



TECHNISCHE
UNIVERSITÄT
WIEN
Vienna University of Technology

Towards Automated Process and Workflow Management: A Feasibility Study on Tool-Supported and Automated Engineering Process Modeling Approaches

Dietmar Winkler

Michaela Schönbauer

Stefan Biffi

TU Vienna, Institute of Software Technology
CDL-Flex, Vienna, Austria

<http://cdl.ifs.tuwien.ac.at>

Motivation & Goals

Motivation:

- Different process approaches in heterogeneous engineering and multi-disciplinary environments.
- Vision: Process definition support towards automation-supported process management.

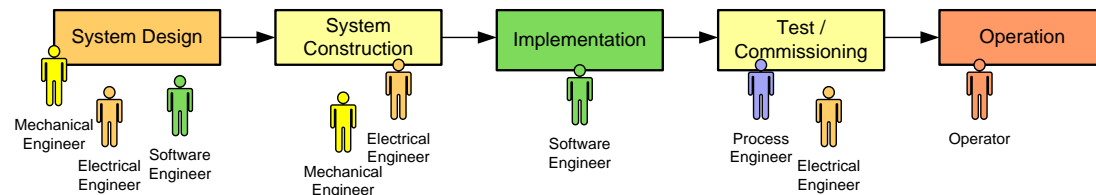
Key research questions focus on:

- Identify best-practice BPMN modelling tools to support efficient model definition and reuse.

