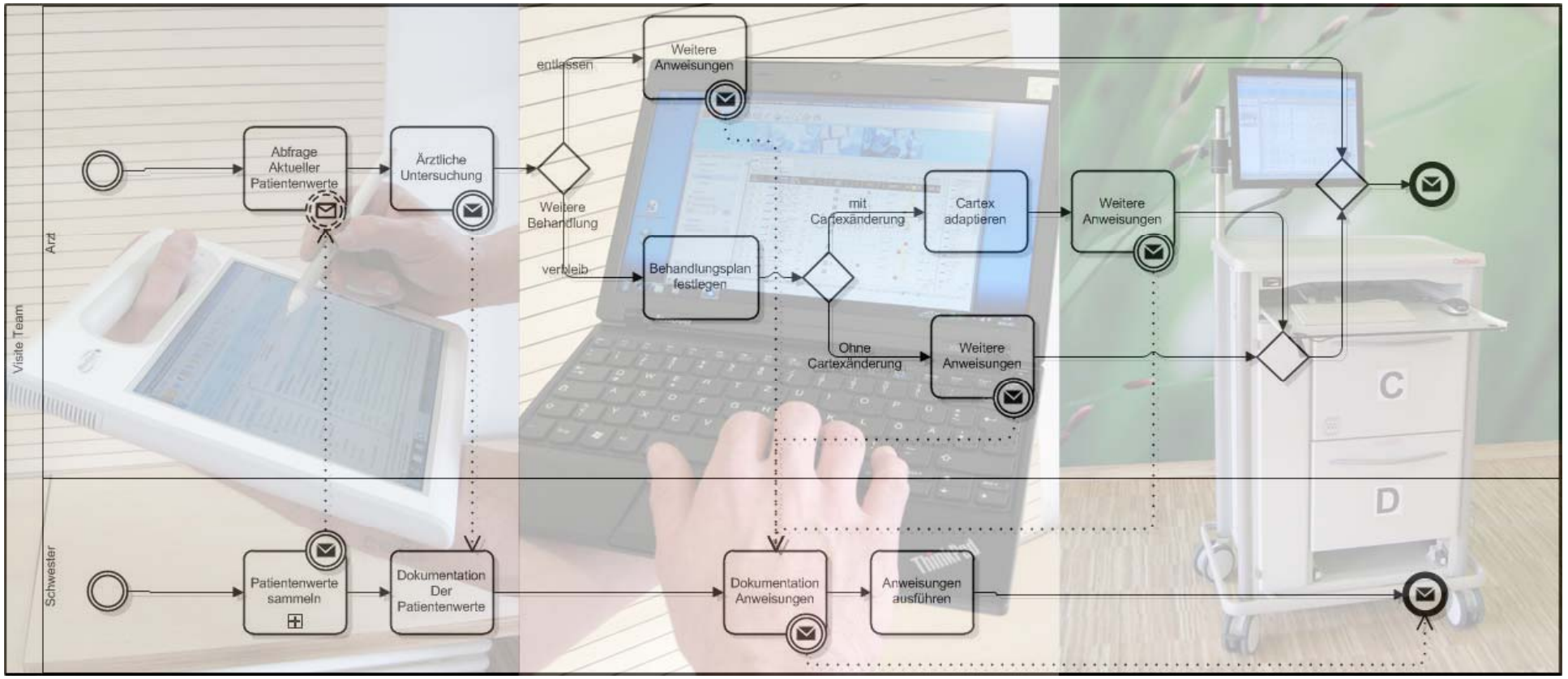
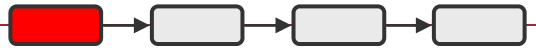
DBIS EXPERIENCE
processes for a flexible world

ulm university universität ulm

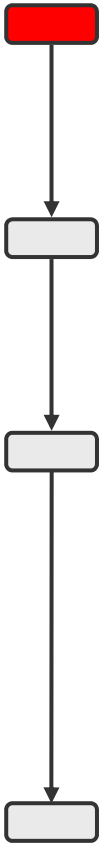


What Business Process Management Technology Can Do for Healthcare Process Support?

