Organization Analysis with Protégé

Towards “Living” Theorizing?

by Vladimir Diatlov for
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Attempt of Organization Analysis

- Review of organization studies to create ontology structure
  - Processes, structures and boundaries framework (Pettigrew et al. 2000)
  - Interdependence as a denominator for organization context
- Populating ontology with empirical data
- Protégé for leveraging of knowledge of organisation studies domain
  - Maps and relations among concepts – easier reframing and new connections
  - New angles – new ideas
- Protégé as an R&D tool rather than an application to edit a stable ontology
Empirical Case: Data Collection and Generation

- Documentary Analysis (intensive, Intranet, 700 pages of raw data)
- Structured Interviews (25, 1 hour on average)
- Observation (branch work, physical structure, visual tools like wall with project management documentation)
- Participation (work with information systems)
- Talks, context study, notices…
- Process and obstacles:
  - Information requirements and interpretation
  - Get all information needed while access is active
  - Preparation for interviews
From Literature Review: Organisation Context and IT

<table>
<thead>
<tr>
<th>Processes</th>
<th>Structures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institutionalization processes and IT</td>
<td>Social structure</td>
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<tr>
<td><em>Isomorphism and imitation</em></td>
<td>– Routines</td>
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<tr>
<td><em>Strategising</em></td>
<td>– Norms</td>
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<td>Decision-making</td>
<td>– Rules</td>
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<td><em>Integration</em></td>
<td>– Controls</td>
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<td>Communication</td>
<td>– Relations</td>
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<td><em>Coordination</em></td>
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<td>Collaboration and teamwork</td>
<td><strong>Work Organisation through information lens:</strong></td>
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<tr>
<td>Learning</td>
<td>– Authority Hierarchy</td>
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<tr>
<td>Culture</td>
<td>– Information Access</td>
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<tr>
<td><em>Power</em></td>
<td></td>
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<tr>
<td><em>Structuration</em></td>
<td><strong>IT Function</strong></td>
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<tr>
<td><em>Interpretation</em></td>
<td>– Application routines</td>
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<td><em>Sensemaking</em></td>
<td>– Reliability routines</td>
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<td>Information processing</td>
<td>– Learning and training routines</td>
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<td><strong>Information and knowledge management</strong></td>
<td>– Innovation routines</td>
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<td>– Evaluation routines</td>
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<td></td>
<td>– Controls</td>
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<td>– Relations among immediate and adjacent co-workers for:</td>
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<td></td>
<td>– IT support</td>
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<td></td>
<td>– Teamwork</td>
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<td></td>
<td>– Workflow (specialization)</td>
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</tbody>
</table>

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Ontology of Organization Elements

- Using Protégé “knowledge acquisition” and object-oriented ontology building software
- A Semantic Web development from Stanford University
- Becomes recognized standard in ontology building
Ontology of Organization Elements (graph)
## Ontology Descriptive Statistics

**What Does It Say?**

### Entered entities, mostly dependencies

<table>
<thead>
<tr>
<th>Summary</th>
<th>System</th>
<th>Included</th>
<th>Direct</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classes</td>
<td>14</td>
<td>29</td>
<td>43</td>
<td>86</td>
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<tr>
<td>Slots</td>
<td>33</td>
<td>19</td>
<td>8</td>
<td>60</td>
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<tr>
<td>Facets</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Instances</td>
<td>0</td>
<td>5</td>
<td>950</td>
<td>955</td>
</tr>
<tr>
<td>Frames</td>
<td>59</td>
<td>53</td>
<td>1001</td>
<td>1113</td>
</tr>
</tbody>
</table>

### Degree of interdependence in described structure: entity has X references and referred by Y times

### Characteristics per entity/dependence

### Per object like "employee" or "unit-unit task relation"
Protégé Facilities for Theorizing

- Parent-child relations – for concept decomposition
- Multiple inheritance – for linking concepts (:Norm and :Symbol are elements of structure and cultural processes both)
- Reconfiguration of facets, when attaching a slot to various frames (down to class hierarchy)
- Abstract classes – for auxiliary and root concepts
- Meta-classes – for properties of concept *per se*, not instances
- Self-reflexivity for processes: a class is also an *individual* of itself with own slots/properties – “power points/increases itself”
Use of Facilities. Design and Modelling Choices

