InfoSphere :
NAVIGATING THE WORLD OF INFORMATION

Preserving the Past, Valuing Present, Enriching the Future

UNIVERSITI TEKNOLOGI MARA
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InfoSphere:
Navigating the World of Information

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Preface

It gives me great pleasure to present *InfoSphere: Navigating the World of Information*, a collective effort that brings together insightful discussions, empirical findings, and critical reflections from academics in information management, library management, records management, and information and communication technology (ICT).

In today's digital era, the vast and complex landscape of information continues to expand at an unprecedented pace. The convergence of technology and information systems has transformed how data is created, organized, stored, and utilized. This book aims to navigate that dynamic "infosphere" , a term that reflects the interconnected environment in which information flows seamlessly across platforms, disciplines, and contexts.

The chapters compiled here explore diverse perspectives and contemporary issues shaping the management of information resources and services. From emerging trends in digital librarianship and knowledge governance to innovations in ICT applications and recordkeeping practices, each contribution highlights the growing importance of integrating technology, policy, and human expertise in managing information effectively.

This publication also serves as a reflection of our faculty's commitment to advancing scholarship and practice in the information domain. It showcases the intellectual depth and interdisciplinary collaboration among academics who continue to shape the future of information work.

As the Chief Editor, I wish to express my sincere appreciation to all the contributing authors for their dedication and scholarly rigor, and to the editorial team for their meticulous effort in ensuring the quality and coherence of this volume. Special thanks are also extended to the Faculty of Information Science and Universiti Teknologi MARA Cawangan Johor for their continuous support and encouragement in realizing this publication.

I hope that *InfoSphere: Navigating the World of Information* will inspire readers among students, educators, researchers, and practitioners alike to engage critically with the evolving information landscape and to contribute meaningfully to its advancement.

Azura Abdul Jamil @ Kamarudzzaman
Chief Editor
InfoSphere: Navigating the World of Information
2025

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INTRODUCTION TO METADATA

By Siti Hajar Baharin; Siti Nur Shahira Dahari; Nurfaizah Kamarudin and Ahmad Fuzi Ajis
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1.0 Definition and Importance of Metadata

Metadata is often referred to as "data about data" because it is information that describes and provides context for other data. More formally, metadata is structured information that describes, explains, locates, or otherwise facilitates the retrieval, use, or management of an information resource (Duval, Hodgins, Sutton, & Weibel, 2002; National Center for Education Statistics, 2025). One of the most fundamental elements in managing digital information is metadata, and its importance cannot be over state. Simply put, metadata provides the context needed to understand and manage data, acting in the most basic sense as an information wrapper around content. A digital photograph has metadata that describes it which includes the date it was taken, the model of the camera, and the GPS coordinates of the photograph. Each of these data helps to furnish the photograph and put it in context. More formally, metadata is structured information that describes, explains, locates, or otherwise makes it easier to retrieve, use, or manage an information resource (Duval, Hodgins, Sutton, & Weibel, 2002; National Centre of Education Statistics, 2025)

Good metadata practices ensure that resources are discoverable, identifiable, and usable over time (ANSI/ INSO, 2004; National Centre of Education Statistics, 2025). Metadata allows users and systems to find relevant information by title, author, keywords, dates, and other criteria, much as a library catalog record (a classic form of metadata) helps locate a book resource (National Centre of Education Statistics, 2025). It also helps distinguish similar items and organize resources into meaningful categories (ANSI/ INSO, 2004). Critically, metadata is *key to the long-term preservation and access* of digital resources, as it documents essential information that helps future users verify authenticity and understand a resource even as technologies change. For instance, metadata that records *file format* and *creation date* can be crucial if one needs to migrate an old digital file into a new format years later. With the advent of the big data era and the surrounding chaos of information, effective metadata is required to manage and structure data for easy sharing and retrieval within and across systems over time. The absence of metadata would render digital content analogous to physical content in a library with a missing index, existing but effectively hidden and inaccessible.

