Ontology Design Patterns - Part 2

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Overview

- eXtreme Design

- Change Management Patterns

- State of ODP Research
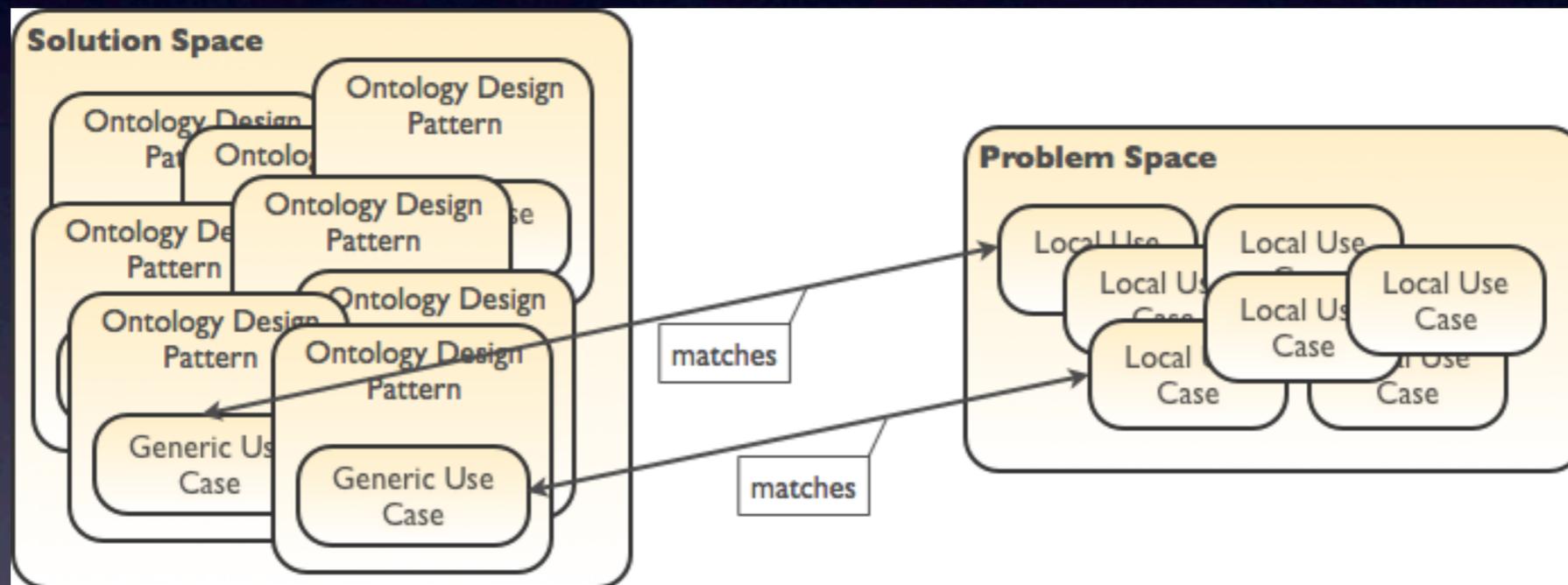
Terms and definitions

- Ontology = OWL (DL) ontology

- Portal = ontologydesignpatterns.org

- Typology = NeOn typology

- Ontology Design Pattern / Ontology Pattern = ???

eXtreme Design

- Collaborative incremental and iterative method for ontology design.

- Based on patterns.

- Influenced by agile methods of software engineering.

XD General Approach

Use Case Mapping

- Competency Questions (natural language).
  - Tool does string matching and suggests patterns.
- Possibly metamodelling language (future work).
  - Would possibly allow for OL.
  - Not known if practically feasible.

Work method

- Decompose the problems.
- Stories -> CQ + contextual statements.
- Pair design.
- Rather tight customer integration.
- Test-driven.
- Use supporting tools.

