Industry Knowledge Graph LLC

An Intro To Ontology for Business Executives

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Industry Knowledge Graph
solution for Business Execs™

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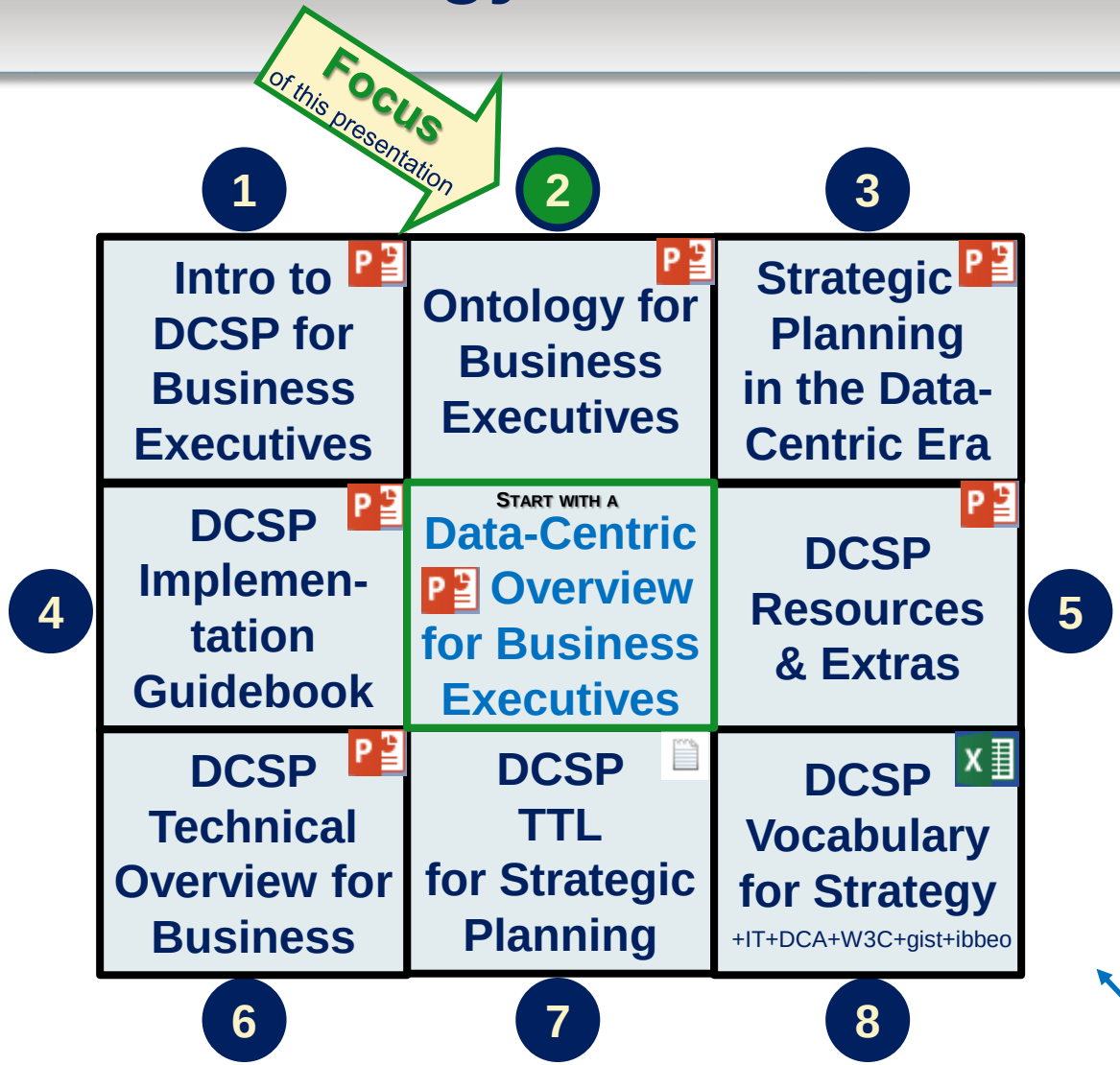
Instructor, Alan S. Michaels
Director of Industry Research, Industry Knowledge Graph LLC

An Intro to Ontology for Business Execs



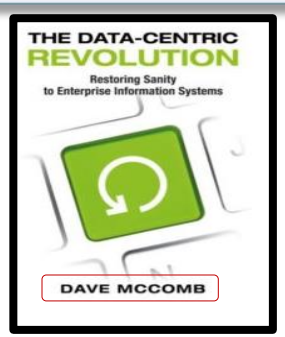
The Data-Centric Strategic Planning (DCSP) Series

IndustryKG™

There Is A Lot of Intellectual Capital Here

:Author :isAuthorOf :Book

isAuthorOf



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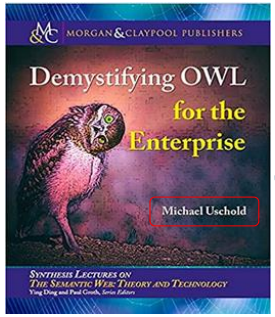

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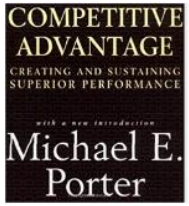

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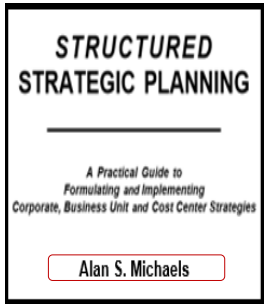

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Intellectual Capital Used In This Course

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Built by Semantic Arts Inc.

Instructor
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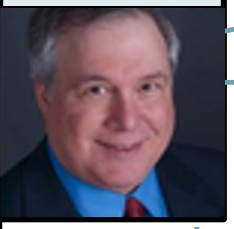

BINGHAMTON UNIVERSITY

graduated From

is Founder & Owner Of

The Economy IBB INDUSTRY BUILDING BLOCKS

is Located In

Binghamton, NY

has Developed

believes In

is Based On Theories Of

IBB Vision (extend Porter matrix p 356 in Competitive Advantage)

Analyze the Global Economy, by Industry

Industry Name	Bus 1	Bus 2	Bus 3	Bus N	Data ...	More Data
Industry 1 Data →						
Industry 2 Data →						
Industry 3 Data →						
Industry 4 Data →						
Industry 5 Data →						
...						
Industry 21000 Data →						

The Economy IBB

Research Focus: Companies with a Global Market Share of 1% or more in any Industry

IBB (5 Forces Level) Industry Data

is Thought Leader For

COMPETITIVE STRATEGY Techniques for Analyzing Industries and Competitors — Michael E. Porter

COMPETITIVE ADVANTAGE Creating and Sustaining Superior Performance — Michael E. Porter

US CLUSTER MAPPING

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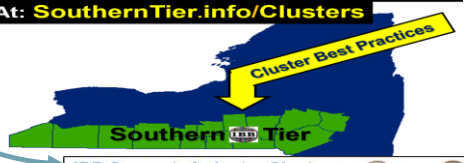
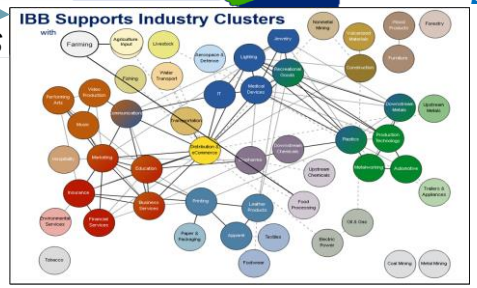
At: SouthernTier.info/Clusters





Apple Inc (Logical) Lines of Business*

1	Smartwatches & Computerized Wrist Watches
2	PCs / All-In-One PC Manufacturing
3	Notebooks / Consumer Laptops
4	Tablet PC Operating System Software
5	Auto Operating Software & Car OS Software
6	Smartphones
7	Computer & Software Stores
8	Ecommerce Stores: Computers & Electronics
9	Payments/ Mobile Payment Services

Sample Extract

*Apple Inc competes in **62** industries in the IBB database.

profiles Companies By Industry

profiles Markets By Industry

Market Area - Robots

1	Robot Engineering Services & Robot Consulting
2	Robot Operating Systems
3	Robot Simulation Software
4	Robots / Floor Washing Robots Manufacturing
5	Robots / Guide Dog Robot Manufacturing
6	Robots / Gutter Cleaning Robot Manufacturing
7	Robots / Lawn Mower Robots Manufacturing
8	Robots / Pet Robot Manufacturing
9	Training / Robot Training Services

Each Industry has a story

Sample Extract

There are **110** robot industries in the IBB database

profiles 23,000 industries

Industry Revenue	**Competitors, by:** • Top Corporate Parent • Immediate Parent • Brand
Industry Attractiveness	
Product Segments	
Customer Segments	
Channel Segments	Industry Substitutes
End Users	Industry Complements
Industry Trends	Industry Vendors
Economic Trends	Buyer Purchase Criteria
Technology Trends	Industry Uncertainties
Geopolitical Trends	& Much More

is 20x more granular than **NAICS**

is Exclusively Available Via

Industry Knowledge Graph LLC **Offers**

- IndustryKG™ Subscription ,
- Industry Knowledge Graph™ triples ,
- Data-Centric Strategic Planning™ .

