An Introduction to Knowledge Graphs

for Information Architects

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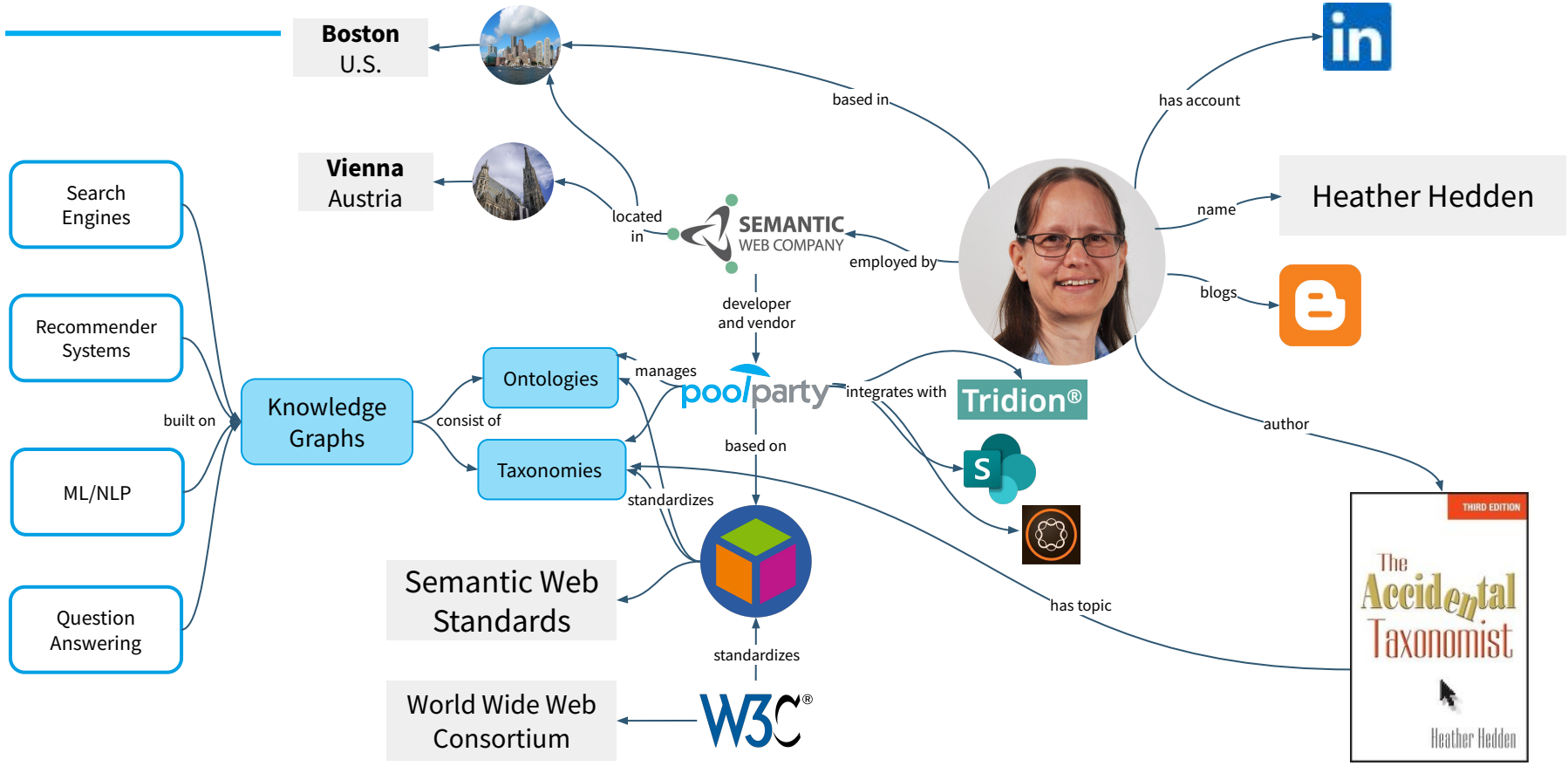
About - Click the Graph and get in contact!



Outline

- Knowledge Graph Background
  - Information architecture domain relevance
  - Problems & solutions for connecting information
  - Knowledge graphs defined and history
- Knowledge Graph Components
  - Data stored in a graph database
  - Taxonomies
  - Ontologies
- Knowledge Graph Building and Applications
  - Building knowledge graphs
  - Applications based on knowledge graphs

Knowledge Graph Background

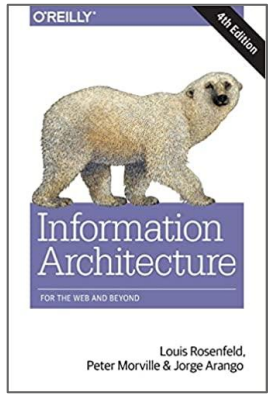
Information Architecture Domain

Evolving the Practice of IA

As we consider change and resilience, we'd like to consider:
What can adjacent and complementary fields… teach IAs? And what can we learn from our sibling domains …

IA Definitions

1. The structural design of shared information environments.
2. The synthesis of organization, labeling, search, and navigation systems within digital, physical, and cross-channel ecosystems.
3. The art and science of shaping information products and experiences to support usability, findability, and understanding.
4. Organizing and labeling web sites, intranets, online communities, and software to support findability and usability.
5. An emerging discipline and community of practice focused on bringing principles of design and architecture to the digital landscape.



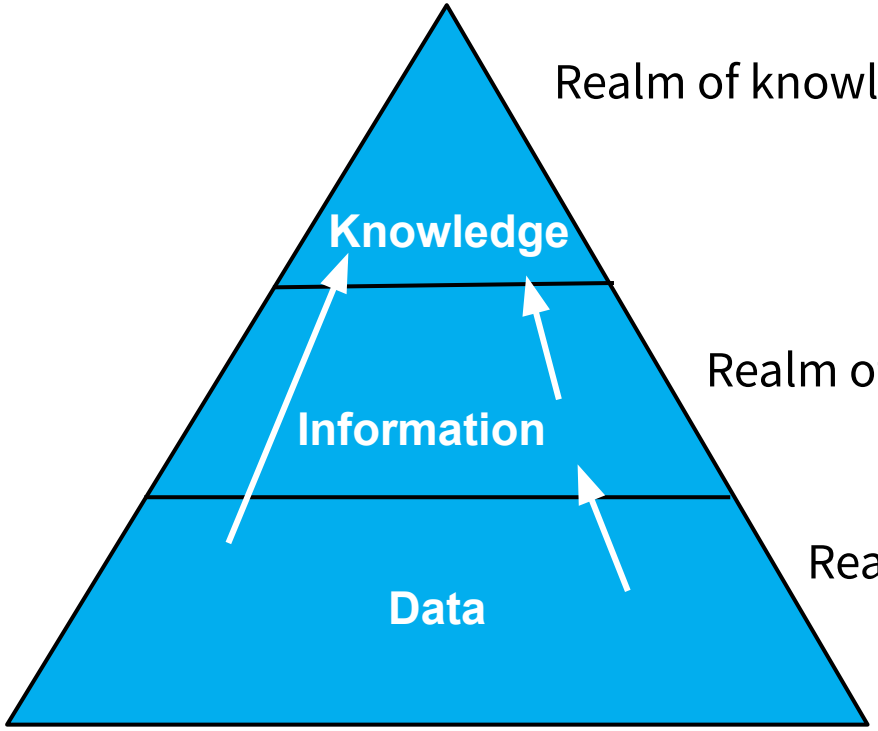
-- Louis Rosenfeld, Peter Morville, and Jorge Arango, Information Architecture, 4th ed. , O'Reilly, 2015, p. 24

Information Architecture Domain

“Information Environments”

- Not limited to a single web site, intranet, application, or online community
- Within an organization/enterprise environment, information that should be shared, pooled, linked, related, is often scattered in different applications and sources:
  - multiple content management systems
  - document management systems
  - digital asset management systems
  - employee experience platforms
  - internal collaboration software
  - external/partner collaboration spaces
  - policies, procedures, guidelines
  - customer information
  - Product info/technical documentation
  - marketing content/collateral
  - internal research information
  - external/market research information
  - people/experts
- Users want to access disparate information together.
- Users prefer a single user interface and experience.

Information Architecture Domain



Realm of knowledge managers

Realm of information architects

Realm of data scientists and data engineers

Information architects need to consider **data** and **knowledge**, too, not just **information**, because they are all connected.