Method Illustration
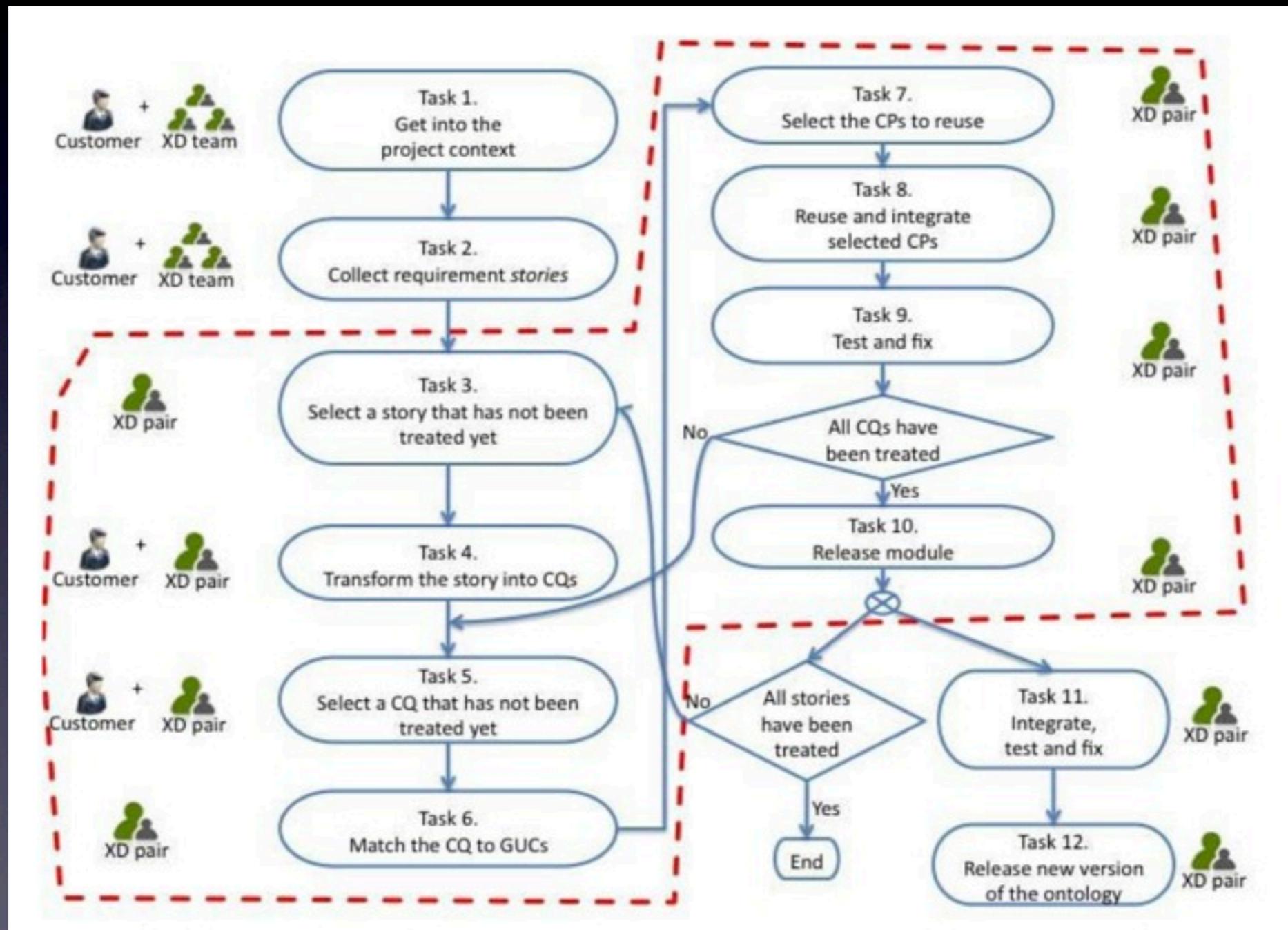
XD Tools

- XD Plugin for NeOn Toolkit
  - CP Browser / CP Details View
  - XD Annotation dialog
  - XD Selector (unfinished)
  - XD Assistant
  - XD Wizards

Preliminary results

- See previous speaker ;-)

Change Management Patterns

- Problem: knowledge changes and develops.

- Ontologists have to keep up and adapt their models.

