

Challenges in Creating Taxonomies for Learning & Development

Taxonomy Boot Camp
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Walmart Academy



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Areas of Expertise

Learning & Development, Instructional Technology, Remembering Movie Quotes, and now.... KM!

We are a People Led, Tech-Enabled Organization



Walmart Academy Supports all Core Functions

Our Scope: 2.4 Million Associates

Our Mission: Our role within Walmart Academy, is to build the skills for the future, in close partnership with the business, by providing learning opportunities to help our associates grow and succeed in their roles.



Review of Common Statistics Shared During KM World

1. Knowledge Workers spend on average 20% of their **time searching for information.**
2. Search results are **ONLY** successful 50% of the time or less.
3. 40% of corporate users **CANNOT FIND** the information they **need to do their jobs.**
4. Some studies suggest that 90% of the time knowledge workers spend **recreating information that ALREADY exists.**
5. 80% - 90% of learning content/artifacts is created utilizing unstructured information & data. Unstructured information **DOUBLES** every 3 months.

Disclaimer:

- Based on KM World 2019 Presentation – Presenter Unknown



Sample, Our Scope of Learning Artifacts

- WM US Learning Management Systems (LMS): 6+
- LMS Artifacts: 30K+
- Web Artifacts (WCMS): 40K+
- Digital Artifacts (DAM): 750K+
- Electronic Documents (EDMS): 1Million+
- Licensed & Copyrighted Content: 50K+
- Taxonomy Top Concepts: 36
- Taxonomy Concepts: 4.8K



Success Requires Connecting Learning to Taxonomies

Getting started

- Define your problems by defining tomorrow's needs, then work backwards.

Yesterday's Problems

- ***Siloed*** learning platforms with ***unstructured data, limited search*** capabilities that require ***institutional knowledge*** to discern.
 - ***Lack of a seeded taxonomy*** to support standardization.
 - ***Minimal attributes populated*** and aligned to existing content.
 - ***Lack of an Adopted Universal Schema & Governance.***

Today's Problems

- Extensive effort to ***manually classify content*** at the source.
- Lack of alignment & ***connectivity of multiple Taxonomies.***
 - ***Ineffective search experience.***
 - ***Lack of visibility to current and future skill gaps within our learning content.***

Tomorrow's Problems

- ***Needed content data model*** to support content curation, recommender systems, and informational queries.
- Need the ability to ***link external taxonomies*** to Walmart specific taxonomies.



Before Doing So, We Needed a Foundation

Getting started

- Change your narrative from problems to questions.
- Develop user stores.

Yesterday's Problems

- ***Siloed*** learning platforms with ***unstructured data, limited search*** capabilities that require ***institutional knowledge*** to discern.
 - ***Lack of a seeded taxonomy*** to support standardization.
 - ***Minimal attributes populated and*** aligned to existing content.
 - ***Lack of an Adopted Universal Schema & Governance.***

Yesterday's Questions

1. What is universally needed for all learning artifacts to remove silos and enable search capabilities?
 - a. What is our “Walmart language”?
 - b. What does housekeeping look?
 - c. How do we manage change & set governance?

