Requirements for Ontologists: Current and Future

Denise A. D. Bedford, Ph.d.
Goodyear Professor of Knowledge Management
Information Architecture and Knowledge Management Program
Kent State University
Kent, OH 44242-0001

‘As-Is’ and ‘To-Be’

- My background over the past five years is enterprise architecture
- Hinda Kada, World Bank Enterprise Architecture from 2003-2007 used as-is and to-be state modeling to define architectures
- Find it very useful to look at issues in this way – because it provides a natural roadmap for moving forward
- In case of ontology work, I think it helps us to compare where we are today with where we need to be tomorrow

Ontologies – As-Is

- The study of being, existence, reality for the purpose of helping machines to understand what people know
  - Challenge: people don't agree on what they know and people know different things about the same entity
- Focus on "ontological encoding" – including defining entities and the classification of those entities
  - Challenge: Engineering approach imposes classical and sometimes one-dimensional approach – top-down and logic oriented
  - Challenge: Transforming existing reference structures to ontological forms rather than developing in context

Ontologies – To-Be

- Focus on ontological descriptions vs. ontological classification
  - Characteristics are broadly defined and not limited to simply classifying the entity itself to one or more classification schemes
  - Multiple characterizations of an entity are possible and important – classification of entities is by context (value, use, etc.)
- Shift to a middle-out or bottom-up approach – practical vs. theoretical approach
  - Practice oriented with growth coming from learning and mapping ontological descriptions of ontologies
  - Focus on those entities that are important to describe ontologically

Competencies for Ontologists

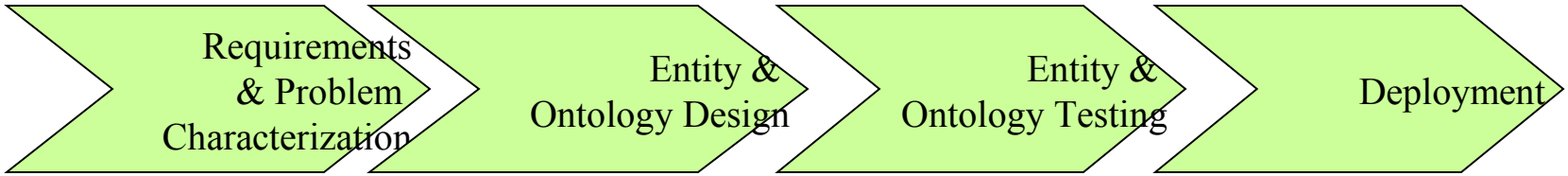
- Today
  - Primary focus on “coding” and back room – largely technical people engaged in ontological engineering
- Future
  - Roles and competencies must expand to bridge between practical context for which the entity has value and the technical context in which it is encoded
  - Skills and competencies expand to include more SME knowledge elicitation, representation, entity modeling and description (less classification)

What do ontologists do?

- What KOS work is within or heading toward formal ontology development?
  - Master data management
  - Business rule development
  - Business semantics and business object development
  - Semantic analysis profiling of entity attributes

- What types of projects do ontologists work on?
  - Turn the normal argument a bit inside out
  - “Ontology-light” work is being done anywhere entities are being defined or coded, anywhere logic is being applied to entities
  - Some of the “Ontology light” work is important to supplementing entity description and characterization

Ontological Workflow



- What is the context?
- What is the problem?
- What entities are relevant?
- What actions or decisions are performed on the entity?
- How does a person make the decision?
- Are there existing entity characterizations/?
- Will one characterization work or is this a complex Characterization?

- Define attributes
- Define context
- Define behavior & business rules
- Translate rules into formal logic
- Define relationships to other entities
- Develop conceptual model
- Construct conceptual model
- Desk check concept. models
- Encode/construct physical model

- In context testing –
  - Known rules, context, content
  - entity focused
  - instance focused
- Out of context testing
- Refine models
- Document limitations
- Formalize ontology description

- Establish governance Process and rules
- Establish change mgmt. process
- Store ontology
- Publish ontology

For Whom Do Ontologists Work?

- Typically, within organizations you will find people doing “ontology-like” work in for:
  - Data Services
  - Data Quality
  - Application Support (particularly business process management, business rule development)
  - Enterprise Architecture (business architecture,
  - Master Data Management

- Ontologists work for all types of organizations, all sectors of economy – but primarily wherever business decisions and business information quality are important to the organization

What do Ontologists Need to Know (Competencies)?

1. Need to understand the business context – domain knowledge, process behaviors, how people make decisions and how they think about entities
2. Knowledge elicitation techniques and methods
3. Existing domain KOS, warrants, gaps, deficiencies and common KOS data structures
4. Modeling and methods of description and characterization
5. Need to understand basic encoding structures
6. Basic logic and inference structures
7. Need to understand risk management and tolerance – what is acceptable fault rate and what is unacceptable
8. Standard application development and testing methods

What do Ontologists Need to Know (Skills)?

1. Communication and listening skills
2. Patience (working through design is iterative process)
3. Attitude - ability to leave ego at home
4. Balanced right and left brain – art and science of ontology
5. Service orientation – know when design and product are good enough
6. Collaborative – ability to develop ontology to point and then hand it off to others to improve

Where do Ontologists Learn?

- Need a new interdisciplinary context – one that promotes what I would characterize as knowledge architecting and knowledge engineering (old concept)
  - Where domain experts can learn the architecture and engineering side
  - Where architects and engineers can learn the business side
  - Where architects can learn how to capture, publish, test and use existing ontologies and to build the "upper" ontologies from the bottom up or middle out
- If this is to become a formal discipline, there need to be academic credentials supporting it – new departments, new curricula

What Do Employers Know?

- Depends on the context
  - Business semantics and master data management probably the best informed
- Most common expectation is likely modeling capabilities
- Least common expectation:
  - Knowledge elicitation and representation capabilities (most critical in my opinion)
  - Domain knowledge (SME backbround, engineering not sufficient)

How Are Ontologists Selected?

- Modeling and coding skills – why most work does not progress in a sustainable way
- What is sustainable is the essential characterization and description – anyone can encode anything
- Need to focus more on the process – where no process exists, though, there is no basis for evaluating candidate's fitness

Thank You!

Denise A. D. Bedford, Ph.d.
Goodyear Professor of Knowledge Management
Information Architecture and Knowledge Management
Kent State University
Kent, OH 44242-0001
dbedfor3@kent.edu, db233@georgetown.edu,
dbedford@utk.edu