Mapping, Merging, and Multilingual Taxonomies

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- Author of *The Accidental Taxonomist* (Information Today, 2010)

Previously worked as:
- Controlled vocabulary editor, IAC/Gale/Cengage Learning
- Internal taxonomy manager for an energy company
- Taxonomy consultant with consulting firms
- Taxonomist in product development at a search software vendor
Agenda

- Background
- Mapping Taxonomies
- Merging Taxonomies
- Multilingual Taxonomies
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Background: Taxonomies

Controlled Vocabulary/Taxonomy/Thesaurus

- An authoritative, restricted list of terms (words or phrases)
- Each term for a single unambiguous concept (synonyms/nonpreferred terms, as cross-references, may be included)
- Policies (control) for who, when, and how new terms can be added
- Typically has structured relationships between terms
- To support indexing/tagging/metadata management of content to facilitate content management and retrieval
Hierarchical taxonomy
- Agriculture
- Applied technologies
- Business
- Communications
  - Intercultural communication
- Journalism
  - Broadcast journalism
  - Electronic journalism
  - Photojournalism
  - Print journalism
- Mass communication
- Mass media
  - Nonverbal communication
  - Oral communication
  - Propaganda
  - Public relations
  - Social commentary
  - Social communication
  - Subliminal communication
- Telecommunication
  - Visual communication
- Computer and information science
- Economics
- Education
- Family and consumer sciences
- Geography
- Health and wellness
- History
- Language arts
- Languages
- Literature and drama

Thesaurus

- patients
  - RT human beings
  - human pathology
  - therapy

- Patriot missile
  - DEF Surface to air, antiaircraft missile
  - GS missiles
    - . surface to air missiles
    - . Patriot missile
  - RT missile configurations
    - rockets
    - weapons

- patrols
  - RT reconnaissance

- pattern distribution
  - USE distribution (property)

- pattern method (forecasting)
  - GS management methods
    - . pattern method (forecasting)
    - predictions
    - . forecasting
    - . technological forecasting
      - . . pattern method (forecasting)
  - RT Delphi method (forecasting)
    - estimating
      - . methodology
      - . operations research
      - . planning
      - . probe method (forecasting)
      - . technology assessment

- pattern recognition
  - DEF The identification of shapes, forms and configurations by automatic means.
  - UF automatic pattern recognition
    - feature extraction
  - GS recognition
    - . pattern recognition
    - . character recognition
    - . graphology
  - RT change detection
    - clumps
    - cluster analysis
    - computer vision

Faceted Taxonomy

Narrow by
- Category
  - Select category(s)
    - Banquet Tables (4)
    - Bistro Table (2)
    - Bistro Tables (5)
    - Counter-Height Table (1)
    - Counter-Height Tables (6)
    - Dining Table (10)
    - Dining Tables (52)
    - Folding Table (8)
    - Folding Tables (12)
    - Kitchen Table (1)
    - Kitchen Tables (1)
    - Nook Table (1)
    - Nook Tables (1)
    - Pub Table (7)
    - Pub Tables (29)

Material
- Select material(s)
  - Hardwood (29)
  - MDF Composite (1)
  - Metal (28)
  - Plastic (1)
  - Wood (48)
  - Wood Composite (35)

Finish
- Select finish(s)
  - Cherry (4)
  - Dark Cherry (1)
  - Ebony (1)
  - Espresso (14)
  - Mahogany (5)
  - Natural (7)
  - Oak (7)
  - Painted (8)
  - Unfinished (1)
  - Walnut (8)

Color
- Select color(s)
Background: Mapping, Merging, & Multilingual Taxonomies

Taxonomies/Controlled Vocabularies (CVs) are:
1. Designed
2. Built
3. Maintained/Managed

But in time, a taxonomy may gain additional uses, and may need to be:
- Mapped or merged with another taxonomy
- Translated into another language or localized
Mapping, Merging, and Multilingual Taxonomies:

- Methods of combining taxonomies
- Different methods > Different purposes

- Mapping
- Merging
- Multilingual
Agenda

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- Merging Taxonomies
- Multilingual Taxonomies
Mapping Taxonomies

