

# Ontology Summit 2013

## Hackathon & Clinics

### 13 -14 April 2013

Testing OOPS, OQuaRE and OntoQA  
as examples of tools for Ontology  
Evaluation using FIBO

# Overview

- Description
- Collaborators
- Ontologies involved
- Outcomes

# Objectives

## **Use of an example ontology quality tool for the evaluation of FIBO Business Conceptual Ontologies**

- Identification of relevant quality metrics and aspects for 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

# Hackathon /Clinic 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
- OQuaRE
  - Review the automated quality measures for the stated quality requirements in the OQuaRE Document
- OOPS!
  - Catalog the ontology pitfalls with reference to the FIBO BCO
  - Align with the OQuaRE quality requirements
- OntoQA
  - Identify possible uses of the tool
  - Align with the OQuaRE table of quality requirements

# Participants

- Amanda Vizedom (Independent)
- Astrid Duque Ramos (Universidad de Murcia)
- Bill Freeman (Independent, FIBO)
- Bob Smith (Tall Tree Labs)
- Derek Lasalle (Credit Suisse, FIBO)
- Dennis Wisnosky (EDM Council, FIBO)
- Francesca Quattri (Hong Kong Polytechnic University)
- Jacobus Geluk (Independent, FIBO)
- Kevin Tyson (J P Morgan, FIBO)
- Max Gillmore (ANZ Bank, FIBO)
- Maria Poveda Villalón (Universidad Politécnica de Madrid)
- Mike Dean (Raytheon BBN Technologies)
- Peter Yim (Ontolog; CIM3)
- Samir Tartir (Philadelphia University Jordan)
- Simon Spero (University of North Carolina)
- Todd Schneider (Raytheon)

# Ontologies Involved in this Hackathon

- FIBO Conceptual Ontologies
  - FIBO Business Entities
  - FIBO Foundations (supporting terms semantics)
- Used on the day: a set of 18 draft OWL ontologies from FIBO Foundations, created to support FIBO-BE.

# 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
- FIBO Operational Ontologies
  - Are different from Conceptual Ontologies
  - Should conform with all application-specific operational quality requirements
  - Should reflect the business semantics in the BCO
  - Should NOT reflect the compromises made for business readability

# Day 1: Saturday 13 April

- We had practical demonstrations of all 3 tools – OOPS! OQuaRE and OntoQA on real FIBO OWL ontologies
  - Looked at what measures the tools were showing us.
  - Explored a couple of the metrics in depth.
  - Looked at the OQuaRE table of quality measures and considered some changes and additions.
- Considered additional quality measures
- Discussed potential use of FIBO Archetypes and whether these can be used in ensuring consistency in future iterations of FIBO



# Day 1: Saturday 13 April

- OOPS!
  - Ingested all FIBO foundations ontologies into single OWL ontology for processing
  - List of possible “pitfalls”
  - Analyze for applicability to Conceptual v Operational ontologies
- OQuaRE
  - Ran the measures on 2 or 3 individual ontologies
  - Analyze metrics, applicability
- OntoQA
  - Ran this on the full set of FIBO ontologies
  - Includes measures for Knowledge Base
    - Not applicable but would have applications to test ontologies

# OOPS! Summary screenshot



## Ontology Pitfall Scanner!

**OOPS! (Ontology Pitfall Scanner!)** helps you to detect some of the most common pitfalls appearing when developing ontologies.

To try it, enter a URI or paste an OWL document into the text field above. A list of pitfalls and the elements of your ontology where they appear will be displayed.

Scanner by URI:

Scanner by URI

Example: [http://data.semanticweb.org/ns/swc/swc\\_2009-05-09.rdf](http://data.semanticweb.org/ns/swc/swc_2009-05-09.rdf)

Scanner by direct input:

Scanner by RDF

## Evaluation results

[Expand All] | [Collapse All]

Results for P04: Creating unconnected ontology elements.	5 cases
Results for P08: Missing annotations.	141 cases
Results for P11: Missing domain or range in properties.	57 cases
Results for P13: Missing inverse relationships.	29 cases
Results for P24: Using recursive definition.	1 case
SUGGESTION: symmetric or transitive object properties.	1 case
WARNING: the following classes do not have <code>rdf:type owl:Class</code> or equivalent.	3 cases

References:

- [1] Gómez Pérez, A. "Ontology Evaluation". Handbook on Ontologies, F. Stuck and B. Stuber, Editors, Springer, International

Want to help?

