



Ontological Engineering

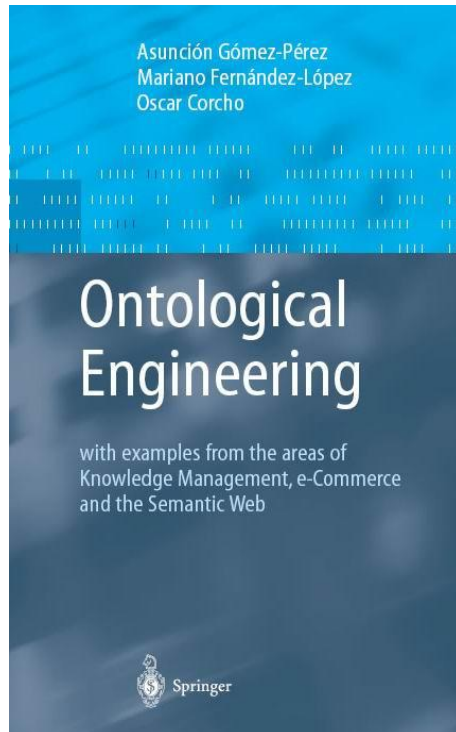
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References



<http://www.neon-project.org/>

- Deliverable D5.3.1
- Deliverable D5.3.2
- Deliverable D5.4.1

NeOn Book



NeOn Methodology in a Nutshell

Title	Author(s)
Introduction	Asunción Gómez-Pérez, Enrico Motta, Mari Carmen Suárez-Figueroa
Definition of Ontology Networks	Mathieu d'Aquin, Aldo Gangemi, Peter Haase
NeOn Methodology Framework:	
Scenarios for Building Ontology Networks and Glossary of Processes and Activities	Mari Carmen Suárez-Figueroa, Asunción Gómez-Pérez
Collection of Ontology Life Cycle Models	Asunción Gómez-Pérez, Mari Carmen Suárez-Figueroa, Mariano Fernández-López
Methodology guidelines	
Ontology Requirements Specification	Asunción Gómez-Pérez, Mari Carmen Suárez-Figueroa
Searching Ontologies	Mathieu d'Aquin, Holger Lewen
Scheduling using gOntt	Mari Carmen Suárez-Figueroa, Asunción Gómez-Pérez
Reusing and Re-engineering Non-Ontological Resources	Asunción Gómez-Pérez, Boris Villazón-Terrazas
Reusing General Ontologies	Mariano Fernández-López, Asunción Gómez-Pérez, Mari Carmen Suárez-Figueroa
Reusing Domain Ontologies	Mari Carmen Suárez-Figueroa, Asunción Gómez-Pérez
Reusing Statements	Mari Carmen Suárez-Figueroa, Mathieu d'Aquin
Conceptualizing using ODPs	Eva Blomqvist, Enrico Daga, Aldo Gangemi, Valentina Presutti,

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Executive Summaries on the NeOn Methodology

Ontology Requirements Specification

Authors: Asunción Gómez-Pérez, Mari Carmen Suárez-Figueroa

What is an Ontology Requirements Specification?

Ontology Requirements Specification

Definition

Ontology Requirements Specification refers to the activity of collecting the requirements that the ontology should fulfill (e.g., reasons to build the ontology, target group, intended uses) and possibly reach through a consensus process.

Goal

The activity states why the ontology is being built, which its intended uses are, who the end-users are, and which requirements the ontology should fulfill.

Input

A set of ontological needs

Output

Ontology Requirements Specification Document (ORSRD)

Who

Software developers and ontology practitioners, who form the ontology development team (ODT), in collaboration with users and domain experts.

When

This activity must be carried out at the beginning of the ontology project and in parallel with the knowledge acquisition activity.

What is the output?

Ontology Requirements Specification Document Template

1 Purpose

The main goal of the ontology. In other words, the main function or role that the ontology should have.

2 Scope

The general coverage and the degree of detail that the ontology should have.

3 Implementation Language

The formal language that the ontology should use.

4 Intended End-Users

The intended end-users of the ontology.

5 Intended Uses

The intended uses of the ontology.

6 Ontology Requirements

a. Non-Functional Requirements

The general requirements or aspects that the ontology should fulfill, including optional priorities for each requirement.

b. Functional Requirements: Groups of Competency Questions

The content specific requirements that the ontology should fulfill in the form of groups of competency questions and their answers, including optional priorities for each group and for each competency question.

7 Pre-Glossary of Terms

a. Terms from Competency Questions

The list of terms included in the competency questions and their frequencies.

b. Terms from Answers

The list of terms included in the answers and their frequencies.

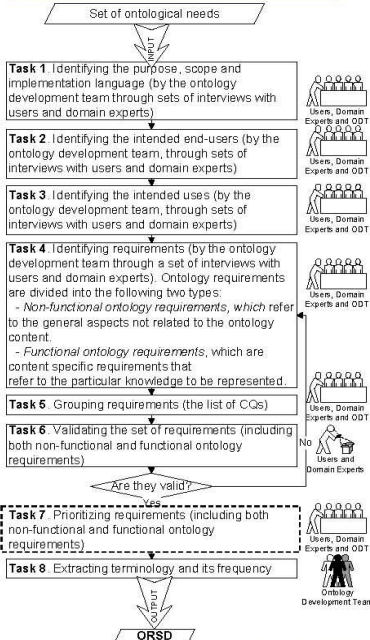
c. Objects

The list of objects included in the competency questions and in their answers.

Motivation

One of the critical activities when developing ontologies is to identify their requirements. Requirements included in the ORSD facilitates the ontology development in different ways: (1) allowing the identification of which particular knowledge should be represented in the ontology; (2) facilitating the reuse of knowledge resources by means of focusing the resource search towards the particular knowledge to be represented in the ontology; and (3) permitting the verification of the ontology with respect to the requirements that the ontology should fulfill.

What is the process?



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IST-2005-027595
NeOn-project.org

Ontology Requirements Specification

Experiments and examples

SEEMP Reference Ontology Requirements Specification Document					
1 Purpose					
The purpose of building the Reference Ontology is to provide a consensual knowledge model of the employment domain to be used by public employment services.					
2 Scope					
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.					
3 Implementation Language					
The ontology has to be implemented in WSMML language.					
4 Intended End-Users					
User 1. Unemployed candidate searching for a job or another occupation for immediate or future purposes User 2. Employer who needs more human resources. User 3. Public or private employment search service that provides assistance to gather CVs or job postings and to prepare some data and statistics. User 4. National and Local Governments that want to analyze the situation on the employment market in their countries and to prepare documents on employment, social and educational policy.					
5 Intended Uses					
Use 1. Publishing CV. Job seeker places his/her CV on the PES Portal. Use 2. Publishing Job Offer. An Employer places a Job Offer on the PES Portal. Use 3. Searching for Job Offers. The Employer looks for candidates for the Job Offer through the PES Portal. Use 4. Searching for Employment information. Job Seeker looks for general information about employment in a given location at the PES Portal.					
6 Ontology Requirements					
a. Non-Functional Requirements					
NFR1. The ontology must support a multilingual scenario in the following languages: English, Spanish, Italian, and French. NFR2. The ontology must be based on the international, European or de-facto standards in existence or under development.					
b. Functional Requirements: Groups of Competency Questions					
CQ G1: Job Seeker (14 CQ)			CQ G2: Job Offer (11 CQ)		
CQ1. What is the Job Seeker's name? Lewis Hamilton			CQ12. What is the employer's information? CEFRIEL Research Company, Milano, Italy; AT OS, Madrid, Spain		
CQ2. What is the Job Seeker's nationality? British; Spanish; Italian; French;			CQ13. What kind of job does the employer's offer? Java Programmer; C Programmer, Database administration		
CQ3. What is the Job Seeker's contact information? Tel: 34600654231. Email: jsanz@f2.upm2.es			CQ14. What kind of contract does the employer's offer? Seasonal Job; Autonomous		
CQ4. What is the Job Seeker's current job? Programmer; Computer Engineer; Computer Assistant			CQ15. How much salary does the employer's offer? 3500 Euros, 3000 USD		
CQ5. Which is the Job Seeker's desired job? Radio Engineer; Hardware designer; Software Engineer			CQ16. What kind of economical activity does the employer have? Research; Financial; Education; Industrial		
CQ6. Which are the Job Seeker's desired working conditions? Autonomous; Seasonal Job; Traineeship; Consultant			CQ17. What is the description of the job offer? Sun Certified Java Programmer		
CQ7. What kind of contract does the Job Seeker want? Full time; Partial time; Autonomous; Seasonal Job			CQ18. What are the working conditions of the job offer? Full time; Partial time; Autonomous; Seasonal Job		
CQ8. What is the Job Seeker's work experience? 6 months, 1 year, 2 years			CQ19. What is the required education level for the job offer? Basic Education; Higher education/University		
CQ9. What is the Job Seeker's area of knowledge? Java Programming; Programming, Database Administration			CQ20. What is the required work experience for the job offer? 1 year, 2 years, 3 years, 4 years, 5 or more years		
CQ10. What is the Job Seeker's expertise? Software Engineering			CQ21. What is the required knowledge for the job offer? Java, Haskell, Windows		
CQ11. Which are the Job Seeker's skills? SQL programming, network administration			CQ22. What are the required skills for the job offer? ASP Programmer, Data warehouse, Hardware programming		
7 Pre-Glossary of Terms					
a. Terms from Competency Questions + Frequency					
Job Seeker	27	Name	4	Address	3
CV	2	Gender	1	Nationality	1
Personal Information	3	Birth date	1	Contact (phone, fax, mail)	3
b. Terms from Answers + Frequency					
SW engineer, programmer	5	Autonomous, Seasonal Job,	2	Research, Financial, Education	4
British, Spanish, Italian, French	1	Basic education, Higher education	1	3000 Euros per month	1
			1 year, 2 years, 3 years	CEFRIEL Research Company	1
c. Objects					
Andorra, Argentina, Australia, Bolivia, France, Italy, Spain, etc.; Euro, Zloty, Great British Pound, US Dollar, Peso, etc.; CEFRIEL, AT OS, etc.					

Additional information:

Contact person: mcsuarez@fi.upm.es

- NeOn Deliverable D5.4.1 (http://www.neon-project.org/web-content/images/Publications/neon_2008_d5.4.1.pdf)
- ODBASE'09 Paper: "How to write and use the Ontology Requirements Specification Document". Mari Carmen Suárez-Figueroa, Asunción Gómez-Pérez, and Boris Villazón-Terrazas

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Slide 5

Ontological Engineering

Slide 5

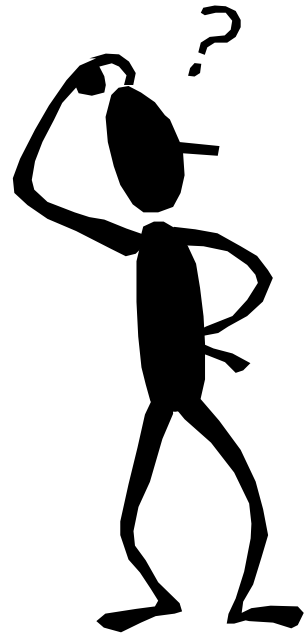
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 - ❑ Guidelines for Ontology development project Planning
 - ❑ Methodological Guidelines for Non Ontological Resource Reuse and Reengineering
 - ❑ Methodological Guideliness for Ontology Reuse
 - ❑ Creating the final Ontology Model

I want to build my ontology



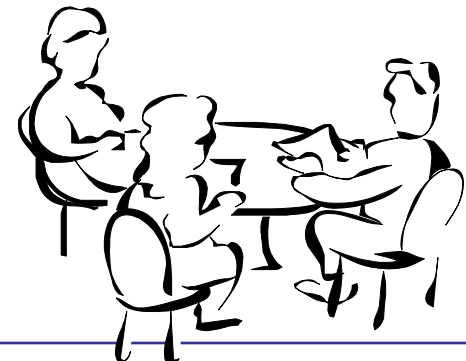
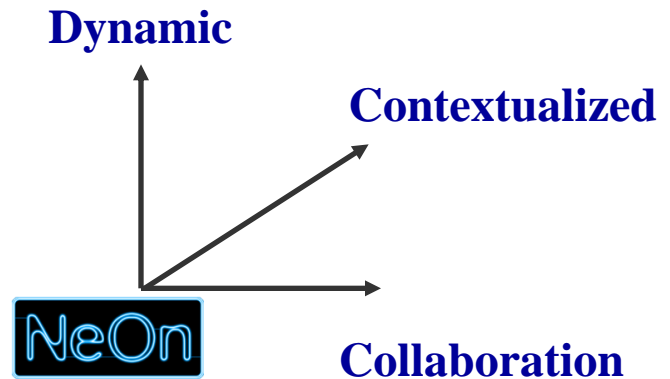
- Which are the key process and activities in ontology development?
- Which activities do I need in my development?
- When should I carry out each activity?
- Where is the relationship of one activity with the others?
- How do I collect the requirements of my ontology?
- Where can I find ontologies with the goal of reusing them?
- How can I reuse exiting knowledge resources?
- ...

Most relevant methodologies

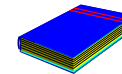
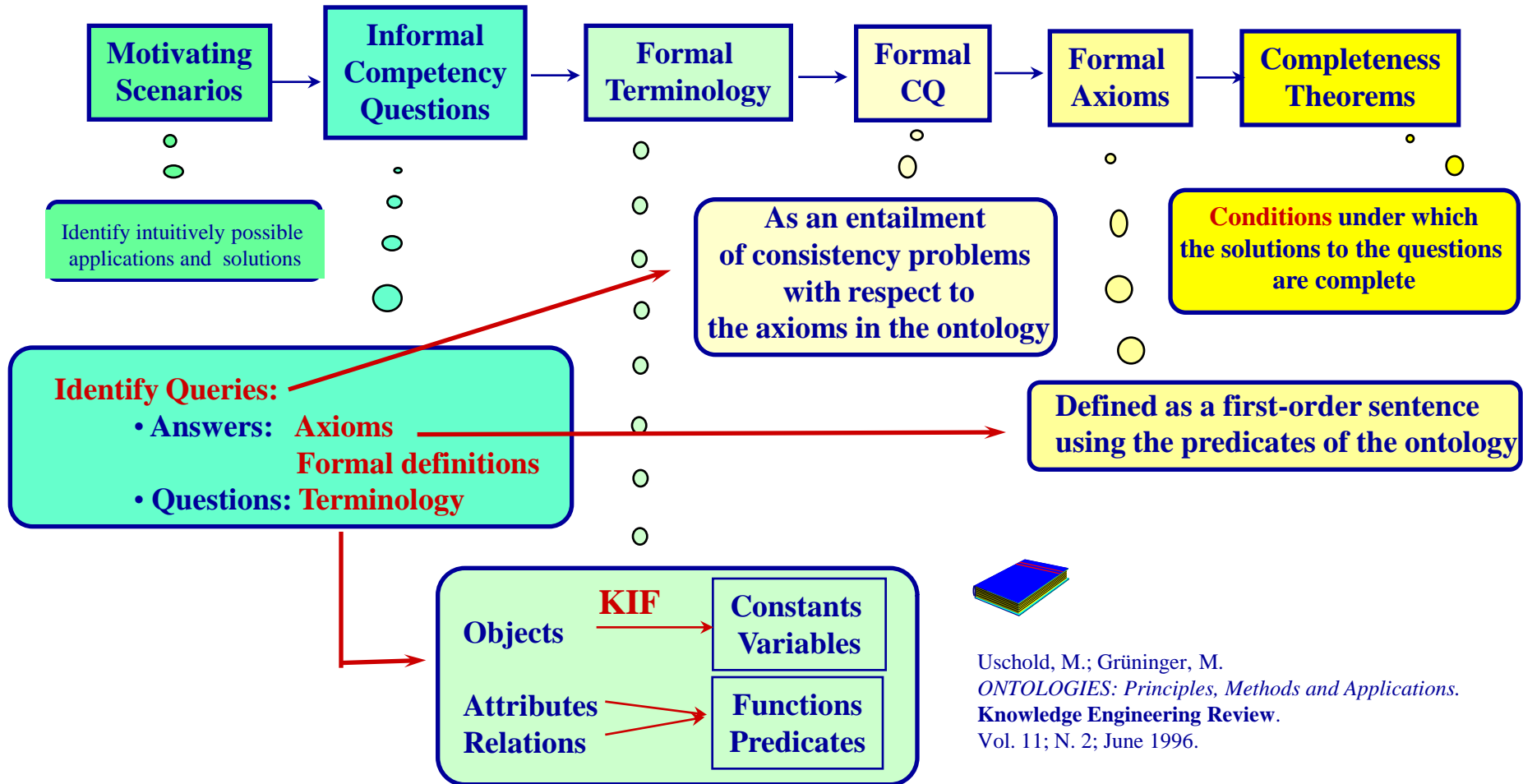
Methodologies for building single ontologies

- Uschold and King's method
- Grüninger and Fox's methodology
- KACTUS approach
- METHONTOLOGY
- SENSUS method
- On-To-Knowledge
- DILIGENT

NeOn methodology for building ontology networks

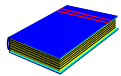
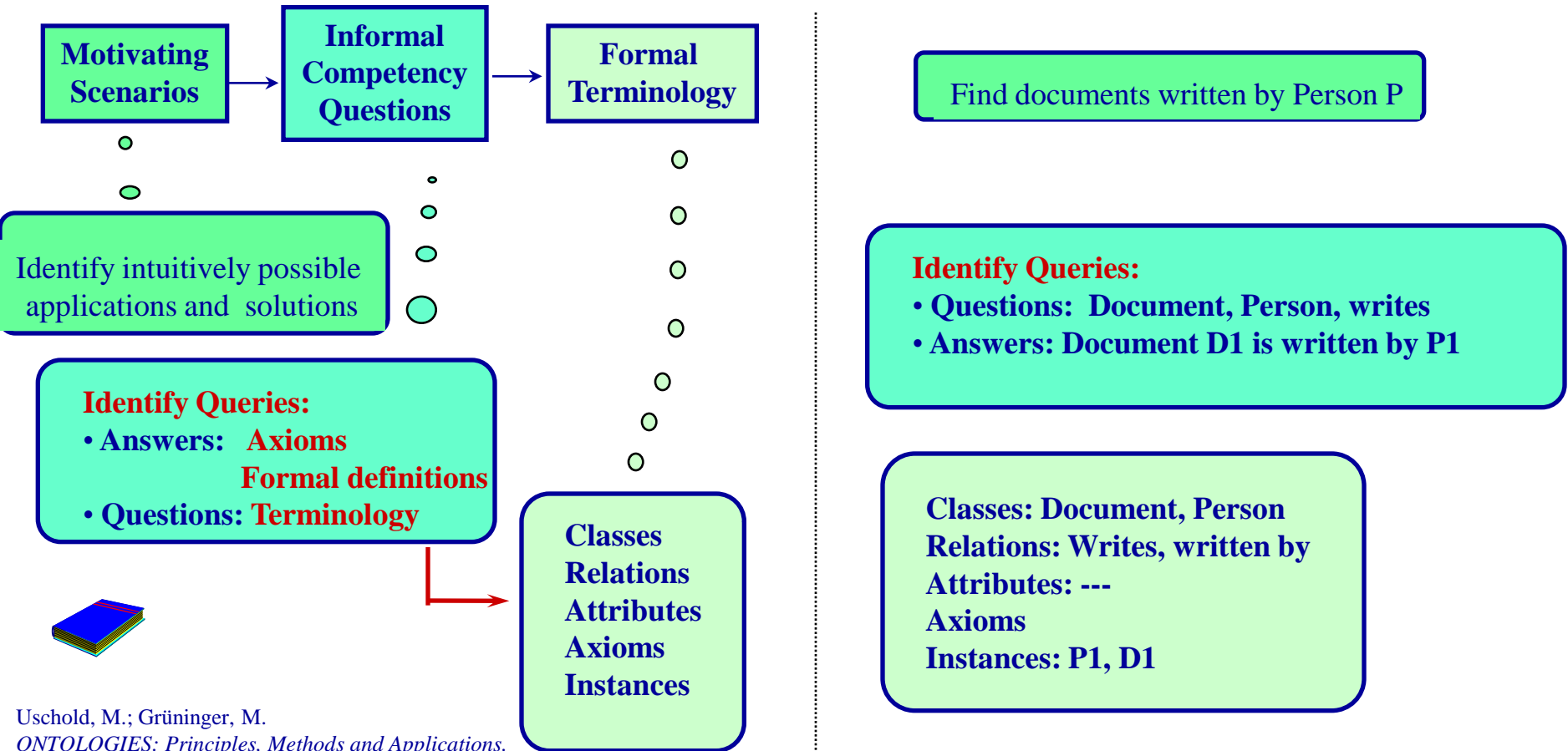


TOVE Methodology



Uschold, M.; Grüninger, M.
ONTOLOGIES: Principles, Methods and Applications.
 Knowledge Engineering Review.
 Vol. 11; N. 2; June 1996.

Getting terminology using Competency Questions



Uschold, M.; Grüninger, M.
ONTOLOGIES: Principles, Methods and Applications.
 Knowledge Engineering Review.
 Vol. 11; N. 2; June 1996.

Uschold Methodology

1. Identify **Purpose** and Scope

2. Building the ontology

- Ontology **Capture**

- Ontology **Coding**

- **Integrating** existing ontologies

- Identify **key concepts** and relationships
- Produce **unambiguous** text definitions
- Identify **terms** to refer to such concepts and relations

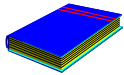
- Commit to a **meta-ontology**
- Choose a **representation language**
- Write the code

How and whether to **reuse ontologies** that already exist

3. **Evaluation**

4. Documentation

5. Guideliness for each phase

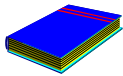
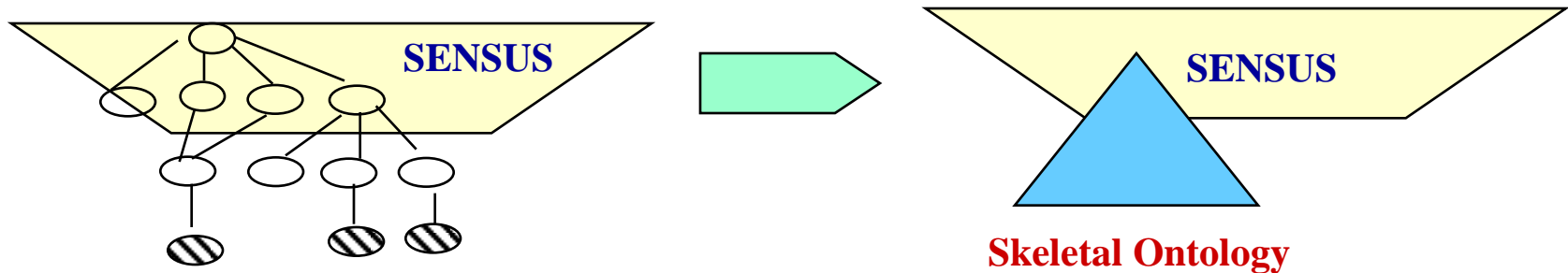


Uschold, M.; Grüninger, M. *ONTOLOGIES: Principles, Methods and Applications*.
Knowledge Engineering Review. Vol. 11; N. 2; June 1996.

