

Information Architecture vs. Artificial Intelligence in Taxonomies

Heather Hedden

Information Architecture for Artificial Intelligence
SWARM Community Event

October 10, 2024

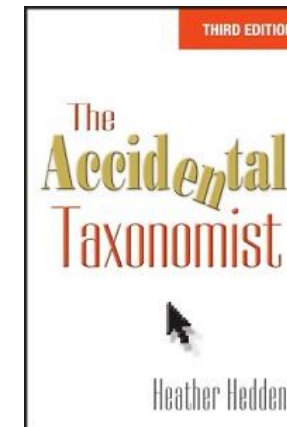
About Heather Hedden

- 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



Information Architecture vs. Artificial Intelligence

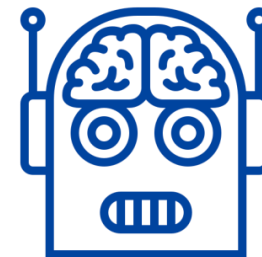
Information architects' goal:

To help people find information

To help people find specific information they seek, through interactive user interfaces

- The goal of information architecture (IA)
- The goal of a lot of artificial intelligence (AI)
 - The goal of AI in the field of information/knowledge management

Are IA and AI in competition,
or do they complement each other?



Outline

- What are taxonomies
- How taxonomies support information architecture
- Taxonomies and information architecture (IA) in the user experience
- Taxonomies and AI in the user experience
- Information architecture (IA) in taxonomy design and creation
- AI in taxonomy design and creation
- AI in taxonomy implementation: Tagging
- Future of IA, AI, and taxonomies

What Are Taxonomies?

Introduction to Taxonomies

Shop by category

- Motors** >
 - Parts & accessories
 - Cars & trucks
 - Motorcycles
 - Other vehicles
- Clothing & Accessories** >
 - Women
 - Men
 - Handbags
 - Collectible Sneakers
- Sporting goods** >
 - Hunting Equipment
 - Golf Equipment
 - Outdoor sports
 - Cycling Equipment

data

- 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
- Data engineering**
Context: Topics

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

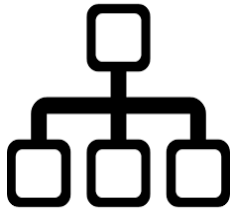
- Decision tree learning
- Deep learning
- Ensemble methods
- Machine learning algorithms
- Relevance vector machines
- Supervised machine learning
- Support vector machines
- Unsupervised machine learning

Taxonomies help people find information at a more detailed level than site navigation.

Introduction to Taxonomies

Two major approaches to (or features of) taxonomies

1. A hierarchy of terms/topics/categories arranged with narrower topics/subcategories displayed under their broader/parent categories.



- To guide users to find the desired topic (and its linked content of pages or documents)
- Similar to navigation and site maps, but more topical and not just based on page titles

2. A controlled vocabulary of metadata tags/labels to apply to pages, posts, or documents, so that they can be more precisely and comprehensively retrieved (better than by search algorithms alone on keywords in text).



- Implemented as search suggestion terms, search refinement filters, or related topics and searches

Introduction to Taxonomies

Taxonomy definitions

from the thesaurus standards

a collection of **controlled vocabulary terms organized** into a **hierarchical structure**. Each term in a taxonomy is in one or more parent/child (broader/narrower) relationships to other terms in the taxonomy.

– *ANSI/NISO Z39.19-2005 r2010 Guidelines for the Construction, Format, and Management of Monolingual Controlled Vocabularies, section 4.1 Definitions*

a scheme of **categories and subcategories** that can be used to sort and otherwise **organize items of knowledge or information**.

