Quality Reporting, Quality Indicators and Metadata

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1. Introduction

• Quality report is a summary description, and most often related to only one statistical product.
• However, the product quality INCLUDES many aspects of process quality, sometimes also institutional set-up.
• Thus it contains partly a holistic view of the process while the key results reflect properties of a particular product.
1. Introduction – typology

• Basic typology:

1. Comprehensive quality reports
2. Quality descriptions
3. Quality profiles and other brief reports describing change of quality in time
4. Metadata (separate part in presentation)
1.1. Comprehensive quality reports

- European Statistical System: *Producer-oriented quality reports*
  US Federal Committee on Statistical Methodology: *Analytical reports*

- Contain all aspects described above and require substantial research activity
- Main audience: fellow statisticians, researchers and other advanced users
- Not very suitable for laymen or journalists
1.1. Quality descriptions

- **ESS**: *User-oriented quality reports*
- Brief reports telling the main quality characteristics - A short separate publication, chapter in main publication or similar
- Main quality aspects and indicators with non-technical explanation
- Users should be provided with guidelines on how to use the statistics or data
1.1. Quality profiles and other brief reports

- Brief reports (e.g. "quality box" in publication) which tell the main issues and follow certain key indicators in time.
- Often presented with figures which are easy to understand from the first look
- Note: quality profiles of certain surveys (esp. in US) are actually comprehensive reports!
1.2. EU Legal base

- In the European context quality reporting is based on law:
  - The Regulation on European Statistics (No 223/2009)
    - contains specific section on quality starting from the Code of Practice and containing the ESS quality dimensions
  - Many statistics have their own acts which contain requirements of quality reporting
    - E.g. LFS, short-term and structural business statistics, census etc.
1.3. ESS Quality Documents

- Current versions of quality reporting standard is presented in the ESS Handbook for Quality Reporting (EHQR) finalized 2008-2009 and updated 2014

- See the standard as well as many other documents at http://epp.eurostat.ec.europa.eu/portal/page/portal/quality/quality_reporting
1.4. Types of Statistical Processes

- Product quality includes many aspects of process quality.
- At the moment the Handbook is based on the categorisation into six distinctive types.
  - Sample survey
  - Census
  - Statistical process using administrative source(s)
  - Statistical process involving multiple data sources
  - Price or other economic indices
  - Statistical compilations, esp. National Accounts are accumulated from many other statistics
2. ESS Quality Dimensions - CoP

(Article 12: Statistical Quality)
- Relevance
- Accuracy
- Timeliness
- Punctuality
- Accessibility and clarity
- Coherence
- Comparability
2. ESS Quality Dimensions – Quality Reporting Structure

- 1. Synthesis of the quality report, introduction to the statistical process and its outputs – an overview to provide context
- 2. Relevance, assessment of user needs and perceptions – an output quality component
- 3. Accuracy and reliability – an output quality component
- 4. Timeliness and punctuality – output quality components
- 5. Accessibility and clarity – output quality components
- 6. Coherence and comparability – output quality components
- 7. Cost and burden – process quality components
- 8. Confidentiality – process quality components
- 9. Statistical processing – process quality components
2.1. Relevance

Definition:

Relevance is an attribute of statistics measuring the degree to which statistical information meets current and potential needs of the users.
2.1.1 Relevance is divided to

- **User needs:**
  Description of users and their respective needs with respect to the statistical data.

- **User satisfaction:**
  Measures to determine user satisfaction

- **Completeness:**
  The extent to which all statistics that are needed are available
2.1.2 What should be reported on relevance

- A content-oriented description of all statistical outputs.
- Definitions of statistical target concepts (population, definition of units and aggregation formula) including discrepancies from ESS/international concepts. (Can also be discussed under Coherence and Comparability.)
- Information on completeness compared with relevant regulations/guidelines.
- Unmet user needs, including reasons for not meeting them.
- Available quality indicators.
2.2. Accuracy and reliability

Definitions:

The **accuracy** of statistical outputs in the general statistical sense is the degree of closeness of computations or estimates to the exact or true values that the statistics were intended to measure.

