



# Metodologías (II)

**Asunción Gómez-Pérez** ([asun@fi.upm.es](mailto:asun@fi.upm.es))

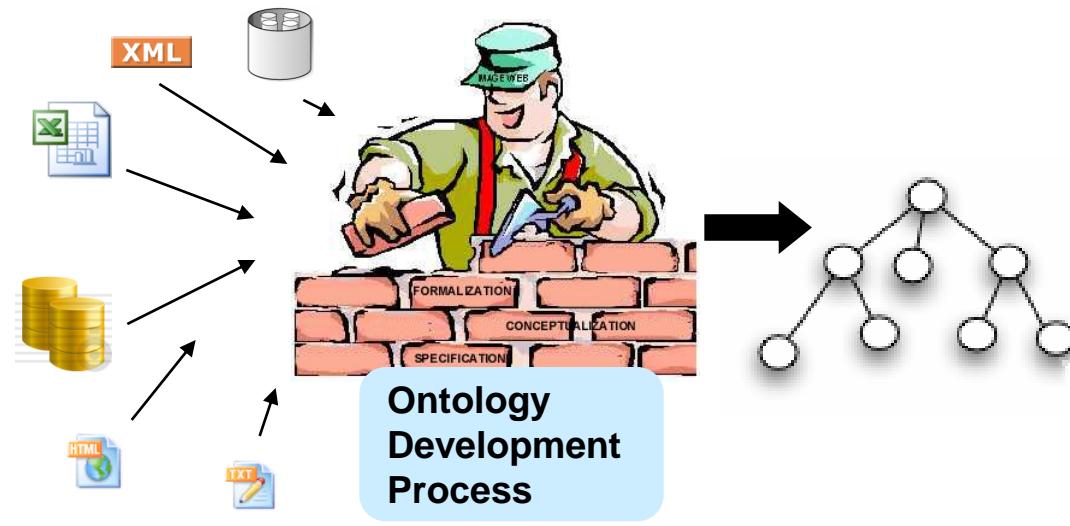
Credits to:

**Boris Villazón-Terrazas** ([bvillazon@fi.upm.es](mailto:bvillazon@fi.upm.es))  
**Mari Carmen Suárez -Figueroa** ([mcsuarez@fi.upm.es](mailto:mcsuarez@fi.upm.es))  
**Guadalupe Aguado** ([lupe@fi.upm.es](mailto:lupe@fi.upm.es))

*Work distributed under the license Creative Commons Attribution-Noncommercial-Share Alike 3.0*

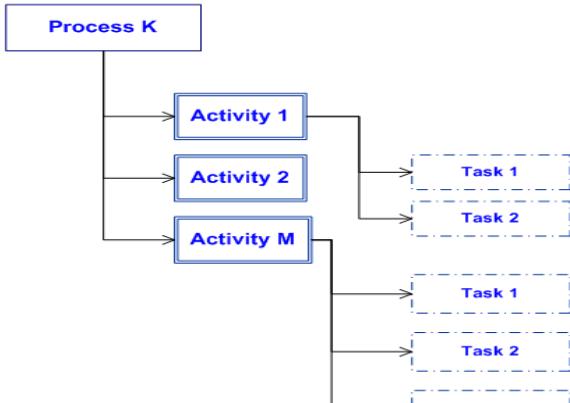
# Current situation in 2010

- Reuse of knowledge-aware resources
- Ontologies are built collaboratively
- Ontologies are connected in ontology networks



Process and activities covered:

- Ontology Specification
- Scheduling
- Non-Ontological Resource Reuse
- Non-Ontological Resource Re-engineering
- Reuse General Ontologies
- Reuse Domain Ontologies
- Reuse Ontology Statements
- Reuse Ontology Design Patterns



3

All processes and activities are described with:

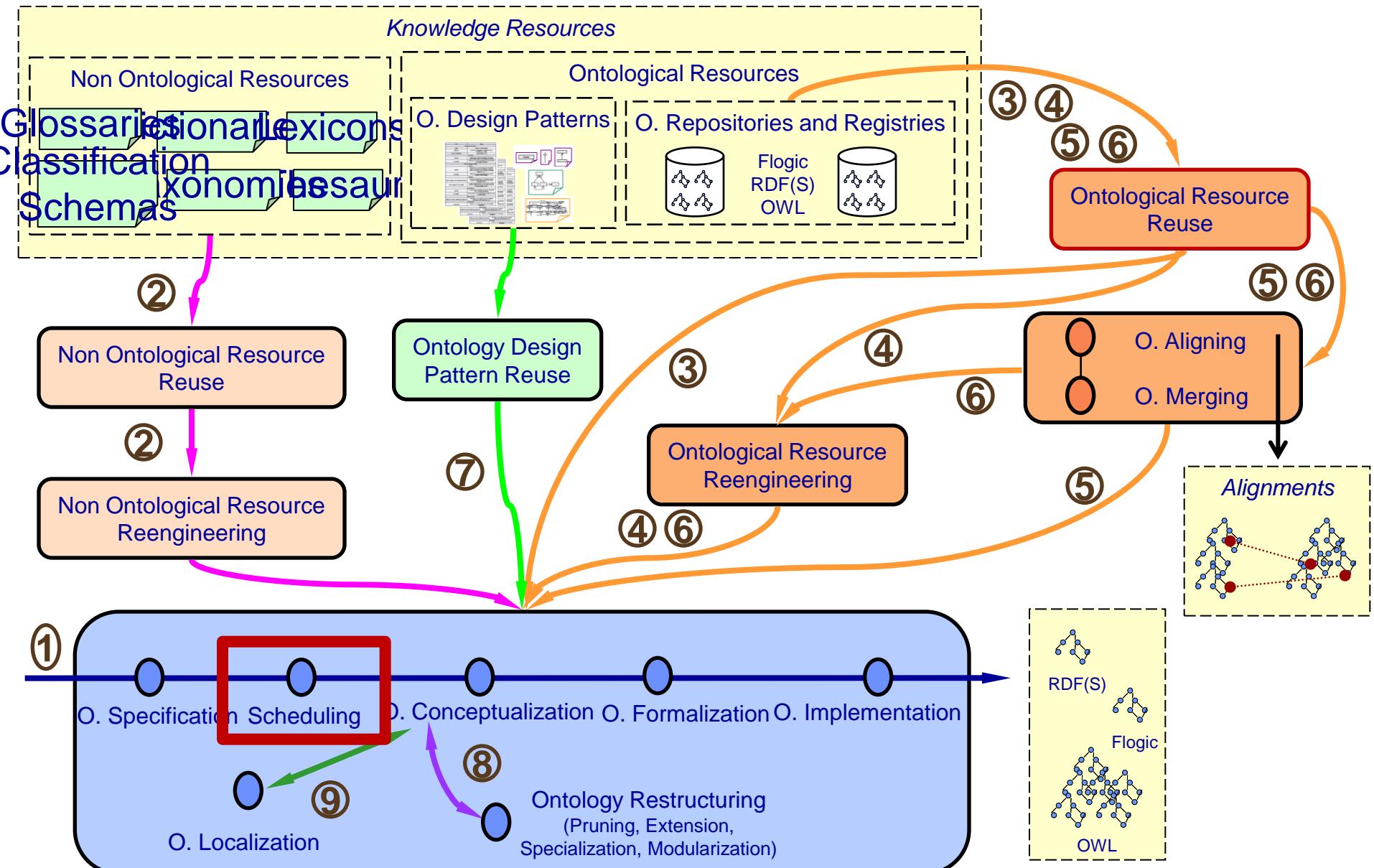
- A filling card
- A workflow
- Examples

Process or Activity Name	
Definition	
Goal	
Input	Output
Who	
When	

Task 1: Identify purpose, scope and level of formality  
 Task 2: Identify intended users  
 Task 3: Identify intended uses  
 Task 4: Identify requirements  
 Task 5: Group requirements  
 Task 6: Validate the set of requirements  
 Task 7: Prioritize requirements  
 Task 8: Extract terminology and its frequency

Start of ontological reuse → User, Domain Expert and ODT → Task 1 → Task 2 → Task 3 → Task 4 → Task 5 → Task 6 → Decision: Are they valid? → If Yes: Task 7 → Task 8 → Output → ODSO

© A. Gómez et al., 2012, University of Almería, Spain, D. Aguado, M. Espinoza



Ontology Support Activities: Knowledge Acquisition (Elicitation); Documentation; Configuration Management; Evaluation (V&V); Assessment

1, 2, 3, 4, 5, 6, 7, 8, 9

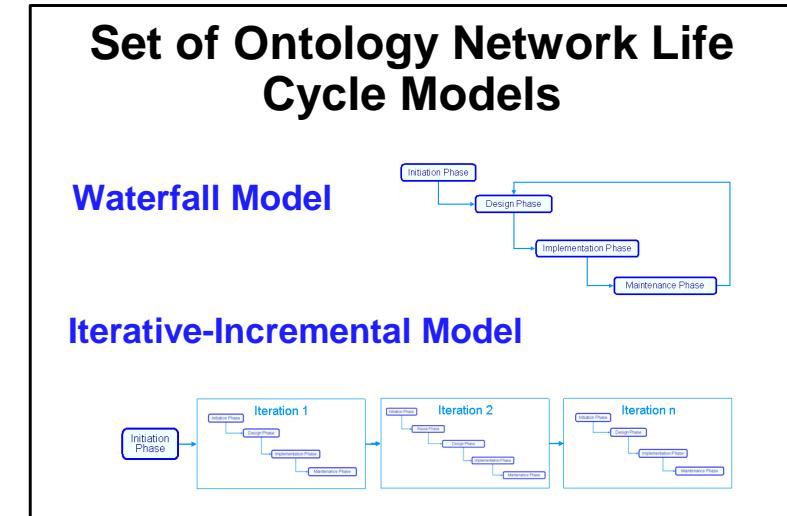
Aeroa, B. Villazón, E. Montiel, G. Aguado, M. Espinoza

# Scheduling Ontology Development Projects. Index

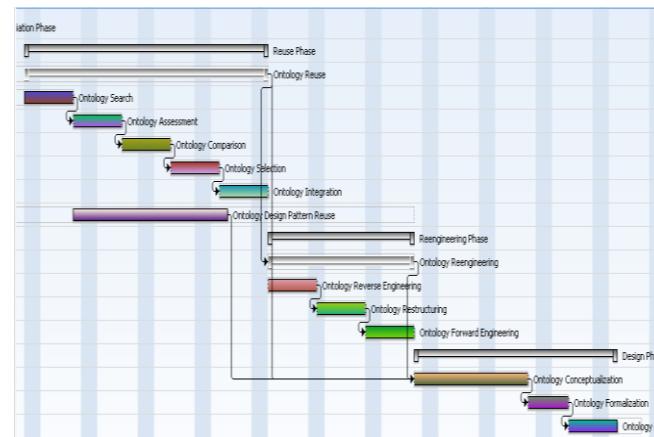
- **Life cycle models and life cycle**
- Guidelines for Scheduling
- Technological Support: gOntt

# Life Cycle Models and Life Cycle for Ontology Networks

- **Ontology network life cycle model:** a model to describe how to develop (and maintain) an ontology network project.



- The **ontology life cycle** is the specific sequence of activities that the ontology practitioners carry out for developing an ontology.



## Waterfall

- This model represents the stages as **sequential phases**
- This model family contains **5 versions**
- The **requirements** are
  - completely known, without ambiguities, and unchangeable at the beginning of the development

## Iterative incremental

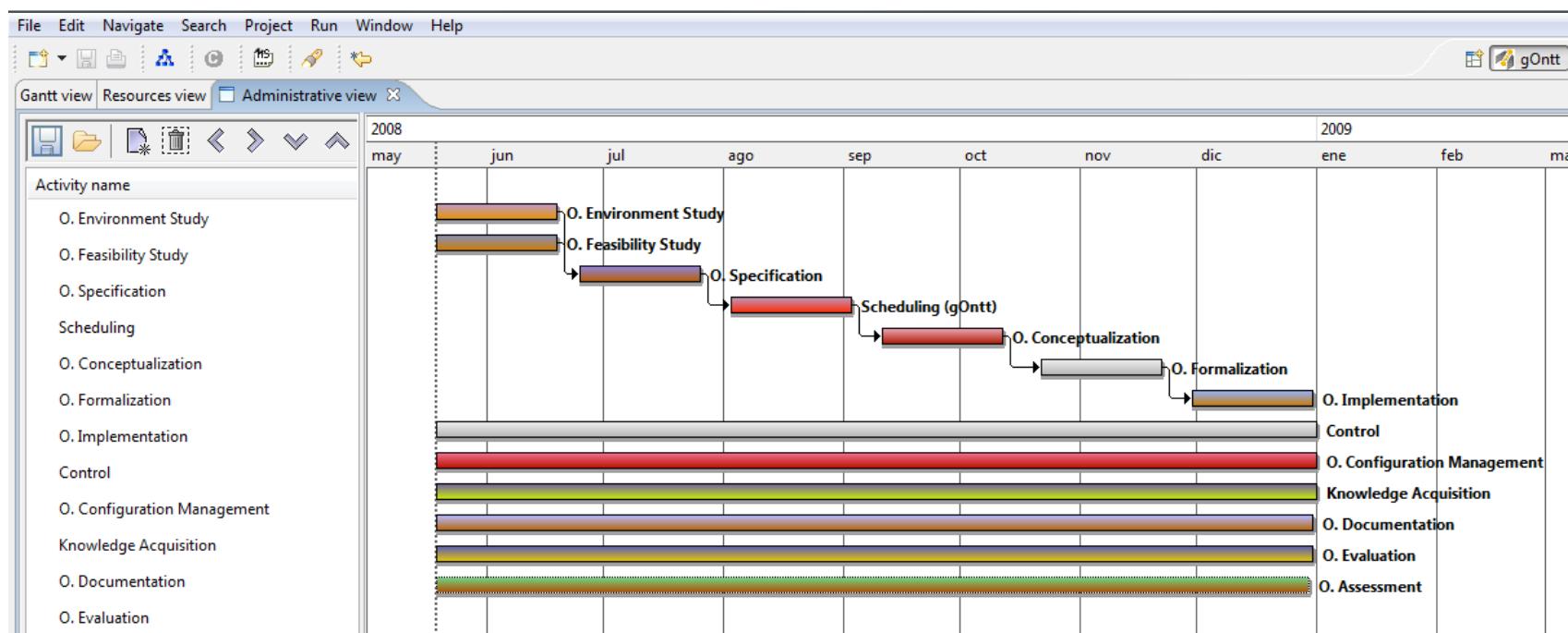
- The development of ontology networks is organized in a **set of iterations**
  - Each individual iteration can follow a different version of the waterfall model
- No backtracking is allowed between phases

# Ejemplo 1



Vamos a planificar el desarrollo de una ontología en el que se necesitan realizar

- La especificación de requisitos
- La planificación
- El desarrollo (conceptualización, formalización, implementación)



## Ejemplo 2 (I)

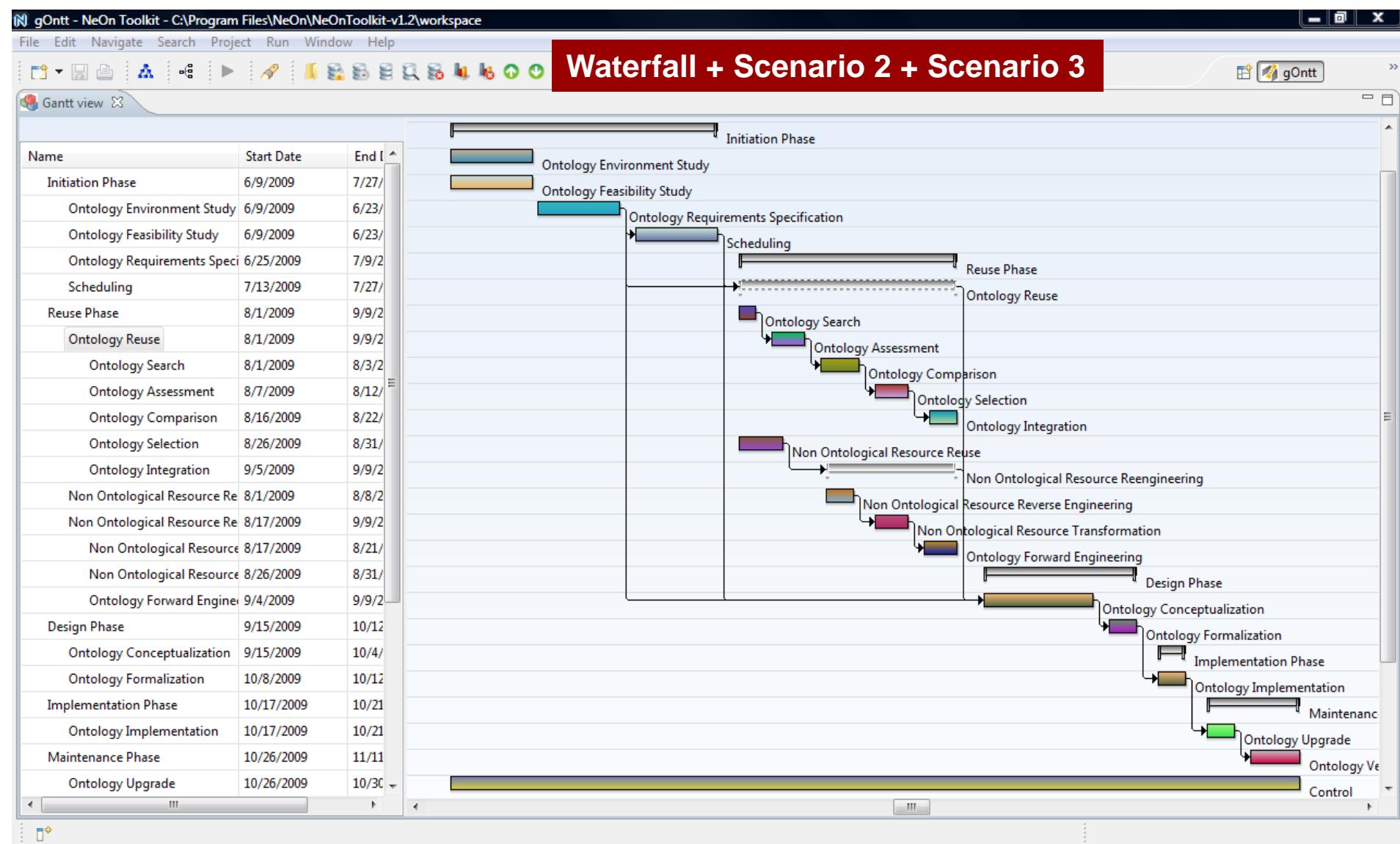


Vamos a planificar el desarrollo de una ontología en el que se necesitan realizar

- La especificación de requisitos
- La planificación
- La reutilización de ontologías
- La reutilización de recursos no ontológicos (NORs)
- El desarrollo (conceptualización, formalización, implementación)

*Nota:* La reutilización de recursos se debe realizar en paralelo.

## Ejemplo 2 (II)



# Ejemplo 3 (I)



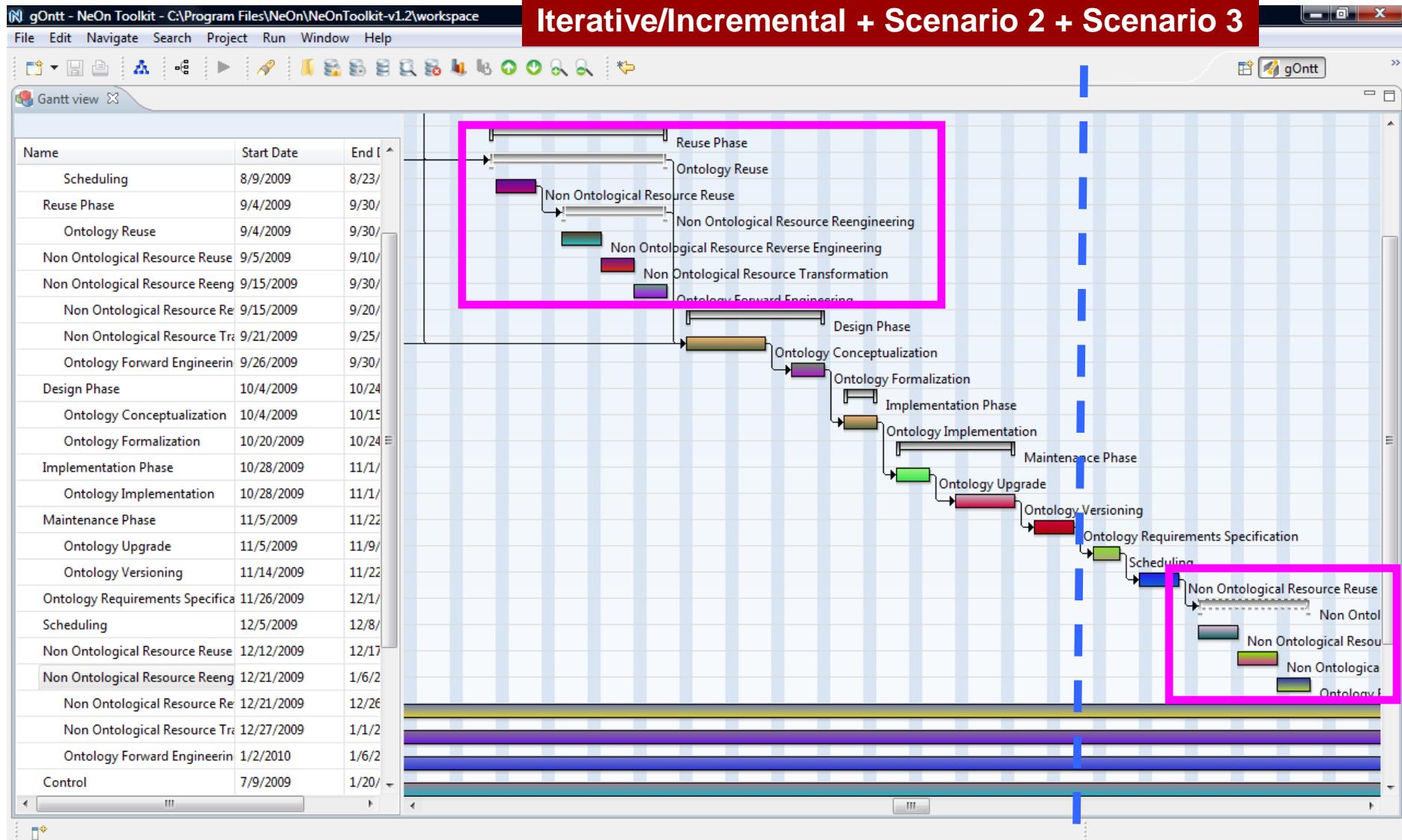
Vamos a planificar el desarrollo de una ontología en el que se necesitan realizar

- La especificación de requisitos
- La planificación
- La reutilización de recursos no ontológicos (NORs)
- La reutilización de ontologías
- El desarrollo (conceptualización, formalización, implementación)

Notas:

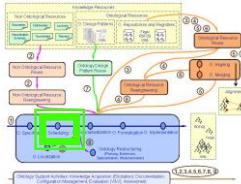
- La reutilización de NORs se debe realizar antes que la reutilización de ontologías.
- Cada proceso de reutilización se debe realizar en una iteración distinta.

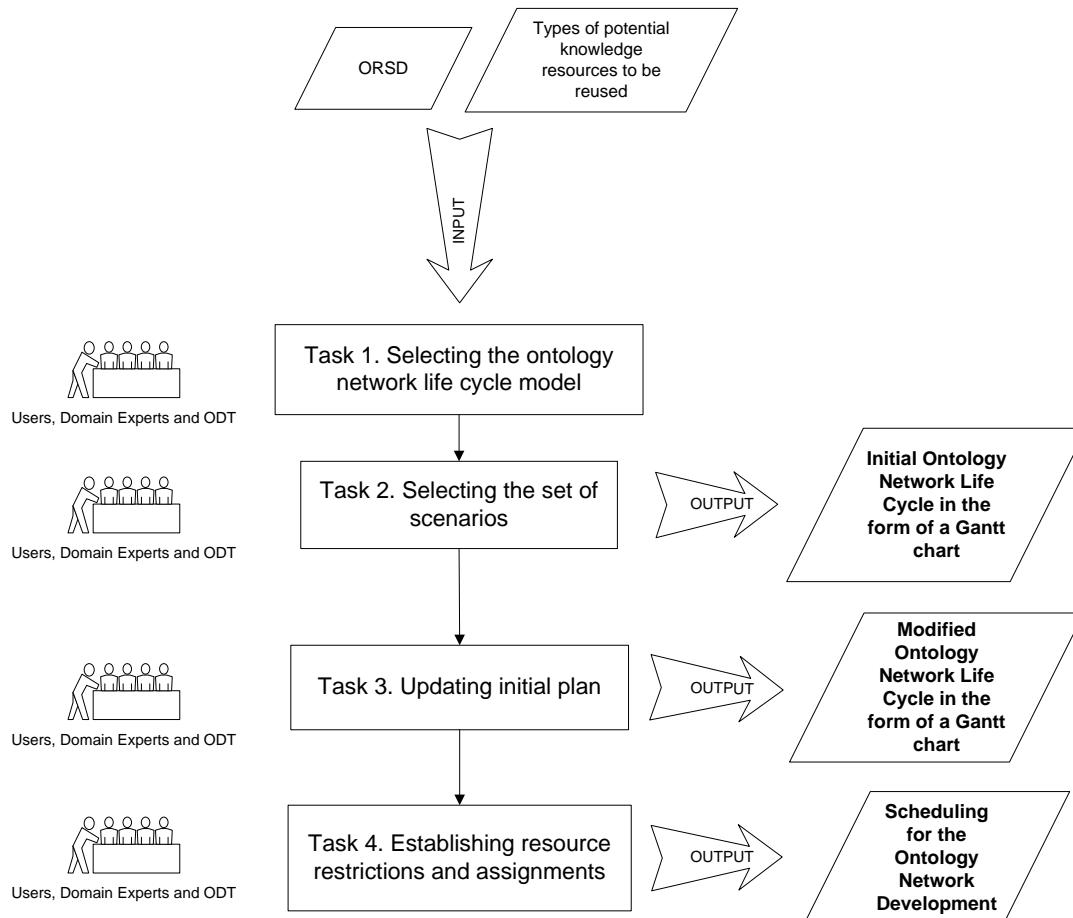
## Iterative/Incremental + Scenario 2 + Scenario 3



- Life cycle models and life cycle
- **Guidelines for Scheduling**
- Technological Support: gOntt

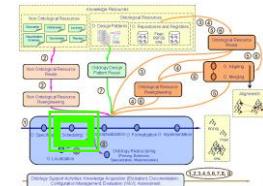
Scheduling	
<b>Definition</b>	
<p><i>Scheduling</i> refers to the activity of identifying the different activities and processes to be performed during the ontology development, their arrangement, and the time and resources needed for their completion.</p>	
<b>Goal</b>	
<p>The scheduling activity states a concrete programming or scheduling to guide the ontology network development, including processes and activities, their order, and time and human resources restrictions and assignments.</p>	
<b>Input</b>	<b>Output</b>
Ontology Requirements Specification Document (ORSD).	Schedule for the ontology network development.
<b>Who</b>	
Software developers and ontology practitioners, who form the ontology development team (ODT), in collaboration with users and domain experts.	
<b>When</b>	
This activity must be carried out after the ontology requirements specification activity.	





# Scheduling Ontology Development Projects. Index

- Life cycle models and life cycle
- Guidelines for Scheduling
- **Technological Support: gOntt**



- gOntt helps in scheduling an ontology network development.

- To create particular schedules from scratch
  - To create particular schedules in a guided way
    - gOntt provides wizard menus to select the ontology life cycle model and to select processes and activities
    - gOntt generates the **initial plan for the ontology project in the form of a Gantt chart**

- gOntt is a NeOn plug-in for integrating the NeOn Methodology and the NeOn Toolkit.

- gOntt provides filling cards, workflows, and methodological guidelines.
  - gOntt triggers the NeOn plug-ins associated to each process and activity planned.

