CHARM
Cultural Heritage Abstract Reference Model

CHARM White Paper

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Introduction

This document presents a quick introduction to CHARM, the Cultural Heritage Abstract Reference Model. If you are not familiar with CHARM, you can use this document to obtain basic information about what it is, how it works, and whether it can be useful to you or your organization.

This document is intentionally kept brief and simple. If you are already familiar with CHARM, or need a technical description of its features, please use the online *CHARM Reference* [8] or the *CHARM Extension Guidelines* [7] instead. If you need information on the academic underpinnings of CHARM, please see the *Research* and *Resources/Publications* areas, online [8].

For additional information on CHARM, please visit www.charminfo.org.

Background and Motivation

Cultural heritage is a complex reality with which people from multiple fields often interact. Cultural heritage specialists may include anthropologists, archaeologists, architects, art historians, documentalists, geographers, geoscientists, palaeobiologists or sociologists. Teams of experts working on cultural heritage are becoming larger and more heterogeneous, and are generating more and more information about their findings, observations, hypotheses and conclusions. In addition, non-specialists also play a crucial role in cultural heritage; the general public and the society at large are major actors in the construction and interpretation of cultural heritage.

In interacting with cultural heritage, different agents need to express what they find, observe, interpret or conclude. This need for expression comes from two sources and serves two purposes. First of all, it helps us understand the reality that we observe; it supports our exploration, validation and reasoning about it. Secondly, it helps us communicate with others; we can thus document our observations, hypotheses and conclusions about cultural heritage; we can convey them to others; and others can therefore reuse them later.

In this process there is an ongoing tension. On the one hand, we strive to express things in a manner that is as clear and understandable as possible, so that as many people as possible can benefit from it. This leads us to adopt conventions, shared views of reality and agreed-upon approaches. But, on the other hand, we know that each project or endeavour (such as an archaeological excavation or an ethnographic study) has its own peculiarities and specific needs, and so it needs a particular, unique way of expressing things. This leads us to employ special, unrepeatable ways of expressing things in order to obtain the best possible fit for our purpose. Adopting conventions and employing unique solutions are, in fact, two contradictory strategies, each one having its pros and cons.

In any case, and irrespective of the strategy that dominates in each occasion, the need to express what we find, observe, interpret or conclude about cultural heritage can be enormously facilitated by using a conceptual model. A model is a representation of a portion of reality that removes non-essential characteristics in order to yield a simpler view of it that can be used as its proxy. This means that the model is simpler to use and reason about than the corresponding reality, and that the outcomes of our reasoning on the model can be applied to such reality with great confidence.

Cultural heritage, being such a complex portion of reality, and being dealt with from so many different perspectives, can greatly benefit from the use of conceptual models. CHARM is our proposal.

Solution

CHARM stands for *Cultural Heritage Abstract Reference Model*.

Firstly, CHARM is a *model*, that is, a semi-formal representation of a portion of reality that we are interested in studying, describing and/or communicating. Every model necessarily entails a simplification, which removes some nuances and details, and allows us to manage information that would be too complex to handle otherwise.

Secondly, CHARM refers to *cultural heritage*; this is the portion of reality represented by CHARM. By "cultural heritage" we mean anything that may be the recipient of cultural value ascribed by any individual, plus the associated valorizations ascribed to said things, plus the representations of these things that may exist. In this way, CHARM does not only represent the specific entities that might receive cultural value, but also other entities which, without doing so, are necessary in order to describe and understand the former.

Thirdly, CHARM is a *reference* model. This means that CHARM is intended to be used by a wide and diverse range of organizations and individuals in order to achieve a common understanding.

Finally, CHARM is an *abstract* model. In order for CHARM to be used by a wide and diverse range of users, the model cannot specify too many details about cultural heritage, since each organization, project and situation has different, specific needs. CHARM provides an abstract view that can be, hopefully, shared by everyone, but it is up to each user to define their own particularities by using extension mechanisms. This means that you do not use CHARM "as is"; rather, you need to extend CHARM into a particular model that suits your specific needs.

The following sections provide some details about how CHARM eases the tension described in *Background and Motivation*, p. 3, what its major areas are, and how extension mechanisms work. In addition, a collection of usage scenarios are given to provide a glimpse of typical situations where CHARM can be useful.