**Reliability** refers to the closeness of the initial estimated value to the subsequent estimated value.
2.2.1. Accuracy and reliability is divided to

• **Overall accuracy:**
  Overall accuracy is the assessment of accuracy linked to a certain data set or domain, which is summarising the various components.

• **Sampling error:**
  That part of the difference between a population value and an estimate thereof, derived from a random sample, which is due to the fact that only a subset of the population is enumerated.
2.2.1. Accuracy and reliability is divided to...

- **Non-sampling error:**
  Error in survey estimates which cannot be attributed to sampling fluctuations.
2.2.2 What should be reported on overall Accuracy and reliability

- A presentation of the methodology sufficient for (i) judging whether it lives up to internationally accepted standards and best practice and (ii) enabling the reader to understand specific error assessments.

- Identification of the main sources of error for the main variables.

- A summary assessment of all sources of error with special focus on the key estimates.

- An assessment of the potential for bias (sign and order of magnitude) for each key indicator in quantitative or qualitative terms.
2.2.2 Accuracy and reliability: What should be included on...

- Sampling Errors...
- Coverage Errors...
- Measurement Errors...
- Nonresponse Errors...
- Processing Errors...
- Accuracy for a Census...
- Accuracy for a Statistical Process using Administrative Source(s)...
- Accuracy for a Statistical Process involving Multiple Data Sources
2.2.2 Accuracy and reliability: What should be included on... – 2

- Accuracy for Price or Other Economic Index Process...
- Accuracy for Statistical Compilations...
- Model Assumptions and Associated Errors...
- Seasonal Adjustment...
- Mistakes...
- Revisions...

See ESS Handbook for Quality Reports for further information!
2.3. Timeliness and Punctuality

Definitions:

- **Timeliness** describes the length of time between data availability and the event or phenomenon they describe.

- **Punctuality** is the time lag between the actual delivery of data and the target date on which they were scheduled for release as announced in an official release calendar, laid down by Regulations or previously agreed among partners.
2.3.1 What should be reported on Timeliness and Punctuality?

- For annual or more frequent releases: the average production time for each release of data.
- For annual or more frequent releases: the percentage of releases delivered on time, based on scheduled release dates.
- The reasons for non-punctual releases explained
2.3.2. Discussion: Tradeoffs between Timeliness and Accuracy

- Short-term statistics
- Revisions
2.4. Accessibility and clarity, dissemination format

Definitions:

- **Dissemination format** refers to media, various means and formats by which statistical data and metadata are disseminated to users and their accessibility.

- **Accessibility** and **clarity** refer to the simplicity and ease, the conditions and modalities by which users can access, use and interpret statistics, with the appropriate supporting information and assistance.
2.4.1 Accessibility and clarity, dissemination format are divided to

- **News release:**
  Regular or ad-hoc press releases linked to the data.

- **Publications:**
  Regular or ad-hoc publications in which the data are made available to the public.

- **On-line database:**
  Information about on-line databases in which the disseminated data can be accessed.

- **Micro-data access:**
  Information on whether micro-data are also disseminated.
2.4.1 Accessibility and clarity, dissemination format are divided to... - 2

- **Other:**
  References to the most important other data dissemination done.

- **Documentation on methodology:**
  Descriptive text and references to methodological documents available.

- **Quality documentation:**
  Documentation on procedures applied for quality management and quality assessment.
2.4.2 What should be reported on accessibility and clarity

- A description of the conditions of access to data: media, support, pricing policies, possible restrictions etc.
- A summary description of the information (metadata) accompanying the statistics (documentation, explanation, quality limitations, etc).
- The description should refer to both less sophisticated and more advanced users and how their needs have been taken into account.
- A summary of user feedback on accessibility and clarity.
2.5. Coherence and Comparability

Definitions:

• **Coherence** measures the adequacy of the statistics to be combined in different ways and for various uses.

• **Comparability** is a measurement of the impact of differences in applied statistical concepts, measurement tools and procedures where statistics are compared between geographical areas or over time.
2.5.1 Coherence and Comparability
are divided to

- Coherence
  - Cross domain(s)
    i.e. with other statistics describing the same phenomenon
  - Sub-annual and annual statistics
    i.e. consistency in summing up etc.
  - National accounts
    i.e. reconcilability even though the concepts may differ
  - Internal
    i.e. consistency of data from different sources in the same data set
2.5.1 Coherence and Comparability are divided to... - 2

- Comparability

  - **Geographical**
    consistency over regions, countries etc. (esp. ESTAT...)