---

# Scheduling. How gOntt looks like

**Workflow**

**Gantt Chart  
(Iteration 3: Scenarios 7, 8, and 9)**

The Gantt chart shows the following tasks and their timelines:

- Initiation Phase:** Starts on 03/26/2010, ends on 05/10/2010. Tasks include: Ontology Environment Study, Ontology Feasibility Study, Ontology Requirements Specification, and Scheduling.
- Reuse Phase:** Starts on 05/11/2010, ends on 05/20/2010. Task: Ontology Design Pattern Reuse.
- Design Phase:** Starts on 05/25/2010, ends on 06/21/2010. Tasks include: Ontology Conceptualization, Ontology Formalization, Ontology Restructuring, and Ontology Localization.
- Implementation Phase:** Starts on 06/25/2010, ends on 06/29/2010. Task: Ontology Implementation.
- Maintenance Phase:** Starts on 06/30/2010. Tasks include: Ontology Upgrade, Ontology Versioning, Control, Ontology Quality Assurance, Ontology Configuration Management, Ontology Elicitation, Ontology Documentation, Ontology Evaluation, and Ontology Assessment.

**Filling Card**

**Plugin**

**Ontology Localization: Workflow and Methodological Guidelines**

This cheat sheet helps you achieve the different tasks that conform the Workflow of an activity.

**Introduction**

The goal of this task is to select the most appropriate linguistic assets experts and the ontology development team carry out this task taking as input an ontology whose terms expressed in a source natural language need to be localized to a target natural language. The task output is a set of ontology terms with information of the text to be translated and its context.

**Task 1. Select the most appropriate linguistic assets**

Since there are no methodological guidelines for guiding in the selection of the ontology terms, we believe that the user is the one who has to choose the space of candidates to be localized. At this stage, the user may choose to localize the complete ontology or certain terms only.

**Task 2. Select ontology term(s) to be localized**

Different techniques can be used to automate this task:

- 1) cross-language term extraction to discover translation equivalents,
- 2) word sense discovery for discovering the possible senses or definitions of the translations, and
- 3) word sense disambiguation for selecting the most appropriate translation for each ontology term(s).

The task output is a ranked set of translations for each ontology term(s).

**Task 3. Obtain ontology term translation(s)**

For each ontology term, the goal of this task is to obtain the most appropriate translations in the target language. Domain and linguistic experts carry out this task taking as input the text of the ontology term(s) to be localized.

**Task 4. Evaluate term translation(s)**

**Task 5. Ontology update**

# gOntt. How to create the Gantt chart in two clicks (I)

## Selecting the life cycle model

The image shows two windows of the gOntt application overlaid on each other. Both windows have a blue title bar with the text 'New Ontology planning project'.

**Top Window:**

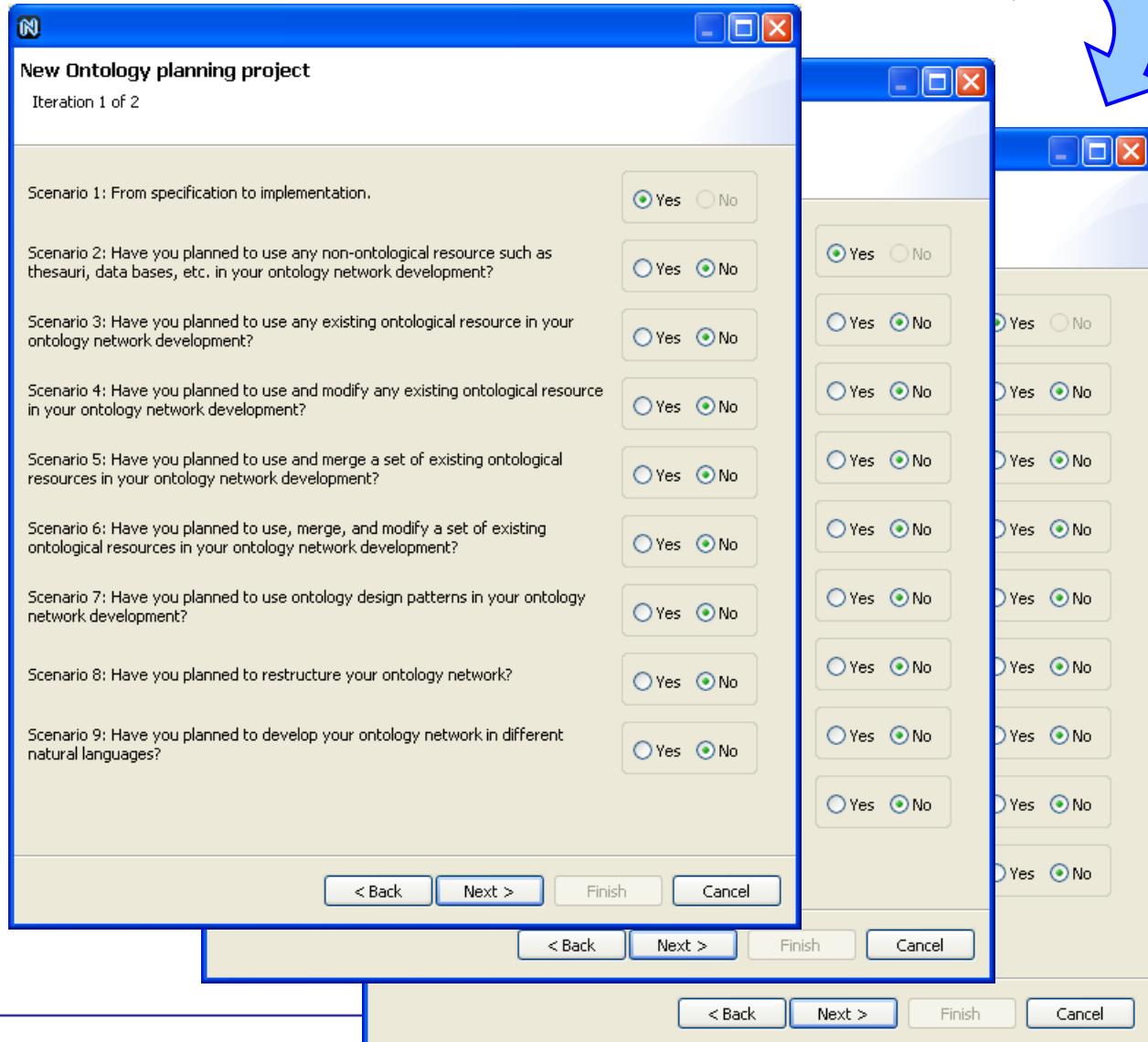
- Header: 'New Ontology planning project'
- Message: 'Please, answer to the questions'
- Question: 'Are the ontology requirements assumed to be fully known at the beginning of the ontology network development?'
- Buttons: 'Yes' (radio button) and 'No' (radio button)
- Buttons: '< Back' and 'Next >' at the bottom

**Bottom Window:**

- Header: 'New Ontology planning project'
- Text: 'The ontology life cycle model.'
- Question: 'Are the ontology requirements assumed to be fully known at the beginning of the ontology network development?'
- Buttons: 'Yes' (radio button) and 'No' (radio button, selected)
- Question: 'How many cycles do you want to perform in your ontology network development?'
- Input: A dropdown menu showing the value '2'
- Buttons: '< Back' and 'Next >' at the bottom, plus 'Finish' and 'Cancel'

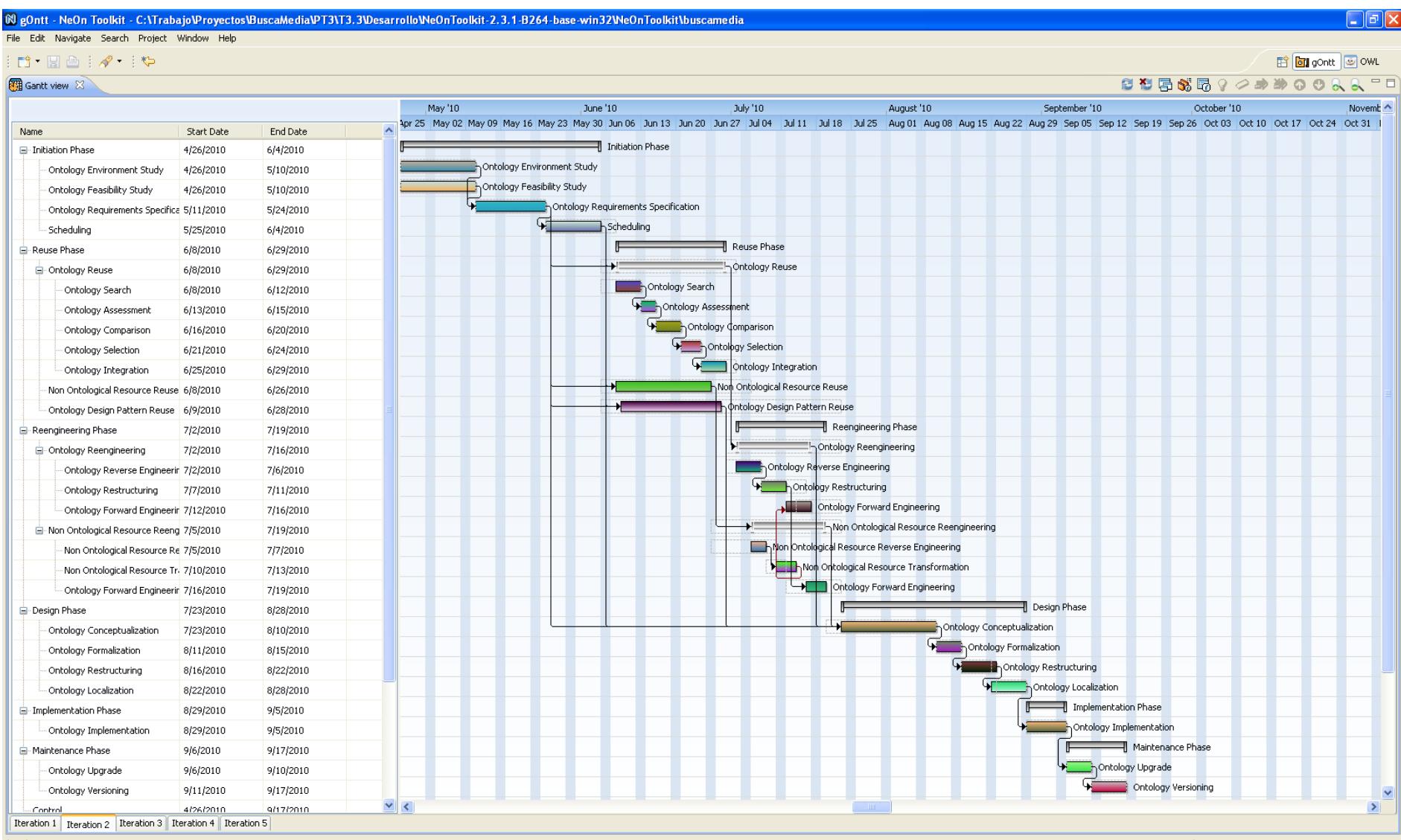
# gOntt. How to create the Gantt chart in two clicks (II)

## Selecting the scenarios

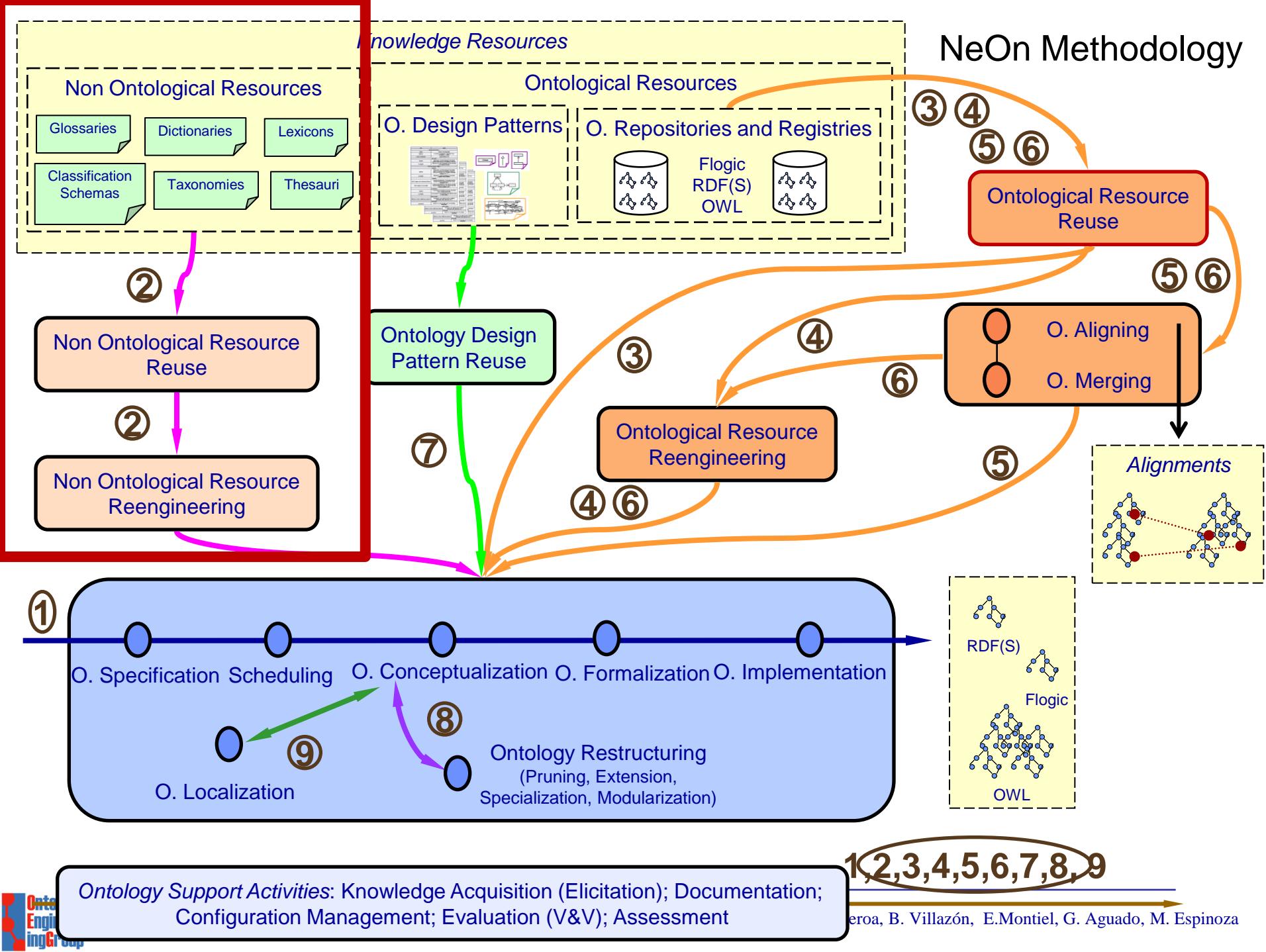


For each iteration

# gOntt. The preliminary plan as a Gantt chart



# NeOn Methodology



*Ontology Support Activities:* Knowledge Acquisition (Elicitation); Documentation; Configuration Management; Evaluation (V&V); Assessment

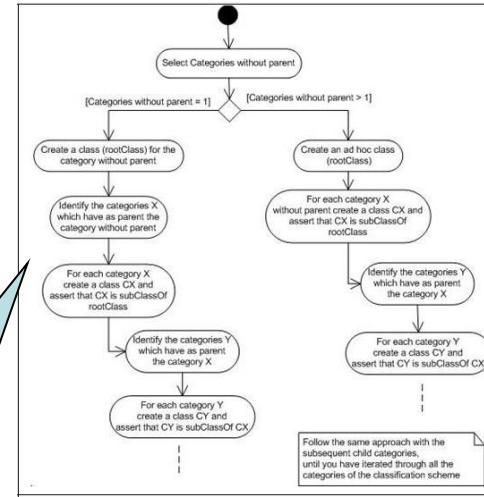
eroa, B. Villazón, E. Montiel, G. Aguado, M. Espinoza

# Motivation

resource

Id	Category Name	Parent
20000	Water area	1
21000	Environmental area	20000
22000	Fishing Statistical area	20000
24020	Jurisdiction area	20000
21001	Inland/marine	21000
21002	Ocean	21000
21003	North/South/Equatorial	21000
21004	Sub Ocean	21000
21005	Large Marine ecosystem	21000

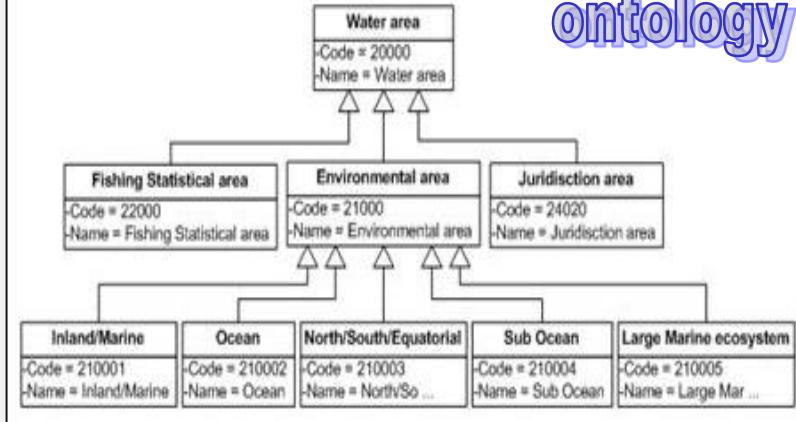
Algorithm



I want to transform my adjacency list-based classification into an ontology



(UML)  
Example Solution  
Ontology



ontology

Term	BT	NT	RT	UF
Rice	Cereals	Broken rice Basmati rice	Rice straw Oryza	Paddy
Oryza	Poaceae	Oryza sativa Oryza perennis Oryza rufipogon Oryza longistaminata Wetland rice Oryza glaberrima Upland rice Oryza punctata	Rice fields Cereal crops Rice	

Thesaurus

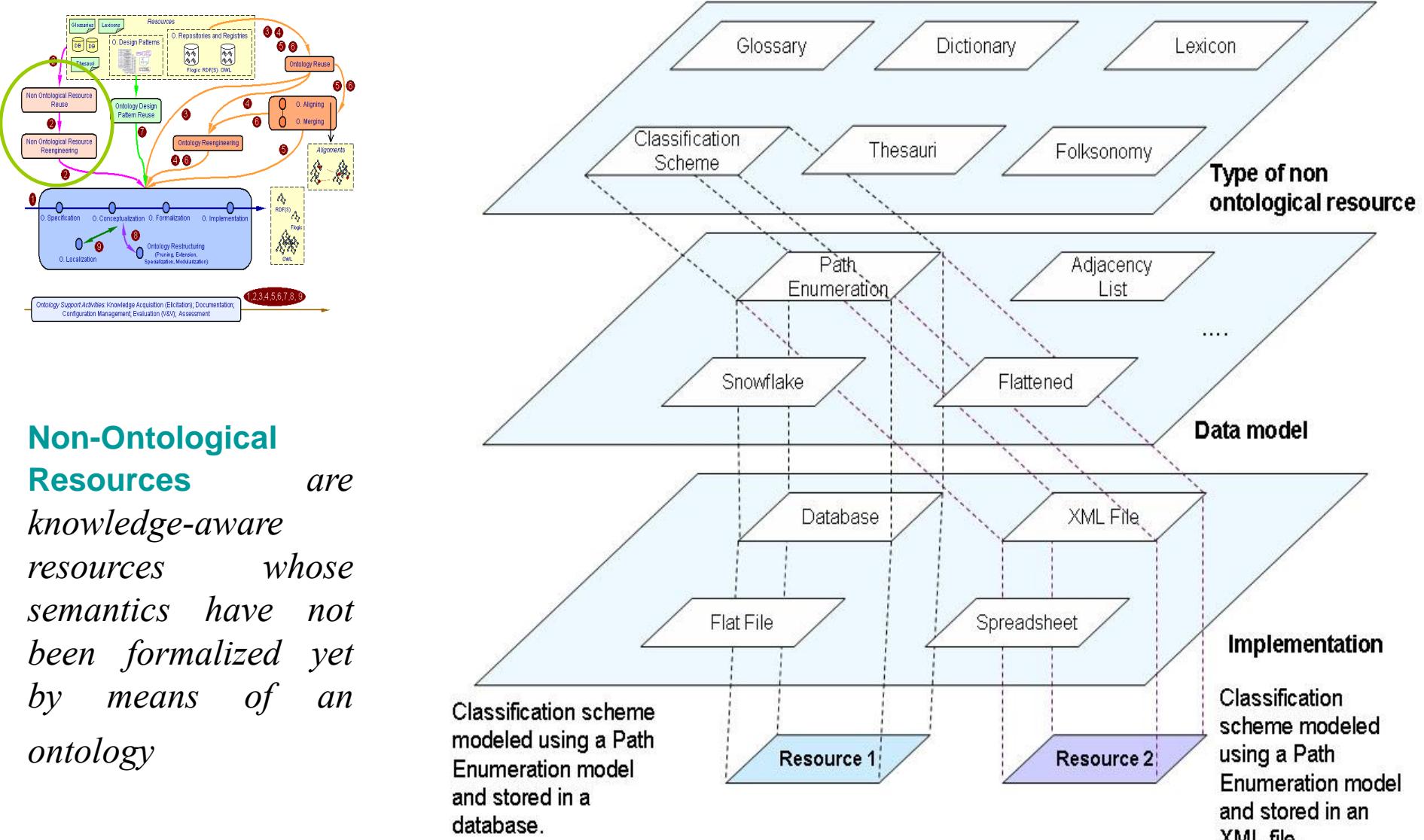
The screenshot shows the 'Catalog/ID' section of the Spanish National Geographic Catalog. It includes a header with the Spanish flag, the Government of Spain logo, and the Ministry of Development logo. Below the header, there are links for Archivo, Edición, Formato, Ayuda, and Dirección General del Instituto Geográfico Nacional. The main content area is titled 'NOMENCLÁTOR GEOGRÁFICO' and 'ENTIDADES'. A red box highlights the 'Catalog/ID' link. The list of entities includes: Nación, Región geográfica, Capital de Nación, Elevación orográfica, Comunidad Autónoma, Llanura/Raso, Ciudad con Estatuto de Autonomía, Depresión orográfica, Capital de Comunidad Autónoma, Accidente costero, Provincia, Accidente marítimo, Capital de Provincia, Accidente hidrográfico, Coprincipado, Corriente fluvial, Capital de Coprincipado, Canal, Comarca, Embalse, Capital de Comarca, Lago/Laguna, Isla Humedal, Capital de Isla, Isla Fluvial, Municipio, Isla marítima, Capital de Municipio, Garganta/Hoz, E.A.T.I.M., Lugar/Paraje, Capital de E.A.T.I.M., Paso/Collado, Población, Puerto de montaña, Comunidad de Municipios, Puerto comercial, Enclave, Helipuerto comercial, Territorio anejo, Aeródromo/Aeropuerto, Territorio autonómico, Estación de Ferrocarril, Zona neutral.

XX-YY-ZZ  
02-01-02  
02: transportation  
01: road  
02: 3-lines highway

Diccionario usado por Geotools diccionario de conversión DGN -> EDM. FORMATO:				
Tipo_dgn Entidad Tipo_istream Grupo Código_bcn cerrado Trato [				
Tipo_dgn...NNSCCGG				código_bcn...TTGGSS
NN : Nivel elemento				TT : Tema
S : Estilo linea dgn				GG : Grupo
CCC : Color linea dgn				SS : Subgrupo
GG : Grosor linea dgn				
Entidad				Tipo_istream....???
104 : polilínea				
203 : célula se convierte a símbolo				
-1 : célula se explota en sus componentes				
304 : rótulo				
Grupo				
0 : sin determinar				
1 : carreteras				
2 : hidrografía				
3 : conducciones				
4 : administrativo				
En textos el grupo corresponde a la fuente Microstation				
Cerrado				
en líneas				en textos
1 : perimetral				n : altur
0 : entidad lineal abierta				
-1 : cultivo perimetral				
-2 : cultivo linea abierta				
Trato				
I: Intocable	A: Altimetría	N: No tratar	T: Textos Asociados	
S: Textos sueltos	C: Cultivo	F: Solo salida	!: Tratar norma	
			TTGGSS	
02000900 104 1 0 090101 1 !I Marco de hoja				
02300902 104 2 0 100200 0 !I Base Geodésica de Ma				
06005900 104 3 0 025102 0 !I Acantilado				
06006900 104 4 0 025302 0 !I Costa rocosa no acar				
06009900 104 5 2 037402 1 !I Playa Fluvial de gui				
06012900 104 6 0 025501 1 !I Lavas. Contorno				
06015900 104 7 0 058303 0 !I Dique de hormigón >				
06018900 104 8 0 058304 0 !I Dique de hormigón <				
07013400 104 9 0 058302 0 !I Dique de tierra				
07016400 104 10 0 055401 1 !I Vertedero. Contorno				
11003003 104 11 1 062202 0 !I Autopista. Enlace				
11012000 104 12 0 056091 1 !I Patio. Contorno				
13003300 104 13 1 060101 0 !I Autopista. Eje				
13303300 104 14 1 060131 0 !I Autopista en Contruc				
14002401 104 15 1 066901 1 !I Puesto de s.o.s.				
14003301 104 16 1 067901 1 !I Peaje				
15003003 104 17 1 062204 0 !I Autovía. Enlace				
15003004 104 18 1 060701 0 !I Autovía				

Implicit knowledge coded in numbers

# Types of non-ontological resources

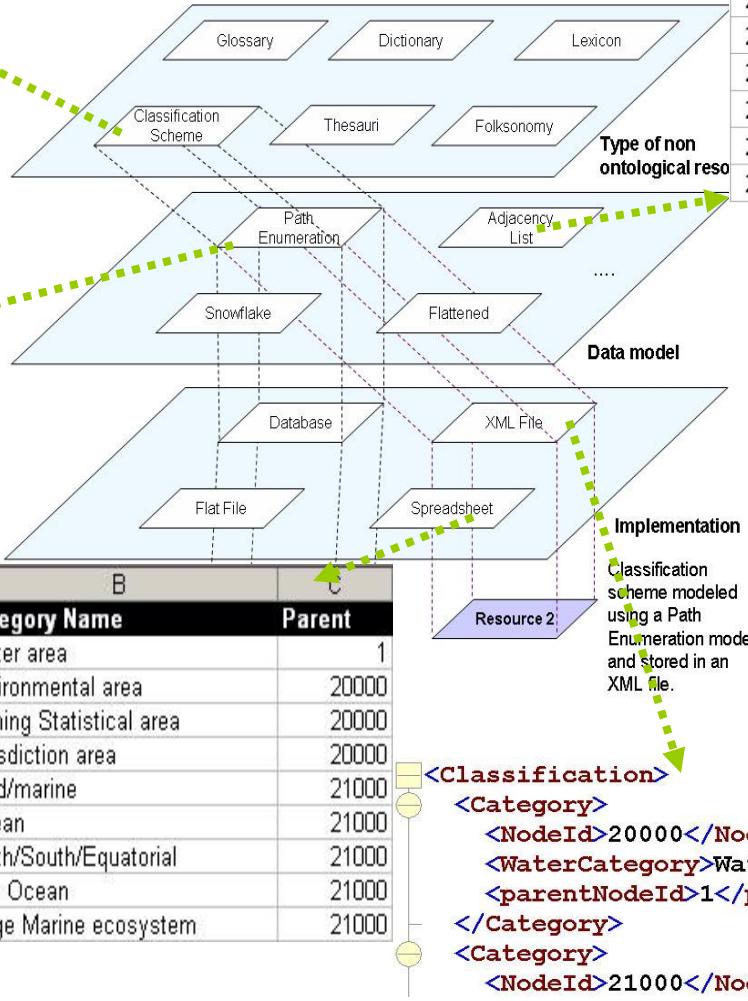


# Types of non-ontological resources

<input checked="" type="radio"/>	Water area
<input type="checkbox"/>	Environmental area
<input type="checkbox"/>	Inland/marine
<input type="checkbox"/>	Ocean
<input type="checkbox"/>	North/South/Equatorial
<input type="checkbox"/>	Sub-Ocean
<input type="checkbox"/>	Large Marine Ecosystem
<input type="checkbox"/>	Fishing Statistical area
<input type="checkbox"/>	Jurisdiction area
<input type="checkbox"/>	Fishery Management area
<input type="checkbox"/>	Reporting area

Id	Category Name
20000	Water area
20000.21000	Environmental area
20000.22000	Fishing Statistical area
20000.24020	Jurisdiction area
21000.21001	Inland/marine
21000.21002	Ocean
21000.21003	North/South/Equatorial
21000.21004	Sub Ocean
21000.21005	Large Marine ecosystem

