

## THE MEXICAN CULTURAL HERITAGE REPOSITORY PROJECT: ACCELERATING THE PACE TOWARD A HOLISTIC DOCUMENTATION OF THE MEXICAN CULTURAL HERITAGE

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**Abstract.** Mexico is a country with a vast and extraordinary cultural heritage that is the result of a rich history of cultural exchange, syncretism and transculturation. This circumstance is materialized into the consolidation of a long and prestigious museum tradition, which at the same time is sadly characterized by an endemic lack of technological resources, rather than professional skills.

As a result, we find that Mexican museums produce a very heterogeneous documentation (often not even managed using information technologies), and most of them deploy ad hoc solutions that directly limit the usefulness and value of the documentation process itself.

In response, the recently founded Mexican Ministry of Culture is undertaking the development of the Mexican cultural heritage data model (Modelo de Datos México), which is aimed at contributing to the cultural heritage domain of our country through the correct characterization and documentation of its cultural objects. It is the first documented experience in Mexico of a large scale, loosely adapted CIDOC-CRM data model that is complemented with a set of terminological tools that attempt to capture the singularities and idiosyncrasies of the Mexican cultural sector.

In the present paper we will describe the motivations and decisions made so far to optimize the data model to the Mexican reality, and the development of the project that will define a set of local terminologies built on the expertise of linguists, information architects, developers and, especially, museum professionals.

Keywords: data model development, CIDOC-CRM loose adaptation, terminology, normalization, standardization

### 1 Introduction

In recent years, Mexican institutions related to cultural heritage have engaged more frequently in digitalization projects and, like other parts of the world, this activity contributes to reveal how this information has been organized, the different ways to publish it and, perhaps most importantly, the tradition of its documentation.

The Ministry of Culture (Mexican government entity established quite recently in December 2015), started a project coordinated from the “Agenda Digital de Cultura de la Dirección General de Tecnologías de la Información y Comunicaciones”, that has a direct impact in these matters. During the short but fruitful period of September 2017 to date, it has promoted actions tending toward the creation and implementation of the first Mexican aggregator, sustaining its development in a semantic data model: the Modelo de Datos México (MDM).

The strategy to achieve such a goal consisted in selecting some national museums and other institutions from the cultural sector and, mainly, decidedly encouraging the work of data normalization that describes cultural objects under its guarding responsibility, so after that, implement different actions aimed at the training and professionalization of the personnel in charge of these tasks, starting as well, in a formal manner, a frame of lists of terminological control. In this presentation, we introduce a short account of this experience.

## 2 The first Mexican aggregator

The story of documentation and cataloguing of Mexican cultural heritage is, as many others, a work in progress. After less than a century of constant works within the current institutional and legislative framework, it is still a challenge to evaluate which are the most relevant contributions in this area. However, as a general hypothesis, we can establish that even in recent stages where information technologies are associated to these activities in a quotidian way, the spreading of information shows a methodological constant: the documentation, the description of cultural objects, the catalogues, the database and even the annotations of people who produce these tools, maintain extremely narrow interoperability.

There are still local uses among those who try in elaborating information of the cultural heritage, and this practice (specific to each organization or person within it) has also eventually limited local reach without specifying a strategy that helps to conceive information in a different way. In Mexico, the notion of cultural sector applies best to the field of material infrastructure, but barely or not at all, to the information produced by the entities that comprise it, and much less to the potential it would have if it were associated to notions such as Linked Open Data or information reutilization, contributing to its integration in a continuous data flow with other sectors of the Mexican State, or promoting the spread of information via the web, something which this sector is in dire need.

The Ministry of Culture has managed to identify this problematic perspective, aiming the attributions of its “Dirección General de Tecnologías de la Información y Comunicaciones” to strengthen the relations of the Ministry itself with information technologies, and to establish actions aimed at boosting the use of digital tools. In the Internal Regulations of the Ministry (Article 25, section III) this Directorate is entrusted to “design, develop and establish an architecture of information and *interoperability* that facilitates the automation of processes, assimilation, use and exploitation in an electronic way of the information generated by the administrative units and decentralized administrative organs of the Ministry of Culture”<sup>1</sup> (Ministry of Culture; 2016).