  - **Over time**
    how well the information is comparable despite the changes in time
2.5.2 What should be reported on Coherence and Comparability in general

- Brief descriptions of all conceptual and methodological metadata elements that could affect coherence/ comparability
- Assessment (preferably quantitative) of the possible effect of each reported difference on the output values
- Differences between the statistical process and the corresponding European regulation/standard and/or international standard (if any)
2.6. Cost and Burden

Definition

- **Cost and burden** is the cost associated with the collection and production of a statistical product and burden on respondents.

- Note also the CoP Principles:
  - **Principle 9. Non-excessive Burden on Respondents.** The reporting burden is proportionate to the needs of the users and is not excessive for respondents. The statistical authorities monitor the response burden and set targets for its reduction over time.
  - **Principle 10. Cost effectiveness.** Resources are used effectively.
2.6.1. What should be reported on Performance, Cost and Respondent Burden

- Performance and Cost
  - Annual operational cost with breakdown by major cost component
  - Recent efforts made to improve efficiency

- Respondent Burden
  - Annual respondent burden in financial terms and/or hours
  - Respondent burden reduction targets
  - Recent efforts made to reduce respondent burden
2.7. Confidentiality

• Definition:

Confidentiality is a property of data indicating the extent to which their unauthorised disclosure could be prejudicial or harmful to the interest of the source or other relevant parties.

• Further divided to:
  Confidentiality – policy
  Confidentiality – data treatment
2.7.1. What should be included on Confidentiality

- Whether or not confidentiality is required by law and if so whether survey staff have signed legal confidentiality commitments
- Whether external users may access micro-data for research purposes, and, the confidentiality provisions that are applied
- Procedures for ensuring confidentiality during collection, processing and dissemination, including rules for determining confidential cells in output tables and procedures for detecting and preventing residual disclosure
2.8. Statistical processing

Definition:

**Statistical processing** refers to the operations performed on data to derive new information according to a given set of rules.
2.8.1. Statistical processing divided to

• **Source data:**
  Characteristics and components of the raw statistical data used for compiling statistical aggregates.

• **Frequency of data collection:**
  Frequency with which the source data are collected.

• **Data collection:**
  Systematic process of gathering data for official statistics.
2.8.1. Statistical processing divided to... - 2

- Data validation:
  Process of monitoring the results of data compilation and ensuring the quality of statistical results.

- Data compilation:
  Operations performed on data to derive new information according to a given set of rules.
2.8.1. Statistical processing divided to... - 3

• Adjustment:

  The set of procedures employed to modify statistical data to enable it to conform to national or international standards or to address data quality differences when compiling specific data sets.

  (most often: seasonal adjustment).
3. Quality indicators

- Quality indicators are summary measures for certain key elements to be followed and reported to users

- Current focus is at the European level but many indicators can also be useful for national needs (most are requested from NSIs)

- The list of indicators was accepted together with the quality reporting standard and will be implemented gradually
3.1. User and producer reports

- Indicators in user-oriented quality reports:
  - R1: Data completeness – rate*
  - A1: Sampling errors – indicators
  - A4: Unit non-response – rate
  - A5: Item non-response – rate
  - TP2: Time lag – final results
  - TP3: Punctuality – delivery and publication*
  - CC2: Length of comparable time series
  - A6: Data revision – average size
3.1. User and producer reports – 2

• Additional indicators in producer-oriented quality reports:
  A2 Over-coverage – rate
  A3 Common units – proportion
  A7 Imputation – rate
  TP1 Time lag – 1st results
  CC1 Asymmetry for mirror flows
  AC1 Data tables – consultations
  AC2 Metadata – consultations
  AC3 Metadata completeness – rate

Asterisk (*) means different calculation for users and prod’s!
3.2. Further development

