IV Information Action Types

IV actions model the processing information objects in the system. Every action is associated with at least one object. Actions cause state changes in the objects that participate in them.

The figure shows a collection of action types specified in the information viewpoint.

Information Action Types

Notation

IV Actions

- Information Action Definitions
  - add metadata
  - annotate
  - annotate data
  - annotate metadata
  - assign unique identifier
  - build conceptual models
  - carry out backup
  - check quality
  - describe service
  - do data mining
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  - perform mapping
  - perform measurement or observation
  - process data
  - publish data
  - publish metadata
  - query data
  - query metadata
  - register metadata
  - resolve annotation
  - semantic annotation
  - setup mapping rules
  - specify investigation design
  - specify measurement or observation
  - store data
  - track provenance

Information Action Definitions

add metadata

Add additional data according to a predefined schema (metadata schema). This partially overlaps with data annotations.

annotate

Perform **Annotation** of an information object. Adding structured or unstructured information to describe a data object.

There are two basic types of annotation: **free text annotation** and s**emantic annotation**. free text annotation refers to adding short explanations or opinions to a text or drawing (dictionary definition). Semantic annotation refers to linking data to structured conceptual model (ontology)

annotate data

Semantic annotation of persistent data with concepts of predefined local or global conceptual models.

In practices, this can be done by adding tags or a pointer to concepts within a conceptual model to the data. If the concepts are terms e.g., in an SKOS/RDF thesaurus, and published as linked data, then data annotation would mean to enter the URL of the term describing the meaning of the data.

There is no exact borderline between metadata and semantic annotation.

annotate metadata

Semantic annotation of metadata with concepts of predefined local or global conceptual models.

This can be done by adding pointers from concepts within a conceptual model to the metadata. For instance, if concepts are terms of a SKOS thesaurus, identified by URIs and published as linked data, then annotation amounts to associating metadata with the terms' URIs.

assign unique identifier

Obtain a unique identifier and associate it to the data.

build conceptual models

Establish a local or global model of interrelated concepts.

This may involve the following issues:

- commitment: the agreement of a larger group of scientists / data providers / data users should be achieved;
- unambiguousness: the conceptual model should be unambiguously defined;
- readability: the model should be readable by both human and machine. Ontologies, for instance, express the meaning of the concepts with the relations to other concepts while being human and machine readable. Recently it has increasingly become important to add definitions in human readable language.
- availability: the conceptual model must be referenceable and dereferenceable for a long time

carry out backup

Replicate data to an additional data storage so it may be used to restore the original after a data loss event. Long-term preservation is a special type of backup.

check quality

Actions to verify the quality of data.

For example it may involve:

- remove noise
- remove apparently wrong data
- calculate calibrations

Quality checks can be carried out at different points in the chain of data lifecycle.

Quality checks can be supported by software tools for those processes which can be automated (e.g. statistic tolerance checks).

describe service

Describe the accessibility of a service or processes, which is available for reuse, the interfaces, the description of behavior and/or implemented algorithms

do data mining

Execute a sequence of metadata / data request --> interpret result --> do a new request

Usually this sequence helps to deepen the knowledge about the data. Classically this sequence can:

- lead from data to metadata and semantic annotations
- follow the provenance of data
- can follow data processing

It can be supported by special software that helps to carry out that sequence of data request and interpretation of results.

final review

Review the data to be published, which will not likely be changed again.

The action triggers the change of the data state to be "finally reviewed". In practices, an annotation for such a state change should be recorded for provenance purposes. Usually, this is coupled with archiving and versioning actions.

free text annotation

To add a short explanation or opinion to an information object.

perform mapping

Execute transformation rules for values (mapping from one unit to another unit) or translation rules for concepts (translating the meaning from one conceptual model to another conceptual model, e.g. translating code lists).

perform measurement or observation

Measure parameter(s) or observe an event. The performance of a measurement or observation produces measurement results.

process data

Process data for the purposes of:

- converting and generating data products
- calculations: e.g., statistical processes, simulation models
- visualisation: e.g., alpha-numerically, graphically, geographically

Data processes should be recorded as provenance instances.

publish data

Make data public accessible.

For example, this can be done by:

- presenting them in browsable form on the world wide web
- by presenting them via special services:
- RESTful service
- SOAP service
- OPEN GRID service
- OGC service (web feature service, web map service)
- SPARQL endpoint

publish metadata

Make the registered metadata available to the public.

query data

Send a request to a data store to retrieve required data.

In practice, there are two types of data query:

- two step approach:

  step 1: query/search metadata;

  step 2: access data

  For example, when using OGC services, it usually first invokes a web feature service to obtain feature descriptions, then a web map service can be invoked to obtain map images.

- one step approach: to query data e.g., by using SQL services or SPARQL endpoints

  Requests can be directly sent to a service or distributed by a broker.

query metadata

Send a request to metadata resources to retrieve metadata of interests.

register metadata

Enter the metadata into a metadata catalogue.

resolve annotation

Retrieve the reference to the specific set of objects that correspond to a set of annotation terms.

semantic annotation

Linking of data objects whit structured information from predefined local or global conceptual models.

setup mapping rules

Specify the mapping rules of data and/or concepts.

These rules should be explicitly expressed using a language that can be processed by software.

A minimal set of mapping rules should include the following data:

- source data / concept for which the mapping is valid
- target data / concept for which the mapping is valid
- mapping process (the translation and/or transformation process)
- validity constraints for the mapping (temporal constraints, context constraints, etc.)

specify investigation design

specify design of investigation, including sampling design:

- geographical position of measurement or observation (site) -- the selections of observations and measurement sites, e.g., can be statistical or stratified by domain knowledge;
- characteristics of site;
- preconditions of measurements.

specify measurement or observation

Specify the details of the method of observations/measurements.

For example, it may include the specification of a measurement device type and its settings, measurement/observation intervals.

store data

Archive or preserve data in persistent manner to ensure continued accessibility and usability.

track provenance

Automatically generate and store metadata about the actions and the data state changes as provenance instances.