Problems & Solutions for Connecting Information

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Problems

- Data and content silos
- Heterogeneous sources
- Mix of unstructured and structured data
- Mix of data and content
- Same things with different names
- Localized meanings
- Change

Causing

- Inefficiencies
- Missed opportunities
- Poor decisions
- Poor user experience

Solutions

- Sharing data
- Reusing data
- Linking data
- Linking content
- Semantic links
- Unified views

Provided by

- Data-centric architecture
- Ontologies
- **Knowledge graphs**

Results in

- Knowledge discovery
- Better decisions
- User/customer satisfaction

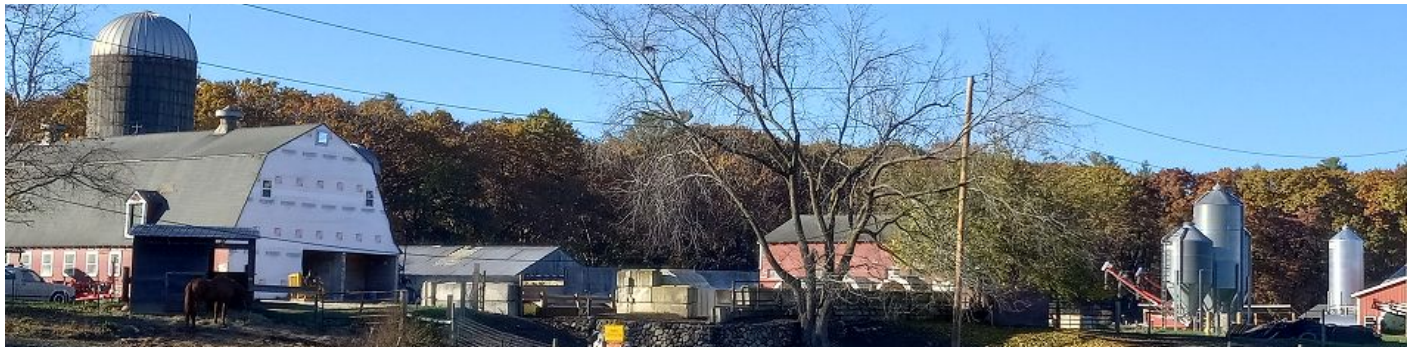
Problems & Solutions for Connecting Information

Content/data silos need not (or cannot) be fully broken down

- Content is in systems/applications with specific features.
- Content is owned and managed by their subject matter experts.
- Content is for specific users and delivery systems.

But silos can be bridged

- Extracting and transforming data into standard linked data formats
- Linking content with metadata, taxonomies, ontologies



Problems & Solutions for Connecting Information

What knowledge graphs can do

- Integrate knowledge
- Serve data governance
- Provide semantic enrichment
- Bring structured and unstructured data together
- Provide unified view of different kinds of unconnected data sources
- Provide a semantic layer on top of the metadata layer
- Improve search results beyond machine learning and algorithms
- Answer complex user questions instead of merely returning documents on a topic
- Combine with deep text analytics, semantic AI, and machine learning

Problems & Solutions for Connecting Information

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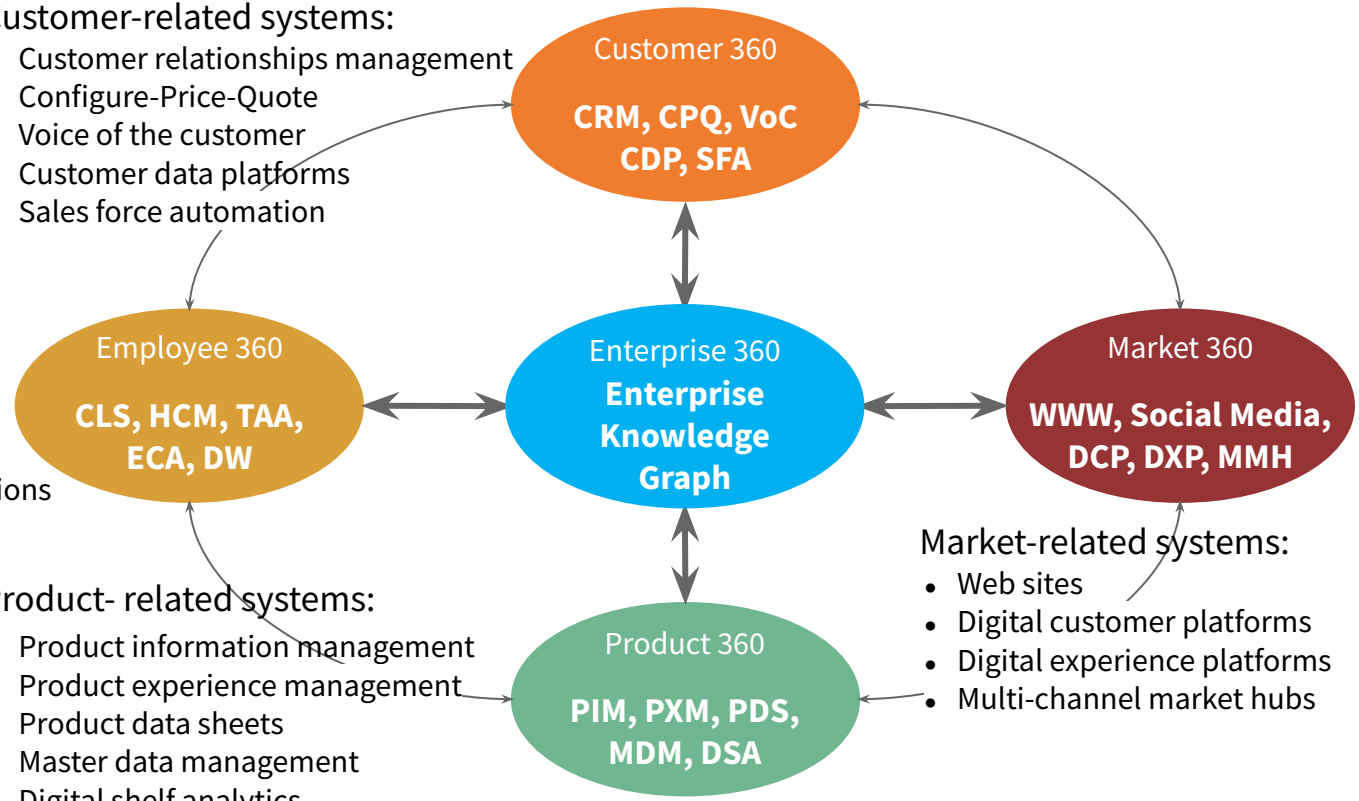
Siloed information in different systems and departments

Customer-related systems:
- Customer relationships management
- Configure-Price-Quote
- Voice of the customer
- Customer data platforms
- Sales force automation

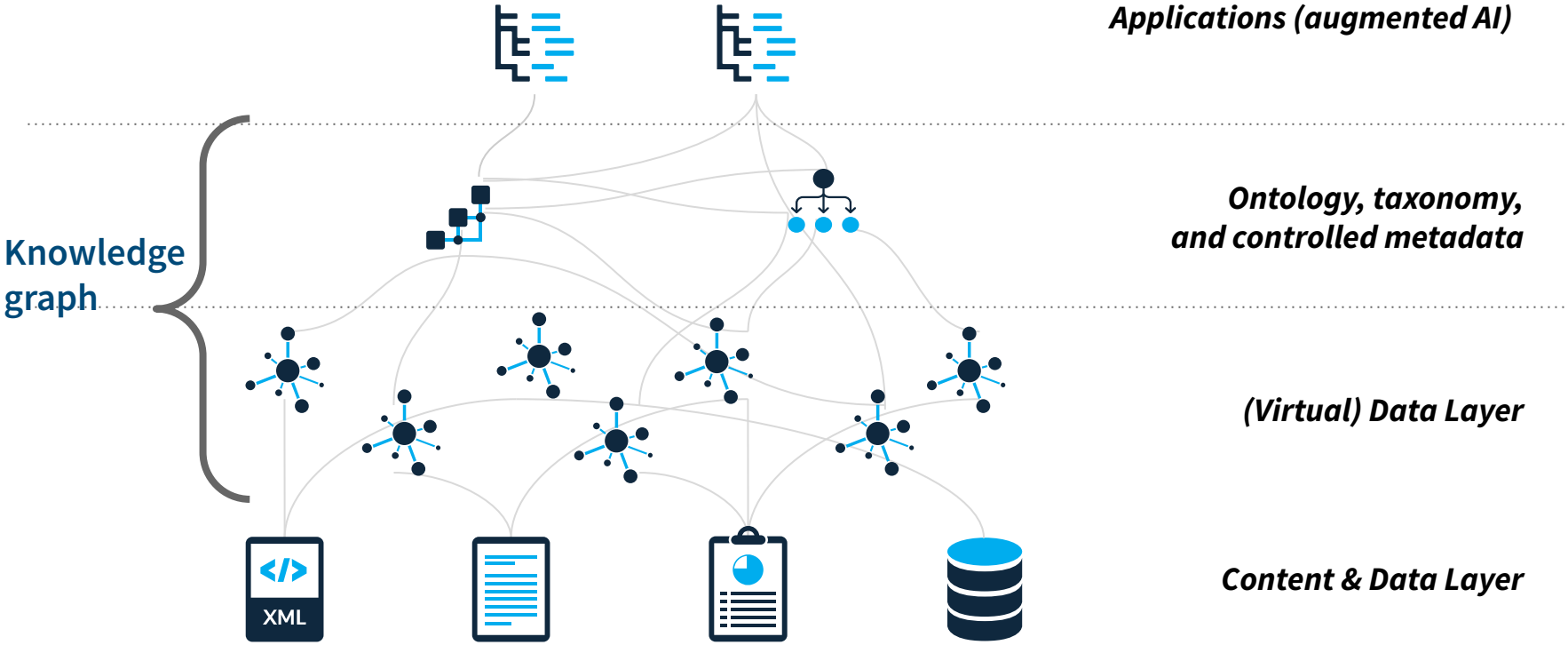
Employee-related systems:
- Corporate learning systems
- Human capital management
- Talent acquisition applications
- Employee communication applications
- Data warehouses