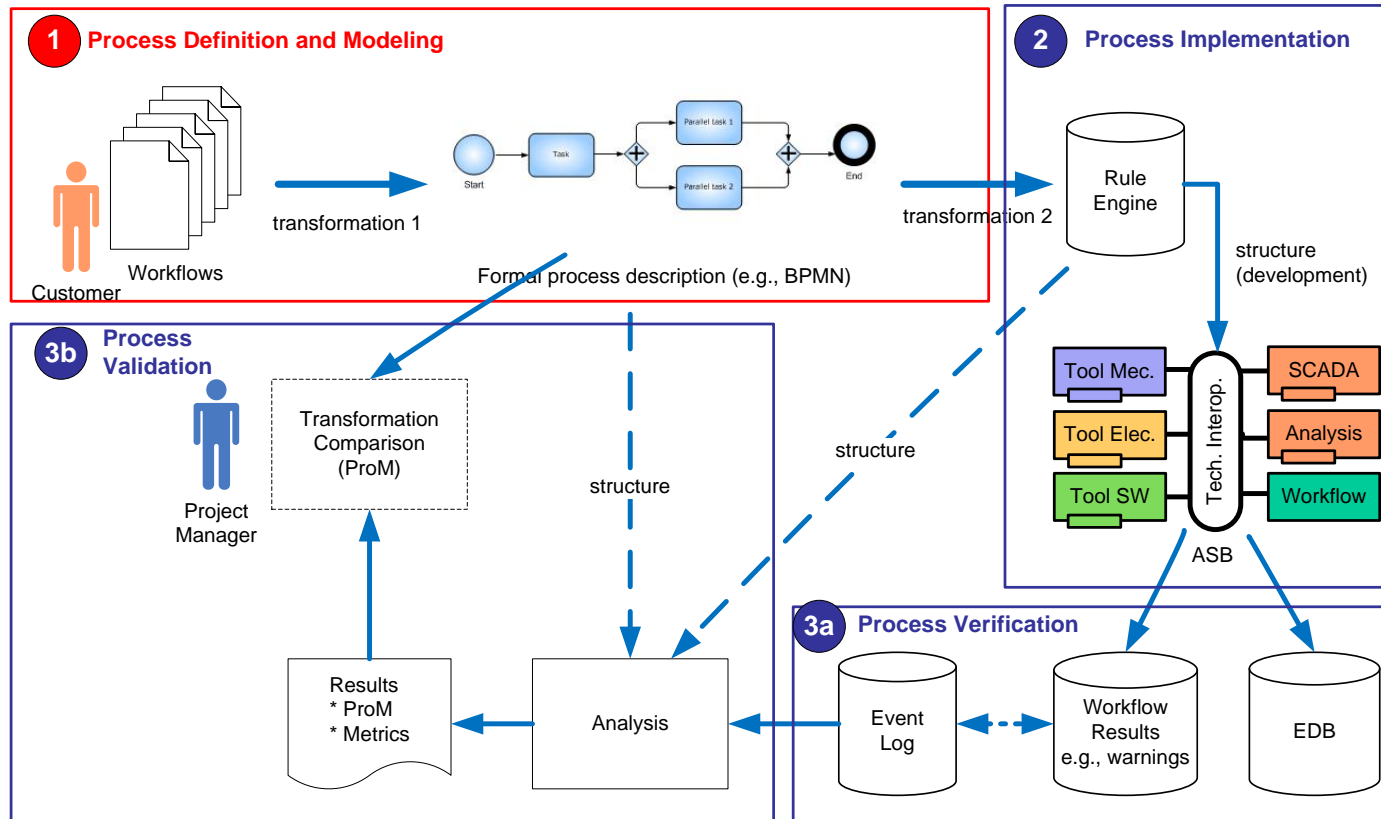


Goals of the paper:

- Process approach for systematic (BPMN) tool evaluation.
- Identification of BPMN tools that support automated process definition.



Vision: Towards Automated Process and Workflow Management



- Process Definition and Modeling (Step 1) → Focus of this paper
- Automation Supported Process Implementation (Step 2)
- Process Verification (Step 3a)
- Process Validation (Step 3b)

BPMN Tool Support & Research Issues



- **BPMN is a well-established approach for business modeling**
 - Readable for Non-Process Experts (various disciplines are involved).
 - Formal definition could enable a transition from process definitions to process implementations (candidate for process automation).
 - Vendor-specific tool support for BPMN modeling (is it a limitation?)
 - Interoperability of different tools (data exchange)?
 - Ability to enable automation-supported workflow implementation in ASE* & ASB** context?

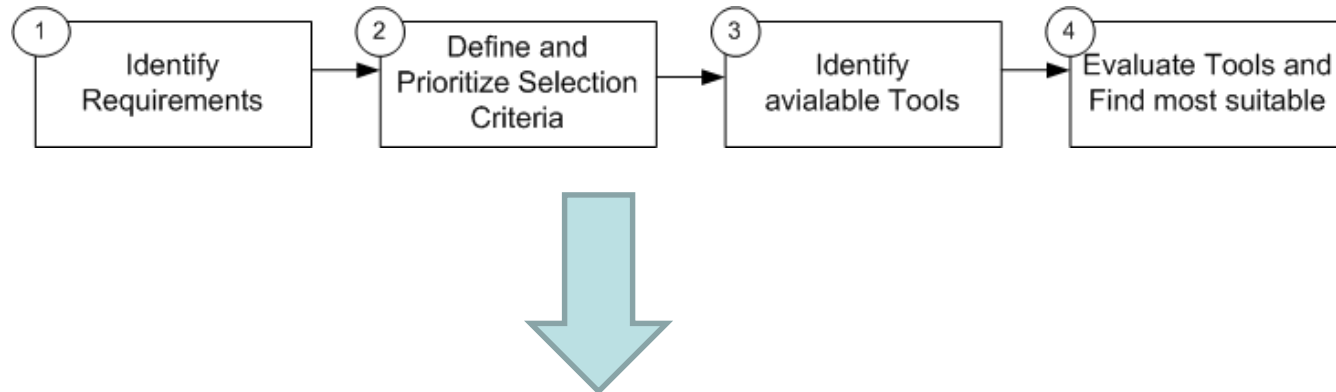
- **Research Issues:**
 - What are the **requirements** for tools to automate workflow definition steps in ASE projects?
 - **Tool Evaluation Process:** How can candidate BPMN tools be evaluated efficiently?
 - To which extent do the identified tools support the **definition of executable processes and workflows?**

