LOD = **L**inked **O**pen **D**ata
KOS = **K**nowledge **O**rganization **S**tructures/**S**ystems

Functional Metrics for LOD KOS Products

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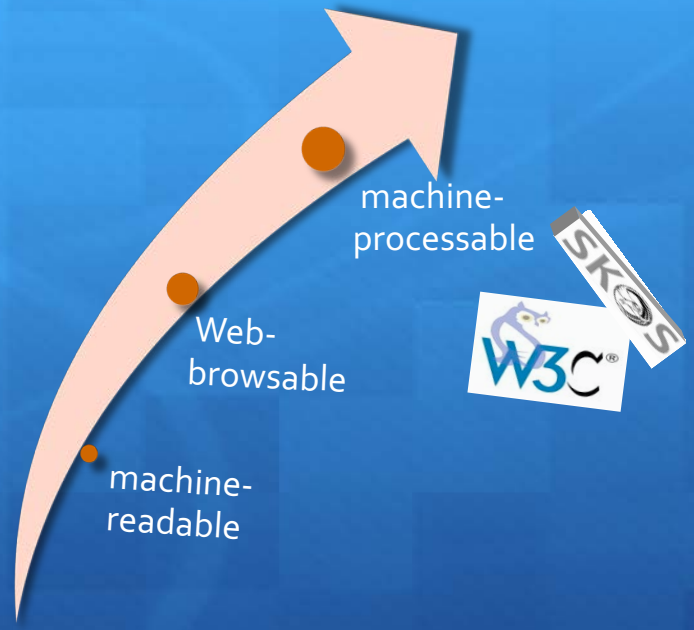
Kent State University, USA

NKOS Workshop, Sept. 25 @DC2019, Seoul, S.Korea

Outline

- A. Trend: Publishing KOS as LOD
- B. Metrics development for LOD KOS
  a) -- as an open dataset
  b) -- as a KOS vocabulary
- C. Discussion



A. Trend: Publishing KOS as LOD

Semantic Web standards *enables* **LOD KOS**

- SKOS
- OWL
- RDFS

- Many KOS schemes have been turned into
  - OWL ontologies, or
  - SKOS-ified datasets;

- SPARQL
- RDF

- Such datasets are usually available
  - as data dumps, or
  - through SPARQL endpoints.

BARTOC

(The Basel Register of Thesauri, Ontologies & Classifications)

KOS registered:

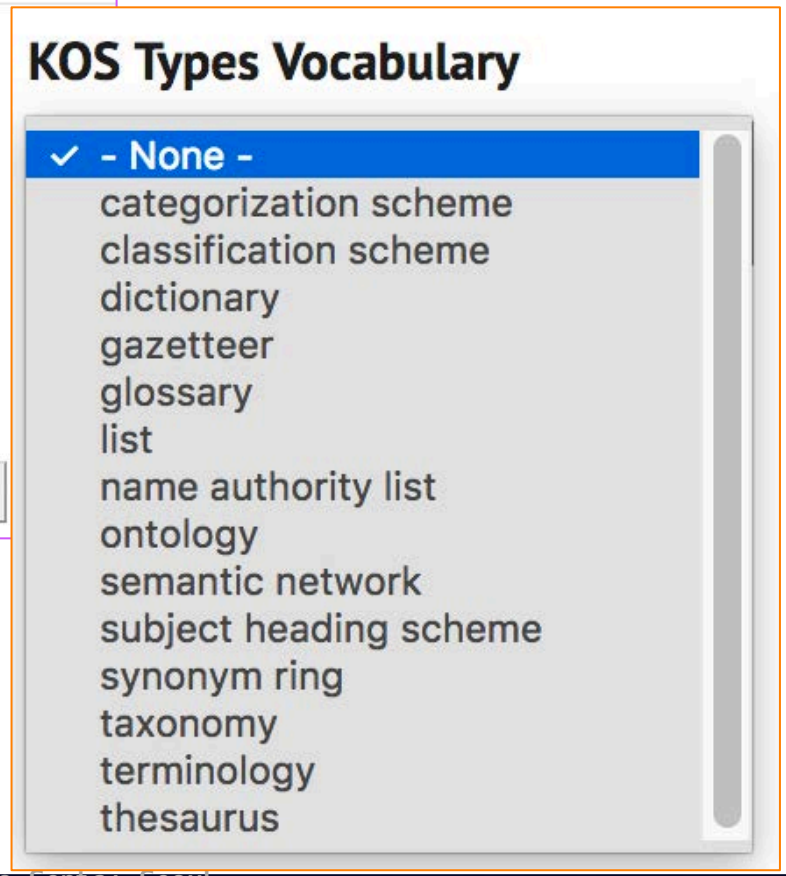
-(2016-05): 1,836

-(2017-08): 2,753

- RDF: 297

-(2019-08): **2,988**

- **RDF: 438**
- **SKOS: 433**



http://bartoc.org/
Accessed 2019-05-14

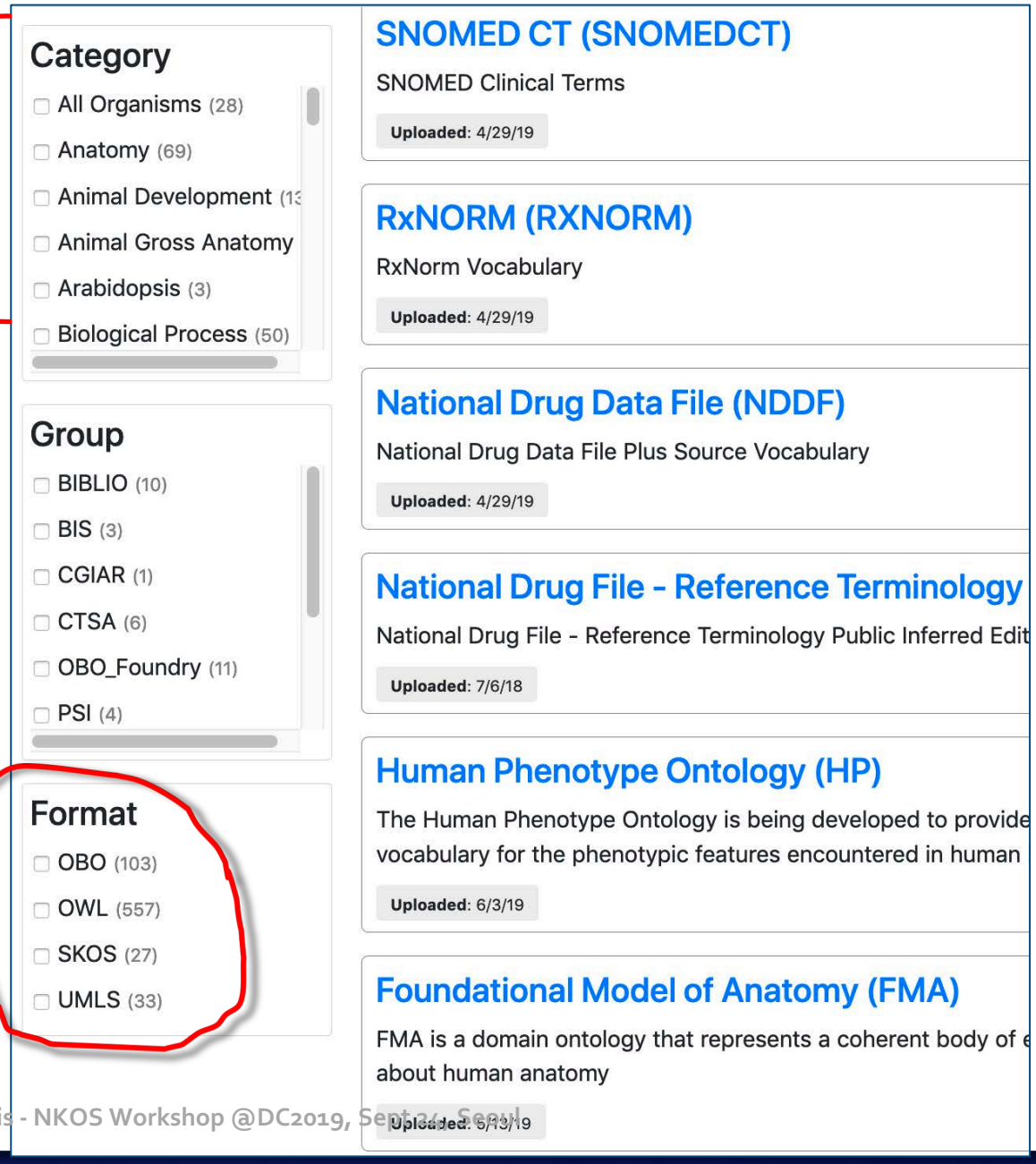
A. Trend: Publishing KOS as LOD

BioPortal

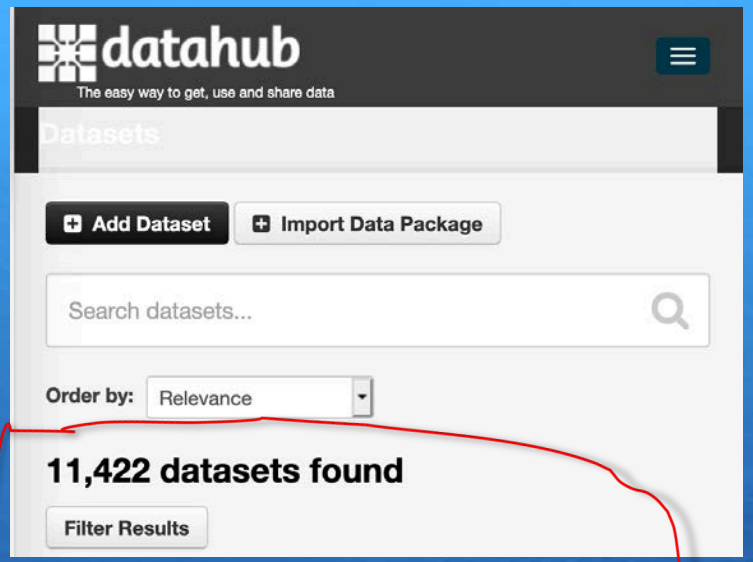
BioPortal Statistics	
Ontologies	796
Classes	9,821,387
Resources Indexed	0
Indexed Records	0
Direct Annotations	95,468,433,792
Direct Plus Expanded Annotations	144,789,582,932

2019-08-22 data

http://bioportal.bioontology.org/



A. Trend: Publishing KOS as LOD



(for LOD datasets, not limited to KOS)

https://old.datahub.io/dataset
Accessed 2019-08-21

Findings from the datahub, as of 2019-08

Search **Type of KOS/DATASET**	**# found (initial)**	**# found (verified)**	**# with SPARQL endpoints**
Authority Files	164	18	11
List	825	71	59
Terminology	39	35	8
Thesaurus	80	91*	41
Taxonomy	37	22	10
Classification	478	43	31
**Ontology	531	266	114
Totals	1623 (+531 ontologies)	280 (+ 266 ontologies)	160 (+114 ontologies)

A. Trend: Publishing KOS as LOD

From Library of Congress Subject Headings

Details | Suggest Terminology

Smartphones

URI(s)
- http://id.loc.gov/authorities/subjects/sh2007006251
- info:lc/authorities/sh2007006251
- http://id.loc.gov/authorities/sh2007006251#concept

Instance Of
- MADS/RDF Topic
- MADS/RDF Authority
- SKOS Concept

Scheme Membership(s)
- Library of Congress Subject Headings

Collection Membership(s)
- LCSH Collection - Authorized Headings
- LCSH Collection - General Collection
- LCSH Collection - May Subdivide Geographically

Variants
- Smart cell phones
- Smart phones

Broader Terms
- Cell phones
- Pocket computers

Narrower Terms
- Atrix (Smartphone)
- BlackBerry (Smartphone)
- BlackBerry Bold (Smartphone)
- BlackBerry Curve (Smartphone)
- BlackBerry Pearl (Smartphone)
- BlackBerry Storm (Smartphone)
- Droid (Smartphone)
- G1 (Smartphone)
- HTC One (Smartphone)
- iPhone (Smartphone)
- Nexus One (Smartphone)
- Nokia smartphones
- Palm Pre (Smartphone)
- Samsung Galaxy Nexus (Smartphone)
- Samsung Galaxy Note (Smartphone)
- Samsung Galaxy S (Smartphone)

Closely Matching Concepts from Other Schemes
- älypuhelimet
- smartphone *Label from public data source Wikidata*
- Smartphones
- Smartphones

Data of a LOD KOS are expressed as RDF triples and may be encoded using any concrete RDF syntax.

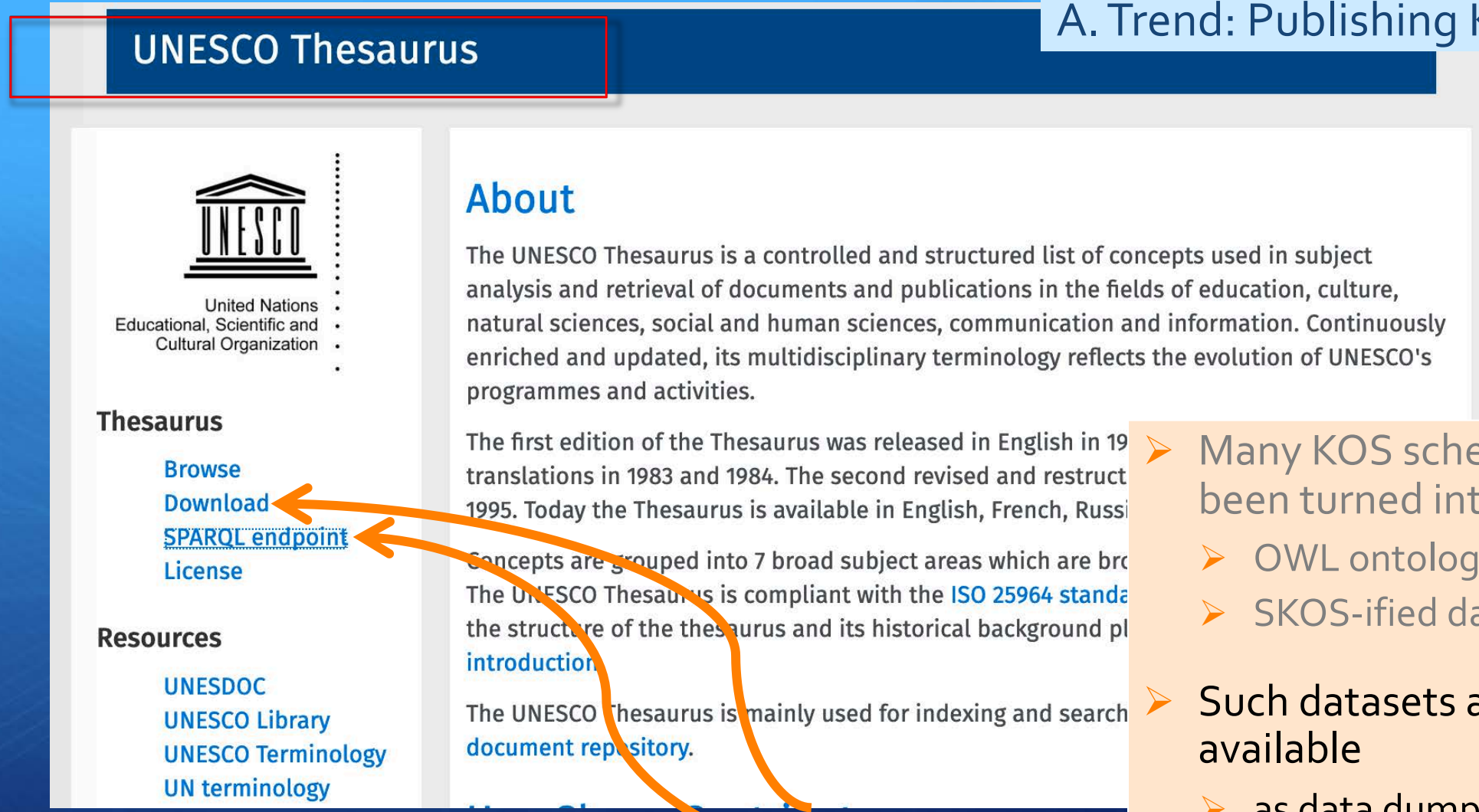
Available in various formats

Alternate Formats
- RDF/XML (MADS and SKOS)
- N-Triples (MADS and SKOS)
- JSON (MADS/RDF and SKOS/RDF)
- MADS - RDF/XML
- MADS - N-Triples
- MADS/RDF - JSON
- SKOS - RDF/XML
- SKOS - N-Triples
- SKOS - JSON
- MADS/XML
- MARC/XML