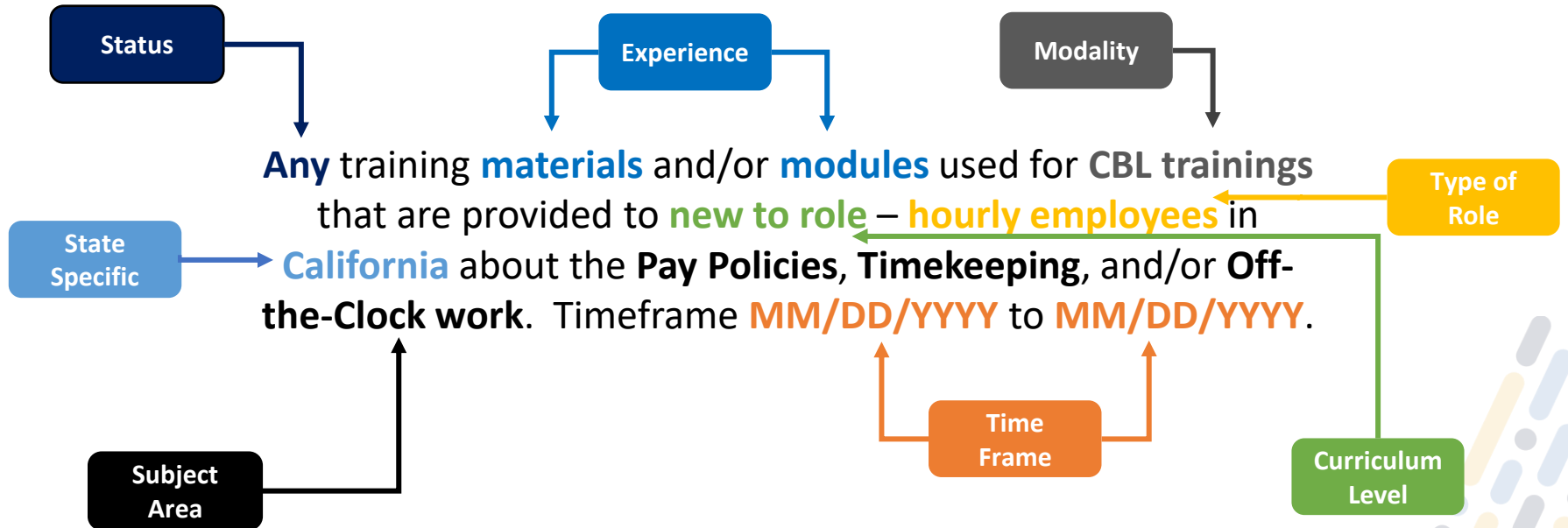
Keys for Enablement: PoolParty's Taxonomy Management Platform, Change Management, Stakeholders & Training



Example, What is Universally Needed for all Learning Artifacts?

Getting started

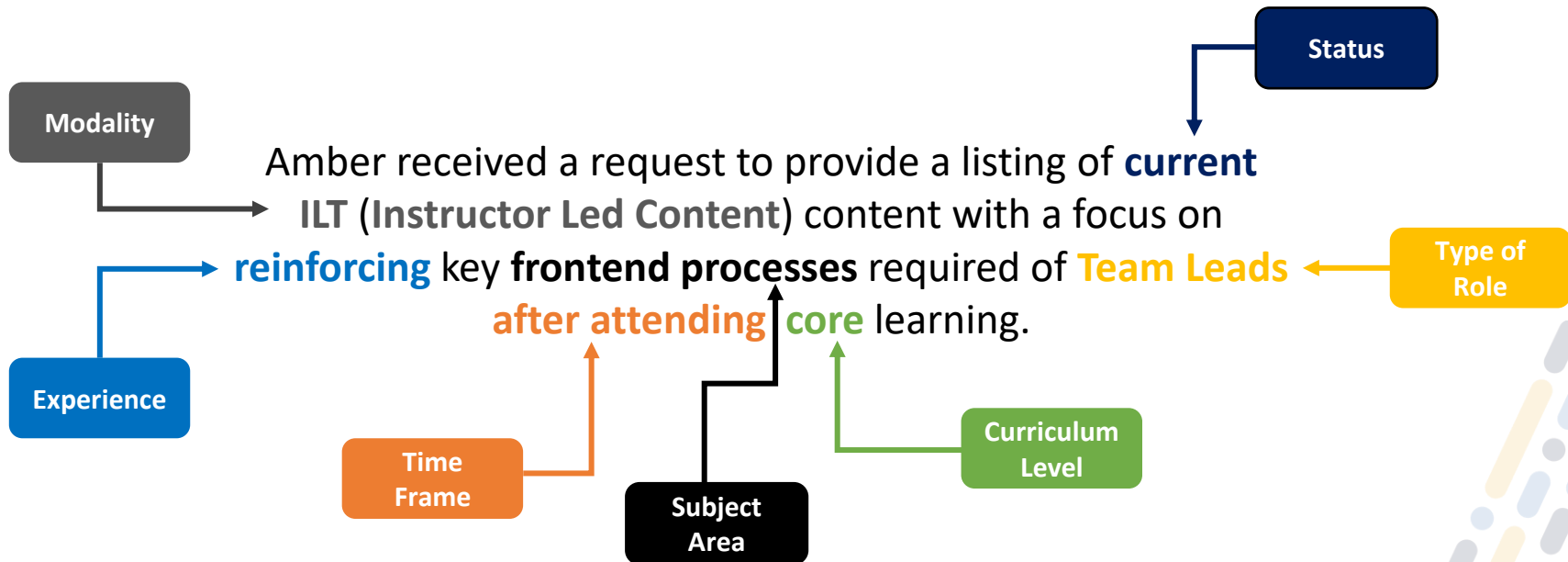
- We built a user stories focused on specific search scenarios. This helped us flush out our universal metadata schema and essentially, our seeded Taxonomies.