An Intro To Ontology for Business Execs

- ✓ An Ontology is a Conceptual Model
  - That's Implementable
- ✓ An Ontology is a set of Assertions
- ✓ An Ontology is a set of **Triples**
- ✓ Triples form a Directed Graph

- ✓ Directed Graphs have a set of nodes with connecting arrows
- ✓ OWL = Web Ontology Language
  - an International standard to model ontologies / characterize things
- ✓ OWL = a Semantic Technology
- ✓ SPARQL = a Semantic Technology
- ✓ SPARQL = Query Graph Language

A Logical View of the Answer
(every time). A Triple Store = triples.

Subject	Predicate (Property)	Object
S	P	O
What we're talking about	How S and O are related	An individual or literal linked to S
		An individual thing. e.g., IBM

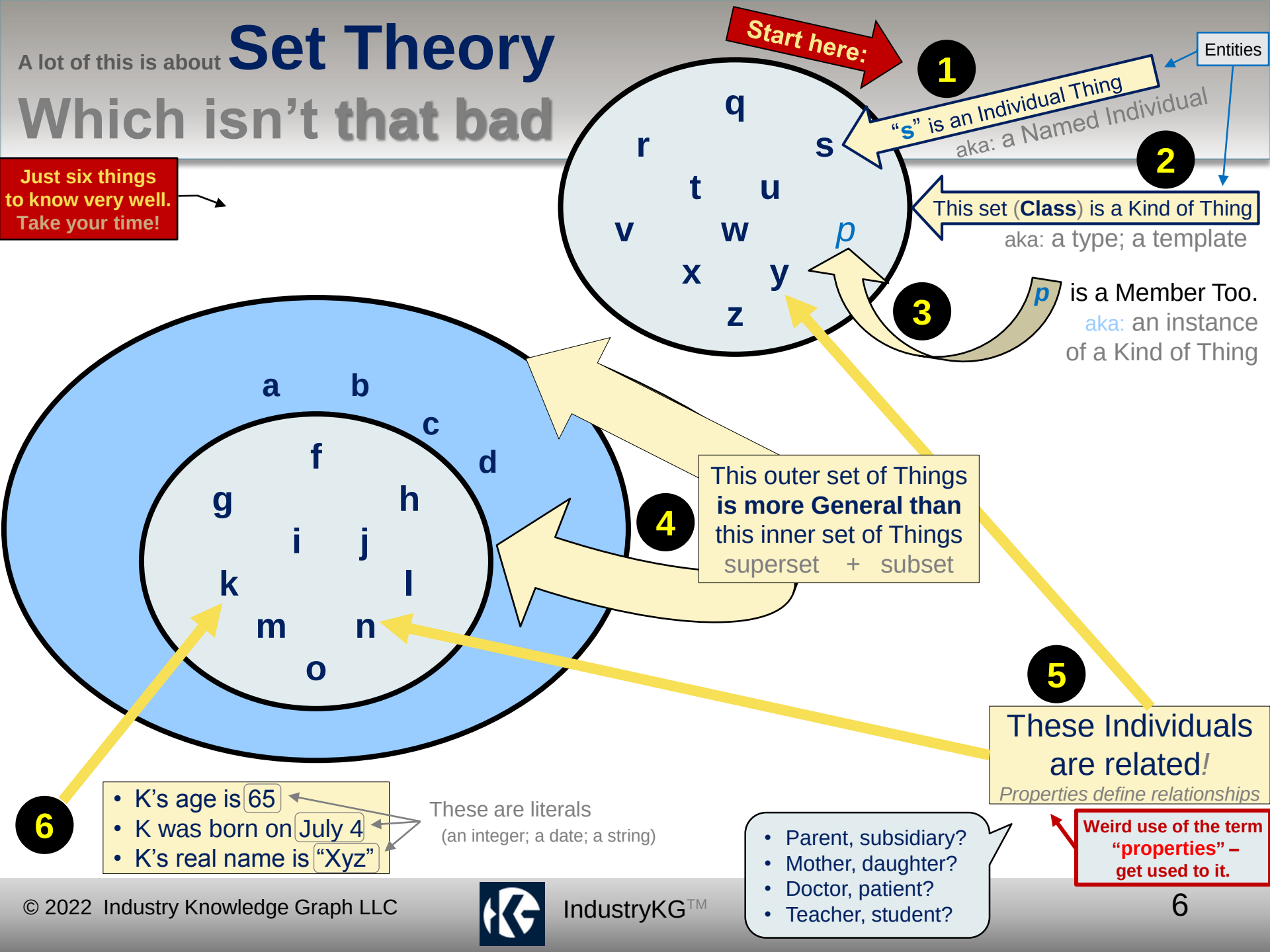
Have something to say?
Just write Triples.
For the metadata + the data

Ontologies focus on the Subject matter

A lot of this is about **Set Theory**

Which isn't that bad

Just six things to know very well. Take your time!



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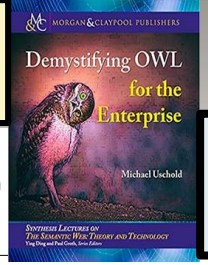
Big TIP: memorize this page



Assertions in OWL

From Demystifying OWL

The format for **Triples** ← for all cases except

Subject	Predicate	Object
IRI:xxx	IRI:xxx	IRI:xxx

1. There are **Individual Things** — owl:**Thing**
   Google is an individual thing — ibb:_Google — rdf:type — owl:**NamedIndividual**

2. There are **Kinds of Things** — ibb:Corporation — rdf:type — owl:**Class**
   Corporation is a kind of thing

3. An Individual Thing is an **instance** of a Kind of thing — rdf:**type**
   Google is an instance of a kind of thing — ibb:_Google — rdf:type — ibb:Corporation

4. There are more **Specific Things** and more **General Things** — rdfs:**subClassOf**
   A corporation is a kind of company — ibb:Corporation — rdfs:subClassOf — ibb:Company

5. There are **relationships between** two Individual Things — owl:**ObjectProperty**
   Google is a subsidiary of Alphabet — Ibb:_Google — Example of a ibb:isSubsidiaryOf — ibb:_Alphabet

6. Things have **attributes** that relate them to **literals** — owl:**DatatypeProperty**
   Google's official name is "Google Inc" — Ibb:_Google — Example of a ibb:hasOfficialName — "Google Inc"^^xsd:string

- **URL** = Uniform Resource Locator.
- **URI** = Uniform Resource Identifier.
- ✓ **IRI** = an International URI that supports Unicode characters. What OWL uses.

Owl triples start with the **globally unique identifier** IRI:xxx

or literal

For Emphasis & To Highlight The Relative ^ Simplicity

of Set Theory

1. There are **Individual Things**
   Google is an individual thing — ***Easy***

2. There are **Kinds of Things**
   Corporation is a kind of thing — ***Easy***

3. An Individual Thing is an **instance** of a Kind of Thing
   Google is an instance of a kind of thing – such as a corporation — ***Easy***

4. There are more **Specific Things** and more **General Things**
   A corporation is a kind of company — ***Easy***

5. There are **relationships between** two Individual Things
   Google is a subsidiary of Alphabet — ***Not That Easy***

6. Individual Things have **attributes** that relate them to **literals**
   Google's official name is "Google Inc" — ***So Easy***

Literals are primitive. There's nothing to say about them. Literals cannot be a Subject. (They can't be a predicate either, correct?)

It's been 20 minutes... Time to READ your 1st complete ontology!

