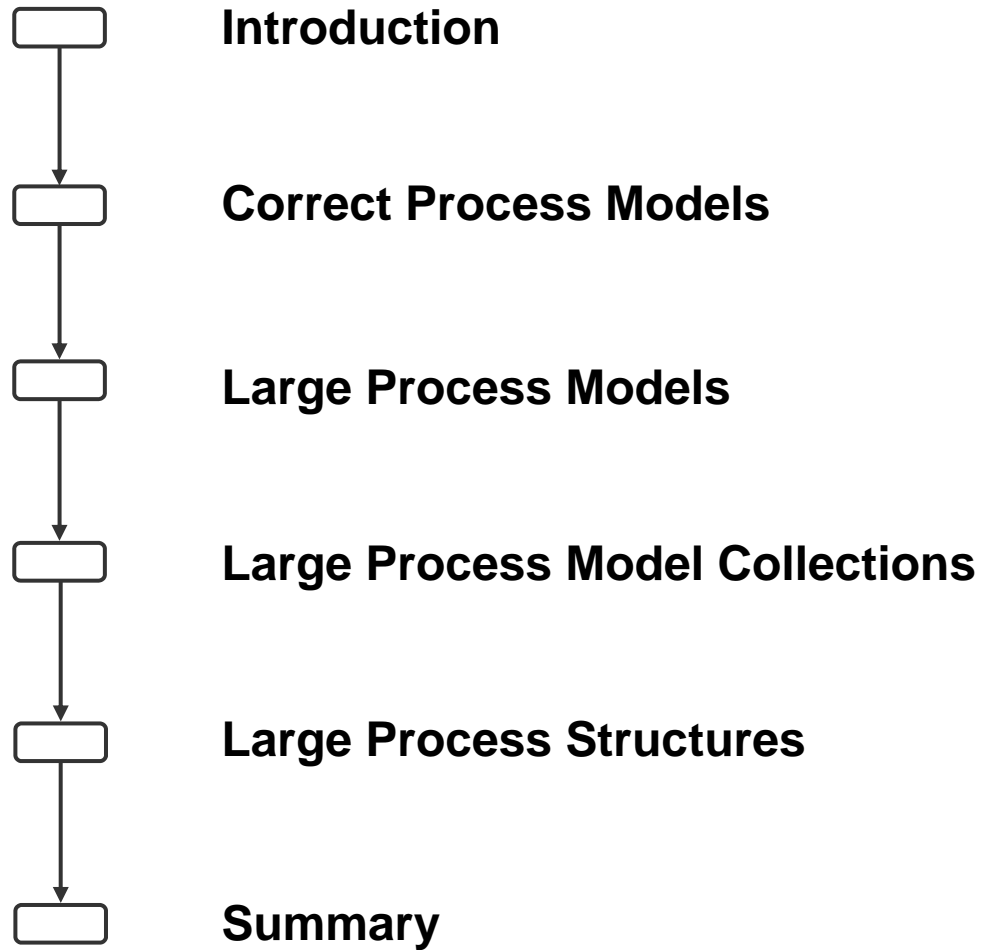


Business Process Management: Quo Vadis?

Prof. Dr. Manfred Reichert

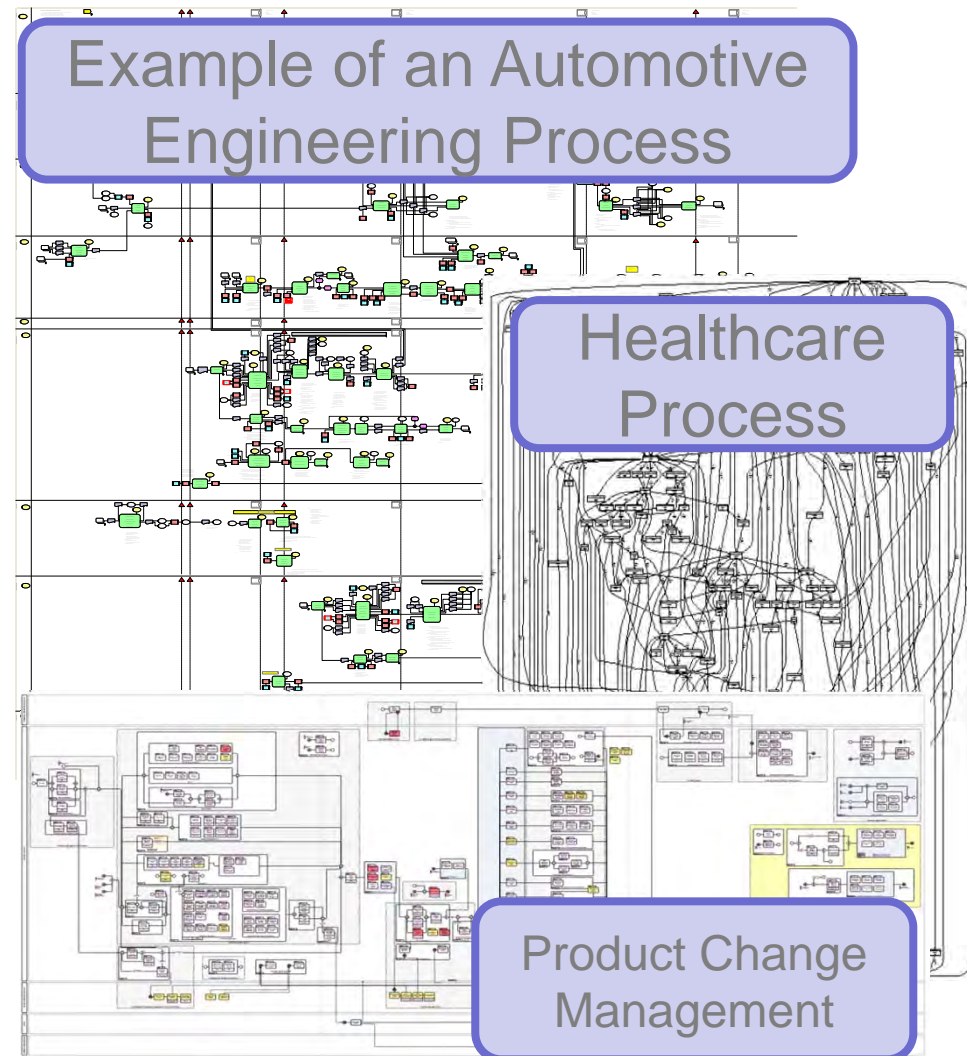
E-Mail: manfred.reichert@uni-ulm.de

Homepage: www.uni-ulm.de/dbis



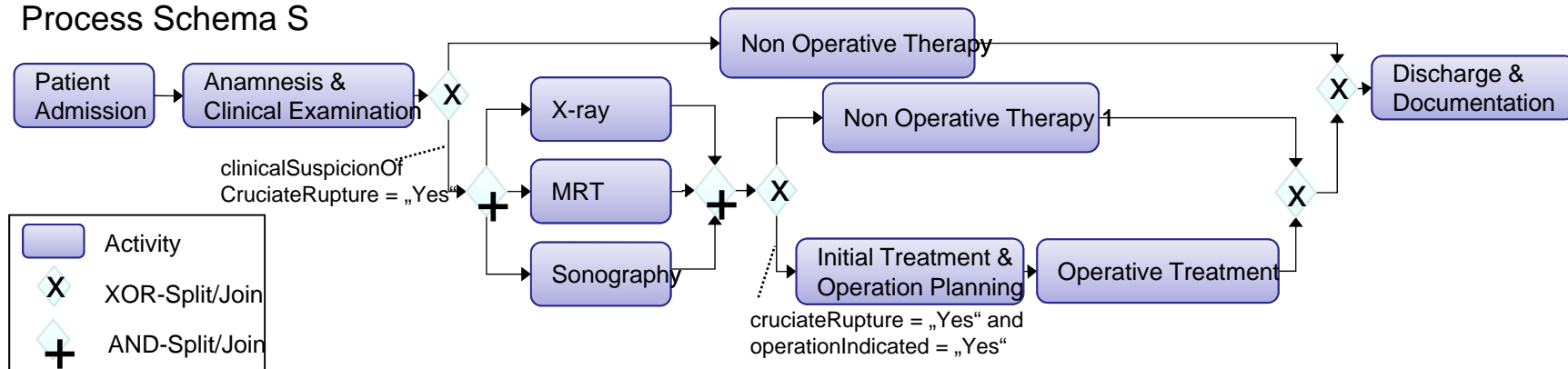
Challenges

- ❑ **Correct modeling and execution of processes:** Correctness and robustness are crucial features of every process-aware inf. system
- ❑ **Large process models:** Processes can become very large and complex
- ❑ **Large process model collections:** Large collections of process models need to be maintained
- ❑ **Large process structures:** Concurrently executed process instances may depend on each other
- ❑ **Full lifecycle support:** Integrated support of all phases of the process lifecycle required

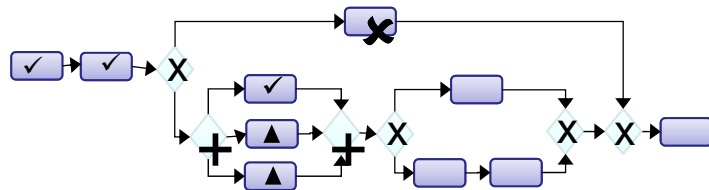


Process Models

Process Schema S



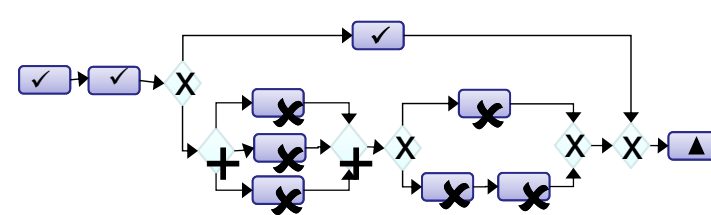
Process Instance I1



Execution Trace:

$\sigma_1 = \langle \text{„Patient Admission“}, \text{„Anamnesis \& Clinical Examination“}, \text{„X-ray“} \rangle$

Process Instance I2

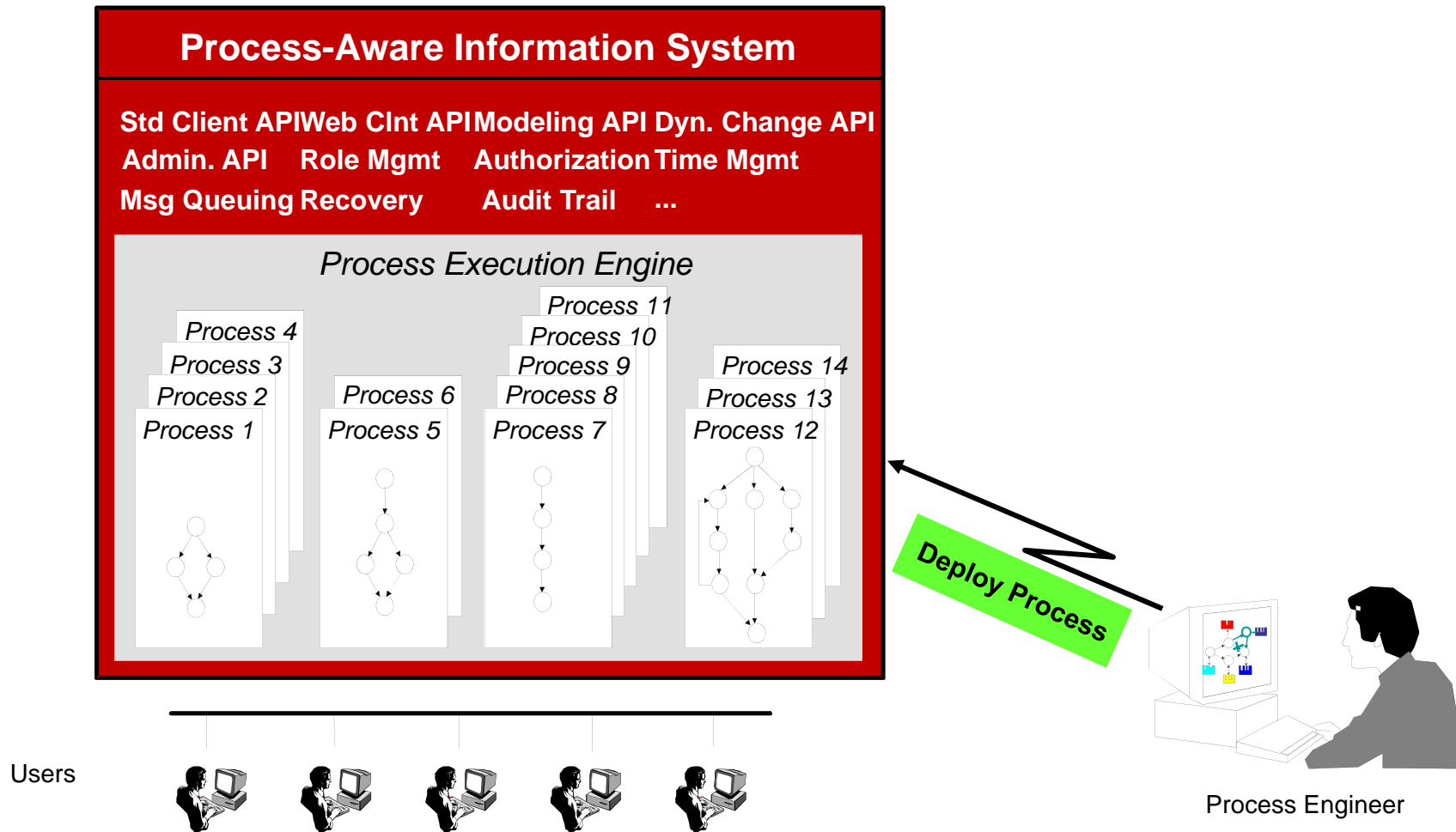


Execution Trace:

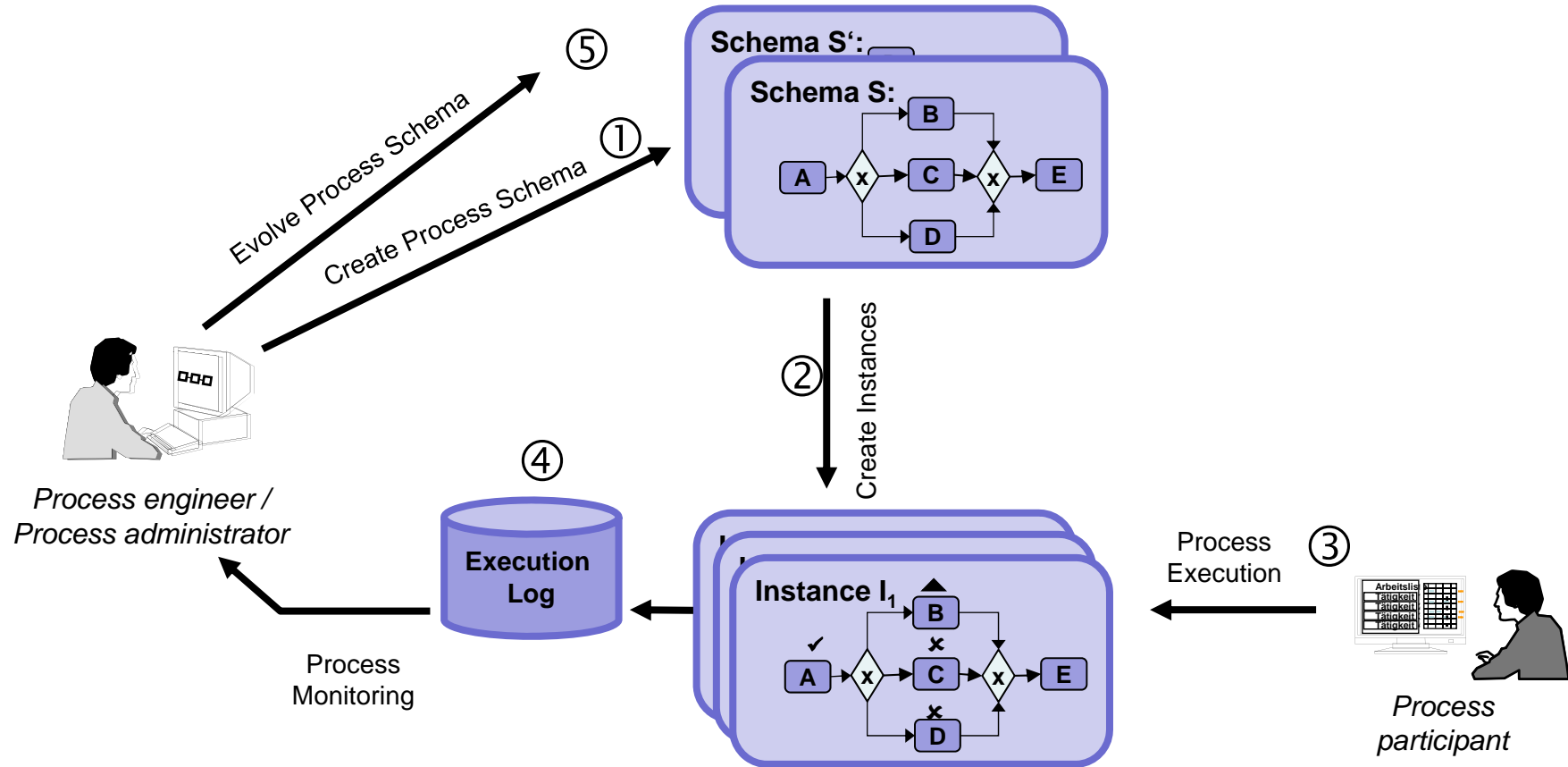
$\sigma_2 = \langle \text{„Patient Admission“}, \text{„Anamnesis \& Clinical Examination“}, \text{„Non Operative Therapy“} \rangle$

Activity States: ▲ Activated ✓ Completed ✗ Skipped

Process Execution



The Process Lifecycle



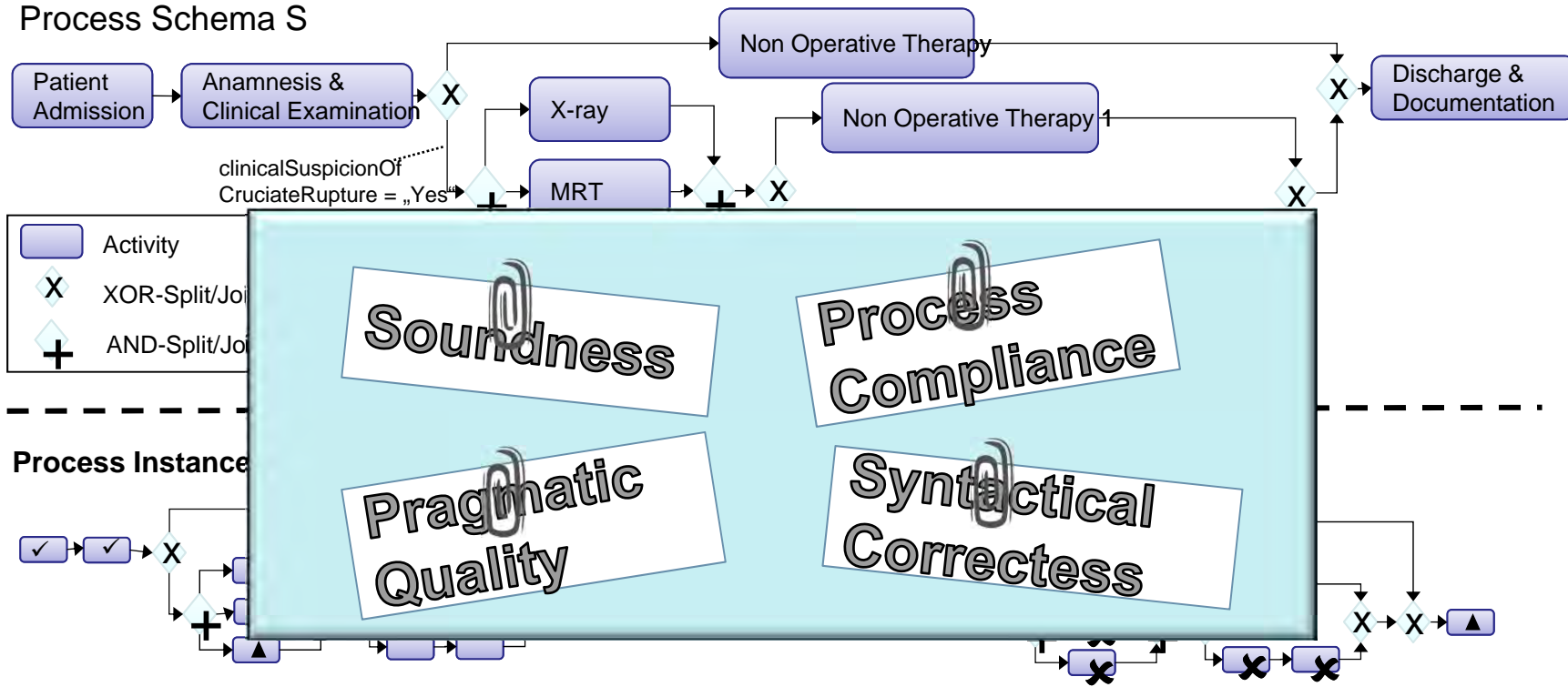
Correct Process Models: Complying with Global Regulations

SeaFlows

The logo for C³ Pro features a stylized graphic of three overlapping curved lines in blue, green, and yellow, positioned above the text "C³ Pro".

Correct Process Models

Process Schema S



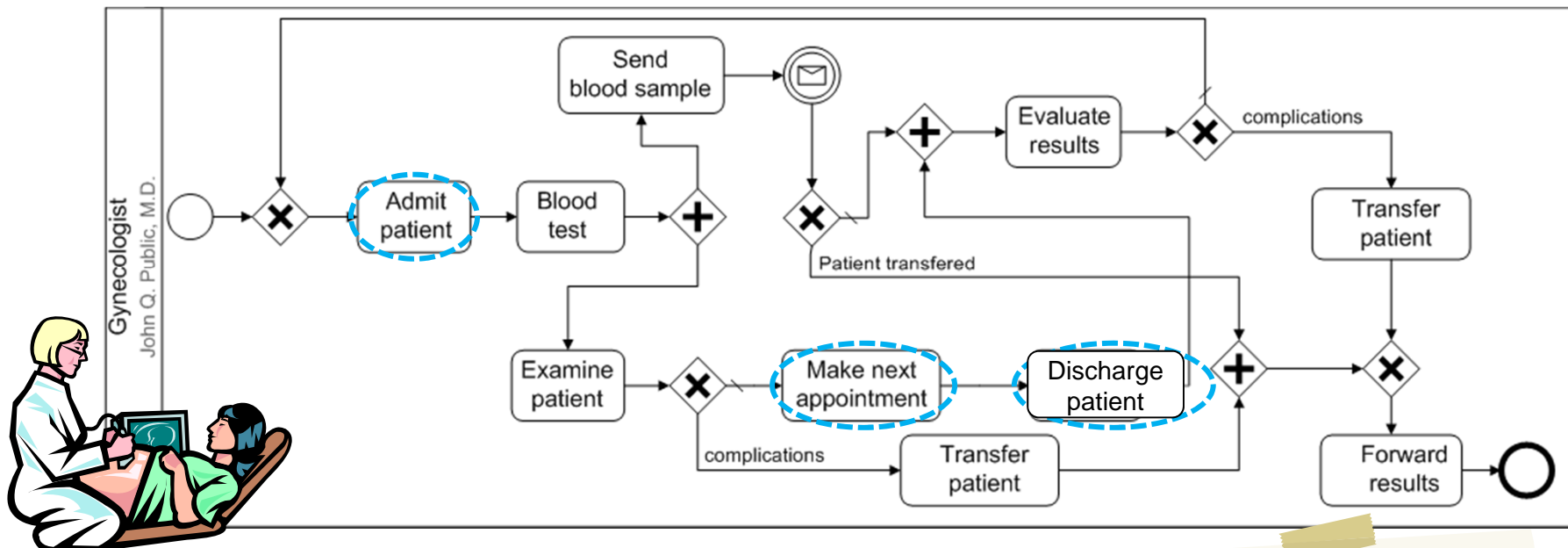
Execution Trace:
 $\sigma_1 = \langle \text{„Patient Admission“}, \text{„Anamnesis & Clinical Examination“}, \text{„X-ray“} \rangle$

Execution Trace:
 $\sigma_2 = \langle \text{„Patient Admission“}, \text{„Anamnesis & Clinical Examination“}, \text{„Non Operative Therapy“} \rangle$

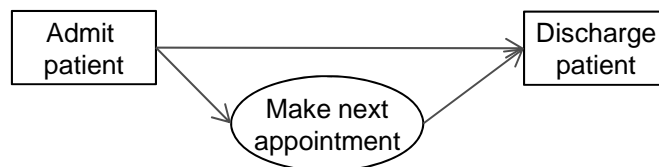
Activity States: ▲ Activated ✓ Completed ✗ Skipped

Correct Process Models: Compliance

Process Compliance



$G(\text{Admit_patient} \rightarrow (\text{not Release_patient} \cup \text{Make_next_appointment}))$



Guideline:
 After admission, a patient should not be discharged without making the appointment for his next visit.

Correct Process Models: Compliance

Condition

A CT

Prior to a CT, the patient has to be informed and after the CT the results have to be reported to the patient.