Manfred Reichert



Overview



Motivation

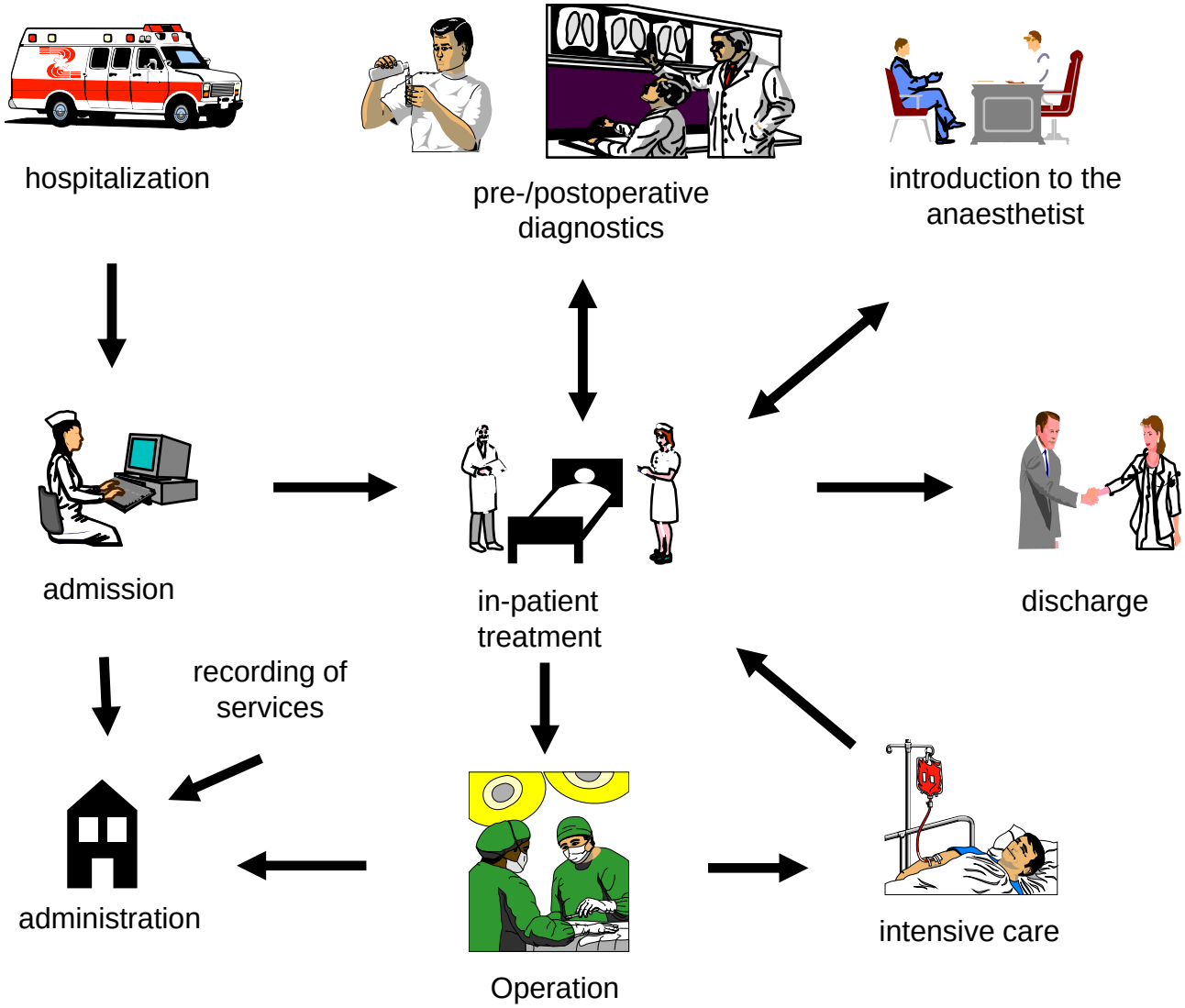
Process-aware Information Systems (PAIS)

Adaptive PAIS

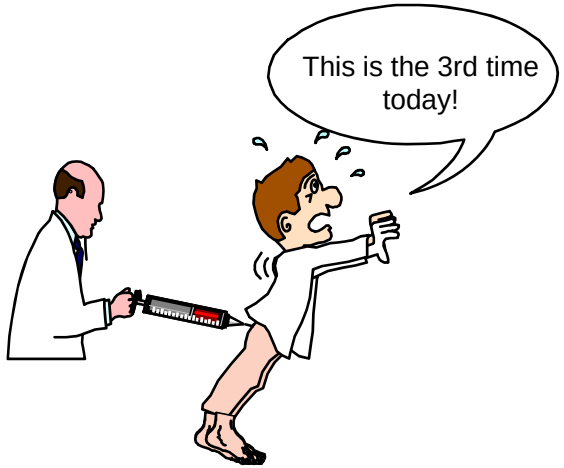
- Ad-hoc Deviations
- Process Evolution
- User Assistance
- Mining Process Logs
- Process Configuration