The technical process of the interoperability evidently conducted to consider an information aggregation model by means of structured data harvesting based on the information provided by different supplying organizations. The enclosed rooms of interoperability in the data of such organizations forced to consider something much more complex than the simple implementation of some type of software: in case of being conceived as such, the aforementioned project would have few possibilities of success if a documentation widely established in norms and international standards is not propelled at the same time.

The project formally began on September 2017 and continues to this day. To date, the main actions implemented for achieving the goal of building a Digital Repository of the Mexican Cultural Heritage have been:

- the development of a Mexico Data Model (MDM) with a certain degree of orientation to the CIDOC-CRM;
- the analysis, refinement and normalization of information provided by several institutions that are dependents of the Ministry of Culture. Taking into consideration those defined as “required metadata” (see Table 1), a first publication was made with debugged data of seven museums from the sector on the website *Museos de México* (Ministry of Culture, 2018a). Eventually, each participating institution in this pilot study will be provided with a data entry platform and will be enabled to serve as a provider for the repository;
- as part of the normalization process, the creation of lists of terminological control of documented concepts in the museum database has been initiated. Such lists were incorporated to the web *Museos de México*, to the functionality of the repository and, eventually, they will be part of a wider terminological control that serves the description of the Mexican cultural heritage;

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<sup>1</sup> The translation is made by us.

- finally, another aspect was initiated toward the professionalization of those who are in charge of the documentation of the cultural heritage in Mexico. The first phase was aimed at the integral organizations of the pilot program, although the works are considered to be widened in the near future. To date, this part of the project started with a first cycle of courses which included the following topics:
  - aspects of intellectual property;
  - cataloguing and normalization of the cultural heritage;
  - and vocabularies and terminological documentation.

An aspect to highlight in this initial phase of the program consisted in promoting a first version of the CIDOC Training, which was taught recently in July from the 23<sup>rd</sup> to the 27<sup>th</sup> this year, as well as to consolidate agreements with interested organizations such as the case of the Instituto de Investigaciones Estéticas (Institute of Esthetic Research), from which it is intended to create academic programs that are aimed at different environments and publics related to the Mexican cultural heritage.

Another event worth mentioning in this brief account is that, within the framework of the CIDOC Training México, the board of the International Council of Museums (ICOM), promoted the reactivation of the Mexican board of the CIDOC, initially created in 1997 by the remarkable museologist Felipe Lacouture Fornelli (1928 – 2003), which had ceased operations after his decease.

Element	Properties	Requirement
BIC's identifier (E42 Identifier. CIDOC-CRM)	ID value	Required
BIC's type (Concept. SKOS)	Preferential term	Required
Rights about the digital object that BIC represents (E30 Right. CIDOC-CRM)	Permissions / Restrictions	At least, one of the properties required
Rights about BIC (E30 Right. CIDOC-CRM)	Permissions / Restrictions	At least, one of the properties required
Digital object that represents BIC (E73 Information Object. CIDOC-CRM)	Web identifier	Required
Institution that guards BIC (E40 Corporate body. CIDOC-CRM)	Entity name	Required
BIC's title (E35 Title)	Title Value	Required
BIC's creator (E39 Actor)	Institution name (Institution)/ Group name (Group)/ Name (Person)	Properties corresponding to type of agent required
BIC's date creation (E52 Time-Span)	Date value (Date)/ Period value (Period) /Start; End (Range)	Properties corresponding to the type of temporal identifier required

BIC's type of identifier (Concept. SKOS)	Preferential term	Recommended
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**Table 1.** Analysis of required elements in the information provided by the entities of the Ministry of Culture.

