DCPAPERS

From Conceptual Modeling to Practical Implementation

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Abstract

Conceptual models have been developed for the representation of LAM resources, with an end-goal to produce interoperable metadata. These models can vary in level or framework of modeling. This panel explores the potential and challenges in the implementation of different high-level models in the context of LAMs.

Keywords

Conceptual modelling, metadata conceptual models, bibliographic conceptual models, implementation of conceptual models, system design, description standards, teaching theory and practice

1. Introduction

Metadata, simply defined as data about data, are the structured data used to describe information resources, and key to the managing and organizing collections of information resources and cultural heritage objects. Metadata can serve different roles and purposes [1] and metadata standards are developed for the consistent description of resources, access to the resources, and the sharing of the description data among cultural heritage institutions, such as libraries, archives, and museums, also known collectively as LAMs.

Conceptual modeling is used to represent the entities and relationships in the context of a system within the limitation of the context. In the case of LAMs, the context is the entities, relationships, and attributes needed to represent information resources and cultural heritage objects. Conceptual models can vary in the level of modelling and often are described as high-level conceptual models or generalized models, defining terms and concepts [2].

Issued by the library community, the IFLA Library Reference Model (LRM) is one example of high-level model within the contextual limitation of modeling library bibliographic data. LRM is using the entity-relationship framework, to provide a high-level conceptual model and includes user tasks, entities, attributes, and relationships elements. The purpose of the IFLA LRM is "to make explicit general principles governing the logical structure of bibliographic information, without making presuppositions about how that data might be stored in any particular system or application" [3].

Given that the focus of LRM is the data and functionality required by users to meet their information needs, i.e. to support user tasks, it can be described and an outcome-based model. LRM defines generic user tasks (based on end-user needs), entities (classes of interest), attributes (data characterizing instances

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of entities), and relationships (properties linking the instances of entities). In an implementation of the model, the level of precision needs to be considered based on the needs of the community. Therefore, each implementation may require adjustments within the context of the model. They may include the addition of entity subclasses, entity attributes, or relationships, or, in some cases, the omissions of some entities, attributes or relationships.

Other, related LAM models include within the context of museum, the CIDOC Conceptual Reference Model (CIDOC-CRM), an event-based model developed by the International Committee for Documentation of the International Council of Museums (ICOM), and within the context of archives, the Records in Context: A Conceptual Model for Archival Description (RiC) developed by the International Council on Archives. Additional efforts have been made to create models across domains, using as the basis and harmonizing existing domain-specific models. For example, LRM-oo, which replaced FRBR-oo, is a collaborative effort between the library and museum communities, and an object-oriented model that aligns with IFLA-LRM and CIDOC-CRM.

Although each of these models covers a different information context, there are several shared commonalities among them. Among these are the focus on collections of information resources and access to them, the consideration of user needs, and the separation of intellectual contents and physical or digital objects.

The purpose of developing conceptual models is to enable interoperable implementations. A conceptual model can be further defined or implemented as a data model or a metadata standard that takes the application context into consideration. These implementations can result in simple metadata standards or very complex description standards. Additionally, encoding schemas can influence the implementation of a model and network or local practices can introduce further application variations. As a result, we see specific implementations with varying interpretations and versions of a model. In the context of LAMs, when multiple models exit, there is the potential for each of the models to have varying interpretations and implementations.

Even with the development of these models and standards, there are still gaps in the types of cultural heritage covered by them. Conventional LAM metadata schemas are primarily developed to describe items, i.e., objects included in their collections, to manage and provide access to those items. However, in the networked information environment where any entities are realized as a digital objects, a new conceptual model is needed, which can comprehensively express any entities which users want to find and access – tangible entities (i.e., physical or digital/electronic objects), intangible entities such as knowledge and skills, events and experiences such as disasters and performances, and concepts. Conceptual models which can seamlessly connect these entities and are not necessarily item-oriented are required for the development of metadata schemas for LAMs in the digital environments.

