



Basic Concepts of Normalized and Structured Product Data

White Paper





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1 Introduction

Structured and normalized product data is the essential lifeblood of a truly usable product catalog. It provides the basic information necessary to single out one product as being unique from many other products in a group. These unique identifying characteristics include part number, price, and short description, as well as product attribute information, long descriptions, images, PDFs, and even more-detailed descriptive information, such as marketing text, features and benefits, and so on.

Most of what passes for product data is really just raw transactional data. Truly structured and normalized product data for searchable electronic catalogs and printed paper catalogs simply does not exist for most products. Frequently a great, and costly, effort must be made to understand, analyze, and manipulate product catalogs. And even if the raw product data exists in electronic format, it often resides in a variety of incompatible formats and structures.

A product catalog is an online or printed publication, book, or pamphlet, containing a list or display of products, usually arranged systematically according to a categorical or other system with descriptive information and illustrations.

Printed Industrial Catalogs

When speaking about catalogs, the reference is not to a typical Land's End or J. Crew catalog, but rather to an industrial catalog. A tool catalog, for example, is often cumbersome, requires a large production staff, and is very expensive to layout and print. An industrial catalog may have several thousand pages and contain several hundred thousand products.

Electronic Catalogs

Electronic catalogs are a publishing vehicle created for the purpose of e-Commerce. An electronic catalog can be published on the Web or as a CD. Electronic catalogs can be divided into two types:

- Database type (dynamic pages)
- PDF type (printed catalog converted to PDF, and that can be browsed as static pages). Some companies add search capabilities that enable users to view the page where a specific item resides.

The table below displays functional elements for product data and the platforms where these elements can be found.

Presentation	Logistic Information (ERP)	Printed Catalogs (Paper)	Electronic Catalogs (Web+CDs)
Single-Item	X	X	X
Item List	X	X	X
Family (Grouped)		X	X
Searchability	Logistic Information (ERP)	Printed Catalogs (Paper)	Electronic Catalogs (Web+CDs)
Keyword Search	X		X
Index Search		X	
Multi-dimensional Drill-down Search			X
Parametric Search			X
Side-by-side Comparison			X
Data Elements	Logistic Information (ERP)	Printed Catalogs (Paper)	Electronic Catalogs (Web+CDs)
Part Number	X	X	X
Alternate Part Number	X	X	X
Product Name	X	X	X
Manufacturer Name	X	X	X
Price	X	X	X
Long/Short Description	X	X	X
Category		X	X
Attributes		X	X
Attribute Values		X	X
Features & Benefits		X	X
Product Relationships		X	X
Images – Low Resolution			X
Images – High Resolution		X	
Drawings		X	X
Drawings with Hot Spots			X
Spec Sheets			X
MSDS			X
Structured and Normalized Data	No	Yes	



2 Understanding Product Data

2.1.1 Product Data

The following are functional elements of product data:

- Data Elements
- Presentation Format
- Searchability
- Taxonomy

2.1.2 Data Elements

Product data is composed of product characteristics or data elements. Data elements define a product.

FOR EXAMPLE, the data elements in the brief description that follows lead us to understand what the item is: 4" x 6", built-in alarm, blue, snooze feature, with a minute and second hand, for telling time, numbers on the face, and an image displaying an alarm clock.

Data elements include:

Part Number	Images
Product Name	Text
Category	Drawings
Attributes Values	Spec sheets, TDS, MSDS

2.1.3 Presentation Format

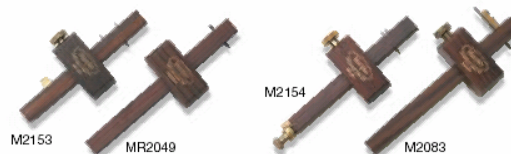
A style is a way of presenting printed material, including usage, punctuation, spelling, typography, and arrangement. Two styles commonly found in catalogs are the Family Presentation Style and the Single-Item Presentation Style.