A	B	C
Id	Category Name	Parent
1	Water area	1
2	20000 Environmental area	20000
3	21000 Fishing Statistical area	20000
4	22000 Jurisdiction area	20000
5	21001 Inland/marine	21000
6	21002 Ocean	21000
7	21003 North/South/Equatorial	21000
8	21004 Sub Ocean	21000
9	21005 Large Marine ecosystem	21000
10		



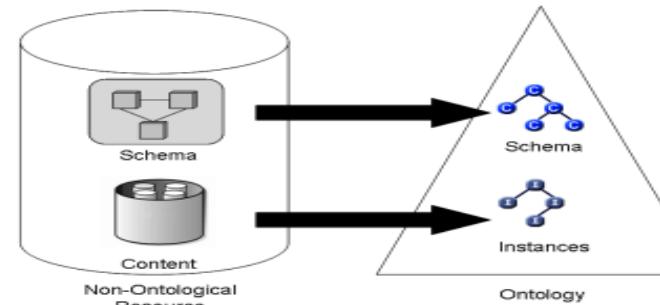
```

<Classification>
  <Category>
    <NodeId>20000</NodeId>
    <WaterCategory>Water Area</WaterCategory>
    <parentNodeId>1</parentNodeId>
  </Category>
  <Category>
    <NodeId>21000</NodeId>
  </Category>

```

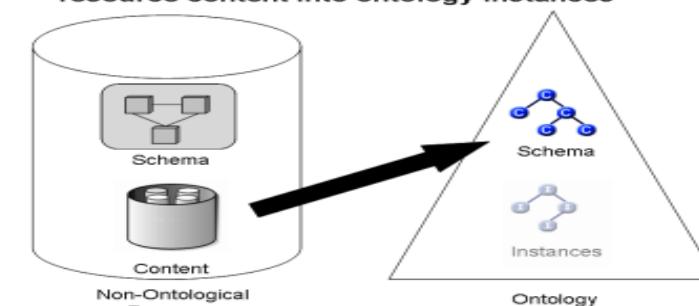
# Approaches to transform resources into ontologies

ABox



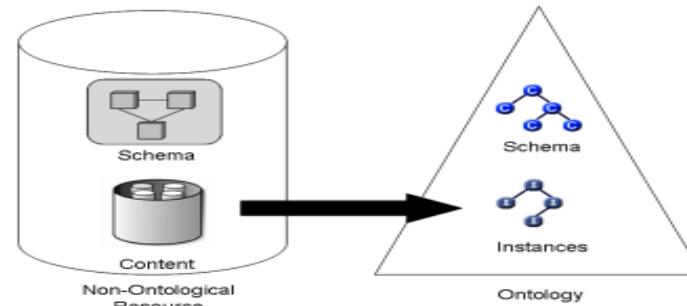
Transforming resource schema into an ontology schema, and resource content into ontology instances

TBox



Transforming resource content into an ontology schema

Population



Transforming resource content into instances of an existing ontology

# From Knowledge resources to Ontologies

- Making explicit the semantic of the relations between concepts

```
<TERM>
<DESCRIPTOR>water</DESCRIPTOR>
<RT>distilled water</RT>
<RT>tear</RT>
</TERM>
```

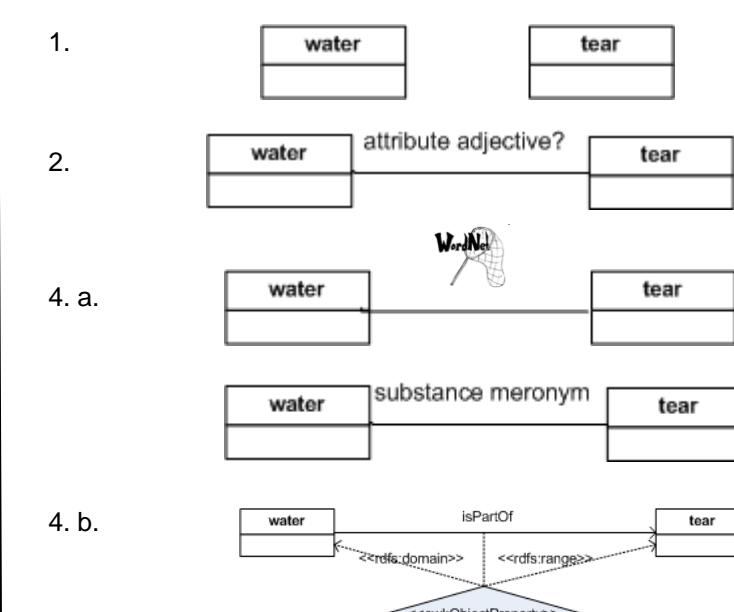
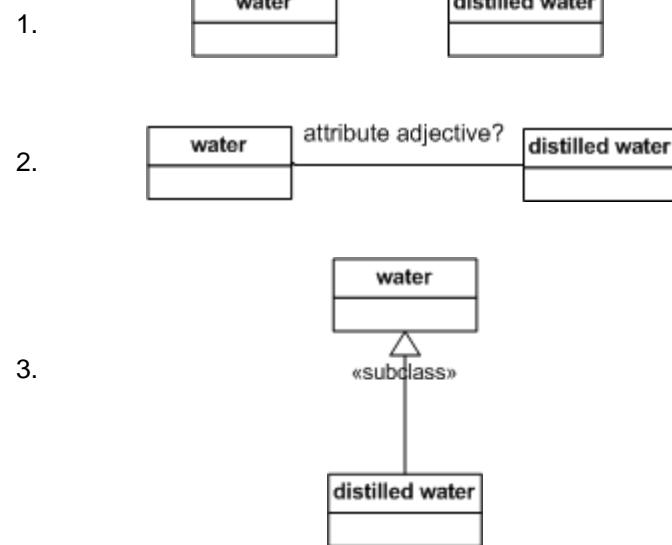
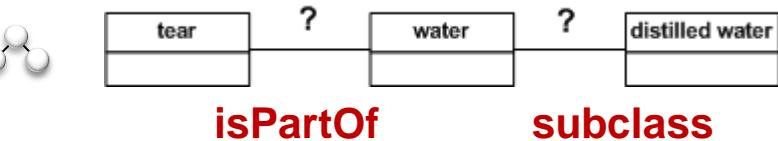
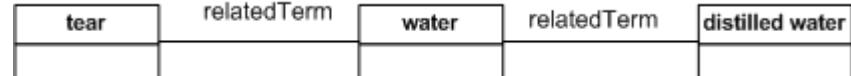


ID	Name	
10	Vehicle	?
10.01	Car	
10.02	Motorcycle	
10.03	Bicycle	
10.01	Vehicle	?
10.01.01	Wheel	
10.01.02	Seat	
10.01.03	Door	

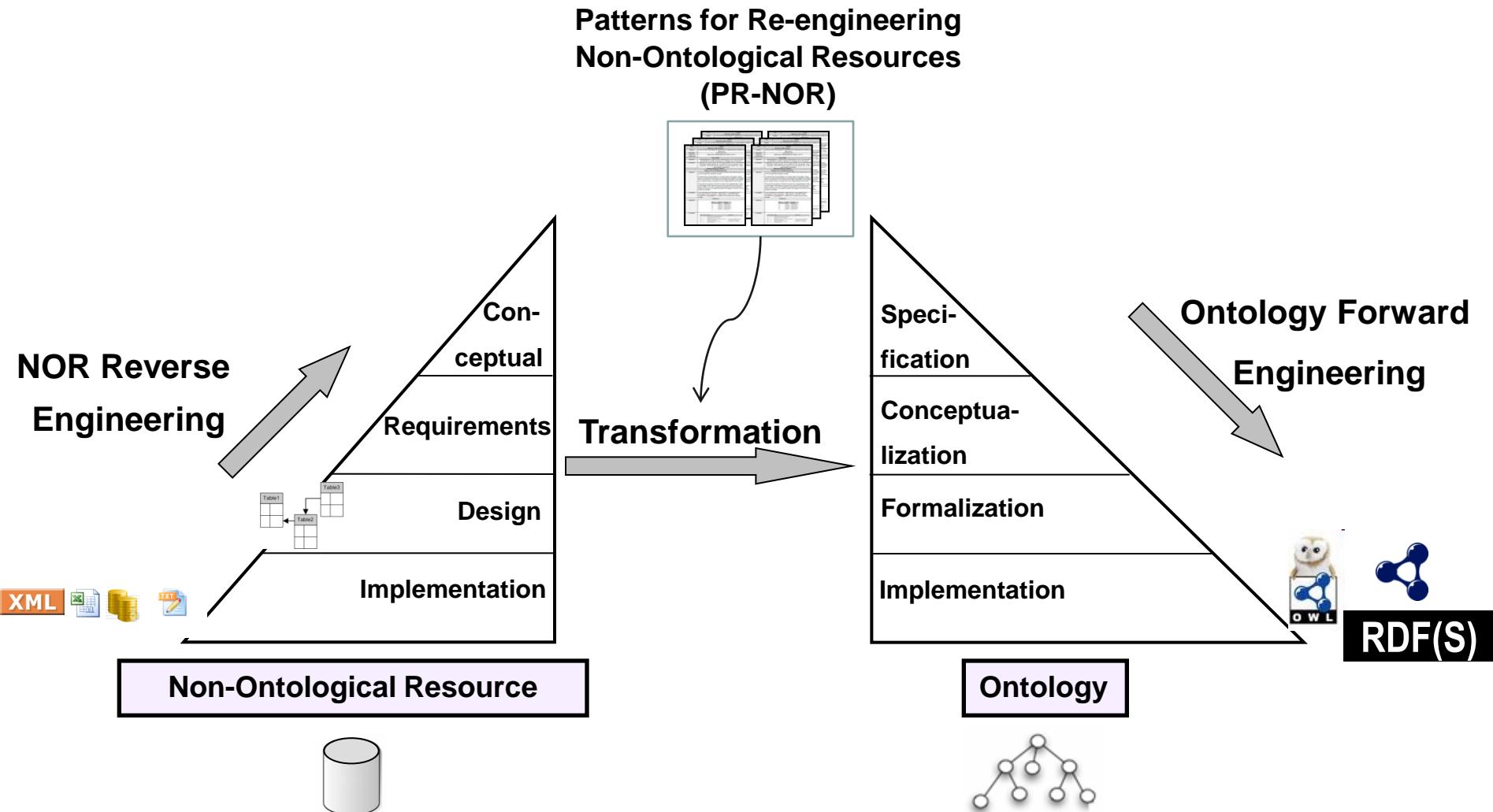
# Semantics of the Relations among the entities

- TBox transformation: patterns must disambiguate the semantics of the relations among the NOR entities.

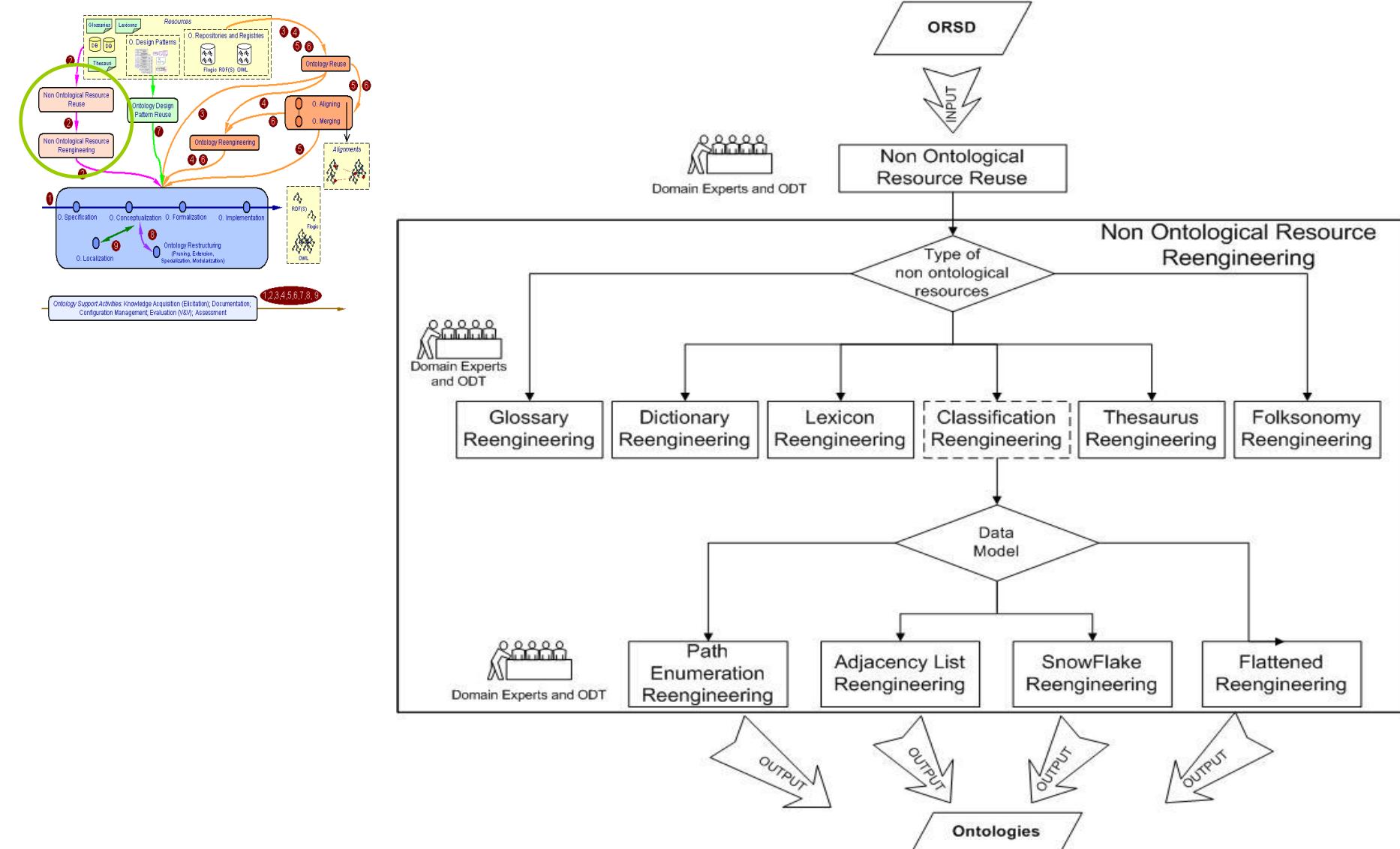
```
<TERM>
<DESCRIPTOR>water</DESCRIPTOR>
<RT>distilled water</RT>
<RT>tear</RT>
</TERM>
```



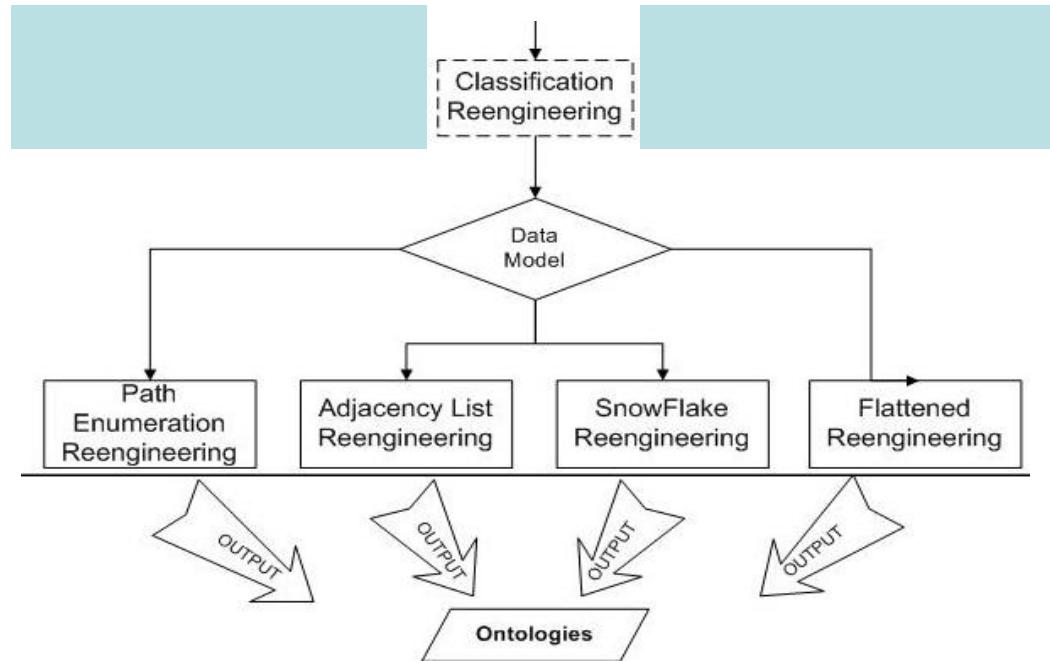
# Re-engineering Model for NORs



# Reuse and Re-engineering Non-ontological Resources



# A pattern for each resource data model



## *Classification to Taxonomy ( Adjacency List)*

	Value
<b>Name</b>	Name of the organization
<b>Member</b>	An external committee of shareholders that represents the interests of the organization
<b>General</b>	Description of the general principles addressed by the organization
<b>Example</b>	Description of the general principles addressed by the organization
<b>Policies for Recognizing Non-Domestic Resources</b>	Policies for recognizing non-domestic resources
<b>General</b>	Describe a value judgment of the non-domestic resource
<b>Example</b>	Describe a value judgment of the non-domestic resource
<b>Standard Practice</b>	Describe standard practice of the organization
<b>General</b>	Description of standard practice after applying the policy for recognizing the non-domestic resource
<b>Example</b>	Description of standard practice after applying the policy for recognizing the non-domestic resource
<b>Guideline</b>	General practices or recommendations for how to not recognize domestic mining
<b>APC/Practices</b>	Excludes a particular phenomenon of the mining method for recognition
<b>General</b>	Description of relevant aspects of the mining method for recognition
<b>Example</b>	Description of relevant aspects of the mining method for recognition
<b>Requirement</b>	Requirements for the organization to not recognize domestic mining
<b>General</b>	Description of relevant aspects of the mining method for recognition

## *Classification to Taxonomy (Path Enumeration Model)*

Name	General Description	Value
Name	Identifies the concerned individual.	
Specifier	An optional extension of the primary component + number	
Site of Concern	Indicates the anatomical location of the problem	
Type of Condition	Indicates the type of condition or disease	
Severity	Indicates the severity of the condition	
Exacerbation	Describes an increase in the severity of the existing problem	
Pain or Discomfort	Describes pain or discomfort associated with the existing problem	
General	Describes an overall picture of the clinical picture	
Disease	Describes a disease entity or episode of the patient's history	
Diagnosis	Describes the diagnosis of the condition/recurrence	
Procedure	Describes a procedure or treatment performed by the patient or healthcare professional	
Observation	Describes an observation made by the clinician during the history taking	
Other	Provides additional information about the clinical history being taken	
Initial	Indicates the first visit to the physician for the clinical problem being treated	
Urgent	Indicates a prompt visit to the physician for a medical emergency	
Follow-up	Indicates a return visit to the physician for a medical problem related to the initial visit	
Normal	Indicates the absence of any pathological findings; may be a descriptive term	
Emergency	Indicates a visit to the physician for a life threatening problem	
Assessment	Indicates the physician's evaluation of the patient's problem	
Reassurance	Indicates the physician's assurance to the patient that the problem is not serious	
Advice	Indicates the physician's advice to the patient about the problem	
Request	Indicates a request from the physician to another physician	
Referral	Indicates a referral from the physician to another physician	
Diagnostic Request	Indicates a request for diagnostic tests or procedures	
Prescription	Indicates a prescription issued by the physician	
Information	Indicates information provided by the physician to the patient	

## *Classification to Taxonomy (Flattened Model)*

## *Classification to Taxonomy (Snowflake Model)*

<u>Item</u>	<u>Description</u>	<u>Value</u>
<u>Name</u>	General Description of the System	
<u>Identifier</u>	An extensive identifier of the system component	System Identifier: <b>Urgent Change</b>
<u>Category</u>	Classification of the system component	System Category: <b>Urgent Change</b>
<u>Version</u>	Identifies the version of the system component	System Version: <b>Urgent Change</b>
<u>Size</u>	Size of the system component	System Size: <b>Large</b>
<u>Complexity</u>	Complexity of the system component	System Complexity: <b>High</b>
<u>Exercise</u>	Description of the system component's normal operating problem	System Exercise: <b>Dependence on external systems for critical functionality</b>
<b>Pattern for Requesting New Or Changes To Existing Resources</b>		
<u>General</u>	Description of the usual language of the new or changed resource	General Language: <b>Urgent Change</b>
<u>Exercise</u>	Description of the language of the new or changed resource	Exercise Language: <b>Urgent Change</b>
<u>General</u>	Description of the usual language of the new or changed resource	General Language: <b>Urgent Change</b>
<u>Exercise</u>	Description of the language of the new or changed resource	Exercise Language: <b>Urgent Change</b>
<b>Design Change</b>		
<u>General</u>	Description of the design change process after initiating the pattern for negotiating the change request	General Design Change Process: <b>Urgent Change</b>
<u>Exercise</u>	Description of the design change process after initiating the pattern for negotiating the change request	Exercise Design Change Process: <b>Urgent Change</b>
<u>John</u>	Design Change Requester	Design Change Requester: <b>John</b>
<u>David</u>	Design Change Requestor	Design Change Requestor: <b>David</b>
<u>George</u>	Design Change Requester	Design Change Requester: <b>George</b>
<u>John</u>	Design Change Requester	Design Change Requester: <b>John</b>
<u>David</u>	Design Change Requestor	Design Change Requestor: <b>David</b>
<u>George</u>	Design Change Requester	Design Change Requester: <b>George</b>
<u>General</u>	Description of the language of the new or changed resource	General Language: <b>Urgent Change</b>
<u>Exercise</u>	Description of the language of the new or changed resource	Exercise Language: <b>Urgent Change</b>
<b>Adding Resources</b>		
<u>Reasons to Add</u>	Description of the reasons to add resources to the system	Reasons to Add: <b>Urgent Change</b>
<u>Adding Requirements</u>	Description of the reasons to add requirements to the system	Adding Requirements: <b>Urgent Change</b>
<u>General</u>	Description of the language of the new or changed resource	General Language: <b>Urgent Change</b>
<u>Exercise</u>	Description of the language of the new or changed resource	Exercise Language: <b>Urgent Change</b>



# Template for the PR-NOR

Slot	Value
<b>General Information</b>	
Name	Name of the pattern
Identifier	An acronym composed of component type + abbreviated name of the component + number
Component Type	Pattern for Re-engineering Non-Ontological Resource (PR-NOR)
<b>Use Case</b>	
General	Description in natural language of the re-engineering problem addressed by the pattern for re-engineering non-ontological resources.
Example	Description in natural language of an example of the re-engineering problem.
<b>Pattern for Re-engineering Non-Ontological Resource</b>	
<b>INPUT: Resource to be Re-engineered</b>	
General	Description in natural language of the non-ontological resource.
Example	Description in natural language of an example of the non-ontological resource.
<b>Graphical Representation</b>	
General	Graphical representation of the non-ontological resource.
Example	Graphical representation of the example of non-ontological resource.
<b>OUTPUT: Designed Ontology</b>	
General	Description in natural language of the ontology created after applying the pattern for re-engineering the non-ontological resource.
<b>Graphical Representation</b>	
(UML) General Solution Ontology	Graphical representation, using the UML profile (Brockmans & Haase, 2006), of the ontology created for the non-ontological resource being re-engineered.
(UML) Example Solution Ontology	Example showing a graphical representation, using the UML profile (Brockmans & Haase, 2006), of the ontology created for the non-ontological resource being used.
<b>PROCESS: How to Re-engineer</b>	
General	Description in natural language of the general re-engineering process, using a sequence of activities.
Example	Description in natural language of the re-engineering process applied to the non-ontological resource example, using the above sequence of activities.
<b>Formal Transformation</b>	
General	Formal description of the transformation by using the formal definitions of the resources.
<b>Relationships (Optional)</b>	
Relations to other modelling components	Description of any relation to other PR-NOR patterns or other ontology design patterns.

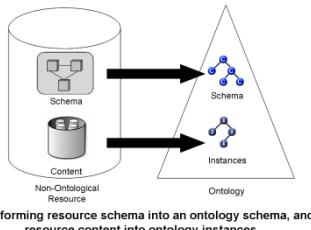
INPUT

OUTPUT

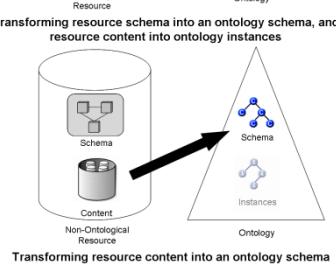
PROCESS

# Patterns for Re-engineering Classification Schemes into Ontologies

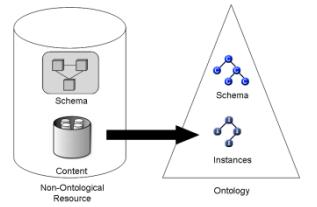
N	Identifier	Type of NOR	NOR Data Model	Transformation approach	Target
1	PR-NOR-CLTX-01	Classification Scheme	Path Enumeration	TBox	Ontology Schema
2	PR-NOR-CLTX-02	Classification Scheme	Adjacency List	TBox	Ontology Schema
3	PR-NOR-CLTX-03	Classification Scheme	Snowflake	TBox	Ontology Schema
4	PR-NOR-CLTX-04	Classification Scheme	Flattened	TBox	Ontology Schema
5	PR-NOR-CLLO-10	Classification Scheme	Path Enumeration	ABox	Ontology
6	PR-NOR-CLLO-11	Classification Scheme	Adjacency List	ABox	Ontology
7	PR-NOR-CLLO-12	Classification Scheme	Snowflake	ABox	Ontology
8	PR-NOR-CLLO-13	Classification Scheme	Flattened	ABox	Ontology



– ABox transformation



– TBox transformation



# Pattern for re-engineering a classification scheme, which follows the adjacency list data model, into an ontology schema

## INPUT: Non-Ontological Resource General

A non-ontological resource holds a classification scheme which follows the adjacency list model. A classification scheme is a rooted tree of concepts, in which each concept groups entities by some particular degree of similarity. The semantics of the hierarchical relation between parents and children concepts may vary depending of the context. The adjacency list data model for hierarchical classifications proposes to create an entity which holds a list of items with a linking column associated to their parent items.

Category Code	Category Name	Parent Category Code
1	Category1	Null
2	Category2	Null
3	Category3	1
4	Category4	1
5	Category6	3
6	Category7	4
...	...	...

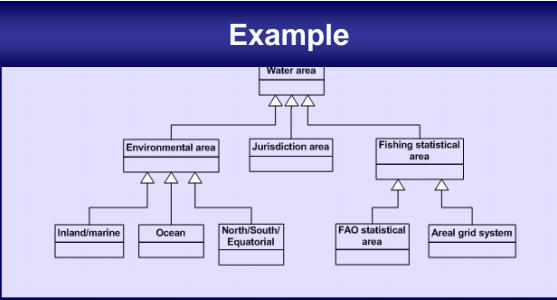
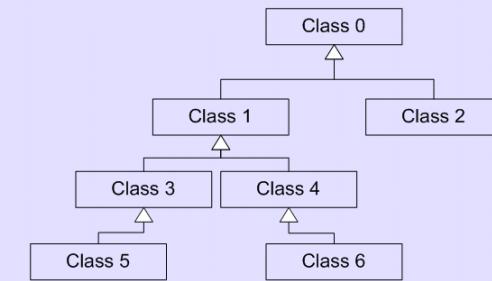
## Example

The FAO classification for water areas groups them according to some different criteria as environment, statistics, and jurisdiction, among others. This classification scheme is available at <http://www.fao.org/figis/servlet/RefServlet>

ID	CSI_Name	Parent
20000	Water area	
21000	Environmental area	20000
24020	Jurisdiction area	20000
22000	Fishing Statistical area	20000
21001	Inland/marine	21000
21002	Ocean	21000
21003	North/South/Equatorial	21000
22001	FAO statistical area	22000
22002	Areal grid system	22000

## OUTPUT: Ontology General

The ontology generated will be based on the taxonomy architectural pattern (AP-TX-01). Each category in the classification scheme is mapped to a class, and the semantics of the relationship between children and parent are disambiguated by using an external resource.



