Ontology Summit 2013

Hackathon & Clinics Program Launch

28 March 2013

FIBO Ontology Evaluation with OOPS!, OQuaRE and Other Tools

Overview

- Description
- Collaborators
- Resources
- Ontologies involved
- Objectives / Goals
- Deliverables
- Remarks

Description

- FIBO
  - Identify the relevant quality measures for two styles of ontology:
    - Business Conceptual Ontology (standard business terms)
    - Operational ontologies (for semantic applications)
  - Develop quality methodology for development and maintenance of FIBO suite of ontology standards for the financial industry

- OOPS!
  - Catalog the ontology pitfalls in the FIBO BCO and Operational Ontologies

- OQuaRE
  - 1) application of the complete quality model;
  - 2) application of the OQuaRE subcharacteristics and metrics relevant for FIBO evaluation, with the possibility of modifying the existing associations subcharacteristics-metrics.

- OntoQA
  - Identify and apply the relevant metrics to FIBO BCO and OOs

Collaborators

FIBO

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Enterprise Data Management Council

OOPS!

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OQuaRE

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Departamento de Informática y Sistemas, Universidad de Murcia, Spain.

ONTOQA

Samir Tartir

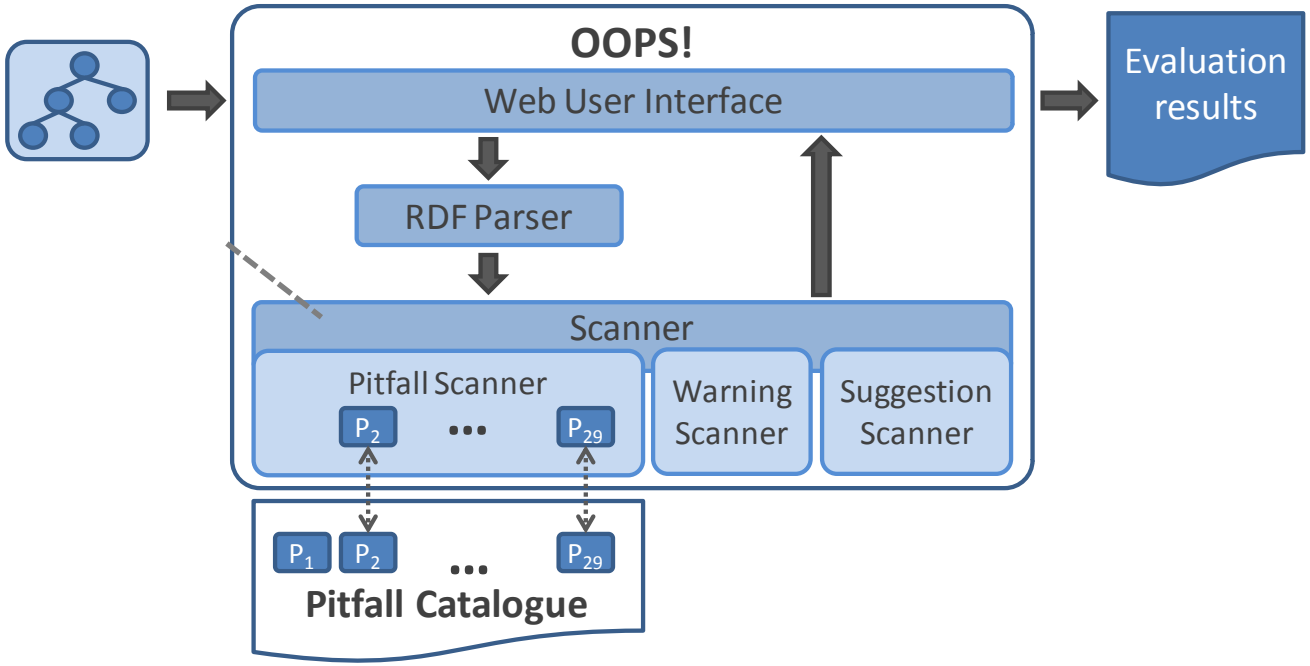
Philadelphia University Jordan • Computer Information Systems.

Others

We are open to working with any and all others who may have tools, techniques or methodological material which may be applied either to business conceptual ontologies, to operational OWL ontologies or both.

Collaborators: OOPS!