2.1.3.1 Family Presentation Style

The family presentation style is used for a grouping of products that are related by fields of common information, such as name, image, descriptive text, specifications, and so on.

Gauges

- MARPLES gauges are fitted with hardened steel spurs. The hole in the stock is carefully broached to match the stem's contour, and, (with the exception of the MR2049) the gauges are fitted with a polyester friction pad between the thumb screw and stem to ensure a smooth sliding action



Description	Bulk Stock #
Marking Gauge; Economy w/ Plastic Thumbscrew	MR2049
Marking Gauge; Deluxe Brass Thumbscrew, Brass Facing	M2050
Cutting Gauge; Hardened Steel Blade	M2083
Mortice & Marking Gauge; Single Spur Top, Double Spur Base, Brass Slide	M2153
Mortice & Marking Gauge; Deluxe; Adjusted Slide and Brass Facing	M2154

Figure 1: Presentation Unit Using Family Formatting Style



2.1.3.2 Single-Item Presentation Style

As opposed to the family presentation style, the single-item presentation style is used when the characteristics for a single item are presented. The single-item presentation style is commonly seen when information is generated from databases, CDs, or from the Web. When only one product is displayed, it's difficult to understand how the product relates to a family grouping, see Figure 2.

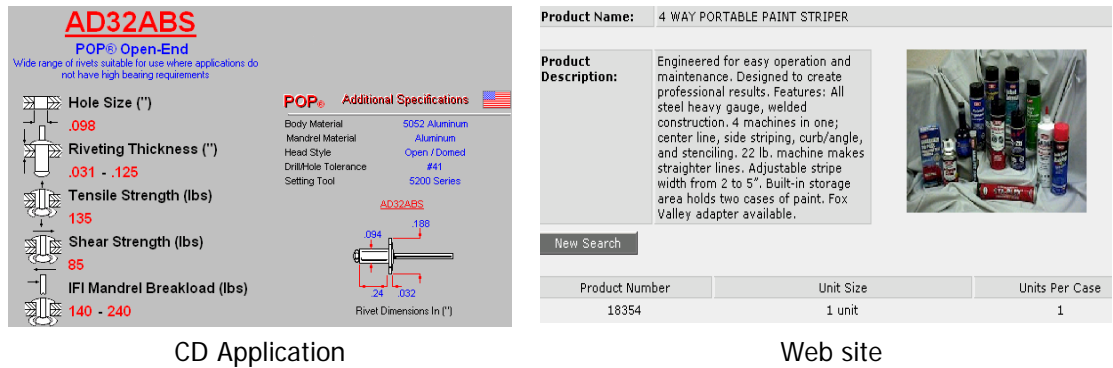


Figure 2: Single-Item Presentation Style

2.1.4 Searchability

Products reside in a data source. Some data sources are interactive and some are not. The ease of finding a product depends on the type of data source used.

A data source is any type of manufacturer's published material that is available for general public use. This includes catalogs, Web sites, price lists, marketing brochures, specification sheets, and material safety data sheets. They are all data sources from which relevant product information can be retrieved. Some data sources provide only limited information and some are more searchable than others.

2.1.5 Taxonomy

A well designed, organized, and understandable structure is like a road map, because by using the roadmap, the items housed within the structure can be located easily. A large product catalog may contain hundreds of thousands products, and these products can be organized into hierarchical multiple taxonomies of categories and subcategories. In addition, a catalog may contain tens or hundreds of thousands of data elements, such as images, texts, and PDF files. These data elements also need to be organized, so that it is possible to locate an object or group of objects to link to a particular record.

Taxonomy is a classification system that typically consists of a hierarchy of categories. Analyzing, organizing, and structuring product data from various manufacturer sources provides a consistent look and feel that enhances usability. The consistent look and feel means that the product data is *normalized*. By normalizing and structuring data elements from different sources an item can be found using the normalized data elements as search parameters.