2.0 Types of Metadata

For the purpose of describing and managing information resources, metadata can take several forms. The major categories include:

- **Descriptive Metadata:** This refers to the content of metadata elements used to enable the identification and discovery of a tangible resource. Descriptive metadata includes attributes such as title, author, abstract, keywords, and subject matter. An instance is the bibliographic information on a library catalog card or

the title and description within a data repository record. These data elements are stored in the descriptive metadata, enabling users to locate the resource and understand its content.

- **Structural Metadata:** Structural metadata conveys how the parts of an information resource relate to and interact with one another. It reveals something about the resource's internal structure, for instance, the order of elements, or book pages, or the arrangement of chapters, sections, and subsections, which is a part of a document (NFES, 2009). For digital objects, structural metadata might describe how a set of image files together constitutes a multi-page scanned report, or how database tables relate to one another. For digital objects, structural metadata might describe how a set of image files together constitute a multi-page scanned report, or how database tables relate to one another. This type of metadata is crucial for navigation and display – for instance, a table of contents for a digital textbook is enabled by structural metadata.

- **Administrative Metadata:** concerns the management and processing of resources and can be further subdivide into analytical types with respect to technical aspects, rights, and preservation. This essentially covers the administrative 'who, what, when, and where' aspects of any process, including the file type, file size, file creation date, and the entire process of file modification. This is sometimes referred to as 'technical metadata' when discussing such details as systems (CCSDS, 2012). This also includes rights metadata (also known as administrative access control and the individual management of copyright and usage rights to the information resource) and preservation metadata (which includes data resources to be kept and maintained for future resource time). For instance, administrative metadata of a PDF document might as well include the software version and the document's checksum (technical metadata), the copyright and the license (rights metadata), and other actions accomplished for its preservation, such as a change from another format (also referred to as obsolete format preservation). Every organization has specific administrative metadata for each resource, enabling it to store, secure, and preserve the resource with proper administrative metadata.

- **Preservation Metadata:** A subset of administrative information often highlighted on its own due to its importance, preservation metadata includes all the details necessary to sustain and protect a digital resource in the long term. he protective administrative access to the document is partially classified and simultaneously contains administrative metadata that indicates the document should not altered. This metadata includes description information and details of actions taken to preserve the document, such as backups or changes to the document's format. Preservation metadata standards, such as PREMIS (Preservation Metadata: Implementation Strategies), identify entities like objects and events, and culminate in maintaining a record of this information. Preserving such records and maintaining access to this information is essential, alongside the metadata that ensures, at the very minimum, the digital materials can be relied upon to be authentic and accessible throughout the advancement and emergence of new technologies.

- **Provenance/Usage Metadata:** This form of metadata describes how resources have evolved, their usage patterns, or the case histories of owners, including access, modification, and usage characteristics such as downloads and ratings (Idan, 2025). Provenance metadata is especially useful for tracking the lifecycle of data and establishing trust: for instance, a dataset's provenance metadata might detail the dataset's original creator, subsequent alterations or annotations, and references to derived works. In library and archival contexts, usage metadata could include circulation records (e.g., the frequency with which a book or digital item has checked out. This type of metadata helps assess the *impact and authenticity* of resources by providing a usage history.

Table 1 below summarizes some of these metadata types with their typical content, description and examples:

Type of Metadata	Description	Example
Descriptive	Information that *describes* the content of a resource to support discovery and identification. Includes bibliographic details and content summaries.	Title, author, and abstract of an academic article (helps users find and understand the article's topic).
Structural	Information that indicates how a resource is *organize or structured* internally. Describes relationships between parts of a resource (NFES, 2009).	The hierarchy of chapters and sections in an e-book, or the sequence of images in a scanned manuscript, enables proper navigation and display (enables proper navigation and display).
Administrative	Metadata used for *managing* a resource. Includes technical details (format, size, creation date), as well as rights and preservation information necessary for long-term management.	File format (e.g., PDF/A), file size, creation/modification dates; access rights (e.g., Creative Commons license); preservation actions taken (migration from an older format).
Preservation	Information that supports the *long-term preservation* and authenticity of a resource. Often records provenance, technical environment needed,	A digital image's metadata includes its original format (TIFF), checksum hash for integrity, the date it was last successfully copied to a new storage medium, and the identity of the

