Functional Metrics for LOD KOS Products

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FAIR + FIT
Outline

1. FAIR
   - a LOD KOS as an open dataset

2. FIT
   - a LOD KOS as a KOS vocabulary

3. Discussion

Functional Metrics for LOD KOS Products

Why this talk?

• To bring the awareness of the current trends of FAIR principles for open data;

• To help the ITWG team to maximize the vocabularies’ functionality and impacts;

• To seek for good strategies for the vocabulary development, releases, and maintenances.

How the metrics are developed?

• Data collected 2015-16, 2017, 2019
  - from Datahub and other vocab services

• A comparative study
  - from other vocab services
Functional Metrics for LOD KOS Products

FAIR
– a LOD KOS as an open dataset

Findable
Accessible
Interoperable
Reusable
LOD KOS

-- as an open dataset

Following the FAIR Principle

- **FINDABLE**
  Data and supplementary materials have sufficiently rich metadata and a unique and persistent identifier.

- **ACCESSIBLE**
  Metadata and data are understandable to humans and machines. Data is deposited in a trusted repository.

- **INTEROPERABLE**
  Metadata use a formal, accessible, shared, and broadly applicable language for knowledge representation.

- **REUSABLE**
  Data and collections have a clear usage licenses and provide accurate information on provenance.

‘FAIR Guiding Principles for scientific data management and stewardship’
*Scientific Data*, 2016.
doi:10.1038/sdata.2016.18


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Findable
F1. (Meta)data are assigned a globally unique and persistent identifier
F2. Data are described with rich metadata (defined by R1 below)
F3. Metadata clearly and explicitly include the identifier of the data they describe
F4. (Meta)data are registered or indexed in a searchable resource

- Various levels of Findable

Examples from the datahub:

Our additional recommendation:
⇒ Enrich metadata about KOS as much as possible to enable data discovery processes.

https://www.go-fair.org/fair-principles/
**LOD KOS’ FAIR: Accessible**

Metadata and data are understandable to humans and machines. Data is deposited in a trusted repository.

**ACCESSIBLE**

**Accessible**

A1. (Meta)data are retrievable by their identifier using a standardised communications protocol

- **A1.1** The protocol is open, free, and universally implementable
- **A1.2** The protocol allows for an authentication and authorisation procedure, where necessary

A2. Metadata are accessible, even when the data are no longer available

https://www.go-fair.org/fair-principles/

- **Our additional recommendation:**
  - ➔ Provide multiple pathways for accessing the KOS datasets.

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**Examples from the datahub:**

- Various levels of A[ccessible]
Interoperable

1. (Meta)data use a formal, accessible, shared, and broadly applicable language for knowledge representation.
2. (Meta)data use vocabularies that follow FAIR principles
3. (Meta)data include qualified references to other (meta)data

- Preliminary study findings:
  - (Meta)data that have been used in describing the vocabularies vary at different registries.

**Our additional recommendation:**

⇒ Utilize the *KOS Types Vocabulary* to standardize the way vocabulary types are categorized.

*https://nkos.slis.kent.edu/nkos-type.html*
LOD KOS’ FAIR: Reusable

Data and collections have a clear usage licenses and provide accurate information on provenance. REUSABLE

Reusable
R1. Meta(data) are richly described with a plurality of accurate and relevant attributes
  R1.1. (Meta)data are released with a clear and accessible data usage license
  R1.2. (Meta)data are associated with detailed provenance
  R1.3. (Meta)data meet domain-relevant community standards

Our additional recommendation:
⇒ Adequately supply license and provenance metadata to enable datasets’ reusability.

Examples from the datahub:
- Various levels of R[eusible]

VS.

provenance-metadata
vocab-mappings

publications
published-by-producer
rdf
thesaurus

lodcloud-diagram-20...
no-license-metadata
no-proprietary-vocab

no-provenance-metadata
no-vocab-mappings

publications
published-by-producer
FIT – a LOD KOS as a value vocabulary

Functional
Impactful
Transformable
Metrics for LOD KOS -- as a value vocabulary

Functional

[The vocabulary is...] Made available in ways that enhance its inherent purpose

When a KOS is Functional, it could further its Impacts and potential Transformable usages.

