



# Introduction to Ontological Engineering

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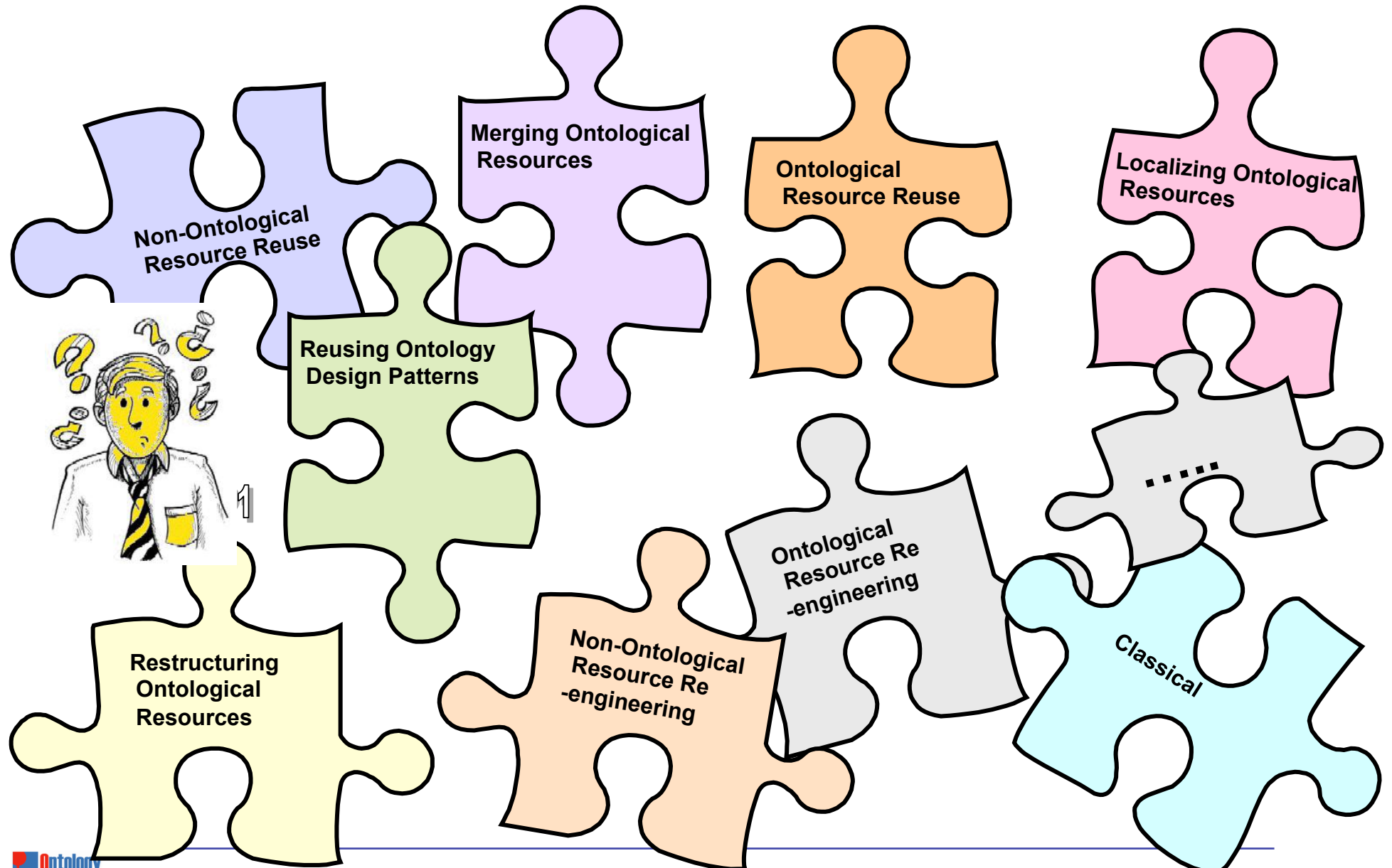
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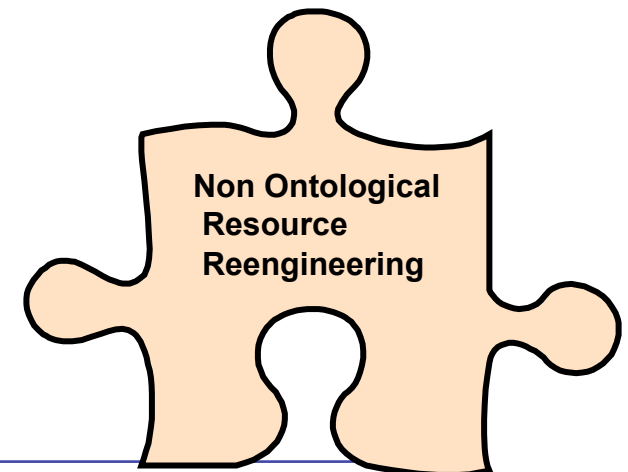
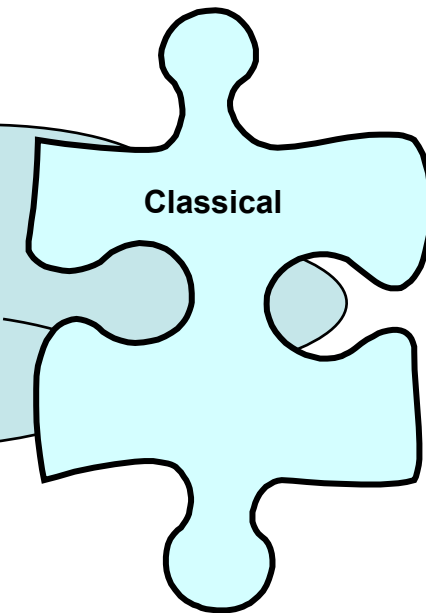
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# Motivation



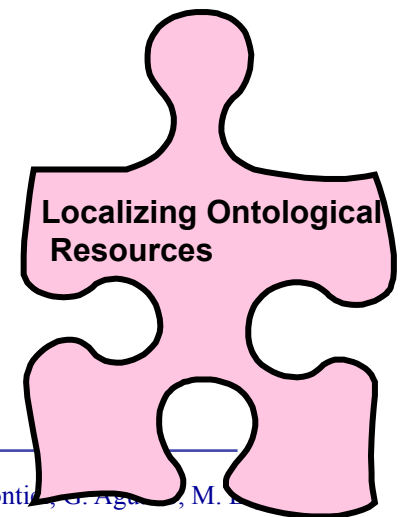
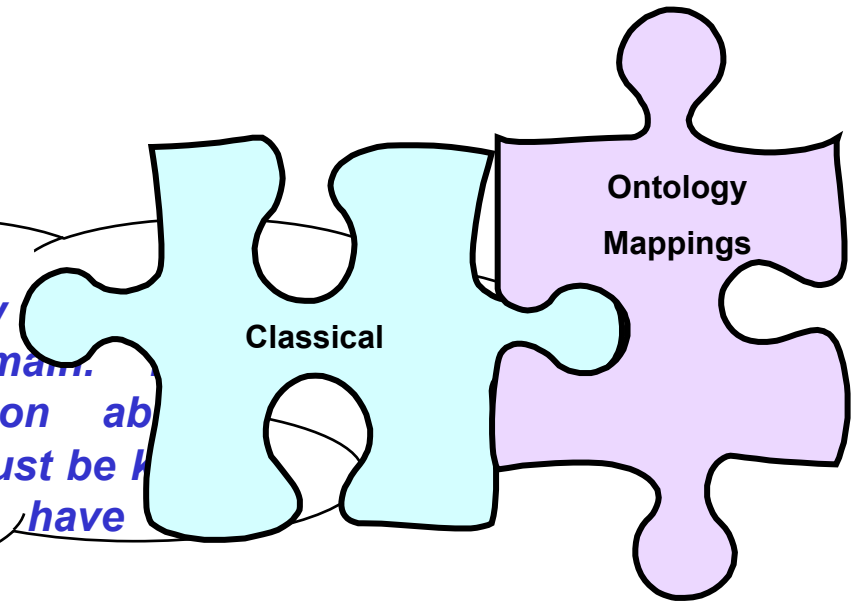
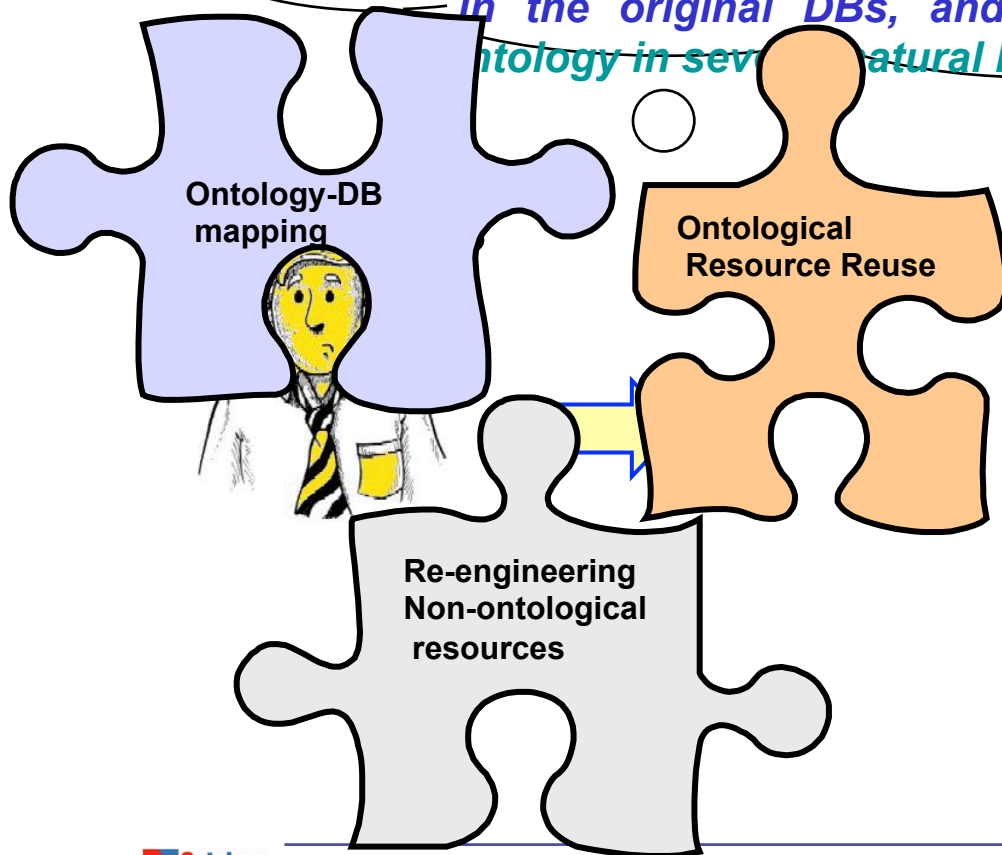
# Motivation

*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.*



# Motivation

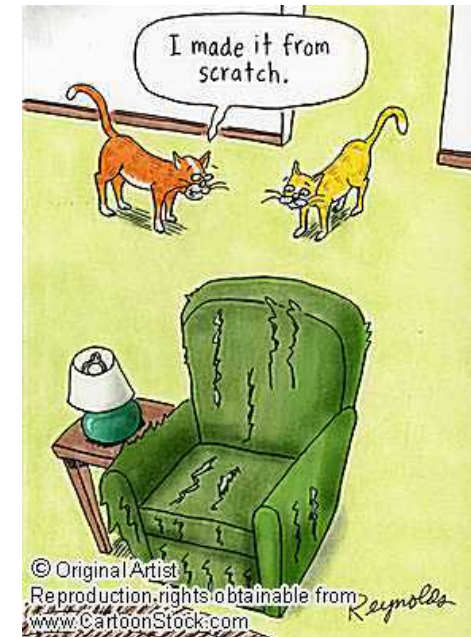
*In our team, we want to build an ontology human resources management domain. ontology should include information about occupations and activity sectors, data must be kept in the original DBs, and we want to have ontology in several natural languages.*



# Building ontologies in the 90s

## Methodologies for building single ontologies

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

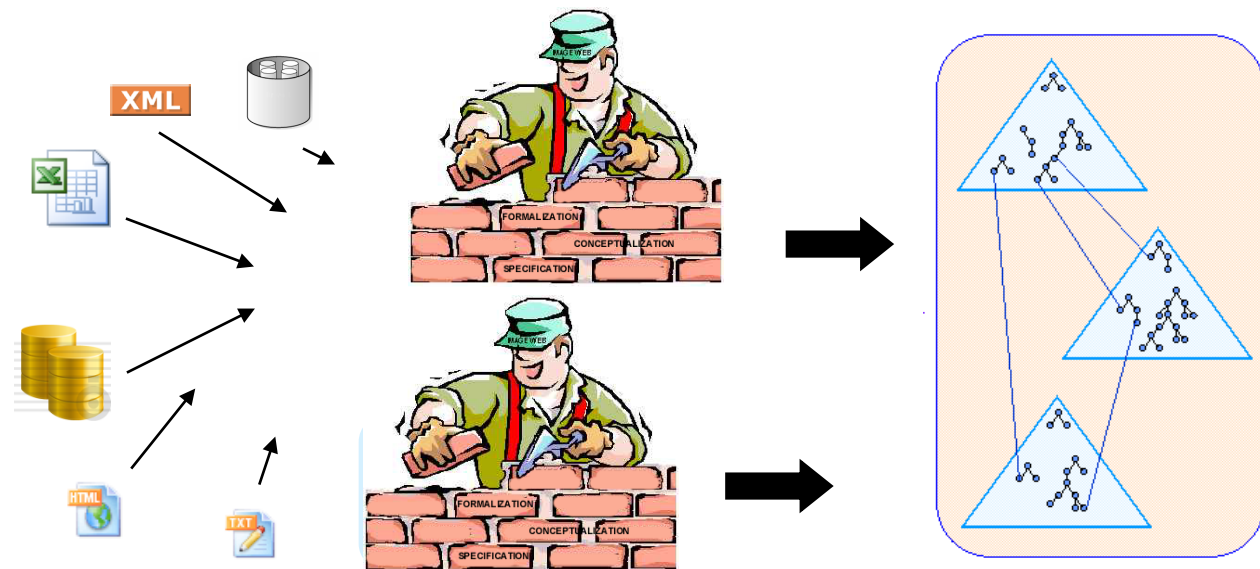


## Ontology learning approaches for building ontologies from structured, semi-structured and non-structured data

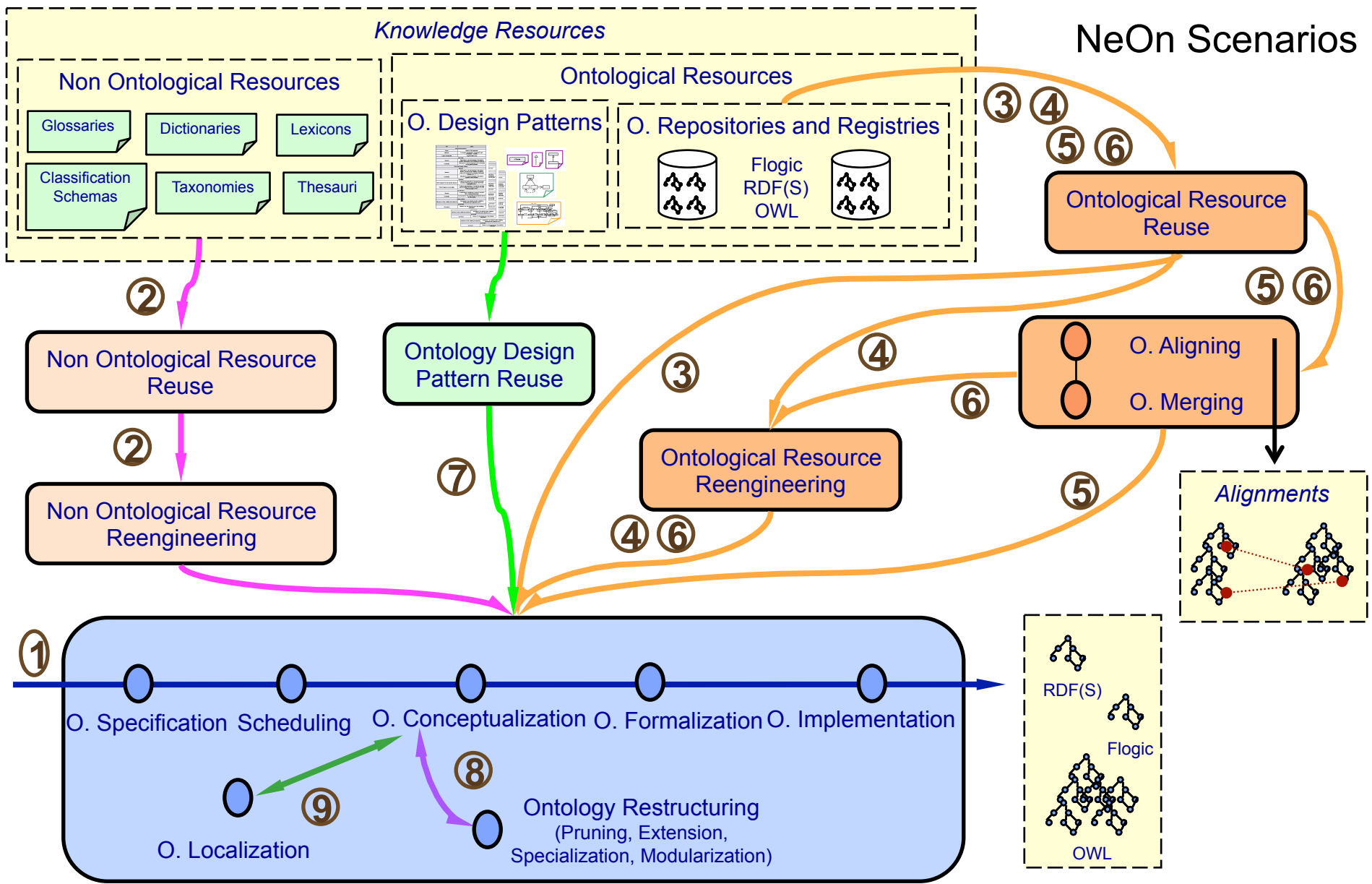
- Are not integrated with current methodologies
- Mainly from non-structured data using NLP techniques

