



## An international approach to a nuclear decommissioning ontology

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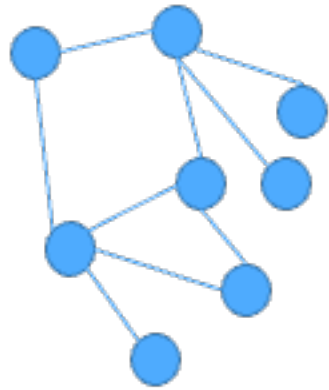
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# Overview

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- Introduction
- Development of the Decom Core Ontology
- Benefits of an ontological approach

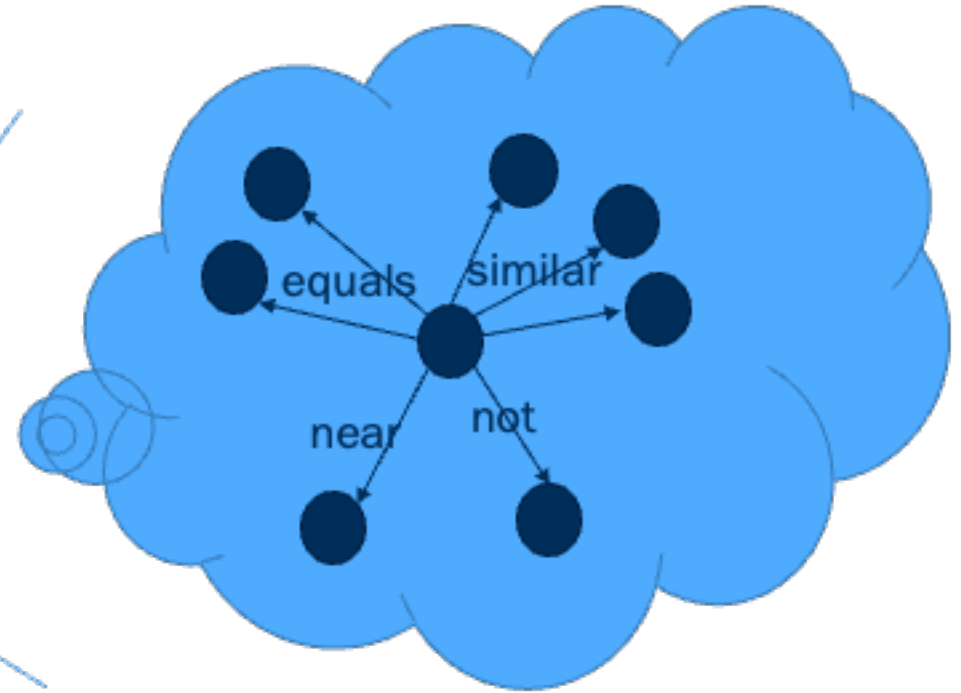
# Ontologies, Taxonomies, Thesauri



Ontology  
linking  
concepts



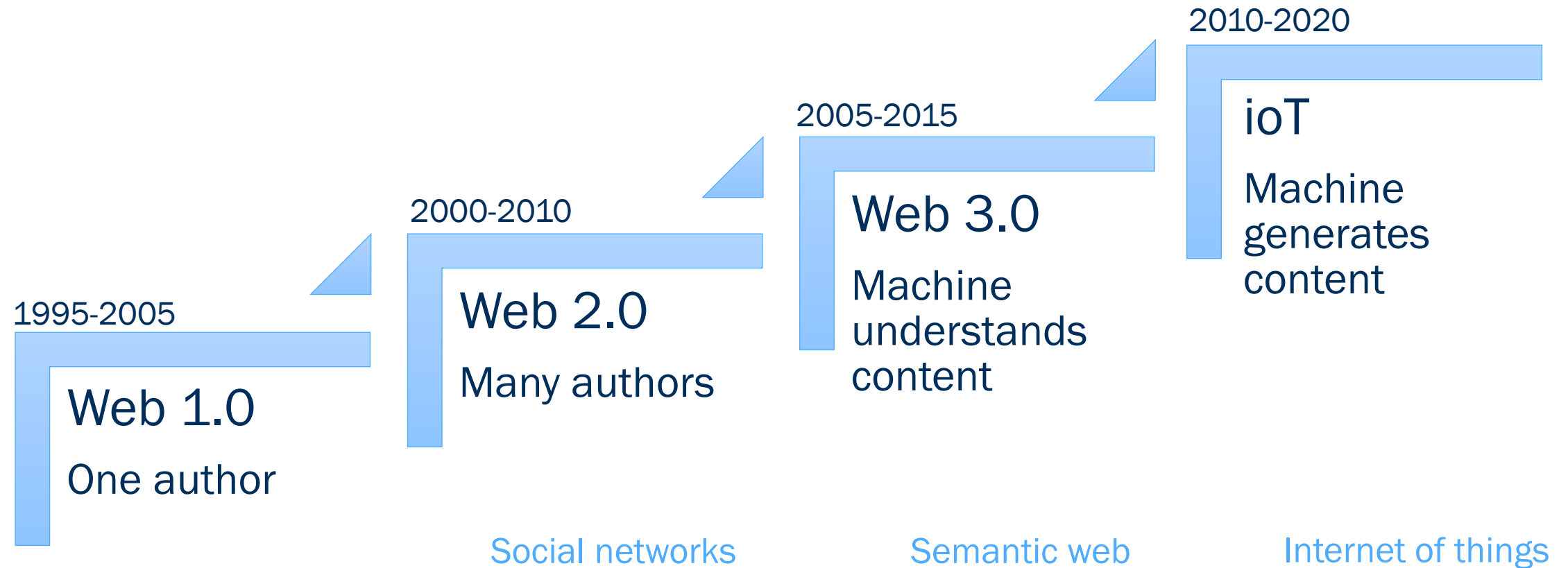
Taxonomy  
sorting terms inside  
concepts



