Forum Guide to Metadata
National Forum on Education Statistics

Mission:

To plan, recommend, and develop education data resources that support local, state, and national efforts to improve public and private education throughout the United States.

Members:

- Representatives of state and local education agencies (SEAs and LEAs)
- Representatives of offices of the U.S. Department of Education and other federal agencies
- Associate members from U.S. territories, Regional Educational Laboratories (RELs), and national education associations
The Forum convened the Metadata Working Group to help education agencies

- use metadata to document operational changes that impact data;
- understand the different types and uses of metadata and how metadata can improve data quality; and
- plan and successfully implement a metadata system in an education setting.
Contents

• **Chapter 1**: Metadata and Metadata Systems
• **Chapter 2**: Using Metadata
• **Chapter 3**: Implementing a Metadata System
• **Chapter 4**: Case Studies
Chapter 1: Metadata and Metadata Systems

Chapter 1 answers these questions:

• What are metadata?
• How do metadata help users to better understand data?
• Which metadata does an education agency need?
• What are the benefits of metadata for different types of data users?
• What is a metadata system?
What Are Metadata?

• Metadata are “data about data”—information that exists around data that makes those data easier to use, manage, and understand.

• Metadata help reduce complexity in data management.

• Metadata promote a better understanding of data by providing contextual information about the data.
Anyone who works with data or uses data for decisionmaking will benefit from metadata. How?

- **Policymakers and administrators** use metadata to improve data analysis, communication with other users, accessibility and timeliness of data, and understanding of why individual data elements are collected.

- **Data and IT staff members** use metadata to define clear and consistent parameters for data collections, identify sensitive and confidential data for protection, and ease system navigation and the exchange of data between systems.

- **Program staff members** use metadata to maintain consistency in reporting, identify and remove redundant data elements to reduce collection demands, clarify data use for policymakers and administrators, and improve data quality in general.
Many Education Stakeholders Regularly Use Data

Consider the many ways these stakeholders use data about 8th grade students in a district.

- **School Principal**: How many students are in 8th grade? A school principal needs to know how many students are in the 8th grade.
- **Superintendent**: How much does it cost to educate those in 8th grade? A superintendent needs to know how much it costs to educate those 8th graders.
- **Finance Director**: How many students are there? A finance director needs to know the number and categories of the students for budget planning.
- **Teacher**: How many students are in my 8th grade classroom? A teacher needs to know how many students are in their classes.
- **Food Service Director**: How many of these students will be buying a school lunch? A food service director needs to know how many meals to prepare, and the cost to each student.
What are the benefits of a well-managed metadata system?

- A metadata system defines and presents metadata to all users in an accessible manner, without disrupting the ongoing processes of data management and use.
- A metadata system ensures that the metadata attached to a data element, such as descriptions, history, definitions, and instructions for use, are timely and accurate.
- Metadata provide the data exchange framework that permits programs and databases to communicate with one another, within and between organizations.
- Metadata inform the policies that govern an organization’s data management, such as technology planning, data retention, and data disposal.
- Metadata help to ensure that researchers outside an organization will understand the content and context of data, including any gaps or collection breaks that may exist (for example, the interruptions in data collection caused by the COVID-19 pandemic).
Chapter 2: Using Metadata

Chapter 2 provides information on types of metadata commonly used in education agencies, including:

- technical metadata;
- data management metadata;
- data reporting and use metadata;
- privacy metadata; and
- business rules.

Chapter 2 also provides information on using metadata to improve data quality and conduct data profiling.
Categories of Metadata

- Technical metadata are specifications and parameters that inform how a piece of data is designed within a technical system. These include field length, element type, code sets, storage locations, and others.

- Data management metadata aid users in understanding the meaning and context of any single piece of data. These metadata also include restrictions, ownership, stewardship, effective dates, and retention period.

- Data reporting and use metadata allow users and researchers outside the agency to better understand public-facing data. These may include supplemental documentation, legends, glossaries, and links to related resources.