# Current situation

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



# NeOn Scenarios



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

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

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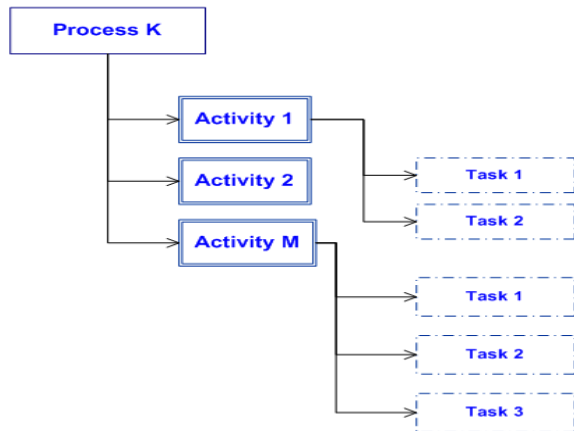




# NeOn Methodology

Process and activities covered:

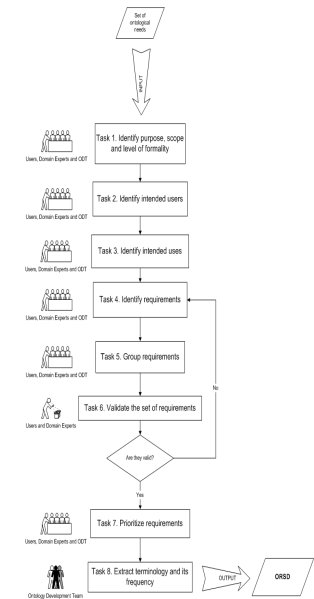
- Ontology Specification
- Scheduling
- Non-Ontological Resource Reuse
- Non-Ontological Resource Re-engineering
- Reuse General Ontologies
- Reuse Domain Ontologies
- Reuse Ontology Statements
- Reuse Ontology Design Patterns



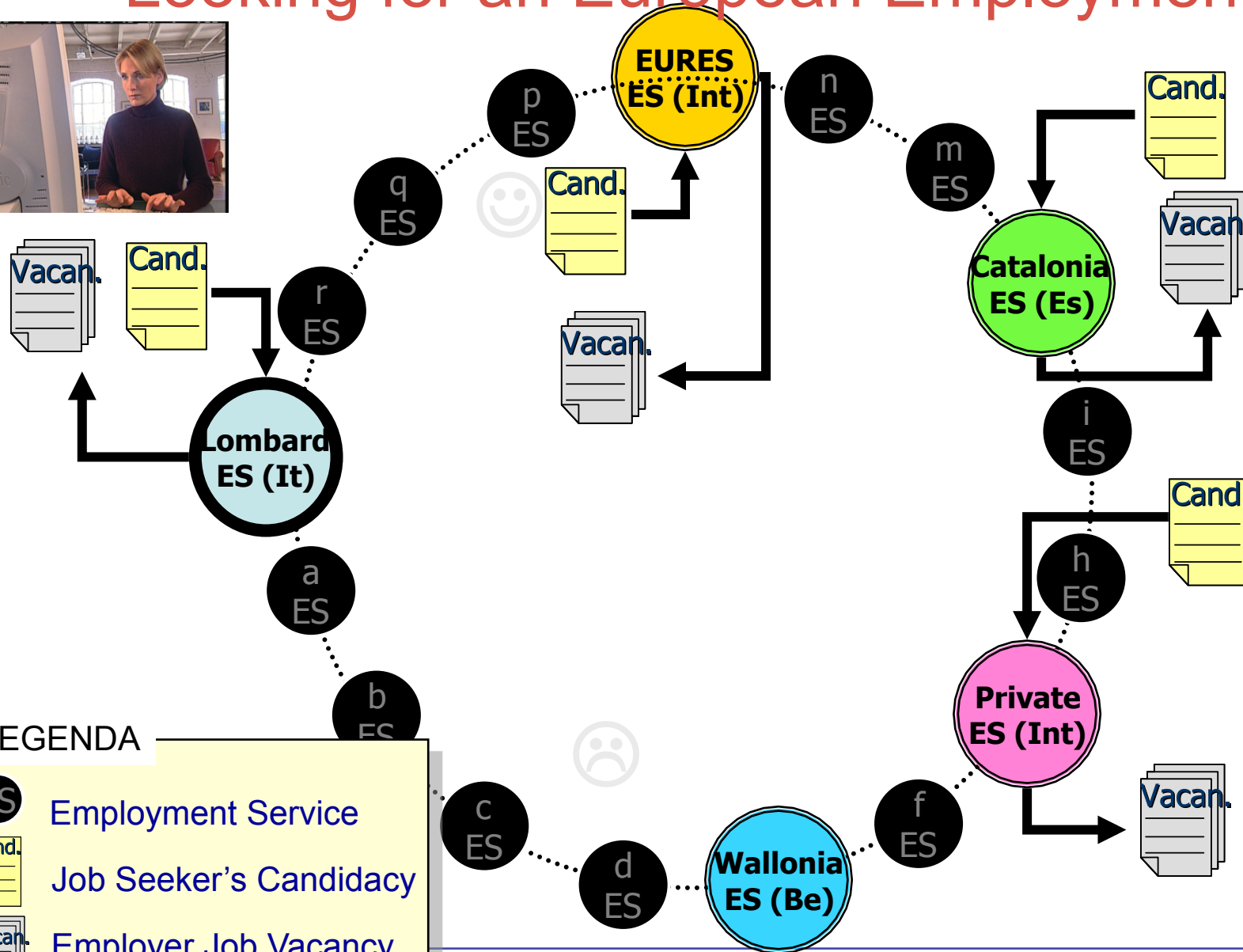
All processes and activities are described with:

- 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"/>     |                      |



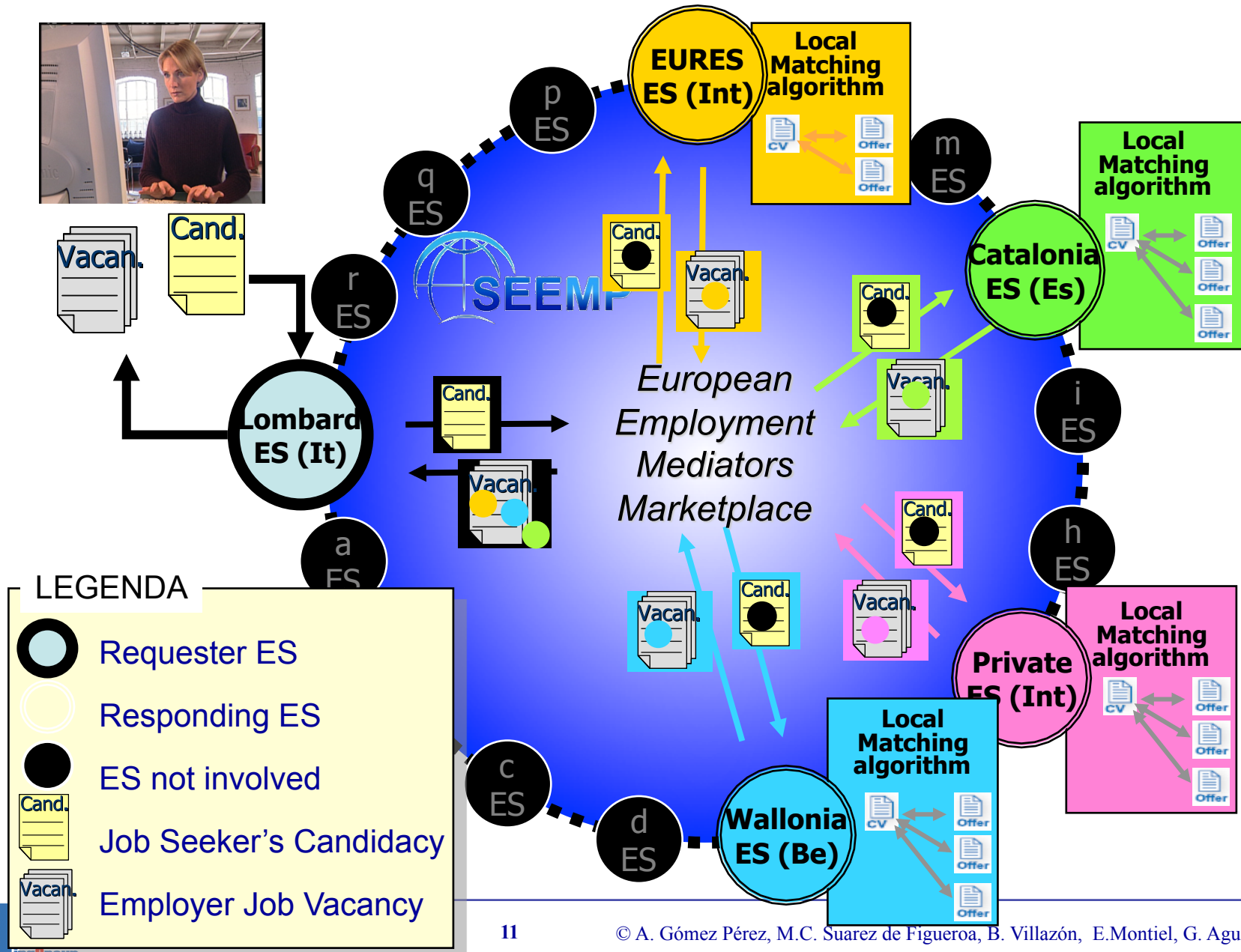
# Looking for an European Employment



**LEGENDA**

- ES** Employment Service
- Cand.** Job Seeker's Candidacy
- Vacan.** Employer Job Vacancy

# Helping Job Seekers on their way



# Key issues

- Reuse of proprietary knowledge-aware resources
- Heterogeneity
  - Terms are in different languages
  - Different conceptualization (different ways of organizing job categories)
  - Different DB schemas
- Data must be kept in the original sources and in their own language.

# Key aspects of Ontological Engineering

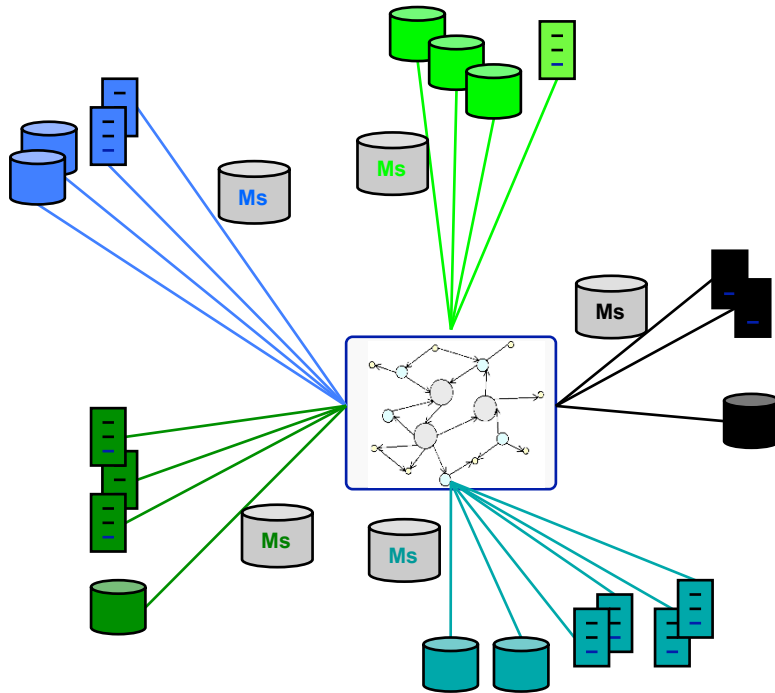
- **Ontologies**

- Single versus network of ontologies?
- Are ontologies built from scratch or reusing knowledge-aware resources?
- Are mappings used for solving conceptual mismatches?

- **Instances**

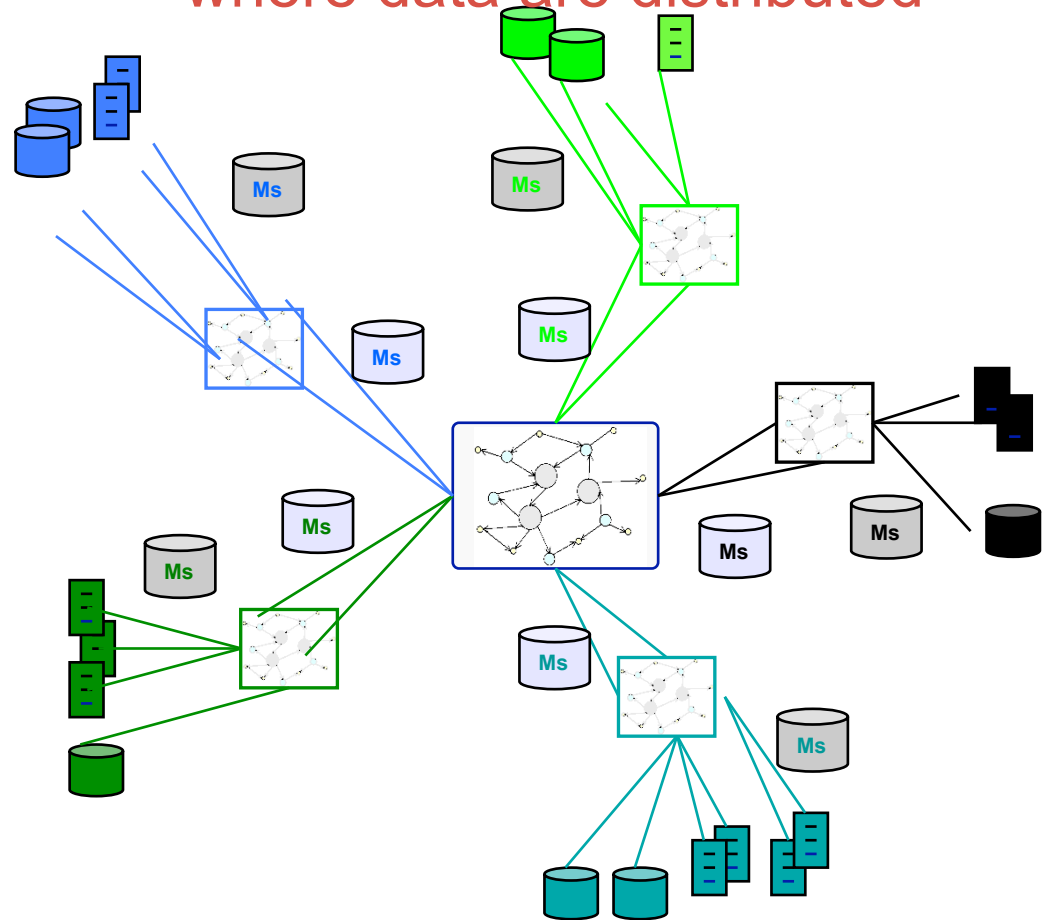
- Where are the data/instances?
  - Instances are in the ontology
  - Instances are in RDF files independently of the ontology
  - Data are kept in the original sources
- Are instances distributed or centralized?
- Have instances a very high rate of changes?
- Heterogeneous provenance of instances
- Degrees of data quality
- Permissions