FOR EXAMPLE, one source may use the word *diameter* to describe the length of a straight line through the center of an object from side to side, while another source uses the term *segment length*, a third uses the term *thickness*, and a fourth *width*. By choosing one term to represent all permutations of the word diameter, the data takes on a consistent look and feel that promotes understanding and allows quick comparison between and within manufacturers.

A taxonomy has three main elements:

- Hierarchy
- Attributes
- Attribute Values

The purpose of a taxonomy is to group like things together into categories, based on a set of common, category-specific characteristics. A taxonomy is hierarchical, meaning that some categories are subcategories of other categories.

2.1.5.1 Hierarchy

A hierarchy is an arrangement of items into subordinate and superordinate categories.

FOR EXAMPLE, most people are familiar with at least part of the hierarchical taxonomy used to classify animals, such as vertebrates → mammals → primates → chimpanzees, and so on. Another life example is groceries → fresh produce → fruit → citrus fruit → oranges. Each level of the hierarchy gets narrower in terms of what it includes.

A hierarchical taxonomy of product categories is used to structure product information in a catalog. A hierarchical taxonomy is typically represented as a *tree*, as shown in Figure 3.

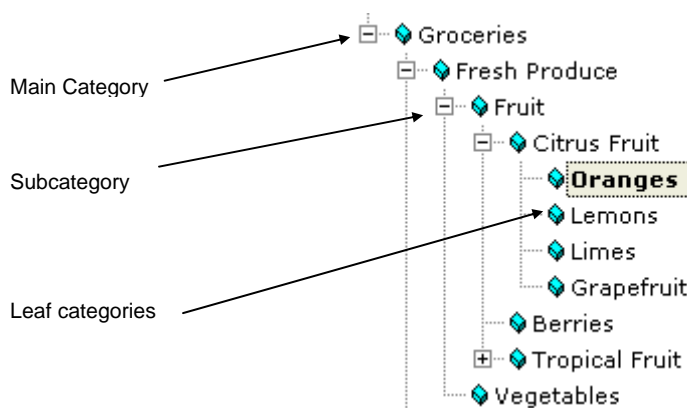


Figure 3: Hierarchy

2.1.5.2 Attributes

Attributes are the defining characteristics of a leaf category in a taxonomy, and they are prioritized according to their importance.

FOR EXAMPLE, in the taxonomy of citrus fruit, oranges form a leaf category. The oranges leaf category has specific characteristics (attributes), as would the leaf categories lemons, limes, and grapefruit.

Figure 4 shows a hierarchy together with a sample of attributes for citrus fruit.

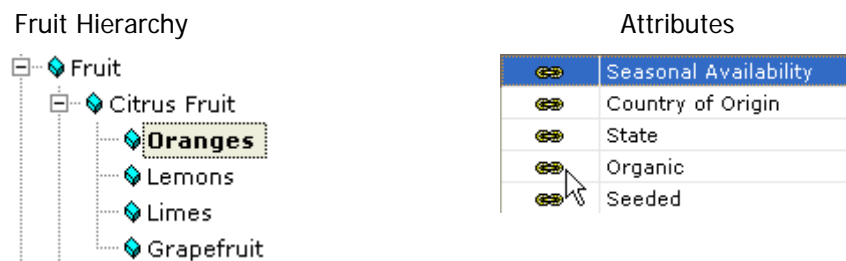


Figure 4: Citrus Fruit Hierarchy

2.1.5.3 Attribute Values

An attribute value is a quality or characteristic inherent in or ascribed to an attribute.

FOR EXAMPLE, the attribute **Seasonal Availability** is linked to oranges and has five values: *All Year, Spring, Summer, Fall, and Winter.*

Attribute	Values
Seasonal Availability	All Year Spring Summer Fall Winter

Figure 5: Attribute Values

3 Creating Normalized and Structured Product Data

Once a designated taxonomy is built, it's ready to accommodate data elements from different sources. Before incorporating the data elements, it's necessary to:

- Understand the designated taxonomy.
- Locate data elements in a designated source.
- Integrate data elements in the designated taxonomy.