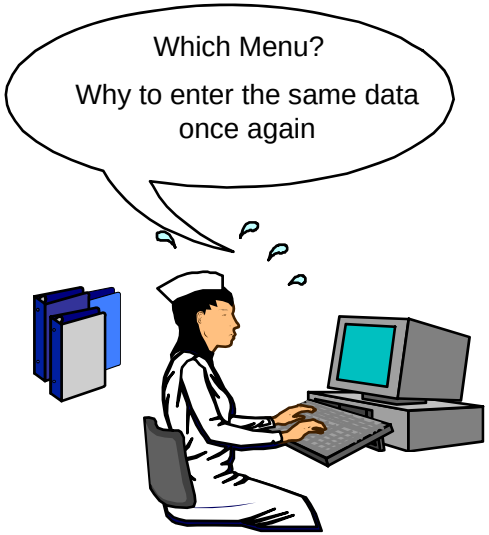
Summary & Outlook

Motivation: The Clinical Workday



Motivation: Some Problems

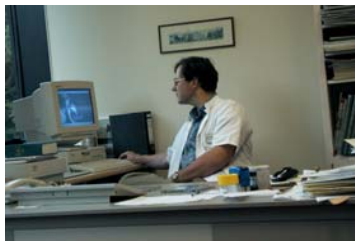




Motivation: Fundamental Goals

Fundamental Goals:

- ❏ Continuity of care
- ❏ Patient-centered treatment
- ❏ Integrated care
- ❏ Process-awareness



provision of information and knowledge at the „point of care"

Urgent need for IT support:

- ❏ Frequent cause of medical errors ⇨ Missing information or knowledge
- ❏ Example: Medication errors
  - 29% due to missing patient-related information
  - 19% due to missing medical knowledge

Leape LL. A systems analysis approach to medical errors.
J Eval Clin Pract 3: 213-22, 1997

Motivation: Fundamental Goals

Fundamental Goals:

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- ❏ Patient-centered treatment
- ❏ Integrated care
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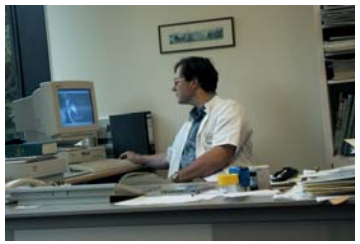
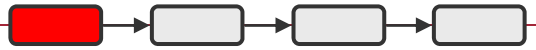


provision of information and knowledge at the „point of care"

There is a discrepancy between the potential and actual usage of IT!

Why?

Committee on Quality of Healthcare in America (IoM)
Crossing the Quality Chasm: A New Health System for the 21st Century. IOM, 2001



Motivation: Levels of Process Support

❑ Organizational processes

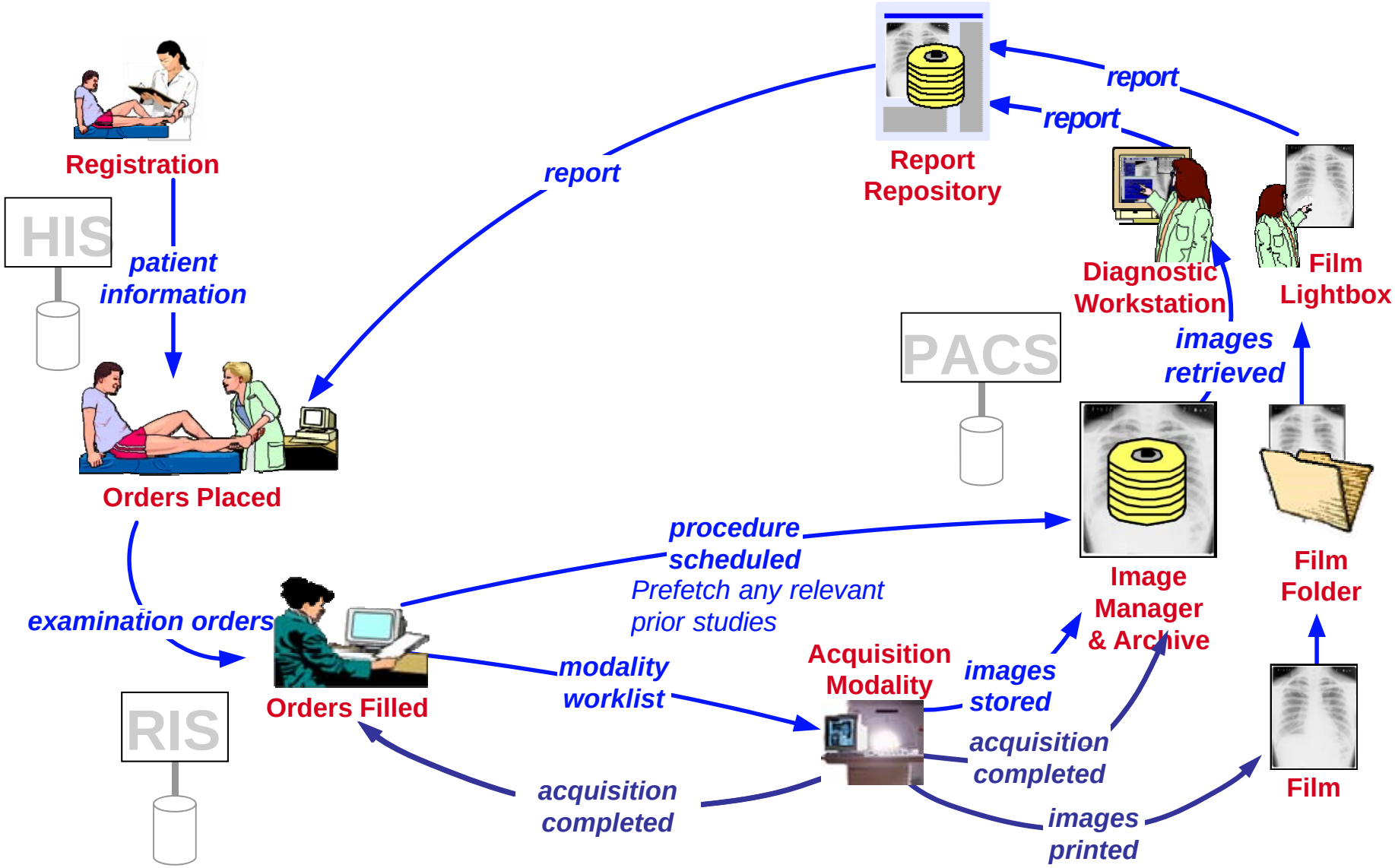
- Interdisciplinary cooperation among different people and organizational units
- Example: Order entry and result reporting

