Big Data Quality Framework

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Overview

Big Data Quality Framework

- Input
- Throughput
- Output

Examples

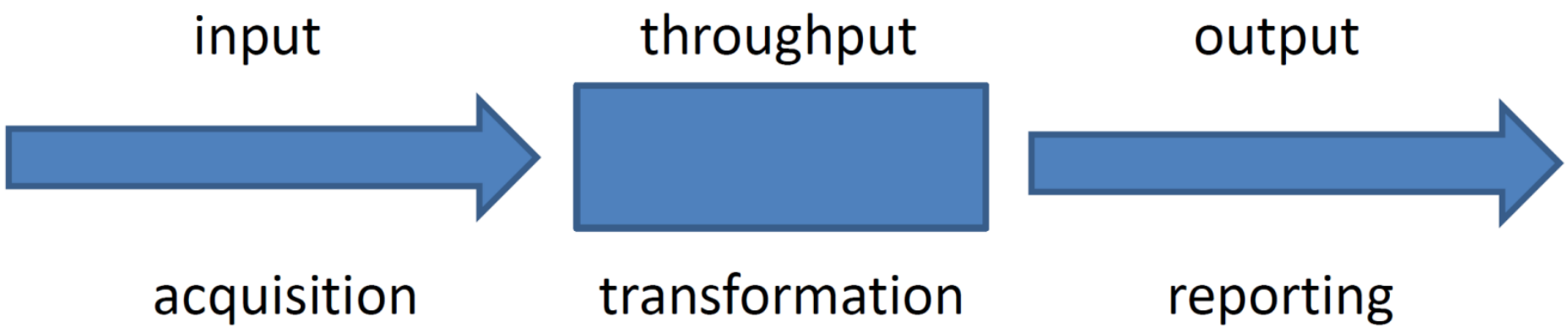
Change Management

Big Data Quality Framework

- **CES**
  - **UNECE Task Force**
  - **1994**

Approach

Business process



Framework

Structured view of quality for each phase

Input

- Discovery stage
  - Dataset not required
  - Hyperdimension: Source and Metadata
- Acquisition
  - Dataset required
  - Hyperdimension: Data
- Approach
  - Factors to consider
    - mple of quality indicators

Hyperdi-mension	Quality Dimension	Factors to consider

SOURCE

Institutional environment

- Sustainability of the data provider
- Reliability of data provider
- Transparency of data provider

Privacy and Security

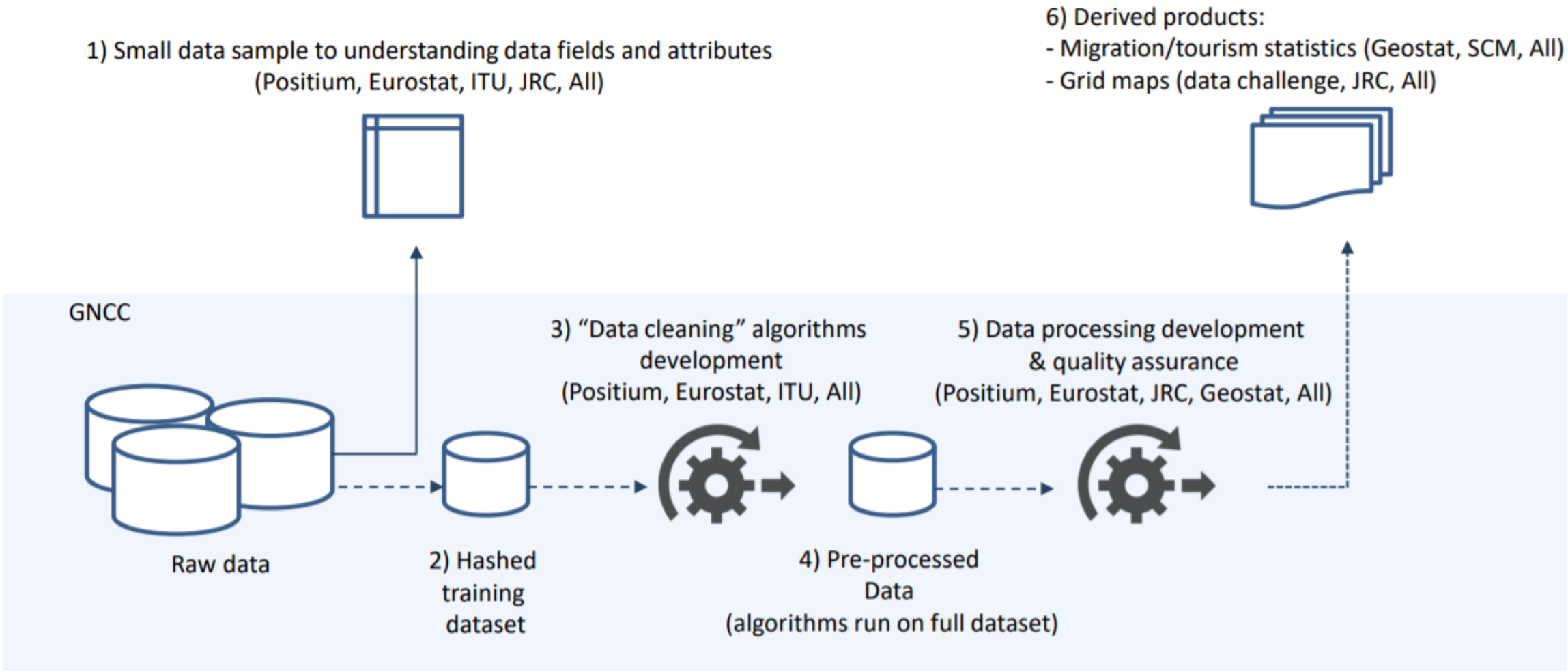
- Legislation
- Data Keeper vs. Data Provider
- Restrictions
- Perception