SENSUS as a basis for a domain-specific ontology (I)

Linking Domain Specific Terms to a broad Coverage Ontology

To identify the terms in SENSUS that are relevant to a particular domain and then **prune** the skeletal ontology using **heuristics**



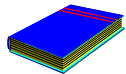
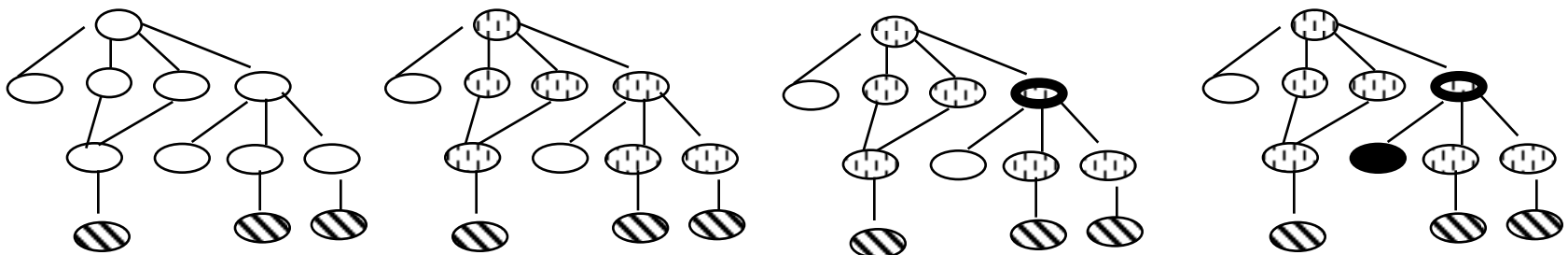
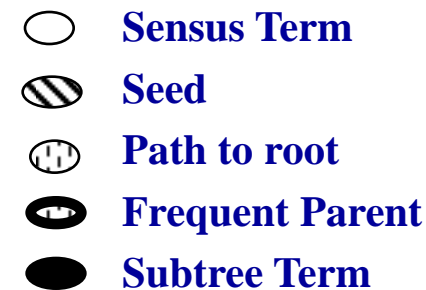
B. Swartout; R. Patil; k. Knight; T. Russ. *Toward Distributed Use of Large-Scale Ontologies*
Ontological Engineering. AAAI-97 Spring Symposium Series. 1997. 138-148.

SENSUS as a basis for a domain-specific ontology (II)

METHOD

1. Identify “seed” terms
2. Link seed terms to SENSUS by hand
3. Include nodes on the path to root
4. Add entire subtrees using the heuristic:

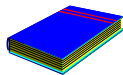
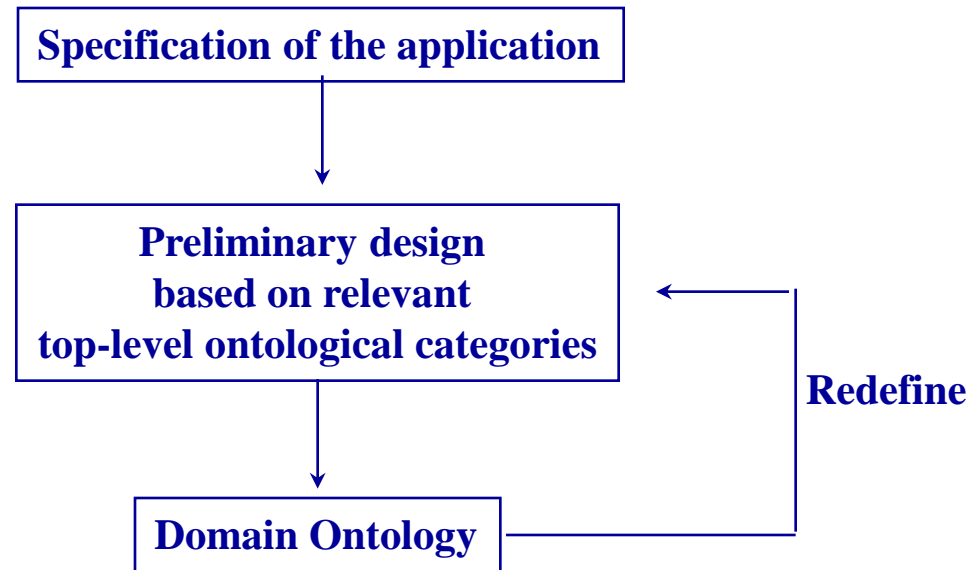
If many nodes in a subtree are relevant,
the other nodes in the subtree are relevant



B. Swartout; R. Patil; k. Knight; T. Russ. *Toward Distributed Use of Large-Scale Ontologies*
Ontological Engineering. AAAI-97 Spring Symposium Series. 1997. 138-148.

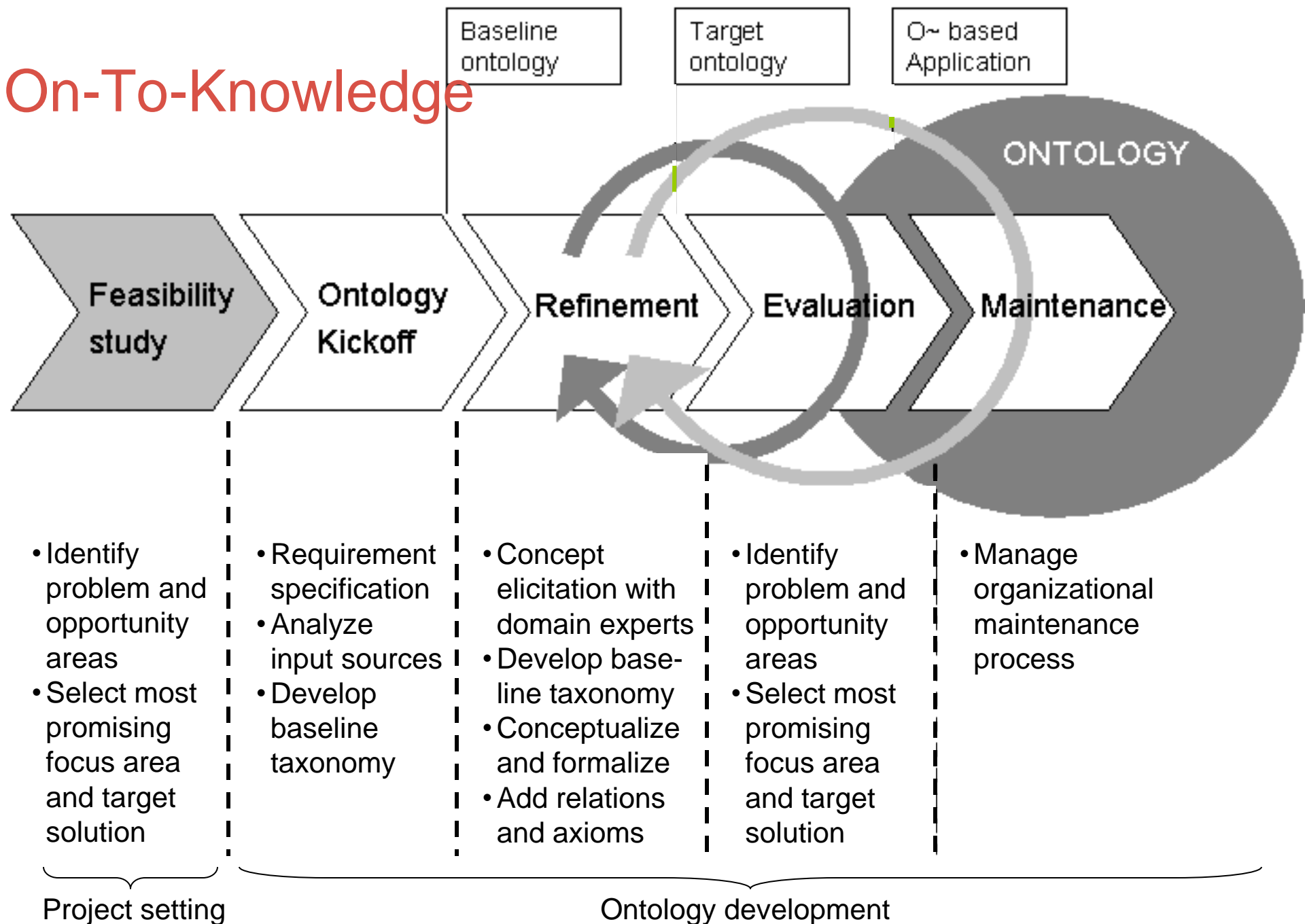
Bernara, Laresgoiti, Corera Methodology

Build a preliminary ontology for refinement and augment with new definitions

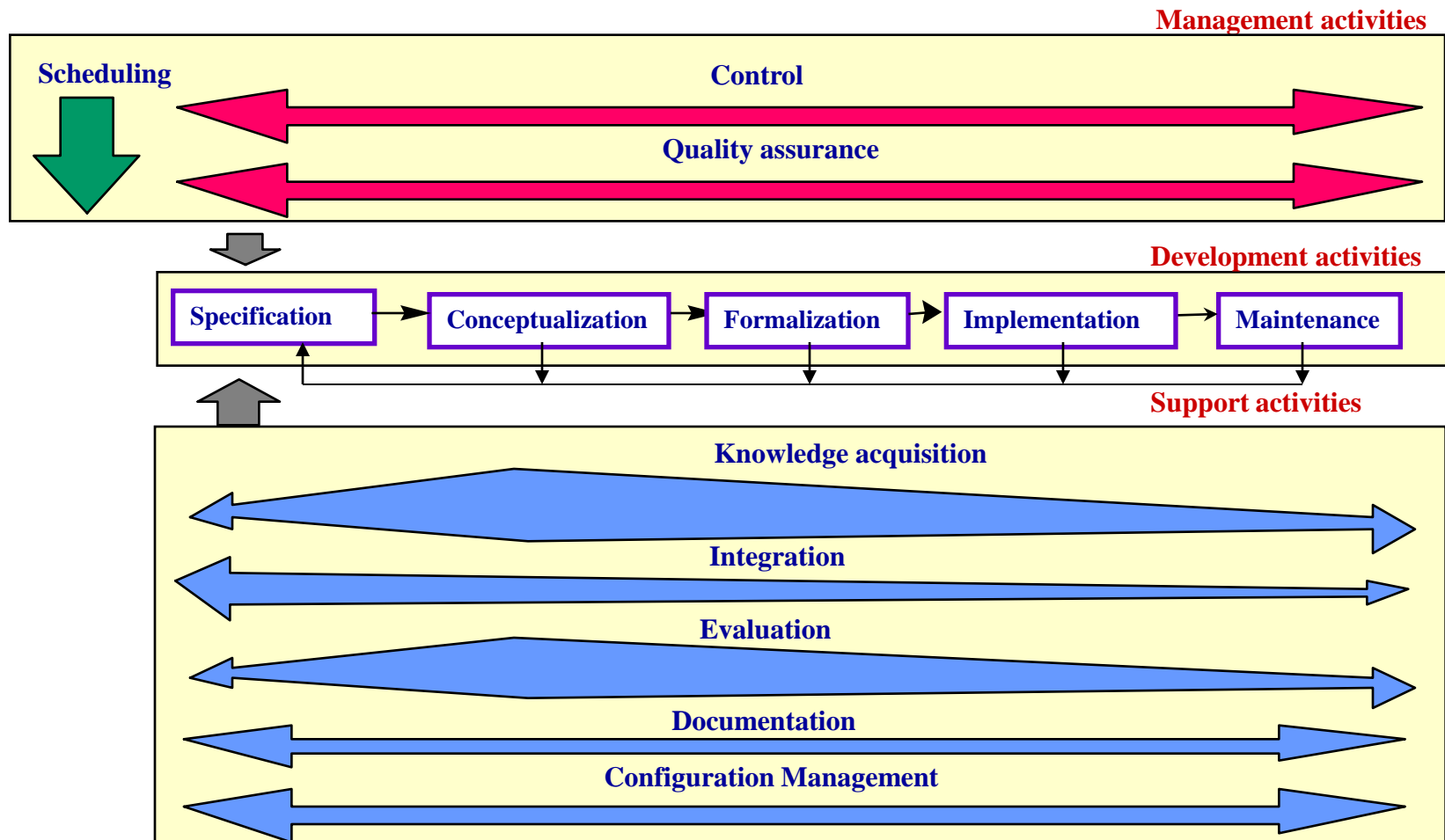


A. Bernaras; I. Laresgoiti; J. Corera. *Building and reusing ontologies for electrical network applications*
ECAI96. 12th European Conference on Artificial Intelligence. 1996. 298-302

On-To-Knowledge



Methontology



State of the Art. Ontology Engineering

	METHONTOLOGY [Fernández-López et al., 1997]	On-To-Knowledge [Staab et al., 2001]	DILIGENT [Pinto et al., 2004]
Ontology development process			
Proposal	Activities in 3 categories	5 processes	5 main processes
Ontology life cycle			
Proposal	Based on the evolutionary prototyping life cycle model	An incremental and cyclic ontology life cycle, based on evolutionary prototyping life cycle model	Based on evolutionary prototyping life cycle model
Dimension			
Collaboration	Not mentioned	Not mentioned	Treated
Detailed Guidelines for Processes and Activities			
Ontology Requirements Specification	Not provided Only Competency Questions are proposed	Not provided Only Competency Questions are proposed	This activity is not proposed by the methodology
Scheduling	Not provided	Not provided	Not provided
Reusing Ontological Resources	Not provided Only a list of activities to be carried out is proposed	Not provided Only recommendation of identifying ontologies to be reused is given	Not provided, neither explicitly mentioned
Audience			
Targeted to Software Developers and Ontology Practitioners	Targeted to ontology engineers and researchers	Targeted to ontology engineers and researchers	Intended to domain experts and users

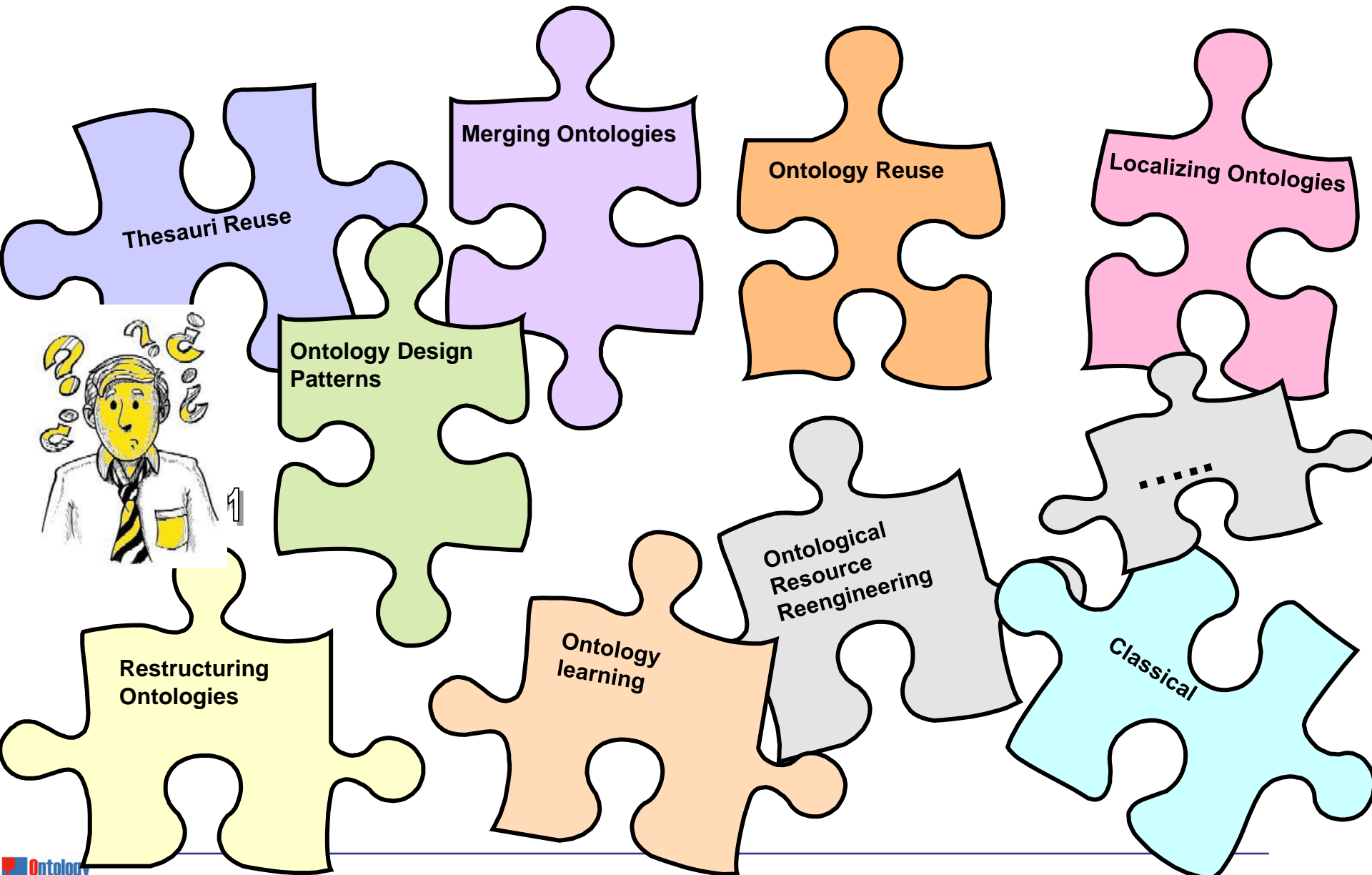
Limitations of current methodologies

- Methontology, On-To-Knowledge are for building ontologies from scratch
- They lack guidelines for:
 - building ontologies by **reusing and reengineering** existing knowledge aware resources
 - for **contextualizing** an existing ontology and plugging it in with existing ontologies that might be in continuous evolution
 - Building ontologies in a **collaborative** way
 - software developers that need to include ontologies into their IT developments

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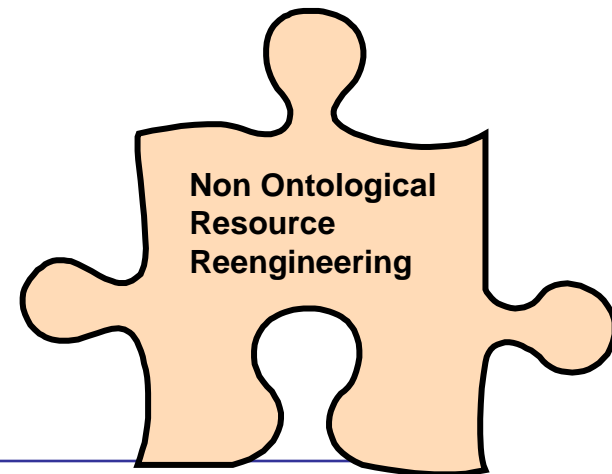
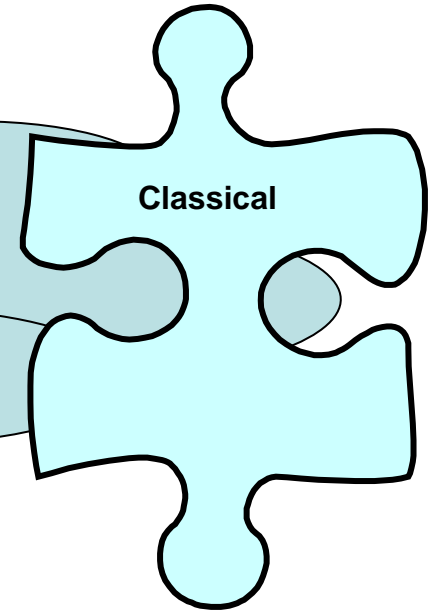
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Too many activities...



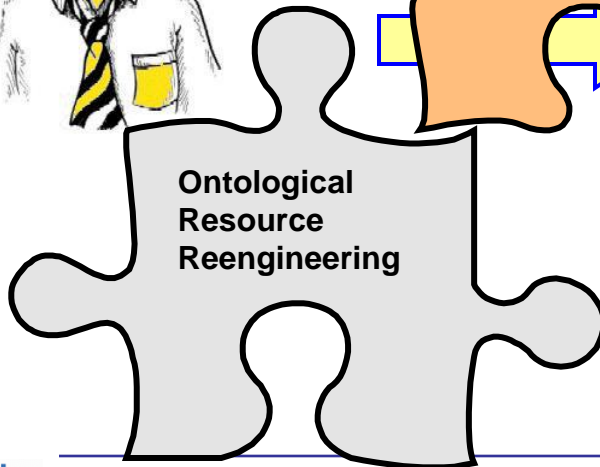
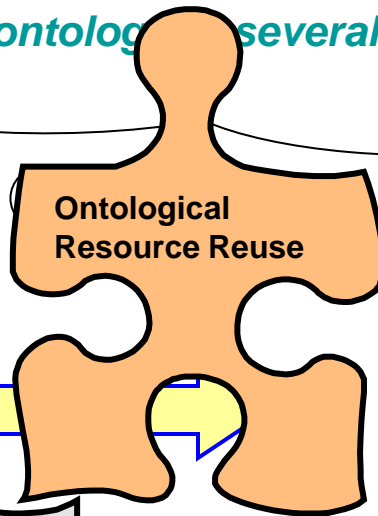
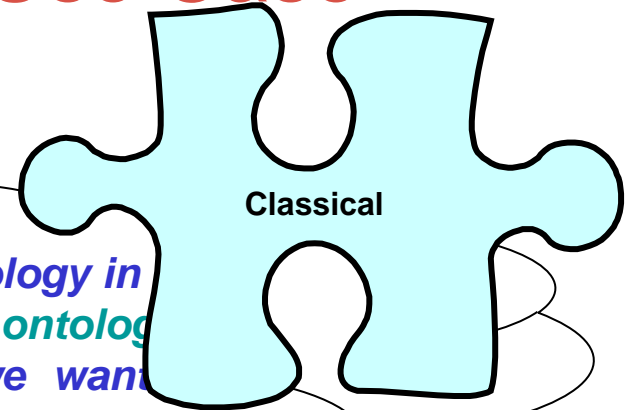
Building Ontologies: Use Case

In our team, we want to build an OWL ontology in the pharmaceutical domain, but we want to use several pharmaceutical standards in XML and classification schemes in our own format.