3.1 Understanding the Designated Taxonomy

Understanding the designated leaf category taxonomy means being able to

- Identify the designated leaf category in the taxonomy hierarchy.
- Understand attributes linked to the designated leaf category.
- Understand attribute values for the designated attributes.

3.1.1 Identifying the Designated Leaf Category

The group of items designated for work determines the leaf category in the hierarchy. For example, if the items designated for work are End Mills, then the leaf category in the hierarchy is End Mills, see Figure 6.

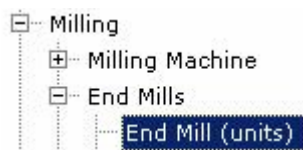


Figure 6: Leaf Category in a Hierarchy

3.1.2 Understanding Attributes Linked to the Designated Leaf Category

It is necessary to understand the set of attributes linked to the designated leaf category, so that the designated data elements in a source can be located. For example, attributes for the leaf category End Mills are *Overall Length*, *Shank Diameter*, and *Cutting Length*, see Figure 7. Understanding the meaning of each attribute in a designated leaf category is important, because the meaning of the same attribute in a *different leaf category* may not be the same.

In Figure 7, the following are displayed:

- **A** - Leaf Category: End Mills
- **B** – Sample End Mill attributes linked to the leaf category (Shank Diameter, Cutting Length, Cutting Depth, and Overall Length)
- **C** - End mill drawing denoting the following attributes: d_1 Shank Diameter, l_2 Cutting Length, and l_1 Overall Length.

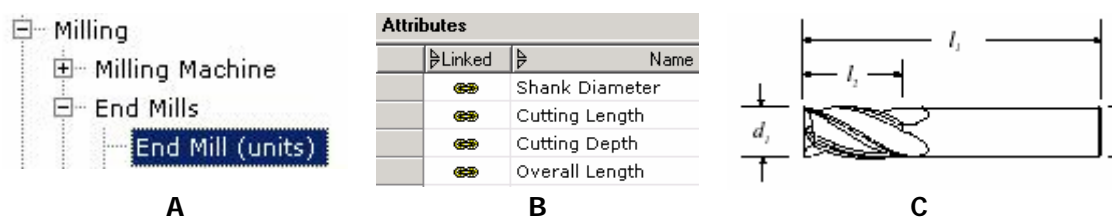


Figure 7: Hierarchy and Attributes for End Mills

3.1.3 Understanding Attribute Values for the Designated Attributes

It is necessary to understand the attribute values linked to the designated attributes, so that the designated data elements in a source can be located. Once located, the data elements can be normalized (integrated) into the taxonomy.

For example, Figure 8 displays the attribute values for the attribute Coating in the leaf category End Mills. Included in these values are TiN, TiCN, and TiAIN. The same attribute values are displayed in the manufacturer's catalog as Ti-NAMITE, Ti-NAMITE-C, and Ti-NAMITE-A respectively.

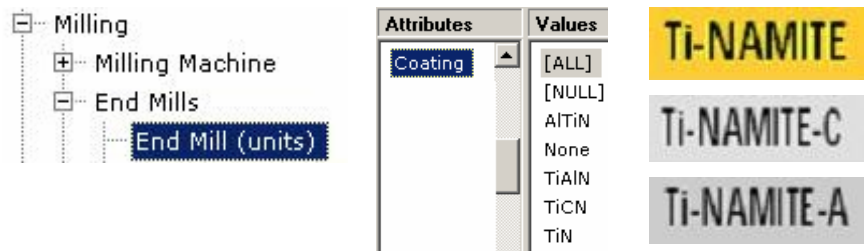


Figure 8: Attribute Values

3.2 Locating Data Elements in Manufacturer Sources

The data elements for a product can be extracted from four areas in the manufacturer's source:

- Source (general information)
- Section
- Family
- Item

3.2.1 Source

General information found in a source applies to all products. Data elements found in this area have to be identified and moved to their designated place in the taxonomy.