## PROCESS: How to Re-engineer

2. Create the Environmental area class.
3. Using the external resource identify the semantics of the relation between the Environmental area class and the Water area class, and set up the relation identified.
  - 3.1. Create the Inland/marine class.
  - 3.2. Using the external resource identify the semantics of the relation between the Inland/marine class and the Environmental area class, and set up the identified relation.
  - 3.3. Create the Ocean class.
  - 3.4. Using the external resource identify the semantics of the relation between the Ocean class and the Environmental area class, and set up the relation identified.
  - 3.5. Create the North/South/Equatorial class.
  - 3.6. Using the external resource identify the semantics of the relation between the North/South/Equatorial class and the Environmental area class, and set up the relation identified.
4. Create the Fishing Statistical area class.
5. Using the external resource identify the semantics of the relation between the Fishing Statistical area class and the Water area class, and set up the relation identified.
  - 5.1. Create the FAO statistical area class.
  - 5.2. Using the external resource identify the semantics of the relation between the FAO statistical area class and the Fishing Statistical area class, and set up the relation identified.
  - 5.3. Create the Areal grid system class.
  - 5.4. Using the external resource identify the semantics of the relation between the Areal grid system class and the Fishing Statistical area class, and set up the relation identified.
6. Create the Jurisdiction area class.
7. Using the external resource identify the semantics of the relation between the Jurisdiction area class and the Water area class, and set up the relation identified.



# PR-NOR library at the ODP Portal

submissions:reengineeringodps discussion view source history

## Submissions:ReengineeringODPs

Below you find the currently proposed Re-engineering OPs (RPs).  
New proposals of RPs are very welcome. Please [post a new proposal](#) if you want to contribute.

### Proposed Re-engineering ODPS

Pattern for re-eng scheme, which follows the recordbased data model, into an ontology schema  
Pattern for re-eng scheme, which follows the recordbased data model, into an ontology schema  
Pattern for re-eng scheme, which follows the recordbased data model, into an ontology schema  
Pattern for re-eng scheme, which follows the recordbased data model, into an ontology schema  
Pattern for re-eng scheme, which follows the recordbased data model, into an ontology schema  
Pattern for re-eng scheme, which follows the recordbased data model, into an ontology schema  
Term-based – record-based thesaurus to light

submissions:pattern for re-engineering a term-based thesaurus, which follows the recordbased data model, into an ontology schema discussion view form history

## Submissions:Pattern for re-engineering a term-based thesaurus, which follows the recordbased data model, into an ontology schema

If you are a member of [quality committee](#) please visit the [evaluation section](#).

If you are author of this proposal or you want to contribute to this pattern's review, you can:

- ask for a review [post your open review](#)
- specify if this revision takes in account any of the review(s) [Add a new scenario for Pattern for re-engineering a term-based thesaurus, which follows the recordbased data model, into an ontology schema](#)

In general, it could be useful to visit the [evaluation section](#) to have informations about the evaluation process of this proposal

Current revision ID: 8956

### General information

**Name** Pattern for re-engineering a term-based thesaurus, which follows the recordbased data model, into an ontology schema  
**Problem** Re-engineering a term-based thesaurus which follows the record-based model to design an ontology schema.

### Non-Ontological Resource

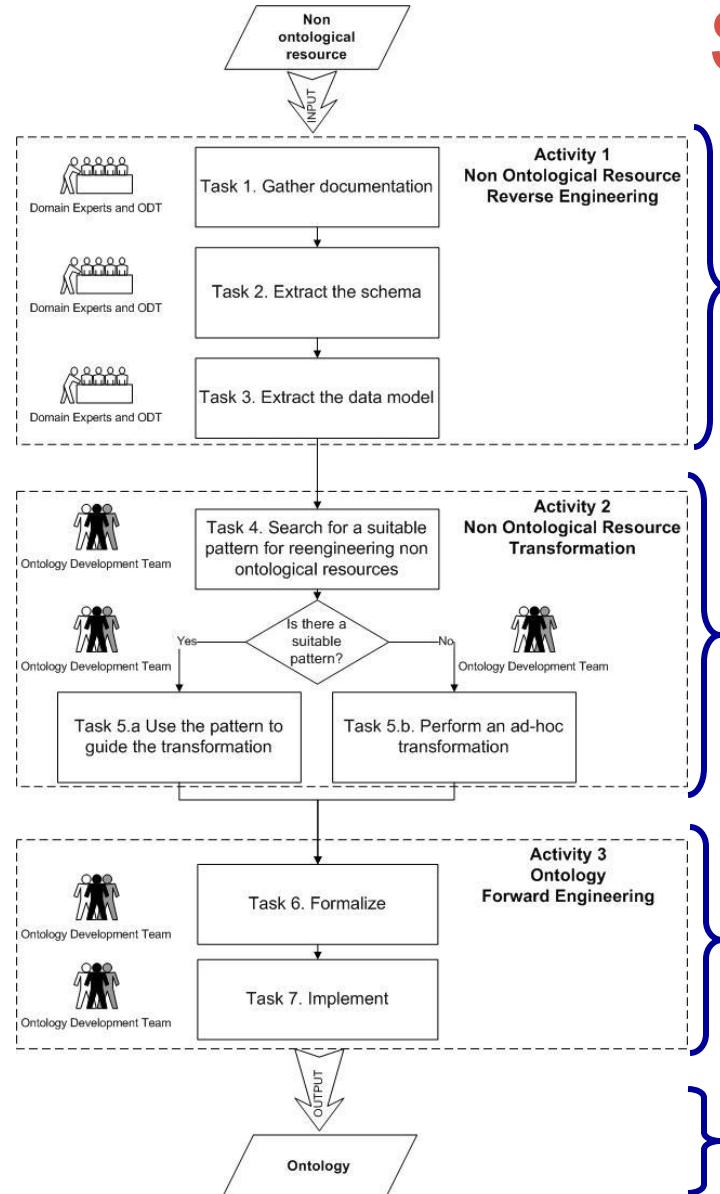
**Description** A non-ontological resource holds a term-based thesaurus which follows the record-based model.  
A thesaurus represents the knowledge of a domain with a collection of terms and a limited set of relations between them. The record-based data model is a denormalized structure, uses a record for every term with the information about the term, such as synonyms, broader, narrower and

<http://ontologydesignpatterns.org/wiki/Submissions:ReengineeringODPs>

# SEEMP Use Case - ISTAT



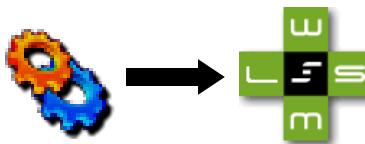
SEEMP

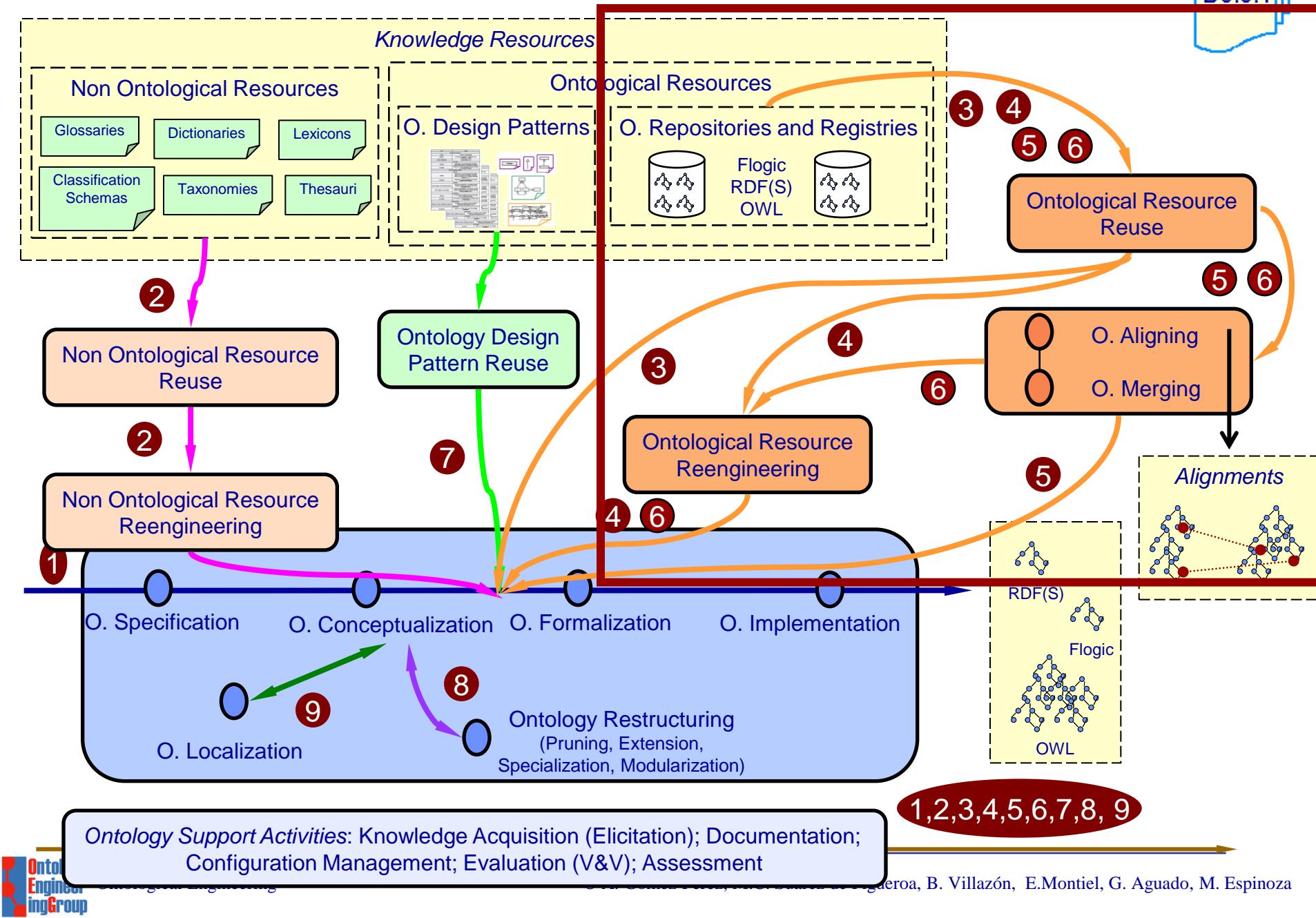


*Adjacency list*

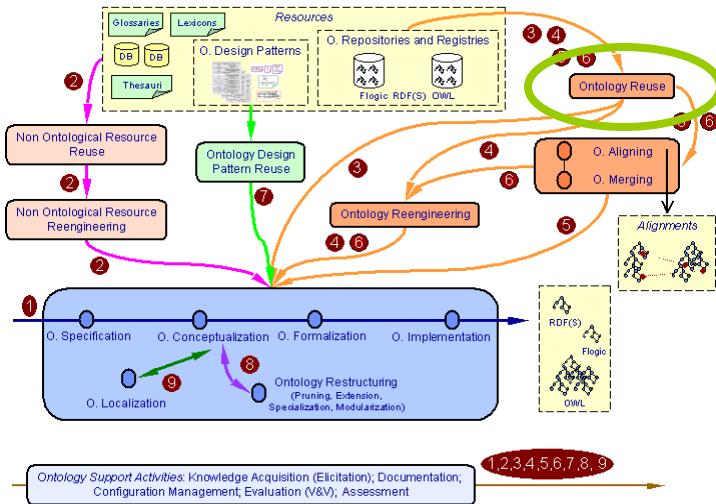
Search criteria:

- NOR Type: **classification scheme**
- Data model: **adjacency list**
- Target ontology: **lightweight**
- The semantics of the relations between classification scheme items: ***subClassOf***



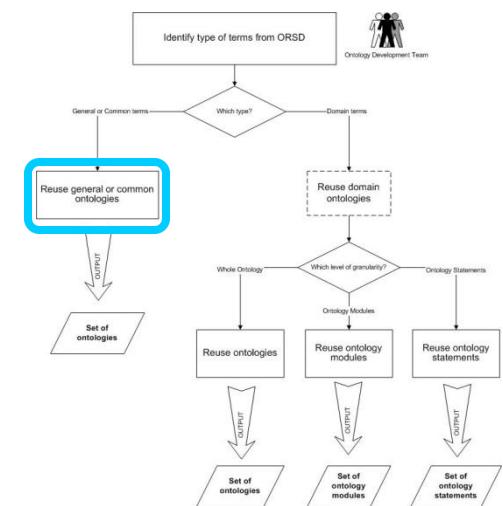


# Ontological Resource Reuse Process



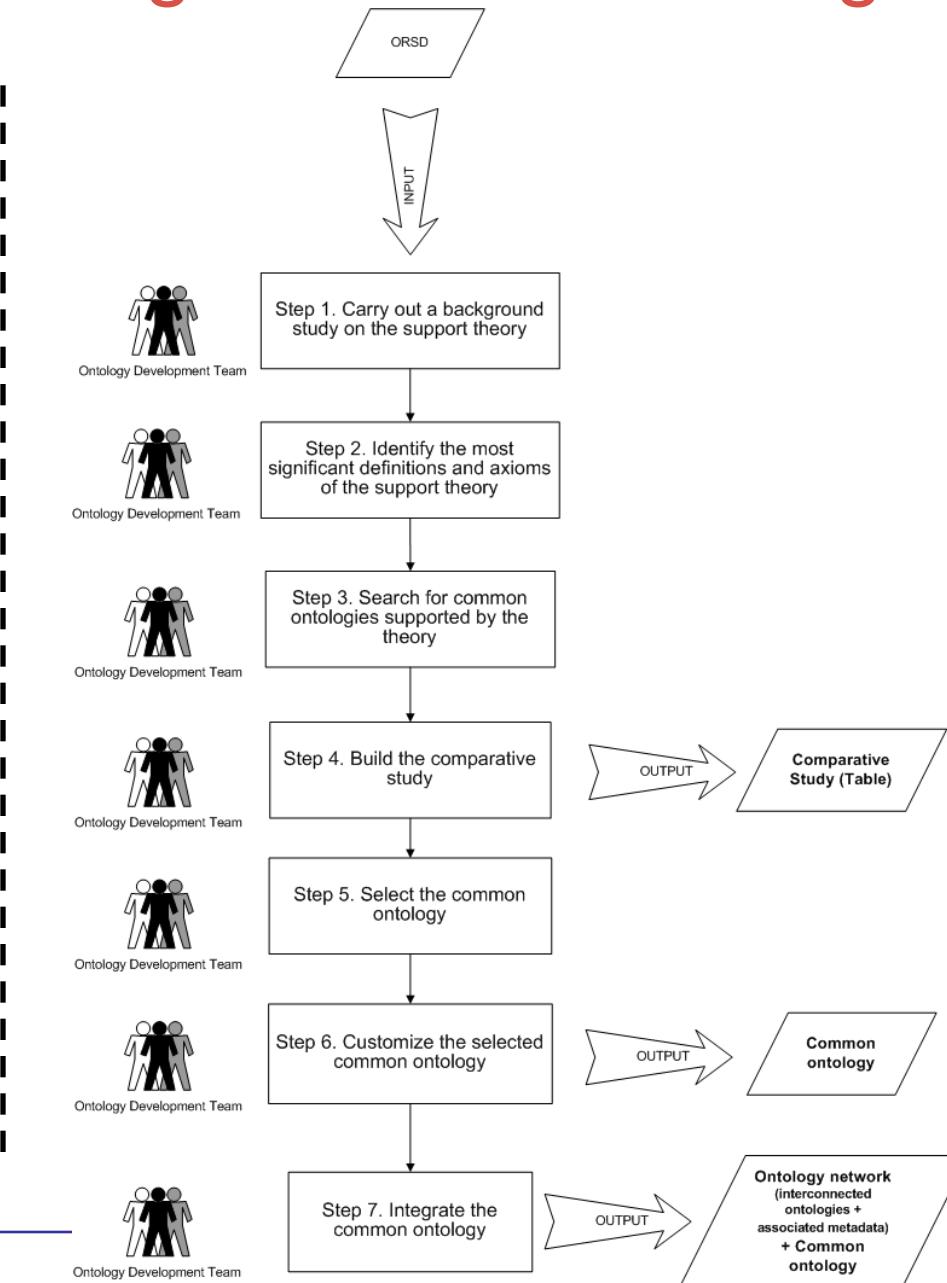
- **Ontological Resource Reuse** is defined as the process of using available ontological resources (ontologies, modules, statements) in the solution of different problems.

# Reusing Common Ontologies

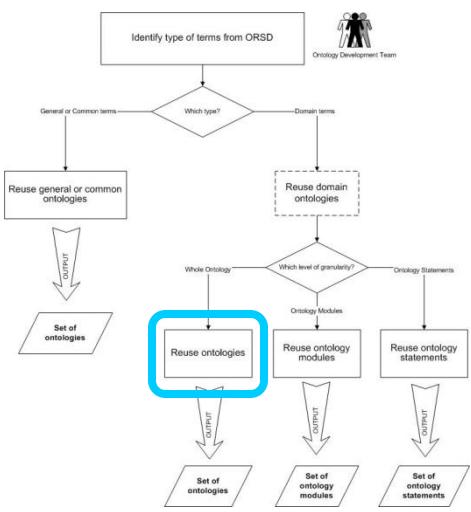


## 3 examples:

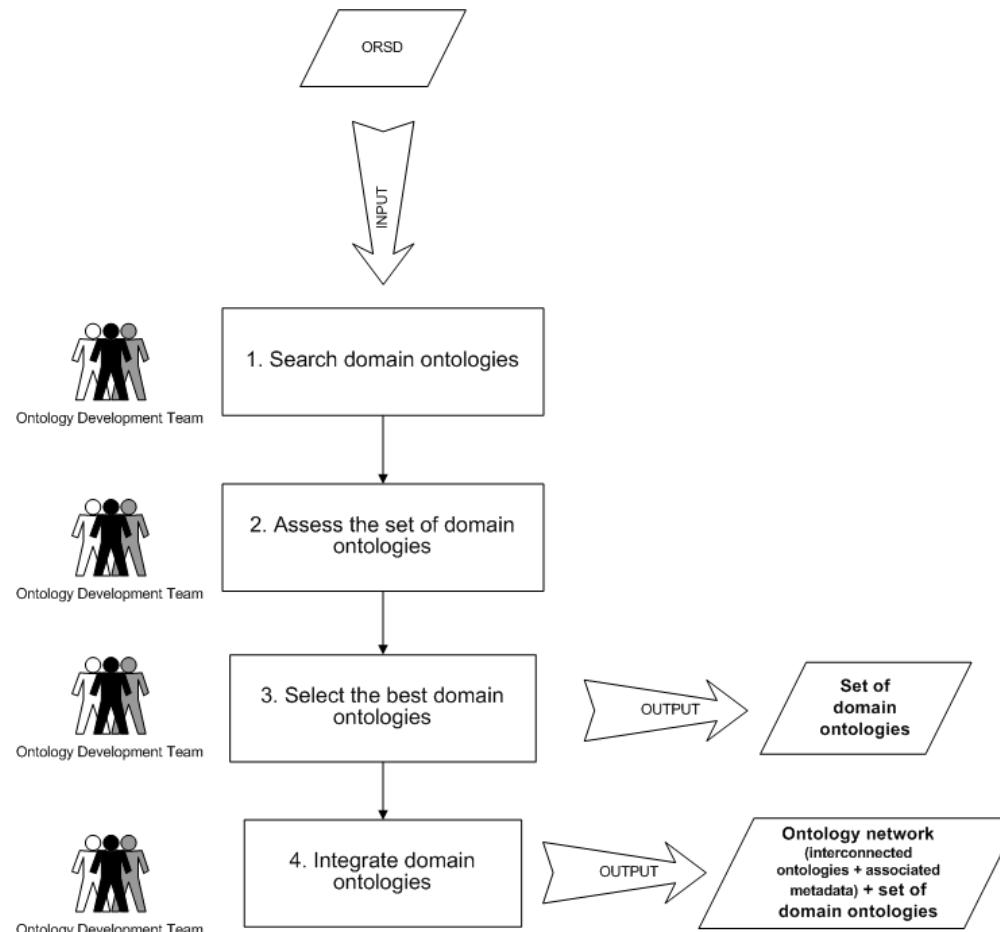
- SEEMP Project
- Invoice Use Case
- Nomenclature Use Case



# Reusing Ontologies as a Whole

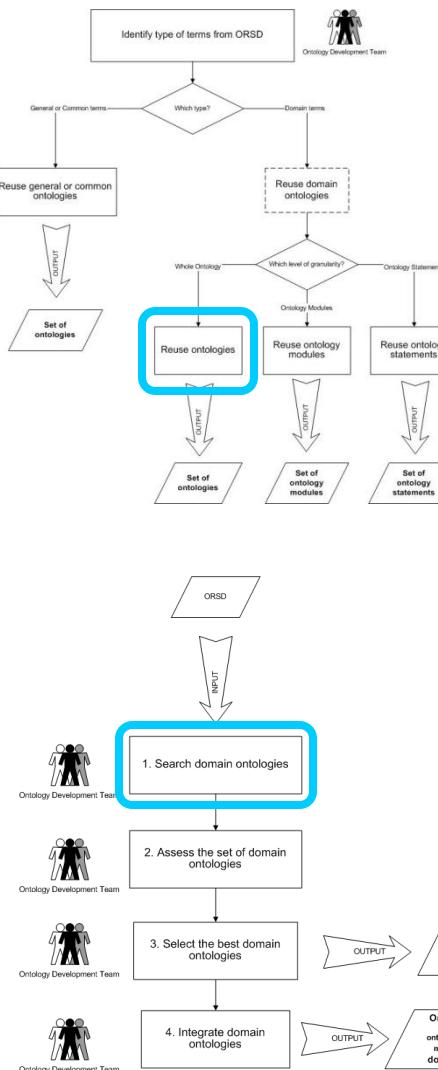


**Ontology Reuse** is redefined as the activity of using ontologies (in this case domain ontologies) in the solution of different problems.

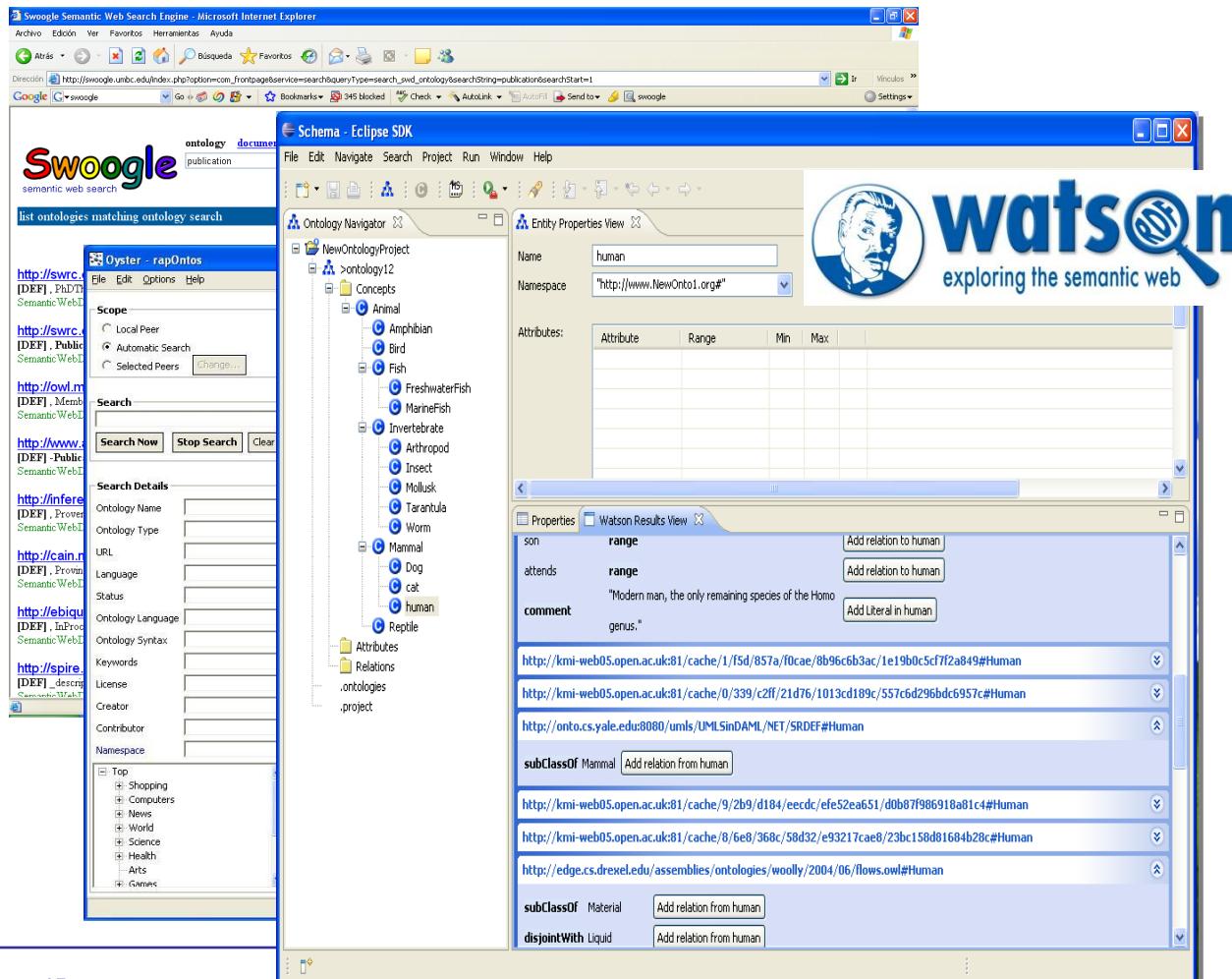


# Reusing Ontologies as a Whole.

## Domain Ontology Search



Use ontology libraries and ontology repositories to search domain ontologies, using those terms that have a high frequency in the ORSD.



# Reusing Ontologies as a Whole. Domain Ontology Assess

## Are the found ontologies useful?

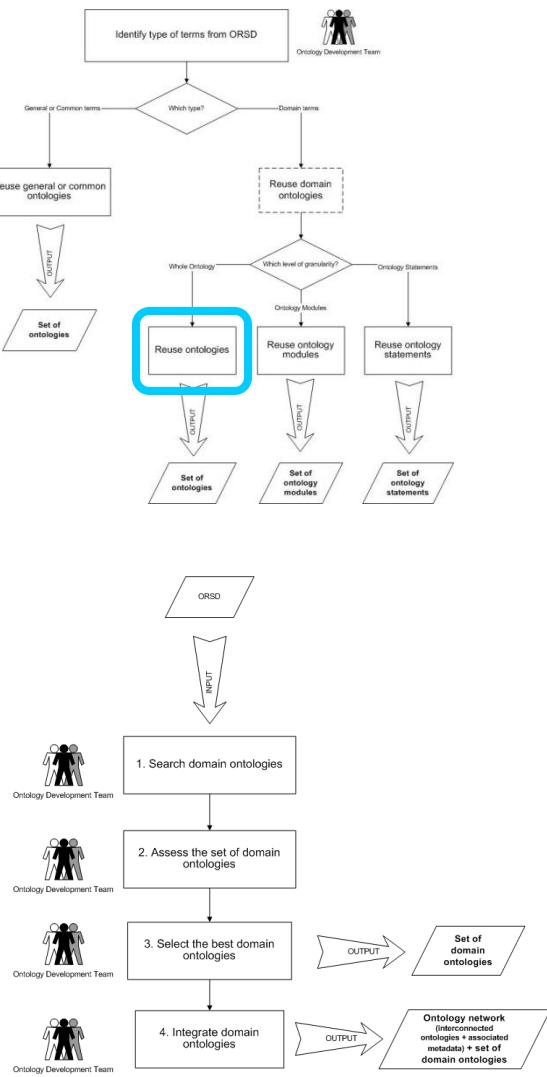
- Check the terminology in the CQs in the found ontologies
- Other requirements: language, standardized terms, multilinguality, etc.

## Which ones are the best?

- Good documentation
- Modular ontology
- Integration effort is low.
- Ontology is reused by others.
- If the ontology used naming conventions.
- If the ontology have been evaluated.