Easing the Tension

In *Background and Motivation*, p. 3, a tension is described between adopting conventions and employing unique solutions when describing information in cultural heritage. CHARM eases this tension by acknowledging two facts:

- Imposing a common standard on everyone does not work, since each project or endeavour has its own specificities that need to be addressed.
- Despite of that, it is still interesting to maintain some level of compatibility between projects or endeavours, in order to exchange, compare or reuse information.

By being an abstract model, CHARM lets each user add the details that are necessary for their particular project or endeavour through extension mechanisms. At the same time, by being a reference model, CHARM guarantees that information generated within different projects or endeavours, even under different versions of CHARM that have been extended differently, are mutually compatible, comparable and reusable. The tension is thus eased.

How CHARM Is Expressed

CHARM is a conceptual model and, as such, is expressed as a ConML [6] type model.

A type model is a particular kind of model composed, primarily, of classes. A *class* is the formal equivalent of a category of things, which can be tangible or intangible, concrete or abstract, real or imaginary. Classes are useful to represent categories of real-world things that are relevant to the model; for example, a model about cultural heritage may include classes named *ArchaeologicalSite*, *HistoricalEvent* or *Building*. Classes, in addition, have *attributes*, i.e. formalized characteristics of the corresponding category that can be expressed by simple pieces of information. For example, the *Building* class in a model may have an attribute named *Address*, which provides the address of each building; and an attribute *Height*, which allows us to document the height (in metres, for example) of each building. Attributes marked with an "L" in parenthesis are multilingual, i.e. they can be expressed in multiple languages when using CHARM to document actual entities.

Finally, classes may be related to each other through two different mechanisms. On the one hand, classes can be organized in generalization/specialization hierarchies, meaning that some classes are sub-types of others. For example, a model may state that class *Building* is a sub-type of class *Structure*. On the other hand, classes can be related to each other through *associations*, which describe semantic connections between the corresponding categories. For example, the class *Structure* could be associated to the class *ArchaeologicalObject* through the association named *Contains*, meaning that each structure may contain certain archaeological objects.

Classes, attributes, generalization/specialisation hierarchies and associations can be depicted graphically in diagrams for convenience, although diagrams do not show all the information in the type models, such as the definitions. The following sections use class diagrams to illustrate CHARM and related examples.

The details of the syntax, semantics and notation of models are usually given by *modelling languages*. CHARM uses ConML, a particular modelling language that was specifically designed to be simple and easy to use by people who are not computer specialists, and with the humanities and social sciences in mind. For more information about ConML, please visit www.conml.org or see [5].

Main Areas of CHARM

CHARM is a model of cultural heritage, which includes anything that may be the recipient of cultural value ascribed by any individual, plus the associated valorizations ascribed to said things, plus the representations of these things that may exist. This is captured by three major classes in CHARM:

- ***ValuableEntity***. A valuable entity is anything that has been, is or may be culturally valuated. Almost anything can be a valuable entity, since almost anything can be given cultural and heritage value by someone.
- ***Valorization***. A valorization is a valuable entity of a discursive nature that adds cultural value to other valuable entities through interpretive processes that have been agreed upon within a group or discipline. Since valorizations are valuable entities too, it is possible to valorize other valorizations.
- ***Representation***. A representation is an entity that describes the persistent manner in which certain contents are captured on an embodiment, reflecting the forms and characteristics of the former. Both the contents and the embodiment are valuable entities. Representations can be "chained" together so that the embodiment of a representation acts as contents of a different representation.

These three classes make up the backbone of CHARM. It is important, however, to understand how they are connected to other classes in generalization/specialization hierarchies and through associations.

Valuable Entities

Figure 1 depicts a class diagram showing the most abstract classes in CHARM, that is, the classes at the top of the main generalization/specialization hierarchy.