Images captured 2019-05-14

http://id.loc.gov/authorities/subjects/sh2007006251

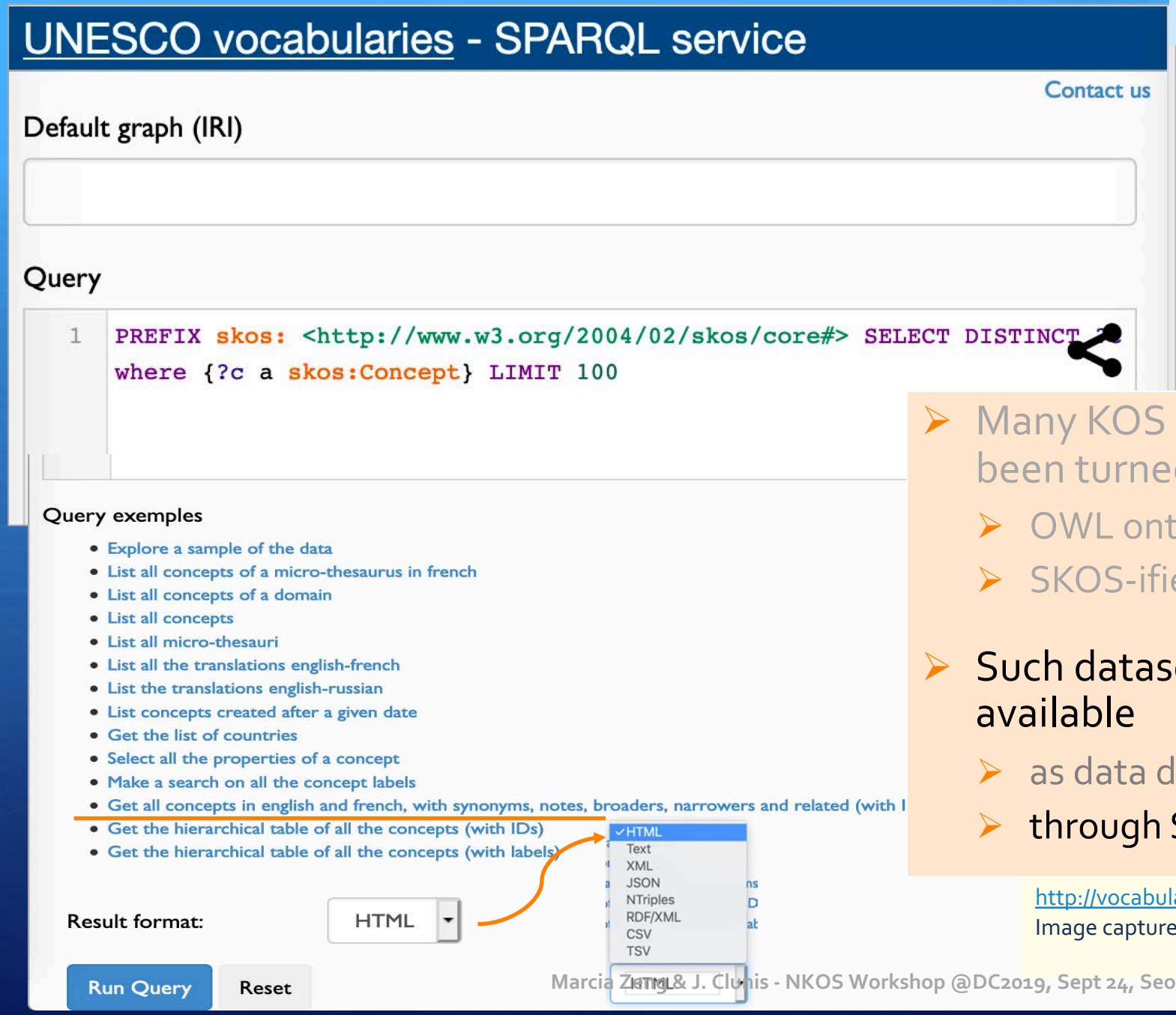
A. Trend: Publishing KOS as LOD



http://vocabularies.unesco.org/browser/en/about
Image captured 2019-05-14

- Many KOS schemes have been turned into
  - OWL ontologies or
  - SKOS-ified datasets;
- Such datasets are usually available
  - as data dumps or
  - through SPARQL endpoints.

A. Trend: Publishing KOS as LOD



- Many KOS schemes have been turned into
  - OWL ontologies or
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  - as data dumps or
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http://vocabularies.unesco.org/sparql-form/
Image captured 2019-05-14

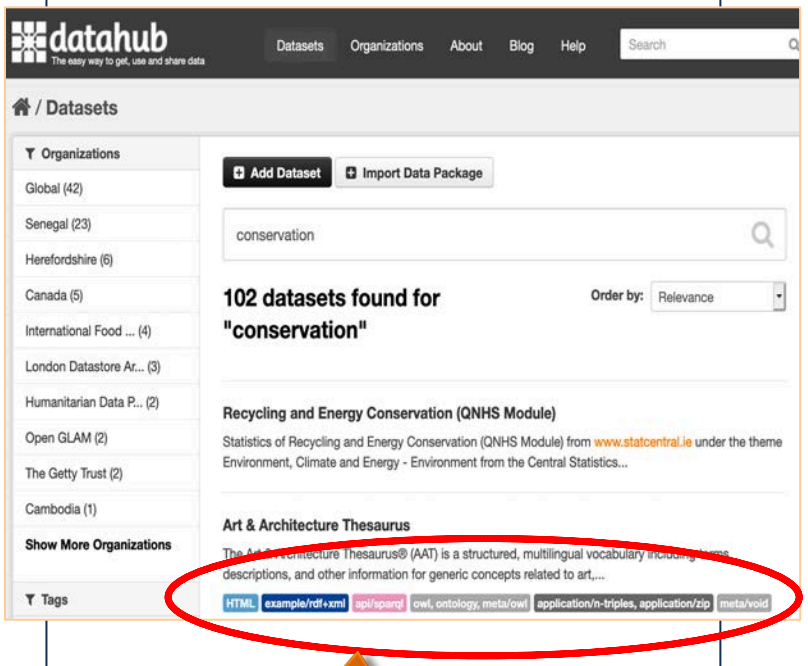
LOD KOS in the Datahub -Examples

General-purpose KOS

- Library of Congress Subject Headings (LCSH)
- EuroVoc
- Faceted Application of Subject Terminology (FAST)
- Universal Decimal Classification (UDC) Summary
- Library of Congress Classification;
- National Diet Library of Japan subject headings

Name-authority types of KOS

- Getty Thesaurus of Geographic Names (TGN)
- Union List of Artist Names (ULAN)
- FAO geopolitical ontology
- VIAF (Virtual International Authority File)
- & several national library's name authorities



Available in various formats

Standardized domain KOS

- AGROVOC
- Art and Architecture Thesaurus (AAT)
- ICONCLASS - Multilingual Thematic Classification
- English Heritage Monument Types Thesaurus & a series of thesauri for cultural heritage
- Medical Subject Headings (MeSH)
- Gene Ontology
- STW Thesaurus for Economics
- & dozens for biomedicine

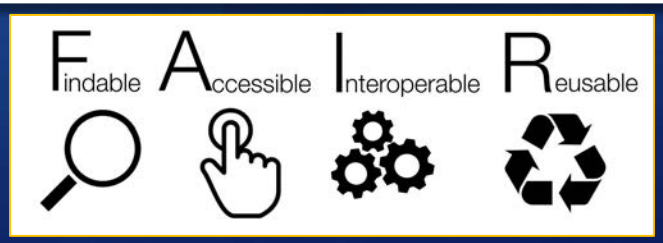
Language- and culture-specific KOS

- Traditional Korean Medicine Ontology
- Art and Architecture Thesaurus-Taiwan
- National Diet Library of Japan (NDL) Authorities
- & more

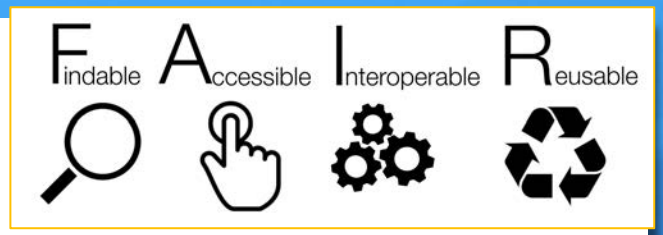
B. Metrics development for LOD KOS

a) -- as an open dataset -- FAIR

b) -- as a KOS vocabulary



a).-- as an open dataset



➢ Following the FAIR Principle

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

FINDABLE

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

ACCESSIBLE

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

INTEROPERABLE

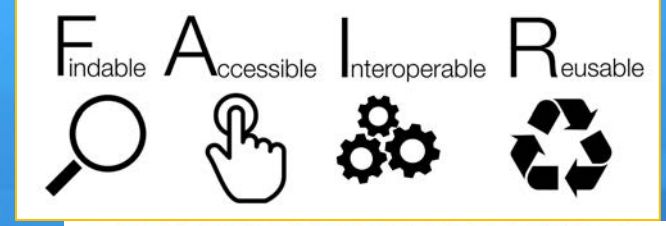
Data and collections have a clear usage licenses and provide accurate information on provenance.

REUSABLE

Image source: LIBER Europe: [Implementing FAIR Data Principles - The Role of Libraries](https://en.wikipedia.org/wiki/FAIR_data)

https://en.wikipedia.org/wiki/FAIR_data

LOD KOS' FAIR: **F**indable



Findable

F1. (Meta)data are assigned a globally unique and persistent identifier

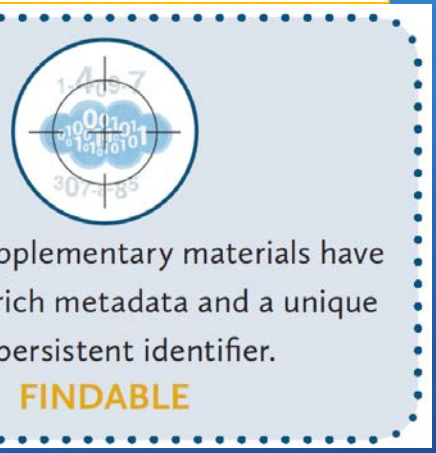
F2. Data are described with rich metadata (defined by R1 below)

F3. Metadata clearly and explicitly include the identifier of the data they describe

F4. (Meta)data are registered or indexed in a searchable resource

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

Examples from the datahub:
– Various levels of F[indable]

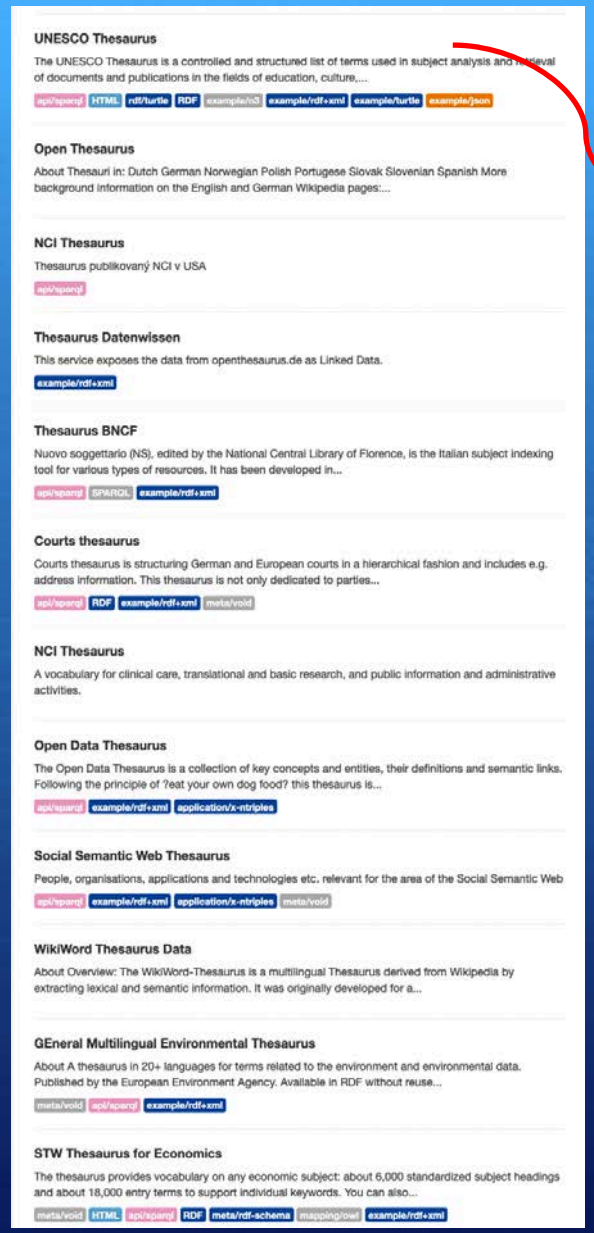


Additional Info
Field
Source
Author
Maintainer
Version
Last Updated
Created
Languages

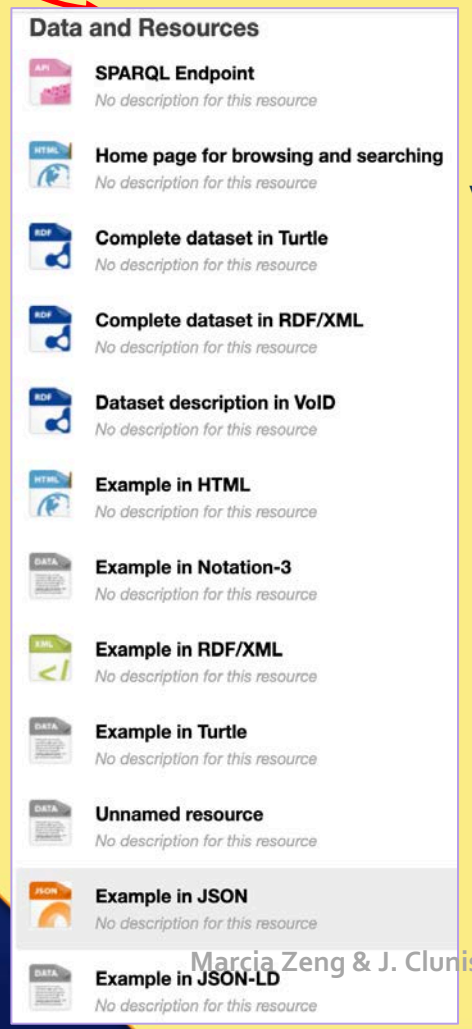
vs.

Additional Info
Field
Source
Last Updated
Created

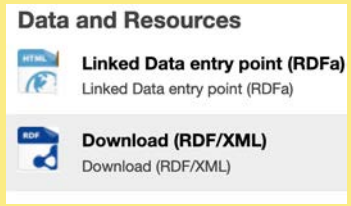
LOD KOS' FAIR: **A**ccessible

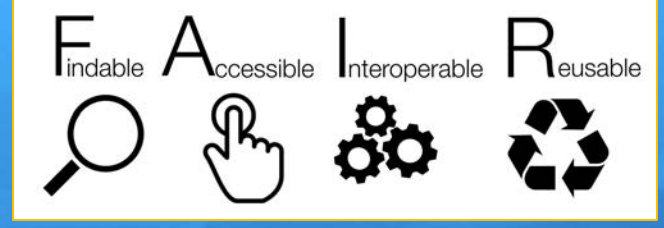


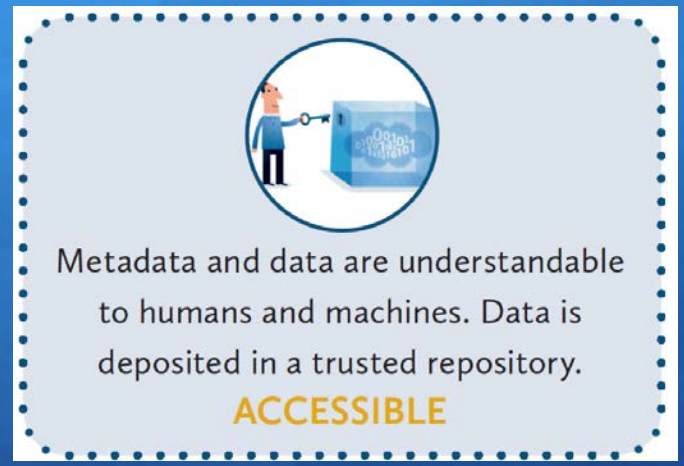
Examples from the datahub:
– Various levels of A[ccessible]



vs.







Accessible

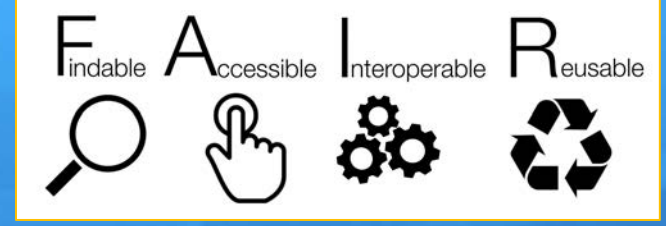
A1. (Meta)data are retrievable by their identifier using a standardised communications protocol

- 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/

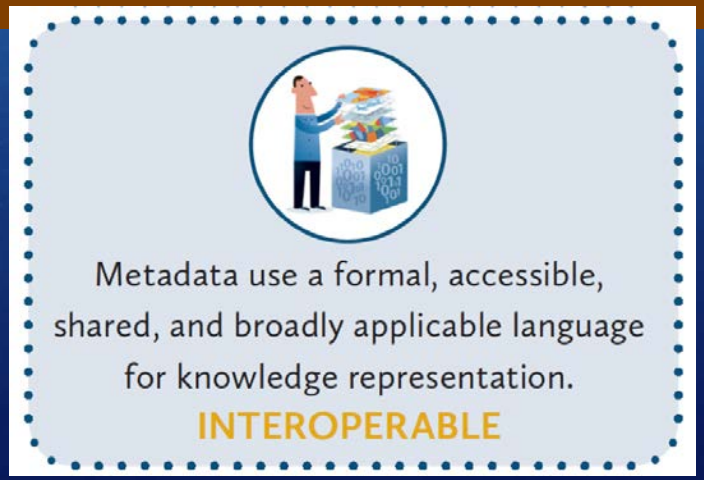
LOD KOS' FAIR: Interoperable



Interoperable

I1. (Meta)data use a formal, accessible, shared, and broadly applicable language for knowledge representation.
I2. (Meta)data use vocabularies that follow FAIR principles
I3. (Meta)data include qualified references to other (meta)data

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



Preliminary study findings:

- (Meta)data that have been used in describing the vocabularies vary at different registries.
- The way of categorizing the vocabulary type in the datahub is unstandardized, even though the terms to use are suggested.