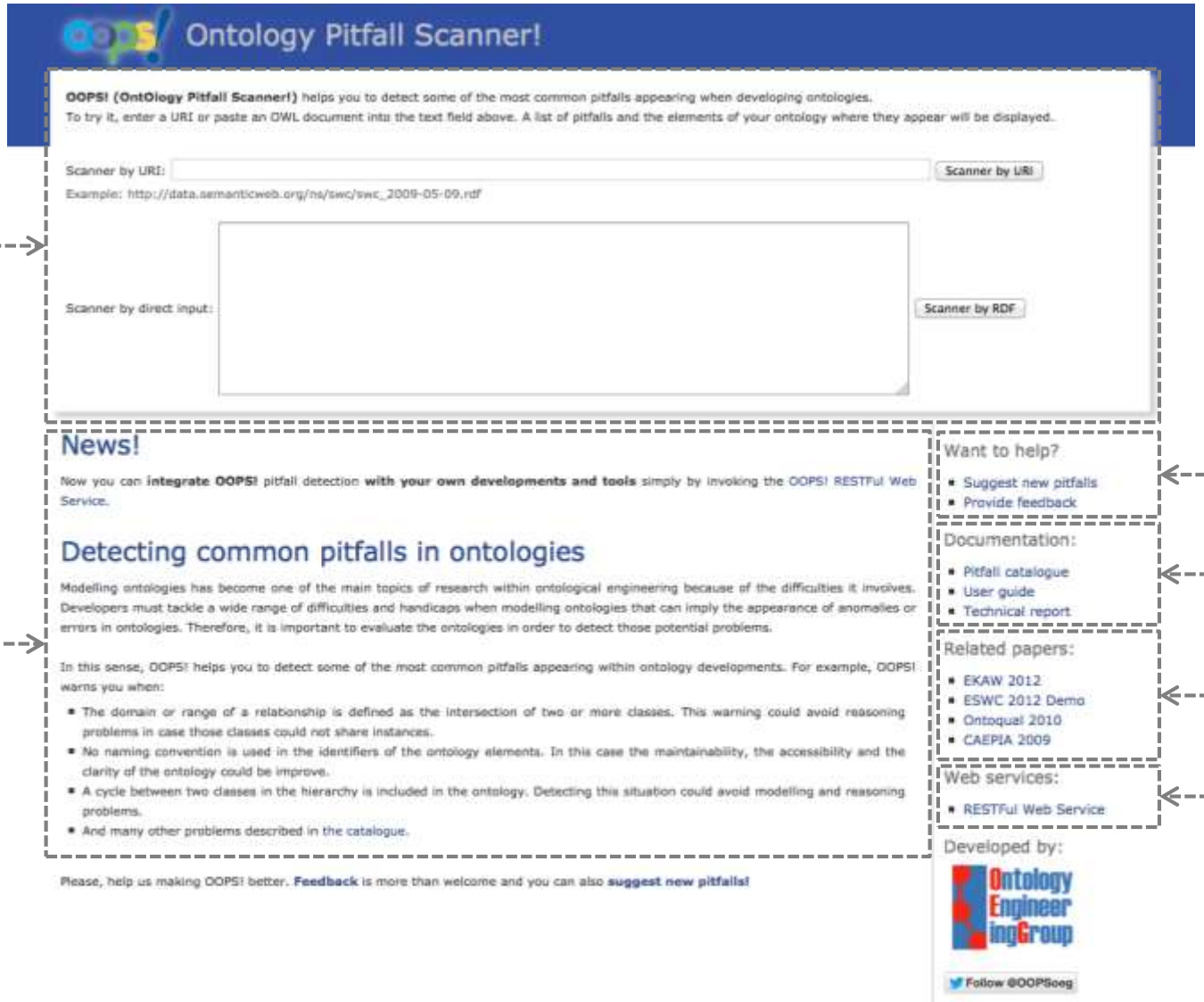
- **Web-based** tool
- Available at **http://www.oeg-upm.net/oops**



Jena API: http://jena.sourceforge.net/
Java EE: http://www.oracle.com/technetwork/java/javaee/overview/index.html
HTML: http://www.w3.org/html/wg/

jQuery: http://jquery.com/
JSP: http://www.oracle.com/technetwork/java/javaee/jsp/index.html
CSS: http://www.w3.org/Style/CSS/

Collaborators: OOPS!