For example, warranty information may affect all products in a catalog. This is general information usually situated at the beginning or at the end of a catalog. Warranty has been identified as a required data element in the taxonomy. The warranty needs to be located in the catalog and moved to its designated place in the taxonomy.

Limited Warranty

Fastcut Tool Corporation warrants to original equipment manufacturers, distributors and industrial and commercial users of its products that each new product which it manufactures or supplies is free from defects in material and workmanship. Its sole obligation under this warranty is limited to furnishing, without additional charge, a replacement for, or, at its option, repairing or issuing credit for any such product which shall, within one year from the date of sale by Fastcut Tool Corporation, be returned freight prepaid to Fastcut Tool Corporation and which, upon inspection, is determined by Fastcut Tool Corporation to be defective in materials or workmanship. The provisions of this warranty shall not apply to any product which has been subjected to misuse, improper operating conditions, or which has been repaired or altered, if such would adversely affect performance of the product. Complete written information with respect to all such matters must be furnished to Fastcut Tool Corporation as a prerequisite to its consideration of any claim or complaint under this warranty.

The repair, replacement or issuance of credit for parts provided for in this warranty constitutes the Buyer's exclusive remedy. The warranty is in lieu of all other warranties, express or implied, including any implied warranty of merchantability or fitness for a

particular purpose. Fastcut Tool Corporation has no liability or responsibility on any claim of any kind, whether in contract, tort or otherwise, for any loss or damage arising out of, connected with, or resulting from the manufacture, sale, delivery or use of any product sold hereunder, in excess of the cost of replacement or repair as provided herein. *In no event shall Fastcut Tool Corporation be liable for any special, incidental or consequential damages.* Fastcut Tool Corporation makes no other warranty, express or implied, except as set forth above, and neither assumes nor authorizes any other person or entity to assume for it any other obligation or liability in connection with any of its products.

WARNING
Any cutting tool may break or shatter under improper use. Government regulations require use of safety glasses and other appropriate safety equipment at all times in the vicinity of use. Wet or dry grinding of cutting tools produces potentially hazardous dusts or mists; to avoid adverse health effects, use adequate ventilation and read the material Safety Data Sheet for further applicable tool material or grade before grinding.

Figure 9: Warranty



3.2.2 Section

A section refers to a grouping of one or more subjects within a source. Data elements located in a section contain information limited to items in a specific section. Data elements from a category have to be identified and moved to their designated place in the taxonomy. Data elements for a specific category can only be identified using multiple manufacturer sources.

Taper Gauges



Large and Small Diameter

5572/5637-D/5554

All Allen Taper Gauges are adjustable to permit measurement of a broad range of sizes. A simplified design, when compared to the original style gauges, results in a durable and stable lightweight gauge frame. Through use of several common components, these gauges maintain the required API accuracy at a reduced cost. Gauges in this series have a standard 5" throat depth which is of ample length to cover all API casing, tubing and line-pipe as well as the majority of API RSC joints. The steel frame is lightweight, balanced and easy to use. The positive locking system makes switching to other diameter sizes simple and quick.

The dial indicators have a travel of either 1/2" or 1", graduated in 0.001" increments, with a required API accuracy of 0.001" over their entire range. The metric dial has graduations of 0.01mm and complete compliance to API specifications through the 25mm range. It also accepts the complete range of Allen Contact Points.

All taper gauges are furnished with 2 Allen Ball Points, a certificate of compliance to API specifications and a fitted box.

All taper gauges, except the **5619** and **5624**, are furnished with a fitted carrying case.

Figure 10: Section Information

For example, data elements such as *attribute values*, *features*, and *registered trademarked name* affect all products in the section shown in Figure 10. Attribute values, features, and registered trademarked names have all been identified as required data elements in the taxonomy. They need to be located in the catalog and moved to their designated place in the taxonomy.

3.2.3 Family

Data elements located in the family area contain information limited to items in a specific family. Data elements from the family area have to be identified and moved to their designated place in the taxonomy.