Search **Type of KOS/DATASET**	**# found (initial)**	**# found (verified)**
Authority Files	164	18
List	825	71
Terminology	39	35
Thesaurus	80	91*
Taxonomy	37	22
Classification	478	43
**Ontology	531	266
Totals	1623 (+531 ontologies)	280 (+ 266 ontologies)

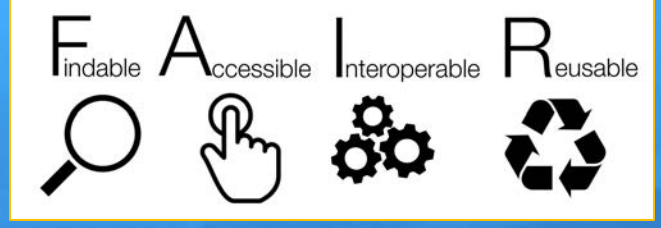
LOD KOS' FAIR: **R**eusable

Reusable

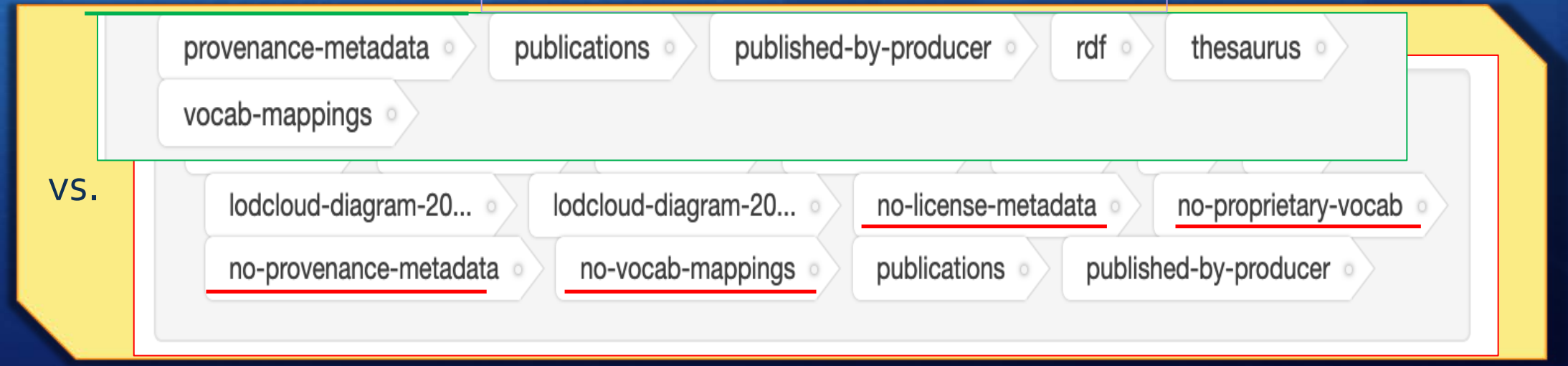
R1. Meta(data) are richly described with a plurality of accurate and relevant attributes

- 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

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



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



B. Metrics development for LOD KOS

a) -- as an open dataset -- FAIR

b) -- as a KOS vocabulary -- FIT

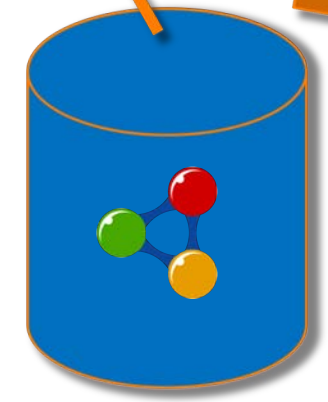
Functional
Impactful
Transformable

b) -- as a value vocabulary

KOS vocabularies in the Datahub -Examples

SPARQL

DUMP



- **General-purpose KOS**
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  - Faceted Application of Subject Terminology
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  - Library of Congress Classification
  - National Diet Library of Japan subject Headings

- **Name-authority types of KOS**
  - Getty Thesaurus of Geographic Names (TGN)
  - Union List of Artist Names
  - VIAF (Virtual International Authority File)
  - and several national library's name authorities
  - FAO geopolitical ontology

- **Standardized domain KOS**
  - AGROVOC
  - Great! Thesaurus for Economics
  - Art and Architecture Thesaurus (AAT)
  - ICONCLASS - Multilingual Thematic Class
  - However
  - English Heritage Monument Type Thes a se
  - Med
  - Gen
  - and
- **Languag**
  - Trad
  - Art a
  - Nati Auth

They need to be explored through RDF delivery services ➔

Delivering the [whole] KOS vocabularies

Asset

EuroVoc

Thesaurus

URI: http://publications.europa.eu/resource/dataset/eurovoc

About | Browse content | Documentation | Links | Releases | SKOS

EuroVoc is a multilingual, multidisciplinary thesaurus covering the activities of the
particular. It contains terms in 23 EU languages (Bulgarian, Croatian, Czech, Danis
French, German, Greek, Hungarian, Italian, Latvian, Lithuanian, Maltese, Polish, Po
Slovenian, Spanish and Swedish), plus in three languages of countries which are ca
македонски (mk), shqip (sq) and српски (sr).

ID: EuroVoc

Version: 20190329-1 LATEST

Published: 2019-03-29

Author: Publications Office

Publisher: Publications Of

DUMP

Downloads

- EuroVoc_Excel_export.zip
- EuroVoc_MarcXML.zip
- eurovoc_skos.zip
- eurovoc_in_skos_core_concepts.zip
- eurovoc_skos_ap.zip
- eurovoc-skos-ap-act.rdf
- at-eurovoc-v3.xsd
- eurovoc_xml.zip

Alignments

- EuroVoc Alignment Rameau
- EuroVoc Alignment UMTHES
- EuroVoc Alignment Inspire
- EuroVoc Alignment ESCO
- EuroVoc Alignment Eclas
- EuroVoc Alignment Gemet

https://publications.europa.eu/en/web/eu-vocabularies/th-dataset/-/resource/dataset/eurovoc

- Example

EU Vocabularies

EUROPA › Publications Office of the EU › EU Vocabularies › linked-data

Home | Controlled vocabularies | Models | Business collections | Releases

Linked data query wizard

Select scope | Select metadata | Define conditions | Cu

SELECT

Pref Label

WHERE

Pref Label

PREV

Query results

SPARQL

SORT BY

RESULTS: 10

START FROM: 0

Save to my searches | Edit in FLINT | Execute

Linked data

New | Edit | View | Help | Save

Mode: SPARQL 1.0 | Output: Plain text

Query 1

```
1  PREFIX cdm:<http://publications.europa.eu/ontology/cdm#>
2  SELECT DISTINCT
3  ?SKOS_definition
4  ?SKOS_prefLabel
5  WHERE{
6  ?work a skos:Concept.
7  OPTIONAL{?work skos:prefLabel ?SKOS_prefLabel}.
8  OPTIONAL{?work skos:definition ?SKOS_definition}.
9  OPTIONAL{?work skos:altLabel ?SKOS_altLabel}.
10 FILTER(?SKOS_prefLabel="rice" OR ?SKOS_altLabel="rice")
11 }
12 LIMIT 10
13 OFFSET 0
```

Line: 1; Position: 1; Query is valid

Query Results

https://publications.europa.eu/en/advanced-sparql-query-editor

B. **Metrics for LOD KOS**

b) -- as a value vocabulary

Functional

Functional

Made available in ways that enhance their inherent purpose.

F1. Delivered in *consumable* formats

- **Available in various data serialization formats**
- **Accessible through SPARQL endpoints**

F2. Endpoints are *operational*

- **Ensures sustainability**

F3. Dataset properties and structures are *informed* effectively

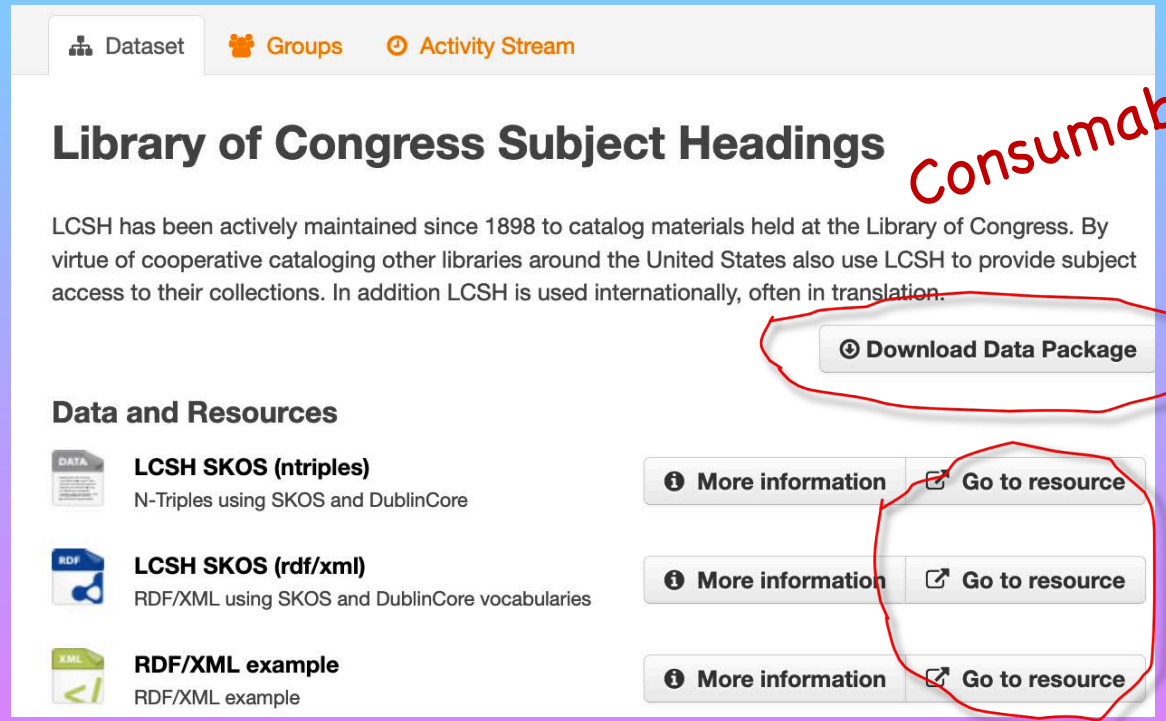
- **Contains refined query examples to reveal the internal structures.**

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

- **Enhanced *usability (user friendliness)* through default or example queries for data exploration.**

F1. Exposed to users in *consumable* formats

- Available in various data serialization formats



Consumable?

Offering various serializations make data more likely to be FIT (functional, impactful and transformable.)

Findings based on data from datahub: **Functional**

Format	2016	2017	2019
json	54	42	75
html	47	37	72
xml	55	42	70
tsv	44	30	64
rdf+xml	40	30	62
default/auto	37	27	51
turtle	30	26	40
csv	34	20	40
n-triples	26	18	37
javascript	23	11	32
spreadsheet	22	3	31
plain/text	20	21	28
query structure	15	15	23
Serialized PHP	15	15	22
ASCII			3
Raw Response			3
Pivot Table			2
Google Chart			2
json-ld		3	1
sqLite Database		1	1

Functional

- **Accessible through SPARQL**

with **SPARQL Endpoints**

In addition to **data dumps** …

2016

Search Type of KOS/DATASET	# found	# with SPARQL endpoints
Thesaurus	67	39
Classification	458	29
Taxonomy	26	8
Terminology	35	7
List	665	52
Total	**1251**	**135**

2017

Search Type of KOS/DATASET	# found	# with SPARQL endpoints
Thesaurus	79	40
Classification	476	31
Taxonomy	35	8
Terminology	39	8
List	821	58
Total	**1450**	**145**

2019

Search Type of KOS/DATASET	**# found**	**# with SPARQL endpoints**
Authority File	164	11
Thesaurus	80	41
Classification	478	31
Taxonomy	37	10
Terminology	39	8
List	825	59
Total	**1623**	**160**

- Data collected from datahub

Functional

F2. Endpoints are *operational* .

Findings (2019): Near 80% are operational.

Reality check

after removing duplicates and not including ontologies.

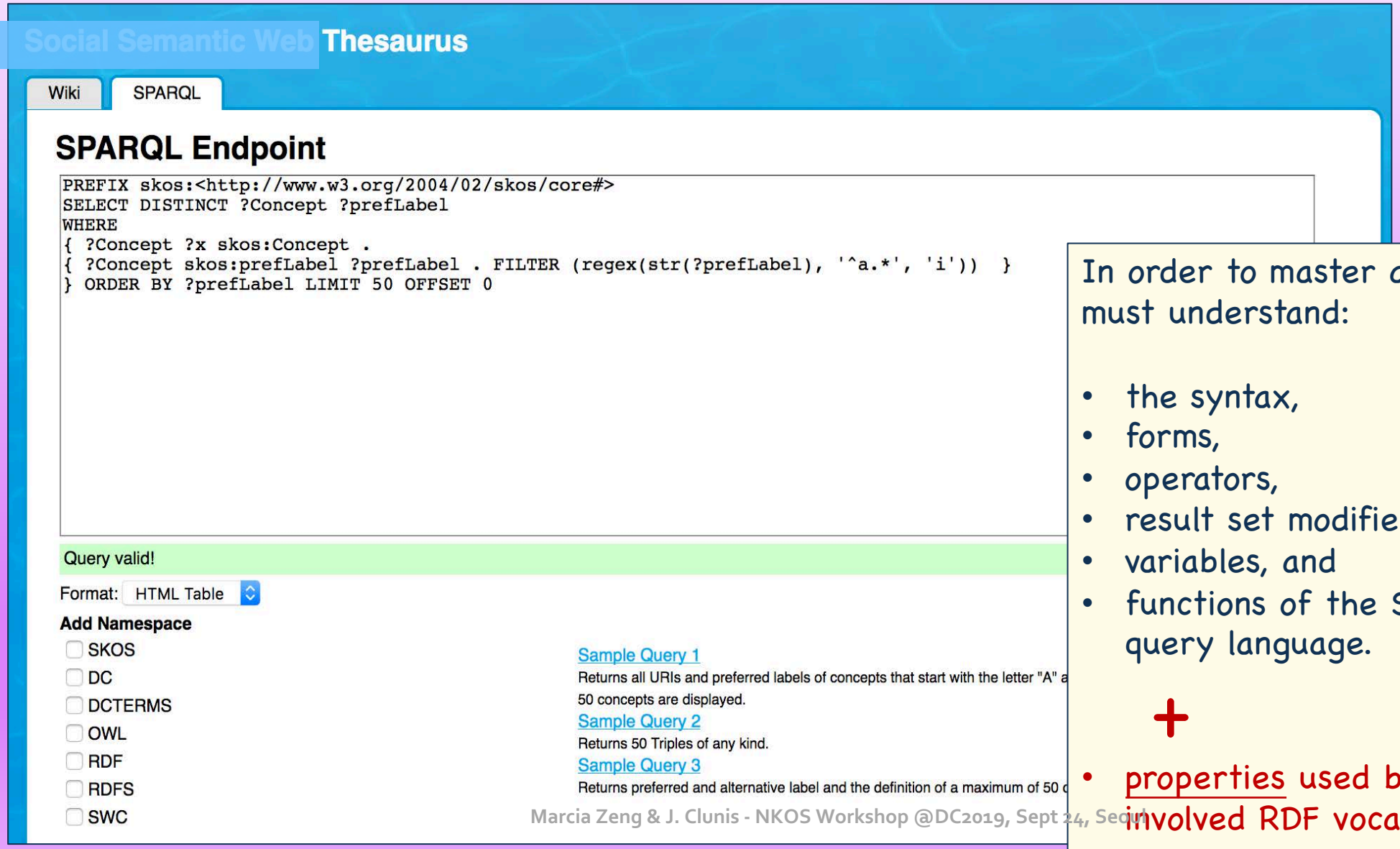
Number of Non-Functioning SPARQL endpoints

Year	Checked	Not available
2019	**171**	83
2017	117	63
2016	127	29

Ensures sustainability!

F3. Dataset properties and structures are *informed* effectively.

Functional



In order to master a query, one must understand:

- the syntax,
- forms,
- operators,
- result set modifiers,
- variables, and
- functions of the SPARQL query language.

+

- properties used by various involved RDF vocabularies

(cont.)F3. Dataset properties and structures are *informed* effectively.