Example, What is Universally Needed for all Learning Artifacts?

Getting started

- We built a user stories focused on specific search scenarios. This helped us flush out our universal metadata schema and essentially, our seeded Taxonomies.



Sample, Universal Metadata Schema

Topical

- Status
- Est. Duration
- Modality
- Type of Role
- Learning Objective
- Curriculum
- Level
- State Specific

Administrative

- Created By
- Created Date
- Modified By
- Modified Date
- Version

Disclaimer:

- This is just a sample of our Universal Metadata Schema for today's presentation.



Sample, Seeded Taxonomy

The screenshot shows a web application interface for managing taxonomies. On the left is a tree view of taxonomies, and on the right is a detailed view of the 'Learning Taxonomy'.

Left Panel (Taxonomy Tree):

- Bloom's Taxonomy (6)
 - Analyze (3) 1
 - Apply (0) 1
 - Create (0) 1
 - Evaluate (0) 1
 - Remember (0) 1
 - Understand (0) 1
- Business Segment/Format (5)
- Career (21)
- Compliance, Legal, & Ethics (2)
- Course Format (5)
- Critical Knowledge (0)
- Critical To (3)
- Curriculum (8)
- Delivered As (31)
- Department/Store Area (3)
- Description (0)
- Division (83)
- Duration (0)
- Equipment (53)
- Facility Type (5)
- Field Operations (19)
- Format (4)
- Home Office (16)
- Krathwohl's Taxonomy (4)
 - Conceptual Knowledge (0) 1
 - Factual Knowledge (0) 1
 - Metacognitive Knowledge (0) 1
 - Procedural Knowledge (0) 1
- Language (11)
- Learning Curriculum Level (4)
 - Advanced (0)
 - Beginner (0) 1
 - For Everyone (0)
 - Intermediate (0)
- Learning Objective (1)

Right Panel (Learning Taxonomy):

af24afe7-f94b-4506-92b5-5ecaf08932bc

en Search Thesaurus Concepts

en Search Thesaurus Concepts

PROJECT CORPORA TOOLS ADVANCED

en Search Thesaurus Concepts

Learning Taxonomy

af24afe7-f94b-4506-92b5-5ecaf08932bc

Metadata & Statistics Concepts Triples SPARQL Autopopulate Visualization Quality Management History

Metadata **Statistics** ADMS

Class Statistics		Relation Statistics	
Number of Concept Schemes	38	Number of Broader/Narrower Relations	
Number of Concepts	5025	Number of Related Relations	
Number of Suggested Concepts	0		

Label Statistics: en		SKOS-XL Label Statistics: en	
Number of Preferred Labels	5025	Number of SKOS-XL-Labels	
Number of Alternative Labels	1225	SKOS-XL Labels Used as Preferred Label	
Number of Hidden Labels	50	SKOS-XL Labels Used as Alternative Label	
		SKOS-XL Labels Used as Hidden Label	

Label Statistics: es		SKOS-XL Label Statistics: es	
Number of Preferred Labels	26	Number of SKOS-XL-Labels	
Number of Alternative Labels	0	SKOS-XL Labels Used as Preferred Label	
Number of Hidden Labels	0	SKOS-XL Labels Used as Alternative Label	
		SKOS-XL Labels Used as Hidden Label	

Label Statistics: Total		SKOS-XL Label Statistics: Total	
Number of Preferred Labels	5051	Number of SKOS-XL-Labels	
Number of Alternative Labels	1225	SKOS-XL Labels Used as Preferred Label	
Number of Hidden Labels	50	SKOS-XL Labels Used as Alternative Label	
		SKOS-XL Labels Used as Hidden Label	

Disclaimer:

- Sample of our Taxonomies within our PoolParty Taxonomy Playground.

