

# **Semantic Modeling of Organizational Knowledge as a Basis for Enterprise Data Governance 4.0**

From a people/policy-centric Data Governance to a metadata-centric Data Governance

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Knowledge Graph Forum  
Zurich - September 29th, 2022

# **Disclaimer**

“The opinions expressed in this presentation and on the following slides are solely those of the presenter and not necessarily those of my current employer (Roche). Roche does not guarantee the accuracy or reliability of the information provided herein.”

Was few days sick - Not COVID (unless the test was false negative)

Not a native technical person

# **Acronyms**

DG = Data Governance

KG = Knowledge Graph

# Motivational Questions

*“Why most of digital transformation initiatives are failing?”*

(i.e. not able to show concrete return on investments and/or business improvements)

*“Why corporate data quality is worsening?”*

(although everybody agrees that data quality is an issue)

*“Why enterprises are still struggling with Data Governance”*

(although many people agree Data Governance makes sense)

# **Observed Problem**

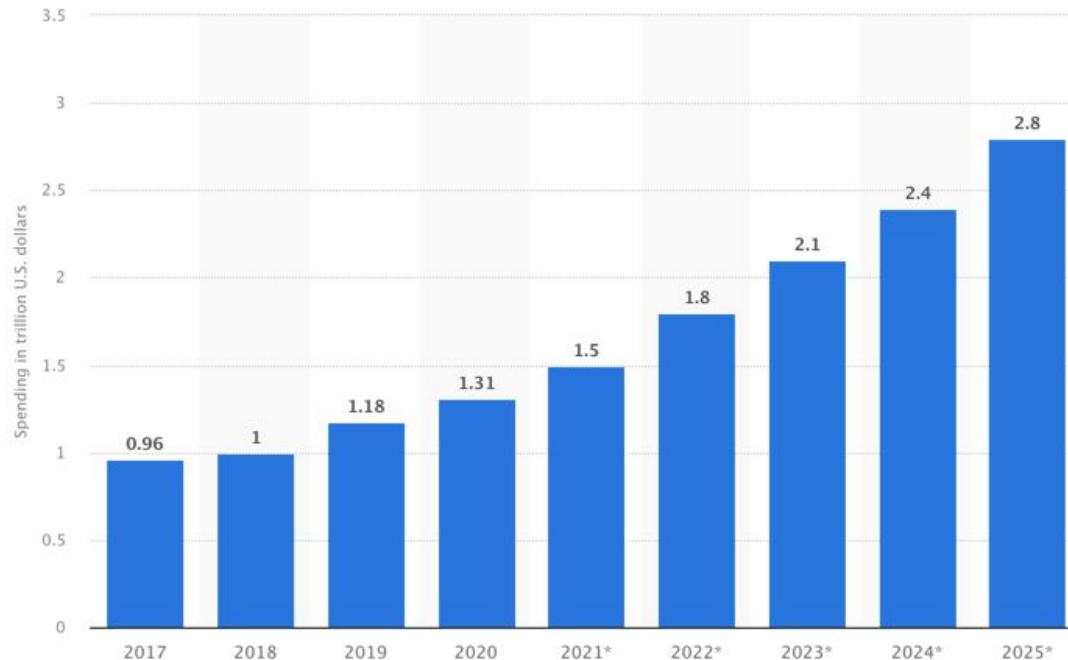
# Digital Revolution



# The Business of Digital Revolution

*Big money*

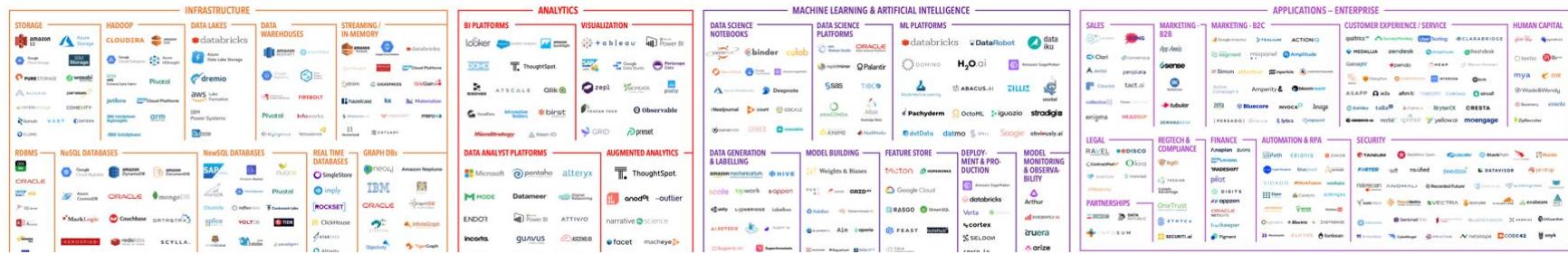
Spending (trillion USD) on  
digital transformation  
technologies and services  
worldwide from 2017 to 2025



© Statista 2022

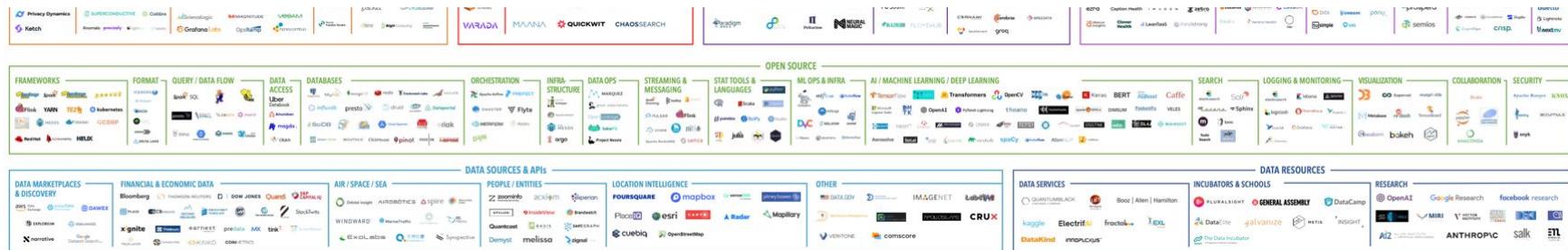
# By Whom Is Made This Money?

*Technology providers: machines and pipes*



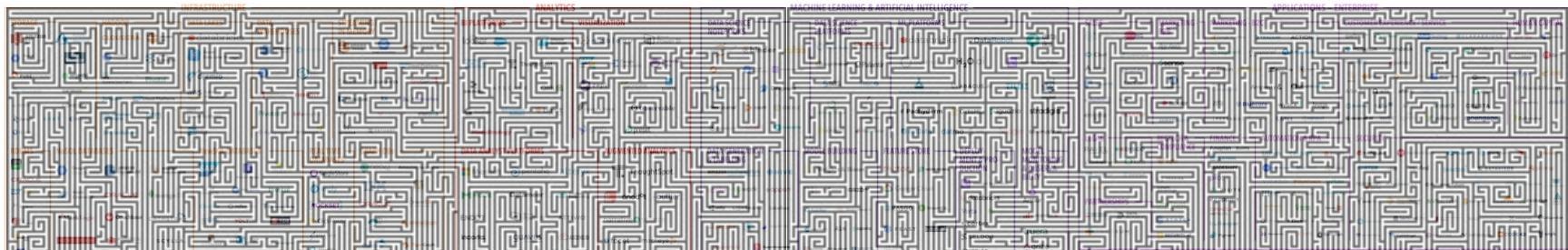
“Global spending on enterprise IT reached US\$3.7 trillion in 2018”

Gartner, <https://www.strategy-business.com/article/Are-You-Spending-Way-Too-Much-on-Software>

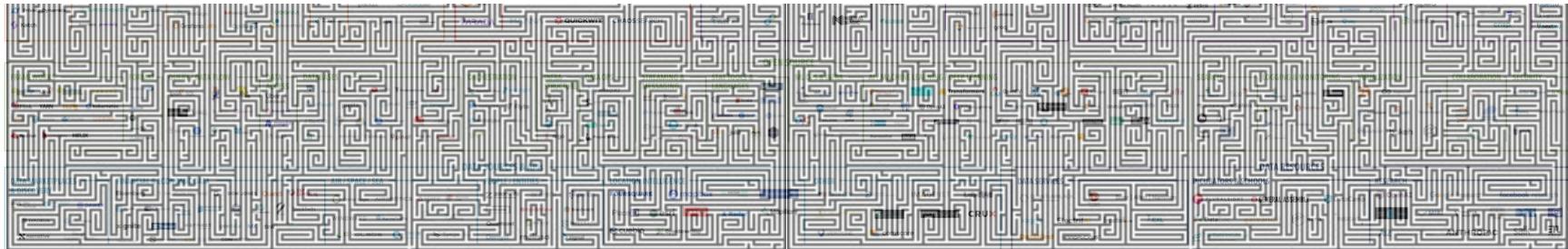


# Resulting Data Complexity

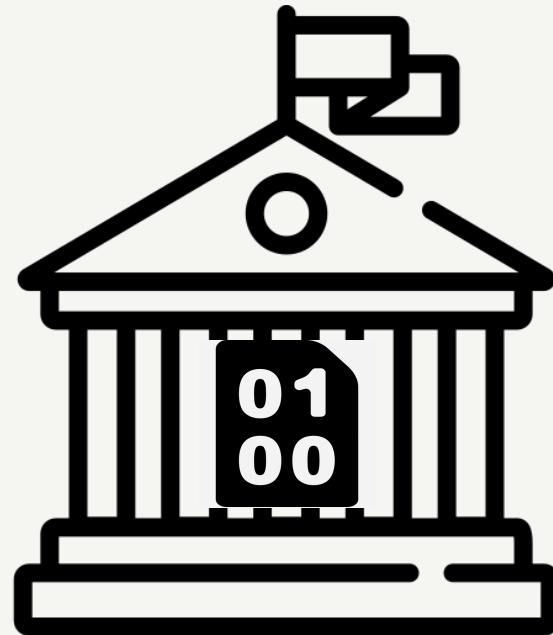
*The “fluid” processed and carried by machines and pipes*