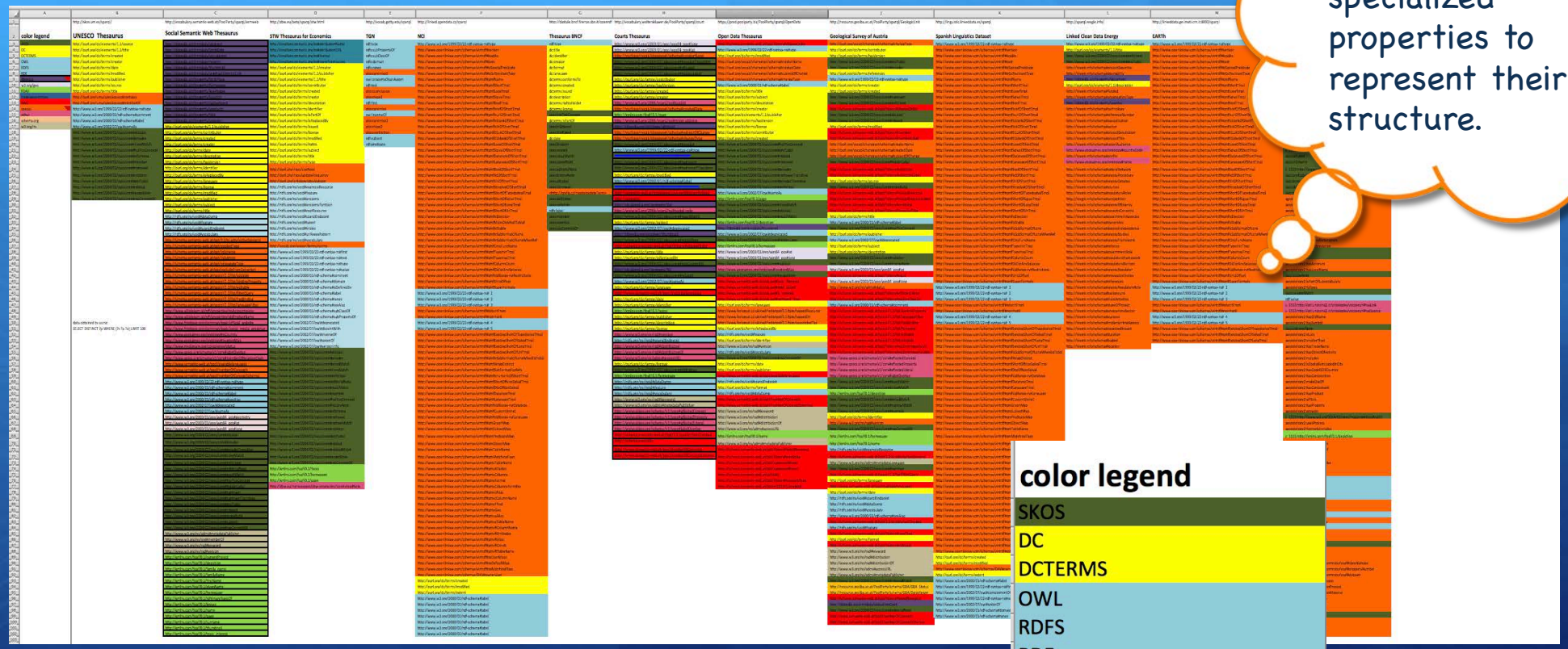
Reality check

	A	B
1		http://skos.um.es/sparql/
2	**color legend**	**UNESCO Thesaurus**
3	SKOS	http://purl.org/dc/elements/1.1/source
4	DC	http://purl.org/dc/elements/1.1/title
5	DCTERMS	http://purl.org/dc/terms/created
6	OWL	http://purl.org/dc/terms/creator
7	RDFS	http://purl.org/dc/terms/date
8	RDF	http://purl.org/dc/terms/modified
9	dbpedia	http://purl.org/dc/terms/publisher
10	w3.org/geo	http://purl.org/dc/terms/source
11	FOAF	http://purl.org/dc/terms/title
12	creativecommons	http://purl.org/umu/uneskosvoc#contains
13	SWC	http://purl.org/umu/uneskosvoc#memberOf
14	special	http://www.w3.org/1999/02/22-rdf-syntax-ns#type
15	other	http://www.w3.org/2000/01/rdf-schema#comment
16	schema.org	http://www.w3.org/2000/01/rdf-schema#label
17	w3.org/ns	http://www.w3.org/2002/07/owl#sameAs
18		http://www.w3.org/2004/02/skos/core#altLabel
19		http://www.w3.org/2004/02/skos/core#broader
20		http://www.w3.org/2004/02/skos/core#closeMatch
21		http://www.w3.org/2004/02/skos/core#hasTopConcept
22		http://www.w3.org/2004/02/skos/core#inScheme
23		http://www.w3.org/2004/02/skos/core#member
24		http://www.w3.org/2004/02/skos/core#narrower
25		http://www.w3.org/2004/02/skos/core#notation
26		http://www.w3.org/2004/02/skos/core#prefLabel
27		http://www.w3.org/2004/02/skos/core#related
28		http://www.w3.org/2004/02/skos/core#scopeNote
29		http://www.w3.org/2004/02/skos/core#topConceptOf

WHY?
If these thesauri are **similar in structure** and **use similar sets of properties**, I could learn from one, and then apply that knowledge to others when forming the SPARQL queries …

Reality check: For the 82 KOSs which provided SPARQL Endpoints, are they similar in structure and do they use a similar sets of properties?
[Study conducted in **2016**.]

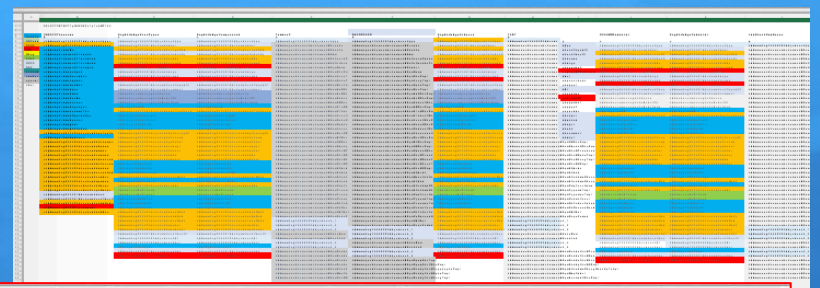
Finding:
The majority have specialized properties to represent their structure.

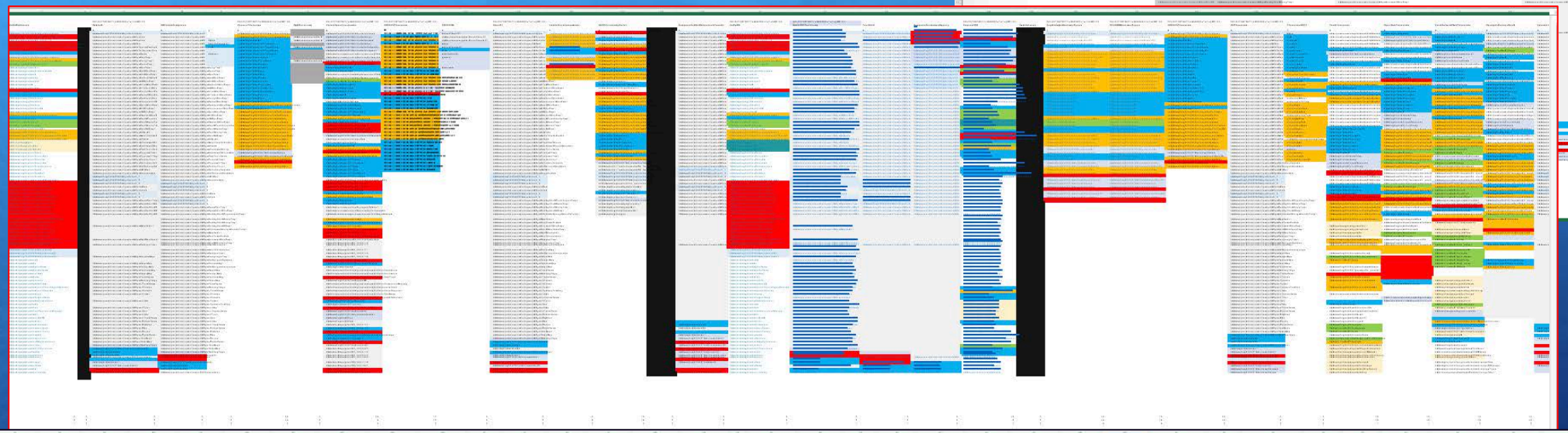


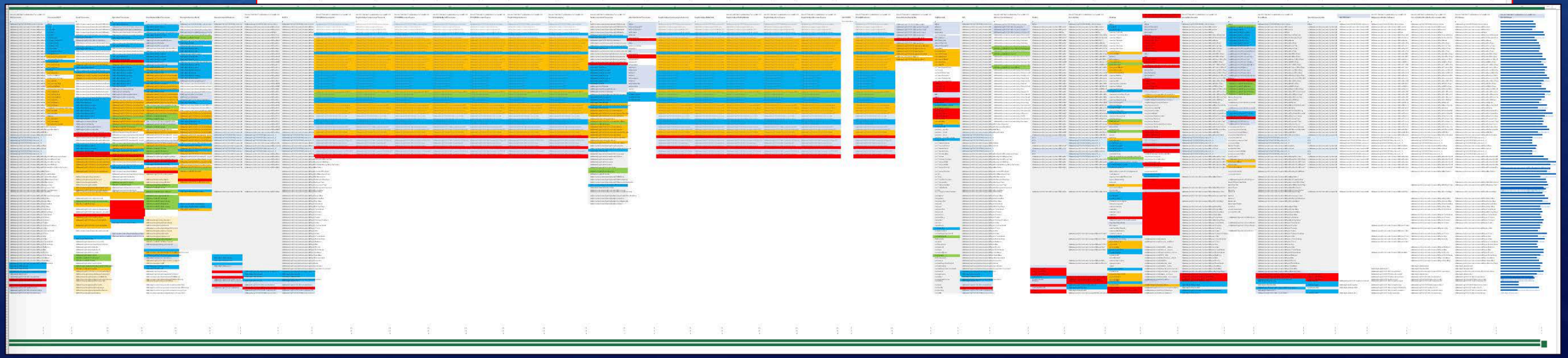
Even if you know how to make a SPARQL query, you still have to know the internal properties and data structures, in order to use them.

Again, reality check: For the KOSs which provided SPARQL Endpoints, are they similar in structure and do they use a similar set of properties?

[Study conducted in **2019**.]







(cont.)F3. Dataset properties and structures are *informed* effectively.

- Contains multiple refined query examples to *inform* knowledge of dataset properties and structures.

- Include at least a basic default query such as SELECT * WHERE ?s ?p? o? LIMIT 100 which would allow users to explore the first 100 triples in the graph.

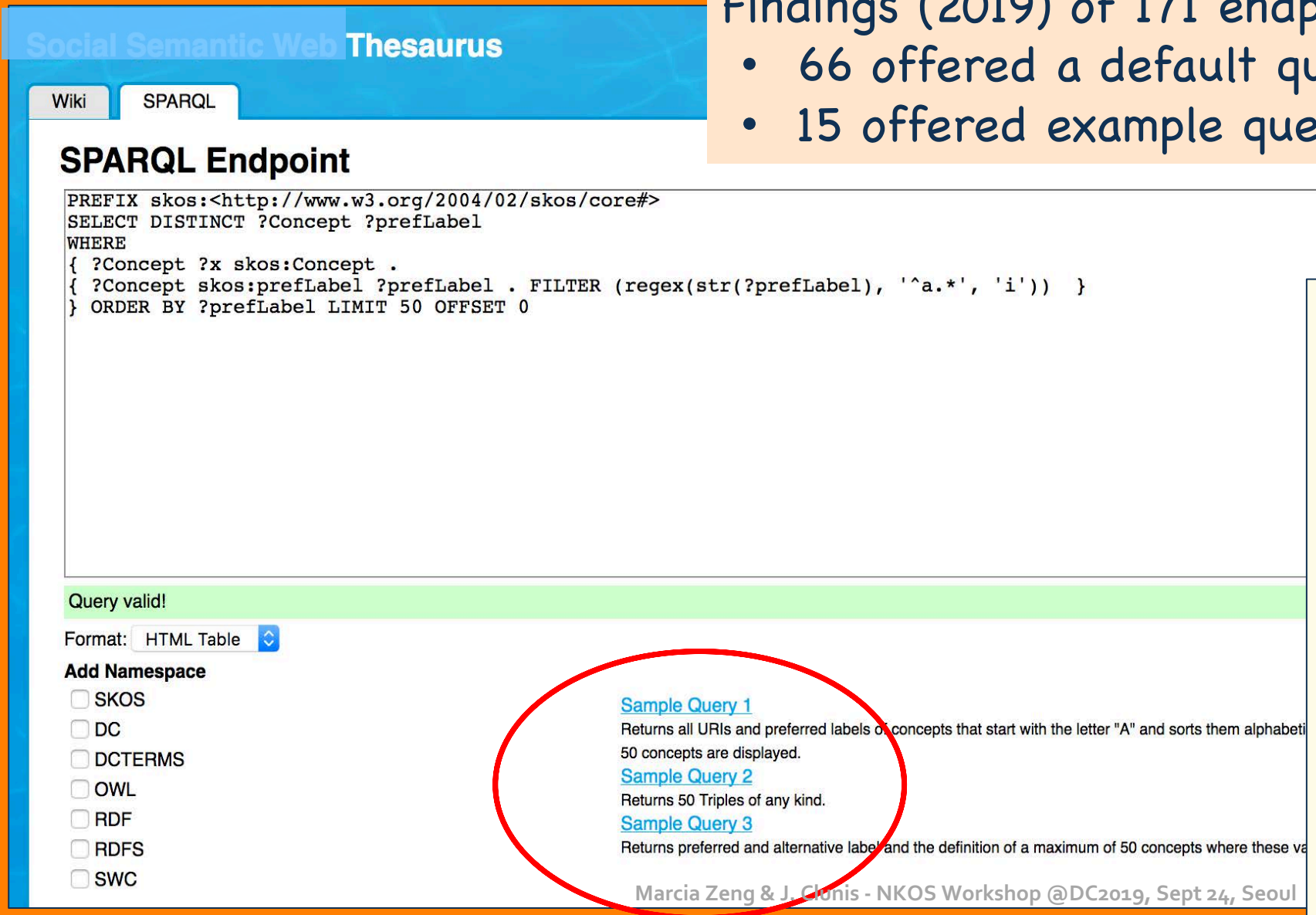
- Include queries to allow users to explore unique features of the dataset.

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

Functional

Findings (2019) of 171 endpoints:

- 66 offered a default query.
- 15 offered example queries of any kind.



In order to master a query, one must understand:

- the syntax,
- forms,
- operators,
- result set modifiers,
- variables, and
- functions of the SPARQL query language.

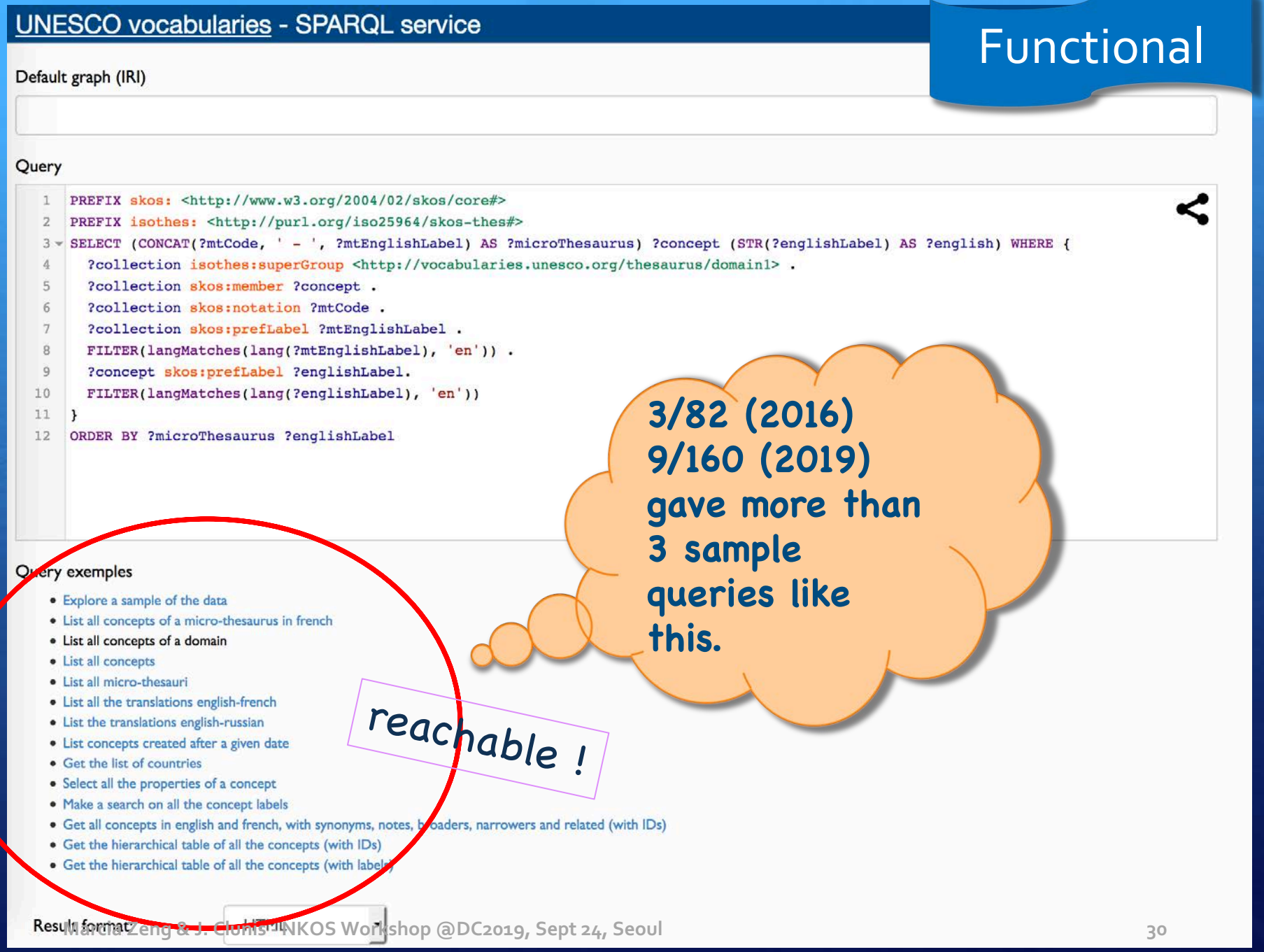
+

- properties used by various involved RDF vocabularies

Functional

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

Enhance *usability (user friendliness)* through default or example queries for data exploration.