Product- related systems:
- Product information management
- Product experience management
- Product data sheets
- Master data management
- Digital shelf analytics

Market-related systems:
- Web sites
- Digital customer platforms
- Digital experience platforms
- Multi-channel market hubs

Knowledge Graphs Defined



Knowledge Graphs Defined

What is a knowledge graph?

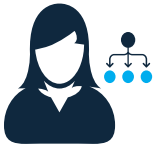
- A model of a knowledge domain combined with instance data
- Represents **unified information** across a domain or an organization, enriched with context and semantics.
- Contains business objects and topics that are closely **linked**, classified, and connected to existing data and documents.
- A **layer** between the actual content and the querying layer.
- Both **machine-readable** and **human-readable** through some form of display.
- Gets its name from **knowledge** base + **graph** database and optional **graph** visualizations.

Knowledge Graphs Defined

"Knowledge graphs" have different meanings from different perspectives.

From a Knowledge Engineer's perspective

*A Knowledge Graph is a **model of a knowledge domain** created by subject-matter experts with the help of intelligent machine learning algorithms.*



From a Data Architect's perspective

*Structured as an additional virtual data layer, the KG lies on top of existing databases or data sets to **link all your data together at scale**.*

From a Data Engineer's perspective

*It provides a **structure and common interface** for all of your data and enables the creation of smart multilateral relations throughout your databases.*

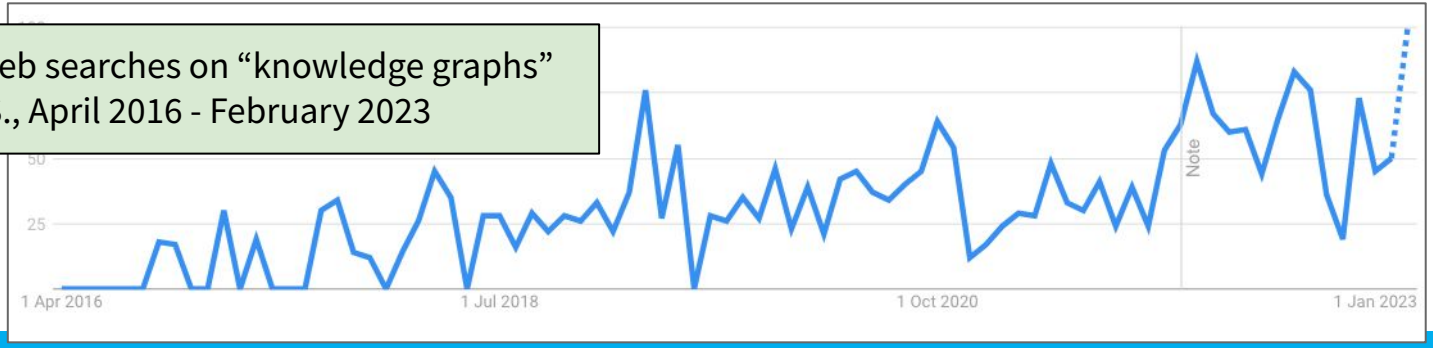
"A knowledge base that uses a graph-structured data model or topology to integrate data."

Knowledge base: "A technology used to store complex structured and unstructured information used by a computer system." - *Wikipedia*

Knowledge Graphs History

- “Knowledge Graphs” project for mathematics by researchers of the University of Groningen and University of Twente , Netherlands, 1982
- Rise of topic-specific knowledge bases: e.g. Wordnet in 1985; Geonames in 2005
- General graph-based knowledge repositories, DBpedia (based on linked data) in 2006, Freebase in 2007
- Google introduced its Knowledge Graph (based on Freebase) to improve search results value in 2012.
- Large data-heavy companies adopted knowledge graphs: Airbnb, Amazon, Apple, Bank of America, Bloomberg, Facebook, Genentech, Goldman Sachs, JPMorgan Chase, LinkedIn, Microsoft, Uber, Wells Fargo
- Knowledge graphs became a topic at various conferences by 2019.
- Enterprise knowledge graphs become the focus.

Google web searches on “knowledge graphs” in the U.S., April 2016 - February 2023



Knowledge Graph Components

Knowledge Graph Components

Knowledge graph components

- Extracted **data**, stored in either
  - A **graph database**, of either
    - RDF-based triple store
    - Labeled property graph
  - A search index (if not large)
    - RDF-based triple store

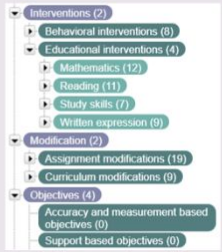
- which are tagged/linked with metadata or concepts in **controlled vocabularies** (especially **taxonomies**) to label and organize the data,

- which in turn are semantically linked to represent conceptual relationships and enriched with additional metadata attributes in an **ontology**.

Scope issue/question: What kind of data is included or not? Data vs. content

Knowledge Graph Components

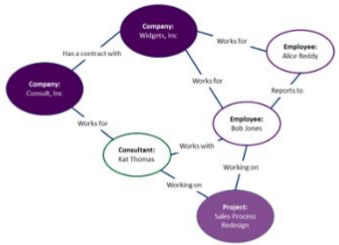
Business Taxonomy



Content Sources

salesforce
SharePoint
Drupal
Excel
MediaBeacon An ESKO Company
twitter
Microsoft Dynamics
WebDAM web-based digital asset management

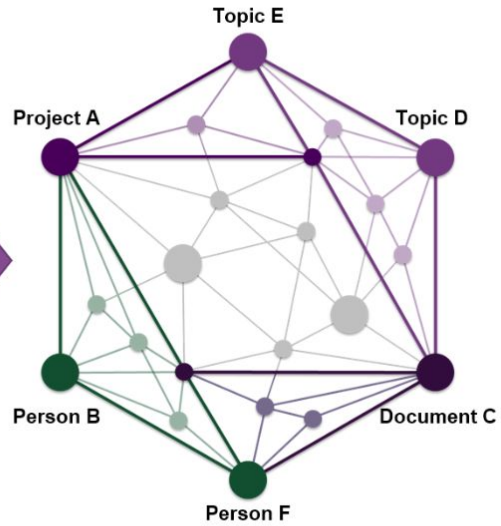
Business Ontology



Graph Database

Subject	Predicate	Object
Project A	hasTitle	Title A
Person B	isPMOn	Project A
Document C	isAbout	Topic D
Document C	isAbout	Topic F
Person B	IsExpertIn	Topic D
…	…	…

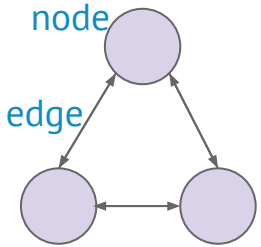
Enterprise Knowledge Graph



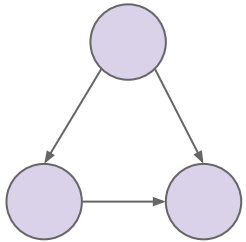
Source: Enterprise Knowledge, https://enterprise-knowledge.com/what-is-an-enterprise-knowledge-graph-and-why-do-i-want-one

KG Components: Data in a Graph Database

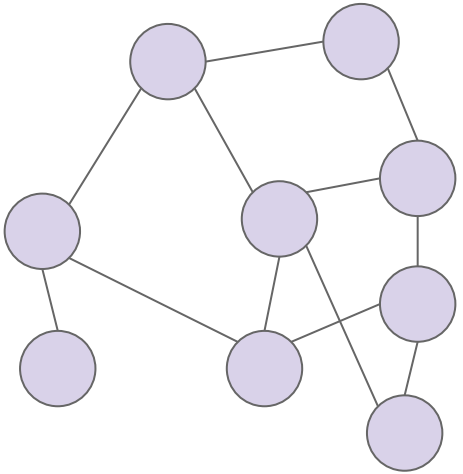
Graph databases structure data in the form of graphs, comprising **nodes** (points, vertices) and **edges** (lines, links), *not* as tables of rows and columns, as relational database are.