*“How much Data Governance can counterbalance the data swamp created by a technology-centric culture?”*



# Data Governance



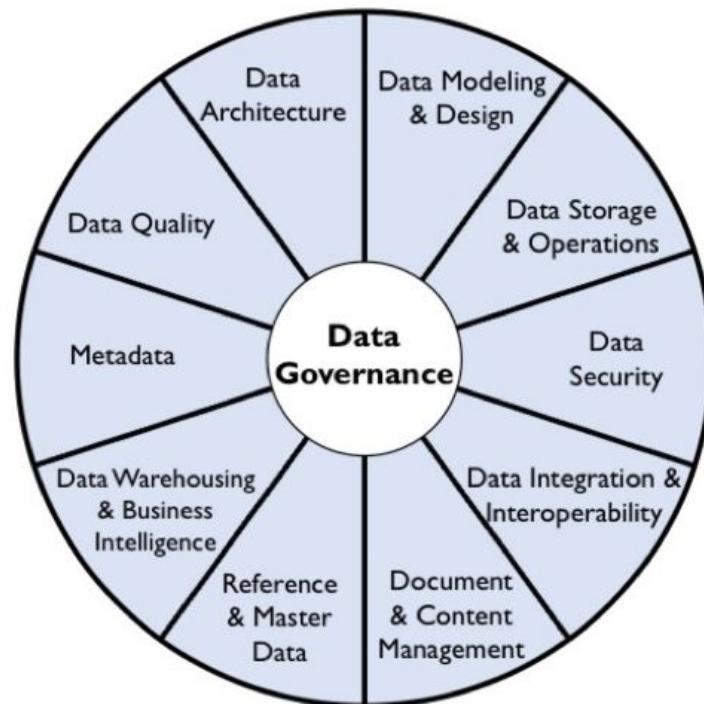
# Legacy Data Governance

*What is commonly understood and applied as DG*

**(One) definition (among others)\*:** A data management concept concerning the capability that enables an organization to ensure that high data quality exists throughout the complete lifecycle of the data, and data controls are implemented that support business objectives.

Traditional data governance is

- **People**, processes and **policies**
- **Single-shot** and reactive
- **System** centric

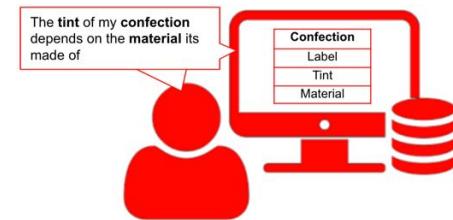
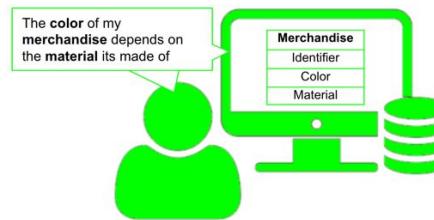
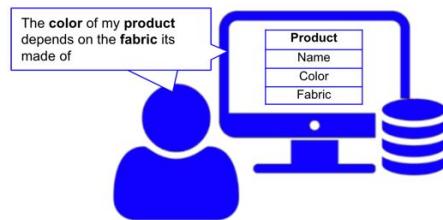


Copyright® 2017 DAMA International

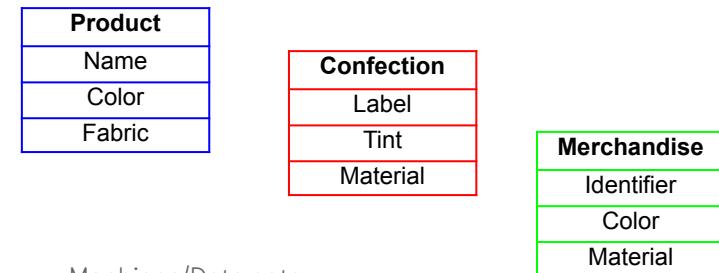
# Still... Common Observed Problem with Data Primary Use

*Primary use of data: data operations required for running daily business*

Different businesses, different people with different mindsets/incentives, using different systems exchanging same, similar or overlapping data.



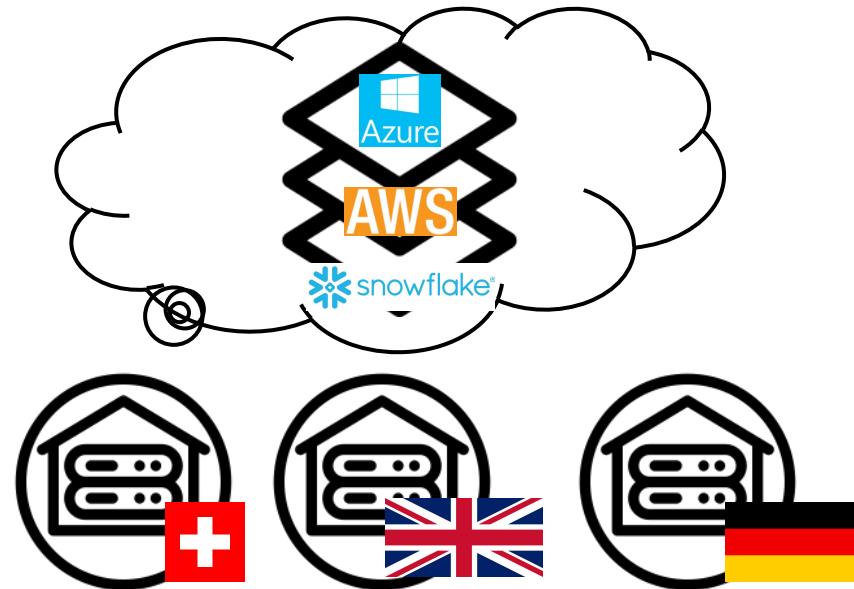
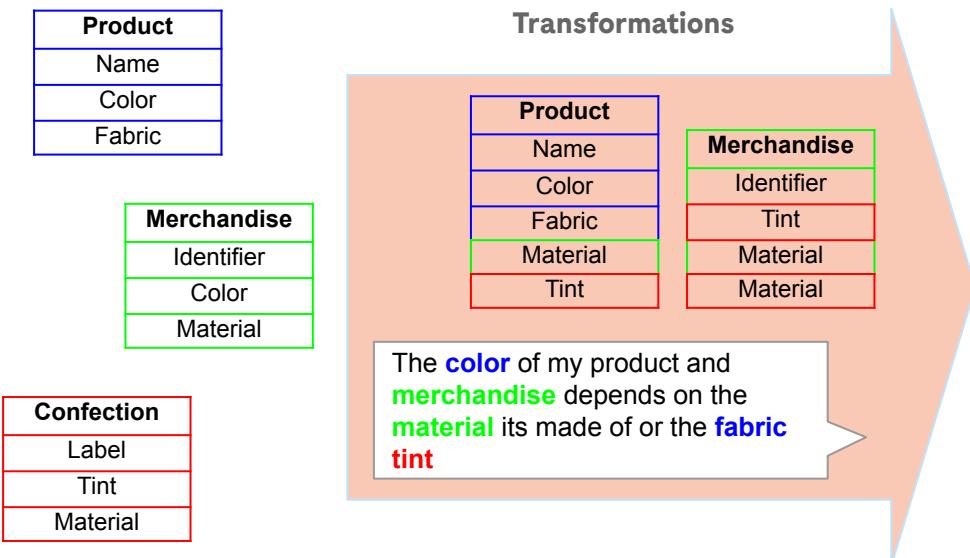
Need to disambiguate and reconcile unstructured and structured data:



# Still... Common Observed Problem with Data Secondary Use

*Secondary use of data: data operations required for exploratory analyses (i.e. data science)*

Same, similar or overlapping data in different formats, using no or different standards (for structure or content), more or less complete, with non-defined ownership (people and machine) need to be integrated using different pipeline/transformation logics in several platforms to enable data science/analyzes in a compliant way with global and local regulations (e.g. GDPR).