Mapping:
Enabling one controlled vocabulary (CV) to be used for another in the same subject area

- Retain them both as continued distinct vocabularies.
- A CV continues to be used to retrieve its content as before, plus additional content associated with the other CV.
- Mapping tables also called “crosswalks”
Mapping Taxonomies

Situations:

- Selected content with an enterprise taxonomy is made available on a public web site with a different public-facing taxonomy
- A content provider with a CV partners with a third-party information vendor with its own CV
- A provider of scientific/technical/medical content with a technical CV creates a simpler CV aimed at laypeople
- Search log query terms need to be integrated into the CV as additional nonpreferred (variant/synonym) terms.
- To support “federated search” that involves multiple taxonomies
Mapping Taxonomies

- From a CV indexed to content to a retrieval/user-interface CV
- Use a software tool or scripts to compare vocabularies, to obtain matches in succeeding passes.
- Human review confirms and approves automatically proposed matching terms.
- Unmatched terms cannot be utilized.
- Narrower-to-broader matches are fine.
- Set automatic matches to also include matches of words/phrases of the retrieval taxonomy within a term from the indexing CV.

<table>
<thead>
<tr>
<th>Indexing taxonomy</th>
<th>Retrieval/UI taxonomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDTV Television sets</td>
<td>Television sets</td>
</tr>
</tbody>
</table>

ONE WAY
## Mapping Taxonomies

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Programmable logic controller</td>
<td></td>
<td>Programmable controllers</td>
</tr>
<tr>
<td>2</td>
<td>Programmable logic devices</td>
<td>ok</td>
<td>PLDs (Programmable logic devices)</td>
</tr>
<tr>
<td>3</td>
<td>Programming (Computers)</td>
<td>ok</td>
<td>Computer programming</td>
</tr>
<tr>
<td>4</td>
<td>Progressivism (United States politics)</td>
<td>b</td>
<td>Progressive movement</td>
</tr>
<tr>
<td>5</td>
<td>Prohibited books</td>
<td>ok</td>
<td>Banned books</td>
</tr>
<tr>
<td>6</td>
<td>Project method in teaching</td>
<td>ok</td>
<td>Project method (Education)</td>
</tr>
<tr>
<td>7</td>
<td>Projectile points</td>
<td>ok</td>
<td>Projectile points (Archaeology)</td>
</tr>
<tr>
<td>8</td>
<td>Projection</td>
<td>n</td>
<td>Projection (Drawing)</td>
</tr>
<tr>
<td>9</td>
<td>Projection televisions</td>
<td>ok</td>
<td>Projection television sets</td>
</tr>
<tr>
<td>10</td>
<td>Prolactin</td>
<td>n</td>
<td>Prolactin test</td>
</tr>
<tr>
<td>11</td>
<td>Proletariat</td>
<td>ok</td>
<td>Working class</td>
</tr>
<tr>
<td>12</td>
<td>Prolog (Computer program language)</td>
<td>ok</td>
<td>Prolog (Programming language)</td>
</tr>
<tr>
<td>13</td>
<td>Promethazine hydrochloride</td>
<td>b</td>
<td>Promethazine</td>
</tr>
<tr>
<td>14</td>
<td>Promoters (Entertainment)</td>
<td>b</td>
<td>Promoters</td>
</tr>
<tr>
<td>15</td>
<td>Promotion (School)</td>
<td>ok</td>
<td>Student promotion</td>
</tr>
<tr>
<td>16</td>
<td>Pronghorn antelope</td>
<td>ok</td>
<td>Pronghorns</td>
</tr>
<tr>
<td>17</td>
<td>Propaganda, American</td>
<td>ok</td>
<td>American propaganda</td>
</tr>
</tbody>
</table>

Indexing CV in column A. Retrieval CV in column C. Taxonomist notes in column B.

(“ok” is equivalent, “b” means second term is broader so also ok, and “n” is narrower or otherwise not acceptable.)
Mapping Taxonomies

Mapping user-entered search queries (column 2) to terms, in this case the term “Type of Vehicles.”