Metrics:

F1. The vocabulary is delivered in consumable formats
   - Available in various data serialization formats
   - Accessible through SPARQL

F2. Provided SPARQL endpoints are operational

F3. Dataset properties and structures are informed effectively

F4. Services are user-friendly, making vocabulary contents reachable
Metrics development for LOD KOS

(cont.) FIT
– a LOD KOS as a value vocabulary

Functional
Impactful
Transformable
Impactful Metrics:

1. Exposed through terminology services
2. Used by data providers
   a) as a primary value Vocab
   b) in semantic enrichment
3. Mapped with other KOS vocabs
4. Showed/discussed at professional conferences and publications

-- as a KOS vocabulary

Maximizes the impact of a LOD KOS vocab
I1. Exposed through terminology services

1) Registries -- offer information about vocabularies

a. Registry of KOS

- BARTOC (Basel Register of Thesauri, Ontologies & Classifications):
  2900+ https://bartoc.org/
The slides from here onwards have different names and event titles on the bottom. I'm not sure if this is deliberate. eg. This is one is Zeng and hlava - taxonomy division. I changed them but you may change back if need be

Clunis, Julaine, 9/1/2019
I1. Exposed through terminology services

1) Registries --- offer information *about* vocabularies

a. Registry of KOS
   - BARTOC (Basel Register of Thesauri, Ontologies & Classifications):
     2900+ [https://bartoc.org/](https://bartoc.org/)

b. Registry of LOD vocabularies (“property vocabularies” & “value vocabularies”)
   - E.g., LOV (Linked Open Vocabularies) [http://lov.okfn.org/dataset/lov](http://lov.okfn.org/dataset/lov):
     - 600+ registered, some are value vocabularies.

c. Registry of LOD products, including KOS
   - DataHub [https://datahub.io/](https://datahub.io/)
The slides from here onwards have different names and event titles on the bottom. I'm not sure if this is deliberate. eg. This is one is Zeng and hlava - taxonomy division. I changed them but you may change back if need be.

Clunis, Julaine, 9/1/2019
I1. Exposed through terminology services

c) Registry of LOD products, including KOS

DataHub https://datahub.io/

LOD Cloud https://lod-cloud.net/datasets

Download Links

SPARQL Endpoints
- SPARQL Endpoint

Examples
- Objects
- Furnishings and Equipment (Hierarchy Name)
- Containers by function or context
- Containers by function or context (hierarchy name)
- Rhyta

Other downloads
- Homepage
- Getty Vocabulary Program ontology
- Semantic Representation Documentation
- Total AAT statements / Mirror 1
- Explicit AAT statements
- VOID Description

LOD Cloud Requires
- 1000+ triples
- 50+ links to other datasets in the Cloud.

Impactful
I2. Used by data providers

a) as a primary value vocabulary

http://bioportal.bioontology.org/ontologies/MESH

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II. Used by data providers

b) in semantic enrichment

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<thead>
<tr>
<th>Vocabulary</th>
<th>URL</th>
<th>Type of entity</th>
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<tbody>
<tr>
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</tr>
</tbody>
</table>

Europeana semantic enrichment ([https://pro.europeana.eu/page/europeana-semantic-enrichment](https://pro.europeana.eu/page/europeana-semantic-enrichment)) -- link to several vocabularies, captured 2019.9.
I3. Mapped with other KOSs

a) vocabulary-based mapping

Alignments require interoperability in syntax & structure

STW Thesaurus for Economics

STW Mappings

Here you find mappings to other thesauri and vocabularies which can also be downloaded.

