Taxonomy Tools: Requirements and Capabilities

Joseph A. Busch, Principal Analyst
Today’s agenda

<table>
<thead>
<tr>
<th>Time</th>
<th>Duration</th>
<th>Agenda</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00-1:15</td>
<td>15 min</td>
<td>Introductions</td>
</tr>
<tr>
<td>1:15-2:00</td>
<td>45 min</td>
<td>Taxonomy Basics</td>
</tr>
<tr>
<td>2:00-3:00</td>
<td>60 min</td>
<td>Taxonomy Development Process</td>
</tr>
<tr>
<td>3:00-3:15</td>
<td>15 min</td>
<td>Coffee Break</td>
</tr>
<tr>
<td>3:15-4:00</td>
<td>45 min</td>
<td>Taxonomy Construction Tools</td>
</tr>
<tr>
<td>4:00-4:45</td>
<td>45 min</td>
<td>Exercise</td>
</tr>
<tr>
<td>4:45-5:00</td>
<td>15 min</td>
<td>Q&amp;A, Closing</td>
</tr>
</tbody>
</table>
Learning Objectives:
▪ Ability to identify taxonomies by type, to choose the appropriate type for an information product development application, and to articulate the benefits of the taxonomy for use in development of an information product.
▪ Understand basic taxonomy-related terminology.
▪ Demonstrate the ability to identify taxonomy term record elements.
▪ Demonstrate the ability to focus on the key concepts and build terms records for a small taxonomy.

1. TAXONOMY BASICS
What taxonomy is: Systematics view

Biological taxonomy places an organism in one and only one place.

Linnaeus …
What taxonomy is: Pragmatic view

But most of the time things belong to more than one category.

Linnaeus …
## Other semantic schemes

<table>
<thead>
<tr>
<th>Type</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synonym Ring</td>
<td>4A set of words/phrases that can be used interchangeably for searching. 4Example: Hypertension, High blood pressure</td>
</tr>
<tr>
<td>Controlled Vocabulary</td>
<td>4A list of preferred and variant terms, with defined hierarchical and associative relationships. A taxonomy is a type of controlled vocabulary. 4Typically used for names of countries, individuals, organizations</td>
</tr>
<tr>
<td>Classification Scheme</td>
<td>4An arrangement of knowledge that does not follow taxonomy rules. 4Usually enumerated; e.g., Dewey Decimal Classification</td>
</tr>
<tr>
<td>Thesaurus</td>
<td>4A tool that controls synonyms and identifies the semantic relationships among terms.</td>
</tr>
<tr>
<td>Ontology</td>
<td>4Resembles faceted taxonomy but uses richer semantic relationships among terms and attributes and strict specification rules.</td>
</tr>
</tbody>
</table>
Semantic schemes: Simple to complex

Synonym Rings | Authority Files | Classification Schemes | Thesauri
---|---|---|---
Simple | Equivalence | Hierarchical | Associative | Complex

(Vocabularies)

Taxonomic metadata

**Content Types**
- FAQs
- Forms & Applications
- News & Announcements
- Policies & Procedures
- Publications
- Presentations
- Regulated Product Information
- Reports
- Tools & Databases
- Transcripts & Statements

**Health Topics**
- Children’s Health
- Food Safety
- Health Advisories
- Health Effects
- Health Risks
- Occupational Health
- Pesticide Effects
- Seniors’ Health
- Sun Protection
- Toxicity

**Industries**
- Agriculture
- Automobile Repair
- Chemical
- Construction
- Dry Cleaning
- Electronics & Computer
- Energy
- Extractive
- Food Processing
- Leather Tanning & Finishing

**Substances**
- Allergens
- Biological
- Contaminants
- Carcinogens
- Chemicals
- Explosives
- Liquid Waste
- Microorganisms
- Ozone
- Pesticides
- Radioactive Waste

**Busch’s Golden Rule:**
Four metadata-controlled vocabularies of 10 values each have the same discriminatory power as one taxonomy of 10,000 values.
Standards

Taxonomy

- ISO 25964. Thesauri and interoperability with other vocabularies
  - Part 1: Thesauri for information retrieval
  - Part 2: Interoperability with other vocabularies