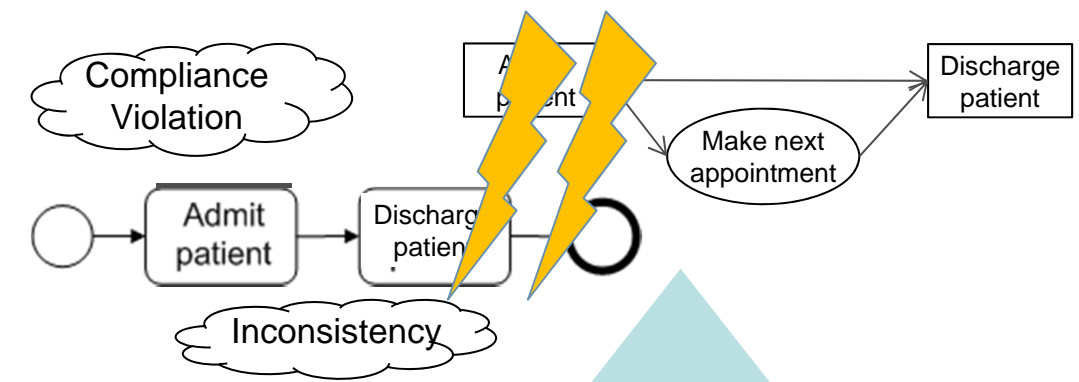
Consequence Part

A Inform Patient → A CT → A Report Results

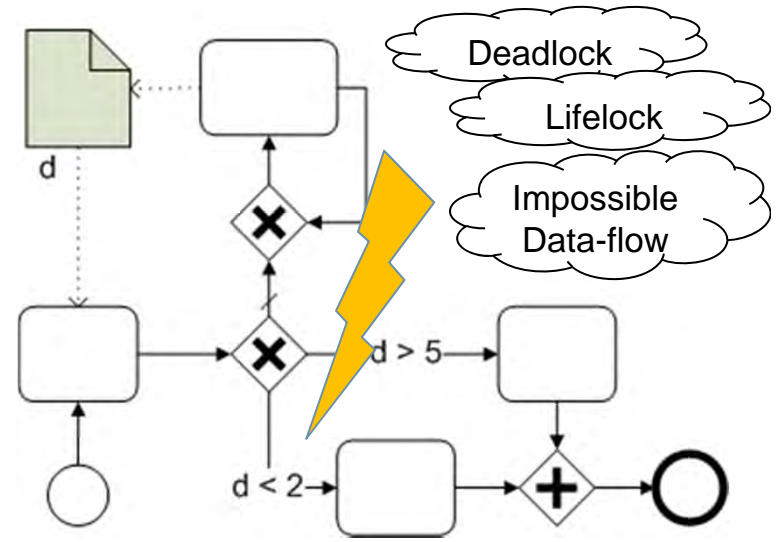
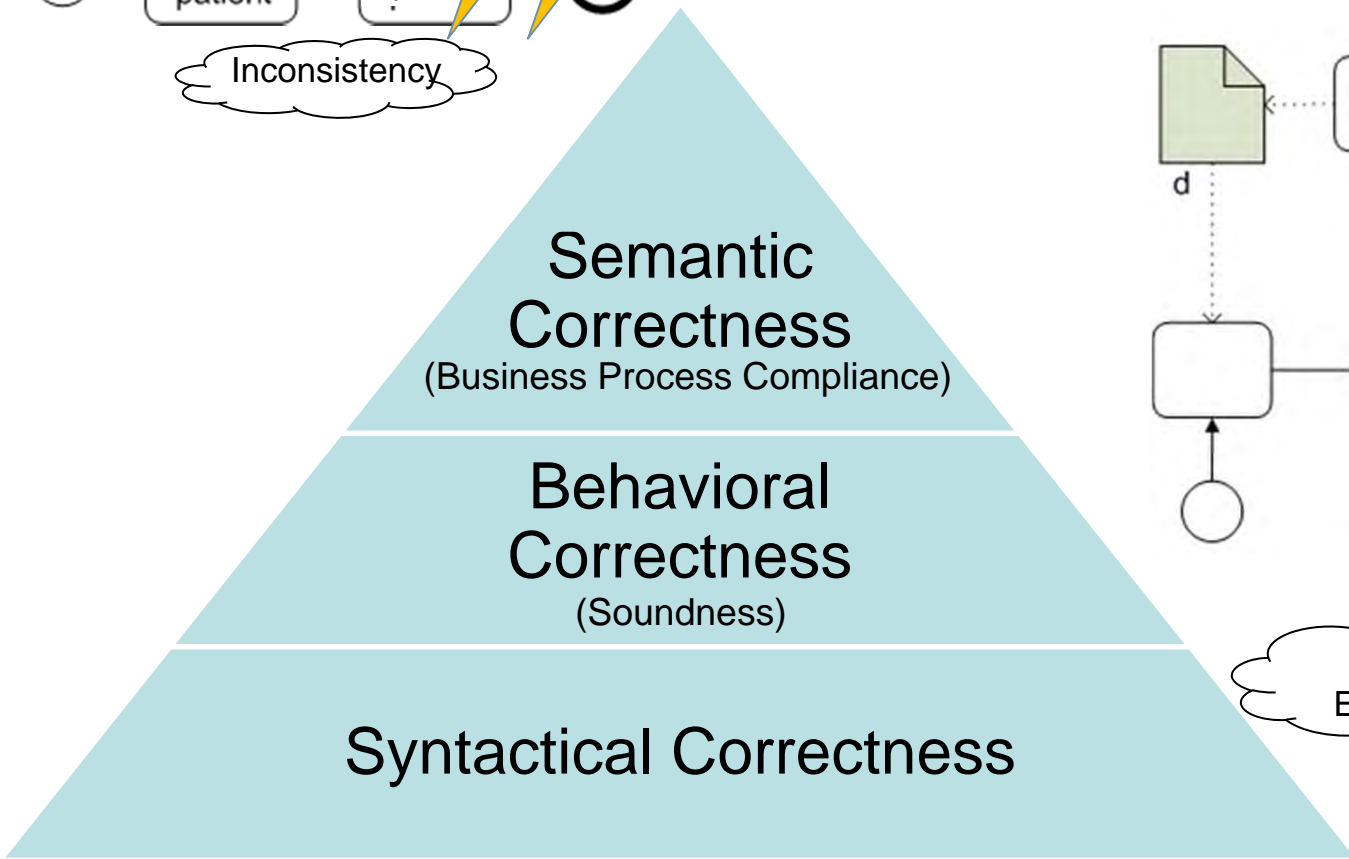
Constraint check result for template Template1 from 31.08.2009 10:33:36:

- ✖ A violation of constraint number 1 in constraints.sfc has been detected.
- ✖ A violation of constraint number 2 in constraints.sfc has been detected.
 - ⚠ The consequence of this rule consists of multiple subterms that shall all be fulfilled, but subterm 1 is not fulfilled.
 - ⚠ Problem in subterm 1: An occurrence of activity CT in an execution trace doesn't imply an occurrence of activity Inform patient in the right order.
 - ⚠ Activities CT and Inform patient are on different branches of an XOR block
- ✖ A violation of constraint number 3 in constraints.sfc has been detected.
 - ⚠ There are 2 reasons for this problem:
 - ⚠ An occurrence of activity Surgery in an execution trace doesn't imply an occurrence of any of the activities Aftercare or Make appointment in the t
 - ⚠ There are execution traces in which activity Su
 - ⚠ An occurrence of activity Discharge Patient in an

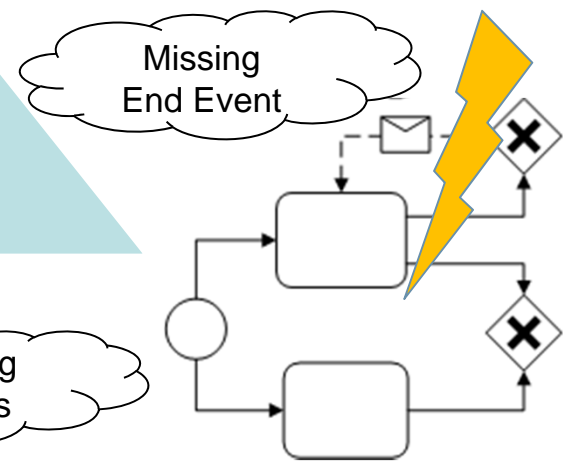
The activities CT and Inform patient are on different branches of an XOR-Block



Process Model Correctness: Levels



- Deadlock
- Livelock
- Impossible Data-flow

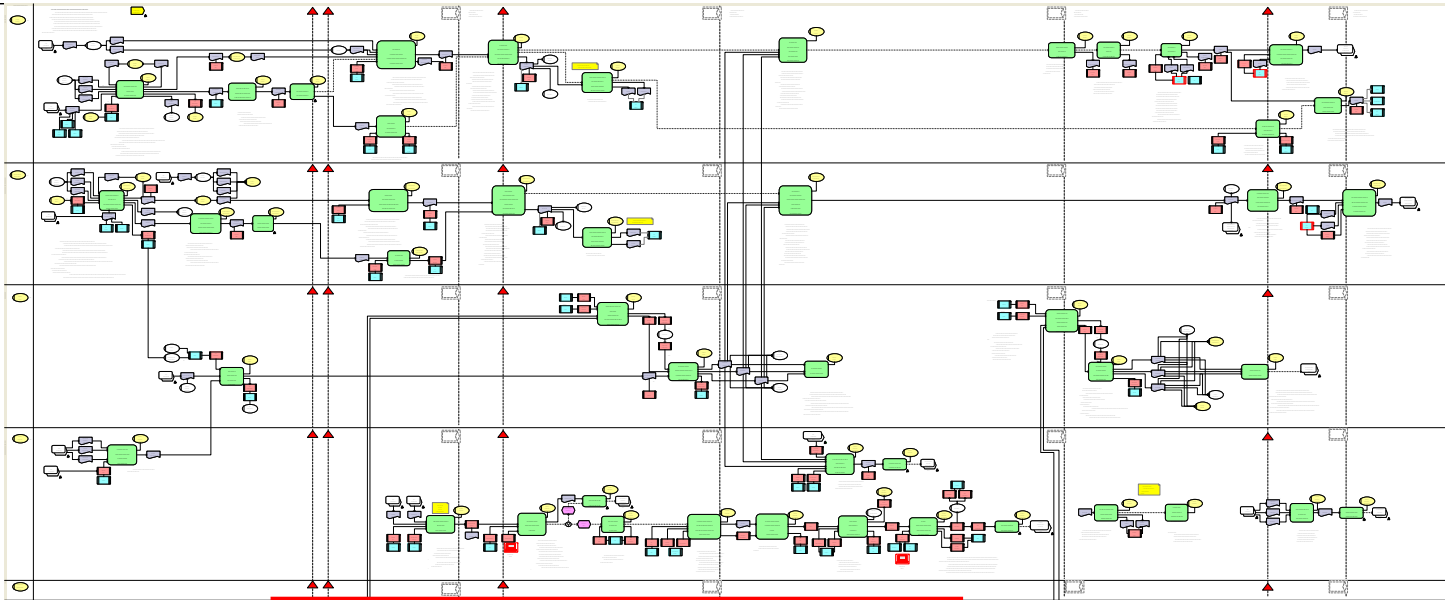


- Missing End Event
- Wrong Flows

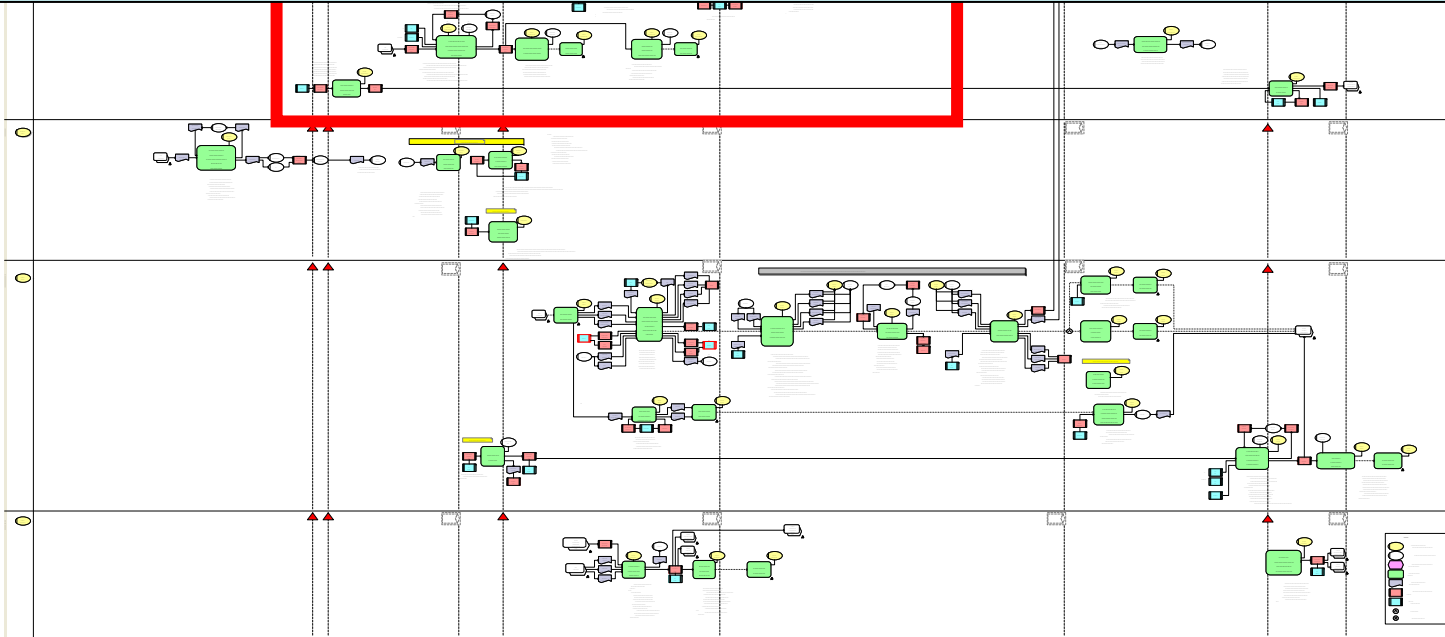
Large Process Models: Process Visualization & Abstraction

Proviado

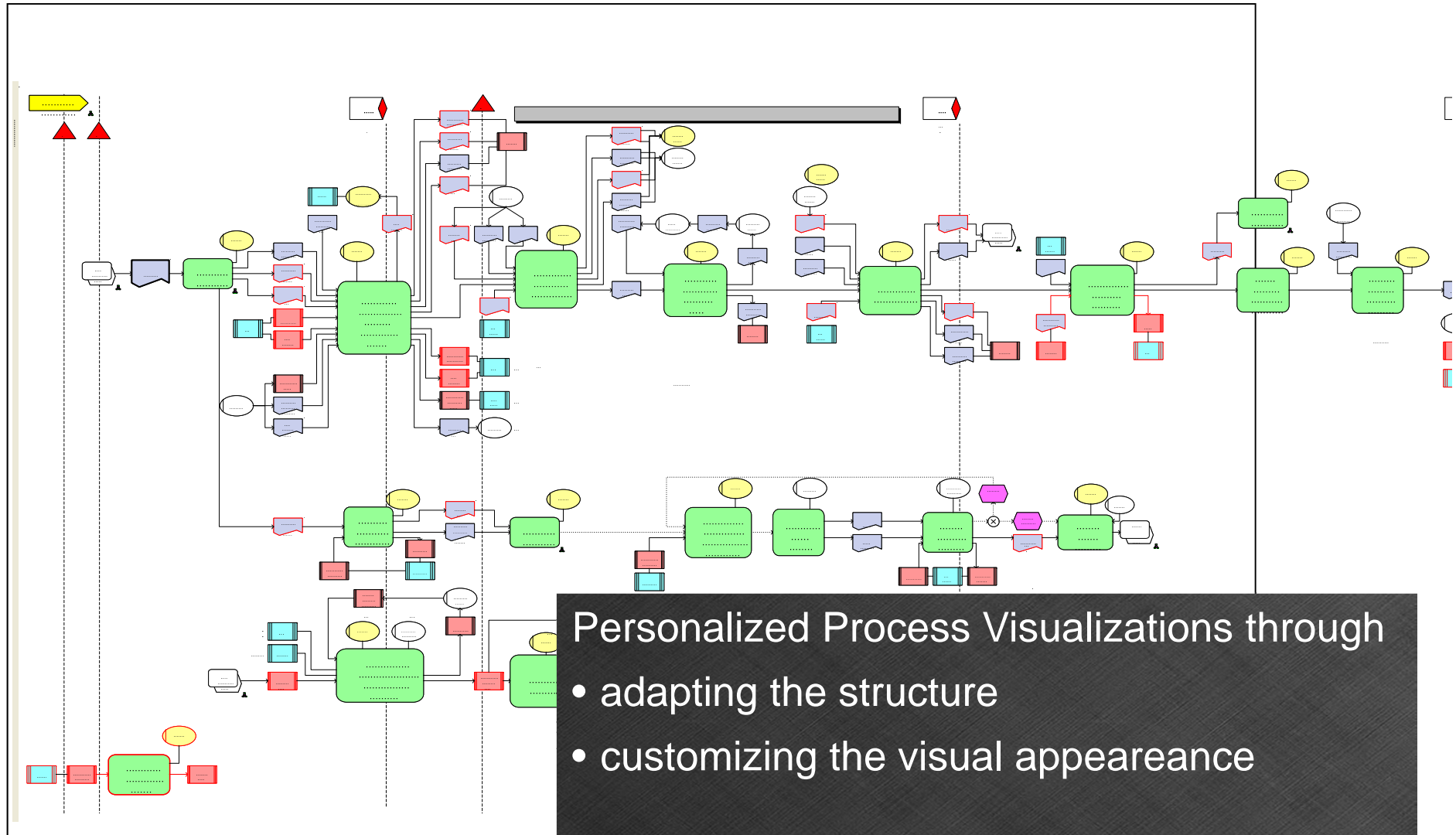
proVie**W**



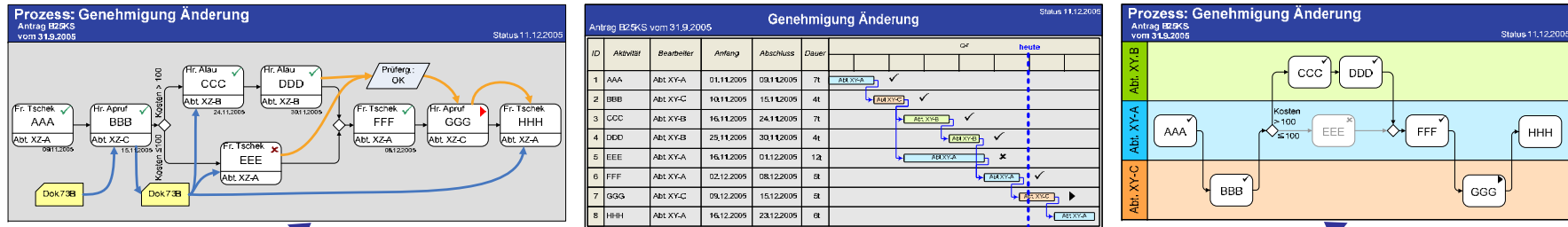
**The Challenge:
Dealing with Large Process Models**



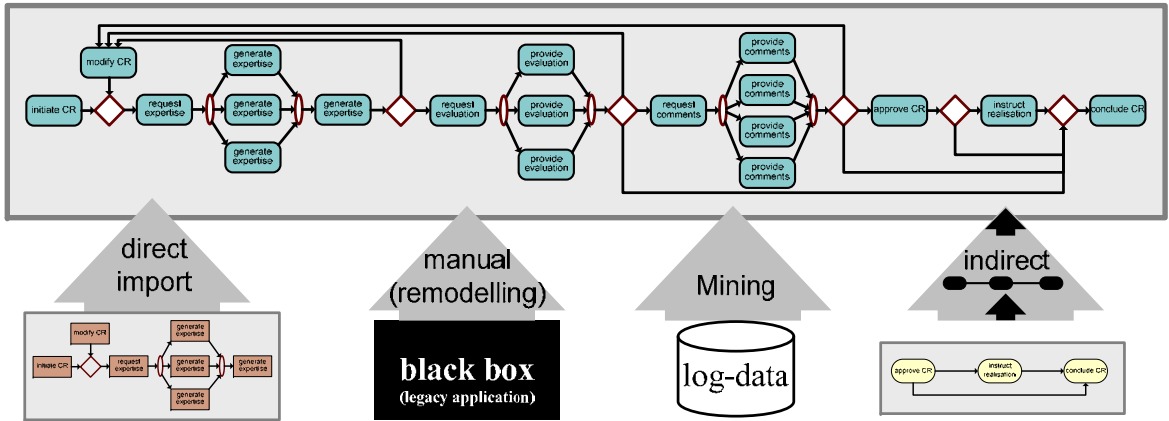
The Challenge: Dealing with Large Process Models



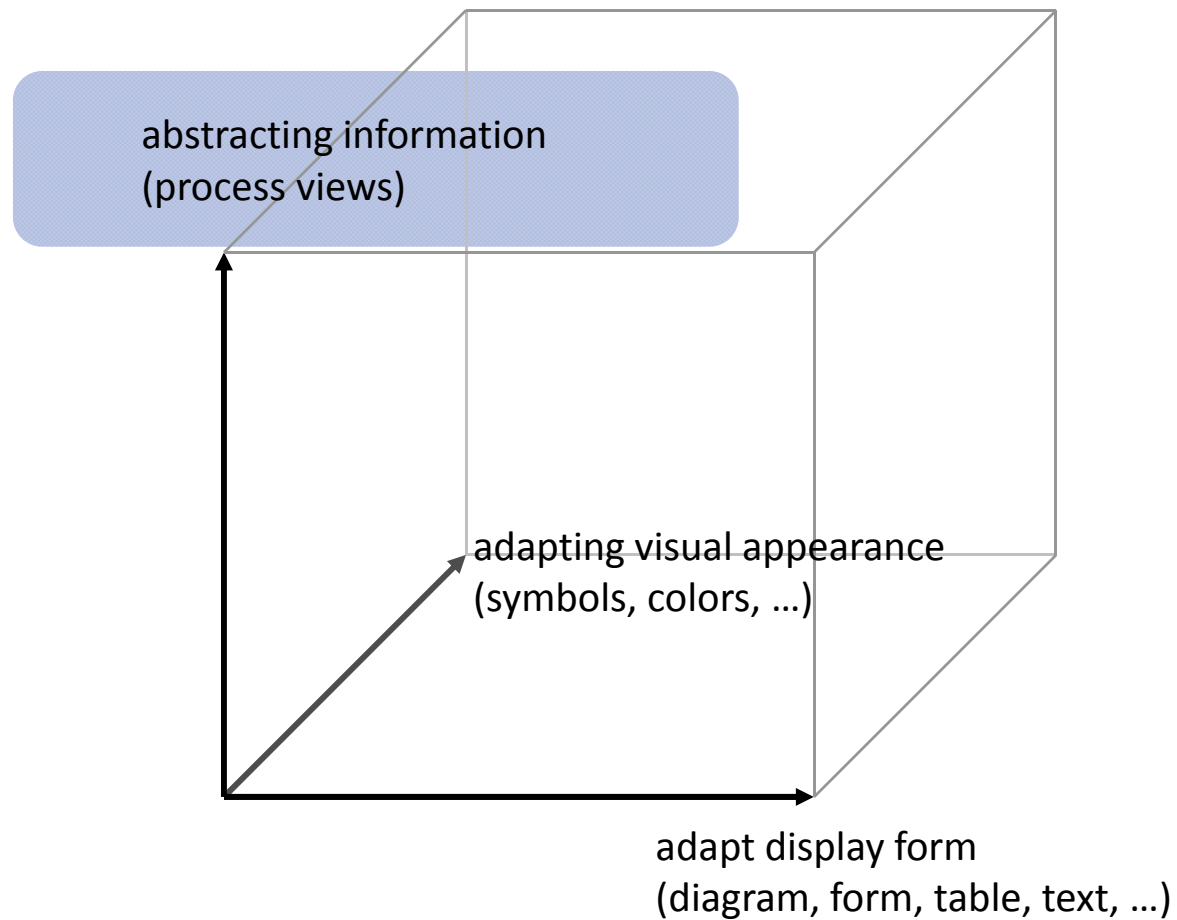
Dealing with Large Process Models: Need for an Advanced Visualization Framework



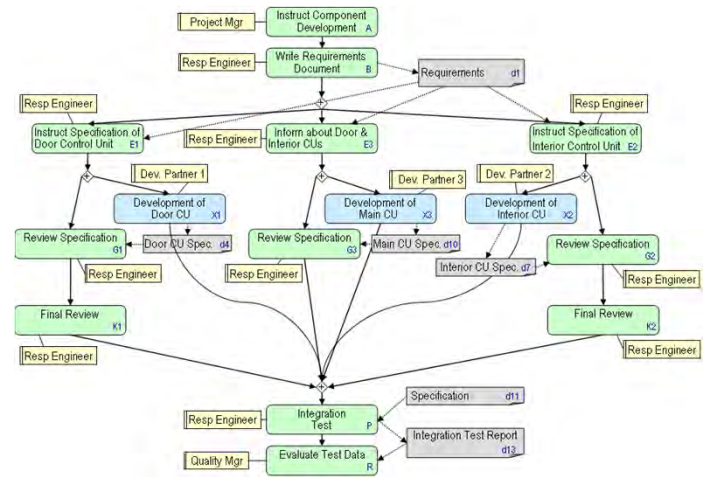
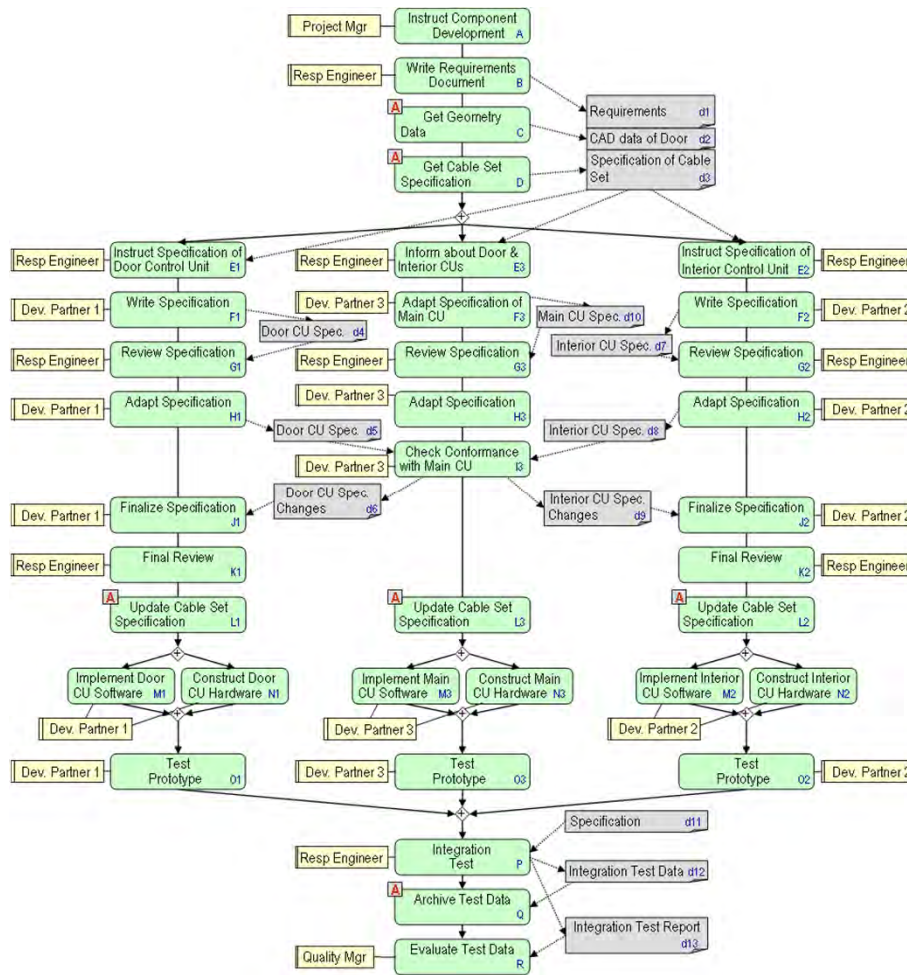
Visualization Component