Good design suggests listing the namespaces (in any order) upfront first and then have three sections:
1) A section for terms – the Classes and the Properties (aka: the TBox)
2) A section for taxonomies, categories, or enumerated lists (aka: the CBox)
3) A section for the assertions – the data (aka: the ABox)

NOTE: The order of triples doesn't matter, although good design will have all the triples about a given concept (Class or Property) in the same place (with each unique concept defined only once, very well)

"#" means a comment line

The @prefix lines define namespace prefixes that make it easier to reference IRIs.
3 parts that end with a space + a period.
@prefix prefixname: <http etc> .

```
# Example of a complete Ontology

# It's a shame there's no 1 term for these namespaces owl+rdf+xml+xsd+rdfs+skos
    @prefix owl: <http://www.w3.org/2002/07/owl#> .
    @prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
    @prefix xml: <http://www.w3.org/XML/1998/namespace> .
    @prefix xsd: <http://www.w3.org/2001/XMLSchema#> .
    @prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .
    @prefix skos: <http://www.w3.org/2004/02/skos/core#> .
    @prefix gist: <https://ontologies.semanticarts.com/gist/> .
    @prefix ibbeo: <https://ontologies.industrybuildingblocks.com/ibbeo/> .
```

Too bad these prefix namespaces are not just all grouped together and given 1 prefix name like owl+ or wol for Web Ontology Language

Note the space before the period

Note the space before the semicolon

```
ibbeo:SBUStrategyDocument    rdf:type      owl:Class ;
    rdfs:subClassOf     ibbeo:CorporatePlanningDocument ;
    skos:definition     "The SBU Strategy Document logically includes the Industry
                         Analysis for this line of business + the SBU Competitive Positioning
                         document"^^xsd:string ;
    skos:prefLabels     "SBU Strategy Document"^^xsd:string ;
    skos:example        "Potato Chip SBU Strategy Document"^^xsd:string .

# Note the use a semicolon to mean assume the same subject in next line
```

These are TRIPLES!

Let not the "." ";" fool you

(as it did me for a long time)

Most of (the skos: stuff) above is just for humans.
The number of spaces between terms doesn't matter.

What Do Semicolon & Comma Mean in OWL / RDF?

Example of SHORT FORM TRIPLES FORMAT for gist:Intention

```
gist:Intention
        rdf:type  owl:Class ;
        rdfs:isDefinedBy  <https://ontologies.semanticarts.com/o/gistCore> ;
        owl:disjointWith
                gist:Magnitude ,
                gist:Organization ,
                gist:PhysicalIdentifiableItem ,
                gist:PhysicalSubstance ,
                gist:UnitOfMeasure
                ;
        skos:definition 'Goal, desire, aspiration. This is the "teleologic" aspect of the system
that indicates things are done with a purpose.'^^xsd:string ;
        skos:prefLabel "Intention"^^xsd:string ;
        .
```

Example of LONG FORM TRIPLES FORMAT for gist:Intention

SUBJECT	PREDICATE	OBJECT
gist:Intention →	rdf:type →	owl:Class .
gist:Intention	rdfs:isDefinedBy	<https://ontologies.semanticarts.com/o/gistCore> .
gist:Intention	owl:disjointWith	gist:Magnitude .
gist:Intention	owl:disjointWith	gist:Organization .
gist:Intention	owl:disjointWith	gist:PhysicalIdentifiableItem .
gist:Intention	owl:disjointWith	gist:PhysicalSubstance .
gist:Intention	owl:disjointWith	gist:UnitOfMeasure .
gist:Intention	skos:definition	'Goal, desire, aspiration. This is the "teleologic" aspect of the system that indicates things are done with a purpose.'^^xsd:string .
gist:Intention	skos:prefLabel	"Intention"^^xsd:string .

1 2 **These are the same!**

A space followed by a semicolon means that for the next line assume that the **SUBJECT** is the same as the Subject for this triple
(which in this case is gist:Intention)

A space followed by a comma means that for the next line assume that the **SUBJECT *and the* PREDICATE** are the same as the Subject and the Predicate for this triple
(which in this case are gist:Intention owl:disjointWith)

These terms are defined in the **DCSP Controlled Vocabulary**, as well as explained in the DCSP Intermediary Owl Course. For this Owl intro course, just recognize that the semicolon and the comma are just used as shortcuts for typing.

Not a semicolon or comma to be found

To some, this format is easier to understand.
It looks like 3 columns in Excel.
A triple store is just one triple after another.
This is why there are billions of triples.

Some Conventions

- use an underscore _ for: Named Individuals
  _JaneDoe
- use Upper Camel case for: Classes
  Organization
- use Lower Camel case for: Properties
  isMemberOf

Remember earlier slide on Set Theory (for 1, 2 & 5)

Reminder: "properties" define the relationship between two individuals

NOTE: no spaces between words

The **@prefix** stuff for namespaces

- begin your ontology by listing the namespaces; then list all the metadata Terms (aka: TBox); then list all the taxonomies / Categories (aka:CBox); and then list the data Assertions (aka: ABox)

The vocabulary for talking about the subject matter

Enumerated lists often managed by the business

Some Hot Tips

- Each namespace adds to the vocabulary (just get used to it)
- P = Predicate = Property (in OWL)
  Property = Object Property **or** Data Property

> **Or sometimes:**
> - Annotation Property

- Although URIs are unique. two URIs can mean the sameAs
- Domain applies to the Subject. Range applies to the Object.
- Try very hard to reuse Classes + Properties, especially those carefully defined by the *(minimalist)* **gist** upper ontology
  - Stop the runaway proliferation of classes
  - Although these 'hot tips' are mostly for ontology novices, beware of 'professionals' who don't get the importance of minimizing classes (especially top-level orphan classes where clear definitions, restrictions, and disjointness bring downstream benefits)

This tip, which is beyond novice territory, is provided to help business users control costs via a (data-centric) critical success factor.

A Little SPARQL Goes A long Way

SPARQL is used to query your Triple Store (your data)

Data Requested (variables in black bold)

SELECT **?companyName ?whatTheCompanyDoes**

Pattern used to select triples

WHERE {

?company rdf:type x:Company .

?company x:isBasedIn x:Binghamton . }

The WHERE section is a list of triples. These triples are used to select the triples of interest.

(e.g., companies in Binghamton)

(It doesn't matter how many spaces between terms)

Heading + example answer row

?companyName ?whatTheCompanyDoes

"Industry Building Blocks" "Industry Research"

More SPARQL

This is where ontologists and developers like to show off. Let them.
Business execs should focus on:
"**SELECT**" – What data do you want?
"**WHERE**" – Which triples should be used based on a pattern you can describe
"**FILTER**" – to remove stuff you're not interested in

```
prefix skos: <http://www.w3.org/2004/02/skos/core#>
prefix gist: <https://ontologies.semanticarts.com/gist/>
prefix ibbeo: <https://ontologies.industrybuildingblocks.com/ibbeo/>
prefix ibbeox: <https://taxonomies.industrybuildingblocks.com/ibbeo/>
prefix ibbeod: <https://data.industrybuildingblocks.com/ibbeo/>

# Count how many industries each company is in

SELECT (count(?industry) as ?industryCount) ?organizationUri ?organizationLabel

WHERE {

  ?organizationUri rdf:type ibbeo:IbbOrganization .

  ?organizationUri skos:prefLabel ?organizationLabel .

  ?organizationUri gist:categorizedBy ?organizationLevel .

  ?organizationLevel a ibbeo:OrganizationLevel .

  # ?organizationUri gist:categorizedBy ibbeox:_selectable .

  ?organizationUri ^ibbeo:hasCompetingOrganization ?industry .

  FILTER (

    ?organizationLevel IN (

      ibbeox:_OrganizationLevel_Division,

      ibbeox:_OrganizationLevel_Subsidiary,

      ibbeox:_OrganizationLevel_TopParent

    )

  )

}

GROUP BY ?organizationUri ?organizationLabel

ORDER BY DESC(?industryCount) ?organizationLabel
```

Initially, (business execs should) focus on what questions you want answered.
Let the ontologist construct the pattern used to select the data you want from the subset of triples you're interest in.

	A	B	C
1	industryCount	organizationUri	organizationLabel
2	668	https://data.industrybuildingblocks.com/ibbeo/_Organization_1059000	International Business Machines
3	331	https://data.industrybuildingblocks.com/ibbeo/_Organization_1049963	Goya Foods Inc
4	321	https://data.industrybuildingblocks.com/ibbeo/_Organization_1027080	Conagra Brands Inc
5	271	https://data.industrybuildingblocks.com/ibbeo/_Organization_1064422	Koch Industries
6	252	https://data.industrybuildingblocks.com/ibbeo/_Organization_1082817	Oracle Corporation
7	243	https://data.industrybuildingblocks.com/ibbeo/_Organization_1053802	Hewlett Packard Enterprise
8	229	https://data.industrybuildingblocks.com/ibbeo/_Organization_1020872	Caterpillar Inc
9	216	https://data.industrybuildingblocks.com/ibbeo/_Organization_1033624	Dell Technologies Inc
10	202	https://data.industrybuildingblocks.com/ibbeo/_Organization_1096984	SAP AG
11	190	https://data.industrybuildingblocks.com/ibbeo/_Organization_1012347	BASF
12	189	https://data.industrybuildingblocks.com/ibbeo/_Organization_1071550	McCormick & Company
13	186	https://data.industrybuildingblocks.com/ibbeo/_Organization_1100461	Siemens AG
14	180	https://data.industrybuildingblocks.com/ibbeo/_Organization_1026176	Cognizant Technology Solutions
15	174	https://data.industrybuildingblocks.com/ibbeo/_Organization_1073529	Microsoft Corporation