Focusing on Aligning & Classifying Learning Content

Getting started

- We have a foundation, now it is time to automate.
- Transition problems into outcomes.

Today's Problems

- Extensive effort to ***manually classify content*** at the ***source***.
- Lack of alignment & ***connectivity of multiple Taxonomies***.
 - ***Ineffective search experience***.
 - ***Lack of visibility to current and future skill gaps within our learning content***.

Actions

- Leverage semantic boosters & text classifiers to auto-tag learning content at the source.
- Utilize PoolParty's taxonomy management platform to link our projects, topic concepts & concepts.
- Integrate our taxonomy management platform with our metadata hub to enable search relevancy.

Sample, Seeded Taxonomy

The screenshot shows the PoolParty Taxonomy Playground interface. On the left is a taxonomy tree with various categories like Bloom's Taxonomy, Business Segment/Format, Career, Compliance, Legal, & Ethics, Course Format, Critical Knowledge, Critical To, Curriculum, Delivered As, Department/Store Area, Description, Division, Duration, Equipment, Facility Type, Field Operations, Format, Home Office, Krathwohl's Taxonomy, Language, and Learning Curriculum Level. The right pane displays the 'Learning Taxonomy' (ID: af24afe7-494b-4506-92b5-5ecaf08932cb) with tabs for Metadata & Statistics, Concepts, Triples, SPARQL, Autopopulate, Visualization, Quality Management, and History. The 'Statistics' tab is active, showing data for Class, Label, and SKOS-XL Label statistics across different languages (en, es) and a total.

Class Statistics		Relation Statistics	
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Examples of Linking

- Bloom's Taxonomy to Curriculum Level
- Department to Task
- Role to Department

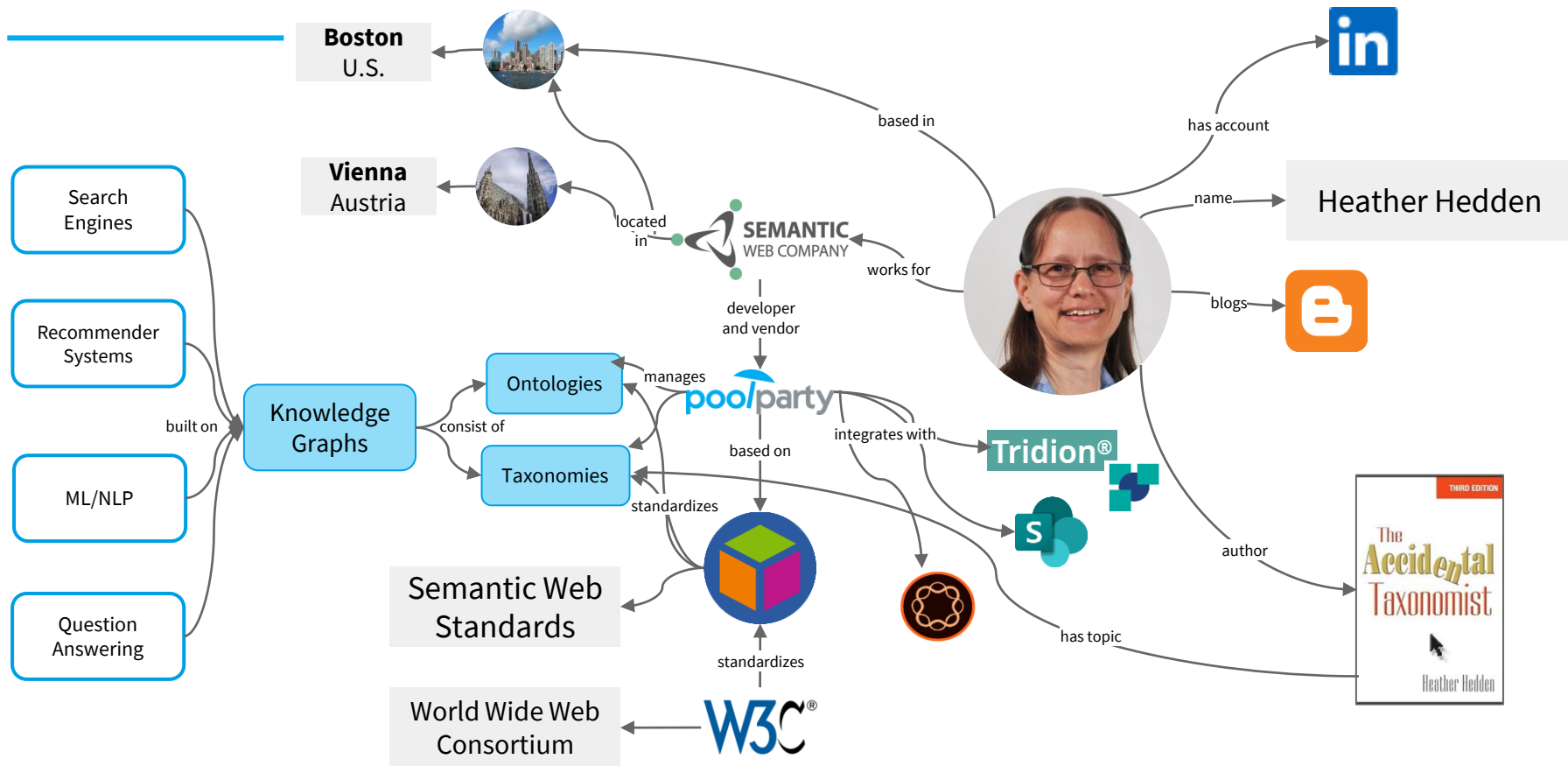
Disclaimer:

- Sample of our Taxonomies within our PoolParty Taxonomy Playground.

Part 2 Outline:

- ▶ Learning content search issues
- ▶ Faceted taxonomies for training content
- ▶ Semantic relations and recommendation
- ▶ Skills taxonomies: sources
- ▶ Skills taxonomies: challenges
 - ▶ What to include
 - ▶ Level of detail
 - ▶ Distinguishing skills in tagging

About Heather Hedden & Semantic Web Company



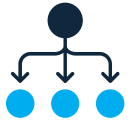
Issues in Searching for Training Content

- ▶ Inconsistent metadata for training content from different sources
- ▶ Common searches retrieve too many results:
 - ▶ such as “communication”
- ▶ Training course titles may be vague and omit the key word:
 - ▶ “*Use Plain Language*”
 - Does that mean in speaking or writing?



Solution: Have a **taxonomy** of topics to tag the training content by topic.

- ▶ It brings together synonyms/alternative labels for the same concept.
- ▶ It arranges concepts in a hierarchy, so narrower concepts can be identified.
 - ▶ E.g., specific types of communication are narrower concepts to Communication.





Skills (4)

Business skills (9)

Administrative skills (0)

Business development (16)

Customer success (2)

Finance (1)

HR Skills (8)

Industry knowledge (6)

Management (9)

Marketing skills (22)

Sales skills (2)

Languages (11)

Soft skills (4)

Communication skills (25)

Observation skills (4)

Accuracy (0)

Concept thinking (0)

Critical thinking (0)

Strategic thinking (0)

Organizational skills (7)

Social skills (5)

Technical skills (7)

Automation (1)

Development (6)

Information security management (3)

Semantic Web skills (16)

Solution design (6)

System operation (7)

Tools (13)

Communication skills

[+ Create Narrower Concept...](#)[Delete Concept](#)<https://elysium.poolparty.biz/TrainingContent/1014>[+ Add to Blacklist](#)[+ Add to ExactMatch](#)

Classes: Skill

Details

Notes

Documents

Linked Data

Triples

Visualization

Quality Management

History

SKOS

Training Scheme

+

Broader Concepts

[Soft skills](#)

Narrower Concepts

[Confidentiality](#)[Consulting](#)[Content creation](#)[Content research](#)[Conveying feedback](#)[Cross-team communication](#)[Customer contacts](#)[Customer meetings](#)[Customer query analysis](#)[Documentation](#)[Facilitating workshops and meetings](#)[Facilitation](#)[Influencing skills](#)[Interviewing](#)[Language analysis of competitors](#)[Learning](#)