Building Ontologies: Use Case

In our team, we want to build an OWL ontology in fishery domain. We want to base on our ontology about species and commodities, and we want to have the ontology in several natural languages.

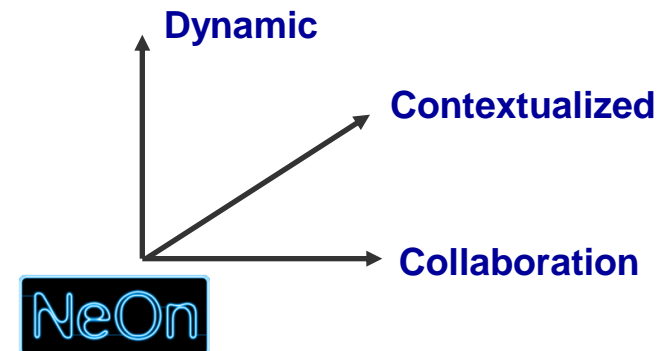


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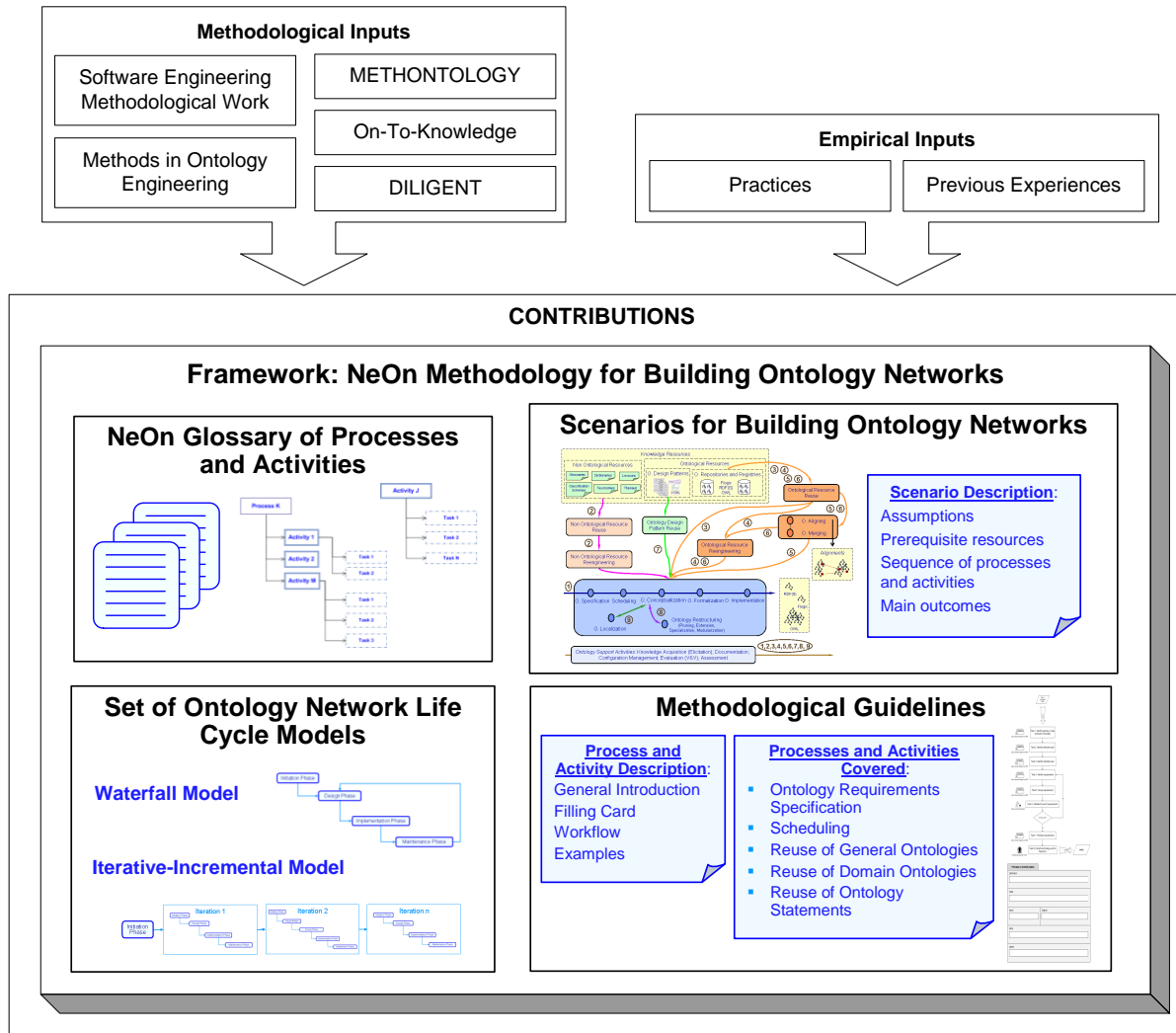
NeOn Ontology Development Paradigm

Whose emphasis is on

- ❑ the *reuse and reengineering of knowledge aware resources*
- ❑ the *collaborative and argumentative ontology development*
- ❑ the *building of ontology networks*, as opposed to custom-building new ontologies from scratch.

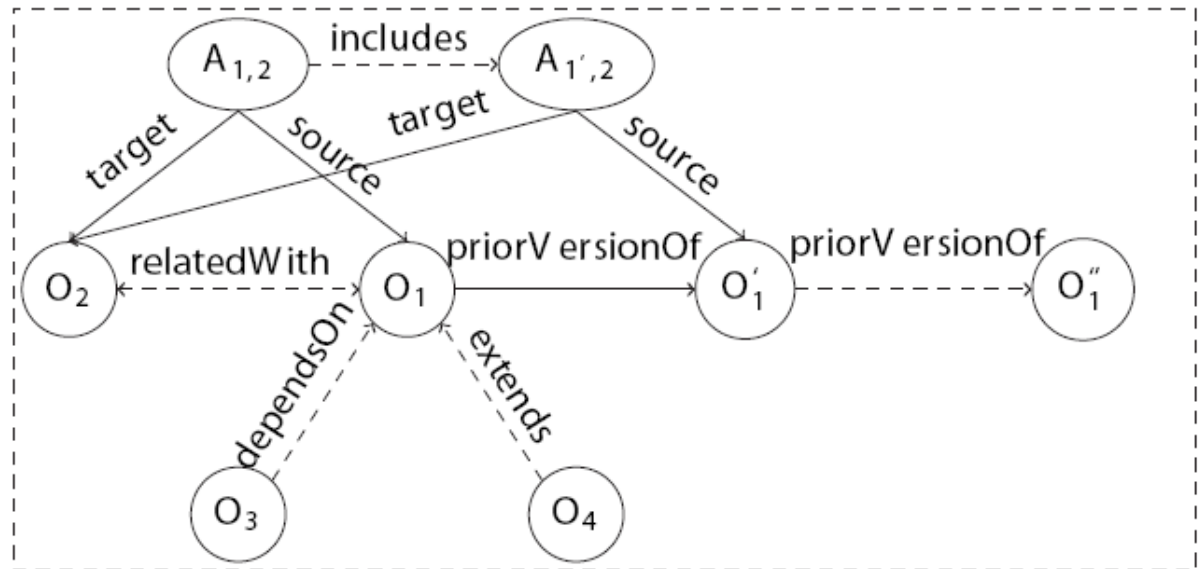
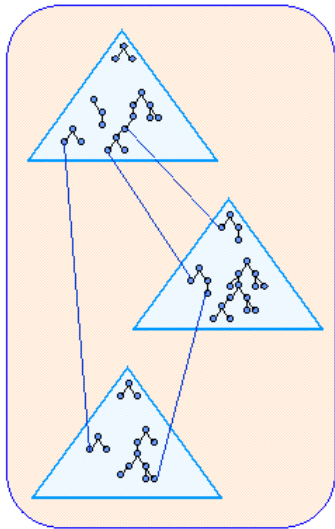


Research Methodology



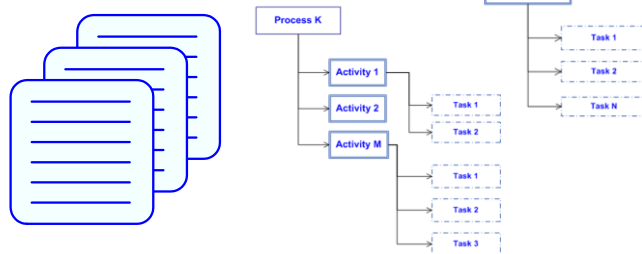
Ontology Networks

The Semantic Web of the future will be characterized by using a very large number of **ontologies embedded in ontology networks** built by distributed teams in a collaborative way.

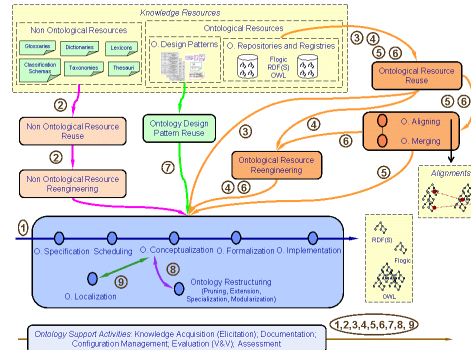


Framework: NeOn Methodology for Building Ontology Networks

NeOn Glossary of Processes and Activities



Scenarios for Building Ontology Networks

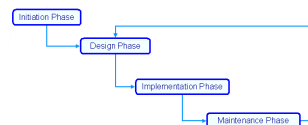


Scenario Description:

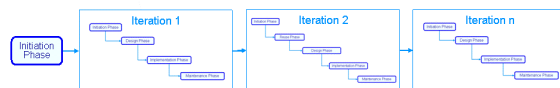
Assumptions
Prerequisite resources
Sequence of processes and activities
Main outcomes

Set of Ontology Network Life Cycle Models

Waterfall Model



Iterative-Incremental Model



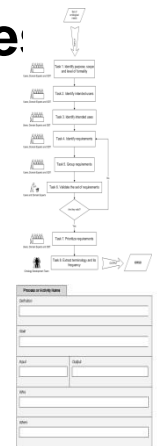
Methodological Guideline

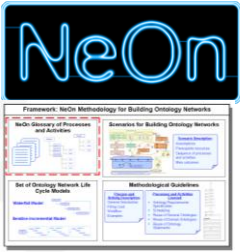
Process and Activity Description:

General Introduction
Filling Card
Workflow
Examples

Processes and Activities Covered:

- Ontology Requirements
- Specification
- Scheduling
- Reuse of General Ontologies
- Reuse of Domain Ontologies
- Reuse of Ontology Statements





The NeOn Glossary of Activities

- The *NeOn Glossary of Activities* identifies and defines 55 activities that are carried out when ontology networks are collaboratively built
- Published in the NeOn website
- Consensuated by *all NeOn* partners
- On-going procedure for getting feed-back from the community

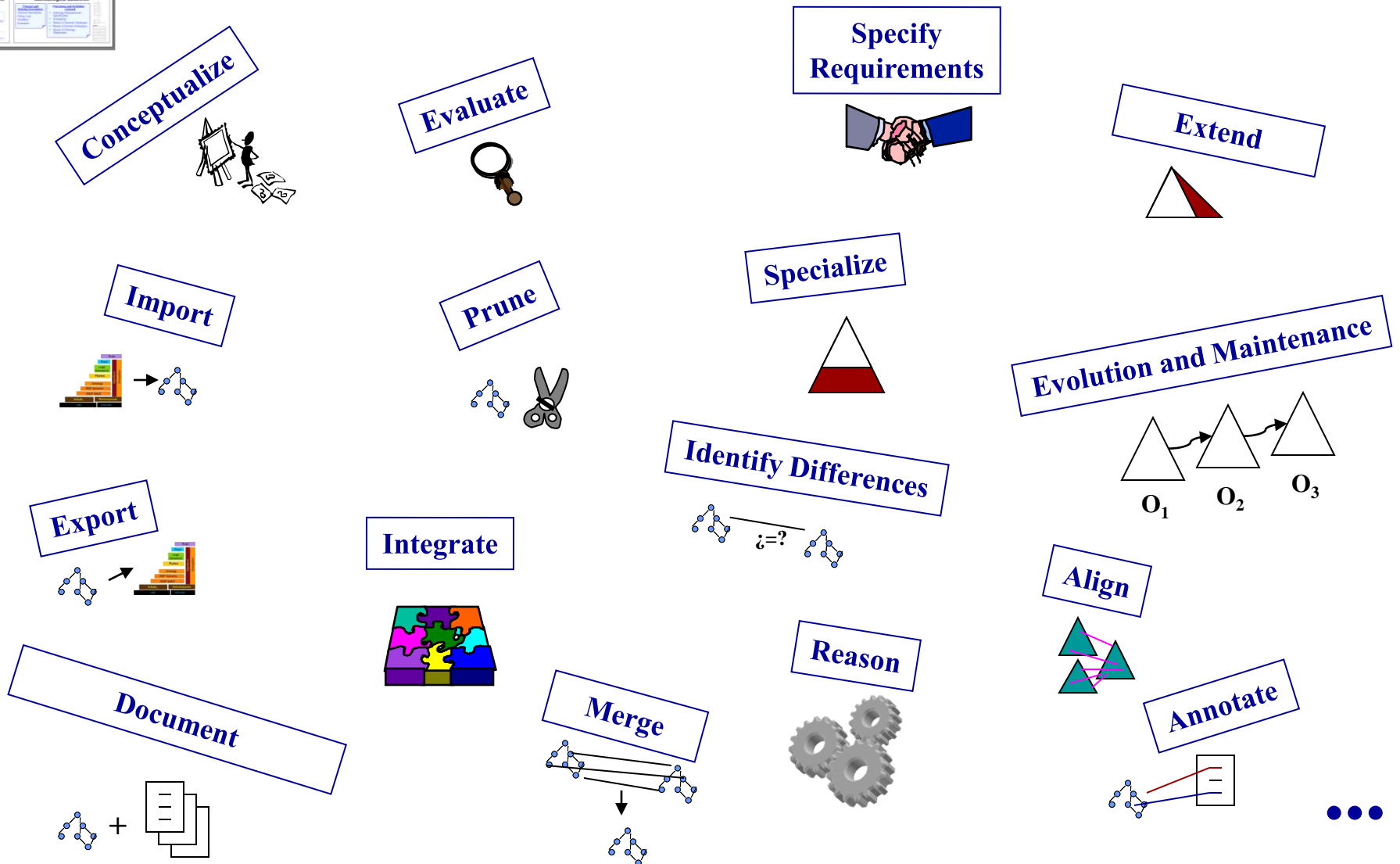
NeOn Glossary of Activities

- **Ontology Alignment / Aligning**
- **Ontology Articulation**
- **Ontology Assessment**
- **Ontology Combining**
- **Ontology Conceptualization**
- **Ontology Configuration Management**
- **Ontology Coordination**
- **Ontology Diagnosis**
- **Ontology Documentation**
- **Ontology Elicitation**
- **Ontology Enrichment**
- **Ontology Evaluation**
- **Ontology Evolution**
- **Ontology Extension**
- **Ontology Formalization**
- **Ontology Implementation**
- **Ontology Integration**
- **Knowledge Acquisition for Ontologies**
- **Ontology Learning**
- **Ontology Localization**
- **Ontology Mapping**
- **Ontology Matching**
- **Ontology Mediation**



<http://www.neon-project.org/>

Activities for Building Ontologies




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WP5WorkingArea: Knowledge Acquisition for Ontologies

- **Final Definition:** *Knowledge Acquisition for Ontologies* comprises activities for capturing knowledge (e.g., T-Box and A-Box) from a variety of sources. We distinguish between: **Ontology Elicitation**, **Ontology Learning** and **Ontology Population**.
- **Activity Group:** *Development*.



WP5WorkingArea: Ontology Elicitation

- **Final Definition:** *Ontology Elicitation* is a knowledge acquisition activity in which conceptual structures (e.g. T-Box) and their instances (e.g. A-Box) are acquired from domain experts.
- **Activity Group:** *Development*.

WP5WorkingArea: Ontology Learning

- **Final Definition:** *Ontology Learning* is a knowledge acquisition activity that relies on (semi-) automatic methods to transform unstructured (e.g. corpora), semi-structured (e.g. folksonomies, html pages, etc.) and structured data sources (e.g. data bases) into conceptual structures (e.g. T-Box).
- **Activity Group:** *Development*.

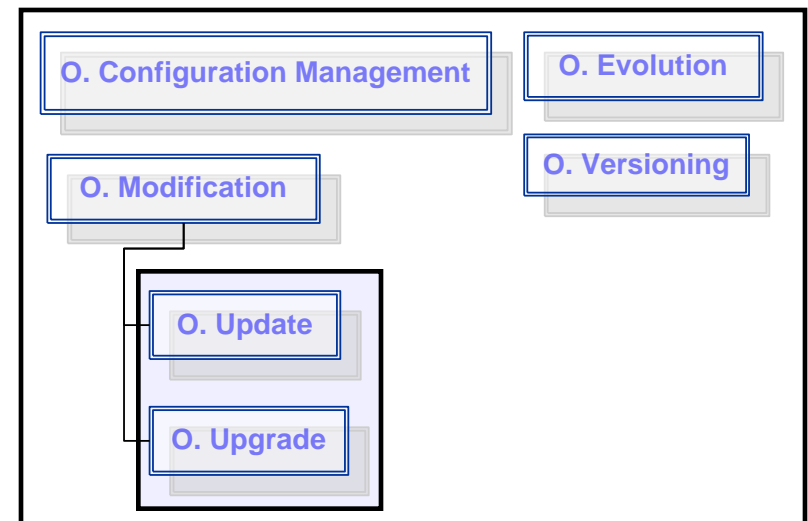
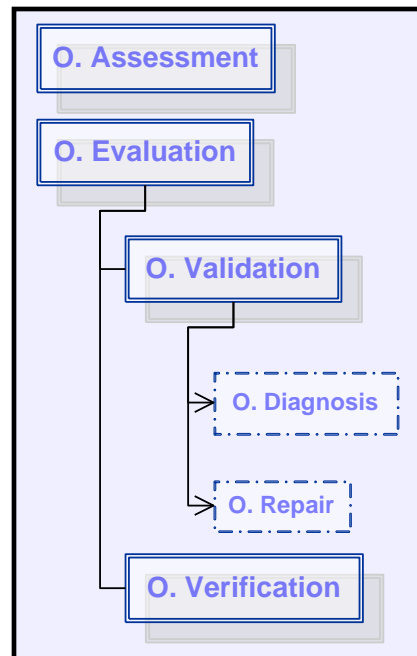
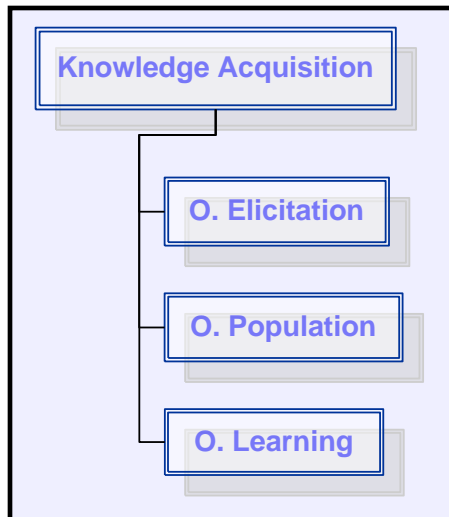
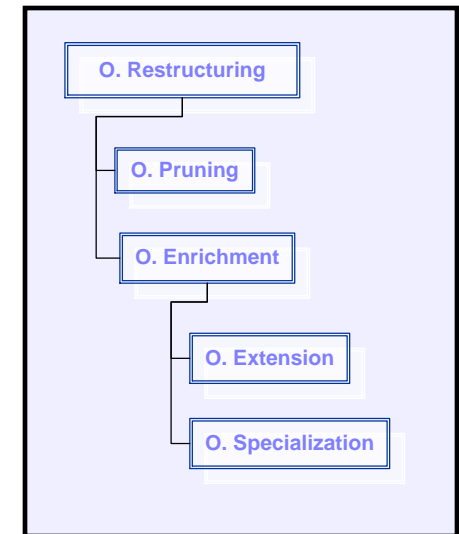
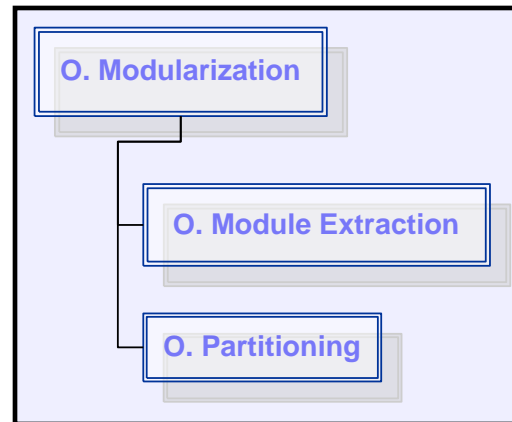
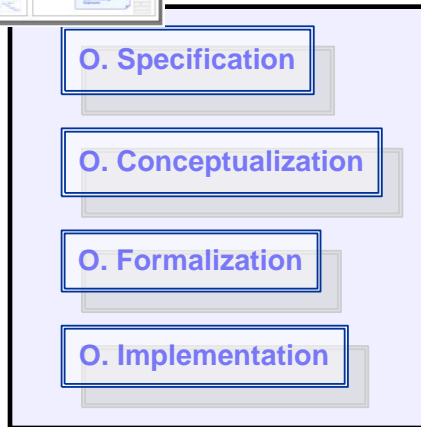
WP5WorkingArea: Ontology Population

(Redirected from [WP5WorkingArea: Ontology Population/Grounding](#))

- **Final Definition:** *Ontology Population* is a knowledge acquisition activity that relies on (semi-) automatic methods to transform unstructured (e.g. corpora), semi-structured (e.g. folksonomies, html pages, etc.) and structured data sources (e.g. data bases) into instance data (e.g. A-Box).
- **Activity Group:** *Development*.

http://www.neon-project.org/wiki/index.php?title=WP5D5.3.1#NeOn_Glossary_of_Activities