- Proposed solution: Change Management Patterns, CMPs

CMP Typology

- Change patterns

- Inconsistency patterns

- Alternative patterns

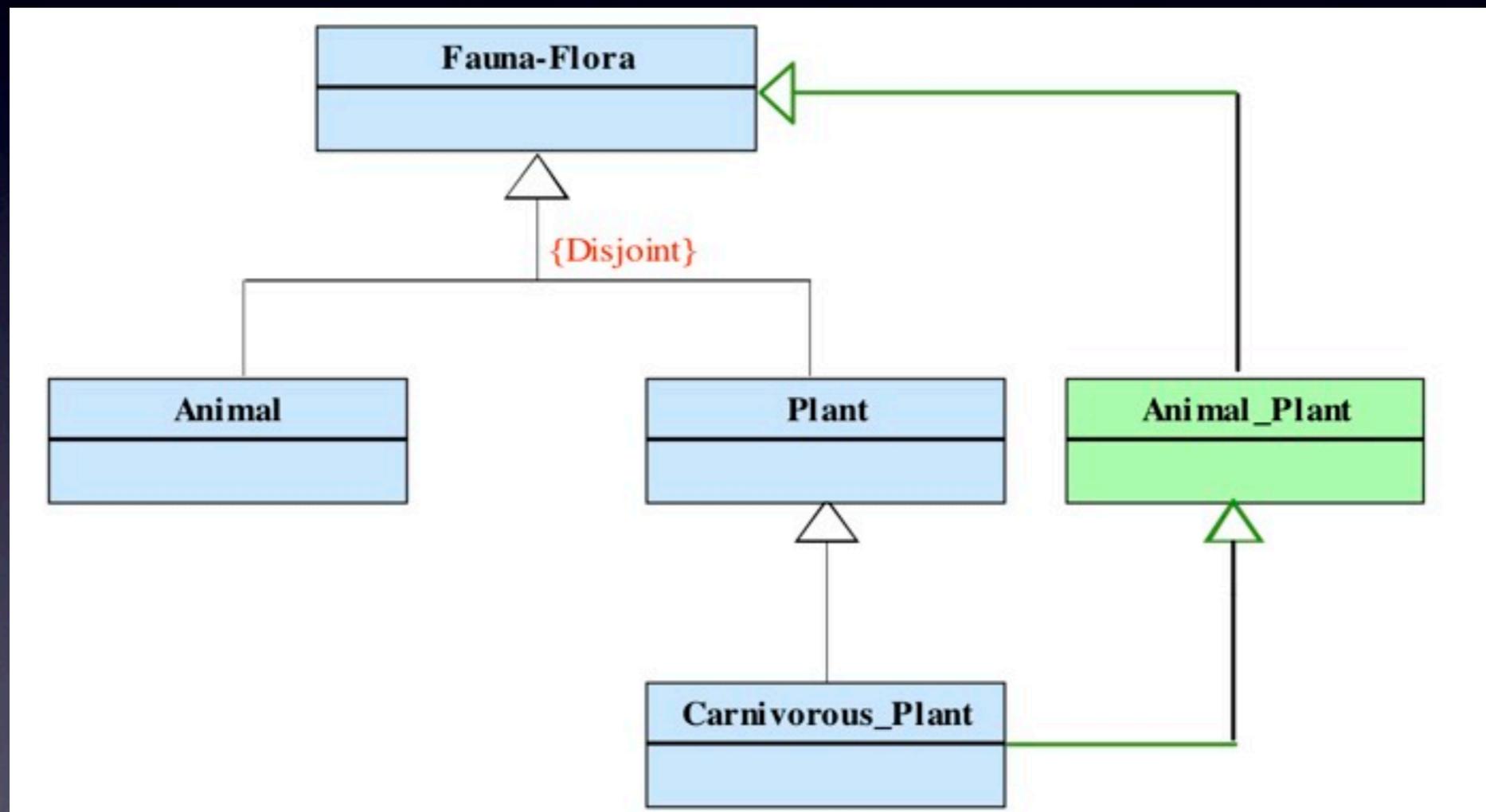- ... instances of such patterns refer to one another.

