

From Taxonomy to Ontology

by

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About Heather Hedden

- Independent taxonomy consultant, Hedden Information Management
- Instructor of online and corporate taxonomy courses and workshops
- Previously a taxonomy consultant in consulting firms, Enterprise Knowledge and PPC. Also, a contract consultant for others.
- Former taxonomy-related roles at Semantic Web Company, Gale/Cengage, Viziant, and First Wind.
- Author of *The Accidental Taxonomist*, 3rd ed. (2022, Information Today, Inc.)



**Hedden Information
Management**
Making information findable



Outline

- Introduction and why combine taxonomies and ontologies
- Definitions and features of taxonomies and ontologies
- Semantic Web standards for taxonomies and ontologies
- Approaches to combining a taxonomy and ontology
- Combining taxonomies and ontologies: examples in tools

Introduction and Why Combine Taxonomies and Ontologies?

Taxonomies and Ontologies

Taxonomies and ontologies both

- Aim to organize and access knowledge
- Have names derived from other disciplines (biology and philosophy)
- Have varied definitions

Traditional differences

- Have had different uses
- Have different origins
- Have been parts of different disciplines with different professionals (library/information science and computer/data science)

Distinctions between taxonomies and ontologies have more recently been blurred, as they have increasingly been combined, and are supported in the same software.

Background to Taxonomies

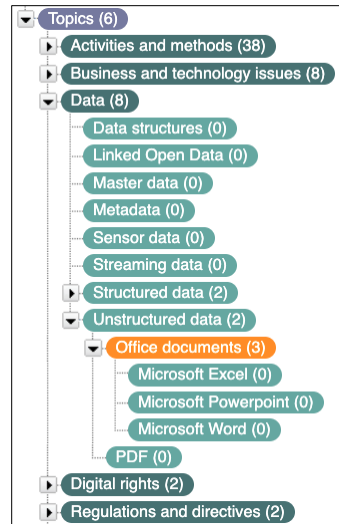
Origins of modern information taxonomies

1. Classification systems (since Linnaean classification 1758)
2. Subject heading schemes (since 1898) and thesauri (1960s)

Dewey Decimal Classification	
000 GENERAL WORKS 020 Library and Information Science 030 General Encyclopedias 050 General Periodicals 060 General Organizations	600 TECHNOLOGY 610 Medical Sciences 620 Engineering 630 Agriculture 640 Domestic Sciences 650 Business and Management 660 Chemical Technology 670 Manufacturers 690 Building Construction
100 PHILOSOPHY 110 Metaphysics 130 Psychology, occultism 140 Philosophy 150 Psychology 160 Logic	700 THE ARTS 710 Landscape and Civic Art 720 Architecture 730 Sculpture, Plastics 740 Drawing, Decorative Arts 750 Painting 760 Prints and Print Making 770 Photography 780 Music 790 Recreation, Performing Arts
200 RELIGION 220 The Bible 230 Christian Doctrine 290 Comparative and Other Religions	800 LITERATURE 810 American Literature 820 English Literature 830 German Literature 840 French Literature 850 Italian, Rumanian Literature 860 Spanish, Portuguese Literature 870 Latin and Other Italic Literatures 880 Classical and Modern Greek Literature 890 Other Literature
300 SOCIAL SCIENCES 310 Statistics 320 Political Science 330 Economics 340 Law 350 Public Administration 360 Social Welfare 370 Education 380 Public Service 390 Customs and Folklore	900 HISTORY, GEOGRAPHY 910 Geography, Travel 920 Biography, Genealogy 930 Ancient History 940 Europe 950 Asia 960 Africa 970 North America 980 South America 990 Pacific Ocean, Islands 991 Indonesia 992 New Zealand and Melanesia 994 Australia 995 New Guinea (Papua) 996 Polynesia 997 Atlantic Ocean Islands 998 Arctic Region 999 Antarctic Regions
400 LANGUAGE 410 Comparative Linguistics 420 English and Anglo Saxon 430 German Language 440 French 450 Italian, Rumanian 460 Spanish, Portuguese 470 Latin and Other Italic Languages 480 Classical and Modern Greek 490 Other Languages	500 SCIENCE 510 Mathematics 520 Astronomy 530 Physics 540 Chemistry 550 Earth Sciences 560 Paleontology 570 Life Sciences 580 Botanical Sciences 590 Zoological Sciences

classification system

taxonomy



- Safety goggles** (*May Subd Geog*)
 - UF Goggles, Safety
 - Safety glasses
- BT Eye—Protection
 - Eyeglasses, Protective
 - Personal protective equipment
- Safety harness (Aeronautics)** (*May Subd Geog*)
 - UF Safety belts (Aeronautics)
 - BT Aeronautics—Safety appliances
- Safety hats** (*May Subd Geog*)
 - [T55.3.S23 (*Industrial safety*)]
 - UF Safety helmets
 - BT Hats
 - Helmets
 - Personal protective equipment
 - NT Bicycle helmets
 - Fire helmets
 - Flying helmets
 - Motorcycle helmets
- Safety helmets
 - USE Safety hats
- Safety in advertising** (*May Subd Geog*)
 - BT Advertising

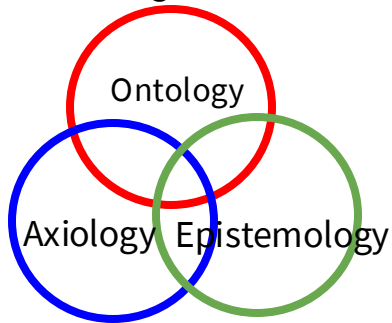
subject heading scheme

Modern information taxonomies arose in 1990s with the user interface capabilities of the Web and the development of information architecture.

Background to Ontologies

Traditional meaning
from philosophy:

A branch of
metaphysics
concerned with the
nature and relations
of being



Modern computer/data science definition:

“An ontology defines a set of representational primitives with which to model a domain of knowledge or discourse.

The representational primitives are typically classes (or sets), attributes (or properties), and relationships (or relations among class members).