- Privacy metadata identify data elements that may be made available to the public and those that should be protected as private or confidential. These metadata permit agencies to comply with federal, state, and local privacy statutes.
Business Rules

- *Business rules* are metadata that outline an agency’s guidelines for data collection, modification, and use. They act as constraints and guidelines for an agency’s data practices.

- Business rules must be clear and true statements about how the agency operates.

- Some best practices for business rules:
  - They should be explicitly expressed.
  - They should follow a known standard adopted by the agency.
  - They should be declarative, stating plainly what is required or prohibited.

- The different categories of metadata will have their own business rules.
Data Quality and Profiling

- **Quality metrics** applied to data elements or datasets also may be used as metadata for tracking and assessing quality. These metrics include
  - identity;
  - accuracy and reliability;
  - completeness;
  - continuity;
  - contiguity;
  - currency; and
  - frequency of change.

- These data quality items may be used to prepare a *data profile*, a formal summary used in auditing an agency’s data for accuracy, usability, and correspondence between the agency’s data expectations and reality.
Chapter 3: Implementing a Metadata System

Chapter 3 examines a number of options and decisions that an agency may confront when implementing a metadata system, including

• how a metadata system relates to and affects a larger data system;
• how an agency can best determine its needs for a future metadata system;
• how to perform a cost-benefit analysis when considering a metadata system;
• the choice between purchasing a metadata system solution from an external vendor and building a metadata system within the agency; and
• a suggested outline for a project implementation plan for a metadata system.
Metadata systems are *shaped to fit the larger data systems they support*. Key steps in the planning process include:

1. Establishing a Planning Team
2. Conducting a Metadata Needs Assessment
3. Incorporating Relevant Metadata Standards
5. Conducting a Build-Versus-Buy Analysis
6. Determining Metadata System Architecture
7. Establishing a Project Implementation Plan
8. Conducting a Pre-release Review and Final Assessment
The efforts of the planning team culminate in a project implementation plan, a comprehensive roadmap showing how the metadata system will be prepared, put into place, and maintained. Best practices that contribute to the success of a project implementation plan include the following:

- **Details and planning for the full scope of the project.** This means all aspects from end to end, with room and time for testing, correcting, re-testing, and refining the metadata system.

- **Time for feedback and modifications.** The system’s users will have more advanced requests and needs once they have started using it, so the team should plan for extending or modifying the system to meet these needs.

- **Sensible task management.** A massive project like metadata system implementation should be broken up into discrete, manageable tasks, all assigned and accounted for in the plan.

- **Train and customize.** Focus the initial implementation of the system on features that the users know and understand. As they continue to use the system, institute ongoing training for all users, customized to meet their specific metadata needs.
Chapter 4: Case Studies

Milwaukee Public Schools (WI): Clear, Collegial Communication

Oregon Department of Education: Consistency Through Collaboration

West Virginia Department of Education: The Importance of a Metadata Plan

Metro Nashville Public Schools (TN): A User-Focused Approach to Metadata
Metadata Working Group

Chair
Georgia Hughes-Webb, West Virginia Department of Education

Members
Laura Boudreaux, Louisiana Department of Education
Matthew Danzuso, Ohio Department of Education
Brenda Dixon, Illinois State Board of Education
Stephen Gervais, San Bernardino City Unified School District (CA)
Dawn Gessel, Putnam County Schools (WV)

Ryan Kuykendall, DeSoto County Schools (MS)
Rose LeRoy, New York State Education Department
Rich Nye, Granite School District (UT)
Melanie Stewart, Milwaukee Public Schools (WI)
Debbie Yedlin, Arizona Department of Education
For more information about the Forum, please visit https://nces.ed.gov/forum/index.asp

Download free Forum resources at http://nces.ed.gov/forum/publications.asp

The information and opinions published are those of the Forum and do not necessarily represent the policy or views of National Center for Education Statistics, the Institute of Education Sciences, or the U.S. Department of Education.