Undirected graph



Directed graph



Two kinds of graph databases: **RDF Triple Stores**, and **Labeled Property Graphs (LPGs)**

KG Components: Data in a Graph Database

	RDF Triple Store	Labeled Property Graph
Standardization	World Wide Web Consortium (W3C)	Different vendors
Designed for	Linked Open Data, publishing and linking data with formal semantics and no central control	Graph representation for analytics
Processing strengths	Set analysis operations	Graph traversal
Data management strengths	Interoperability via global identifiers and a standard. Data validation, data type support.	Compact serialization, shorter learning curve.
Main use cases	Data-driven architecture, data integration, metadata management, knowledge representation	Graph analytics, path search, network analysis
Additional options	Inferencing	Shortest path calculations
Formal semantics	Yes	No

KG Components: Data in a Graph Database

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RDF Triple Store Graph Databases

- Store data
- Store links to content
- Store metadata, controlled vocabularies, taxonomies, ontologies

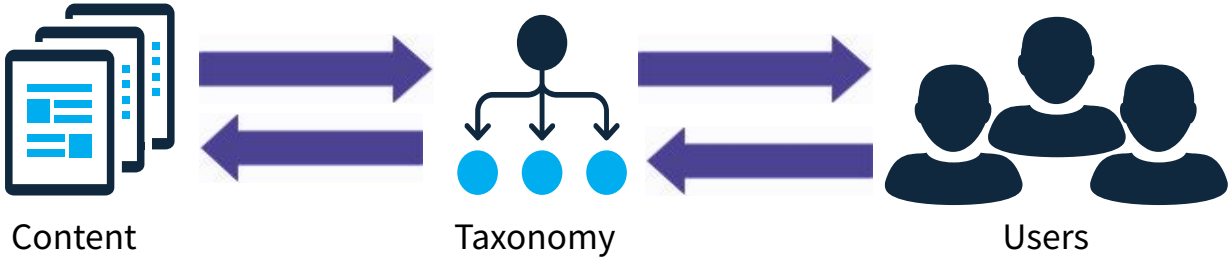
Based on RDF: Resource Description Framework

- A World Wide Web (W3C) recommendation www.w3.org/TR/rdf11-concepts
- “A standard model for data interchange on the Web”
- Requires the use of URIs to specify things and to specify relations.
- Models information as **subject – predicate – object** triples.

KG Components: Taxonomies

What and why taxonomies?

- A taxonomy is a controlled vocabulary organized into a hierarchical structure.
- Concepts/terms are used to tag/index/categorize content to make it easier to be found and retrieved
  - supporting better findability than search alone
- The taxonomy is an intermediary that links the user to the desired content.



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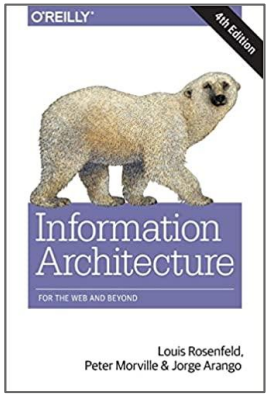

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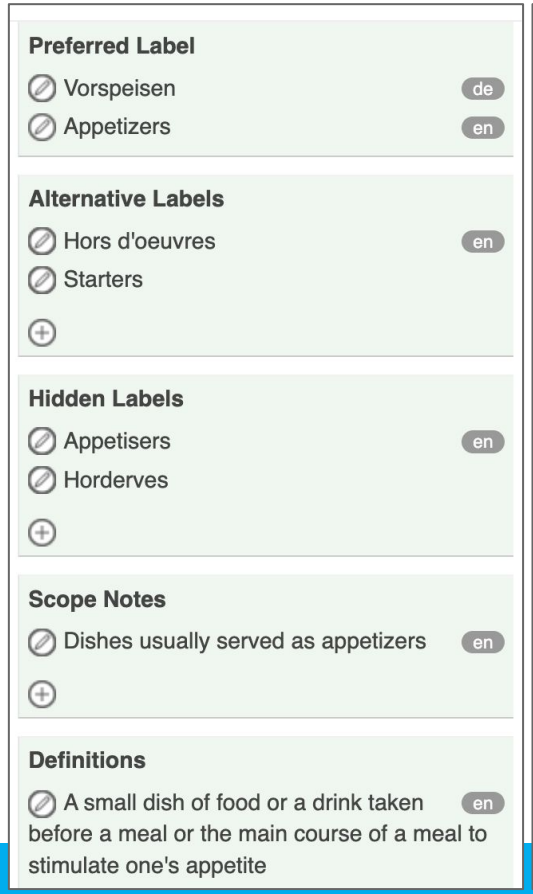
KG Components: Taxonomies

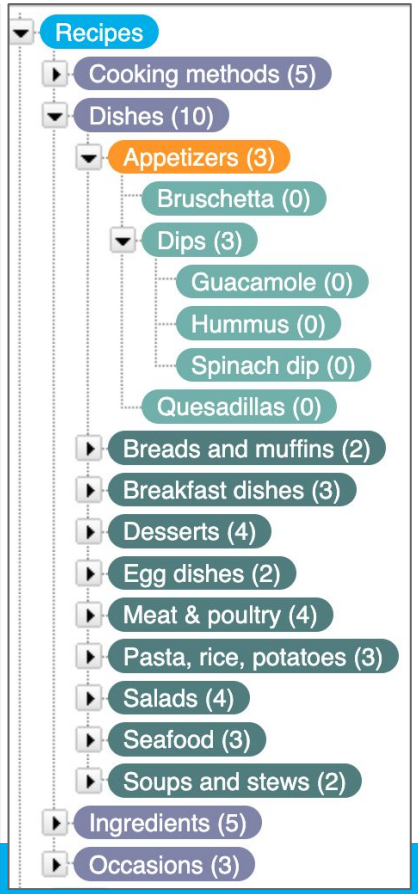
controlled *organized*

What is a taxonomy?

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.





KG Components: Taxonomies

SKOS (Simple Knowledge Organization System)

- A data model (“standard”) to represent knowledge Organization systems.
- A World Wide Web (W3C) recommendation (initial version 2004 - revised 2009)
- “A common data model for sharing and linking knowledge organization systems via the Web” www.w3.org/TR/skos-reference
- To enable easy publication and use of such vocabularies as linked data.
- Based on RDF (Resource Description Framework), and encoded in XML, JSON, JSON-LD, etc.
- Concepts and relations are resources with URIs.
- A KOS built on SKOS is machine-readable and interchangeable.
- Different KOS types (name authority, glossary, classification scheme, thesaurus, taxonomy) can all be built in SKOS.

KG Components: Taxonomies

SKOS principles and elements

- A KOS is a group of **concepts** identified with URIs and
- Concepts can be grouped hierarchically into **concept schemes**.
- Concept can be labeled with any number of lexical strings (**labels**) in any natural language.
  - Concepts have one **preferred label** in any natural language, and any number of **alternative labels** and **hidden labels**.
- Concepts can be linked to each other using hierarchical and associative semantic **relations**:
  - **broader**/**narrower** and **related**.
- Concepts of different concept schemes can be linked using various **mapping relations**.
- Concepts can be documented with **notes**:
  - **scope note**, **definition**, **editorial note**, **history note**
- Concepts can additionally be members of **collections**, which can be labeled or ordered.