❑ Patient treatment processes

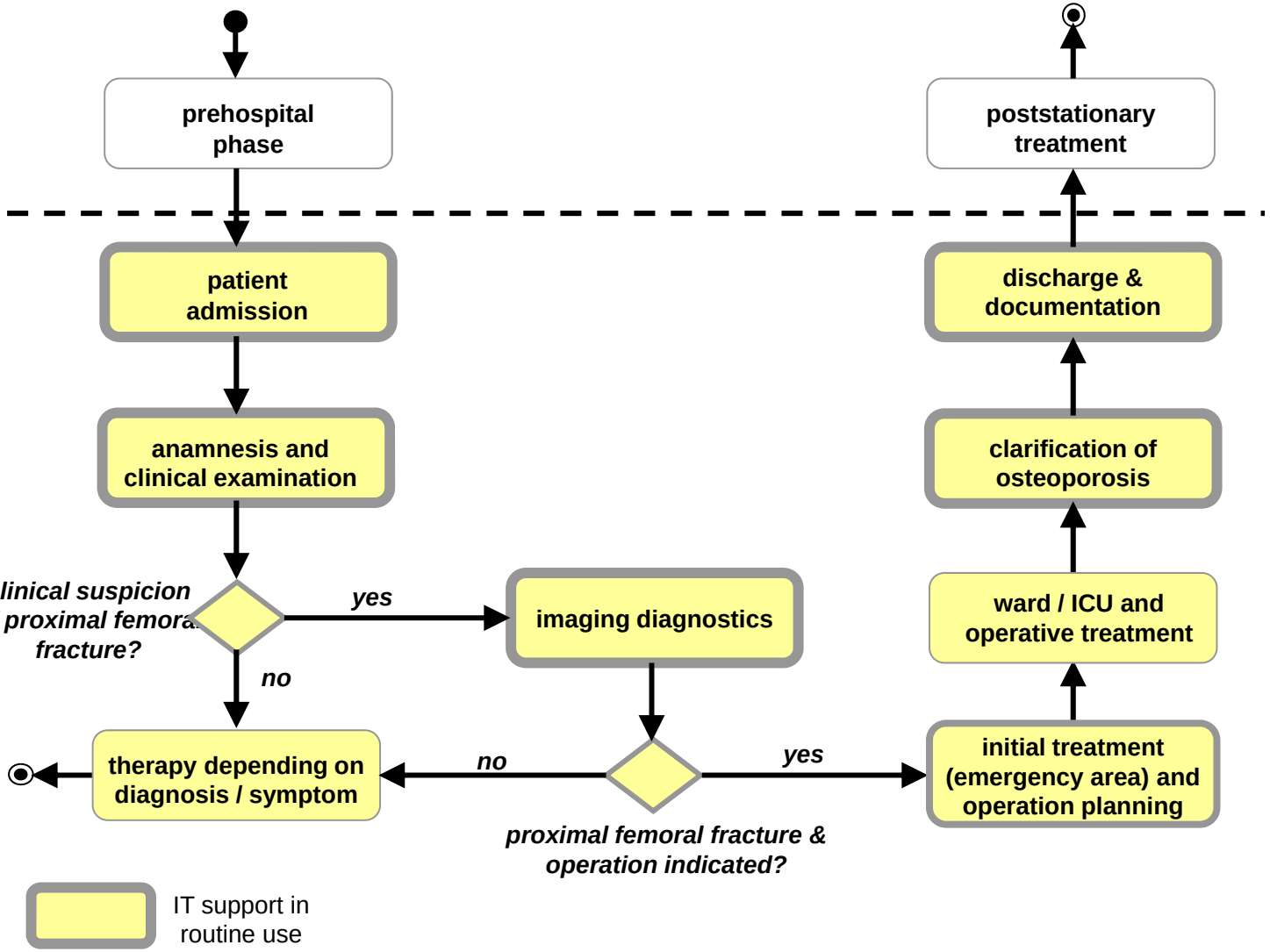
- Guided by available patient information
- Dependent on medical knowledge