Thesaurus/SKOS  
describing terms and their  
environment



# Progression of web technologies

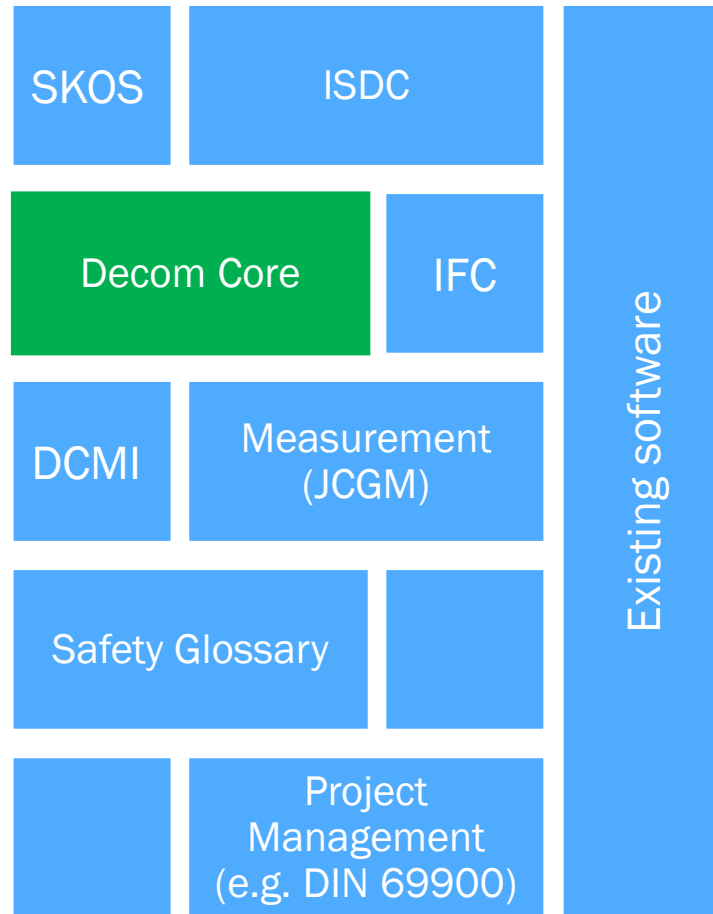


# Why an ontology for PLEIADES?

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- The task is to achieve a common platform for existing software for 3D and BIM in decommissioning
- Each software has it's own history, terms and concepts
- Direct interfaces would be very difficult to generate and maintain
- A common understanding of the decommissioning process is necessary
  - Between subject matter experts
  - Between subject matter experts and data scientists

# The development approach



- No intention to reinvent the wheel, use what is available, established and suitable
- Simultaneous top-down and bottom-up approach
- Decom core covers specific parts



# Development steps

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- Definition of boundaries
- Informal capture of concepts from subject matter experts
  - Series of discussions captured on mindmaps
  - Several topical workshops
  - Final review workshop with external participants
  - Integration of workshop outcomes
- Connection of concepts by core properties
- Reality check – can we describe a real project?
- Formalization (SKOS, definitions, translations, OWL-format)

## PLEIADES Ontology feedback

The diagram is a complex semantic network with the following components:

- Nodes (Concepts):** Knowledge, Actors, Roles, Documents, Decisions, Tasks, Applications, Methods, Assets, Materials, Risks, Measurements, Calibration, Physical Model, IFC, SSD, Schedules, Cost, Scenarios, Requirements, and a central 'Knowledge' node.
- Relationships (Edges):**
  - Knowledge *has knowledge* Actors
  - Actors *has role* Roles
  - Roles *writes, checks* Documents
  - Documents *is on jobs* Roles
  - Documents *works in* Decisions
  - Decisions *takes* Roles
  - Decisions *triggers* Tasks
  - Tasks *works in* Documents
  - Tasks *influences* Applications
  - Applications *aim for* Tasks
  - Applications *is applied for application* Methods
  - Methods *are applied to* Assets
  - Assets *context of* Materials
  - Assets *refers to asset* IFC
  - Assets *refers to asset* SSD
  - Materials *bound to* Risks
  - Risks *bound to* Assets
  - Risks *bound to* Methods
  - Risks *bound to* Applications
  - Risks *bound to* Measurements
  - Risks *bound to* Calibration
  - Risks *bound to* Physical Model
  - Risks *bound to* IFC
  - Risks *bound to* SSD
  - Risks *bound to* Schedules
  - Risks *bound to* Cost
  - Risks *bound to* Scenarios
  - Risks *bound to* Requirements
  - Measurements *used for* Calibration
  - Calibration *is an limited by* Measurements
  - Physical Model *is implicit in* Measurements
  - IFC *refers to asset* Assets
  - SSD *refers to asset* Assets
  - Schedules *related to* Cost
  - Cost *related to* Schedules
  - Scenarios *implies an application* Applications
  - Requirements *evidence to meet* Documents
  - Requirements *is on jobs* Documents
  - Requirements *is on jobs* Roles
  - Requirements *is on jobs* Decisions
  - Requirements *is on jobs* Tasks
  - Requirements *is on jobs* Applications
  - Requirements *is on jobs* Methods
  - Requirements *is on jobs* Assets
  - Requirements *is on jobs* Materials
  - Requirements *is on jobs* Risks
  - Requirements *is on jobs* Measurements
  - Requirements *is on jobs* Calibration
  - Requirements *is on jobs* Physical Model
  - Requirements *is on jobs* IFC
  - Requirements *is on jobs* SSD
  - Requirements *is on jobs* Schedules
  - Requirements *is on jobs* Cost
  - Requirements *is on jobs* Scenarios
- Sticky Notes:** Numerous yellow sticky notes are attached to the nodes, containing handwritten text in various colors (yellow, pink, blue, green) that provides additional context or examples for the concepts.