Ontology input area

Brief description

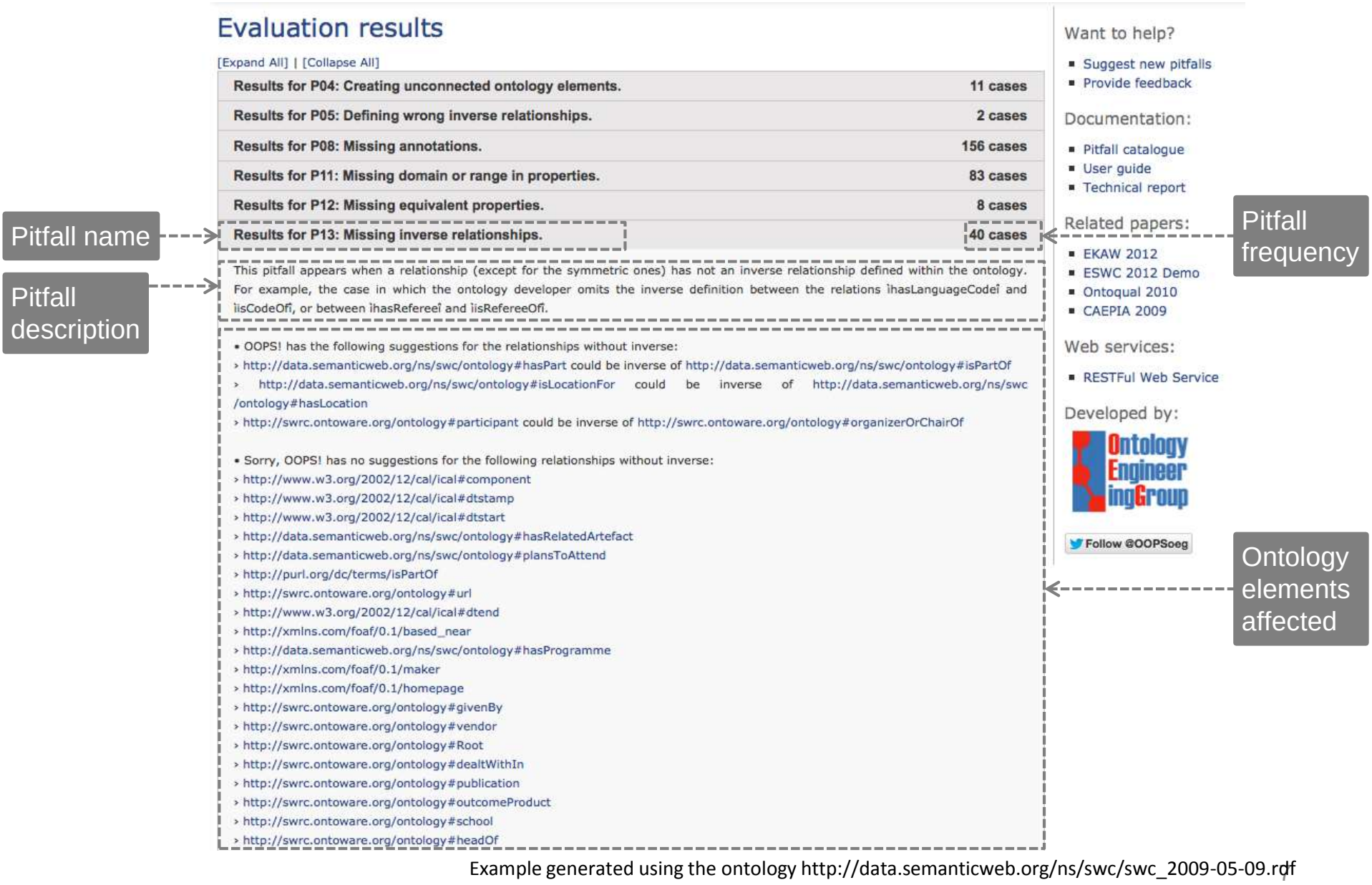
Suggestions & feedback

Documentation

Related papers

Web Services

Collaborators: OOPS!



Example generated using the ontology http://data.semanticweb.org/ns/swc/swc_2009-05-09.rdf

Collaborators: OQuaRE

- OQuaRE is a framework for Ontology Quality Requirements and Evaluation based on ISO/IEC 25000:2005, the standard for Software Quality Requirements and Evaluation. OQuaRE defines intrinsic and extrinsic quality criteria in terms of quality sub-characteristics.

- OQuaRE aims to define all the elements required for ontology evaluation: evaluation support, evaluation process and metrics. The current version of OQuaRE includes, so far, the quality model and the quality metrics:
  1. The quality model is composed of a set of quality characteristics such as structural, functional adequacy, maintainability etc. and its associated sub-characteristics such as reliability, reusability, availability, redundancy, consistency, etc.
  2. The quality metrics have been taken from the state of the art in ontology, such as Depth of subsumption hierarchy, Class Richness, Tangledness etc.