If terms could be (narrower) examples of automobiles, put a “y” in the CV_Terms_Y column. Some terms are too broad and vague.

<table>
<thead>
<tr>
<th>Makes</th>
<th>CV_Terms_Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>GVX</td>
<td>y</td>
</tr>
<tr>
<td>4 Wheel Drive</td>
<td>y</td>
</tr>
<tr>
<td>Four Wheel Drive</td>
<td>y</td>
</tr>
<tr>
<td>4x4</td>
<td>y</td>
</tr>
<tr>
<td>4 X 4</td>
<td>y</td>
</tr>
<tr>
<td>4x4s</td>
<td>y</td>
</tr>
<tr>
<td>4WD</td>
<td>y</td>
</tr>
<tr>
<td>All Wheel Drive</td>
<td>y</td>
</tr>
<tr>
<td>AWWD</td>
<td>y</td>
</tr>
<tr>
<td>Classic</td>
<td>y</td>
</tr>
<tr>
<td>Vintage</td>
<td>y</td>
</tr>
<tr>
<td>Antique</td>
<td>y</td>
</tr>
<tr>
<td>Commercial Vehicles</td>
<td>y</td>
</tr>
<tr>
<td>Commercial Trucks</td>
<td>y</td>
</tr>
<tr>
<td>Commercial Vans</td>
<td>y</td>
</tr>
<tr>
<td>Fleets</td>
<td>y</td>
</tr>
<tr>
<td>Convertibles</td>
<td>y</td>
</tr>
<tr>
<td>Coupes</td>
<td>y</td>
</tr>
<tr>
<td>Diesel</td>
<td>y</td>
</tr>
<tr>
<td>Domestic</td>
<td>y</td>
</tr>
</tbody>
</table>
Mapping Taxonomies

Tools for mapping

- In commercial thesaurus/taxonomy software, designate a custom equivalence relationship:
  - Example: USE-Map / UF-Map (in place of USE/UF)

- Import CSV mapping tables, such as created in Excel
Agenda

- Background
- Mapping Taxonomies
- Merging Taxonomies
- Multilingual Taxonomies
Merging Taxonomies

- Merging:

  Combining two or more redundant vocabularies in same subject area into one

  - Without any longer retaining them as distinct
  - Legacy content is retrieved through added equivalence relationships
Merging Taxonomies

Situations

- An enterprise taxonomy replaces multiple CVs of separate administrative departments
- An organization acquires or merges with another organization, and their redundant vocabularies are merged
- A folksonomy is incorporated into a CV
- An internally created CV is combined with a purchased/licensed CV
Merging Taxonomies

Merging – Which Direction?
Designate a dominant/primary CV into which to merge the other:

- If an organization acquires another, then the acquirer’s CV is dominant.

Or choose:
- The larger CV
- The CV with greater breadth
- The CV with greater depth
- The more structured CV
- The “better” CV
# Merging Taxonomies

Use a software tool or scripts to compare vocabularies, to obtain matches in succeeding passes:

<table>
<thead>
<tr>
<th>Merging CV (will go away)</th>
<th>Primary CV <em>(Keep and grows)</em></th>
<th>Taxonomist Reviews</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exact matches of:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Preferred term: Cars</em></td>
<td><em>Preferred term: Cars</em></td>
<td>no need</td>
</tr>
<tr>
<td><em>Preferred term: Automobiles</em></td>
<td><em>Nonpreferred term: Automobiles</em></td>
<td>no need</td>
</tr>
<tr>
<td>Nonpreferred term: Cars</td>
<td>Preferred term: Cars</td>
<td>yes</td>
</tr>
<tr>
<td>USE Automobiles</td>
<td>USE Autos</td>
<td>yes</td>
</tr>
</tbody>
</table>

| Inexact matches of:        |                               |                    |
| *Preferred term: Automobile* | *Preferred term: Automobiles* | yes                |
Merging Taxonomies

Can create rules for automatic inexact or "fuzzy" matches, then subject to human review:

<table>
<thead>
<tr>
<th>Match Type:</th>
<th>Examples:</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>hyphens, parentheses, punctuation, and spaces</em></td>
<td>Healthcare</td>
</tr>
<tr>
<td><em>plural/singular</em></td>
<td>Teaching method</td>
</tr>
<tr>
<td><em>common abbreviations and acronyms</em></td>
<td>and Dept.</td>
</tr>
<tr>
<td><em>Word order</em></td>
<td>Photography, digital</td>
</tr>
<tr>
<td><em>Addition of specified words (industry, services, etc.)</em></td>
<td>Healthcare industry</td>
</tr>
<tr>
<td><em>Grammatical endings</em></td>
<td>Production</td>
</tr>
</tbody>
</table>
Merging Taxonomies

Tools for merging

- Commercial thesaurus/taxonomy software with merge vocabularies feature
  - Synaptica
  - Wordmap
- Custom scripting (Perl, etc.) to compare vocabularies
Mapping and Merging Summary

- **Mapping**
  - Overlapping Controlled Vocabularies remain distinct, one used for the other in a specific application (indexing vs. retrieval CVs)

- **Merging**
  - Overlapping Controlled Vocabularies combined permanently, removing duplicates
Mapping and Merging Summary

- Compare two closely redundant vocabularies side-by-side, term-by-term
- First pass is automatic, followed by taxonomist review of matches
- Taxonomy software may have the feature, or do your own scripting
- Taxonomist reviews, discerns distinction between equivalent, broader/narrower, related terms to approve matches
- Taxonomist deals with terms more than structure.
Agenda

- Background
- Mapping Taxonomies
- Merging Taxonomies
- Multilingual Taxonomies
  1. Multilingual Taxonomy Goals
  2. Multilingual Taxonomy Design
  3. Taxonomy Translation Management
Multilingual Taxonomy Goals

Bilingual/Multilingual Taxonomies can enable:

1. A user to search and retrieve content that is in multiple languages through a single taxonomy in their own language

Taxonomy: Single-language user interface (UI).

Multiple language translations, not displayed.
Multilingual Taxonomy Goals

Bilingual/Multilingual Taxonomies can enable:

2. Different users who speak different languages to search the same body of content (in one other language), each using a taxonomy in the user interface in their native language.

Multiple, different language UIs.
Multilingual Taxonomy Goals

Bilingual/Multilingual Taxonomies can enable:

3. Different users who speak different languages to search the same body of content that is in multiple languages.

Multiple, different language UIs.
Multilingual Taxonomy Goals

Goals #1 or #2: *Users of one language can access content in a different language.*
- Taxonomy in one language with equivalent translated terms
- The taxonomy needs to function in only one direction.

Goal #3: *Multilingual users can access multilingual content.*
- *Fully* multilingual taxonomy or distinct taxonomies for each language linked at equivalent-meaning terms
- The taxonomy needs to function in both/all language directions.
**Multilingual Taxonomy Goals**

*Different scenario:* Multiple language taxonomies, each connected to its own language content, such as for separate web sites.

- **Spanish speaker**
  - Español
- **French speaker**
  - Français
- **German speaker**
  - Deutsch

*Multiple, different language UIs.*
Multilingual Taxonomy Design

Design the multilingual taxonomy to meet the taxonomy goals.

- **In a one-direction translated taxonomy:**
  - The language of the searcher has structure to display.
  - The language of the content may not need structure.
  - Translations may be in one direction (user/display term *may be used for* content/index term, not vice versa).

- **For a fully bidirectional multilingual taxonomy:**
  - Both language taxonomies need structure.
  - Translations must be exact matches in *both* directions.

- **For separate taxonomies in different languages:**
  - Taxonomies are not translated but each created and managed separately.
Multilingual Taxonomy Design

Dedicated taxonomy/thesaurus management software tools provide varying multilingual capabilities.