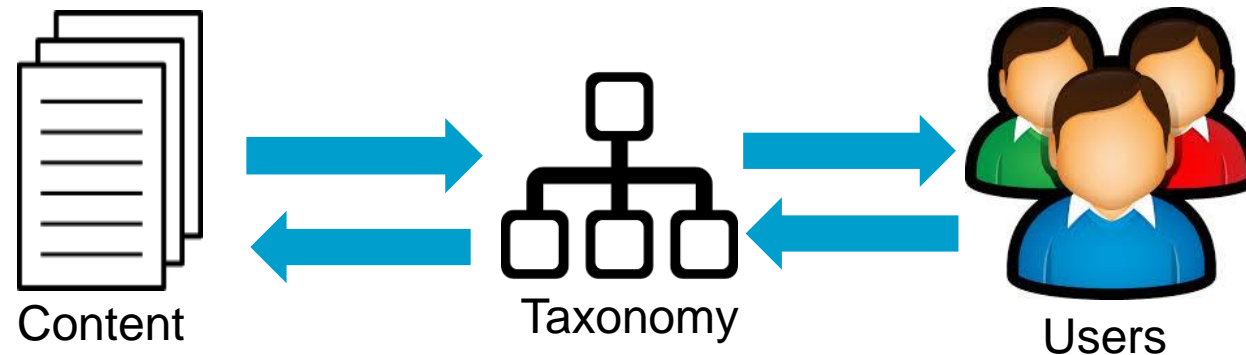
NOTE Taxonomies range from the very simple to the very complex. In the simplest taxonomies the categories are not necessarily divided into subcategories, while in the complex ones, multiple hierarchical levels can be found. Other features too can be present, such as all the thesaurus features described in ISO 25964-1, and/or the features commonly found in classification schemes. Outside of this International Standard, the term is often used loosely to refer to any type of structured vocabulary.

– *ISO 25964-2:2013(E) Thesauri and interoperability with other vocabularies — Part 2: Interoperability with other vocabularies, section 3: Terms and definitions*

Introduction to Taxonomies

What is a taxonomy for?

- Concepts/terms are used to tag/index/categorize content or pages to make them 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.
- The taxonomy should suit the **context** of the content and the users.



Introduction to Taxonomies

What is a taxonomy not?

- Not just any metadata or tags
 - Not business glossary
 - Not a classification scheme
 - Not a navigation scheme
- It needs to be controlled, structured, related
 - It's for finding, not defining
 - It's for tagging/indexing, not merely classifying
 - It's also for searching, not just browsing

Site navigation hierarchy vs. a taxonomy

Site Navigation

- Often reflects the site-map structure
- Often includes task-based labels
- Labels based on page titles
- Designed to be browsed hierarchically, top-down
- 1-3 level hierarchy
- One-to-one label-to-page
- Limited size; does not cover all pages
- Biased to emphasize what is important
- Not so flexible for updating
- Paths and links, not metadata

Taxonomies

- Reflect natural relations of the topics
- Based on topics, subjects
- Labels based on terms/topics
- Designed to be browsed, searched, or may not be fully displayed to end-users
- Options for deeper hierarchy and/or facets
- One-to-many concept to multiple pages
- Can be large; covers all pages/content
- Neutral to topic importance
- Can grow and adapt without limits
- Often used as metadata

Introduction to Taxonomies

Features of taxonomies

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.

The screenshot displays a web application interface for Knowledge Model Management. The top navigation bar includes 'Home', 'Semaphore', 'Knowledge Model Management', 'Training Content', and 'Master'. The main content area is titled 'Organizational skills' and is divided into several sections:

- Concept Class:** Includes 'Add a concept class' and a search bar. A purple box labeled 'Organized' is overlaid on this section.
- Preferred Labels:** Shows 'Organizational skills (en)' and a 'Create a preferred label' button. A purple box labeled 'Controlled' is overlaid on this section.
- Alternative Labels:** Shows 'alternative label > Self-organization (en)' and 'alternative label > Working efficiently (en)', with a 'Create an alternative label' button.
- Metadata:** Includes 'Add metadata field' and a 'definition' field with the text: 'The ability to use time and resources efficiently and effectively, including time, energy, and physical workspace so as to accomplish tasks successfully. (en)'. It also has a 'scope note' field with the text: 'Organizing one's own tasks, not organization others. (en)'.
- Navigation:** On the right side, there are links for 'Top Concept Of', 'Related Concepts', 'Broader Concepts', and 'Narrower Concepts', each with a 'Select a...' button.

The left sidebar shows a tree view of 'Skill' categories: Business skills, Languages, Soft skills (Communication skills, Observation skills), Organizational skills (Coordination, Prioritization, Structured thinking, Time management, Social skills), and Technical skills (Automation, Programming, Solution design, System operation, Testing and debugging).

At the bottom of the interface, it says: 'KMM Version 5.8.0 · Copyright © 2024 Progress Software Corporation and/or its subsidiaries or affiliates. All Rights Reserved.'

