Pavlos Fafalios
SdS	Stephen D. Stead
DO	Dominic Oldman
AG	Anais Guillem
MA	Marta Acierno
MD	Martin Doerr
CEO	Christian-Emil Ore
DF	Donatella Fiorani
TV	Thanasis Velios
GH	Gerald Hiebel
OE	Oyvind Eide
FB	Francesco Beretta
GB	George Bruseker
ETz	Elias Tzortzakakis
MF	Mark Fichtner
PM	Philippe Michon
OM	Olivier Marlet
ETs	Eleni Tsouloucha
PR	Pat Riva

II: Amendments

Issue 614

I4 Proposition Set

NEW

I4 Proposition Set

Subclass of:

E89 Propositional Object

Superclass of:

I10 Provenance Statement

I11 Situation

Ixx1 One-Proposition Set

Scope note:

This class comprises sets of unambiguous propositions that are or could, in principle be, encoded in a knowledge representation language. These propositions should be factual, i.e., each proposition should pertain to at least one particular item, in contrast to universals, such as instances of E55 Type. The identity of an instance of I4 Proposition Set is given by the total of its content, regardless equivalent encodings.

An instance of I4 Proposition Set should be regarded per se to be neutral to its relationship to reality. The relationship to reality is determined by the link using the proposition set:

If an instance of I2 Belief refers to an instance of I4 Proposition Set, the belief value of "TRUE" will mean that the propositions are believed to correspond to reality, if the propositions can be related to reality (i.e., are about real-world items, in contrast to, e.g., mathematical statements). "FALSE" would mean that at least one of the propositions in the set is regarded to not correspond to reality. Belief values expressing possibility or probability will mean "possibly real" if the propositions can be related to reality.

Some properties associating an activity with an instance of I4 Proposition Set may imply the belief of the Actor carrying out the activity that the propositions are true. This should be expressed in the respective scope notes.

In a Knowledge Base implementation, an instance of I4 Proposition Set may be represented by the URI of a Named Graph, but only if the propositions are encoded in the data model of the Knowledge Base and held to be true by the maintainers of a Knowledge Base because they become part of the stated knowledge. In this case, the platform-internal relation between the URI and its content are regarded as equivalent to the property *Jxx1 is encoded by*. Proposition Sets held to be possibly true by the maintainers of a Knowledge Base may also be introduced as Named Graphs, if the operation of the Knowledge Base foresees filtering by provenance and likelihood. In this case, Named Graphs are particularly effective.

Examples:

- The proposition set with content:
 - {Nero in July 19, 64 AD (E93 Presence)
 - P164 is temporally specified by: July 19, 64 AD (E52 Timespan)
 - P195 was a presence of: Nero Claudius Caesar Drusus Germanicus (E21 Person)
 - P167 was within: Antium in 64AD, Italy (E53 Place)
 - P133 is spatiotemporally separated from: The Great Fire of Rome (E5 Event)

P1 is identified by: incendium magnum Romae (E41 Appellation)
P4 has timespan: July 19-27, 64 AD (E52 Timespan)
P7 took place at: Rome in 64AD, Italy (E53 Place)
} (Bologna 2021)

- The proposition set with content:
{Nero July 19, 64 AD (E93 Presence)
P164 is temporally specified by: July 19, 64 AD (E52 Timespan)
P195 was a presence of: Nero Claudius Caesar Drusus Germanicus (E21 Person)
P167 was within Rome in 64AD, Italy (E53 Place)
P10 falls within (contains): Nero Singing (E7 Activity)
P2 has type: Singing (E55 Type)
P14 carried out by: Nero Claudius Caesar Drusus Germanicus (E21)
P4 has timespan: July 19, 64 AD (E52 Timespan)
P7 took place at: Rome in 64AD, Italy (E53 Place)
P132 spatiotemporally overlaps with: The Great Fire of Rome (E5 Event)
P1 is identified by: incendium magnum Romae (E41 Appellation)
P4 has timespan: July 19-27, 64 AD (E52 Timespan)
P7 took place at: Rome in 64AD, Italy (E53 Place)
}(I4) (Bologna 2021)

In First Order Logic:

$I4(x) \Rightarrow E73(x)$

Properties:

Jxx1 is encoded by: E52 String
Jxx2 is formal meaning of (has formal meaning): E73 Information Object
Jxx4 contains entity (is contained in): E1 CRM Entity
Jxx5 contains property type (is property type in): E55 Type

OLD

I4 Proposition Set

Subclass of: E73 Information Object

Superclass of:
I10 Provenance Statement

Scope note:

This class comprises the sets of formal, binary propositions that an I2 Belief is held about. It could be implemented as a named graph, a spreadsheet, or any other structured dataset. Regardless of the specific syntax employed, the effective propositions it contains should be made up of unambiguous identifiers, concepts of a formal ontology, and constructs of logic.

