Semantic EPC: Enhancing Process Modeling Using Ontologies

Dr. Oliver Thomas, Michael Fellmann
Agenda

1. Motivation
2. Framework for the semantic annotation of business process models
3. Ontology development
4. Use cases, benefit
5. Conclusion
Semi-formal business process models

Characteristics

- Easy to model
- Pretty close to natural language
Problems of semi-formal business process models

Company A

- Order received
  - Process order
    - XOR
      - Order is OK
      - Order is rejected

Company B

- Receipt of order
  - Process customer order
    - XOR
      - Order accepted
      - Order declined

→ Ambiguity, lack of clearly defined semantics
→ Not machine interpretable, therefore hard to query, compare, validate and transform other than manually
Semantic annotation of business process models

Framework

Conception
- Ontologies
- Metadata
- Models

Representation
- OWL
- RDF
- XML
Semantic annotation of business process models

Framework

Conception

 Ontologies
 Metadata
 Models

Representation

 OWL
 RDF
 XML
Towards a core Ontology for sBPM

Resources

- **Ontologies**
  - Domain specific
    - Enterprise Ontology
    - TOVE
    - BMO
    ...  
  - General purpose (upper) ontologies
    - CyC
    - SUMO
    - WordNet
    ...  
- **BPM languages and -methods**
  - BPMN
  - ARIS/EPC
  - UML Activity Diagram
  ...  

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**Problems of ontology merging**

- Contradicting definitions
- Highly interdependent definitions
- Different methods such as top-down, bottom-up or middle-out result in different conceptualizations
- Heterogeneous ontology languages
- Lack of authority, relevance

→ **Merging of all relevant ontologies will not be beneficial**

→ **Filtering and selection of concepts is needed**
How to find relevant classes and instances?

BPM languages and existing models as a source

→ Classes can be extracted from languages, instances from models
How to find relevant classes and instances?

BPM languages and existing models as a source

→ Classes can be extracted from languages, instances from models
# How to find relevant views (Categories)

## Analysis of methods and frameworks

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<th>Function</th>
<th>Data or Information</th>
<th>Resource</th>
<th>Process or Behavior</th>
<th>Goal or Strategy</th>
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## Selected views (top-level Categories) for the SBPM-Ontology

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Semantic annotation of business process models

Framework

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Benefits
Querying with Inference

“Which function depends on which rule?”

SPARQL-Query

```
PREFIX s: <http://semantic-business.org/2007/02/sepc#>
SELECT ?func ?rule
WHERE
   ?rule rdf:type s:Rule }
```

→ New facts that are not contained in the original model can be inferred
Benefits

Further examples

- **Validation using Rules (e.g. SWRL)**
  - Integration of rules in the ontology for advanced reasoning and validation
  - Example: A car rental company wants to introduce the following rule:
    "Each process model in which the function 'rent sportscar' occurs, there must be a
    subsequent function 'check age > 25'".

  ➔ *Validation on the semantic level*

- **Semantic standardization of models**
  - Consistent usage of terminology provides better understanding spanning enterprises
  - Reduced effort of transformation in executable models

- **Enhanced process modeling environments are possible**
  - Display of context information using reasoning, e.g. products or organizational units
  - Suggestions on how to avoid semantic errors

  ➔ *Potential benefits regarding querying, validation, modeling and transformation*
Some obstacles and Problems...

- **Increased modeling effort**
  - Knowledge and skills regarding semantics
  - Selection of instances for annotation during model creation
  - Complexity of the ontology must be hidden

- **Dynamics, changes of the ontology**
  - Who is responsible for the process modeling ontology?
  - How can ontology evolution be handled?
  - Ontology evolution must be community-driven
...and a possible solution: Semantic collaborative BPM
Aspects

Scenario

- Model process using a standard tool and language.
- Import of the process model in a wiki-like environment.
- Process-Annotation as a collaborative effort.

→ Collaborative tools may solve some of the problems
Conclusion

- **Our contribution**
  - Framework for the semantic annotation of business process models
  - Core ontology for business process annotation

- **Future research directions**
  - IT-support for the semantic annotation of business process models
  - Use cases
Thank you for your attention!