- The main problem may be whether the indicators are sensitive to changes or not.
- Proposals have been put forward to develop an overall index by using some multivariate method:
  - No overall success yet
  - Country-wise models work better
- Some other indicators are to be included in the new metadata structure SIMS: cost calculations, respondent burden, user satisfaction survey results etc.
4. IMF Data Quality Assessment Framework (DQAF)

- International Monetary Fund developed its own quality assurance framework over 10 years ago

- First DQAF version adopted in 2003, and it was updated 2012

- see Dsbb.imf.org/pages/dqrs/dqaf.aspx
4. IMF Data Quality Assessment Framework (DQAF) – 2

• DQAF is applied to economic and financial statistics:

  • National accounts statistics (2012)
  • Consumer and producer price indices (2012)
  • Monetary statistics (2012)
  • Balance of payments and International Investment Position Statistics (2012)
  • External debt statistics (2013)
  • Also a DQAF for household income (esp. poverty) together with World Bank
4.1. DQAF dimensions

0. Prerequisites of quality

1. **Assurances of integrity** - The principle of objectivity in the collection, processing, and dissemination of statistics is firmly adhered to.

2. **Methodological soundness** - The methodological basis for the statistics follows internationally accepted standards, guidelines, or good practices.

3. **Accuracy and reliability** - Source data and statistical techniques are sound and statistical outputs sufficiently portray reality.

4. **Serviceability** - Statistics, with adequate periodicity and timeliness, are consistent and follow a predictable revisions policy.

5. **Accessibility** - Data and metadata are easily available and assistance to users is adequate.
4.2. DQAF for different statistics
4.3. Comparison of DQAF and the ESS CoP

Comparison of IMF and Eurostat Quality Dimensions

**DQAF (including elements)**

- 0. Prerequisites
  - 0.1 Legal Environment
  - 0.2 Resources
  - 0.3 Quality awareness
- 1. Integrity
  - 1.1 Professionalism
  - 1.2 Ethical standards
  - 1.3 Transparency
- 2. Methodological Soundness
  - 2.1 Concepts & Def, 2.2 Scope, 2.3 Clarity & sector, 2.4 Recording basis
- 3. Accuracy and Reliability
  - 3.1 Sources, 3.2 Techniques, 3.3 Validation of source, 3.4 Vol of int. & final, 3.5 Revision studies
- 4. Serviceability
  - 4.1 Relevance
  - 4.2 Timeliness and Periodicity
  - 4.3 Consistency
  - 4.4 Revision procedures
- 5. Accessibility
  - 5.1 Data
  - 5.2 Metadata

**Eurostat**

- 1. Professional Independence
- 2. Mandate for data collection
- 3. Adequacy of resources
- 4. Quality commitment
- 5. Statistical confidentiality
- 6. Impartiality and objectivity
- 7. Non-Excessive, Respondent, Burden
- 8. Cost Effectiveness
- 9. Sound Methodology
- 10. Appropriate, Statistical procedures
- 11. Relevance
- 12. Accuracy and Reliability
- 13. Timeliness and Punctuality
- 14. Coherence and Comparability
- 15. Accessibility and Clarity
4.4. DQAF Follow-up

- Follow-up by

  - Reports on the Observance of Standards and Codes (ROSCs) – and SDDS metadata
    Quarterly reports on each statistics above

  - ROSC is carried out as a peer review where statistics producers, production process and stakeholder views are evaluated, e.g. India: 3 weeks in May, 2002; Thailand April 2006. Reports contain up 250 pages.
5. OECD Quality Framework

Framework accepted 2003, update 2011

Main idea to have systematic evaluation of quality for data coming from different international sources
5. OECD Quality Framework – 2

The OECD Quality Framework has four elements:

• a definition of quality and its dimensions;
• a procedure for assuring the quality of proposed new statistical activities;
• a procedure for evaluating the quality of existing statistical activities on a regular basis;
• a set of broad principles on which OECD statistical activities are to be conducted and quality guidelines covering all phases of the statistical production process.
5.1. OECD Quality Framework contents

OECD quality dimensions:

1. Relevance
2. Accuracy
3. Credibility
4. Timeliness
5. Accessibility
6. Interpretability
7. Coherence
8. Cost-efficiency
6. Metadata