Examples:

- {Nero in July 19, 64 AD (E93 Presence)
P164 is temporally specified by: July 19, 64 AD (E52 Timespan)
P195 was a presence of: Nero Claudius Caesar Drusus Germanicus (E21 Person)
P167 was within Antium in 64AD, Italy (E53 Place)
P133 is spatiotemporally separated from: The Great Fire of Rome (E5 Event)
P1 is identified by: incendium magnum Romae (E41 Appellation)
P4 has timespan: July 19-27, 64 AD (E52 Timespan)

P7 took place at: Rome in 64AD, Italy (E53 Place)
} (Bologna 2021)

[The Proposition Set above represents Francesca Bologna’s adopted belief, according to which Publius Cornelius Tacitus meant that “Nero was at Antium when the Great Fire broke out and did not return to Rome until the fire approached his house”]

- {Nero July 19, 64 AD (E93 Presence)
 - P164 is temporally specified by: July 19, 64 AD (E52 Timespan)
 - P195 was a presence of: Nero Claudius Caesar Drusus Germanicus (E21 Person)
 - P167 was within Rome in 64AD, Italy (E53 Place)
 - P10 falls within (contains): Nero Singing (E7 Activity)
 - P2 has type: Singing (E55 Type)
 - P14 carried out by: Nero Claudius Caesar Drusus Germanicus (E21)
 - P4 has timespan: July 19, 64 AD (E52 Timespan)
 - P7 took place at: Rome in 64AD, Italy (E53 Place)
 - P132 spatiotemporally overlaps with: The Great Fire of Rome (E5 Event)
 - P1 is identified by: incendium magnum Romae (E41 Appellation)
 - P4 has timespan: July 19-27, 64 AD (E52 Timespan)
 - P7 took place at: Rome in 64AD, Italy (E53 Place)

} (I4) (Bologna 2021)

[The Proposition Set above represents Francesca Bologna’s intended meaning belief, according to which Gaius Suetonius Tranquillus assumed that Nero was singing in Rome while it was burning from July 19 in 64 AD.]

In First Order Logic:

$I4(x) \Rightarrow E73(x)$

Properties:

Ixx1 One-Proposition Set

Ixx1 One-Proposition Set

Subclass of:

I4 Proposition Set

Scope note:

This class comprises proposition sets containing exactly one binary proposition which is or could, in principle be, encoded in a knowledge representation language. The identity of an instance of Ixx1 One-Proposition Set is given by the total of its content, regardless equivalent encodings.

A property linking to an instance of Ixx1 One-Proposition Set in a Knowledge Base may alternatively be implemented by a “reification” construct, and is regarded as logically equivalent in this model. Similarly, all triples of properties declared for one class to denote the domain, type and range of another property, such as the properties of E13 Attribute Assignment and its subclasses, can be interpreted as shortcuts to an instance of Ixx1 One-Proposition Set and its properties *Jxx6 has domain (is domain of)*, *Jxx7 has range (is range of)*, *Jxx8 has property type (is property type of)*, or as a “reification” implicit to the declaring class.

As such, the class Ixx1 One-Proposition Set plays the role of an important *logical interface* between different ways to document a discourse about propositions within a Knowledge Base in different ways. In practice, the use of shortcut properties will typically be preferred for documentation purposes.

Examples:

- <example 1>
- <example 2>

In First Order Logic:

$I_{xx1}(x) \Rightarrow I4(x)$

$I_{xx1}(x) \Rightarrow (\exists uvw) [E1(u) \wedge J_{xx6}(x,u) \wedge E1(v) \wedge J_{xx7}(x,v) \wedge E55(w) \wedge J_{xx8}(x,w)]$

Properties:

Jxx6 has domain (is domain of): E1 CRM Entity

Jxx7 has range (is range of): E1 CRM Entity

Jxx8 has property type (is property type of): E55 Type

Jxx1 is encoded by

Jxx1 is encoded by

Domain:

I4 Proposition Set

Range:

E62 String

Superproperty of:

<??>

Subproperty of:

<??>

Quantification:

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

Scope note:

This property associates an instance of I4 Proposition Set with a “serialization” of its content in the format of a knowledge representation language. There may be more than one ontologically equivalent formal encodings of the same propositions.