Metadata

- ISO 15836-1:2017 Information and documentation — The Dublin Core metadata element set. The Dublin Core is the de facto standard for cataloging content on the Web. There are 15 core elements.
  - Part 1: Core elements
  - Part 2: DCMI Properties and classes
- Functional Requirements for Bibliographic Records (FRBR) is a conceptual entity-relationship model. Entities that are the foundation of the FRBR model are Work, Expression, Manifestation, and Item, and the relationships applied to them.
Standards (2)

- **Resource Description Framework (RDF)** is a standard model for interchanging data on the Web. RDF extends the linking structure of the Web to use URIs to name subject-predicate relationships between things.
  - **Simple Knowledge Organization System (SKOS)** provides a standard way to represent knowledge organization systems using RDF.
  - **Web Ontology Language (OWL)** provides a standard way to represent rich and complex knowledge about things, groups of things, and relations between things using RDF.
### Taxonomy definitions

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept</td>
<td>The characteristics of a real or imaginary object expressed as terms in the taxonomy.</td>
</tr>
<tr>
<td>Controlled Vocabulary</td>
<td>A list of terms that have been explicitly enumerated. The terms are controlled and published by a designated authority or authoritative source. If multiple terms are used to mean the same thing, one of the terms is identified as the Preferred Term in the Controlled Vocabulary and the other terms are listed as synonyms or aliases.</td>
</tr>
<tr>
<td>Facet</td>
<td>A grouping of concepts of the same inherent category. Examples of categories that may be used for grouping concepts into facets are: Audience, Channels, Components, Content Types, Functions, Industries, Intentions, Lifecycle, Location, Organization, Products, etc.</td>
</tr>
<tr>
<td>Taxonomy</td>
<td>The core metadata elements and the Controlled Vocabularies required to find, use, and manage content in a collection.</td>
</tr>
</tbody>
</table>
## Some definitions associated with terms

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>UID</td>
<td>The unique identifier for the concept.</td>
</tr>
<tr>
<td>Entry Term</td>
<td>The preferred term that is used to label a concept. An entry term is also known as a Descriptor.</td>
</tr>
<tr>
<td>Broader Term (BT)</td>
<td>A term to which another term (or multiple terms) are subordinate in a hierarchy.</td>
</tr>
<tr>
<td>Narrower Term (NT)</td>
<td>A term that is subordinate to another term or to multiple terms in a hierarchy.</td>
</tr>
<tr>
<td>Used For Term (UF)</td>
<td>Non-preferred term(s) that are equivalent to the Entry Term. Used for terms may be synonyms, aliases (such as abbreviations) and quasi-synonyms (such as more specific terms).</td>
</tr>
<tr>
<td>RT (Related Term)</td>
<td>A term that is associatively (but not hierarchically) linked to another term in a Controlled Vocabulary.</td>
</tr>
<tr>
<td>SN (Scope Note)</td>
<td>A note following a term explaining its source, rationale, coverage, specialized usage, or rules for assigning it.</td>
</tr>
</tbody>
</table>
## Relationships

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associative Relationship</td>
<td>A relationship between or among terms that leads from one term to other terms that are related to or associated with it. An Associative Relationship is a Related Term or cross-reference relationship.</td>
</tr>
<tr>
<td>Equivalence Relationship</td>
<td>A relationship between or among terms in a Controlled Vocabulary that leads to one or more terms that are to be used instead of the term from which the Reference is made. An Equivalence Relationship is a Used For Term relationship.</td>
</tr>
<tr>
<td>Hierarchical Relationship</td>
<td>A relationship between or among terms in a Controlled Vocabulary that depicts broader (generic) to narrower (specific) or whole-part relationships. A Hierarchical relationship is a Broader Term to Narrower Term relationship.</td>
</tr>
</tbody>
</table>
Concept, terms and relationships

CONCEPT

IBM

Is Used For

I.B.M.

Is Used For

RELATIONSHIPS

Is Preferred Label

IBM

Is Used For

International Business Machines

TERMS
Business taxonomy problem: How can a customer pick from >5,000 faucets w/o quitting?