Example pattern

Inconsistency Pattern Example	
General Properties	
General Information	
Name*	Inconsistency disjointness related to subsumption.
Identifier*	InconsP_DisjSub.
CMP Type*	Inconsistency Pattern.
Use Case	
Problem	Analyze and delineate a disjointness inconsistency related to a subsumption relation between two classes.
Examples	Suppose that we need to explain and track a disjointness inconsistency caused by a subsumption relation between the class *Carnivorous-Plant* and the class *Animal*.
CMP Abstraction Level	
Pattern Description	
Intent	The pattern models explicitly the analysis of a disjointness inconsistency related to a subsumption relation between two classes of an ontology.
Consequences	The pattern explains a disjointness inconsistency related to a subsumption relation and gives details on its analysis and localization.

Relationships	
Relations to other CMP	
Change Patterns	Add a sub-class, …
Alternative Patterns	- Define Hybrid Class for Resolving Disjointness Subsumption, - Enlarge Class Definition for Resolving Disjointness Subsumption.

Scenarios	Explain disjointness inconsistency caused by a subsumption relation between the class *Carnivorous-Plant* and the class *Animal* by tracking the classes concerned by this inconsistency and specifying the axioms causing it.
Inconsistency Abstraction Level	
Pattern Description	
Arguments*	
Implicated Entities*	
ID SuperClass1	ID of a first super-class (super_class1ID).
ID SuperClass2	ID of a second super-class (super_class2ID).
ID SubClass	ID of the sub-class (sub_classID).
Examples	
ID SuperClass1	Plant.
ID SuperClass2	Animal.
ID SubClass	Carnivorous-Plant.
Involved Entities*	
ID SuperClass2	ID of the involved super-class (super_class2ID).
ID SubClass	ID of the sub-class (sub_classID).
Examples	
ID SuperClass2	Animal.
ID SubClass	Carnivorous-Plant.
Axioms*	
Involved Axioms	(super_class1ID disjointWith super_class2ID), (sub_classID ⊑ super_class1ID).
Examples	(Plant ⊑ ¬Animal), (Carnivorous-Plant ⊑ Plant).
Responsible Axioms	(sub_classID ⊑ super_class2ID).
Examples	(Carnivorous-Plant ⊑ Animal)
Graphical Representation	
Diagram	
Diagram Examples	

Example alternative

Method

- Change specification phase instantiates a change pattern.

- Inconsistency checking is run.

- If inconsistencies found match possible inconsistency outcomes of initial change pattern, provide resolution alternatives.
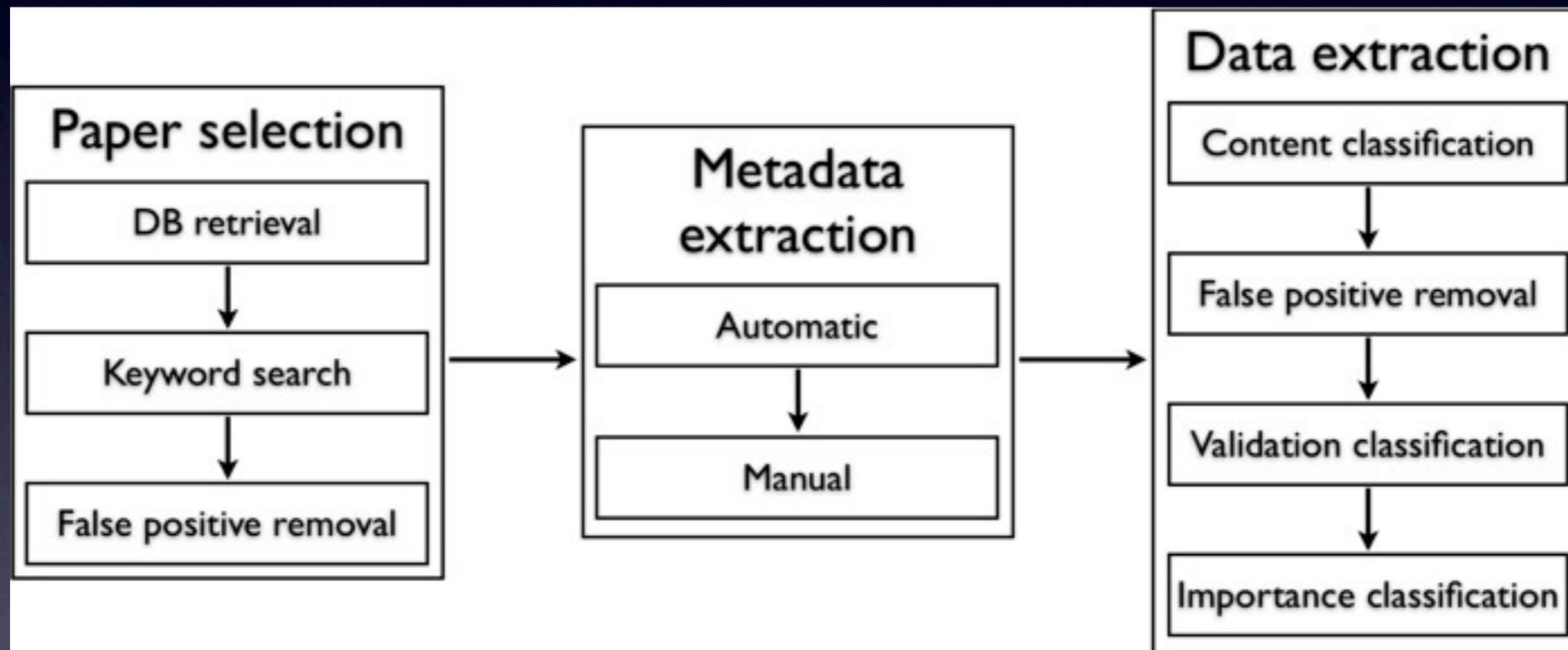
Pros and cons