## Centralized network of ontologies where data are distributed



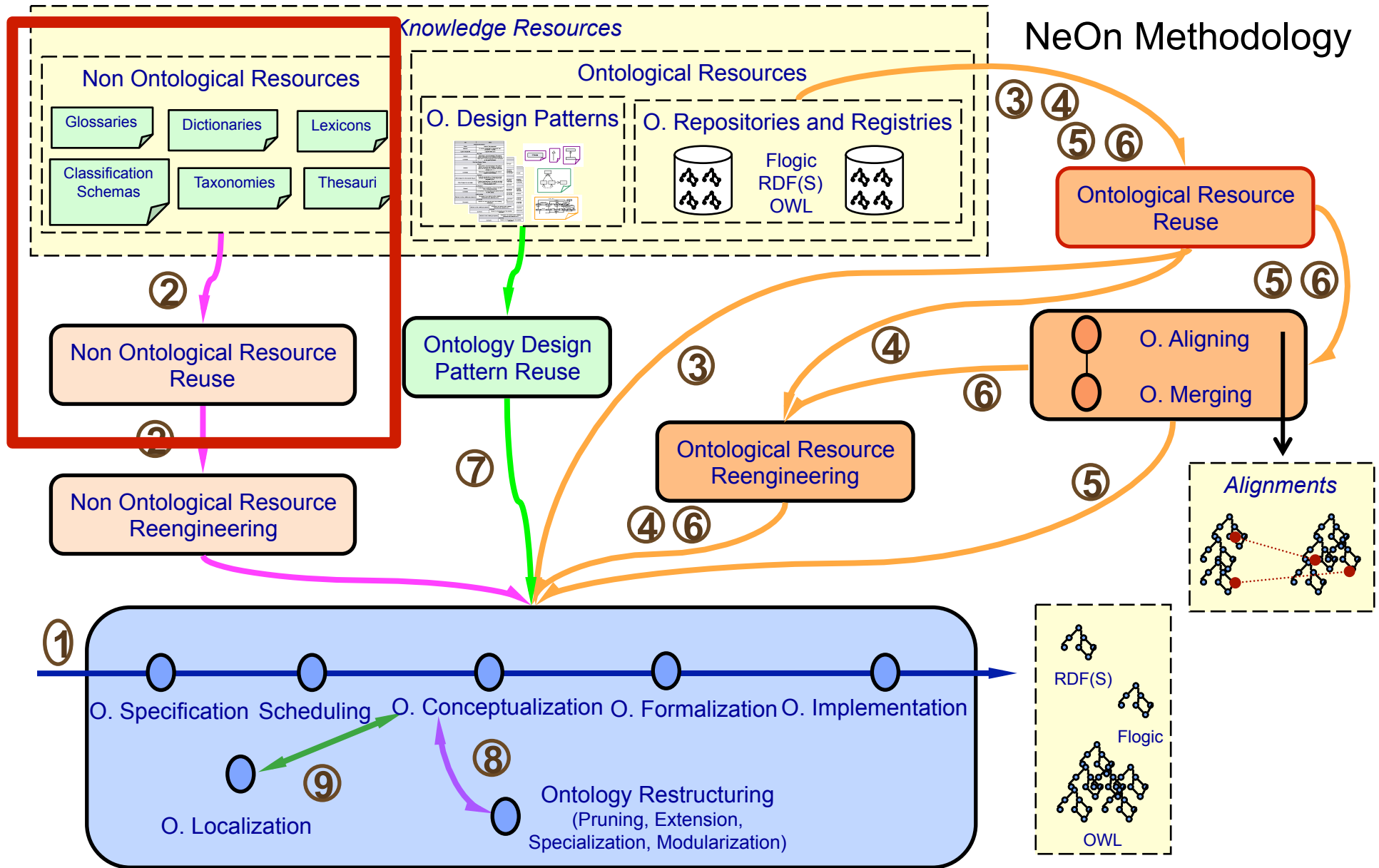
1. Build a reference ontology
2. Build mappings between the reference ontology and the data sources

## Federated network of ontologies where data are distributed



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

# NeOn Methodology

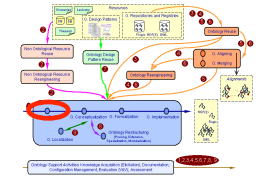


**Ontology Support Activities:** Knowledge Acquisition (Elicitation); Documentation; Configuration Management; Evaluation (V&V); Assessment

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



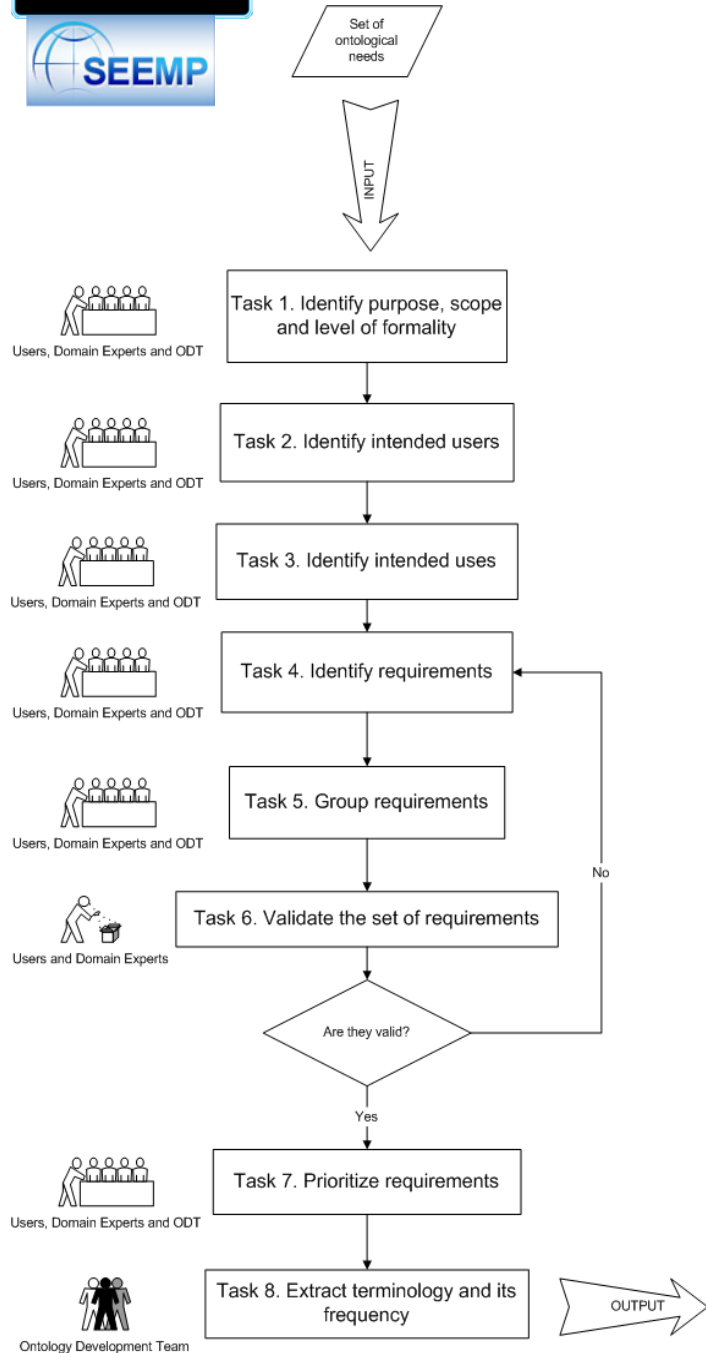
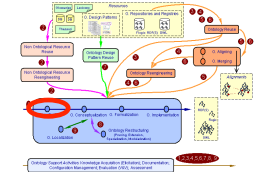
# Ontology Requirement Specification Document



| Ontology Requirements Specification Document Template |   |
|---|---|
| 1   | <b>P u r p o s e</b><br><i>"Software developers and ontology practitioners should include in this slot the purpose of the ontology"</i>   |
| 2   | <b>S c o p e</b><br><i>"Software developers and ontology practitioners should include in this slot the scope of the ontology"</i>   |
| 3   | <b>L e v e l o f F o r m a l i t y</b><br><i>"Software developers and ontology practitioners should include in this slot the level of formality of the ontology"</i>  |
| 4   | <b>I n t e n d e d U s e r s</b><br><i>"Software developers and ontology practitioners should include in this slot the intended users of the ontology"</i>  |
| 5   | <b>I n t e n d e d U s e s</b><br><i>"Software developers and ontology practitioners should include in this slot the intended uses of the ontology"</i>   |
| 6   | <b>G r o u p s o f C o m p e t e n c y Q u e s t i o n s</b><br><i>"Software developers and ontology practitioners should include in this slot the groups of competency questions and their answers, including priorities for each group"</i> |
| 7   | <b>P r e - G l o s s a r y o f T e r m s</b><br><b>T e r m s</b><br><i>"Software developers and ontology practitioners should include in this slot the list of terms included in the CQs and their frequencies"</i>                           |
|   | <b>O b j e c t s</b><br><i>"Software developers and ontology practitioners should include in this slot a list of objects and their frequencies"</i>   |



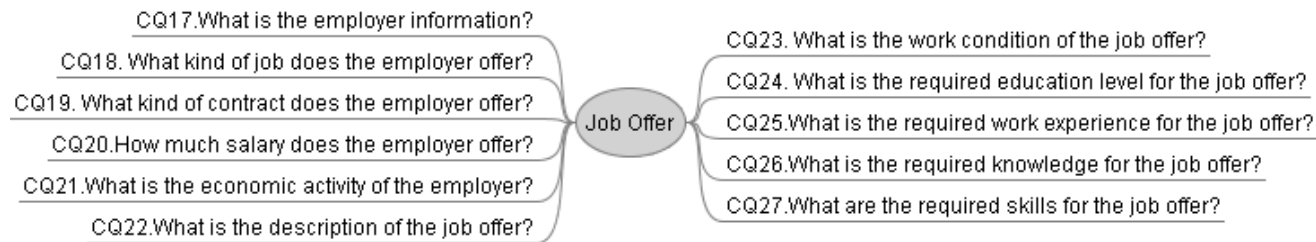
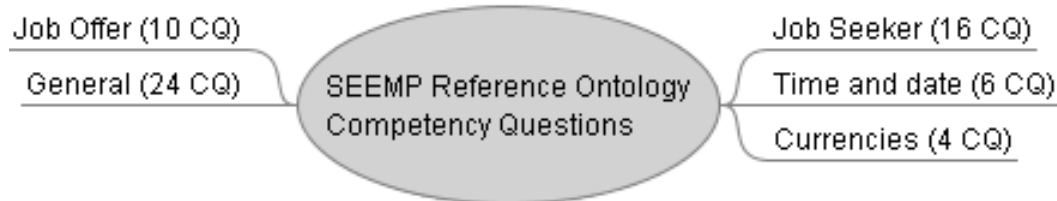
# Ontology Specification



|          |   |
|----------|---|
| <b>1</b> | <b>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</b> | <b>Scope</b>  |
|          | The ontology has to focus just on the ICT (Information and Communication Technology) domain.<br>The level of granularity is directly related to the competency questions and terms identified.  |
| <b>4</b> | <b>Intended Users</b>   |
|          | <ol style="list-style-type: none"> <li>1. Candidate who is unemployed and searching for a job or searching another occupation for immediate or future purposes</li> <li>2. Employer who needs more human resources.</li> <li>3. Public or private employment search service which offers services to gather CVs, enrich postings and to prepare some...</li> </ol>  |
| <b>5</b> | <b>Intended Uses</b>  |
|          | <ol style="list-style-type: none"> <li>1. Publish CV. Job seeker places his/her CV on the PES Portal.</li> <li>2. Publish Job Offer. An Employer places a Job Offer on the PES Portal.</li> <li>3. Search for Job Offers. The Employer looks for candidates for the Job Offer through PES Portal.</li> <li>4. Search for Employment information. Job Seeker looks for of general information about employment in a given location at the PES Portal.</li> <li>5. Provide Job Statistics. The PES Portal provides employment statistics to the Job Seeker and Employer.</li> </ol> |

|    | A        | B   | C  |
|----|----------|---|--|
| 1  | <b>N</b> | <b>Competency Questions</b>   | <b>Answers</b>   |
| 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?                         |  |

# Ontology Specification: Group requirements.



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?

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?

General

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 zlotes 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?

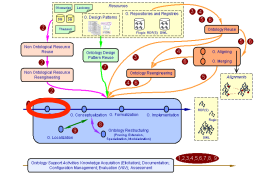
CQ57. Given the age (20 years old) and the desired salary (equal or greater than 14000 zlotes) of the job seeker, what job offers posted in last month are the most appropriate?

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?

# Ontology Specification. The Ontology Requirement Specification Document



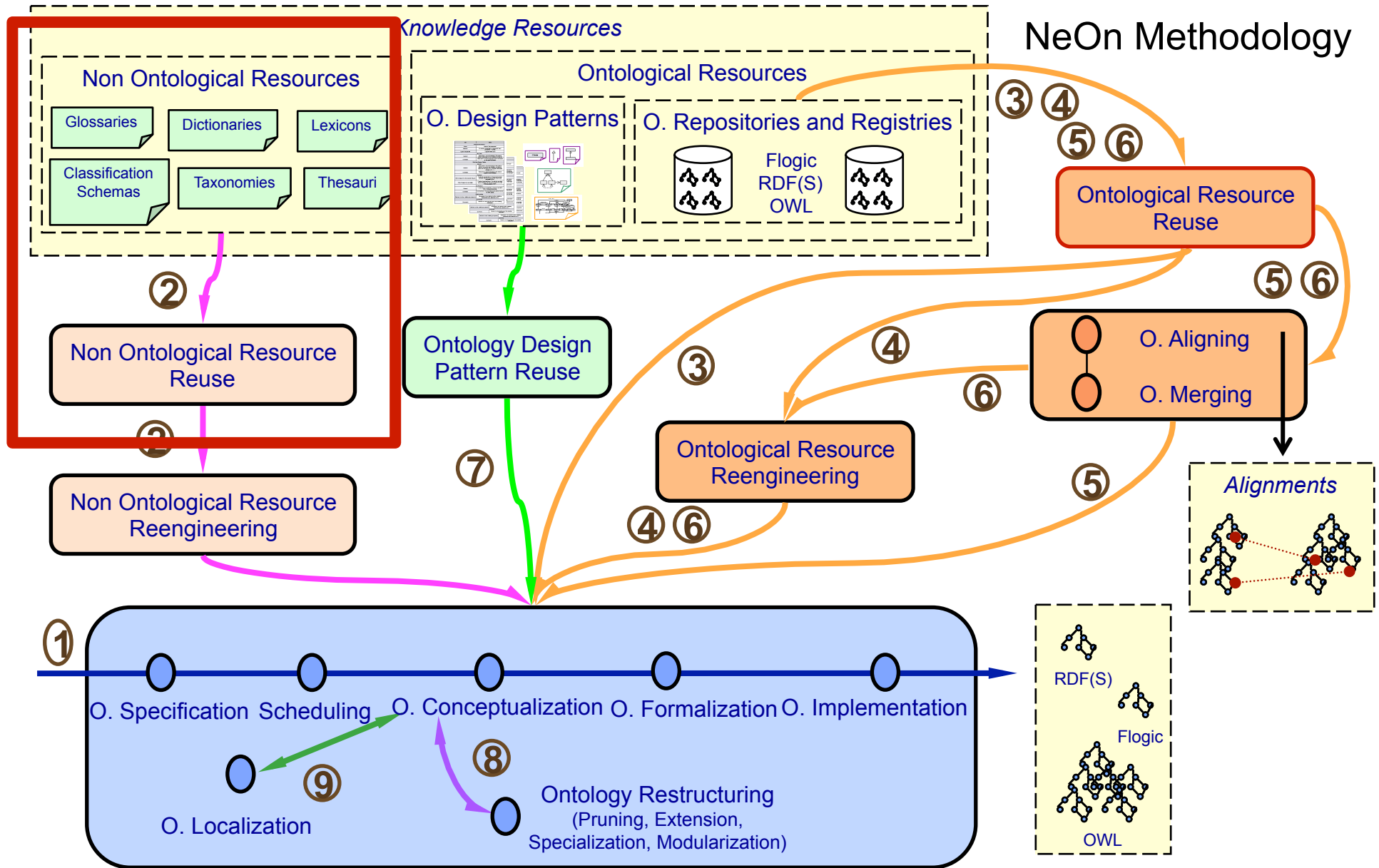
| SEEMP Reference Ontology Requirements Specification |   |
|---|---|
| <b>1 Purpose</b>                                    | The purpose of building the Reference Ontology is to provide a consensual knowledge model of the employment domain that could be used by public e-Employment services (PES).                |
| <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 WSMML 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  |

| 7 Pre-Glossary of Terms       |  | Frequency |
|-------------------------------|--|-----------|
| Terms                         |  |           |
| a. Job Seeker                 |  | 27        |
| b. CV                         |  | 2         |
| c. Personal Information       |  | 3         |
| d. Name                       |  | 5         |
| e. Gender                     |  | 1         |
| f. Birth date                 |  | 1         |
| g. Address                    |  | 2         |
| h. Nationality                |  | 1         |
| i. Contact (phone, fax, mail) |  | 4         |
| j. Objective                  |  | 3         |
| 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 |   |
|----------------------------------|---|
| <b>CQG1. Job Seeker (16 CQ)</b>  | <ul style="list-style-type: none"> <li>CQ1. What is the Job Seeker Name?</li> <li>CQ2. What is the Job Seeker nationality?</li> <li>CQ3. When is the Job Seeker birthdate?</li> <li>CQ4. What is the Job Seeker contact information?</li> <li>CQ5. What is the Job Seeker current job?</li> <li>CQ6. What is the Job Seeker desired job?</li> <li>CQ7. What are the Job Seeker desired working conditions?</li> <li>CQ8. What kind of contract does the Job Seeker want?</li> <li>CQ9. How much salary does the Job Seeker want to earn?</li> <li>CQ10. What is the Job Seeker education level?</li> <li>CQ11. What is the Job Seeker work experience?</li> <li>CQ12. What is the Job Seeker knowledge?</li> <li>CQ13. What is the Job Seeker expertise?</li> <li>CQ14. What are the Job Seeker skills?</li> <li>CQ15. What publications does the Job Seeker have?</li> <li>CQ16. What hobbies does the Job Seeker have?</li> </ul> |
| <b>CQG2. Job Offer (10 CQ)</b>   | <ul style="list-style-type: none"> <li>CQ17. What is the employer information?</li> <li>CQ18. What kind of job does the employer offer?</li> <li>CQ19. What kind of contract does the employer offer?</li> <li>CQ20. How much salary does the employer offer?</li> <li>CQ21. What is the economic activity of the employer?</li> <li>CQ22. What is the work condition of the job offer?</li> <li>CQ23. What is the required education level for the job offer?</li> <li>CQ24. What is the required work experience for the job offer?</li> <li>CQ25. What is the required knowledge for the job offer?</li> <li>CQ26. What is the required knowledge for the job offer?</li> </ul>  |

| Objects   |   |
|---|---|
| Objects in the universe of discourse, which are instances of: | <ul style="list-style-type: none"> <li>• Education           <ul style="list-style-type: none"> <li>O29. Life Science</li> <li>O30. Mathematics</li> <li>O31. Computer Science</li> <li>O32. Computer Use</li> <li>O33. Statistics</li> <li>O34. Physics</li> <li>O35. Network Administration</li> </ul> </li> <li>• Languages           <ul style="list-style-type: none"> <li>O36. Swedish</li> <li>O37. Spanish</li> <li>O38. Slovenian</li> <li>O39. Portuguese</li> <li>O40. English</li> <li>O41. French</li> <li>O42. German</li> </ul> </li> <li>• Currency           <ul style="list-style-type: none"> <li>O43. Euro</li> <li>O44. Krone</li> <li>O45. Great British Pound</li> <li>O46. Zlote</li> <li>O47. US Dollar</li> <li>O48. Franc</li> </ul> </li> <li>• Location           <ul style="list-style-type: none"> <li>O49. Austria</li> <li>O50. Belgium</li> <li>O51. Denmark</li> <li>O52. Estonia</li> <li>O53. Finland</li> <li>O54. France</li> <li>O55. Germany</li> <li>O55. Greece</li> </ul> </li> </ul> |
| • 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>   |
| • 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>   |
| • 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>  |