### 3 Model overview

The Mexican Cultural Heritage Data Model (known as Modelo de Datos México in Spanish or MDM for short) is an attempt to tackle the problem of cultural heritage documentation in Mexico from a technological perspective, which is a complex task considering the socioeconomic, geopolitical, technological and cultural context of Mexico. Nevertheless, and despite the difficulties, the purpose of the MDM is to put the Mexican cultural sector, in the short term, on par with countries that have a much longer tradition in the documentation of cultural objects and the application of information technologies to museums.

The underlying ideas we used to develop the model are based on the principles of the semantic Web and Linked Open Data: interoperability and reutilization of open information in different platforms and applications (Hammar, Lin, and Tarasov, 2010). In such a way, it is possible to develop enriched information services for a wide range of external users, as well as to fulfill the information needs of the users within the institution itself. That was one of the priorities of this project since the endemic lack of an efficient information management system in Mexican museums required for us to focus on the development of a user-friendly model, based on new information technologies that could be used to preserve the museographic tradition and professional practices of local museographers, and help them to exploit the information they are producing.

As a first step, we had to make the decision about which data model in the cultural heritage sector would best fit our needs and could be used as a basis for the development of the MDM. The ideal model should be able to provide the means to describe cultural objects with high accuracy, exhaustiveness and quality standards. We finally opted for a loose adaptation of CIDOC-CRM (CIDOC and ICOM 2015) because of the coverage and extension possibilities it offers in comparison to other data models. It is robust, stable and seeks to serve as the basis for data modeling harmonization in the cultural heritage sector, providing a common language to heterogeneous information niches (i.e., archives, libraries and museums), making it possible to share and retrieve information without losing specificity or accuracy. Therefore, using CIDOC-CRM as reference model, it is possible to create a basic framework and enrich it with elements both locally defined and extracted from other semantic vocabularies. In the following section, we describe the structure and main features of the MDM in more detail.

The model is made up of five main classes that follow the structure of CIDOC-CRM's class hierarchy:

- **Date:** Class used to describe periods of time.
- **Dimension:** Class that defines physical dimensions of things.
- **Place:** Class that includes entities related to the description of physical locations.
- **Temporal entity:** Class comprising entities with a limited existence in time (such as events and activities).
- **Persistent entity:** Class that includes entities with a persistent identity through time.

While the first three classes define physical and contextual limits of things (dimensions, time and places), the latter are classes that allow the description of events and objects (both material and immaterial). So, essentially, the MDM harnesses the hierarchical infrastructure and semantics defined by CIDOC-CRM, but introduces a series of modifications aimed to meet its specific requirements. We have classified these modifications into four categories:

- **Class hierarchy:** It is common to find CIDOC-CRM classes that have more than one superclass, thus giving the museographer the chance to decide which one has the most appropriate semantics to carry out

a specific documentation task. However, this kind of hierarchical structures is disadvantageous in contexts where the priority is simplicity. In this case, we have analyzed classes with multiple superclasses and decided which one of them could be discarded without causing a negative impact on the semantics of the model. For example, for the “*E12 Production*” class, which is a subclass of “*E63 Beginning of Existence*” and “*E11 Modification*”, we decided to exclusively leave the dependence to “*E11 Modification*” for the sake of simplicity (although that implies a limitation on the expressiveness of the model).