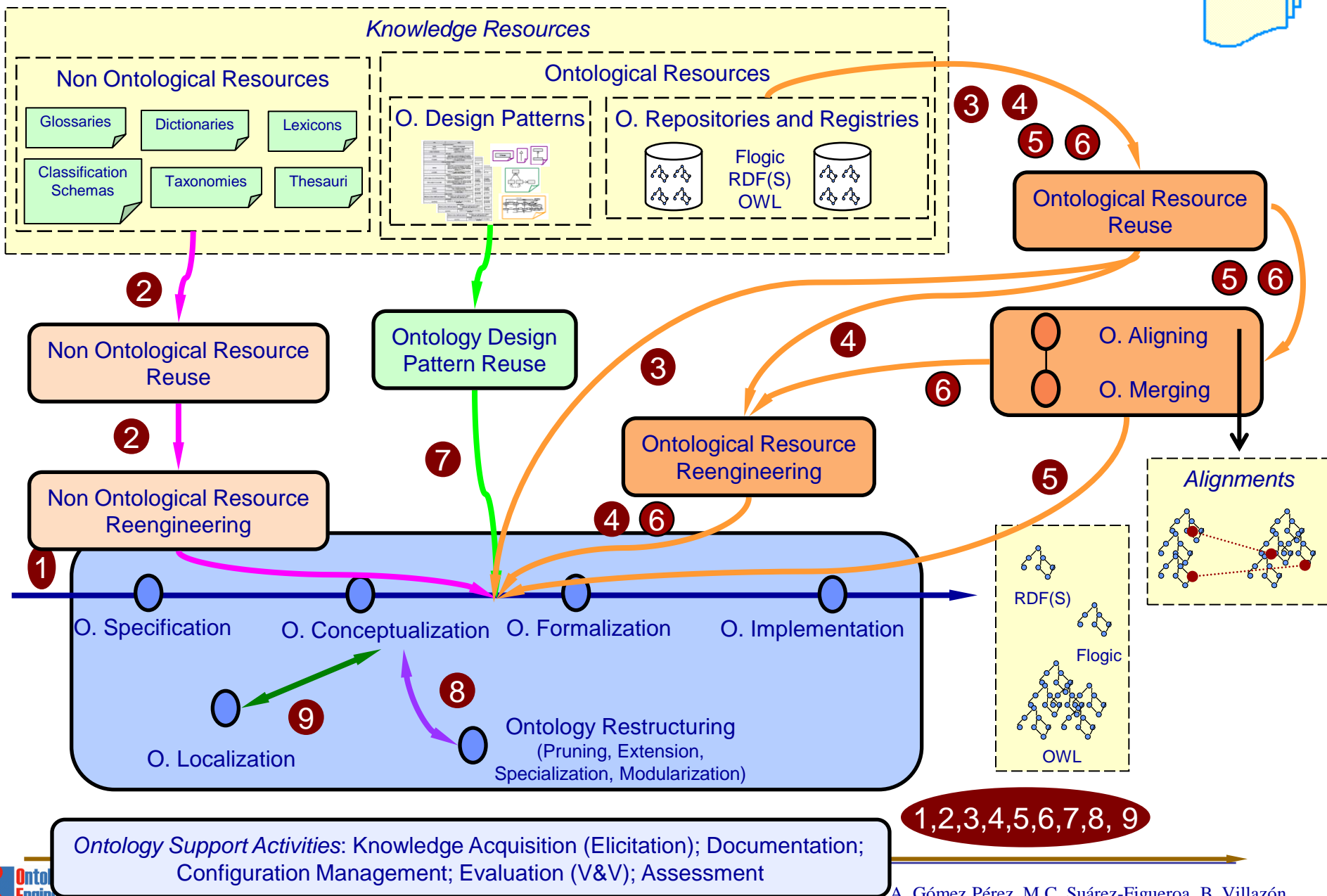
Relating Activities

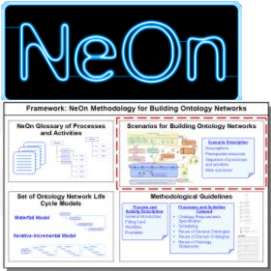


“Recommended and If-Applicable” Activities

- For each activity included in the NeOn Glossary of Activities, the table identifies which activities are **required** and which activities are **optional** (can be carried out or not, depending on the case) during the ontology network building process.

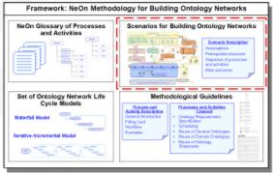
	<i>Required</i>	<i>If Applicable</i>
<i>Ontology Conceptualization</i>	X	
<i>Ontology Evaluation</i>	X	
<i>Ontology Integration</i>	X	
<i>Knowledge Acquisition for Ontologies</i>	X	
<i>Ontology Learning</i>		X
<i>Ontology Localization</i>		X
<i>Ontology Matching</i>		X
<i>Ontology Search</i>	X	
<i>Ontology Specification</i>	X	





Scenarios

1. Building ontology networks from scratch without reusing existing resources.
2. Building ontology networks by reusing and reengineering non ontological resources.
3. Building ontology networks by reusing ontologies or ontology modules.
4. Building ontology networks by reusing and reengineering ontologies or ontology modules.
5. Building ontology networks by reusing and merging ontology or ontology modules.
6. Building ontology networks by reusing, merging and reengineering ontologies or ontology modules.
7. Building ontology networks by reusing ontology design patterns.
8. Building ontology networks by restructuring ontologies or ontology modules.
9. Building ontology networks by localizing ontologies or ontology modules.

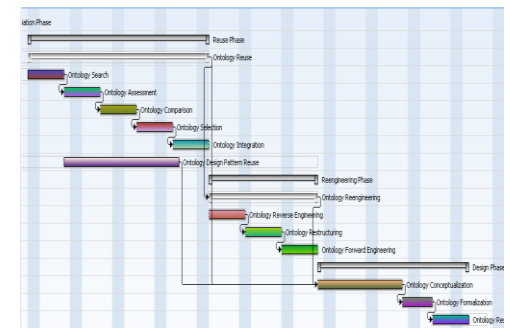
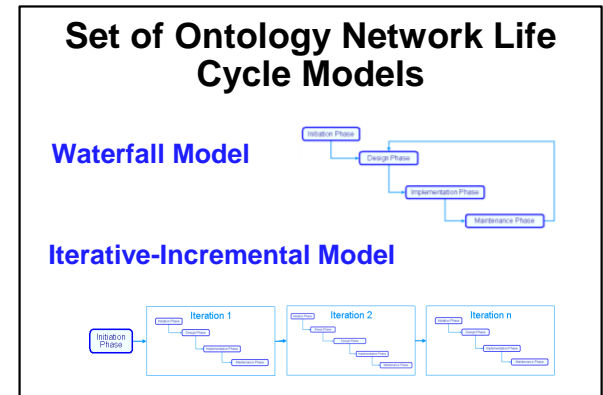


Scenarios for Building Ontology Networks

- **Nine flexible scenarios** for collaboratively building ontologies and ontology networks
 - Emphasis on reusing and reengineering knowledge resources.
- Each scenario is decomposed into different processes or activities.
 - Processes and activities are defined in the NeOn Glossary of Processes and Activities.
- Scenarios can be combined in different ways.
 - Any combination of scenarios should include Scenario 1.
- Scenarios are described with the following structure:
 - Motivation for the scenario.
 - Assumptions for the scenario.
 - Prerequisite resources.
 - Sequence of processes, activities, and tasks to be carried out.
 - Outcomes for the scenario.

Life Cycle Models for Ontology Networks

- **Ontology network life cycle model:** a model to describe how to develop (and maintain) an ontology network project.
 - How to organize the processes and activities of the NeOn Glossary into phases or stages
- **Set of two ontology network life cycle model:**
 - Waterfall ontology network life cycle model.
 - Iterative-Incremental ontology network life cycle model.
- Relation between the set of two life cycle models and the set of nine scenarios
 - Both models and scenarios takes into account the importance of reusing and reengineering knowledge resources and merging resources.
- The **ontology life cycle** is the specific sequence of activities that the ontology practitioners carry out for developing an ontology.

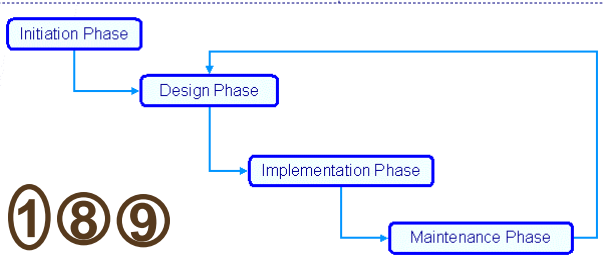




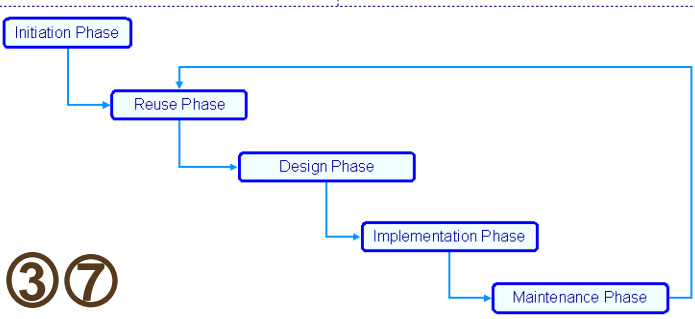
Waterfall Life Cycle Model Family

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

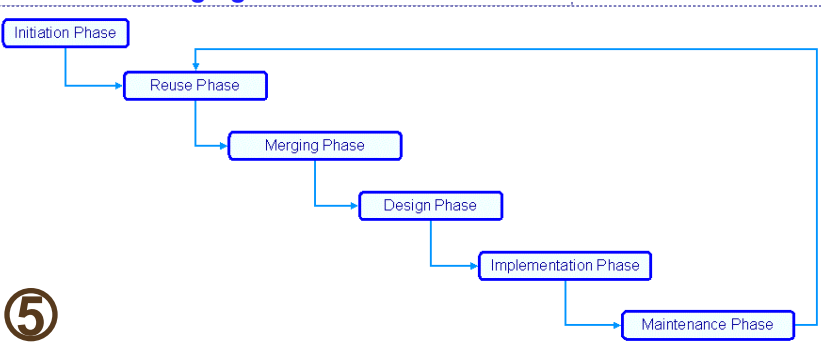
4-Phase Waterfall Model



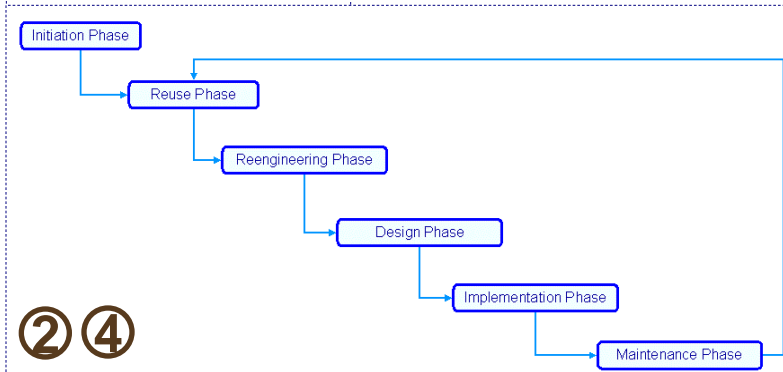
5-Phase Waterfall Model



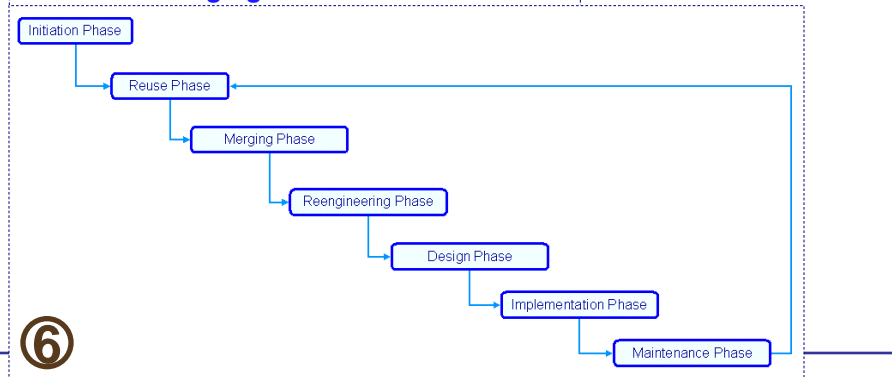
5-Phase + Merging Phase Waterfall Model



6-Phase Waterfall Model

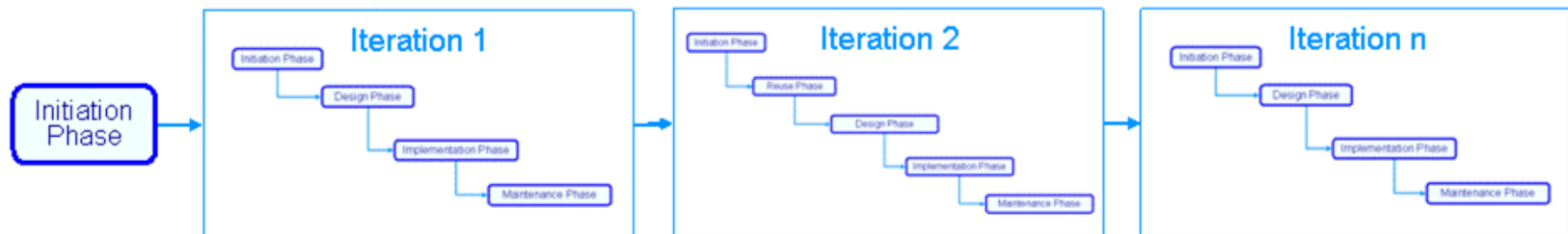


6-Phase + Merging Phase Waterfall Model



Iterative-Incremental Life Cycle Model

- The development of ontology networks is organized in a **set of iterations**
 - Each individual iteration can follow a different version of the waterfall model.
- In the **initiation phase** the main outcomes are:
 - the ontology network requirements
 - the general and global plan for the development
- No backtracking is allowed between phases
- In the **initiation phase** of each iteration:
 - the revision of the requirements
 - the revision of the global plan
 - the detailed plan for the current iteration



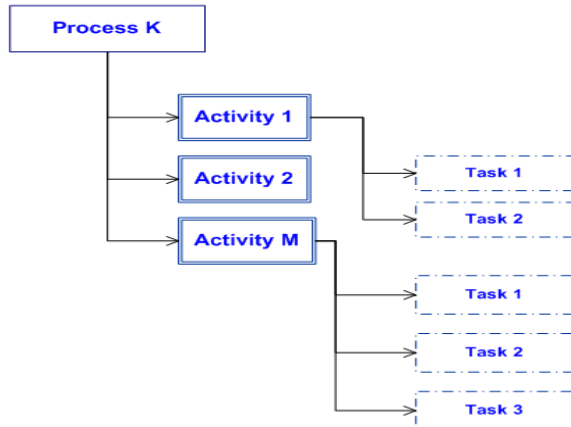
Index

- ☐ **Introduction**
- ☐ Use cases in Ontology Building
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 - ☐ Glossary of activities
 - ☐ Scenarios
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- ☐ **Main Activities**
 - ☐ Methodological Guidelines for Ontology Specification
 - ☐ Quick Search of Existing Knowledge Resources
 - ☐ Guidelines for Ontology development project Planning
 - ☐ Methodological Guidelines for Non Ontological Resource Reuse and Reengineering
 - ☐ Methodological Guideliness for Ontology Reuse
 - ☐ Creating the final Ontology Model

NeOn Methodology

Process and activities covered:

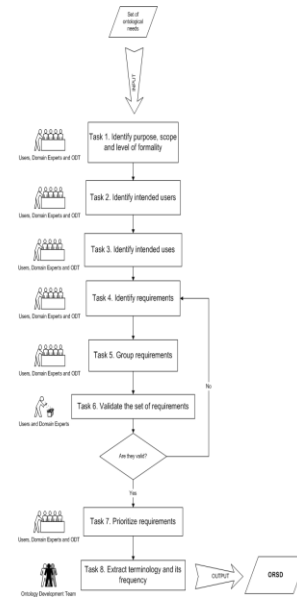
- ☐ Ontology Specification
- ☐ Scheduling
- ☐ Non Ontological Resource Reuse
- ☐ Non Ontological Resource Reengineering
- ☐ Reuse General Ontologies
- ☐ Reuse Domain Ontologies
- ☐ Reuse Ontology Statements
- ☐ Reuse Ontology Design Patterns



All processes and activities are described with:

- ☐ A filling card
- ☐ A workflow
- ☐ Examples

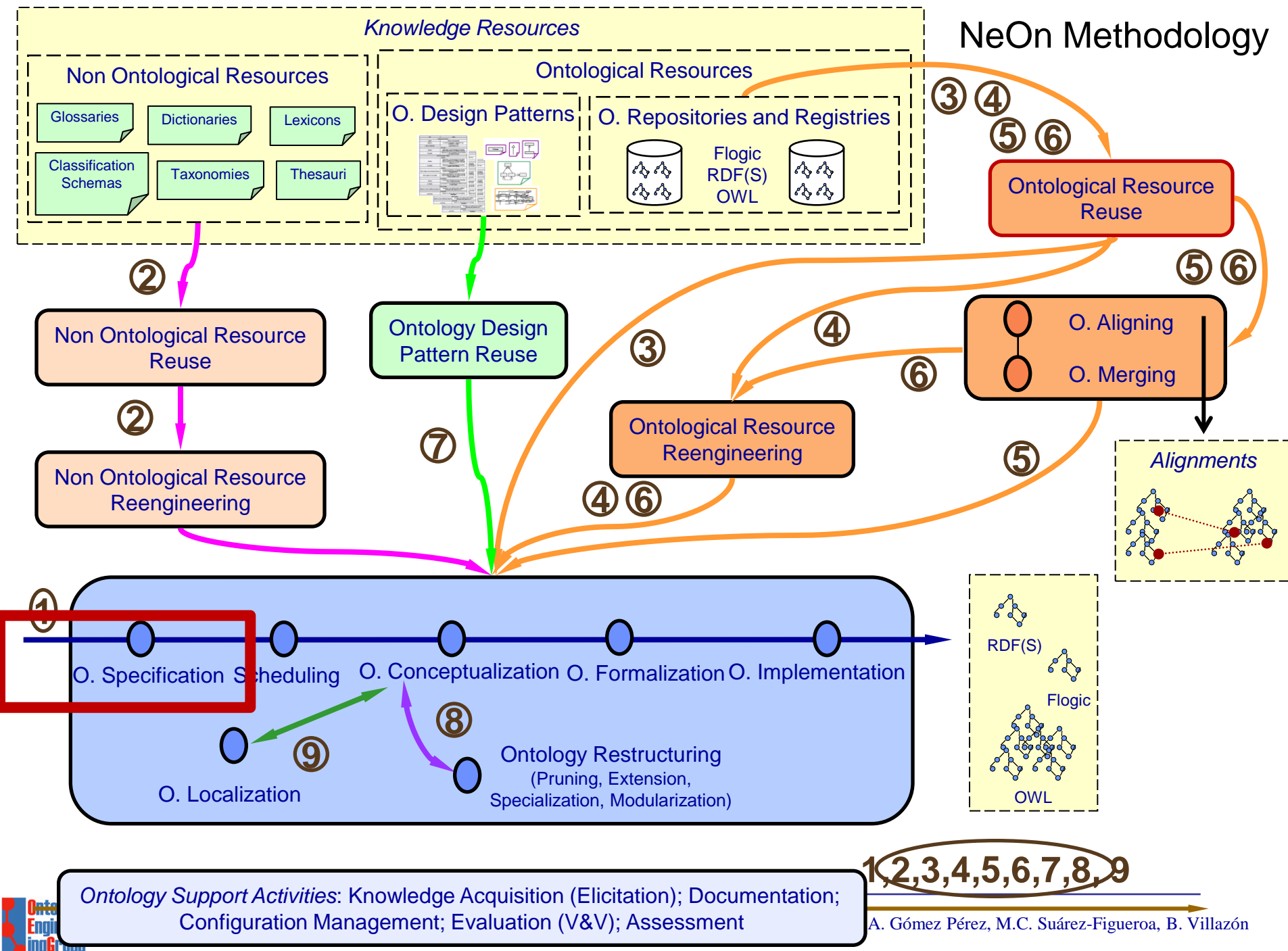
Process or Activity Name	
Definition	
<input type="text"/>	
Goal	
<input type="text"/>	
Input	Output
<input type="text"/>	<input type="text"/>
Who	
<input type="text"/>	
When	
<input type="text"/>	



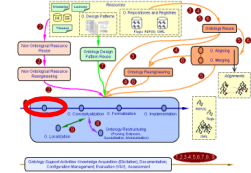
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NeOn Methodology



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



Ontology Specification

Definition

Ontology Specification refers to the activity of collecting the requirements that the ontology should fulfill, e.g. reasons to build the ontology, target group, intended uses, possibly reached through a consensus process.

Goal

The specification activity states why the ontology is being built, what its intended uses are, who the end-users are, and what the requirements the ontology should fulfill are.

Input

A set of ontological needs.

Output

Ontology Requirements Specification Document (ORSD).

Who

Software developers and ontology practitioners, who form the ontology development team (ODT), in collaboration with users and domain experts.

When

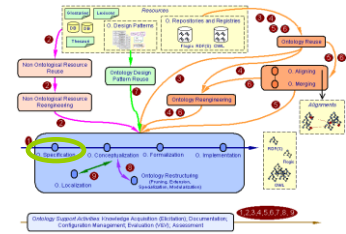
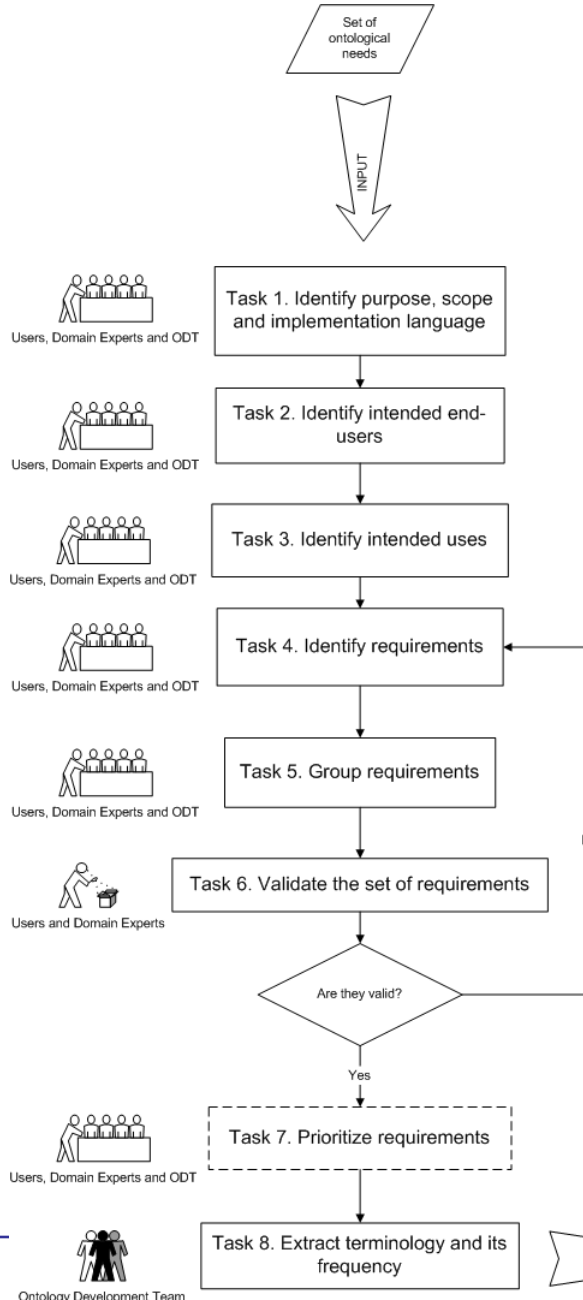
This activity must be carried out in parallel with the knowledge acquisition activity.