Introduction to Taxonomies

Features of taxonomies

A screenshot of a search interface. The search bar contains the text 'data'. Below the search bar, a list of results is shown, each with a title 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
- Data engineering**
Context: Topics

A callout box is overlaid on the right side of the search results, containing the text: "Taxonomy implementation: focus on **controlled**".

Topics (8)

- > Standards - 1029
- > Activities and methods - 1028
- ▼ Data - 1000
 - Metadata - 345
 - > Unstructured data - 213
 - ▼ Structured data - 117
 - > Spreadsheet - 99
 - Relational data - 19
 - ▼ Open data - 72
 - Linked Open Data - 52
 - Linked Open Data - 52
 - Master data - 42
 - Data structures - 21
 - Sensor data - 7
 - Streaming data - 7
- ▼ Knowledge organization systems - 898
 - > Taxonomies - 598
 - > Knowledge graphs - 405

Taxonomy implementation: focus on **organized**

How Taxonomies Support Information Architecture

Taxonomies in Information Architecture

Information architecture 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



Taxonomies in Information Architecture

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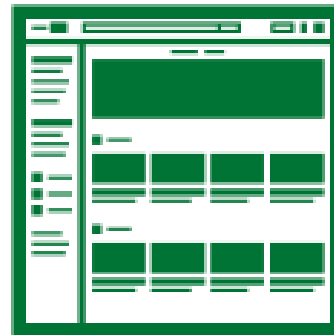


Taxonomies in Information Architecture

Information architecture components

1. Organization systems
 - Taxonomies are knowledge organization systems
2. Labeling systems
 - Taxonomies provide labels for concepts
3. Navigation systems
 - Many taxonomies can be navigated by browsing
4. Searching systems
 - Taxonomies support search

-- Louis Rosenfeld, Peter Morville, and Jorge Arango, *Information Architecture*, 4th ed. , O'Reilly, 2015, p. 90



Taxonomies and Information Architecture in the User Experience

Taxonomies and IA vs. AI in the User Experience

What do user prefer to do?

- to explore topics and interact to find information (provided by IA)
- to have answers and information served to them (provided by AI)

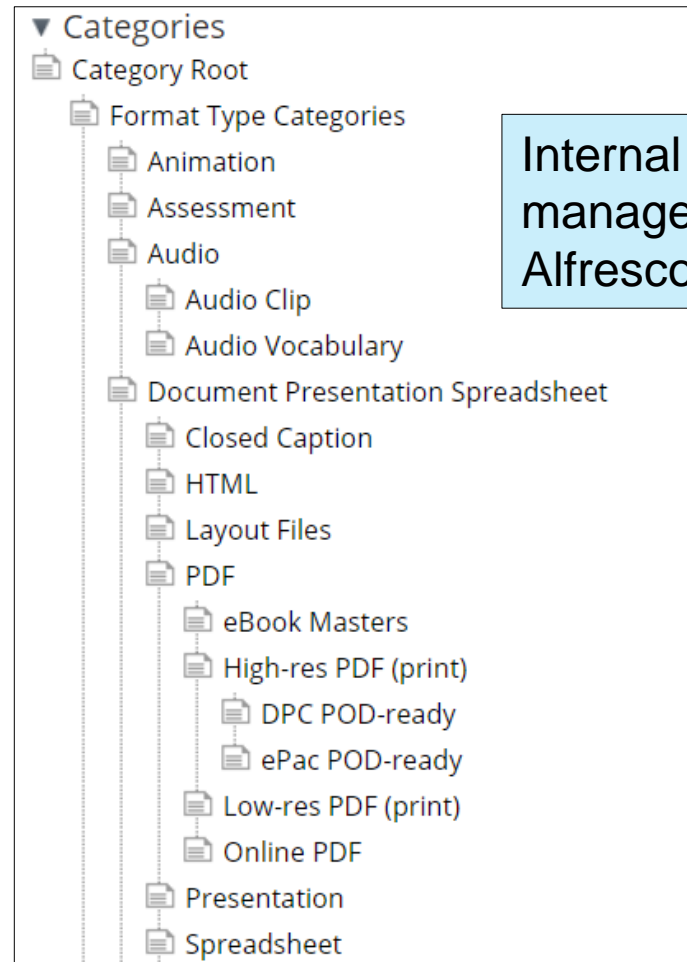
It depends on the user, the information, and the context.