B. Metrics development for LOD KOS

a) -- as an open dataset -- PAIR

b) -- as a KOS vocabulary -- FIT

Functional

Impactful

Transformable

-- as a KOS vocabulary

Impactful

Maximizing the impact of a LOD KOS vocabulary

I1. Exposed through terminology services

a) Vocab Registries

b) Vocab Repositories / portals

I2. Used by data providers

a) as a primary value Vocab

b) in semantic enrichment

I3. Mapped with other KOS vocabularies

I4. Showed/discussed at professional conferences and publications

I1. Exposed through terminology services

Impactful

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

a. **Registry of KOS**

- BARTOC (Basel Register of Thesauri, Ontologies & Classifications): 2900+ https://bartoc.org/
- Taxonomy warehouse http://www.taxonomywarehouse.com/default.aspx
- Taxobank: 2000 vocabularies http://www.taxobank.org/

b. **Registry of LOD vocabularies ("property vocabularies" & "value vocabularies")**

- E.g., LOV (Linked Open Vocabularies) http://lov.okfn.org/dataset/lov :
  - 600+ registered, some are value vocabularies.

c. 3) **Registry of LOD products, including KOS**

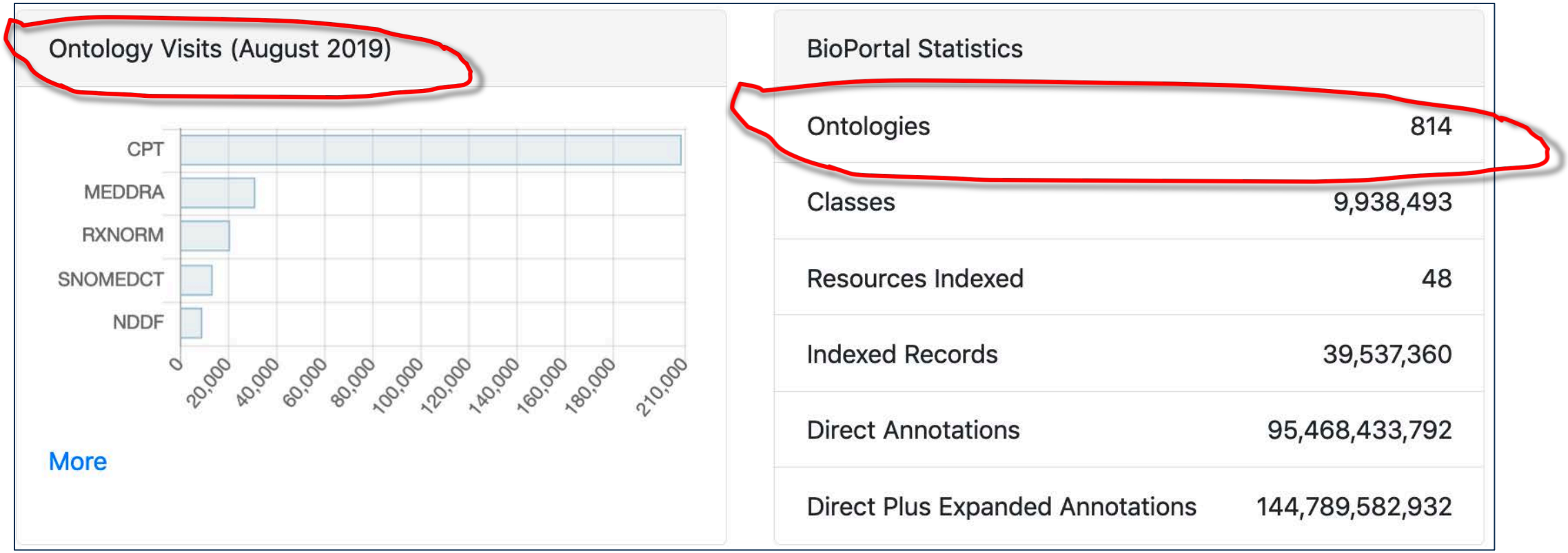
- DataHub https://datahub.io/

I1. Exposed through terminology services

b) Vocabulary repositories - Hosting & managing; updated regularly

BioPortal

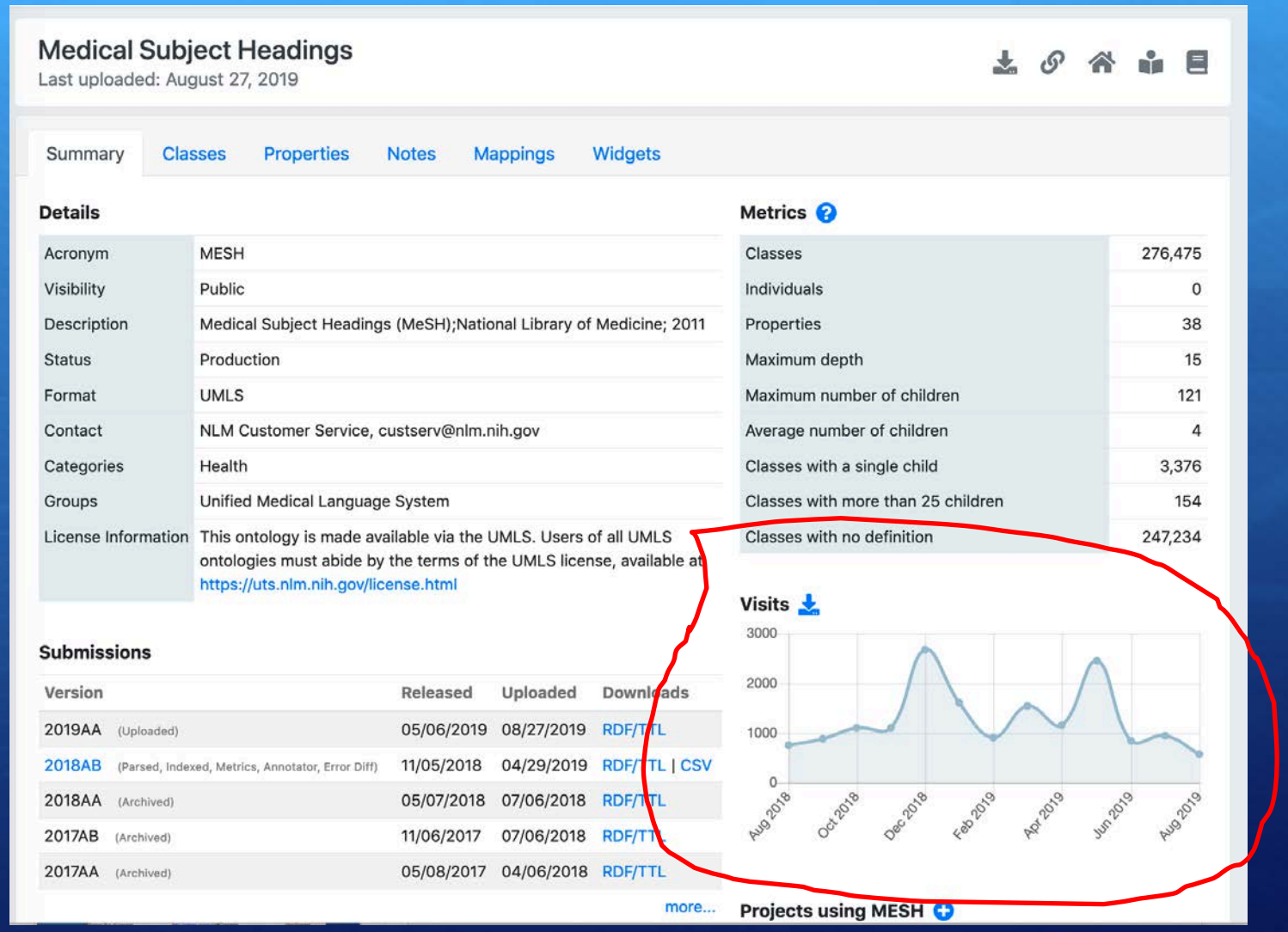
2019-09-10 data



A domain-oriented portal, revealing the impacts

I2. Used by data providers

a) as a primary value vocabulary



Medical Subject Headings

Last uploaded: August 27, 2019

Summary | Classes | Properties | Notes | Mappings | Widgets

Details

Acronym	MESH
Visibility	Public
Description	Medical Subject Headings (MeSH);National Library of Medicine; 2011
Status	Production
Format	UMLS
Contact	NLM Customer Service, custserv@nlm.nih.gov
Categories	Health
Groups	Unified Medical Language System
License Information	This ontology is made available via the UMLS. Users of all UMLS ontologies must abide by the terms of the UMLS license, available at https://uts.nlm.nih.gov/license.html

Metrics

Classes	276,475
Individuals	0
Properties	38
Maximum depth	15
Maximum number of children	121
Average number of children	4
Classes with a single child	3,376
Classes with more than 25 children	154
Classes with no definition	247,234

Visits

Submissions

Version	Released	Uploaded	Downloads
2019AA (Uploaded)	05/06/2019	08/27/2019	RDF/TTL
2018AB (Parsed, Indexed, Metrics, Annotator, Error Diff)	11/05/2018	04/29/2019	RDF/TTL | CSV
2018AA (Archived)	05/07/2018	07/06/2018	RDF/TTL
2017AB (Archived)	11/06/2017	07/06/2018	RDF/TTL
2017AA (Archived)	05/08/2017	04/06/2018	RDF/TTL

more...

Projects using MESH

Projects using MESH

- ARRS GoldMiner
- Biomedical Semantic QA
- Cell line ontology
- DisGeNET-RDF
- eagle-i
- Epidemic Marketplace
- Kino
- Lexigram
- Neuronal Morphologies and Species Metadata Classification System
- Plant Ontology
- PubChem
- Retrospective Analytics System
- Semantic Indexing of French Biomedical Data Resources
- Socrates MD
- The Ontological Discovery Environment

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

I2. Used by data providers
b) in semantic enrichment

Europeana enriches … by aligning to (xxx)

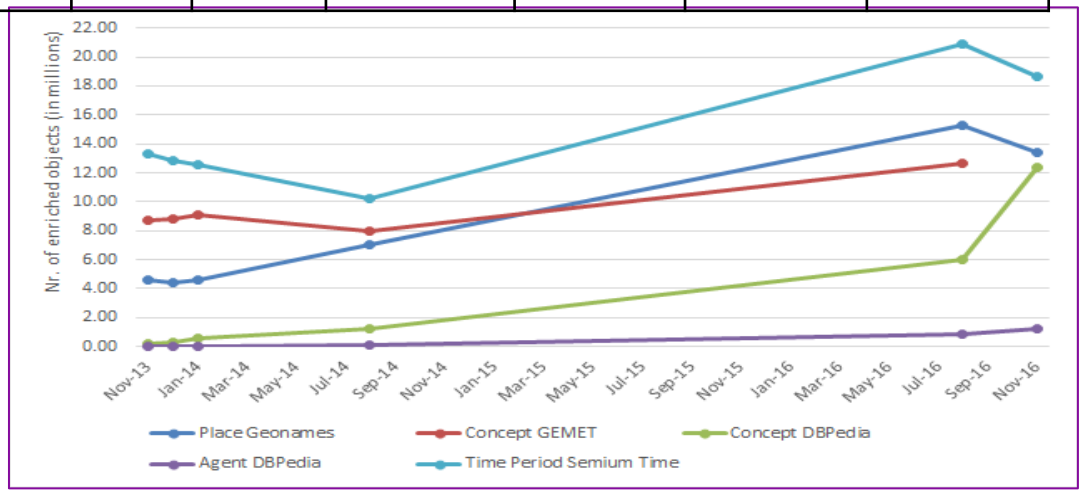
- places (GeoNames),
- agent names (Dbpedia),
- concepts (GEMET, Dbpedia), and
- time period (Semium Time).

-- relate Objects to concepts, agents, places, etc., using the properties in EDM (e.g., *dc:subject*, *dc:creator*).

Results obtained with the semantic enrichment

Table 3. Quantitative overview of the results obtained with the semantic enrichment.

Type	Nov-13	Dec-13	Jan-14	Aug-14	Aug-16	Nov-16	April-18	June-19
Place	4.6M	4.4M	4.6M	7,0M	15,269,339	13,449,346	13,684,525	14,019,045
Concept	8.9M	9.1M	9.7M	9,2M	12,633,522	12,367,496	13,275,736	15,734,342
Agent	12K	34K	44K	144K	889,152	1,228,862	1,400,248	1,309,614
Time Period	13.3M	12.8M	12.6M	10,2M	20,925,367	18,607,930	18,786,476	17,406,100



- Source: Europeana Semantic Enrichment Framework *Documentation*, Available from https://pro.europeana.eu/page/europeana-semantic-enrichment

Vocabularies used by Europeana in semantic enrichment

	A	B	C
1	**Vocabulary**	**URL**	**Type of entity**
2	The Getty - Art & Architecture Thesaurus (AAT)	http://vocab.getty.edu/aat/	skos:Concept
3	The Getty - Union List of Artist Names (ULAN)	http://vocab.getty.edu/ulan/	edm:Agent
4	Getty Thesaurus of Geographic Names (TGN)	http://vocab.getty.edu/tgn/	edm:Place
5	Virtual International Authority File (VIAF)	http://viaf.org/viaf/	edm:Agent
6	Geonames	http://sws.geonames.org/	edm:Place
7	IconClass	http://iconclass.org/	skos:Concept
8	Gemeinsame Normdatei (GND)	http://d-nb.info/gnd	edm:Agent, edm:Place, skos:Concept
9	Israel Museum Jerusalem Concepts	http://www.imj.org.il/imagine/thesaurus/objects/	skos:Concept
10	data.europeana.eu WWI Concepts from Library of Congress Subject Headings (LCSH)	http://data.europeana.eu/concept/loc	skos:Concept
11	Europeana Sounds Genres	http://data.europeana.eu/concept/soundgenres/	skos:Concept
12	UDC	http://udcdata.info/rdf/	skos:Concept
13	UNESCO Thesaurus	http://vocabularies.unesco.org/thesaurus/	

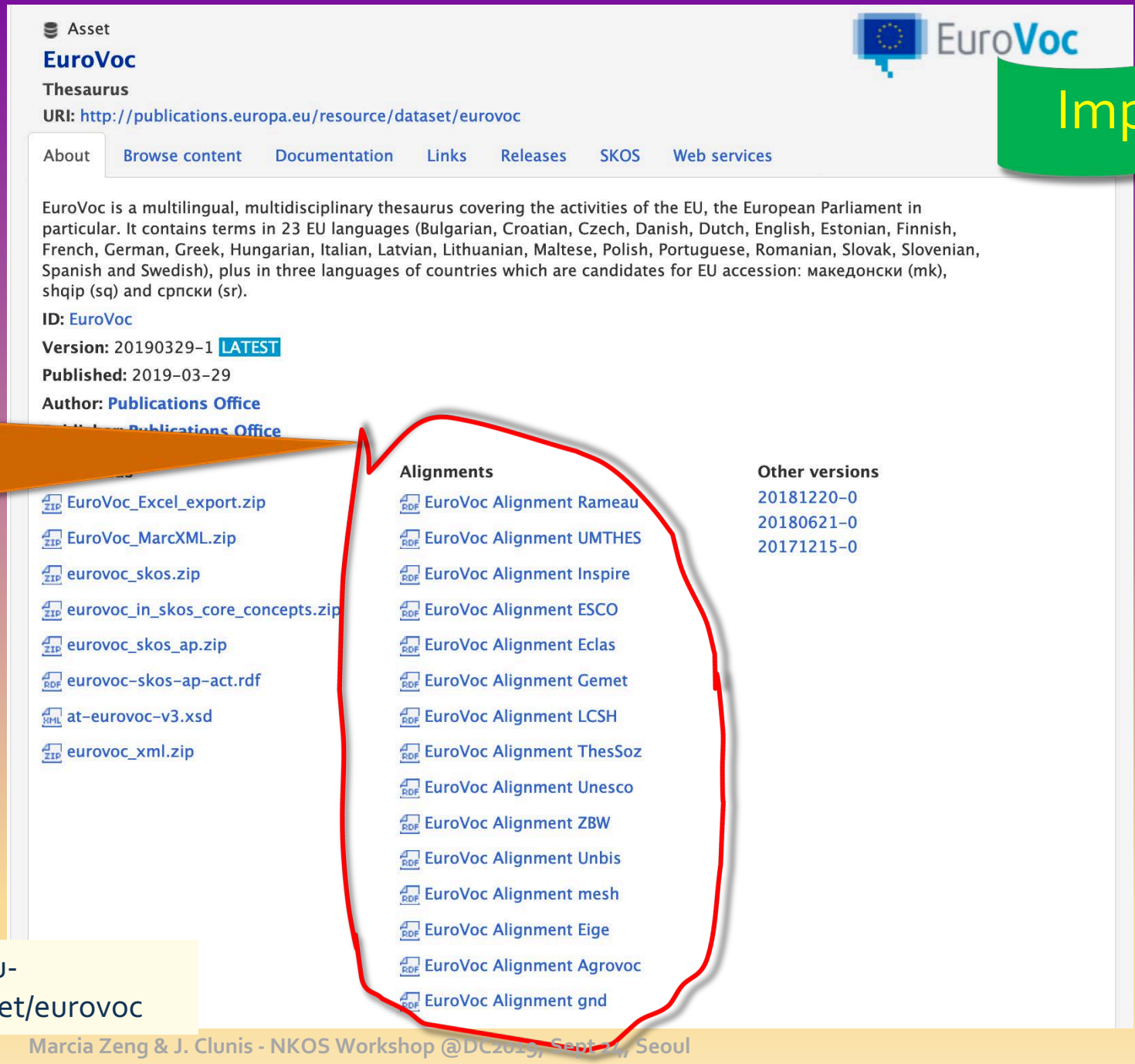
Europeana semantic enrichment (https://pro.europeana.eu/page/europeana-semantic-enrichment) -- link to several vocabularies , captured 2019.9.

