



IBM Knowledge Accelerators

Metamodel Specification Document

Version 1.0

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Introduction

This document describes the metamodel adopted to enforce standardization of the vocabulary content provided as part of the **IBM Knowledge Accelerators** (IBM KAs).

Specifically, this metamodel describes the various objects and associated properties contained in the IBM Knowledge Accelerators as they are deployed in the **IBM Watson Knowledge Catalog** (WKC) metadata repository.

This document is intended for use by Data Stewards, Business Analysts or other more technical personas who are interested in gaining a detailed understanding about the structures underpinning the IBM KAs with a view to carrying out any customizations or extensions that they believe are necessary.

Main principles in the content of the IBM Knowledge Accelerators

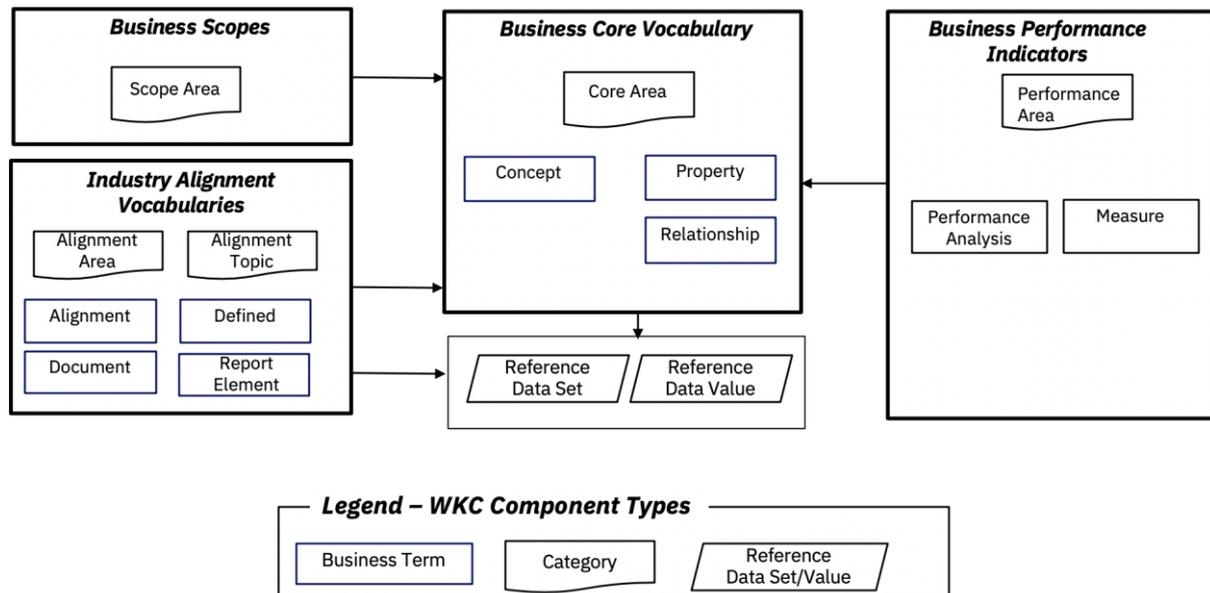
The main principles used to guide the overall structure of the IBM Knowledge Accelerator metamodel include :

1. Avoid unnecessary overloading/abusing of metamodel constructs. E.g. a relationship type can be used for only one purpose (e.g. IS TYPE OF is only used in the Business Core Vocabulary to define type Hierarchy for Concept Terms).
2. Avoid any use of generic phrases that do not resonate with business users or other non-technical personas.
3. All terms to have a name that is business meaningful in its own right. It should not be reliant on a related term to understand its meaning. (e.g. can't have a term named "Accepted").
4. All terms to have a business meaningful description, with the exception of certain terms in the Industry Alignment Vocabularies where no definitions are provided or derivable.
5. Categories primary role is to group terms (and potentially other objects) pertaining to ownership or usage.
6. Exploit new capabilities of IBM WKC wherever possible (e.g. Reference Data, Classification/Tags, etc).
7. Ensure structures are kept as simple as possible. They should be intuitive to business users yet structured and standardized for use by machines.
8. Ensure that as wide a set of personas are supported as possible, including technical/engineering personas who will need to use vocabulary as basis for any future generation of physical artefacts (e.g. JSON, OWL/RDF ontologies, Logical Data Models).

The IBM KAs metamodel is an extension of the metamodel of the underlying Watson Knowledge Catalog. Where possible key components of the WKC metamodel are used with more detailed specialization of these components defined as necessary.

The main metamodel areas of the IBM Knowledge Accelerators

The metamodel associated with the IBM Knowledge Accelerators has an extensive set of components that are used to describe specific usages of the underlying WKC metamodel objects. The intention of this more detailed metamodel to ensure the necessary expressiveness to enable the representation of the full vocabulary of business knowledge, as well as ensuring the precision necessary to assist the use of the vocabulary both by humans and machine.