The "?" = variable

It's a little shocking at first.... that the variable name can be a random list of characters (just not some special characters)

X

Data:

```
<http://example.org/book/book1> <http://purl.org/dc/elements/1.1/title> "SPARQL Tutorial" .
```

Query:

```
SELECT ?title
WHERE
{
  <http://example.org/book/book1> <http://purl.org/dc/elements/1.1/title> ?title .
}
```

This query, on the data above, has one solution:

Query Result:

title
"SPARQL Tutorial"

A SPARQL Temporary Slide

Data:

```
@prefix foaf:  <http://xmlns.com/foaf/0.1/> .

_:a  foaf:name   "Johnny Lee Outlaw" .
_:a  foaf:mbox   <mailto:jlow@example.com> .
_:b  foaf:name   "Peter Goodguy" .
_:b  foaf:mbox   <mailto:peter@example.org> .
_:c  foaf:mbox   <mailto:carol@example.org> .
```

Query:

```
PREFIX foaf:   <http://xmlns.com/foaf/0.1/>
SELECT ?name ?mbox
WHERE
  { ?x foaf:name ?name .
    ?x foaf:mbox ?mbox }
```

Query Result:

name	mbox
"Johnny Lee Outlaw"	<mailto:jlow@example.com>
"Peter Goodguy"	<mailto:peter@example.org>

A SPARQL Temporary Slide

Data:

```
@prefix foaf:  <http://xmlns.com/foaf/0.1/> .

_:a  foaf:givenName   "John" .
_:a  foaf:surname  "Doe" .
```

Query:

```
PREFIX foaf:   <http://xmlns.com/foaf/0.1/>
SELECT ( CONCAT(?G, " ", ?S) AS ?name )
WHERE  { ?P foaf:givenName ?G ; foaf:surname ?S }
```

Query:

```
PREFIX foaf:   <http://xmlns.com/foaf/0.1/>
SELECT ?name
WHERE  {
   ?P foaf:givenName ?G ;
      foaf:surname ?S
   BIND(CONCAT(?G, " ", ?S) AS ?name)
}
```

name
"John Doe"

A SPARQL Temporary Slide

Data:

```
@prefix org:    <http://example.com/ns#> .

_:a  org:employeeName   "Alice" .
_:a  org:employeeId     12345 .

_:b  org:employeeName   "Bob" .
_:b  org:employeeId     67890 .
```

Query:

```
PREFIX foaf:   <http://xmlns.com/foaf/0.1/>
PREFIX org:    <http://example.com/ns#>

CONSTRUCT { ?x foaf:name ?name }
WHERE  { ?x org:employeeName ?name }
```

Results:

```
@prefix foaf: <http://xmlns.com/foaf/0.1/> .

_:x foaf:name "Alice" .
_:y foaf:name "Bob" .
```

which can be serialized in RDF/XML as:

```
<rdf:RDF
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:foaf="http://xmlns.com/foaf/0.1/"
    >
  <rdf:Description>
    <foaf:name>Alice</foaf:name>
  </rdf:Description>
  <rdf:Description>
    <foaf:name>Bob</foaf:name>
  </rdf:Description>
</rdf:RDF>
```

A SPARQL Temporary Slide

Data:

```
@prefix dc:   <http://purl.org/dc/elements/1.1/> .
@prefix :     <http://example.org/book/> .
@prefix ns:   <http://example.org/ns#> .

:book1  dc:title  "SPARQL Tutorial" .
:book1  ns:price  42 .
:book2  dc:title  "The Semantic Web" .
:book2  ns:price  23 .
```

3.1 Restricting the Value of Strings

SPARQL `FILTER` functions like `regex` can test RDF literals. `regex` matches only string literals. `re`

Query:

```
PREFIX  dc:  <http://purl.org/dc/elements/1.1/>
SELECT  ?title
WHERE   { ?x dc:title ?title
          FILTER regex(?title, "^SPARQL")
        }
```

Query Result:

title
"SPARQL Tutorial"

Regular expression matches may be made case-insensitive with the "`i`" flag.

Query:

```
PREFIX  dc:  <http://purl.org/dc/elements/1.1/>
SELECT  ?title
WHERE   { ?x dc:title ?title
          FILTER regex(?title, "web", "i" )
        }
```

Query Result:

title
"The Semantic Web"

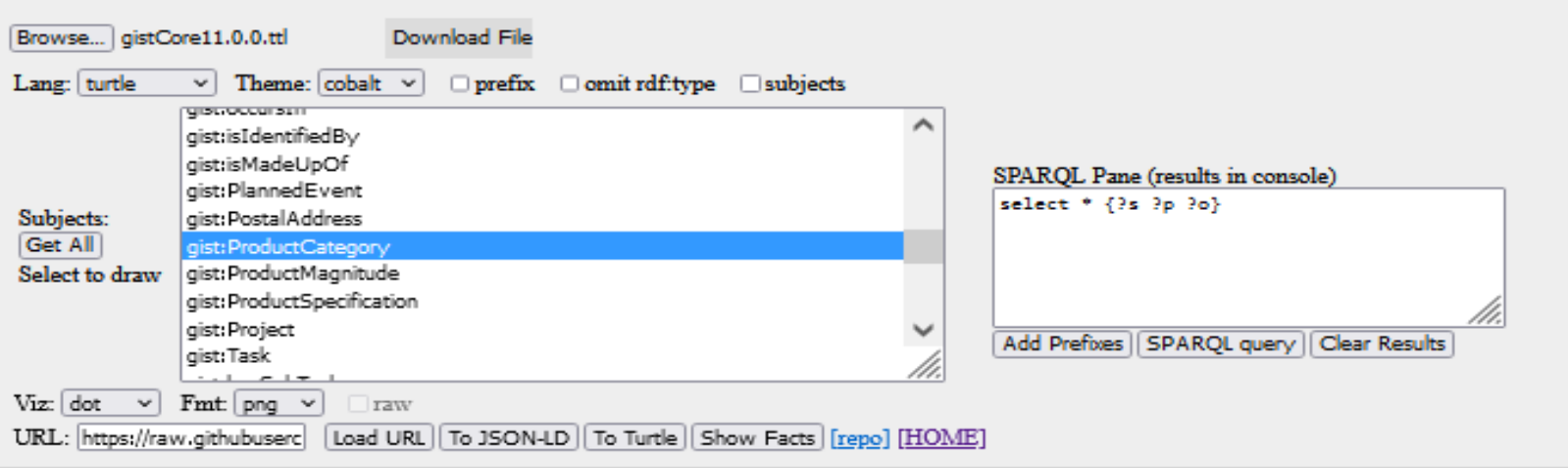
A SPARQL Temporary Slide

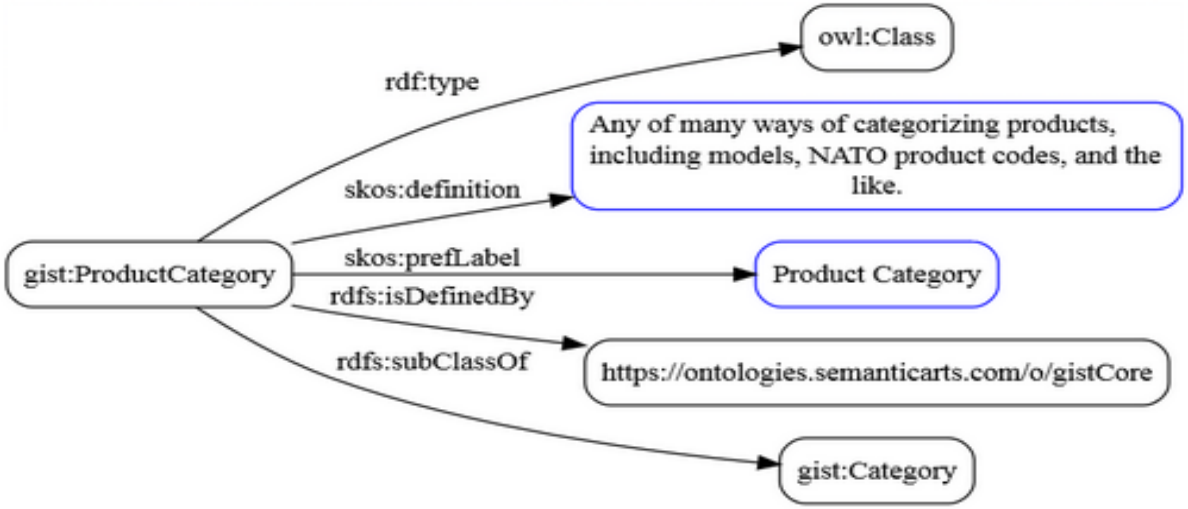
- triple patterns called a basic graph pattern. Triple patterns are like RDF triples except that each of the subject, predicate and object may be a variable.