I3. Mapped with other KOSs

Impactful

Alignments require **interoperability** in **syntax** & **structure**

Interoperable



https://publications.europa.eu/en/web/eu-vocabularies/th-dataset/-/resource/dataset/eurovoc

The figure shows two AGROVOC concepts linked by the property skos:broader (hierarchical relation), each with an SKOS-XL label.

Example
syntax
&
structure

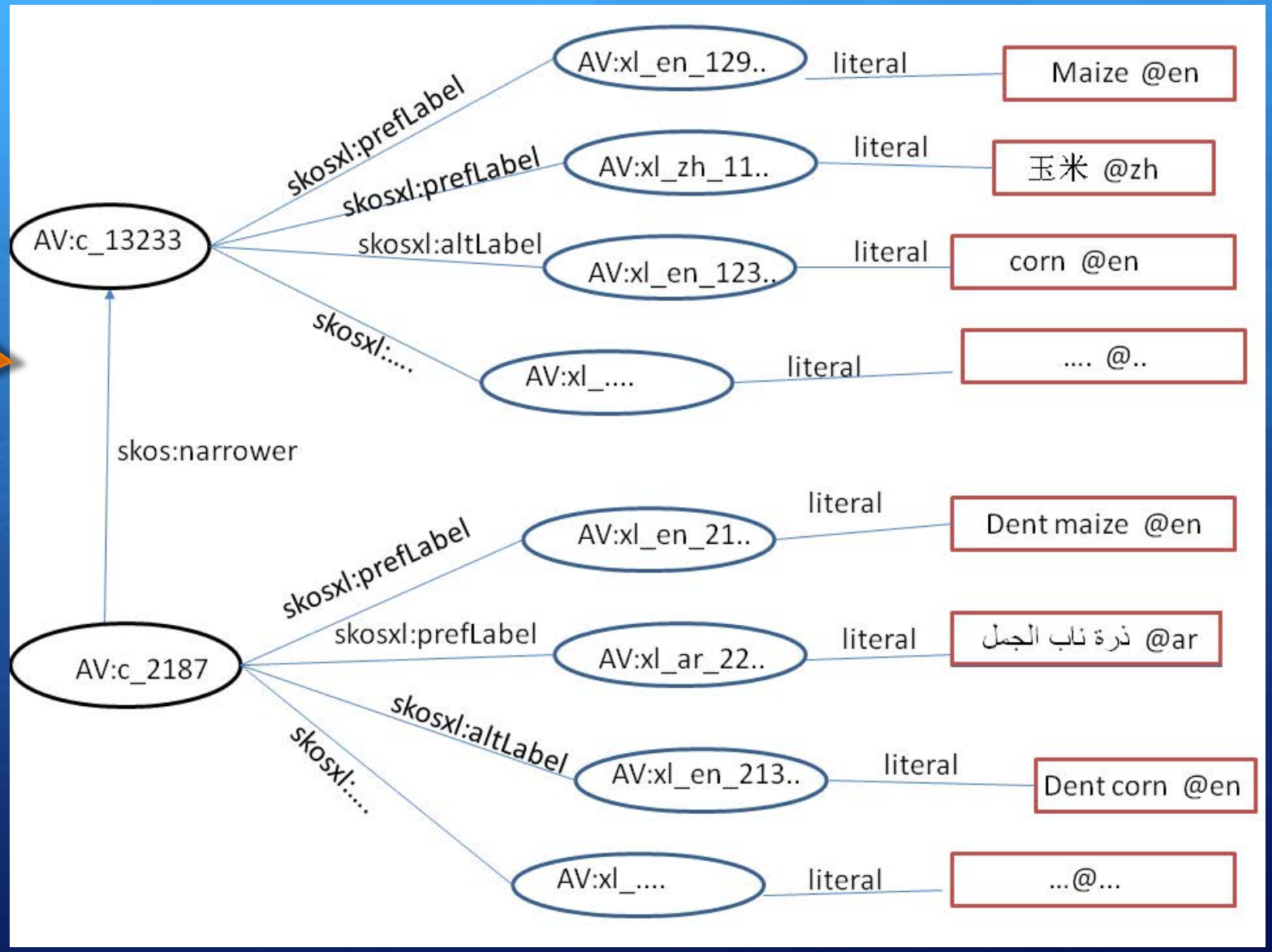


Image source: http://aims.fao.org/standards/agrovoc/concept-scheme

AGROVOC Linked Open Data

	Resource	Topics	Total # of Linked concepts	Languages	Linked Resource available as LOD?	Type of link (and # of linked concepts)
1	Aquatic Sciences and Fisheries Abstracts (ASFA): Thesaurus	Fisheries	1784		Yes	skos:closeMatch (38), skosLexactMatch (1741)
2	Biotechnology Glossary (FAO)	Biotechnologies	793	EN, ES, FR, +3 more	Yes	skos:closeMatch (793)
3	Chinese Agricultural Thesaurus (CAT)	Agriculture	up to 20700		Yes	skos:narrowMatch (137) skos:broadMatch (10153) skos:exactMatch (10325)
4	DBpedia	General	11013	EN, ES, FR + 8 more	Yes	skos:closeMatch (11013)
5	Dewey Decimal Classification (DDC)	General	401	EN, ES, FR + 8 more	Yes	skos:closeMatch (2) skos:exactMatch (399)
6	EUROVOC	General EU	1 269	EN, ES, FR + 21 more	Yes	skos:exactMatch (1269)
7	GEMET	Environment	1 185	EN, ES, FR + 30 more	Yes	skos:exactMatch (1185)
8	GeoNames	Geographical entities	206	EN, ES, FR + 63 more	Yes	skos:exactMatch (206)
9	Geopolical Ontology	Geopolitical entities	253	AR, CH, EN, ES, FR, RU	Yes	skos:exactMatch (253)
10	Library of Congress Subject Headings (LCSH)	General	1 079	EN	Yes	skos:exactMatch (1079)
11	NALThesaurus	Agriculture	13705	EN, ES	Yes	skos:exactMatch (13703) skos:closeMatch (2)
12	RAMEAU Répertoire d'autorité-matière encyclopedique et alphabetique unifie	General	671	FR	Yes	skos:exactMatch (671)
13	STW - Thesaurus for Economics	Economy	1125	EN, DE	Yes	skos:exactMatch (1122) skos:closeMatch (3)
14	TheSoz - Thesaurus for the Social Sciences	Social sciences	827	EN, DE	Yes	skos:exactMatch (821) skos:closeMatch (6)
15	SWD (Schlagwortnormdatei)	General	6245	DE	Yes	skos:exactMatch skos:closeMatch skos:broadMatch skos:narrowMatch
16	Environmental Applications Refe Thes	Environment	1385	EN+	Yes	skos:exactMatch (1385)

http://aims.fao.org/standards/agrovoc/linked-data

ZBW Leibniz-Informationszentrum Wirtschaft
Leibniz Information Centre for Economics

RDF/XML RDF/Turtle

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STW Relaunch
Alphabetical descriptor list
Mappings
Versions
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- B Business economics
- W Economic sectors
- P Commodities
- N Related subject areas
- G Geographic names
- A General descriptors

STW Thesaurus for Economics

STW Mappings

Here you find mappings to other thesauri and vocabulari
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

STW Thesaurus for Economics (v 9.06, 2018-08-15) ▪ Suggestions and comments to the thesaurus team ▪
Mailing lists: stw-announce, stw-user
ZBW - Leibniz Information Centre for Economics - Imprint

STW Thesaurus for Economics

Mapping AGROVOC

About the Mapping

Description:	Built by an automatic string matching process, verified intellectually by a domain expert (see also http://thedatahub.org/dataset/agrovoc-skos)
Creator:	FAO - Food and Agriculture Organization of the United Nations
Rights:	see http://aims.fao.org/download-agrovoc
Relations:	1027 skos:exactMatch 1 skos:closeMatch
Publisher:	ZBW - Leibniz Information Centre for Economics

Mapping WKD German labor law thesaurus

About the Mapping

Description:	Created by WKD and SWC in course of the LOD2 project and continously 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/norms/odc-by-sa/
Relations:	270 skos:exactMatch
Publisher:	ZBW - Leibniz Information Centre for Economics

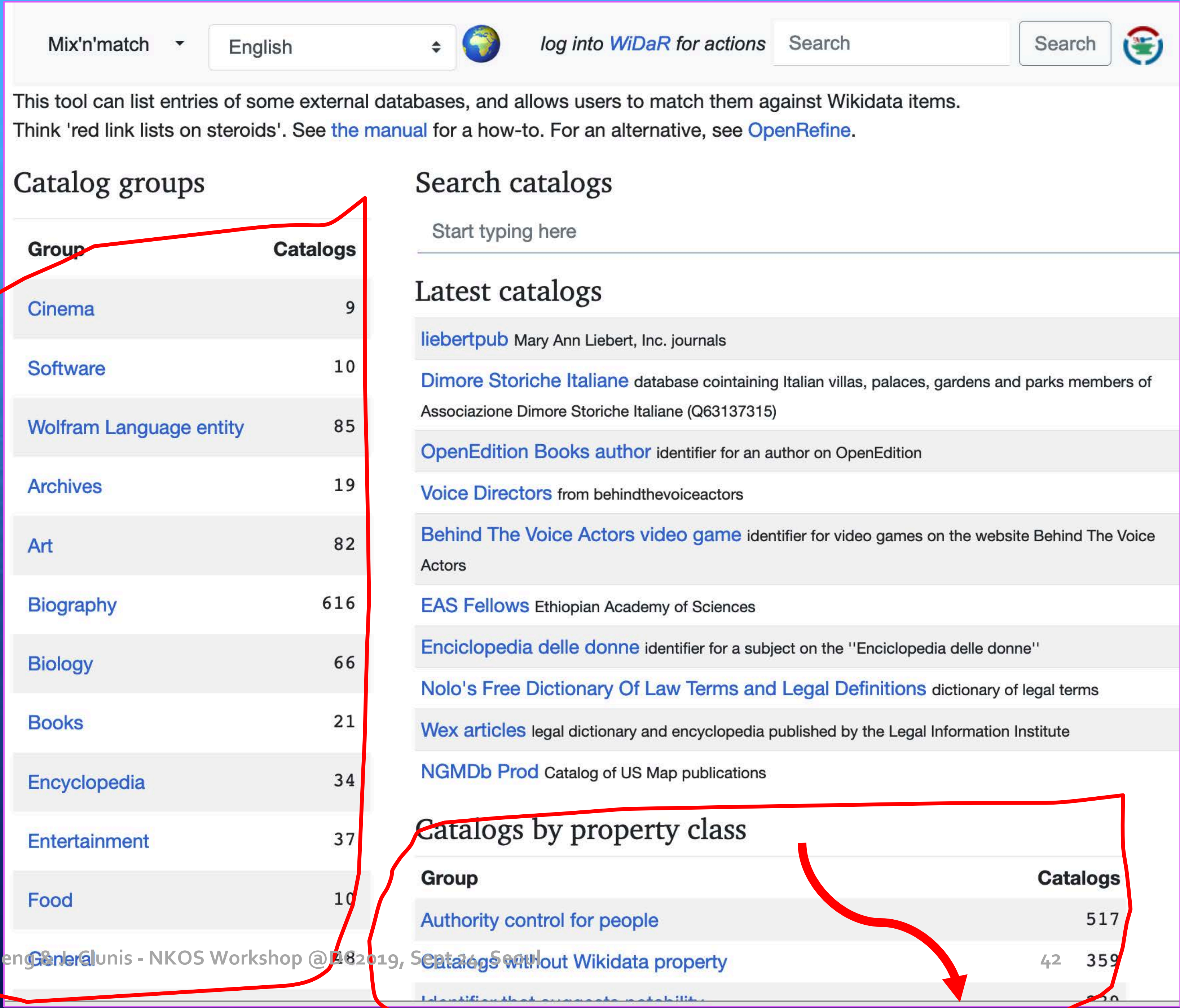
http://zbw.eu/stw/version/latest/mapping/agrovoc/about.en.html

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.

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.

Encyclopedia	34
Entertainment	37
Food	10
General	48
Geography	91
Heritage	61
Infrastructure	19
Journals	64
Language	6
Literature	51
Location	37
Media	70
Medical	24
Organisation	38
Philately	4
Religion	10
Science	46

Catalogs by property class

Group	Catalogs
Authority control for people	517
Catalogs without Wikidata property	359
Identifier that suggests notability	239
Identifier	196
Authority control	102
Software	95
Authority control for places	85
Taxa	75
Films	72
Organisations	66
Authority control for artists	63
Encyclopedias	61
Film industry	59
Identifier that does not imply notability	53
Authority control for works	53
Authority control for writers	53
Video games	48
Sports hall of fame	45
Politics	41
Artworks	37
Medicine	37

Mix'n'Match

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.

I4. Showed/discussed at professional conferences and publications

Impactful

-- as a KOS vocabulary

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

B. Metrics development for LOD KOS

a) -- as an open dataset -- PAIR

b) -- as a KOS vocabulary -- FIT

Functional

Impactful

Transformable

-- as a KOS vocabulary

Transformable

Extends the functionality and impact through innovative adaptations.

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

T3. *Extended* to fit diverse needs, e.g. language and culture

T4. Supports *innovative* transformative uses beyond normal "value vocabularies"

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

Transformable

Top - -down

UNESCO vocabularies - SPARQL service

Default graph (IRI)

Query

```
PREFIX skos: <http://www.w3.org/2004/02/skos/core#> PREFIX isothes: <http://purl.org
/iso25964/skos-thes#> SELECT ?domainNotation (STR(?domainLabel) AS ?domainEnglish)
?mtNotation (STR(?englishLabel) AS ?english) WHERE {
  ?collection a <http://vocabularies.unesco.org/ontology#MicroThesaurus> .
  ?collection isothes:superGroup ?domain .
  ?collection skos:notation ?mtNotation .
```

Query exemples

- Explore a sample of the data
- List all concepts of a micro-thesaurus in french
- List all concepts of a domain
- List all concepts
- List all micro-thesauri
- List all the translations english-french
- List the translations english-russian
- List concepts created after a given date
- Get the list of countries
- Select all the properties of a concept
- Make a search on all the concept labels
- Get all concepts in english and french, with synonyms, notes, broaders, narrowers and related (with IDs)
- Get the hierarchical table of all the concepts (with IDs)
- Get the hierarchical table of all the concepts (with labels)

derivable?

Result format: HTML

HTML
Text
XML
JSON
NTriples
RDF/XML
CSV
TSV

HTML

Run Query Reset

http://vocabularies.unesco.org/sparql-form/
Image captured 2019-08-21

About 100 micro-thesauri can be obtained

Transformable

Top - -down

domainNotation	domainEnglish	mtNotation	english
"1"	"Education"	"1.05"	"Educational sciences and environment"
"1"	"Education"	"1.10"	"Educational policy"
"1"	"Education"	"1.15"	"Educational planning"
"1"	"Education"	"1.20"	"Educational administration"
"1"	"Education"	"1.25"	"Educational management"
"1"	"Education"	"1.30"	"Educational systems and levels"
"1"	"Education"	"1.35"	"Educational institutions"
"1"	"Education"	"1.40"	"Curriculum"
"1"	"Education"	"1.45"	"Basic and general study subjects"
"1"	"Education"	"1.50"	"Technical and vocational study subjects"
"1"	"Education"	"1.55"	"Educational population"
"1"	"Education"	"1.60"	"Teaching and training"
"1"	"Education"	"1.65"	"Educational evaluation"
"1"	"Education"	"1.70"	"Educational facilities"
"2"	"Science"	"2.05"	"Scientific approach"
"2"	"Science"	"2.10"	"Science and research management"
"2"	"Science"	"2.15"	"Mathematics and statistics"
"2"	"Science"	"2.20"	"Physical sciences"
"2"	"Science"	"2.25"	"Chemical sciences"
"2"	"Science"	"2.30"	"Space sciences"
"2		"2.35"	"Earth sciences"
"2		"2.40"	"Geography and oceanography"

"Politics, law and economics"	"6.05"	"Legal systems"
"Politics, law and economics"	"6.10"	"Human rights"
"Politics, law and economics"	"6.15"	"Politics and government"
"Politics, law and economics"	"6.20"	"International relations"
"Politics, law and economics"	"6.25"	"Economics"
"Politics, law and economics"	"6.30"	"Economic and social development"
"Politics, law and economics"	"6.35"	"Agriculture"
"Politics, law and economics"	"6.40"	"Industry"
"Politics, law and economics"	"6.45"	"Civil, military and mining engineering"
"Politics, law and economics"	"6.50"	"Manufacturing and transport engineering"
"Politics, law and economics"	"6.55"	"Materials and products"
"Politics, law and economics"	"6.60"	"Equipment and facilities"
"Politics, law and economics"	"6.65"	"Services"
"Politics, law and economics"	"6.70"	"Finance and trade"
"Politics, law and economics"	"6.75"	"Organization and management"
"Politics, law and economics"	"6.80"	"Personnel management"
"Politics, law and economics"	"6.85"	"Labour"

http://vocabularies.unesco.org/sparql-form/
Image captured 2019-08-21

Transformable

Other special KOS sets can be obtained.