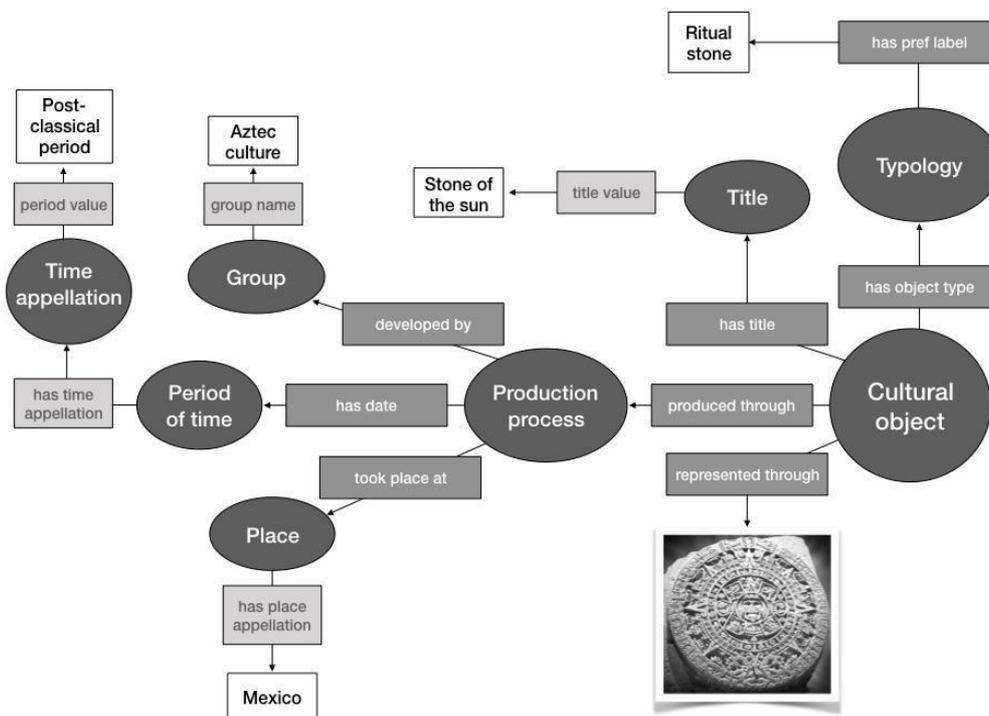


Fig. 1. Example of a cultural object description using the MDM

- Definition of local elements:** Most of the classes and properties defined in the MDM have an equivalent element in CIDOC-CRM, but it is hard to find a *one-size-fits-all* standard capable of meeting all the requirements to describe a specific domain of knowledge. Therefore, we decided not to bond our model to a unique vocabulary but to develop an integrated framework according to international standards and capable at the same time to capture the singularities of Mexican museography. So, we incorporated different elements from other data models (such as Creative commons, DBpedia, DCterms, W3C Time, Schema.org, and SKOS<sup>2</sup>) and developed a set of local classes and properties unavailable in any semantic specification. For example, CIDOC-CRM lacks a specific event to describe the process of exhibiting cultural objects, so we decided to define the element “*Exhibition*” as a local subclass of “*Activity*”. Similarly, we have defined local time appellations or new subclasses of the “*Information object*” element (as the “*Digital cultural object*” class).
- Discursive logic of description:** Like in CIDOC-CRM, the MDM considers events and activities as the central descriptive elements of the model to understand the processes carried out in a cultural heritage

<sup>2</sup> Elements available at: <http://creativecommons.org/ns#>; <http://dbpedia.org/ontology/>; <http://purl.org/dc/terms/>; <http://www.w3.org/2006/time#>; <http://schema.org/>; <http://www.w3.org/2004/02/skos/core#>.

institution that affect the cultural objects' life cycle (i.e., the period between the creation of an object and the eventual end of its existence). This approach allows to describe cultural objects as the result of a specific process or activity and represents a dramatic change regarding the object-centric traditional description. Defining the discursive logic of descriptions presented a challenge because one of the main requirements of the project was to be as much faithful as possible to the Mexican museographical tradition to facilitate the smooth transition of museum professionals to the methodological and technological transition to the MDM, which implies moving from barely automated work environments to dealing with semantic information systems. The solution we found was to limit CIDOC-CRM expressiveness and take cultural objects as the starting point of any descriptive or documentation process (see Figure 2), thus providing local museographers a nondisruptive discursive logic while introducing them, at the same time, to a new technological paradigm.