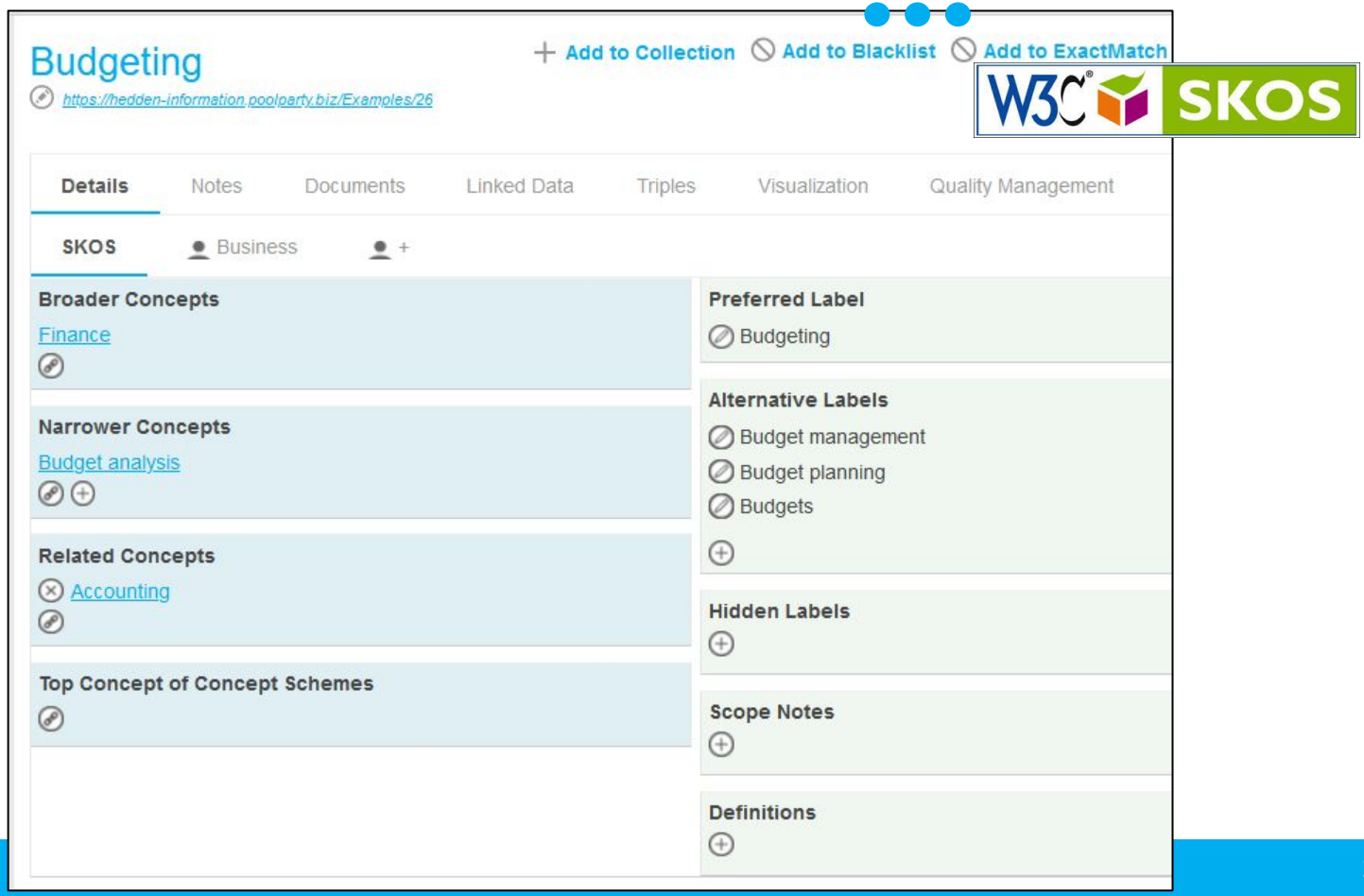
KG Components: Taxonomies

SKOS elements

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

KG Components: Taxonomies

Basic SKOS view for taxonomy editing



KG Components: Taxonomies

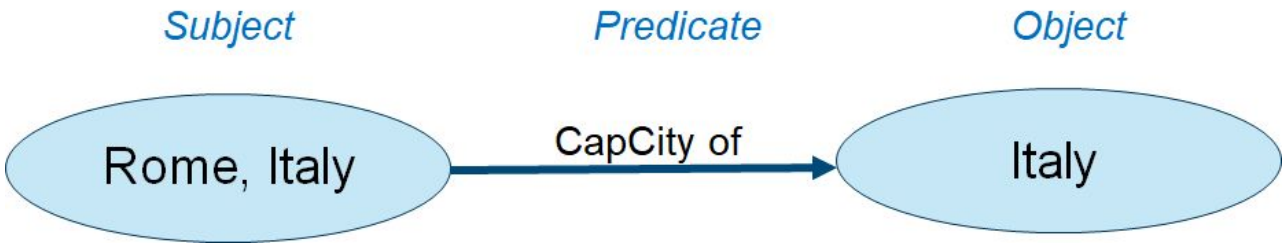
- Centrally managed taxonomies (not a taxonomy built in a siloed application), now tend to be built on the SKOS data-exchange model.

- Since SKOS is based on RDF,
  SKOS taxonomies are easily managed in RDF graph databases,
  and connect to the data, other taxonomies, and ontologies,
  in addition to linking to content.

KG Components: Ontologies

Ontology

- A model of a knowledge domain
- Similar to (most of) a knowledge graph, but excludes the actual instance data
- A formal naming and definition of the types, properties and interrelationships of entities in a particular domain.
  - Relations contain meaning, are “semantic.”
  - Properties are customized attributes of entities.
- Common standards provided by W3C: Web Ontology Language (OWL) and RDF-Schema.
- Comprises classes, relations, and attributes, which are linked in triples.



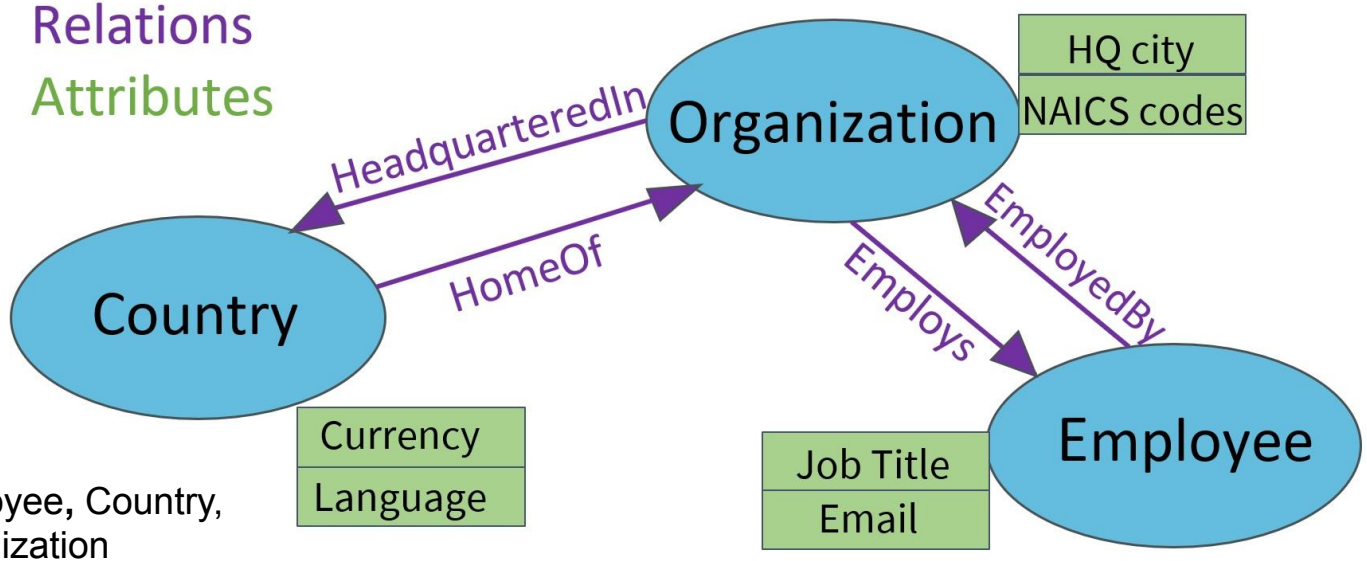
KG Components: Ontologies

Ontology

Classes

Relations

Attributes



Classes

Employee, Country, Organization

Relations: HeadquarteredIn < > HomeOf
EmployedBy < > Employs

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

KG Components: Ontologies

W3C Standards and Guidelines for Ontologies

RDF (Resource Description Framework)

www.w3.org/TR/rdf11-concepts

"A standard model for data interchange on the Web" modeling triples

RDFS (RDF-Schema)

www.w3.org/2001/sw/wiki/RDFS

"A general-purpose language for representing simple RDF vocabularies on the Web"
Goes beyond RDF to designate **classes** and **properties** of RDF resources, as ontology basics

OWL (Web Ontology Language)

www.w3.org/OWL

"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.

SPARQL (SPARQL Protocol and RDF Query Language)

www.w3.org/TR/2008/REC-rdf-sparql-query-20080115

Language to query and update RDF data

KG Components: Ontologies

OWL-Specified Ontology Components

Entities – subjects or objects of triples (domains and ranges)

- Classes
  - Named sets of concepts that share characteristics and relations
  - May group subclasses or individuals (instances of the class)
- Individuals
  - Members or instances of a class. (Could be managed in a separate, linked taxonomy)

Properties – predicates of triples, about individuals

- Object properties
  - Relations between individuals
  - May be directed (single direction), symmetric, or with an inverse (different in each direction)
- Datatype properties
  - Attributes or characteristics of individuals
  - The object of a datatype property is a *value*.