Competency Questions (CQs)

are questions that the ontology to be built should be able to answer.

- ☐ CQs in natural language
- ☐ CQs in SPARQL

Ontology Requirements Specification. Tasks



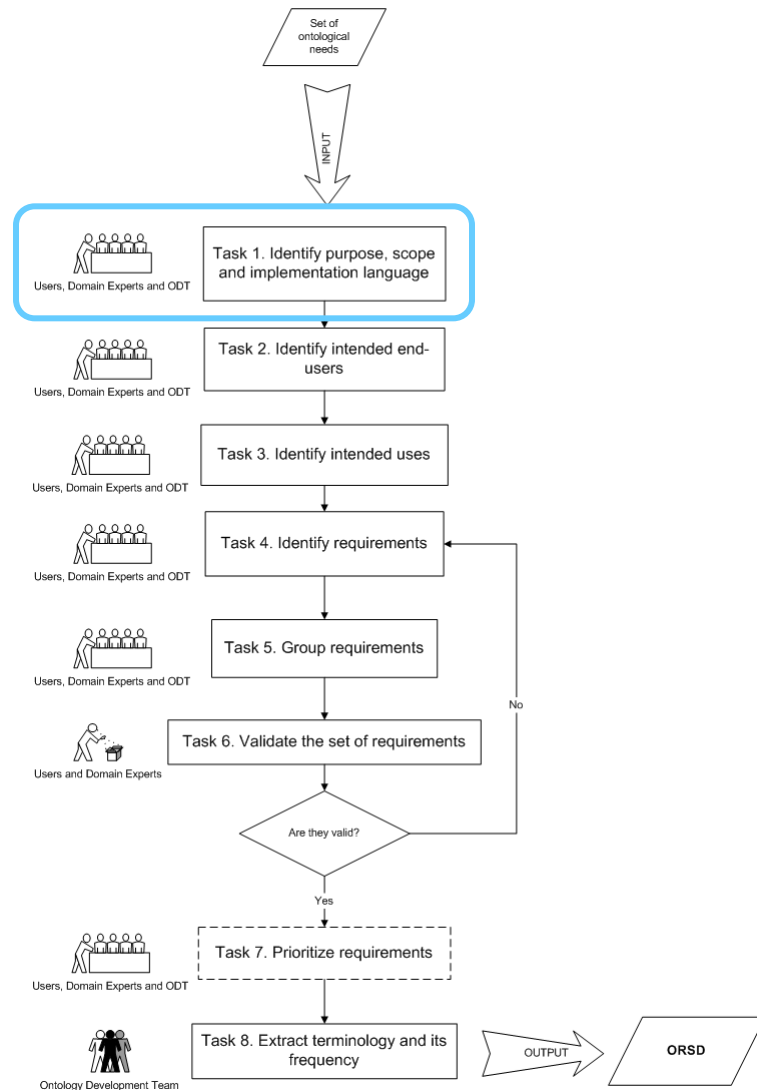
Ontology Requirements Specification Document. Template

Ontology Requirements Specification Document Template	
1	Purpose
	<i>The main general goal of the ontology. In other words, the main function or role that the ontology should have.</i>
2	Scope
	<i>The general coverage and the degree of detail that the ontology should have.</i>
3	Implementation Language
	<i>The formal language that the ontology should have.</i>
4	Intended End-Users
	<i>The intended end-users expected for the ontology.</i>
5	Intended Uses
	<i>The intended uses expected for the ontology.</i>
6	Ontology Requirements
	a. Non-Functional Requirements
	<i>The general requirements or aspects that the ontology should fulfil, including optionally priorities for each requirement.</i>
	b. Functional Requirements: Groups of Competency Questions
	<i>The content specific requirements that the ontology should fulfil, in the form of groups of competency questions and their answers, including optionally priorities for each group and for each competency question.</i>
7	Pre-Glossary of Terms
	a. Terms from Competency Questions
	<i>The list of terms included in the competency questions and their frequencies.</i>
	b. Terms from Answers
	<i>The list of terms included in the answers and their frequencies.</i>
	c. Objects
	<i>The list of objects included in the competency questions and in their answers.</i>

Ontology Requirements Specification.

Task 1

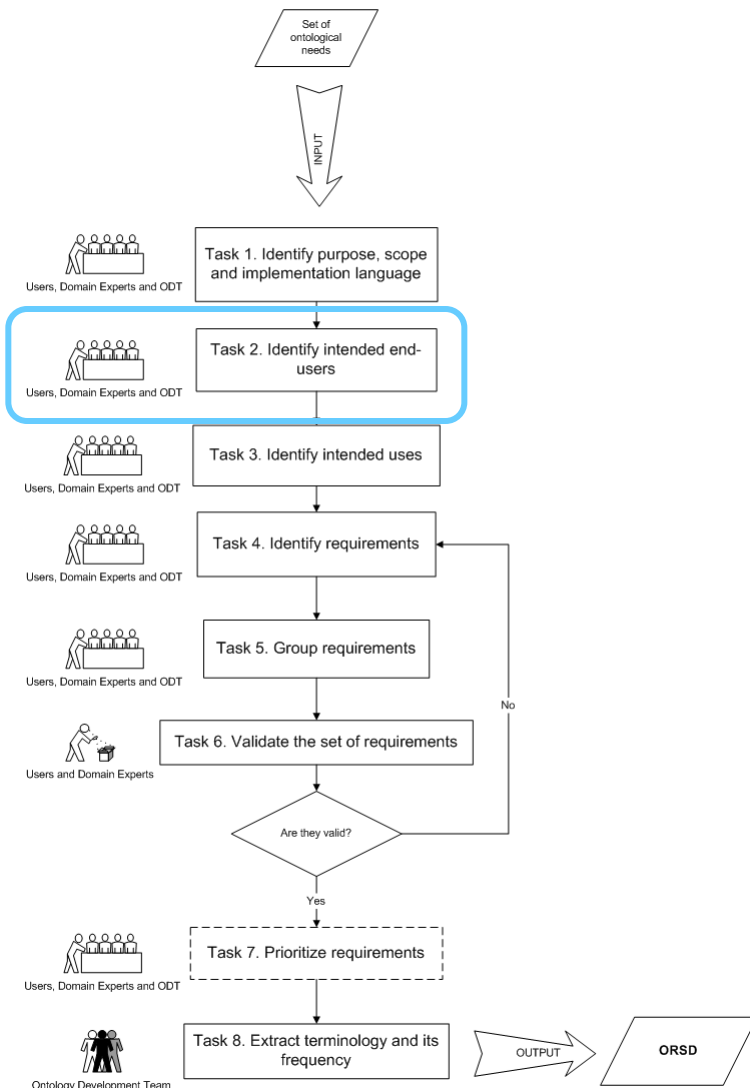
- ❑ Input: a set of ontological needs
- ❑ Objective: obtaining the **purpose, scope and formality level of the ontology**
- ❑ Techniques: physical or virtual interviewers
- ❑ Output: purpose, scope and level of formality of the ontology, which will be included in the corresponding slots of the OSRD template



SEEMP Reference Ontology Requirements Specification Document	
1	Purpose
	The purpose of building the Reference Ontology is to provide a consensual knowledge model of the employment domain that can be used by public e-Employment services.
2	Scope
	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.
3	Implementation Language
	The ontology has to be implemented in WSML language.

Ontology Requirements Specification. Ia

2

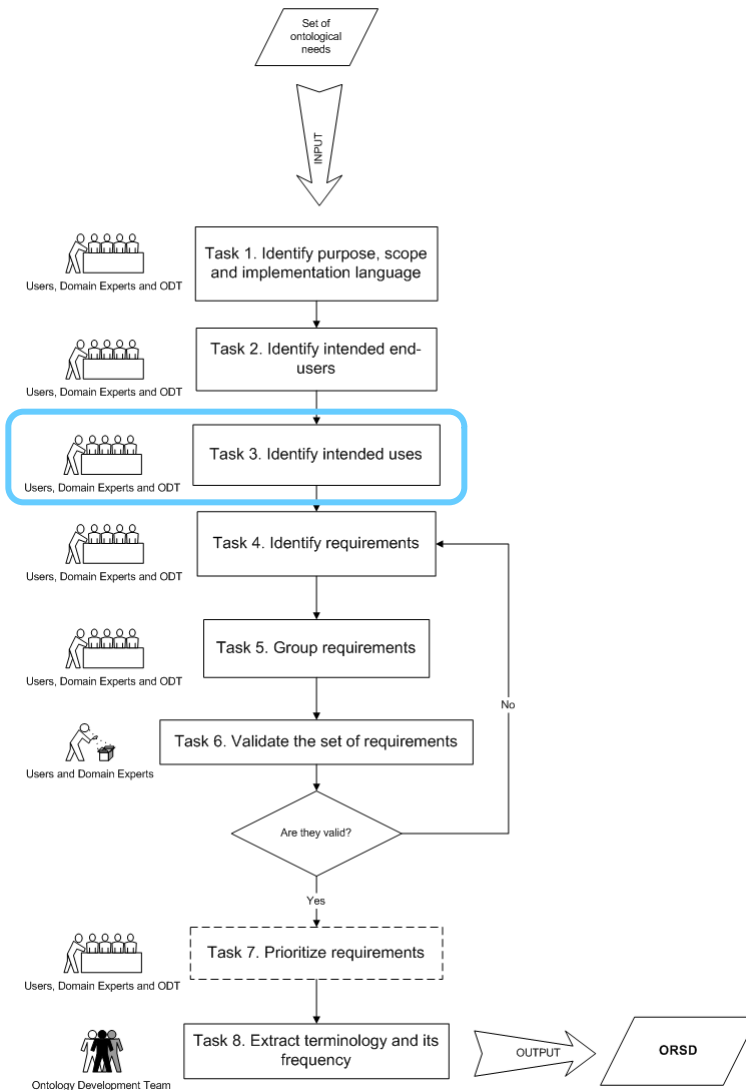


- Input: a set of ontological needs
- Objective: identifying the **intended end-users**
- Techniques: physical or virtual interviewers
- Output: a list with the intended users, which will be included in the corresponding slot of the OSRD template

4	Intended End-Users
User 1.	Candidate who is unemployed and searching for a job or searching another occupation for immediate or future purposes
User 2.	Employer who needs more human resources.
User 3.	Public or private employment search service which offers services to gather CVs or job postings and to prepare some data and statistics.
User 4.	National and Local Governments which want to analyze the situation on the employment market in their countries and prepare documents on employment, social and educational policy.
User 5.	European Commission and the governments of EU countries which want to analyze the statistics and prepare international agreements and documents on the employment, social and educational policy.

Ontology Requirements Specification.

Task 3

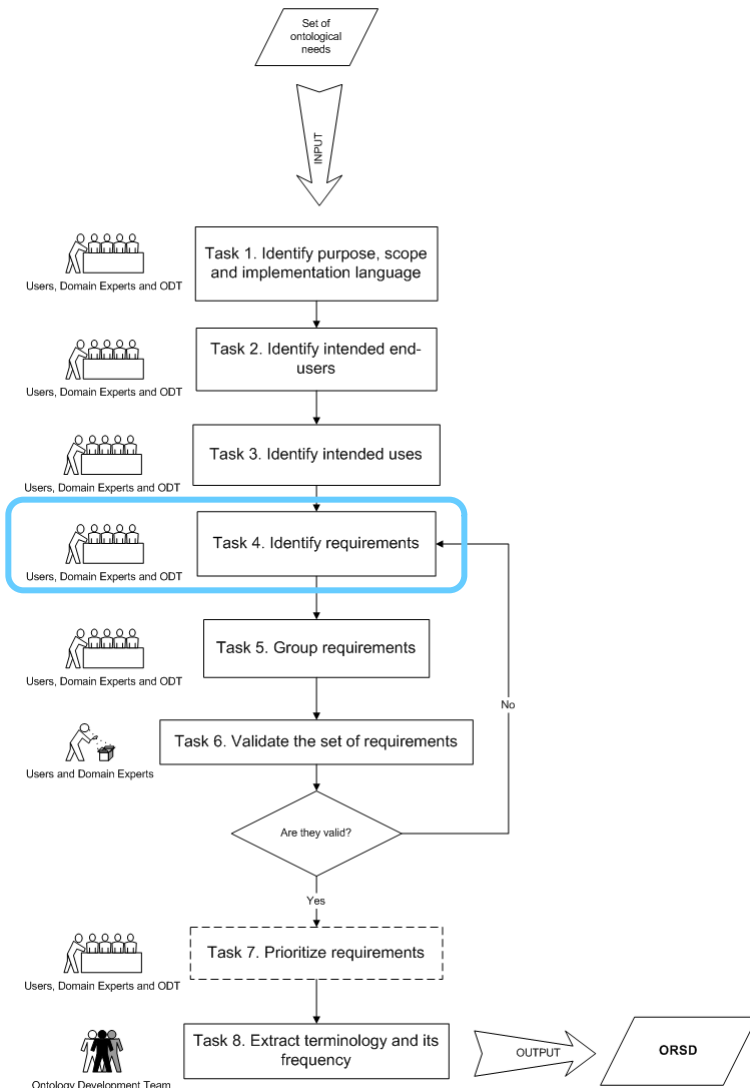


- ❑ Input: a set of ontological needs
- ❑ Objective: identifying the **intended uses**
- ❑ Techniques: physical or virtual interviewers between them
- ❑ Output: a list of intended uses in the form of scenarios. The scenarios can be described in natural language or expressed in UML as use cases. The list of scenarios will be included in the corresponding slot of the OSRD template.

5	Intended Uses
Use 1.	Publish CV. Job seeker places his/her CV on the PES Portal.
Use 2.	Publish Job Offer. An Employer places a Job Offer on the PES Portal.
Use 3.	Search for Job Offers. The Employer looks for candidates for the Job Offer through PES Portal.
Use 4.	Search for Employment information. Job Seeker looks for of general information about employment in a given location at the PES Portal.
Use 5.	Provide Job Statistics. The PES Portal provides employment statistics to the Job Seeker and Employer.

Ontology Requirements Specification.

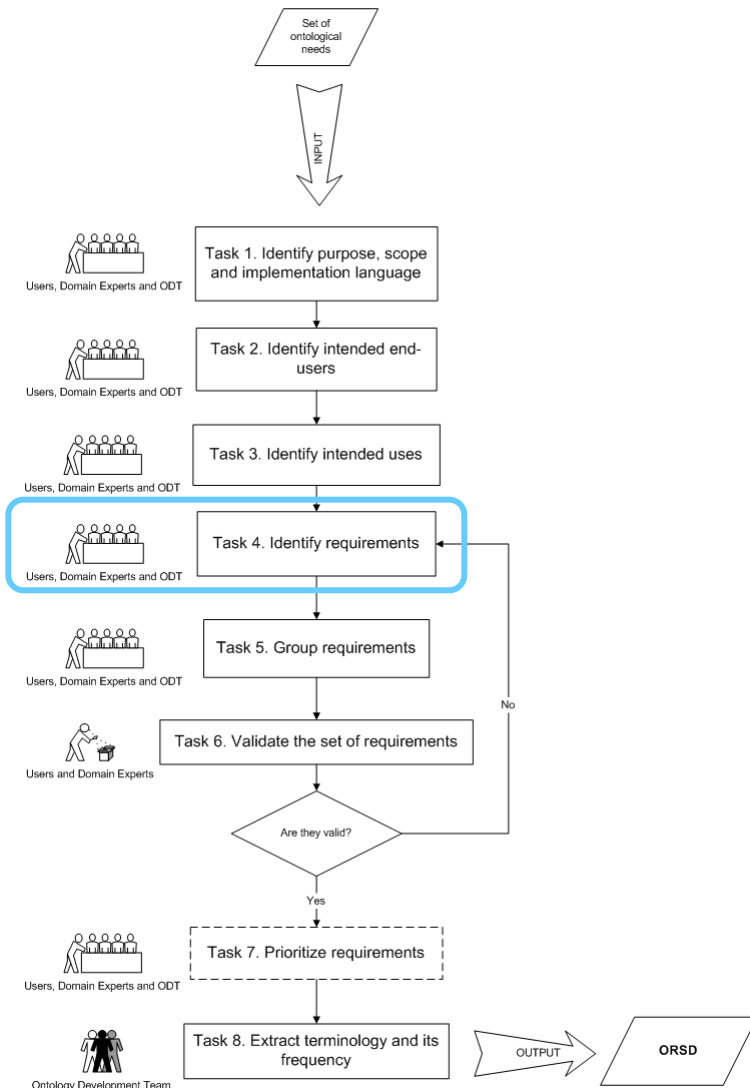
Task 4 (I)



- ❑ *Input:* a set of ontological needs
- ❑ *Objective:* identifying the set of **ontology requirements that the ontology should satisfy**
 - **Non-functional ontology requirements** refer to the characteristics, qualities, or general aspects not related to the ontology content that the ontology should satisfy
 - **Functional ontology requirements**, which can be also seen as content specific requirements, refer to the particular knowledge to be represented by the ontology
- ❑ *Techniques:* interview users and domain experts. For functional ontology requirements → writing the requirements in Natural Language in the form of the so-called **competency questions (CQs)**
- ❑ *Tools:* mind map tools, excel, and collaborative tools (e.g., Cicero)
- ❑ *Output:* (1) a list of non-functional ontology requirements written in natural language; and (2) a list functional ontology requirements in the form of CQs and their associated answers

Ontology Requirements Specification.

Task 4 (II)



Approaches:

- Top-Down: Complex questions are decomposed in simple ones.
- Bottom-Up: Simple questions that are organised to form complex ones.
- Middle out: Mix approach between top-down and bottom-up.

6	Ontology Requirements
	a. Non-Functional Requirements
	NFR1. The ontology must support a multilingual scenario in the following languages: English, Spanish, Italian, and French.
	NFR2. The ontology must be based on the international, European or de-facto standards in existence or under development.

Task 4. Identify requirements: Functional requirements

CQ1. What is the Job Seeker Name?
 CQ2. What is the Job Seeker nationality?
 CQ3. When is the Job Seeker birthdate?
 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?
 CQ9. How much salary does the Job Seeker want to earn?
 CQ10. What is the Job Seeker education level?
 CQ11. What is the Job Seeker work experience?
 CQ12. What is the Job Seeker knowledge?
 CQ13. What is the Job Seeker expertise?
 CQ14. What are the Job Seeker skills?
 CQ15. What publications does the Job Seeker have?
 CQ16. What hobbies does the Job Seeker have?
 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?
 CQ22. What is the description of the job offer?
 CQ23. What is the work condition of the job offer?
 CQ24. What is the required education level for the job offer?
 CQ25. What is the required work experience for the job offer?
 CQ26. What is the required knowledge for the job offer?
 CQ27. What are the required skills for the job offer?
 CQ28. When the Job Seeker completed his/her first degree?
 CQ29. Is the Job Seeker older than 30 years?
 CQ30. How much time did the Job Seeker spend completing his/her first degree?
 CQ31. How long is the duration of the contract?
 CQ32. Which job offers were posted in the last 24 hours?
 CQ33. Which job offers were posted in the last 7 days?
 CQ34. Which job offers were posted in the last month?
 CQ35. Is the job offer's salary greater than 14000 zlotos?
 CQ36. Is the job offer's salary lower than 25000 kroner?
 CQ37. The offered salary is given in US dollars?
 CQ38. The offered salary is given in Euros?

SEEMP Reference Ontology
Competency Questions

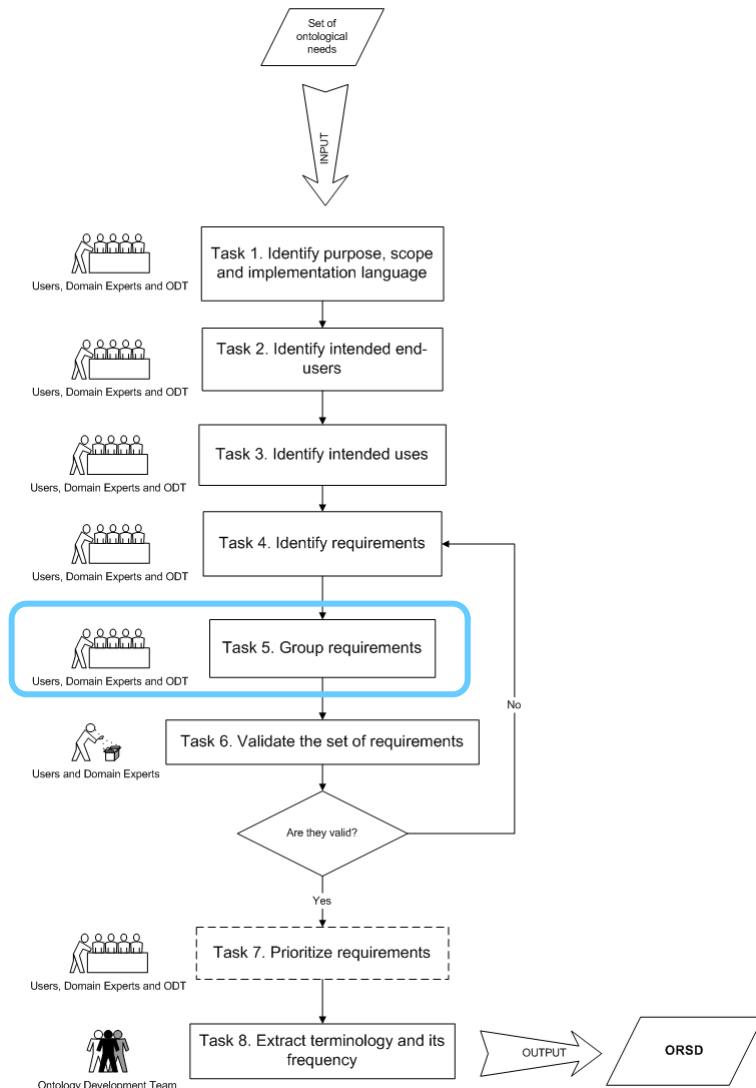
CQ40. Given the personal information (name, nationality, birth date, contact information) and the profile (current job, education level, work experience, knowledge, expertise, skill) of the job seeker what job offers are the most appropriate?
 CQ41. Given the objectives (desired contract type, desired job, desired working conditions, desired salary) and the profile (current job, education level, work experience, knowledge, expertise, skills) of the job seeker, what job offers are the most appropriate?
 CQ42. Given the personal information (name, nationality, birth date, contact information), the profile (current job, education level, work experience, knowledge, expertise, skill) and the objectives (desired contract type, desired job, desired working conditions, desired salary) of the job seeker, what job offers are the most appropriate?
 CQ43. Given the employer information, economic activity of the employer and the job offer profile (job, contract type, salary, work condition), what job seekers are the most appropriate?
 CQ44. Given the employer information, economic activity of the employer and the required profile to seek (required education level, required work experience, required knowledge, required skills), what job seekers are the most appropriate?
 CQ45. Given the job offer profile (job, contract type, salary, work condition) and the required profile to seek (required education level, required work experience, required knowledge, required skills), what job seekers are the most appropriate?
 CQ46. Given the employer information, economic activity of the employer, job offer profile (job, contract type, salary, work condition) and the required profile to seek (required education level, required work experience, required knowledge, required skills), what job seekers are the most appropriate?
 CQ47. When the job seeker completed his/her first degree and how much time did he/she spend completing his/her first degree?
 CQ48. When the job seeker completed his/her first degree and is he/she older than 30 years?
 CQ49. Is the job seeker older than 30 years and how much time did he/she spend completing his/her first degree?
 CQ50. Which job offers were posted in last 24 hours and how long is the duration of their contracts?
 CQ51. Which job offers were posted in last 7 days and how long is the duration of their contracts?
 CQ52. Which job offers were posted in last month and how long is the duration of their contracts?
 CQ53. Is the job offer's salary greater than 14000 zlotos and could it be given in US dollars?
 CQ54. Is the job offer's salary lower than 25000 kroner and could it be given in Euros?
 CQ55. Given the age (30 years old) and the desired salary (equal or greater than 14000 €) of the job seeker, what job offers are the most appropriate?
 CQ56. Given the employer information, economic activity of the employer and the job offer profile (job, contract type, salary, work condition, contract duration), what job seekers are the most appropriate?
 CQ57. Given the age (20 years old) and the desired salary (equal or greater than 14000 zlotos) of the job seeker, what job offers posted in last month are the most appropriate?
 CQ58. Given the employer information, economic activity of the employer and the job offer profile (job, contract type, salary of 3400 €, work condition, contract duration), what job seekers are the most appropriate?
 CQ59. Given the time spend for his/her degree (8 years) and the desired salary (equal or greater than 14000 €) of the job seeker, what job offers posted in last 7 days are the most appropriate?
 CQ60. Given the time spend for his/her degree (8 years) and the desired salary (equal or greater than 14000 €) of the job seeker, what job offers posted in last 24 hours are the most appropriate?

