Transparency and UNECE Metadata Standards

Dan Gillman

US Bureau of Labor Statistics
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Outline

- Transparency panel report
- Conditions for transparency
  - Metadata schemas and instances
  - Conformance
  - Metadata quality
  - Usability
CNSTAT Panel on Transparency and Reproducibility in Federal Statistics

- Panel approved April 2019
- Sponsor agency: NSF/NCSES
- 15 panel members
  - US statistical agencies
    - Including Dan Gillman (US BLS)
  - International agencies
    - Including David Barraclough (OECD)
  - Academia, Archives, Consultants
Work of the Panel

- Periodic 2-day meetings
  - Day 1 – fact-finding with invited speakers
  - Day 2 – internal deliberations

- Covid interfered with schedule
  - No face-to-face meetings after February 2020
  - Drafting complete document was slowed

- 10-member review panel
  - Produced many comments
  - Comment resolution was time-consuming
Report

- Official Title of Report
  Transparency in Statistical Information for the National Center for Science and Engineering Statistics and All Federal Statistical Agencies

- Report issued November 2021
- Focus on transparency
- Divided into
  - Summary
  - 7 Chapters + 2 (substantive) Appendices

Relevance to MSW Standards

- Chapter 5 – Metadata and Standards
  - Detailed description of metadata
  - Return on Investment
    - for metadata management and systems
  - Rationale for adopting standards
    - Includes argument for joining UNECE efforts

- Co-authored by:
  - David Barraclough, Dan Gillman
Relevance to MSW Standards

Appendix A –

- Statistical Metadata Standards – in detail
- Description of UNECE, DDI, and SDMX standards
  - UNECE: GSBPM, GSIM, CSPA, CSDA
  - DDI: Codebook, Lifecycle, CDI, SDTL, XKOS, others
  - SDMX: SDMX, VTL
  - Other standards: DCMI, DCAT, PROV, ISO 19115, others

Co-authored by:

- David Barraclough, Dan Gillman, Michael Lenard, Andrea Thomer
How to Read the Report

- The report is long - 178 pages
  - From TOC to end of Appendix B
- For quicker and less technical read
  - Summary, Chapters 1 and 7
- All recommendations & conclusions in Summary
- Each chapter has its own recommendations
  - More contextualized, better understanding
Decisions

■ Provide recommendations in each chapter
  ▶ Devote chapter 6 to specifics for NCSES

■ Definition of transparency:
  provision of sufficiently detailed documentation of all the processes of producing official estimates

■ Focus on documentation -> need for metadata

■ Reduce emphasis on reproducibility
  ▶ Transparency is a pre-condition
Documentation

- Needed to find, understand, and use
  - Data
  - Methodologies
  - Processes (designs, algorithms, code)

- Documentation and Metadata
  - Generally, synonymous
  - Often
    - Documentation refers to textual explanations
    - Metadata is a more formalized way of explaining
Documentation

- Formal metadata conundrum
  - Textual descriptions “tell a story”
  - Formal metadata attempts the same thing
  - The information obtained from metadata
    - Must be at least as informative as text
    - Organized metadata can do more
      - E.g., comparability over time and studies
  - Hard to subdivide each kind of description
    - Consider descriptions for variables versus for rationales
Metadata

- In the formal case, metadata
  - Set of descriptors for a kind of objects
    - E.g., variables, questions

- What descriptors needed for variables?
  - Example
    - Name
    - Universe
    - Allowed values
    - Datatype
    - Related data sets
    - Related concept
Metadata

What descriptors needed for questions?

