Ontology Summit 2012Cross
Track A1: Ontology Quality

Co-Champions

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Mission Statement

This cross-track aspect will focus on the evaluation of ontologies within the context of Big Systems applications.

Whether creating, developing, using, reusing, or searching for ontologies for use in big systems, engineers, architects, designers, developers and project owners will encounter questions about ontology evaluation and quality.

How should those questions be answered? How do we know whether an ontology is fit for use in (or on) a large-scale engineered system or a large-scale systems engineering effort?

This cross-track aspect ties together the evaluation-related discussions that arise within the Summit Tracks and individual sessions, providing a context in which to take up and address the issues generally.

Specific focus will evolve with recurring themes, potentially including such topics as ontology quality characteristics, fitness for purpose, requirements, metrics, evaluation methodologies and resources.

Cross Track Activities

- Tracked & gathered ontology quality - related discussions in main tracks
- Looked at existing research into ontology quality related issues
- Cross track speaker session
- Analyzed chat session comments in other sessions which relate to ontology quality
- Synthesized all this into our findings
- Arranging a survey for feedback on these issues

Common Themes

Meaning of "Quality"

- How good is this thing, according to some usage-independent, universal standard? *versus*
- How well does this thing meet the requirements of the intended usage?

Measures of Quality

- Syntactic / structural - formal soundness
  - formal language used correctly
  - interpretation and reasoning according to the logical and set-theoretic foundations built in to the ontology language yield correct results
- Semantic - how to ensure the constructs in the model
  - represent meaningful things
  - represent the things meant

Existing Research

- Formal methods exist for evaluating some aspects of ontology quality
  - Focus is on formalism
  - Ontology design patterns potentially address meaning
- The bulk of the research
  - addresses quality independently of use case
  - assume the ontology is a semantic technology deployment of some sort
- Recent trend
  - greater attention to usage
- Ontologies as a business conceptual artifact
  - are part of quality assurance for some system
  - do not have documented approaches to the quality assurance of these themselves

Speaker Session

- Jennifer Williams (Highfleet Inc.)

  "System requirements and the unobtrusive ontology"
- Nicola Guarino (Laboratory for Applied Ontology)

  "Ontology quality, ontology design patterns and competency questions"
- Aldo Gangemi (Semantic Technology Lab)

  "Ontology Evaluation and Pattern-based Design"
- Amanda Vizedom (Wind River Consulting)

  "Finding or Making Ontology Fit for your Purpose"

Analysis of Other Sessions

- Main points raised:
  - Proof of correctness v fitness for purpose
  - Continual integrity
  - Common sense v formal ontologies
  - Evolution
  - Support for semantic processing functions
  - Completeness
  - Relevance
- Experiences:
  - Very variable experiences in using ontologies
  - Understanding of ontology engineering
  - Conveying to business subject matter experts the intended meaning of a concept
  - Getting business domain folks out of the "Vocabulary" comfort zone
  - Knowing what the ontology is intended to support

Synthesis

- Many of the cases presented for ontology in big systems engineering point to the use of ontology as part of the engineering process, as a conceptual model artifact
  - This is a different ontology requirement to creating semantic tech apps
  - Ontology quality measures in the literature focus less on this use case
  - Ontology design patterns may be applicable in both use cases
  - For many participants, ontology quality measures don't apply when the ontology is itself part of the quality assurance of the big system.
- There is a case for classifying the different ontology quality measures which exist in the literature
  - Quality as in "how good is it?," according to some context-independent standard, is important but does not cover fitness for purpose, or how meaningful it is
  - Other measures aimed at semantic integrity are important
  - So is identifying how the ontology meets its intended purposes for both of the main purposes to which an ontology may be put (and for ontologies which are to be put to both purposes)

Strength and diversity of opinion re: Ontology Quality

- With practical experience often comes
  - strong opinion and Lessons Learned
  - often pro or con some particular, partial ontology feature(s) or method(s)
- Experience does *not* bring
  - consensus in those opinions
  - confidence in repeatability
  - ability to connect lessons to more complete methodology or principles
- Increasing agreement in ontology community
  - different ontology uses may call for somewhat different features, methods, emphases.
- Interpretation: diversity of opinions may reflect diversity in actual needs

Ontology Requirements in a Black Box

- Hope for reusable lessons:
  - understand *how* ontology requirements relate (map?) to different ontology features and methods.
- Want to know about projects:
  - what ontology was done and how
  - how well that worked out (were there quality (management) issues? Consequences?)

  and
  - what were the projects' ontology requirements
- Reviewed, asked, and found:
  - dominant case: ontology requirements unknown
  - questions: *how* to identify ontology requirements
  - problem of unknown relationships between features of usage & ontology features and methods

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→ Problem of unknown **relationships** between
features of usage and
appropriate **ontology features & methods**

Open Questions → Questionnaire

- Initial set of open questions
  - eliciting info about project features, ontology characteristics and methods, quality measures, outcomes
  - Got early feedback from several members
  - Realized that subject would benefit from more structured survey treatment
- Revised, extended and expanded
  - to cover more range of possible scenarios and transitions
  - to create survey structure from which patterns could be more easily discovered
  - to balance potential usefulness of results with length

Conclusions

- Quality as "Fitness for Purpose" is not the same as Quality in the "how (universally) good is this?" sense
  - Techniques given in the literature focus on the latter
  - Need to be able to incorporate these into a more comprehensive quality assurance framework for big systems engineering
- Big systems engineering may incorporate ontologies as:
  - A component of the system
  - Formal definition of the business semantics for the system
  - Both
- A more comprehensive quality assurance framework would start with the use case
  - Identify the required QA techniques for that use case
  - Define the auditable set of processes to implement and enforce
- Need to ensure that the ontology is meaningful as well as consistent and complete

Ongoing: Survey

- Way-finding mission,
  - launching from summit as continuing activity following up on this x-track.
- Hoped-for results
  - pointers toward likely correlations between usage characteristics and ontology features and methods
  - identification of usage characteristics that make a difference to what ontology is needed
  - identification of ontology characteristics and methods that make a difference to the purposes for which ontology is fit.
- Open now! *<link>*