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Like

Dislike

Like

Dislike

[illegible]

The diagram is a 2x2 matrix titled "Managing Stakeholder Expectation". The vertical axis is labeled "INTEREST" and the horizontal axis is labeled "AVAILABILITY".

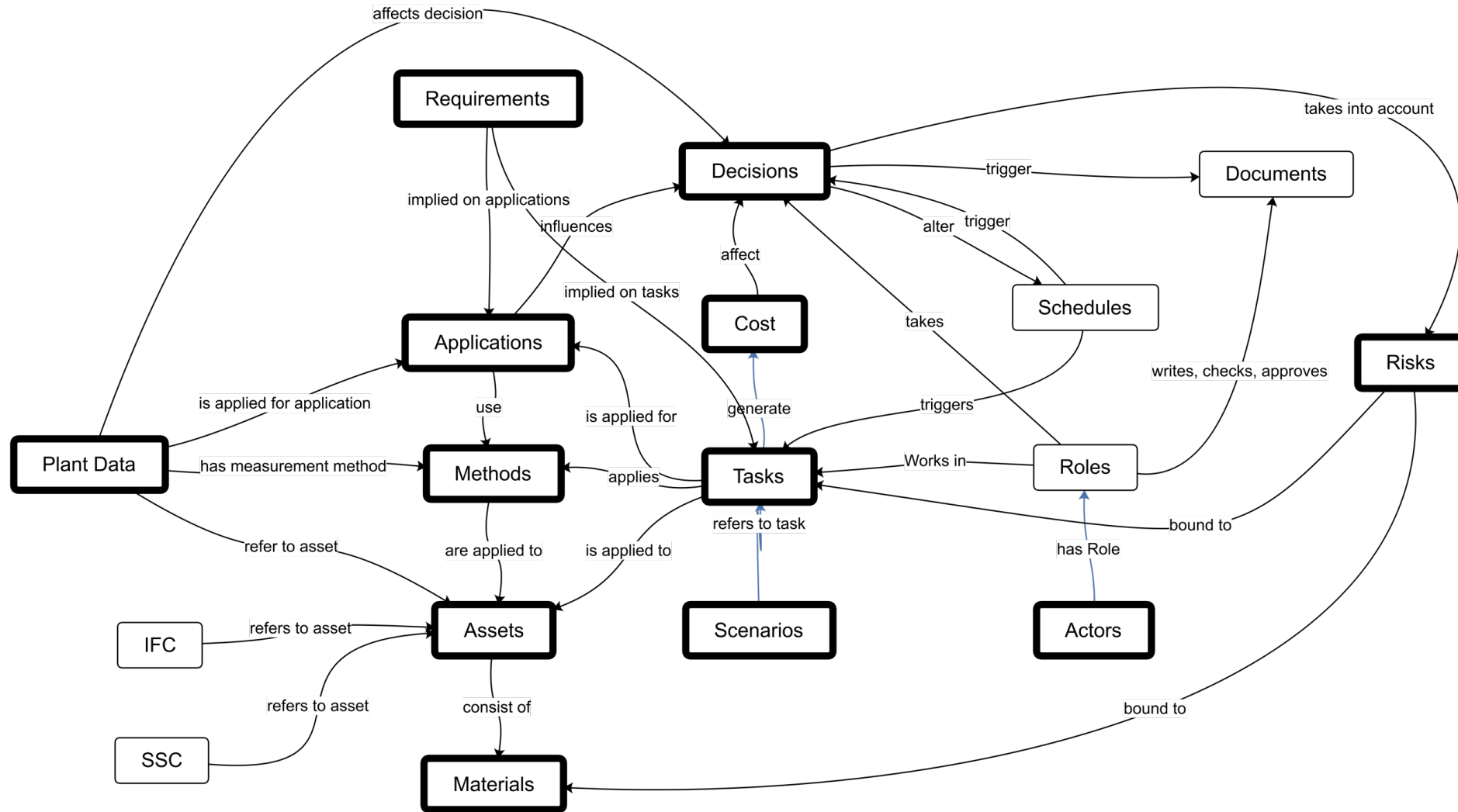
- Top-Left Quadrant (High Interest, Low Availability):** Labeled "Keep satisfied". It contains a single yellow sticky note with the text "Share the vision".
- Top-Right Quadrant (High Interest, High Availability):** Labeled "Actively engage". It contains three yellow sticky notes: "Share the vision", "Share the vision", and "Share the vision".
- Bottom-Left Quadrant (Low Interest, Low Availability):** Labeled "Monitor". It contains a single yellow sticky note with the text "Share the vision".
- Bottom-Right Quadrant (Low Interest, High Availability):** Labeled "Keep informed". It contains two yellow sticky notes: "Share the vision" and "Share the vision".

