Ontology Summit 2011: Making the Case for Ontology

Track 3: Value Metrics, Value Models & the Value Proposition

Ontology Performance
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Raytheon
Ontology Performance

- How Much/Well does the Ontology or Related Semantic Technologies Improve or Impede Performance?
- How much does the Cost of Ontology Performance Affect the Value Proposition?
- How Well Can we Measure this?

GOAL

Analyze Ontology Technology to better understand the performance impact on systems in multiple domains from the viewpoints of the Developer and End User.
Ontology Performance: GQM Model

- Using GQM to determine what to look at

The GQM Paradigm

**Conceptual Level**
Measurement goals involve products, processes and/or resources

**Operational Level**
Questions try to characterize the object of measurement in the context of a quality issue from a particular viewpoint

**Quantitative Level**
Associated with every question is a set of data, either subjective or objective, that helps provide a quantitative answer

- Goal 1
  - Q1
  - Q2
  - Q3
  - M1
  - M2
  - M3

- Goal 2
  - Q4
  - Q5
  - M4
  - M5
  - M6

Source: Derived from Basili, Caldiera, and Rombach, "The Goal Question Metric Approach", 1990
Ontology Performance: GQM Applied

Conceptual Level

Analyze Ontology Technology to better understand the performance impact on systems from the viewpoints of the Developer and End User

Operational Level

Can performance improvement be gained?  Can performance be negatively impacted?  How much does the Cost of Ontology Performance Affect the Value Proposition?

Quantitative Level

M1  M2  M3  M4  M5  M6  M7  M8  M9
Ontology Performance: Notional Measures

- Can performance improvement be gained?
  - M1: Cycle Times
  - M2: Storage Needs
  - M3: Functional Effectiveness / Correctness
  - M4: Ontology Quality (Frequency of Defects)
  - M5: Ontology Maturity (Breath of Model, Validation History)

- Can performance be negatively impacted?
  - M1: Cycle Times
  - M2: Storage Needs
  - M3: Functional Effectiveness / Correctness
  - M4: Ontology Quality (Frequency of Defects)
  - M5: Ontology Maturity (Breath of Model, Validation History)

- How much does the Cost of Ontology Performance Affect the Value Proposition?
  - M6: Cost of Ontology Design & Development
  - M7: Cost of Ontology Implementation & Operation
  - M8: Cost of Ontology Validation
  - M9: ROI
Ontology Performance: Notional Radar

Ontology Performance Measures
Notional Quantitative Approach

M1: Cycle Times

M2: Storage Needs

M3: Functional Effectiveness / Correctness

M4: Ontology Quality (Frequency of Defects)

M5: Ontology Maturity (Breath of Model, Validation History)

Sample / Desired

High Range □ Low Range
Ontology Performance: Notional Radar

Ontology Performance Cost Measures
Notional Quantitative Approach

M6: Cost of Ontology Design & Development

M7: Cost of Ontology Implementation & Operation

M8: Cost of Ontology Validation

M9: ROI

Sample / Desired

High Range □ Low Range
Ontology Performance - Qualitative

- How Well Can we Measure? Tailor Qualitative from specific factors.

<table>
<thead>
<tr>
<th>Magnitude</th>
<th>Ct Technical Factor</th>
<th>Cc Cost Factor</th>
<th>Cs Schedule Factor</th>
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<tbody>
<tr>
<td>1, Low</td>
<td>Meets requirements or minimal consequence</td>
<td>Budget estimates not exceeded, some money transfer required</td>
<td>Negligible impact, slight increase covered by available slack</td>
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<td>3, Minor</td>
<td>Small reduction in performance</td>
<td>Cost estimates exceed budget by 1 to 5%</td>
<td>Minor slip in schedule (less than 1 month)</td>
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<td>5, Moderate</td>
<td>Some reduction in performance</td>
<td>Cost estimates exceed budget by 5 to 20%</td>
<td>Small slip in schedule (1 to 3 months)</td>
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<td>Significant reduction in performance</td>
<td>Cost estimates exceed budget by 20 to 50%</td>
<td>Schedule slip in excess of 3 months</td>
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<td>9, High</td>
<td>Technical goals cannot be achieved</td>
<td>Cost estimates increased in excess of 50%</td>
<td>Large schedule slip</td>
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Ontology Performance - Qualitative

How Well Can we Measure? Tailor Qualitative from specific factors.

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<tr>
<td>M1: Cycle Times</td>
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<td>7</td>
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<td>M2: Storage Needs</td>
<td>25</td>
<td>32</td>
<td>37</td>
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<td>M3: Functional Effectiveness / Correctness</td>
<td>100</td>
<td>93</td>
<td>87</td>
<td>81</td>
<td>75</td>
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<tr>
<td>M4: Ontology Quality (Frequency of Defects)</td>
<td>5</td>
<td>9</td>
<td>11</td>
<td>13</td>
<td>15</td>
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<tr>
<td>M5: Ontology Maturity (Breath of Model, Validation History)</td>
<td>100</td>
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Ontology Performance

Summary

- Ontology Performance measurement, like other measurements, can be developed using the GQM model
- May discover measurements in one area overlaps other areas
- ‘Goodness’ of measures are subjective, but you can develop a scheme to support qualitative assessments
- Area of opportunity for more research