





- Business processes are often the starting point for software development
- Business processes define requirements for the software systems to be designed

BUT: No mechanism or formal notion is available for linking business processes with software systems

THE GOAL: Extending existing BPMLs with missing concepts and notations















Metamodel – BP Context Perspective





Languages

Goals Variabilities

Results of the Evaluation



	Functional	Behavioural	Informational	Organisational	BP Context
UML 2 AD	+	+	+	~	2
EPC	+	+	~	~	~
BPMN	+	+	~	~	~
IDEF3	+	+	~	-	~
Petri Nets	+	+	-	-	-
RAD	+	+	~	~	~
	3				
	Legend:	 + fully supported ~ partially supported 			W1T 10























- Variability models are not integrated into an modelling framework like the Unified Modeling Language (UML).
- Variability models have also an impact on processes.
 Variabilities can change the process flow, e.g.
 - in a car engine manufacturing process the decision if the variability manufacture a diesel engine or a petrol engine is chosen, changes the process flow.





The UML profile for variability models ...

Goals

- ... can be easily created, presented and edited with existing UML modelling tools.
- represents variability requirements to software developers or process engineers in a well-known modelling languages.
- and its shown dependencies onto activity diagrams visualizes the relationship between structural and behavioural models.



Examples of Variability Dependencies



Variability Dependency	Multiplicity	Generalisation Set	Class Diagram	UML Profile
Mandatory	1	{complete, disjoint}	Door Lock {c, d} Fingerprint Eye- Scanner	V Door Lock [11] V Fingerprint Eye-Scanner
Alternative	01	{incomplete, disjoint}	Color of Car {i, d} Red Blue	VP Color of Car [01] V Red V Blue
Alternative	1*	{complete, overlapping}	calendar entry	V Calendar- Entry [1*] V ToDo-List
Optional	0*	{incomplete, overlapping}	operating system Image: Algorithm of the system Image: Algorithm of the system	V V Windows V V V V Mac OS X

Dependency between Variability Models and Business Processes



- Variability models show the different variabilities of a software.
- Activity Diagrams are a part of the behavioural set of UML 2 diagrams
 - show the control and data flow between different tasks.
- The two modelling techniques describe the complementary views
 - variability model describes the structural view and the activity diagram the behavioural view.

Showing the dependency between these metamodels to examine in which way they are related to each other.

Languages

Goals Variabilities















Publications



- Birgit Korherr and Beate List: A UML 2 Profile for Variability Models and their Dependency to Business Processes. 1st International Workshop on Enterprise Information Systems Engineering (WEISE 07), September 2007, Regensburg, Germany, IEEE Press, 2007.
- Birgit Korherr and Beate List: Extending the EPC and the BPMN with Business Process Goals and Performance Measures. 9th International Conference on Enterprise Information Systems (ICEIS 07), June 2007, Madeira, Portugal, ACM Press, 2007.
- Birgit Korherr and Beate List: Extending the EPC with Performance Measures (short paper). Proceedings of the 22nd ACM Symposium on Applied Computing (SAC'07), Seoul, Korea, March 11-15, ACM Press, 2007.
- Birgit Korherr and Beate List: Extending the UML 2 Activity Diagram with Business Process Goals and Performance Measures and the Mapping to BPEL. 2nd International Workshop on Best Practices of UML (BP-UML'06) at the 25th International Converence on Conceptual Modeling (ER'06), November 2006, Tucson, Arizona, USA, 2006, Spinger Verlag, Lecture Notes in Computer Science.
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- Beate List and Birgit Korherr: An Evaluation of Conceptual Business Process Modelling Languages. Proceedings of the 21st ACM Symposium on Applied Computing (SAC'06), April 2006, Dijon, France, ACM Press, 2006.
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- Veronika Stefanov, Beate List and Birgit Korherr: Extending UML 2 Activity Diagrams with Business Intelligence Objects. Proceedings of the 7th International Conference on Data Warehousing and Knowledge Discovery (DaWaK 2005), August 2005, Copenhagen, Denmark, Springer Verlag, Lecture Notes

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- [Jacobson 95]: Jacobson, I., Ericson, M., Jacobson, A.: The **Object Advantage - Business Process Reengineering** with Object Technology. ACM Press, Addison-Wesley Publishing, 1995.
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Later BPMLs: Functional & Behavioural P.