Lenz, Richard and Reichert, Manfred (2007) *IT Support for Healthcare Processes - Premises, Challenges, Perspectives.*. Data and Knowledge Engineering, 61(1): 39-58, Elsevier.

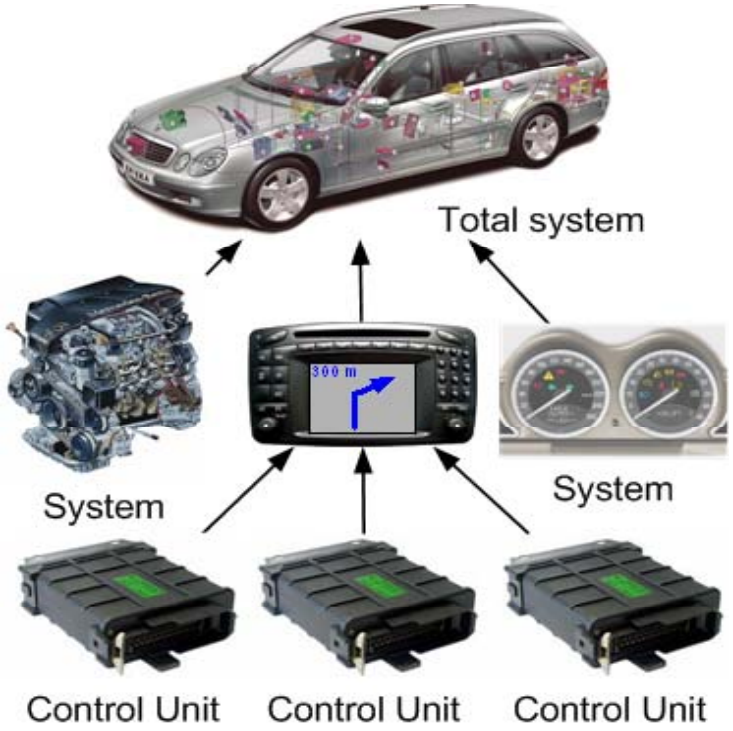
Motivation: Example of an Organizational Process