A taxonomy can support either capability.

The same taxonomy can have both implementations.

Taxonomies and IA in the User Experience

With IA: Explore topics and interact to find information via hierarchies and facets



Internal content management in Alfresco CMS

ed2go Courses Skill

Filter By:

COURSE TYPES

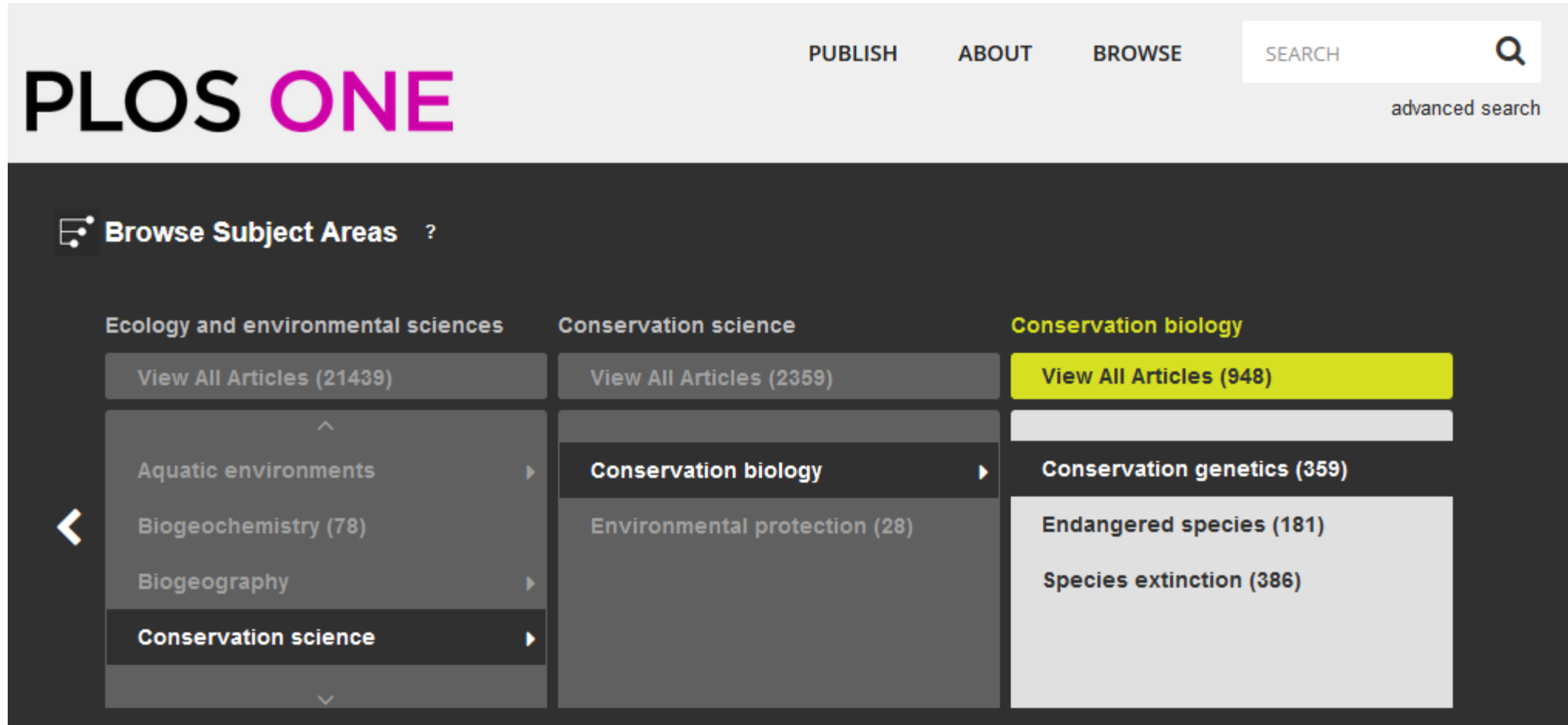
- Fundamentals ⓘ
- Advanced Career Training ⓘ