- **Typologies:** One of the most versatile elements defined in CIDOC-CRM is the class “*Type*”, which enables the definition of terms from thesauri and controlled vocabularies to characterize any entity of the model. In the MDM model, we can find a similar element, the class “*Typology*”, that is semantically equivalent to “*Type*” but deals with controlled vocabularies using a similar solution to the one proposed by Pedro Szekely for the Smithsonian American Art Museum (Szekely et al. 2014), which considers “*Type*” instances as SKOS concepts (W3C Working Group 2009). That implies that any controlled term is not merely described but inserted into a hierarchical structure (i.e., a thesaurus) that relates it with broader, narrower and semantically related terms (even from different knowledge schemata). In other words, the use of SKOS clears the path to linked data and helps dealing with semantic ambiguity through the interconnection of multiple controlled and specialized vocabularies.

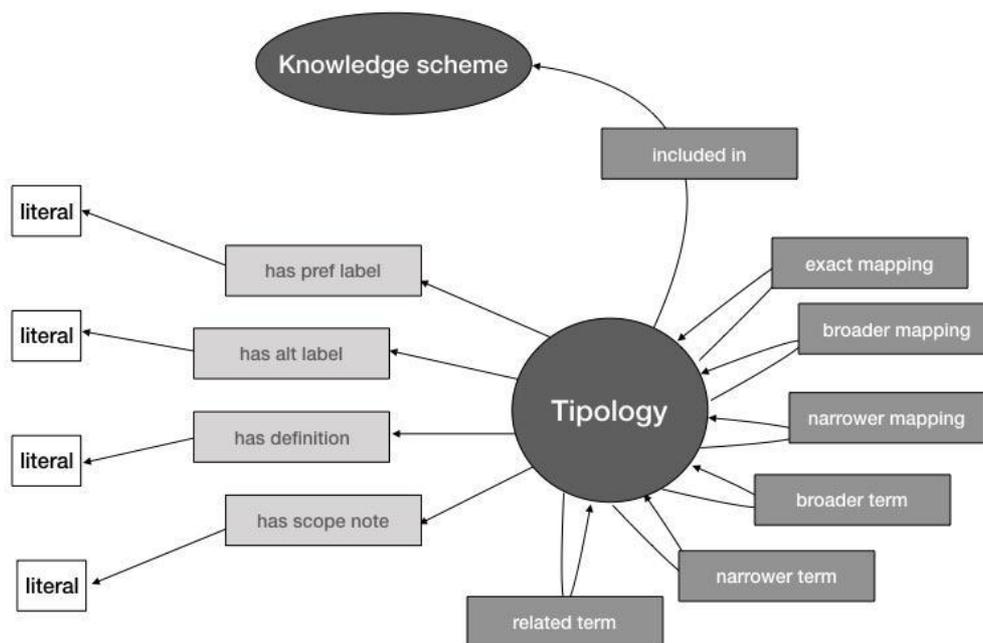


Fig. 2. Detailed caption of the element “*Typology*” and its main attributes

#### 4 The catalogues of the Mexican repository

Developing a terminological control for the project is questionable, given that there are already several terminological control projects in Spanish. Nevertheless, contrary to what one might think, the abundance of technical dictionaries and terminological controls do not lead to vocabulary normalization of a given domain of human knowledge (Muñiz, 2004). If this were the case, the terminological variability problem would have been overcome many years ago. For instance, the term “bacín” documented in the *Tesaurus de Arte & Arquitectura* in Spanish, in the “nota de aplicación”, the meaning of the term of three forms is defined: (1) a pot that can contain solids and liquids, (2) a type of shallow bowl and (3) a bowl (The J. Paul Getty Trust and DIBAM).

With the example, we can confirm that the reference work does not sufficiently normalize the concept from two different viewpoints: Firstly, three meanings are associated to a single term, which is defined as polysemy and that, is undesired for vocabularies of control, given that it leads to conceptual ambiguity (Cabré, 1993); and secondly, the definition reach.

In addition, in the *Tesaurus del Arte & Arquitectura* in Spanish, not all the terms searched for are available, for example, the term “mojigango” is not registered (reality whose origin can be traced to the Mexican state of Colima, and that has transcended as an inherited object in regional and national museums of popular cultures in the entire country). This is an indicator that the thesaurus does not have a local normalizing reach (in Mexico) and, as a consequence, it lacks coverage of local vocabularies.