Motivation: Example of a Treatment Process



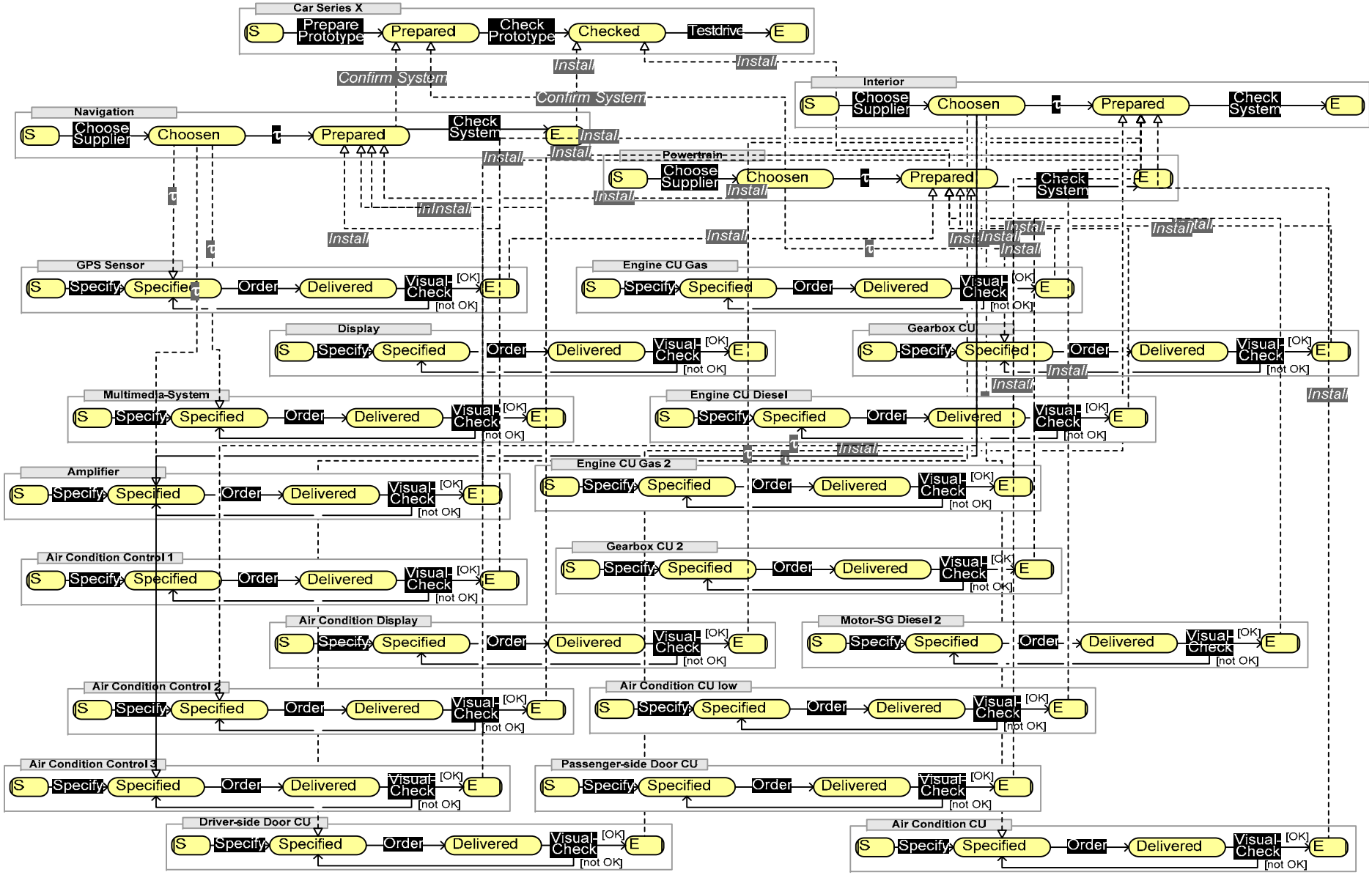
Motivation: Another Application Example



- Example: Release management for E/E-systems in a car
- 200 - 300 control devices to be systematically tested and released
- Requires the execution of hundreds up to thousands of processes
- Concurrent engineering ➪ complex dependencies have to be considered
- The overall process is long-running

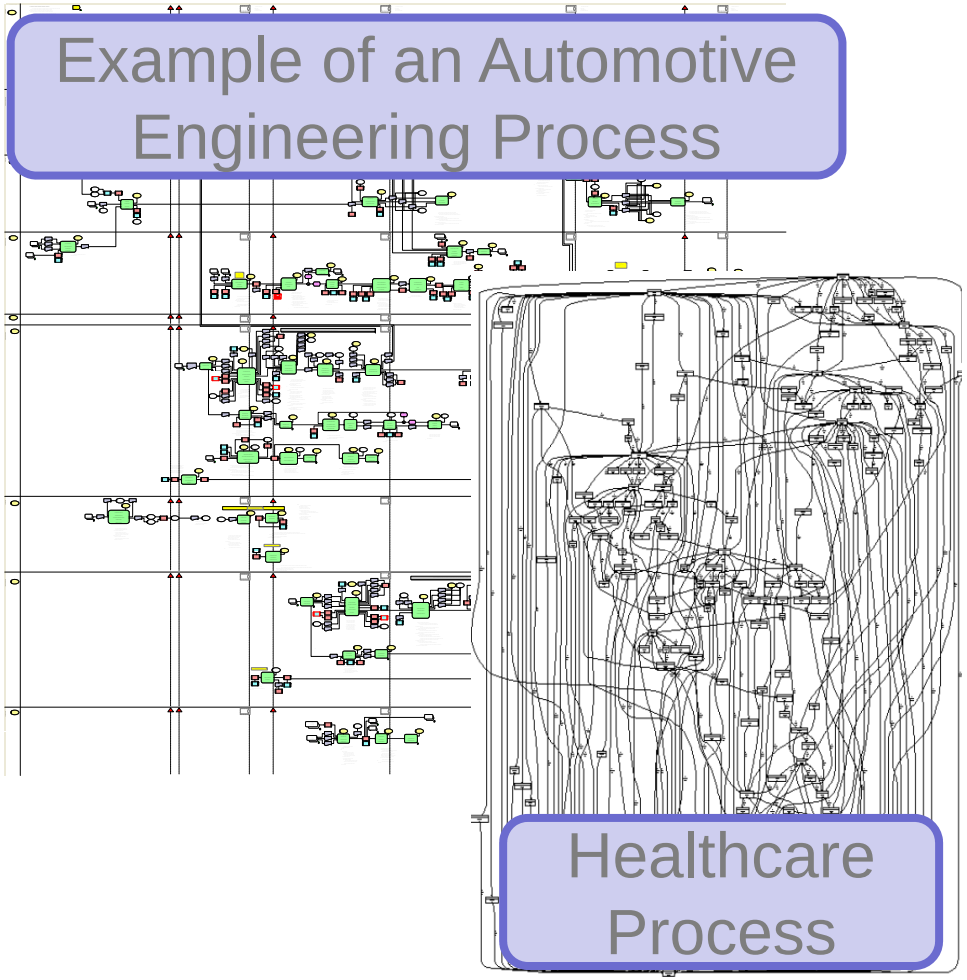
Müller, D., Herbst, J., Hammori, M., Reichert, M. (2006) *IT Support for Release Management Processes in the Automotive Industry.* In: 4th Int'l Conf. on Business Process Management (BPM'06), Vienna, pp. 368-377.