Top - -down

UNESCO vocabularies - SPARQL service

Contact us

Default graph (IRI)

Query

```
1  PREFIX skos: <http://www.w3.org/2004/02/skos/core#> SELEC
   where {?c a skos:Concept} LIMIT 100
```

Query exemples

- Explore a sample of the data
- List all concepts of a micro-thesaurus in french
- List all concepts of a domain
- List all concepts
- List all micro-thesauri
- List all the translations english-french
- List the translations english-russian
- List concepts created after a given date
- Get the list of countries
- Select all the properties of a concept
- Make a search on all the concept labels
- Get all concepts in english and french, with synonyms, notes, broaders, narrowers and related
- Get the hierarchical table of all the concepts (with IDs)
- Get the hierarchical table of all the concepts (with la

Result format: HTML

HTML
Text
XML
JSON
NTriples
RDF/XML
CSV
TSV

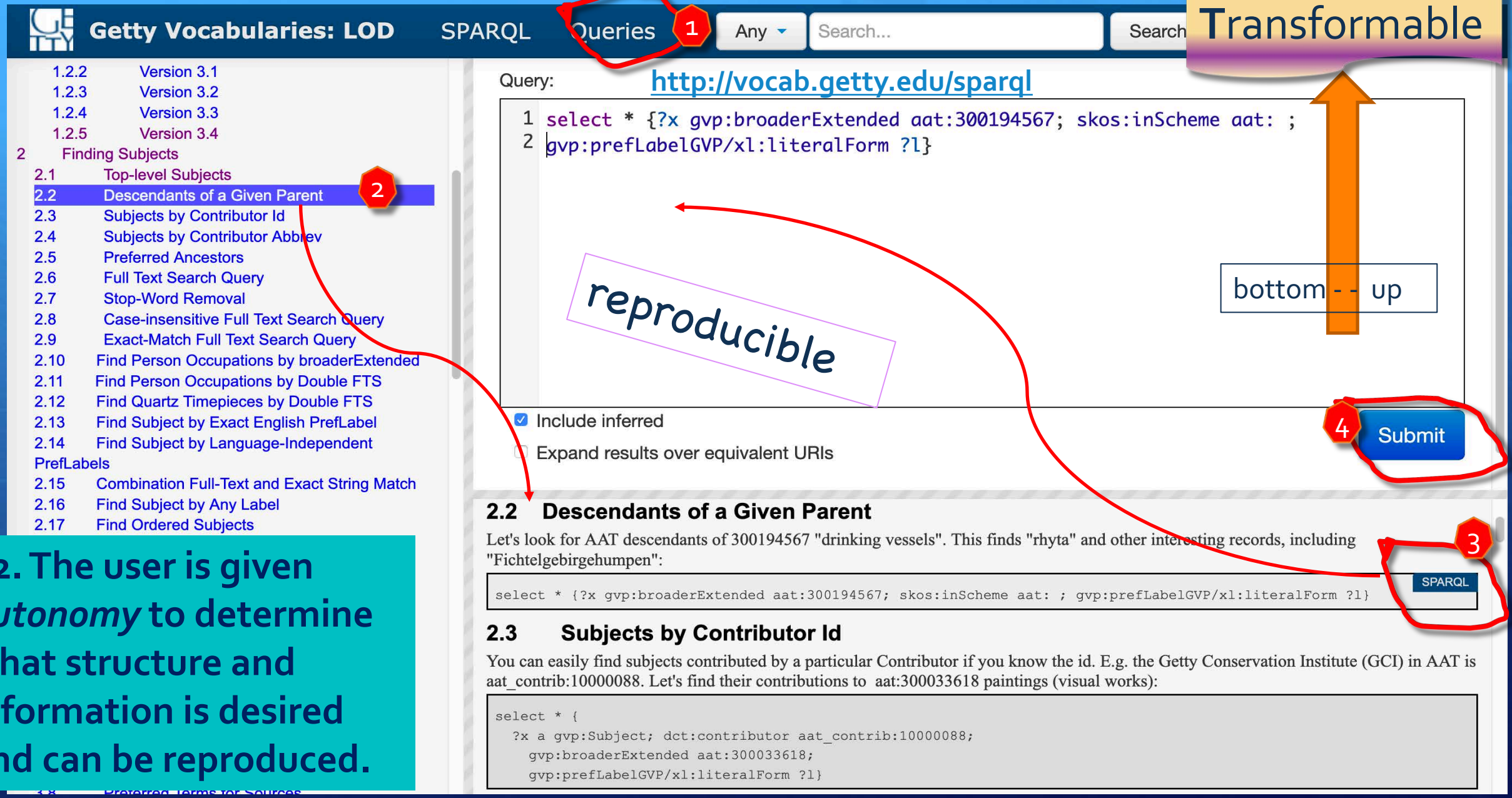
HTML

Run Query Reset

microThesaurus	country	english	french
"7.05 - Africa"	<http://vocabularies.unesco.org/thesaurus/concept688>	"Africa"	"Afrique"
"7.05 - Africa"	<http://vocabularies.unesco.org/thesaurus/concept1608>	"Africa South of the Sahara"	"Afrique au su du Sahara"
"7.05 - Africa"	<http://vocabularies.unesco.org/thesaurus/concept689>	"Algeria"	"Algérie"
"7.05 - Africa"	<http://vocabularies.unesco.org/thesaurus/concept690>	"Angola"	"Angola"
"7.05 - Africa"	<http://vocabularies.unesco.org/thesaurus/concept691>	"Benin"	"Bénin"
"7.05 - Africa"	<http://vocabularies.unesco.org/thesaurus/concept692>	"Botswana"	"Botswana"
"7.05 - Africa"	<http://vocabularies.unesco.org/thesaurus/concept693>	"Burkina Faso"	"Burkina Fasc
"7.05 - Africa"	<http://vocabularies.unesco.org/thesaurus/concept694>	"Burundi"	"Burundi"
"7.05 - Africa"	<http://vocabularies.unesco.org/thesaurus/concept696>	"Cabo Verde"	"Cabo Verde"
"7.05 - Africa"	<http://vocabularies.unesco.org/thesaurus/concept695>	"Cameroon"	"Cameroun"
"7.05 - Africa"	<http://vocabularies.unesco.org/thesaurus/concept697>	"Central Africa"	"Afrique centi

http://vocabularies.unesco.org/sparql-form/

Image captured 2019-05-14



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

AAT descendants of 300194567 "drinking vessels".

Getty Vocabularies: LOD

SPARQL Queries Any Search... Search Brief

Results: (200 of 211) Query: Descendants_of_a_Given_Parent

Download SPARQL Results in: JSON | XML | CSV | TSV

x	l
aat:300417997	chih pei@en
aat:300418000	cold drink cups@en
aat:300311263	porongos@en
aat:300410765	achawall metahues@en
aat:300395558	maigeleins@en
aat:300200347	Pechkrüge@en
aat:300265252	Amen glasses@en
aat:300264998	segment cups@en
aat:300265003	Corinthian type skyphoi@en
aat:300265233	Fichtelgebirgehumpen@en
aat:300198910	band cups@en
aat:300198904	droop cups@en
aat:300410551	huacollas@en

Got the dataset in 2 seconds!

Download in a format you like.

The query can also generate scope note, etc.

Endless reuse potentials.

The query can also generate scope note, etc.

- Top of the AAT hierarchies
- .... Objects Facet
- ..... Furnishings and Equipment (hierarchy name)
- ..... Costume (hierarchy name)
- ..... costume (mode of fashion)
- ..... <costume by function>
- ..... beachwear [N]
- ..... bathing costumes
- ..... bathing suits
- ..... beach pajamas
- ..... bearing cloths
- ..... binders (costume)
- ..... ceremonial costume
- ..... academic costume
- ..... ceremonial masks [N]
- ..... chains of office [N]
- ..... christening gowns [N]
- ..... collectantenkleding
- ..... copes [N]
- ..... crowns (headdresses)
- ..... kpeli-yehe [N]
- ..... liturgical costume
- ..... parade armors [N]
- ..... parade helmets [N]
- ..... robes (main garments) [N]
- ..... wedding dresses [N]
- ..... wreaths (costume accessories) [N]
- ..... chrismales (clothing)
- ..... costumes (character dress)
- ..... karaori [N]
- ..... coverups
- ..... day wear
- ..... dress (culture-related concept) [N]
- ..... afternoon dress
- ..... court dress

300212133 <costume by function>

through http://vocab.getty.edu/sparql

Getty Vocabularies: LOD

SPARQL Queries | Any | Search... | Search | Brief

Results: (200 of 474) Query: Finding_Subjects

Download SPARQL Results in: JSON | XML | CSV | TSV

x	label	note
aat:300411751	doll's clothing@en	Miniature versions of clothing meant to be worn by figural toys.@en
aat:300224239	livery (uniforms)@en	Distinctive uniforms worn by servants or other classes of people.@en
aat:300412126	comic masks@en	Masks used by actors in Ancient Greek and Roman theater, having many standard variations, representing comical or silly expressions.@en
aat:300404137	academic robes@en	Formal or ceremonial robes of varying color and trim meant to convey status in an academic context. These have evolved from what was once everyday attire for scholars and clerics.@en
aat:300400705	laurel wreaths@en	Headgear comprising circular or U-shaped garlands made from the leaves and branches of the laurel tree. An example was worn by Roman commanders during the triumphal procession after a martial victory.@en
aat:300209945	bathrobes@en	Loose-fitting knee-length or ankle-length garments, often tied with a belt, usually of a warm absorbent material worn before and after bathing or informally around the house.@en
aat:300390928	monastic clothing@en	Distinctive clothing worn by religious orders, by which their membership is typically identified.@en

reproducible

bottom - - up

Transformable

(cont.) T2. The user is given *autonomy* to determine what structure and information is desired and can be reproduced.

GACS

Vocabularies About Feedback Help

GACS Beta

Content language English Search

Alphabetical Hierarchy Groups

- OBJECTS
  - ABSTRACT OBJECTS
  - FIELD OF STUDY
  - LOCATION
  - PHYSICAL OBJECTS
    - ANATOMICAL STRUCTURE
    - components
    - contaminants
    - cultures
    - equations
    - infrastructure
    - MANMADE OBJECTS
    - organisms
      - amoebae
      - aquatic organisms
      - autotrophs
      - beneficial organisms
      - biological control agents
      - bryophytes
      - chimeras (en-us)
      - dwarfs
      - edible species
      - eukaryotes
      - extremophiles
      - females
      - genetically modified organisms
      - hosts
        - alternative hosts
        - **host plants**
          - food plants
          - weed hosts
        - immunocompromised population
        - intermediate hosts
        - sentinel animals
      - indicator species
      - life form
      - males
      - microorganisms
      - nontarget organisms
      - pathogens
      - pests
      - pioneer species
      - plants (botany)
        - algae
        - alpine plants
        - annuals
        - antifungal plants
        - antiviral plants
        - aquatic plants
        - bamboo plants
        - C3 plants
        - C4 plants
        - carnivorous plants
        - climbing plants
        - clovers
        - crops
        - cryptogams
        - deciduous plants
        - embryophytes
        - endophytes
        - ferns and fern allies
        - forbs
        - gametophytes
        - grasses
        - halophytes
        - herbaceous plants
        - **host plants**
          - food plants
          - weed hosts
        - hyperaccumulators
        - introduced plants
        - lawns and turf
        - mature plants
        - mosses and liverworts
        - noxious plants

OBJECTS > PHYSICAL OBJECTS > organisms > plants (botany) > host plants
OBJECTS > PHYSICAL OBJECTS > organisms > hosts > host plants

PREFERRED TERM **host plants**

TYPE Organism

DEFINITION Plantas que sirven de albergue, hábitat, sitios de crianza o fuente de alimentos como parte del ciclo vital de otros organismos.
Plants which are hosts for symbiont organisms, including those that are trophically associated with them (such as plant pathogens, plant parasites and phytophagous arthropods).
Plants which provide shelter, habitat, breeding sites or serve as a food source as part of the life cycle of another organism.

BROADER CONCEPT hosts, plants (botany)

NARROWER CONCEPTS food plants, weed hosts

RELATED CONCEPTS plant parasites, plant pathogens

ALTERNATIVE LABEL *host crops*, *host plant*, *hosts of plant diseases*, *hosts of plant pests*, *plant host*, *plant hosts*

BELONGS TO GROUP organisms, by non-taxonomic groups

IN OTHER LANGUAGES

نباتات عائلة	Arabic
寄主植物	Chinese
hostitelské rostliny	Czech
waardplanten	Dutch
Plante hôte	French
…nspflanze	German
	Hindi
	Hungarian
گیاهان میزبان	
Roślina żywicielska	
plantas hospedeiras	Portugu…
Planta hospedeira	
растения-хозяева	Russian
hostiteľské rastliny	Slovak
plantas huéspedes	Spanish
plantas hospedantes	
అతిథేయ మొక్కలు	Telugu
พืชอาศัย	Thai
konukçu bitki	Turkish
рослини-хазяї	Ukrainian

URI http://id.agrisemantics.org/gacs/C1029

Download this concept: RDF/XML TURTLE JSON-LD

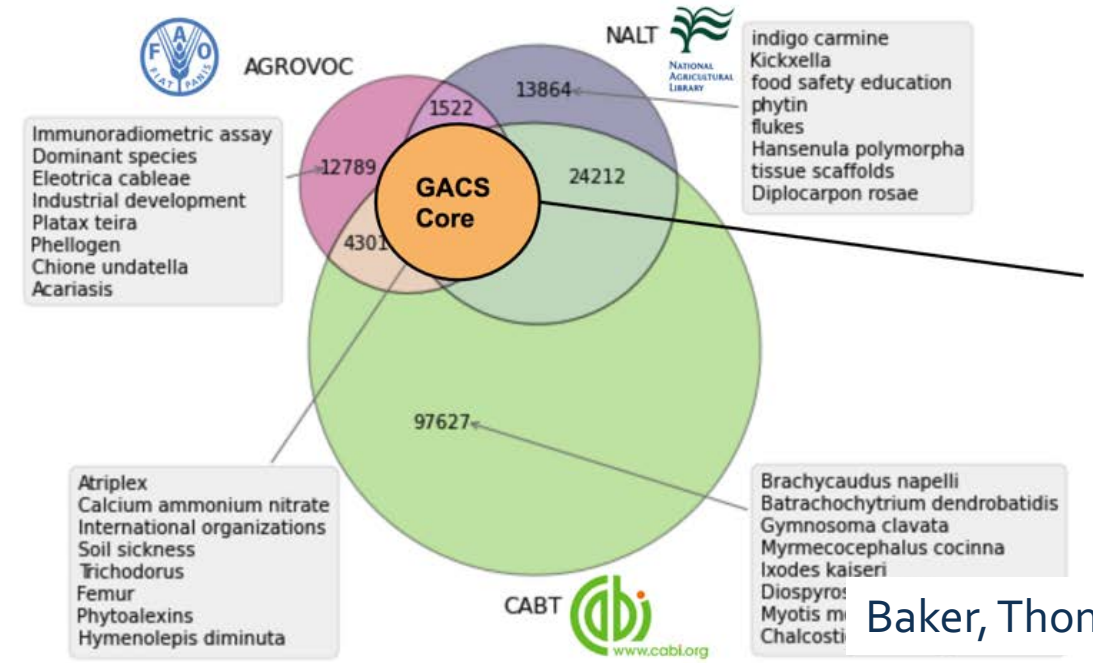
EXACT MATCH host plants (en) — lod.nal.usda.gov
host plants
http://id.cabi.org/cabt/58442 — id.cabi.org

reproducible

http://browser.agrisemantics.org/gacs/en/

GACS – Global Agricultural Concept Scheme

May 2016



GACS Core Beta 3.1
- 15,000+ concepts
- 350,000+ labels in 29 languages

Baker, Thomas et al. 2016.

http://aims.fao.org/global_agricultural_concept_scheme_gacs

T3. *Extended* to fit diverse needs, e.g. language and culture

- 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

CASE: FAST

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


```
<foaf:focus>
<rdf:Description rdf:about="http://en.wikipedia.org/wiki/John_F._Kennedy">
<rdfs:label>John F. Kennedy</rdfs:label>
</rdf:Description>
</foaf:focus>
```

```
<schema:sameAs>
<rdf:Description rdf:about="https://viaf.org/viaf/68910251">
<rdfs:label>Kennedy, John F. (John Fitzgerald), 1917-1963</rdfs:label>
</rdf:Description>
</schema:sameAs>
```