For example, data elements such as number of flutes, cutting direction, length group, and material, affect all products in the family shown in Figure 11. These data elements have been identified as being required in the taxonomy. They need to be located in the catalog and moved to their designated place in the taxonomy.

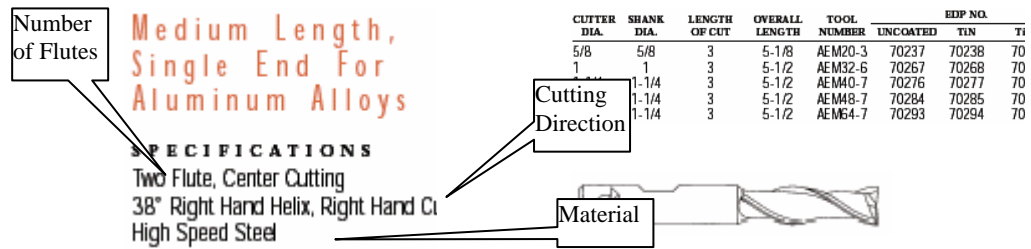


Figure 11: End Mill Family

3.2.4 Item

Data elements located in the item area contain information limited to a specific item. Data elements identified in the item area have to be identified and moved to their designated place in the taxonomy.

For example, data elements such as cutting diameter, shank diameter, and cutting length are specific for each product. These data elements have been identified as being required in the taxonomy. They need to be located in the catalog and moved to their designated place in the taxonomy.

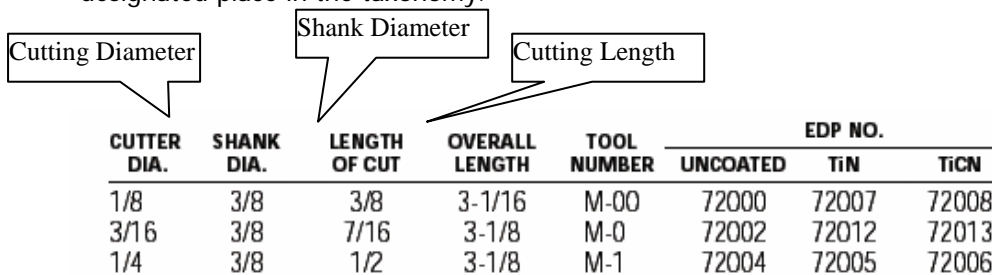


Figure 12: Data Elements

3.3 Integrating Data Elements in a Taxonomy

Once a taxonomy is understood and all relevant data elements are located in the manufacturer's source, the relevant data elements are ready to be integrated into their designated place in the taxonomy, see **Figure 13**. When all data elements, textual and graphic, have been integrated into a taxonomy, any product residing in that taxonomy has been described completely.



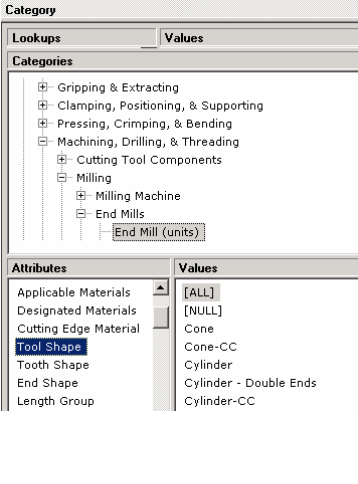
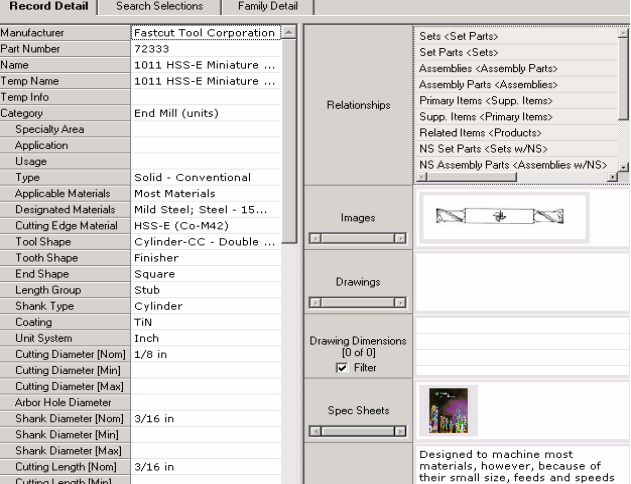


