METADATA
Marcia Lei Zeng and Jian Qin

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Preface

Although rooted in library and information science (the first metadata scheme targeted for Internet resources—the Dublin Core Metadata Element Set—was proposed in 1995), metadata has expanded its territory beyond traditional libraries and is now a widely adopted vital solution for describing the explosively growing, complex world of digital information.

As many organizations turn to metadata applications for managing massive quantities of digital information, demand increases for information professionals who are prepared for the immediate tasks at hand. During the past decade, this book's authors have engaged in teaching metadata and information organization courses as well as conducting research in this area. The authors have also had opportunities to provide training for professionals and to act as consultants for digital library projects. The experience we accumulated through teaching, research, and consulting motivated us to write a textbook that systematically introduces metadata concepts and principles through the incorporation of practical examples and learning assessment materials.

Metadata is both a textbook and an instructional guide for practitioners. As a textbook, its primary purpose is to provide educators with a convenient and reliable source for teaching metadata-related courses in universities or in continuing education programs for information professionals. Among the unique features of this book are instructional materials such as sample problems and solutions and hands-on tutorials. These instructional features also make *Metadata* an ideal resource for practitioners who wish to use the book for self-study or on-the-job training.

While focusing on metadata concepts, principles, and applications, the book also covers trends, innovative ideas, and advanced technologies in metadata research and practice that will have significant implications in the years to come. The wide application of metadata in different domains has created different communities of practice, each of which defines a metadata structure based on its own norms and needs. We will therefore cover the conceptual and practical knowledge that is fundamental to all application domains. This is not an overview of all existing metadata standards, nor is it an interpretation of individual metadata schemas. Although many of those will be mentioned or discussed and their features will be referenced as examples, the text is not a

step-by-step manual for creating metadata records. Rather, it identifies commonalities among metadata schemas and focuses on the design and profiling processes as they relate to the needs of application domains and environments. The inclusion or exclusion of a schema in this book should not be interpreted as a sign of favoritism or preference for one schema over another.

Focus and Organization

The topics covered in this book are selected and organized based on an outcome-oriented learning philosophy which holds that regardless of learners' locations or backgrounds, we can expect them to be able to learn the how-tos of metadata application design, implementation, and evaluation, in addition to understanding the underpinning theory. This approach allows learners of all kinds and skill levels to adapt the knowledge and practices they obtain from this book to the domains in which they work. Therefore, we concentrate on the tasks typical to successful implementation of metadata application projects. Such tasks include applying an existing standard to a project, establishing localized element sets or application profiles by drawing elements from multiple metadata schemes, and performing advanced tasks related to services, integration, and assessment.

Metadata is divided into four parts: "Fundamentals of Metadata," "Metadata Building Blocks," "Metadata Services," and "Metadata Outlook in Research."

The first part includes Chapters 1 and 2. Starting with metadata application scenarios, Chapter 1 introduces the definitions, types and functions, principles, and anatomy of metadata. It provides a bridge for readers from abstract scenarios to real-world applications of metadata functions and structures in digital environments. Chapter 2 introduces metadata standards within major application domains. We emphasize semantics of the element sets, the needs of domain-specific information objects, and the functions these standards aim to fulfill. Standards covered in Chapter 2 include those for general purposes, cultural objects and visual resources, learning objects, archives and preservation, rights management, scientific data, media, and agents.

The second part of the book moves from general fundamentals to metadata building blocks. Chapter 3 is devoted to the development of the structure and semantics of a metadata schema. It discusses perspectives and techniques for assessing needs in different project environments: identifying desired elements and refinements for an element set, controlling the values in value spaces, creating application profiles, and establishing crosswalks between or among element sets. The last section explains what should be included in best practice guidelines and how guidelines should be presented.

While Chapter 3 discusses how semantics in metadata elements and their structures are defined, Chapter 4 details how the schema will be encoded and how the semantics are controlled by using namespaces. XML Schemas from a flat structure element set, a hierarchical structure set, and an application profile provide useful examples. The goal and outcome is to provide a basic understanding of the issues that may arise in applications regarding schema encoding.

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Chapter 5 is a major component of the text, dedicated to the issues and techniques related to creating metadata records. It can be considered as consisting of two major topics: the issues related to metadata records and the issues regarding encoding. Conceptual models are first presented to provide a better understanding about metadata statements that form the descriptions of the resources. The discussion then turns to the granularity of records, i.e., levels of description at which a metadata record may be created. We emphasize creating sharable records because interoperability is an important concept in metadata applications. Discussion of metadata resources and tools presents the options that records may be created by human catalogers fully or partially, generated by computer programs, or converted and harvested from other sources. Chapter 5 gives these issues a closer examination. Encoding metadata is a long and comprehensive section, in which metadata storage methods are introduced first, followed by details and examples of expressing metadata records in HTML/XHTML, XML, and RDF. The last section covers other methods related to metadata records, such as linkage, wrapper, display, and parallel metadata.

The third part of the book brings together metadata services that have appeared in recent years. Chapter 6 introduces the types of infrastructures for these services. Standards in XML, RDF, data communication, policies, and procedures promise an exciting yet challenging future for metadata services. Detailed explanations are applied to metadata registries and repositories (including the metadata harvesting protocol). For each of these services, we look at the functionalities of the service, basic components, and types of models so that learners gain a basic understanding of these advanced topics. Chapter 6 summarizes the emerging approaches to ensure optimal metadata discovery through discussions involving metadata retrieval technologies and methods of exposing metadata and maximizing its usage. Chapter 7 offers a systematic view of the issues and methodologies of measuring metadata quality. Evaluation criteria, measurement processes, and methods of evaluation are discussed in detail. Chapter 8 summarizes the methods of ensuring and achieving interoperability based on research of this all-important issue. Interoperability approaches are analyzed at the schema, record, and service levels. Examples are selected from projects throughout the world.

The final section draws attention to the research landscape. Chapter 9 reviews major research areas in metadata architecture, modeling, and metadata semantics that are not discussed in detail in the rest of the text.

As professional educators, we understand the importance of exercises and practical examples in a textbook. Each chapter in this book provides a recommended reading list, some with a series of practice and assessment instruments. In addition to general exercises at the end of major chapters, the digital library prepared for instructors contains detailed exercises and hints for some assignments. All exercises have been created as an interactive component, available either on an instructor's CD-ROM from the publisher or via this book's accompanying Web site. We hope that our experience in metadata research, teaching, and consulting will offer our readers a unique, enlightening, and holistic approach to the topic.

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