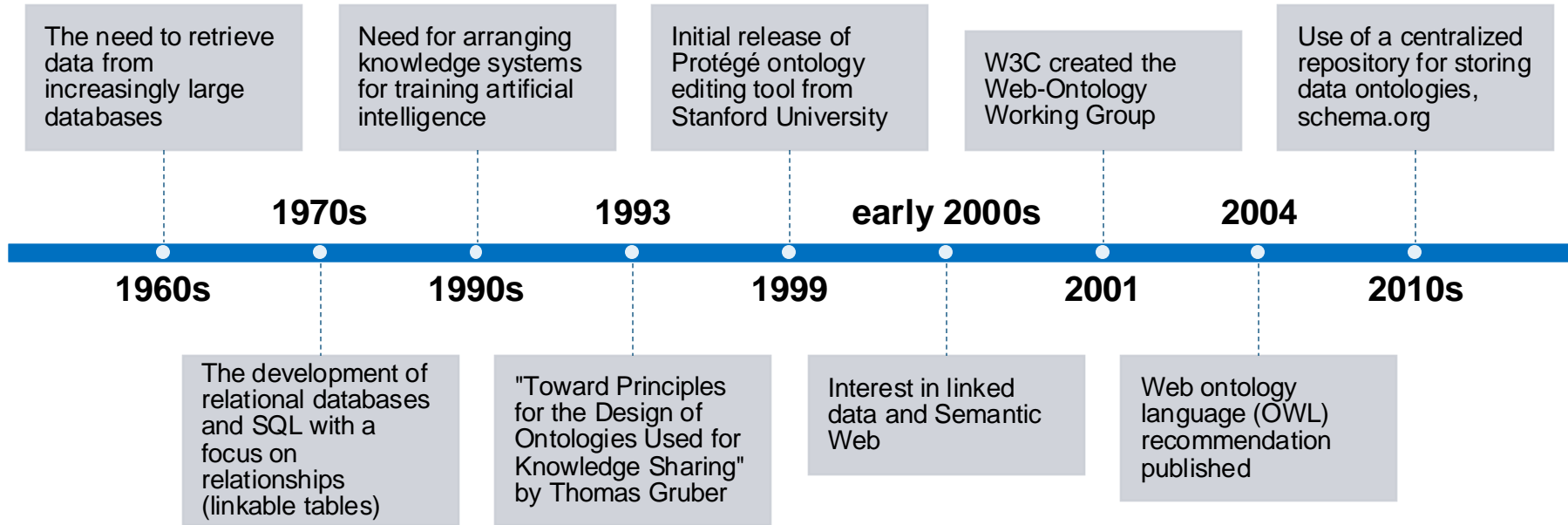
The definitions of the representational primitives include information about their **meaning and constraints on their logically consistent application.**

In the context of database systems, ontology can be viewed as a level of abstraction of data models, analogous to hierarchical and relational models, but intended for modeling knowledge about individuals, their attributes, and their relationships to other individuals.”

<https://tomgruber.org/writing/definition-of-ontology.pdf>

Gruber, Tom (2016) Ontology. In: Liu L., Özsu M. (eds) Encyclopedia of Database Systems. Springer, New York, NY, based on his original definition in 1993.

Background to Ontologies: History of Ontologies



Influencing ontology origins:

- Need to manage and understand data
- Support for computers and artificial intelligence
- Application to the Semantic Web

Why Combine Taxonomies and Ontologies

What you can do with a taxonomy

- **Search:** find content about.... (search string matches taxonomy concepts)
- **Topic browse:** explore subjects arranged in a hierarchy linked to content on the subject
- **Faceted (filtering/refining) search:** find content meeting a combination of terms/criteria
- **Tagging:** index content consistently so that retrieval is comprehensive and accurate
- **Discovery:** find other content tagged with same concepts as tagged to found content; explore broader, narrower, and related taxonomy topics
- **Content curation:** set up feeds or alerts based on user profile (personalization) and taxonomy concepts tagged
- **Metadata management:** for content identification, comparison, analysis, etc.



Why Combine Taxonomies and Ontologies

What you *cannot* do with a taxonomy alone, but can with an added ontology

- **Complex multi-part searches:** “chained” queries beyond just “about a subject.” (e.g. contacts in a location, employed by companies, which belong to certain industries)
- **Search on data:** obtain specific data, and not just content/full documents
- **Search on more specific criteria:** searches that vary based on category (class)
- **Knowledge graph or semantic layer creation:** to connect data and content from different repositories and to search, analyze, and infer across all sources



What else you can do with an ontology

- **Modeling complex interrelationships:** to understand operations and systems better (e.g. in product approval or supply chain processes)
- **Exploring explicit relationships:** between concepts (not just broader, narrower, related)
- **Visualization:** graph representations of concepts and semantic relationships
- **Reasoning and inferencing:** based on logic, to gain new knowledge

Why Combine Taxonomies and Ontologies

What you can do with a taxonomy and not with an ontology



- **Search with synonyms:** utilize alternative labels to match to search strings
- **Tag with synonyms:** utilize alternative labels to match to text strings
- **Support multiple languages:** support access to users of different languages and tag content in different language
- **Include definitions and scope notes:** as standardized types of fields
- **Map/link to other taxonomies:** to enable access to other content tagged with other taxonomies
- **Support metadata as filters:** aligning concept schemes to metadata properties and facets
- **Browse hierarchies in a frontend UI:** browsable display of concepts linked directly to content, unlike ontology visualizations
- **Implement easily in content systems:** CMSs, DAM systems, Intranets, websites, etc.

Definitions and Features of Taxonomies and Ontologies

Introduction to Taxonomies

The screenshot shows the eBay homepage with a search bar containing 'Womer'. A dropdown menu is open, displaying a list of categories. The 'Shop by category' dropdown is expanded, showing sub-categories like 'Motors', 'Clothing & Accessories', and 'Sporting goods'. The 'Motors' category is highlighted, showing sub-items like 'Parts & accessories', 'Cars & trucks', 'Motorcycles', and 'Other vehicles'. The 'Clothing & Accessories' category is also expanded, showing sub-items like 'Women', 'Men', 'Handbags', and 'Collectible Sneakers'. The 'Sporting goods' category is expanded, showing sub-items like 'Hunting Equipment', 'Golf Equipment', 'Outdoor sports', and 'Cycling Equipment'.

The screenshot shows a search results page for 'data'. The search bar contains 'data'. Below the search bar, there are several filter categories, each with a count and a context: 'Metadata' (Context: Topics), 'Linked Open Data' (Context: Topics), 'Linked Data enrichment' (Context: PoolParty Product), 'Output data unit' (Context: PoolParty Product), 'Data processing' (Context: PoolParty Product), and 'Data engineering' (Context: Topics). Each category has a blue checkmark icon next to it.