Refine search by:
- Category
- Price
- Brand
- Color/Finish
- # Handles
- Series Name
- Water Filter?
- Faucet Spray
- Handle Shape
- Soap Dispenser?
How business taxonomy translates into front-end interface

**Metadata Field: Size**
**Taxonomy Values:**
- 4.5
- 5.5
- 6
- 6.5
- 7
- 8
- ...

**Metadata Field: Color**
**Taxonomy Values:**
- Black
- Blue
- Brown
- Green
- Grey
- Ivory
- ...

**Metadata Field: Type**
**Taxonomy Values:**
- Athletic Inspired Boots
- Loafers and Slip-ons
- Oxfords and More
- Sandals

**Metadata Field: Brand**
**Taxonomy Values:**
- Antonio Maurizi
- Bacco Bucci
- Ben Sherman
- Bruno Magli
- ...
Learning Objectives:

- Demonstrate knowledge of multiple taxonomy development methods.
- Demonstrate the ability to choose the appropriate taxonomy development method for use in development of an information product.
- Demonstrate knowledge of common taxonomy facets.
- Demonstrate the ability to identify specialized facets for use in an information product.
- Demonstrate the ability to map the facets to the appropriate elements in a Dublin Core-based metadata specification.

2. TAXONOMY DEVELOPMENT PROCESS
## Taxonomy development methods

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automated analysis</td>
<td>Munge, blast, crunch text to analyze corpus.</td>
</tr>
<tr>
<td>Workshopping</td>
<td>Guide group in activities to identify key concepts.</td>
</tr>
<tr>
<td>Strawman</td>
<td>Prepare best guess, then bring it to the table to discuss.</td>
</tr>
<tr>
<td>Adapt Existing Vocabularies</td>
<td>Customize internal terminology, industry standards, etc.</td>
</tr>
<tr>
<td>Hybrid</td>
<td>Combination of some or all of these methods.</td>
</tr>
</tbody>
</table>
Key components to a successful taxonomy project

1. Identify business case
2. Setup taxonomy team
3. Planning & research
4. Define use cases
5. Interview stake-holders
6. Build high-level taxonomy
7. Build out taxonomy detail
8. Validation testing & review
9. Migrate content
10. Maintain & evolve taxonomy
Define business case: Business case examples

- Improve search and browsing to reduce the amount of time employees spend looking for information.
- Reduce business silos, foster collaboration and content reuse, and thereby reduce redundant work.
- Reduce the amount of time employees spend e-mailing basic information to each other.
- Build confidence that employees are getting the most up to date information, and increase employee loyalty by helping them stay “up to date” on the company.
Research & planning

- Identify target content to be focused on.
  - Provide a list of websites (and/or other target content file stores)
  - Prioritize this list for the purposes of the taxonomy project.
- Gather any query logs, usage statistics and usability surveys.
- Collect any existing documentation related to audience personas, content organization, metadata, keywords, and any other guidelines or standards.
- Identify and gather any internal classifications (org charts, sales regions, records retention schedule, code of conduct, product lists, etc.); and any relevant industry standard classifications (UNSPSC, NAICS, USPS, regulated activities, etc.)
Interview stakeholders

- Recruit people from business-critical functions such as marketing, public relations, product marketing, legal, etc.
  - Include people who have credibility, are early adopters, hold large amounts of content, and are “squeaky wheels” or “fans.”
- Conduct 10-20 interviews.
- The goal is for stakeholders to be the review board during the taxonomy development process, and beyond.
Define use cases: Intranet examples

Content related to business areas or facilities
- By geographic location, by type, by specific facility, by access restrictions, by audience, etc.
  - **Use Case:** Create a safety policies and procedures website for facilities organized by State.
  - **Use Scenario:** Find all safety policies and procedures related to facilities located in Ohio.

Company-wide content
- By business function, by topic, by access rights, etc.
  - **Use Case:** Locate any content that has policies and procedures around a particular topic.
  - **Use Scenario:** A policy regarding smoking company-wide has changed and references to outdated policies should be removed. Find official policies, as well as newsletters related to the smoking policy company-wide.
Define use cases: .com examples

Web content managers
- By content type, by topic, by location, etc.
  - **Use Case**: Find and recall all public-facing pages that describe a specific safety tip.
  - **Use Scenario**: Find and recall all public-facing pages that discuss gas safety.

Public users seeking information
- by topic, by location, etc.
  - **Use Case**: Provide search for dividend schedules, earnings statements and stock splits; and the corresponding press releases for a specific time period.
  - **Use Scenario**: An investor who recently sold stock is preparing taxes and would like to do a concise search so that they can find historical information about their holdings.
Build high-level taxonomy

- Identify the types of actors
  - Audiences, roles & access rights
- Identify the types of content
- Identify the types activities
  - Business processes, applications & uses
- Identify the types of named entities
  - Products, services, projects, organizations, locations, etc.
- Topics will be everything else.