To what degree, then, do model implementations and applications continue to serve the purpose of conceptual modeling? To what degree can these models and resulting metadata influence the design of system interface to facilitate a positive and helpful user experience?

This panel will present some of the LAM-related conceptual models, modeling issues, implementation challenges of generalized models, especially in the context of digital humanities and intangible cultural heritage [4], and system-design and search experience [5]. In addition, challenges in the education and training of information professionals will be discussed. Following the panel presentations, panelists will be asked to provide their perspective on a number of questions and invite attendees to contribute to the discussion. Two main questions will guide the discussion, but additional questions will be addressed, based on their presentations and audience comments. These guiding questions are:

1. Is it possible to have one conceptual model for all LAMs?
2. Is it possible to have multiple models and still have interoperability? If so, under what conditions?

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References

[1] M. L. Zeng, J. Qin, Metadata (3rd. ed.), ALA Neal-Schuman, Chicago, 2022
[2] K. Golub, Y.-H. Liu (Eds), Information and Knowledge Organisation in Digital Humanities: Global Perspectives, Routledge, London, 2022
[3] P. Riva, P. LeBoeuf, M. Žumer. IFLA Library Reference Model: A Conceptual Model for Bibliographic Information, (as amended and corrected through December 2017), 2017. URL: https://www.ifla.org/files/assets/cataloguing/frbr-lrm/ifla-lrm-august-2017_rev201712.pdf
[4] S. Sugimoto, C. Wijesundara, T. Mihara, K. Fukuda, Modelling cultural entities in diverse domains for digital archives, in: K. Golub, Y.-H. Liu (Eds), Information and Knowledge Organisation in Digital Humanities: Global Perspectives, Routledge, London, 2022, pp. 25-42
[5] T. Aalberg, L. Tallerås, D. Massey, The impact of new bibliographic models on the search experience, in: Proceedings of CoLIS, the Tenth International Conference on Conceptions of Library and Information Science, Ljubljana, Slovenia, June 16-19, 2019. Information Research, 24:4 (2019), http://InformationR.net/ir/24-4/colis/colis1915.html

Panelist Bios

Trond Aalberg, Ph.D., is a professor in information science at Oslo Metropolitan University, Norway and professor in computer science at the Norwegian University of Science and Technology. His research interests include metadata, models and ontologies in the context of search and discovery. He has been involved in the development of the LRMoo model (and the previous FRBRoo model), is a member of the IFLA Bibliographic Conceptual Models (BCM) Review Group and the Norwegian National Committee of Cataloguing.

Athena Salaba, Ph.D., is a professor at the School of Information (iSchool), Kent State University, USA. Her research interests include metadata, knowledge organization systems, subject access, conceptual modeling, and user interactions with information. She was involved in the development of the FRSAD conceptual model serving as a member and secretary of the IFLA FRSAD Working Group, member of the IFLA FRBR and LRM Review Groups, chair of the IFLA Subject Analysis and Access Section, and Board Director of the International Society for Knowledge Organization (ISKO).

Shigeo Sugimoto, Ph.D., is a professor emeritus, University of Tsukuba, Japan. He served as a faculty member at Faculty of Library, Information, and Media Science, University of Tsukuba, which is known as iSchool@Tsukuba, for many years. His primary research interests include metadata for digital archiving, digital archiving of cultural and historical entities, and digital preservation. Since he first participated in the 4th Dublin Core Workshop in 1997, he has been involved in DCMI. He is currently a member of the Governing Board of DCMI.

Maja Žumer, Ph.D., is Professor of Information Science at University of Ljubljana, Slovenia. Her research interests include design and evaluation of information retrieval systems, end-user interfaces, usability and conceptual modelling. She was co-chair of IFLA FRSAD Working Group. As a member of the Consolidation Editorial Group, she is co-author of IFLA LRM (with Pat Riva and Patrick LeBoeuf) and co-author of LRMoo. From 2017 to 2019 she was member of IFLA Professional Committee and Governing Board.

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