Literals – values of attributes (metadata values)

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

KG Components: Ontologies

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	Semantic relationships Classes Attributes

KG Components: Ontologies

Knowledge organization systems

Less — Semantic Expressiveness — More

Ontology			
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

KG Components: Ontologies

What you can do with ontologies, that you cannot do with taxonomies alone

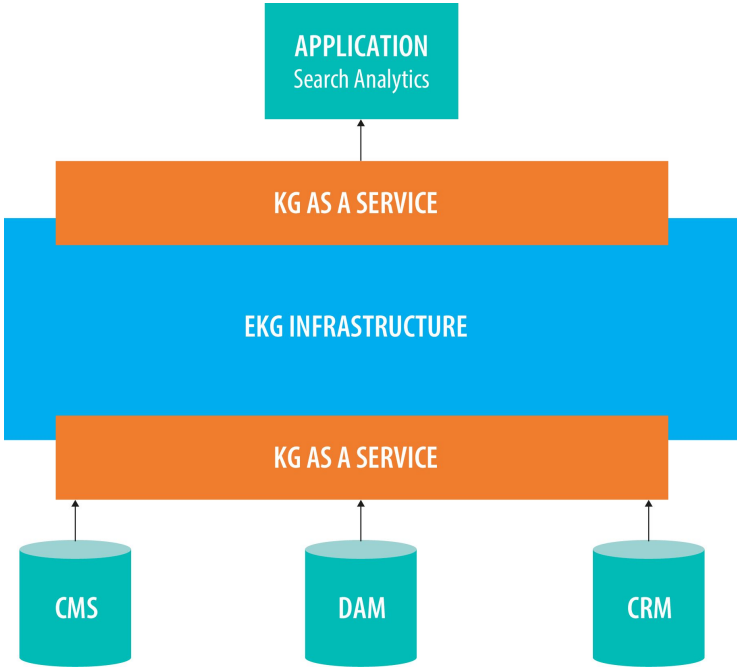
- Modeling complex interrelationships, such as those in processes, regulatory compliance, etc.
- Complex multi-part searches from different aspects
- Exploring explicit relationships between concepts beyond merely broader/narrower and generic related
- Searching across datasets as well as content
- Searching using more specific criteria that vary based on a category (class), such as ecommerce product attributes
- Merging information from multiple sources, internal and on the Web
- Rules-based auto-classification driven by specific classes and relationships
- Visualizing concepts and semantic relationships
- Reasoning based on statements (axioms) and inferencing

Knowledge Graph Building and Applications

Building Knowledge Graphs

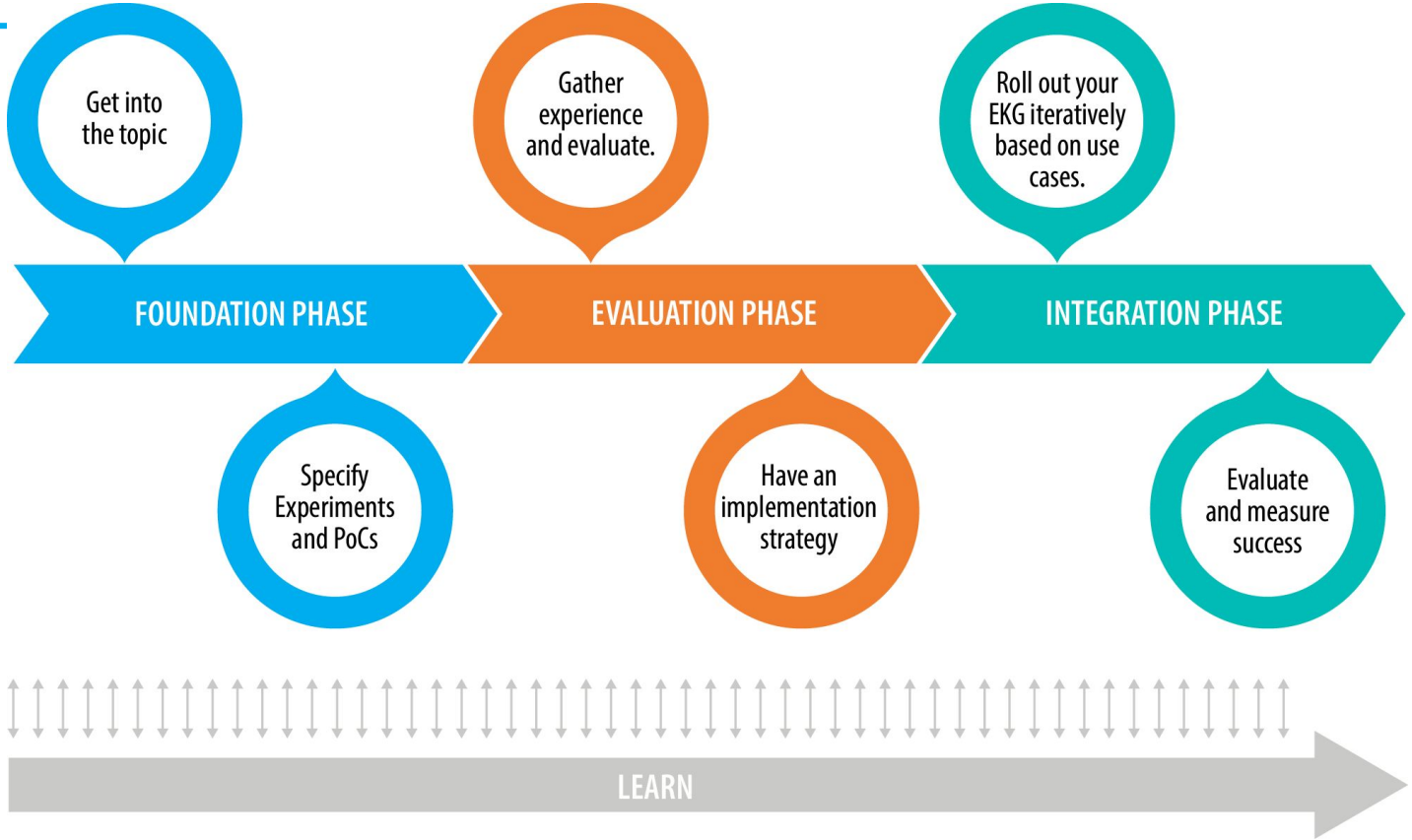
Steps to build a knowledge graph

- Identify use cases, problems to be solve
- Inventory and organize relevant data and content
- Identify relationships across data: design ontologies
- Incorporate sample data in a graph database connected to the ontology/taxonomy, as a test proof of concept.
- Connect to or build user applications and interfaces.
- Automate and scale with data pipelines, auto-tagging, and AI.



Building Knowledge Graphs

Suggested project management phases



Building Knowledge Graphs

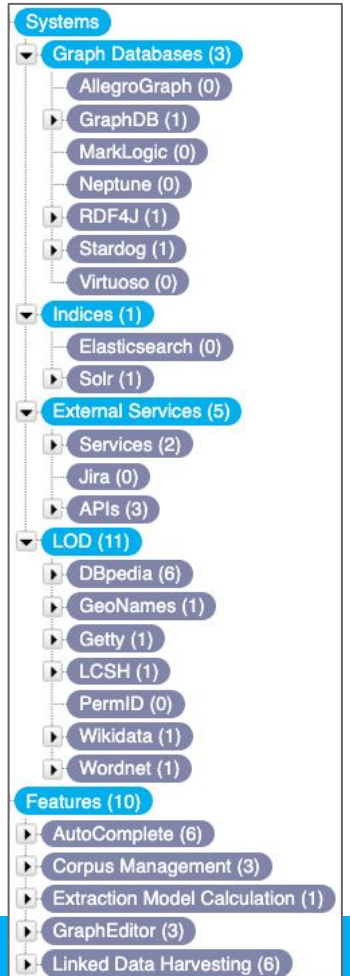
Software and technology needed

- Graph database management software
- Taxonomy/ontology management software based on W3C standards
- Search software (such as Solr or Elasticsearch)
- Front-end (web) application
  - whether commercial software or custom web developed user interface based on an API connection

Optional:

- Data catalog software
- Text mining/natural language processing/entity extraction tool
- Machine-learning auto-classification tool
- Capabilities (such as algorithms for weighting/scoring relations) specified in SPARQL query language for RDF

Often these are combined, but there is no single “knowledge graph software.”



Building Knowledge Graphs

Collaboration of people:

- Data engineers
- Data scientists
- Data analysts
- Data architects
- Knowledge engineers
- Taxonomists
- Ontologists
- Content strategists
- Solutions architects
- Software engineers
- Web developers
- Information architects

Challenges/Requirements:

- A specific business/use case, not just curiosity to try new technologies
- Implementation expertise with software tools and guidance from consultants
- Commitment from all stakeholders
- Sufficient time, effort, and expertise to deal with a very complex project
- Data quality

Knowledge Graph Applications

Applications

- Semantic search
- Recommendation
- Intent — Personalization and insight engines
- Question-answering engines / natural language search across data
- Compliance and risk prediction
- Chatbots and voice assistants
- Expert finder
- Customer 360 – view of everything known about customers

- An organization typically builds its own web-browser-based knowledge graph application.
- The application UI and UX also utilize information architecture.