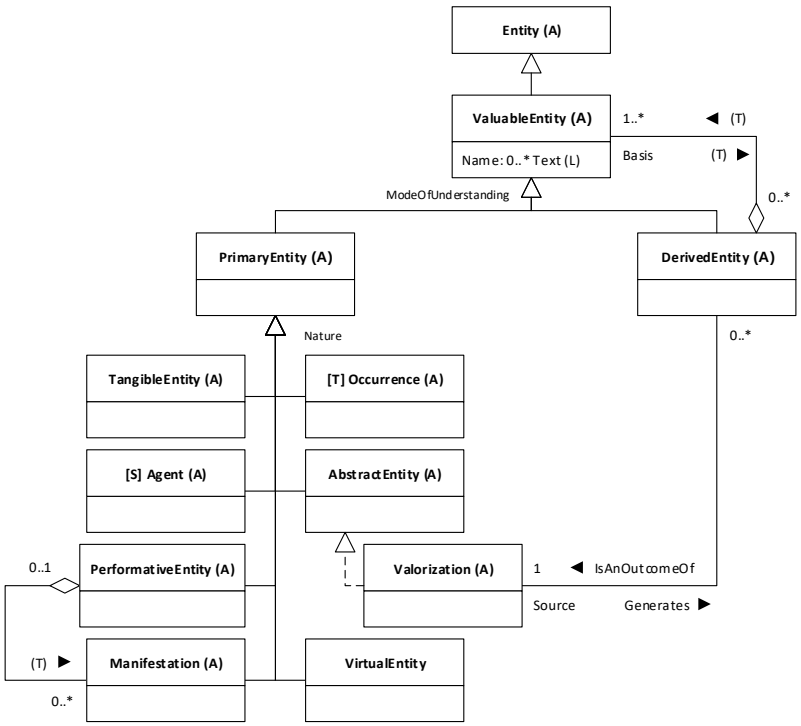

Figure 1. CHARM most abstract classes. Arrows with a white triangular head depict generalization relationships, e.g. *PrimaryEntity* is a subtype of *ValuableEntity*. Other lines linking classes depict associations. A diamond shape at the end of an association line conveys whole/part semantics in the relationship, e.g. each performative entity is composed of manifestations. For additional details on the notation of class diagrams, please see the *ConML Technical Specification* [5].

The diagram shows that there are two subtypes of *ValuableEntity*:

- ***PrimaryEntity***. A primary entity is a valuable entity that, when perceived, is clearly delimited from its context, categorized, and understood without the need of explicit interpretive processes. In other words, anyone perceiving a primary entity will be able to separate it from its surroundings, assign it to a category (whatever it is), and understand it as such. This does not mean that everyone will understand it in the same way or give it the same value, but that everyone will acknowledge the fact that it constitutes an entity distinct to its surrounding environment and can categorize it. Primary entities can be of several kinds; please see below for a detailed description.
- ***DerivedEntity***. A derived entity is a valuable entity that, when perceived, is not clearly delimited, categorized, and/or understood in an immediate and implicit manner, but requires an explicit reception process. That is to say, many people who perceive a derived entity will not recognise it as such, and will not be able to differentiate it from it surrounding environment. This is the case of entities that are interpretively constructed through intersubjectivities that not everyone shares. For example, a researcher may determine that a series of sites, villages, roads, social practices and other elements make up a particular cultural landscape. This cultural landscape constitutes a derived entity, which will not be recognised as such by anyone who is not acquainted with the interpretation carried out by the researcher. For this reason, derived entities are always associated to one (or more) valorizations.

The *PrimaryEntity* class, in turn, has the following subtypes:

- ***TangibleEntity***. A tangible entity is a primary entity that is fundamentally perceived in a direct fashion and through its materiality. Tangible entities are physical, material things that we usually perceive through sight or touch, such as buildings, chairs, books or places.
- ***PerformativeEntity***. A performative entity is a primary entity that is fundamentally perceived in an indirect fashion and through the associated manifestations. Performative entities are interpretive constructs that are built from the perception and interpretation of specific manifestations. As such, their ontology is much more subjective than that of tangible entities (the materiality of which gives them certain objectivity) or even manifestations (the phenomenology of which plays a similar role to materiality in the previous case). As opposed to abstract entities, performative entities are totally or almost totally realized in each of their manifestations. They include things such as social acts, gestural designs, language compositions or traditional trades.
- ***Manifestation***. A manifestation is a primary entity corresponding to a human expression at a given time and place, and which is fundamentally perceived in a direct fashion and through performative aspects. Manifestations often realize performative entities, that is, they are the perceivable incarnation of a performative entity. For example, a song being sung by a person (at a specific place and time) is a manifestation of the performative entity that is the song as an interpretive construct.
- ***Occurrence*.** An occurrence is a primary entity corresponding to an event or situation that happens in relation to one or more valuable entities. Occurrences often have agents that cause them and may effect changes on other valuable entities, and may be used to express the "life story" of other valuable entities. Examples include the destruction of a building by a fire or a battle.
- ***AbstractEntity***. An abstract entity is a primary entity that is socially constructed and comprised of abstractions or ideas only, with no concrete realization whatsoever. Abstract entities are completely immaterial and, although they can be physically embodied through representations, they have no direct tangible manifestations. They include things such as beliefs, languages, type systems or laws.
- ***Valorization***. A valorization is an abstract entity of a discursive nature that adds cultural value to other valuable entities through interpretive processes that have been agreed upon within a group or discipline. This corresponds to the concept of Valorization introduced at the beginning of this section, and is explained in the following one.
- ***Agent***. An agent is a primary entity corresponding to a person or group of people. Agents include both individual persons, specific groups (such as organizations or communities), and declared roles that may be fulfilled by different people at different times, such as "the town's mayor" or "the oldest family member".
- ***VirtualEntity***. A virtual entity is a primary entity that can be perceived only by intermediation of an artificial device. Virtual entities often correspond to highly technological information records such as recordings or computer files and similar contents, which cannot be perceived without the necessary mechanical, electrical or electronic devices. Examples include a PDF document stored in a computer or an audio recording on magnetic tape.