In a Knowledge Base implementation, the content of an instance of I4 Proposition Set may be represented by the content of a Named Graph, but only if the propositions are encoded in the data model of the Knowledge Base and held to be true by the maintainers of a Knowledge Base because they become part of the stated knowledge. In this case, the platform-internal relation between the URI of the Named Graph and its content are regarded as equivalent to *Jxx1 is encoded by*, and the property should formally not be instantiated.

Full path:

<??>

Examples:

- <example 1>
- <example 2>

In First Order Logic:

$J_{xx1}(x,y) \Rightarrow I4(x)$

$J_{xx1}(x,y) \Rightarrow E62(y)$

Jxx2 is a formal meaning of (has a formal meaning)

Jxx2 is a formal meaning of (has a formal meaning)

Domain:

I4 Proposition Set

Range:

E73 Information Object

Superproperty of:

Subproperty of:

E1 CRM Entity. P129i is about (is subject of): E89 Propositional Object

Quantification:

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

Scope note:

This property associates an instance of I4 Proposition Set with an instance of E73 Information Object that expresses the content of the former as propositions that are or could, in principle be, encoded in a knowledge representation language.

These propositions should be unambiguous at least within the context of provenance of the information object and the context of documenting them as the content of the instance of I4 Proposition Set. For a textual representation, rules of a normal scholarly consensus should be applied

Full path:

<??>

Examples:

- <example 1>
- <example 2>

In First Order Logic:

$J_{xx2}(x,y) \Rightarrow I4(x)$

$J_{xx2}(x,y) \Rightarrow E78(y)$

$J_{xx2}(x,y) \Rightarrow P129(y,x)$

Jxx3 that formal meaning of (has a meaning belief)

Jxx3 that a formal meaning of (has a meaning belief)

Domain:

I2 Belief

Range:

E78 Information Object

Superproperty of:

<??>

Subproperty of:

<??>

Quantification:

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

Scope note:

This property associates an instance of I2 Belief with an instance of E73 Information Object that expresses the believed propositions in a form that are or could, in principle be, encoded in a knowledge representation language.

This property is a strong shortcut of the fully developed path from I2 Belief, *J4 that (is subject of)*, I4 Proposition Set, *Jxx2 is formal meaning of (has formal meaning)* to E73 Information Object. It

is introduced into this model for the convenience of the user, when the implied instance of I4 Proposition Set appears not to be a separate object of discourse within this documentation context.

Full path:

<??>

Examples:

- <example 1>
- <example 2>

In First Order Logic:

$J_{xx3}(x,y) \Rightarrow I2(x)$
 $J_{xx3}(x,y) \Rightarrow E78(y)$
 $J_{xx3}(x,y) \Leftrightarrow (\exists u) [I4(u) \wedge J4(x,u) \wedge J_{xx2}(u,y)]$

Jxx4 contains entity (is contained in)

Jxx4 contains entity (is contained in)

Domain:

I4 Proposition Set

Range:

E1 CRM Entity

Superproperty of:

Ixx1 One-Proposition Set. Jxx6 has domain (is domain of): E1 CRM Entity
Ixx1 One-Proposition Set. Jxx7 has range (is range of): E1 CRM Entity
I10 Provenance Statement. J20 is about the provenance of (has provenance claim): E70 Thing

Subproperty of:

E89 Propositional Object. P67 refers to (is referred to by): E1 CRM Entity

Quantification:

many to many, necessary (2,n:0,n)

Scope note:

This property associates an instance of I4 Proposition Set with an instance of E1 CRM Entity that appears as an element of one or more propositions in the content of the former.

This property serves on one side to relate an instance of I4 Proposition Set to other contexts of interest, in particular when its content is or cannot be represented as a Named Graph in the same knowledge base. On the other hand, it plays an important structural role in this model for expressing constraints to the content of an instance of I4 Proposition Set or one of its subclasses.