1. Customized text field used for term translations
   - No vocabulary control of second language(s)

2. Second language taxonomy mirroring first, linked at each translated term
   - Vocabulary control of second language(s)
   - Copying taxonomy structure of primary language

3. Multiple taxonomies in different languages linked at equivalent term translations
   - Each language may have its own structure (requires additional work to build)
Multilingual Taxonomy Design

1. Customized field used for term translations
Multilingual Taxonomy Design

2. Second language taxonomy mirroring first, linked at each translated term. Inter-term relationships replicate.
Multilingual Taxonomy Design

3. Multiple taxonomies in different languages linked at equivalent term translations. Inter-term relationships may differ.
Multilingual Taxonomy Design & Tools

Dedicated taxonomy/thesaurus management software tool screenshot examples from:

- Data Harmony Thesaurus Master (Access Innovations, Inc.)
- Synaptica (Synaptica, LLC)
- MultiTes (Multisystems)
- Semaphore Ontology Manager (Smartlogic)

Additional tools also provide similar capabilities.
Method #1: Create user-defined text field and enter translation

Data Harmony Thesaurus Master
Multilingual Taxonomy Design & Tools

Method #1

Synaptica
Method #2: Create second language taxonomy mirroring first, linked at each translated term. Inter-term relationships replicate.

MultiTes
Method #2: Smartlogic Semaphore Ontology Manager
Method #3: Link equivalent terms in different language by user-defined associative relationship.

Synaptica
Translations of a term may display as another kind of relationship.
Similar to equivalence, but both languages are preferred and none is nonpreferred

From the bilingual European Training Thesaurus http://libserver.cedefop.europa.eu/ett
Taxonomy Translation Management

- Taxonomy translations are typically created from scratch, translating each term.
- It is also possible to map and existing/separately created foreign language taxonomies to another, if their coverage is nearly identical.

- For Goals #1 or #2 (*Users of one language accessing content in a different language*) translations may suffice
- For Goal #3 (*Multilingual users accessing multilingual content*) mapping separately created taxonomies in each language is better.
Taxonomy Translation Management

- User interface taxonomies in one language may be mapped to indexing taxonomies in another language.
  - The retrieval taxonomy is in the language of the searcher.
  - The indexing taxonomy is in the language of the content.

- The role of the different language taxonomies is typically dynamic
  - depending on the language of the user
  - depending on the language of the content

- The taxonomy of either language could be the retrieval taxonomy or the indexing taxonomy.

- Mapping has to go in both directions.
- Matches between terms in both languages have to be exact translations.
Taxonomy Translation Management

- Matches are for concepts, not terms.
  - Translations are for the concept and not necessarily for the preferred term.

- Nonpreferred (variant/synonym) terms may vary.
  - Some can be translated
  - Some cannot be translated
  - Additional nonpreferred terms may be created in the second language(s)
Taxonomy Translation Management

Translating taxonomies/thesauri is different from translating documents.

- Pay by hour/project, not by word.
- Translators should have experience with translating in both directions.
- Translators should be familiar with using taxonomies, if not also taxonomists.
- If not using a translator who is also a taxonomist, have a taxonomist/information-specialist native speaker of target languages review the translated taxonomy.
Taxonomy Translation Management

Taxonomy Translation Issues
- Lack of an equivalent translation
- A term in one language having two meanings with two terms in another language (e.g. seguridad = safety or security)
- Term length
- Use of definite articles
- Use of abbreviations
- Use of plural
- Use of capitalization
- Alphabetizing sorting rules
Taxonomy Translation Management

Translation projects end, but taxonomy management does not.

Taxonomy management issues:
- Taxonomy growth
- Taxonomy change
- Taxonomy management/ownership responsibility
- Merging or combining additional taxonomies

Translations/additional language versions will need frequent reviewing and updating.
Conclusions

- Mapping Taxonomies
- Merging Taxonomies
- Making Multilingual Taxonomies

In all cases:

- Need to be pro-active and anticipate and plan for the future
- Need to bring in additional experts: subject matter experts, technology experts, translators
Additional Taxonomy Resources/Training

Book: *The Accidental Taxonomist*
2010, Information Today, Inc.
www.accidental-taxonomist.com

Taxonomies & Controlled Vocabularies 5-week online workshop
Simmons College Graduate School of Library & Information Science
Starting November, 2012, and January, 2013
http://alanis.simmons.edu/ceweb

SLA Taxonomy Division
http://taxonomy.sla.org
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