- Sometimes its good to look at the source, although the source often comes with a lot of baggage: https://www.w3.org/TR/sparql11-query/#docOutline

Get to Know Turtle

semantechs.co.uk/turtle-editor-viewer/





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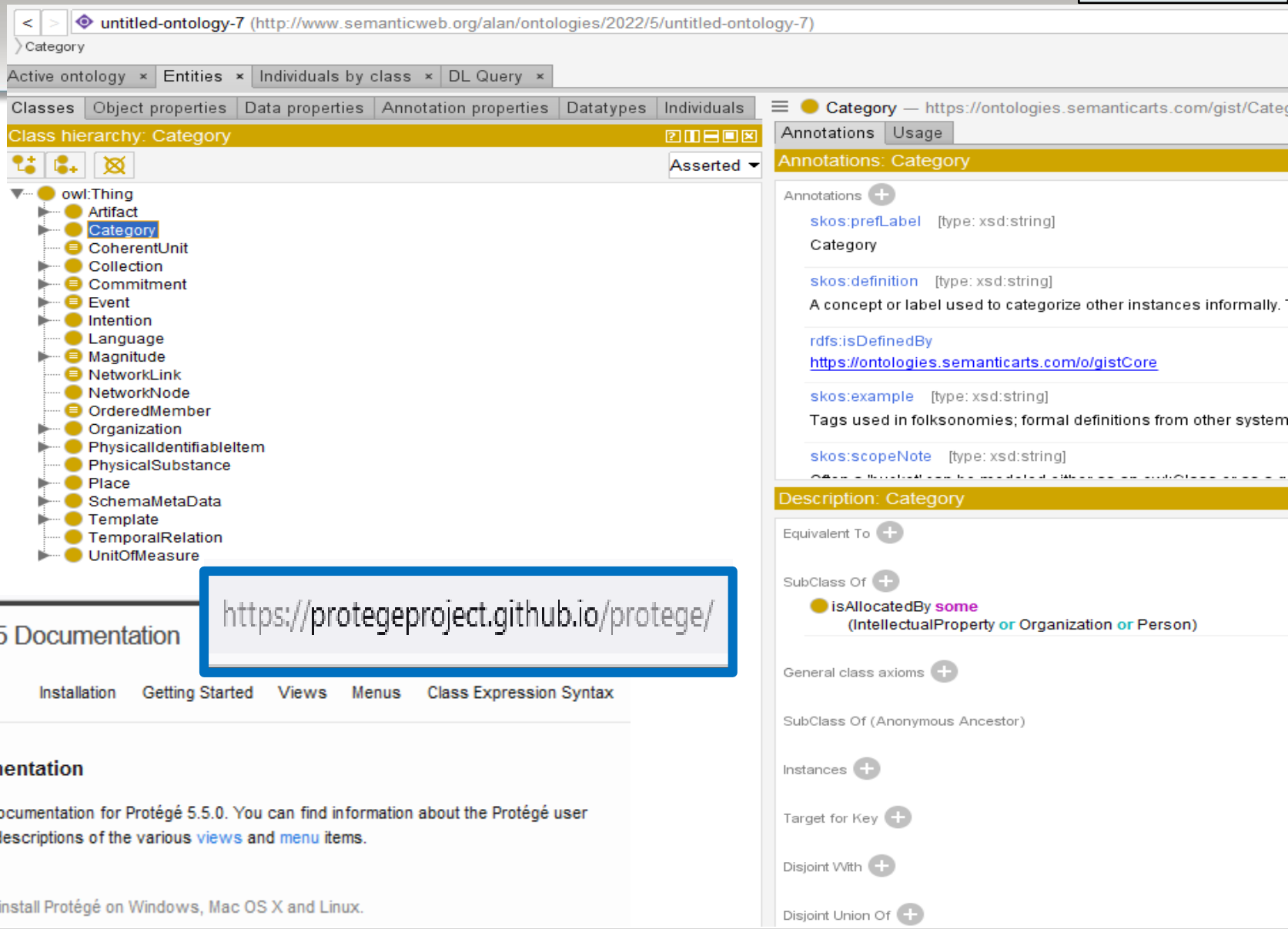
Get to Know Protégé Ontology Editor

Built by Stanford University. Open source.



IndustryKG™

Now It's Time to WRITE a complete Ontology.

What do you do after taking a deep breath?

To create a new .ttl file right click for new file... Select text file and name it something.ttl

- Copy the OWL standard @prefix stuff to a .TTL file.
- Copy the gist prefix
- Think about what to call your @prefix namespace
- Get gist (to have a lot of the triples / vocabulary done for you where great thought went into the terms). To download gist, go to https://www.semanticarts.com/gist/ (gist is free via the Creative Commons 3.0 attribution share-alike license.)
- Write your first triple (Form: IRI.xxx IRI.xxx IRI.xxx .)
- Get Turtle http://semantechs.co.uk/turtle-editor-viewer/ and test using Turtle
- IF successful, THEN Repeat. ELSE Fix.

(Remember to end each triple with a space followed by a semicolon, comma, or period)

To Create A New Ontology
Copy, Paste + Add One New Triple At A Time

```
# Example of a complete Ontology. Get used to this upfront stuff.
@prefix owl: <http://www.w3.org/2002/07/owl#> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix xml: <http://www.w3.org/XML/1998/namespace> .
@prefix xsd: <http://www.w3.org/2001/XMLSchema#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .
@prefix skos: <http://www.w3.org/2004/02/skos/core#> .
@prefix gist: <https://ontologies.semanticarts.com/gist/> .
@prefix ibbeo: <https://ontologies.industrybuildingblocks.com/ibbeo/> .
```

Typically you start with a .ttl file with:
- the basic **W3C namespaces**
- the **gist** upper ontology namespace
- **your own** namespace

Next, maybe define a Class for an SBU Strategy Document for one line of business in your company

```
ibbeo:SBUStrategyDocument      rdf:type          owl:Class ;
    ibbeo:SBUStrategyDocument  rdfs:subClassOf   ibbeo:CorporatePlanningDocument ;
                               skos:definition   "The SBU Strategy Document logically includes the Industry
Analysis for this line of business + the SBU Competitive Positioning document"^^xsd:string ;
                               skos:prefLabel    "SBU Strategy Document"^^xsd:string ;
                               skos:example      "Potato Chip SBU Strategy Document"^^xsd:string .
```

Triples (where a semicolon means assume the same Subject is used in the next line)

Now you get to add Triples (aka: assertions)
Triples are assertions for metadata axioms as well as for the data
Each triple includes: a subject, a predicate, and an object ➔ often shown as: s p o
More specifically, because each resource needs an IRI, it will look like this ➔ **IRI:xxx IRI:xxx IRI:xxx .**
The following slides show the initial vocabulary you will often use ➔

Gist
Classes

Kinds of Things

Subject assertions:

S	P	O
:SRIndustry	rdf:type	owl:Class .
:Ontologist	rdf:type	gist:Person .

Imported ontologies:

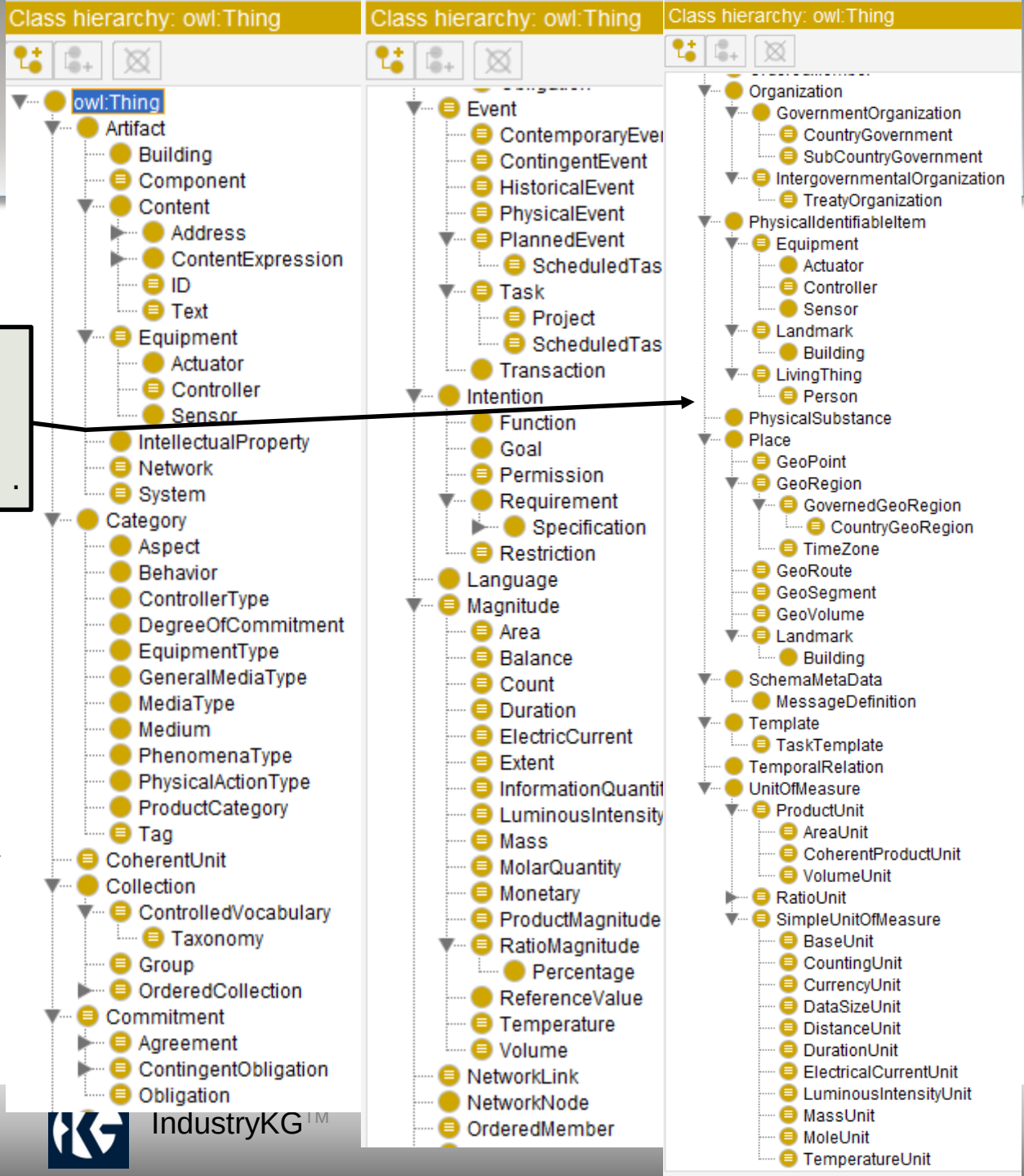
Direct Imports

<https://ontologies.semanticarts.com/o/gistCore11.0.0>

gistCore

139 Classes

Notice the Upper Camel case



Gist

Object properties

Relates an individual to another individual

Object property assertion:

S	P	O
:SRBuyerType	:isDescribedIn	:SRIndustryAnalysis .

Imported ontologies:

Direct Imports

<https://ontologies.semanticarts.com/o/gistCore11.0.0>

gistCore

92 object properties

Object property hierarchy: owl:topObjectProperty

- owl:topObjectProperty
  - accepts
  - affects
  - allows
  - comesFromPlace
  - conformsTo
  - containsGeographically
  - contributesTo
  - directs
  - followsDirectly
  - goesToPlace
  - governs
  - hasAddress
  - hasAltitude
  - hasBiologicalParent
  - hasDenominator
  - hasGoal
  - hasIncumbent
  - hasMagnitude
  - hasMember
  - hasMultiplicand
  - hasMultiplier
  - hasNavigationalChild
  - hasNavigationalParent
  - hasNumerator
  - hasOffsetToUniversal
  - hasPart
  - hasParticipant
  - hasPhysicalLocation
  - hasPrecision
  - hasStandardUnit
  - hasSubCategory
  - hasSubTask
  - hasSuperCategory
  - hasUnitOfMeasure
  - hasViableRange
  - identifies
  - isAbout
  - isAffectedBy
  - isAllocatedBy
  - isAspectOf
  - isBasedOn
  - isBasisFor
  - isCategorizedBy
  - isCharacterizedAs
  - isConnectedTo
  - isDescribedIn
  - isDirectPartOf
  - isDirectSubTaskOf
  - isExpressedIn
  - isGeographicallyContainedIn
  - isGeographicallyOccupiedBy
  - isGeographicallyPermanentlyOccupiedBy
  - isGovernedBy
  - isIdentifiedBy
  - isMadeUpOf
  - isMemberOf
  - isPartOf
  - isRecognizedBy
  - isRenderedOn
  - isSubTaskOf
  - isTriggeredBy
  - isUnderJurisdictionOf
  - links
  - occupiesGeographically
  - occursIn
  - owns
  - precedes
  - prevents
  - produces
  - providesOrderFor
  - recognizes
  - requires
  - respondsTo
  - usesTimeZoneStandard

Notice the Lower Camel case

Object datatypes

Relates an individual to a literal

Object data property assertion:

S	P	O
:SBU1	:hasGoal	:“Be # 1”^^xsd:string .

Imported ontologies:

Direct Imports

<https://ontologies.semanticarts.com/o/gistCore11.0.0>

gistCore

39 object datatypes

Data property hierarchy: owl:topDataProperty

- owl:topDataProperty
  - atDateTime
    - endDateTime
      - actualEndDateTime
        - actualEndDate
        - actualEndMicrosecond
        - actualEndMinute
        - actualEndYear
        - isRecordedAt
      - plannedEndDateTime
        - plannedEndDate
        - plannedEndMinute
        - plannedEndYear
    - startDateTime
      - actualStartDateTime
        - actualStartDate
        - actualStartMicrosecond
        - actualStartMinute
        - actualStartYear
      - birthDate
      - plannedStartDateTime
        - plannedStartDate
        - plannedStartMinute
        - plannedStartYear
  - containedText
    - encryptedText
  - conversionFactor
  - conversionOffset
  - description
  - latitude
  - longitude
  - name
  - numericValue
  - sequence
  - tagText
  - uniqueText
  - unitSymbol
  - unitSymbolHtml
  - unitSymbolUnicode

Notice the Lower Camel case

Imported ontologies:

Direct Imports

<https://ontologies.semanticarts.com/o/gistCore11.0.0>

gistCore

Annotation properties

Annotation property hierarchy:

- license
- owl:backwardCompatibleWith
- owl:deprecated
- owl:incompatibleWith
- owl:priorVersion
- owl:versionInfo
- rdfs:comment
- rdfs:isDefinedBy
- rdfs:label
- rdfs:seeAlso
- skos:definition
- skos:example
- skos:note
- skos:prefLabel
- skos:scopeNote
  - domainIncludes
  - rangeIncludes

Not needed as much – but to complete the set

Datatypes

Datatypes:

- owl:rational
- owl:real
- rdf:PlainLiteral
- rdf:XMLLiteral
- rdfs:Literal
- xsd:anyURI
- xsd:base64Binary
- xsd:boolean
- xsd:byte
- xsd:dateTime
- xsd:dateTimeStamp
- xsd:decimal
- xsd:double
- xsd:float
- xsd:hexBinary
- xsd:int
- xsd:integer
- xsd:language
- xsd:long
- xsd:Name
- xsd:NCName
- xsd:negativeInteger
- xsd:NMTOKEN
- xsd:nonNegativeInteger
- xsd:nonPositiveInteger
- xsd:normalizedString
- xsd:positiveInteger
- xsd:short
- xsd:string
- xsd:token
- xsd:unsignedByte
- xsd:unsignedInt
- xsd:unsignedLong
- xsd:unsignedShort

Individuals

Individuals:

- _ampere
- _bit
- _candela
- _day
- _each
- _greenwichTimeZone
- _kelvin
- _kilogram
- _meter
- _millisecond
- _minute
- _mole
- _one_day
- _one_millisecond
- _one_minute
- _second
- _USDollar

Note that individuals have a leading _underscore

A Controlled Vocabulary for Strategic Planning & Data-Centric Terms

1 = Strategy terms
2 = Data Centric + OWL terms
3 = Gist ontology
4 = IBB ontology
5 = Other