Full path:

<??>

Examples:

- <example 1>
- <example 2>

In First Order Logic:

$J_{xx4}(x,y) \Rightarrow I4(x)$
 $J_{xx4}(x,y) \Rightarrow E1(y)$
 $J_{xx4}(x,y) \Rightarrow P67(x,y)$

Jxx5 contains property type (is property type in)

Domain: I4 Proposition Set

Range: E55 Type

Superproperty of: Ixx1 One-Proposition Set. Jxx8 has property type (is property type of): E55 Type

Subproperty of: E89 Propositional Object. P67 refers to (is referred to by): E1 CRM Entity

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

Scope note: This property associates an instance of I4 Proposition Set with an instance of E55 Type that appears as property type in one or more propositions in the content of the former.

This property plays an important structural role in this model for expressing constraints to the content of an instance of I4 Proposition Set or one of its subclasses.

Full path:

<??>

Examples:

- <example 1>
- <example 2>

In First Order Logic:

$Jxx5(x,y) \Rightarrow I4(x)$

$Jxx5(x,y) \Rightarrow E55(y)$

$Jxx5(x,y) \Rightarrow P67(x,y)$

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Jxx6 has domain (is domain of)

Jxx6 has domain (is domain of)

Domain:

Ixx1 One-Proposition Set

Range:

E1 CRM Entity

Superproperty of:

Subproperty of:

I4 Proposition Set. Jxx4 contains entity (is contained in): E1 CRM Entity

Quantification:

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

Scope note:

This property associates an instance of Ixx1 One-Proposition Set with an instance of E1 CRM Entity that must appear as the only domain instance of the proposition in the content of the former.

This property is part of the fully developed path from E13 Attribute Assignment through *Jxx9 assigned proposition (is assigned by)*, Ixx1 One-Proposition Set, *Jxx6 has domain (is domain of)* E1 CRM Entity, which is shortcut by *P140 assigned attribute to (was attributed by)*.

Full path:

<??>

Examples:

- <example 1>
- <example 2>

In First Order Logic:

$Jxx6(x,y) \Rightarrow Ixx1(x)$

$Jxx6(x,y) \Rightarrow E1(y)$

$Jxx6(x,y) \Rightarrow Jxx4(x,y)$

$Jxx4(x,y) \wedge Ixx1(x) \Rightarrow Jxx6(x,y) \text{ OR } Jxx7(x,y)$ **Restriction of superproperty to subproperties.**

Jxx7 has range (is range of)

Jxx7 has range (is range of)

Domain:

Ixx1 One-Proposition Set

Range:

E1 CRM Entity

Superproperty of:

Subproperty of:

I4 Proposition Set. Jxx4 contains entity (is contained in): E1 CRM Entity

Quantification:

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

Scope note:

This property associates an instance of Ixx1 One-Proposition Set with an instance of E1 CRM Entity that must appear as the range of the proposition in the content of the former.

This property is part of the fully developed path from E13 Attribute Assignment through *Jxx9 assigned proposition (is assigned by)*, Ixx1 One-Proposition Set, *Jxx7 has range (is range of)* E1 CRM Entity, which is shortcut by *P141 assigned (was assigned by)*.

<??>

Full path:

<??>

Examples:

- <example 1>
- <example 2>

In First Order Logic:

$Jxx7(x,y) \Rightarrow Ixx1(x)$

$Jxx7(x,y) \Rightarrow E1(y)$

$Jxx7(x,y) \Rightarrow Jxx4(x,y)$

Jxx8 has property type (is property type of)

Jxx8 has property type (is property type of)

Domain:

Ixx1 One-Proposition Set

Range:

E55 Type

Superproperty of:

Subproperty of:

I4 Proposition Set. Jxx4 contains property type (is property type in): E55 Type

Quantification:

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

Scope note:

This property associates an instance of Ixx1 One-Proposition Set with an instance of E55 Type that must appear as the only property type of the proposition in the content of the former.

This property is part of the fully developed path from E13 Attribute Assignment through *Jxx9 assigned proposition (is assigned by)*, Ixx1 One-Proposition Set, *Jxx8 has property type (is property type of)* E1 CRM Entity, which is shortcut by *P177 assigned property of type (is type of property assigned)*.

