Documenting and evaluating ODPs

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2016-10-17

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).

- <u>NOT</u> to be the authoritative source of everything to do with ODP quality – not exhaustive listing, and only partially evaluated

ODP Quality Metamodel
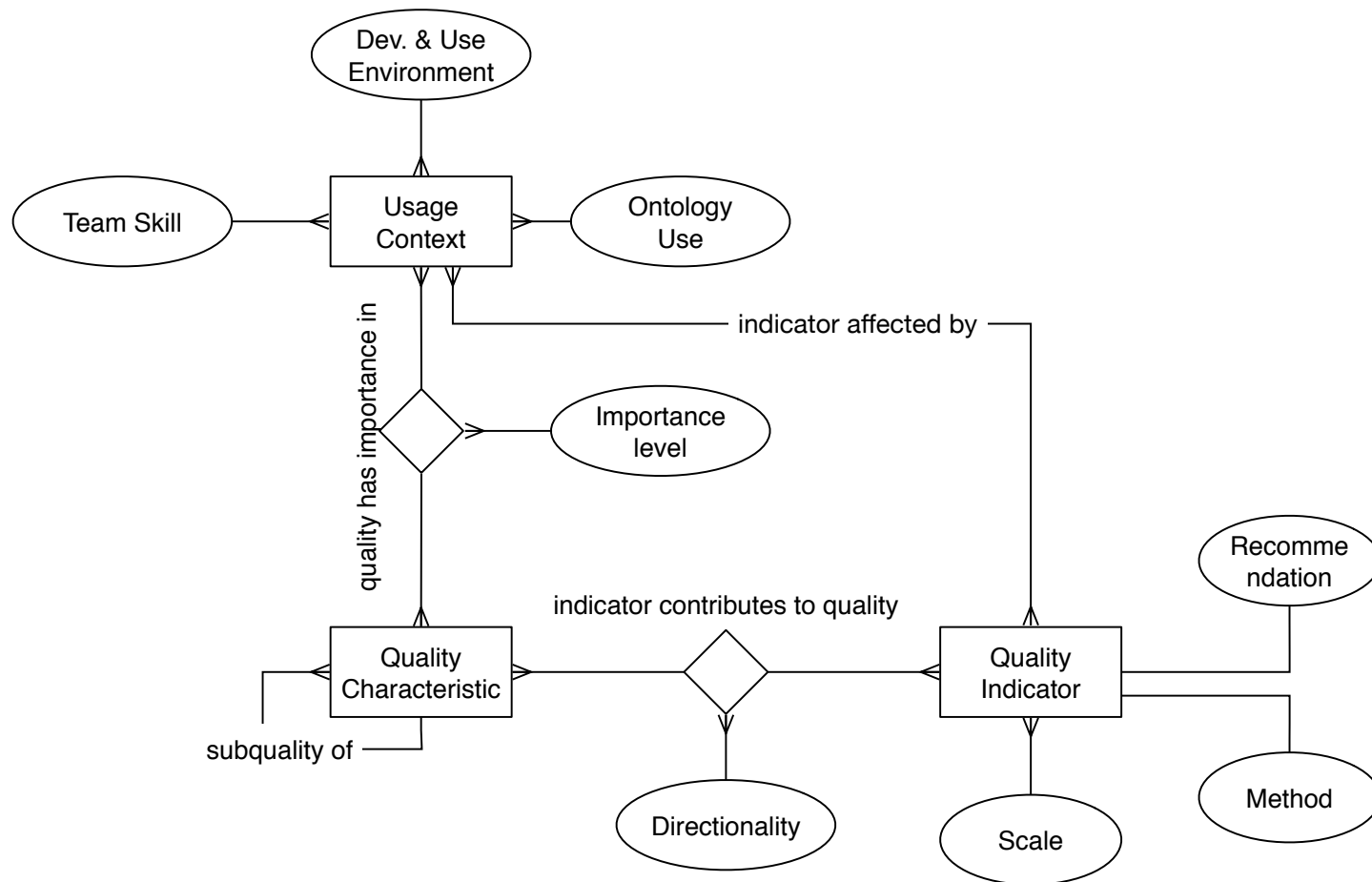
Top-level Qualities

- 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
  - A. Gangemi, C. Catenacci, M. Ciaramita, and J. Lehmann. Modelling On- tology Evaluation and Validation. In The Semantic Web: Research and Applications, pages 140–154. Springer, 2006.
  - A. Gangemi, C. Catenacci, M. Ciaramita, J. Lehmann, R. Gil, F. Bolici, and O. Strignano. Ontology evaluation and validation. Technical report, Laboratory for Applied Ontology, ISTC-CNR, 2005.

Ontology Quality Refs. (2)

- OntoClean
  - N. Guarino and C. Welty. Evaluating Ontological Decisions with OntoClean. Communications of the ACM, 45(2):61–65, 2002.
  - N. Guarino and C. A. Welty. An Overview of OntoClean. In Handbook on Ontologies, pages 201–220. Springer, 2009.

- Gómez-Pérez et al
  - A. Gómez-Pérez, M. Fernandez-Lopez, and O. Corcho. Ontological Engineering. Springer-Verlag, London, Berlin, 2004.
  - A. Lozano-Tello and A. Gómez-Pérez. ONTOMETRIC: A Method to Choose the Appropriate Ontology. Journal of Database Management, 2(15):1–18, 2004.

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