Preferred Label

 Communication skills en

Alternative Labels

 Communication ability en Professional communication

+

Hidden Labels

+

Scope Notes

+

Definitions

+

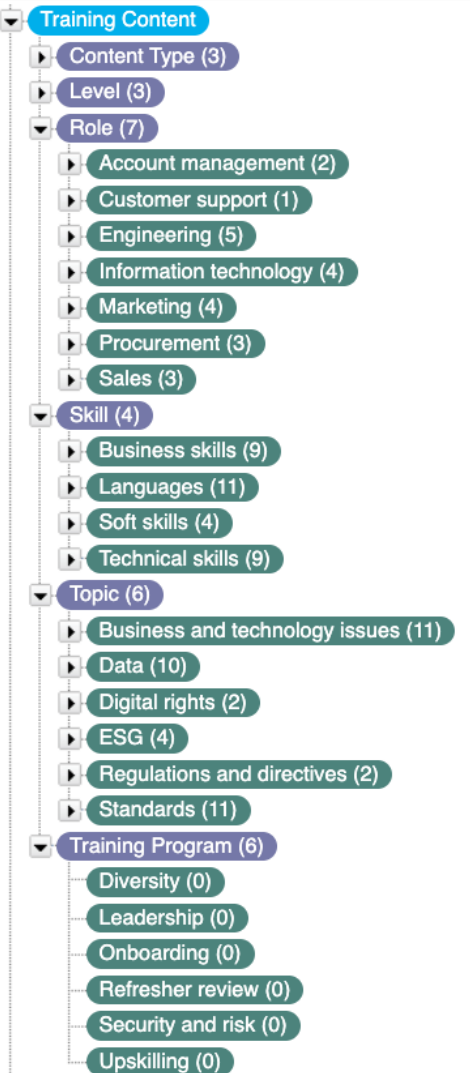
For the complexities of training content, a single topical taxonomy is not enough.

- ▶ Search on topics does not indicate skill level or job level:
 - ▶ e.g. **Manager training** - For new managers or all managers?
- ▶ Ambiguity between topic and format:
 - ▶ e.g. **Presentation slides** - How to create them or the training delivery format?

Solution: Design a **faceted taxonomy** for faceted navigation browse or filtering search results.

Faceted Taxonomy for Training Content

- ▶ Facets are aspects/dimensions/filters/metadata fields.
- ▶ Users select a concept from each of several facets to search with in combination to limit the content results by different aspects.
- ▶ For example, search on training content limited by:
 - ▶ Content type: Video training
 - ▶ Level: Intermediate
 - ▶ Role: Customer support
 - ▶ Skill: Written communication
 - ▶ Training program: Upskilling
- ▶ Training content is very well suited for facets.



Issues in Finding Training Content not Searched

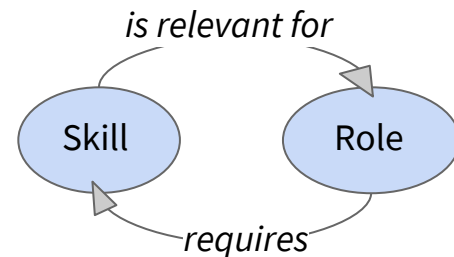
- ▶ Not realizing that a very specific topic exists, so not bothering to look for it.
 - ▶ e.g. *policy for a specific market*
- ▶ Specific soft skills and well-being training topics are useful, but not what people usually search for:
 - ▶ e.g. *“Avoiding burnout,” “Energizing your team”*
- ▶ New topics, people may not think to look for:
 - ▶ e.g. *“Norms for hybrid work”*
- ▶ Wanting to excel in one’s role and thus identify all the training content relevant to one’s specific role.

Solution: **Recommendation** of content based custom **semantic relations** between different sets (classes) of concepts, especially between roles and skills or topics.



Semantic Relations

- ▶ Relations across classes, concept schemes, or what could be facets
 - ▶ E.g. between **Skills** and **Roles**
- ▶ Relations are customized with meaning (semantics) for a specific use case
 - ▶ Not just broader/narrower and related, but for example “Is required for”
- ▶ Based on a knowledge model known as an ontology
 - ▶ Ontologies define classes, semantic relations between classes, and custom attributes for classes (although attributes are not needed in a simple knowledge model).





Training Content

Content Types (3)

Live training event (0)

Slide deck (0)

Video training (0)

Levels (3)

Advanced (0)

Beginner (0)

Intermediate (0)

Roles (7)

Account management (2)

Customer support (1)

Engineering (5)

Information technology (4)

Marketing (4)

Procurement (3)

Sales (3)

Skills (4)

Business skills (9)

Languages (11)

Soft skills (4)

Technical skills (7)

Topics (5)

Business and technology issues (11)

Data (10)

Product knowledge (3)

Regulations (2)

Standards (11)

Training Programs (6)

Customer support

<https://elysium.poolparty.biz/TrainingContent/1146>

+ Add to Blacklist

+ Add to ExactMatch

+ Create Narrower Concept...