Strategy Ontology	Sort A-B	O = Ontology			OWL				
Other	TERM	o	Definition	altLabel	S P O Concept.	Source	Scoring	Examples	Parent
1	ABILITY TO BACKWARD INTEGRAT		ABILITY TO BACKWARD INTEGRATE - refers to the ability fo		N/A	Porter			
1	ACCESS TO DISTRIBUTION CHANN		ACCESS TO DISTRIBUTION CHANNELS - refers to the ability		N/A				
1	ACCESS TO SUPPLIERS		ACCESS TO SUPPLIERS - could represent a barrier to entry i		N/A				
1	ACTIVITY COST		ACTIVITY COST - is the cost of an activity and can be calcula		N/A				Value Chain
1	Ad-Hoc Industry Collection		An Adhoc Industry Collection is a collection of Industries g	AHIC	N/A			attery Industries	
1	ASSET REPLACEMENT COST		ASSET REPLAC ENT COST - is an estimate of the current p						
1	AVERAGE UNIT COSTS		AVERAGE U S - is equal to total costs divided by th						
1	BACKWARD IN		a c			Porter			
1	BARGAINING P		ativ		N/A	Porter			Five Industry Forces
1	BARGAINING P		ive		N/A	Porter			Five Industry Forces
1	BARRIERS TO E		r th		N/A	Porter			Five Industry Forces
1	BENCHMARKING		BENCHMARKING - the process of analyzing and evaluating		N/A				
1	BRAND IDENTITY		BRAND IDENTITY - a trademark or distinctive name identif		N/A				
1	BUNDLING		BUNDLING - selling distinct but complementary products t		N/A	Porter			
1	BUSINESS INTERRUPTION RISK		BUSINESS INTERRUPTION RISK - refers to loss of fixed cost		N/A				
1	BUSINESS UNIT		BUSINESS UNIT - A very general term that means many thi		N/A				Strategic Business Unit
1	BUSINESS Unit MISSION		BUSINESS MISSION - A statement clarifying the purpose of		N/A				Business Unit Competitiv
1	BUSINESS Unit OBJECTIVES		BUSINESS OBJECTIVES - a listing of what the business plan		N/A				Business Unit Competitiv
1	BUSINESS Unit RECOVERY PLAN		BUSINESS RECOVERY PLAN - includes information and proc		N/A				Business Unit Competitiv
1	BUSINESS Unit RISK		BUSINESS RISK - is the uncertainty inherent in business op		N/A				Business Unit Competitiv
1	BUSINESS UNIT STRATEGIC PLANI		BUSINESS UNIT STRATEGIC PLANNING - See Strategic Busin		N/A				Corporate Strategy Devel
1	BUSINESS UNIT VISION		BUSINESS VISION - a building process which has as its foun		N/A				Business Unit Competitiv
1	BUYER INFORMATION		BUYER INFORMATION - refers to whether the buyer has in		N/A				
1	BUYER PURCHASE CRITERIA		BUYER PURCHASE CRITERIA - refers to what the buyer (spe		N/A	Porter			Purchase Criteria
1	BUYER SEGMENT		BUYER SEGMENT - refers to a strategically relevant buyer t		N/A	Porter			
1	BUYER TYPE		BUYER TYPE - encompasses such things as the buyer's size,		N/A	Porter			
1	CAPACITY UTILIZATION		CAPACITY UTILIZATION - refers to activities and assets with		N/A				
1	CAPITAL REQUIREMENTS		CAPITAL REQUIREMENTS - the amount of financial resourc		N/A				
1	CASH FLOW		CASH FLOW - is equal to Cash Inflow minus Cash Outflow.		N/A				
1	CHANGE IN SHAREHOLDER VALUE		CHANGE IN SHAREHOLDER VALUE - is the change in shareh		N/A				

Includes many Porter terms + terms that IndustryKG™ cares about

Strategy terms

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Strategy
Ontology
Other

Sort A-B

o = Ontology

TERM (skos:prefLabel)	o	skos:Definition	skos:altLabel	OWL S P O Concept.	Source	Scoring	Examples	Parent
Axiom		Axioms are the triples that make up the formal definition			The DCR p.185			
Basel Register of Thesauri, Ontol		Basel Register of Thesauri, Ontologies & Classifications	BARTOC					
Blank Node		A blank node in an RDF graph is drawn from an infinite set			W3C			
CBox		CBox – old terminology. Just think of categories and taxon						
Chief Information Officer		Chief Information Officer	CIO					
Closed-world Reasoner		Closed-world Reasoner – a system that can't tell the differ						
Collection		Collection – related things. Example: jury. Use isMember(						
Concept		An owl:Class or an owl:Property (usually an object proper						
Content Management Systems		CMS - Content Management Systems (probably correct)	CMS					
Controlled Vocabulary		Controlled Vocabulary - Words used to tag units of data						
Corpus Analysis		Corpus Analysis - Aka: Corpus Management = ability to ana	Corpis Management					
Covering Concept		A Covering Concept is a broader concept (where the detai			The DCR p.299			Concept
Data Fabric Architecture		Data Fabric Architecture A framework for easy informatior						
Data Property		Data Property - relates an individual to a literal. Data Prop						Property
Data Structures		Data Structures					Tables; Object Oriented	
Data-Centric Architecture		Data-Centric Architecture is a measure an organization's al			McComb			
Datascape		Datascape refers to the totality of the data under manager			The DCR p.122			
Datatype		Datatype – a set of literals. A kind of literal is rdfs:Datatyp						Resource Description Fra
DBpedia SPAQL endpoint		DBpedia SPAQL endpoint – a database version of Wikipedi						
Detailed Concept		Detailed Concept is a specialization (contrast with the bro						Concept
Directed Graph		Directed Graph – a set of triples (a set of nodes with arrow						
Document Management System		DMS - Document Management System to store, track and r	DMS					
Domain		Domain - What kind of thing must the Subject be, in a tripl						
E6tools		E6tools – an OWL syntax. It is a compact visual syntax						Web Ontology Language
Edge		Edge						
Enterprise Data Management Co		EDMC - Enterprise Data Management Council developed a	EDMC					
Enterprise Datascape		Enterprise Datascape -						
Enterprise Ontology		Enterprise Ontology						
EuroVoc		EuroVoc - A multilingual, multidisciplinary thesaurus cove						
Extract. Transform. Load.		ETL process - Extract. Transform. Load. (e.g. combine RDF t	ETL					
Facet		Facet						
Federated Development		Federated Development			p 308			

Data-Centric terms

Includes many terms from The Data-Centric Revolution (DCR)

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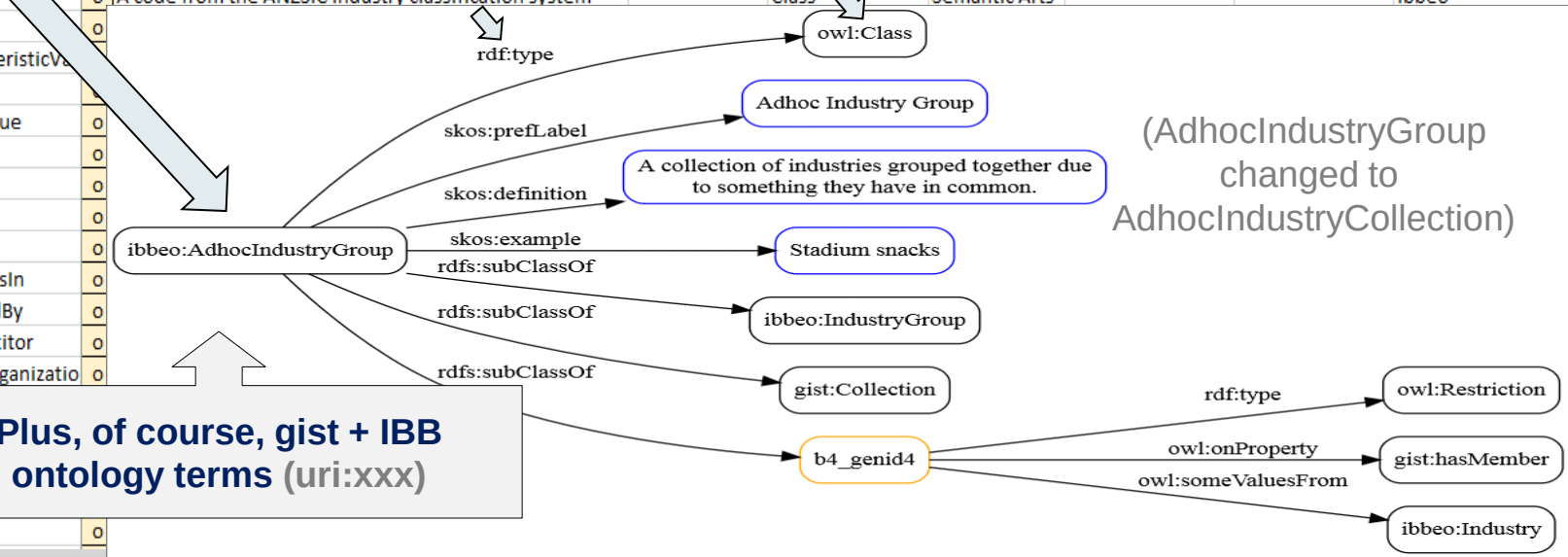
5 = Other

Strategy Ontology Other | Sort A-B TERM | o = Ontology o | Definition | altLabel | OWL S P O Concept. | Source | Scoring | Examples | Parent