CQ39. Given the personal information (name, nationality, birth date, contact information) and the objectives (desired contract type, desired job, desired working conditions, desired salary) of the job seeker, what job offers are the most appropriate?

Task 4. Identify requirements. SEEMP Example

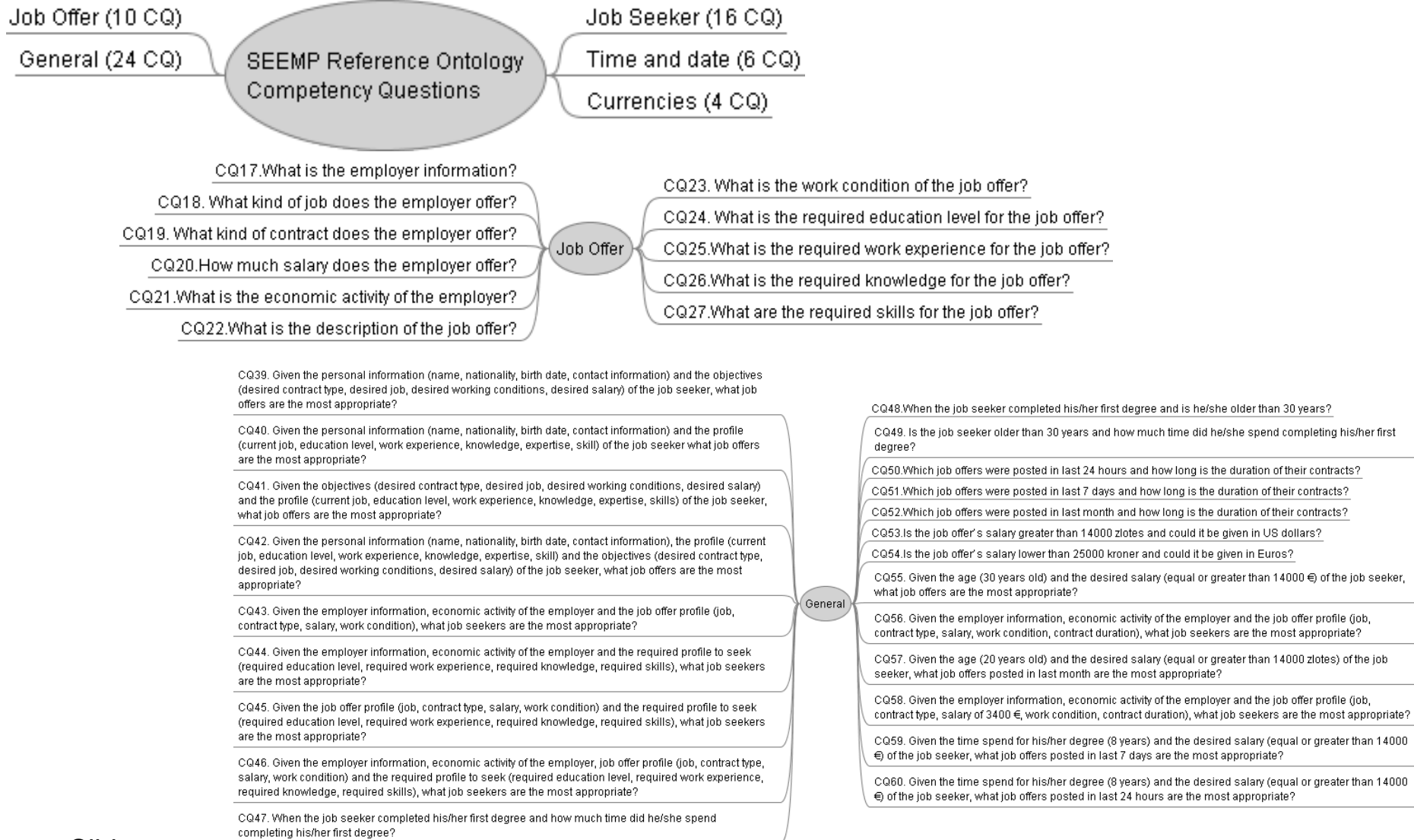
A		B	C
1	N	Competency Questions	Answers
2	CQ1	What is the Job Seeker Name?	Lewis Hamilton
3	CQ2	What is the Job Seeker nationality?	British; Spanish; Italian; French; German
4	CQ3	When is the Job Seeker birthdate?	13/09/1984; 30/03/1970; 15/04/1978
5	CQ4	What is the Job Seeker contact information?	
6	CQ5	What is the Job Seeker current job?	Programmer; Computer Engineer; Computer Assistant
7	CQ6	What is the Job Seeker desired job?	Radio engineer; Hardware designer; Software Engineer
8	CQ7	What are the Job Seeker desired working conditions?	Autonomous; Seasonal Job; Traineeship; Consultant
9	CQ8	What kind of contract does the Job Seeker want?	
10	CQ9	How much salary does the Job Seeker want to earn?	
11	CQ10	What is the Job Seeker education level?	Basic education; Higher education/University
12	CQ11	What is the Job Seeker work experience?	3 months, 6 months, 1 year, 2, years, 3 years
13	CQ12	What is the Job Seeker knowledge?	
14	CQ13	What is the Job Seeker expertise?	
15	CQ14	What are the Job Seeker skills?	SQL programming, network administration
16	CQ15	What publications does the Job Seeker have?	
17	CQ16	What hobbies does the Job Seeker have?	
18	CQ17	What is the employer information?	CEFRIEL Research Company, Milano, Italy
19	CQ18	What kind of job does the employer offer?	Java Programmer; C Programmer, Database administration
20	CQ19	What kind of contract does the employer offer?	
21	CQ20	How much salary does the employer offer?	3500 euros, 3000 USD, 2000 euros
22	CQ21	What is the economic activity of the employer?	Research; Financial; Education; Industrial
23	CQ22	What is the description of the job offer?	Sun Certified Java Programmer
24	CQ23	What is the work condition of the job offer?	Full time; Partial time; Autonomous; Seasonal Job;
25	CQ24	What is the required education level for the job offer?	Basic education; Higher education/University
26	CQ25	What is the required work experience for the job offer?	1 year, 2 years, 3 years, 4 years, 5 or more years
27	CQ26	What is the required knowledge for the job offer?	Java, Object oriented design, Haskell, Windows
28	CQ27	What are the required skills for the job offer?	ASP Programmer, Data warehouse, Hardware programming
29	CQ28	When the Job Seeker completed his/her first degree?	2001; March 1999; 23/10/1970
30	CQ29	Is the Job Seeker older than 30 years?	
31	CQ30	How much time did the Job Seeker spend completing his/her first degree?	4 years, 6 years, 7 years and 6 months
32	CQ31	How long is the duration of the contract?	1 month, 6 months, 1 year, 2 years, 3 years
33	CQ32	Which job offers were posted in the last 24 hours?	
34	CQ33	Which job offers were posted in the last 7 days?	
35	CQ34	Which job offers were posted in the last month?	
		Competency Questions	

Ontology Requirements Specification. Task 5



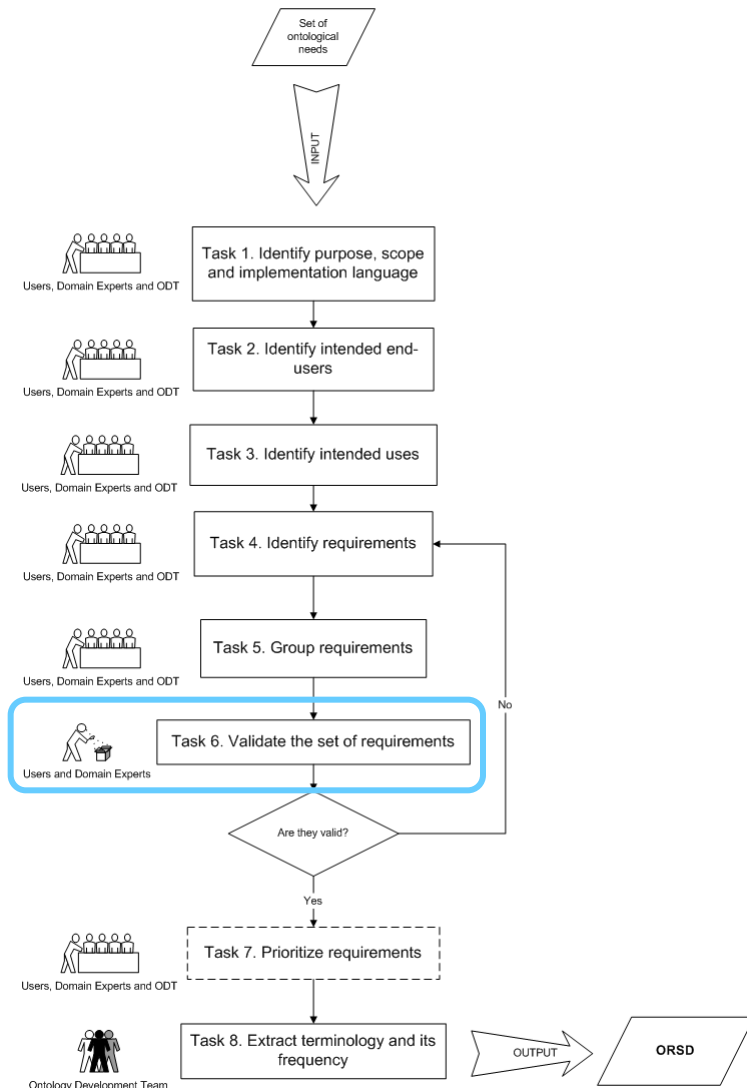
- ❑ *Input:* the list of CQs
- ❑ *Objective:* obtaining different **groups of CQs**
- ❑ *Techniques:* Card Sorting, when the grouping is done manually, and Clustering NL sentences or Information Extraction when the grouping is done automatically
- ❑ *Tools:* MindMap Tools or Cicero Tool (for distributed teams)
- ❑ *Output:* a set of groups including CQs
- ❑ *Hybrid approach:*
 - The analysis of the frequency of terms and the grouping of CQs based on those terms that have a higher frequency.
 - The use of pre-established categories, such as time and date, units of measure, currencies, location, languages, etc.

Task 5. Group requirements (CQs)



Ontology Requirements Specification.

Task 6



- ❑ **Input:** the set of grouped CQs
- ❑ **Objective:** to identify possible conflicts between CQs, missing CQs, and contradictions in CQs. To decide **if such CQs are valid or not**

- ❑ **Output:** a confirmation about the validity of the set of CQs

- ❑ **Criteria:**

Correctness.

Consistent.

Understandable.

Conciseness.

Modifiable.

Traceable.

Completeness.

Verifiable.

No Ambiguity.

Realism.

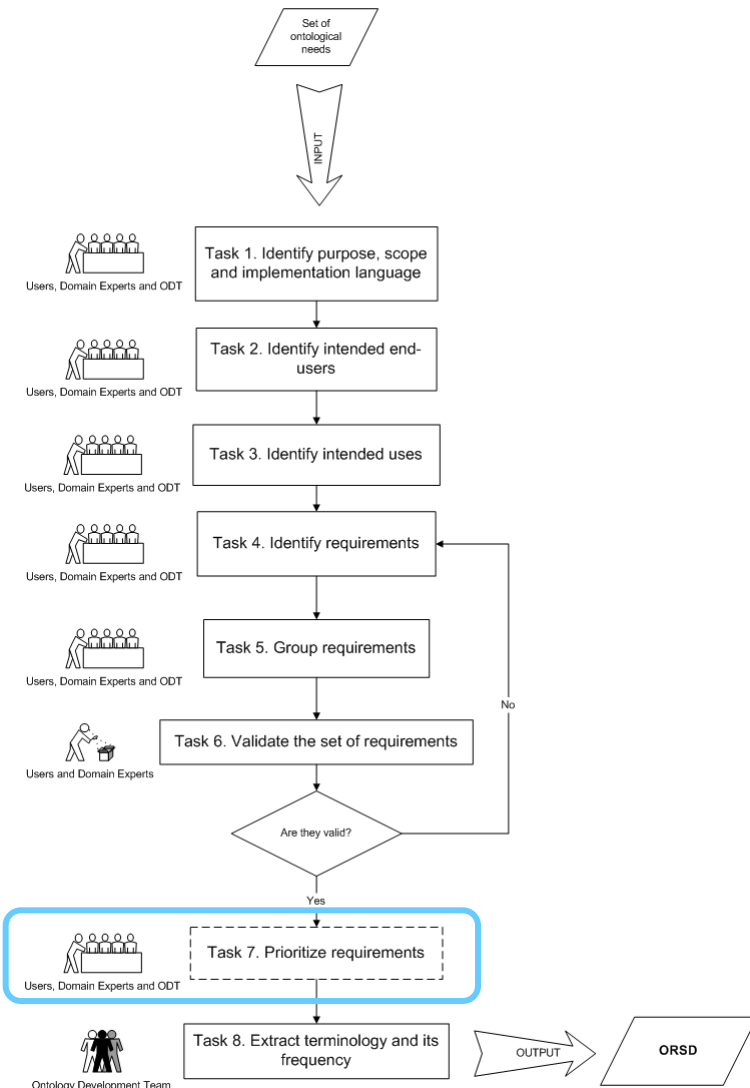
Correctness. Domain experts checked the correctness of each competency question, verifying that its formulation and answers were correct.

Consistent. Domain experts also verified that the competency questions did not have any possible inconsistency.



Ontology Requirements Specification.

Task 7



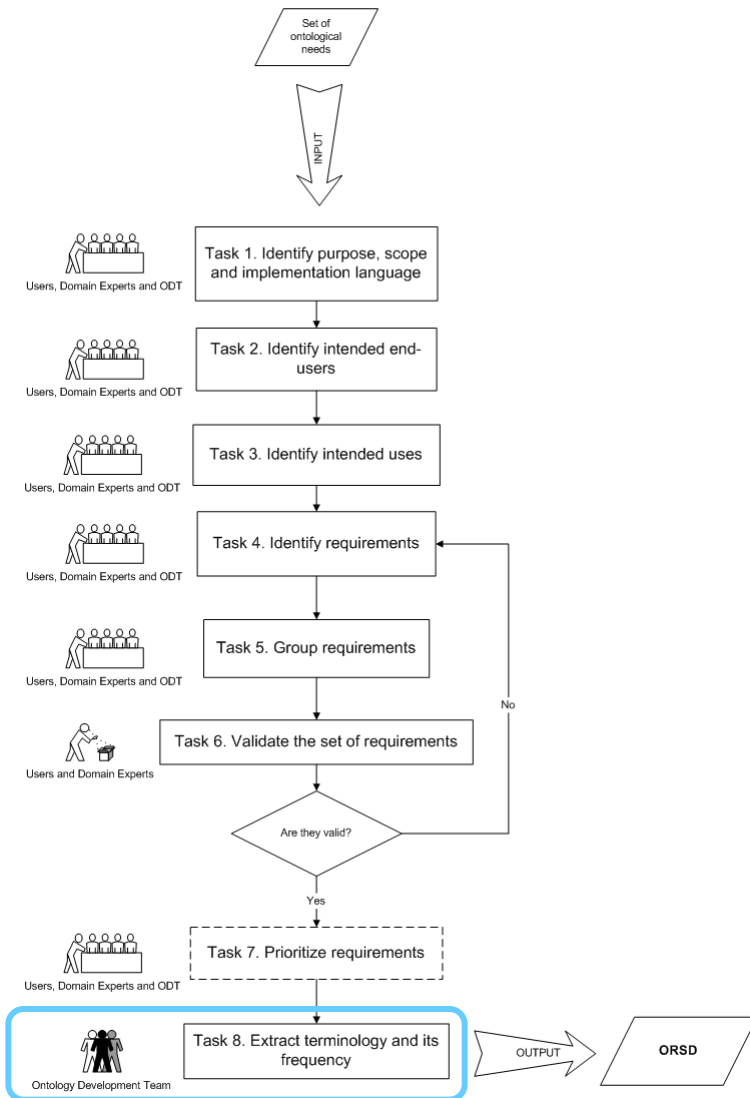
- ❑ *Input:* the groups of CQs written in natural language (obtained in task 5)
- ❑ *Objective:* to give **different levels of priority** to the different groups of CQs, and within each group to the identified requirements (in the form of CQs)
- ❑ *Output:* a set of priorities attached to each group of CQs and to each CQ in a group

Within the SEEMP Reference Ontology specification we did not carry out this step. This means the first version of the ontology must be able to represent the knowledge contained in all the competency questions.



Ontology Requirements Specification.

Task 8



□ *Input:* the list of identified CQs and their answers

□ *Objective:* to extract from the list of CQs a pre-glossary to be used in the conceptualization activity. Obtaining a list of the **most used terms**

□ *Techniques:* terminology extraction techniques and tools supporting such techniques

From the requirements in form of competency questions, we extract the terminology (names, adjectives and verbs) that will be formally represented in the ontology by means of concepts, attributes and relations.

From the answers to the CQs we extract the objects in the universe of discourse that will be represented as instances.

Task 8. Extract terminology and its frequency

7	Pre-Glossary of Terms			
	a. Terms from Competency Questions + Frequency			
	Job Seeker	27	Address	1
	CV	2	Nationality	1
	Personal Information	3	Contact (phone, fax, mail)	3
	Name	4	Objective	3
	Gender	1	Job Category	3
	Birth date	1	...	
	b. Terms from Answers + Frequency			
	SW engineer, programmer	5	Research, Financial, Education	4
	British, Spanish, Italian, French	1	1 year, 2 years, 3 years	1
	Autonomous, Seasonal Job,	2	3000 Euros per month	1
	Basic education, Higher education	1	CEFRIEL Research Company	1
	c. Objects			
	Andorra, Angola, Argentina, Australia, Bolivia, France, Italy, Malta, Spain, etc.			
	Euro, Zloty, Great British Pound, US Dollar, Peso, etc.			
	CEFRIEL, ATOS, etc.			

SEEMP Ontology Requirement Specification Document

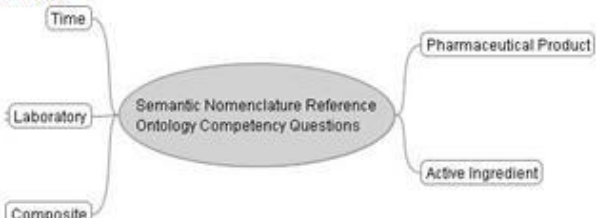

SEEMP Reference Ontology Requirements Specification Document	
1 Purpose	The purpose of building the Reference Ontology is to provide a consensual knowledge model of the employment domain that can be used by public e-Employment services.
2 Scope	The ontology has to focus just on the ICT (Information and Communication Technology) domain. The level of granularity is directly related to the competency questions and terms identified.
3 Implementation Language	The ontology has to be implemented in WSMML language.
4 Intended End-Users	<p>User 1. Candidate who is unemployed and searching for a job occupation for immediate or future purposes</p> <p>User 2. Employer who needs more human resources.</p> <p>User 3. Public or private employment search service which collects CVs or job postings and to prepare some data and statistics</p> <p>User 4. National and Local Governments which want to analyze employment market in their countries and prepare social and educational policy.</p> <p>User 5. European Commission and the governments of EU countries analyze the statistics and prepare international agreements on the employment, social and educational policy.</p>
5 Intended Uses	<p>Use 1. Publish CV. Job seeker places his/her CV on the PES Portal</p> <p>Use 2. Publish Job Offer. An Employer places a Job Offer on the PES Portal</p> <p>Use 3. Search for Job Offers. The Employer looks for candidates through PES Portal.</p> <p>Use 4. Search for Employment information. Job Seeker searches information about employment in a given location at the PES Portal</p> <p>Use 5. Provide Job Statistics. The PES Portal provides employment statistics for Job Seeker and Employer.</p>

6 Ontology Requirements
a. Non-Functional Requirements
<p>NFR1. The ontology must support a multilingual scenario in the following languages: English, Spanish, Italian, and French.</p> <p>NFR2. The ontology must be based on the international, European or de-facto standards in existence or under development.</p>

6 Ontology Requirements
b. Functional Requirements: Groups of Competency Questions
<i>CQG1. Job Seeker (14 CQs)</i>
<p>ish, Italian, French, 0/03/1970; 15/04/1978 Tel: 34600654231. Email: mer; Computer Engineer; gineer; Hardware designer; conditions? Autonomous; t? Full time; Partial time; m? 3000 Euros per month, Basic education; Higher hs, 1 year, 2 years programming; C Programming, teering g; network administration research Company, Milano, n? Java Programmer; C seasonal Job; Autonomous Euros, 3000 USD yer? Research; Financial; ied Java Programmer r? Full time; Partial time; b offer? Basic education; Higher education/University CQG23. What is the required work experience for the job offer? 1 year, 2 years, 3 years, 4 years, 5 or more years CQG24. What is the required knowledge for the job offer? Java, Haskell, Windows CQG25. What are the required skills for the job offer? ASP Programmer. Data warehouse, Hardware programming</p>

7	Pre-Glossary of Terms			
	a. Terms from Competency Questions + Frequency			
	Job Seeker	27	Address	1
	CV	2	Nationality	1
	Personal Information	3	Contact (phone, fax, mail)	3
	Name	4	Objective	3
	Gender	1	Job Category	3
	Birth date	1	...	
	b. Terms from Answers + Frequency			
	SW engineer, programmer	5	Research, Financial, Education	4
	British, Spanish, Italian, French	1	1 year, 2 years, 3 years	1
	Autonomous, Seasonal Job,	2	3000 Euros per month	1
	Basic education, Higher education	1	CEFRIEL Research Company	1
	c. Objects			
	Andorra, Angola, Argentina, Australia, Bolivia, France, Italy, Malta, Spain, etc. Euro, Zloty, Great British Pound, US Dollar, Peso, etc. CEFRIEL, ATOS, etc.			