Hierarchy for End Mills	Relevant data elements have been integrated into the taxonomy for End Mills, including attribute values, images, and text.																																																																										
 <p>Category</p> <p>Lookups Values</p> <p>Categories</p> <ul style="list-style-type: none">Gripping & ExtractingClamping, Positioning, & SupportingPressing, Crimping, & BendingMachining, Drilling, & Threading<ul style="list-style-type: none">Cutting Tool Components<ul style="list-style-type: none">Milling<ul style="list-style-type: none">Milling Machine<ul style="list-style-type: none">End Mills<ul style="list-style-type: none">End Mill (units) <p>Attributes Values</p> <table><tr><td>Applicable Materials</td><td>[ALL]</td></tr><tr><td>Designated Materials</td><td>[NULL]</td></tr><tr><td>Cutting Edge Material</td><td>Cone</td></tr><tr><td>Tool Shape</td><td>Cone-CC</td></tr><tr><td>Tooth Shape</td><td>Cylinder</td></tr><tr><td>End Shape</td><td>Cylinder - Double Ends</td></tr><tr><td>Length Group</td><td>Cylinder-CC</td></tr></table>	Applicable Materials	[ALL]	Designated Materials	[NULL]	Cutting Edge Material	Cone	Tool Shape	Cone-CC	Tooth Shape	Cylinder	End Shape	Cylinder - Double Ends	Length Group	Cylinder-CC	 <p>Record Detail Search Selections Family Detail</p> <table><tr><td>Manufacturer</td><td>Fastcut Tool Corporation</td></tr><tr><td>Part Number</td><td>72333</td></tr><tr><td>Name</td><td>1011 HSS-E Miniature ...</td></tr><tr><td>Temp Name</td><td>1011 HSS-E Miniature ...</td></tr><tr><td>Temp Info</td><td></td></tr><tr><td>Category</td><td>End Mill (units)</td></tr><tr><td>Specialty Area</td><td></td></tr><tr><td>Application</td><td></td></tr><tr><td>Usage</td><td></td></tr><tr><td>Type</td><td>Solid - Conventional</td></tr><tr><td>Applicable Materials</td><td>Most Materials</td></tr><tr><td>Designated Materials</td><td>Mild Steel; Steel - 15...</td></tr><tr><td>Cutting Edge Material</td><td>HSS-E (Co-M42)</td></tr><tr><td>Tool Shape</td><td>Cylinder-CC - Double ...</td></tr><tr><td>Tooth Shape</td><td>Finisher</td></tr><tr><td>End Shape</td><td>Square</td></tr><tr><td>Length Group</td><td>Stub</td></tr><tr><td>Shank Type</td><td>Cylinder</td></tr><tr><td>Coating</td><td>TiN</td></tr><tr><td>Unit System</td><td>Inch</td></tr><tr><td>Cutting Diameter [Nom]</td><td>1/8 in</td></tr><tr><td>Cutting Diameter [Min]</td><td></td></tr><tr><td>Cutting Diameter [Max]</td><td></td></tr><tr><td>Aibor Hole Diameter</td><td></td></tr><tr><td>Shank Diameter [Nom]</td><td>3/16 in</td></tr><tr><td>Shank Diameter [Min]</td><td></td></tr><tr><td>Shank Diameter [Max]</td><td></td></tr><tr><td>Cutting Length [Nom]</td><td>3/16 in</td></tr><tr><td>Cutting Length [Min]</td><td></td></tr><tr><td>Cutting Length [Max]</td><td></td></tr></table> <p>Relationships</p> <ul style="list-style-type: none">Sets <Set Parts>Set Parts <Sets>Assemblies <Assembly Parts>Assembly Parts <Assemblies>Primary Items <Supp. Items>Supp. Items <Primary Items>Related Items <Products>NS Set Parts <Sets w/NS>NS Assembly Parts <Assemblies w/NS> <p>Images</p>  <p>Drawings</p> <p>Drawing Dimensions [0 of 0]</p> <input checked="" type="checkbox"/> Filter <p>Spec Sheets</p>  <p>Description</p> <p>Designed to machine most materials, however, because of their small size, feeds and speeds are very material specific. For general purpose milling, including</p>	Manufacturer	Fastcut Tool Corporation	Part Number	72333	Name	1011 HSS-E Miniature ...	Temp Name	1011 HSS-E Miniature ...	Temp Info		Category	End Mill (units)	Specialty Area		Application		Usage		Type	Solid - Conventional	Applicable Materials	Most Materials	Designated Materials	Mild Steel; Steel - 15...	Cutting Edge Material	HSS-E (Co-M42)	Tool Shape	Cylinder-CC - Double ...	Tooth Shape	Finisher	End Shape	Square	Length Group	Stub	Shank Type	Cylinder	Coating	TiN	Unit System	Inch	Cutting Diameter [Nom]	1/8 in	Cutting Diameter [Min]		Cutting Diameter [Max]		Aibor Hole Diameter		Shank Diameter [Nom]	3/16 in	Shank Diameter [Min]		Shank Diameter [Max]		Cutting Length [Nom]	3/16 in	Cutting Length [Min]		Cutting Length [Max]	
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Figure 13: Integrating Data Elements