- Complete definition of OQuaRE is available at:

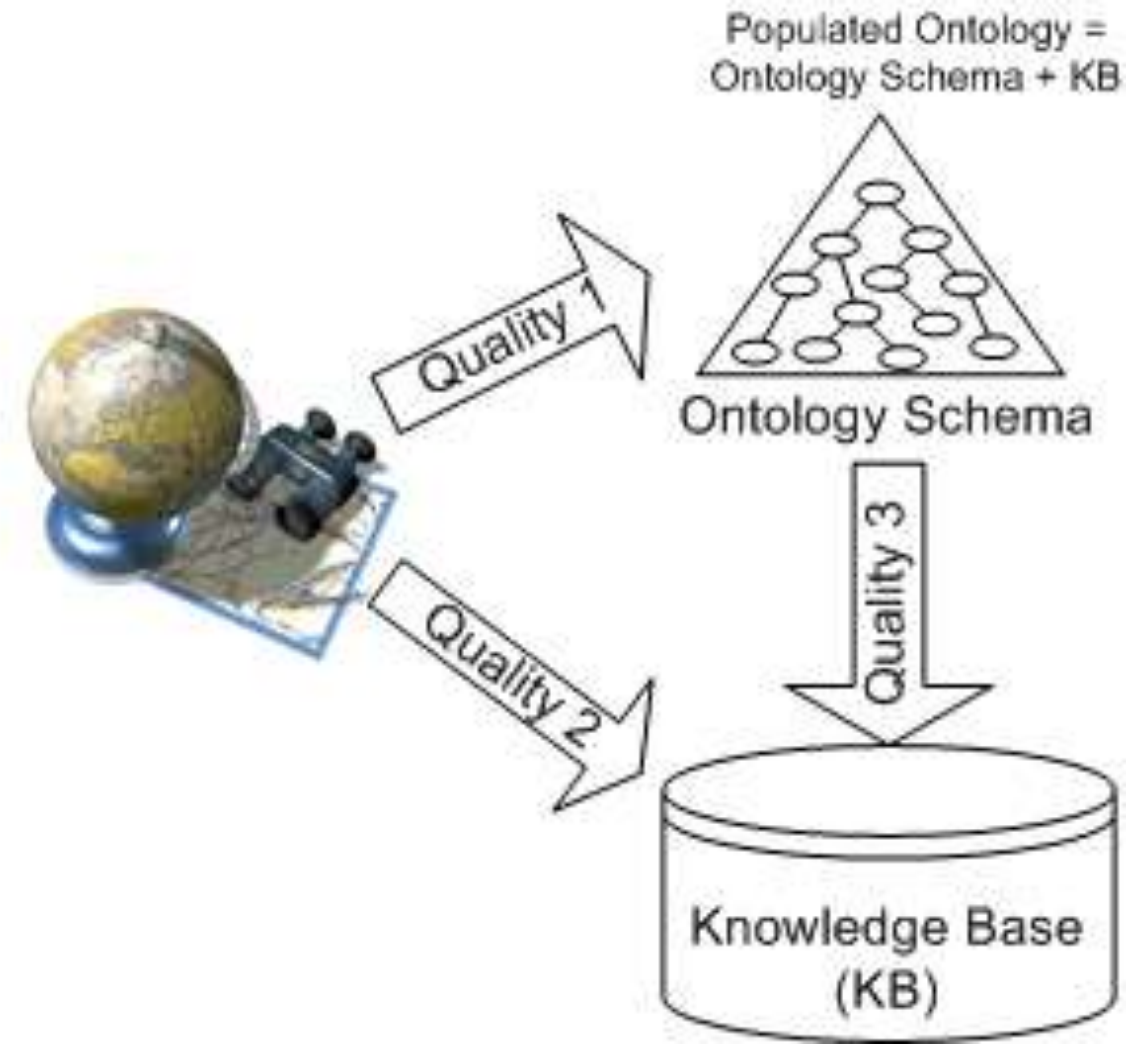
http://miuras.inf.um.es/evaluation/oquare/

and

http://miuras.inf.um.es/oquarewiki/

Collaborators: OQuaRE

Collaborators: OntoQA



Source: "OntoQA: Metric-based ontology quality analysis" (2005), by Samir Tartir , I. Budak Arpinar , Michael Moore , Amit P. Sheth , Boanerges Aleman-meza, IEEE Workshop on Knowledge Acquisition from Distributed, Autonomous, Semantically Heterogeneous Data and Knowledge Sources

Collaborators: OntoQA

- Categorizes the quality of ontologies into three groups:
  1. schema,
  2. knowledgebase (KB)
  3. class metrics.
  - These metrics serve as a means to evaluate the quality of a single ontology or to compare ontologies when more than one candidate fits certain requirements.
- Provides metrics to quantitatively assess the quality in each group.
- A tool for quality analysis and providing experimental results.