COURSE TOPICS

- Arts and Design (39) ▼
- Business (110) ▲
 - Accounting
 - Administrative
 - Communication
 - Finance
 - Marketing and Sales
 - Operations
 - Project Management
 - Small Business
 - Soft Skills
- Computer Applications (88) ▼
- Computer Science (47) ▼
- Construction and Trades (2) ▼
- Data Science & Artificial Intelligence ▼
- Health and Fitness (74) ▼

www.ed2go.com

Taxonomies and IA in the User Experience



Fly-out subcategories: PLOS ONE scholarly articles <https://journals.plos.org/plosone/>

All Categories

eBay Motors

Fashion

Books, Movies & Music ✓

Electronics

Collectibles & Art

Home & Garden

Sporting Goods

Toys & Hobbies

Business & Industrial

Health & Beauty

Others

Books, Movies & Music

Musical Instruments & Gear



Guitars & Basses

Pro Audio Equipment

Percussion Instruments

Wind & Woodwind Instruments

String Instruments

Pianos, Keyboards & Organs

[View all in Musical Instruments & Gear →](#)

DVDs & Movies



DVDs & Blu-ray Discs

VHS Tapes

Movie Film Stock

Other Movie Formats

LaserDisc Movies

DVD & Movie Wholesale Lots

[View all in DVDs & Movies →](#)

Books



Nonfiction Books

Fiction & Literature Books

Antiquarian & Collectible Books

Magazines

Textbooks, Educational & Referenc...

Children & Young Adult Books

[View all in Books →](#)

Music



Music CDs

Vinyl Records

Top Brands

Fender

Gibson

Ibanez

EMG

Roland

Popular Topics

DVDs

Nonfiction Books

Gibson Les Paul Electric Guitars

Antiquarian & Collectible Books

Fiction & Literature Books

<https://www.ebay.com/n/all-categories>

Musical Instruments & Gear

Shop by Category

Brass

See all in Brass

Alto Horns

Baritones

Bugles

Cornets

Euphoniums

Flugelhorns

French Horns

Mellophones

Other Brass Instruments

Parts & Accessories

Sousaphones

Trombones

Trumpets

Tubas

DJ Equipment

Equipment

Guitars & Bases

Shop by Category



Electric Guitars



Acoustic Guitars



Guitar Amplifiers



Guitar Parts & Accessories



Percussion Instruments



Pro Audio Equipment



DJ Equipment



Brass Instruments



Pianos, Keyboards & Organs



Vintage Musical Instruments

Taxonomies and AI in the User Experience

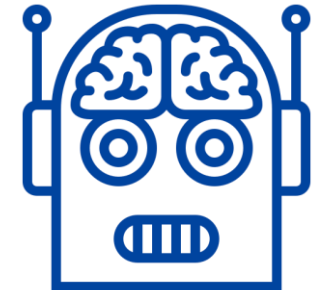
Artificial Intelligence (AI)

Why AI?

- Computers perform tasks to save human effort and time
- Humans can spend more time on other tasks requiring critical thinking.
- IA/taxonomy tasks require varying degrees of critical thinking.

AI in information management

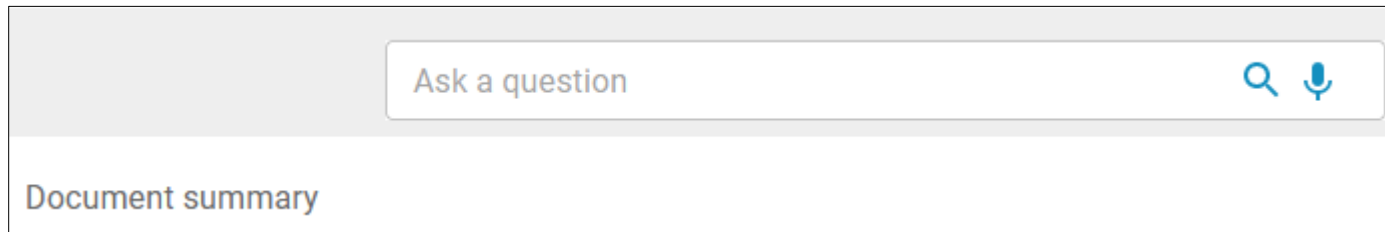
- Summarize a document
- Translate text into another language
- Label a piece of content
- ➔ ▪ Answer a question
- ➔ ▪ Recommend similar content
- ➔ ▪ Predict the completion of text