A business taxonomy should have no more than 6-10 broad divisions.
The Oracle.com taxonomy has no explicit topics, only actors, content types, and named entities.

“Is a” groups of Products

Build high level taxonomy: Oracle.com top-level taxonomy
Build high level taxonomy: SGMS top-level taxonomy

The SGMS (Singapore Government Metadata Standard) Taxonomy is much more focused on Topics.
Build-out taxonomy detail

- Get agreement on the broad divisions first, then build-out the detailed taxonomy.
- Use existing terminologies whenever they are available for business functions, locations, products & services, etc.
- Only build a vocabulary when no alternative authoritative source exists.
- Only create categories for which there already is content, or likely to be content soon.
- Keep the taxonomy broad and shallow.
  - Roll-up more specific terms into broader categories

A business taxonomy should have no more than 1,200 categories.
Build out taxonomy detail: **NASA Taxonomy**
# Validation testing and review

<table>
<thead>
<tr>
<th>Method</th>
<th>Process</th>
<th>Who</th>
<th>Requires</th>
<th>Validation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walk-through</td>
<td>Show &amp; explain</td>
<td>• Taxonomist • SME • Team</td>
<td>• Rough taxonomy</td>
<td>• Approach • Appropriateness to task</td>
</tr>
<tr>
<td>Walk-through</td>
<td>Check conformance to editorial rules</td>
<td>• Taxonomist</td>
<td>• Draft taxonomy • Editorial Rules</td>
<td>• Consistent look and feel</td>
</tr>
<tr>
<td>Usability Testing</td>
<td>Contextual analysis (card sorting, scenario testing, etc.)</td>
<td>• Users</td>
<td>• Rough taxonomy • Tasks &amp; Answers</td>
<td>• Tasks are completed successfully • Time to complete task is reduced</td>
</tr>
<tr>
<td>User Satisfaction</td>
<td>Survey</td>
<td>• Users</td>
<td>• Rough Taxonomy • UI Mockup • Search prototype</td>
<td>• Reaction to taxonomy • Reaction to new interface • Reaction to search results</td>
</tr>
<tr>
<td>Tagging Samples</td>
<td>Tag sample content with taxonomy</td>
<td>• Taxonomist • Team • Indexers</td>
<td>• Sample content • Rough taxonomy (or better)</td>
<td>• Content ‘fit’ • Fills out content inventory • Training materials for people &amp; algorithms • Basis for quantitative methods</td>
</tr>
</tbody>
</table>
Migrate content

- Prioritize content to be tagged
  - Identify and dispose of ROT.
- Use business rules to automate content tagging
  - Tag landing pages for major sections.
  - Lower-level pages inherit tags from top-level pages.
- Use workflow to enforce tagging
  - Require entry of simple tagging in order to submit an item into the content management system.
- Use templates to guide user tagging
  - Pre-populate template fields whenever possible.
  - Use context-sensitive pick lists.
  - Call-out to taxonomy service for more complex controlled vocabularies.
- Provide tagging incentives
  - Almost instantaneous feedback.
Maintain and evolve taxonomy

- Taxonomy building is iterative.
  - A taxonomy should be improved over time and maintained.
- Designate a taxonomy editor as the single point-of-contact for taxonomy changes.
- Log change requests and notify requestors.
- Prioritize taxonomy changes, e.g.
  - Improves information access, use and reuse.
  - Requires creating new data or metadata.
  - Affects program operations or has a financial impact.
  - Enables communication campaigns or organizational strategy.
  - Positive impact on users
Licensing an existing taxonomy

- **BARTOC.org** (Basic Register of Thesauri, Ontologies & Classifications) There are usually license fees, but these will be less than the effort to develop an equivalent taxonomy.
  - But pre-existing taxonomies rarely fit an organization’s needs and may require extensive customization.