# Why is Data Governance still Struggling to Show Added Value?

*Did you ever see a solid, fact-based measurement of DG's return-on-investment?*

## 1. Technology/tools is only a small part of the solution

- DG is about considering **data as a shared asset**
- **No or poor business requirements** for DG; mostly coming from IT organizations
- Can't cope with 5 Vs of big data:
  - **Technology is too rigid** (schema-based)
  - **Processes are too complex** (multi-stakeholders, multi-tools, centralized vs decentralized)
  - **Skills:** People are struggling with overwhelming complexity

## 2. DG has intrinsic paradoxes preventing its implementation and adoption

- Governance comes with **constraints**. Who is willing to pay for constraints?
- DG is an **enterprise endeavor**; it is suboptimal to deploy it in pockets of an organization
- While DG benefits are **global**, constraints are **local**

# **Propose Solution**

**Knowledge and  
Sustainability First**



# Data Knowledge

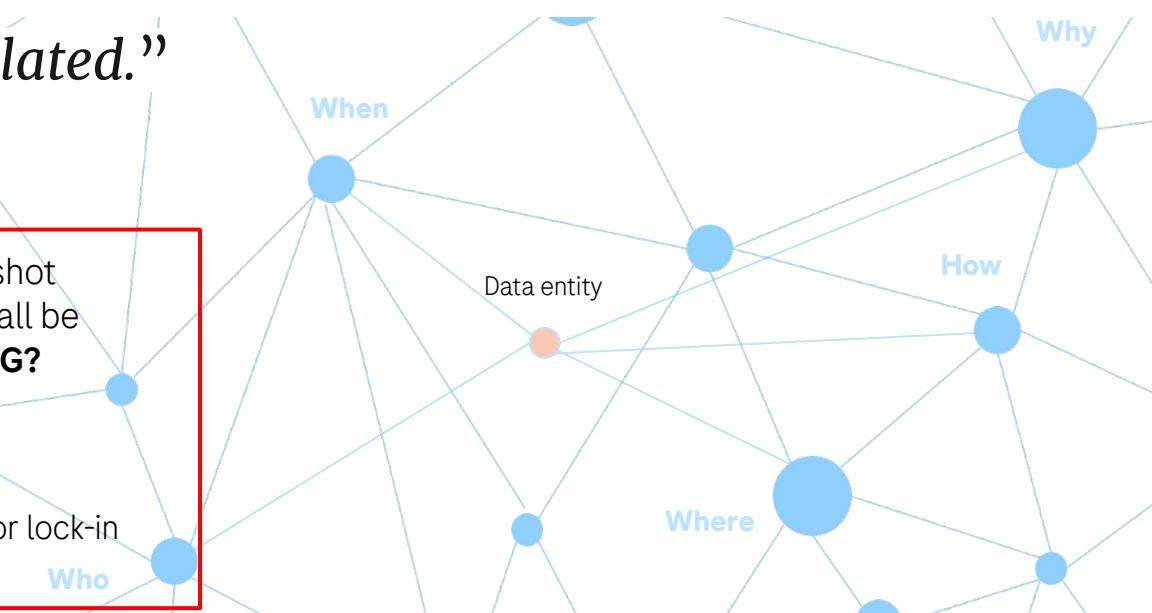
You can only govern data that you know

*“A piece of information is really defined only by what it's related to, and how it's related.”*

Tim Berners-Lee

Instead of people/policy-driven, single-shot and system-centric, data governance shall be

- Defined on **data knowledge: why DG?**
- **Context- or metadata-driven**
- **Sustainable:**
  - open standards/FAIR
  - as less as possible tech/vendor lock-in
  - quality and not quantity



# How Can a Knowledge Graph Supports More Effective DG?

*A context-driven DG*

## 1. Data Governance 4.0

Fourth industrial revolution is about “increasing **interconnectivity** and smart **automation**”\*

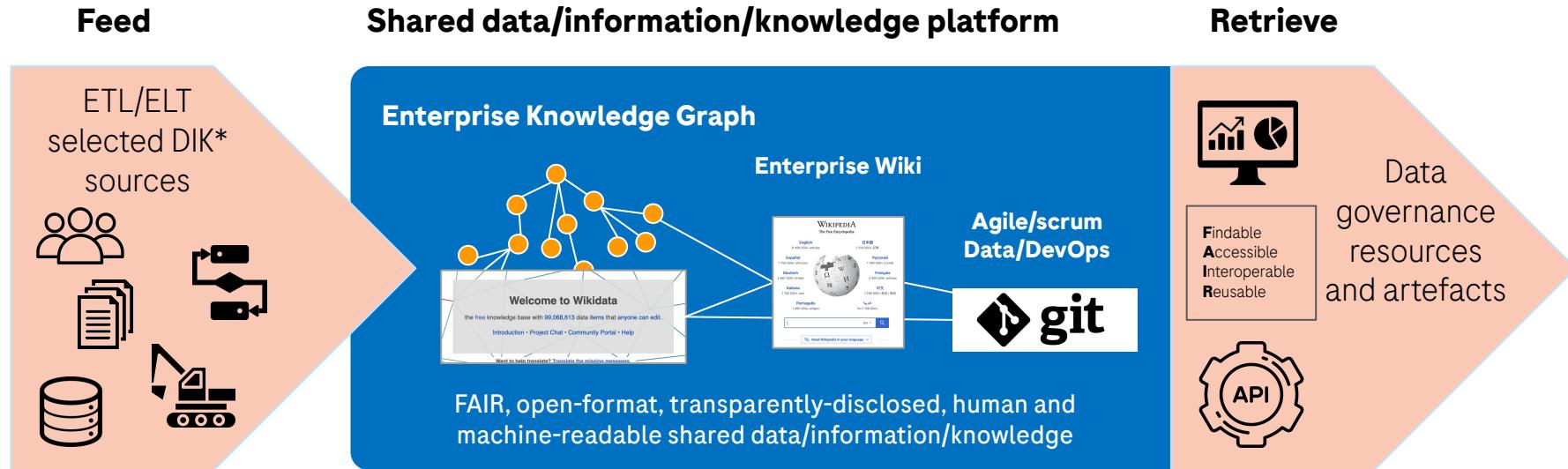
- **Fit-for-purpose:** There is no “one-size-fits-all”: governance constraints shall adapt to use case
- **Agile:** Business needs change fast, so shall adapt data governance (agility)
- **Automated:** 5 Vs of Big data require as much automation as possible to keep up with growing complexity

## 2. Knowledge Graphs

- **Semantic** triple stores vs. Property graph
- Semantic triple stores are best for
  - Human- and **machine-readable** resource description
  - **Flexibility** (schema-free); altering the data model is easy
  - **Easy Import/Export:** standardized serialization; no vendor lock-in
  - **Efficient Querying** with complex queries independent from data schema
  - **Easy Sharing:** URLs
  - Relationship Discovery: ontologies enable the discovery of implicit facts and relationships (**inference**)

