Prospective Benefits, Costs and Risks Related to Transparency, Reproducibility and Replicability in Production of Statistical Information Products and Services as Public Goods

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Overview

Dual relationship of transparency, reproducibility and replicability (TRR) with quality/risk/cost profiles and stakeholder value in production of statistics

1. Align TRR practice with crucial elements of profiles

2. Use TRR to enhance these profiles and value

Overview (Continued)

I. Qualitative Description of Transparency, Reproducibility and Replicability (TRR)

II. Elements of a Conceptual Framework, and Related Operational Definitions, for TRR

III. Prospective Benefits, Costs and Risks

I. Qualitative Description of Transparency, Reproducibility and Replicability (TRR)

A. Transparency for Federal Statistics -

Sufficient Information to:

1. Gauge quality/risk/cost/value profiles of products

2. Assess implications of (1) for substantive uses?

3. Improve (1)-(2) and expand future production?

I. Qualitative Description (Continued)

B. Reproducibility:

Same (?) results from independent analyst using the same (?) original dataset and analysis methods

I. Qualitative Description (Continued)

C. Replicability:

Same (?) inferences, based on independent measures on new independent collection from the same (?) population

Bayesian interpretation of TRR?

II. Elements of a Conceptual Framework, and Related Operational Definitions, for TRR

A. Mission of statistical agencies:

Provide high-quality statistical information on a sustainable and cost-effective basis.

Suggestion: Align operational definitions of TRR with relevant features of this mission statement

II. Conceptual Elements (Continued)

B. “Sustainable and cost-effective basis”

- Fundamental value delivered to stakeholders?
  - From data
  - From TRR (enhanced use value, option value)

- Expectations on transparent reporting on risk factors and cost structures?

II. Conceptual Elements (Continued)

C. "High quality" - customary criteria

Accuracy, relevance, timeliness, comparability, coherence, accessibility (e.g., Brackstone, 1999)

1. Relevance, timeliness, comparability, coherence: Transparency on conceptual populations and estimands

2. Crucial role of conditioning

II. Conceptual Elements (Continued)

3. "accuracy" – classical "total survey error" components (w/extensions to "non-designed data"):
   Report on population coverage, sampling, incomplete data, specification error, measurement error

   PLUS other effects:

   - analysis, adjustment, disclosure limitation methods

   - features of production system architecture, code

II. Conceptual Elements (Continued)

D. Context: Sources of variability considered, controlled or reported in design, analysis and stakeholder communication

Transparency: Clarity and depth of reports?
Inferential goals: "indication" vs. "proof" (Tukey, 1962)

Reproducibility and replicability:
Conditioning on which sources of variability?
(e.g., "house effects")

III. Prospective Benefits, Costs and Risks of TRR

A. Benefits

1. Quality Improvement

a. Better understanding of data
→ Better current use by stakeholders

b. Precondition for improvement of future data

c. Esp important when integrating multiple data sources: Managing complex supply chains of stat information

III. Benefits, Costs and Risks (Continued)

A.2. Risk Reduction – Reduce Likelihood of:

a. Tunnelvision in institution and field

b. Undetected blunders

c. Undetected fraud

III. Benefits, Costs and Risks (Continued)

A.3. Cost Management: Increases

a. Likelihood of efficient design & analysis

b. Pace & efficiency of substantive development, and in supporting methodology & technology

III. Benefits, Costs and Risks (Continued)

A.4. Contract management

A.5. Institutional/organizational dynamics

A.6. Public confidence & institutional credibility: Consistency with reasonable and customary practice?

III. Benefits, Costs and Risks (Continued)

B. Risks

1. Usual risk factors with standards/requirements

a. Formal compliance divorced from substance ("letter but not the spirit")

b. "Regulatory capture" & accountability issues

III. Benefits, Costs and Risks (Continued)

c. “Minimum standard” becomes de facto maximum

d. May distort allocation of resources

e. Underlying science & practice not yet sufficiently mature to support a refined standard

III. Benefits, Costs and Risks (Continued)

2. Risks more specific to transparency:

a. Calcification: Added cost of transparency

– Increases barriers to innovation, one-time studies?

b. Perceived loss of intellectual-property rights:

Discourage cutting-edge investments?

III. Benefits, Costs and Risks (Continued)

c. Potential for unreasonable criticism (cf. “errors”)

d. Stakeholder mis-interpretation of “transparent” statement

Soft drink label: “Very low sodium”

Therefore: It’s good for me!

III. Benefits, Costs and Risks (Continued)

3. Practical approach to management of these risks

a. Awareness/management (≠ avoidance)

b. Identify:

- Impact on stakeholder use and value

- Steps to mitigate

III. Benefits, Costs and Risks (Continued)

C. Costs

1. Direct labor (cf. usual issues with documentation and curation of code, refined datasets)

2. Opportunity costs

3. Cognitive and operational burden for users, especially if “transparent” information is not well-calibrated with stakeholder information base

III. Benefits, Costs and Risks (Continued)

D. Practical issue: Which elements of TRR contribute to the best improvements in the benefit/cost/risk profile?

→ Allocate TRR efforts accordingly

IV. Closing Remarks

Four Suggestions on TRR for Statistical Agencies:

1. Anchor in agency mission, audience

2. Goal: Practical improvement (≠ perfection)
   in long-term stakeholder value
   (via quality, risk, cost and product use)

IV. Closing Remarks (Continued)

3. Align effort with dominant sources of variability

4. Work out TRR improvements at the relevant level of specificity