Semantic Nomenclature Reference Ontology Specification Document

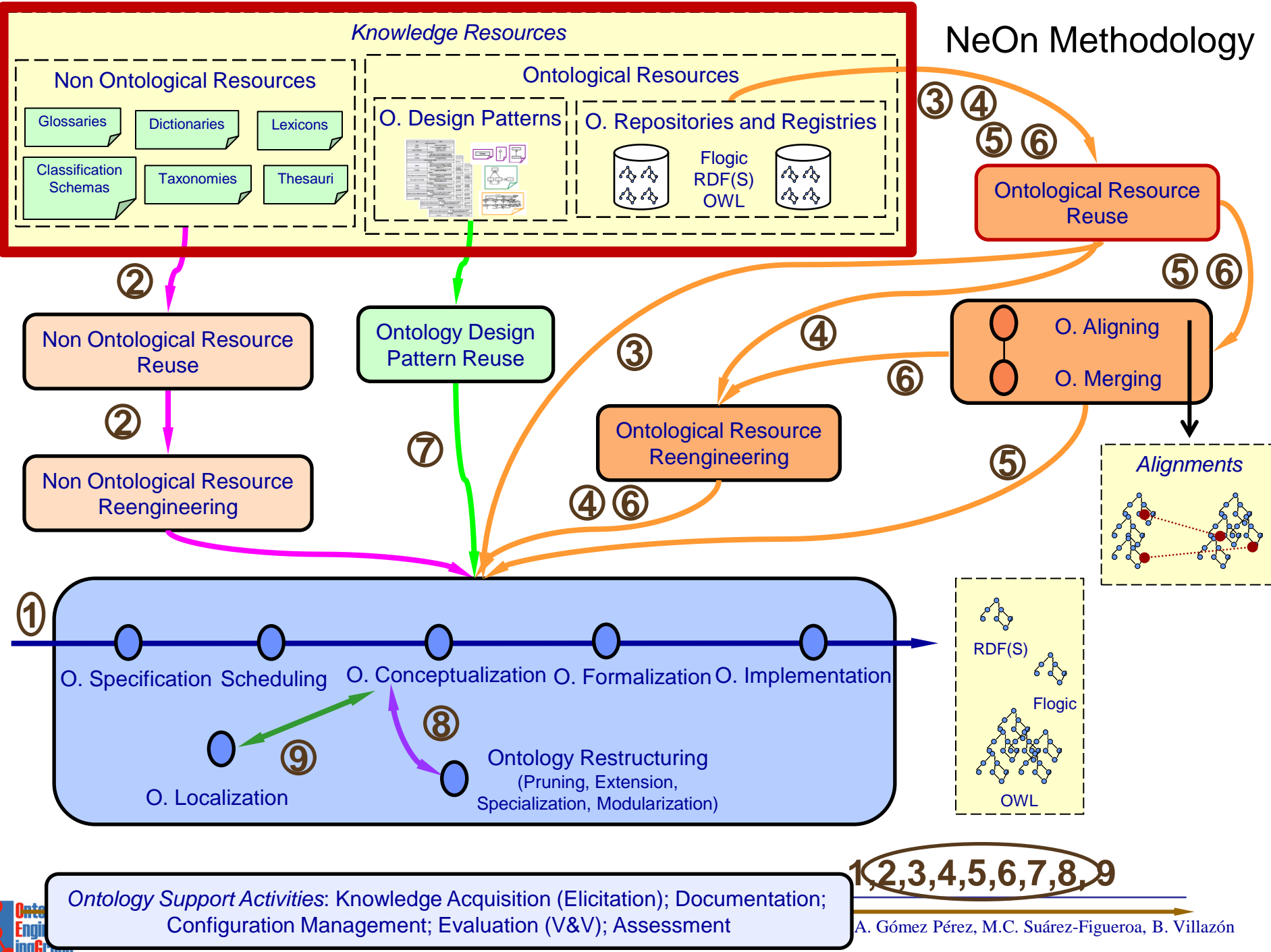
Semantic Nomenclature Reference Ontology Requirements Specification		7 Pre-Glossary of Terms																													
1 Purpose	The purpose of building the Reference Ontology is to provide a network of ontologies for the pharmaceutical domain. This model is a compilation of the main terms and objects for this particular domain and could be used by health & pharmaceutical entities.	Terms																													
2 Scope	The ontology has to focus just on the Spanish & European pharmaceutical domain. The level of granularity is directly related to the competency questions and terms identified.	<table border="1"> <thead> <tr> <th>Term</th> <th>Frequency</th> </tr> </thead> <tbody> <tr> <td>Drug</td> <td>29</td> </tr> <tr> <td>• Date (registration, withdrawal)</td> <td>3</td> </tr> <tr> <td>• Price (reference, commercial)</td> <td>3</td> </tr> <tr> <td>• Therapeutical Subgroup</td> <td>3</td> </tr> <tr> <td>• Dosage</td> <td>1</td> </tr> <tr> <td>• Composition</td> <td>2</td> </tr> <tr> <td>• Identification</td> <td>2</td> </tr> <tr> <td>• National Health financing</td> <td>2</td> </tr> <tr> <td>• Route of administration</td> <td>1</td> </tr> <tr> <td>• Units content</td> <td>1</td> </tr> <tr> <td>• Indications</td> <td>2</td> </tr> <tr> <td>• Status</td> <td>1</td> </tr> <tr> <td>• Pharmaceutical form</td> <td>1</td> </tr> </tbody> </table>		Term	Frequency	Drug	29	• Date (registration, withdrawal)	3	• Price (reference, commercial)	3	• Therapeutical Subgroup	3	• Dosage	1	• Composition	2	• Identification	2	• National Health financing	2	• Route of administration	1	• Units content	1	• Indications	2	• Status	1	• Pharmaceutical form	1
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• Units content	1																														
• Indications	2																														
• Status	1																														
• Pharmaceutical form	1																														
3 Level of Formality	The ontology has to be implemented in OWL	Objects																													
4 Intended Users	<p>User 1: Pharmadist. Pharmadists are the end-users of the ontology and navigate across the ontology searching for drug information.</p> <p>User 2: GSCoP technician. GSCoP technicians navigate across the ontology network and search for more information or relations about a given concept (drug, active ingredient, etc.). Also, GSCoP technicians extract the latest information from different sources and update their BOTPlus database</p> <p>User 3: Spanish Government. Spanish Government analysts study the situation of the pharmaceutical product information in the Spanish market or update the content.</p>	<table border="1"> <thead> <tr> <th>Active Ingredient Objects</th> </tr> </thead> <tbody> <tr><td>Ibuprofeno</td></tr> <tr><td>Butibufeno</td></tr> <tr><td>Penicilamina</td></tr> <tr><td>Niflumico Acid</td></tr> <tr><td>Galamina</td></tr> <tr><td>Tetrazepam</td></tr> <tr><td>Procaína</td></tr> <tr><td>Ketamina</td></tr> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td> </td></tr> </tbody> </table>		Active Ingredient Objects	Ibuprofeno	Butibufeno	Penicilamina	Niflumico Acid	Galamina	Tetrazepam	Procaína	Ketamina																			
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Ketamina																															
5 Intended Uses	<p>Use1. Search updated information about the characteristics of pharmaceutical products</p> <p>Use2. Connect heterogeneous pharmaceutical models</p> <p>Use3. Update pharmaceutical product information databases</p>	<div> <div>CQ11.Which is the drug generic name?</div> <div>CQ12.Which is the drug defined daily doses DDDs?</div> <div>CQ13.Which is the drug composition?</div> <div>CQ14.Is it a narcotic?</div> <div>CQ15.Which are the drug contraindications?</div> <div>CQ16.What is the drug dosage?</div> <div>CQ17.Which method of administration has the drug?</div> <div>CQ18.What is the drug pharmaceutical form?</div> </div>																													
6 Groups of Competency Questions	<p>CQG1. Pharmaceutical Product (29 competency questions)</p> <p>CQG2. Laboratory (4 competency questions)</p> <p>CQG3. Active Ingredient (12 competency questions).</p> <p>CQG4. Composed ones (16 competency questions).</p> <p>CQG5. Time / Date</p> 																														

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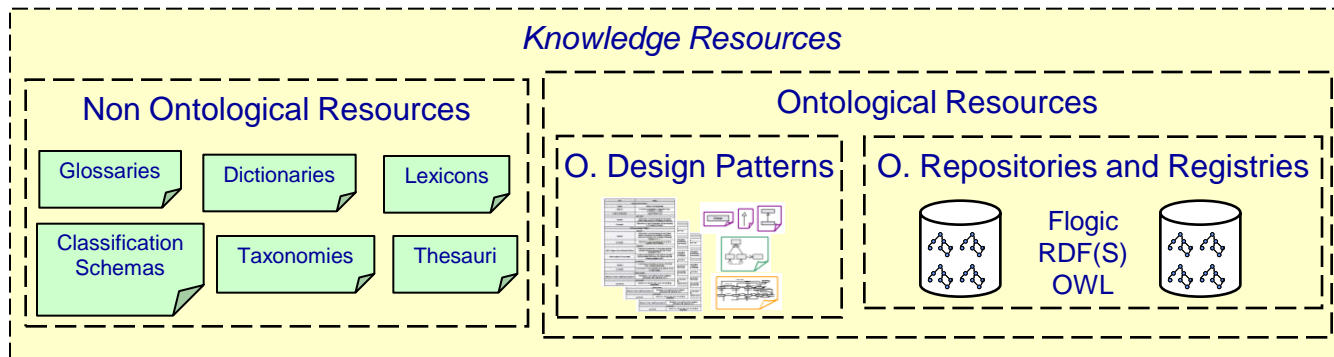
- ❑ **Introduction**
- ❑ Use cases in Ontology Building
- ❑ The NeOn Methodology
 - ❑ Glossary of activities
 - ❑ Scenarios
 - ❑ Lifecycle models
- ❑ **Main Activities**
 - ❑ Methodological Guidelines for Ontology Specification
 - ❑ **Quick Search of Existing Knowledge Resources**
 - ❑ Guidelines for Ontology development project Planning
 - ❑ Methodological Guidelines for Non Ontological Resource Reuse and Reengineering
 - ❑ Methodological Guideliness for Ontology Reuse
 - ❑ Creating the final Ontology Model

NeOn Methodology



Searching Resources

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



Objects

Objects in the universe of discourse, which are instances of:

- Job Category
 - O1. Computer System Designer
 - O2. Computer System Analyst
 - O3. Programmer
 - O4. Computer Engineer
 - O5. Computer Assistant
 - O6. Computer Equipment Operator
 - O7. Industrial Robot Controller
 - O8. Telecommunication Equipment Operator
 - O9. Medical Equipment Operator
 - O10. Electronic Equipment Operator
 - O11. Image Equipment Operator
- Nationality
 - O12. Austrian
 - O13. Belgian
 - O14. Danish
 - O15. Estonian
 - O16. Finnish
 - O17. French
 - O18. German
 - O19. Greek
 - O20. Italian

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

ISO 4217 (currencies)

Entity	Currency	Code	
		Alphabetic	Numeric
AFGHANISTAN	Afghani	AFN	971
ALBANIA	Lek	ALL	008
ALGERIA	Algerian Dinar	DZD	012
AMERICAN SAMOA	US Dollar	USD	840
ANDORRA	Euro	EUR	978
ANGOLA	Kwanza	AOA	973
ANGUILLA	East Caribbean Dollar	XCD	951
ANTARCTICA	No universal currency		
ANTIGUA AND BARBUDA	East Caribbean Dollar	XCD	951
ARGENTINA	Argentine Peso	ARS	032
ARMENIA	Armenian Dram	AMD	051
ARUBA	Aruban Guilder	AWG	533
AUSTRALIA	Australian Dollar	AUD	036
AUSTRIA	Euro	EUR	978
AZERBAIJAN	Azerbaijani Manat	AZN	944
BAHAMAS	Bahamian Dollar	BSD	044
BAHRAIN	Bahraini Dinar	BHD	048
BANGLADESH	Taka	BDT	050
BARBADOS	Barbados Dollar	BBD	052
BELARUS	Belarussian Ruble	BYR	974

ISO 3166 (countries)

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Non-ontological resources - ISCO-88 (COM)

level	description EN	description FR	description DE	texte auto EN	
3	Religious professionals	Membres du clergé	Geistliche, Seelsorger		
3	Public service administrative professionals	Cadres administratifs des services publics	Wissenschaftliche Verwaltungsfachkräfte des öffentlichen Dienstes	This is a new minor group, designed explicitly for the classification of occupations in which the primary tasks consist of general administrative functions within the public	Hier han ausdrückl deren He
3	Physical and engineering science technicians	Techniciens des sciences physiques et techniques	Material- und ingenieurtechnische Fachkräfte		
3	Computer associate professionals	Pupitreurs et autres opérateurs de matériels informatiques	Datenverarbeitungsfachkräfte	If the job title and associated information on activities does not permit a clear distinction, additional information on a level of relevant qualifications or description of tasks may	Wenn di Informati erlauben
3	Optical and electronic equipment operators	Techniciens d'appareils optiques et électroniques	Bediener optischer und elektronischer Anlagen		
3	Ship and aircraft controllers and technicians	Techniciens des moyens de transport maritime et aérien	Schiffs-, Flugzeugführer und verwandte Berufe		
3	Safety and quality inspectors	Inspecteurs d'immeubles, de sécurité, d'hygiène et de qualité	Sicherheits- und Qualitätskontrolleure		
3	Life science technicians and related associate professional	Techniciens et travailleurs assimilés des sciences de la vie et de la santé	Biotechniker und verwandte Berufe		
3	Health associate professionals (except nursing)	Professions intermédiaires de la médecine moderne (à l'exception du personnel infirmier)	Medizinische Fachberufe (ohne Krankenpflege)		
3	Nursing and midwifery associate professionals	Personnel infirmier et sages-femmes (niveau intermédiaire)	Nicht-wissenschaftliche Krankenpflege- und Geburtshilfefachkräfte	Concerning "Nursing and midwifery professionals", see notes to sub-major group 22.	Für "Wis Geburts
3	Primary education teaching associate professionals	Professions intermédiaires de l'enseignement primaire	Nicht-wissenschaftliche Lehrkräfte des Primarbereiches		
▶ 3	Pre-primary education teaching associate professionals	Professions intermédiaires de l'enseignement préprimaire	Nicht-wissenschaftliche Lehrkräfte des Vorschulbereiches		
3	Special education teaching associate professionals	Professions intermédiaires de l'éducation des handicapés	Nicht-wissenschaftliche Sonderschullehrkräfte		

Searching 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?**

Selection of Ontologies

- Search ontologies
- Compare ontologies in the same domain using a set of criteria
- Assess if the ontologies cover the set of competency questions
- Select the best ontology based on
 - Coverage of the domain
 - Expressivity of the Implementation language

Searching Ontologies in Watson

Ontology Requirement Specification Document

Objects	
Objects in the context of discourse, which are instances of:	
Job Category	<ul style="list-style-type: none"> Education <ul style="list-style-type: none"> 029. Life Science 030. Mathematics 031. Computer Science 032. Computer Use 033. Statistics 034. Physics 035. Network Administration Languages <ul style="list-style-type: none"> 036. Swedish 037. Spanish 038. Slovenian 039. Portuguese 040. English 041. French 042. German Currency <ul style="list-style-type: none"> 043. Euro 044. Krone 045. Great British Pound 046. Zlot 047. US Dollar 048. Franc Location <ul style="list-style-type: none"> 049. Austria 050. Belgium 051. Denmark 052. Estonia 053. Finland 054. France 055. Germany 056. Greece
01. Computer System Designer	
02. Computer System Analyst	
03. Programmer	
04. Computer Engineer	
05. Computer Assistant	
06. Computer Equipment Operator	
07. Industrial Robot Controller	
08. Telecommunication Equipment Operator	
09. Medical Equipment Operator	
10. Electronic Equipment Operator	
11. Image Equipment Operator	
Nationality	<ul style="list-style-type: none"> 012. Austrian 013. Belgian 014. Danish 015. Estonian 016. Finnish 017. French 018. German 019. Greek 020. Italian
Activity Sector	<ul style="list-style-type: none"> 021. Telecommunication 022. Justice and Judicial 023. Public Security and law 024. Manufacture of 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/

Search "smoking"

diana Apple (110) Amazon eBay Yahoo! News (1049) neon-newsfe...n,WP4) (3) WII Old Compute... computers

https://oufe.o... Mail :: Welcom... Virgin.net We... MegaTokyo - ... Watson Sema... Widget Devel... DEXA 2007

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
- <http://daml.umbc.edu/ontologies/cobra/0.4/academia#Researcher> Comment:
- <http://daml.umbc.edu/ontologies/cobra/0.4/academia#GradStudentResearcher> Label: GradStudentResearcher
- <http://daml.umbc.edu/ontologies/cobra/0.4/academia#Student> Comment:
- <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#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>

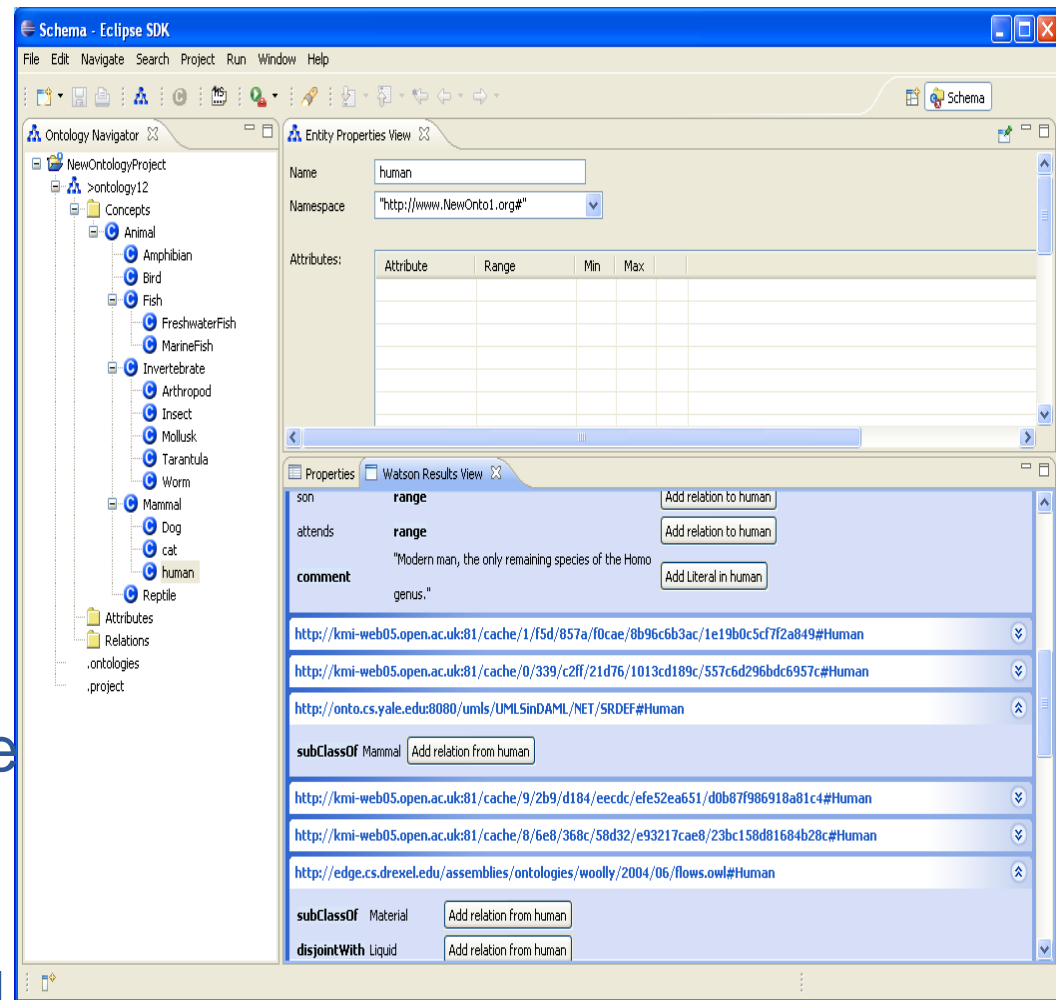
- <http://kmi-web05.open.ac.uk:81/cache/7/64e/14aa/3dd17/adbdb1ce20/2653b336ce35ba101#University>
- <http://kmi-web05.open.ac.uk:81/cache/7/64e/14aa/3dd17/adbdb1ce20/2653b336ce35ba101#Researcher>
- <http://kmi-web05.open.ac.uk:81/cache/7/64e/14aa/3dd17/adbdb1ce20/2653b336ce35ba101#student>
- <http://kmi-web05.open.ac.uk:81/cache/7/64e/14aa/3dd17/adbdb1ce20/2653b336ce35ba101#Student>
- <http://kmi-web05.open.ac.uk:81/cache/7/64e/14aa/3dd17/adbdb1ce20/2653b336ce35ba101#PhDStudent>

4- http://www.ifi.unizh.ch/ddis/fileadmin/pdf/service_broker/iswc.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#Researcher>