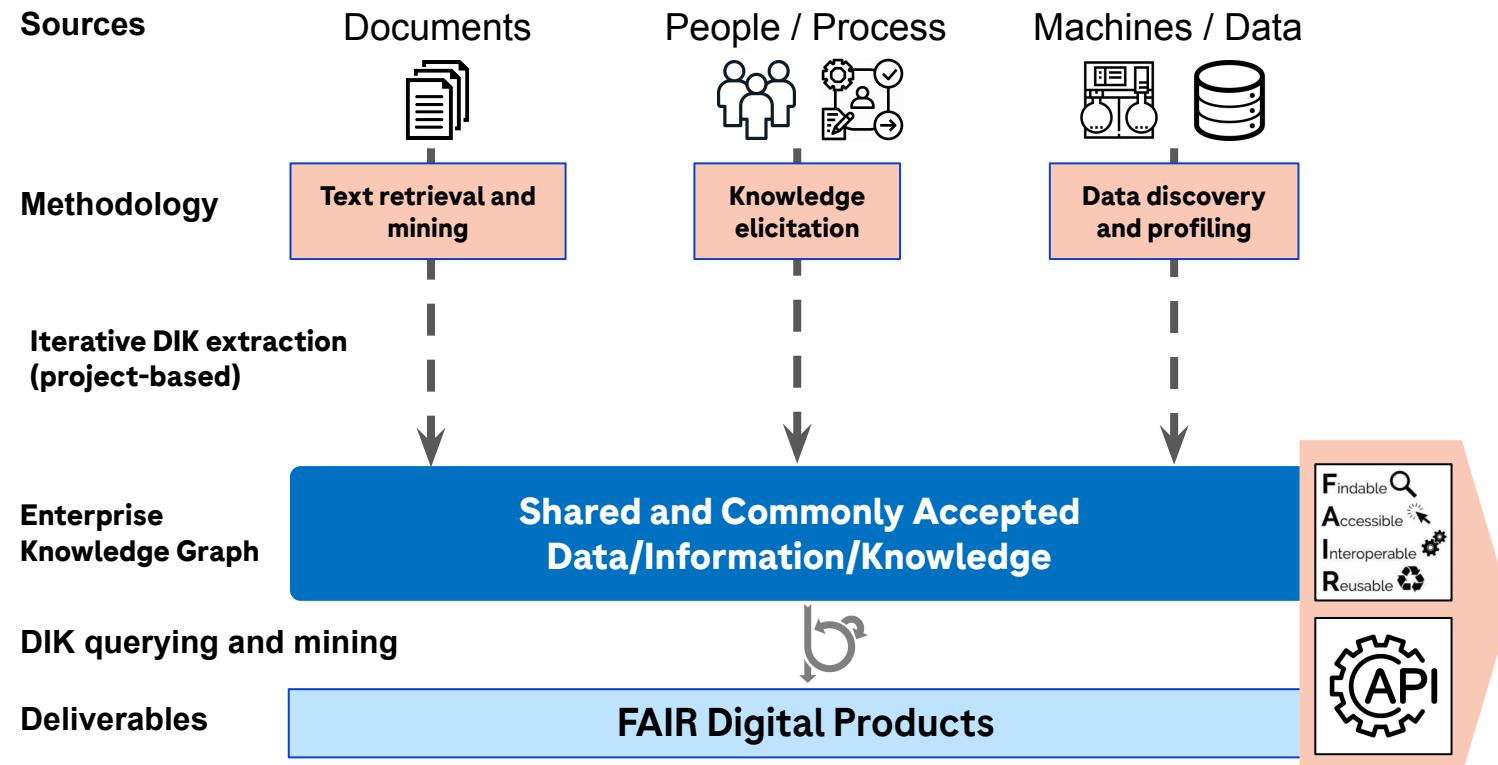
# Proposed Architecture

*Wikipedia + Wikidata + Data/DevOps @ organization level*



# Iteratively Building-Up the Knowledge Graph

*Project-based KG feeding from three main sources*



# Knowledge Elicitation from Multiple Source

*From manual to semi-automatized pipelines to map business architecture*

## Documents



### **Text retrieval and mining**

- Document types
- Document concepts
  - Structure
  - Text
- Document metadata
  - Documentum system
  - Document format
- Business context metadata

## People / Process



### **Knowledge elicitation**

- Business descriptions from experts
- Problem statements, needs, requirements, blockers...
- Know-how, tacit knowledge
- Business processes
- FAQs
- Business resources identification

## Machines / Data



### **Data discovery, profiling, ETL/ELT**

- Data models (theory and reality)
- Architecture handbook
- System diagrams
- Data flow diagrams
- Profiling metadata
- Data ETL/ELT pipelines (for selected data only)

Conformance to a  
**document** ontology

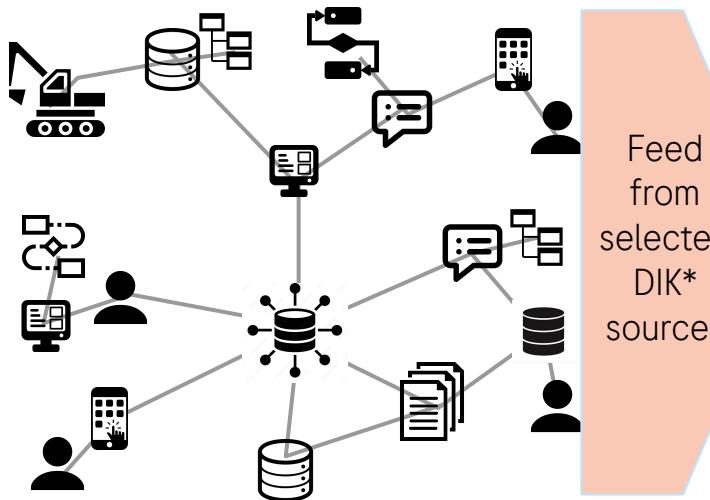
Conformance to a  
**person and/or process** ontology

Conformance to a  
**data set and/or system** ontology

# A Enterprise Digital Twin as a Source for DG Resources

*A dynamic descriptive carbon copy of the business as a library to generates DG artefacts*

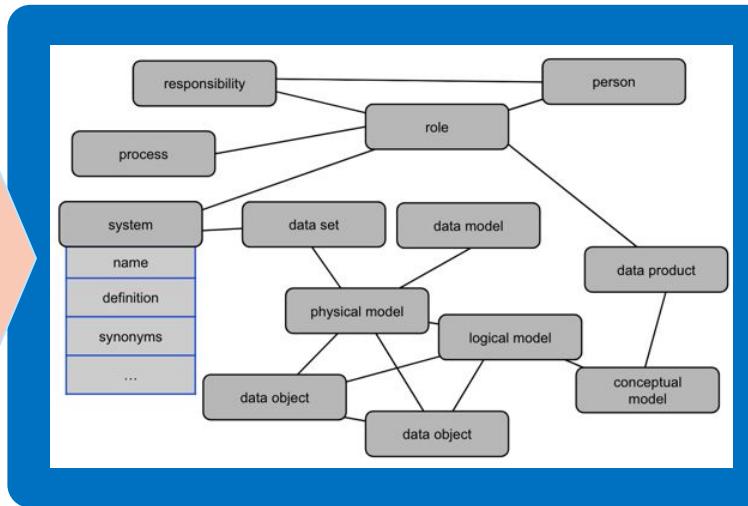
## Complex Business Reality



Feed from selected DIK\* sources

## Business digital twin

(avatar, digital carbon copy of business entities)

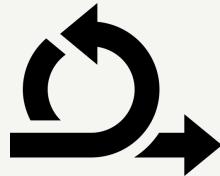


## DG 4.0 resources

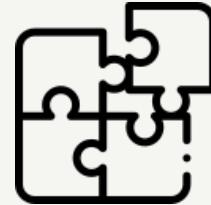
### FAIR digital products

- contextualization
- lineage
- mapping
- master schemas
- reference lists & taxonomies
- transformation
- ownership
- quality metrics
- ...

# Data Governance 4.0



Agile



Fit-for-purpose



Automated

# Example of Knowledge Graph Content

Novartis - 2018 to 2021 - 3 FTEs + 200k Tech Costs

## Enterprise Upper Ontology

Metadata governance: upper ontology, master and reference data management

## Governance Ontology

Principles, policies, laws, rules, checks, classifications, artefacts, roles, pointers to documents, URI builder, processes

Domains and Concepts	Inventories and Catalogues	FAIRification Metadata	Taxonomies Ontologies	Models	Use Cases
Cross-industry business concepts grouped by domains in a one-to-many manner	<ul style="list-style-type: none"><li>Data Sets, Products</li><li>Systems, Applications</li><li>Roles</li><li>Processes and Tasks</li><li>Organization units</li><li>Technologies</li><li>Projects</li><li>Products, Brands</li><li>Customers</li><li>...</li></ul>	<p>Buckets of metadata to capture FAIR aspects</p> <ul style="list-style-type: none"><li>Identification</li><li>Lifecycle</li><li>Controls</li><li>Provenance, lineage</li><li>Licensing</li><li>Anonymization</li><li>Controls, Access rights</li></ul>	Enterprise-specific cross-domain (OBO, BioPortal, MedDRA, ATC,...)	External (CDISC, IDMP, OMOP) and internal (Conceptual, Logical, Physical) structuring models	Project: <ul style="list-style-type: none"><li>Problem need, OKRs</li><li>Proposed solution</li><li>KPIs</li></ul> Domain: <ul style="list-style-type: none"><li>Operationalized solution</li><li>Benefit mapping</li></ul>
			<b>Reference Lists</b>	<b>Master Data Schemas</b>	Utils Maintenance, demos
			Enterprise-specific domain-specific flat lists		

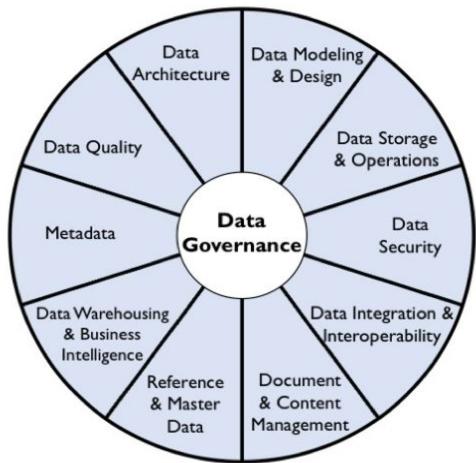
## Semantic basis

Enhanced dictionary featuring terms, syno- anto- hyper- hyponyms, one-to-many definitions and sources

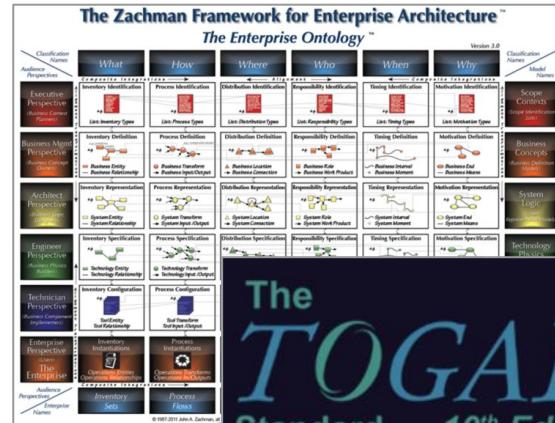
## Enterprise Upper Ontology

Metadata governance: upper ontology, master and reference data management

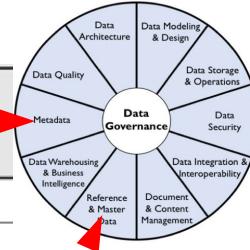
The **glue** to the whole  
data governance  
ecosystem.