- Suggest new pitfalls
- Provide feedback

Documentation:

- Pitfall catalogue
- User guide
- Technical report

Related papers:

- EKAW 2012
- ESWC 2012 Demo
- Ontoqual 2010
- CAEPIA 2009

# OOPS! example screenshot

oeg-lia3.dia.fi.upm.es/oops/response.jsp#

- > <http://www.w3.org/2004/02/skos/core#exactMatch>
- > <http://www.omg.org/spec/FIBO/Foundations/20130501/AgentsAndPeople/Agents/hasIdentity>
- > <http://www.omg.org/spec/FIBO/Foundations/20130501/Relations/Relations/hasDefinition>
- > <http://www.w3.org/2004/02/skos/core#relatedMatch>
- > <http://www.omg.org/spec/FIBO/Foundations/20130501/Relations/Relations/hasContext>
- > <http://www.omg.org/spec/FIBO/Foundations/20130501/Relations/Relations/isInForceIn>
- > <http://www.omg.org/spec/FIBO/Foundations/20130501/Relations/Relations/isManagedBy>
- > <http://www.omg.org/spec/FIBO/Foundations/20130501/Law/Jurisdiction/hasCommonName>
- > <http://www.omg.org/spec/FIBO/Foundations/20130501/Law/Jurisdiction/hasFullName>
- > <http://www.omg.org/spec/FIBO/Foundations/20130501/Annotations/AnnotationVocabulary/isArchetype>
- > <http://www.omg.org/spec/FIBO/Foundations/20130501/Agreements/Contracts/isAssignable>
- > <http://www.w3.org/2004/02/skos/core#notation>
- > <http://www.omg.org/spec/FIBO/Foundations/20130501/Agreements/Contracts/hasEffectiveDate>

**Tip:** Solving this pitfall may lead to new results for other pitfalls and suggestions. We encourage you to solve all cases when needed and see what else you can get from OOPS!

**Results for P13: Missing inverse relationships.** 29 cases

This pitfall appears when a relationship (except for the symmetric ones) has not an inverse relationship defined within the ontology. For example, the case in which the ontology developer omits the inverse definition between the relations `!hasLanguageCode!` and `!isCodeOf!`, or between `!hasReferee!` and `!isRefereeOf!`.

- This pitfall appears in the following elements:
  - > <http://www.omg.org/spec/FIBO/Foundations/20130501/Relations/Relations/hasContext>
  - > <http://www.omg.org/spec/FIBO/Foundations/20130501/AgentsAndPeople/Agents/hasIdentity>
  - > <http://www.omg.org/spec/FIBO/Foundations/20130501/Agreements/Contracts/hasTerms>
  - > <http://www.omg.org/spec/FIBO/Foundations/20130501/Agreements/Contracts/wasOriginatedBy>
  - > <http://www.omg.org/spec/FIBO/Foundations/20130501/Roles/Roles/hasRole>
  - > <http://www.w3.org/2004/02/skos/core#semanticRelation>
  - > <http://www.omg.org/spec/FIBO/Foundations/20130501/Agreements/Contracts/hasNonBindingTerms>
  - > <http://www.w3.org/2004/02/skos/core#inScheme>
  - > <http://www.omg.org/spec/FIBO/Foundations/20130501/Relations/Relations/comprises>
  - > <http://www.omg.org/spec/FIBO/Foundations/20130501/Relations/Relations/isMandatedBy>
  - > <http://www.omg.org/spec/FIBO/Foundations/20130501/Agreements/Contracts/hasPrincipal>
  - > <http://www.omg.org/spec/FIBO/Foundations/20130501/Relations/Relations/characterizes>
  - > <http://www.omg.org/spec/FIBO/Foundations/20130501/Agreements/Contracts/hasCounterparty>
  - > <http://www.omg.org/spec/FIBO/Foundations/20130501/GoalsAndObjectives/Goals/hasGoal>

# OQuaRE example screenshot

Menu

Model:

Configuration:

URL's ontology:

Results

Model: oquare version: oquare 1.0 = 3,88

- Characteristic: functional adequacy = 3,76
  - Subcharacteristic: reference ontology = 5
    - rronto = 1 (scale05)= 5 (POSITIVE)= 5
    - formaldegree = 5 (scale06)= 5 (POSITIVE)= 5
  - Subcharacteristic: controlled vocabulary = 4
    - anonto = 0,67 (scale05)= 4 (POSITIVE)= 4
  - Subcharacteristic: schema and value reconciliation = 4
    - rronto = 1 (scale05)= 5 (POSITIVE)= 5
    - aronto = 0 (scale05)= 1 (POSITIVE)= 1
    - formaldegree = 5 (scale06)= 5 (POSITIVE)= 5
    - consistency = 5 (scale07)= 5 (POSITIVE)= 5
  - Subcharacteristic: consistent search and query = 4
    - rronto = 1 (scale05)= 5 (POSITIVE)= 5
    - aronto = 0 (scale05)= 1 (POSITIVE)= 1
    - inronto = 1,33 (scale05)= 5 (POSITIVE)= 5
    - anonto = 0,67 (scale05)= 4 (POSITIVE)= 4
    - formaldegree = 5 (scale06)= 5 (POSITIVE)= 5
  - Subcharacteristic: knowledge acquisition = 3,33
    - rronto = 1 (scale05)= 5 (POSITIVE)= 5
    - aronto = 0 (scale05)= 1 (POSITIVE)= 1
    - nomonto = 2,33 (scale01)= 4 (POSITIVE)= 4
  - Subcharacteristic: clustering and similarity = 3
    - rronto = 1 (scale05)= 5 (POSITIVE)= 5
    - aronto = 0 (scale05)= 1 (POSITIVE)= 1

# OntoQA

<b>Total Classes</b>	69
<b>Total Relationships</b>	110
<b>Relationship Richness</b>	76.38
<b>Inheritance Richness</b>	1.7
<b>Tree Balance</b>	0.7
<b>Attribute Richness</b>	1.48

# Day 1: Saturday 13 April

- Brainstorming: new quality measures:
  - Having a suite of SPARQL queries that can be used as regression tests or for test-driven agile development, along with example instance data.
  - The OntoQA tool has some tests that can be applied separately to that test data.
  - The ACE plug-in for Protégé can be used not only to provide business descriptions, but as a good quality measure, with a human in the loop, to test whether some of the assertions in the ontology really mean what we meant them to mean.

# Day 2: Sunday 14 April

- Went through the OQuaRE document
  - <https://docs.google.com/document/d/1ErbZV0IFj890lHFcnYgsw6n93dxub1AamOu9oBnHdOo/edit#heading=h.kqnhdvmz5vq>
- Table shows broad quality requirements along with OQuaRE metrics for each
- Identified applicability of each requirement to Conceptual v Operational ontologies
- Added OOPS! Pitfalls to each entry as appropriate
- Added OntoQA measures as appropriate
- Continued this session on a later call and completed the document

# Outcomes

- Identified elements of a formal methodology for development of FIBO Business Conceptual Ontologies
- Potential to extend the tools for FIBO specific requirements
  - Example: Annotation richness:
    - Assumes that only RDFS annotations would be used
    - FIBO uses SKOS based annotations
    - Would require extensions to both OOPS! and OQuaRE code to cover FIBO SKOS annotations
  - OQuaRE measures can be filtered according to required thresholds / values, which may vary between conceptual and operational ontology
    - Again, code could be written to pre-filter these as needed
- Identified testing methodology ideas, use of measures
- Also discussed validation of non standard FIBO aspects e.g. “Archetypes” (ontology patterns conformance)



# Additional Comments

- The present OMG process involves replacing the large number of single-use object properties with restrictions on a smaller number of object properties
  - We did not see a test that explicitly checks for this
    - Would be ratio of number of restrictions to number of object properties
    - Could be programmed along the same lines as OQuaRE measures
- Also are there measures for the extent to which classes are framed according to “necessary” versus “necessary and sufficient” properties?
- These are quality requirements thrown up by the OMG review process which we did not necessarily see in the Clinic
  - To be reviewed.

# 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?
- We have the flexibility to recognize different styles of ontology / different ontology requirements.

# Thank You!

- Useful Links:

- Clinic Page:

- [http://ontolog.cim3.net/cgi-bin/wiki.pl?OntologySummit2013 Hackathon Clinics FIBO OOPS OQuaRE](http://ontolog.cim3.net/cgi-bin/wiki.pl?OntologySummit2013%20Hackathon%20Clinics%20FIBO%20OOPS%20OQuaRE)

- OQuaRE FIBO Document:

- <https://docs.google.com/document/d/1ErbZV0IFj890IHFcnygsw6n93dxub1AamOu9oBnHdOo/edit#heading=h.kqnhdtvmz5vq>