Type of Metadata	Description	Example
	and preservation actions.	archivist who performed the copy.
Provenance/Usage	Metadata captures the history and usage of a resource. Documents the origin, ownership, and how the resource has been used or altered and often used to establish authenticity and track changes.	A dataset's version history showing it was created by researcher A, later updated by researcher B; or library usage logs indicating a document was downloaded 200 times in the past year.

3.0 Conclusion

Metadata serves as one of the new pillars of digital information management. It is metadata that elevates data from a simple collection of bits to something comprehensible, accessible, and credible. In libraries, archives, data repositories, and content management systems, metadata connects users to the necessary information, uniformly describing resources and enabling their effective retrieval. Information in the form of metadata provides the context and evidence needed to manage digital resources over time, from their creation to various stages of use, preservation, and final disposition. In other words, good metadata converts data into a resource, which is then appropriately integrated into the knowledge network of an organization or a community.

At the same time, the challenges associated with generating and sustaining high-quality metadata continue to evolve. As a systematic review of metadata practices observed, "*metadata can be a powerful tool for identifying, describing, and processing information, but its meaningful creation is costly and challenging" (Ulrich et al., 2022)*. Ensuring metadata quality requires investment of time and expertise; decisions about how detailed metadata should be (the principle of refinement) must balance cost and benefit. In addition, the metadata associated with content continues to grow at a high speed and become more diverse, resulting in the need for increasingly sophisticated and specialized metadata frameworks that must continually adapt in new and more sophisticated ways . Configurations that arise in new formats (such as social media status updates and sensor data streams) are associated with emerging metadata standards and, in some cases, even the need for new extensions to existing standards. The principles of modularity and extensibility are more relevant than ever, and metadata schemas can evolve without losing the foundational concepts of interoperability. Interoperability itself remains a substantial concern, as organizations continually attempt to aggregate, share, and exchange metadata between systems (to share research data and its associated metadata through aggregators, library catalogs, and systems that enable users to perform web searches, etc.). Collaborative Interoperability suffers from a lack of Interoperability, the need for Interoperability with shared standards (such as Dublin Core

or schema.org), and the application of controlled vocabularies that have been developed. Other ongoing and relevant challenges include integrating and automating metadata. The generation of automated systems that can create technical metadata or automatically generate technical block systems can change the cost dynamic. However, automation systems of this nature do, in and of themselves, raise concerns about accuracy and consistency. The evolution of metadata is likely to include an engagement of automated systems with human specialized systems to manage the information overload and volume associated with data.

To summarize, metadata plays a crucial role in managing digital information. It is the basis of each activity, from a simple search to a search over an archiving system. Metadata provides the connective tissue that enables information to be organized into collections, understood in context, and preserved as authentic evidence of activities. As technology advances, metadata standards and practices will continue to mature, addressing current challenges such as scalability, semantic interoperability, and multilingual access. In this case, the information society can ensure that metadata meets the challenges by respecting and applying appropriate frameworks, utilizing diverse professional and contemporary techniques and tools. Ultimately, without proper metadata, digital information would not be accessible or valid for future endeavors that support digital research, education, knowledge growth, and the preservation of cultural and ideological heritage.

***Note**: These categories are not always mutually exclusive – for instance, some technical details (an administrative aspect) can also serve preservation purposes, and provenance metadata is often considered part of administrative or preservation metadata. Nonetheless, this classification illustrates the multifaceted nature of metadata, addressing different user needs and management requirements.*

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