Most of the classes described here have subtypes that add extra details to CHARM. Notably, *TangibleEntity* and *PerformativeEntity* are roots of specialization hierarchies that are not described here for the sake of brevity. Please see the online *CHARM Reference* [8] for more information.

Valorizations

Figure 2 depicts a class diagram showing the *Valorization* class and its relationships to other classes in CHARM.

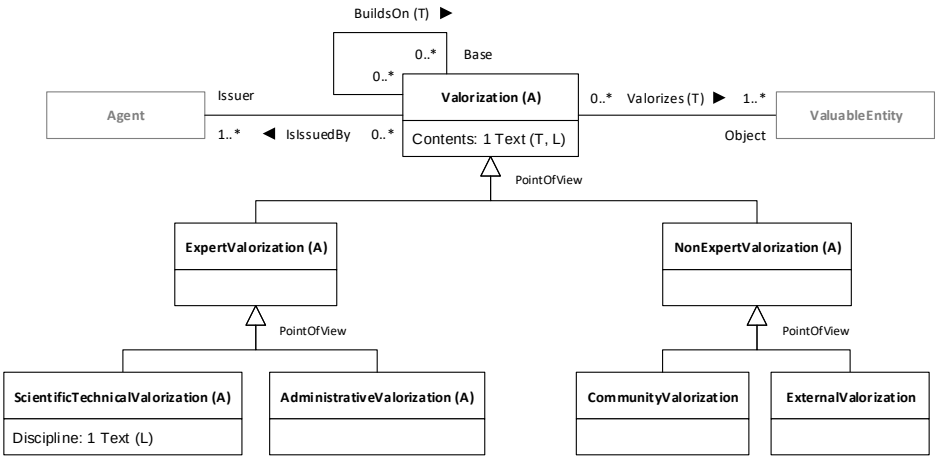

Figure 2. The *Valorization* class and its relationships to other classes in CHARM.

The diagram shows that a valorization always valorizes one or more valuable entities, and that each valorization may have a number of other valorizations as base on which it builds. Although not shown in the diagram, valorizations can produce derived entities as a result.

The diagram does show that *Valorization* has the following subtypes:

- ***ExpertValorization***. An expert valorization is a valorization produced by consensus within a group of experts, and issued in a formal manner. Usually, expert valorizations are explicitly issued, and are communicated by the same agents who create them. There are two subtypes:
  - ***ScientificTechnicalValorization***. A scientific-technical valorization is an expert valorization produced from the perspective of a specific discipline. Usually, they are produced by researchers or technical staff. An example of scientific-technical valorization is a technical report on the conservation state of a historical building.
  - ***AdministrativeValorization***. An administrative valorization is an expert valorization produced from the perspective of heritage management. The word "administrative" in the name of this class refers to the administration (i.e., management) of cultural heritage, rather than public administration. However, administrative valorizations are usually produced within a competent authority for cultural heritage management. An example of administrative valorization is a town plan that establishes specific zoning classes for different areas of a city.
- ***NonExpertValorization***. A non-expert valorization is a valorization produced by a community from a non-expert and non-scientific perspective, and issued in an informal manner. Usually, non-expert valorizations are implicitly issued, and are communicated by agents other than those who create them. There are two subtypes:
  - ***CommunityValorization***. A community valorization is a non-expert valorization expressed in terms of identity, continuity and/or closeness. An example of community valorization is the sense of belonging and attachment that neighbours of a village feel towards their local church and associated social practices.
  - ***ExternalValorization***. An external valorization is a non-expert valorization expressed in terms of wonder and distant appreciation. An example of

external valorization is the sense of awe and respect that pilgrims experience when entering the cathedral of Santiago de Compostela for the first time.