Topic

- Advanced Content (73)
- Agile, Design Thinking, & Facilitation (60)
- Artificial Intelligence (25)
- Change Management & Communications (23)
- Company (19)
- Content & Brand Strategy (5)
- Enterprise Learning (23)
- Enterprise Search (49)
- Knowledge Graphs & Data Modeling (108)
- Knowledge Management Strategy & Design (243)
- Taxonomy & Ontology Design (113)
- Technology Solutions (98)

Article Type

- Blog (324)
- Podcast (71)
- Presentation (56)
- Case Study (40)
- White Paper (31)

– Computer and information sciences

Artificial intelligence

- Artificial neural networks
- Expert systems
- Genetic programming
- Machine learning

– Artificial intelligence

Machine learning

- Decision tree learning
- Deep learning
- Ensemble methods
- Machine learning algorithms
- Relevance vector machines
- Supervised machine learning
- Support vector machines
- Unsupervised machine learning

Taxonomies help people find information

Introduction to Taxonomies

Taxonomy type examples

Hierarchical Taxonomy Example

- Leisure and culture
 - Arts and entertainment venues
 - Museums and galleries
 - Children's activities
 - Culture and creativity
 - Architecture
 - Crafts
 - Heritage
 - Literature
 - Music
 - Performing arts
 - Visual arts
 - Entertainment and events
 - Gambling and lotteries
 - Hobbies and interests
 - Parks and gardens
 - Sports and recreation
 - Team sports
 - Cricket
 - Football
 - Rugby
 - Water sports
 - Winter sports
 - Sports and recreation facilities
 - Tourism
 - Passports and visas
 - Young people's activities

Career Level

- Student
- Entry Level
- Experienced
- Manager
- Director
- Executive

Function

- Customer Service & Support
- Delivery
- Engineering
- Finance
- General Management
- Legal & Regulatory Affairs
- Marketing & Advertising
[more]

Industry

- Agriculture
- Apparel & Fashion
- Automotive
- Aviation & Aerospace
- Banking
- Biotechnology
- Broadcast Media
- Chemicals
[more]

Faceted Taxonomy Example

Taxonomy Features

A taxonomy is:

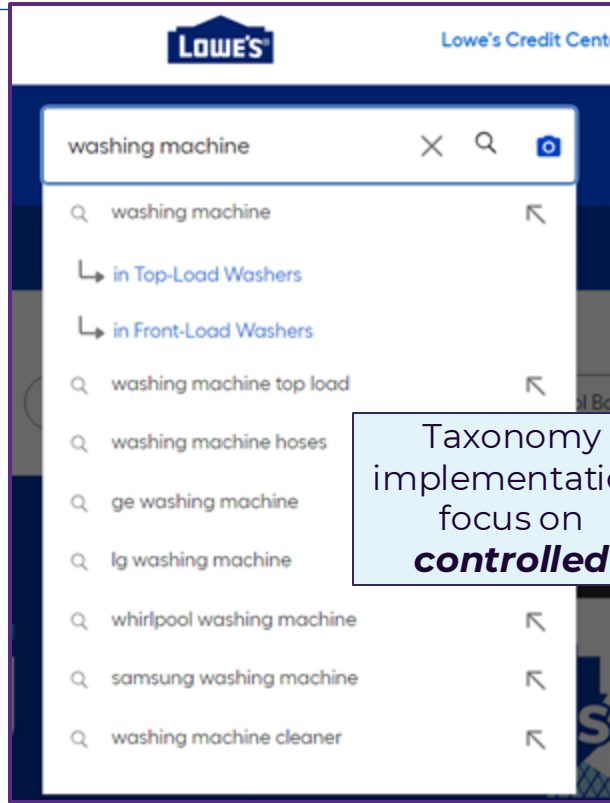
Controlled and **organized**

1. Controlled:

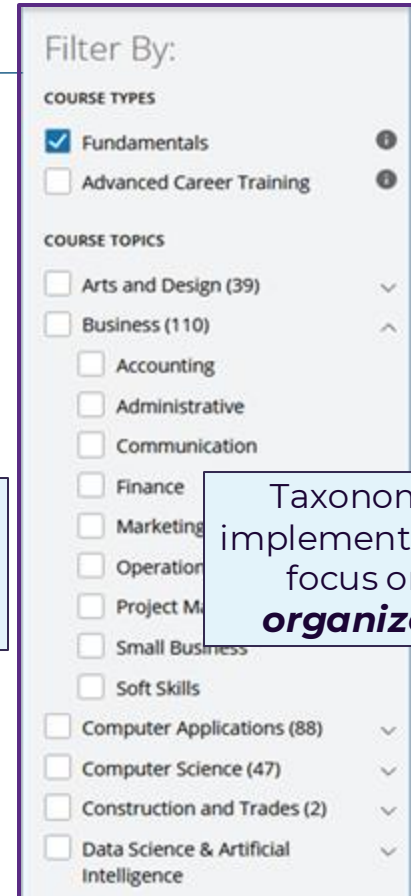
A kind of controlled vocabulary or knowledge organization system, based on unambiguous concepts, not just words: **things, not strings**

2. Organized:

Concepts are arranged in a structure of hierarchies, categories, or facets to organize them.