Above is the overall detailed metamodel of the various areas and components of the IBM Knowledge Accelerator metamodel and the associated relationships. The rest of this chapter will describe in detail these metamodel components.

Business Core Vocabulary

What is it

The core grouping of the terms independent of any business topic. This consists of a set of WKC Categories where each category represents a significant cross-enterprise subject area.

Rationale

To assist with the management of the central vocabulary in a consistent coherent way across the enterprise.

Personas

Data Steward, Data Administrator.

Characteristics :

- The Business Core Vocabulary consists of the set of categories relating to the main subject areas covered and a set of business terms.

- Each business term in the Business Core Vocabulary is owned by one of the categories of the Business Core Vocabulary.
- Each category of the business vocabulary should be a real business concept in its own right that resonates with business users.
- The Core Area categories should be generally of relevance to the broader enterprise - not just applicable to one department or function.
- And a general rule most of the categories in the Business Core Vocabulary would typically own between 40 and 500 business terms.
- Each term in the Business Core Vocabulary will have a primary category one of the Core Area categories. It is possible for different terms in a Term Type Hierarchy to have as primary category different Core Area categories.
- Any property terms should belong to the same Core Area category as their owning concept (with the exception of any common properties which will have Business Core Vocabulary as their primary category).

Business Performance Indicators

What is it

The set of terms and linkages that reflect the key measurement areas the organization would want to report on.

Rationale

A starting point for the building of reports or queries or data marts.

Personas

Business Users, Data Engineers, Data Modellers.

Characteristics

- Each category of the Business Performance Indicators relates to a specific area or sub-area of analysis or reporting.
- Each Measure term will have a Business Performance Category as their Primary Category or can be a measurable property from the Business Core Vocabulary.
- Dimensions will be terms from the Business Core Vocabulary which are referenced by the Business Performance Categories.

Business Scopes

What is it

The different views across the business vocabulary to identify how key business topics or business process areas are covered.

Rationale

Helps users to quickly find the portion of the vocabulary that is relevant to a particular business area they are interested in.

Personas

Business Users, Data Engineers, Data Modellers.

Characteristics

- Each category of the Business Scopes should describe a particular business issue .

- Business Scopes are used to group concept terms that together reflect key business functions and processes.
- Each category should only have relationships to Terms as a Secondary Category (the Business Scopes do not "own" any terms).
- The terms referenced by a Business Scopes category can span terms owned by many categories in the Business Core Vocabulary.

The Business Scopes do not contain/own any business terms. Instead they reference business terms in other areas that are relevant to a particular business issue.

Industry Alignment Vocabularies

What is it

Supplemental groupings of terms that represent critical external regulations, standards, external interfaces, etc relevant to an industry.

Rationale

Helps users working on regulatory or standards alignment to quickly determine which parts of the vocabulary are pertinent to their particular regulation or standard.

Personas

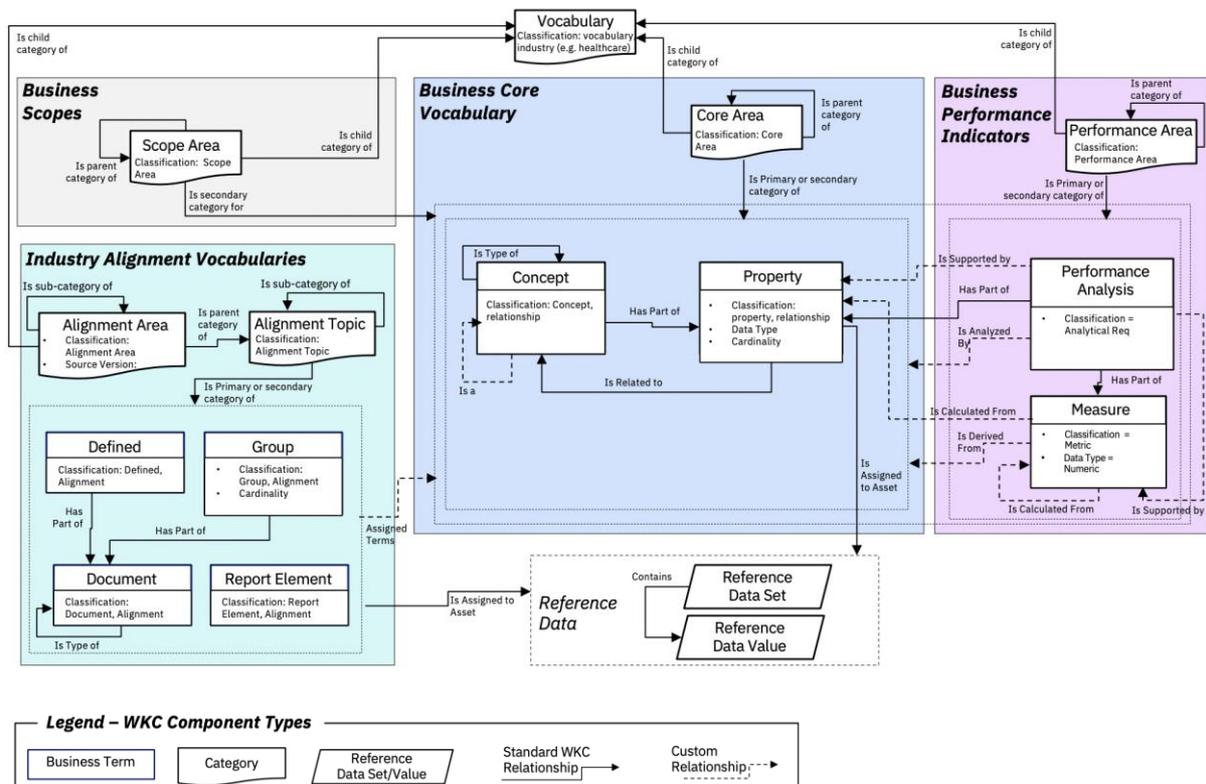
Regulatory Analysts, Data Stewards.