*ASE: Automation Systems Engineering, e.g., Hydro Power Plants and Steel mills

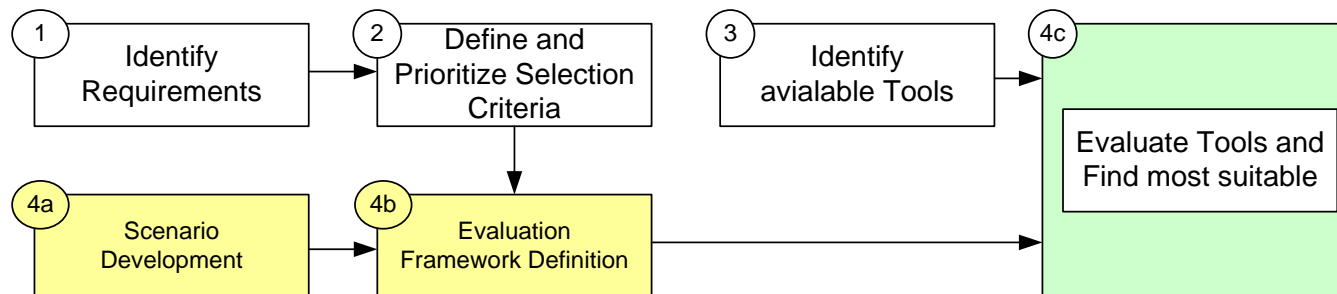
** Automation Service Bus: Middleware collaboration platform for distributed and heterogeneous engineering environments, <http://cdl.ifs.tuwien.ac.at>

Tool Evaluation Process

- Based on Tool Evaluation Process by Poston *et al.*, 1992.



- Adapted Tool Evaluation Process for BPMN Tool Evaluation:



*Poston R.M., Sexton MP.: "Evaluating and selecting testing tools", In: *IEEE Software*, 9(3), pp. 33-42, 1992.

Step 1: Identification of Requirements

- Based on related work and workshops with industry partners and ASB developers.
- EasyWinWin* process approach.
- Classification of requirements and related weights of requirements:
 - Critical requirements
 - Important requirements
 - Less important
 - Nice-to-have features

Step 2: Definition and Prioritization of Selection Criteria.

- Definition of success-critical requirements (based on requirements classes).

Step 3: Identification of available tools for BPMN Support

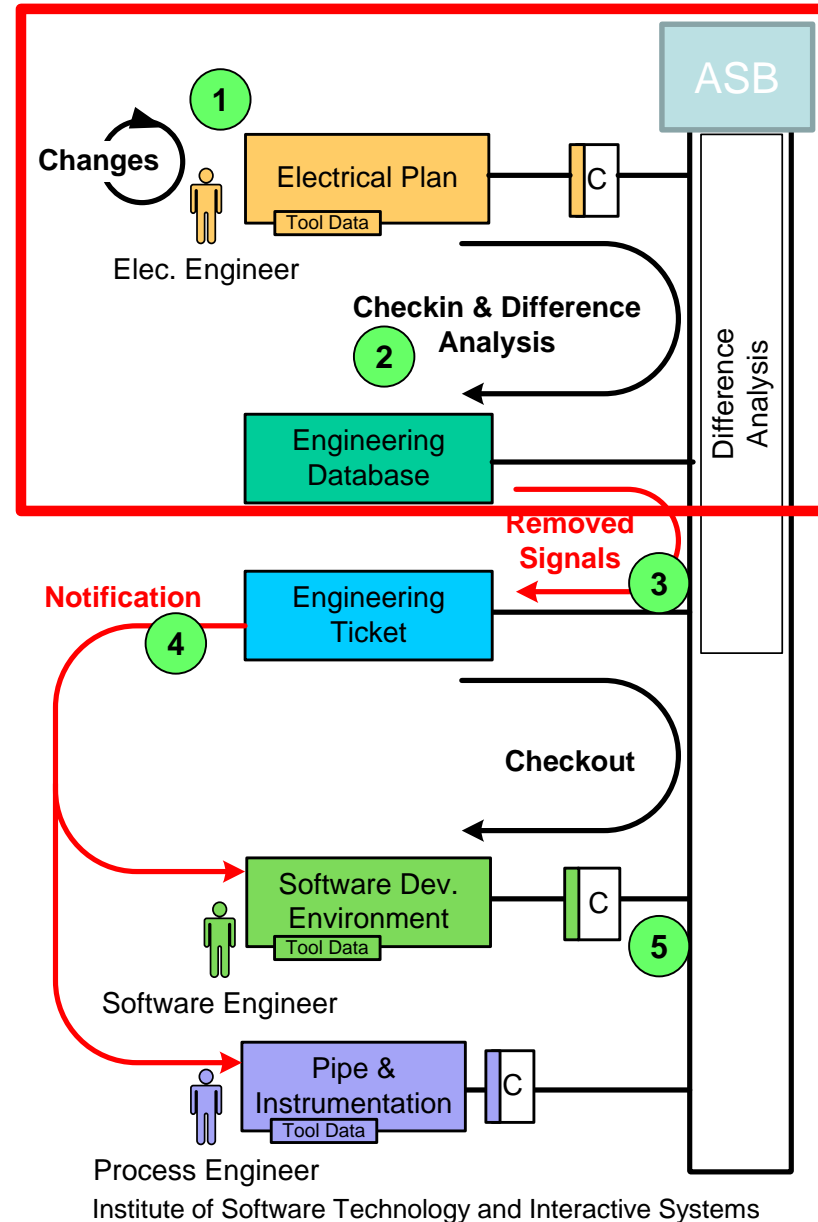
- Based on existing work** and tool search (→76 candidate tools identified).