Full path:

<??>

Examples:

- <example 1>
- <example 2>

In First Order Logic:

$Jxx8(x,y) \Rightarrow Ixx1(x)$

$Jxx8(x,y) \Rightarrow E55(y)$

$Jxx8(x,y) \Rightarrow Jxx5(x,y)$

Jxx9 assigned proposition (is assigned by)

Jxx9 assigned proposition (is assigned by)

Domain:

E13 Attribute Assigment

Range:

Ixx1 One-Proposition Set

Superproperty of:

Subproperty of:

Quantification:

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

Scope note:

This property associates an instance of E13 Attribute Assignment with an instance of Ixx1 One-Proposition Set that describes the proposition made and believed to be true.

This property constitutes a formal logical alternative to specifying the proposition made by an instance of E13 Attribute Assignment via *P140 assigned attribute to (was attributed by)*, *P141 assigned (was assigned by)* and *P177 assigned property of type (is type of property assigned)*. As such, it is of importance for querying knowledge bases compatible with either model.

This property forms part of the following three (3) fully developed paths from E13 Attribute Assignment through:

- *Jxx9 assigned proposition (is assigned by)*, Ixx1 One-Proposition Set, *Jxx6 has domain (is domain of)* to E1 CRM Entity, which is shortcut by *P140 assigned attribute to (was attributed by)*.
- *Jxx9 assigned proposition (is assigned by)*, Ixx1 One-Proposition Set, *Jxx7 has range (is range of)* to E1 CRM Entity, which is shortcut by *P141 assigned (was assigned by)*,
- *Jxx9 assigned proposition (is assigned by)*, Ixx1 One-Proposition Set, *Jxx8 has property type (is property type of)* to E1 CRM Entity, which is shortcut by *P177 assigned property of type (is type of property assigned)*.

This property is a shortcut for the path from E13 Attribute Assignment through *J2 concluded that (was concluded by)*, I2 Belief, *J4 that (is subject of)*, I4 Proposition Set, *J5 holds to be* to I6 Belief Value (= “True”).

Full path:

<??>

Examples:

- <example 1>
- <example 2>

In First Order Logic:

$Jxx9(x,y) \Rightarrow E13(x)$

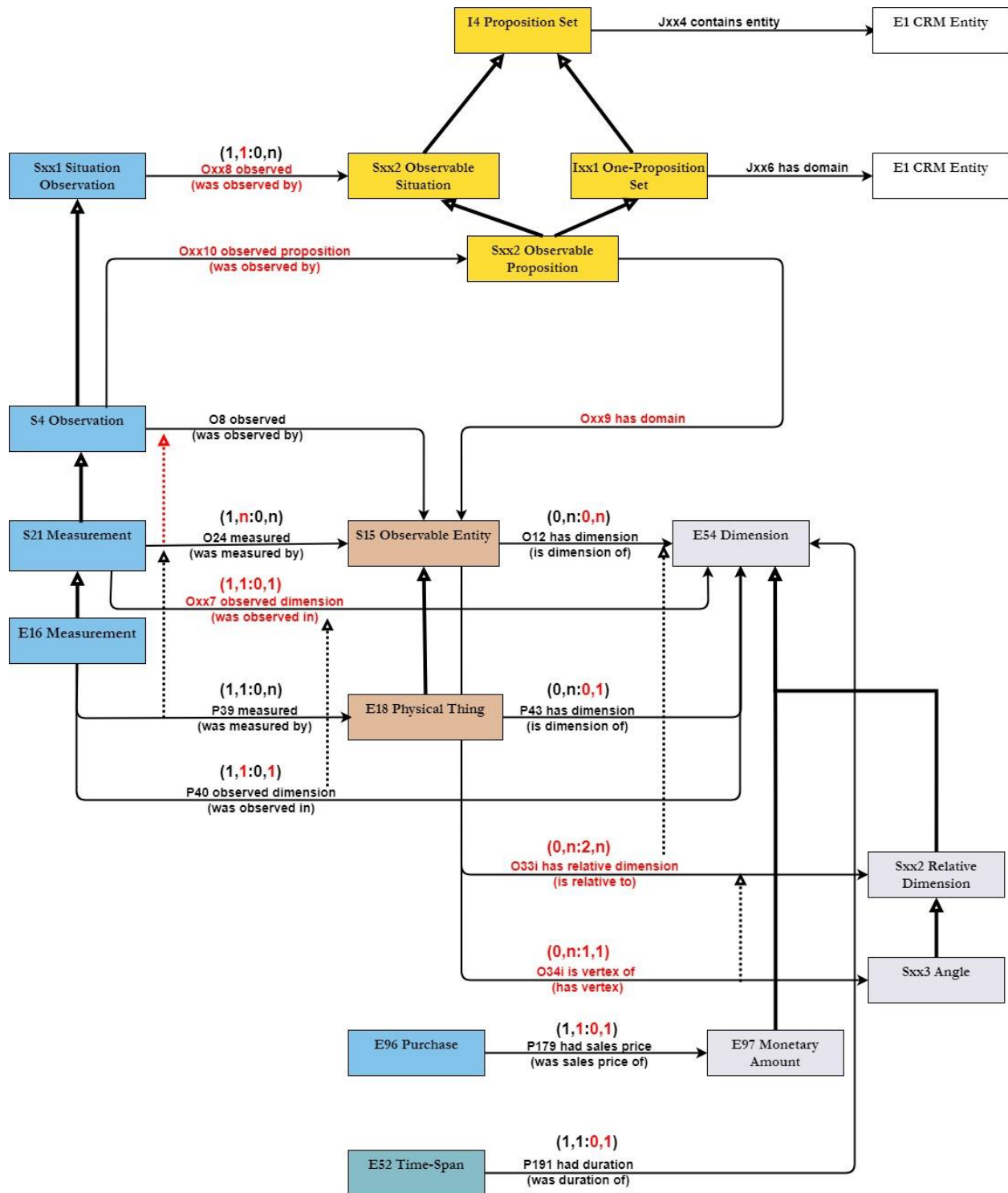
$Jxx9(x,y) \Rightarrow Ixx1(y)$

$Jxx9(x,y) \Rightarrow P140(x,u) \wedge Jxx6(y,u) \wedge P141(x,v) \wedge Jxx7(y,v) \wedge P177(w) \wedge Jxx8(y,w)$

$Jxx9(x,y) \Rightarrow (\exists u) [I2(u) \wedge J2(x,u) \wedge J4(u,y) \wedge J5(u, 'TRUE')] \text{ **believed to be true!**}$

$E13(x) \Rightarrow (\exists uvw) [E1(u) \wedge P140(x,u) \wedge E1(v) \wedge P141(x,v) \wedge E55(w) \wedge P177(x,w)]$

$J2(x,y) \wedge E13(x) \Rightarrow Jxx9(x,y)$



Issue 646
Introduction

This document presents CRMinf, an extension of the CIDOC Conceptual Reference Model (CRM, ISO21127) created to support the documentation of scholarly and scientific arguments for documented propositions about the past. The making of documented propositions and their arguments are seen as historical facts regardless their relevance. The purpose of documenting the argumentation is safeguarding and understanding the provenance of

knowledge, for future assessments of authenticity and for providing sufficient information for reassessing the validity of an argument and its conclusions based on given or new evidence of whatever kind. CRMInf *does not* aim at promoting the application of formal logical reasoning about historical facts or replacing scholarly arguments by automation. Whereas the results of formal logical reasoning can be documented in CRMInf, it commits rather to an epistemology of “inference to the best explanation” (J.Ladyman XXXX).

Scope

CRMInf regards as “knowledge” to be anything someone says and can justify as “I know that X”, regardless whether X is regarded to be true, false, probable, etc., whereas X itself is regarded as information or “data”. In this sense, knowledge resides in humans, the ones which can relate the symbols in information to states of affairs in current or past reality. “Knowledge representation” is regarded as a particular form of encoded information, for instance, a CRM compatible form. Consequently, CRMInf aims at connecting the people who know something to the information representing their knowledge, and its justification. The model supposes scientific ethics and is not concerned with beliefs of people using CRMInf different from what they state, but it can quite well be used to reason about deliberately false statements in historical sources.

CRMInf is inspired by the IAM model in Doerr, Kritsotaki and Boutsika (2011), which in turn draws on a background of other argumentation models under the aspect of application *to knowledge about the past*, among them being the “logicist” approach (XXXX) in use in France for archeological data. As the IAM, CRMInf deals with the sources of knowledge for facts stated in explicit propositions. It simplifies IAM by making the general theories used for inferences (such as a mathematical proof, universal properties etc) and the belief in their correct application an implicit part of an argumentation event (possibly represented in a text). CRMInf is also less formal than IAM with respect to inference chains (i.e., using conclusions as premises for the next inference) of different granularity. As in IAM, a documented chain of inferences represents a state of knowledge at a point in time, and *not* the historical order of finding its elements. The latter is given explicitly by the time of argument making, which is taken to be a historical fact.