# NeOn Methodology



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

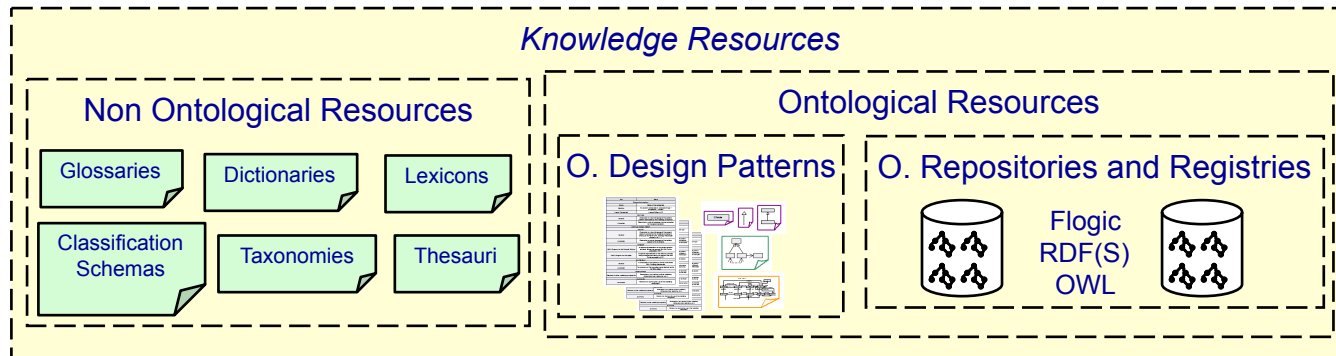
1, 2, 3, 4, 5, 6, 7, 8, 9

errea, 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



Catalog/ID

Glossary Thesaurus

Informal is-a

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

Thesaurus

Informal is-a

| 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  |

GOBIERNO DE ESPAÑA  
Ministerio de Fomento  
Dirección General del Instituto Geográfico Nacional

NOMENCLATOR GEOGRÁFICO  
ENTIDADES

**Catalog/ID**

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 de Conversión DGN -> EDM.
FORMATO:
Tipo_dgn Entidad Tipo_istram Grupo Código_bcn Cerrado Trato [
Tipo_ dgn...NNSCCCGG                     Codigo_bcn...TTGGSS
NN : Nivel elemento                        TT : Tema
S : Estilo línea dgn                      GG : Grupo
CCC : Color línea dgn                    SS : Subgrupo
GG : Grosor línea dgn

Entidad                                Tipo_istram...???
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 línea abierta

Trato
I : Intocable A: Altimetría N: No tratar T: Textos Asociado
S: Textos Suelos C: Cultivo F: Solo salida !: Tratar norma
TTGGSS
02000900 104 1 0 090101 1 !I Marco de hoja
02300902 104 2 0 100200 0 ! Base Geodésica de Ma
06003900 104 3 0 025102 0 ! Acantilado
06006900 104 4 0 025302 0 ! Costa rocosa no acan
06009900 104 5 2 037402 1 ! Playa fluvial de guí
06012900 104 6 0 025501 1 ! Lavas. Contorno
06015900 104 7 0 058303 0 !I Dique de hormigón >1
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 ! Vertedero. Contorno
11003003 104 11 1 062202 0 ! Autopista. Enlace
11012000 104 12 0 056091 1 !I Patio. Contorno
13003300 104 13 1 060101 0 ! Autopista. Eje
13303300 104 14 1 060131 0 ! Autopista en Construc
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 ! Autovía. Enlace
15003004 104 18 1 060701 0 ! Autovía

```

Implicit knowledge coded in numbers

## 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     |

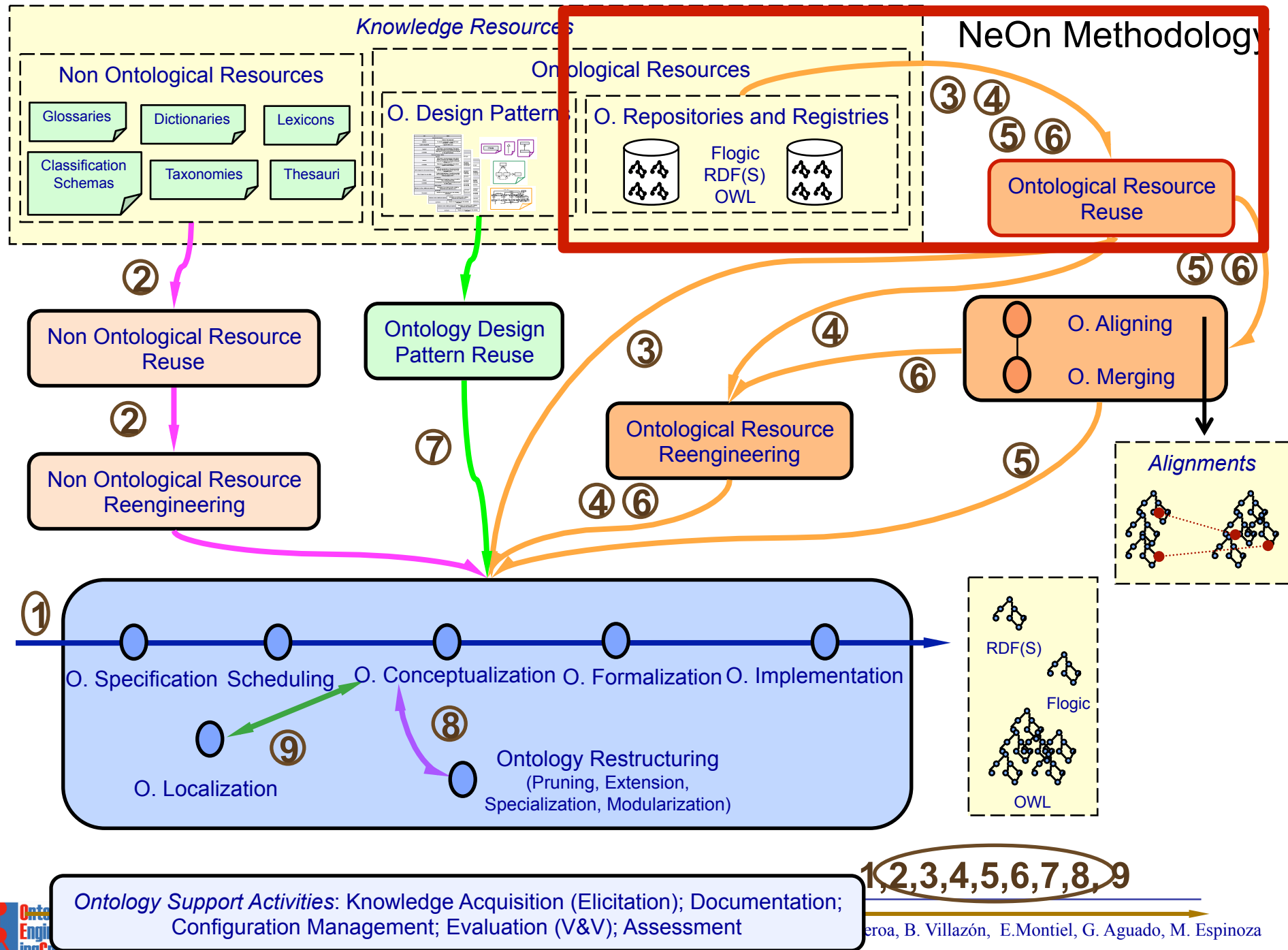
## ISO 3166 (countries)

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    <ISO_3166-1_Alpha-2_Code_element>AF</ISO_3166-1_Alpha-2_Code_element>
  </ISO_3166-1_Entry>
  <ISO_3166-1_Entry>
    <ISO_3166-1_Country_name>ÅLAND ISLANDS</ISO_3166-1_Country_name>
    <ISO_3166-1_Alpha-2_Code_element>AX</ISO_3166-1_Alpha-2_Code_element>
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  <ISO_3166-1_Entry>
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    <ISO_3166-1_Alpha-2_Code_element>DZ</ISO_3166-1_Alpha-2_Code_element>
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  <ISO_3166-1_Entry>
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  <ISO_3166-1_Entry>
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  </ISO_3166-1_Entry>

```





# 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 domain of discourse, which are instances of: |  |
| Job Category  |  |
| 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   |  |
| 12. Austrian  |  |
| 13. Belgian   |  |
| 14. Danish  |  |
| 15. Estonian  |  |
| 16. Finnish   |  |
| 17. French  |  |
| 18. German  |  |
| 19. Greek   |  |
| 20. Italian   |  |
| Activity Sector   |  |
| 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  |  |
| 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. Zloty  |  |
| 047. US Dollar  |  |
| 048. Franc  |  |
| Location  |  |
| 049. Austria  |  |
| 050. Belgium  |  |
| 051. Denmark  |  |
| 052. Estonia  |  |
| 053. Finland  |  |
| 054. France   |  |
| 055. Germany  |  |
| 055. Greece   |  |

Watson Semantic Web Search

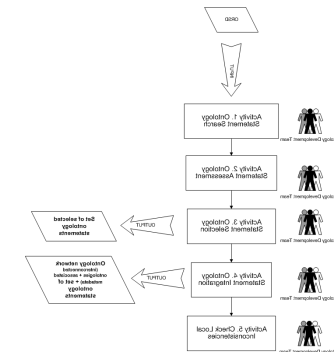
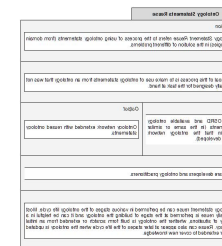
Search Watson

university researcher student

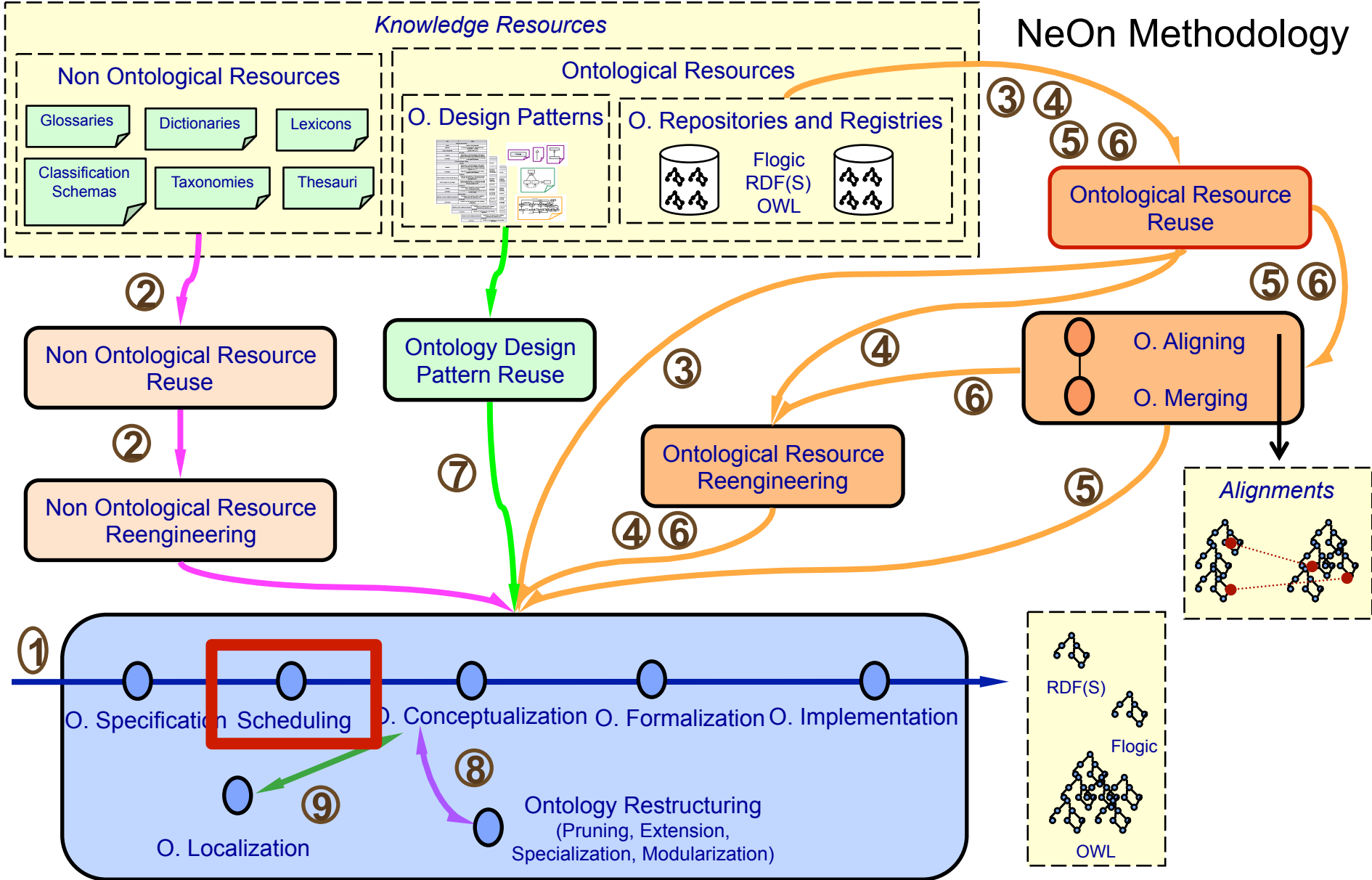
Found 19 semantic documents - Restrict Search

- <http://daml.umbc.edu/ontologies/cobra/0.4/academia>
- <http://annotation.semanticweb.org/ontologies/iswc.owl>
- <http://ontobroker.semanticweb.org/ontologies/ka2-onto-2000-11-07.daml>
- [http://www.jfi.unizh.ch/ddis/fileadmin/pdf/service\\_broker/iswc.daml](http://www.jfi.unizh.ch/ddis/fileadmin/pdf/service_broker/iswc.daml)