*Boehm B., Grünbacher P., and Briggs R.: "Easy-WinWin: A Groupware-Supported Methodology for Requirements Negotiation", In: *Proc. of ICSE*, 2001.

**Object Management Group (OMG): <http://www.bpmn.org>

Scenario Development (Step 4a)

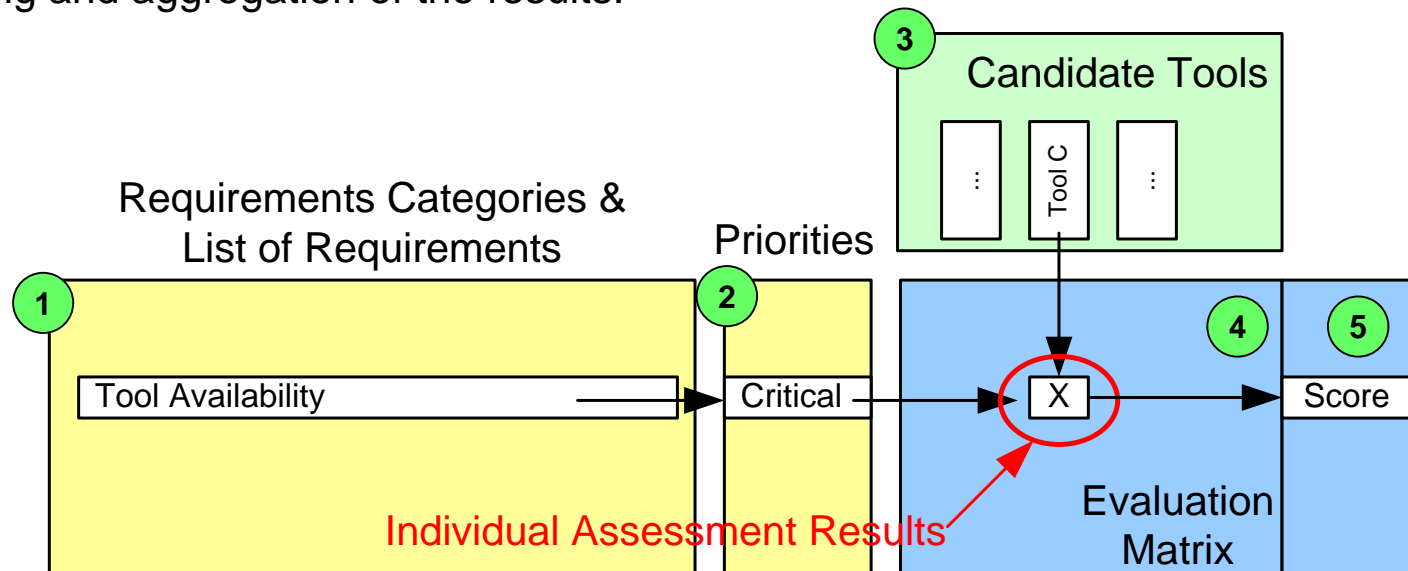
- Typical scenarios and use cases can help to identify strengths and weaknesses of tools under investigation.
- Selection of a critical use case from industry partners, i.e., **signal change management**.
 - Hydro Power Plant Applications.
 - List of Signals as main outcome (of individual tools) that have to be synchronized.
- **Main Steps of Change Management:**
 1. Execute change in local tools.
 2. Difference analysis.
 3. Identify change and generate an Engineering Ticket.
 4. Notify related stakeholders.
 5. Checkout.