Representations

Figure 3 depicts a class diagram showing the *Representation* class and its relationships to other classes in CHARM.

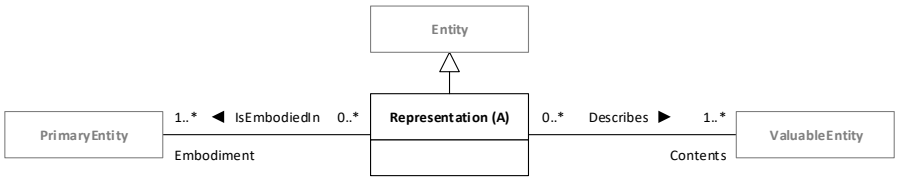

Figure 3. The *Representation* class and its relationships to other classes in CHARM.

The diagram shows that representations in CHARM are conceived in the following manner:

- ***Representation***. A representation is an entity that describes the persistent manner in which certain contents are captured on an embodiment, the latter reflecting the forms and characteristics of the former. Examples of representations include a map of a place (the contents) drawn on paper (the embodiment), or a tale (the embodiment) that alludes to Christian elements (the contents).

Notice that the contents of a representation are valuable entities, and the embodiment are primary entities which, as shown in Figure 1, are a subtype of *ValuableEntity* as well. This means that representations can be chained in complex relationships. For example, imagine a photograph that shows a person narrating a tale which in turn alludes to Christian elements; the photograph is the embodiment of the tale-as-told, which is the contents of the photograph but also the embodiment of the Christian elements, which are the contents of said tale.

Other Areas

In addition to the three major areas described so far, CHARM also contains classes to represent:

- Geographical locations, both absolute and relative, which can be used to locate any valuable entity.
- Measures of physical quantities, which can be associated to any tangible entity.
- Categories and type systems, which can be used to define classification formalisms for valuable entities.
- Phases, changes, situations, phenomena, processes and other occurrences related to valuable entities.
- Specific tangible entities such as structures and objects, plus the associated relationships of composition, reuse and fragmentation.
- Stratigraphic sequences and complex relationships between stratigraphic units and of stratigraphic units with structures and objects.
- Proper names (such as anthroponyms and toponyms) and their referencing features.
- Normative situations in which agents may be involved, including rights and obligations in relation to other valuable entities.
- Entities derived from the interpretive processes that are inherent to valorizations.

Extending CHARM

As explained in previous sections, CHARM is an *abstract* model, i.e. it does not contain enough detail as to be used “as is”, because it would be impossible to know in advance what the needs of each project or endeavour will be. On the contrary, you need to extend CHARM in order to

use it. Extending CHARM means adding the necessary details so that the resulting model is as suitable for your needs as possible.

More specifically, extending CHARM means adding, removing or modifying classes, attributes, associations and other model elements in order to obtain a particular model. A *particular model* is a variant of CHARM that has been constructed by extension, and which is specifically adjusted to the needs of a given project, endeavour or situation. Figure 4 shows a graphical depiction of this process.

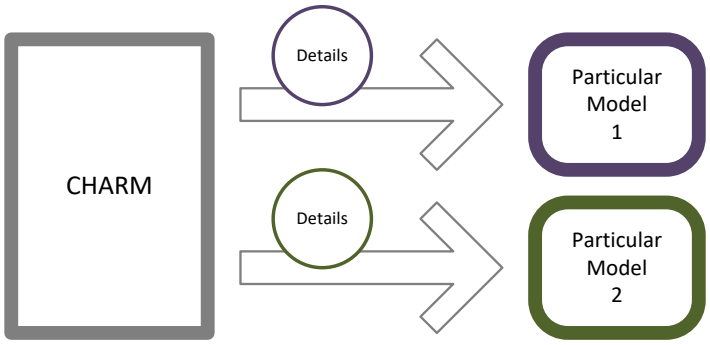

Figure 4. Extending CHARM. The arrows depict the extension process, which entails adding details to CHARM in order to obtain a particular model. Multiple particular models can be obtained by extending CHARM multiple times with different sets of details.