- Integrated Authority File (GND)
- Wikidata
- DBpedia
- Thesaurus Social Sciences (TheSoz)
- AGROVOC
- WKD German labor law thesaurus
- JEL classification
- SDMX subject-matter domains classification

Mapping WKD German labor law thesaurus

About the Mapping

Description: Created by WKD and SWC in course of the LOD2 project and continuously maintained by domain experts of WKD
Creator: Wolters Kluwer Deutschland GmbH
License: http://creativecommons.org/publicdomain/zero/1.0/
Rights: The CC0 license has been applied to the mapping for broad and easy re-use without legal restrictions. We would, however, appreciate an attribution to the creators (as indicated above) and the free availability of projects which make use of this mapping.
http://opendatacommons.org/licenses/odc-by-sa/
Relations: 270 skos:exactMatch
Publisher: ZBW - Leibniz Information Centre for Economics
Tool: Mix’n’Match
This tool lists entries of some external databases (over 1000 catalogs), and allows users to match them against Wikidata items.

https://tools.wmflabs.org/mix-n-match/#/
(cont.) Vocabulary sharing and mapping by volunteers (non-centralized)

**Tool: Mix’n’Match**

This tool lists entries of some external databases (over 1000 catalogs), and allows users to match them against Wikidata items.
**Authority Control (100+) includes:**

- Well-known vocabularies such as GeoNames, FAST, UNESCO Thesaurus, and MeSH (Medical Subject Headings) sub-lists,

- Other specialized vocabularies, e.g.:
  - DoS (Dictionary of Sydney),
  - INRAN Italian Food Nutrient profiles,
  - ISO 15924 numeric code,
  - Gran Enciclopèdia Catalana,
  - Europeana Fashion Thesaurus,
  - MIMO Music Instruments,
  - Great Russian Encyclopedia
  - etc.

More than half of these vocabularies have over 70% of entries manually mapped to Wikidata.
I3. Mapped with other KOSs

b) value-based mapping

---

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<td>Bells · Little Dedo · Mays · Sculptures (Virgin of Paris) · Spire</td>
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I4. Showed/discussed at professional conferences and publications

- NKOS workshops
- LODLAM Summit
- ISKO and ISKO-chapter events
- Books and journal articles
- … …
Review

-- as a KOS vocabulary

**Impactful**

Maximizes the impact of a LOD KOS vocab

**Metrics:**

I1. Exposed through terminology services

I2. Used by data providers
   - a) as a primary value Vocab
   - b) in semantic enrichment

I3. Mapped with other KOS vocabbs

I4. Showed/discussed at professional conferences and publications
Metrics development for LOD KOS

FIT
– a LOD KOS as a value vocabulary

Functional
Impactful
Transformable
--- as a KOS vocabulary

**Transformable**

Extends the functionality and impact through innovative adaptations.

**Metrics:**

T1. Allows special KOS products to be derived from the original data

T2. The user is given autonomy to determine what structure and information is desired and can be reproduced from the vocabulary

T3. Enables extensibility to fit diverse needs

T4. Supports innovative and transformative uses beyond normal “value vocabularies”

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T1. Allows special KOS products to be derived from the original data.
About 100 micro-thesauri can be obtained

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<td>&quot;Labour&quot;</td>
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</table>
Other special KOS sets can be obtained.
T2. The user is given *autonomy* to determine what structure and information is desired and can be reproduced.
Extended to fit diverse needs
- Culture
- Language
- Domain
- Structure

Virtual harmonization through linking
- E.g., Faceted Application of Subject Terminology (FAST) – VIAF, Wikidata

- because the vocabulary is available as a LOD KOS
With the correct coding of properties a FAST’s controlled term
• is related to a real-world entity and
• allows humans to gather more information about the entity that is being described

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T4. Supports innovative transformative uses beyond normal “value vocabularies”

- LOD KOS can be used for
  - obtaining special graphs or datasets for very complicated questions, and
  - revealing unknown relationships.

Could a LOD KOS dataset be considered
- as a knowledge base?
- as the foundation of a network analysis?
- as the building blocks of a framework for research in humanities and science?

beyond being a ‘vocabulary’
One can obtain special RDF graphs or datasets for very complicated questions, and for revealing unknown relationships.