Evaluation Framework Definition (4b) and Execution (4c)

Definition of an Evaluation Framework*

1. List of Classified Requirement
2. Requirements Priorities
3. Candidate Tools (according to tool selection criteria)
4. Evaluation results: Scenario Execution and Assessment.
5. Scoring and aggregation of the results.



*Winkler D., Biffi S., Kaltenbach A.: "Evaluating Tools that Support Pair Programming in a Distributed Engineering Environment", In: Proc. of EASE, Keele, Great Britain, 2010

Case Study: Requirements and Selection Criteria

- 39 Identified requirements with focus on
 - ...
 - Export Functionality and Interoperability between different tools.
 - BPMS Activity Support (on example for automation supported process implementation).
 - Process Simulation Capability.
 - ...
- 5 (13%) Critical Requirements (Selection Criteria for Tool Pre-Selection)

Requirement Category	Requirements		No of Critical Requirements
	No	%	
General Requirements	4	10%	1
BPMN 2.0 Support	1	3%	1
Export Functionality and Interoperability	9	23%	1
Usability	11	28%	1
BPMS Activiti Support	2	5%	0
Process Simulation Capability	12	31%	1
Total	39	100%	5 (13%)

Case Study: Tool Selection

- Initially 76 Candidate Tools.
- Application of Selection Criteria

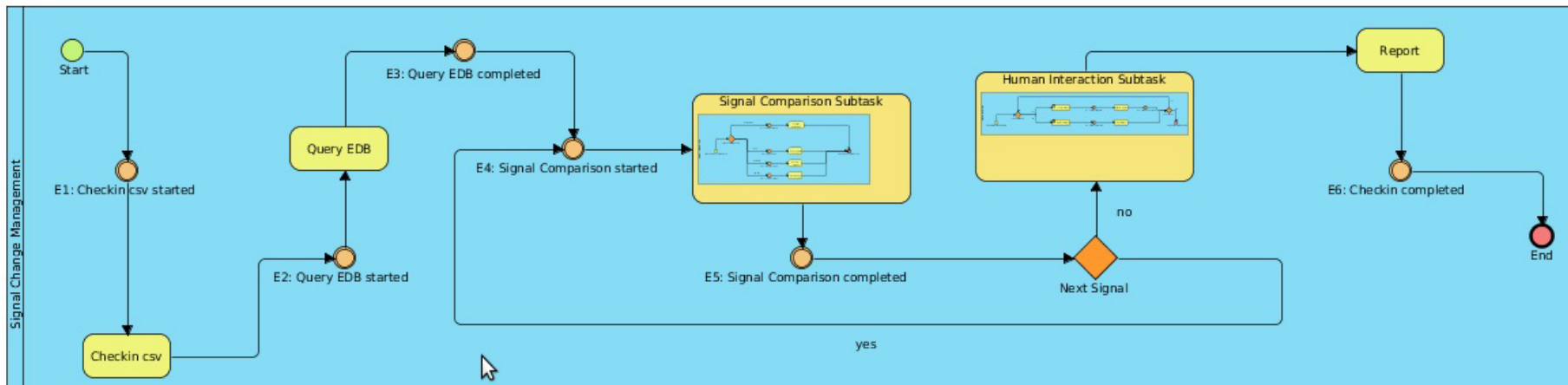
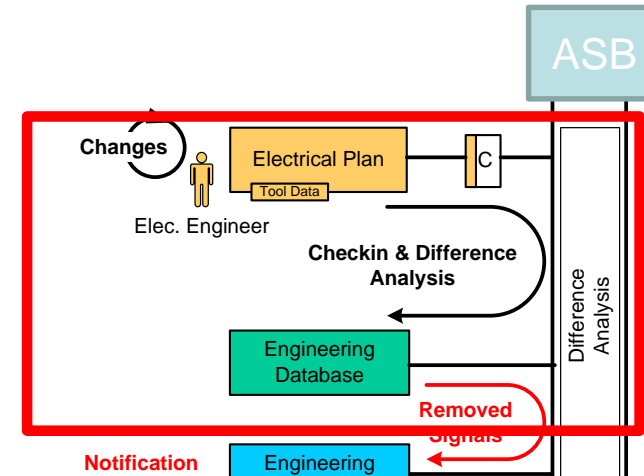
Requirement Category	Individual Critical Requirement
General Requirements	Availability for Testing Purpose
BPMN 2.0 Support	Support of the BPMN 2.0 standard
Export Functionality and Interoperability	Export model in xml that can enable interoperability with other tools.
Usability	Tool installation performance
BPMS Activiti Support	-
Simulation Support	Offering UI for specifying simulation parameters and executing a simulation