Virtual harmonization through linking

Transformable

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

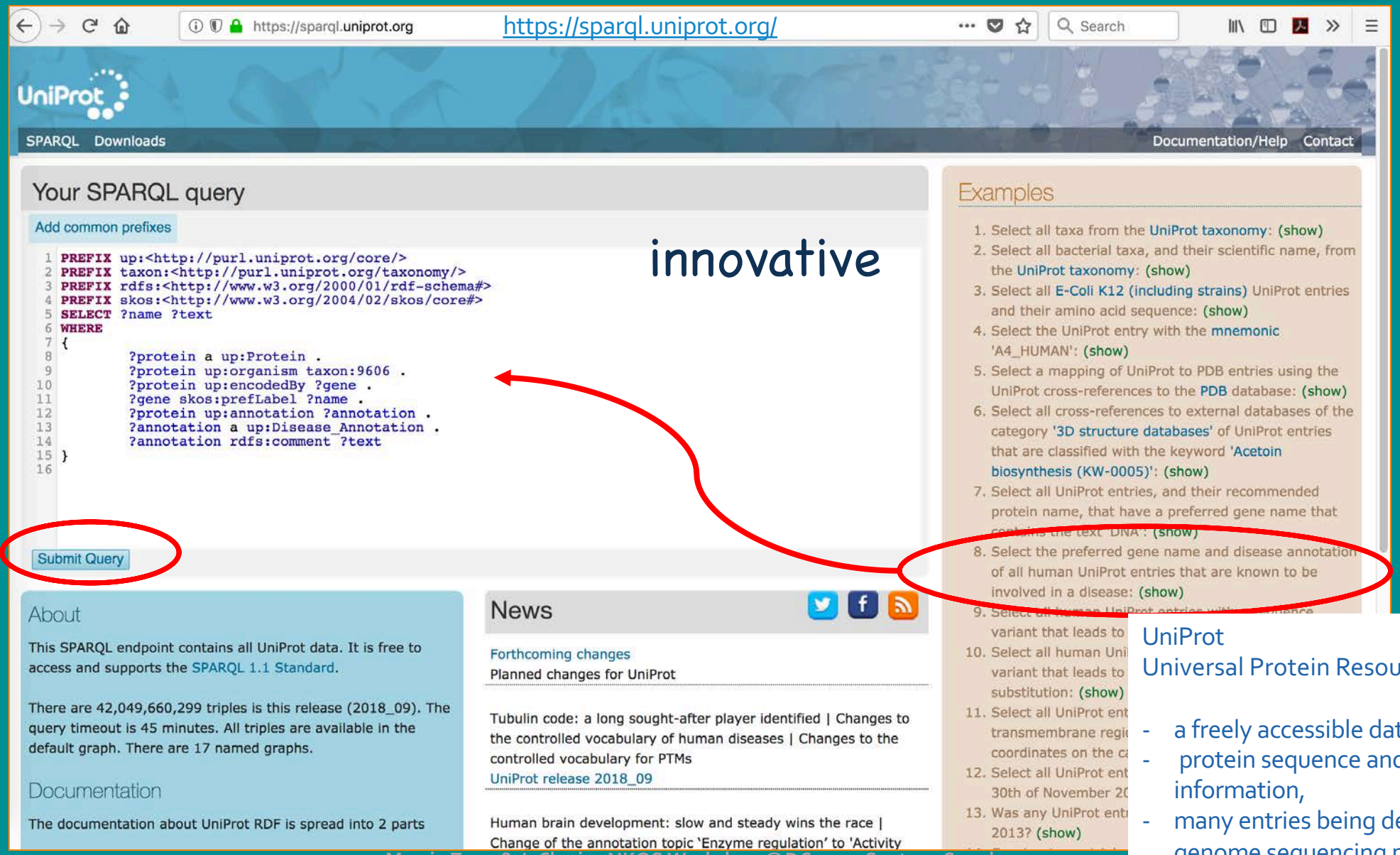
- as a knowledge base?
- as the foundation of a network analysis?
- as the building blocks of a framework for research in humanities and science?

beyond being a 'vocabulary'

Query examples can lead users to **explore** the rich contents of the datasets

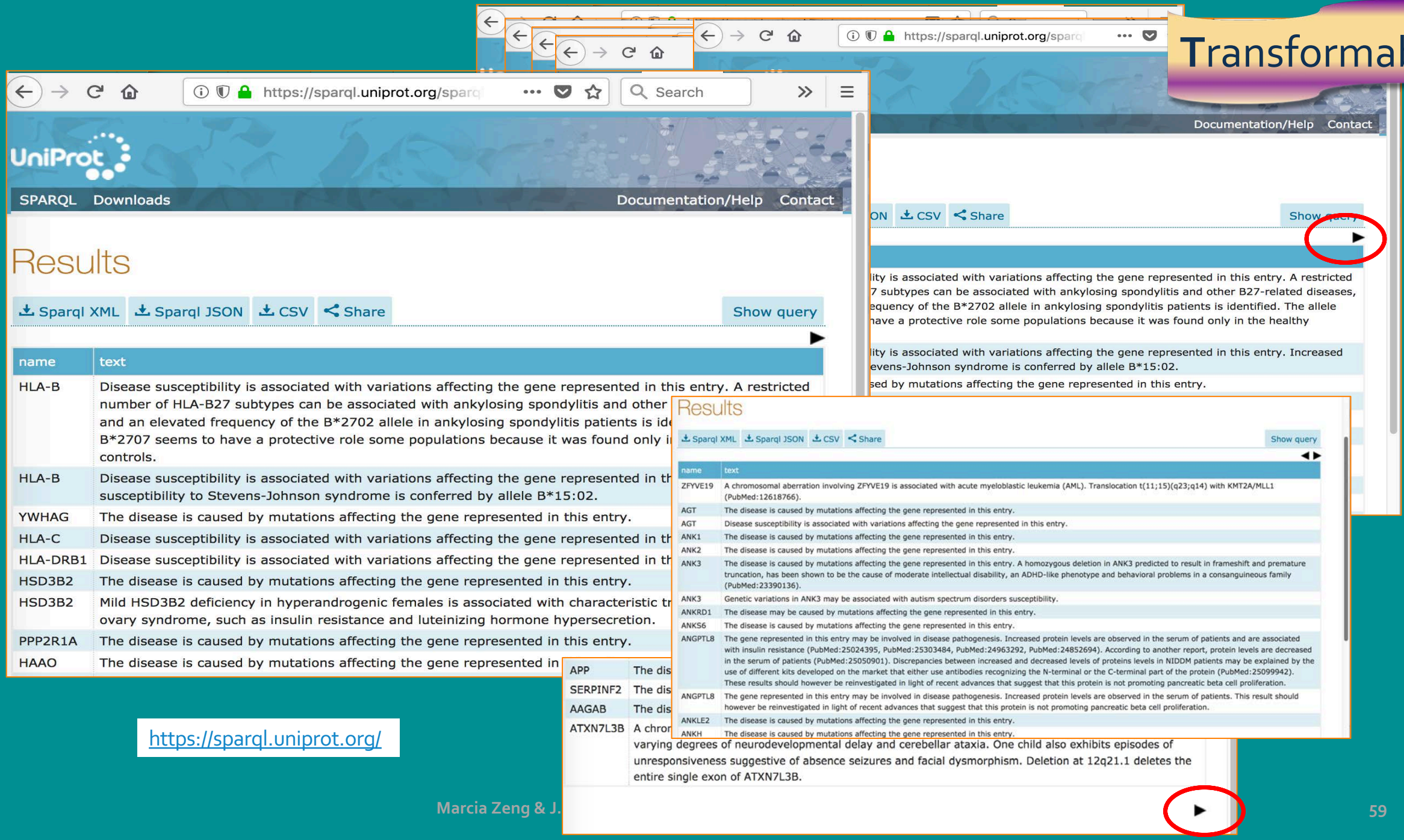
Example: Universal Protein Resource (UniProt)

Transformable



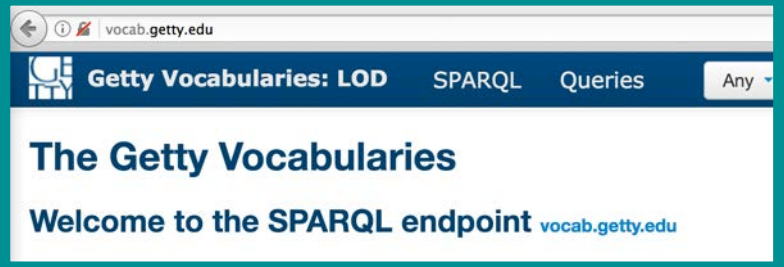
UniProt
Universal Protein Resource

- a freely accessible database
- protein sequence and functional information,
- many entries being derived from genome sequencing projects.



https://sparql.uniprot.org/

Example:
Getty Vocabularies: LOD



innovative

Transformable

Getty Vocabularies: LOD SPARQL

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

Query:

```
1 select ?place
2   ?place skos
3     foaf:focu
4     gvp:prefL
5   filter (50.
```

Include inferred

Expand results ove

4.16 Places by C

Find places whose coordi

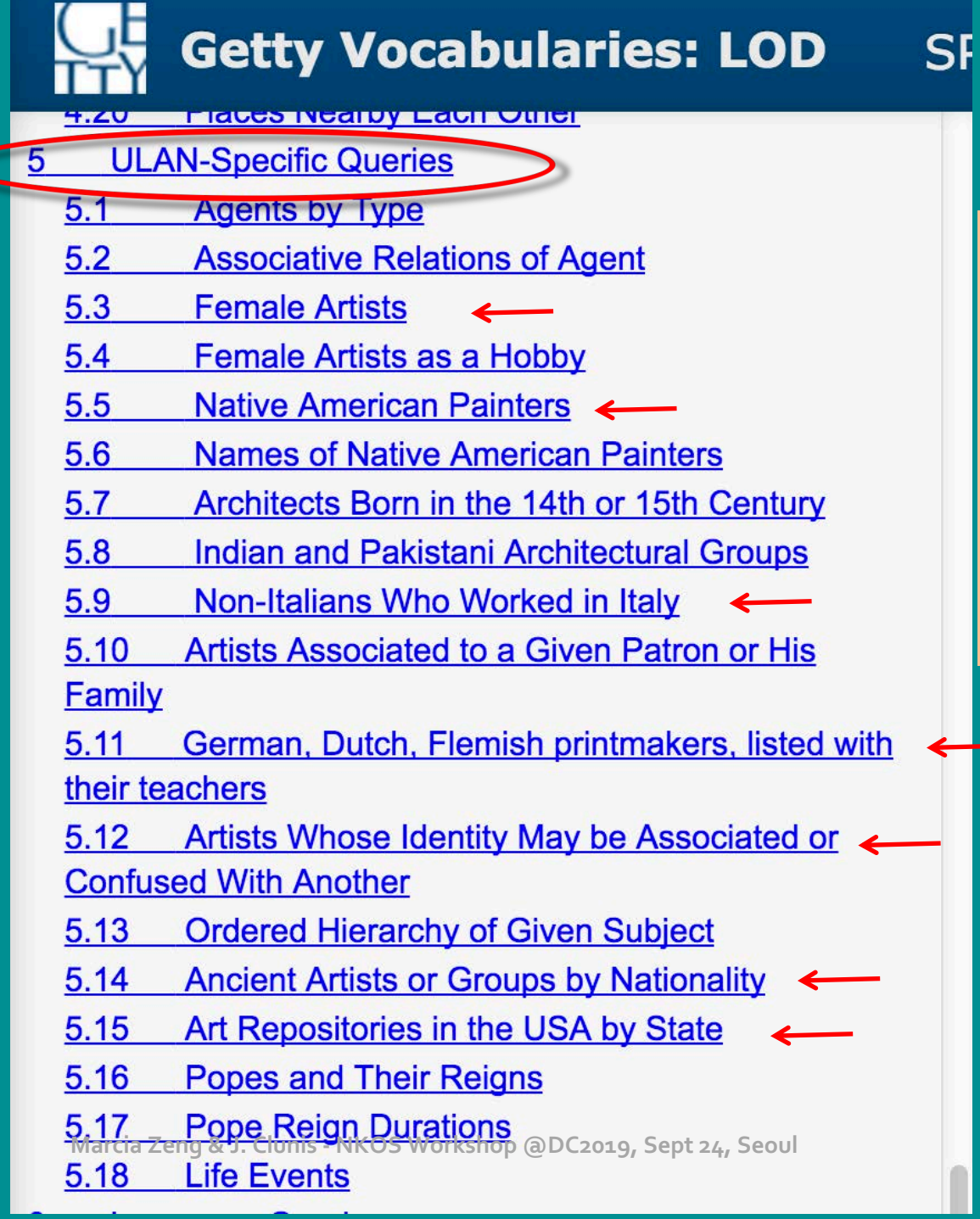
```
select ?place ?name ?
```

One can obtain special RDF graphs or datasets for
very complicated questions,
and for
revealing unknown relationships

http://vocab.getty.edu/queries#Top-level_Subjects

Name authorities offer foundational structured data for network analyses.

innovative



Transformable

http://vocab.getty.edu/queries

At the same query templates page

Find the section for ULAN.

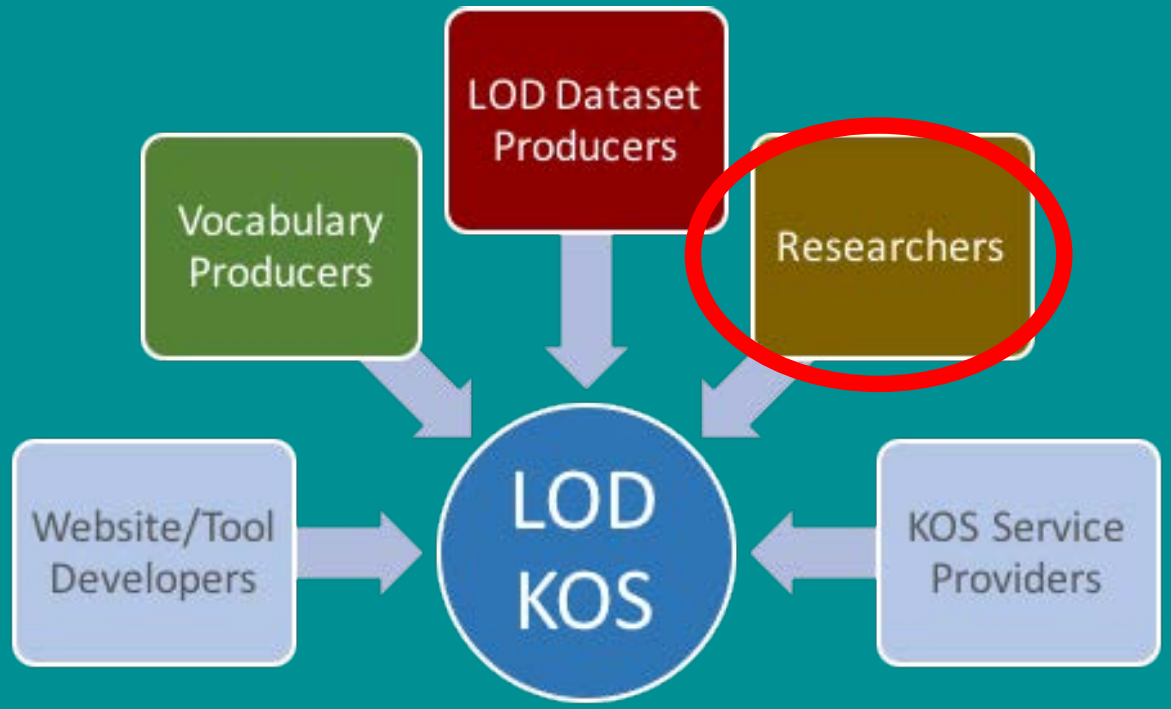
- There are many interesting query examples.

Transformable

(cont.)T4. Supports *innovative* transformative uses

LOD KOS products can be **t**ransformed **beyond** being just "value vocabularies"

They can become knowledge bases and provide semantic-rich discoveries



FIT Metrics for LOD KOS b) -- as a value vocabulary

Functional

Made available in ways that enhance their inherent purpose

F1. Delivered in *consumable* formats.

F2. Endpoints are *operational*.

- Ensures sustainability

F3. Dataset properties and structures are *informed* effectively.

- Contains refined query examples to reveal the internal structures.

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

- Enhanced *usability (user friendliness)* through default or example queries for data exploration.

Impactful

Maximizing the impact of a LOD KOS vocab

I1. Exposed through terminology services

a) Vocab Registries

b) Vocab Repositories / portals

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

Extends the functionality and impact through innovative adaptations

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.

T3. *Extended* to fit diverse needs, e.g. language and culture

T4. Supports *innovative* transformative uses beyond normal "value vocabularies"

C. Discussion:
Can we decide on the principles for the **LOD KOS**?

FAIR & FIT

- As a dataset
  - **FAIR**
- As a value vocabulary
  - **F**unctional
  - **I**mpactful
  - **T**ransformable

How can we categorize and produce other labels?

- **Functional**
  - Consumable
  - Operational
  - Use-friendly, Reachable
  - Informative
- **Impactful**
  - Exposed
  - Used
  - Mapped
  - Showed/Discussed

- **Transformable**
  - Derivable
  - Autonomous
  - Extendable
  - Innovative

Other?
? Trustworthy
? Mature
? Refined

LOD = **L**inked **O**pen **D**ata **KOS**=**K**nowledge **O**rganization **S**tructures/**S**ystems

Please email me if you got more ideas, and would like to work together. mzeng@kent.edu

Thank you!

Functional Metrics for LOD KOS Products

Marcia Lei Zeng, Julaine Clunis
College of Communication and Information (CCI)
Kent State University, USA

NKOS Workshop, Sept. 25 @DC2019, Seoul, S.Korea