Collaborators: OntoQA

- **Schema Metrics**
  - Relationship richness
  - Schema depth (Inheritance Richness)
- **Instance Metrics**
  - Knowledgebase Metrics
    - Class Utilization
    - Class Instance Distribution
    - Cohesion
  - Class-Specific Metrics
    - Class Connectivity (centrality)
    - Class Importance (popularity)
    - Relationship Utilization
  - Relationship-Specific Metrics
    - Relationship Importance (popularity)

- Observation: FIBO does not include any knowledge base components

Ontologies Involved

- Financial Industry Business Ontology
  - Background: What and why
  - Conceptual v Operational Ontology
- FIBO Conceptual Ontologies
  - Business Entities
  - Foundations (supporting terms semantics)
- Operational Ontologies (subject to availability)
  - Business Entity
  - Corporate control / ownership hierarchies
  - Interest Rate Swaps
  - Credit Default Swap?

FIBO Conceptual Ontology Quality Considerations

- Requirements for a “Business” or “Conceptual Model”
  - should not reflect application constraints
  - Should be validated by business domain experts
  - Should be logically consistent and well formed semantically
  - Business meaning also requires:
    - Abstraction / reuse
    - Partitions usage / structure
    - Formal semantic grounding of concepts

- Compromises for Business SME View
  - Use of property restrictions
  - Object property sub-types (functional etc.)
  - Distinguishing the necessary / necessary and sufficient properties of a class
  - Tool Effects
    - Used ODM (UML Profile for OWL) to create business views;
    - UML tooling has some limitations

- FIBO Operational Ontologies
  - Should conform with all application-specific operational quality requirements
  - Should reflect the business semantics in the BCO
  - Should NOT reflect the compromises listed above

Objectives

A: Evaluation of FIBO Business Conceptual ontologies

- Identification of relevant quality metrics and aspects for FIBO Business Conceptual Ontologies
- Use and evaluation of ontology quality tools for the evaluation of FIBO Business Conceptual Ontologies
- Applying these measures to the “FIBO-Business Entities” set of ontologies and its imports from the “FIBO-Foundations” ontologies using the available tools
- Consider how this can inform the formal methodology for FIBO development

B: Operational Ontologies

- Identify the relevant quality measures for a FIBO-derived Operational Ontology
- Apply these to one or more candidate operational ontologies
- Identify how the application use case can be shown to be satisfied by the operational ontology
- See whether this can be formalized in such a way that formal “Conformance Points” can be defined which are of a suitable level of clarity and repeatability to be included in the OMG specification as formal Conformance criteria
- Even if these requirements and tests cannot be formalized, consider what application guidelines can be created around these tools and techniques, to guide users of FIBO in creating robust ontology based applications which conform to their stated user requirements

Objectives / Goals

- Can we define what are the formal requirements for BCO?
- What is the quality of the BCO at present?
  - Checklist of things we should change now
  - Checklist of things we *could* change once SME presentation is achievable for certain OWL constructs
- Operational Ontologies
  - Design requirements (reasoning; OWL dialect etc.)
  - Conformance with BCO semantics
  - Would like to arrive at a set of allowed and disallowed transformations from BCO semantics to operational OWL applications, which can be cited as “Conformant” with FIBO
- Formal OMG Specification Material
  - Conformance section: what is a possible “conformant” implementation of FIBO in operational ontologies
  - Formal, repeatable measures needed for conformance points

Deliverables

- Elements of a formal methodology for development of FIBO Business Conceptual Ontologies
- Elements of a formal methodology for local extension of FIBO BCOs by end users, to create their own ontologies at the same conceptual level
  - (for onward use either in conventional technology model driven development, data integration or the development of operational ontologies for semantic processing)
- Formal conformance points for operational ontologies (new textual material for future versions of the FIBO OMG specifications)
- Notes and “how to” material for developers of semantic technology applications that use FIBO
- Formal Findings on the ontology quality tools

Remarks

- Clinic as a vital first step in development of
  - Formal methodology for FIBO standards development
  - For end users of FIBO in semantic technology-based applications:
    - Conformance points
    - Developer guidance

- The tools and techniques which are applied in this clinic will likely form a part of those formal processes going forward.

- Development lifecycle framed in terms of Tools and Techniques
  - Quality measures
  - Tools for analysis of the ontologies

- What measures can be formalized to the extent needed for formal standards conformance language?

- Do we have the flexibility needed to recognize different styles of ontology / different ontology requirements?

Questions?