Delete Concept

Classes: Role

Details

Notes

Documents

Linked Data

Triples

Visualization

Quality Management

History

SKOS

Training Scheme

+

Broader Concepts



Preferred Label

 Customer support

en

Narrower Concepts

[Technical support](#)

Alternative Labels



Hidden Labels



Related Concepts



Top Concept of Concept Schemes

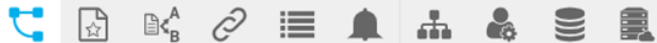
[Roles](#)

Scope Notes



Definitions





Training Content

Content Types (3)

Live training event (0)

Slide deck (0)

Video training (0)

Levels (3)

Advanced (0)

Beginner (0)

Intermediate (0)

Roles (7)

Account management (2)

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Marketing (4)

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Standards (11)

Training Programs (6)

Customer support

+ Create Narrower Concept...

Delete Concept

<https://elysium.poolparty.biz/TrainingContent/1146>

+ Add to Blacklist

+ Add to ExactMatch

Classes: Role

Details

Notes

Documents

Linked Data

Triples

Visualization

Quality Management

History

SKOS

Training Scheme

+

Is concerned with ⓘ

 [Customer service](#) [Product knowledge](#)

No attributes defined yet.

Requires ⓘ

 [Problem solving](#) [Verbal communication](#) [Written communication](#)

Training Content

- Content Types (3)
 - Live training event (0)
 - Slide deck (0)
 - Video training (0)
- Levels (3)
 - Advanced (0)
 - Beginner (0)
 - Intermediate (0)
- Roles (7)
 - Account management (2)
 - Customer support (1)
 - Engineering (5)
 - Information technology (4)
 - Marketing (4)
 - Procurement (3)
 - Sales (3)
- Skills (4)
 - Business skills (9)
 - Languages (11)
 - Soft skills (4)
 - Technical skills (7)
- Topics (5)
 - Business and technology issues (11)
 - Collaboration (0)
 - Customer experience (0)
 - Customer service (0)
 - Data quality issues (0)

Customer support

<https://elysium.poolparty.biz/TrainingContent/1146>

Classes: **Role**

Details	Notes	Documents
SKOS		Training Scheme
Is concerned with		
<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Customer service <input checked="" type="checkbox"/> Product knowledge 		
Requires		
<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Problem solving <input checked="" type="checkbox"/> Verbal communication <input checked="" type="checkbox"/> Written communication 		

Training Content

- Content Types (3)
 - Live training event (0)
 - Slide deck (0)
 - Video training (0)
- Levels (3)
 - Advanced (0)
 - Beginner (0)
 - Intermediate (0)
- Roles (7)
 - Account management (2)
 - Customer support (1)
 - Engineering (5)
 - Information technology (4)
 - Marketing (4)
 - Procurement (3)
 - Sales (3)
- Skills (4)
 - Business skills (9)
 - Languages (11)
 - Soft skills (4)
 - Technical skills (7)
- Topics (5)
 - Business and technology issues (11)
 - Collaboration (0)
 - Customer experience (0)
 - Customer service (0)
 - Data quality issues (0)

Customer service

<https://elysium.poolparty.biz/TrainingContent/787>

Classes: **Topic**

Details	Notes	Documents
SKOS		Training Scheme
Is relevant for		
<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Customer support 		

Varied goals of skills taxonomies

- ▶ Find training of interest for oneself
- ▶ As a manager, find training for reporting team members to improve skills
- ▶ Find an expert with the desired skill, to work on a project or task or just answer questions requiring the skill
- ▶ As a hiring manager, make job openings discoverable by candidates, based on skills
- ▶ As an HR manager, map roles and skills to identify gaps, provide better training and professional development

Varied sources of skills taxonomies

- ▶ Subject matter experts or managers of roles of the skills
- ▶ Human resources staff
- ▶ Taxonomist, librarian, metadata specialist, information architect
- ▶ Externally published taxonomies
 - ▶ ESCO (European Skills, Competences, Qualifications and Occupations)
 - ▶ Specific trade and professional organizations' resources
 - ▶ Job board websites, LinkedIn - full list difficult to obtain, but can be searched
 - ▶ Caution: Searching on “skills” taxonomies often results in primary/secondary school educational skills

Suggestion:

- Start with your organization's skills from HR, edit out what is not needed for training/learning content
- Build out further the skills suggested by managers.
- Consider subject matter expert suggestions and external sources to fill in gaps, but not as starting point.