Based-on and inspired by



ISO 15926



## Semantic basis

Enhanced dictionary featuring terms, syno- anto- hyper- hyponyms, one-to-many definitions and sources

Based on: **Simple**

It provides a **semantic ID card** for all business-facing concepts in the KG.

Enables business glossaries, thesauri, dictionaries, acronym list and definition...

Define all data governance items and artefacts

### Enterprise Business Glossary

The Enterprise Glossary is a company wide effort to clean and link terms and definitions for various business processes followed by multiple stakeholders/business domains using different IT systems/applications. One term can have several definitions as per the different understandings and usage by humans or machines.

Each term and each definition is linked to the enterprise data landscape.  
New terms will be added constantly.  
Want to leave feedback? Please click here.

Show 42 entries (overall 4,330)

#### Term

Clinical Trial

More details for Clinical Trial

Glossary PUIDs

Is Defined By

Clinical investigation

Clinical research

Clinical study

### Enterprise Acronyms

Show 100 entries (overall 4,793)

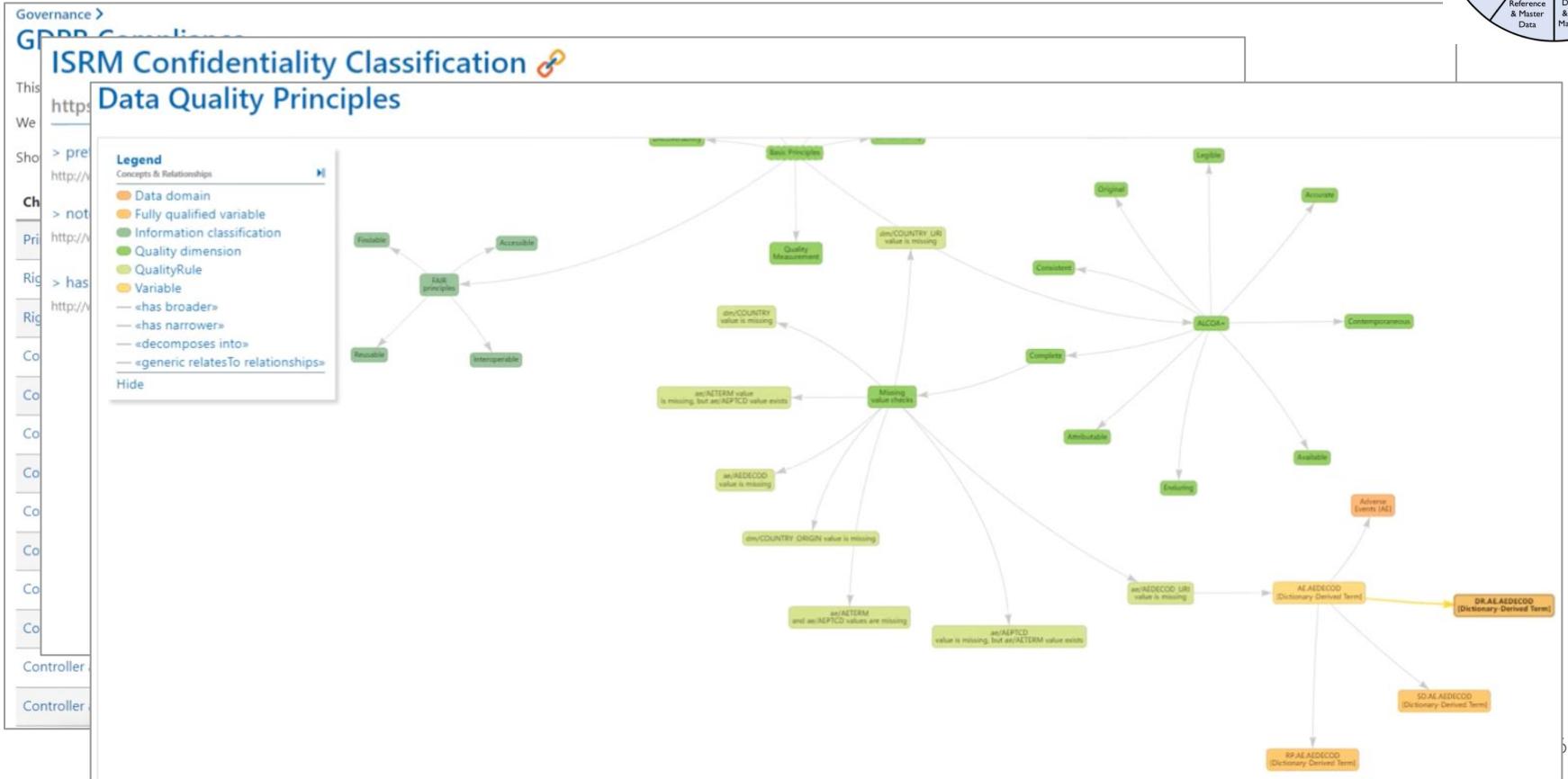
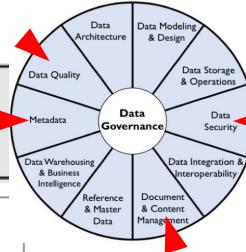
#### Acronym

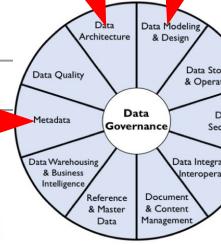
#### Definition

(p)OPRC	(pivotal) Oncology Protocol Review Committee
1337	1 = L _ 3 = E _ 7 = T ; this is a short term for _ELITE_
3rdPAP	3rd Party Supplier _ Manufacturer Application
A	Allocations & Operations
A & O Manager	Allocation & Operations Manager
A&P	Advertising & Promotion
A/L	AMAC_LACan (Asia, Middle East African Countries_Latin America Canada)
AAMP	Argus Affiliate Manual for Processing

# Governance Ontology

Principles, policies, laws, rules, checks, classifications, artefacts, roles, pointers to documents, URI builder, processes

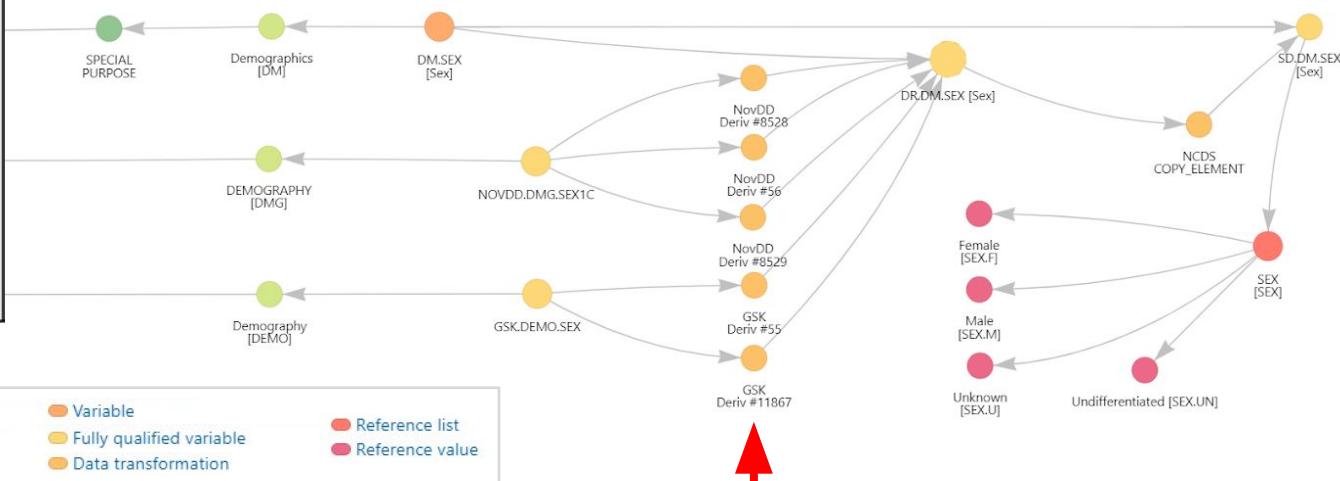




# Domains and Concepts

Cross-industry business concepts grouped by domains in a one-to-many manner

## Target Model



**NOVDD.DMG.SEX1C**  
[https://data-qa.novartis.net/v1/development/clinical/globalmetadata/v1/fullyqualifiedelement/NOVDD\\_DMG\\_SEX1C](https://data-qa.novartis.net/v1/development/clinical/globalmetadata/v1/fullyqualifiedelement/NOVDD_DMG_SEX1C)