3.4 Conclusion

The building of meaningful data requires thorough in-depth planning. The foundation of this in-depth planning is the taxonomy. Building a taxonomy requires professionalism, expertise, and a thorough knowledge of the subject matter. InQuera's professionals have the knowledge, tools, and expertise to smoothly transfer your raw, unstructured data to a normalized and structured state. Saving time and money, and producing easy to read and easy to understand data.

4 Glossary

Attribute	Characteristic or feature of a catalog item that makes it possible to distinguish different items of the same kind. With water valves, for example, different valves may be distinguished by their material, diameter, pressure limits, and so on—these are all attributes of water valves.
Attribute Value	A property or characteristic of an attribute.
Catalog	An online or printed publication, book, or pamphlet, containing a list or display of products, usually arranged systematically according to a categorical or other system with descriptive information and illustrations.
Category	Name for a group of records that share the same attributes.
Data Element	A single characteristic of a product
Data Source	Any type of manufacturer's published material that is in general public use.
Drawing	A technical drawing of a product.
Multi-dimensional Drill-Down Search	A progressive search for product records by alternately drilling down hierarchy trees and flat lists.
Family	A group of product records that are related by one or more common fields and/or attributes having the same value, and that may also have additional fields of <i>common information</i> , such as an image, a logo, a paragraph of descriptive text, bullets of specifications, and so on.
Hierarchy	Arrangement of items into subordinate and superordinate categories.
Image	A likeness or reproduction of an object.
Index Search	A search for a product or part number, usually in a printed catalog.
Keyword Search	Specified word search, typically found in electronic catalogs.
Leaf Category	A branch that has no child branches.
Normalizing Data	Information designed in a consistent, organized, and understandable structure.
Parametric Search	Process of finding records by selecting attributes and/or values (parameters) that must be matched in the records searched.
Part Number	Numerals, letters, or a series of both used to identify a product.
PDF	An electronic document formatted in Adobe's Portable Document Format, readable with Adobe Acrobat Reader.



Product Relationship	A specific and distinct connection of a commercial nature between two or more products.
Side-by-side Comparison	The ability to compare two or more products within the same category (within and across manufacturers) using normalized data elements.
Taxonomy	Classification system that typically consists of a hierarchy of categories. Catalog items are classified in a hierarchy of categories.
Text	Original wording from a source that has undergone paraphrasing or condensation.