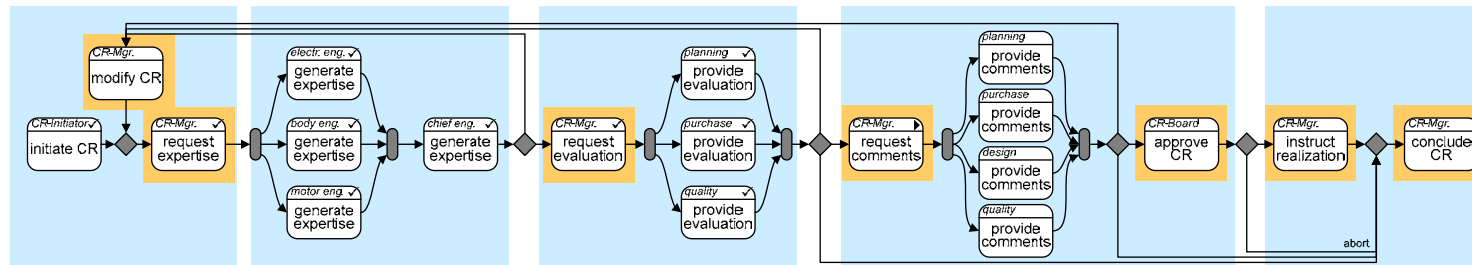
Process Visualization and Abstraction



Process Abstraction: Example

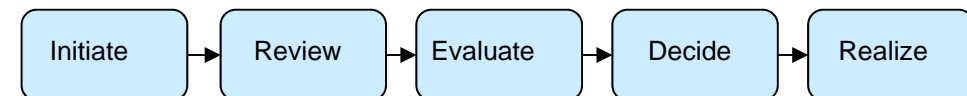
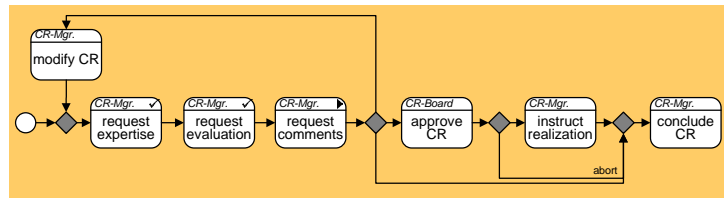


Process Abstraction: Fundamentals (1)



```
CREATE REDUCED VIEW cr-manager AS
SELECT FROM cr-process p
WHERE p.activity.actor = „CR-Mgr.“
```

```
CREATE VIEW cr-overview AS
AGGREGATE(,Initiate CR',...) AS ,Initiierung'
...
FROM cr-process
```



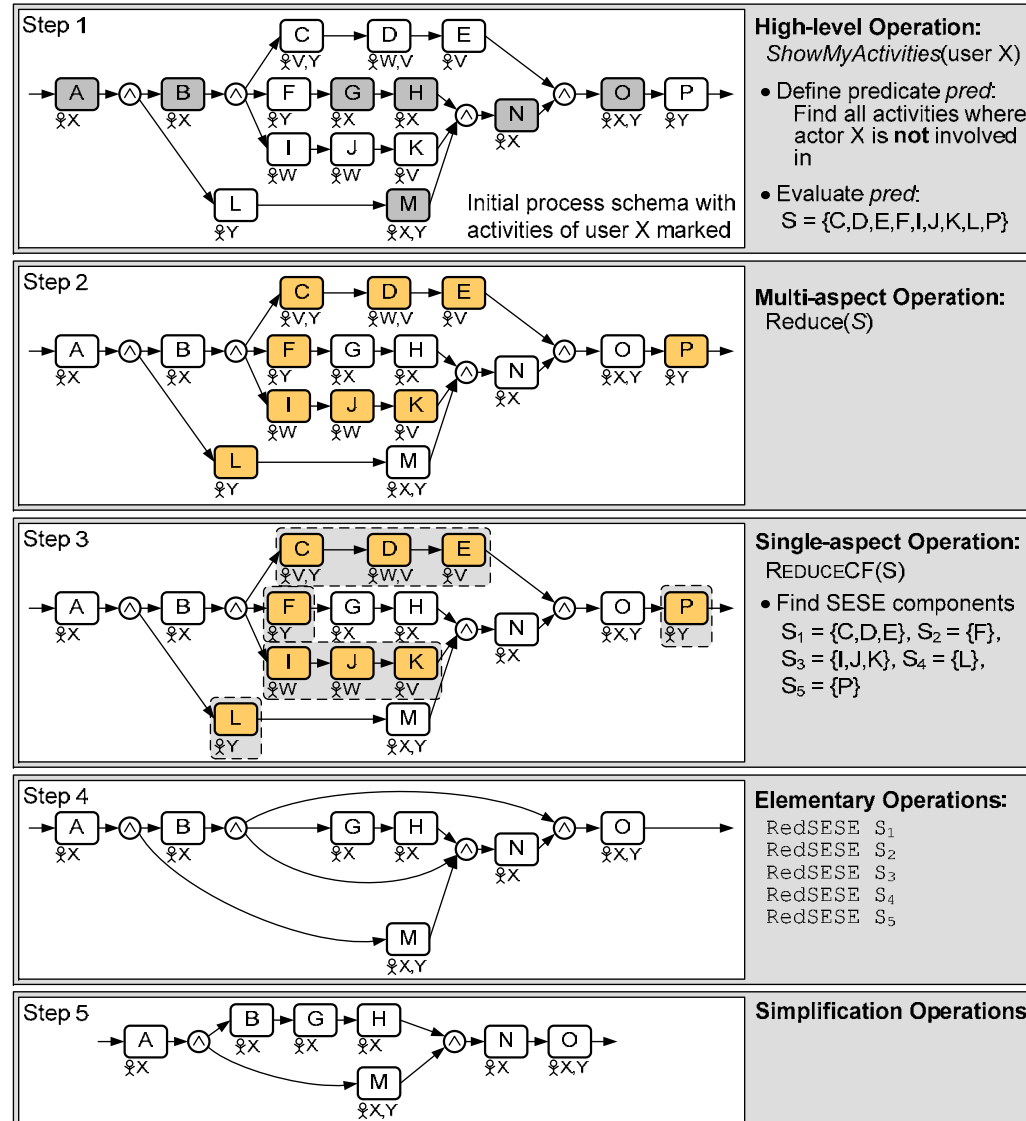
Some Requirements:

- Reduce complexity of (large) process models
- Aggregate or eliminate certain process information in a given application context
- Cover all process perspectives: behavior, data, ...

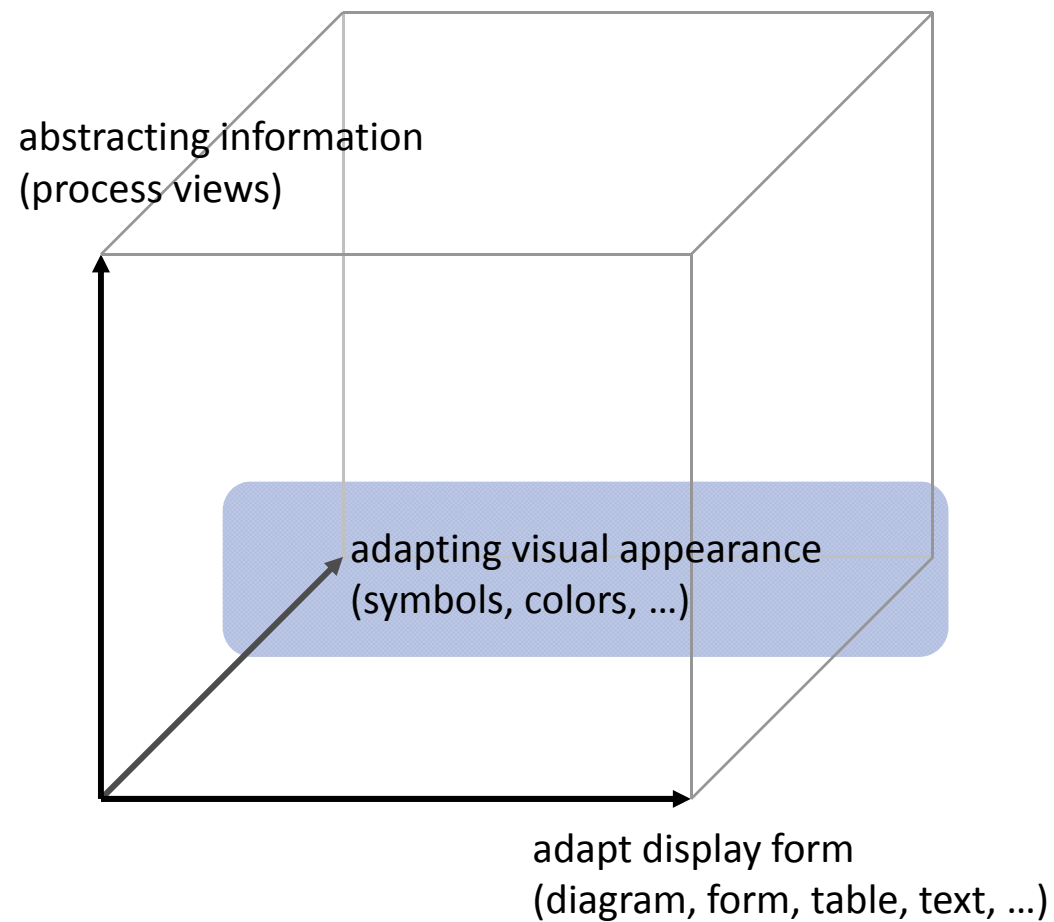
Process Abstraction: Fundamentals (2)

Example:

ShowMyActivities

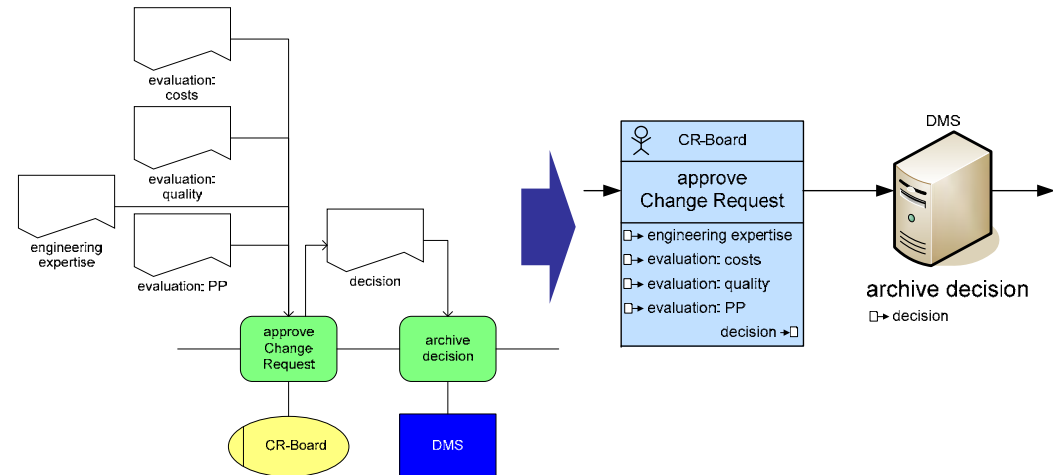
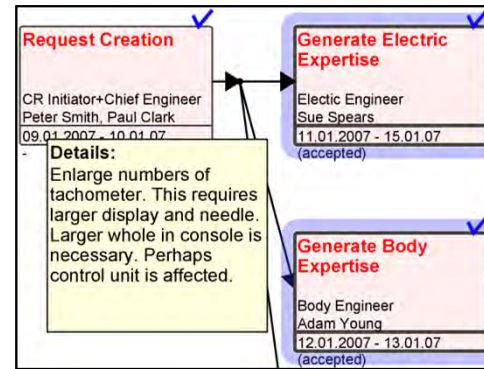
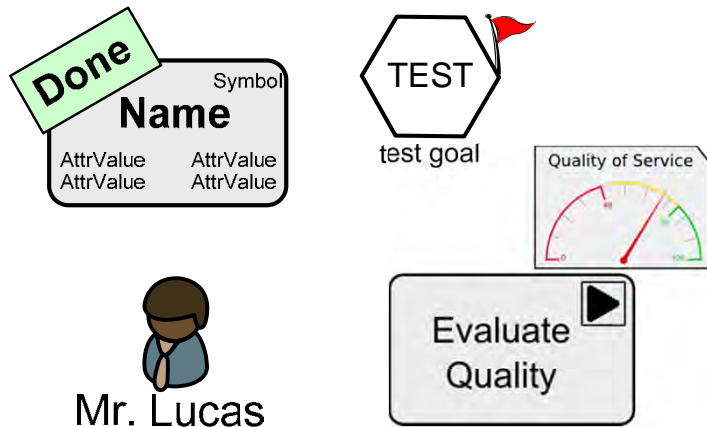


Process Visualization and Abstraction



Configuring the Visual Appearance of Process Models (1)

Visualization templates

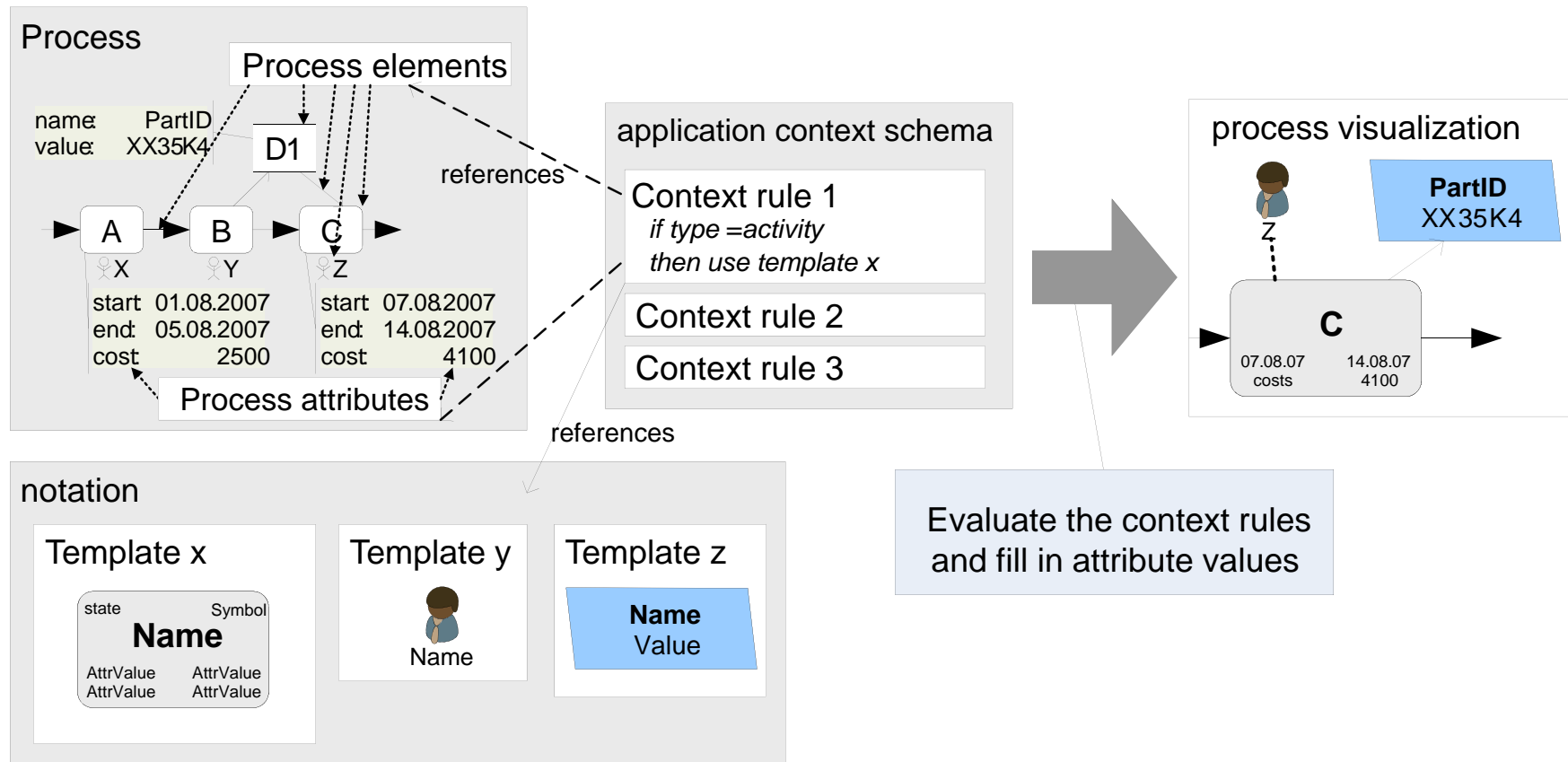


Visualization template defines

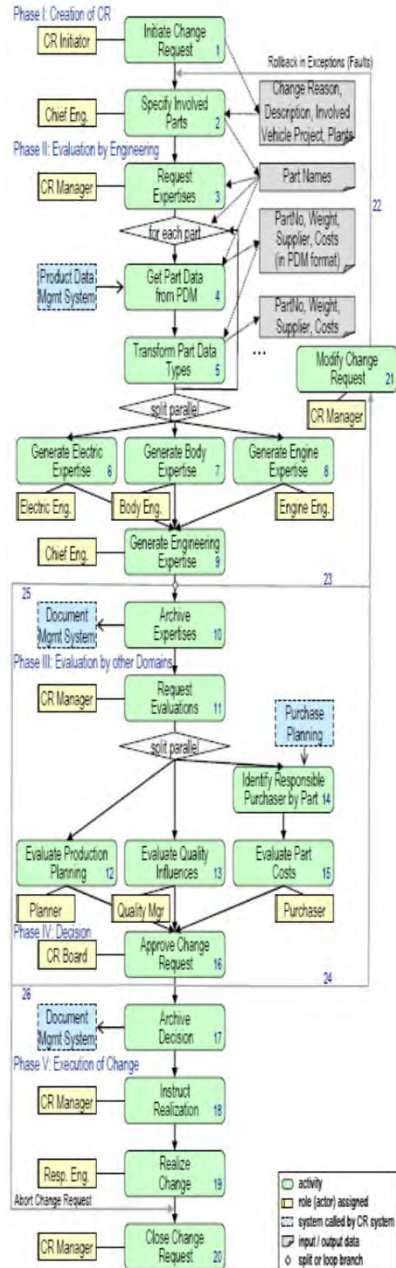
1. symbol to be used
2. data to be displayed
3. application context

Configuring the Visual Appearance of Process Models (2)

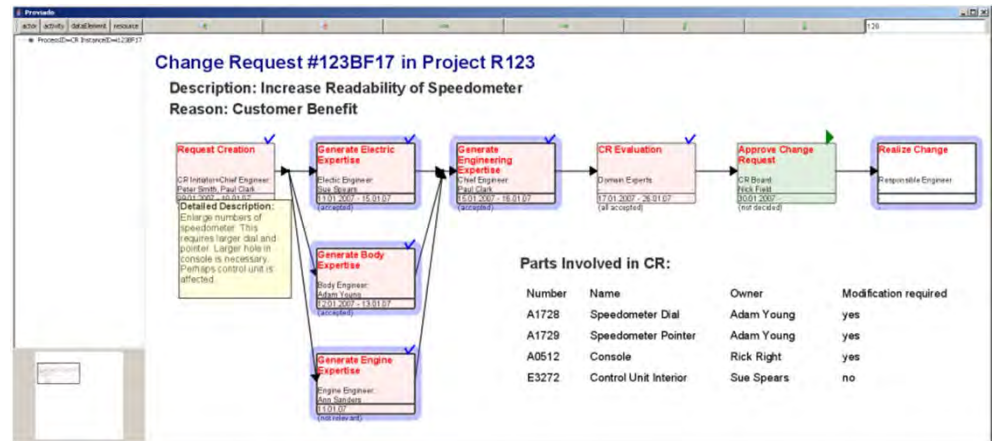
Creating a process visualization



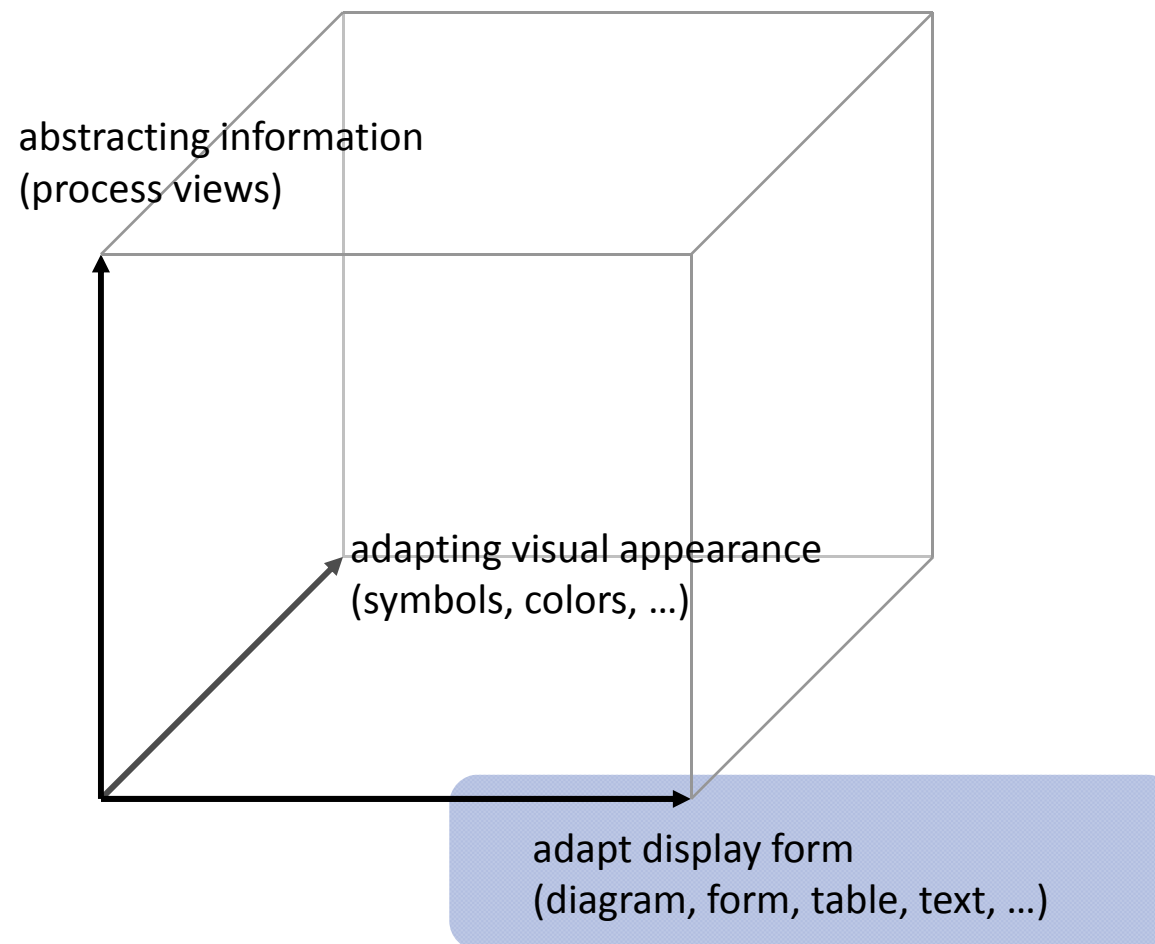
Abstraction + Visual Configuration



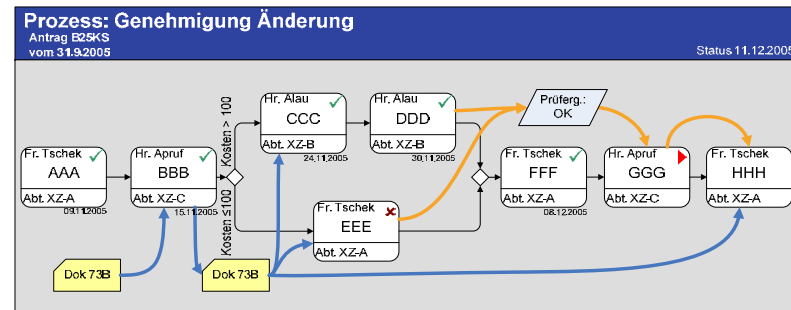
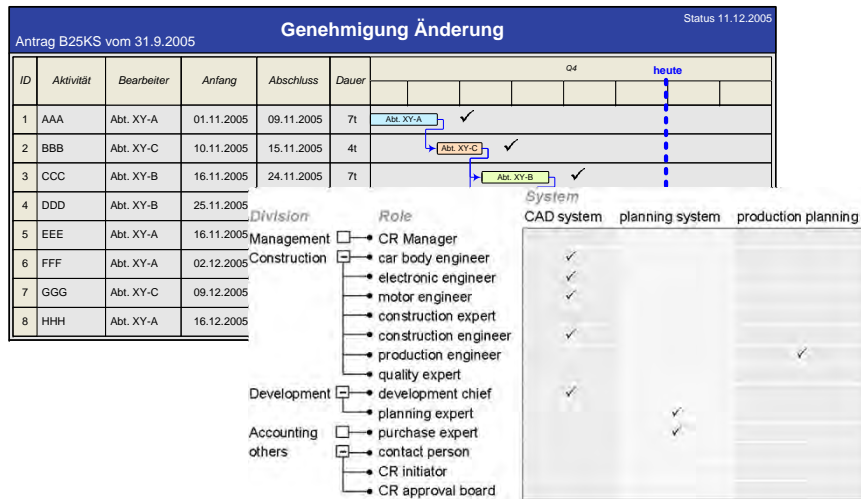
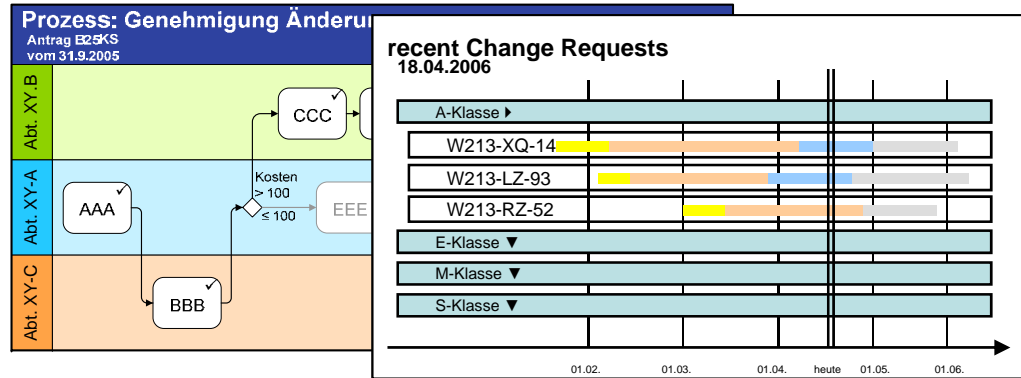
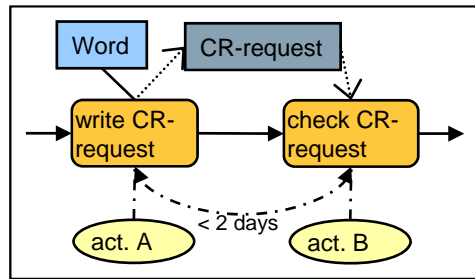
Personalized Visualization