Copy URI to clipboard

Add all «specificationSourceRow»  
 specificationModifiedBy: GUILLAU2  
 specificationModificationDate: 2019-03-21T00:00:00  
 specificationModificationDate: 2019-01-18T00:00:00  
 specificationBucket: b1.2  
 specificationBucket: b0.9  
 comment: NovDD GSK NCDS mapping  
 preferred label: NOVDD.DMG.SEX1C  
 hidden label: NOVDD.DMG.SEX1C  
 alternative label: NOVDD.DMG.SEX1C  
 type: Fully qualified variable of type [Class]  
 has broader: DEMOGRAPHY [DMG] of type [Data domain]  
 Add all «input variable of»  
 Add input variable of  
 Restart navigation from NOVDD.DMG.SEX1C  
 Remove NOVDD.DMG.SEX1C

**NovDD Deriv #8528**  
[https://data-qa.novartis.net/v1/development/clinical/globalmetadata/v1/ncds\\_gsk\\_novdd\\_derivation/8528](https://data-qa.novartis.net/v1/development/clinical/globalmetadata/v1/ncds_gsk_novdd_derivation/8528)

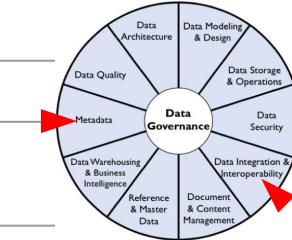
Describe NovDD Deriv #8528  
 Copy URI to clipboard

transformationRuleConceptual: COPY\_ELEMENT  
 transformationRule: undefined  
 specificationSourceRow: 8528  
 specificationModifiedBy: GUILLAU2  
 specificationModificationDate: 2019-03-21T00:00:00  
 specificationBucket: b1.2  
 comment: NovDD GSK NCDS mapping  
 preferred label: NovDD Deriv #8528  
 type: Data transformation of type [Class]  
 has output variable: DR.DM.SEX [Sex] of type [Fully qualified variable]  
 has input variable: NOVDD.DMG.SEX1C of type [Fully qualified variable]

Restart navigation from NovDD Deriv #8528  
 Remove NovDD Deriv #8528

## Inventories and Catalogues

- Data Sets, Products
  - Systems, Applications
  - Roles
  - Processes and Tasks
  - Organization units
  - Technologies
  - Projects
  - Products, Brands
  - Customers
  - ...



## Classification

## Inventories

ganization in different business projects, the Data Strategy team has methodically collected information about raw data sets used by each project.

## And Study Indications

tries (overall 39.104)

From DGSS Repository: Q02\_EasyFind on 2021-09 [live data]

Copy 

## Compounds

Show 200 entries (overall 1,561)

From DGSS Repository: Q02\_EasyFind on 2021-09 [live data]

## Clinical Study Protocols

Show 200 entries (overall 2,038)

From DGSS Repository: Q02\_EasyFind

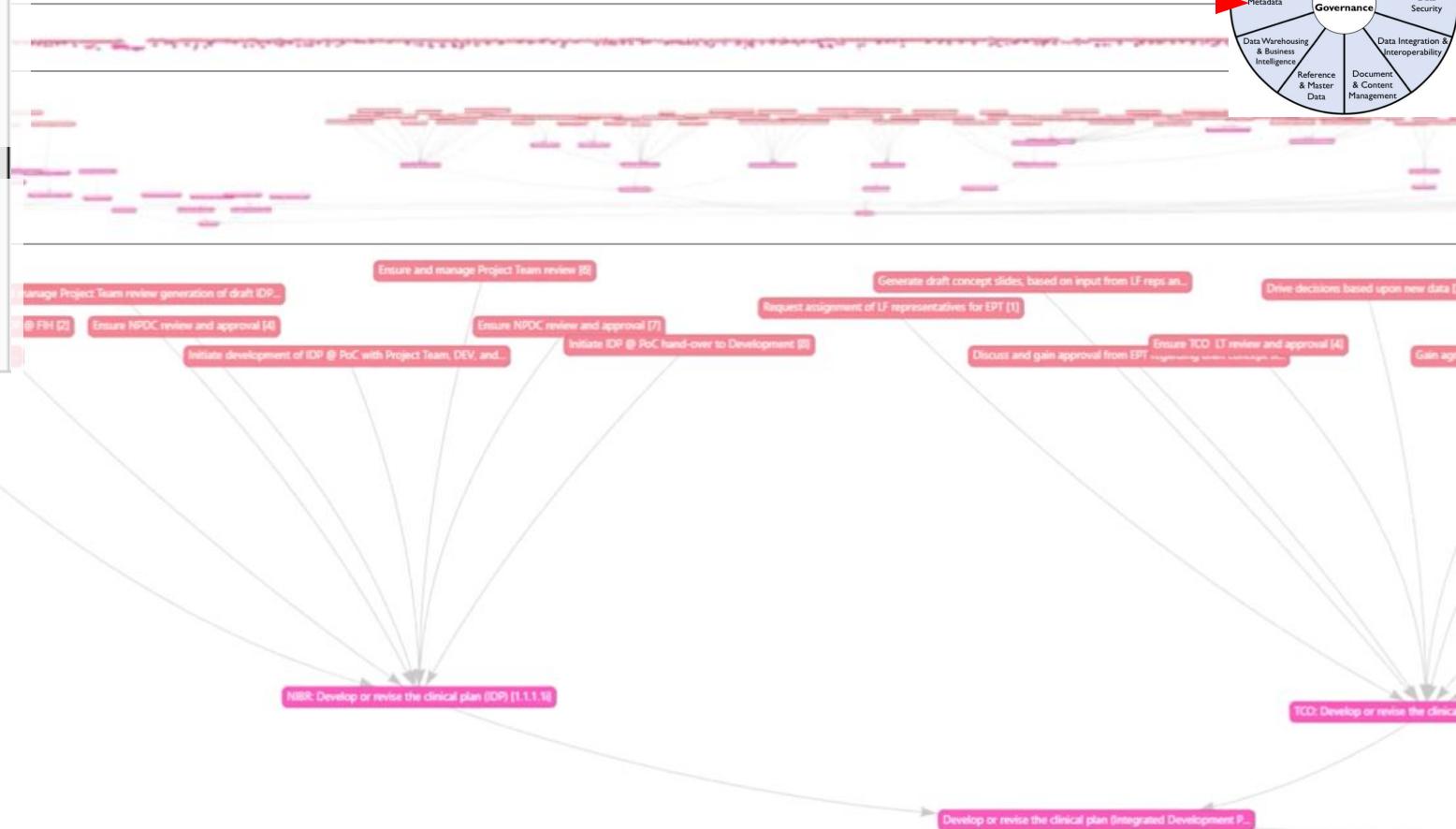
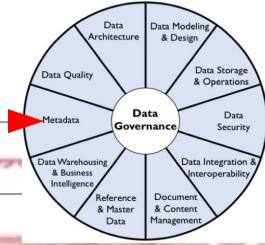
Clinical Study Protocols									
DROI	1.2.3 MAILI	Show	CRTV1998	ZPL521	https://data-qn.novartis	Study Protocol	Study Code Alias	Title	Document Version
Data [DGSS]	100% Prop	Data	CRTV1998	ZPL389	https://data-qn.novartis	AAE581 JP2 protocol (Ver.3).doc	CAAE581A1201	A 12-month, multicenter, double-blind, randomized, placebo-controlled parallel-group dose-finding study of AAE581 in postmenopausal women with osteopenia/osteoporosis supplemented with calcium and Vitamin D	Version 3
Data	10L Tank St	AACT	CRTV1998	Zometa [100120]	https://data-qn.novartis	AAE581A2203E2_Working protocol Amendment 1.doc	CAAE581A2203E2	An observational, safety follow-up extension to studies 2203 and 2203E1 to assess the safety of AAE581 in postmenopausal women with osteopenia/osteoporosis	01 (incorporating change from Amendment 1)
Gene	1A Pharma	AACT	CRTV1998	Zolpidem [100357]	https://data-qn.novartis	AAE581C2201E1_Working protocol.doc	CAAE581C2201E1	An observational, safety follow-up extension to the phase II, 12-month, double-blind, placebo-controlled, dose-finding, multicenter study to evaluate the safety, tolerability, and disease modifying efficacy of daily oral AAE581 (10, 25 and 50 mg tablets) in patients with painful knee osteoarthritis, Kellgren-Lawrence grade 3 by X-ray	02 (incorporating change from Amendment 1)
Glass	1C 8.2	AACT	CRTV1998	Zoledronate [0424]	https://data-qn.novartis	ABF656A2103 protocol.doc	CABF656A2103	A single dose pharmacokinetic evaluation of albinterferon alfa-2b in subjects on hemodialysis as compared to matched healthy volunteers	01 (original protocol)
	1C Account	AACT	CMHS552A	ZOL446	https://data-qn.novartis	abf656a2206-working protocol incl amend 2 clean.pdf	CABF656A2206	A pharmacokinetic/pharmacodynamic evaluation of ABF656 in patients with chronic hepatitis B, e Ag+, infection.	03
	1C Account	AACT	CLXE408A1	ZLO707	https://data-qn.novartis	CABF656B2202 Working Protocol Amendment 1 & 2 Clean.doc	CABF656B2202	An open-label, randomized, multicenter, active-controlled, dose-ranging study to evaluate the safety and efficacy of albinterferon alfa-2b administered every 4 weeks plus ribavirin in interferon alfa-naïve patients with chronic hepatitis C.	1.2 (incorporating changes from Amendment 1)