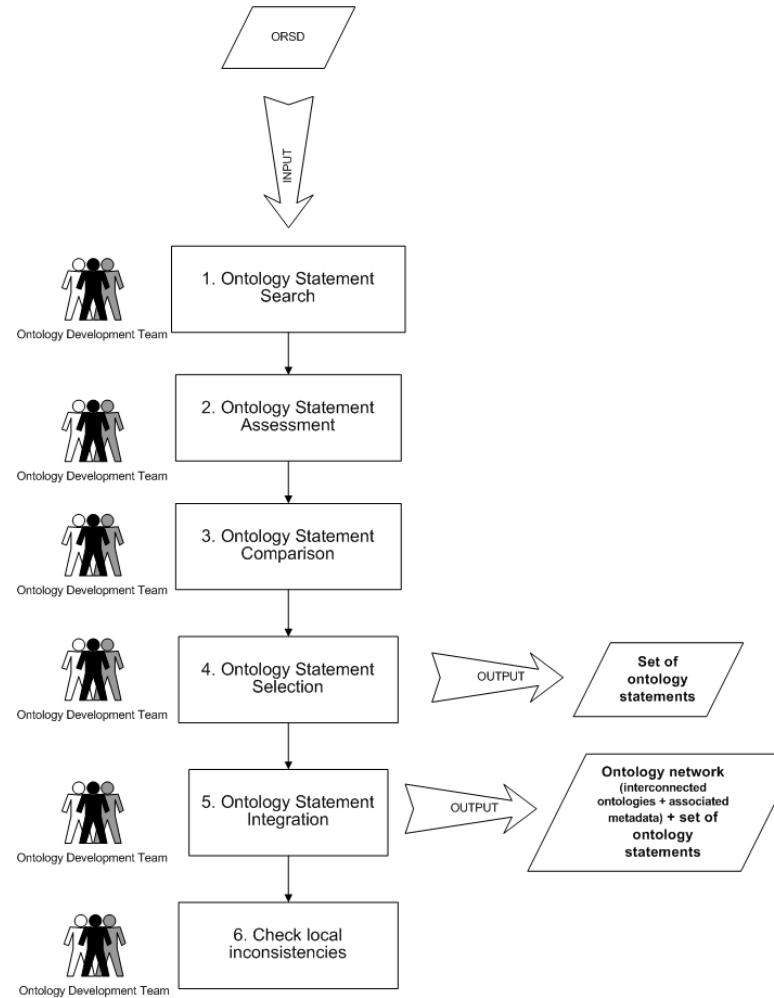
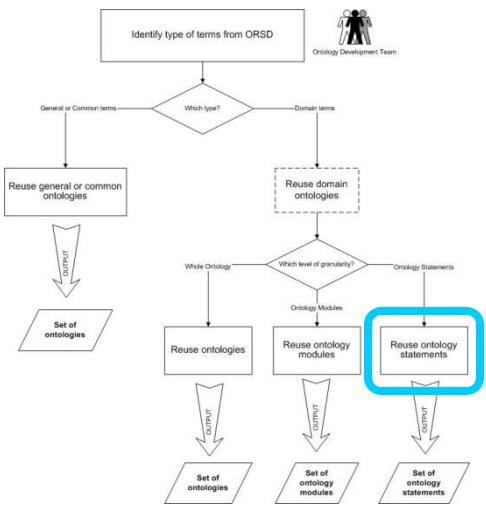
## How do I integrate?

- Reused as it is.
- Ontology reengineering
- Ontology merge



# Reusing Ontology Statements

**Ontology Statement Reuse** is defined as the activity of using ontology statements in the solution of different problems.



**Ontology Navigator**

- NewOntologyProject
  - >paella
    - Concepts
      - Food
        - Beverage
        - FoodCondiment
        - GrainFood
        - Meat
          - MeatOfLandAnimal
          - Seafood
        - PreparedFood
        - SpiceIngredient
        - Vegetables
      - KitchenEquipment
      - Pan

**Entity Properties View**

Name	Meat		
Namespace	"http://www.NewOnto1.org#"		
Attributes:			
Attribute	Range	Min	Max

**Properties**  Watson Results View

Search results for: Meat

<http://kmi-web05.open.ac.uk:81/cache/d/f98/6a16/f9d98/8c9fa90adf/8ed3118eae323e337#Meat>

<http://www.w3.org/2001/sw/WebOnt/guide-src/food#Meat>

disjointWith	Fruit	Add relation from Meat
disjointWith	Dessert	Add relation from Meat
disjointWith	Seafood	Add relation from Meat
disjointWith	Fowl	Add relation from Meat
subClassOf	EdibleThing	Add relation from Meat
RedMeat	subClassOf	Add relation to Meat
NonRedMeat	subClassOf	Add relation to Meat
OtherTomatoBasedFood	disjointWith	Add relation to Meat
Pasta	disjointWith	Add relation to Meat

<http://www.w3.org/2002/03owlt/miscellaneous/consistent002#Meat>

```

graph TD
    A[1. Ontology Statement Search] --> B[2. Ontology Statement Assessment]
    B --> C[3. Ontology Statement Comparison]
    C --> D[4. Ontology Statement Selection]
    D --> E[5. Ontology Statement Integration]
    E --> F[6. Check local inconsistencies]
    
```

1. Ontology Statement Search

2. Ontology Statement Assessment

3. Ontology Statement Comparison

4. Ontology Statement Selection

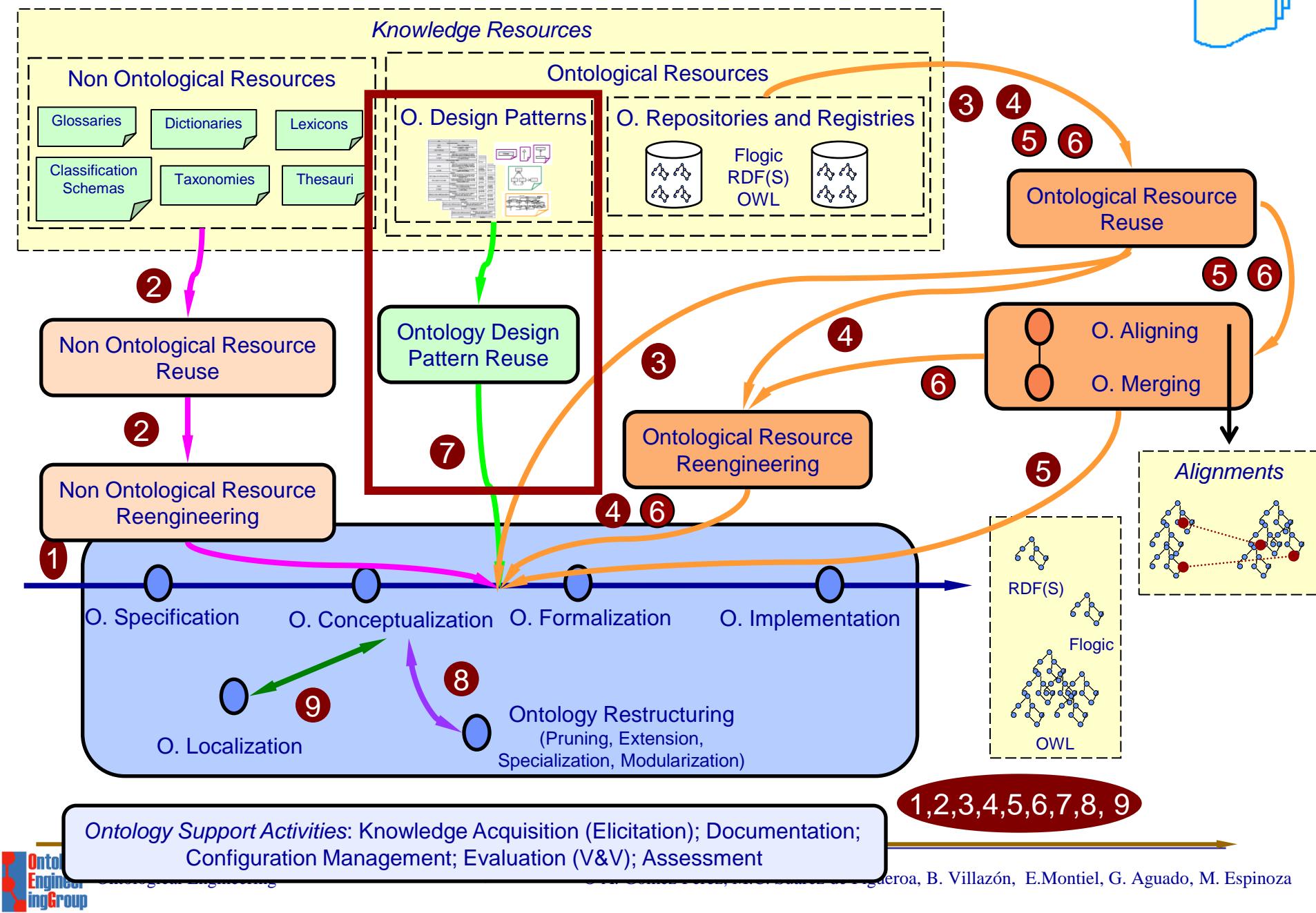
5. Ontology Statement Integration

6. Check local inconsistencies

Ontology Development Team

Set of ontology statements

Ontology network (interconnected ontologies + associated metadata + set of ontology statements)



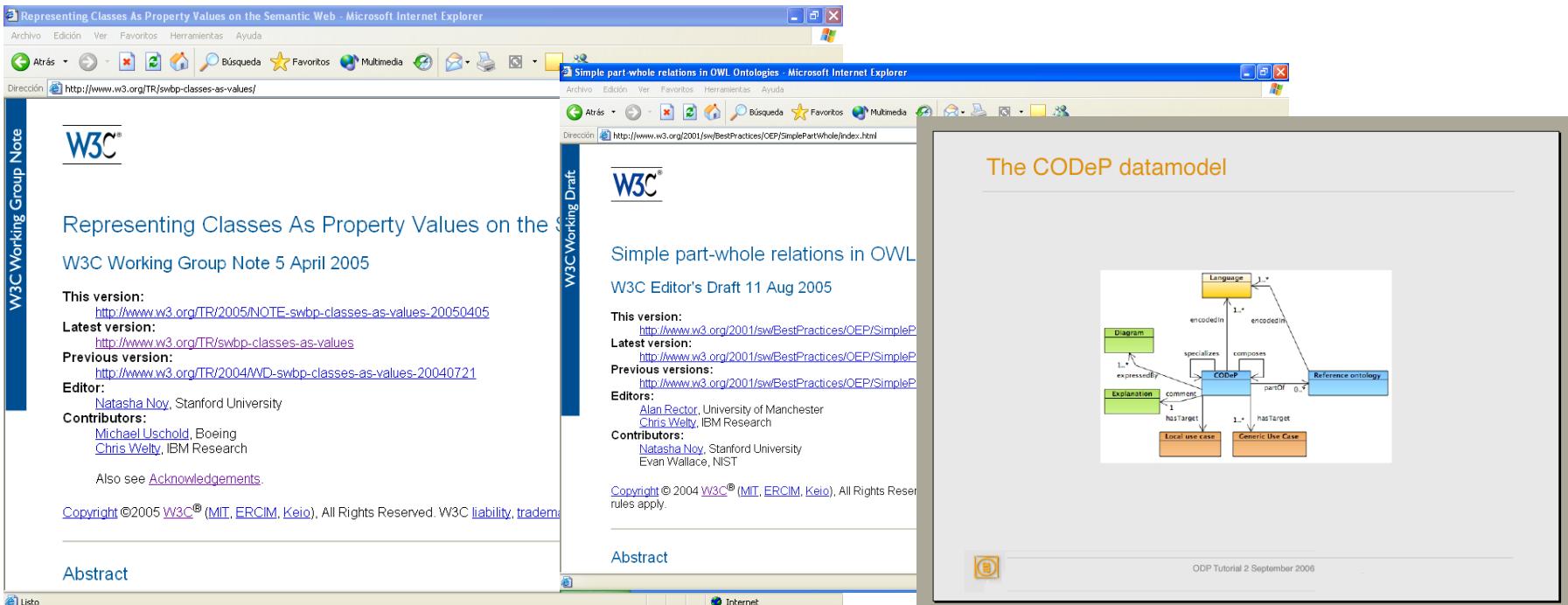
# Patterns

**Pattern** is something proposed for imitation.

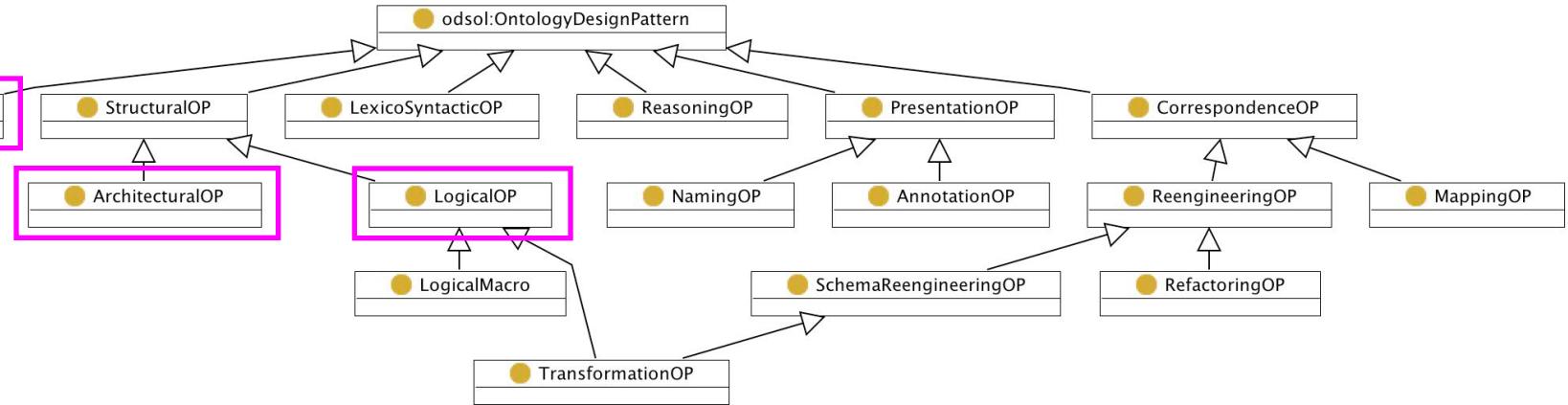
**Design Pattern** refers to shared guidelines that help solve design problems.

**Ontology Design Pattern (ODP)** is a modeling solution to solve a recurrent ontology design problem.

Our concept of “pattern” is associative with the wider “good/best practice” of software engineering. It includes a wider range of solution types. For example: naming conventions in software engineering are considered good practices, they are not design patterns.



# Types of Ontology Design Patterns



**Content OPs (CPs)** encode conceptual, rather than logical design patterns.

Logical OPs solve design problems independently of a particular conceptualization.

CPs propose patterns for solving design problems for the domain classes and properties that populate an ontology. They address content problems.

A **Logical OP** is a formal expression, whose only parts are expressions from a logical vocabulary e.g., OWL DL, that solves a problem of expressivity.  
Logical OPs are independent from a specific domain of interest i.e. they are content-independent

**Architectural OPs** affect the overall shape of the ontology: their aim is to constrain ‘how the ontology should look like’.

# Inventory of Patterns (I)

- *General Information:*
  - Name
  - Identifier
  - Ontology modelling component type (LP, AP and CP)
- *Use Case*, or problem to be addressed.
- *Ontology Design Pattern*, or proposed solution in different formats.
- *Relations to other ontology model components*. This slot is optional.
- *Comments*. This slot is also optional.

Slot	Value
General/Information	
Name	Name of the component
Identifier	An acronym composed of component type + component identifier
Type of Component	Logical Pattern (LP)
Use Case	
General	Description in natural language of the general problem addressed by the modeling component.
Example	Description in natural language of some examples related to the general problem.
Ontology Design Pattern	
General	
General	Description in natural language of the general solution provided by the modeling component, relating to the Use Case. It must be detailed in ODL.
Example	Description in natural language of the solution applied to the examples.
Graphical	
UML / Diagram for the General Solution	Graphical representation of the general solution provided taking into account the UML. Private (internal) UML diagrams are not accepted.
UML / Diagram for Examples	Graphical representation of the solution provided, using examples and taking into account the UML. Private (internal) UML diagrams are not accepted.
Formulation	
General	Formulation of the pattern in terms of the NeOn ODL Ontology Reference.
Example	Formulation of the example using abstract syntax of ODL (optional).
Relationships	
Relations to other modeling components	Description of any relation to other modeling components (use, association, etc.).
Comments	
Comments	Remarks clarifying the use of the modeling component.



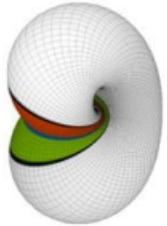
NeOn Deliverable D5.1.1

# Inventory of Patterns (II)

<http://ontologydesignpatterns.org>

category discussion view source history

83.49.237.159 talk for thi



## Category:ProposedContentOP

This category uses the form Content OP Proposal Form.  
Reviews about articles in this Category will use Form:Content OP Proposal Review Form

### Pages in category "ProposedContentOP"

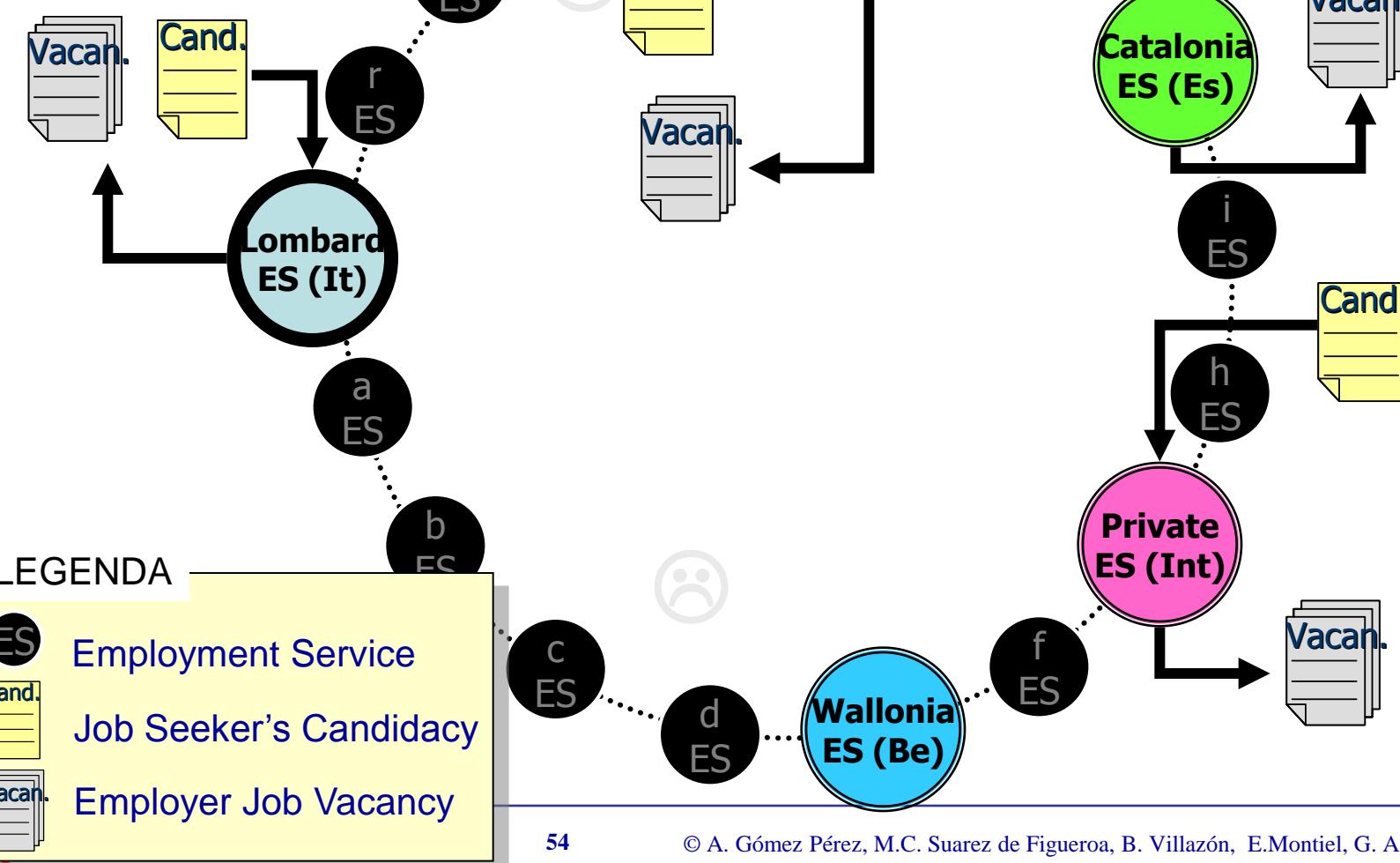
The following 41 pages are in this category, out of 41 total.

<b>S</b> <ul style="list-style-type: none"><li>■ Submissions:AgentRole</li><li>■ Submissions:AquaticResourceObservation</li><li>■ Submissions:AquaticResources</li><li>■ Submissions:Biological Entities</li><li>■ Submissions:Classification</li><li>■ Submissions:Co-participation</li><li>■ Submissions:CollectionEntity</li><li>■ Submissions:Componency</li><li>■ Submissions:Constituency</li><li>■ Submissions:Description</li><li>■ Submissions:GO Top</li><li>■ Submissions:GearSpecies</li><li>■ Submissions:GearVessel</li></ul>	<b>S cont.</b> <ul style="list-style-type: none"><li>■ Submissions:GearWaterArea</li><li>■ Submissions:HasPest</li><li>■ Submissions:Information realization</li><li>■ Submissions:Invoice</li><li>■ Submissions:Metonymy-species-commodity</li><li>■ Submissions:Nary Participation</li><li>■ Submissions:Objectrole</li><li>■ Submissions:Observation</li><li>■ Submissions:PartOf</li><li>■ Submissions:Participation</li><li>■ Submissions:PharmaInnova</li><li>■ Submissions:RTMSmapping</li><li>■ Submissions:Role task</li><li>■ Submissions:Sequence</li></ul>	<b>S cont.</b> <ul style="list-style-type: none"><li>■ Submissions:SimpleTopic</li><li>■ Submissions:Situation</li><li>■ Submissions:SpeciesBathymetry</li><li>■ Submissions:SpeciesConditions</li><li>■ Submissions:SpeciesConservation</li><li>■ Submissions:SpeciesEat</li><li>■ Submissions:SpeciesHabitat</li><li>■ Submissions:SpeciesNames</li><li>■ Submissions:TaskExecution</li><li>■ Submissions:TimeIndexedPartOf</li><li>■ Submissions:TimeInterval</li><li>■ Submissions:Types of entities</li><li>■ Submissions:VesselSpecies</li><li>■ Submissions:VesselWaterArea</li></ul>
---	--	--

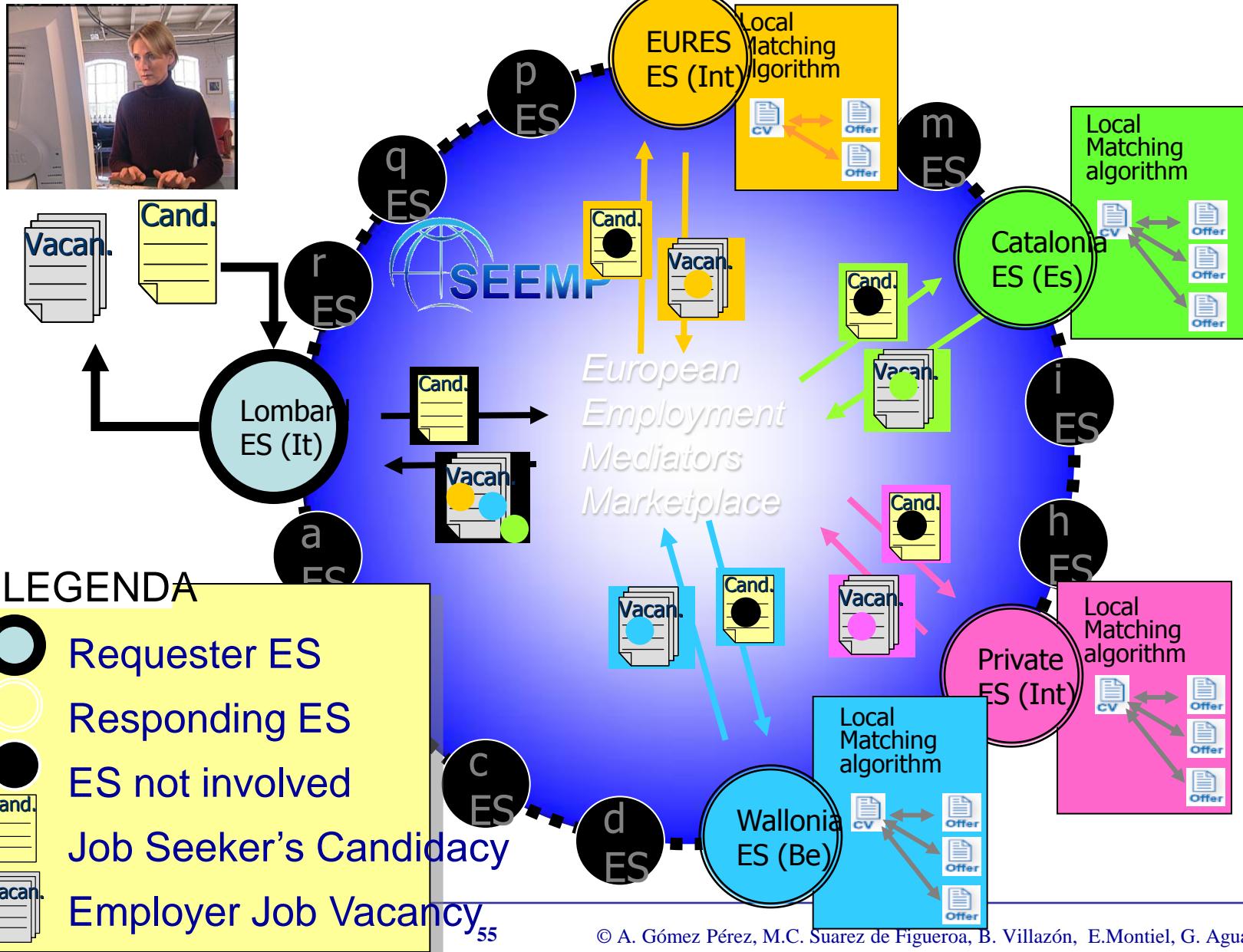


NeOn Deliverable D2.5.1

# Looking for an European Employment



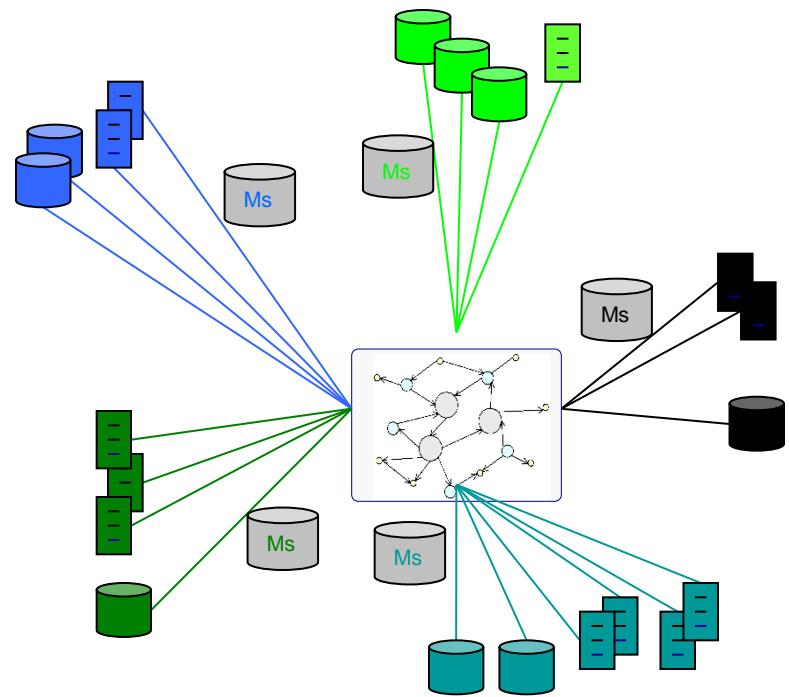
# The Goal: Helping Job Seekers on their way