Watson NeOn Toolkit plugin

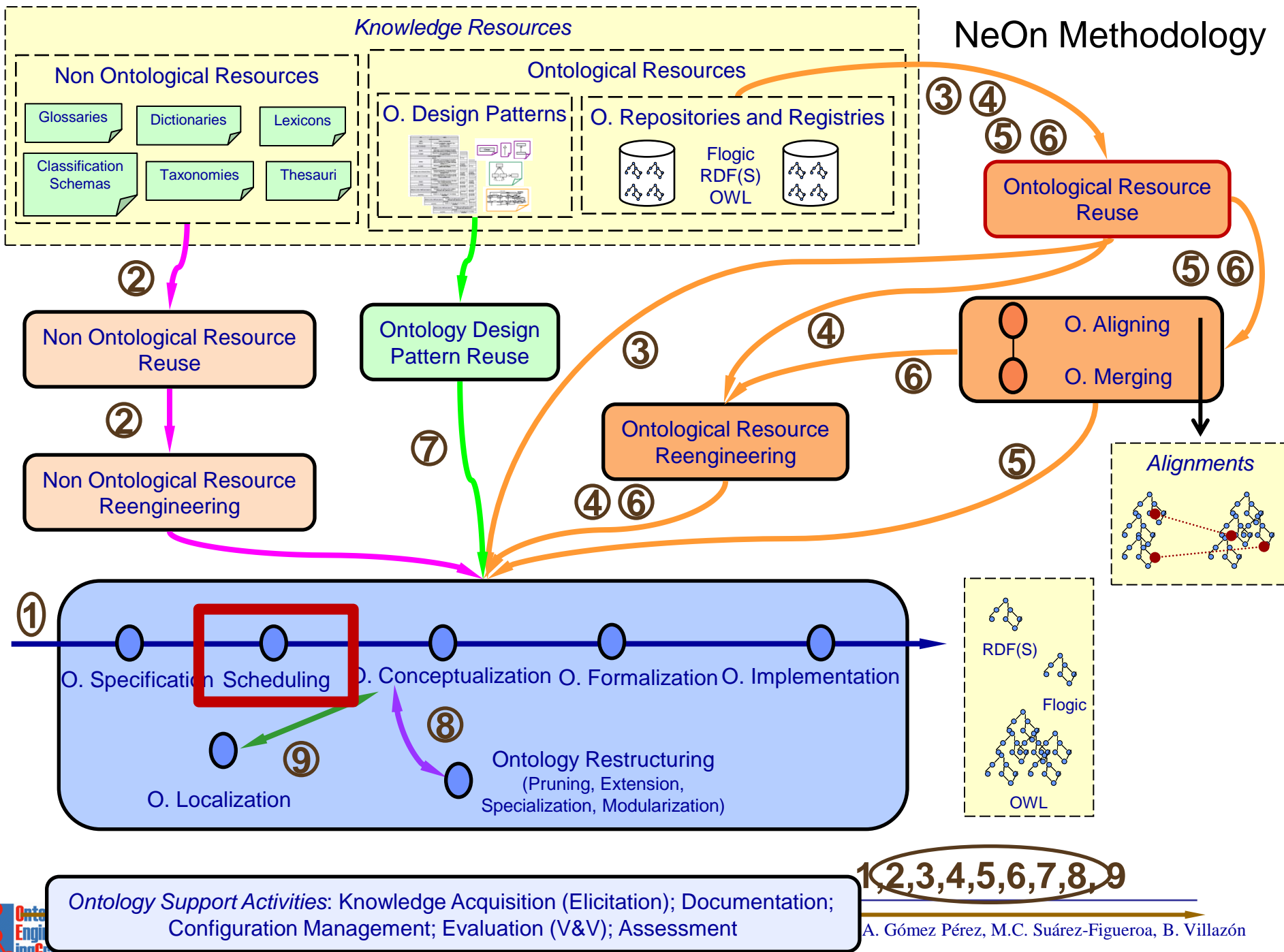
- While building an ontology with the Neon toolkit
- Find descriptions of existing entities in Web ontologies
- Integrate these descriptions into the edited ontology
- Thus allowing knowledge reuse at the scale of the Semantic Web
- In one simple, integrated, and interactive tool



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- ❑ **Main Activities**
 - ❑ Methodological Guidelines for Ontology Specification
 - ❑ Quick Search of Existing Knowledge Resources
 - ❑ **Guidelines for Ontology development project Planning**
 - ❑ Methodological Guidelines for Non Ontological Resource Reuse and Reengineering
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 - ❑ Creating the final Ontology Model

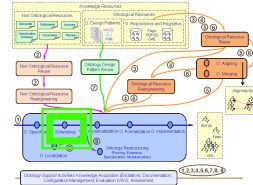
NeOn Methodology



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

Scheduling. Filling Card

D5.3.2



Scheduling

Definition

Scheduling 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.

Goal

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.

Input

Ontology Requirements Specification Document (ORSD).

Output

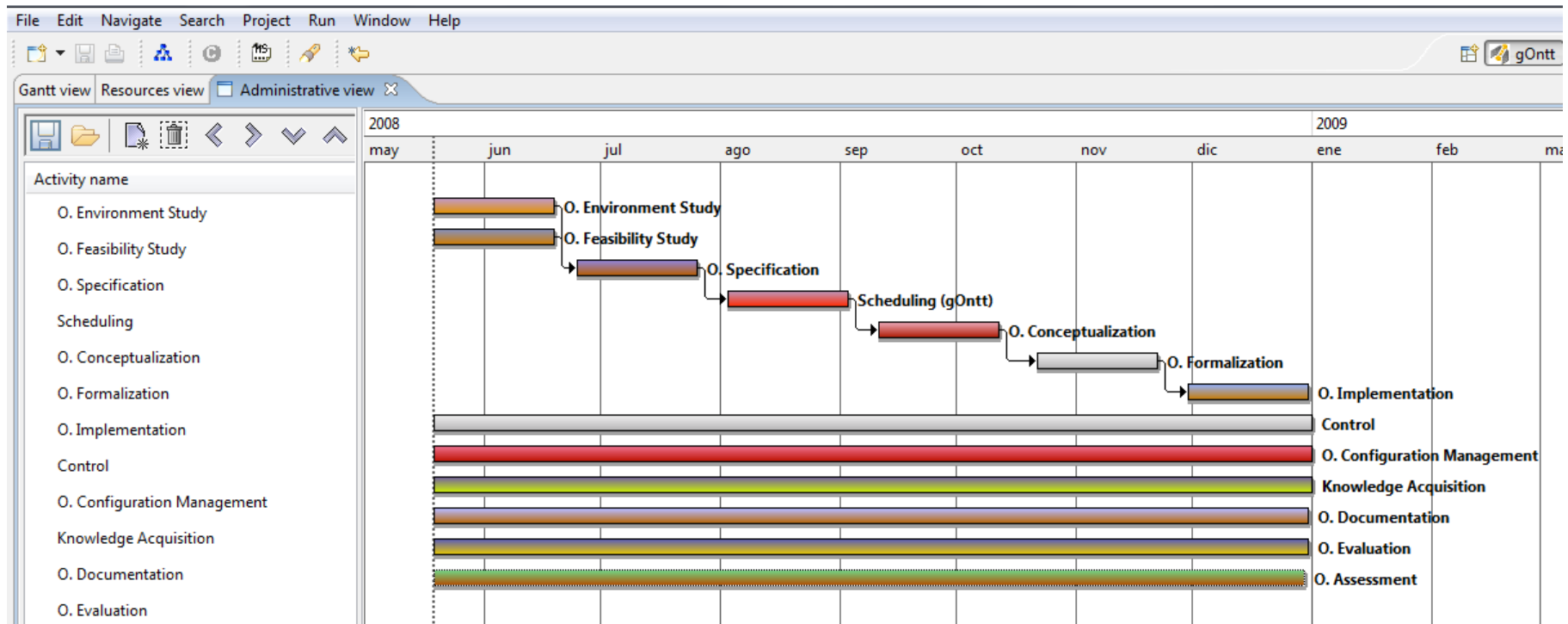
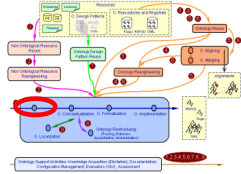
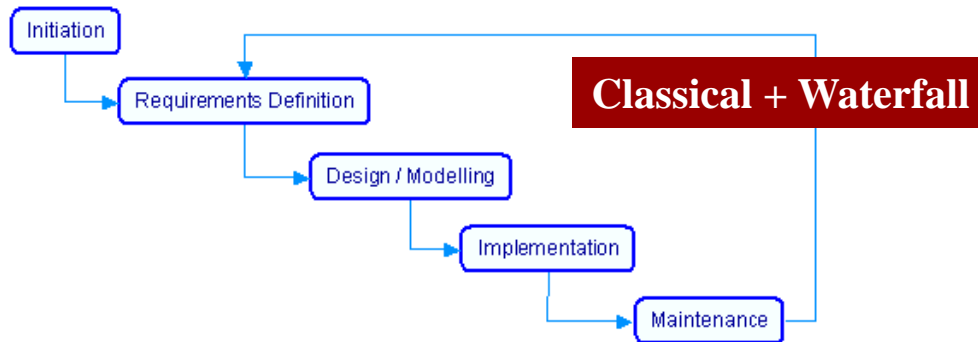
Schedule for the ontology network development.

Who

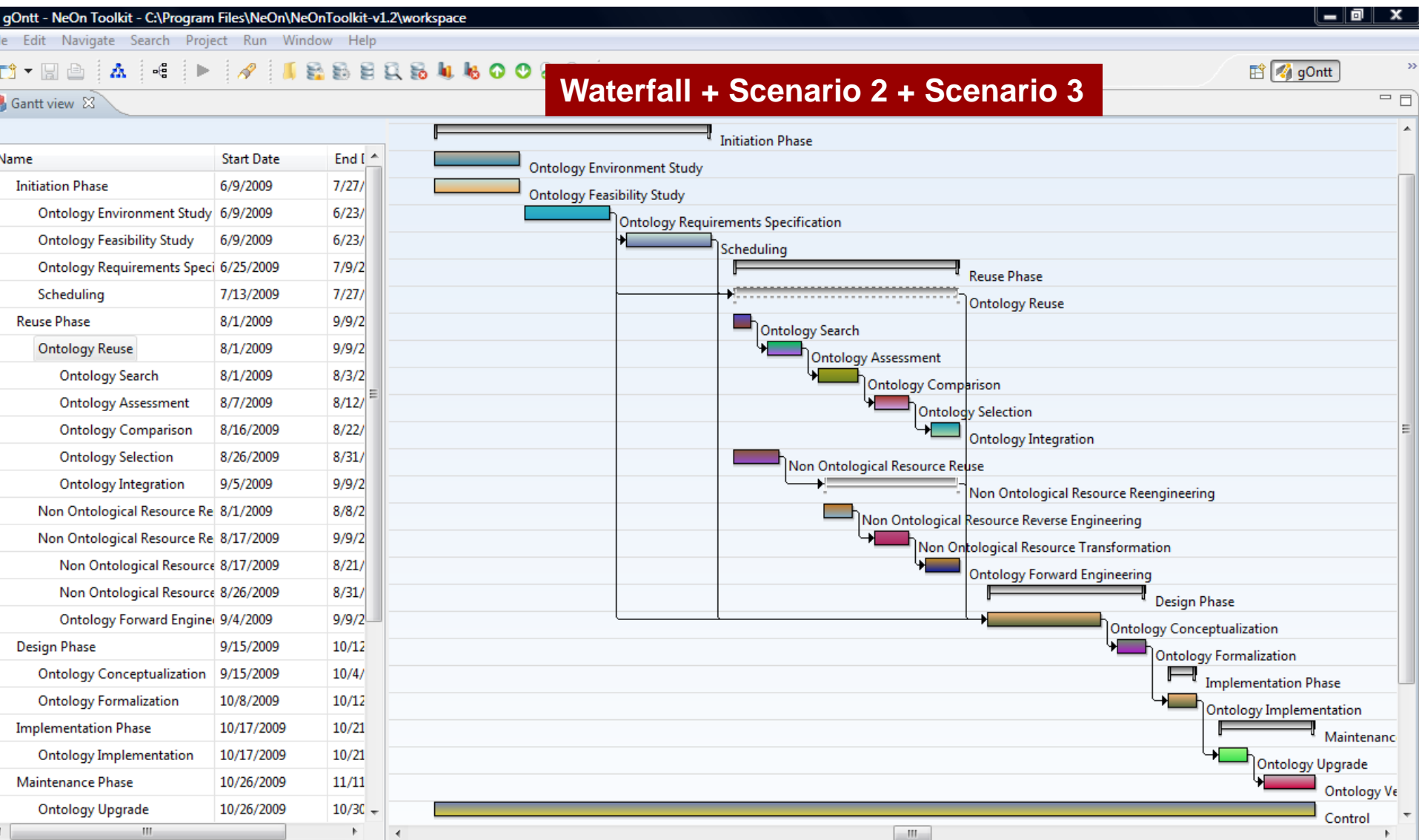
Software developers and ontology practitioners, who form the ontology development team (ODT), in collaboration with users and domain experts.

When

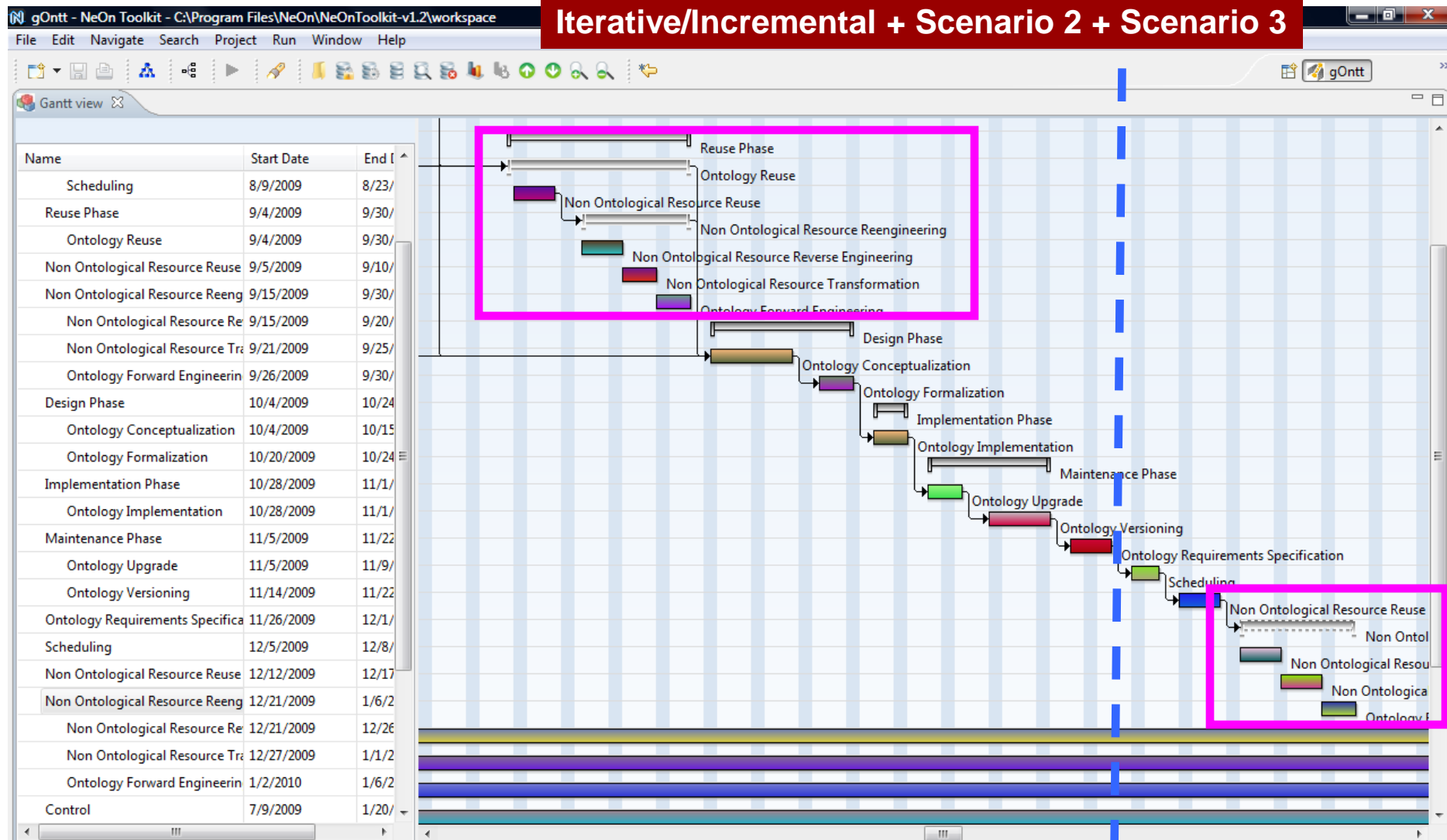
This activity must be carried out after the ontology requirements specification activity.



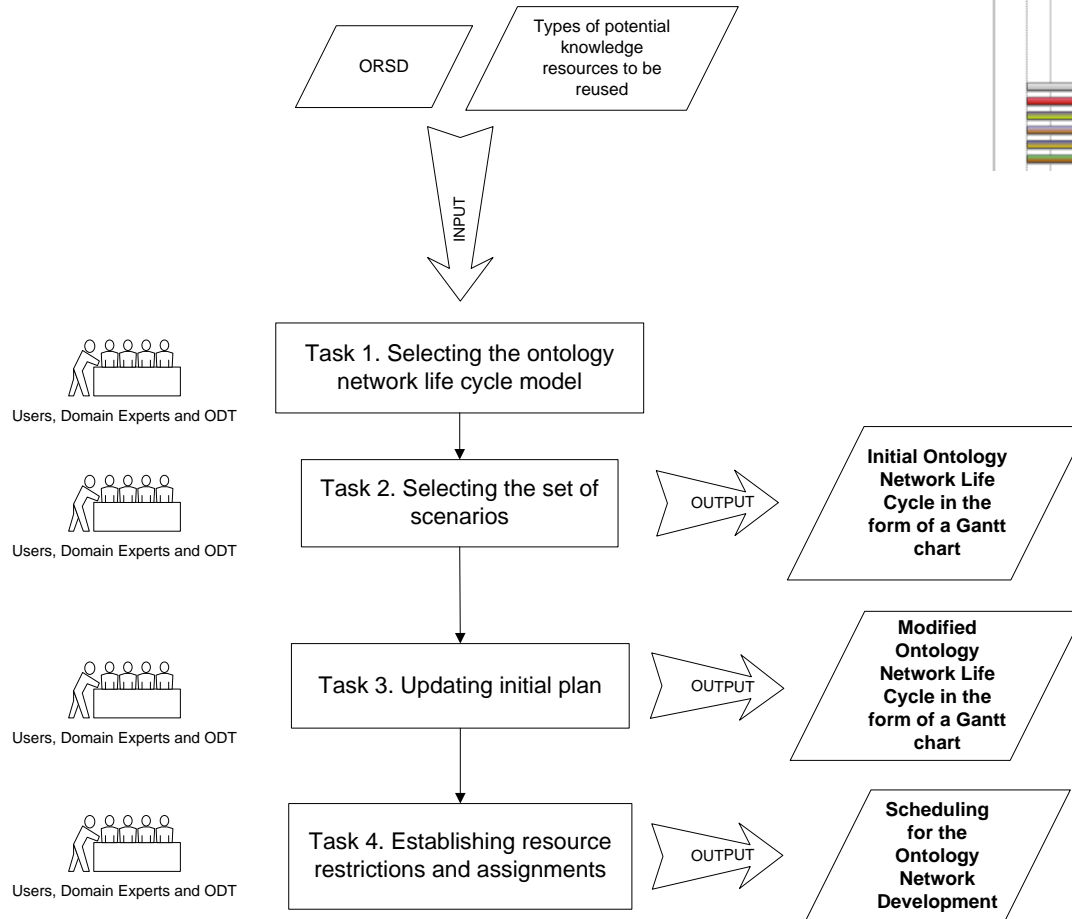
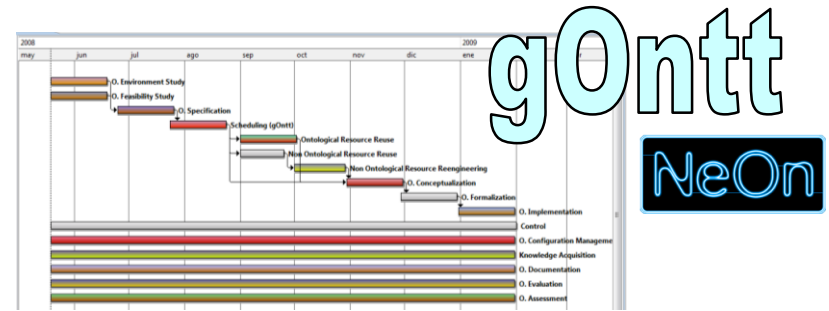
Gantt chart for your project (I)



Gantt chart for your project (II)

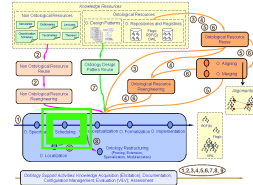
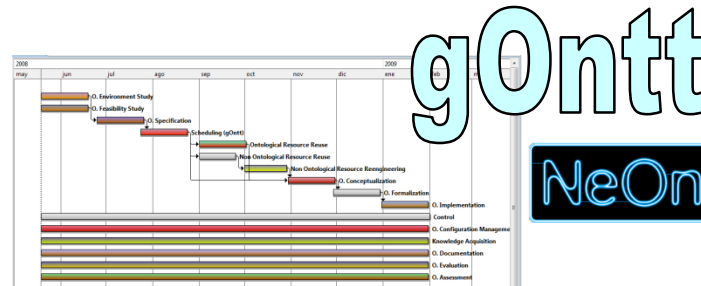


Scheduling. Methodological Guidelines



Scheduling. gOntt Plug-in

D5.3.2



- **gOntt helps in scheduling an ontology network development.**
- **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. gOntt and Methodological Guidelines

Are the ontology requirements assumed to be fully known at the beginning of the ontology network development?

☐ Yes ☒ No

How many cycles do you want to perform in your ontology network development?

Scenario 1: From specification to implementation.

☒ Yes ☐ No

Scenario 2: Have you planned to use any non-ontological resource such as thesauri, data bases, etc. in your ontology network development?

☒ Yes ☐ No

Scenario 3: Have you planned to use any existing ontological resource in your ontology network development?

☒ Yes ☐ No

Scenario 4: Have you planned to use and modify any existing ontological resource in your ontology network development?

☒ Yes ☐ No

Scenario 5: Have you planned to use and merge a set of existing ontological resources in your ontology network development?

☐ Yes ☒ No