Characteristics

- Each category hierarchy within Industry Alignment Vocabularies applies to a specific standard or regulation.
- Any sections or chapters in regulations sourced as documents are represented as Alignment Area categories or sub categories.

The IBM Knowledge Accelerator metamodel details and relationships

Beyond the main IBM Knowledge Accelerator metamodel areas described in the previous chapter, there is a more detailed layer of components and relationships.



The above diagram shows the interaction of these categories, terms, relationships and classifications. The rest of this chapter describes these in more detail.

Categories

The various specializations of categories used in the IBM Knowledge Accelerators are listed in this section.

Category – Vocabulary

This is a specific use of category, which is intended to contain all of the terms (and other Governance assets) relating to a particular vocabulary.

Category – Core Area

This is a specific use of category, which is intended to contain the terms for the Business Core Vocabulary. These can be either conceptual (e.g. Product, Location) or can be business specific (e.g. Risk & Compliance, Customer, etc). Any terms in the Business Core Vocabulary can have potentially many referencing relationships to different categories within that vocabulary. Note, if necessary it is possible to extend the objects within a scope to other assets (e.g. Data Model assets).

Category – Alignment Area

This is a specific use of category, which is intended to provide the main root category for a specific regulation or standard. There may be different instances of the main Industry Alignment Vocabulary category for different versions of that regulation or standard.

Category – Alignment Topic

This is a specific use of category, which is intended to represent the various different sub topics that make up a particular standard or regulation.

Category – Scope Area

This is a specific use of category, which is intended to provide the basis for grouping the Business Scopes. These Scope categories will only have references to Terms in other areas.

Category – Performance Area

This is a specific use of category, which is intended to provide the basis for grouping the various Business Performance Indicators.

Business Terms

The various specializations of business terms used in the IBM Knowledge Accelerators are listed in this section.

Concept Term

This is a specific use of business term which is intended to represent a specific thing or object which is of business or technical interest to the organization. (E.g. *Customer, Product, Account*).

Property Term

This is a specific use of business term which is intended to represent a characteristic or “property” of a Concept Term. it represents a specific thing of business or technical interest to the organization (E.g. *Date of Birth, First Name, Primary Branch Indicator*).

Relationship Term

This is a specific use of business term which is intended to represent any specific relationships that may need to be recorded between Properties and Concepts (e.g. *Primary Address* is a relationship between *Customer* and *Address*). Overall a relationship can either be represented as a Property of a Concept with a data type indicating it is a relationship OR the relationship can be a concept in its own right (especially where it has additional properties that describe the relationship e.g. date, restrictions, percentage of involvement in the relationship).

A Concept can have an additional Classification of “Relationship” when it is decided that a relationship is best defined as a Concept. Such “Relationship Concepts” will have at least two Relationship property terms pointing to two other concepts.

Performance Analysis Term

This is a specific use of a business term which is intended to represent a specific business issue that an organization would need to have addressed by some analytical means (e.g. Credit Risk Analysis).

Measure Term

This is a specific use of a business term which is intended to represent a numeric term that is use as part of a Performance Analysis Term.

Alignment Term

This is a specific use of business term, which represents the various noun and noun phrases that occur within a particular standard or regulation.

An Alignment Term can be further sub-classified as follows :

- Document Term
- Group Term
- Defined Term
- Report Element Term

Defined Term

This is a specific use of a business term which has its description provided in the source document or regulation.

Document Term

This is a specific use of a business term which has been derived or extracted from a source document or regulation without any associated description (except in the case of Industry Alignment Vocabularies where no definition is provided or is derivable).

Group Term

This is a specific use of a business term which represents a higher level or root term in an Industry Alignment Vocabulary.

Report Element Term

This is a specific use of a business term which represents an element in a regulatory report.

Relationships

The following are the WKC out of the box relationships used by the IBM Knowledge Accelerators.