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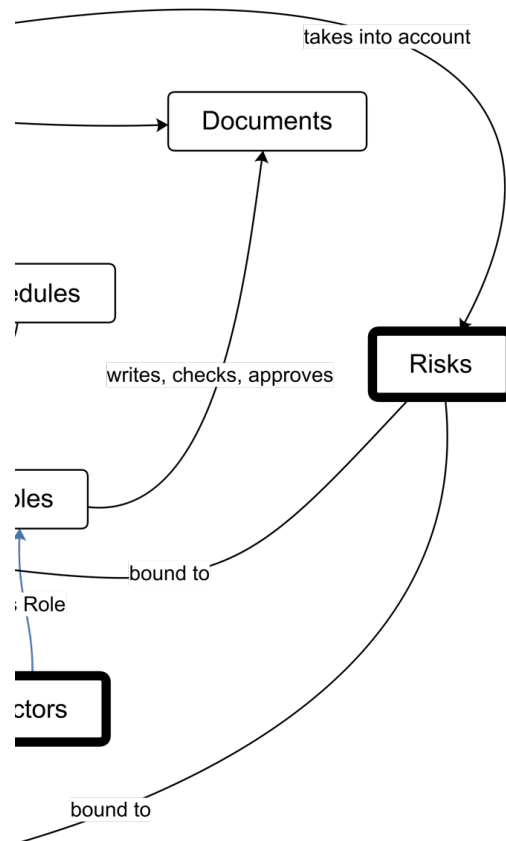