The NeOn methodology includes guidelines for reusing statements



# NeOn Methodology

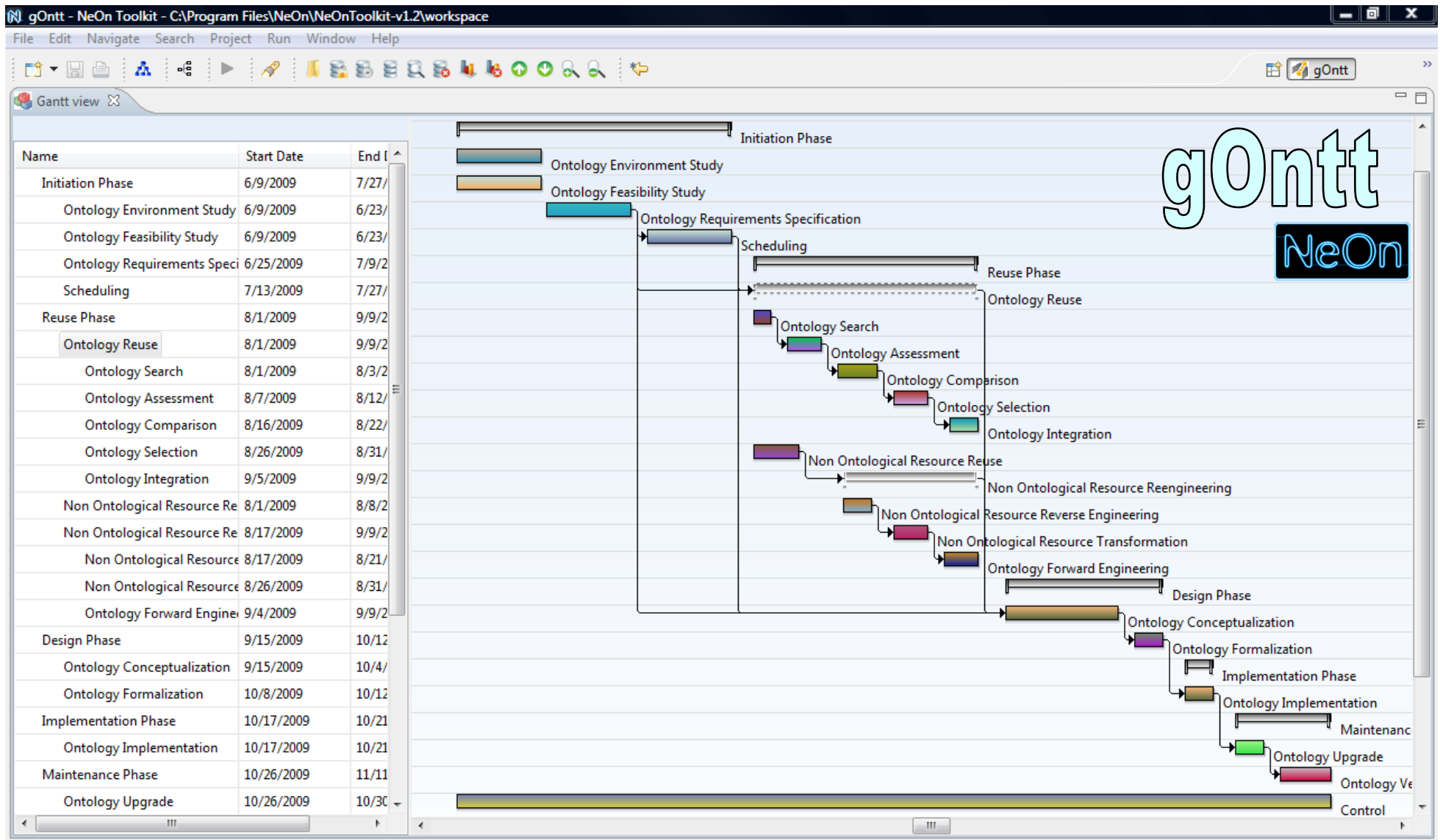


**Ontology Support Activities:** Knowledge Acquisition (Elicitation); Documentation; Configuration Management; Evaluation (V&V); Assessment

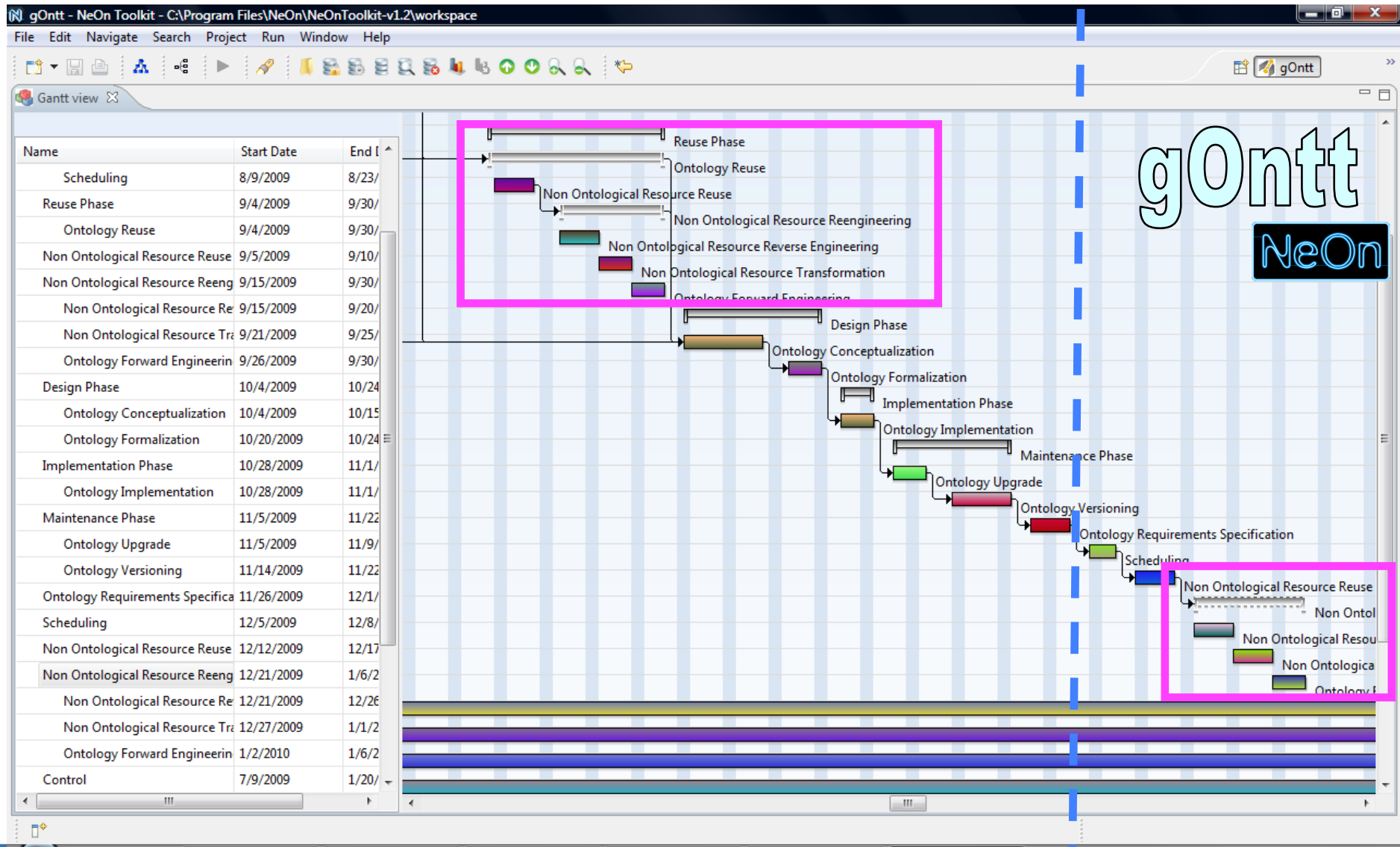
1, 2, 3, 4, 5, 6, 7, 8, 9



# Gantt chart for your project. Waterfall model



# Reuse and Re-engineering + Incremental



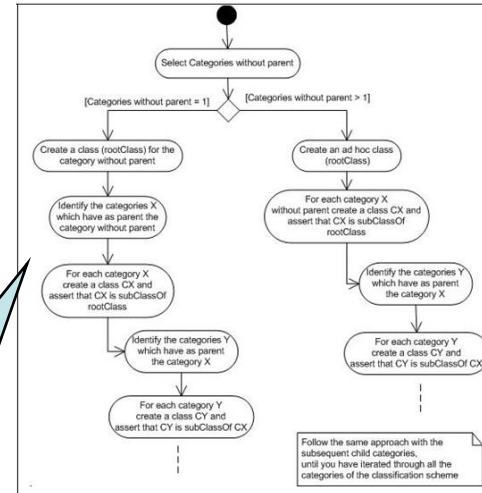
gOntt  
NeOn

# Motivation

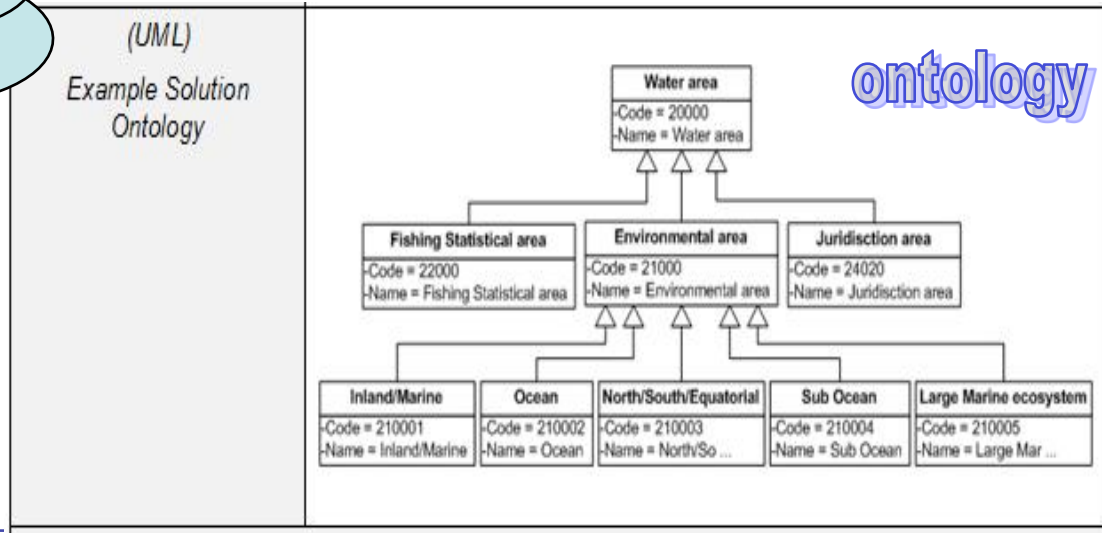
resource

| 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  |

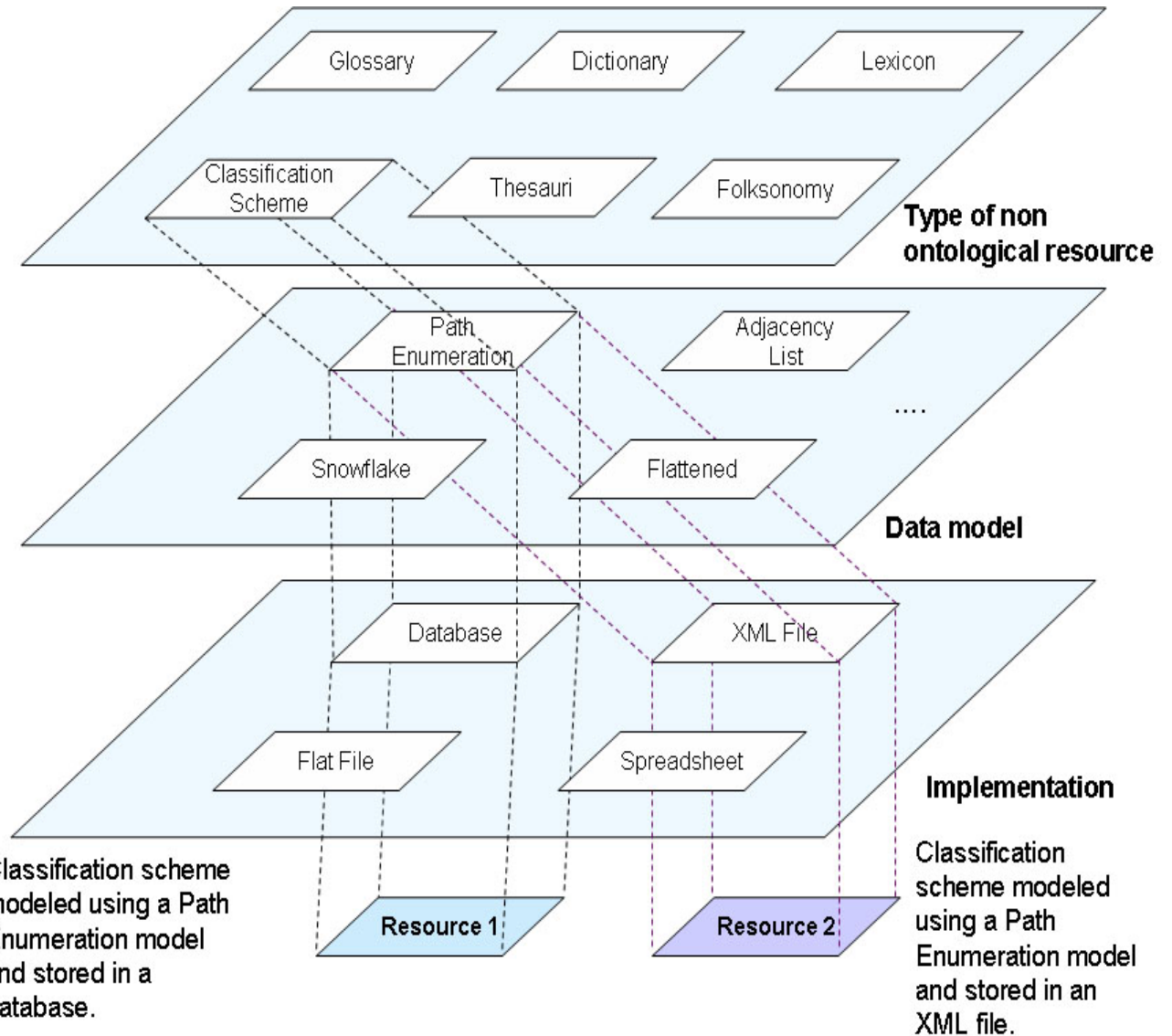
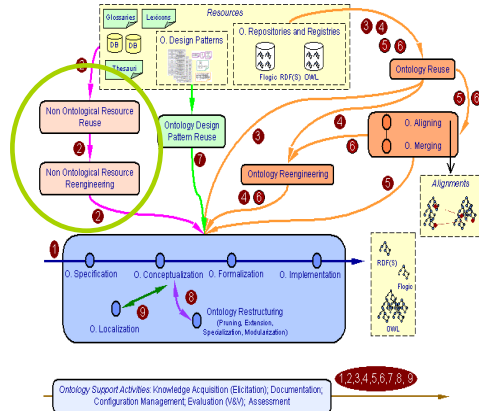
Algorithm



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



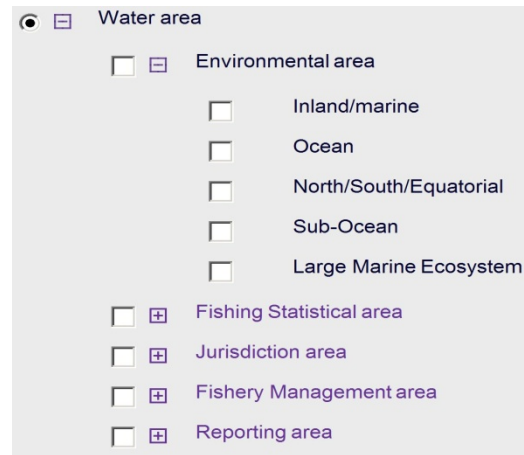
# Types of non-ontological resources



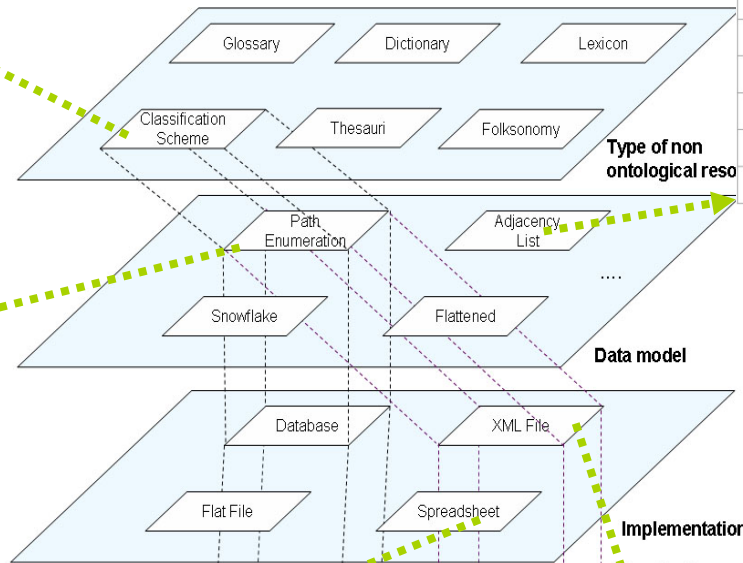
**Non-Ontological Resources** are knowledge-aware resources whose semantics have not been formalized yet by means of an ontology