Is Type of / Has Types (Terms)

This relationship type is only used in the IBM KA vocabulary to show where a Term has sub types of that term. Will be used only

- in the Business Core Vocabulary to indicate subtype/supertype relationship between Concept Terms
- in the Industry Alignment Vocabularies, when specific Alignment Terms are genuine sub types of other Alignment Terms

Has Subcategories/Is Subcategory of (Categories)

This relationship type is only used in the IBM KAs vocabulary to indicate either where a category has sub categories.

Is Part of / Has a Part of

This relationship type is only used in the IBM KA vocabulary to show where a Term has specific properties or attribution. The specific examples are : A concept Term has Properties and An Analytical Term has Measures.

Is Related to

This relationship type is only used in the IBM KA vocabulary to show a relationship between a specific property identifying a relationship between a concept and another concept.

Is Assigned to Reference Data

This relationship type is only used in the IBM KA vocabulary to show a relationship between a property term and the Reference Data Set or Reference Data Value. A Term can be related to either the Reference Data Set or the Reference Data Value.

Custom Attributes

The following are the WKC Custom Attributes used by the IBM Knowledge Accelerators.

Data Type

Indicates what is the specific data type associated with a particular Property, Relationship or Measure term. Indicates what is the specific data type associated with a particular Property term. This only relates to Property terms.

The current list of data type values are :

- Boolean
- String
- Text
- Binary
- Reference data
- Relationship
- Decimal
- Number
- Monetary Amount
- Percentage
- date
- Datetime
- Time

Cardinality

Indicates what is the cardinality relating to an instance of a Property, Relationship or Measure term. The following are the possible cardinality values :

- 0..1 - optional, max 1. equivalent to nullable
- 1..1 - mandatory, max 1. equivalent to not null
- 0..n - optional, multivalued property - e.g. comma separated string or array/json/xml .
Assume that the inverse of this relationship always 0 .. n
- 1..n - as above but not nullable, mandatory at least 1 value

Formula

Indicates what is the calculation expression details to be used in a formula assigned to a measure term.

Alternative Names

Indicates a list of names that a term is also known as.

External Document Reference

Indicates a reference to an external document.

Depends On Reference Data Value

Indicates a business term dependency on a reference data value.

Supportive Content Version

Indicates the origin and version of the industry alignment content. Used with Categories in the Industry Alignment Vocabularies.

Referenced Topic

Indicates references to one or more other categories that represent alignment topics. Used with Categories in the Industry Alignment Vocabularies.

Custom Attributes of Type Relationship

The following are the WKC Custom Relationships used by the IBM Knowledge Accelerators.

Is A / Can be

Indicates a broad equivalence or role between two concepts - for example a "Customer" Is A "Party".

Is Analyzed By / Analyzes

Indicates what are the indicators in the performance area analyzed by - for example a concept or a property term.

Derived From / Derives

Indicates when a measure term is derived from one or more terms in the Business Core Vocabulary.

Calculated From / Calculates

Indicates where a measure term is calculated from one or more measure terms.

Is Synonym For/ Is Synonym to

Indicates two terms that have the same or very similar meaning.

Is Assigned to Term/ Assigned

– Indicates when an alignment term is related to a term in the Business Core Vocabulary.

Supporting/Is Supported By

Indicates where a measure or a property is indirectly referenced by an Performance Analysis Term.

Note : As WKC does not support Custom Relationships before November 2020, any release of the Knowledge Accelerators before that will represent the custom relationships as follows :

- Implement the actual relationship via the standard WKC IS RELATED TO relationship
- Provide a custom attribute showing the intended relationship type for each such related term.

Classifications (on Categories)

The following are the WKC Classifications for Categories used by the IBM Knowledge Accelerators.

vocabulary

Indicates that the category is the root for a Knowledge Accelerator.

core area

Indicates that the category is part of the Business Core Vocabulary area of the Knowledge Accelerator.

performance area

Indicates that the category is part of the Business Performance Indicator area of the Knowledge Accelerator.

scope area

Indicates that the category is part of the Business Scopes area of the Knowledge Accelerator.

alignment area

Indicates that the category is part of the Industry Alignment Vocabulary area of the Knowledge Accelerator.

alignment topic

Indicates that the category is sub category of the Industry Alignment Vocabulary area of the Knowledge Accelerator.

healthcare

Indicates that the category is part of the Knowledge Accelerator for Healthcare.

energy and utilities

Indicates that the category is part of the Knowledge Accelerator for Energy and Utilities.

insurance

Indicates that the category is part of the Knowledge Accelerator for Insurance.

financial services

Indicates that the category is part of the Knowledge Accelerator for Financial Services.

[Classifications \(on Terms\)](#)

The following are the WKC Classifications for Terms used by the IBM Knowledge Accelerators.