- Metadata (i.e. “data about data”, or information on data contents) will be more and more important part to provide the clients with quality information
6.1. Most important metadata standards

- Standards develop fast. Currently the mostly used standards in statistics are
  - Special Data Dissemination Standard (SDDS) by IMF (and its less demanding version General Data Dissemination System – GDDS)
  - Statistical Data and Metadata eXchange (SDMX) by BIS, ECB, ESTAT, IMF, OECD, UN, WB is in implementation phase – Also ISO standard **IS 17369** (2013)
6.2. EURO-SDMX Metadata (ESMS) structure

• Extended and modified from the generic SDMX standard
• Final version of contents was accepted in 2009
• Implementation in data and metadata exchange between statistical agencies and Eurostat has been started
• Standard contains following concepts:
## 6.2. EURO-SDMX Metadata (ESMS) structure

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<tbody>
<tr>
<td>1. Contact</td>
<td>8. Release policy</td>
<td>15. Timeliness and punctuality</td>
</tr>
<tr>
<td>4. Unit of measure</td>
<td>11. Accessibility of documentation</td>
<td>18. Cost and burden</td>
</tr>
<tr>
<td>7. Confidentiality</td>
<td>14. Accuracy and reliability</td>
<td>21 Comment</td>
</tr>
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### 6.2. EURO-SDMX Metadata (ESMS) structure

<table>
<thead>
<tr>
<th></th>
<th>Accuracy and reliability</th>
<th>ACCURACY</th>
<th>ACCURACY: closeness of computations or estimates to the exact or true values that the statistics were intended to measure. Reliability: closeness of the initial estimated value to the subsequent estimated value.</th>
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<tbody>
<tr>
<td>14</td>
<td>Overall accuracy</td>
<td>ACCURACY_OVERALL</td>
<td>Assessment of accuracy, linked to a certain data set or domain, which is summarising the various components.</td>
<td>Text</td>
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<tr>
<td></td>
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<td></td>
<td>Provide a summary of the main sources of error and an assessment of the potential for bias (sign and order of magnitude) for each key indicator in quantitative or qualitative terms.</td>
<td></td>
</tr>
<tr>
<td>14.2</td>
<td>Sampling error</td>
<td>SAMPLING_ERR</td>
<td>That part of the difference between a population value and an estimate thereof, derived from a random sample, which is due to the fact that only a subset of the population is enumerated.</td>
<td>Text</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>If probability sampling is used, it should be provided estimates of the accuracy, normally in the form of cv's, standard errors or confidence intervals. It should be stated if adjustments for non-response, misclassifications and other uncertainty sources</td>
<td></td>
</tr>
<tr>
<td>14.3</td>
<td>Non-sampling error</td>
<td>NONSAMPLING_ERR</td>
<td>Error in survey estimates which cannot be attributed to sampling fluctuations.</td>
<td>Text</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Provide an assessment, preferable quantitative, on the non-sampling errors and the bias risks associated with: - Overcoverage, undercoverage and multiple listings. - Survey instrument, respondent and interviewer where relevant. - Unit (non)response inclu</td>
<td></td>
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6.3. From EURO-SDMX to SIMS

- At the moment this metadata standard is being finalised again.
- The new forthcoming standard will be called as Single Integrated Metadata Standard (SIMS)
  - the idea is to make a better fit with the European Statistical System Standard and Handbook for Quality Reports.
  - Finally metadata may “take over” traditional quality reports...
6.3. From EURO-SDMX to SIMS – 2

- Use: - in-depth (or Producer) quality reports
  - general (or User) quality reports
  - metadata for data users

- Contents (a separate document):
  - Original ESMS metadata: 77 elements
  - Additional quality reporting elements (not included in ESMS)
  - Quality indicators
  - Altogether slightly over 100 elements
6.3. From EURO-SDMX to SIMS – 3

- Final decision on SIMS and Quality reporting was made by the ESS-Committee (Nov 2013), and its implementation in March 2014

- Technical implementation to be planned by a specific task force which has gathered already twice
6.4. Contents of SIMS

- Main contents: see a separate leaflet
7. Discussion

Thank you!

Questions?
Comments?