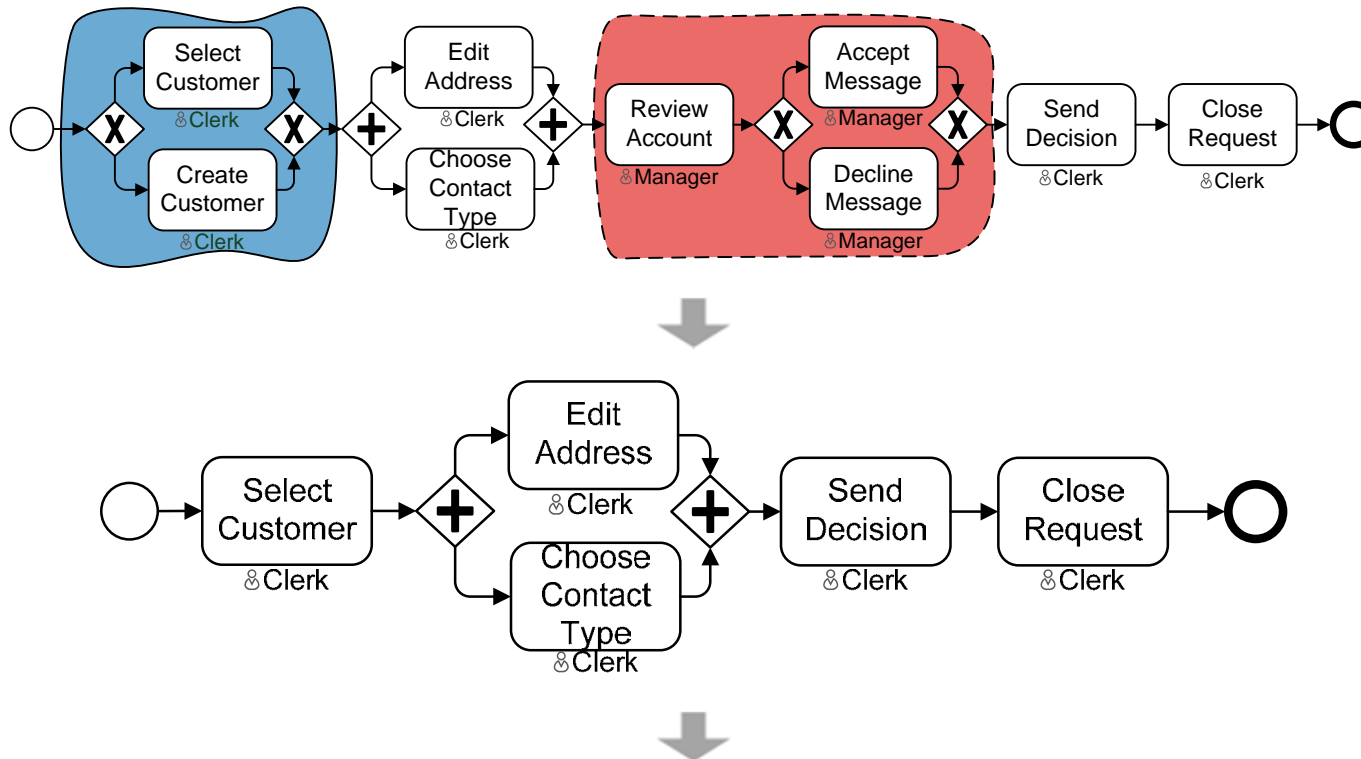
Process Visualization and Abstraction



Displaying Process Models in Different Forms (1)



Displaying Process Models in Different Forms (2)



The clerk selects the customer. Then, the process is split into two parallel streams of action:

- The clerk edits the address.
- The clerk chooses the contact type.

Afterwards, the clerks sends the decision. Finally, he closes the request.



Large Process Models: Process Navigation

Motivation | Integration of Process Information

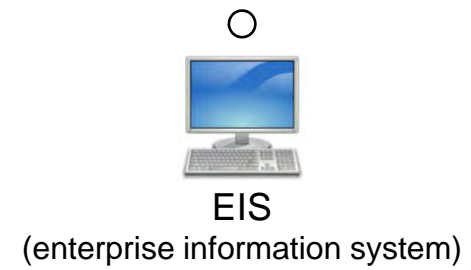


...
○



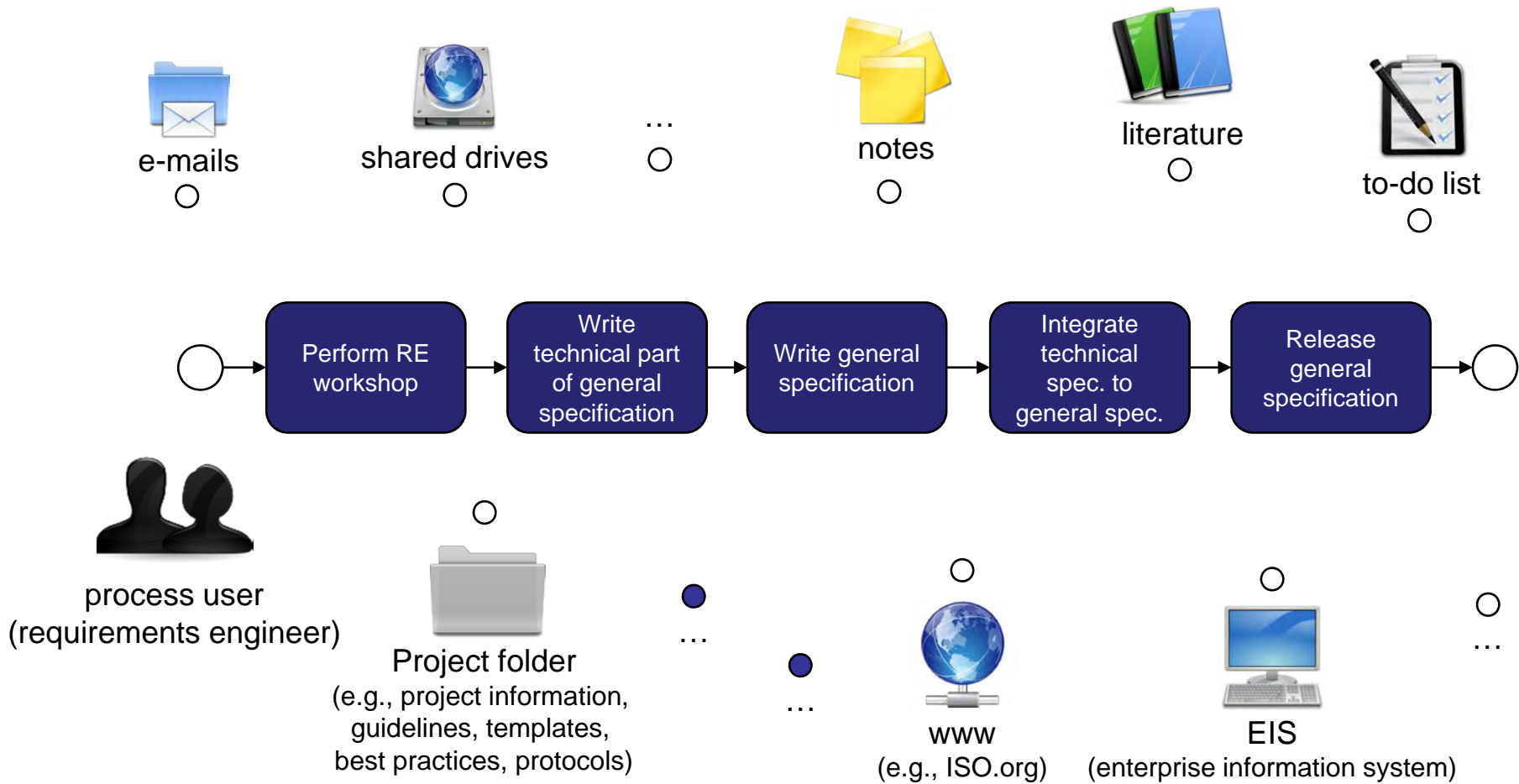
●
...

●
...

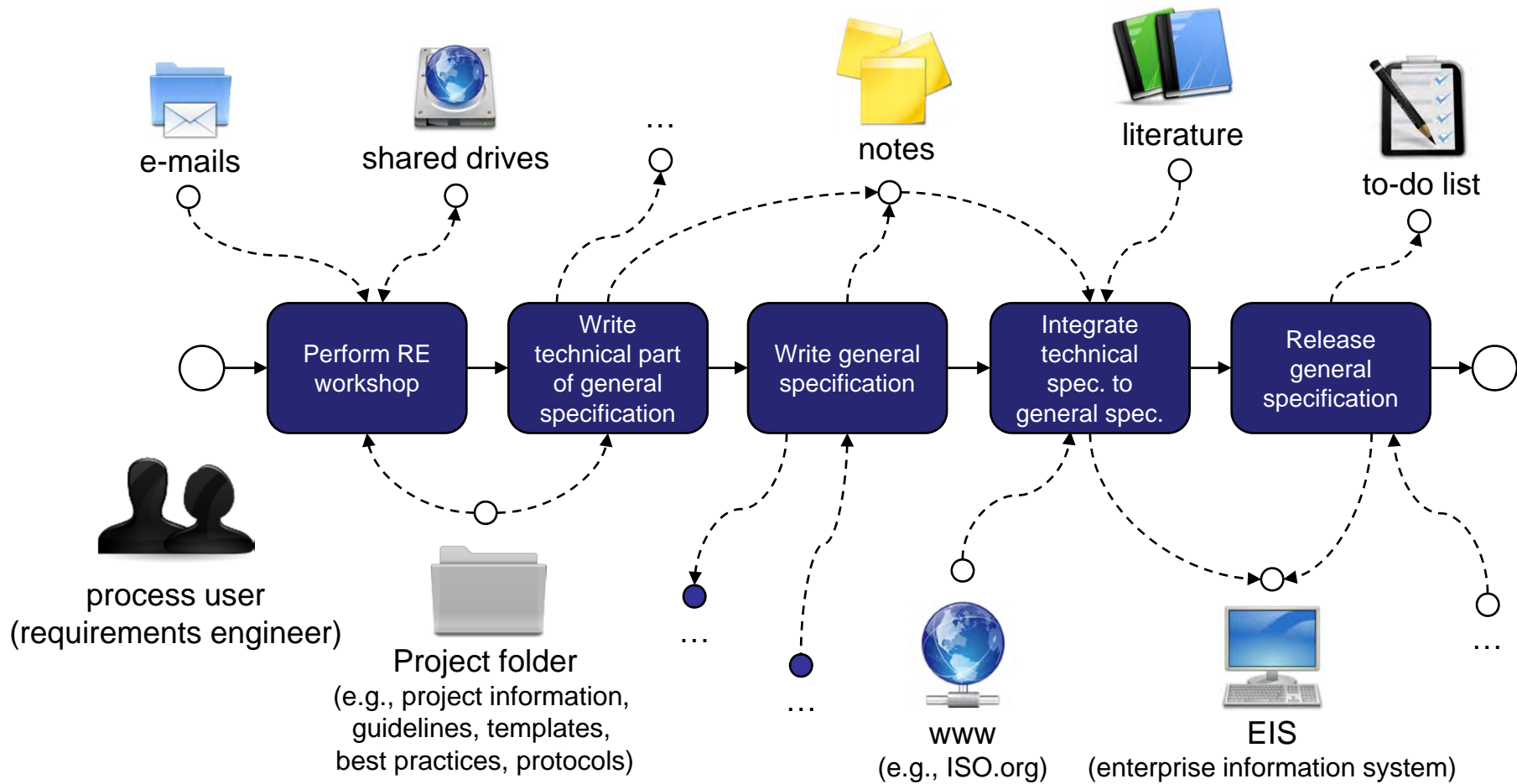


○
...

Motivation | Integration of Process Information



Motivation | Integration of Process Information



The niPRO Framework

The right information in the right quality at the right time for the right people !