Skills Taxonomie

ESCO (European Skills, Competences, Qualifications and Occupations)

<https://esco.ec.europa.eu>

3008 occupations and **13,890 skills** linked to the occupations, translated into 28 languages

The screenshot shows the ESCO website interface. At the top, there is a navigation bar with the European Commission logo and the text "European Commission". The main navigation menu includes "Home", "About ESCO", "Classification", "Use ESCO", "News & Events", and "Get in touch". The current page is "Skills & competences", as indicated by the breadcrumb "Home > The ESCO Classification > Skills & competences".

The page features a search bar with the text "Search skills" and a search input field containing "Search ...". To the right of the search bar is a "Find" button and a "Show filters" dropdown menu. A "Select an ESCO version" dropdown menu is set to "ESCO dataset - v1.1.1".

The main content area displays a list of skills and competences. The first item is "T - transversal skills and competences" with a plus sign. Below it is "S - skills" with a minus sign. The list is expanded to show "S1 - communication, collaboration and creativity" with a minus sign. Under "S1", there is "S1.0 - communication, collaboration and creativity" with a minus sign. Under "S1.0", there is "S1.0.0 - communication, collaboration and creativity" with a minus sign. Below "S1.0.0", there is "- capture people's attention" with a plus sign. At the bottom, there is "- communicate by use of interpretation services" with a minus sign.

A large blue box highlights the number "13890" with the word "Skills" underneath. To the right of this box, there is a text block: "The skills pillar provides a comprehensive list of knowledge, skills and competences relevant to the European labor market. It contains 13,890 concepts structured in a hierarchy which contains four sub-classifications:"

- Knowledge
- Language skills and knowledge
- Skills
- Transversal skills

Below the list, there is a text block: "The ESCO skills pillar distinguishes between i) skill/competence concepts and ii) knowledge concepts by indicating the skill type. There is however no distinction between skills and competences.. Each of these concepts come with one preferred term and a number of non-preferred terms in each of the 28 ESCO

Challenges in Creating Skills Taxonomies

Varied goals of skills taxonomies

What to include?

Skills that might be useful in a job descriptions and resumes (matching to roles) but are not so applicable to training courses

Example business skills:

- Strategic alliances
- Technology strategy
- Company strategy
- Decision making
- Product management

Example soft skills:

- Idea development
- Critical thinking
- Working independently
- Creativity
- Interpersonal skills

Challenges in Creating Skills

Varied sources of skills taxonomies

Hierarchy that is generic vs. industry-specific

Example:

Skill of **plan retail space**, in the retail industry might be narrower to **Merchandising**.

In the generic ESCO taxonomy, it's narrower to **work with shape and space**



Challenges in Creating Skills Taxonomies

Tendency to get too detailed and then also not supporting the hierarchical integrity

For example:

Business Skills having narrower concepts for every detailed aspect of business

Should methodologies be **Skills**?

Maybe they should be **Topics**?



Distinguishing skills from other concepts

Customer service - Is it a skill or a role?

Microsoft Office - Is it a skill or software/tool?

Market trends - Is it a skill or a topic?

Ambiguity, vagueness, and use of qualifying words (“skills” or “knowledge”) in concept labels, makes auto-tagging challenging.

Distinguishing a skill as:

Customer service *skills*

Microsoft Office *skills*

Market *knowledge*

Suggestions:

- ▶ Skills (unqualified) can be auto-tagged, when content is structured, and there is a Skills metadata field or section in the content.
- ▶ Skills (qualified) are better manually tagged, when content is unstructured descriptive text.

Questions/Contact

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Visit the team at the PoolParty booth in the
KMWorld Showcase.

Buy *The Accidental Taxonomist*, 3rd ed. In the lobby
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near registration, Tuesday & Wednesday, and get it
signed.