- 8 remaining tools for in-depth evaluation.

Tool	Tool
1. Abacus	5. iGrafx Process
2. AccuProcess Modeler	6. inubit BPM Suite
3. Agilian	7. Logizian
4. Bonita BPM Suite	8. Signavio Process Editor

Case Study: Evaluation Scenario

- Signal Change Management Process
 - Tool Specific data (e.g., Engineering Plans) Export (CSV)
 - Engineering Database
 - Automated comparison / classification of changes
 - User Input: Accept/Reject changes
 - Synchronization of the Engineering Database



Case Study Results

- Tool application based on the defined scenario, i.e., the change management process.
- Snapshot of the results of selected requirements.

Selection Criteria			Logizian		Agilian		Signavio		Bonita BPM Suite		iGrafx Process		inubit BPM Suite		AccuProcess Modeler		Abacus	
General Requirements	Priority/Weight		Rate	Score	Rate	Score	Rate	Score	Rate	Score	Rate	Score	Rate	Score	Rate	Score	Rate	Score
BPMN 2.0 Support																		
Support of the actual BPMN 2.0 standard	C	10,0	80%	8,0	80%	8,0	70%	7,0	40%	4,0	75%	7,5	70%	7,0	30%	3,0	50%	5,0
Export Functionality and Interoperability																		
Export of a xml based file that may allow exchange with other tools is possible (.bpmn, .xml, .xpd)	C	10,0	100%	10,0	100%	10,0	100%	10,0	100%	10,0	100%	10,0	100%	10,0	50%	5,0	100%	10,0
Import of xml based files from other tools is possible	H	7,0	50%	3,5	50%	3,5	70%	4,9	70%	4,9	80%	5,6	0%	0,0	0%	0,0	0%	0,0
Output of the tool can be imported in other tools	H	7,0	50%	3,5	50%	3,5	30%	2,1	50%	3,5	30%	2,1	20%	1,4	0%	0,0	-	-
Simulation Support																		
Offering UI for specifying simulation parameters and for executing a simulation	C	10,0	100%	10,0	100%	10,0	100%	10,0	100%	10,0	100%	10,0	100%	10,0	100%	10,0	0%	0,0
Number of process instances for simulation can be specified	H	7,0	100%	7,0	100%	7,0	0%	0,0	100%	7,0	100%	7,0	100%	7,0	100%	7,0	0%	0,0
Usability																		
Getting started with the tool (installation, etc.) is easy and fast (< 20min)	C	10,0	100%	10,0	100%	10,0	100%	10,0	100%	10,0	100%	10,0	100%	10,0	100%	10,0	100%	10,0
Business process diagrams can be created without any specific previous knowledge (except of the BPMN itself)	H	7,0	100%	7,0	100%	7,0	100%	7,0	100%	7,0	100%	7,0	100%	7,0	100%	7,0	50%	3,5
Activiti Compatibility																		

Details and the full evaluation results are available at:

Schönbauer M., Winkler D.: 'A Feasibility Study on Tool-Supported and Automated Business Process Modeling Approaches', Technical Report No.: IFS-CDL-14-02, TU Vienna, March 2014, Online available at: <http://qse.ifs.tuwien.ac.at/publication/IFS-CDL-14-02.pdf>.