# Key aspects of Ontological Engineering

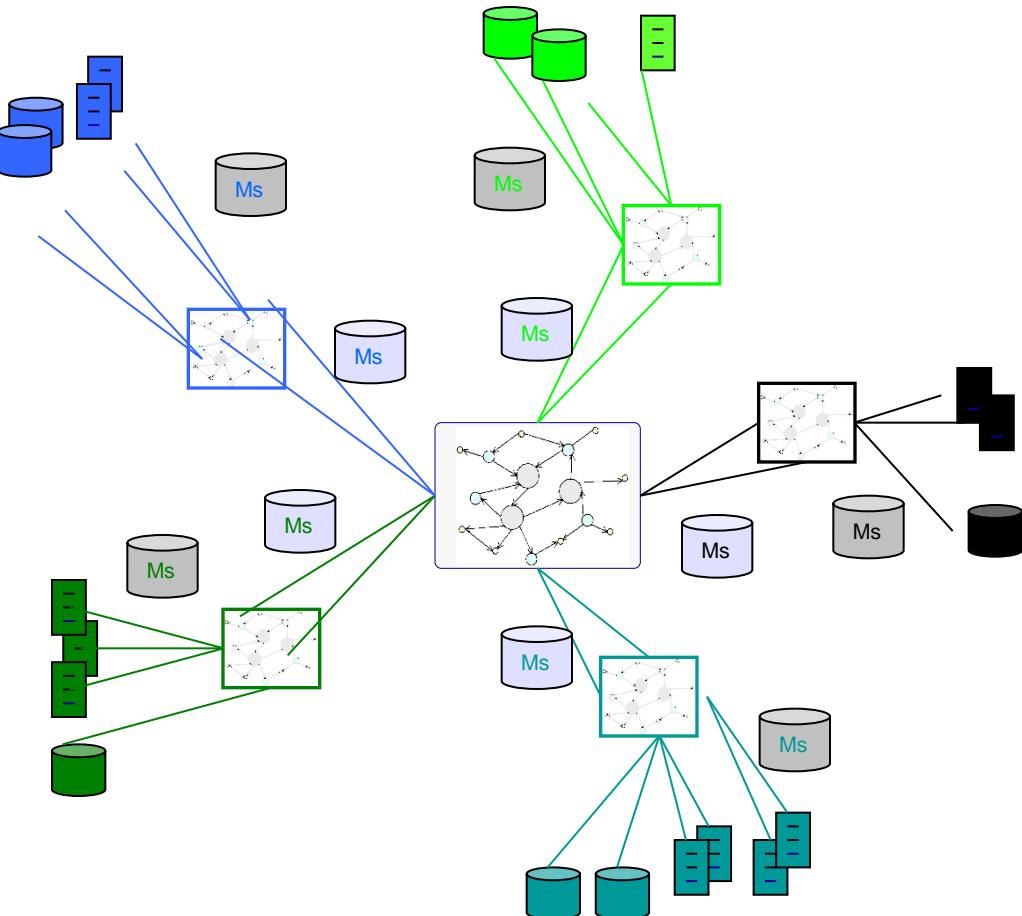
- **Ontologies**
  - Single versus network of ontologies?
  - Are ontologies built from scratch or reusing knowledge-aware resources?
  - Are mappings used for solving conceptual mismatches?
- **Instances**
  - Where are the data/instances?
    - Instances are in the ontology
    - Instances are in RDF files independently of the ontology
    - Data are kept in the original sources
  - Are instances distributed or centralized?
  - Have instances a very high rate of changes?
  - Heterogeneous provenance of instances
  - Degrees of data quality
  - Permissions

## Centralized network of ontologies



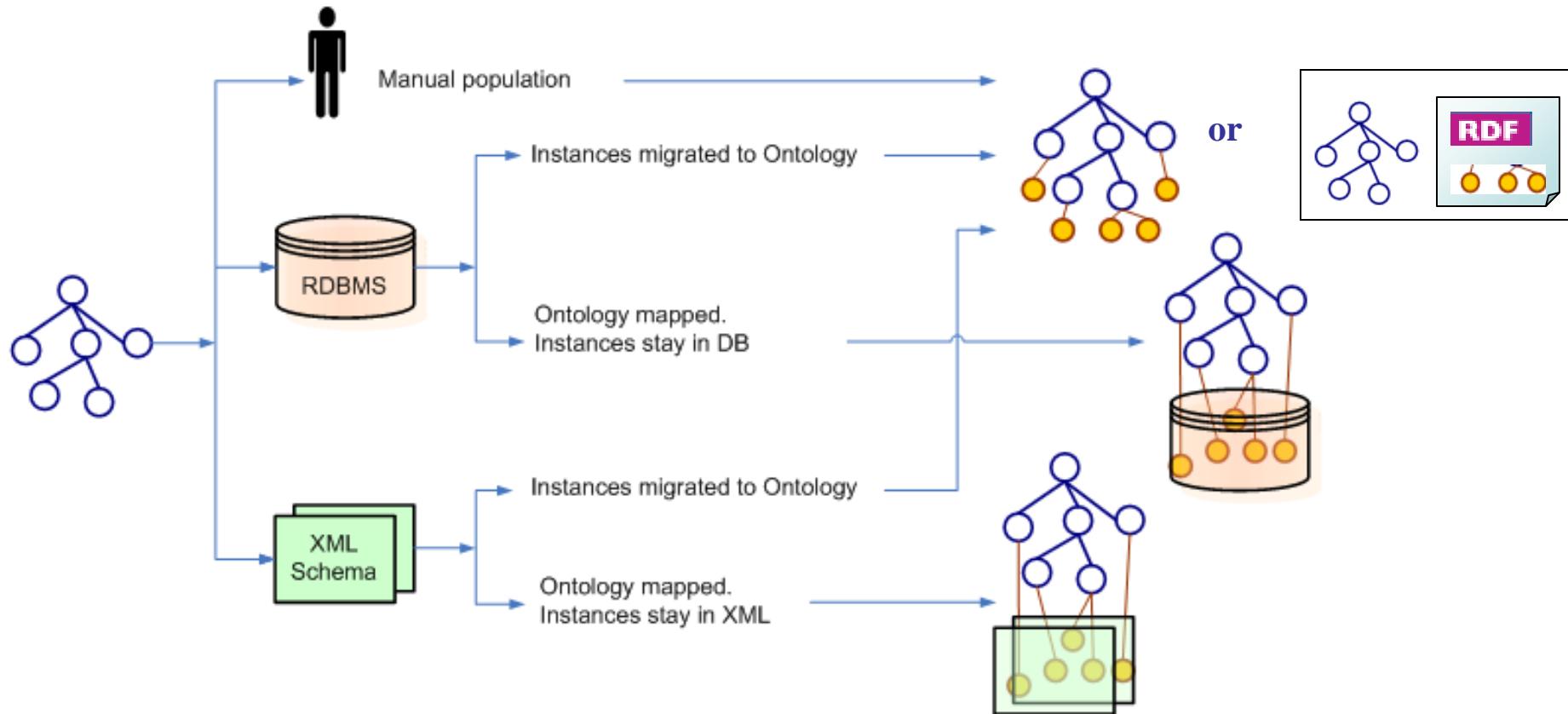
1. Build a reference ontology
2. Build mappings between the reference ontology and the data sources

## Federated network of ontologies

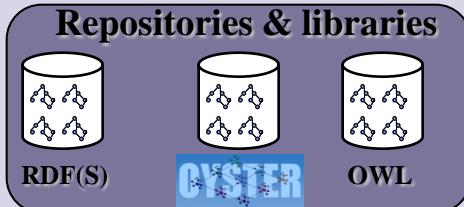


1. Build a reference ontology for the domain
2. Build local ontologies
3. Build mappings between the core and local ontologies
4. Build mappings between the local ontologies and the data sources

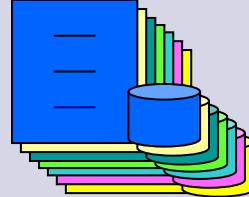
# Where are the instances?



ISCO-88 (COM),  
ONET,  
EURES taxonomy,  
FOET, ISCED97,  
NACE, ISO 4217,  
ISO 3166, ISO 6392,  
HR-XML, ...



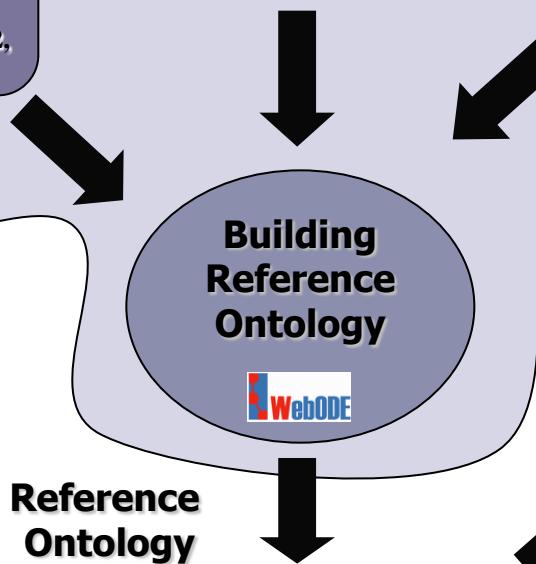
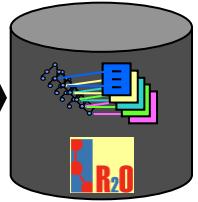
## ES Data Sources



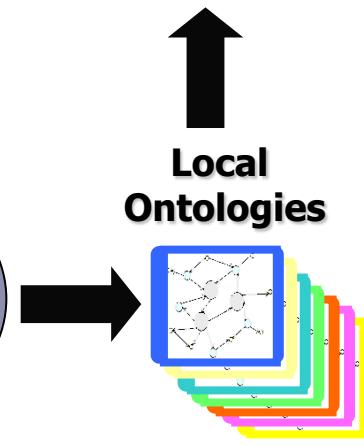
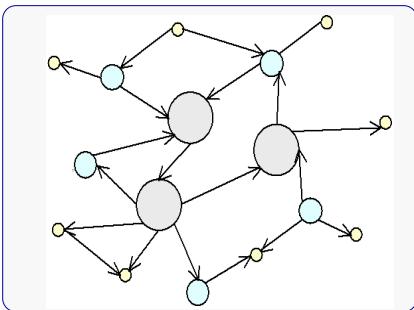
## Building Mappings L.O. - ES Data Sources



**Mappings L.O. - ES Data Sources**



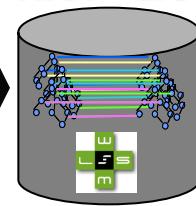
**Reference Ontology**



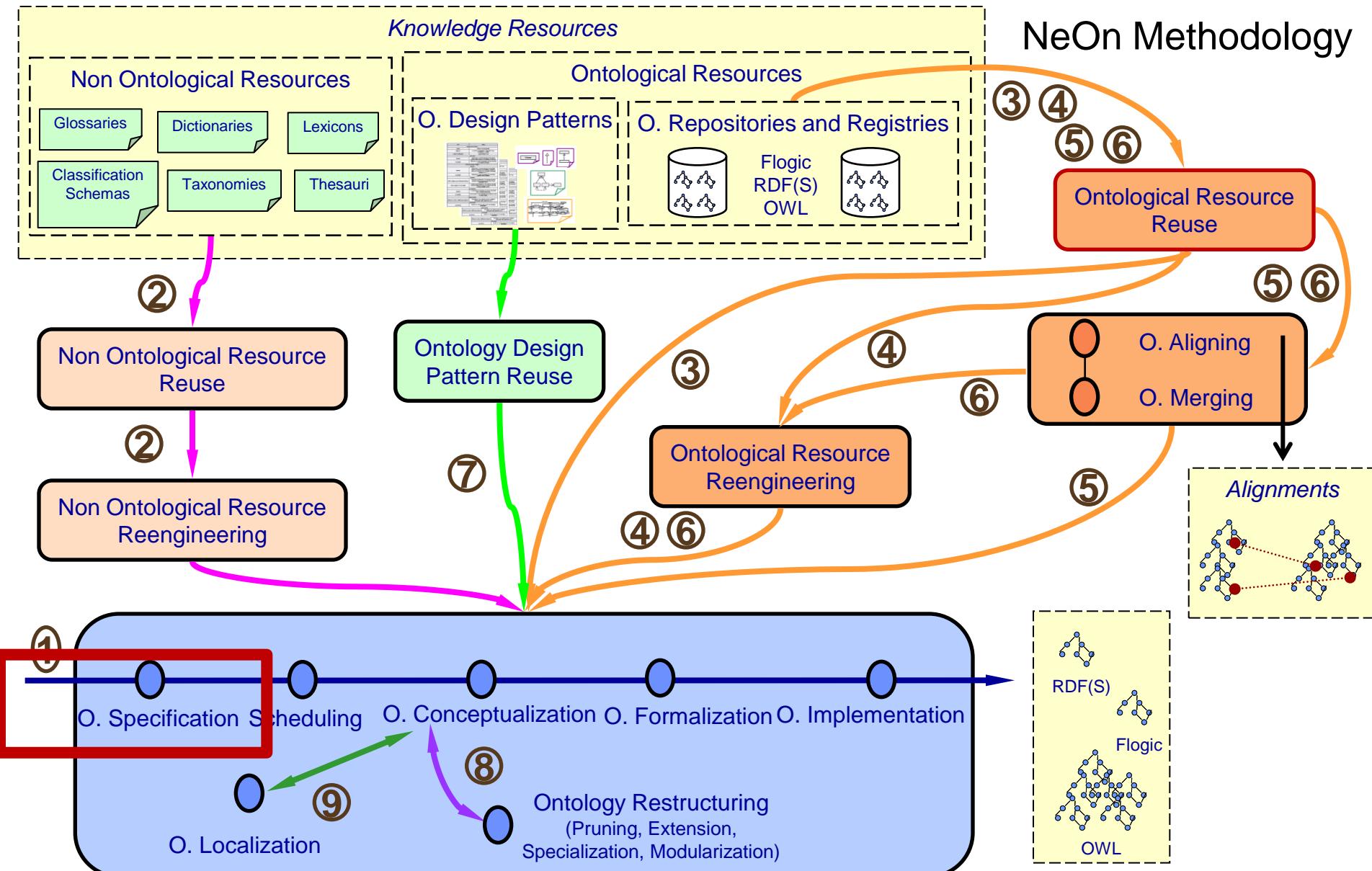
## Building Mappings R.O. - L.O.



**Mappings R.O. - L.O.**



# NeOn Methodology

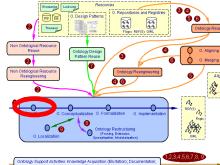


*Ontology Support Activities:* Knowledge Acquisition (Elicitation); Documentation; Configuration Management; Evaluation (V&V); Assessment

eroa, B. Villazón, E. Montiel, G. Aguado, M. Espinoza

# Ontology Specification.

## The Ontology Requirement Specification Document

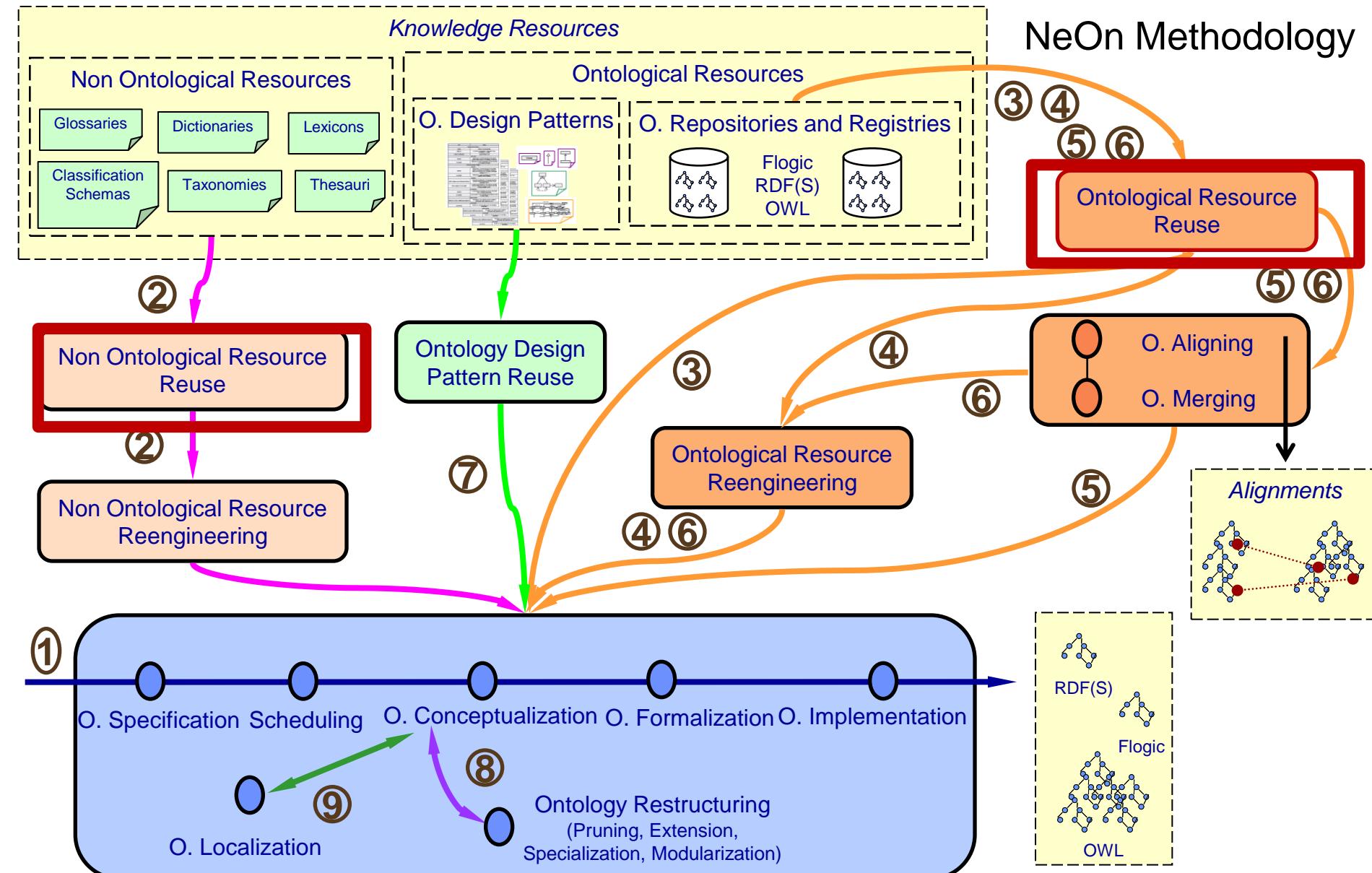


SEEMP Reference Ontology Requirements Specification	
<b>1 Purpose</b>	The purpose of building the Reference Ontology is to provide a consensual knowledge model of the employment domain that could be used by public e-Employment services (PES).
<b>2 Scope</b>	
The ontology has to focus just on the ICT (Information and Communication Technology) domain. The level of granularity is directly related to the competency questions and terms identified.	
<b>3 Level of Formality</b>	
The ontology has to be implemented in WSML language	
<b>4 Intended Users</b>	
User 1.	Candidate who is unemployed and searching for a job or searching another occupation for immediate or future purposes
User 2.	...
User 3.	...
User 4.	...
User 5.	...

Pre-Glossary of Terms		
	Terms	Frequency
User 1.	a. Job Seeker	27
User 2.	b. CV	2
User 3.	c. Personal Information	3
User 4.	d. Name	5
User 5.	e. Gender	1
5 Intend	f. Birth date	1
Use 1.	g. Address	2
Use 2.	h. Nationality	1
Use 3.	i. Contact (phone, fax, mail)	4
Use 4.	j. Objective	3
Use 5.	k. Job Category	6
	l. Job Offer	27
	m. Employer Information	1
	n. Vacancy	1
	o. Activity Sector	1
	p. Location	3
	q. Work Condition	3
	r. Contract Type	3
	s. Salary	3
	t. Education	3
	u. Work Experience	3

6 Groups of Competency Questions		
	CQG1. Job Seeker (16 CQ)	<p>CQ1. What is the Job Seeker Name?  CQ2. What is the Job Seeker nationality?  CQ3. When is the Job Seeker birthday?  CQ4. What is the Job Seeker contact information?  CQ5. What is the Job Seeker current job?  CQ6. What is the Job Seeker desired job?  CQ7. What are the Job Seeker desired working conditions?  CQ8. What kind of contract does the Job Seeker want?</p> <p><b>Job Seeker</b></p>
	CQG2. Job Offer (10 CQ)	<p>CQ17. What is the employer information?  CQ18. What kind of job does the employer offer?  CQ19. What kind of contract does the employer offer?  CQ20. How much salary does the employer offer?  CQ21. What is the economic activity of the employer?</p> <p><b>Job Offer</b></p>
	CQG3. Objects (10 CQ)	<p>Objects in the universe of discourse, which are instances of:</p> <ul style="list-style-type: none"> <li>Job Category <ul style="list-style-type: none"> <li>O1. Computer System Designer</li> <li>O2. Computer System Analyst</li> <li>O3. Programmer</li> <li>O4. Computer Engineer</li> <li>O5. Computer Assistant</li> <li>O6. Computer Equipment Operator</li> <li>O7. Industrial Robot Controller</li> <li>O8. Telecommunication Equipment Operator</li> <li>O9. Medical Equipment Operator</li> <li>O10. Electronic Equipment Operator</li> <li>O11. Image Equipment Operator</li> </ul> </li> <li>Nationality <ul style="list-style-type: none"> <li>O12. Austrian</li> <li>O13. Belgian</li> <li>O14. Danish</li> <li>O15. Estonian</li> <li>O16. Finnish</li> <li>O17. French</li> <li>O18. German</li> <li>O19. Greek</li> <li>O20. Italian</li> </ul> </li> <li>Activity Sector <ul style="list-style-type: none"> <li>O21. Telecommunication</li> <li>O22. Justice and Judicial</li> <li>O23. Public Security and law</li> <li>O24. Manufacture of machine tools</li> <li>O25. Research and Development</li> <li>O26. Hardware Consultancy</li> <li>O27. Software Consultancy and Supply</li> <li>O28. Data processing</li> </ul> </li> </ul>

## NeOn Methodology

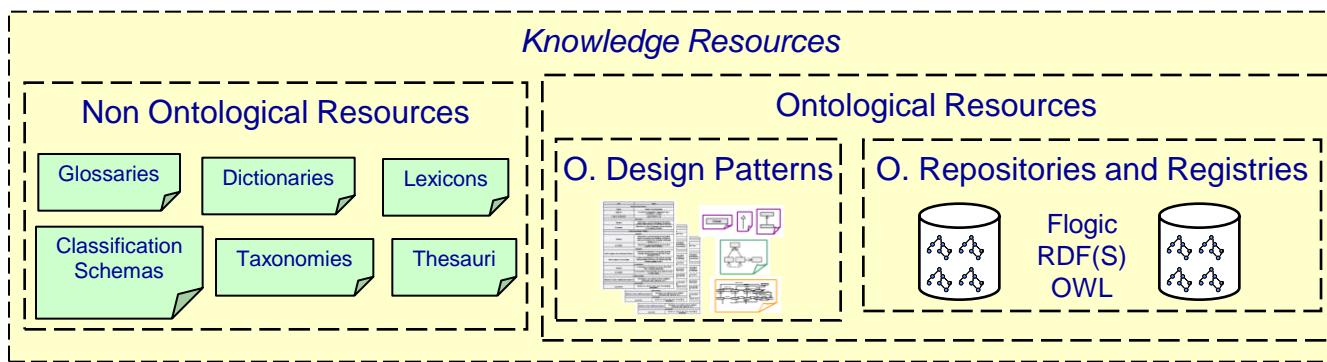


*Ontology Support Activities:* Knowledge Acquisition (Elicitation); Documentation; Configuration Management; Evaluation (V&V); Assessment

eroa, B. Villazón, E. Montiel, G. Aguado, M. Espinoza

# Searching Resources

- Use the terminology from the ORSD
- Find resources covering the terminology



Objects
Objects in the universe of discourse, which are instances of:
<ul style="list-style-type: none"> <li>• Job Category           <ul style="list-style-type: none"> <li>O1. Computer System Designer</li> <li>O2. Computer System Analyst</li> <li>O3. Programmer</li> <li>O4. Computer Engineer</li> <li>O5. Computer Assistant</li> <li>O6. Computer Equipment Operator</li> <li>O7. Industrial Robot Controller</li> <li>O8. Telecommunication Equipment Operator</li> <li>O9. Medical Equipment Operator</li> <li>O10. Electronic Equipment Operator</li> <li>O11. Image Equipment Operator</li> </ul> </li> <li>• Nationality           <ul style="list-style-type: none"> <li>O12. Austrian</li> <li>O13. Belgian</li> <li>O14. Danish</li> <li>O15. Estonian</li> <li>O16. Finnish</li> <li>O17. French</li> <li>O18. German</li> <li>O19. Greek</li> <li>O20. Italian</li> </ul> </li> </ul>

- Where:
  - Internet
  - Standardization bodies (ISO,...)
  - Intranet of the organization
  - Ontology Registries



# Search and Select non-ontological resources

- We select the most appropriate standards and taxonomies for:
  - Occupation Classification  
ISCO-88 (COM), SOC, ISCO-88, ONET, Eures Taxonomy.
  - Classification of Economic Activities  
ISIC Rev. 3.1, NACE Rev. 1.1, NAICS
  - Apprenticeship classifications  
ISCED 97, FOET
  - Currency Classification  
ISO 4217
  - Geography Classification  
ISO 3166, Eures Taxonomy

Language Classification

ISO 6392, CEF

Driving License Classification

European Legislation

Skill Classification

Eures Taxonomy

Contract Types Classification

LE FOREM, Eures and BLL Classification

Work Condition Classification

LE FOREM, Eures and BLL Classification

Is the terminology included in  
the Ontology Requirements Specification Document  
covered by the resources?