Concept

Indicates that the business term is a concept term.

property

Indicates that the business term is a property term.

measure

Indicates that the business term is a measure term.

performance analysis

Indicates that the business term is a performance analysis term.

group term

Indicates that a business term is a higher level terms in an Industry Alignment Vocabulary.

document term

Indicates that a business term is a document term in an Industry Alignment Vocabulary.

defined term

Indicates that a business term is a defined term in an Industry Alignment Vocabulary.

alignment term

Indicates that the business term is part of an Industry Alignment Vocabulary.

preferred

Indicates that the business term is a preferred term in the group of synonyms.

relationship

Indicates that the business term is a relationship term.

report element

Indicates that the business term is a report element term.

Reference Data Sets

The IBM Knowledge Accelerators populate Reference Data Sets, but do not define any additional specializations.

Reference Data Values

The IBM Knowledge Accelerators populate Reference Data Values, but do not define any additional specializations.

Data Classes

The IBM Knowledge Accelerators do not currently populate any instances of WKC Data Classes. However where relevant any terms in the IBM KAs will have a default mapping to the out-of-the-box Data Classes supplied with WKC. In addition, it is possible for clients to create new Data Classes as required by deriving them from the Reference Data Sets and Values supplied as part of the IBM KAs, using standard WKC Data Class creation functionality.

Policies and Rules

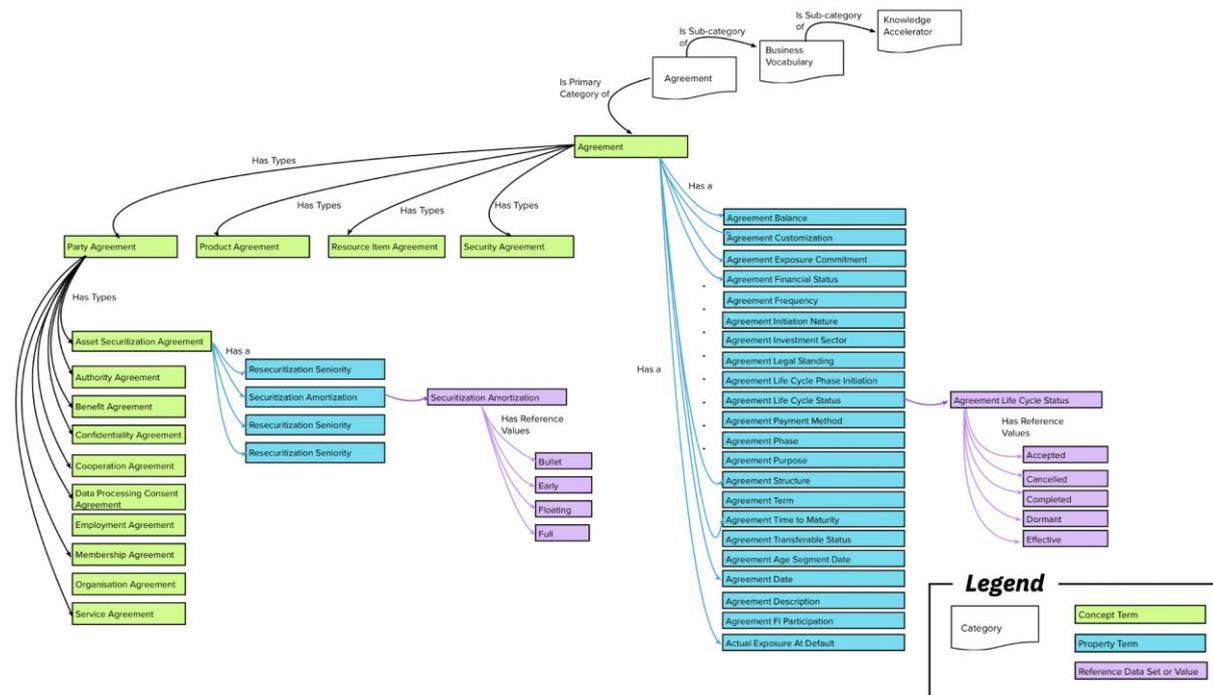
The IBM Knowledge Accelerators do not currently populate any instances of WKC Policies and Rules.

Sample Structural Patterns

This section outlines some sample structural patterns to demonstrate how these metamodel constructs are expected to operate.