Knowledge Graph Applications

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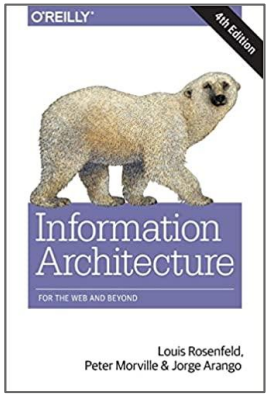
2. The synthesis of organization, labeling, search, and navigation systems within digital, physical, and cross-channel ecosystems.
3. The art and science of shaping information products and experiences to support usability, findability, and understanding.
4. Organizing and labeling web sites, intranets, online communities, and software to support findability and usability.
5. An emerging discipline and community of practice focused on bringing principles of design and architecture to the digital landscape.



-- Louis Rosenfeld, Peter Morville, and Jorge Arango, Information Architecture, 4th ed. , O'Reilly, 2015, p. 24

Knowledge Graph Applications

Knowledge Panels delivery of information from the Google Knowledge Graph

Feedback

About

w3.org

Sir Timothy John Berners-Lee, OM, KBE, FRS, FREng, FRSA, DFBCS, RDI, also known as TimBL, is an English computer scientist best known as the inventor of the World Wide Web. He is a professorial research fellow at the University of Oxford and a professor emeritus at the Massachusetts Institute of Technology. Wikipedia

Born: June 8, 1955 (age 67 years), London, United Kingdom

Spouse: Rosemary Leith (m. 2014), Nancy Carlson (m. 1990–2011)

Siblings: Mike Berners-Lee

Dates knighted: 1997, 2004

Parents: Conway Berners-Lee, Mary Lee Woods

Organizations founded: World Wide Web Consortium, MORE

Education: The Queen's College (1973–1976), Emanuel School (1969–1973), Sheen Mount Primary School

Claim this knowledge panel

Feedback

Profiles

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Boston

City in Massachusetts

Boston, officially the City of Boston, is the capital and largest city of the Commonwealth of Massachusetts and the cultural and financial center of the New England region of the Northeastern United States. The city boundaries encompass an area of about 48.4 sq mi and a population of 675,647 as of 2020. Wikipedia

Area: 89.63 mi²

Weather: 56°F (13°C), Wind W at 11 mph (18 km/h), 77% Humidity More on weather.com

Population: 654,776 (2021)

Local time: Thursday 10:25 PM

Neighborhoods: South Boston, East Boston, North End, Downtown, MORE

Clubs and Teams: Boston Celtics, Boston Bruins, Boston Red Sox, MORE

Colleges and Universities

View 30+ more


Northeast... University


Boston University

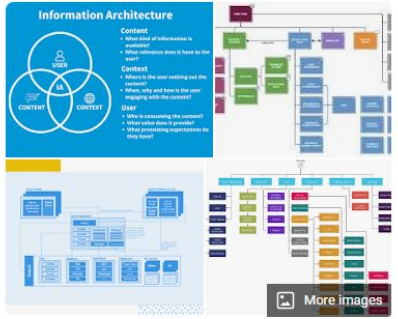

UMass Boston


Suffolk University

Events

Fri, Mar 24 8:30 AM — Open Game Room, Cohasset

Information architecture



Information architecture is the structural design of shared information environments; the art and science of organizing and labelling websites, intranets, online communities and software to support ... Wikipedia

4 types
4 types of information architecture

Examples
What is information architecture examples

8 principles
What are the 8 principles of information architecture

How to
How to do a information architecture

More

Information Architecture Books


Information

How to Make

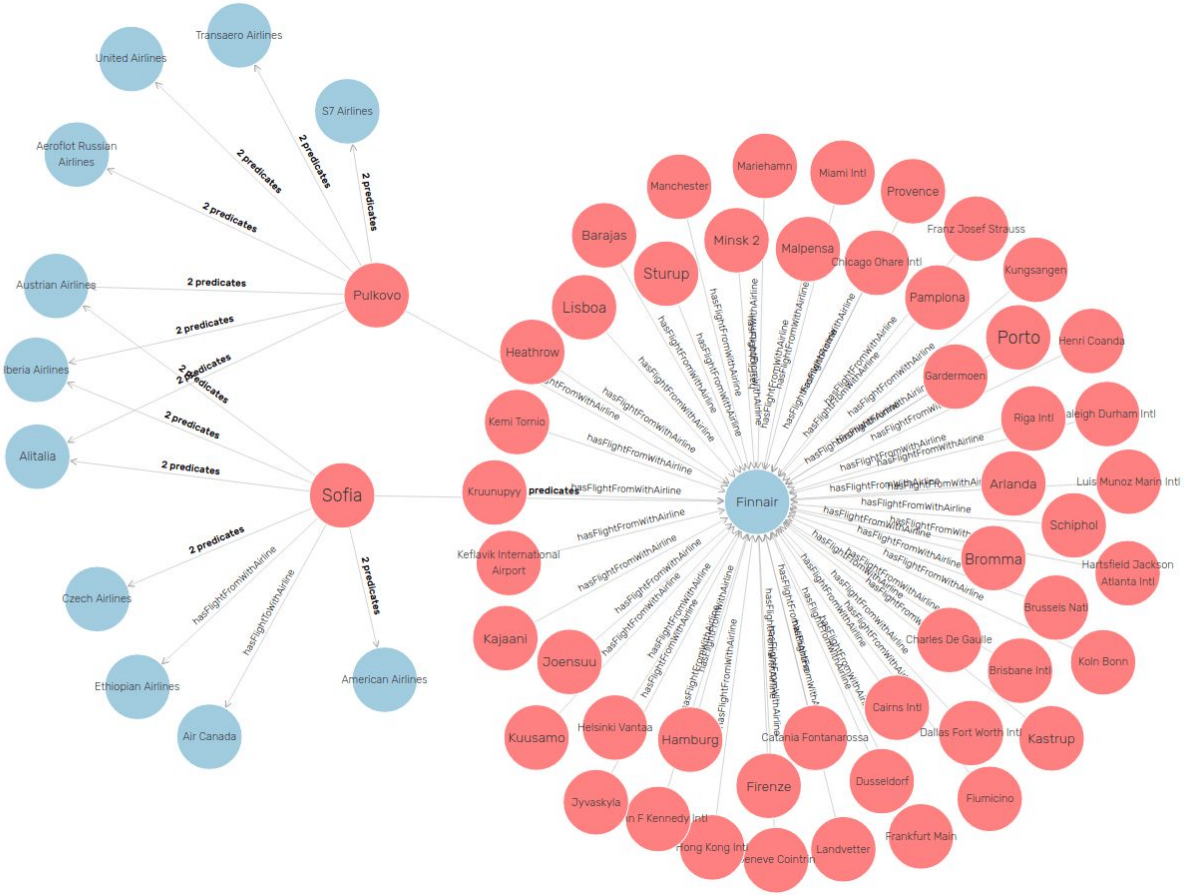

Information

Understandin

Knowledge Graph Applications

Graph visualizations

Airlines and destinations from GraphDB, a triple store graph database



Knowledge Graph Applications

Sample Applications

- Healthdirect Australia - public website health symptom checker
  https://www.healthdirect.gov.au/symptom-checker
- Semantic Web Company's HR Recommender proto-type
  https://hr-recommender.poolparty.biz/hr-recommender/overview
- Semantic Web Company's Wine & Cheese Harmonizer
  https://ppil-dev.semantic-web.at/PPIL
- QAnswer
  https://www.qanswer.eu