(D) Visualization

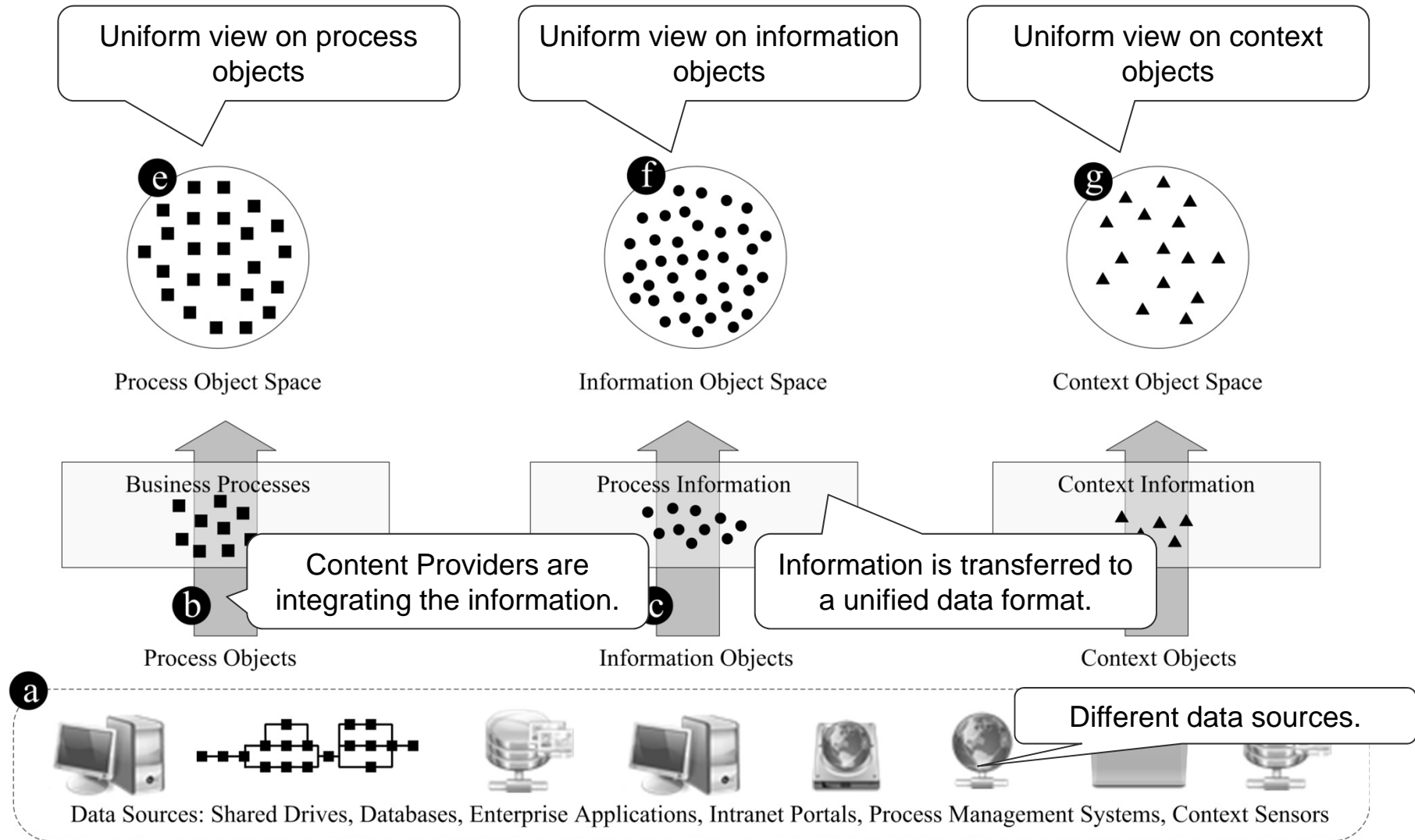
(C) Navigation

(B) Analysis

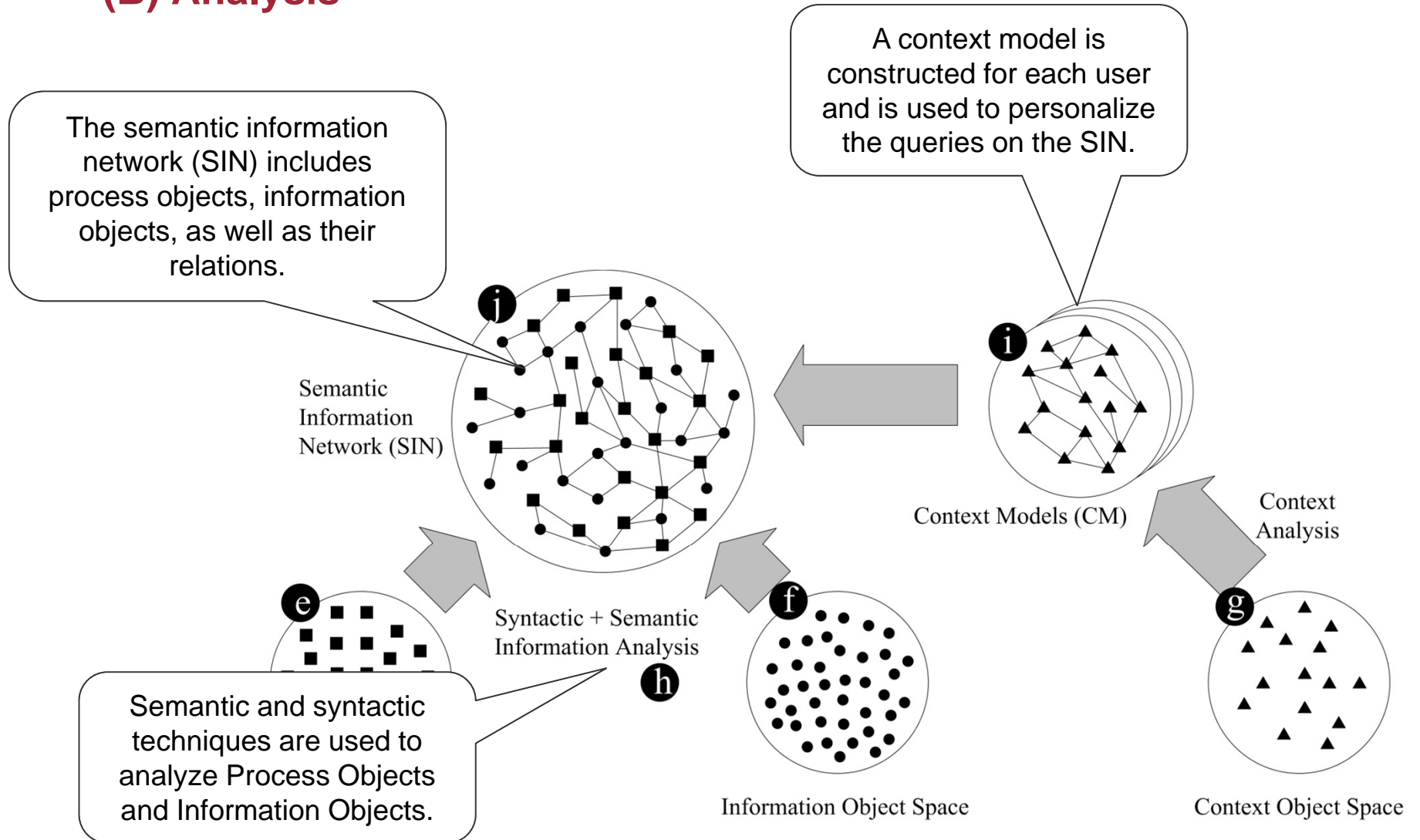
(A) Integration



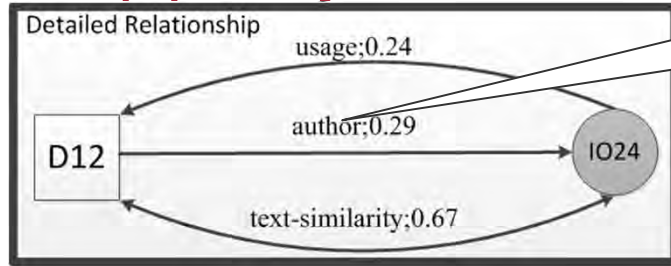
(A) Integration



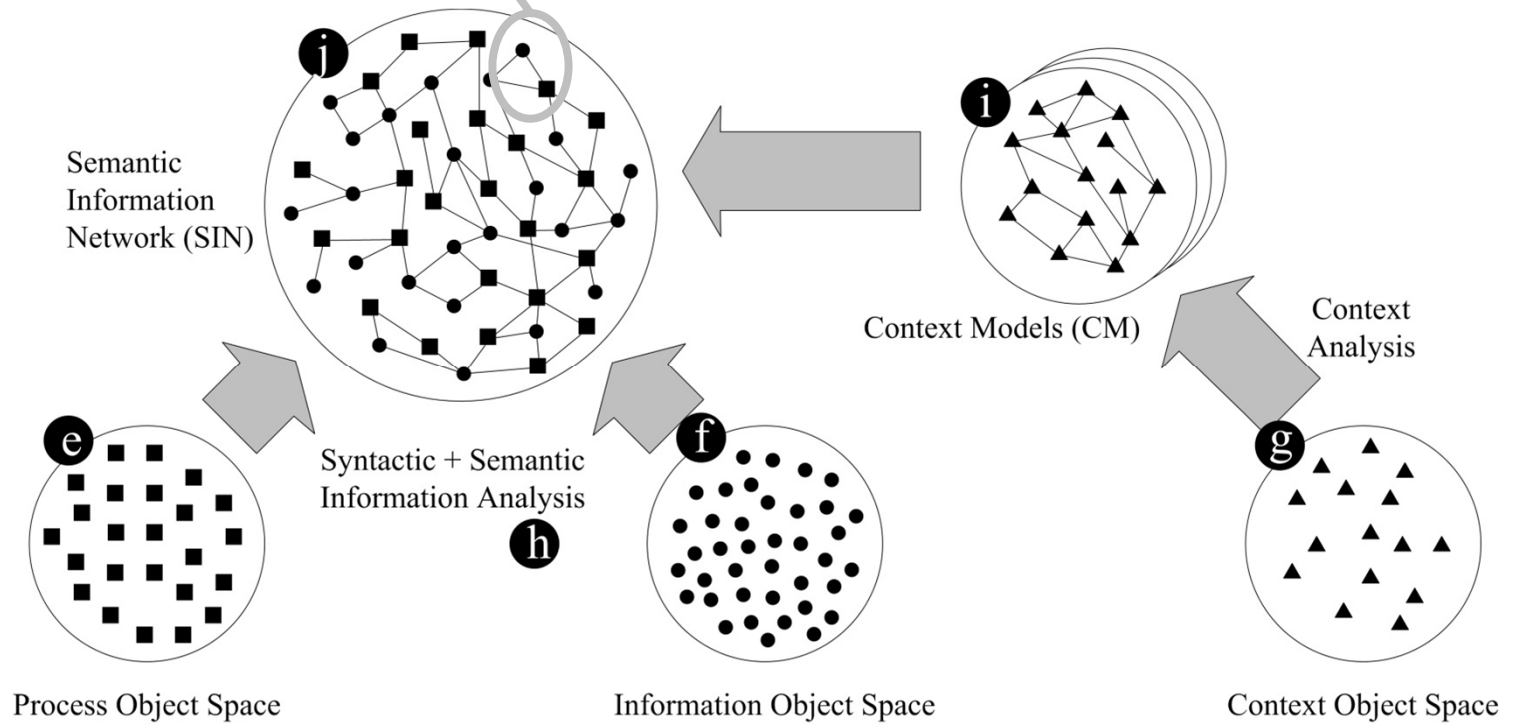
(B) Analysis



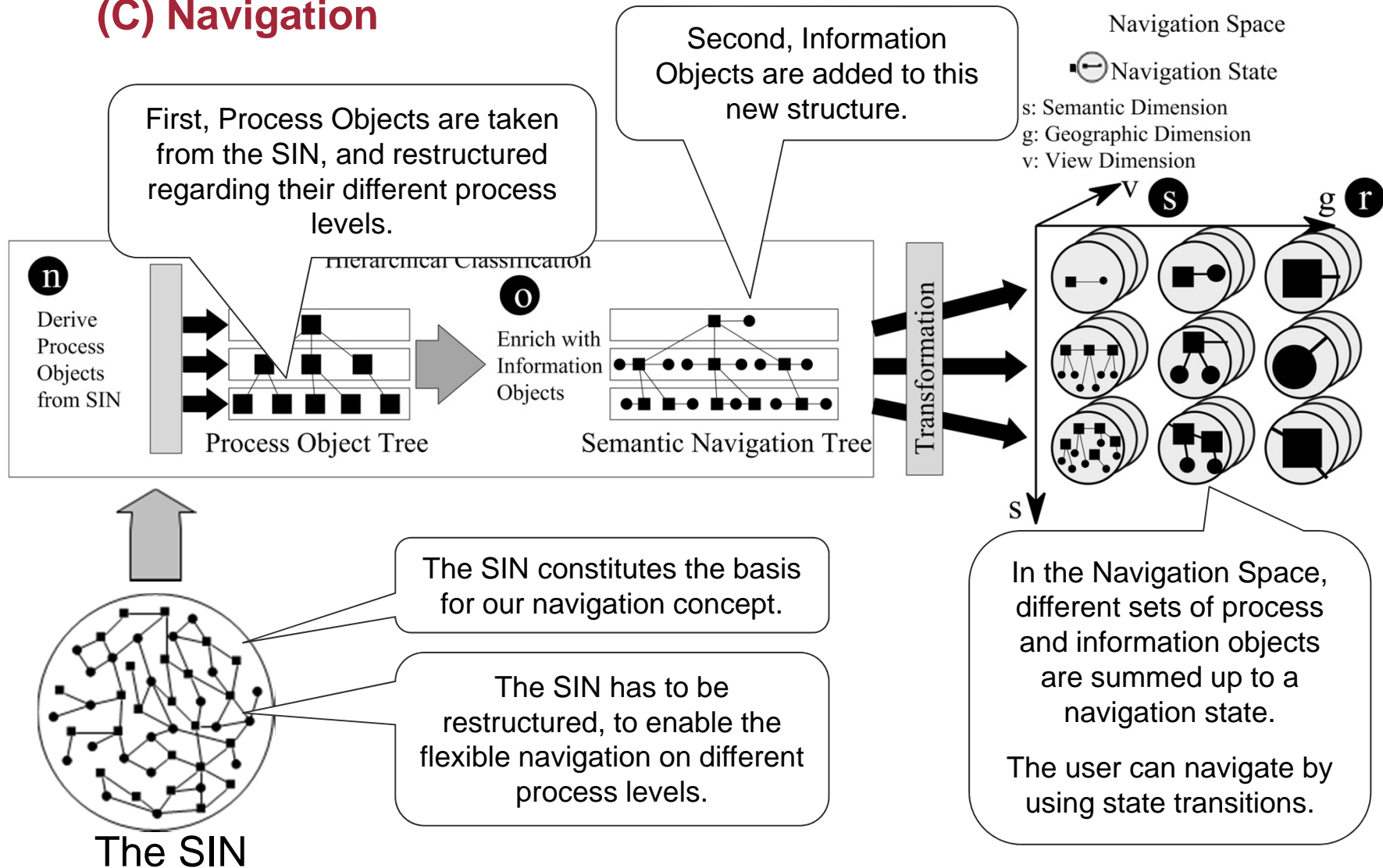
(B) Analysis



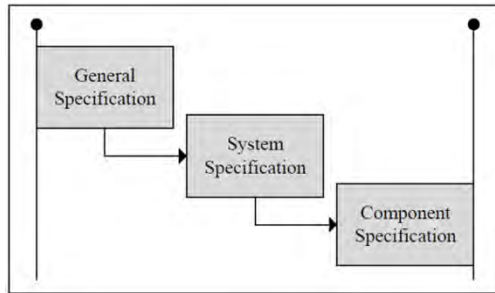
There exist different relations between process and information objects.
Relation label; Relation weight



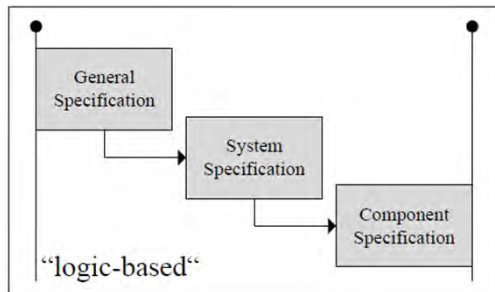
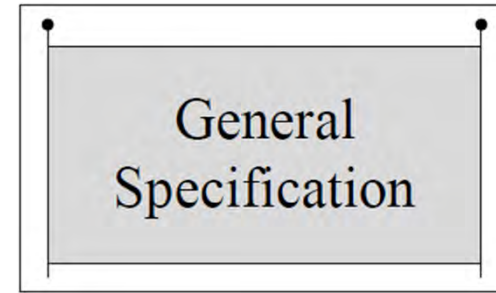
(C) Navigation



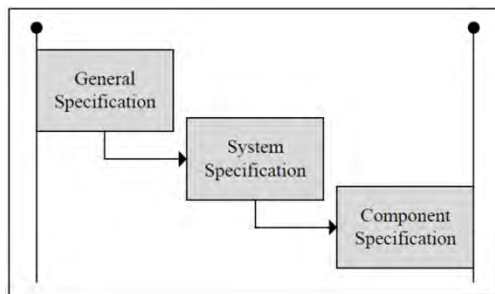
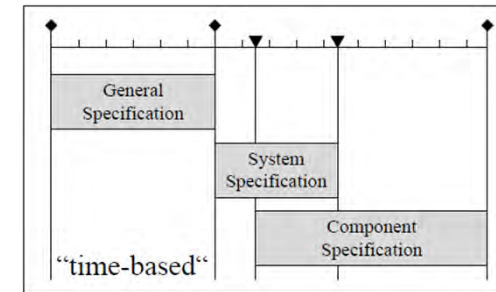
(C) Navigation | The Navigation Space



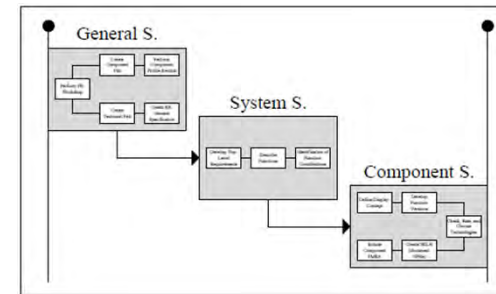
Geographic dimension



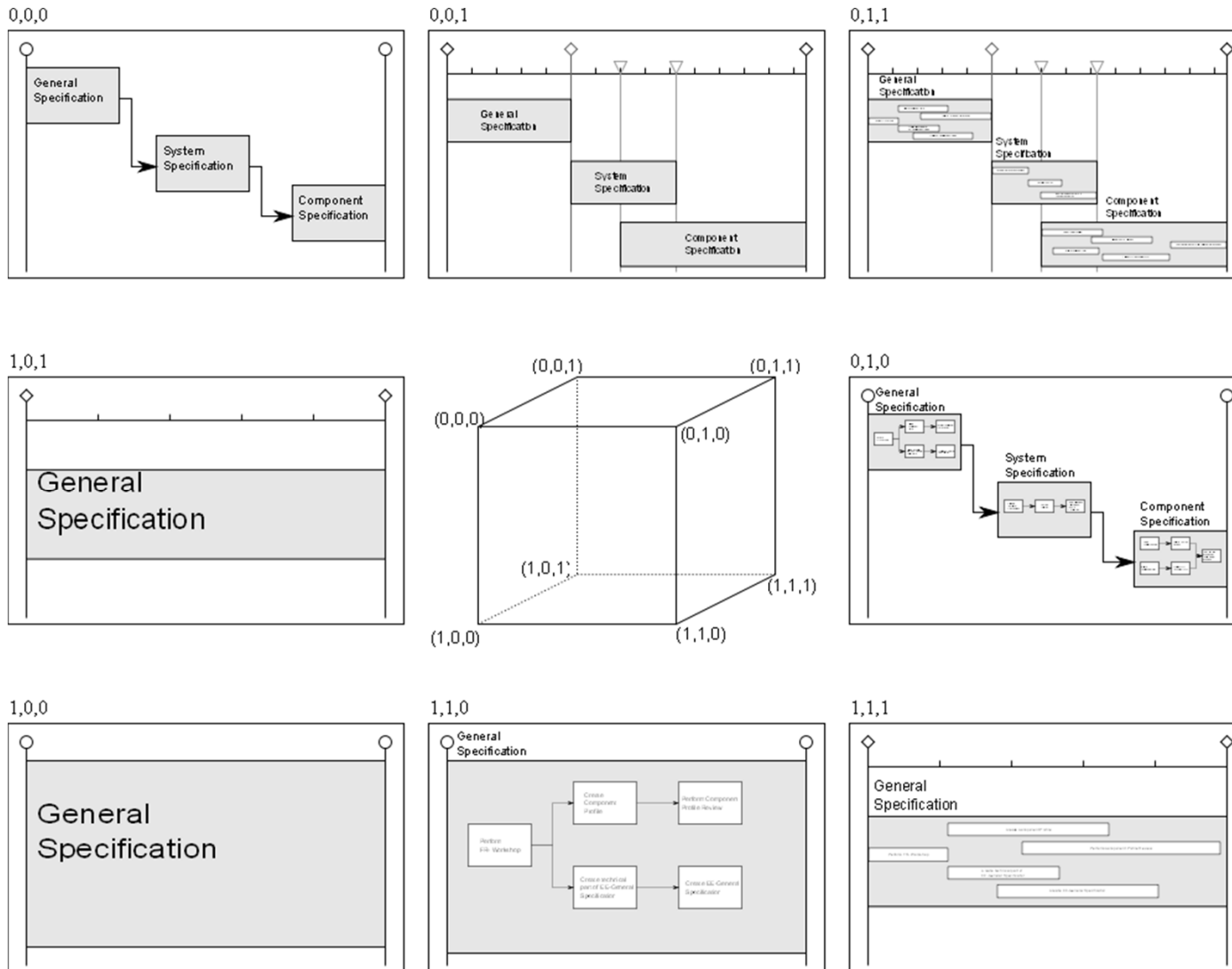
View dimension



Semantic dimension



(C) Navigation | An Example







(C) Navigation | An Example

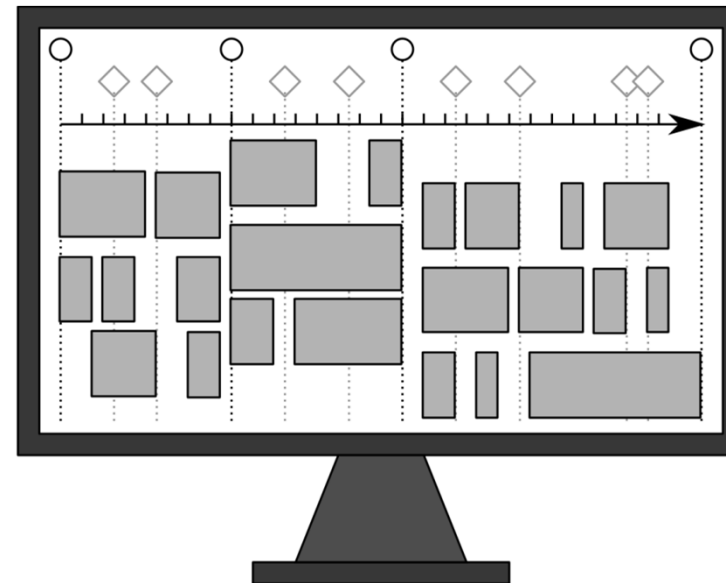
This example uses the presented navigation approach with additional filter mechanisms

Scenario

A developer wants to see which process step has to be done, after finishing the current process step.

(C) Navigation | An Example

	G		S		V
1		Process Areas	<input type="checkbox"/>	<input checked="" type="radio"/>	time-based
2		Ref. Process Areas	<input type="checkbox"/>	<input type="radio"/>	logic-based
3		Processes	<input checked="" type="checkbox"/>	<input type="radio"/>	text-based
4		Process Steps	<input type="checkbox"/>	<input type="radio"/>	data-based
Filter: no Filter					



G: Geographic Dimension

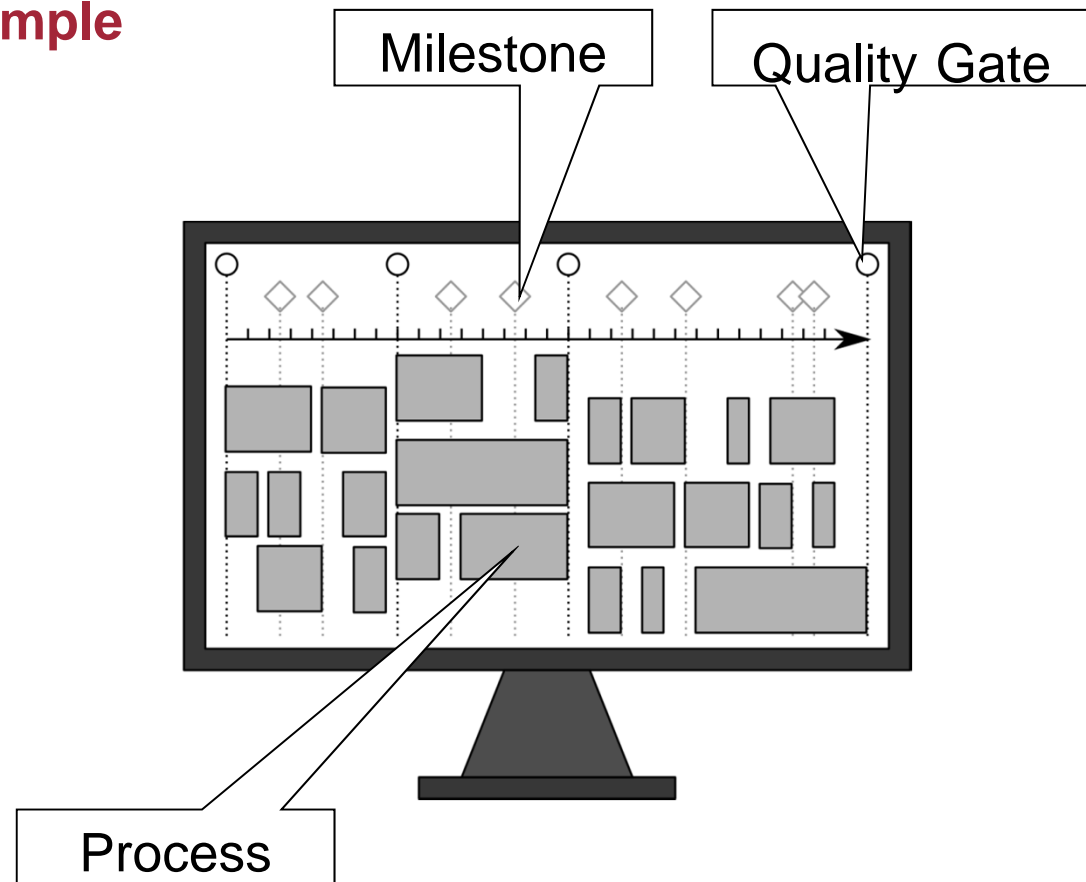
S: Semantic Dimension

V: View Dimension

(C) Navigation | An Example

	G	S	V
1	<input type="checkbox"/> Process Areas	<input type="checkbox"/>	<input checked="" type="radio"/> time-based
2	<input type="checkbox"/> Ref. Process Areas	<input type="checkbox"/>	<input type="radio"/> logic-based
3	<input type="checkbox"/> Processes	<input checked="" type="checkbox"/>	<input type="radio"/> text-based
4	<input type="checkbox"/> Process Steps	<input type="checkbox"/>	<input type="radio"/> data-based

Filter:
no Filter

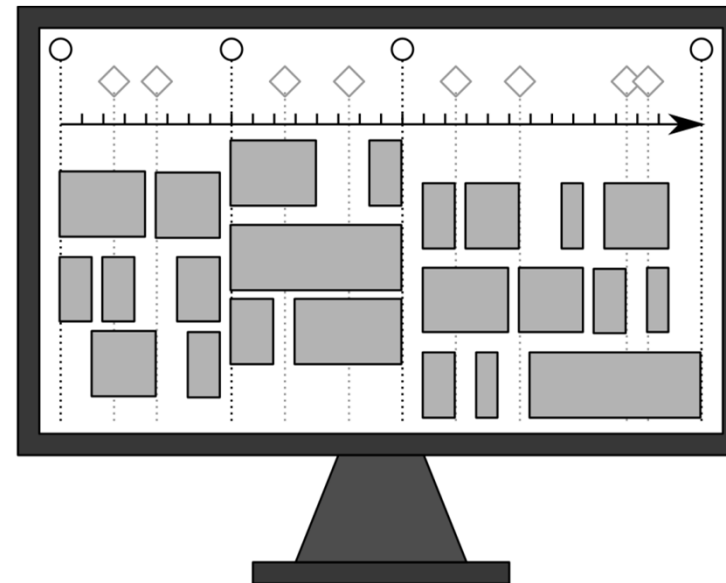


G: Geographic Dimension
S: Semantic Dimension
V: View Dimension

(C) Navigation | An Example

	G	S	V
1	Process Areas	<input type="checkbox"/>	<input checked="" type="radio"/> time-based
2	Ref. Process Areas	<input type="checkbox"/>	<input type="radio"/> logic-based
3	Processes	<input checked="" type="checkbox"/>	<input type="radio"/> text-based
4	Process Steps	<input type="checkbox"/>	<input type="radio"/> data-based

Filter:
no Filter

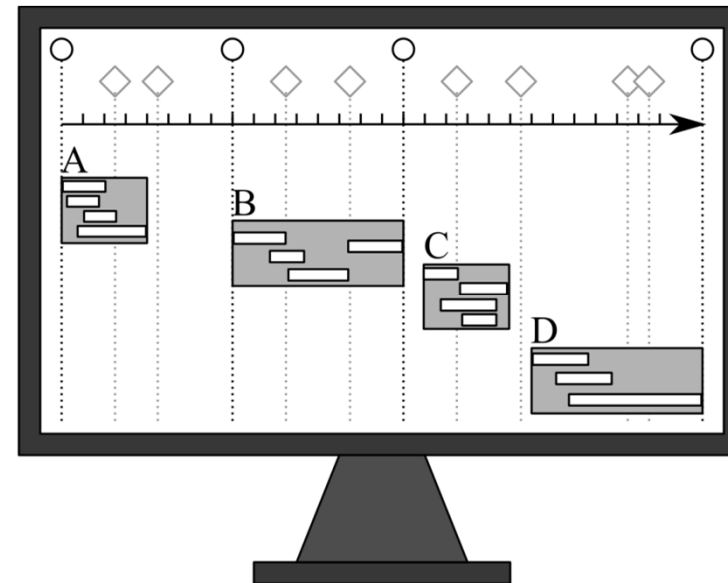
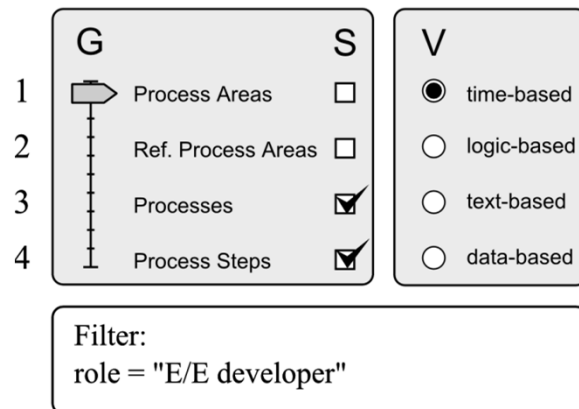


G: Geographic Dimension

S: Semantic Dimension

V: View Dimension

(C) Navigation | An Example

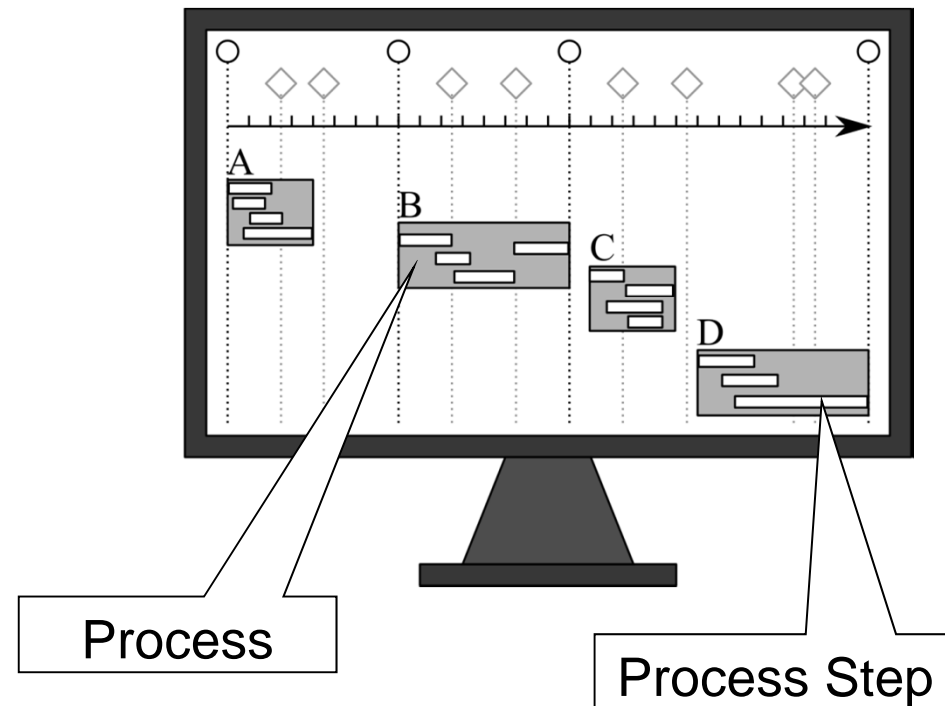
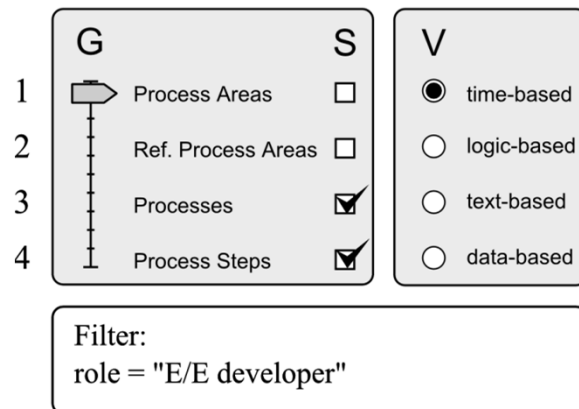


G: Geographic Dimension

S: Semantic Dimension





V: View Dimension

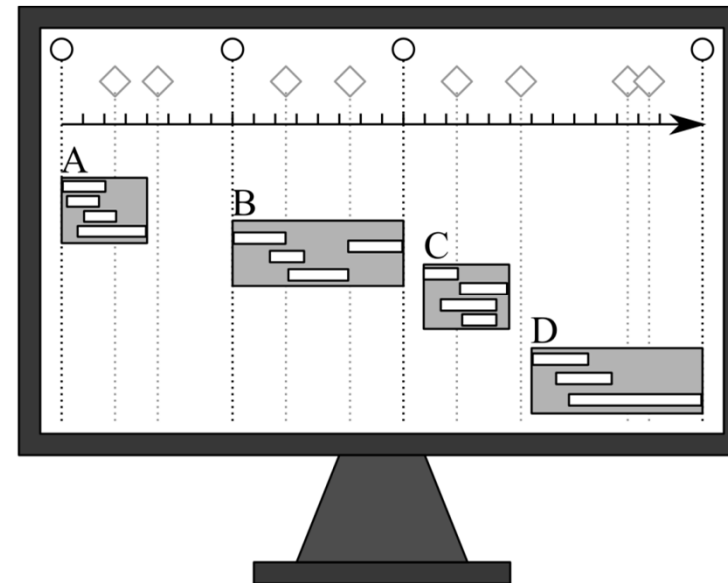
(C) Navigation | An Example



G: Geographic Dimension
S: Semantic Dimension
V: View Dimension

(C) Navigation | An Example

	G		S		V
1		Process Areas	<input type="checkbox"/>	<input checked="" type="radio"/>	time-based
2		Ref. Process Areas	<input type="checkbox"/>	<input type="radio"/>	logic-based
3		Processes	<input checked="" type="checkbox"/>	<input type="radio"/>	text-based
4		Process Steps	<input checked="" type="checkbox"/>	<input type="radio"/>	data-based
Filter: role = "E/E developer"					

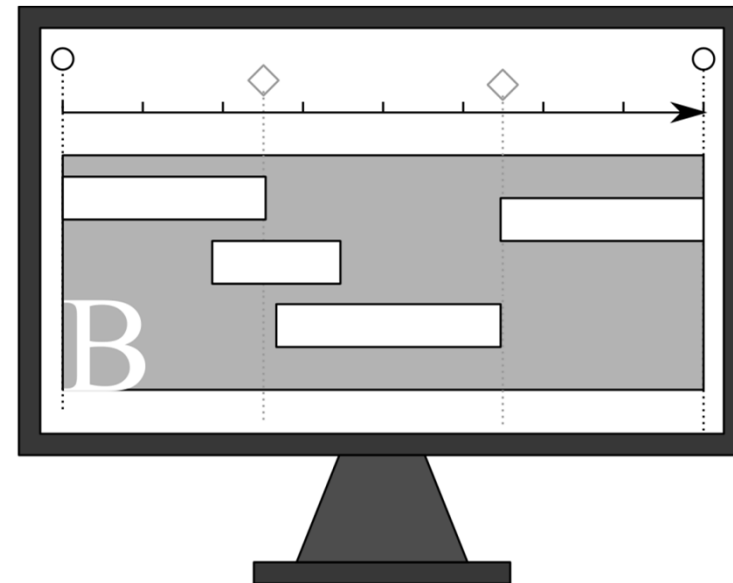
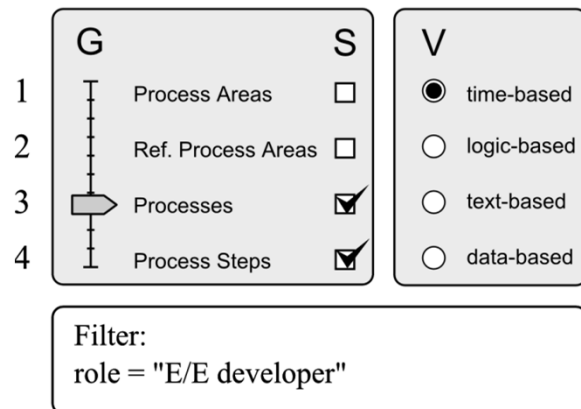