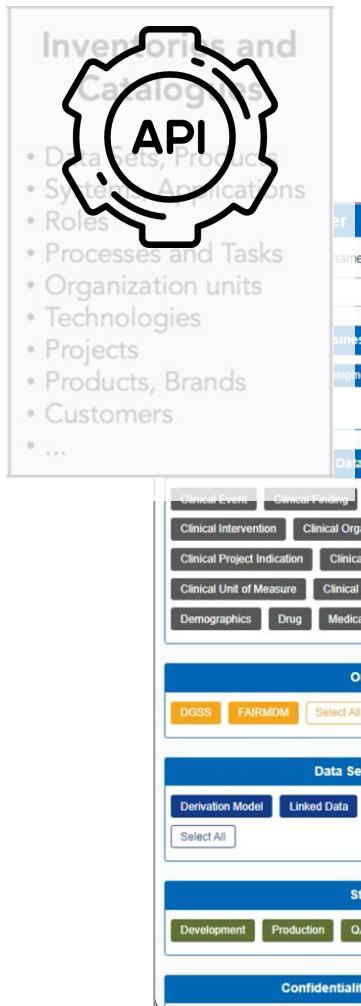
## Inventories and Catalogues

- Data Sets, Products
- Systems, Applications
- Roles

## Processes and Tasks

- Organization units
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- ...





**Inventories and Catalogues**

- Data Sets, Products
- Systems, Applications
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- Processes and Tasks
- Organization units
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- Customers
- ...



**Data Governance**

The Data Governance wheel diagram illustrates various domains of data management:

- Data Architecture
- Data Modeling & Design
- Data Storage & Operations
- Data Security
- Data Integration & Interoperability
- Document & Content Management
- Reference & Master Data
- Data Warehousing & Business Intelligence
- Metadata
- Data Quality

Red arrows point from the interface to the "Metadata" and "Data Quality" segments of the wheel.

Cedric Berger

**Anatomical Therapeutic Chemical Classification v1.0**

**Development**

ID: AnatomicalTherapeuticChemicalClassification\_v1  
Anatomical Therapeutic Chemical Taxonomy

Data Entity: Drug, Origin, DGSS

Data Service Type: Taxonomy, Status, Production

Confidentiality: Business Use Only, Privacy, Not Applicable

Had Primary Source: WhoDrug, Acquisition Domain: Commercial

Tag: Drug

**MedDRA Preferred Term v1.0**

**Development**

ID: MedDRA\_PT\_v1  
International dictionary for the classification of medical terms used in biopharmaceutical regulated activities (e.g. clinical trials, post-marketing surveillance etc.)

Data Entity: Medical Condition, Origin, DGSS

Data Service Type: Taxonomy, Status, Production

Confidentiality: Business Use Only, Privacy, Not Applicable

Had Primary Source: MedDRA, Acquisition Domain: Commercial

Tag: Clinical

**Country v1.0**

**Development**

ID: Country\_v1  
Country Reference List

Data Entity: Country, Origin, DGSS

Data Service Type: Reference List, Status, Production

Confidentiality: Business Use Only, Privacy, Not Applicable

Had Primary Source: ISO, Acquisition Domain: Internal

Tag: Country

**Unified Clinical Model Derivation Details v1.0**

**Development**

ID: UnifiedClinicalModelDerivationDetails\_v1  
Unified Clinical Model Derivation Details

Data Entity: Clinical Variable, Origin, DGSS

Data Service Type: Derivation Model, Status, Production

Confidentiality: Business Use Only, Privacy, Not Applicable

Had Primary Source: Clinical Data Standards, Acquisition Domain: Internal

Tag: Clinical

**Clinical Event v2.0**

**Development**

**Unified Clinical Model Derivation Summary v1.0**

**Development**

**Materials v1.0**

**Drug Manufacturing**

ID: Materials  
Materials List

Origin, FAIRMDM, Status, Development

Confidentiality, Business Use Only, Privacy, Not Applicable

Tag: All, Tag: FAIRMDM, Tag: Buying Engine

Tag: Logistics Hub and Spot ON, Tag: EOS S&OP

**MaterialbyId v1.0**

**Drug Manufacturing**

ID: MaterialsbyId  
specific Material by MDM Id

Origin, FAIRMDM, Status, Development

Confidentiality, Business Use Only, Privacy, Not Applicable

Tag: All, Tag: FAIRMDM, Tag: Buying Engine

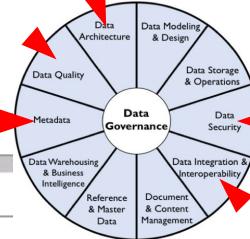
Tag: Logistics Hub and Spot ON, Tag: EOS S&OP

**MaterialsbyQuery v1.0**

**Drug Manufacturing**

ID: MaterialsbyQuery  
Specific Materials based on query

Origin, FAIRMDM, Status, Development



# FAIRification Metadata

Buckets of metadata to capture FAIR aspects

- Identification
- Lifecycle
- Controls
- Provenance, lineage
- Licensing
- Anonymization
- Controls, Access rights

ta

nce

## Licensing

entries

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Metadata Item	Description	Status	Release	Multiplicity	Example
Licensing Information <a href="#">🔗</a> <a href="https://data-qna.novartis.net/r1/enterprise/datastrategy/upperontology/v1/licensingInformation">https://data-qna.novartis.net/r1/enterprise/datastrategy/upperontology/v1/licensingInformation</a>	The defined licensing conditions that allow Novartis to use this data product. Only applicable to externally sourced data.	active	r1.0	zero or many	
FAIR Licensing Provenance					
FAIR Licensing	Licensing Information URL <a href="#">🔗</a> <a href="https://data-qna.novartis.net/r1/enterprise/datastrategy/upperontology/v1/licensingInformationURL">https://data-qna.novartis.net/r1/enterprise/datastrategy/upperontology/v1/licensingInformationURL</a>	A browsable URL to the location that contains the licensing conditions documentation.	active	r1.0	zero or many
FAIR Licensing Provenance					
FAIR Licensing	License Owner <a href="#">🔗</a> <a href="https://data-qna.novartis.net/r1/enterprise/datastrategy/upperontology/v1/licenseOwner">https://data-qna.novartis.net/r1/enterprise/datastrategy/upperontology/v1/licenseOwner</a>	License owner, responsible for the license.	active	r1.1	zero or one
FAIR Licensing Provenance					
FAIR Licensing	License Payer <a href="#">🔗</a> <a href="https://data-qna.novartis.net/r1/enterprise/datastrategy/upperontology/v1/licensePayer">https://data-qna.novartis.net/r1/enterprise/datastrategy/upperontology/v1/licensePayer</a>	License payer, accountable for license payment in case of commercial license.	active	r1.1	zero or one
FAIR Licensing Provenance					
FAIR Licensing	License Validity End Date <a href="#">🔗</a> <a href="https://data-qna.novartis.net/r1/enterprise/datastrategy/upperontology/v1/licenseValidityEndDate">https://data-qna.novartis.net/r1/enterprise/datastrategy/upperontology/v1/licenseValidityEndDate</a>	Date and time (ISO format) of the current license validity end date.	active	r1.1	zero or one
FAIR Licensing Provenance					
FAIR Licensing	License Validity Start Date <a href="#">🔗</a> <a href="https://data-qna.novartis.net/r1/enterprise/datastrategy/upperontology/v1/licenseValidityStartDate">https://data-qna.novartis.net/r1/enterprise/datastrategy/upperontology/v1/licenseValidityStartDate</a>	Date and time (ISO format) of the current license validity start date.	active	r1.1	zero or one
FAIR Licensing Provenance					
FAIR Licensing	Accrual Method <a href="http://purl.org/dc/terms/accrualMethod">http://purl.org/dc/terms/accrualMethod</a>	The method by which the resource is added to a collection.	active	r1.2	zero or one
FAIR Licensing Provenance					