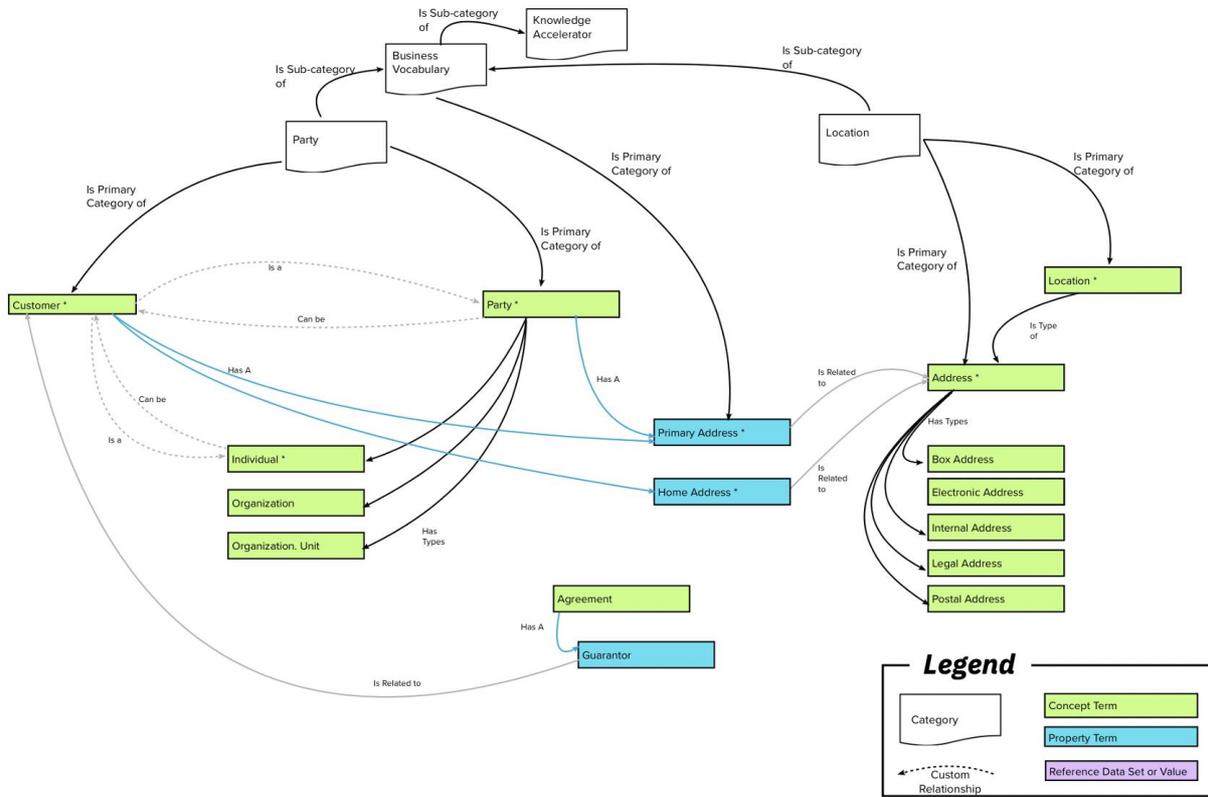
Concepts, Properties and Reference Data Sets/Values

The diagram below shows how the Concept Terms and Property terms may be constructed. Also this diagram shows the proposed integration with the WKC Reference Data Sets and Values.



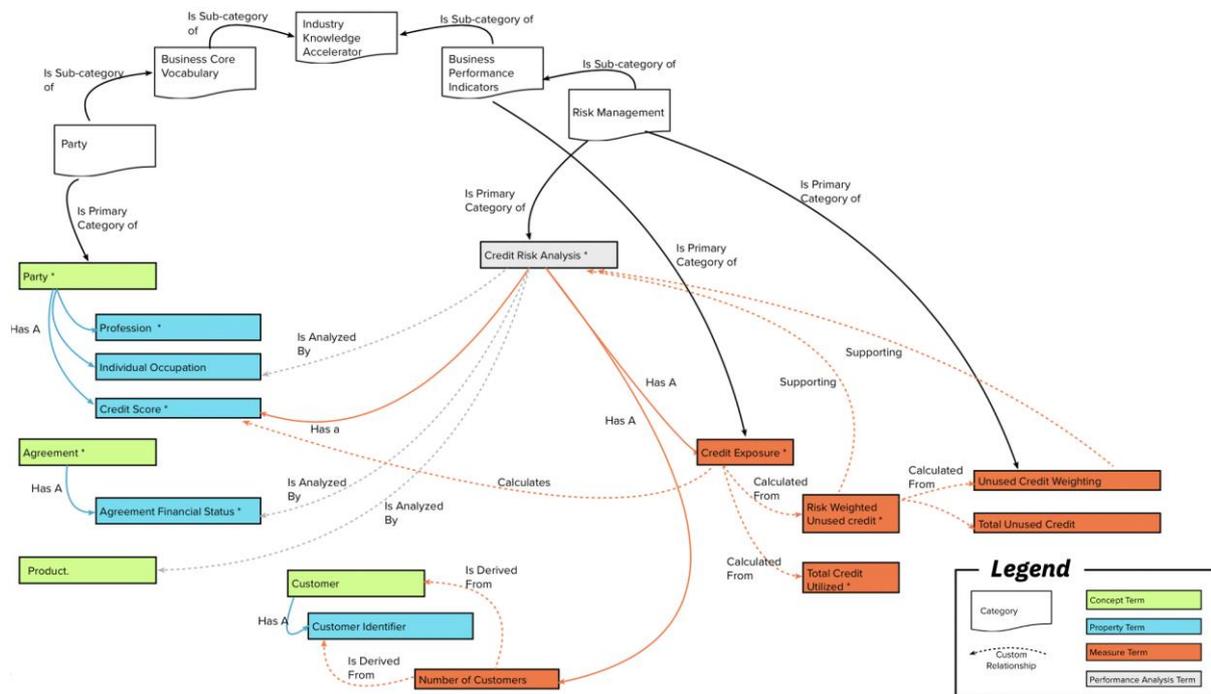
Relationships

The diagram below shows an example of how Concepts can be linked either via a Property Term of type “Relationship” (e.g. Primary Address) or directly via an IS A relationship.