Taxonomy implementation focus on **controlled**

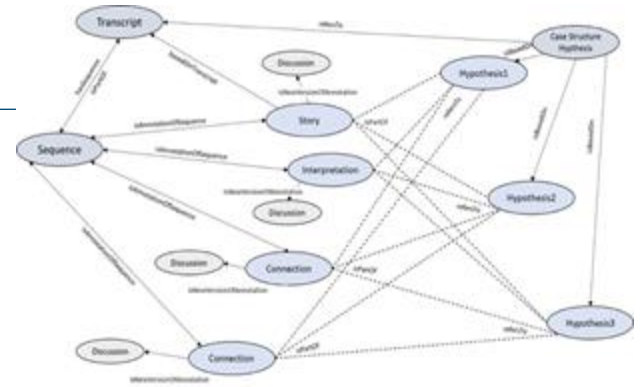


Taxonomy implementation focus on **organized**

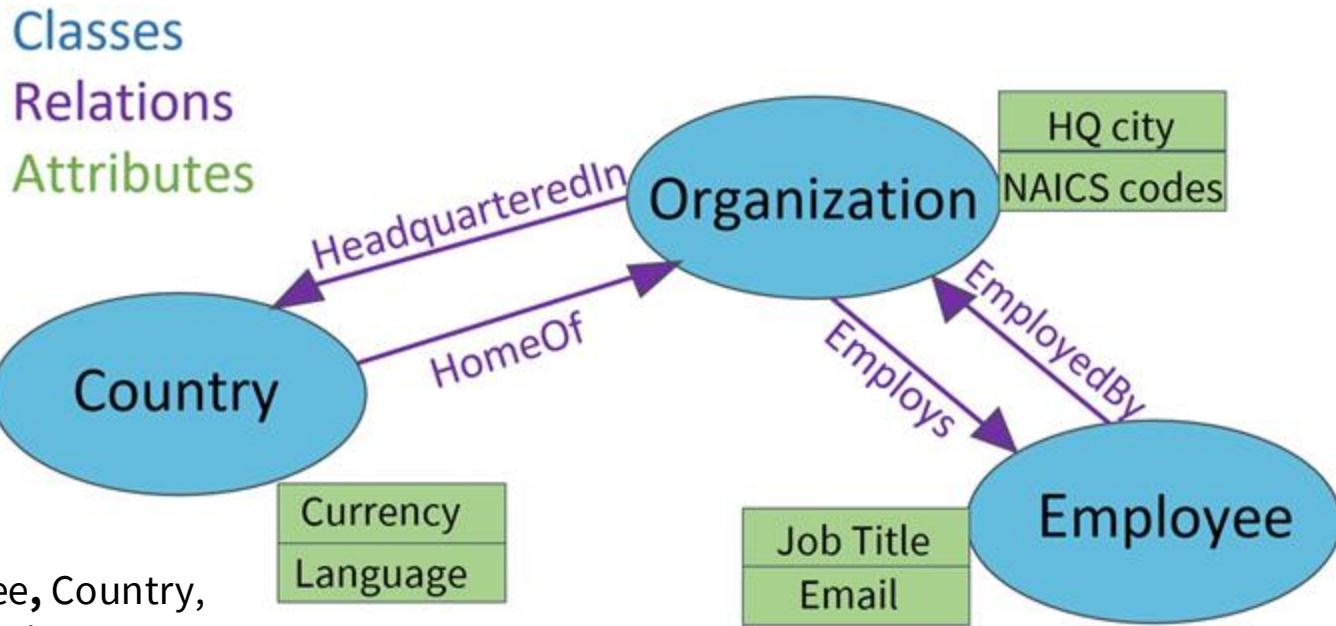
Introduction to Ontologies

Definitions of an ontology

- A form of knowledge representation
 - Not just knowledge organization
- A formal naming and definition of the **types, properties** and **interrelationships** of entities in a particular domain.
 - Classes, custom attributes, and semantic relationships
- A set of precise descriptive statements about a particular domain.
 - Statements as *subject-predicate-object* are expressed as triples.
- A more abstract layer in describing a knowledge organization system
 - Overlays and connects to a taxonomy or other controlled vocabulary to add semantics



Ontology Features



Classes

Employee, Country,
Organization

Relations: HeadquarteredIn <> HomeOf
EmployedBy <> Employs

Attributes: Email address, Job title, HQ city, NAICS codes, Currency, Language

Ontology Features

Ontology model + entities

Ontology example with specific individuals in each class:

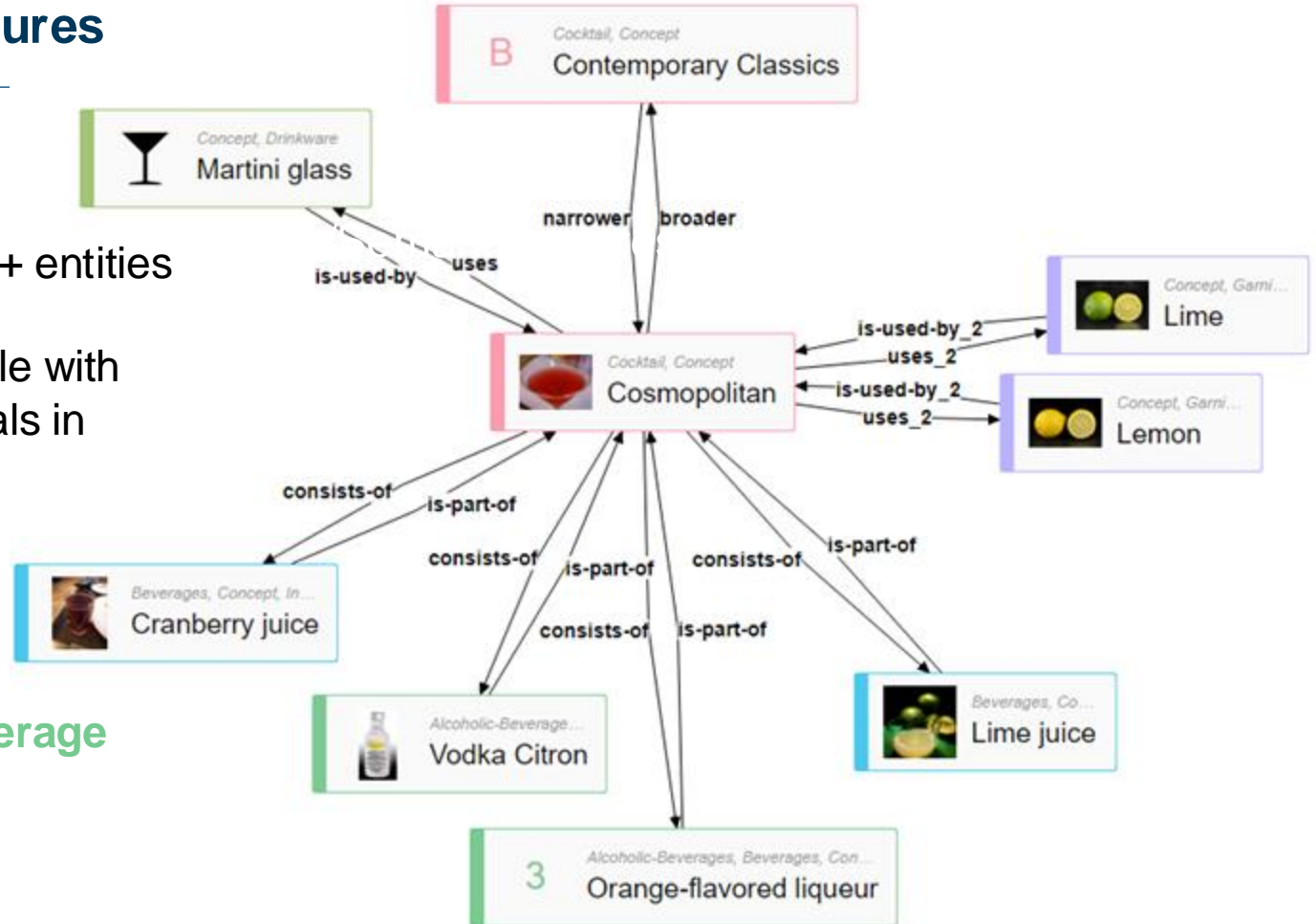
Cocktail

Garnish

Drinkware

Beverage

Alcoholic Beverage



Definitions of Ontologies

Ontology definition questions

Is it

- A knowledge *model*, an *abstract layer*, a form of knowledge representation, that describes the classes, relationship types, and attribute types in a domain, or
- A knowledge organization system, that includes both: the classes, relationship types, and attribute types *and* the specific concepts, entities/individuals, and their specific attributes



A model + individuals is often called an “ontology,” because ontology management software supports the inclusion of individuals, and ontologies are increasingly domain-specific in enterprises. This might be better called a “knowledge graph.”

Knowledge Organization System Types

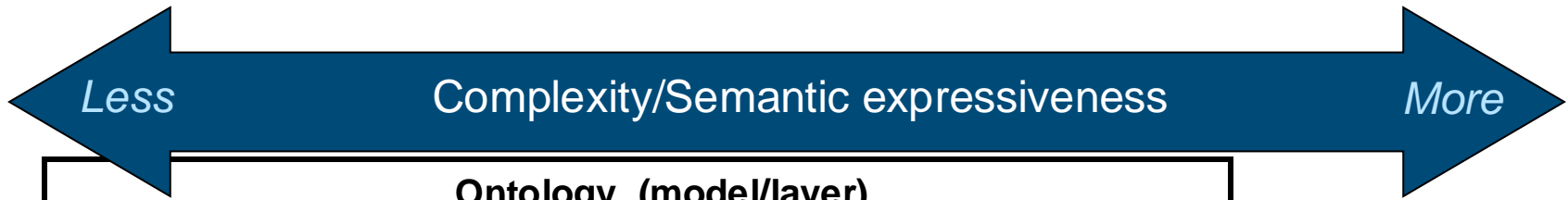


Term List	Name Authority	Taxonomy	Thesaurus	Ontology
Ambiguity control	Ambiguity control Synonym control (Attributes)	Ambiguity control (Synonym control) Hierarchical relationships	Ambiguity control Synonym control Hierarchical relationship Associative relationships	Ambiguity control Semantic relationships Classes Attributes

Model + entities



Knowledge Organization System Types



Ontology (model/layer)			
Term List	Name Authority	Taxonomy	Thesaurus
Ambiguity control	Ambiguity control Synonym control (Attributes)	Ambiguity control (Synonym control) Hierarchical relationships	Ambiguity control Synonym control Hierarchical relationship Associative relationships

Ontology as a semantic model



Semantic Web Standards for Taxonomies and Ontologies

Semantic Web Standards for Taxonomies and Ontologies

For **both** ontologies and taxonomies/controlled vocabularies:

RDF (Resource Description Framework) www.w3.org/TR/rdf11-concepts

- “A standard model for data interchange on the Web”
- Requires the use of URIs and information modelled as **subject – predicate – object** triples.



For **taxonomies/controlled vocabularies**:

SKOS (Simple Knowledge Organization System) www.w3.org/TR/skos-reference (2009)

- “A common data model for sharing and linking knowledge organization systems via the Web”
- Encoded using XML and RDF for publication and use of vocabularies as linked data



For **ontologies**:

RDFS (RDF-Schema) www.w3.org/TR/rdf11-concepts

- “A general-purpose language for representing simple RDF vocabularies on the Web”
- Goes beyond RDF to designate classes and properties of RDF resources.

OWL (Web Ontology Language) www.w3.org/TR/owl2-overview

- “A Semantic Web language designed to represent rich and complex knowledge about things, groups of things, and relations between things”
- Based on RDF and RDFS; OWL is an extension of RDFS.



Semantic Web Standards for Taxonomies: SKOS

SKOS (Simple Knowledge Organization System) elements



Concept Scheme & Collection	Concepts	Labels & Notation	Documentation	Semantic Relations	Mapping Relations
ConceptScheme	Concept	prefLabel	scopeNote	broader	exactMatch
inScheme	hasTopConcept	altLabel	definition	narrower	closeMatch
Collection	topConceptOf	hiddenLabel	example	related	broadMatch
orderedCollection		notation	changeNote	broaderTransitive	narrowMatch
member			editorialNote	narrowerTransitive	relatedMatch
memberList			historyNote		

Human-readable form example: **Preferred label**

Machine-readable form example: **skos:prefLabel**

Semantic Web Standards for Ontologies: OWL

OWL-Defined Ontology Components

Entities – subjects (domains) or objects (ranges) of properties, within RDF triples

- **Classes** (in SKOS: concepts)
 - Named sets of concepts that share characteristics and relations
 - May contain subclasses or individuals (instances of the class)
- **Individuals** (in SKOS: concepts)
 - Members or instances of a class. Unique named entities.

Properties – predicates about individuals (instances)

- **Object properties** (in SKOS: relations)
 - **Relations** between individuals
 - May be directed (single direction), symmetric, or with an inverse (different in each direction)
- **Datatype properties** (not in SKOS, except for notes)
 - **Attributes** or characteristics of individuals
 - The object of a datatype property is a *value*.



Literals – values of attributes, with just a *lexical form* and a *datatype*.