Languages Perspectives	AD	BPDM	BPMN	EPC	
Functional Perspective					
Activity	-/+	-/+	-/+	+/+	
SubProcess	+/+	+/+	+/+	- / +	
Atomic Activity	+/+	+/+	+/+	- / +	
Behavioural Perspective					
Control Flow	- / +	- / +	+/+	+/+	
AND Split	+/+	+/+	+/+	+/+	
AND Join	+/+	+/+	+/+	+/+	
XOR Split	+/+	+/+	+/+	+/+	
XOR Join	+/+	+/+	+/+	+/+	
OR Split	+/+	+/+	+/+	+/+	
OR Join	+/+	+/+	+/+	+/+	
N-out-of-M Join	- / -	- / -	- / +	- / -	



Earlier BPMLs: Functional & Behavioural P.



Languages Perspectives	IDEF3	Petri Nets	RAD			
Functional Perspective						
Activity	+ / +	- / -	+ / +			
SubProcess	- / +	- / +	- / +			
Atomic Activity	- / +	+ / +	- / +			
Behavioural Perspective	Behavioural Perspective					
Control Flow	+ / +	+ / +	- / +			
AND Split	+ / +	- / +	+ / +			
AND Join	+ / +	- / +	+ / +			
XOR Split	+ / +	- / +	- / +			
XOR Join	+ / +	- / +	- / +			
OR Split	+ / +	- / -	- / +			
OR Join	+ / +	- / -	- / +			
N-out-of-M Join	- / -	- / -	- / -			

Later BPMLs: Informational P.



Languages Perspectives	AD	BPDM	BPMN	EPC
Informational Perspective				
Event	+/+	+/+	+/+	+/+
Resource	- / +	- / -	- / -	- / -
Data Flow	- / +	- / +	+/+	+/+
Information Ressource	- / +	- / -	- / -	- / -
Data Repository	+/+	- / +	- / -	-/-
Data Object	- / +	- / +	+/+	- / -
Database Table	- / +	- / -	- / -	+/+
Software	- / +	- / -	- / -	- / -
Traditional Resource	- / +	- / -	- / -	+/+



Earlier BPMLs: Informational P.



Languages Perspectives	IDEF3	Petri Nets	RAD
Informational Perspective			
Event	- / -	- / -	+/+
Resource	+/+	- / -	+/+
Data Flow	- / -	- / -	- / +
Information Ressource	- / -	- / -	- / +
Data Repository	- / -	- / -	- / +
Data Object	- / -	- / -	- / +
Database Table	- / -	- / -	- / +
Software	-/-	- / -	- / +
Traditional Resource	- / +	- / -	- / +



Later BPMLs: Organisational P.



Languages Perspectives	AD	BPDM	BPMN	EPC
Organisational Perspectiv	/e			
Process Participant	+/+	+/+	+/+	- / -
external	+/+	- / +	- / +	- / -
internal	+/+	- / +	- / +	+/+
Human	- / +	- / +	- / +	+/+
Organisational Unit	- / +	+/+	- / +	+/+
Role	- / +	+/+	- / +	+/+
Software	- / +	+/+	- / +	- / -



Earlier BPMLs: Organisational P.



Languages Perspectives	IDEF3	Petri Nets	RAD
Organisational Perspectiv	е		
Process Participant	- / -	- / -	+/+
external	- / -	- / -	- / +
internal	- / -	- / -	- / +
Human	- / -	- / -	- / +
Organisational Unit	- / -	- / -	- / +
Role	- / -	- / -	- / +
Software	- / -	- / -	- / +



Later BPMLs: Business Process Context P.



Languages Perspectives	AD	BPDM	BPMN	EPC		
Business Context Perspective						
Business Process	- / +	- / +	-/+	- / +		
Core Process	- / -	- / -	-/-	- / -		
Support Process	- / -	- / -	- / -	- / -		
Management Process	- / -	- / -	- / -	- / -		
Customer	- / +	- / +	-/+	- / +		
Deliverable	- / +	- / -	- / -	+/+		
Service	- / +	- / -	- / -	- / +		
Product	- / +	- / -	- / -	- / +		
Process Owner	- / -	- / -	- / -	-/-		
Goal	- / -	- / -	- / -	- / -		
Measure	-/-	- / -	-/-	- / -		



Earlier BPMLs: Business Process Context P.



Languages Perspectives	IDEF3	Petri Nets	RAD		
Business Context Perspective					
Business Process	- / +	- / +	- / +		
Core Process	- / -	- / -	- / -		
Support Process	- / -	- / -	- / -		
Management Process	- / -	- / -	- / -		
Customer	- / -	- / -	- / +		
Deliverable	- / +	- / -	- / +		
Service	- / +	- / -	- / +		
Product	- / +	- / -	- / +		
Process Owner	- / -	- / -	- / -		
Goal	- / -	- / -	- / -		
Measure	- / -	- / -	- / -		