# Searching Ontologies in Watson

## Ontology Requirement Specification Document

Objects
Objects in the domain of discourse, which are instances of:
Job Category
• Education
029. Life Science
030. Mathematics
031. Computer Science
032. Computer Use
033. Statistics
034. Physics
035. Network Administration
• Languages
036. Swedish
037. Spanish
038. Slovenian
039. Portuguese
040. English
041. French
042. German
• Currency
043. Euro
044. Krone
045. Great British Pound
046. Zlate
047. US Dollar
048. Franc
• Location
049. Austria
050. Belgium
051. Denmark
052. France
053. Finland
054. France
055. Germany
056. Greece
Activity Sector
• Nationality
012. Austrian
013. Belgian
014. Danish
015. Estonian
016. Finnish
017. French
018. German
019. Greek
020. Italian
• Job Category
021. Telecommunication
022. Justice and Judicial
023. Public Security and law
024. Manufacture & Machine tools
025. Research and Development
026. Hardware Consultancy
027. Software Consultancy and Supply
028. Data processing

Watson Semantic Web Search

http://kmi-web05.open.ac.uk/WatsonWUI/

Read this - Check your ontology - Website - Blog

university researcher student

Search Watson

Found 19 semantic documents - [Restrict Search](#)

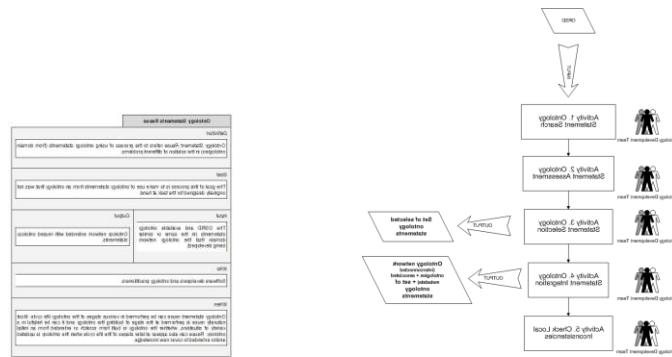
1- <http://daml.umbc.edu/ontologies/cobra/0.4/academia> □  
 5 KB - RDF,OWL (OWL FULL) - ALCH(D)  
 • <http://daml.umbc.edu/ontologies/cobra/0.4/academia#University> □  
 Label: University  
 Comment:  
 • <http://daml.umbc.edu/ontologies/cobra/0.4/academia#Researcher> □  
 • <http://daml.umbc.edu/ontologies/cobra/0.4/academia#GradStudentResearcher> □  
 Label: GradStudentResearcher  
 Comment:  
 • <http://daml.umbc.edu/ontologies/cobra/0.4/academia#Student> □  
 • <http://daml.umbc.edu/ontologies/cobra/0.4/academia#GradStudentResearcher> □

2- <http://annotation.semanticweb.org/ontologies/iswc.owl> □  
 30 KB - OWL,RDF (OWL Lite) - AL(D)  
 • <http://annotation.semanticweb.org/2004/iswc#University> □  
 • [http://annotation.semanticweb.org/2004/iswc#University\\_of\\_Karlsruhe](http://annotation.semanticweb.org/2004/iswc#University_of_Karlsruhe) □  
 • <http://annotation.semanticweb.org/2004/iswc#Researcher> □  
 • <http://annotation.semanticweb.org/2004/iswc#Student> □  
 • <http://annotation.semanticweb.org/2004/iswc#PhDStudent> □

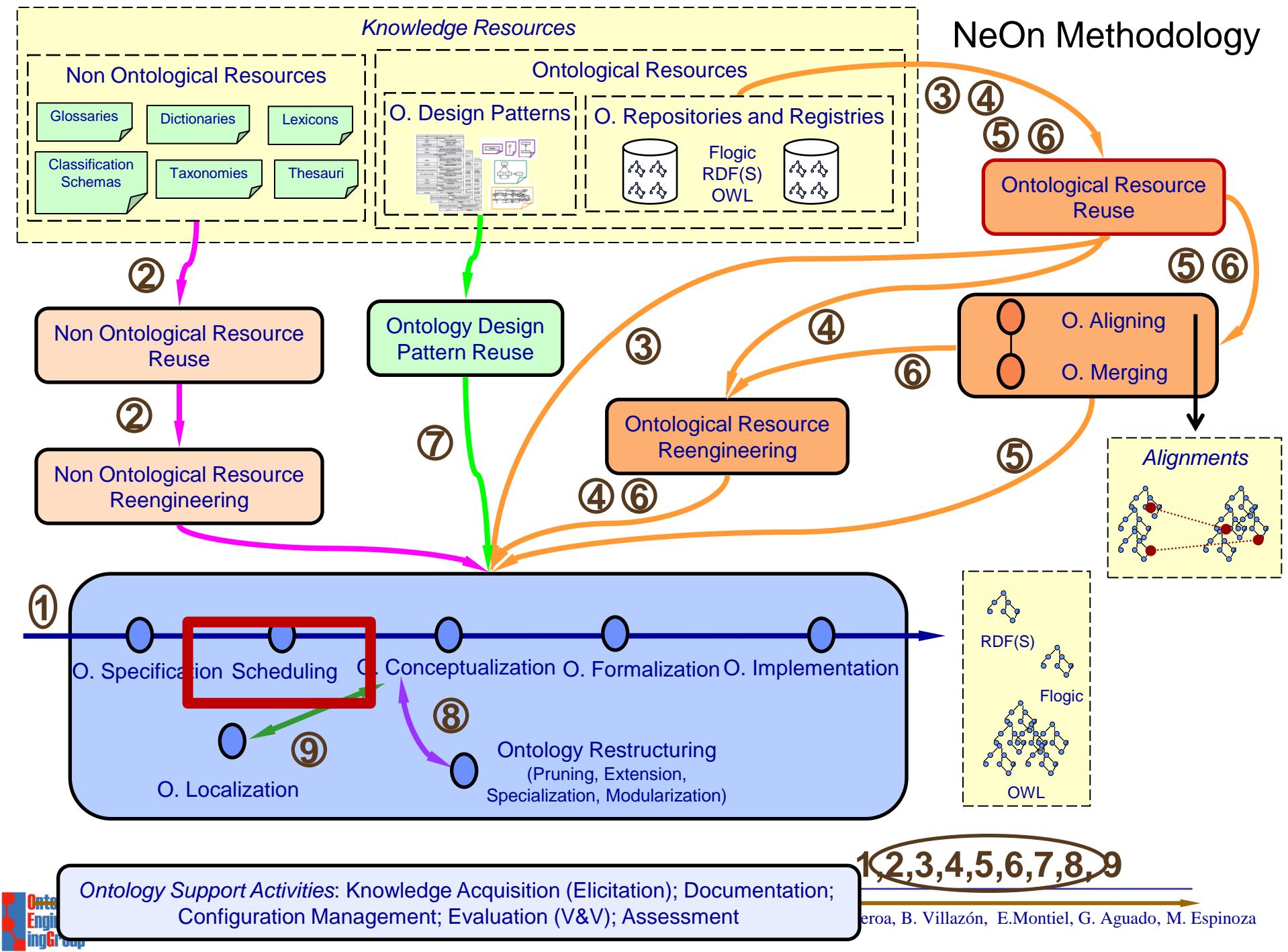
3- <http://ontobroker.semanticweb.org/ontologies/ka2-onto-2000-11-07.daml> □  
 32 KB - DAML+OIL,RDF - AL(D)  
 • <http://kmi-web05.open.ac.uk:81/cache/7f64e14aa3dd17/adbdb1ce20/2653b336ce35ba101#University> □  
 • <http://kmi-web05.open.ac.uk:81/cache/7f64e14aa3dd17/adbdb1ce20/2653b336ce35ba101#Researcher> □  
 • <http://kmi-web05.open.ac.uk:81/cache/7f64e14aa3dd17/adbdb1ce20/2653b336ce35ba101#Student> □  
 • <http://kmi-web05.open.ac.uk:81/cache/7f64e14aa3dd17/adbdb1ce20/2653b336ce35ba101#PhDStudent> □

4- <http://www.ifi.unizh.ch/ddis/fileadmin/pdf/serviceBroker/swc.daml> □  
 32 KB - DAML+OIL,RDF - AL(D)  
 • <http://annotation.semanticweb.org/iswc/iswc.daml#University> □  
 • [http://annotation.semanticweb.org/iswc/iswc.daml#University\\_of\\_Karlsruhe](http://annotation.semanticweb.org/iswc/iswc.daml#University_of_Karlsruhe) □  
 • <http://annotation.semanticweb.org/iswc/iswc.daml#Researcher> □

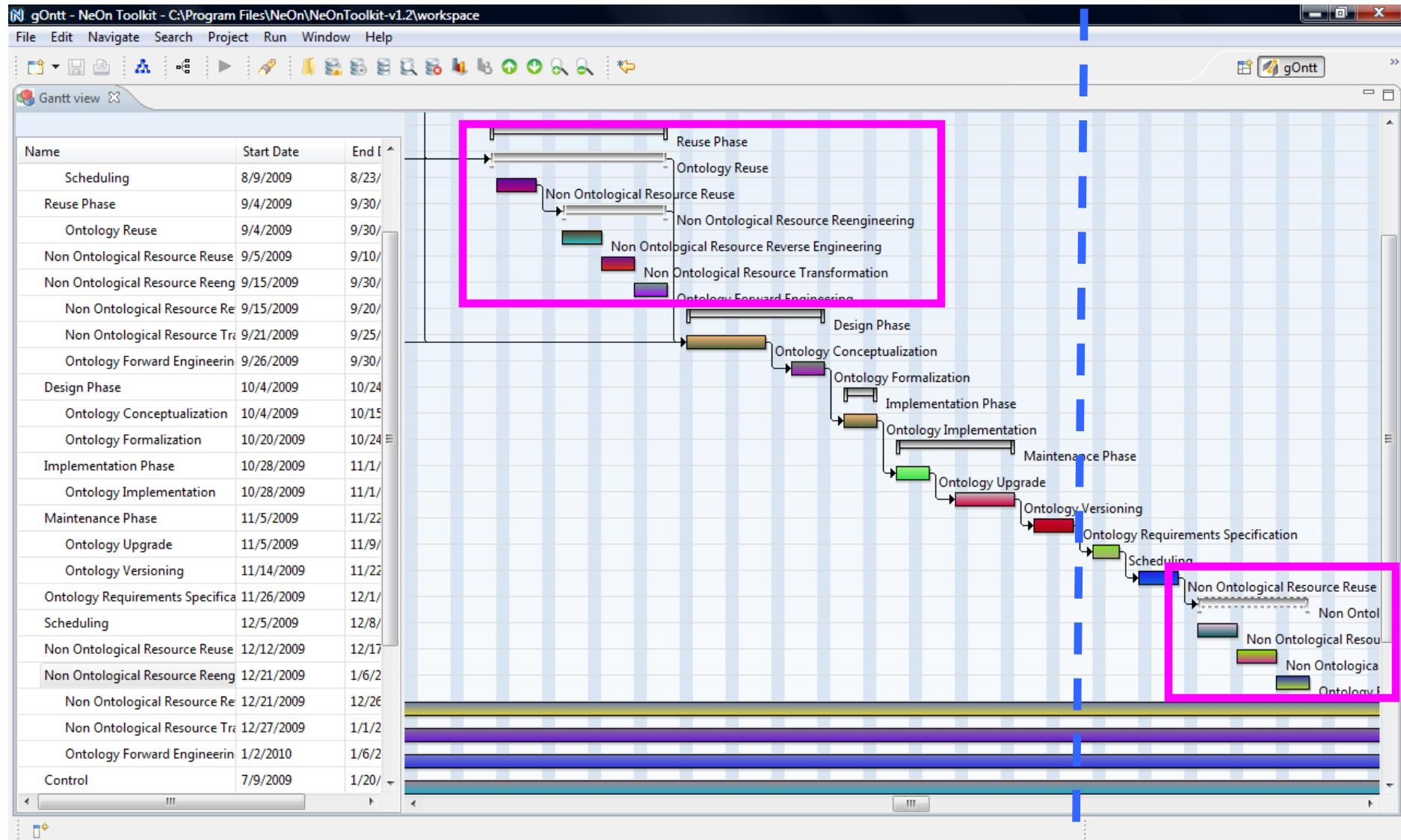
The NeOn methodology includes guidelines for reusing statements



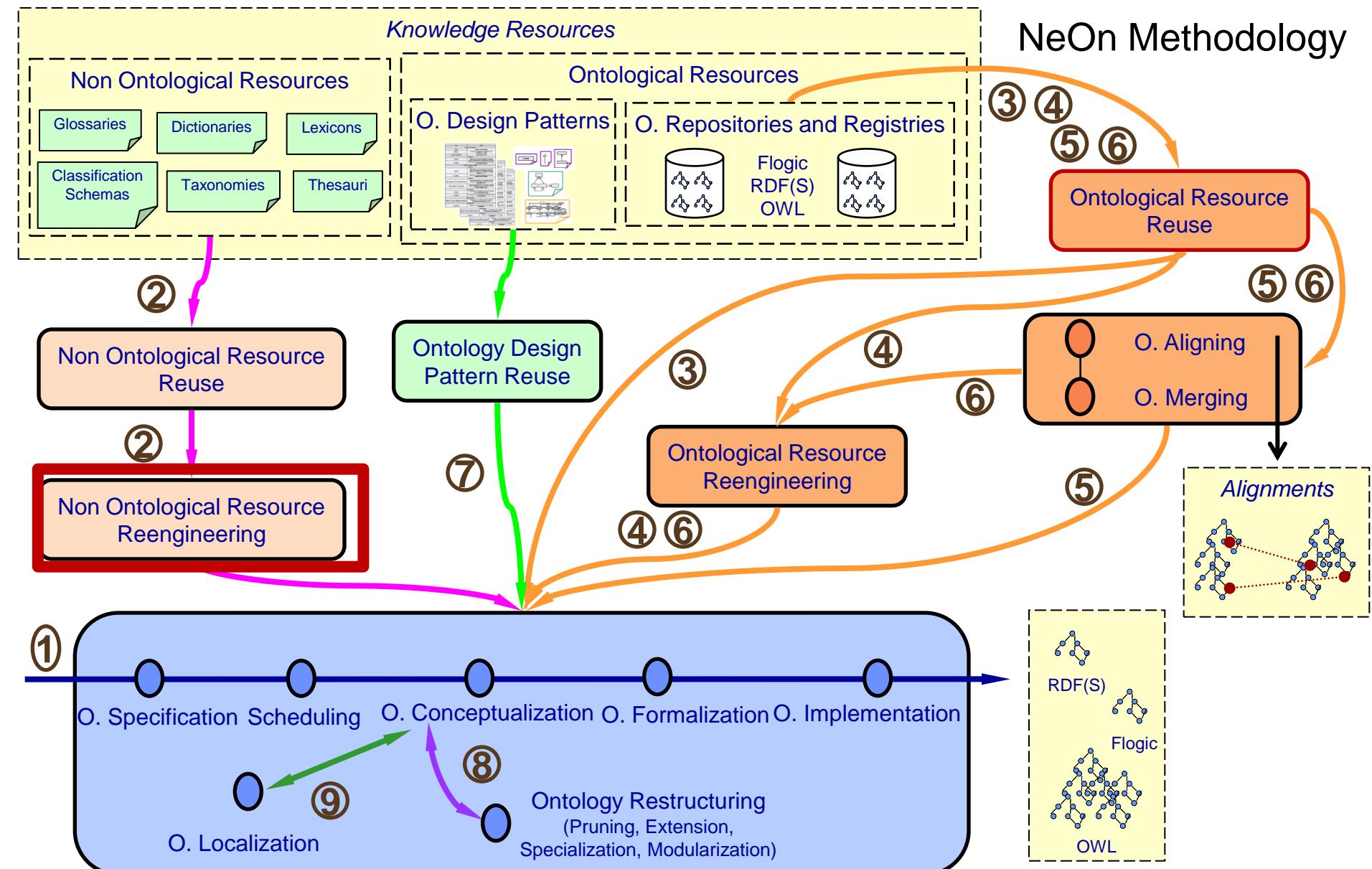
# NeOn Methodology



# Reuse and Re-engineering + Incremental



# NeOn Methodology



*Ontology Support Activities:* Knowledge Acquisition (Elicitation); Documentation; Configuration Management; Evaluation (V&V); Assessment

eroa, B. Villazón, E. Montiel, G. Aguado, M. Espinoza

# Pattern based approach for re-engineering non ontological resources

**ISCO-88 (COM)**  
International Standard Classification  
of Occupations  
(for European Union purposes)



**FOET**  
Classification of fields of  
education and training



**NACE**  
Statistical Classification  
of Economic Activities in the  
European Community



**ISO 3166**  
English country names  
and code elements



**ISTAT**  
Italian Geography  
Standard



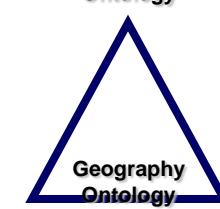
*Pattern for re-engineering a  
classification scheme modelled  
with a Path Enumeration Data Model*



*Pattern for re-engineering a  
classification scheme modelled  
with a Snowflake Data Model*



*Pattern for re-engineering a  
classification scheme modelled  
with an Adjacency List Data Model*



# Reengineering and aggregating resources

## EURES Taxonomy

(proprietary)

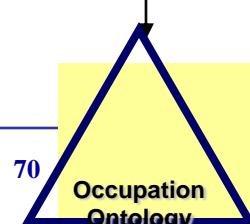
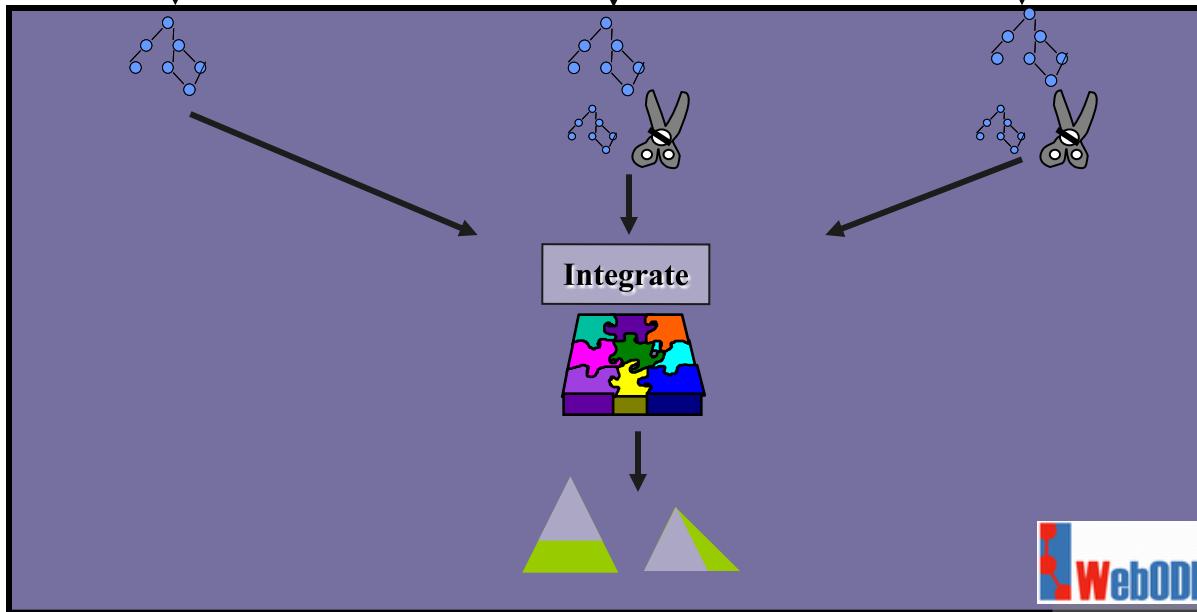
Oracle DB

## ONET

HTML

## ISCO-88 (COM)

MS Access



mez Pérez, M.C. Suárez de Figueroa, B. Villazón, E. Montiel, G. Aguado, M. Espinoza

# Knowledge Resource Re-engineering and Aggregation

## ISO 3166-1 (XML)

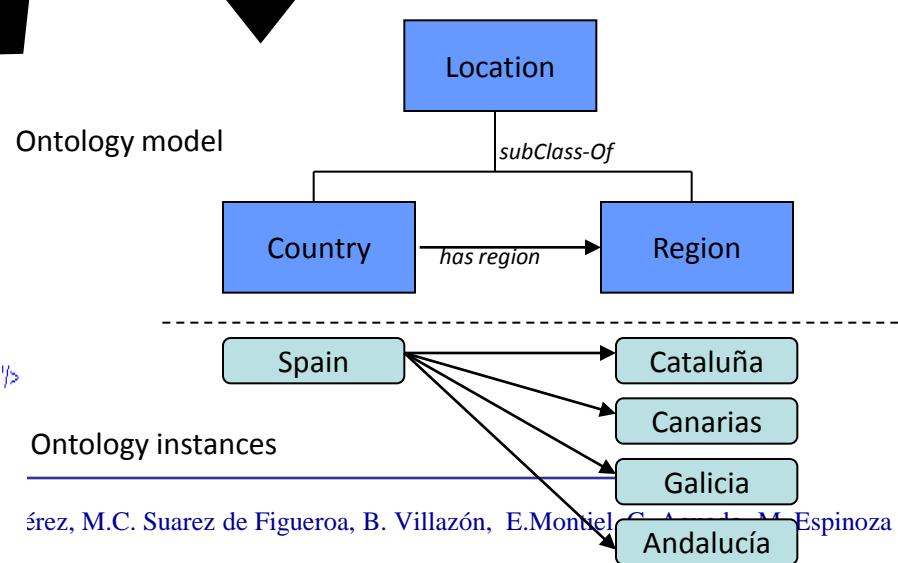
```
<ISO_3166-1_Entry>
  <ISO_3166-1_Country_name>SPAIN</ISO_3166-1_Country_name>
  <ISO_3166-1_Alpha-2_Code_element>ES</ISO_3166-1_Alpha-2_Code_element>
</ISO_3166-1_Entry>
```

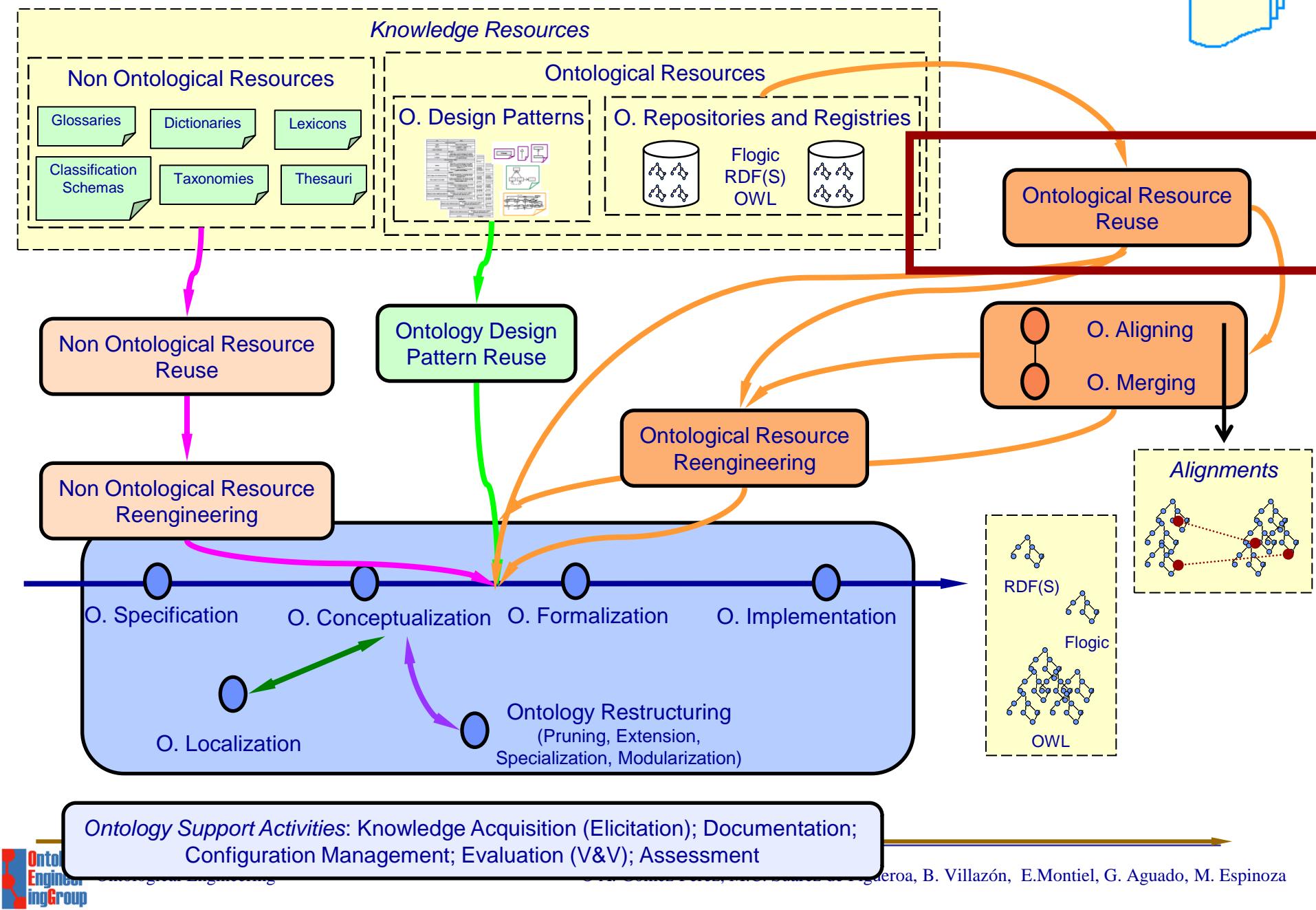
## Excerpt of the Geography Ontology

```
<rdf:Description rdf:about="webode://mccarthy.dia.fi.upm.es/Geography_Ontology#Country_SPAIN">
  <rdf:type rdf:resource="webode://mccarthy.dia.fi.upm.es/Geography_Ontology#Country"/>
  <GeoOnt:Code rdf:datatype="http://www.w3.org/2001/XMLSchema#string">ES</GeoOnt:Code>
  <GeoOnt:Name rdf:datatype="http://www.w3.org/2001/XMLSchema#string">SPAIN</GeoOnt:Name>
  <GeoOnt:is_located_in_Continent rdf:resource="webode://mccarthy.dia.fi.upm.es/Geography_Ontology#EU_Europe"/>
  <GeoOnt:has_region_Region rdf:resource="webode://mccarthy.dia.fi.upm.es/Geography_Ontology#Catalunya"/>
  <GeoOnt:has_region_Region rdf:resource="webode://mccarthy.dia.fi.upm.es/Geography_Ontology#Canarias"/>
  <GeoOnt:has_region_Region rdf:resource="webode://mccarthy.dia.fi.upm.es/Geography_Ontology#Galicia"/>
  <GeoOnt:has_region_Region rdf:resource="webode://mccarthy.dia.fi.upm.es/Geography_Ontology#Andalucia"/>
</rdf:Description>
```

## Regions Table (Eures Oracle DB)

N	ISO31661 Code	Region
100	ES	Cataluña
101	ES	Canarias
102	ES	Galicia
103	ES	Andalucía
104	ES	Navarra
105	ES	Asturias
106	ES	Baleares
107	ES	Murcia
108	ES	Aragon

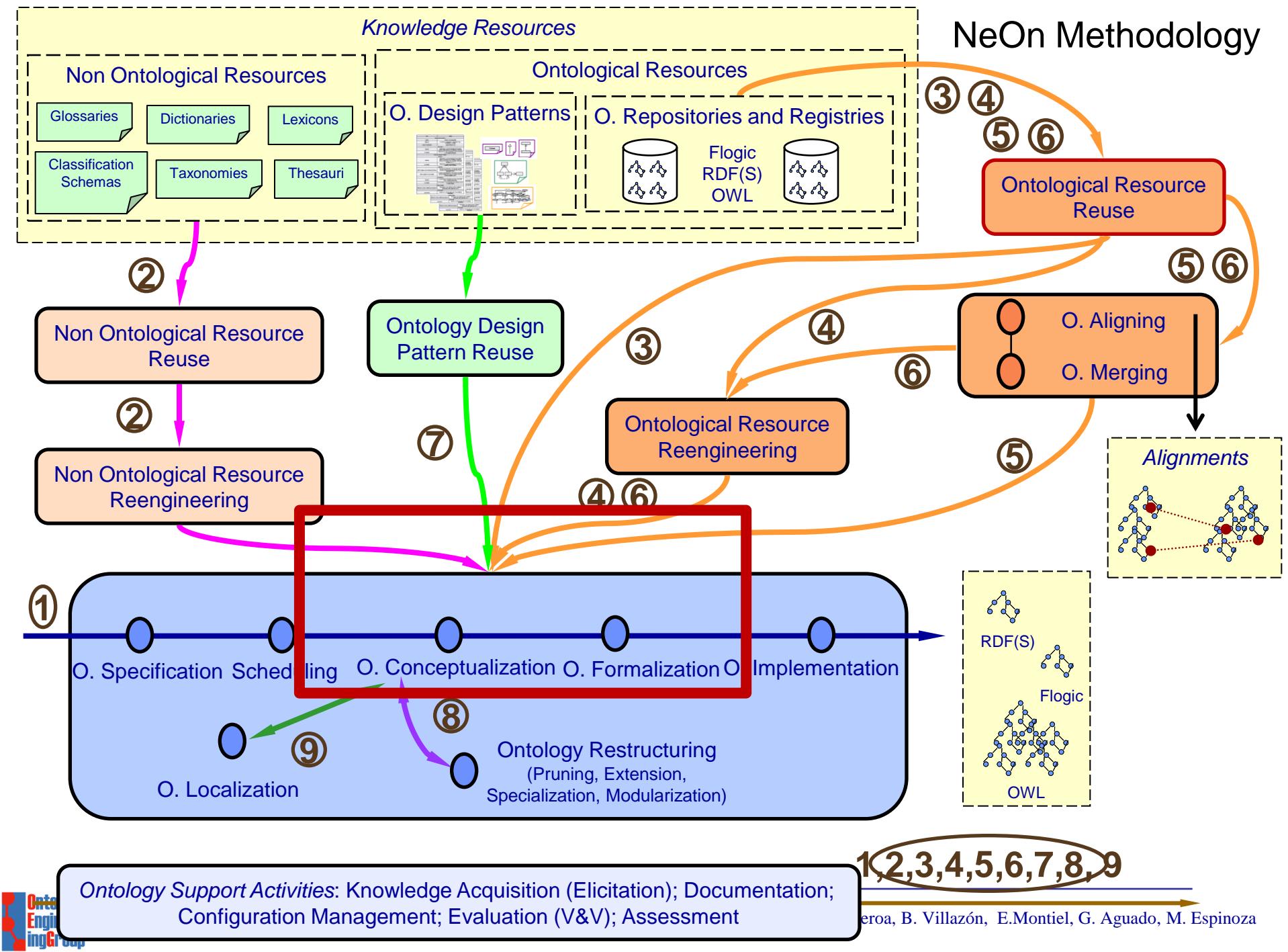




# The Time Ontology Selection

	Cyc's Upper Ontology	Unrestricted Time Ontology	Simple Time Ontology	Reusable Time Ontology	Kestrel Time Ontology	SRI's Time Ontology	SUMO Time Ontology	DAML Time Ontology	AKT Time Ontology
Time Points	<input checked="" type="checkbox"/>								
Time Interval	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
Absolute and Relative Time	<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
Relations between time intervals	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Convex and non convex intervals	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
Distinction between open and close intervals	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
Explicit modeling of proper intervals								<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Concatenation of intervals	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
Different temporal granularities		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
Provides axioms	<input checked="" type="checkbox"/>								