<https://www.w3.org/TR/2012/REC-owl2-primer-20121211/>

Approaches to Combining a Taxonomy and Ontology

Taxonomy + Ontology Creation Approaches

Options for creating the semantic model + individual instances type of an ontology:

1. Use a dedicated ontology tool, e.g. Protégé, or hand-coding OWL to
 - create the ontology and build out the full detailed taxonomic hierarchy (of classes, subclasses) as an extension of the ontology
 - create all individuals associated with the ontology as members of classes
2. Use taxonomy/ontology combined tool to
 - create a taxonomy
 - create an ontology to go with the taxonomy
 - link them, with the ontology providing semantic enrichment



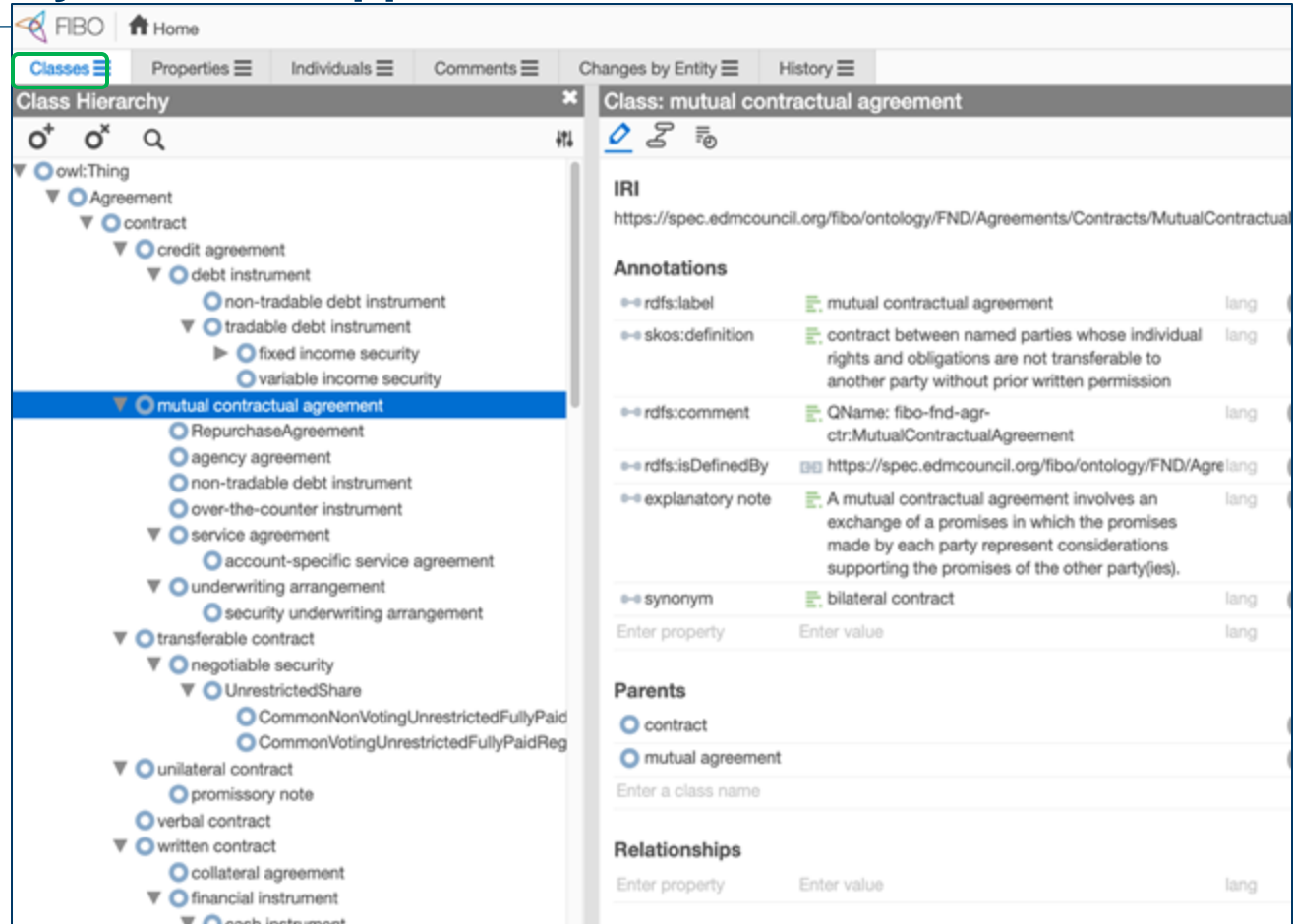
Ontology + Taxonomy Creation Approaches

Method 1:

Using a dedicated ontology tool: Protégé

Example of FIBO Financial Industry Business Ontology

Classes and subclasses in a taxonomy hierarchy



The screenshot displays the FIBO ontology editor interface. The top navigation bar includes "Classes", "Properties", "Individuals", "Comments", "Changes by Entity", and "History". The main area is split into two panes. The left pane, titled "Class Hierarchy", shows a tree structure starting from "owl:Thing", with "Agreement" as a top-level class. Under "Agreement", there is a "contract" class, which has several subclasses including "credit agreement", "debt instrument", "non-tradable debt instrument", "tradable debt instrument", "fixed income security", and "variable income security". The "mutual contractual agreement" class is highlighted in blue. The right pane, titled "Class: mutual contractual agreement", shows the IRI (https://spec.edmouncil.org/fibo/ontology/FND/Agreements/Contracts/MutualContractual...), annotations (including rdfs:label, skos:definition, rdfs:comment, rdfs:isDefinedBy, and explanatory note), parents (contract and mutual agreement), and relationships.

Ontology + Taxonomy Creation Approaches

Method 1 Issues

- Follows ontology standards, but not thesaurus/taxonomy best practices
- Top-down taxonomy design focus; less bottom-up
- Hierarchies focus on subject domain classification; less on supporting users and UX
- Designed by engineers and ontologists, not taxonomists or information architects

Not recommended approach to extending a taxonomy into an ontology:

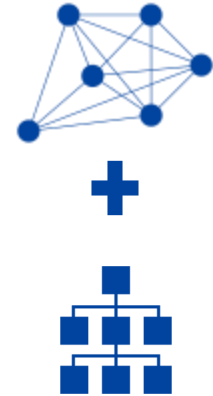
Importing taxonomies into an OWL-based ontology or dedicated ontology tool.