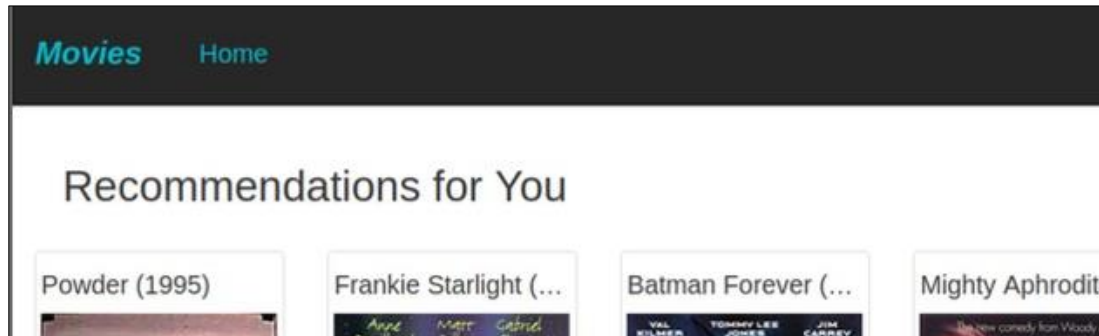
Taxonomies and AI in the User Experience

With AI: Search support

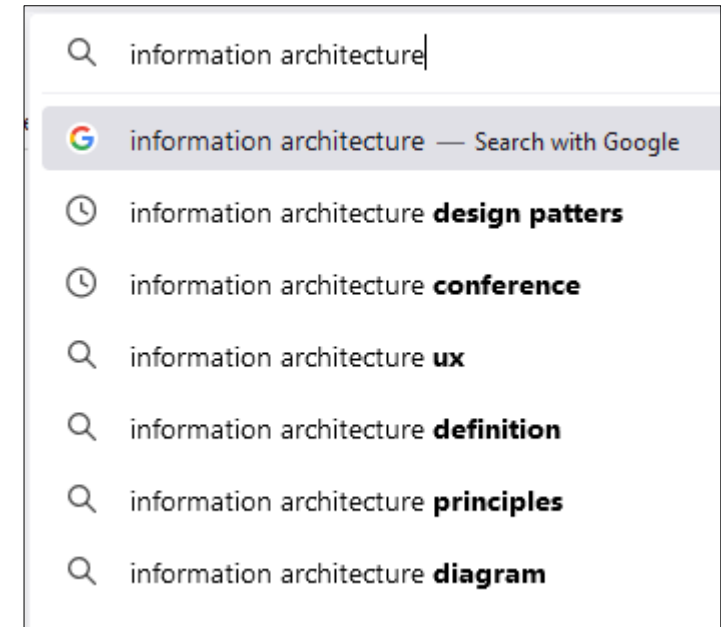
Question answering



AI-based recommendation systems



Auto-complete, auto-suggest

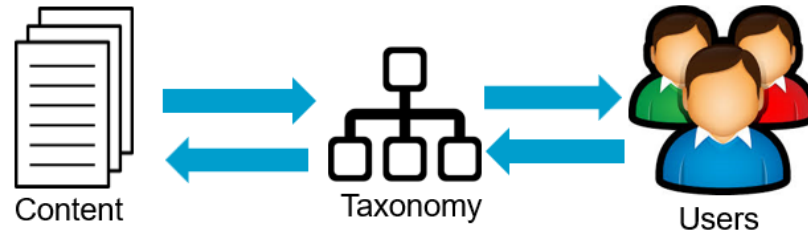


Taxonomy works with AI to provide **context** for search terms.
Taxonomy improves AI results.

Information Architecture in Taxonomy Design and Creation

Taxonomy Design and Creation

The taxonomy is an intermediary that links the users to the desired content.



The taxonomy should be designed for the users and for the content.

To suite the users, **IA** methods are used in taxonomy design.

To suit the content, manual *and* automated (**AI**) content analysis are used.