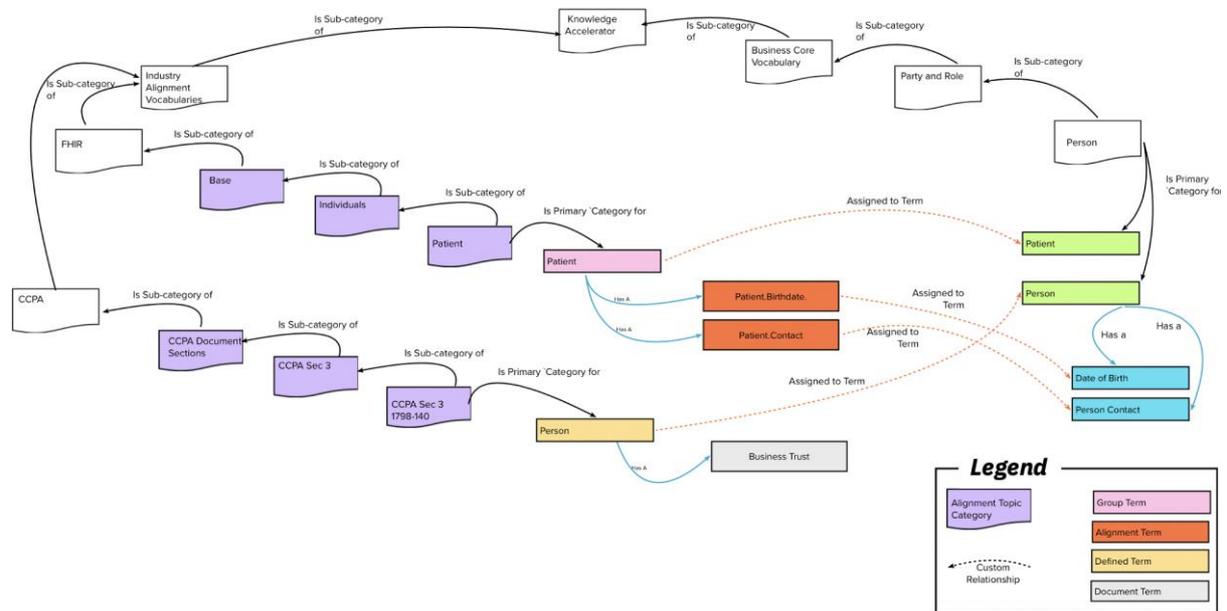
Performance Indicators

The diagram below shows an example of how the Analytical Requirements are proposed to be constructed and integrated with Business Core Vocabulary.



Alignment Vocabularies

The diagram below shows an example of how the Alignment Vocabularies are typically constructed.



Validation Rules

The IBM Knowledge Accelerators as provided, will be subject to validation rules governing the structure, behaviour and inter-relationship between the various components.

While clients are not mandated to follow these rules, clients are encouraged to follow these rules when making any customizations as these rules are designed to assist with ensuring consistency of the vocabulary of business terms and also will enable further integration and exploitation of these metadata structures .

Below are listed most of the typical validation rules applied to the BM Knowledge Accelerators (this is not a full exhaustive list of all validation rules).

Category Validation Rules

- Exactly one category must exist with "vocabulary" label
- The category with "vocabulary" label must not have parent category
- Only one root category (category without parent) must exist
- The category with "vocabulary" label must also have exactly one of the domain labels
- The domain label (one or more) must be only used on category with "vocabulary" label
- Every category must have exactly one category primary label
- "vocabulary" labeled category must not be used as parent or referencing category of a term
- Terms must have exactly one parent category (looked after IGC constraint at the moment but useful for future use)
- Category with "vocabulary" label must not have more than one category with "business area" label
- Category with "vocabulary" label must not have more than one category with "analytics area" label
- Category with "vocabulary" label must not have more than one category with "scope area" label
- Category with "vocabulary" label must not have more than one category with "supportive content" label
- Category with "business area" label must only have for parent category with "business area" or "vocabulary" label
- Category with "analytics area" label must have only for parent category with "analytics area" or "vocabulary" label
- Category with "scope area" label must have only for parent category with "scope area" or "vocabulary" label
- Category with "supportive content" label must only have for parent category with "vocabulary" label
- Category with "supportive topic" label must only have for parent category with "supportive content" or "supportive topic" label
- Name of the category must be unique