# Types of non-ontological resources



| 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  |



| 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   |

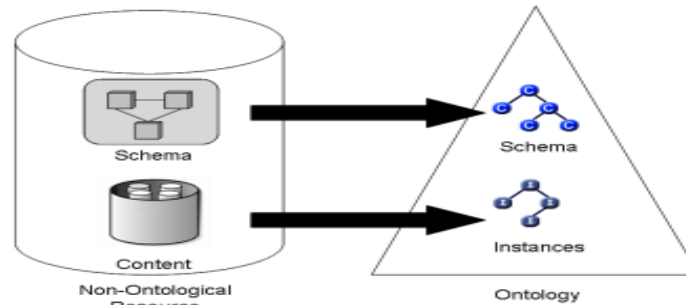
|    | A     | B                        | C      |
|----|-------|--------------------------|--------|
| 1  | Id    | Category Name            | Parent |
| 2  | 20000 | Water area               | 1      |
| 3  | 21000 | Environmental area       | 20000  |
| 4  | 22000 | Fishing Statistical area | 20000  |
| 5  | 24020 | Jurisdiction area        | 20000  |
| 6  | 21001 | Inland/marine            | 21000  |
| 7  | 21002 | Ocean                    | 21000  |
| 8  | 21003 | North/South/Equatorial   | 21000  |
| 9  | 21004 | Sub Ocean                | 21000  |
| 10 | 21005 | Large Marine ecosystem   | 21000  |

```

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    <parentNodeId>1</parentNodeId>
  </Category>
  <Category>
    <NodeId>21000</NodeId>
  </Category>
  
```

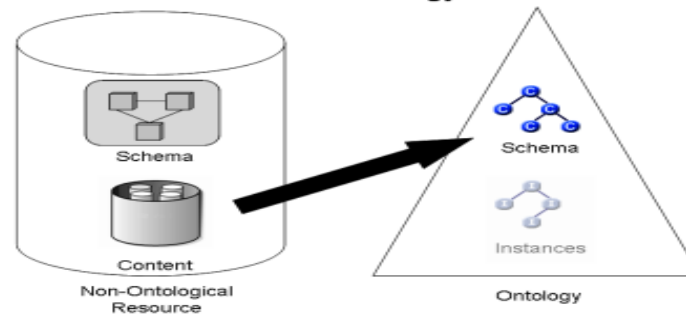
# Approaches to transform resources into ontologies

**ABox**



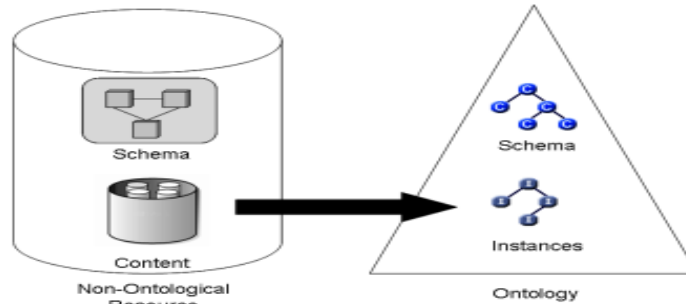
**Transforming resource schema into an ontology schema, and resource content into ontology instances**

**TBox**



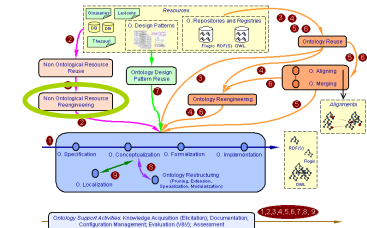
**Transforming resource content into an ontology schema**

**Population**

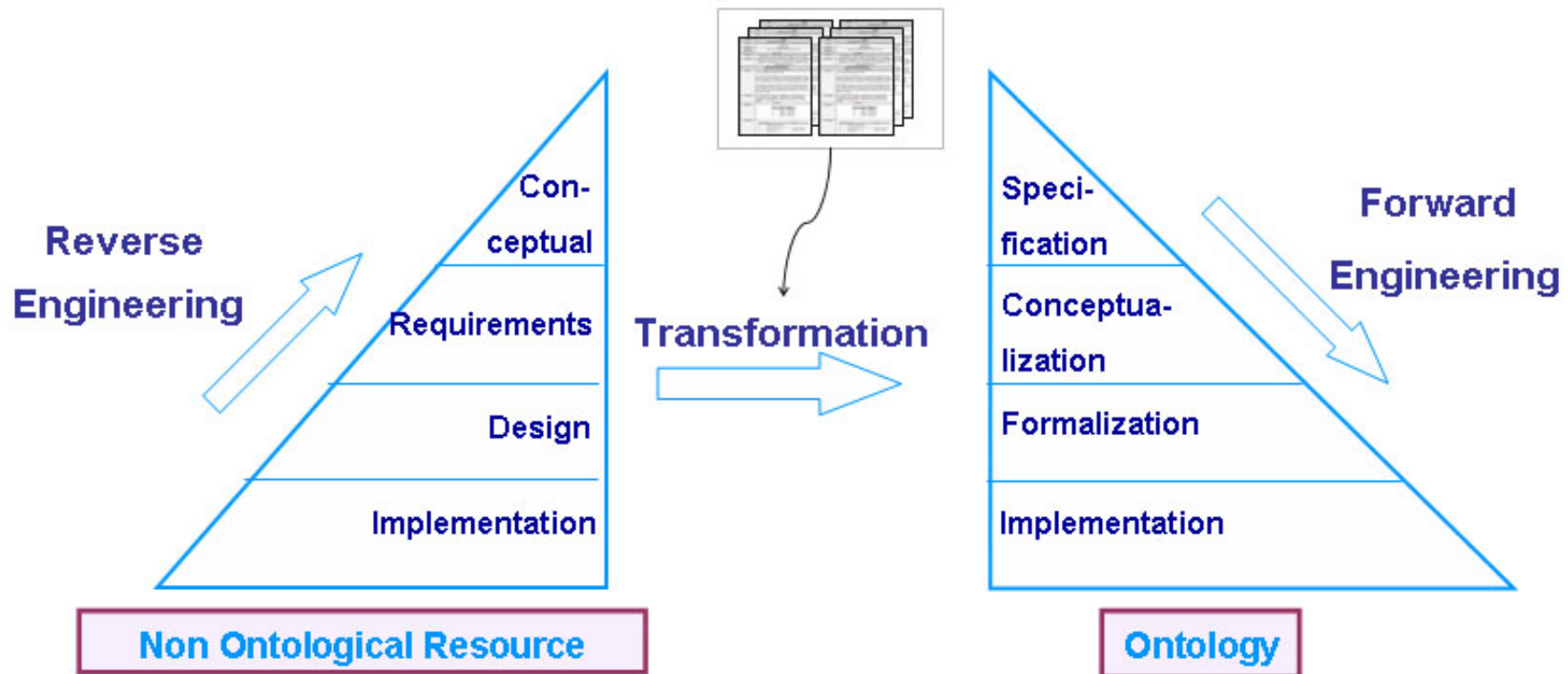


**Transforming resource content into instances of an existing ontology**

# Approach for Re-engineering Non-Ontological Resources



Patterns for Reengineering Non Ontological Resources (PR-NOR)



# 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

|  | Intent   | Submitted               |
|--|--|-------------------------|
| Pattern for re-engineering a classification scheme, which follows the adjacency list data model, into an ontology schema   | Re-engineering a classification scheme, which follows the adjacency list model, to design an ontology schema.  | BorisVillazón-Terrazas  |
| Pattern for re-engineering a classification scheme, which follows the flattened data model, into an ontology schema        | Re-engineering a classification scheme, which follows the flattened model, to design an ontology schema.   | BorisVillazón-Terrazas  |
| Pattern for re-engineering a classification scheme, which follows the path enumeration data model, into an ontology schema | Re-engineering a classification scheme which follows the path enumeration data model to design an ontology schema  | BorisVillazón-Terrazas  |
| Pattern for re-engineering a classification scheme, which follows the snowflake data model, into an ontology schema        | Re-engineering a classification scheme, which follows the snowflake model, to design an ontology schema.   | BorisVillazón-Terrazas  |
| Pattern for re-engineering a term-based thesaurus, which follows the recordbased data model, into an ontology schema       | Re-engineering a term-based thesaurus which follows the record-based model to design an ontology schema.   | BorisVillazón-Terrazas  |
| Pattern for re-engineering a term-based thesaurus, which follows the relationbased data model, into an ontology schema     | Re-engineering a term-based thesaurus, which follows the relation-based model, to design an ontology schema.   | BorisVillazón-Terrazas  |
| Term-based – record-based model – thesaurus to lightweight ontology  | Re-engineering a term-based thesaurus which follows the record-based model to design a lightweight ontology.<br><b>APPLICABILITY</b><br>The semantics of the relation between narrower and broader terms are subClassOf. | Boris Villazón Terrazas |
| model, into an ontology schema   |  |                         |

## NOR2O: a Library for Transforming Non-Ontological Resources to Ontologies

<http://mccarthy.dia.fi.upm.es/nor2o/>

# 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



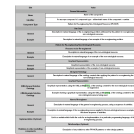
**NACE**  
Statistical Classification of  
Economic Activities in the  
European Community



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



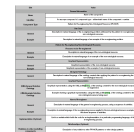
**ISTAT**  
Italian Geography  
Standard



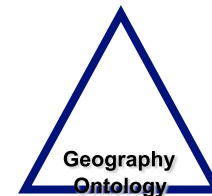
*Pattern for re-engineering a  
classification scheme modelled  
with a Path Enumeration Data Model*



*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*



# Knowledge Resource Re-engineering and Aggregation

```

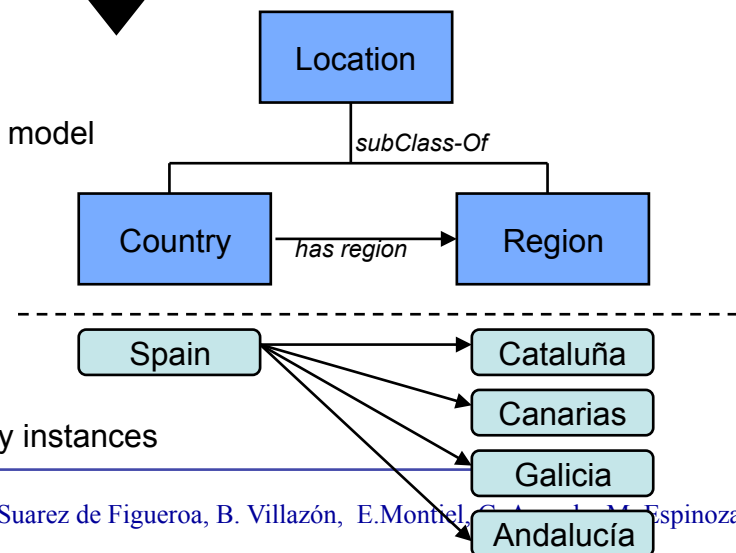
....
ISO 3166-1 (XML)
....
<ISO_3166-1_Entry>
  <ISO_3166-1_Country_name>SPAIN</ISO_3166-1_Country_name>
  <ISO_3166-1_Alpha-2_Code_element>ES</
ISO_3166-1_Alpha-2_Code_element>
</ISO_3166-1_Entry>
...
  
```

Excerpt of the Geography Ontology

Regions Table (Eures Oracle DB)

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

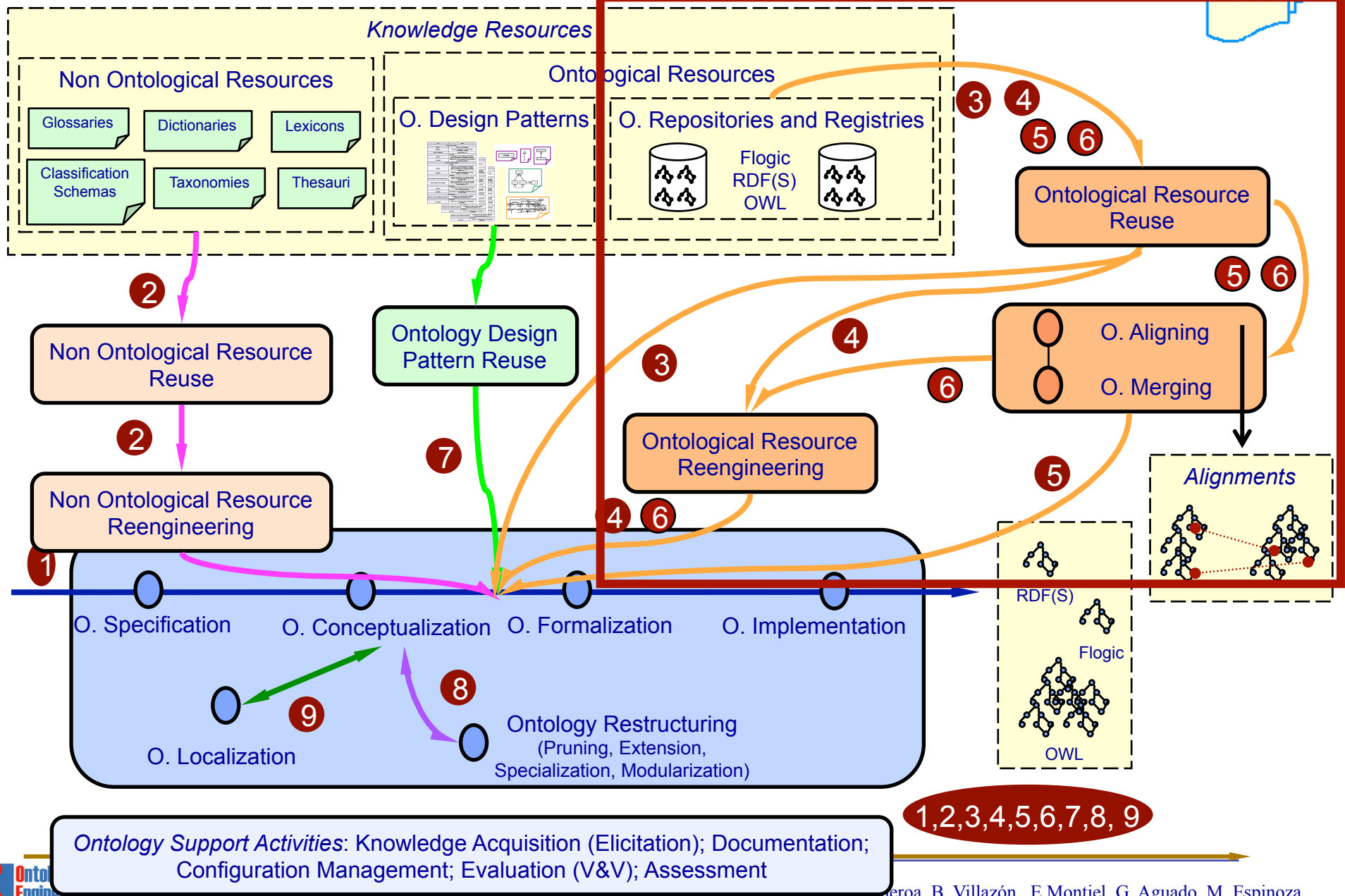
Ontology model



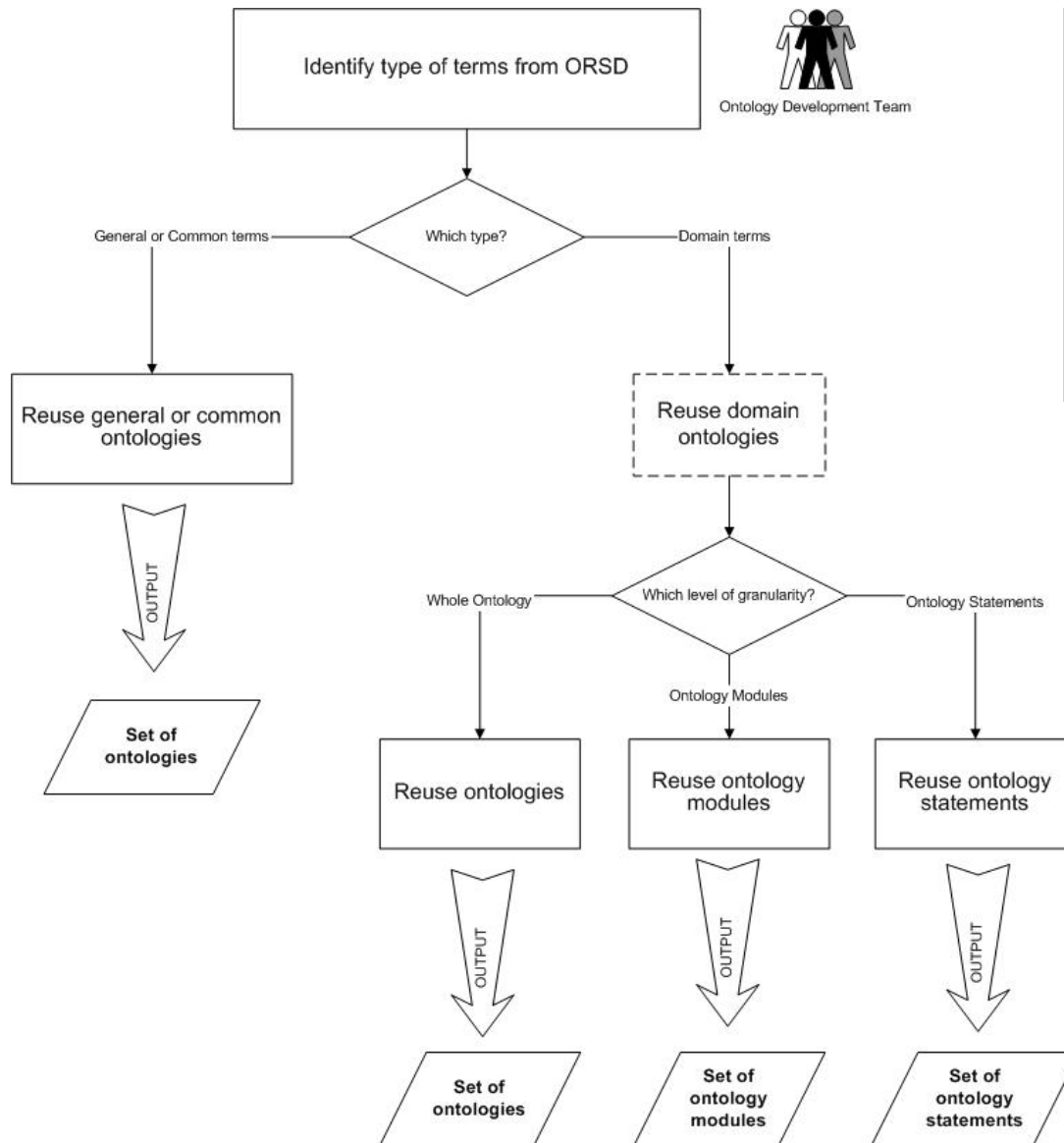
Ontology instances

```

<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>
  