CRMInf makes a basic distinction between three kinds of sources of knowledge because of the way it can be acquired, justified or falsified. These are (1) observation, (2) belief adoption and (3) inference making.

Observation results in knowledge acquired by human senses or by technical devices at a particular place and time. Verification or falsification may reexamine the same environment or things, if sufficiently unaltered, examine observation protocols and the functionality of employed devices and compare with independent observations. Observation is the ultimate primary source of all knowledge. The complexity of observation processes, in particular with calibrated means, is out of the scope of CRMInf, which is primarily concerned with the origin and further history of the observation results, thus providing a common generalization for other extensions, notably CRMsci.

Belief adoption is used in CRMInf as a term for the use of information someone has heard, read or seen presented in symbolic form and accepts it as own knowledge. It is the major source of all our communicated knowledge, including reports from observations. It is supported or questioned by assessing the provenance of the source and trust in its credibility. In case of inconsistencies between reported facts, trust argument may be used to decide for the one or the other. Therefore, CRMInf has developed the concept of Belief Adoption into much more detail than IAM, and created an “articulation” (ontological connection) to the decyphering and reading of original texts addressed by the CRM extension *CRMtex*, in order to be able to represent critical methods in historical research. Subsequent activities of belief adoption form endless networks of information transfer, which are of great importance for historical research,

Inference making, the third kind of acquiring knowledge, means that one concludes from the belief in the truth or likelihood of one or more propositions, the premises, that other propositions are true or likely, using background theories, such as common logic, laws of nature or assumption about general human behavior. The peculiarity of this knowledge is that it is relative to the truth of the premise. Therefore, it may be verified or falsified by revising the truth of the premises and the validity of the background assumptions for the given context and the correct application of the background theory, such as the common errors in applying logic. Note, that an inference may conclude that at least one of the premises must be wrong. In IAM it is described as “recursive inference”, but for reasons of simplicity not distinguished in CRMInf.

The knowledge itself is represented by an instance of I2 Belief, which relates an E39 Actor to a set of propositions (I4 Proposition Set) believed forming one context and holding the same truth value (I6 Belief Value) as explicitly

stated by the Actor. It comes into existence as conclusion of an instance of I1 Argumentation (through one of its sub-classes, S4 Observation, I5 Inference Making, or I7 Belief Adoption), and ends with any modification of its truth value and propositions. Only one E39 Actor may hold a particular instance of I2 Belief, though the E38 Actor may, of course, be an instance of E74 Group. Such an instance of E74 Group may lose or gain members (via one or more instances of E85 Joining or E86 Leaving) without affecting the belief the group representatively maintains. The members supporting the common belief may not necessarily be individually convinced of it. This does not invalidate the (explicitly stated) belief of the Group, for instance, in a publication.

The disciplines addressed by CRMInf are what (Turner XXXX) calls “historical sciences”, i.e., cultural heritage studies, human and natural history, archaeology, but also descriptive empirical sciences, such as biodiversity, ethnology, geology, cultural heritage conservation, even clinical studies, etc., in their focus on documenting particular states of affairs now and in the past.

If scientists and scholars, and in particular curators, would start documenting for each information source the provenance of its immediate sources in publicly accessible systems, this partial knowledge of provenance could be “stitched together” to more and more complete networks of provenance, similar to the way these days citations in scientific publications are processed. This is a major motivation for CRMInf, the other is to make the way transparent how knowledge was acquired for enabling justified future revisions, and who is supporting contested propositions.

Status

CRMInf uses and extends the CIDOC CRM (ISO21127) as a general ontology of human activity, things and events happening in space-time. It uses the same encoding-neutral formalism of knowledge representation (“data model” in the sense of computer science) as the CIDOC CRM, which can be implemented in RDFS, OWL, on RDBMS and other forms of encoding. Since the model reuses, whenever appropriate, parts of CIDOC CRM, we provide in this document also a comprehensive list of all constructs used from ISO201127 following the version 7.1.2 maintained by CIDOC.

CRMInf has so far been validated in the British Museum, and by the European-funded project RICOTRANS. This document describes the first consolidated version from this experience and reviewed by CRM SIG.