An example particular model for a fictitious project would be as follows:

- Remove all the classes related to material entities, since the project is not concerned about them.
- Add a new class, named *Celebration*, as a subtype of the CHARM-provided class *Social-Act*. Add attribute *NumberOfParticipants* to class *Celebration*.
- Add a new class, named *CelebrationSite*, as a subtype of the CHARM-provided class *Site*.
- Add a new association *OccursIn* from *Celebration* to *CelebrationSite*.

The resulting particular model would thus contain classes, attributes and associations that, building on top of CHARM, provide a suitable representation of reality for the project at hand. At the same time, information described by using this model would be completely compatible with information described using any other particular models extended from CHARM, since all of them are based on the same grounds. Particular models may be much more complex than the one in this example, depending on the scope and depth of the portion of reality that is to be represented.

Extension of CHARM is controlled by a set of extension rules, which establish what can be done and what cannot be done. Most changes are allowed, and usually you are free to remove classes, attributes and associations that are not relevant, rename or change them to suit your needs, or add new classes, attributes and associations to express detailed information not addressed by CHARM. For complete information on extension rules and advice on how to best use them please see *CHARM Extension Guidelines* [7].

Usage Scenarios

This section describes a number of scenarios where CHARM is applicable, and can be used as a guide for adoption.

PhD Thesis

Let us assume a student working on his/her PhD thesis in the cultural heritage realm. A common problem in the early stages of research is the delimitation of the research effort, both in terms of scope (how much to cover) and depth (how far to go). Another common problem is

the development of a clear conceptualization of the research domain. The integration of multiple bibliographic sources often entails conflicting terminology and overlapping conceptualizations, which need to be reconciled; in addition, any new developments that are created as part of the original contribution in the thesis need to be cleanly linked to extant concepts in the literature.

CHARM can help solve these problems in two manners. First and most simple, a particular model can be developed to represent the conceptualization that is relevant to the thesis, presenting a concise, self-contained view of portion of reality that the PhD student is dealing with, and which also captures the chosen scope and depth in terms of specialized classes, attributes or other model elements. This model would be a richer and perfected form of the usual glossary that is often found in PhD theses. A more advanced approach, to be used if necessary, would entail the creation of multiple particular models, one for each major bibliographic source, in order to capture their specific views on the target research domain. These particular models, albeit different, would all be variants of CHARM, and consequently they would be a great help towards the reconciliation and integration of the corresponding different views.

An example of this scenario can be found in [1].

Organizational Methodological Guidelines

Let us imagine a medium-sized organization working in the cultural heritage realm. This could be a museum, a private company performing consultancy work or fieldwork, a government agency, a research institute, or any other kind. In some situations, an organization like this wishes to establish methodological guidelines to provide advice to staff working across different projects, while leaving room for the intrinsic variability that each project may have. Moreover, organization-wide methodological guidelines may be established so that individual departments within the organization can customize them according to their peculiarities and needs while maintaining the corporate standard.

CHARM can be applied to such a scenario by creating a particular model that *just* captures the conceptualization that the organization wishes to standardize. This model, which we can call the organization model, would then be further extended by each department to create departmental models, which would add department-specific details. Each individual project could then use any of these models directly, or further customize them as needed. The hierarchical arrangement of models, in this manner, reflects the structure of the organization, capturing the knowledge and practices in each community within it.

Complex Research Project

Let us imagine a large research project involving multiple partners from different countries and multiple disciplines such as sociology, archaeology, philosophy of language and digital media. In a project like this, it is very likely that the same subjects under study are observed, described, interpreted and in general dealt with by specialists from different disciplines. This means that having a common, shared language is crucial to the success of the project. In addition, there is a strong need to document, store and communicate the generated information over the lifetime of the project, and probably well beyond that, given the geographical distribution of the partners.