Metadata	Complexity	Technical constraints, Sructured or Unstructured Readability, Presence of hierarchies and nesting
	Completeness	Metadata is available, interpretable and complete
	Usability	Resources required to import and analyse Risk analysis
	Time-related	Timeliness, Periodicity, Changes through time
	Linkability	Presence and quality of linking variables
	Coherence	Use of standards
	Validity	Transparency of methods and processes Soundness of methods and processes

Data	Accuracy and selectivity	Total survey error approach Reference datasets Selectivity
	Linkability	Quality of linking variables
	Coherence - consistency	Coherence between metadata description and observed data values
	Validity	Coherence between processes and methods and observed data values

Throughput

- **System Independence**: The result of processing the data should be independent of the hardware and software systems used to process it;
- **Steady states**: that the data be processed through a series of stable versions that can be referenced by future processes and by multiple parts of the organisation ;
- **Application of Quality Gates**: that the NSO employ quality gates as a quality control business process.


1) Small data sample to understanding data fields and attributes
(Positium, Eurostat, ITU, JRC, All)
6) Derived products:
- Migration/tourism statistics (Geostat, SCM, All)
- Grid maps (data challenge, JRC, All)
GNCC
3) "Data cleaning" algorithms development
(Positium, Eurostat, ITU, All)
5) Data processing development & quality assurance
(Positium, Eurostat, JRC, Geostat, All)
Raw data
2) Hashed training dataset
4) Pre-processed Data
(algorithms run on full dataset)

Output

- Output quality framework should
  - Meet reporting criteria of the NSO
  - Provide required information to allow users to make informed decision regarding the use of the statistical output
  - Follow transparency principle
  - Follow the general approach with quality dimensions, indicators and factors to consider

UNITED NATIONS

NATIONAL QUALITY ASSURANCE FRAMEWORKS

MANUAL FOR OFFICIAL STATISTICS

(UN NQAF MANUAL)

Including recommendations, the framework and implementation guidance

Examples

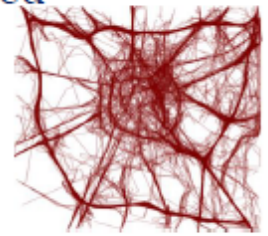
Quality framework in practice: Selectivity

GPS data (Pratesi et. al., 2015): **inhabitants' mobility using data of private vehicles tracked with a GPS device.** The GPS device is automatically turned on when the car is started, and the global trajectory of a vehicle is formed by the sequence of GPS points. Vehicle traces were then mapped on the road network.

Mobility collected on a self-selected sample of car journeys

Methodological Framework:

- reconcile data from the two independent sources (Big Data and sample surveys) ;
- if no common variables are available, known correlated data could be used;
- use Big Data directly as a covariate under a model-based approach.



Examples

Quality framework in practice: Missing data

Remote sensing for Agricultural Statistics (Tam and Clarke, 2015b): investigate the use of satellite sensor data for the production of agricultural statistics such as land use, crop type and crop yield. **The coverage of satellite data is the same as the coverage of land parcels.**

Missing data due to persistent cloud cover.

Methodological Framework:

- Set up a model where ignorability conditions hold: Calibration or imputation techniques;
- Model with Ignorability conditions not found for certain areas (Weather may affect the type of crops being grown, or yields, missing data related to the target variable).

→

Use traditional data collections for these areas

Paolo Righi - Global Conference on Big Data for Off. Statistics. 20-22 October 2015 Abu Dhabi 10.19 Istat

Change Management

Making changes – Maintaining quality

Example

- Statistics Canada
  - Improving Agricultural crop statistics
  - Use of Surveys
  - Use of Satellite data
  - Just Month September

  - Reduce response burden
  - Maintain quality

Example

- Australia Bureau of Statistics
  - Calculating CPI
  - Use of Price Surveys
  - Use of Scanner data
  - Replace 25% of Basket

  - Reduce cost
  - Gain more detail
  - Maintain quality

Change Management

Making changes – Maintaining quality

Tourism Statistics

Border Surveys

- Positives
  - Controlled sample
  - Targeted questions
- Negatives
  - Non-response
  - Long processing time
  - Aggregated data

Mobile Phone Data

- Positives
  - Detail
  - Short processing time
- Negatives
  - Selectivity
  - No info on purpose

Thank you