IA Methods in Taxonomy Design and Creation

Information architecture methods:

Information gathering from **users** for taxonomy design involves:

- Stakeholder interviews
- Questionnaires
- Focus groups
- Persona or use case definition
- Taxonomy design workshops
- Card sorting exercises



Information gathering from **content** and other sources for taxonomy design involves:

- Content analysis
- Search log review
- Tagging statistics

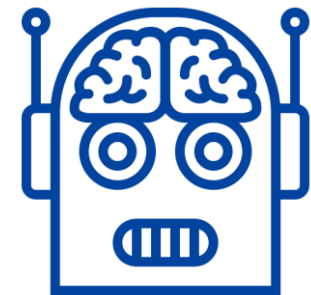


Artificial Intelligence (AI) in Taxonomy Design and Creation

AI in Taxonomy Design and Creation

With AI:

- Extraction of candidate terms from a body of text
 - Using text analytics technologies, such as natural language processing (NLP)
- Suggestions of narrower terms, alternative labels, and definitions
 - Using generative AI and internal LLMs
 - May be a feature of taxonomy management software
- Formulating SPARQL queries to analyze SKOS-based taxonomies
 - Using generative AI and web LLMs



- Thesaurus
- Employers (31)
- Industries (144)
- Job roles (5)
- Locations (4)
- Skills (3)
- Corpora
- Job skills
- Candidate Concepts
 - cyber security
 - risk assessment
- Blacklist

Job skills

corpus:08373cca-cd7a-4984-a1b5-b86dcfc3c579

Metadata & Statistics Extracted Concepts **Extracted Terms** Corpus Documents

Search Terms WSI Filter

Search All

Extracted Terms

Term	Relevance	CTS	MIS <input type="button" value="v"/>	Frequency	
Process Improvement	10.02	0	17.1	14	<input checked="" type="checkbox"/> <input type="button" value="link"/> <input type="button" value="no"/>
Digital Asset Manager	32.86	0	16.89	6	<input checked="" type="checkbox"/> <input type="button" value="link"/> <input type="button" value="no"/>
Managing Director	27.69	0	16.75		
social media	36.69	0	16.73		
video games	2.77	0	16.61		
communication skills	10.71	0	16.61	7	<input checked="" type="checkbox"/> <input type="button" value="link"/> <input type="button" value="no"/>
annual budget	6.88	0	16.61	5	<input checked="" type="checkbox"/> <input type="button" value="link"/> <input type="button" value="no"/>
Economic evaluation	3.09	0	16.25	3	<input checked="" type="checkbox"/> <input type="button" value="link"/> <input type="button" value="no"/>
Content Classification Specialist	1.35	0	16.21	4	<input checked="" type="checkbox"/> <input type="button" value="link"/> <input type="button" value="no"/>

Term extraction for candidate taxonomy concepts in PoolParty taxonomy/thesaurus management tool.

AI in Taxonomy Design and Creation

The screenshot shows a taxonomy management tool. On the left is a tree view with categories like 'All About Cocktails', 'Beverages (4)', and 'Alcoholic beverage (11)'. The 'Beer' node is selected, and a context menu is open. The menu items include 'Beer', 'Create Narrower Concept', 'Apply Custom Class...', 'Extend the taxonomy', 'Categorize...', 'Linked Data Harvesting...', 'Relations', 'Linguistics', 'Import', 'Export', 'Workflow', and 'Add to Collection...'. The 'Extend the taxonomy' item is highlighted in blue, and its sub-menu is open, showing 'Add Narrower Concept' as the selected option.

LLM-based feature to suggest narrower concepts to a taxonomy.

The 'Add Narrower Concepts' dialog box is shown. It has a title bar with a 'BETA' badge and a close button. The main content area is titled 'Beer' and contains the text 'New Narrower Concepts that might fit to this Concept'. Below this is a list of suggestions, each with a checkbox and a lock icon. The suggestions are: 'Pale ale', 'Hefeweizen', 'Lager', 'Stout', 'Belgian ale', 'Amber ale', and 'Kölsch'. The 'Belgian ale' option is selected, indicated by a checked checkbox and a blue highlight bar. At the bottom of the dialog are two buttons: 'Add selected concepts' and 'Cancel'.

Artificial Intelligence (AI) in Taxonomy Implementation: Tagging

AI in Taxonomy Implementation: Tagging

Unlike navigation menu labels, taxonomy concepts need to be tagged to all content and constantly tagged to new content.



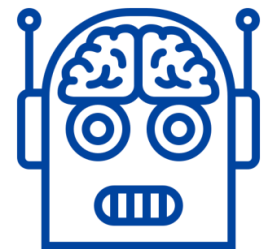
- Manual tagging/classification is not scalable for large backlog or large workflow.
- AI methods, existing since the 1990s, have become more common.
- Not all “auto-tagging” uses AI. Rules can also be written to auto-tag.
- Human review remains a option.