G: Geographic Dimension

S: Semantic Dimension

V: View Dimension

(C) Navigation | An Example



G: Geographic Dimension

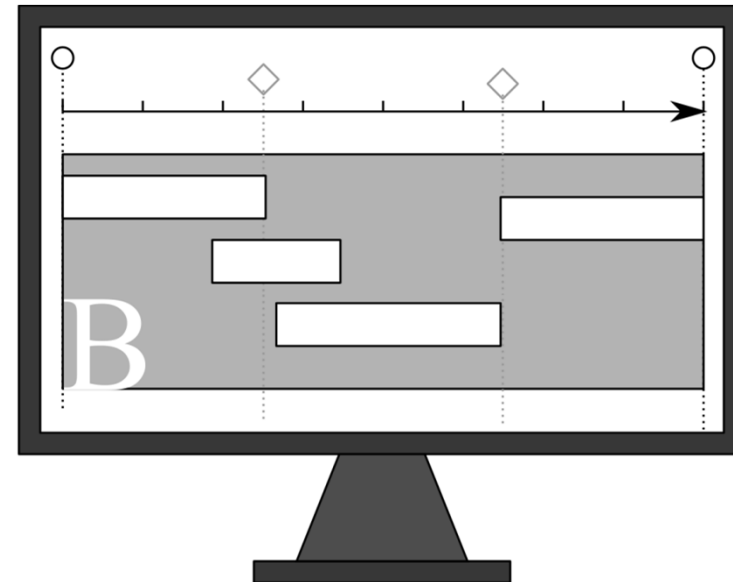
S: Semantic Dimension

V: View Dimension

(C) Navigation | An Example

	G	S	V
1	Process Areas	<input type="checkbox"/>	<input checked="" type="radio"/> time-based
2	Ref. Process Areas	<input type="checkbox"/>	<input type="radio"/> logic-based
3	→ Processes	<input checked="" type="checkbox"/>	<input type="radio"/> text-based
4	Process Steps	<input checked="" type="checkbox"/>	<input type="radio"/> data-based

Filter:
role = "E/E developer"

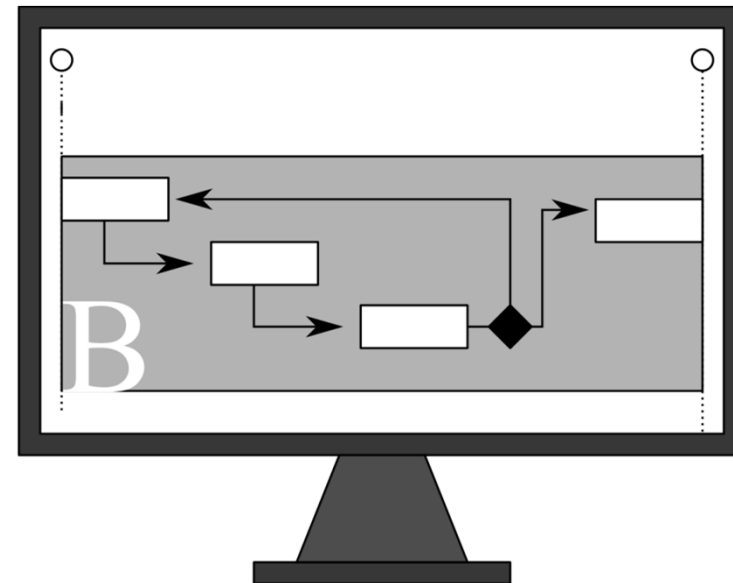
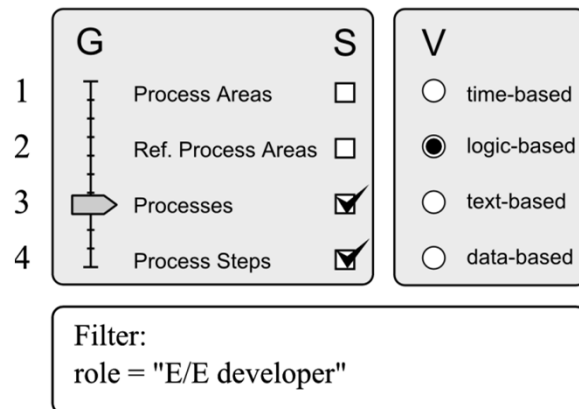


G: Geographic Dimension

S: Semantic Dimension

V: View Dimension

(C) Navigation | An Example



G: Geographic Dimension

S: Semantic Dimension

V: View Dimension

Large Process Collections: Process Configuration & Variability

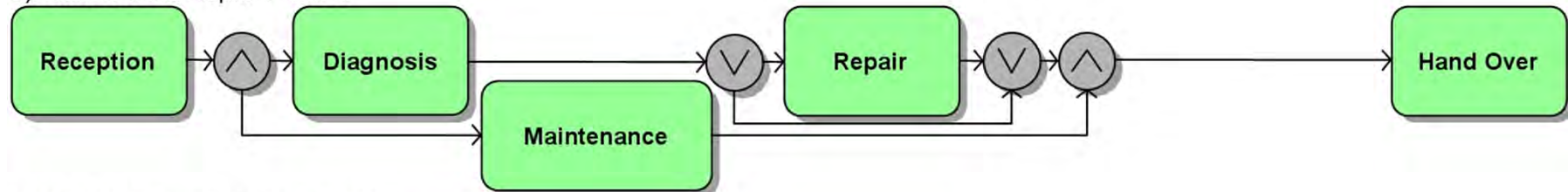
Provop



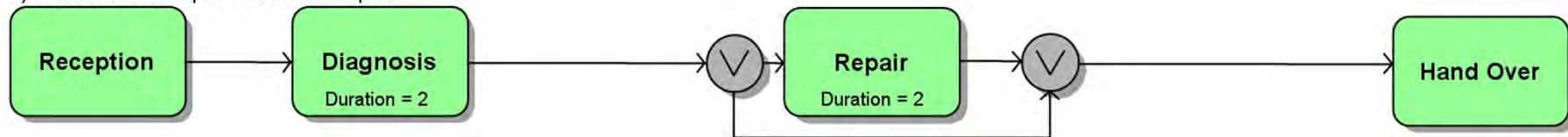
The Challenge: Dealing with Large Process Model Collections

... and a Particular Challenge: Managing Process Variants

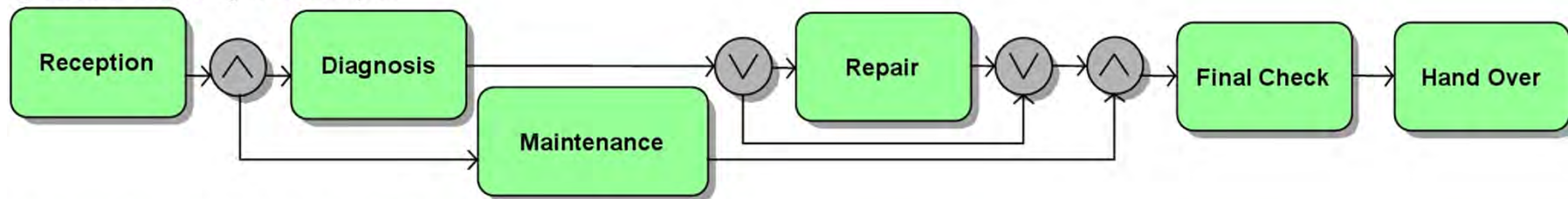
a) Standardized Repair Process



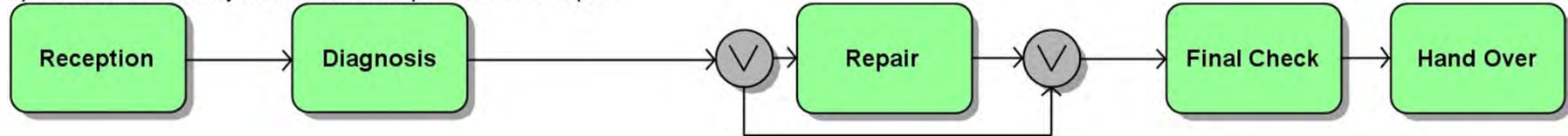
b) Variant 1: Simple Problem Repair



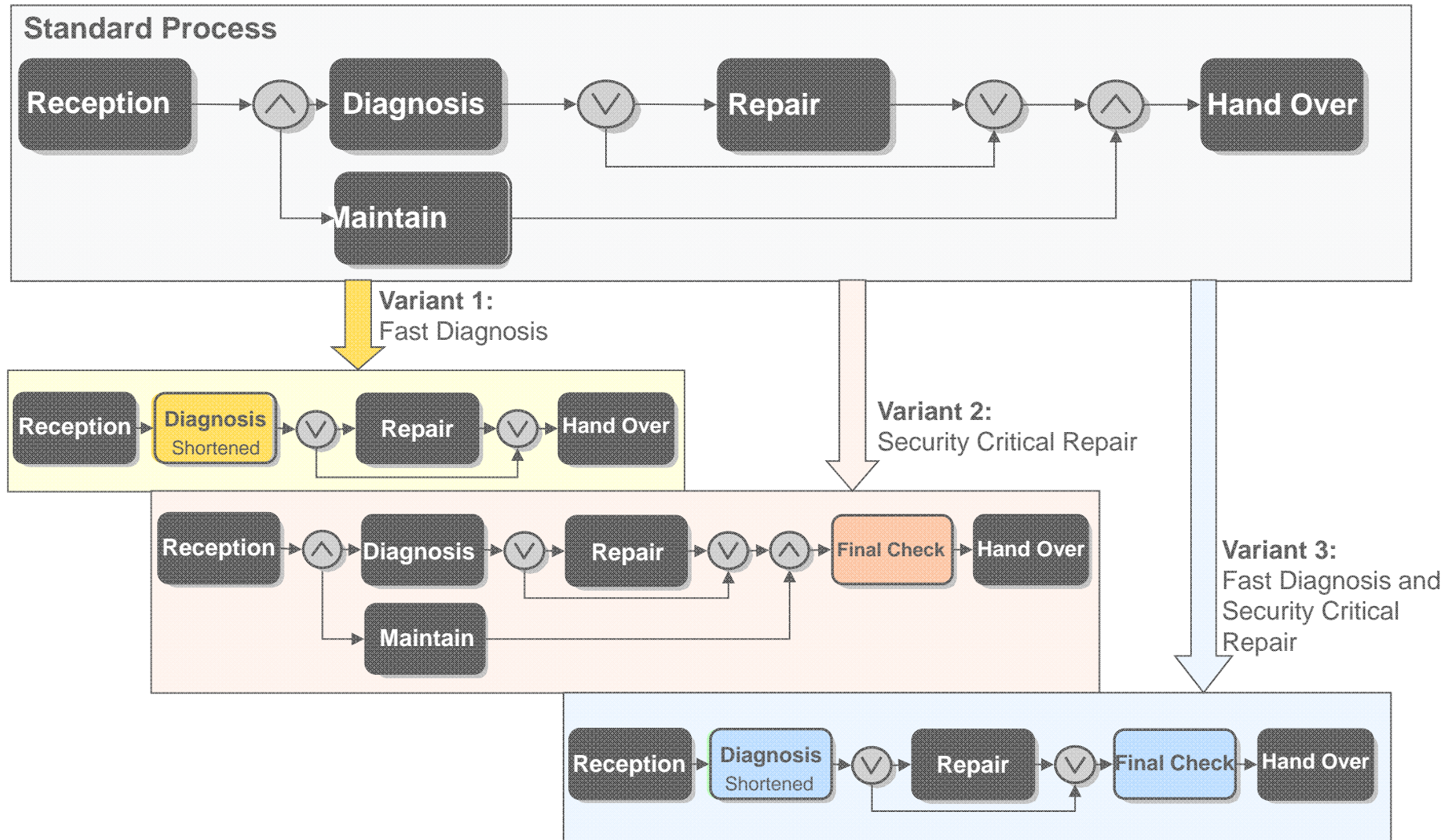
c) Variant 2: Security Critical Repair



d) Variant 3: Security Critical and Simple Problem Repair

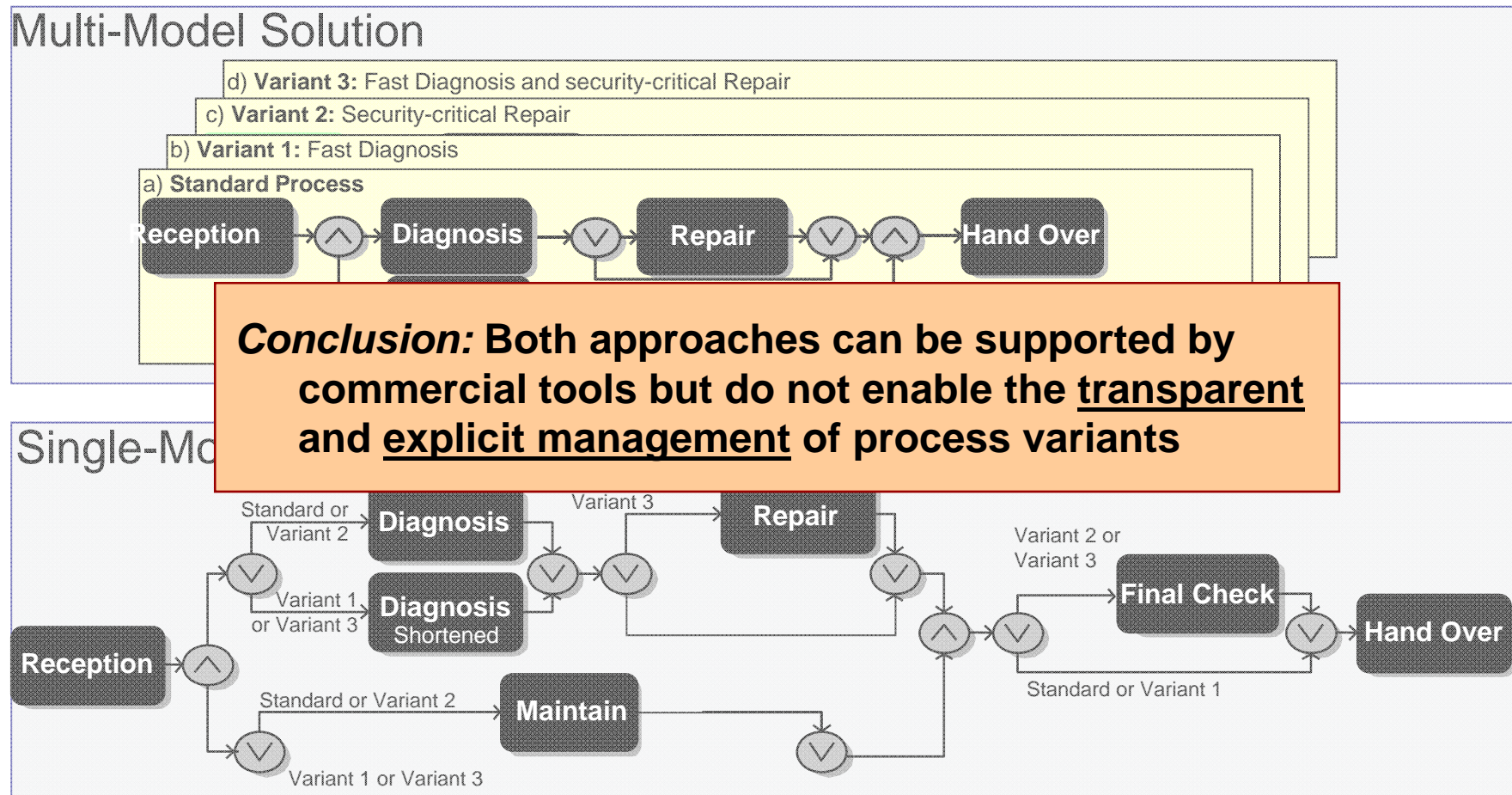


... and a Particular Challenge: Managing Process Variants

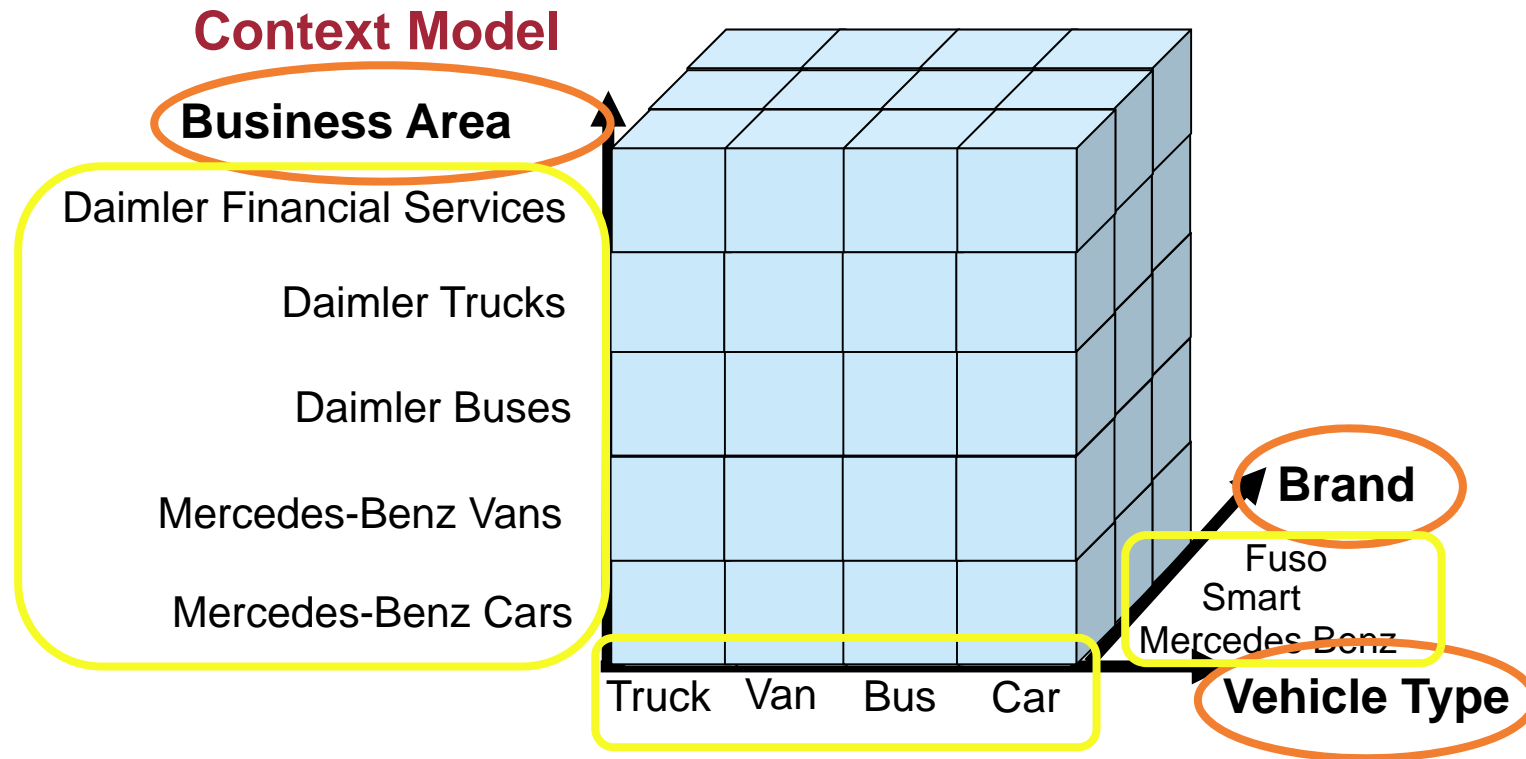


... and a Particular Challenge: Managing Process Variants

How Daimler captured the variants of a process family

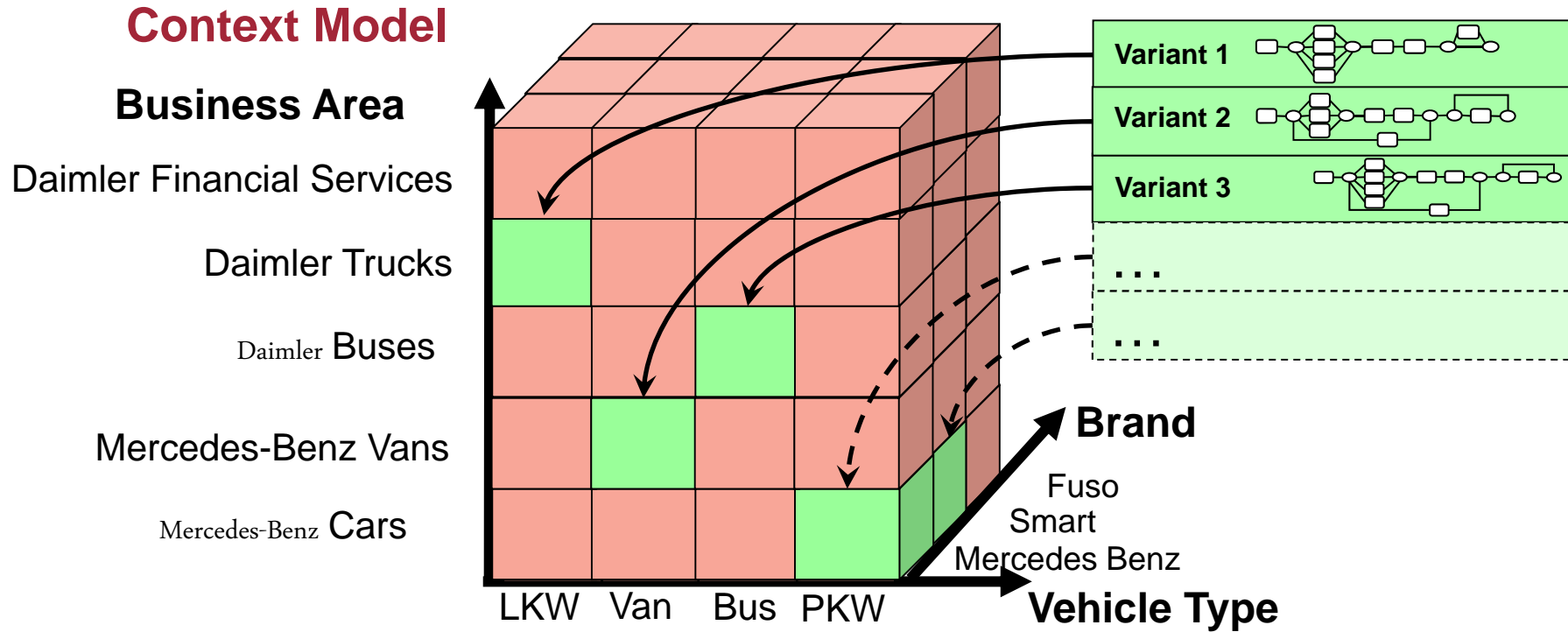


... and a Particular Challenge: Managing Process Variants

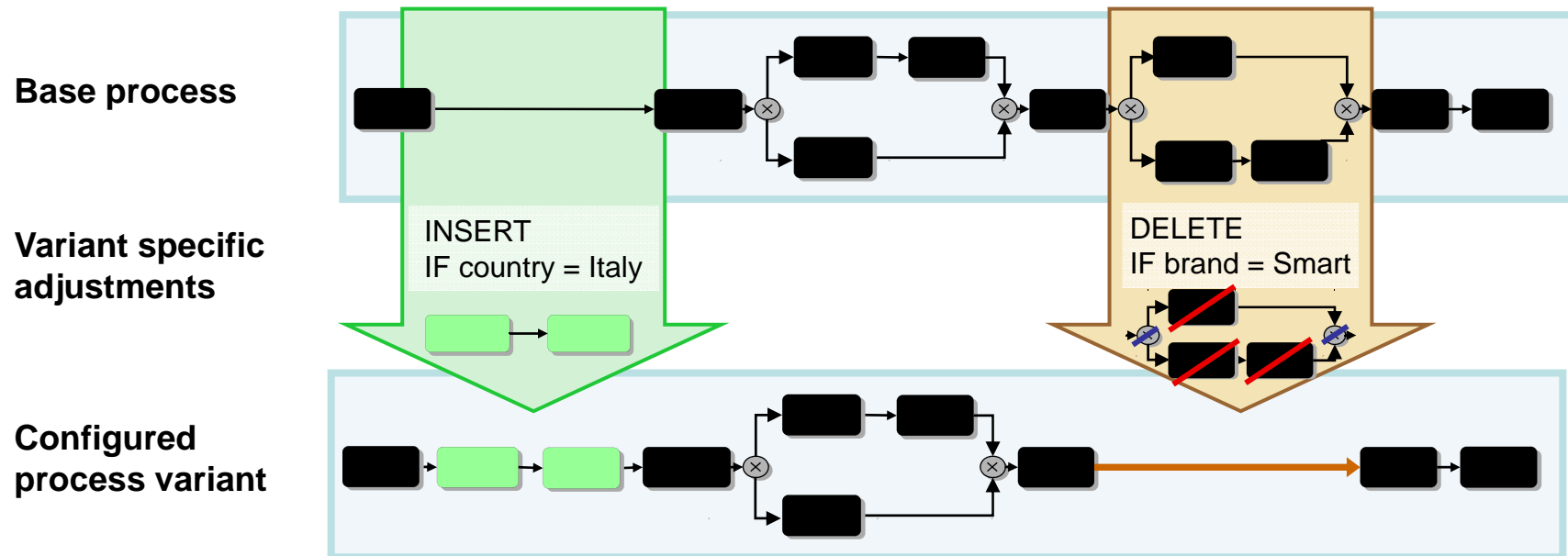


Problem: Not all value combinations make sense!

