Documenting and evaluating ODPs

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Overview

- ODP Quality Model goals and overview
- Usability qualities and indicators
  - Documentation indicators
  - Model indicators
- Quality indicators affecting reasoning performance
- Trade-offs
Organising Quality

- Functional requirement fulfilment vs non-functional qualities
- Immeasurable vs measurable qualities
- Generic qualities vs context-dependent qualities
  - Context affects importance
  - Context affects indicators
- Sub- and super-qualities
Quality Model Goals

- To provide a perspective on how quality can be understood in an ODP context.
- To provide a list of qualities and indicators contributing to those qualities for experts and non-experts evaluating ODPs for use.
- To illustrate trade-offs (i.e., where the same or similar indicators contribute to different qualities in different directions).
- **NOT** to be the authoritative source of everything to do with ODP quality – not exhaustive listing, and only partially evaluated.
ODP Quality Metamodell

Team Skill

Usage Context

Ontology Use

Dev. & Use Environment

importance of

Indicator contributes to quality

Indicator affected by

Quality Characteristic

Quality Indicator

Directionality

Scale

Recommenination

Method

subquality of

importance of

importance of

importance of

importance of
Top-level Qualities

• Functional suitability
• Usability *
• Maintainability
• Compatibility
• Resulting performance efficiency *

For full listing including subqualities, see chapter 4 in Gangemi, Hitzler, Janowicz, Krisnadhi, Presutti (Eds), *Ontology Engineering with Ontology Design Patterns: Foundations and Applications*, iOS Press, 2016 (forthcoming)
Documentation Effects on ODP Usability Qualities

• Indicators contributing to Appropriateness recognisability
  – Presence of documentation text
  – Competency questions count
  – Example usage
  – Illustration of ODP structure

• Indicators contributing to Learnability
  – Same as above plus:
  – Documentation minimalism (possibly)
  – Example illustration of ODP in use
Model Indicator Effects on ODP Usability Qualities

• Indicators contributing to *Learnability*
  – Annotation ratio
  – Property domain/range restrictions ratio
  – Size (recommendation: 3-5 classes and corresponding properties)
  – Anonymous class count (restrictions help understand class use w/o leaving class view in tooling)
  – Class/property ratio (multiple ways of interconnecting entities adds complexity)
  – Minimalism (claim nothing more than really required)
  – Subsumption hierarchy structure (depth, breadth, tangledness)

• Indicators contributing to *Operability*
  – All of the above plus Transitive Import Closure
Measuring Usability Effects

• Functionality questionnaires with timing
  – “How many of these CQ:s can the ODP fulfil?”
  – Measure both correctness of answers and time taken.

• Modification task timing
  – “Update this ontology to also support these new CQs!”
  – Measure correctness of solution and time taken.

• These methods can also be used in the measurement of maintainability qualities.
Model Indicator Effects on Performance Efficiency

• First and foremost: **OWL 2 profile adherence**
• Then, some indicators contributing to decreased reasoning performance:
  – RDF graph structures (class out-degree, in-degree, cyclomatic complexity)
  – Anonymous class count and property domain/range restrictions
  – Spurious nary relations
  – Depth and tangledness of subsumption hierarchy
Tradeoffs

- Learnability vs performance (i.e., “How explicit should I be about how my properties and classes are to be used?”)
- Learnability vs reusability (the risk of possible ontological over-commitment)
- Operability vs interoperability (the transitive import closure problem)
Ontology Quality Refs. (1)

- $O^2$ and oQual
Ontology Quality Refs. (2)

• OntoClean

• Gómez-Pérez et al