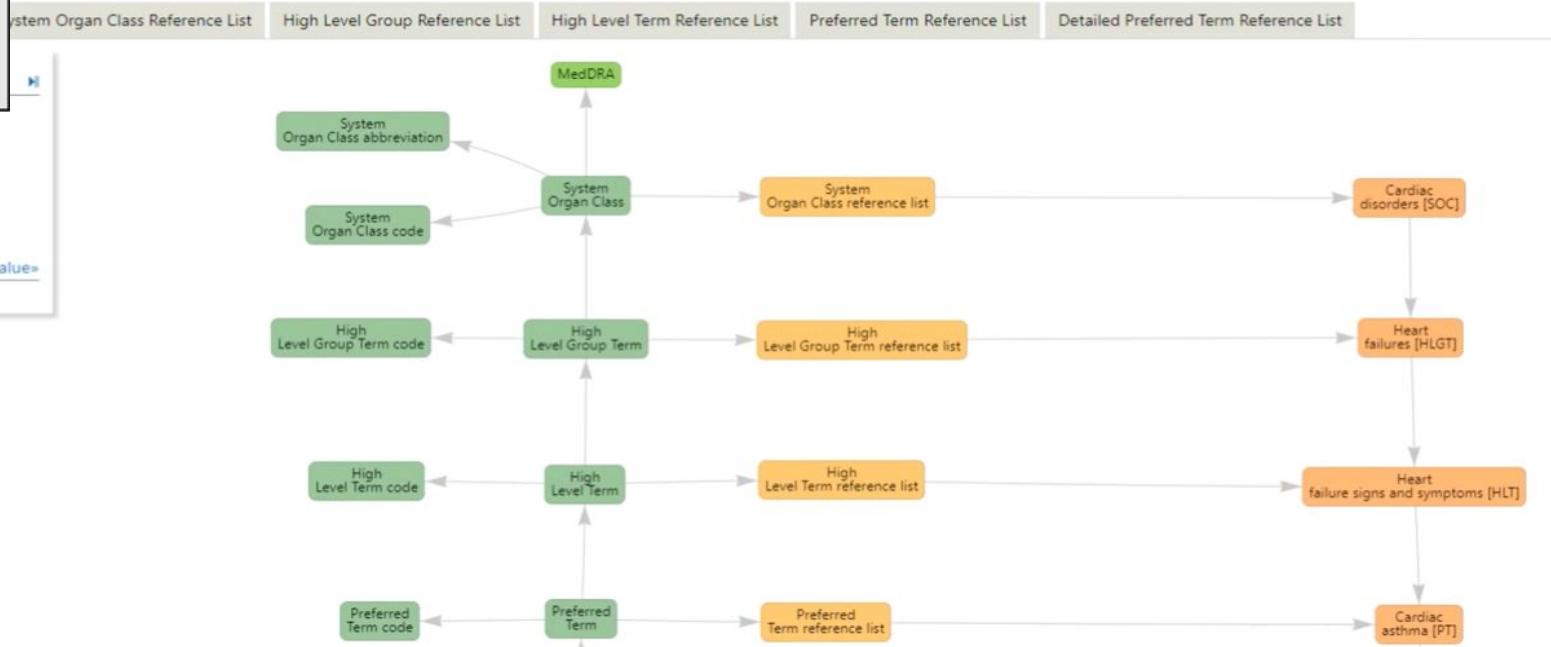
# Taxonomies Ontologies

Enterprise-specific  
cross-domain  
(OBO, BioPortal,  
MedDRA, ATC,...)

## Reference Lists

Enterprise-specific  
domain-specific  
flat lists

- Data object
  - Reference list
  - Reference value
  - «has broader»
  - «has narrower»
  - «has related»
  - «has reference list value»



## Models

External (CDISC, IDMP, OMOP) and internal (Conceptual, Logical, Physical) structuring models

## Master Data Schemas

W

a gene as defined in Metastore.

the functional unit of heredity which occupies a specific position on a particular chromosome and serves as the template for a product that contributes to a phenot

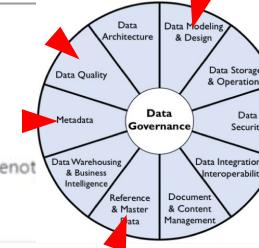
Documentation

Schema-Based Validation (JSON-LD/SHACL)

Schema-Based Validation (TTL/SHACL)

Data Model (JSON-LD)

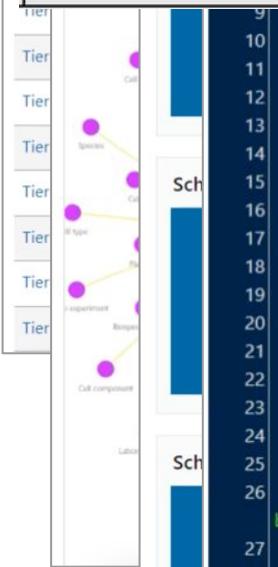
Example Data (CSV)



```

@context: {
  "sh": "http://www.w3.org/ns/shacl#",
  "nvro": "https://data.novartis.net/r1/research/data/ontology/v1/ObjectType/",
  "nrvs": "https://data.novartis.net/r1/research/data/ontology/v1/Shape/",
  "nrvt": "https://data.novartis.net/r1/research/data/ontology/v1/DataType/",
  "ms": "http://linkeddata.ont.nibr.novartis.net/metastore/",
  "ms-core": "http://linkeddata.ont.nibr.novartis.net/metastore/core#",
  "dc": "http://purl.org/dc/terms/",
  "schema": "http://schema.org/",
  "xsd": "http://www.w3.org/2001/XMLSchema#",
  "skos": "http://www.w3.org/2004/02/skos/core#",
  "rdfs": "http://www.w3.org/2000/01/rdf-schema#",
  "rdf": "http://www.w3.org/1999/02/22-rdf-syntax-ns#",
  "": "http://www.w3.org/ns/shacl#",
  "@vocab": "http://www.w3.org/ns/shacl#"
},
"@graph": [
{
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  "@type": [
    "NodeShape",
    "skos:Concept"
  ],
  "name": "Gene",
  "description": "Describes a gene as defined in Metastore.\n\nA gene is the functional unit of heredity which occupies a specific position on a particular chromosome and serves as the template for a product that contributes to a phenotype.", 
  "closed": true,
  "shapeType": "NodeShape"
}
]

```



# IDMP Ontology

FIBO for Healthcare Industry



Project description: <https://www.pistoiaalliance.org/projects/current-projects/idmp-ontology/>

## IDMP Ontology: Digital standard

Work together with the ISO IDMP Logical Model to augment

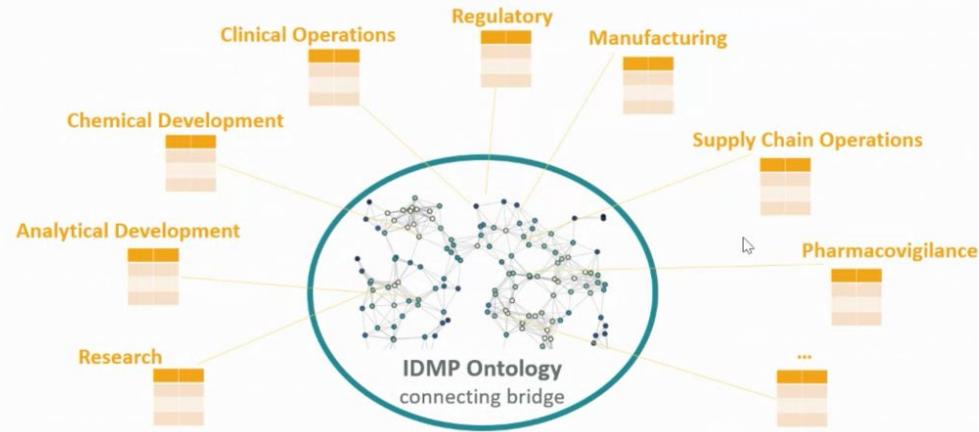


ISO standards to ensure patient safety with unambiguous identification of medicinal products.

PDF

## IDMP Ontology as the connecting bridge

Delivers data-centricity and collaboration across all functions



# Conclusion

*How does a KG supports DG4.0?*

**It makes DG fit-for-purpose:**

- DG = data constraints
- One-size-fits-all DGov hinders the business and digital transformation
- It is key to adapt constraints to use cases

**It makes DG more agile:**

- Business change by the day; so do requirements toward technology/data
- The KG is a digital twin of the business/governance landscape, it virualizes interdependencies
  - a change in a business, data, process description is directly related to DG entities
  - a change in governance directly impacts business/data instances in the KG

**It enable DG automation:**

DG entities interlinked in the graph can be (complex) queried and exported in standard format to configure, populate or controle data operations/transformations by human and machines

**It make DG sustainable and low cost/risks:** no silo, no proprietary solution, reusable, FAIR by-design, only what is needed

But... subject of innovation adoption, steep learning curve, facing resistance from legacy environment and the current technology-centric lucrative business model

Thanks for your  
Attention !

Questions?