```



# Ontological Resource Reuse Process



*Reuse Common Ontologies*

*Reuse Domain Ontologies*

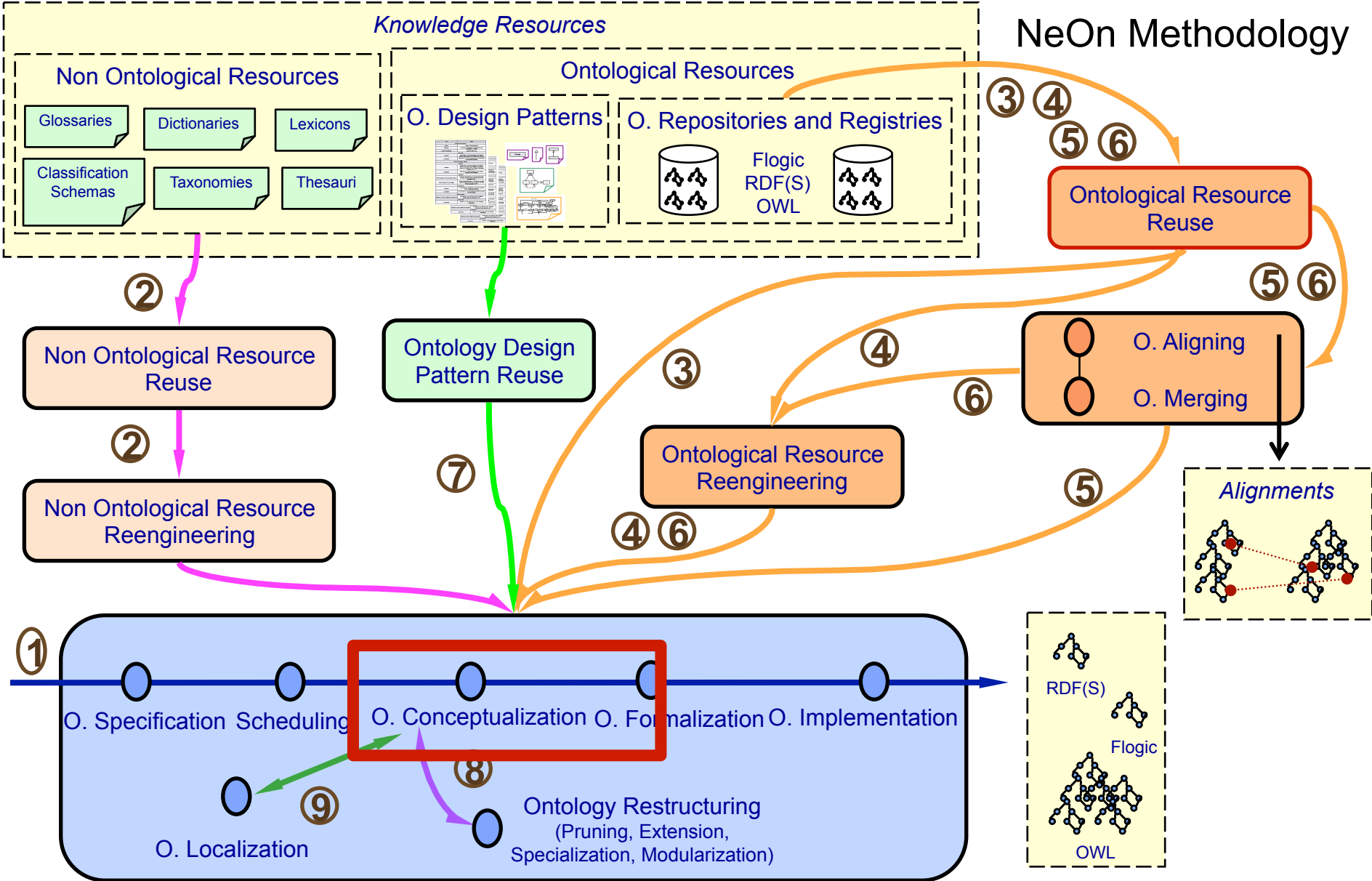
*Reuse ODPs by naive users*

*Reuse Ontology Statements*

**Watson**



# NeOn Methodology



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

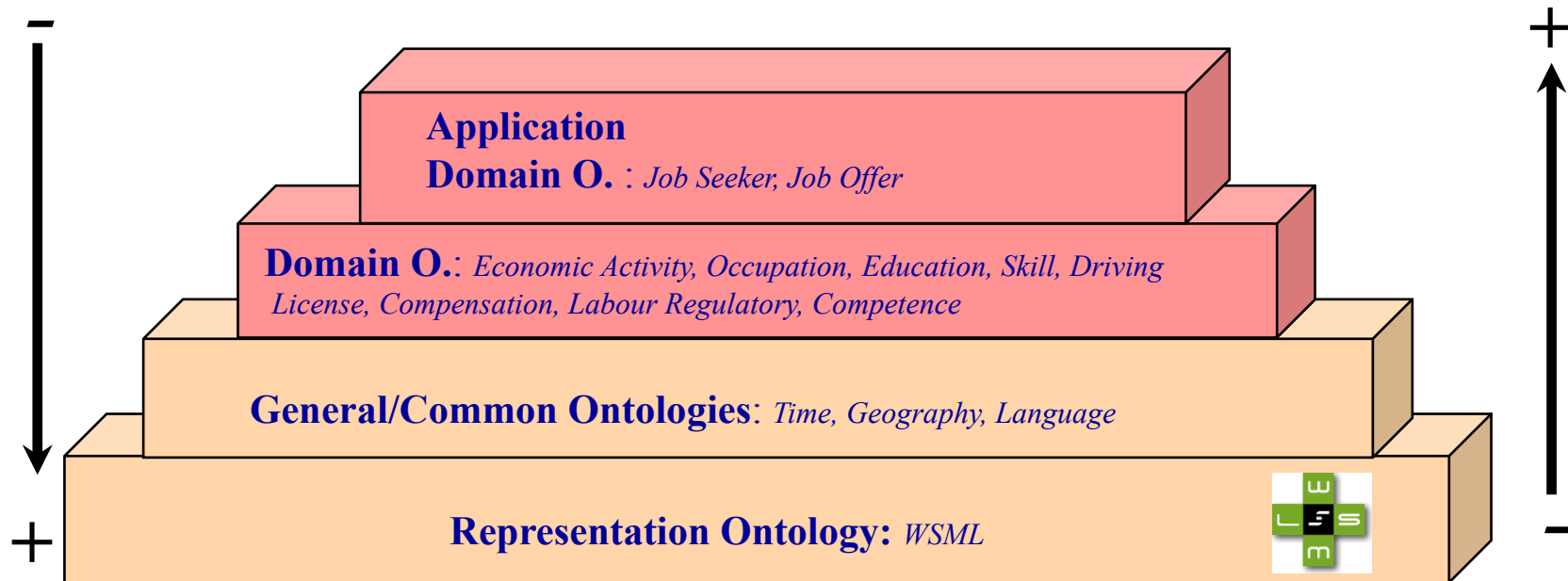
Ontology Support Activities: Knowledge Acquisition (Elicitation); Documentation; Configuration Management; Evaluation (V&V); Assessment



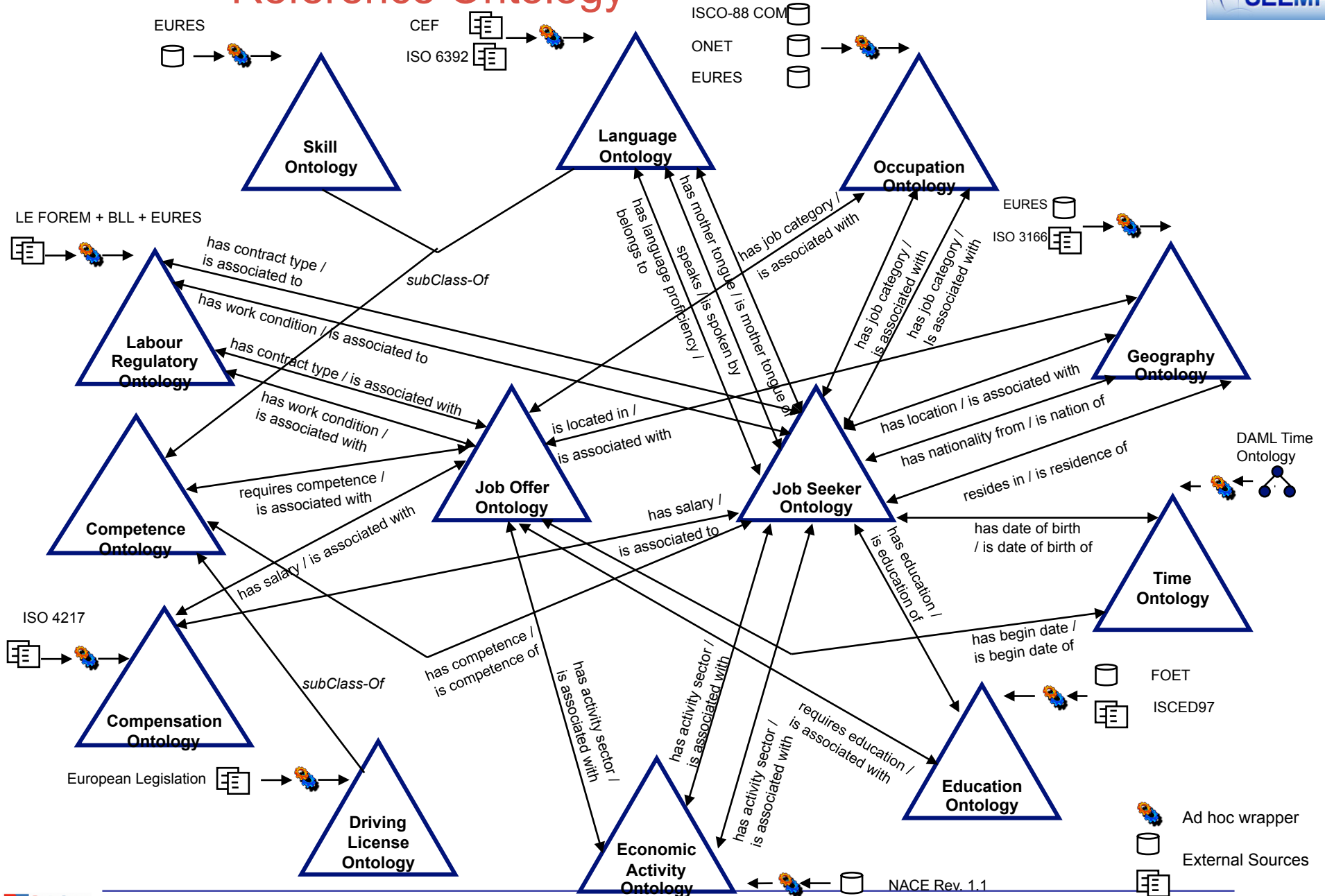
# Conceptualization: Modular approach for ontology construction