CHARM is helpful in this scenario as the common language that the whole project team can share. By adopting CHARM as a lingua franca, the team is adopting a well-known conceptualization of their domain of interest, which includes both a structure and a set of definitions. The project team would probably extend CHARM into a project-specific particular model that focusses on the relevant concepts and adds the necessary detail. In addition, different project partners with different interests or disciplinary approaches would extend this

model to create even more specific models for their own usage. Models could be stored (in the form of diagrams or otherwise) for sharing and for archival and delivery purposes.

Data Integration Project

Very often, museums and other cultural heritage organizations keep large amounts of information about their relevant objects of study. Unfortunately, it is often the case that each organization uses a different and non-standard structure for their data. Although standards such as ISO 21127:2006 (also known as CIDOC CRM; see [9]) exist, they are not always implemented. Let us imagine a project pursuing the integration of several data sources from different organizations, each of them having a completely different structure and having been developed without any knowledge or provision about the others. This project would aim at developing a federated search system that would allow users to carry out searches across the different organization data collections using a common view, and without having to worry about the specificities of each of them; at the same time, each organization needs to keep working with their own, particular system.

CHARM can help in this scenario as a true reference model on which the reconciliation of the different data sets would be based. To achieve this, a particular model for each organization would be created by reverse engineering their data set; this particular model would mirror the structure of the data, and be derived from CHARM. Once a particular model for each organization has been obtained, the collection of particular models can be examined as a whole, and similarities detected. It is likely that some of the organizations are closer to each other than others; for example, two museums specialising in ethnographical material culture would almost certainly produce particular models having a greater conceptual overlap than either of them and a museum of contemporary art. As a next step, a common particular model, also derived from CHARM, would then be derived; this model would be abstract enough as to cater for every involved organization, but as concrete as possible. Also, this model would serve as the basis for the implementation of the federated search software that would offer a reconciled view across organizations, hiding organization-specific peculiarities for global searches, but showing them once specific search results are obtained by users.

Government Recommendation

Let us imagine a government agency wishing to establish a standard of practice on archaeological fieldwork, which is supposed to be adopted by anyone in the country doing archaeological excavations or surveys. This standard could take the form of a recommendation, a policy or a set of “best practices”. In any case, the government agency wants to ensure that all organizations generating information about archaeological artefacts and sites use the same conceptualization and follow the same procedure. At the same time, the agency acknowledges that each organization may want to customize their working style as long as it does not clash with government requirements.

CHARM is ideal in this scenario given its extension capacities. The government agency could create a particular model for archaeological fieldwork, adding as much detail as necessary to regulate excavations and surveys. Then, practitioners would use this model as a template to generate the information that would be fed back to the government agency. Practitioners could also extend this model, if they wish, to accommodate specific recording or research needs of their own, without any impact on the information being passed back to the government agency.

Learning Unit

Conveying knowledge and curiosity about heritage to high school (or even primary school) students is often difficult. Let us a school department or teacher wanting to develop a learning unit on cultural heritage for students of social sciences or a related subject. First of all, this

learning unit should present the key ideas about heritage very clearly, challenging the students' assumptions about what heritage is and how it is characterized, and explaining that things do not become heritage because of intrinsic properties but as a result of cultural interpretations. Secondly, the learning unit should also introduce some concepts that would allow the students to identify heritage elements in their local environment, for example, of types other than the usual officially recognized, tangible monuments.

In a scenario like this, CHARM could work as the base for an extension that, firstly, would maintain a clear separation between *ValuableEntity* and *Valorization*, so that the interpretive nature of heritage is highlighted. Also, different subtypes of valuable entities could be kept to represent what kinds of elements students are likely to find in their environment, so that the mere use of the concepts works as a stimulus to find specific instances. Finally, some specific types of derived entities could be used to underline the importance of the social construction of heritage and explain issues related to multivocality. The model thus constructed would provide the conceptual and terminological basis for the learning unit.

An example of this scenario can be found in [3].

Alternatives

CHARM is not the only solution to the problem described in *Background and Motivation*, p. 3, but it is possibly the best one. The following sections describe alternative solutions, together with a list of pros and cons as compared to CHARM.

CIDOC CRM

The CIDOC Conceptual Reference Model (CRM) is an ontology covering "all information required for the scientific documentation of cultural heritage collections" [2]. CIDOC CRM is a product of CIDOC, ICOM's International Committee for Documentation; ICOM, in turn, is the International Council of Museums. CIDOC CRM has been standardized as ISO 21127:2006 [9].