Lastly, and quite unfortunately, the stages of the *Tesaurus del Arte & Arquitectura* in Spanish could be unclear for Spanish speakers because the Spanish version is a translation from English causing the arrangement and hierarchical structure of the terminology behind the thesaurus’ facets to reflect an anglocentric conception and interpretation of knowledge.

On the other hand, an alternative use of the *Tesaurus del Arte & Arquitectura* in Spanish would be to adopt any of the *Tesoros-Diccionarios del patrimonio cultural de España* as a terminological control in our research context and heritage description work. However, one of the first limitations I find is the low availability of thesauri: we only have a Dictionary of materials, a Dictionary of cultural property denomination, a Dictionary of geography and a Dictionary of techniques, considered as part of a set called “general thesauri” and, on the other hand, three dictionaries or specific thesauri: Dictionary of ceramics, Dictionary of numismatics and Dictionary of furniture. In regards to the possibility of adopting other works of reference as a terminological control such as the UNESCO Thesaurus, it has been reported that some works online retake meanings of general language dictionaries, which implies an implicit error in the description of concepts (Molina, 2017) and, therefore, only partially provides the specialized meaning of terms.

Naturally, thesauri and reference works on paper are not exempt from all observations mentioned and, additionally, are incompatible with the current cataloguing systems given that they have not been considered to offer standardized contents such as the authority or the vocabulary in which terms, a unique ID number for each term, a unique URL that grants access to the term in the vocabulary that describes it are defined, among others (Molina, 2017).

Considering all above, it has been suggested the immediate construction of 27 terminological control lists. Next, we offer the typology of these terminological controls, and we will describe, roughly, the nature of each of them. A problem we face in compiling the terms of these 27 terminologies was that of integrating, for instance, measurement units, names of institutions or geographic locations that are not exclusive terms to the discipline. Then, to justify the control of these necessary lexical units, we turned to the assumption of the existence of *sensu lato* terms and *sensu stricto* terms. *Sensu lato* terms are designations of common language that specialize their meaning, and that are common to several fields of knowledge, while a *sensu stricto* term will be an exclusive denomination of a technical or scientific domain (Cardero, 2003).

The existence of these differences between terms hierarchies, applied to the typology of terminological controls for the project, has represented a first categorization of the terminological lists. On one hand, we have a set of terminologies related to art and archeology in Mexico and, on the other hand, we would have *sensu lato* terminologies that the art and archeology domain share with law, mathematics and other sciences, as well as other human disciplines, informatics and information technologies.

In regards to the *sensu stricto* terminological control lists, we can find terms that refer to types of objects (photography or frieze), materials (wax or jute), techniques (polishing or marbling), documental typology (letter or flyer) and physical characteristics of the property of cultural interest (delamination or patination). All these terminologies so far gather a total of 7,103 documented terms in the *Diccionario de Denominaciones de Bienes Culturales*, the *Diccionario de Materias*, the *Diccionario de Técnicas* and the database of participant institutions in the project. Currently, they have been assigned a unique alphanumeric identifier for the system, and it is expected that in the short term they will grow, which gives them the property of being dynamic terminologies.

*Sensu lato* terminologies are more abundant than the former, and they can be classified, in turn, into more specific types, that is, the ones that refer to the intrinsic conditions of the properties of cultural interest that are directly related to the object, and the conditions that refer to administrative aspects or extrinsic conditions of objects. The intrinsic conditions of the properties of cultural interest are described with the terminologies referring to the state of preservation (good state or requires intervention), to the physical backup (acetate or microSD), names of length, mass and time units (gram or second) type of mark (autograph signature or sign) type of format (.zip or .m3u), type of production (manufacture or ornamentation) and type of agent (colorist or xylographer). These terminologies are constructed from the document “Resumen del Sistema Internacional de Unidades, el SI”, the *Diccionario de la Lengua Española* (DLE), and the database of participant institutions in the project. To summarize, they add 389 lexical units to the general total of the lists developed.