- Allows more helpful inconsistency resolution than just deletion of knowledge.

- However - requires extensive tool support.

- Future work: make use of ontology evolution log information.

State of ODP Research

- What is being done?

- How has it developed over time?

- Where is it being done?

- How is it being done?

Systematic Literature Survey

Content classification

Category	Definition
New pattern presentation	The paper presents a new ontology pattern.
Pattern usage method	The paper presents a new general approach or method of using patterns to achieve some goal(s).
Pattern creation method	The paper presents a new approach for isolating or creating ontology design patterns (including re-engineering from other knowledge representation forms).
Patterns used	The paper describes a case where patterns have been used for achieving some goal(s)
Evaluation	The paper focuses on evaluating patterns or pattern usage/creation methods
Pattern typology	The paper discusses or suggests different types or groupings of patterns.
Pattern features	The paper discusses specific features of ontology patterns. This includes features of not only the reusable reference implementation, but also the documentation and metadata associated with it.
Pattern identification	The paper deals with finding instances of patterns in an existing ontology.
Pattern languages	The paper discusses languages or formalisms for representing or displaying patterns.
Antipatterns	The paper concerns antipatterns or worst practices.
Not relevant	The paper is a false positive - it does not deal with ontology pattern research, but only mentions the term in passing.

Validation classification

- No validation

- Anecdotal validation

- Validation by example

- Empirical validation

The dataset

- Three conferences: ISWC, ASWC, ESWC, 2005-2009

- Associated workshops

- 2462 papers total

- Additionally: 1691 papers added in second iteration support the findings

The results

- Patterns are used, but not studied.

- Growth in volume 2005-2009.

- Almost exclusively European research.

- Research cooperation common.

- Empirical validation lacking.

Sources

- Valentina Presutti, Enrico Daga, Aldo Gangemi and Eva Blomqvist, *eXtreme Design with Content Ontology Design Patterns*, Workshop on Ontology Patterns (WOP) at ISWC 2009

- Rim Djedidi, and Marie-Aude Aufaure, *Change Management Patterns (CMP) for Ontology Evolution Process.* 3rd International Workshop on Ontology Dynamics, (IWOD) at ISWC 2009

- Hammar, Karl & Sandkuhl, Kurt, *The State of Ontology Pattern Research: A Systematic Review of ISWC, ESWC and ASWC 2005–2009.* Workshop on Ontology Patterns (WOP) at ISWC 2010