Case Study: Summarized Results & Limitations



- **Share of requirements coverage** (per category) based on the weighted assessment results.

Rank	Tool	Score
1	Logizian	89%
2	Agilian	87%
3	Signavio Process Editor	80%
4	Bonita BPM Suite	78%
5	iGrafx Process	76%
6	inubit BPM Suite	70%
7	AccuProcess Modeler	62%
8	Abacus	37%

- The results showed **strengths and weaknesses** and can be the starting point for further development of tools towards automated process management.
- **Limitations:**
 - Requirements and Scenarios are based on real-world settings.
 - Tool selection focuses on available tools (i.e., OSS, test versions), excluding commercial tools from the current evaluation.
 - Data collection is based on subjective assessment that needs to be revisited to increase evidence.

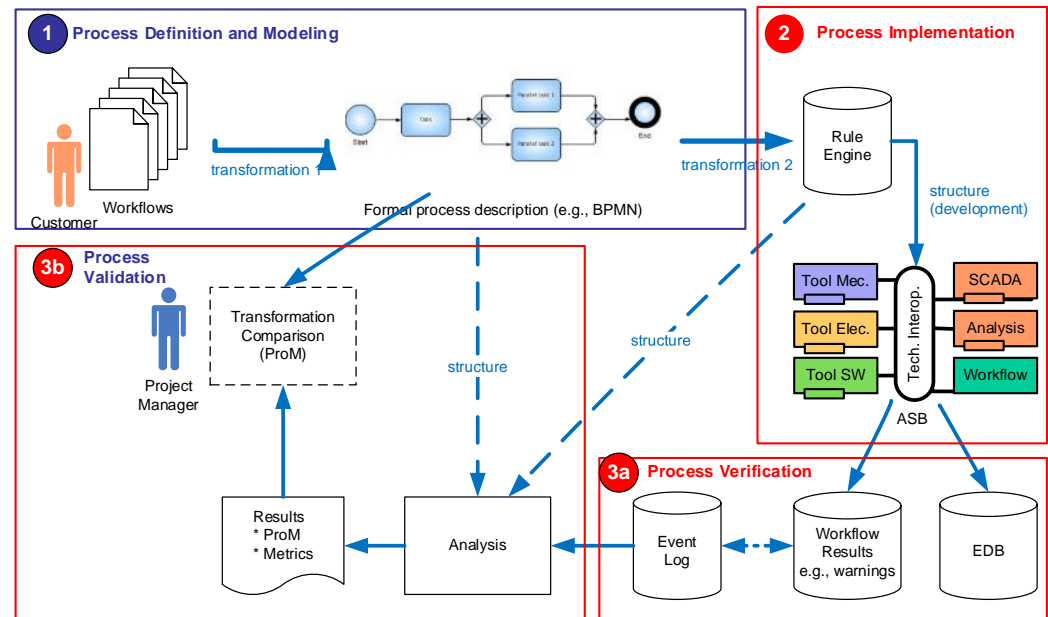
Summary & Future Work

Summary

- BPMN Tools can support engineers and non-experts in efficiently capturing workflows and processes.
- The tool evaluation framework provide systematic support for tool evaluation.
- Results can support tool vendors in improvement their tools and practitioners in selecting the most valuable tool for their purposes.

Future Work

- Refinement of the tool evaluation study (additional tools and requirements).
- Elaborating on automation-supported generation of workflow implementation (execution, verification, and validation).



Thank you ...



**Towards Automated Process and Workflow Management:
A Feasibility Study on Tool-Supported and Automated Engineering
Process Modeling Approaches**

Dietmar Winkler, Michaela Schönbauer, Stefan Biffel

TU Vienna, Institute of Software Technology, CDL-Flex, Austria

Dietmar.Winkler@tuwien.ac.at