On the other hand, the extrinsic conditions gather the names of institutions that guard the properties of cultural interest (Museo Nacional de San Carlos or Museo Nacional de Antropología), countries and locations of these institutions (Spain or Coahuila de Zaragoza), names of languages in Spanish (finés or popoloca), type of title (descriptive or popular), type of note (generic note or maintenance recommendations), type of descriptor (thematic or temporal), types of magnitudes (length units or time units), types of acquisition (allocation or rescue), form of use (ceremonial or medicinal), type of dimension (diameter or volume) type of place (country or municipality) and type of identifier (ISBN or registry number).

The sources used to document these lexical units, which in total add up to 14,733, were the *Sistema de Información Cultural de México*, the *Catálogo de Lenguas Indígenas Nacionales: Variantes Lingüísticas de México* with their self-denominations and geostatistical references, and the database of the participant museums. To summarize, the sum of all terminological control lists adds up to a total of 22,165 terms for the database.

## Conclusion

The creation of the MDM represents a first effort on the part of the cultural sector of Mexico for having a technological and methodological infrastructure capable of facing new challenges in the short and long term, in the cultural heritage documentation.

Such a necessary change of perspective implies a transformation of extraordinary proportions since it needs to be accompanied by a modification in the practice of documentation which incorporates norms and international standards, with the objective of turning the data of guarding entities of the cultural heritage into the main source of any aggregation system.

The bet on semantic technologies does not only allow the definition of the data model necessary to conduct a proper documentation of the cultural heritage (using the standard CIDOC-CRM as a basis), or the terminological control through knowledge schemata expressed with the SKOS vocabulary, but also opens the path

to the development of new services and to the interconnection of the Mexican cultural heritage repository with the data collection of big libraries, files and museums at an international level for mutual enrichment.

Additionally, we have placed an emphasis on the fact that the best information will always have its origin in specialists, cataloguers or curators who work directly with the objects. With the MDM, the effort favors the data integration from the guideline of a system of providers and data aggregator (the national repository of Mexico) and, for the same reason, it also proposes an academic view, all the training and window of opportunities to “get the house in order” mean and make use of the contents from the web that the documentation and description of the Mexican cultural heritage can offer.

We admit that this extremely relevant effort has many tints of boldness; our work, more than offering radical solutions, looks for exposing common difficulties in Latin America. As it can be seen, we have worked on a very uneven context in which projects are produced in the middle of atavistic delays (many national museums do not have access to a high quality web, their database is not normalized, they lack conditions of technological resources, etcetera), and, however, little by little from an academic perspective, we already thought in the development of subjects in the postgraduate of art history in UNAM.

Regarding the development of vocabularies, the terminological documentation that has been conducted is just the beginning of a much more complex process. We found very valuable initiatives in projects such as the *Tesaurus del Arte & Arquitectura* in Spanish or the *Tesauros-Diccionarios del patrimonio cultural de España*. Unfortunately for us, they do not consider the local context of the use of art terminology and, therefore, do not include common terms in use in Mexico; they do not take into account all the subdomains of the field of knowledge, meaning, they do not have enough coverage; and, lastly, they present definitions that contribute to conceptual ambiguity or that define the ignored term technical aspects exclusive to the discipline.

In general, we propose a working method based on a terminological normalization work localized to the cultural context of Mexico that, naturally, turns into the creation of a thesaurus. The creation of the thesaurus will be based on the ISO 25964 norm in which, roughly, the following must be described: relations of equivalence (synonymy), of hierarchy (general term vs. particular term), associative (conceptual proximity) and they add a unique identifier for each concept, which have to be based on, mainly, in a linguistic and ethnographic local analysis.

Even though there are still many possibilities, the project we described in this work represents a declaration of intentions on behalf of the cultural sector of Mexico for claiming its space and placing the rich cultural heritage of Mexico at the level of other countries with more resources and technological infrastructure.

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