- Recommendation
  - Adopt a faceted approach.
  - Reuse existing (especially internal) vocabularies for as many of the facets as possible.
  - Plan on doing full-custom “Content Type” and “Topic” taxonomies.
## Free sources for 8 common taxonomies

<table>
<thead>
<tr>
<th>Taxonomy</th>
<th>Definition</th>
<th>Potential Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization</td>
<td>Organizational structure.</td>
<td>SP 800-87SP 800-87, U.S. Government Manual, Your organizational structure, etc.</td>
</tr>
<tr>
<td>Content Type</td>
<td>Structured list of the various types of content being managed or used.</td>
<td>Dublin Core Type Vocabulary, AGLS Document Type, Your records management policy, etc.</td>
</tr>
<tr>
<td>Industry</td>
<td>Broad market categories such as lines of business, life events, or industry codes.</td>
<td>SIC, NAICS, Your market segments, etc.</td>
</tr>
<tr>
<td>Location</td>
<td>Place of operations or constituencies.</td>
<td>GNIS, ISO 3166, UN Statistics Div, US Postal Service, Your sales regions, etc.</td>
</tr>
<tr>
<td>Business Activity</td>
<td>Business activities or functions performed to accomplish mission and goals.</td>
<td>Federal Enterprise Architecture Business Reference Model, Enterprise ontology, Your business functions, etc.</td>
</tr>
<tr>
<td>Topic</td>
<td>Business topics relevant to your mission &amp; goals.</td>
<td>Federal Register Thesaurus, NAL Agricultural Thesaurus, Your research areas, etc.</td>
</tr>
<tr>
<td>Audience</td>
<td>Subset of constituents to whom a piece of content is directed or is intended to be used by.</td>
<td>ERIC Thesaurus, Thesaurus, IEEE LOM, Your psycho-graphics or personas, etc.</td>
</tr>
<tr>
<td>Products &amp; Services</td>
<td>Names of products/programs and services.</td>
<td>ERP system, Your products and services, etc.</td>
</tr>
</tbody>
</table>
Learning Objectives:

- Demonstrate the ability to identify appropriate taxonomy sources for use in development of an information product.
- Demonstrate the ability to define and populate a small taxonomy with 3-5 facets using MultiTes.
- Demonstrate the ability to design the validation methods for a taxonomy.

3. TAXONOMY CONSTRUCTION TOOLS
Tools

- Taxonomy editing
  - Data Harmony, MultiTes, protégé, Synaptica, SchemaLogic, Wordmap
- Metadata tagging (automated categorization)
  - CIS, ConceptSearching, Data Harmony, MetaTagger, nStein, Smartlogic, temis
- Content management
  - Documentum, Drupal, Fat Wire Interwoven, Joomla!, OpenText, SharePoint
## Taxonomy editing tools

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Taxonomy Editing Tool</th>
<th>Key Characteristics</th>
<th>URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambridge Semantic</td>
<td>Anzo</td>
<td>Complete platform for knowledge graphs</td>
<td><a href="https://cambridgesemantics.com/anzo-platform/">https://cambridgesemantics.com/anzo-platform/</a></td>
</tr>
<tr>
<td>Mondeca</td>
<td>Intelligent Taxonomy Manager</td>
<td>Complete platform for taxonomy management</td>
<td><a href="https://mondeca.com/software/">https://mondeca.com/software/</a></td>
</tr>
<tr>
<td>Multites</td>
<td>Multites Pro</td>
<td>Inexpensive tool</td>
<td><a href="https://multites.net/">https://multites.net/</a></td>
</tr>
<tr>
<td>SmartLogic</td>
<td>Semaphore</td>
<td>Complete platform taxonomy management &amp; automated tagging</td>
<td><a href="https://www.smartlogic.com/">https://www.smartlogic.com/</a></td>
</tr>
<tr>
<td>Stanford University</td>
<td>Protégé</td>
<td>Inexpensive ontology tool</td>
<td><a href="https://protege.stanford.edu/">https://protege.stanford.edu/</a></td>
</tr>
<tr>
<td>Synaptica</td>
<td>Graphite; KMS</td>
<td>Complete platform vocabulary management or knowledge graphs</td>
<td><a href="https://www.synaptica.com/">https://www.synaptica.com/</a></td>
</tr>
<tr>
<td>TopQuadrant</td>
<td>TopBraid EDG-VM</td>
<td>Complete platform for vocabulary management</td>
<td><a href="https://www.topquadrant.com/vocabulary-management">https://www.topquadrant.com/vocabulary-management</a></td>
</tr>
<tr>
<td>Università degli Studi di Roma 'Tor Vergata'</td>
<td>VocBench</td>
<td>Open source vocabulary management</td>
<td><a href="http://vocbench.uniroma2.it/">http://vocbench.uniroma2.it/</a></td>
</tr>
</tbody>
</table>
Normal taxonomy editor functionality requirements

### Basic
- Standard and Custom Fields
- Standard and Custom Relations
- Data Typing and Restrictions
- Consistency Enforcement
- Flexible Reporting
- Flexible Importing?