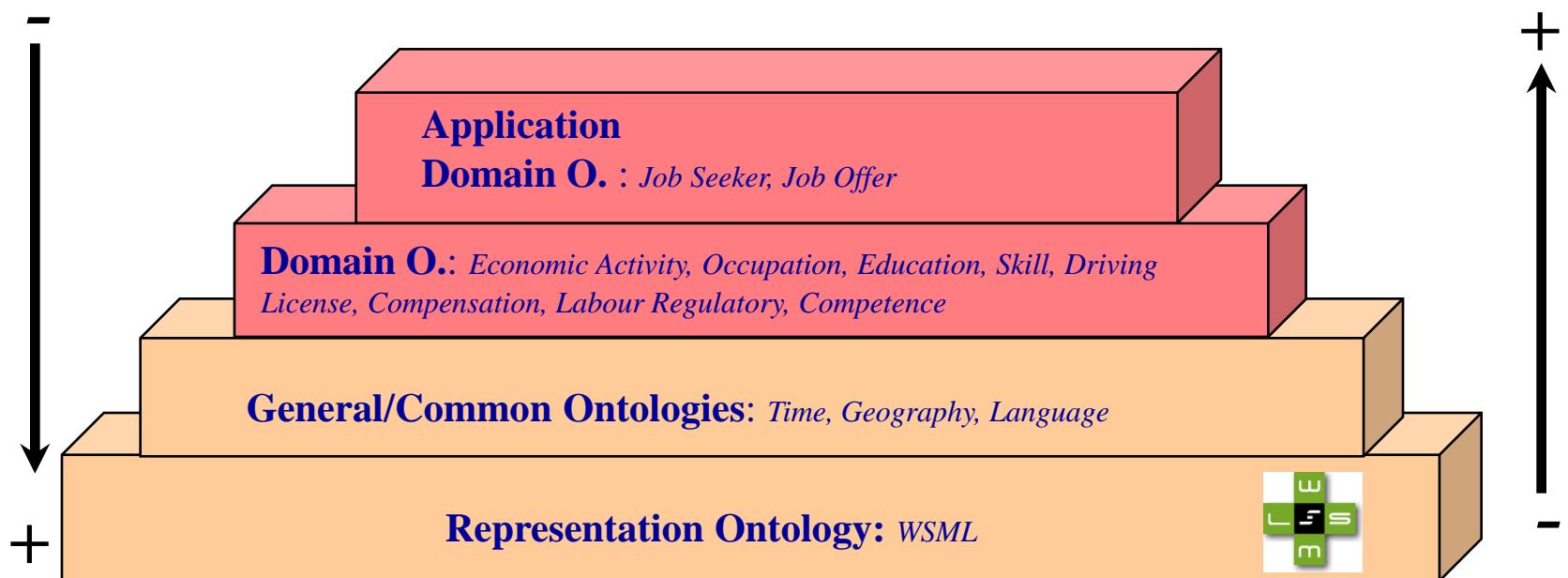
# NeOn Methodology



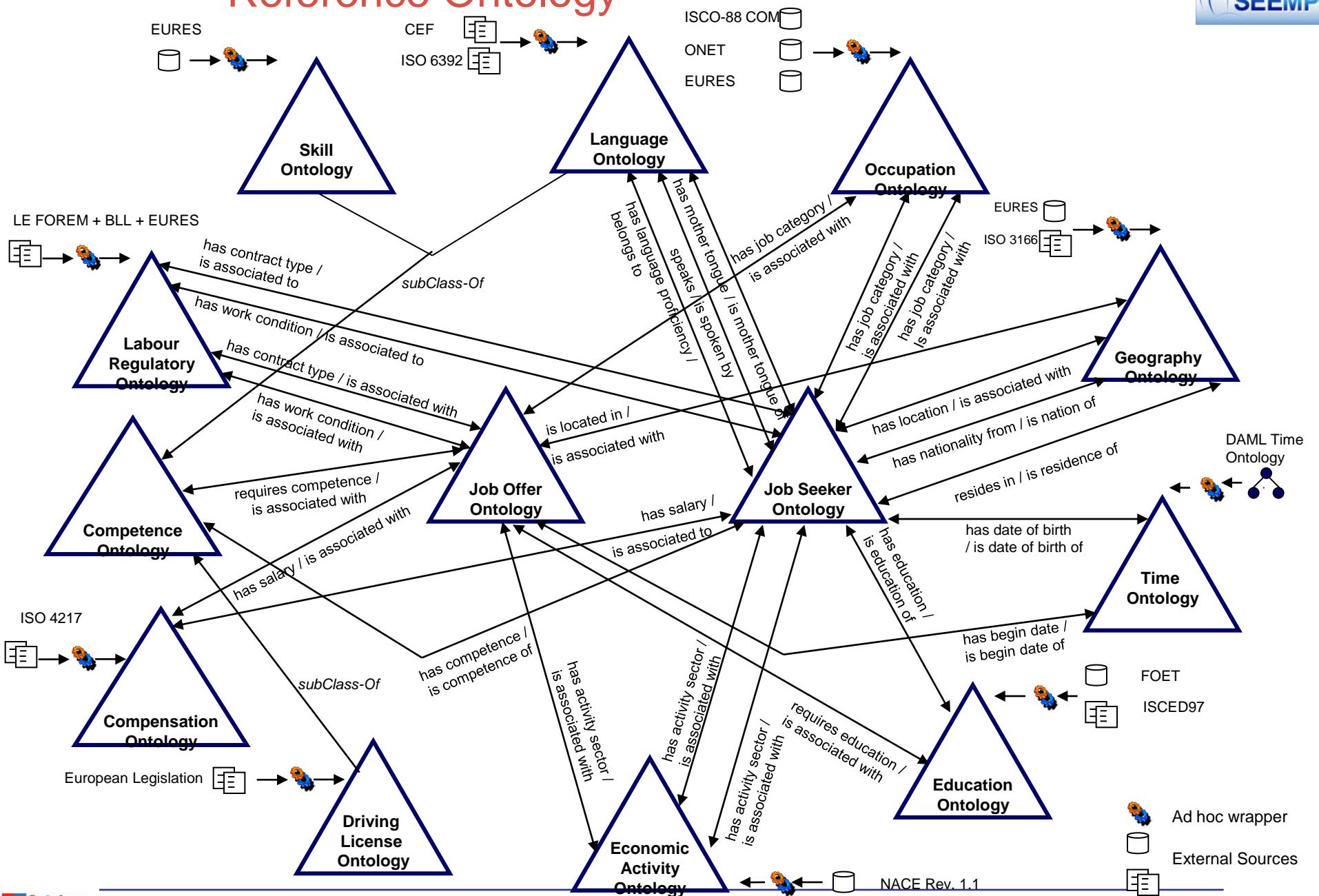
# Conceptualization: Modular approach for ontology construction

Reusability

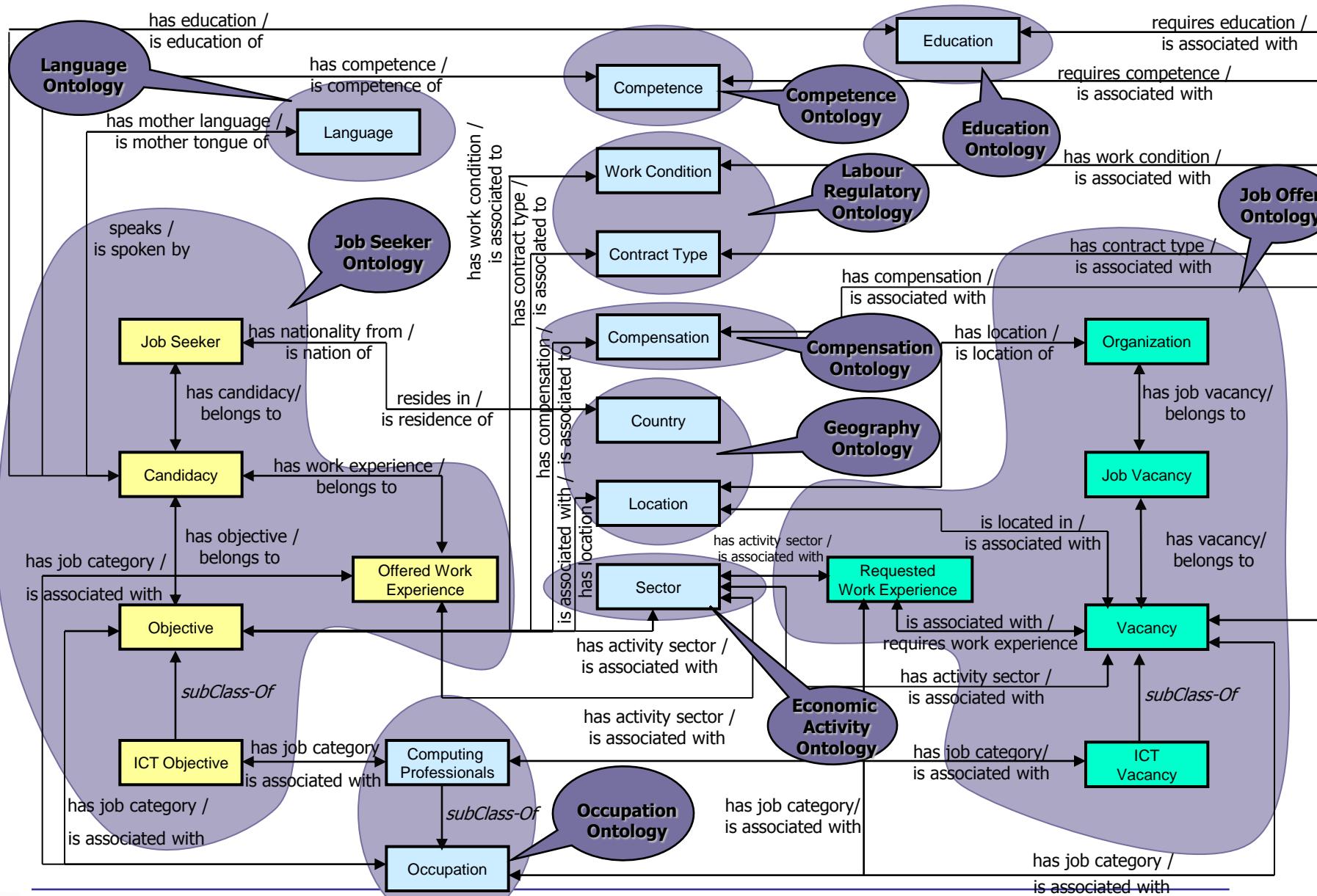
Usability



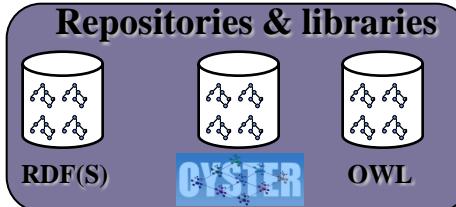
# Reference Ontology



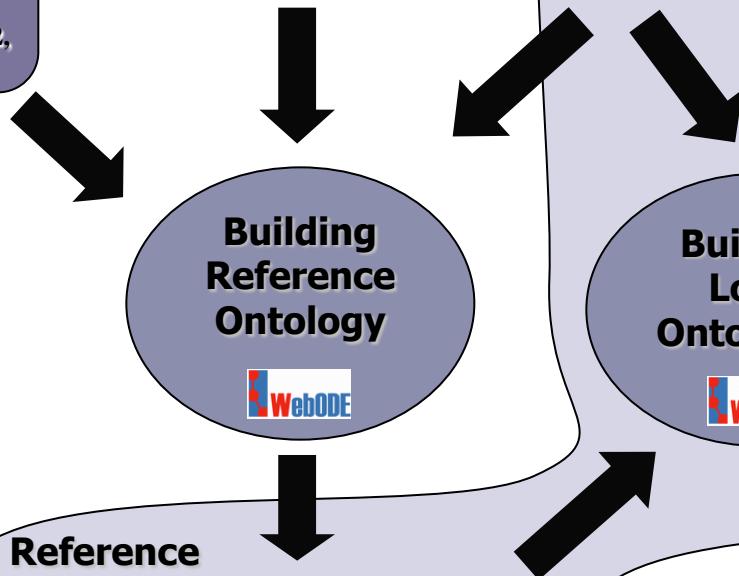
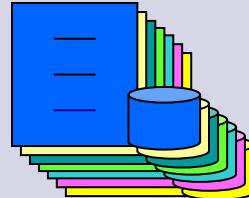
# Details of the ontology



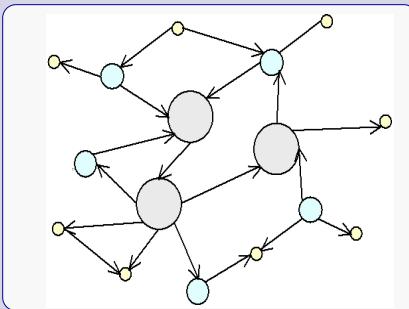
ISCO-88 (COM),  
ONET,  
EURES taxonomy,  
FOET, ISCED97,  
NACE, ISO 4217,  
ISO 3166, ISO 6392,  
HR-XML, ...



## ES Data Sources

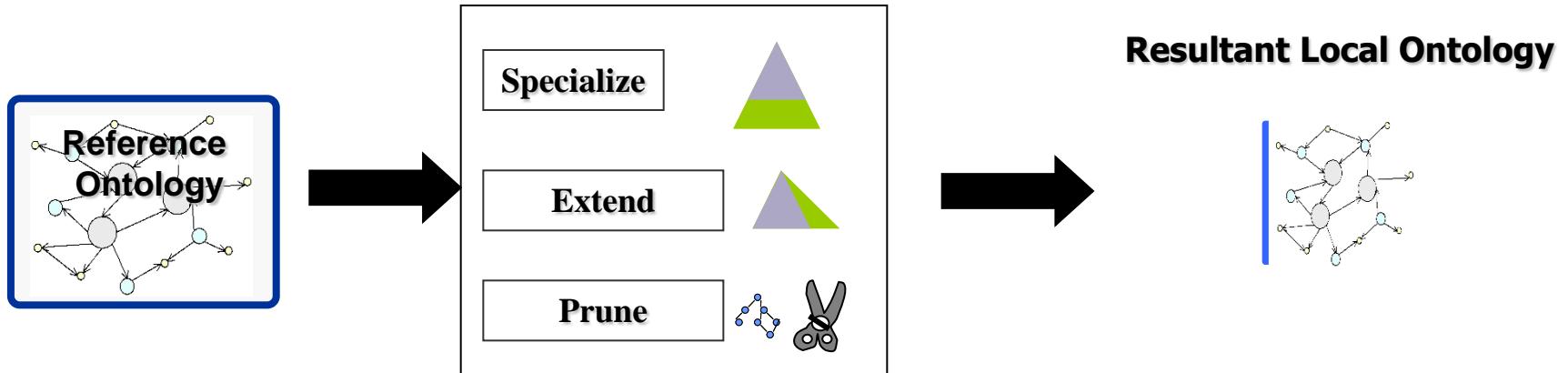


## Reference Ontology



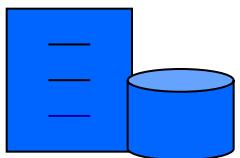
# Local Ontologies Building Process

- Option 1: *Building Local Ontologies from the Reference Ontology.*



- Option 2: *Building Local Ontologies as a reverse engineering process from ES Data Sources.*

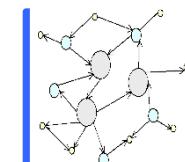
**ES Data Sources**



**Reverse Engineering**



**Resultant Local Ontology**



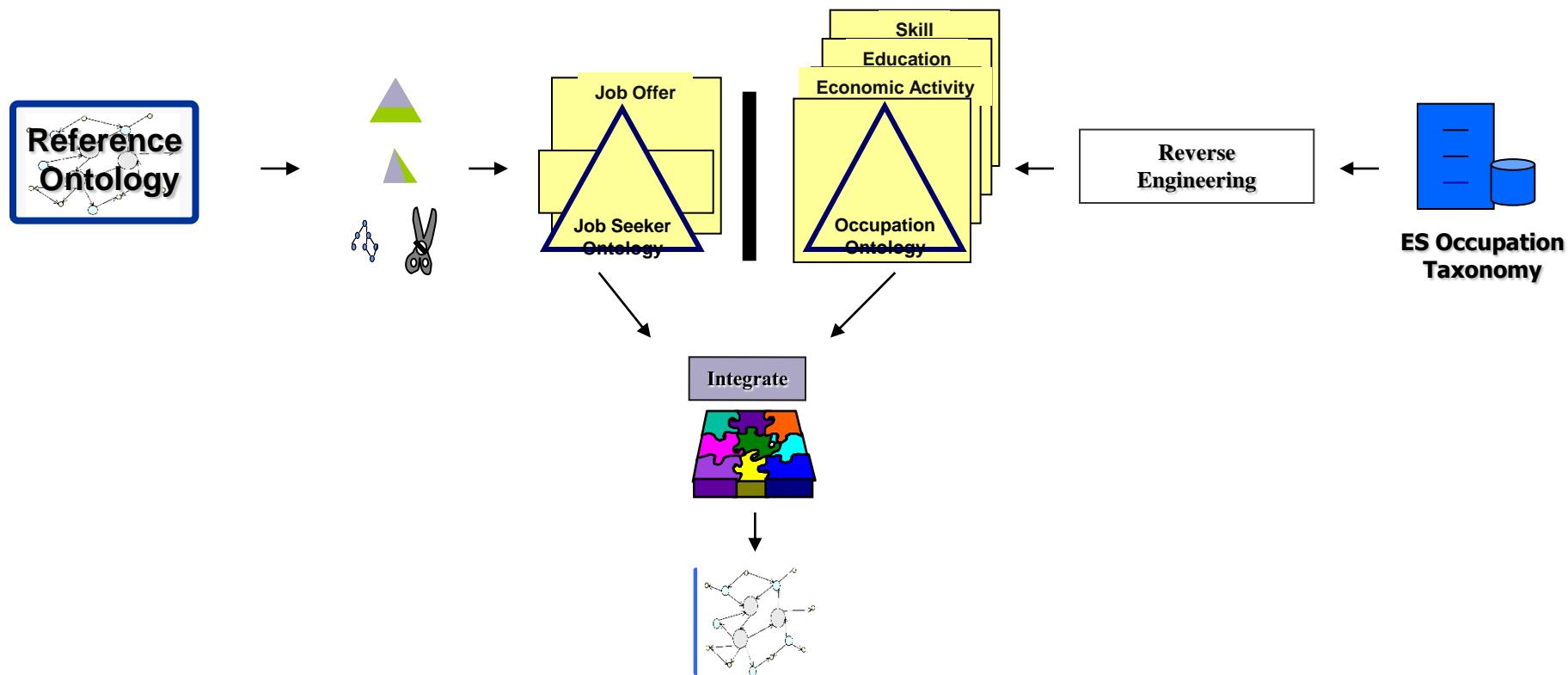
# Which option is the most appropriate for the use

	<b>Option 1: Building Local Ontologies from the Reference Ontology.</b>	<b>Option 2: Building Local Ontologies as a reverse engineering process from ES Data Sources.</b>
<b>Mappings between Local Ontologies and Reference Ontology</b>	Mappings are not complex. They use the same terms.	Complex mappings due to terminology heterogeneity.
<b>Mappings between Local Ontologies and ES schema sources</b>	Complex mappings due to terminology and structural heterogeneity.	Mappings are not complex. They use the same terms.
<b>Building process</b>	Structured/guided by the architecture of the Reference Ontology and scoped with applications needs.	Requires more sophistication of knowledge engineering and good acquaintance of all the data and their structures of the application.
<b>Changes in the Reference Ontology</b>	Imply changes in <ul style="list-style-type: none"> <li>- the mappings between local and reference ontologies.</li> <li>- the mappings between the local ontologies and the ES schema sources.</li> <li>- the Local Ontology.</li> </ul>	Imply changes in <ul style="list-style-type: none"> <li>- the mappings between Local Ontologies and the Reference Ontology.</li> </ul>
<b>Changes in the ES schema sources</b>	Imply changes in <ul style="list-style-type: none"> <li>- its Local Ontology (probably the part that is not a mirror of the Reference Ontology).</li> <li>- the mappings between Local Ontologies and ES schema sources.</li> <li>- in the mappings between Local Ontology and the Reference Ontology.</li> </ul>	Imply changes in <ul style="list-style-type: none"> <li>- the Local Ontologies.</li> <li>- in mappings between ES sources and Local Ontologies.</li> <li>- mappings between local and the Reference Ontology.</li> </ul>

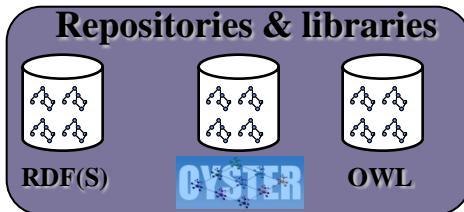
# Approach followed by SEEMP for building Local Ontologies

## A hybrid approach

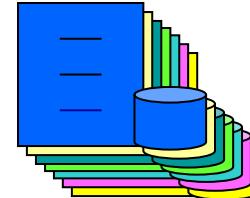
- Option 1 for Job Seeker and Job Offer Ontologies
- Option 2 for Occupation, Education, etc.



ISCO-88 (COM),  
ONET,  
EURES taxonomy,  
FOET, ISCED97,  
NACE, ISO 4217,  
ISO 3166, ISO 6392,  
HR-XML, ...



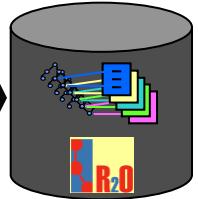
## ES Data Sources



## Building Mappings L.O. - ES Data Sources



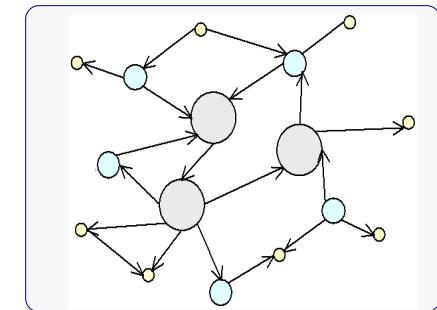
**Mappings L.O. - ES Data Sources**



## Building Reference Ontology



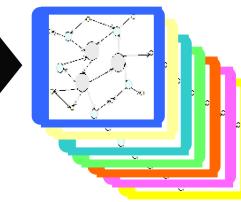
## Reference Ontology



## Building Local Ontologies



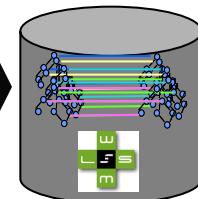
## Local Ontologies



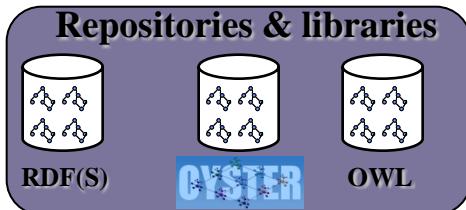
## Building Mappings R.O. - L.O.



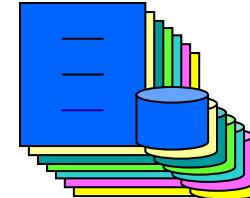
**Mappings R.O. - L.O.**



ISCO-88 (COM),  
ONET,  
EURES taxonomy,  
FOET, ISCED97,  
NACE, ISO 4217,  
ISO 3166, ISO 6392,  
HR-XML, ...



## ES Data Sources

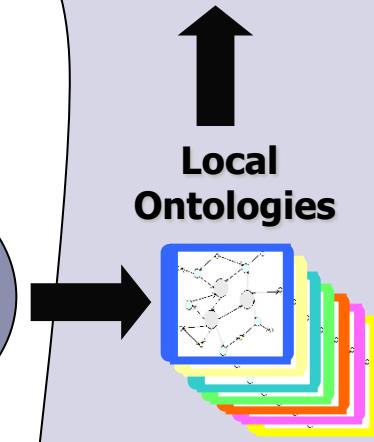
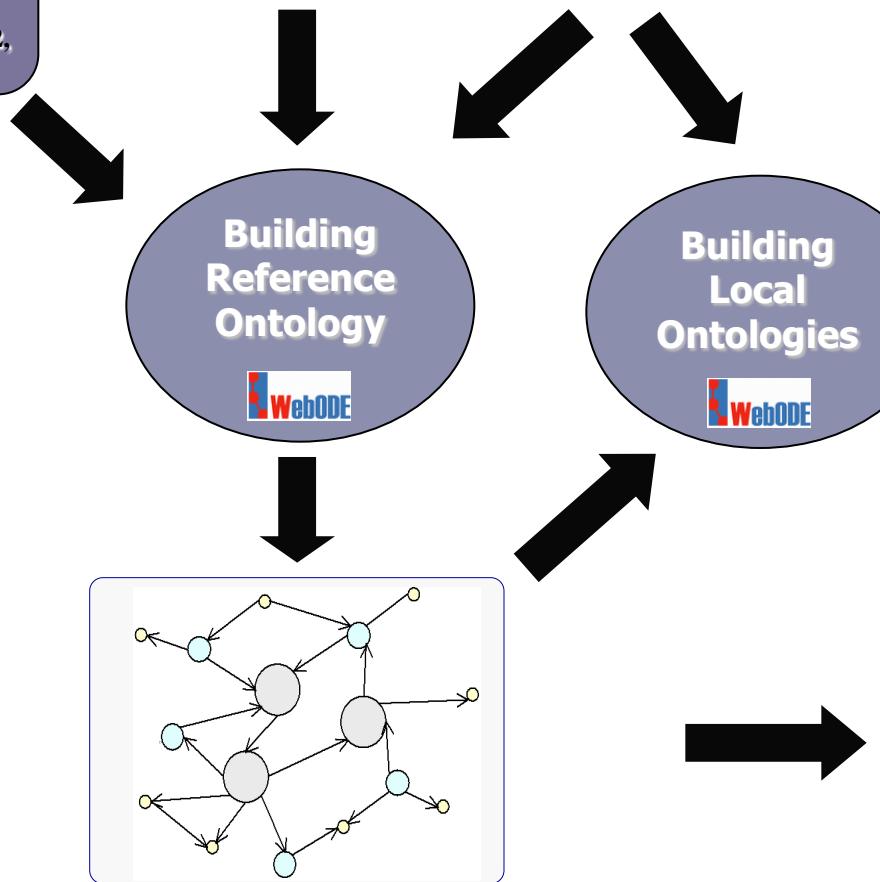


**Building Mappings L.O. - ES Data Sources (ODEMapster)**

ODEMapster  
Mapping Editor

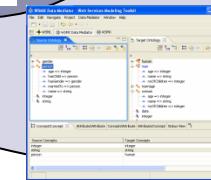
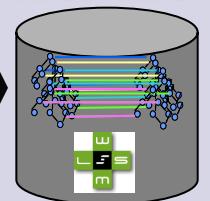
**Mappings ES-LO**

R<sub>2</sub>O  
Mappings



**Building Mappings R.O. - L.O.**

**Mappings R.O. - L.O.**



WSMT

# Conclusions

1. **The NeOn methodology facilitates the reuse and reengineering of non ontological resources into ontologies**
2. The reuse of non-ontological resources that have been reached some degree of consensus in a community allows the development of ontologies easier and quicker
3. The use of external resources for disambiguating the semantics of the relations in the resource, the resultant ontology will have better quality degree.

# NeOn Methodology Pointers

- ❑ Scenarios for Building Ontology Networks → **D5.3.1 and D5.4.2**
- ❑ NeOn Glossary of Processes and Activities → **D5.3.1 and D5.3.2**
- ❑ Set of Ontology Network Life Cycle Models → **D5.3.2**
- ❑ Methodological Guidelines for Ontology Requirements Specification → **D5.4.1**
- ❑ Methodological Guidelines for Scheduling and gOntt plug-in → **D5.3.2**
- ❑ Methodological Guidelines for Non-Ontological Resource Reuse and Reengineering → **D5.4.1 and D2.2.2**
- ❑ Methodological Guidelines for Ontological Resource Reuse → **D5.4.1**
- ❑ Methodological Guidelines for ODP Reuse → **D5.4.1 and D5.4.2**
- ❑ Methodological Guidelines for Ontology Modularization → **D5.4.2**
- ❑ Methodological Guidelines for Ontology Evaluation → **D5.4.2**
- ❑ Methodological Guidelines for Ontology Evolution → **D5.4.2**
- ❑ Methodological Guidelines for Ontology Localization → **D5.4.2**