3	gist:TemporalRelation	o	[Maybe enter skos: definition for this Class]			Semantic Arts			
3	gist:Text	o	[Maybe enter skos: definition for this Class]			Semantic Arts			Gist Concept
3	gist:TimeInstant	o	[Maybe enter skos: definition for this Class]			Semantic Arts			
3	gist:TimeZone	o	[Maybe enter skos: definition for this Class]						gist:GeoRegion
3	gist:TimeZoneStandard	o	[Maybe enter skos: definition for this Class]						gist:Specification
3	gist:Transaction	o	An event which has an effect on at least one accumulator						gist:Event
3	gist:UnitOfMeasure	o	[Maybe enter skos: definition for this Class]						
3	gist:Volume	o	Three-dimensional space, or equivalent fluid measureme			Semantic Arts			gist:Magnitude
3	gist:VolumeUnit	o	[Maybe enter skos: definition for this Class]			Semantic Arts			gist:ProductUnit
4	ibbAllTBox					Semantic Arts			ibbeo
4	ibbeo:	o	@prefix ibbeo: <https://ontologies.industrybuildingblock		prefix	Semantic Arts			ibbeo
4	ibbeo:AdhocIndustryCollection	o	A collection of industries grouped together due to someth	AHIC	Class	Semantic Arts			ibbeo
4	ibbeo:AnzsicCode	o	A code from the ANZSIC industry classification system		Class	Semantic Arts			ibbeo
4	ibbeo:BrandName	o							
4	ibbeo:CategoryCharacteristicV								
4	ibbeo:Characteristic								
4	ibbeo:CharacteristicValue	o							
4	ibbeo:ChargingModel	o							
4	ibbeo:competesIn	o							
4	ibbeo:competesWith	o							
4	ibbeo:CpcCode	o							
4	ibbeo:directlyCompetesIn	o							
4	ibbeo:directlyProducedBy	o							
4	ibbeo:hasBrandCompetitor	o							
4	ibbeo:hasCompetingOrganizatio	o							
4	ibbeo:hasImm								
4	ibbeo:hasLega								
4	ibbeo:hasNun								
4	ibbeo:hasPrin								
4	ibbeo:hasTopParent	o							

Gist & IBB Ontology



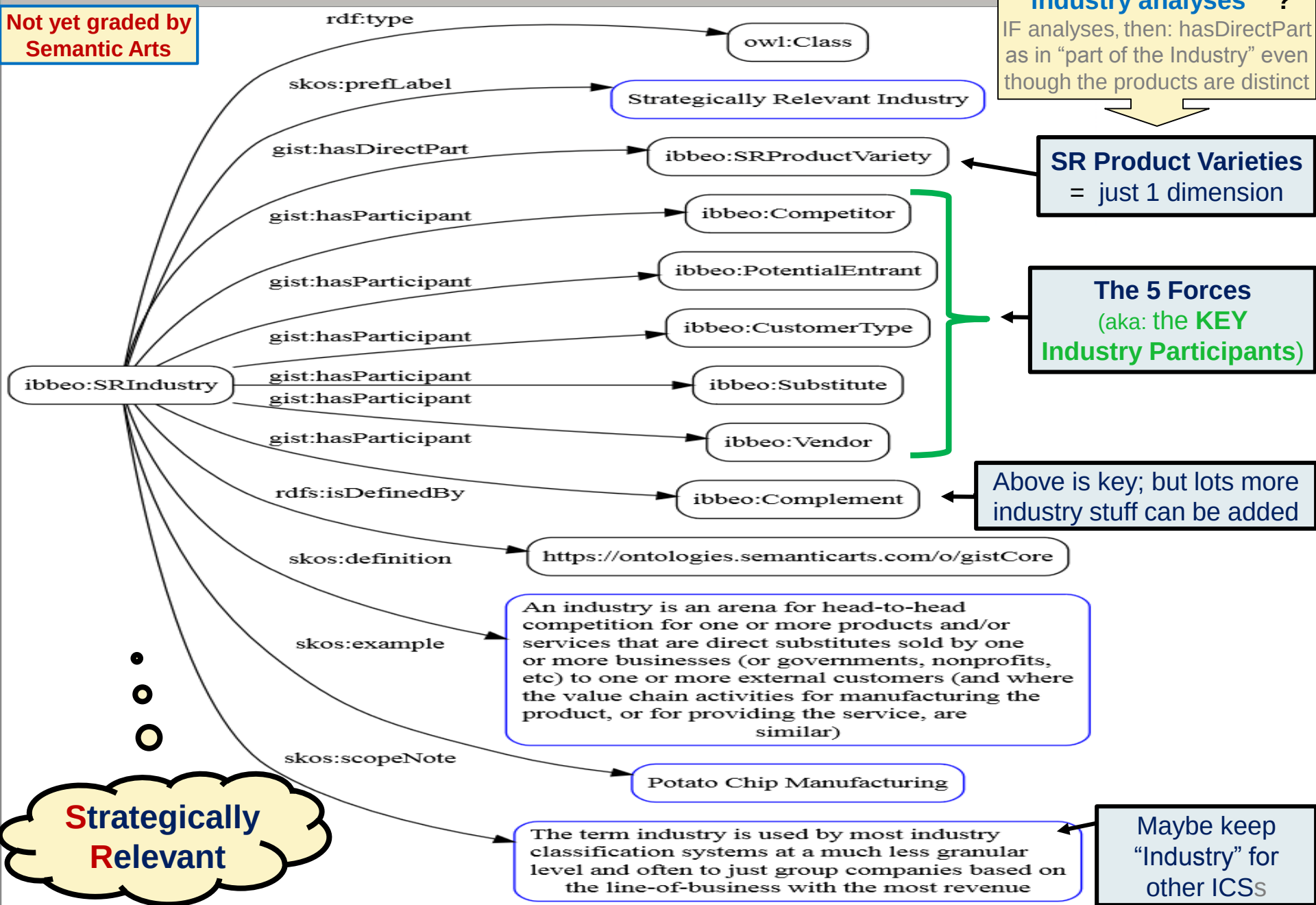
(AdhocIndustryGroup changed to AdhocIndustryCollection)

Plus, of course, gist + IBB ontology terms (uri:xxx)

From “Industry” to “SRIndustry”

Is IBB data about 23,000 “**industries**” **or** “**industry analyses**” **?**
IF analyses, then: hasDirectPart as in “part of the Industry” even though the products are distinct

Not yet graded by Semantic Arts



SR Product Varieties
= just 1 dimension

The 5 Forces
(aka: the **KEY Industry Participants**)

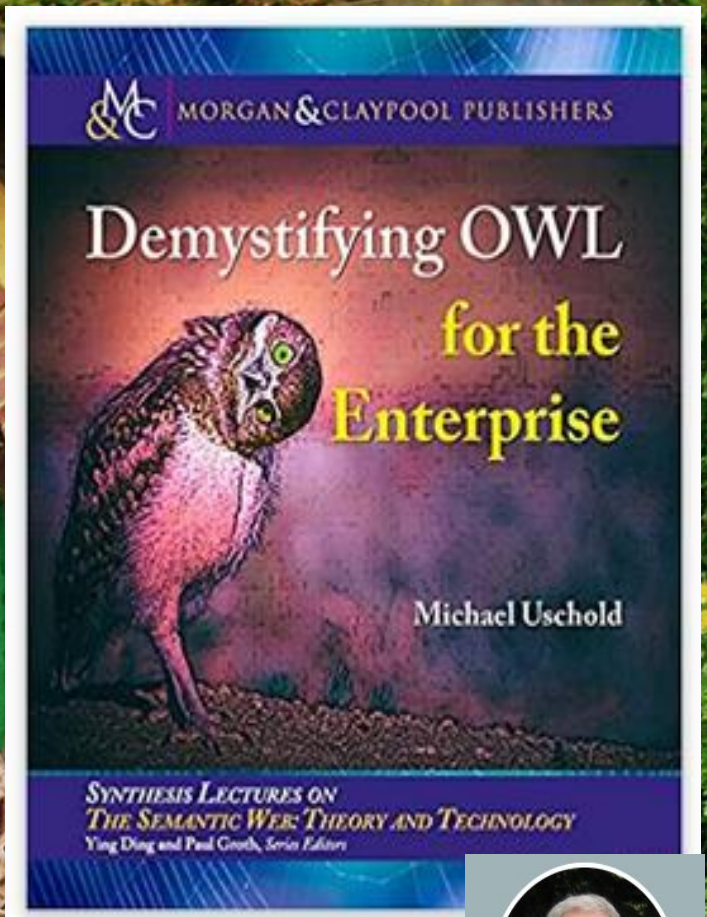
Above is key; but lots more industry stuff can be added

Maybe keep “Industry” for other ICSs

Strategically Relevant

x:Sorcerer rdf:type owl:Class

x:Ontologist rdfs:subClassOf x:Sorcerer



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Industry Knowledge Graph LLC says

Industry Knowledge Graph
solution for Business Execs™

Industry Knowledge Graph ™

Thank you!

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Data-Centric Strategic Planning (DCSP) Series