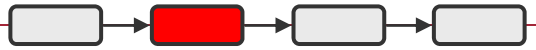
Müller, D., Reichert, M., Herbst, J. (2008) *A New Paradigm for the Enactment and Dynamic Adaptation of Data-driven Process Structures.* In: 20th Int'l Conf. on Advanced Information Systems Engineering (CAiSE'08), Montpellier, pp. 48-63


Car Series X
S
Prepare Prototype
Prepared
Check Prototype
Checked
Testdrive
E
Confirm System
Install
Navigation
Choose Supplier
Choosen
Prepared
Check System
Interior
Powertrain
GPS Sensor
Specify
Specified
Order
Delivered
Visual Check
[OK]
[not OK]
Engine CU Gas
Display
Gearbox CU
Multimedia-System
Engine CU Diesel
Amplifier
Engine CU Gas 2
Air Condition Control 1
Gearbox CU 2
Air Condition Display
Motor-SG Diesel 2
Air Condition Control 2
Air Condition CU low
Air Condition Control 3
Passenger-side Door CU
Driver-side Door CU
Air Condition CU

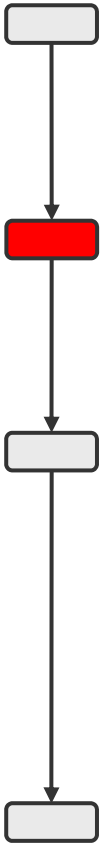
Motivation: Challenges

- Processes can become very large and complex
- Thousands of concurrently executed process instances
- High need for flexibility in all phases of the process lifecycle
- Support for application integration is fundamental
- Correctness and robustness are crucial features of any process-aware inf. systems
- Integrated support of all phases of the process lifecycle required





Overview



Motivation

Process-aware Information Systems (PAIS)

Adaptive PAIS

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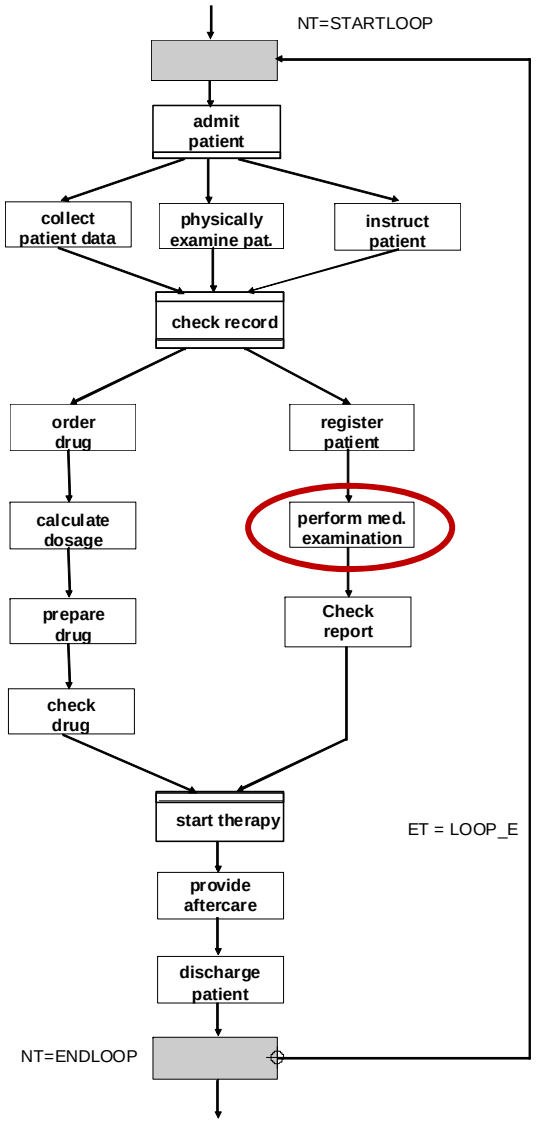
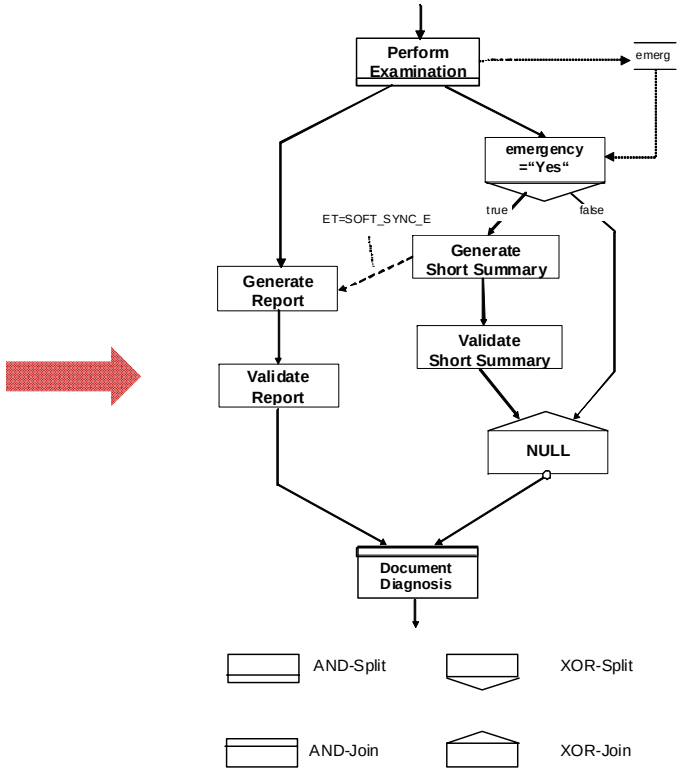
Summary & Outlook