- All taxonomy hierarchies get converted to class-subclass hierarchies.
 - Importing taxonomies into ontologies will incorrectly treat:
 - whole-part taxonomy relations (e.g. geographic) as class-subclass relations
 - generic-instance (named entity) taxonomy relations as class-subclass relations, not class-instance affiliations
- Alternative labels can import, but as “Annotation” properties, and may not function as alternative labels for tagging and search.

Applying Ontologies to Taxonomies

Method 2: Adding an ontology as a semantic model to a SKOS taxonomy

- Starts with existing taxonomies.
- Taxonomies based on SKOS can integrate with RDFS and OWL ontology resources, as all are based on RDF.
- Ontology class labels correspond/match the SKOS concept schemes or concept labels to which they will be applied.
 - The ontology “layer” is not an upper hierarchical layer, but an **overlay** to the higher levels of the SKOS taxonomy.
- Combined taxonomy/ontology management software supports this approach.

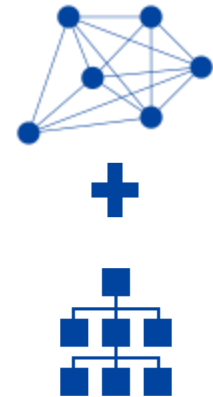


Applying Ontologies to Taxonomies

Benefits of the method of adding an ontology as a semantic model to a taxonomy

- Brings together *multiple* existing controlled vocabularies, term sets, named entity lists
- Easier to model the ontology
 - Existing taxonomies provide a basis for knowledge modeling.
 - No need to distinguish between sub-classes and individuals.
- Supports expert specialization
 - Taxonomists develop and maintain taxonomies.
 - Ontologists (if needed) develop and maintain the ontology.
- More flexible and adaptable
 - The taxonomy changes more frequently than does the ontology.
 - Taxonomies can easily be added.
- Different purposes served
 - The ontology is for modeling, reasoning, analysis, and data queries
 - The taxonomy is for tagging and information retrieval.
- More practical

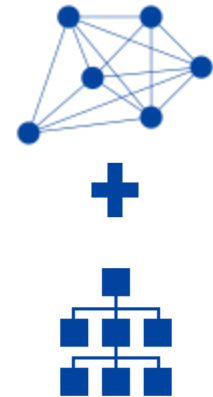
“The main problem SKOS solves is that many of these OWL projects become too involved and the organization loses interest before it ever sees any value. The less formal, concept-oriented SKOS is more practical for 95% of organizations.” *Posted on Reddit September 27, 2024 [Best Ontology Development Environment Tool?]*



Applying Ontologies to Taxonomies

Tips on how to design an ontology based on existing taxonomies

- High level classes in the ontology are based on individual taxonomies, controlled vocabularies, terms lists.
- SKOS concept schemes (and to a lesser extent top concepts) are good candidates for classes.
- The OWL-based ontology “semantic model” should include classes and subclasses only for which there is a use case for distinct properties (attributes and semantic relations).
 - Deeper levels of a “subclass” hierarchy reside in the SKOS taxonomy concepts and their broader/narrower relations.



Combining Taxonomies and Ontologies: Examples in Tools

Combining Taxonomies and Ontologies in Software Tools

Concepts have both:

SKOS relationships and properties

The screenshot displays the PoolParty software interface. On the left, a taxonomy tree is visible under the 'Cooking' category, with 'Fruit cakes (0)' highlighted in orange. On the right, the 'Fruit cakes' concept details are shown, including a URL, a 'Dish' type, and various SKOS relationships like 'Broader Concepts' (Cakes), 'Narrower Concepts', 'Related Concepts', and 'Top Concept of Concept Schemes'. The 'SKOS' label is highlighted with a red box. The right panel also shows 'Preferred Label' (Fruit cakes), 'Alternative Labels' (Christmas cake (dried fruit), Fruitcake), 'Hidden Labels', 'Scope Notes', and 'Definitions'.

Screenshots from PoolParty

Combining Taxonomies and Ontologies in Software Tools

Concepts have both:
SKOS
relationships and properties
and

RDFS-based
semantic
relationships and attributes
from an
ontology-based
custom scheme.

Screenshots
from Poolparty

The screenshot displays the PoolParty interface. On the left is a taxonomy tree under 'Cooking', with 'Fruit cakes (0)' highlighted in orange. On the right is the 'Fruit cakes' concept page. A purple box highlights the 'Dish' icon in the top left of the concept page. Another purple box highlights the 'Recipe-Scheme' tab in the 'SKOS' section. The 'Details' tab is active, showing properties like 'For occasion' (with 'Winter holidays'), 'Goes with' (with 'Chocolate cakes' and 'Whipped cream'), 'Has main ingredient' (with 'Dried fruit'), and 'Prepared by' (with 'Baking'). The right side of the details panel shows values for 'Calories' (200), 'Preparation time' (2 hours 15 minutes), and 'Served' (Room temperature).

Screenshots
from PoolParty

Tourism Example (Advanced)

Countries

Hierarchy Concepts

Find a concept

Antigua

Germany

Greece

Ireland

Jamaica

Portugal

South Africa

Spain

Switzerland

United Kingdom (3)

England

Scotland

Wales

United States of America

Add a child concept

Countries

11 May 2022

Tourism model

Global

Description

Wikipedia page

Any URI <https://en.wikipedia.org/wiki/>

Template

Example Images

Has Flag

This property is expecting text of the form: An image URL (HTTPS)

This property is expecting text of the form: An image URL (HTTPS)



Suitable for Holiday Type

Warm enough to swim

en Beach en Cycling

en August en July en June

en History

Concepts have both:

SKOS relationships and properties *and*

RDFS-based semantic relationships and attributes from an ontology-based custom scheme.