AI in Taxonomy Implementation: Tagging

AI-based auto-tagging and auto-classification makes matches based on a linguistic, logical, or a mathematical profile it expects and recognizes.

Technologies Include:

- **Machine learning (ML):** Use mathematical analysis to find patterns that match known properties.
- **Named entity recognition (NER):** Matches proper nouns mentioned in text.
- **Semantic analysis:** Locates concepts referenced within the content.
- **Natural language processing (NLP):** Analyzes sentences.



Future of IA, AI, and Taxonomies

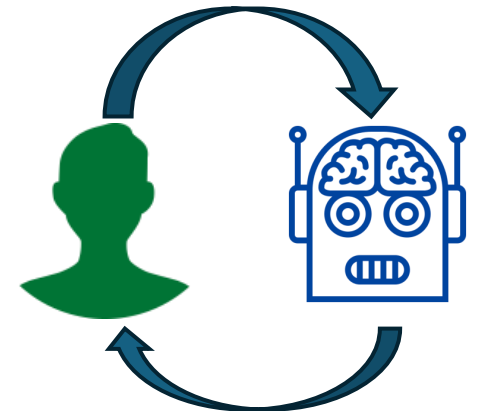
Future of IA and AI with Taxonomy

In user interface implementations:

- As long as users want to explore, browse, filter, refine topics with their own control, there will also be **IA** for user interface design.
- Advances in **AI** will further improve search querying results and recommendations.
- **IA** also provides **understanding**, where **AI** does not.

In the development of taxonomies:

- There will always be user-focused **IA** research methods in taxonomy creation to make the taxonomy suitable for its users.
- **AI** can facilitate some taxonomy creation tasks, but human review is necessary. Remember: “Human in the Loop”

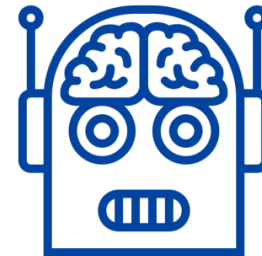


Conclusions

IA and AI don't have to be in competition.

They complement each other, such as in the case of taxonomies, both in their design and development and in their implementation.

Information architects should learn to work with AI.



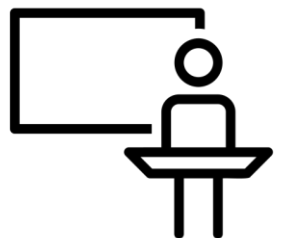
Taxonomy Resources

- ANSI/NISO Z39.19-2005 (2010) *Guidelines for Construction, Format, and Management of Monolingual Controlled Vocabularies*
www.niso.org/publications/ansiniso-z3919-2005-r2010
- The Accidental Taxonomist Blog
<http://accidental-taxonomist.blogspot.com>
 - “[Taxonomy and Information Architecture Compared](#),” 31 March 2023
- Accidental Taxonomist book websites
www.hedden-information.com/accidental-taxonomist/websites
- Hedden Information Management past presentations
www.hedden-information.com/presentations
- Hedden Information Management taxonomy training
www.hedden-information.com/taxonomy-courses-workshops
- Taxonomy Talk, taxonomists community on Discord
<https://discord.com/invite/3qyMVYCAsw>



Upcoming Taxonomy Presentations and Workshops

- ["Taxonomies to Ontologies: How, When and Why to Connect and/or Extend"](#) HS Events' Semantic Data, October 23, New York, NY
- ["Building Taxonomies to Leverage Content"](#) half-day pre-conference workshop, LavaCon content strategy conference, October 27, Portland, OR
- ["The Complete Guide To Sourcing Terms"](#) Taxonomy Boot Camp, November 18, Washington, DC
- ["Taxonomy Design Best Practice for Knowledge Graphs"](#) 2-hour masterclass, Connected Data London, December 11, London, UK, on online
- [Virtual Bite-Sized Taxonomy Boot Camp London](#) (3 hours each time) March 12, June 18, and October 8, 2025



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**Hedden Information
Management**

Making information findable

Hedden, Heather. (2022) *The Accidental Taxonomist*, 3rd edition.

Medford, NJ: Information Today Inc.

www.hedden-information.com/accidental-taxonomist