Example

- Name
- Universe
- Response choices

Question text
Previous question(s)
Following question(s)
Metadata Schema

■ Set of descriptors = Schema
■ Each descriptor = schema element
■ Schema formalized by
  ▶ Specific rules for
    – Element values (formats, etc.)
    – Relationships among elements
    – Optionality / Cardinality for elements or relationships

■ Schema = kind of technical specification
Schema Instance

- Set of values corresponding to schema elements
  - Called a schema instance
  - Example of variable schema instance
    - Name: marital_status
    - Universe: adults
    - Allowed values: <S, single>, <M, married>
    - Datatype: nominal
    - Related datasets: CPS, NLS, CE, ACS, SIPP, others
    - Related concept: “legal marital state”
Schema Instance

Example of question schema instance

- Name: marital_status
- Universe: adults
- Response choices: Single, Married
- Question text: What is your current marital status?
- Previous question(s): ?
- Subsequent question(s): Were you married previously?
Transparency

- Transparency depends on documentation
  - Could be provided as formal metadata

- What makes a variable or question transparent?
  - Have necessary metadata to support required needs
  - Necessary metadata expressed through
    - Kind of object: Schema
    - Specific object: Instance of the schema

- Schema instance = metadata for an object
Conformance

- Question –
  - How do we know an instance follows the rules?
- Schema is a technical (formal) specification
  - Contains requirements and other conditions
- Conformance to a technical specification
  - Satisfy all requirements
- An instance conforms to a schema
  - If the instance satisfies all requirements in schema
Conformance

- This does not say the values are correct
  - Only that they follow formatting rules
- This does not say the elements are effective
  - Schema might have missing elements
  - Schema might have irrelevant elements
- Conformance is only about requirements
  - Found in the technical specification
Transparency

- Necessary condition for transparency
  - Conformance to a schema
- Is this enough? Is this sufficient?
- No. Why?
- How good are the metadata?
  - They can follow all the requirements
  - But do they describe an object of interest well?
Metadata Quality

- Do instance values follow formatting rules?
  - **Syntax**
  - Formats, obligations, cardinality, relationships

- Are all instance values true?
  - **Semantic**
  - Formal truth theory
  - Follow Tarski’s notion of truth in a formal theory
Metadata Quality

- Semantics continued
  - Formal statement “variable name is marital status”
    - Is true, if and only if
  - The name of the variable is “marital status”

- Now, consider all schema element / instance values
- Does combination tell the right story?
  - Pragmatics
    - Schema elements might be missing / irrelevant
Metadata Quality

- Operationalizing this – in 4 steps
  - #1 Conformance - syntax
    - Instances must conform to a schema
  - # 2 Truth - semantics
    - Is each schema / instance value combination true?
    - For example, for variables
      - Is the name of a variable the right one?
      - Is the assigned datatype appropriate?
Metadata Quality

#3 The whole truth - pragmatics
- Is the story incomplete?
- Does the schema need more elements?
- Is there some necessary information left out of the schema?

#4 Nothing but the truth - pragmatics
- Is the story confusing?
- Does the schema include misleading elements?
  - For variables, don’t include
    - Unnecessary: Number of letters in name of variable
    - Irrelevant: Current population of United States
Transparency

- Another necessary condition for transparency
  - Metadata quality

- Are there more conditions?
  - Yes.

- How good is the user/system interface?
  - Can the user get the system to return desired information?
  - Usability
Usability

- Usability:
  - the quality of users' experiences when interacting with systems

- 2 main usability concerns for transparency:
  - Interface design
    - Can the user make sense of what’s on the screen?
  - Available functions
    - Are required functions available through the interface
Usability

User interface

- Usual usability concerns:
  - Colors
  - Button placement and function
  - Clearly stated instructions

Functions: Discovery and Understanding

- Require metadata and schemas
- Both input and output
- Metadata must conform to schemas
  - Discovery input metadata
  - Understanding output metadata
Conclusion

- Transparency requires
  - Metadata
  - Schemas
  - Conformance to the schema
  - Metadata quality
  - Usable system interface

- Claim
  - These requirements are sufficient
Any questions?
Contact Information

Dan Gillman
Office of Survey Methods Research
www.bls.gov/osmr
(w) 202-691-7523
(c) 410-624-9582
Gillman.Daniel@bls.gov
Usability

Discovery

- Open world assumption
  - Can't find an object just means you couldn’t find it
  - Possible search criteria are not known in advance

- Closed world assumption
  - Every object can be found through search
  - All search criteria are known in advance

- Use of controlled vocabularies,
  - Not user defined keywords
  - Provides exact set of values in metadata instances