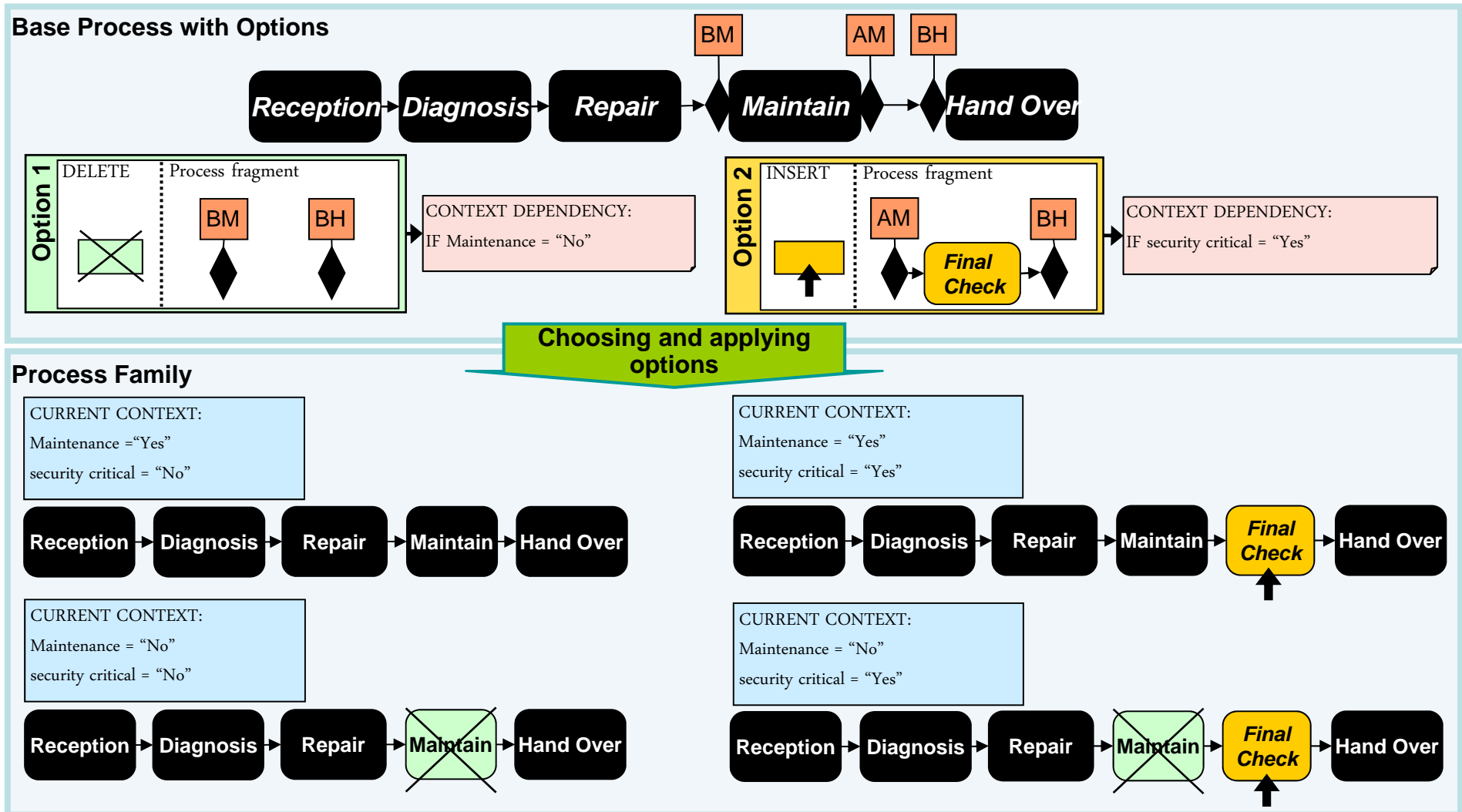
... and a Particular Challenge: Managing Process Variants



A Framework for Managing Process Variants: Provop



A Framework for Managing Process Variants: Provop

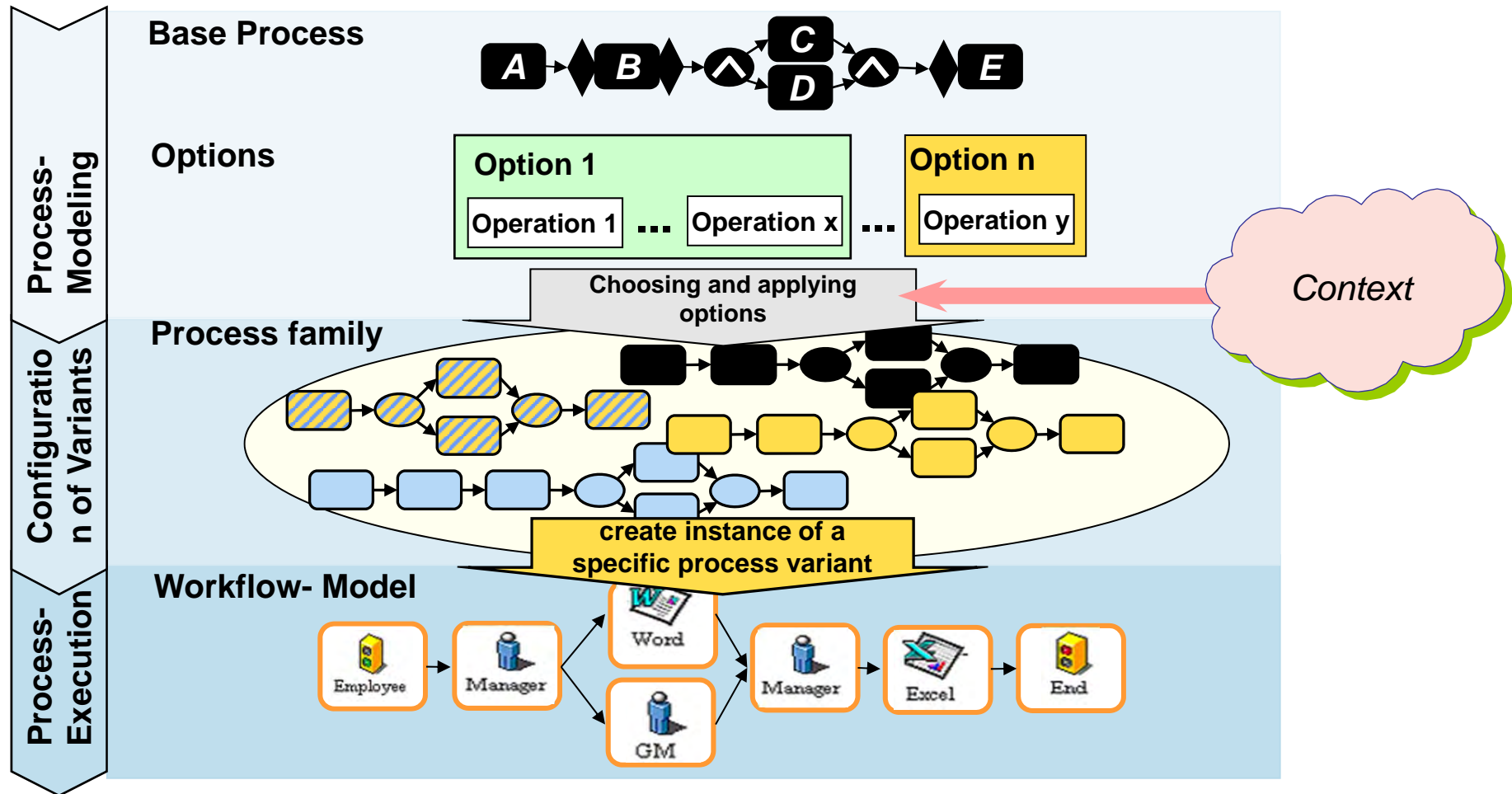


A Framework for Managing Process Variants: Provop

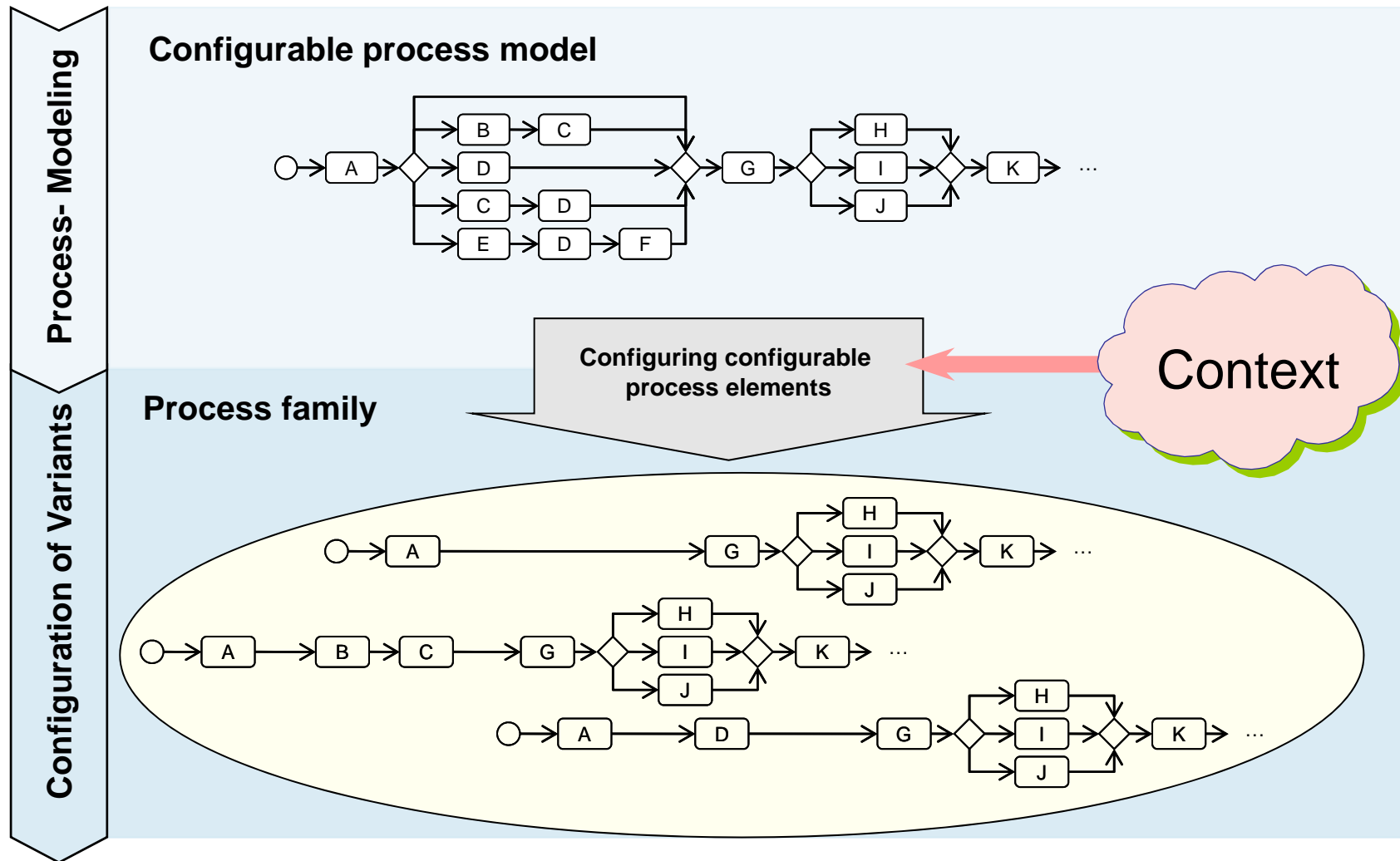
The screenshot displays the ARIS Business Architect 7.1 software interface. The main workspace shows a process diagram titled 'base process' with several green activity nodes: 'Reception', 'Diagnosis', 'Repair', 'Maintenance', 'Final Check', and 'Hand Over'. The flow starts at 'Reception', leading to a decision diamond with a plus sign. From there, it branches into two paths: one through 'Diagnosis' and 'Repair', and another through 'Maintenance'. Both paths merge at another decision diamond with a plus sign. This leads to a third decision diamond with a plus sign, which then flows into 'Final Check' and finally 'Hand Over'. A large arrow labeled 'Over.In' points to the 'Hand Over' activity. The interface includes a menu bar, toolbars, and a navigation pane on the left showing a project tree with folders like 'PROVOP' and 'Result models'.

Name	base process
Type	Provop-Basemodel
Time of generation	09.07.2009 15:09:17
Creator	system
Last change	06.09.2009 19:04:25
Last user	system

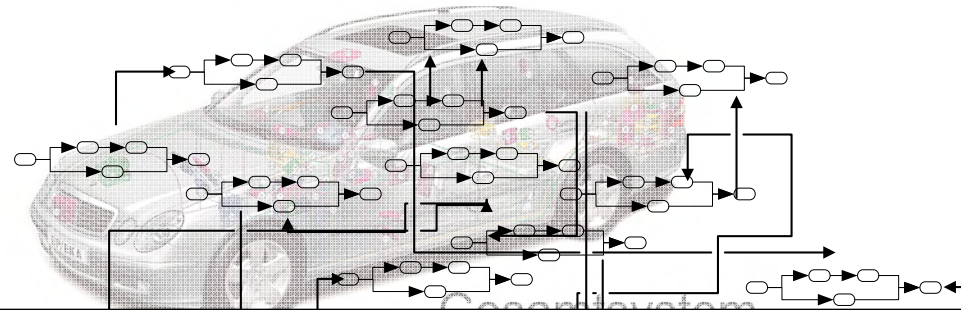
A Framework for Managing Process Variants: Provop



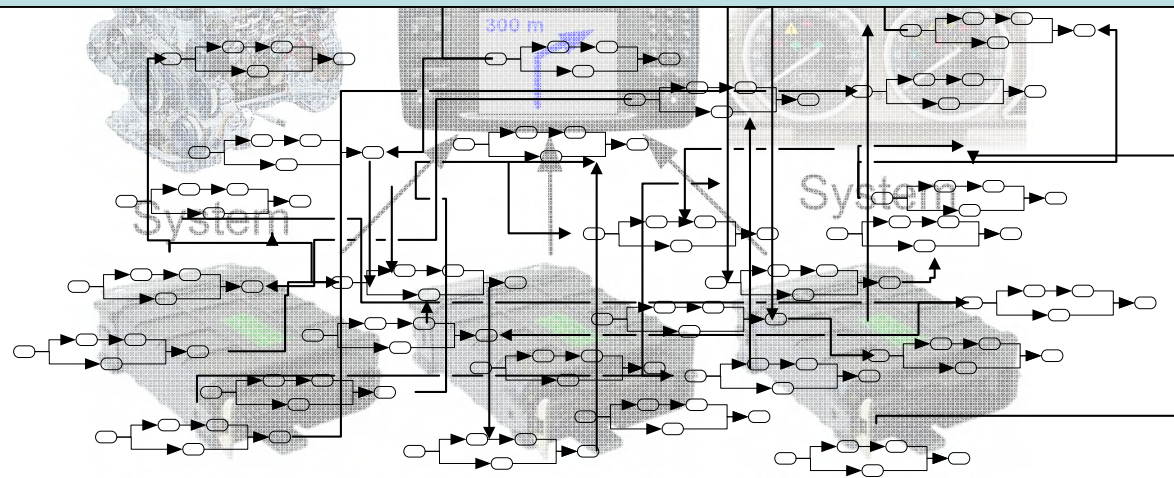
An Alternative Approach: Configurable Process Models



Large Process Structures: Data-Driven Modeling and Adaptation



**The Challenge:
Dealing with Large Process Model Collections**



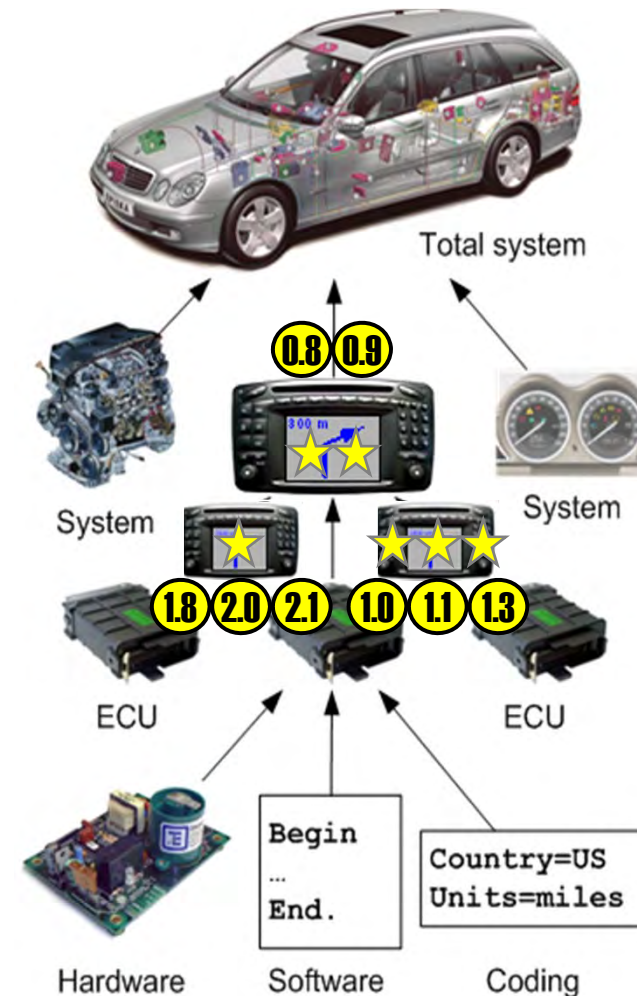
Komponente Komponente Komponente

The Challenge: Dealing with Large and Complex Process Structures

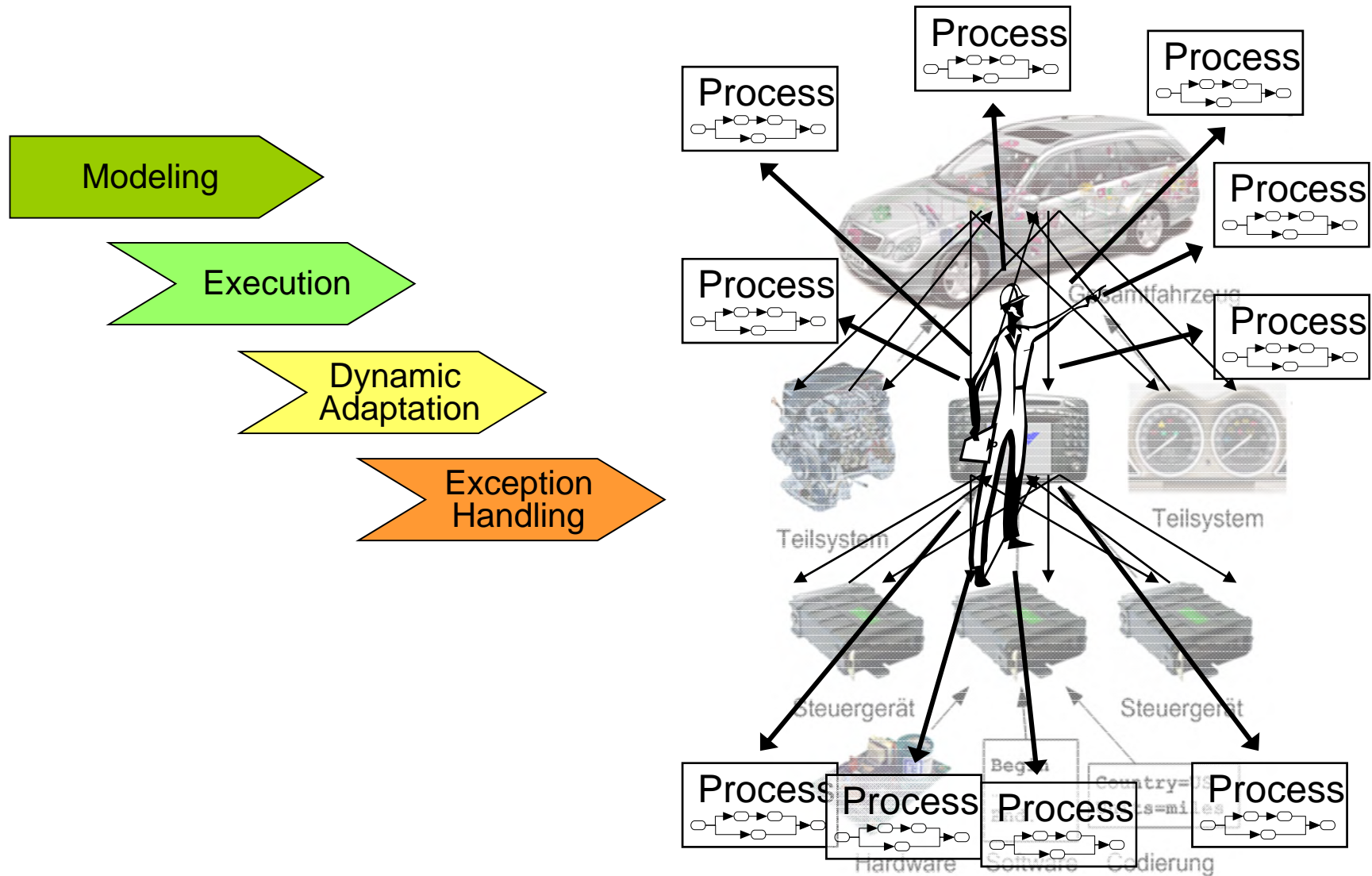
Current Problems in Automotive Engineering

- ❑ Up to 50% of all car breakdowns due to electrical / electronic problems
- ❑ Some facts
 - Many non-obvious dependencies between ECUs
 - Different life and development cycles of mechanics, hardware and software
 - Numerous ECU variants and versions

