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Track C: Building Ontologies to Meet Evaluation Criteria

Matthew West and Mike Bennett
Co-Champions

Track Background

- There are two approaches that can be taken to assuring the quality of an ontology:

  1. Measure the quality of the result against the requirements that it should meet.
  2. Use a process or methodology which will ensure the quality of the resultant ontology.

- If you wait to the end of ontology development to measure the quality, the costs of correction of any errors are likely to be high. Therefore using a process or methodology that builds quality into an ontology can have significant benefits. At present, however, it is unclear if there is any process or methodology that, if followed, is sufficient to guarantee the quality of a resulting ontology, and most of those that do exist are relatively informal and tend to require expert support.

- A consideration in evaluating ontologies is the different scenarios in which they are used. For example, one might be used as a formal conceptual model to inform development and another might be used in an ontology based application. Both the evaluation criteria and the development methodologies employed may vary widely.

Track C Mission and Objectives

Mission

To investigate the state of the art in ontology development methodologies, including key achievements and key gaps that currently exist.

Objectives

1. Examine the explicit and implicit methodologies that are known to exist.
2. Understand the role that upper ontologies play in ontology development methodologies.
3. Understand the role of ontological patterns in ontology development methodologies.
4. Identify how to apply the intrinsic and extrinsic aspects of ontology evaluation identified by the other tracks, within the applicable development methodologies.
5. Identifying how to frame the applicable ontology development methodologies within the frameworks of established quality assurance regimes (such as ISO 9000 and CMMI) for industrial applications.

Sessions

- Ontologies come in two main varieties:
  - ontologies for integration
  - ontologies as applications
- We had sessions around methodologies for developing ontologies in each of these scenarios with the aim to establish the differences and similarities in the methodologies found among and between them.
- Session 4 – 7th February 2013
  - **Ontology Development Methodologies for Integrating Ontologies**
- Session 9 – 14th March 2013
  - **Ontology Development Methodologies for Reasoning Ontologies**

1. Ontology Development Methodologies for Integrating Ontologies:

- Key Points
  - Why methodology
    - Genius v methodology
    - Ontology as CIM; which measures apply?
  - Semantic silos, KR, Evidence based ontology development
    - Develop a methodology around this requirement
  - Common upper ontology criteria
    - Metaontological choices;
    - The need to build this into a methodology
  - Defining methods for ontology development
    - Extension of data model development or something different?
    - Precision v Presentation

Observations on (1)

- Quality considerations for ontologies used as conceptual models as distinct from applications
  - Conceptual model as part of systems development methodology
  - Methodological considerations for the development of the ontology itself

- Quality measures that may be applicable to this kind of ontology requirement
  - Consistency
  - Selection criteria for reuse / upper ontologies
  - Choices in the selection of ontologies
  - Grounding of concepts in prior art, established meaning

2. Ontology Development Methodologies for Reasoning Ontologies

- Use of generalized framework(s) for ontology evaluation
  - The role of the use case for evaluating function
  - Business or external utility components
    - Modules that can be individually validated.
    - Utilize for modular development and test.

- Developing Quality Ontologies Used for Reasoning
  - Ontologies are by default intended for reasoning over.
  - Otherwise simpler semantic models should be used.

- Ontology development practices that would lead to greater quality
  - Intrinsic and extrinsic properties apply, and apply across the ontology lifecycle,
  - the ontology development cycle must include a projected architecture as to how it will be used
  - The architecture includes what the reasoning component will consist of, and the language it will use

Observations on (2)

- The development process for an ontology needs to have a number of stages, just like the data model in a traditional information systems development process.
- Similarly requirements need to be identified in levels:
  - the capabilities of the overall system that the ontology is a component of
  - capabilities of the ontology itself in that setting
  - high level requirements, like consistency
  - detailed requirements, like conforming to naming standards.
- The ontology development needs to go through stages to match
  - equivalent to conceptual, logical, and physical data model development in information systems.
- There are architectural decisions to be made in terms of the choices of ontological commitments the ontology needs to make and does make.
- There are choices of ontology language and implementation environment.
- There is little evidence of this in current practice, where ontology development seems to start with someone writing some OWL or CL.

Summary:

- We seemed to have a kaleidoscope of the pieces of a possible methodology
  - But not the methodology itself
  - Some pointers for a framework to develop methodology
  - Methodological elements in the use of upper ontologies
  - Methodological elements in evaluation frameworks, architectural choices for ontology based applications
- Each of the choices described needs to be fitted within the process flow for development of the relevant kind of ontology
  - These may not all fit in to the same process flow as they may apply to different uses of the integrating ontology / conceptual ontology
- Emphasize business SME validation
- **Conclusion:** Validated the need for a formal methodology and identified a lot of the pieces.

Recommendations

- A better understanding of the relationships between requirements at different levels and how low level requirements support higher level requirements

- Ontology development methodologies that align with and recognize similar stages to information systems development with distinct conceptual, logical, and physical stages, so that ontology development does not start at the physical level with the choice of an implementation language

- A clearer understanding of the architecture of ontology development and the different aspects of architecture that are relevant, from ontological commitments to language choices.

Questions

1. Why have an ontology development methodology?

2. What should an ontology development methodology cover?

3. How do you know if an ontology development methodology is delivering?