<table>
<thead>
<tr>
<th>TGN-Specific Queries</th>
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<tbody>
<tr>
<td>4.1 Places by Type</td>
</tr>
<tr>
<td>4.2 Places, with English or GVP Label</td>
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<tr>
<td>4.3 Places by Direct and Hierarchical Type</td>
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<tr>
<td>4.4 Breakdown of Sovereign States by Type</td>
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<tr>
<td>4.5 Inhabited Places That Were Sovereign States</td>
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<tr>
<td>4.6 Places by Type and Parent Place</td>
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<td>4.7 Places by Type, with placeTypePreferred</td>
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<td>4.8 Places by Triple FTS</td>
</tr>
<tr>
<td>4.9 Places by FTS Parents</td>
</tr>
<tr>
<td>4.10 Capitals by Association</td>
</tr>
<tr>
<td>4.11 Members of the European Union</td>
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<tr>
<td>4.12 Members of the United Nations</td>
</tr>
<tr>
<td>4.13 Geo Chart with sgvizler</td>
</tr>
<tr>
<td>4.14 Column Chart with sgvizler</td>
</tr>
<tr>
<td>4.15 Countries and Capitals By Type and Containment</td>
</tr>
<tr>
<td>4.16 Places by Coordinate Bounding Box</td>
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<tr>
<td>4.17 Places Within Bounding Box</td>
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<tr>
<td>4.18 Places by Type Within Bounding Box</td>
</tr>
<tr>
<td>4.19 Places Outside Bounding Box (Overseas Possessions)</td>
</tr>
<tr>
<td>4.20 Places Nearby Each Other</td>
</tr>
</tbody>
</table>

Marcia Zeng - Getty ITWG 2020, L.A.
Name authorities offer foundational structured data for network analyses.
Demo: Wikidata Query Service

https://query.wikidata.org/
Query: Paintings by Rembrandt in the Louvre or the Rijkmuseum

Query example available at https://query.wikidata.org/
Query: Public sculptures in Paris

Query example available at https://query.wikidata.org/
Public sculptures in Paris

Query example available at
https://query.wikidata.org/

https://www.wikidata.org/wiki/Q3201665
EXAMPLE. Query: Map of economists in PM20* by place of birth

* 20th Century Press Archives
[19 million of newspaper clippings, 1908-2005]
- ZBW donated the dataset and enriched Wikidata (thousands).
http://zbw.eu/labs/

STW Thesaurus for Economics

Query available at:

Example: Map of economists in PM20* by place of birth
(cont.) Example: Map of economists in PM20* by place of birth
Review

-- as a KOS vocabulary

Transformable

Extends the functionality and impact through innovative adaptations.

Metrics:

T1. Allows special KOS products to be derived from the original data

T2. The user is given autonomy to determine what structure and information is desired and can be reproduced from the vocabulary

T3. Enables extensibility to fit diverse needs

T4. Supports innovative and transformative uses beyond normal “value vocabularies”
# FIT Metrics for LOD KOS (as value vocabularies)

**Functional**

[The vocabulary is...]

Made available in ways that enhance its inherent purpose

**Metrics:**

F1. The vocabulary is delivered in consumable formats

F2. Provided SPARQL endpoints are operational

F3. Dataset properties and structures are informed effectively

F4. Services are user-friendly, making vocabulary contents reachable

---

**Impactful**

[The vocabulary...]

Maximizes the impact of a LOD KOS vocab

**Metrics:**

I1. Exposed through terminology services

I2. Used by data providers
   a) as a primary value Vocab
   b) in semantic enrichment

I3. Mapped with other KOS vocabs

I4. Showed/discussed at professional conferences and publications

---

**Transformable**

[The vocabulary...]

Extends the functionality and impact through innovative adaptations

**Metrics:**

T1. Allows special KOS products to be derived from the original data

T2. The user is given autonomy to determine what structure and information is desired and can be reproduced from the vocabulary

T3. Enables extensibility to fit diverse needs

T4. Supports innovative and transformative uses beyond normal “value vocabularies”
**Discussion**

**FAIR**
As a dataset
- Findable
- Accessible
- Interoperable
- Reusable

**FIT**
As a value vocabulary
- Functional
  - Consumable
  - Operational
  - Use-friendly, Reachable
  - Informative
- Impactful
  - Exposed
  - Used
  - Mapped
  - Showed/Discussed

- Transformable
  - Derivable
  - Autonomous
  - Extendable
  - Innovative

Other?
- Trustworthy
- Mature
- Refined
Full paper: “FAIR + FIT – Guiding Principles and Functional Metrics for Linked Open Data (LOD) KOS Products”

Marcia Lei Zeng & Julaine Clunis
[to be published by JDIS, 2020. 04]
References