- Creating ontology means design choices
- No “grand” over-loaded classes for complex concepts
  - Interdependence as a conceptual link – meta-class (plan)
  - Interdependence as a root concept – abstract class (also “structure,” “task,” or “transaction”)
  - Interdependence as a task relation among workers, a concrete link – class/subclasses as types
  - Interdependence as a reified link – subclass of:RELATION
  - Interdependence as a link enacted in particular real context – instance
- Slots with subclasses of :Structure are used for description of subclasses of :Process
- Reified relations: special classes, not slots
- When create ontology or model – TRACE CHOICES, heuristics and conventions!!!
Example: Task and Authority Interdependence

- Interdependence as a root concept (analysis versatility and multiplicity): “Each relation like employee-unit, unit-unit or business process ownership contributes to various interdependence patterns to interpret.”

- Example of research-valuable conclusion: “high amount of enacted interdependencies for business processes definition for core IS replacement initiative highlights its political quality.”
“Living Theorizing?”

- **Dynamism**
  - Dynamic networks of concepts that could be visualized (TVizGraph plug-in)

- **Versatility and multiplicity**
  - Ease of data restructuring or just reframing how one would look at it
  - Keeping track of meanings and their juxtapositions behind a model demands significant knowledge of domain (organization theory)

- **Visibility**
  - Traditional “research models” may take decades of text pages to describe
Ontology-based Research?

- Concept of ontology is traditionally used to delineate “what” is studied in philosophy, social sciences, and organization studies
  - Independent reality, factors, constraints – objectification, visibility, positivism
  - Socially constructed multiple reality – every ontology is only one possible view on knowledge domain – dynamism, versatility, multiplicity, interpretivism

- Ontology as a research method like case study, ethnography or survey

- Validity of ontology-based representation – procedures of data entry and modelling choices are important (“framework from literature,” “data from documents and interviews”)
Data Leveraging

- Reusing ontology-based data – high
  - Data is structured

- Sharing ontology-based data – low?
  - Every ontology is based upon complicated, contextual and “tacit” knowledge – difficult to re-make sense from outside

- Standardized ontologies for transfer of empirical data – within a project or well-established standards are needed

- Technological issues
  - Weak query engine - Protégé Axiom Language (PAL Queries and EZPal tabs), Formal Concept Analysis, F-logic and Prolog are yet complicated for an end-user. What about functionality of SQL?
  - Export and import of structured but non-ontological data, like tables
Knowledge Acquisition?

- Being a “knowledge acquisition tool” or “knowledge base editing system” could encounter a critique

- Knowledge models and metaphors:
  - Object (Simon 1981)
  - Process (Weick 1995) and pattern (Snowden 2002)
  - Interpretation (Winograd and Flores 1986)
  - Relationship (Dilthey 1976)

- Contemporary approach to knowledge as a process poses it as socially recurrently constructed and context-bounded – inextricable

- Nevertheless “knowledge model”/architecture of Protégé is advanced and interestingly fits with theories of knowledge. See theorizing versatility and use of facilities above

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Paradigms, interpretative schemes or just languages (?) of computer scientists and “soft” scientists, including business school researchers

Translation is needed for the parties to recognize value, validity and applications. Some examples:
- Ontology: same word, variety of established meanings
- User requirements versus organisational context
- Intelligence for web/systems, metadata exchange versus corporate information management (broad and human)
- Knowledge management...what does it mean for parties?

Generic issue for research assisted with software, Semantic Web developments or elements of intelligence like automatic reasoning
Examples from Ontology: Interdependence Analysis

Author will readily address your personal enquiry on ontology details at v.v.diatlov@soton.ac.uk as examples are based on sensitive data.