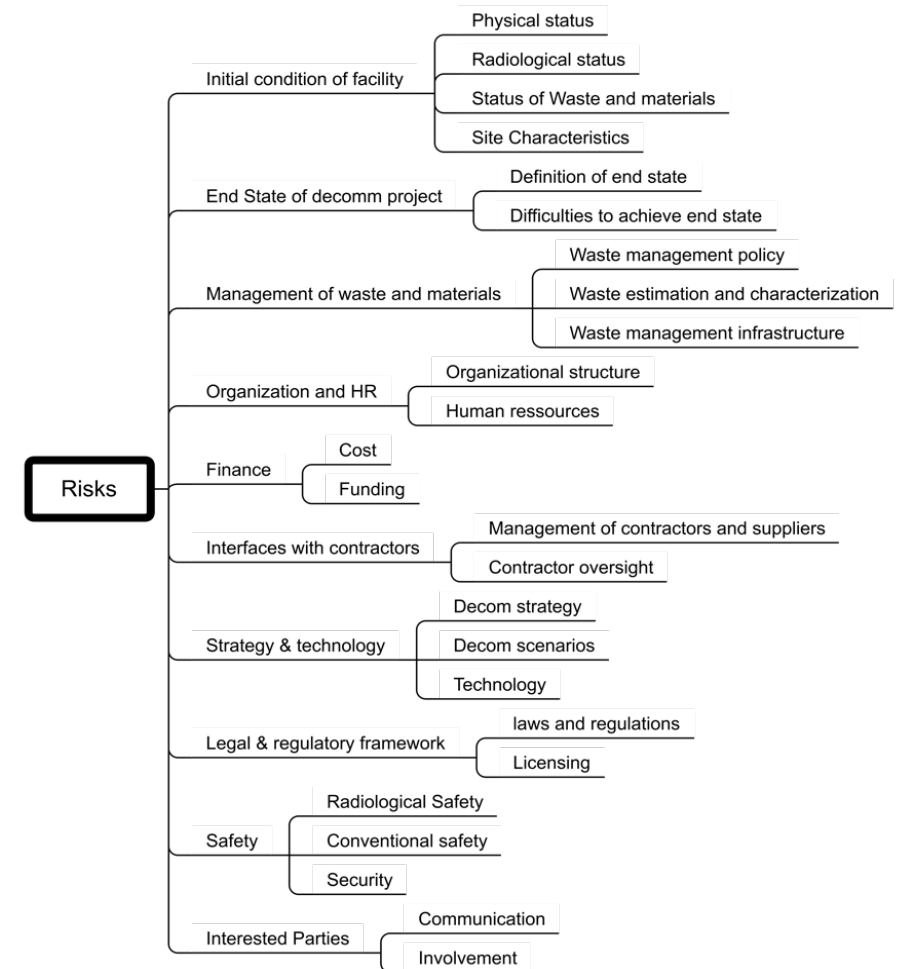
# The Decom Core Ontology



# Example – Decommissioning Risks



Definition:  
Effect of uncertainty on  
objectives [ISO 31000]



# Formalization - VocBench

The screenshot displays the VocBench web application. The left sidebar shows a hierarchical list of concepts under the 'Concept' tab. The main panel shows the detailed view for the concept 'Anforderung (de), Requirement (en)'. The interface includes a top navigation bar with 'About VocBench', 'Data', 'Metadata', 'SPARQL', 'History', 'Validation', and 'Tools'. The current project is 'Decom\_core\_ontology'.

**Concepts**

- Anforderung (de), Requirement (en)
- Anlagendaten (de), Plant Data (en)
- Anwendung (de), Application (en)
- Dokument (de), Document (en)
- Entscheidung (de), Decision (en)
- Handelnder (de), Actor (en)
  - Organisation (de), Organization (en)
  - Organisationseinheit (de), Team (de), Team (en)
  - Person (de), Person (en)
  - Team (de), Team (en)
- Kosten (de), Cost (en)
- Material (de), Material (en)
  - Spezielles Material (de), Special material (en)
  - Stoff (de), Chemical material (en)
  - Strukturmaterial (de), Structural material (en)
- Methode (de), Method (en)
- Risiko (de), Risk (en)
- Rolle (de), Role (en)
- Szenario (de), Scenario (en)
- Terminplan (de), Schedule (en), Terminplan (en)
- Vermögensgegenstand (de), Asset (en)
- Vorgang (de), Task (en)

**SKOS content**

- Labels / Translations
- Definitions
- Relations

**SKOS content details for 'Anforderung (de), Requirement (en)':**

- Types:** rdf:type: Concept (en)
- Top concept of:** skos:topConceptOf: Decom core (en)
- Schemes:** skos:inScheme: Decom core (en)
- Broaders:** (empty)
- Lexicalizations:** rdfs:label: Anforderung (de), Requirement (en)
- Notes:** skos:definition:   
Etablierte oder von den IAEA Fundamental Safety Principles, IAEA Safety Requirements oder durch (nationales oder internationales) Recht oder Regelungen geforderte Bedingungen. [IAEA Safety Glossary 2018]   
requirement (safety) That which is established or required by the Fundamental Safety Principles (IAEA Safety Fundamentals) [17] or IAEA Safety Requirements publications or by (national or international) laws or regulations [IAEA Safety Glossary 2018]
- Other properties:** skos:related:   
Anwendung (de), Application (en)   
Vorgang (de), Task (en)