☞ **Systematic verification and release management required**

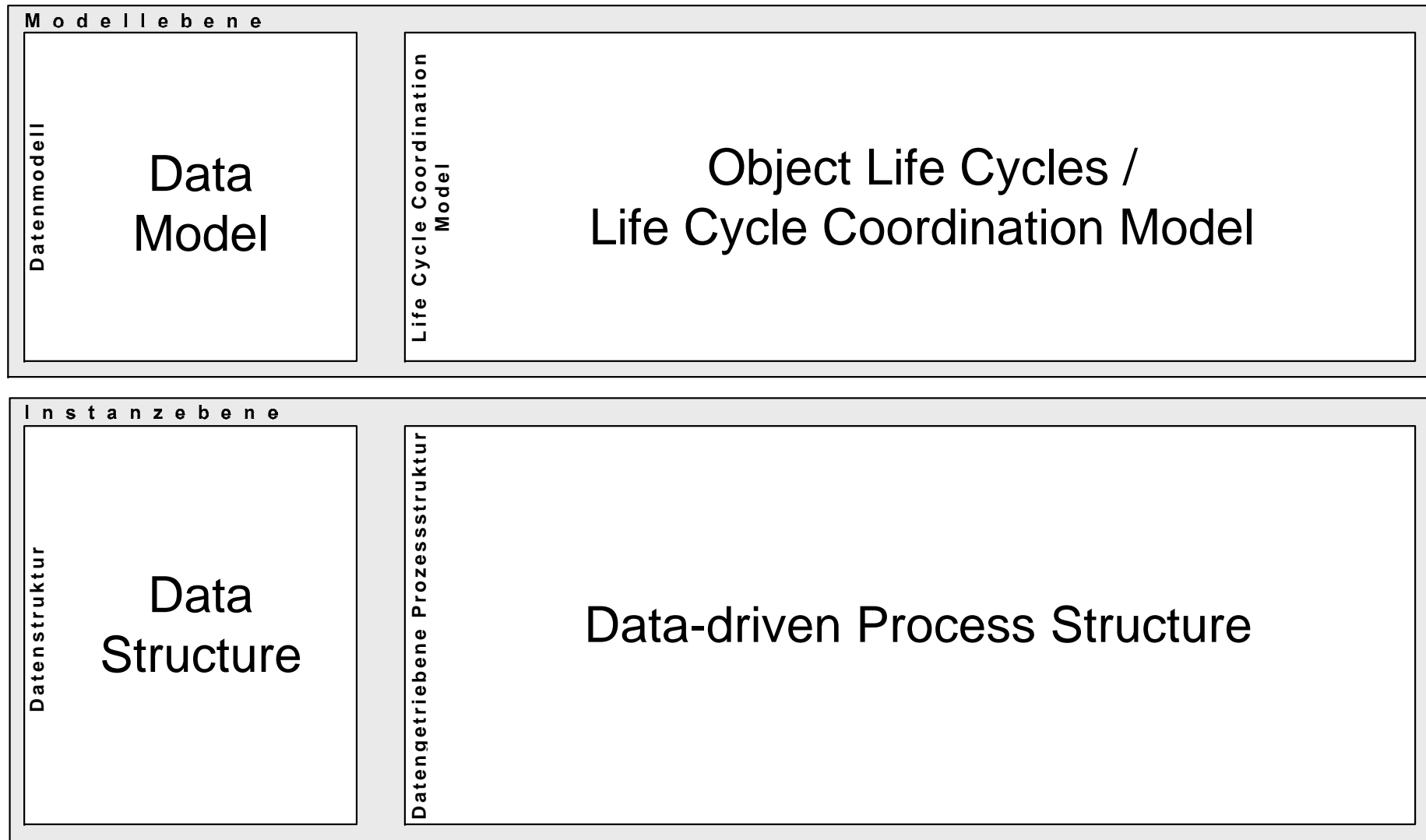


The Challenge: Dealing with Large and Complex Process Structures

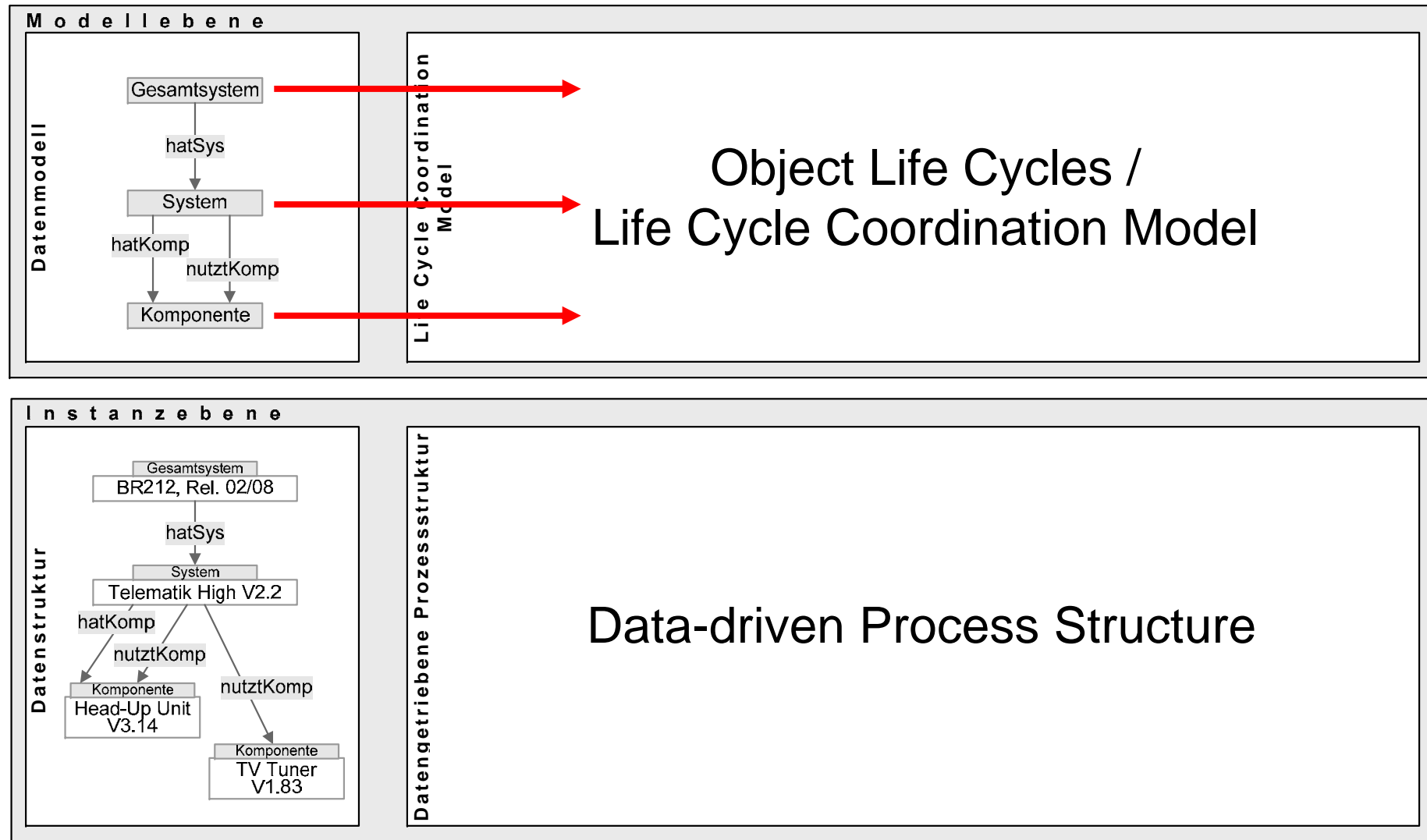


The Corepro Framework

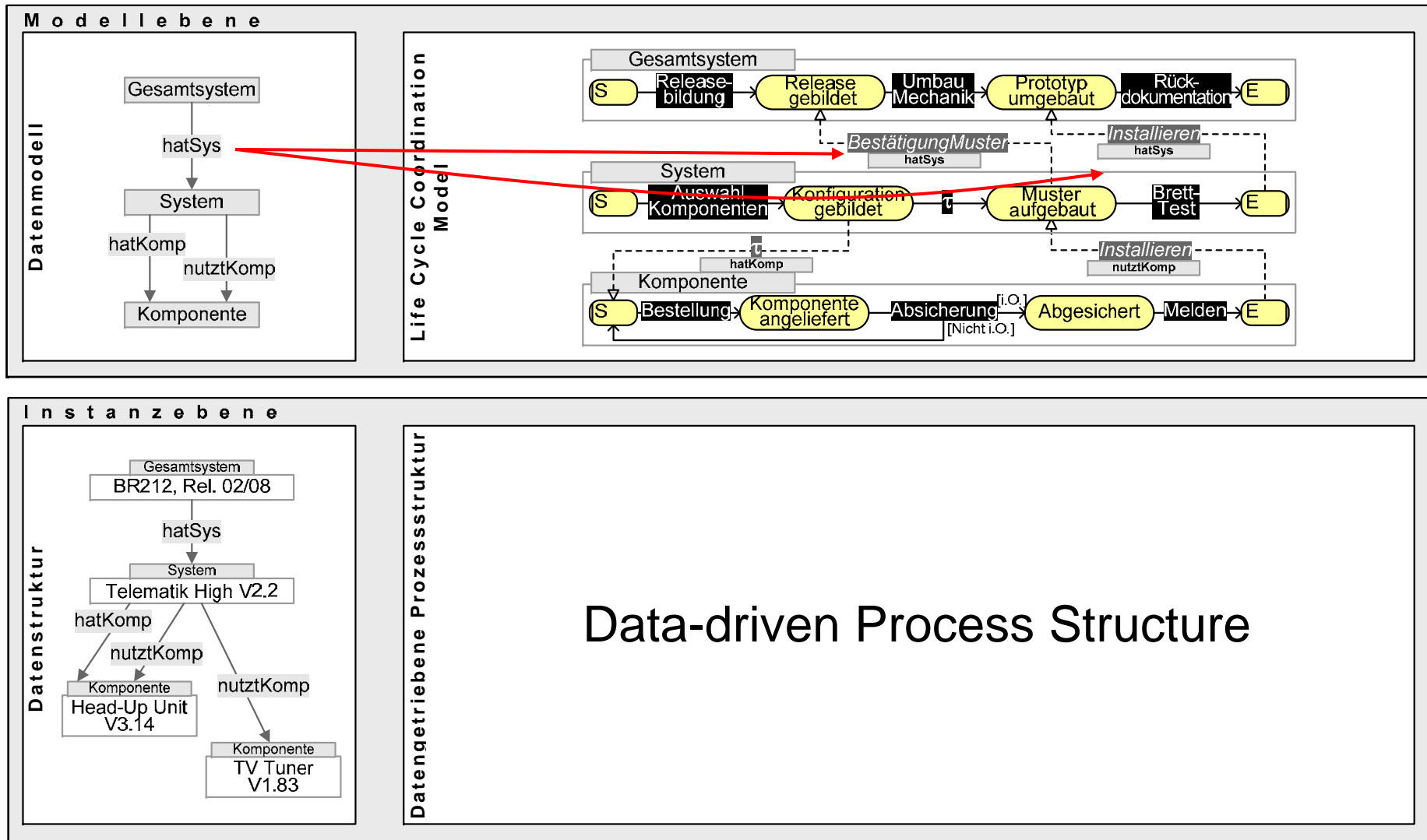
The Corepro Framework – Basic Approach



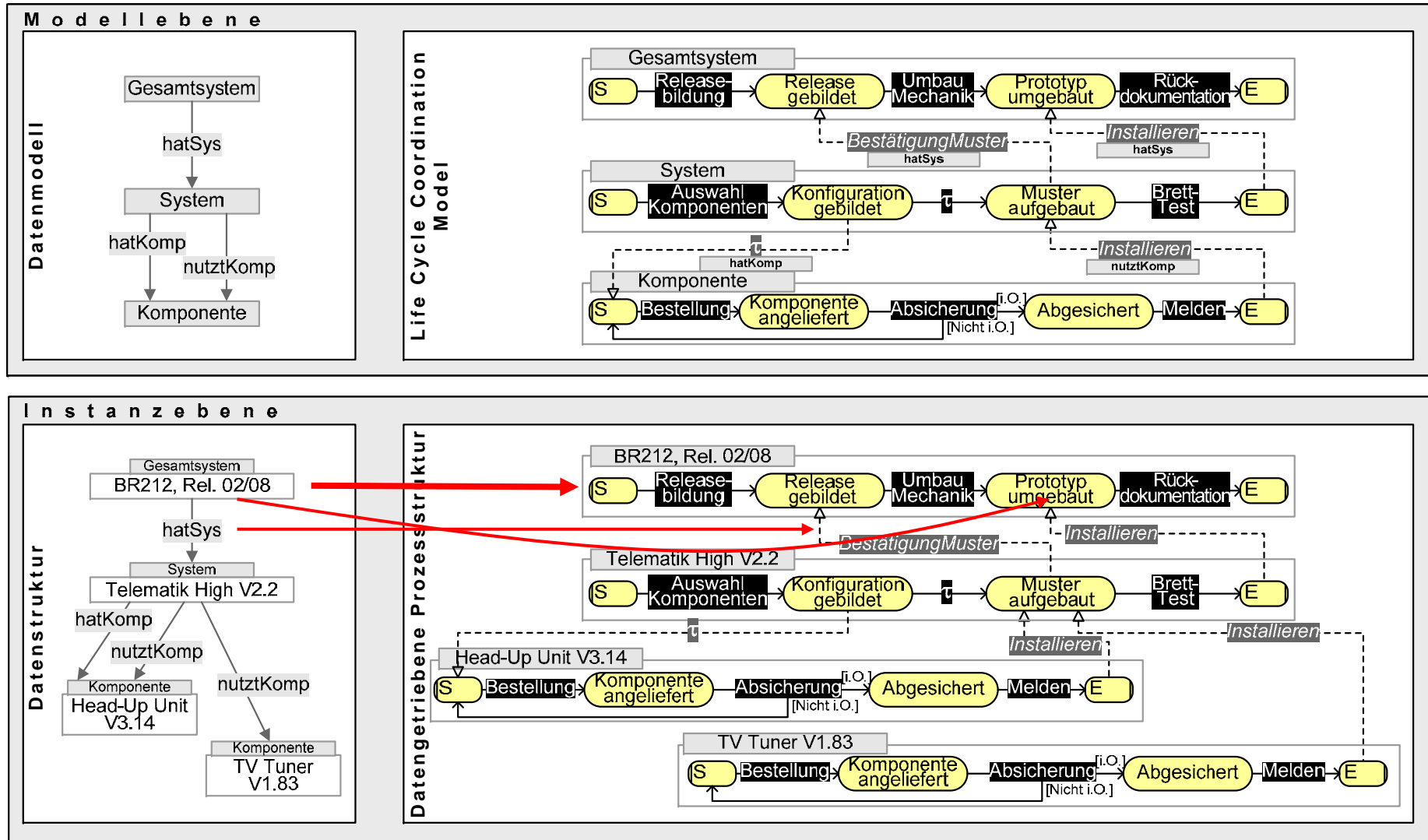
The Corepro Framework – Basic Approach

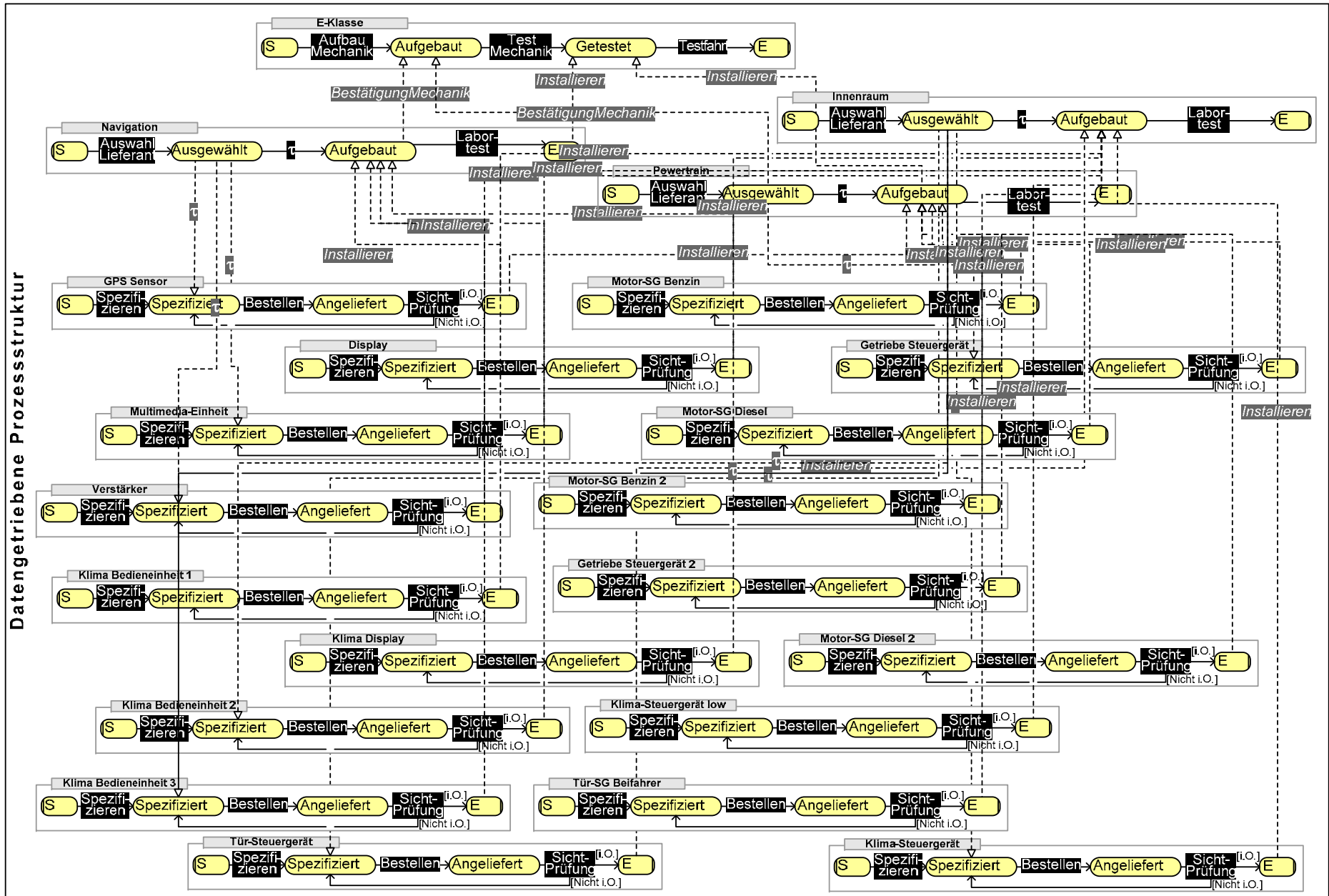


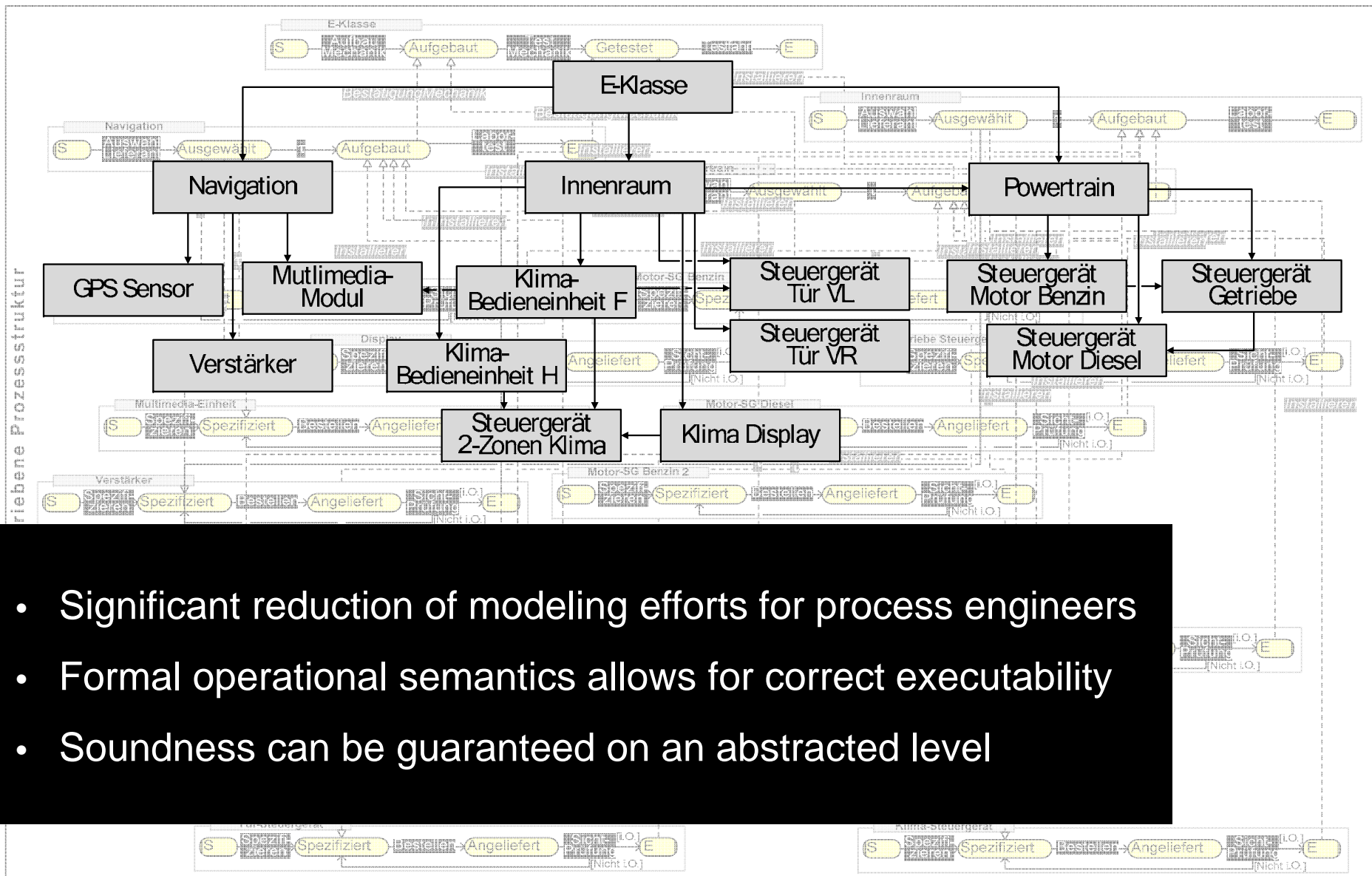
The Corepro Framework – Basic Approach



The Corepro Framework – Basic Approach

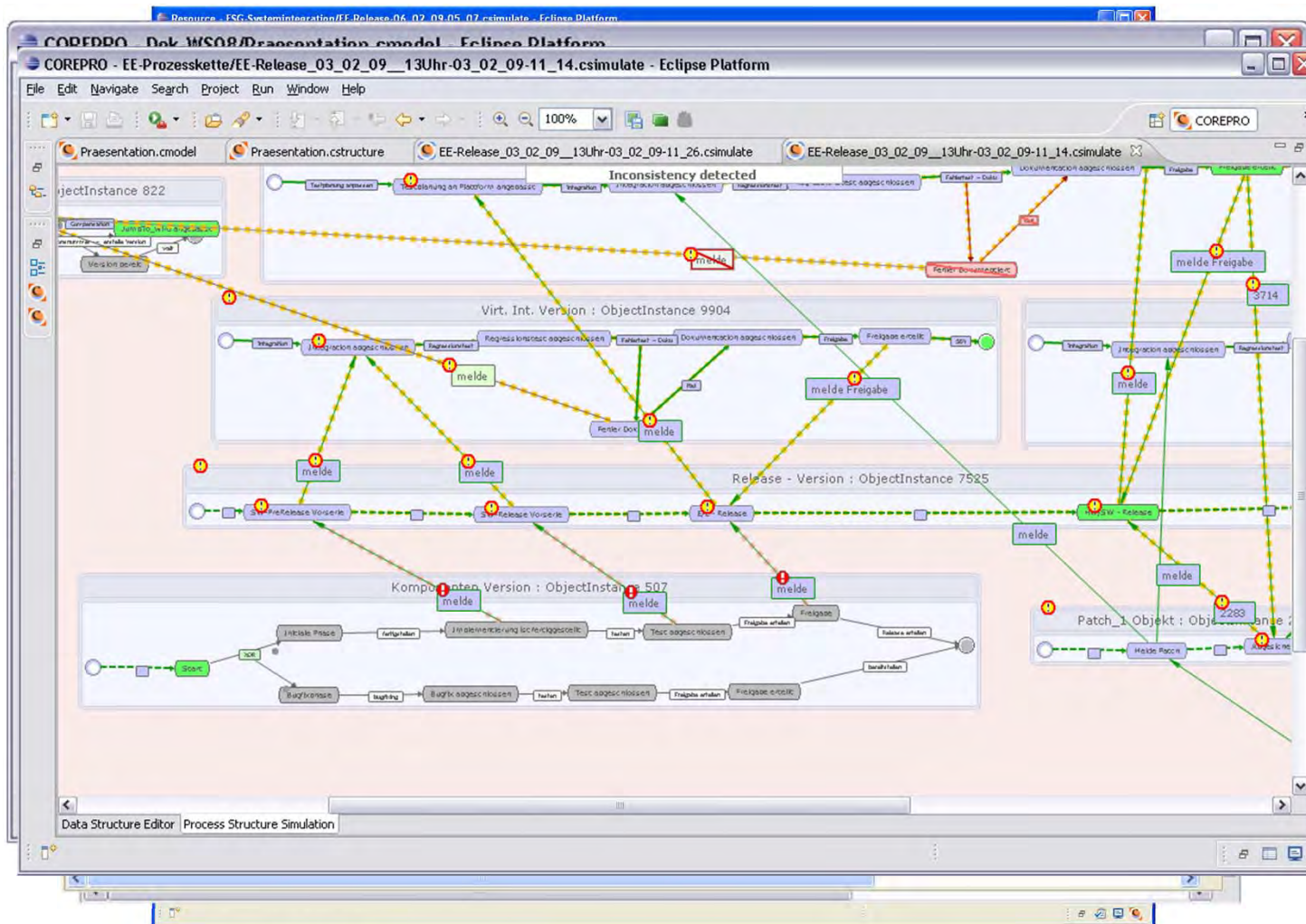






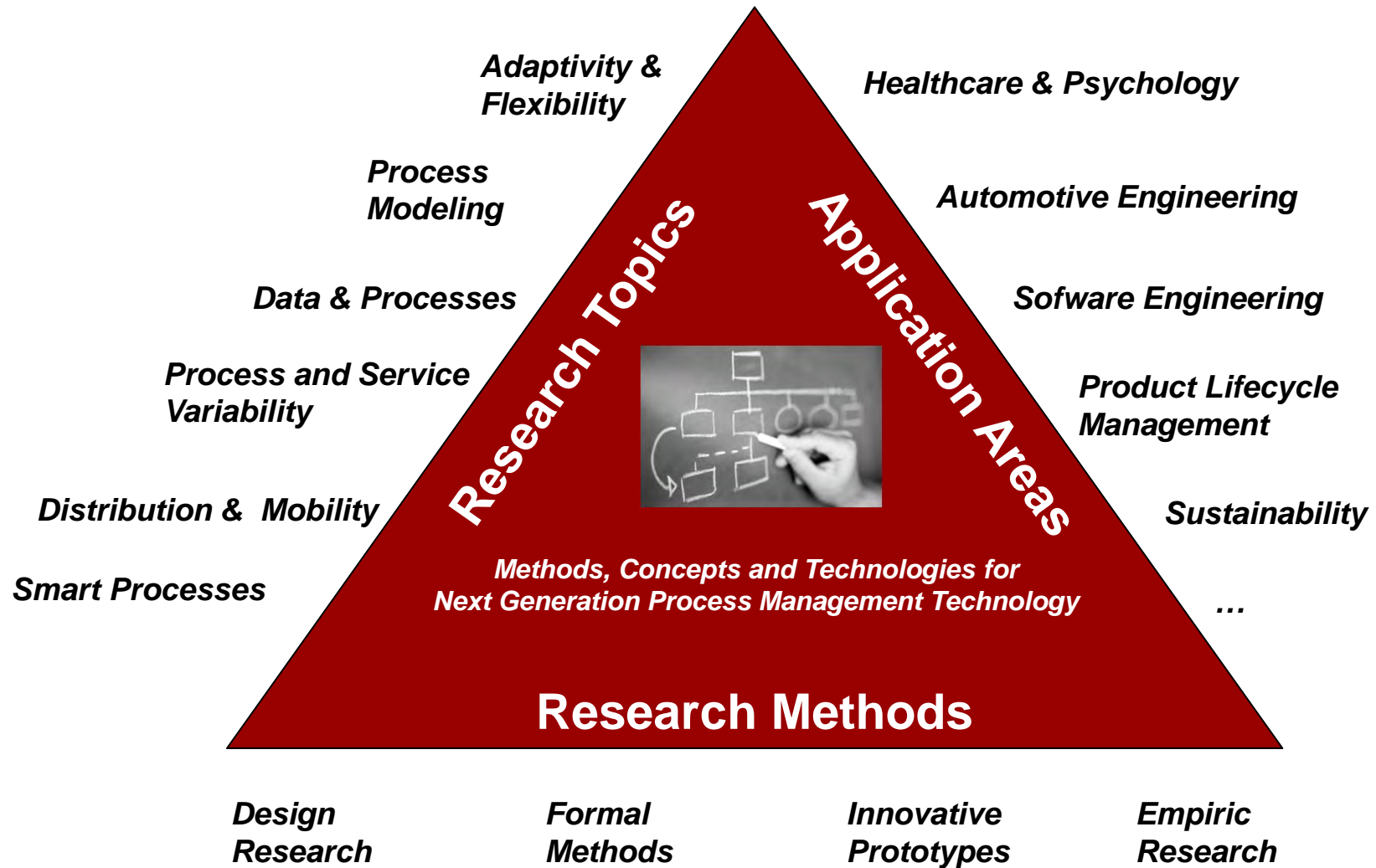
The Corepro Framework – Proof-of-Concept Prototype

Auditing the Model with the Corepro Framework



Summary

DBIS Research



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