CIDOC CRM differs from CHARM in four major ways. First, CIDOC CRM is oriented towards "the curated knowledge of museums" [9, Abstract], i.e. it focuses on tangible artefacts as understood and managed by museums and similar organizations. It can be argued that CIDOC CRM has evolved over the years away from this original conception, and has added support for areas of cultural heritage other than museum collections. Still, CHARM is much wider in scope, encompassing tangible and intangible entities, agents, valorizations, representations, events and other kinds of things related to cultural heritage with equal emphasis.

Secondly, CIDOC CRM is a standard that aims to offer a complete and relatively off-the-shelf solution that is readily applicable. CHARM, conversely, does not provide a finalized solution that can easily become overprescribing, but provides an abstract model that must be extended into particular models to fit each organization and project.

Thirdly, the formalism (or language) in which CIDOC CRM is expressed has not been explicitly described and is not well documented, which makes processing CIDOC CRM models, or extending the standard itself, a very difficult and error-prone task. Although some extensions to CIDOC CRM have been developed (such as CIDOC CRM-EH [10]), the lack of formal underpinnings means that there is no way to verify that extensions are really compatible with the base CIDOC CRM. Contrarily, CHARM is expressed in ConML [6], a well-defined conceptual modelling language that is documented through a public and free specification [5], and explicit extension mechanisms are provided so that reasoning on, and extension of, models can be carried out with minimal ambiguity.

Fourthly, and in relation to the previous point, the language in which CIDOC CRM is expressed lacks infrastructural support for the expression of "soft" issues such as temporality, subjectivity, vagueness or multilingualism, which constitute important aspects of cultural heritage information. These aspects can usually be expressed in CIDOC CRM at the expense of clumsier and more intricate models, as they are not natively supported. CHARM, on the other hand, is expressed in ConML, which supports all these aspects.

Additionally, CIDOC CRM is a recognized ISO standard, which can provide a good argument for stability and commitment. CHARM, being a new development, and lacking the support of an organisation such as ISO, cannot guarantee the level of stability that CIDOC CRM has achieved, since significant improvements are likely to be incorporated in the near future. CIDOC CRM is copyright by ISO, whereas CHARM is licensed under a *Creative Commons Attribution 4.0 International License* [4], meaning that anyone can freely reproduce or modify it, even for commercial purposes, as long as the original authors are mentioned.

Your Own Model

A frequent approach to describing cultural heritage information is to use a custom model that is not based on any other, and does not refer to any existing framework. Of course, this choice alleviates the tension described in *Background and Motivation*, p. 3 by maximizing the fitness of the model to the purpose at hand. But it does so at the expense of interoperability and understandability outside the original domain. In this regard, using our own model is akin to reinventing the wheel every time and refusing to trust the accumulative creation of knowledge on which modern science relies.

No Model

A final and quite common alternative is that of using no model at all. This means that information is generated in an improvised manner, making spontaneous decisions on what is interesting to record and what is not. This may look like an appropriate approach in some circumstances, since it can be argued that the absence of a model means an absence of restrictions about what to document, and thus an endless range of possibilities to explore depending on the course of research. However, this line of reasoning is flawed on two accounts. First of all, the absence of a model means that key concepts in the project will most likely be redefined during the project itself, making information sets generated at different times over the project incompatible to one another. A model, on the contrary, would guarantee the necessary conceptual stability. Secondly, the absence of a model means the lack of a clear, explicit conceptualization of the domain of work, which makes documentation and communication a much harder task. Using no model is rarely a wise option.

Conclusion

This document has introduced CHARM, the Cultural Heritage Abstract Reference Model, focussing on how it can solve the tension that exists in every information generation endeavour: on the one hand, CHARM allows us to use a common, shared conceptual framework so that the information that we describe in any project can be easily understood by people outside the project, and compared or exchanged with other projects under different models; on the other hand, CHARM allows us to add the details that are specific to our needs in the form of a particular model, thus avoiding the overprescriptiveness that other standards try to impose.

CHARM adopts a radical new approach to conceptual modelling in the cultural heritage domain, one that requires you to make a small investment in terms of creating your own

particular model in order to express your specific needs. If you are willing to make this effort, CHARM guarantees that the resulting model will be as fit to your needs as possible, as well as compatible with any other that others may develop.

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