HR Recommender

GET IN TOUCH

OVERVIEW | EMPLOYEES | PROJECTS | OPEN POSITIONS | ABOUT | MY ACCOUNT | LOG OUT

Meet these Employees

Move the sliders to see the coworkers that best match your strengths

RESET SLIDERS

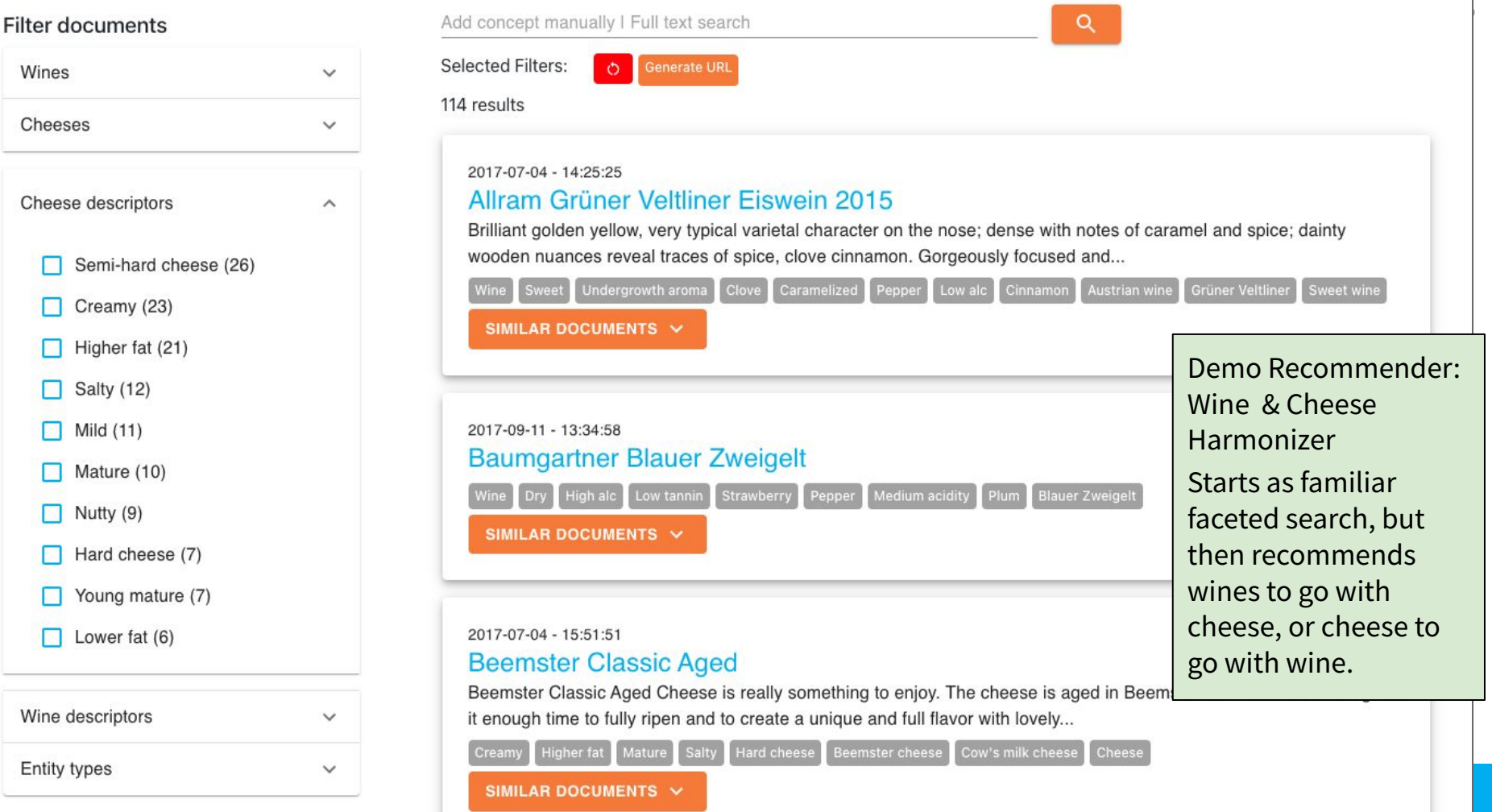
- bootstrapping
- computer science
- CSS
- development
- Frontend developer
- HTML
- JavaScript
- React
- style sheet languages

Employee	Strengths	
 Matthew Walker	JavaScript, HTML, C++, C#, PHP, web programming, Prolog, AJAX, Pascal, C	get in contact
 Florian Bernard	JavaScript, CSS, style sheet languages, Python, Jboss, ASP.NET, Prolog, AJAX, C	get in contact
 Richard Vestnes	HTML, CSS, style sheet languages, Python, Jboss, ASP.NET, PHP, MATLAB	get in contact
 Sophie White	JavaScript, CSS, style sheet languages, Java, C#, Scratch, JavaScript Framework, Perl	get in contact
 Maria Sanz	Frontend developer, Python, C#, PHP, Delphi, AJAX, Perl, Objective-C	get in

Demo HR Recommender:
Recommendations for matches of employees, projects, and open positions, based on profiles and taxonomy/ontology links

HR Recommender - Employees

These are the people you should be talking to! Here you find coworkers that match your strenghts and interests. The recommendation is based on your footprint and may be fine-tuned by using the sliders to



Demo Recommender: Wine & Cheese Harmonizer

Starts as familiar faceted search, but then recommends wines to go with cheese, or cheese to go with wine.

Seahorse Demo

bank of america

Bank of America
Founded: 1998
HQ: Charlotte, North Carolina
Sector: Financials
Subsector: Diversified Banks
Stock ticker: BAC

Key Executives

Mr. Aditya Bhasin (Chief Technology & Information Officer)
Mr. Matthew M. Koder (Pres of Global Corporation & Investment Banking)
Mr. Rudolf A. Bless (Chief Accounting Officer)
Mr. Christopher M. Hyzy (Chief Investment Officer)
Mr. Thomas M. Scrivener (Chief Operations Executive)
Mr. Alastair M. Borthwick (Chief Financial Officer and Vice Chair of Global Diversity & Inclusion Council)
Mr. Geoffrey S. Greener (Chief Risk Officer)
Mr. Paul M. Donofrio (Vice Chairman)
Mr. Dean C. Athanasia (Pres of Regional Banking)
Mr. Brian Officer & F

Bank of America

International Paper

Amgen

Cboe Glo

Bank of America Declares Preferred Stock Dividends

Dateline City: Charlotte Bank of America Corporation today announced the Board of Directors has authorized regular cash dividends on the outstanding shares or depositary shares of the following series of preferred stock: Series of Preferred Stock Dividend per Share or...

3 years ago • newsroom.bankofamerica.com

Bank of America Sets Company Record for Patents Filed and Granted During First Half of 2020

Dateline City: Charlotte Bank of America today announced it has recorded the most patents filed and granted in the first half of any year in the history of the company. The bank achieved that mark during a time in which the company also aligned more than 85% of employees to work...

3 years ago • newsroom.bankofamerica.com

f America Expands Support of Boys & Girls Clubs of America With $1 Million Grant to Support Educational ms

City: Charlotte The Bank of America Charitable Foundation has awarded a $1 million grant over two years to support a Boys & Girls America tutoring program for youth ages 6 to 18 in 10 communities across the country. The initiative is an extension of Project...

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tional Paper CEO to Speak at Bank of America Merrill Lynch 2021 Global Agriculture and Materials Conference

Impersonate

Impersonate

Chief Technology Officer

ESG investor

Investment banker

Rockwell Automation
Henry Schein
Lumen Technologies
Trane Technologies
Positive Sales Outlook
Booking Holdings
Goldman Sachs
New Debt
carbon
accounting
Public Storage
Tapestry, Inc.
Duke Energy
International Paper
ResMed
CME Group
Morgan Stanley
Walmart
Sales Outlook
Discover Financial
Aflac
Equity
ESG

Bank of America

Johnson & Johnson
Citigroup
Qorvo
Marriott International
Amgen
Plan to Finance
Ball Corporation
Extra Space Storage
LyondellBasell
Debt
IBM
Dividend
M&A
Equinix
MetLife
Regulatory Impact
Cboe Global Markets
AMD
Lincoln Financial
Completed Financial Investment
Intuit
SBA Communications
DaVita Inc.
Boston Scientific
Phillips 66
Buyout

Personalized insight engine demo from Squirro.
“Impersonate” roles for tailored results.

Conclusions

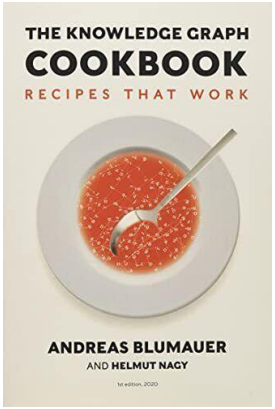
- Information architects who work on taxonomies:
  - should understand that a growing use of taxonomies is in knowledge graphs
  - may expect to work on taxonomies used in knowledge graphs
  - may have the opportunity and interest in designing ontologies

- Information architects who work on search/browse/faceted navigation user interfaces:
  - may contribute to the UIs of knowledge graph applications

- Information architects can raise awareness of the benefits of knowledge graphs within their organizations.

Knowledge Graph Resources

- The Knowledge Graph Conference, New York, NY, and hybrid virtual, May 8-12, 2023
- The Knowledge Graph Conference Slack Channel community and other resources
- "Unlocking Digital Transformation with Knowledge Graphs," webinar recording, Andreas Blumauer (Semantic Web Company) and Bram Wessel (Factor), April 7, 2022
- "How to Build a Knowledge Graph in Four Steps: The Roadmap From Metadata to AI" by Lulit Tesfaye, September 9, 2019, Enterprise Knowledge Blog.
- *The Knowledge Graph Cookbook*, by Andreas Blumauer and Helmut Nagy, 2020, paperback or free as ebook. www.poolparty.biz/the-knowledge-graph-cookbook



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Semantic Web Company www.semantic-web.com

PoolParty software www.poolparty.biz