### Midrange
- UNICODE
- Multiple Vocabulary Support
- Inter-Vocabulary Relations
- Unique IDs: externally supplied IDs are not sufficient

### Advanced
- Workflow
- Voting
- Change Request Mgmt.
- Stylistic rules enforcement
- Programmability
Additional functionality for taxonomy editing software

- Aliases – Need to deal with synonyms, but also with alternative labels based on language or other factors.
- Notes – Useful to have several types of notes fields to keep public notes separate from team’s working notes.
- Effective dates – Enable the determination of what was the ‘valid’ taxonomy on dates in the past. Part of a set of strong requirements on provenance.
- Inter-category relations – Must be able to provide links that don’t follow hierarchy, and even go between vocabularies.
- Poly-hierarchy – Mid-range tools should deal with this.
- Rules checking – Check conformance to style rules like length, use of &, etc.
- Workflow – Tracking the handling of change requests, as well as the process of getting approvals for edits.
Sample taxonomy editor: Data Harmony
MultiTes Taxonomy Tool

- Z39.19 compatible taxonomy editor
- Self-study tutorials:
  - Getting Started with MultiTes Pro
  - Navigating your thesaurus
  - Importing data from text files
  - Working with Subject Categories
  - Working with Multilingual Thesauri

Since MultiTes was designed as a thesaurus tool, the main MultiTes display is an alphabetical list rather than a tree browser.

The term record is a pop-up window.
**MultiTes: Formatting an import file**

Recommendation: Use a text editor (Notepad)

### Subject Taxonomy

<table>
<thead>
<tr>
<th>Arithmetic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operations</td>
</tr>
<tr>
<td>Addition</td>
</tr>
<tr>
<td>Subtraction</td>
</tr>
<tr>
<td>Multiplication</td>
</tr>
<tr>
<td>Division</td>
</tr>
<tr>
<td>Roots</td>
</tr>
<tr>
<td>Factorials</td>
</tr>
<tr>
<td>Factoring</td>
</tr>
<tr>
<td>Properties of Operations</td>
</tr>
<tr>
<td>Estimation</td>
</tr>
<tr>
<td>Fractions</td>
</tr>
<tr>
<td>Decimals</td>
</tr>
<tr>
<td>Comparison of numbers</td>
</tr>
<tr>
<td>Exponents</td>
</tr>
</tbody>
</table>

### MultiTes Import Format

<table>
<thead>
<tr>
<th>Arithmetic</th>
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<tbody>
<tr>
<td>Operations</td>
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<td>Factorials</td>
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<table>
<thead>
<tr>
<th>Factoring</th>
</tr>
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<tbody>
<tr>
<td>BT: Operations</td>
</tr>
<tr>
<td>Properties of Operations</td>
</tr>
<tr>
<td>BT: Operations</td>
</tr>
<tr>
<td>Estimation</td>
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<tr>
<td>BT: Operations</td>
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<tr>
<td>Fractions</td>
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<tr>
<td>Exponents</td>
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**MultiTes: Create a new taxonomy, then Import a file**

- File > New
- Navigate to destination directory, then enter filename
- Click Continue button in New Thesaurus pop-up
- File > Import
- Navigate to target file, then click Open button
## MultiTes: Imported taxonomy

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<th>Flag</th>
<th>Relationships</th>
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MultiTes: Hierarchy report

- Reports > Top term
  - Not Hierarchical
- In Select Term range tab, click on Print/Export button
  - Default should be set to Output to: Screen
MultiTes: Hierarchy report

Arithmetic
- Comparison of numbers
- Decimals
- Exponents
- Fractions
- Operations
  - Addition
  - Division
  - Estimation
  - Factorials
  - Factoring
  - Multiplication
  - Properties of Operations
  - Roots
  - Subtraction
MultiTes: Alphabetical report

- Reports > Alphabetical report
- Click on Print/Export button
MultiTes exercise

- Format a small taxonomy (10-20 terms, 2-3 levels deep)
- Import it into MultiTes.
- Generate hierarchy (TopTerm) and alphabetical reports.
Questions

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