Reusability

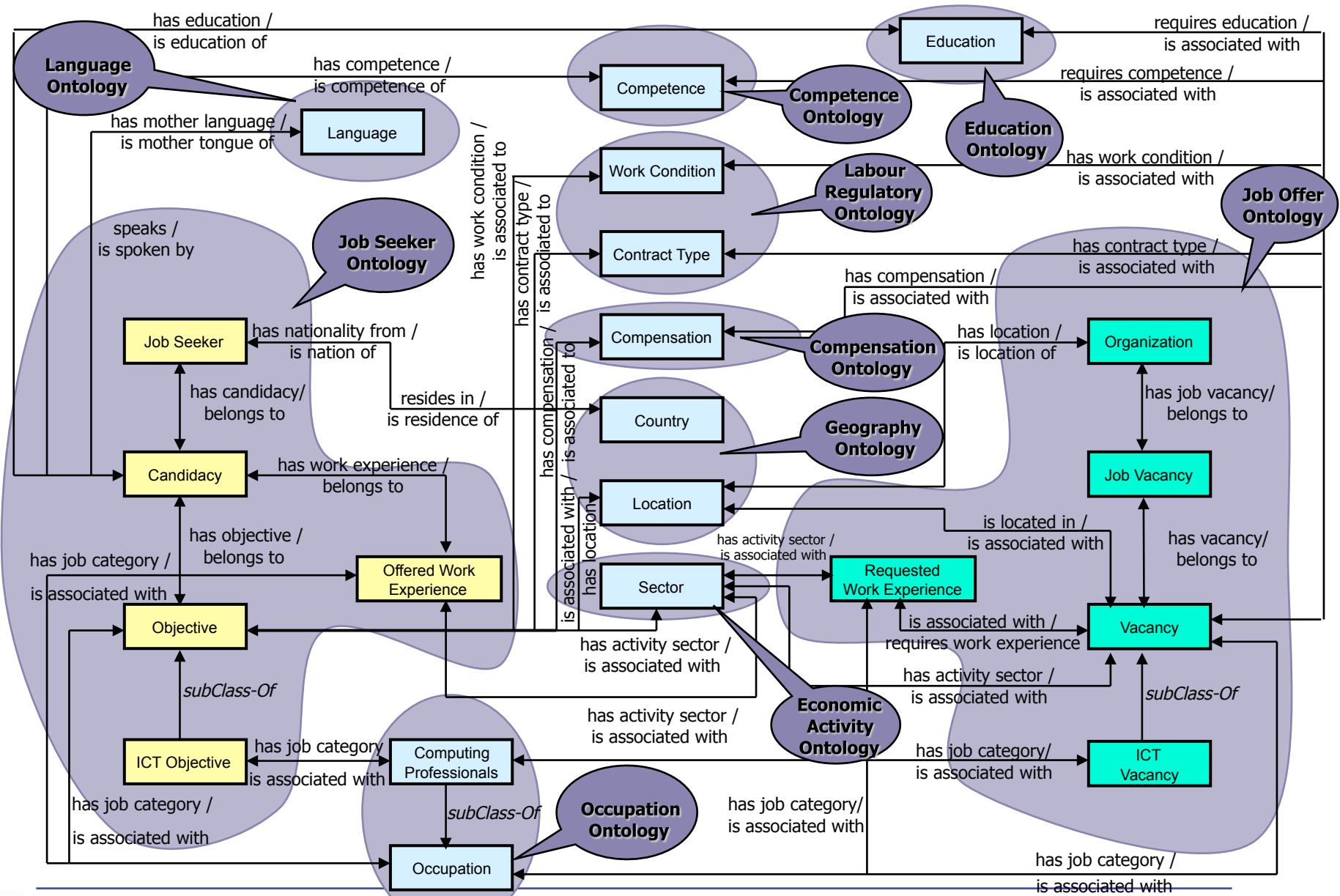
Usability



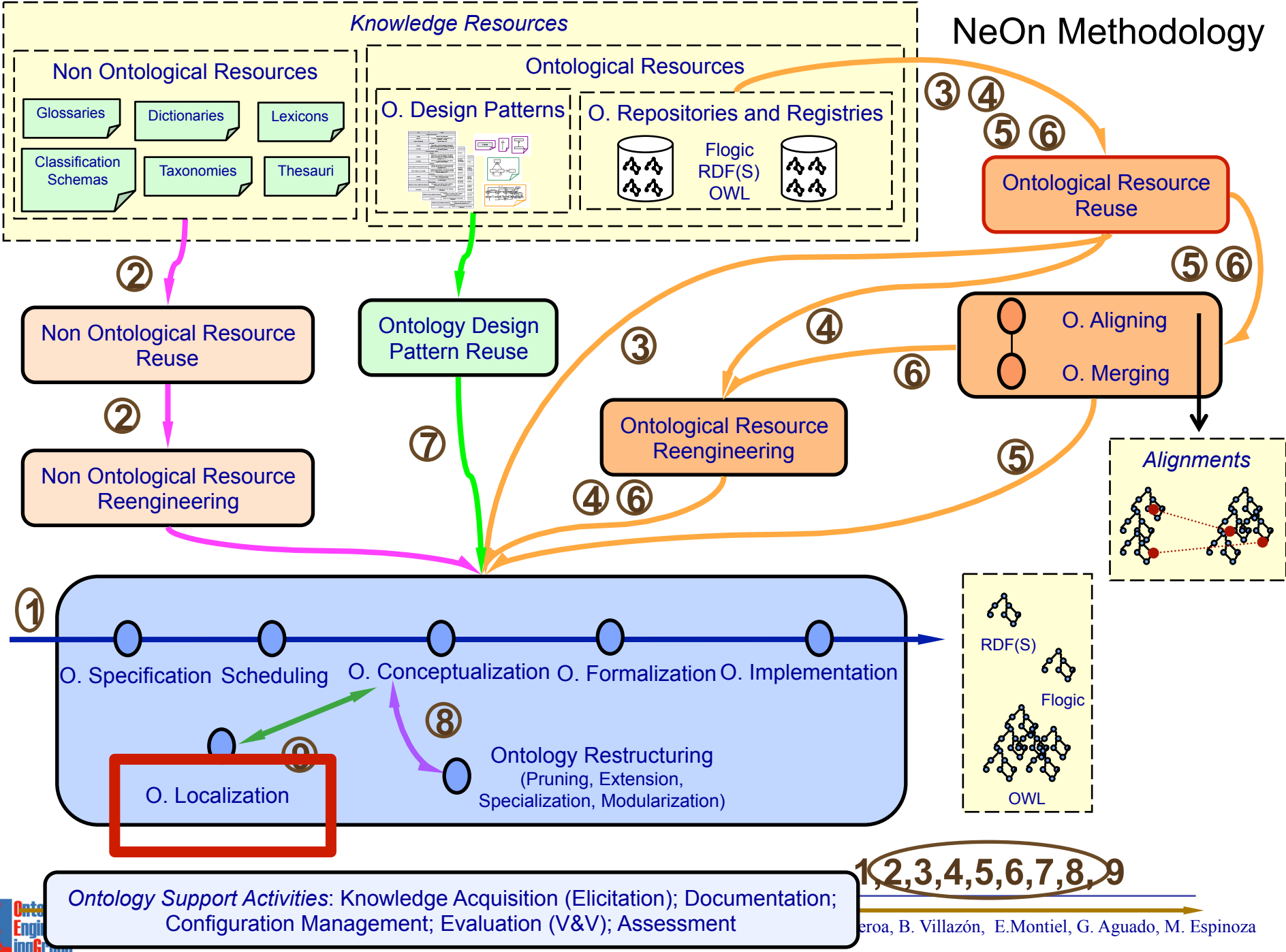
# Reference Ontology



# Details of the ontology

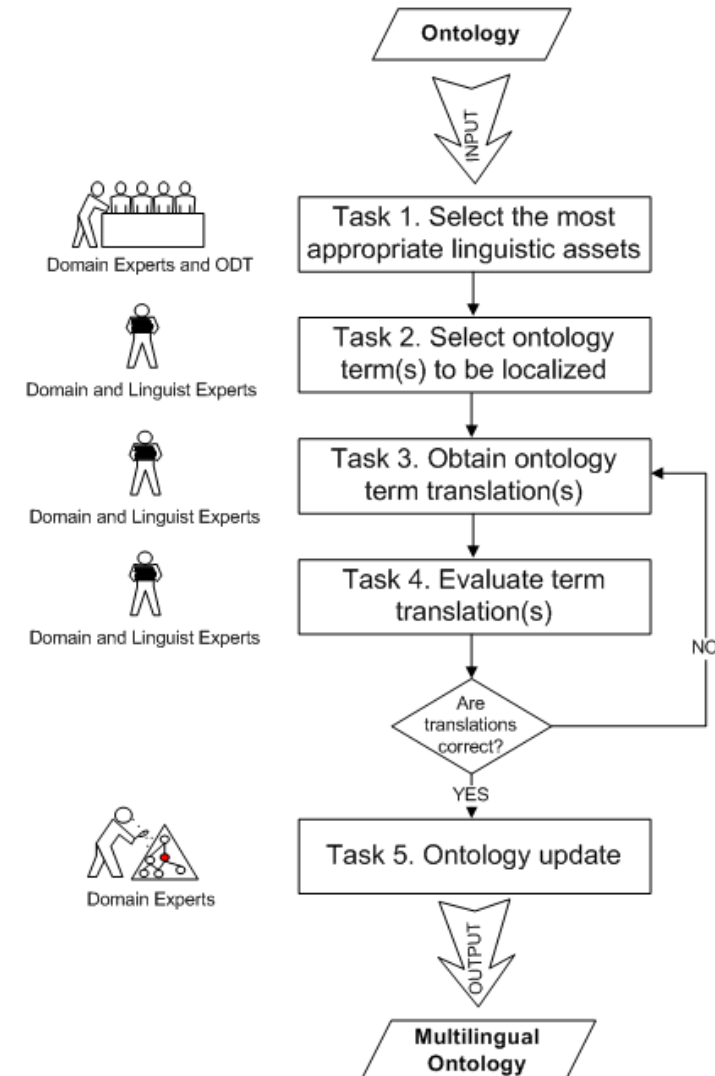


# NeOn Methodology



# Ontology Localization

| Ontology Localization  |   |
|--|---|
| <i>Definition</i>  |   |
| Ontology localization refers to the adaptation of an ontology to particular language and culture   |   |
| <i>Goal</i>  |   |
| To translate an ontology expressed in a source natural language into a target natural language.  |   |
| <i>Input</i>   | <i>Output</i>   |
| An ontology whose ontology terms are expressed in one or several natural languages, from which one is selected as source natural language.           | An ontology whose ontology terms have been translated to the target natural language.<br>The resulting translations are added to available labels of the original ontology already in one or several languages. |
| <i>Who</i>   |   |
| Software developers and ontology practitioners, who form part of the ontology development team, in collaboration with domain and linguistic experts. |   |
| <i>When</i>  |   |
| Once the conceptual model of the ontology is stable, with the aim of avoiding spending time and resources in a model that is not definitive.         |   |



# LabelTranslator NeOn plugin

The screenshot shows the NeOn ontology editor interface. On the left, the 'Ontology Navigator' displays a tree structure of classes under the namespace 'webode://knowledgeweb'. The 'Project' class is selected. The main window, titled 'Entity Properties', shows the 'Ontology element' for 'Project'. The 'Name' field contains 'Project' and the 'Namespace' field contains 'webode://knowledgeweb.semanticweb.org/Documentation+Ontology#'. The 'Lexical Entries' section is expanded, showing a table of entries and a list of relationships.

| Identifier     | Part Of Speech | Language |   |  |
|----------------|----------------|----------|---|--|
| LexicalEntry-1 |                | English  | x |  |
|                |                |          |   |  |
|                |                |          |   |  |

Lexical Entry Relationships

- Identifiers
- Synonyms
- Translations
- Antonyms
- Scientific names

Below the table, there are sections for 'Lexicalizations', 'Lexical Entry Senses', 'Usage Context', 'Sources', and 'Notes'. At the bottom, there are tabs for 'Class Restrictions', 'Disjoint Classes 2', 'Class Restrictions 2', 'Disjoint Classes', 'Linguistic Information', 'Annotations', and 'Annotations 2'.

Slide 47

# Conclusions

## 1. The NeOn methodology gives

1. detailed guidelines for building ontologies
2. 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



# Handbook on the NeOn Methodology

## NeOn Book

### NeOn Methodology in a Nutshell

| Title   | Author(s)  |
|---|--|
| <a href="#">Introduction</a>  | Asunción Gómez-Pérez, Enrico Motta, Mari Carmen Suárez-Figueroa            |
| <a href="#">Definition of Ontology Networks</a>   | Mathieu d'Aquin, Aldo Gangemi, Peter Haase                                 |
| <b>NeOn Methodology Framework:</b>  |  |
| <a href="#">Scenarios for Building Ontology Networks</a> and <a href="#">Glossary of Processes and Activities</a> | Mari Carmen Suárez-Figueroa, Asunción Gómez-Pérez                          |
| <a href="#">Collection of Ontology Life Cycle Models</a>  | Asunción Gómez-Pérez, Mari Carmen Suárez-Figueroa, Mariano Fernández-López |
| <b>Methodology guidelines</b>   |  |
| <a href="#">Ontology Requirements Specification</a>   | Asunción Gómez-Pérez, Mari Carmen Suárez-Figueroa                          |
| <a href="#">Searching Ontologies</a>  | Mathieu d'Aquin, Holger Lewen  |
| <a href="#">Scheduling using gOntt</a>  | Mari Carmen Suárez-Figueroa, Asunción Gómez-Pérez                          |
| <a href="#">Reusing and Re-engineering Non-Ontological Resources</a>  | Asunción Gómez-Pérez, Boris Villazón-Terrazas                              |
| <a href="#">Reusing General Ontologies</a>  | Mariano Fernández-López, Asunción Gómez-Pérez, Mari Carmen Suárez-Figueroa |
| <a href="#">Reusing Domain Ontologies</a>   | Mari Carmen Suárez-Figueroa, Asunción Gómez-Pérez                          |
| <a href="#">Reusing Statements</a>  | Mari Carmen Suárez-Figueroa, Mathieu d'Aquin                               |
| <a href="#">Conceptualizing using ODPs</a>  | Eva Blomqvist, Enrico Daga, Aldo Gangemi, Valentina Presutti,              |
| <a href="#">Ontology Localization</a>   | Elena Montiel-Ponsoda, Mauricio Espinoza                                   |
| <a href="#">Ontology Evaluation</a>   | Marta Sabou  |
| <a href="#">Modularizing Ontologies</a>   | Mathieu d'Aquin  |
| <a href="#">Ontology Evolution   Exploiting Tools</a>   | Raúl Palma, Peter Haase   Fouad Zablith                                    |
| <a href="#">Ontology Alignment</a>  | Jérôme Euzenat, Chan Le Duc  |
| <b>Technology Support</b>   |  |
| <a href="#">NeOn Toolkit Description</a>  | Michael Erdmann, Walter Waterfeld  |
| <a href="#">NeOn Plugins</a>  | Andreas Harth, Walter Waterfeld, Holger Lewen                              |
| <b>Large Scale Development of Ontology Networks</b>   |  |
| <a href="#">Fisheries</a>   | Caterina Caracciolo, Margherita Sini, Aldo Gangemi                         |
| <a href="#">Invoices</a>  | Jose Manuel Gómez-Pérez  |
| <a href="#">Nomenclature</a>  | Germán Herrero, Tomas Pariente-Lobo  |

[http://www.neon-project.org/nw/NeOn\\_Book](http://www.neon-project.org/nw/NeOn_Book)

# 22 Executive Chapter Summaries are available at the NeOn Web Site



## 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 (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 at the beginning of the ontology project and in parallel with the knowledge acquisition activity

### What is the output?

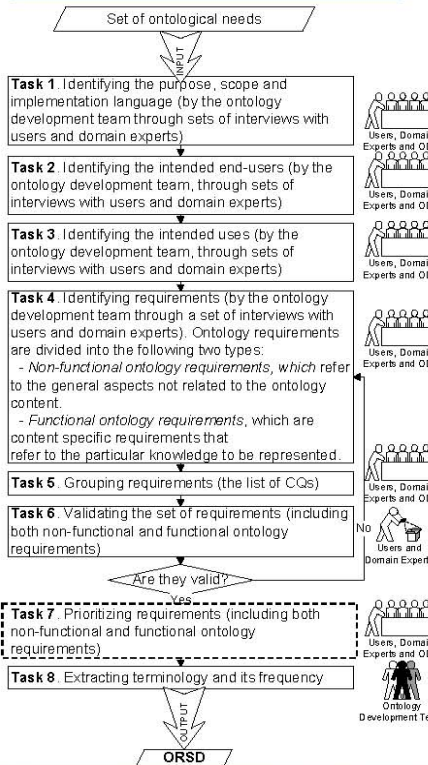
#### Ontology Requirements Specification Document Template

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



## Ontology Requirements Specification

### Experiments and examples

| SEEMP Reference Ontology Requirements Specification Document   |   |                                  |                            |
|--|---|----------------------------------|----------------------------|
| <b>1 Purpose</b>   | The purpose of building the Reference Ontology is to provide a consensual knowledge model of the employment domain to be used by public e-Employment services.  |                                  |                            |
| <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 Implementation Language</b>   | The ontology has to be implemented in WSM Language.   |                                  |                            |
| <b>4 Intended End-Users</b>  | User 1. Unemployed candidate searching for a job or another occupation for immediate or future purposes<br>User 2. Employer who needs more human resources.<br>User 3. Public or private employment search service that provides assistance to gather CVs or job postings and to prepare some data and statistics<br>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. |                                  |                            |
| <b>5 Intended Uses</b>   | User 1. Publishing CV. Job seeker places his/her CV on the PES Portal.<br>User 2. Publishing Job Offer. An Employer places a Job Offer on the PES Portal.<br>User 3. Searching for Job Offers. The Employer looks for candidates for the Job Offer through the PES Portal.<br>User 4. Searching for Employment information. Job Seeker looks for general information about employment in a given location at the PES Portal.  |                                  |                            |
| <b>6 Ontology Requirements</b>   |   |                                  |                            |
| <b>a. Non-Functional Requirements</b>  | NFR1. The ontology must support a multilingual scenario in the following languages: English, Spanish, Italian, and French.<br>NFR2. The ontology must be based on the international, European or de-facto standards in existence or under development.  |                                  |                            |
| <b>b. Functional Requirements: Groups of Competency Questions</b>  |   |                                  |                            |
| <b>CQ01: Job Seeker (14 CQ)</b>  | <b>CQ02: Job Offer (11 CQ)</b>  |                                  |                            |
| CQ01. What is the Job Seeker's name? Lewis Hamilton  | CQ02. What is the employer's information? CEFRIEL Research Company, Milano, Italy; ATOS, Madrid, Spain  |                                  |                            |
| CQ02. What is the Job Seeker's nationality? British; Spanish; Italian; French;   | CQ03. What kind of job does the employer's offer? Java Programmer; C Programmer; Database administration  |                                  |                            |
| CQ03. What is the Job Seeker's contact information? Tel: 34600654231. Email: jsanz@fi2.upm2.es   | CQ04. What kind of contract does the employer's offer? Seasonal Job; Autonomous   |                                  |                            |
| CQ04. What is the Job Seeker's current job? Programmer; Computer Engineer; Computer Assistant  | CQ05. How much salary does the employer's offer? 3500 Euros, 3000 USD   |                                  |                            |
| CQ05. Which is the Job Seeker's desired job? Radio Engineer; Hardware designer; Software Engineer  | CQ06. What kind of economical activity does the employer have? Research; Financial; Education; Industrial   |                                  |                            |
| CQ06. Which are the Job Seeker's desired working conditions? Autonomous; Seasonal Job; Traineeship; Consultant                                   | CQ07. What is the description of the job offer? Sun Certified Java Programmer   |                                  |                            |
| CQ07. What kind of contract does the Job Seeker want? Full time; Partial time; Autonomous; Seasonal Job  | CQ08. What are the working conditions of the job offer? Full time; Partial time; Autonomous; Seasonal Job   |                                  |                            |
| CQ08. What is the Job Seeker's work experience? 6 months, 1 year, 2 years  | CQ09. What is the required education level for the job offer? Basic education; Higher education/University  |                                  |                            |
| CQ09. What is the Job Seeker's area of knowledge? Java Programming; C Programming; Database Administration                                       | CQ10. 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   | CQ11. What is the required knowledge for the job offer? Java, Haskell, Windows  |                                  |                            |
| CQ11. Which are the Job Seeker's skills? SQL programming, network administration   | CQ12. What are the required skills for the job offer? ASP Programmer, Data warehouse, Hardware programming  |                                  |                            |
| <b>7 Pre-Glossary of Terms</b>   |   |                                  |                            |
| <b>a. Terms from Competency Questions + Frequency</b>  |   |                                  |                            |
| Job Seeker 27  | Name 4  | Address 1                        | Objective 3                |
| CV 2   | Gender 1  | Nationality 1                    | Job Category 3             |
| Personal Information 3   | Birth date 1  | Contact (phone, fax, mail) 3     | ...                        |
| <b>b. Terms from Answers + Frequency</b>   |   |                                  |                            |
| SW engineer, programmer 5  | Autonomous, Seasonal Job, 2   | Research, Financial, Education 4 | 3000 Euros per month 1     |
| British, Spanish, Italian, French 1  | Basic education, Higher education 1   | 1 year, 2 years, 3 years 1       | CEFRIEL Research Company 1 |
| <b>c. Objects</b>  |   |                                  |                            |
| Andorra, Argentina, Australia, Bolivia, France, Italy, Spain, etc.; Euro, Zloty, Great British Pound, US Dollar, Peso, etc.; CEFRIEL, ATOS, etc. |   |                                  |                            |

### Additional information:

- NeOn Deliverable D5.4.1 ([http://www.neon-project.org/web-content/images/Publications/neon\\_2008\\_d5.4.1.pdf](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

Contact person: mcsuarez@fi.upm.es