Screenshots from Graphologi

- Training Datasets
 - Chemistry (OWL) +
 - Chemistry (SKOS) +
 - Chemical Compounds +
 - Chemical Elements +
 - Metalloids +
 - Metals +
 - Nonmetals +
 - Noble gasses +
 - Other nonmetals +
 - Carbon +
 - Hydrogen +
 - Oxygen +
- GEMET Thesaurus +
- Graphite Glossary +
- UNESCO Thesaurus +

View Populated Panels View All Panels View Specific Panels +

has broader (SKOS)	+ Q 1
Other nonmetals x	
has narrower (SKOS)	+ 0
elementOf (Graphite Chemistry)	+ Q 3
Carbon dioxide x Ethanol x Water x	
has broader match (SKOS)	+ 0
has close match (SKOS)	+ 0
has exact match (SKOS)	+ 0
has narrower match (SKOS)	+ 0
has related match (SKOS)	+ 0
hasElement (Graphite Chemistry)	+ 0
Related Compound Diagrams (Property Paths)	3

Resource Types	SKOS Concept
Property Templates	Chemistry Governance Mapping
Collections	
Preferred Labels ?	
preferred label (SKOS) +	Oxygen en x
Alternative Labels	
alternative label (SKOS) +	en x
Properties ?	
readyForApprover (Graphite Knowledge Model)	<input type="radio"/> Yes <input type="radio"/> No x
rejectedByApprover (Graphite Knowledge Model)	<input type="radio"/> Yes <input type="radio"/> No x
approverComment (Graphite Knowledge Model) +	en x
smeComment (Graphite Knowledge Model) +	en x
reviewDate (Graphite Knowledge Model) +	x
atomicSymbol (Graphite Chemistry)	

Screenshot from
Synptica Graphite



English (en) ▾



[Details](#)

[History](#)

[Visualizer](#)

Content Type

Level

Role

Consultant

Knowledge and data engineer

Marketing specialist

Sales engineer

Software engineer

Support engineer

Skill

> Business skills

> Languages

▼ Soft skills

Communication skills

Observation skills

▼ Organizational skills

Coordination

Consultant

[Concept Class](#)

Role

⊕ Preferred Labels

[Create a preferred label](#)

Consultant en

⊕ Alternative Labels ⁰

[Create an alternative label](#)

⊕ Metadata

[Add metadata field](#)

Pay range

[Add Pay range](#)

↑ Top Concept Of

Role

→ Related Concepts ²

[Select a related concept](#)

requiresSkill > [Communication skills](#)

requiresSkill > [Organizational skills](#)

↶ Broader Concepts ⁰

[Select a broader concept](#)

↳ Narrower Concepts ⁰

[Select a narrower concept](#)

🗺 Mappings ⁰

[Define a mapping](#)

Screenshot from Progress Semaphore

Armando

VocBench

localhost:8080/vb3/#/Data

About VocBench

Current project: TestProject Global Data Management

VocBench Projects Data SPARQL History Tools

Class Concept Scheme Collection Property

SportsCar (en) http://test.project/c_74ee3f83

Rename

Types:

- rdf:type
 - skos:Concept

Top Concept of:

Schemes:

- skos:inScheme
 - main scheme (en)

Broaders:

- skos:broader
 - Car (en)

Lexicalizations:

- http://www.w3.org/2008/05/skos-xl#prefLabel
 - SportsCar

Notes:

Properties:

Search...

Screenshots from VocBench

Armando

VocBench

localhost:8080/vb3/#/Data

About VocBench

Current project: OWLTestProject Global Data Management

VocBench Projects Data SPARQL History Tools

Class Property

owl:Thing

- :Person
- owl:Nothing

:Armando_Stellato

Person (en) http://owl.test.project#/Person

Rename

Types:

rdf:type

- Class

Class axioms:

rdfs:subClassOf

- :friend ONLY :Person
- Thing

Lexicalizations:

rdfs:label

- Person

Properties:

Search...

Screenshots from VocBench

The screenshot displays the VocBench web application. At the top, there's a browser window with the URL localhost:8080/vb3/#/Data. Below the browser, the application header includes 'VocBench' and navigation tabs for 'Projects', 'Data', 'SPARQL', 'History', and 'Tools'. The 'Data' tab is active, showing a class hierarchy on the left and a detailed view of the 'Person' class on the right. The class hierarchy shows 'owl:Thing' as the parent, with ':Person' and 'owl:Nothing' as children. The 'Person' class details include its URI, type, sub-classes (like ':friend ONLY :Person' and 'Thing'), and a lexicalization with the label 'Person'. A search bar is at the bottom left, and a text box with 'Screenshots from VocBench' is at the bottom right.

Conclusions

Why connect taxonomies and ontologies or extend a taxonomy to an ontology?

- Provides more uses than either a taxonomy or ontology alone
- Brings together the strengths of each: semantic and linguistic expressiveness
- Supports knowledge graphs and semantic layers and their benefits
- Makes use of existing taxonomies
- Conforms to both taxonomy and ontology standards for interoperability

When to connect taxonomies and ontologies

- When you have identified a business use case
- When you have resources skilled in taxonomies, ontologies, and implementations
- When you have a combined taxonomy/ontology management tool

How to connect a taxonomy and ontology

- Develop an ontology based on existing taxonomies/term lists, and add the ontology “layer”
- Use a software tool dedicated to combined taxonomy/ontology management (based on RDF, SKOS, RDFS and OWL)

Resources on Taxonomy / Ontology Combinations

Posts from The Accidental Taxonomist Blog

- [“Taxonomies and Ontologies as Semantic Models,”](#) August 18, 2024
- [“Taxonomies vs. Ontologies,”](#) January 31, 2023

Presentations

- [“The Role of Taxonomy and Ontology in Semantic Layers”](#) webinar, April 16, 2024
- [\(first half hour of 1-hour video recording link\)](#)
“Taxonomy-Driven Ontology Design” The Knowledge Graph Conference, May 8, 2023.
[\(1.5-hour video recording link\)](#)

Articles by others

- [“Combined usage of SKOS and OWL: an experimentation on the Digital Europa Thesaurus,”](#)
by Nicolas Figay, April 21, 2024
- [“Editing schemas, ontologies, and SKOS taxonomies with VocBench,”](#)
by Bob Ducharme, August 25, 2024

Upcoming Taxonomy Presentations and Workshops

- [“Connecting Users to Content Through Taxonomies”](#) full-day pre-conference workshop
Information Architecture Conference, Philadelphia, April 29, 2025
- [Virtual Bite-Sized Taxonomy Boot Camp London](#) (3 sessions/hours each time)
March 12, June 18, and October 8, 2025

Any time:

- [“Controlled Vocabularies and Taxonomies”](#) training course of four 75-minute video recordings, HS Events
- [“Taxonomies and Controlled Vocabularies”](#) training course of 5 web-based lessons and exercises, Hedden Information Management

Questions/Contact

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