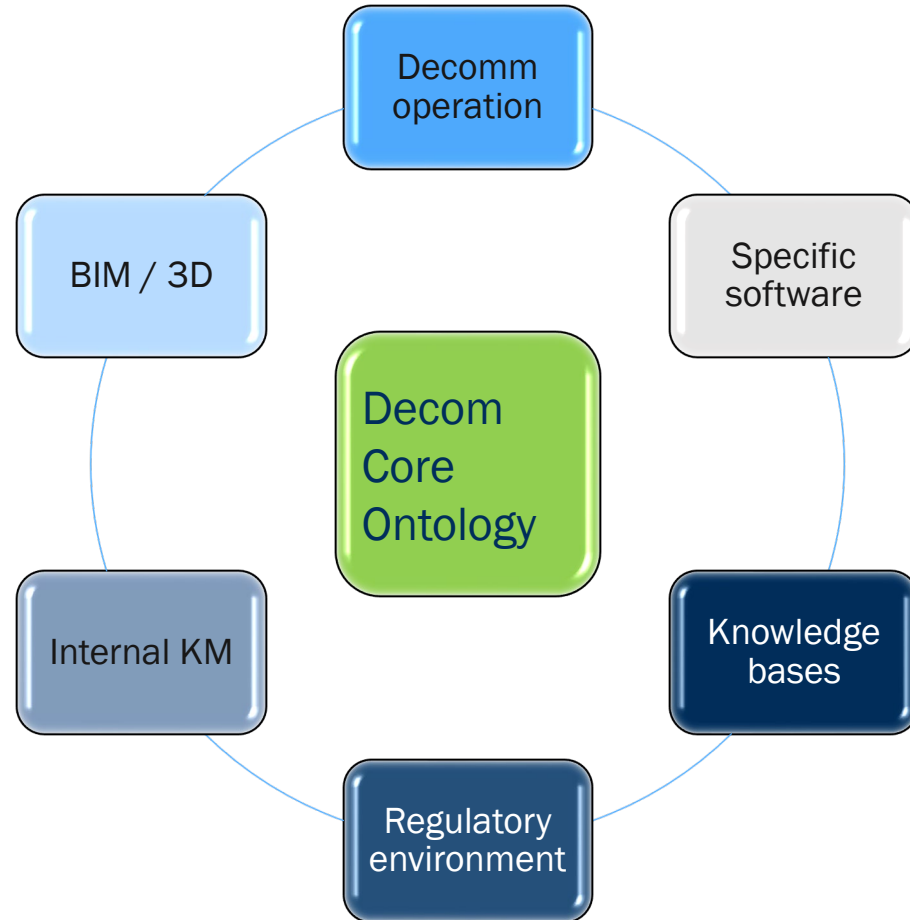
# The Conclusions

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- **Ontology** will be the basis of PLEIADES
- Provision of an **interface** will only work if all participants have a **common understanding** of the content
- Development follows
  - A **top-down approach** ensuring compatibility i.a. to IAEA approach for the top layer
  - A **bottom-up approach** from the participants existing solutions to ensure a common understanding
- **Alignment** of approaches highly recommended and **beneficial** for all sides
- **Time window** is rather narrow (ends **Mid 2021**)
- Clear limits of cooperation possibilities by funding scheme and financial capabilities



# Ontologies foster interoperability



Through the decom core ontology, it will be much easier to connect different applications and knowledge bases

In PLEIADES it will allow access also to other knowledge resources

It will be feasible to deploy knowledge content packages for multiple applications and frameworks

This will also allow to reuse the vast decommissioning knowledge



# Beyond PLEIADES

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- In parallel, a Working Group of IAEA, OECD-NEA and EU-JRC has formed and worked out an ontology for managing the knowledge on decommissioning
- Different scope, PLEIADES aims for managing decommissioning projects
- The interaction between the Working Group and PLEIADES allowed both sides to come to an aligned approach
- The ontology forms a basis for the further digitalization of decommissioning, for example AI

# Questions? Ideas?



## Contact:

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<http://pleiades-platform.eu>



[@pleiades platform](#)