Category Relationships Validation Rules

- target of "parentCategory" relationship must be a category with "business area" label for all "concept" or "property" or "reference data set" or "reference data value" labeled terms (as defined in "business term labels" list)

- target of "referencedByCategories" relationship must be a category with "business area" or "scope area" label for all "concept" or "reference data set" or "reference data value" labeled terms
- target of "referencedByCategories" relationship must be a category with "business area" or "scope area" or "analytics area" label for all "property" labeled terms
- target of "parentCategory" relationship must be a category with "analytics area" label for all "measure" or "analytical requirement" labeled terms (as defined in "analytical requirement labels" list)
- target of "referencedByCategories" relationship must be a category with "analytics area" or "scope area" label for all "measure" or "analytical requirement" labeled terms (as defined in "analytical requirement labels" list)
- target of "parentCategory" relationship must be a category with "supportive content" label for all "supportive term" or "group term" or "document term" or "defined term" labeled terms (as defined in "supportive content labels" list)
- target of "referencedByCategories" relationship must be a category with "supportive topic" or "scope area" label for all "supportive term" or "group term" or "document term" or "defined term" labeled terms (as defined in "supportive content labels" list)

Terms and Category Validation Rules

- All objects (terms and categories) must have name defined
- All objects (terms and categories) must have ID
- All objects (terms and categories) must have description defined
- "concept" labeled term must be target of at least one "isOf" relationship
- a term with "concept" and "relationship" labels must be target of at least two "isOf" relationships from terms labeled with "property" and "relationship"
- a term with "concept" and "relationship" labels can only have "isATypeOf" relationship to term labeled with "concept" and "relationship"
-

Term Validations for Business Core Vocabulary

- Every term must have exactly one primary term classification label
- Name of the business, analytical or scope term must be unique
- "relationship" label must only be applied to "concept" or "property" labeled terms
- "preferred" label must only be applied to "concept" or "property" or "measure" labeled terms
- "data type" custom property must not be empty for "property" or "measure" labeled terms
- "data type" custom property must be empty for all terms without "property" and "measure" labels
- "data type" custom property for "property" labeled terms must have value from predefined list "property data types"
- "data type" custom property for "measure" labeled terms must have value from predefined list "measure data types"
- "data type" custom property must be equal to "Relationship" (configurable, see lists "Relationship Data Type") for term with labels "property" and "relationship"
- "data type" custom property must be not set to "Relationship" (configurable, see lists "Relationship Data Type") for term without labels "property" or "relationship"
- "cardinality" custom property must not be empty for "property" or "measure" labeled term

- "cardinality" custom property must be empty for all terms without "property" or "measure" label
- "cardinality" custom property for "property" terms must be from predefined list "property cardinalities"
- "cardinality" custom property for "measure" terms must be from predefined list "measure cardinalities"
- "property" or "measure" labeled term must have at least one "isOf" relationship
- all terms without "property", "measure", "alignment term" and all term having both "alignment term" and "group term" labels must not have "isof" relationship
- all "isOf"relationships of "property" labeled terms must be with "concept" or "analytical requirement" labeled terms only
- all "isOf"relationships of "measure" labeled terms must be with "analytical requirement" labeled terms only
- Term with "property" and "relationship" labels must have exactly one "relatedTerms" relationship
- Term with "reference data set" labels must have at least one "relatedTerms" relationship
- Terms without labels ("property" and "relationship") or "concept" or "reference data set" or (datatype = "Reference Data") must not have any "related terms" relationships
- all "relatedTerms" relationships of ("property" and "relationship") labeled terms must be with "concept" labeled terms only
- all "relatedTerms" relationships of "reference data set" labeled terms must be with "property" labeled terms only
- all "relatedTerms" relationships of ("concept") labeled terms must be with ("property" and "relationship") labeled terms only
- all "relatedTerms" relationships of ("property") labeled terms that are not "relationship" labeled must be with "reference data set" labeled terms only
- all terms without "concept" label must not have "isATypeOf" relationship
- all "isATypeOf" relationships must only point to terms with "concept" label
- the primary label of a term must be the same for source and target object for all "synonymOf" relationships
- only "property", "concept" and "measure" labeled terms can have "synonymOf" relationship

Business Performance Indicator validation rules

- "performance analysis" labeled term must be target of at least one "is of" relationship
- "is analyzed by" relationship must be only used for " performance analysis " labeled terms
- "is analyzed by" relationship must only target "property" or "concept" labeled term
- "derived From" relationship must not be used for terms without "measure" label
- "derived From" relationship target term must have "concept" or "property" label
- "calculated From" relationship must not be used for terms without "measure" label
- "calculated From" relationship target term must have "measure" or "property" label
- "calculated From" relationship target term must be attached to the same performance analysis term as source term of the "calculated From" relationship
- "formula" custom attribute must be empty for terms without "measure" label
- "Formula" custom attribute must not be empty for "measure" labeled terms with "Calculated From" relationship
- terms with "Calculated From" relationship must exist if "Formula" custom attribute is not empty



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