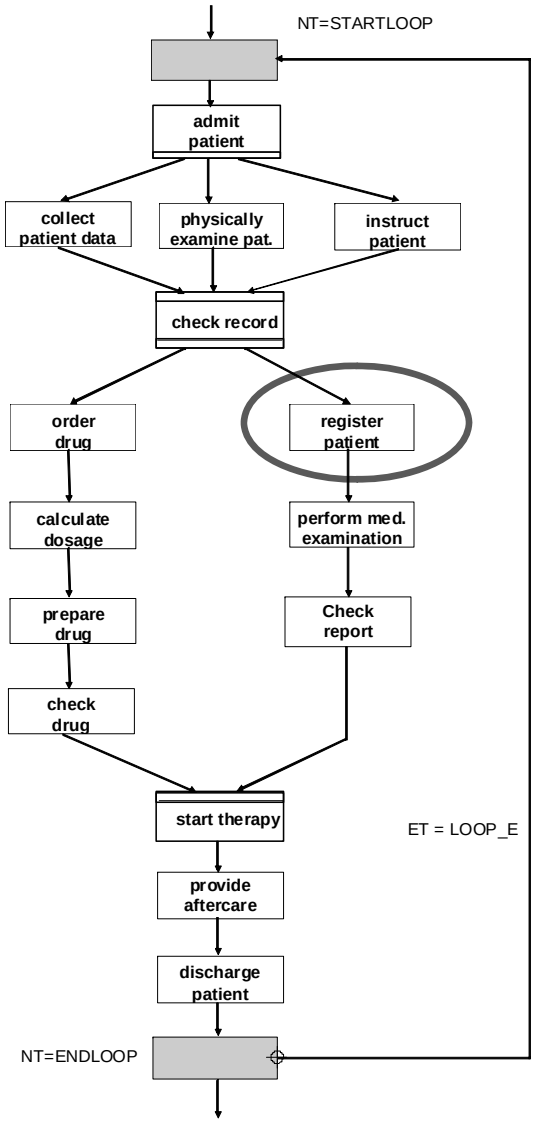
Process-aware Inf. Systems (PAIS): Process Modeling





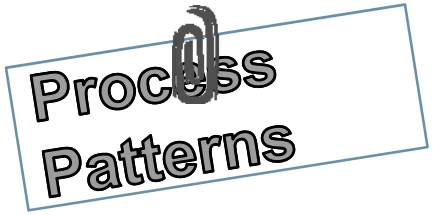
Reichert, M., Weber, B.: Enabling Flexibility in Process-aware Information Systems – Challenges, Methods, Technologies, Springer (to appear)

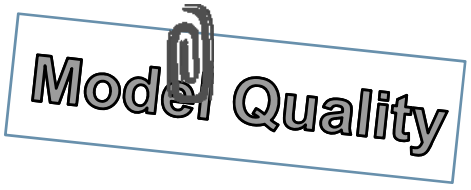
Process-aware Inf. Systems (PAIS): Process Modeling



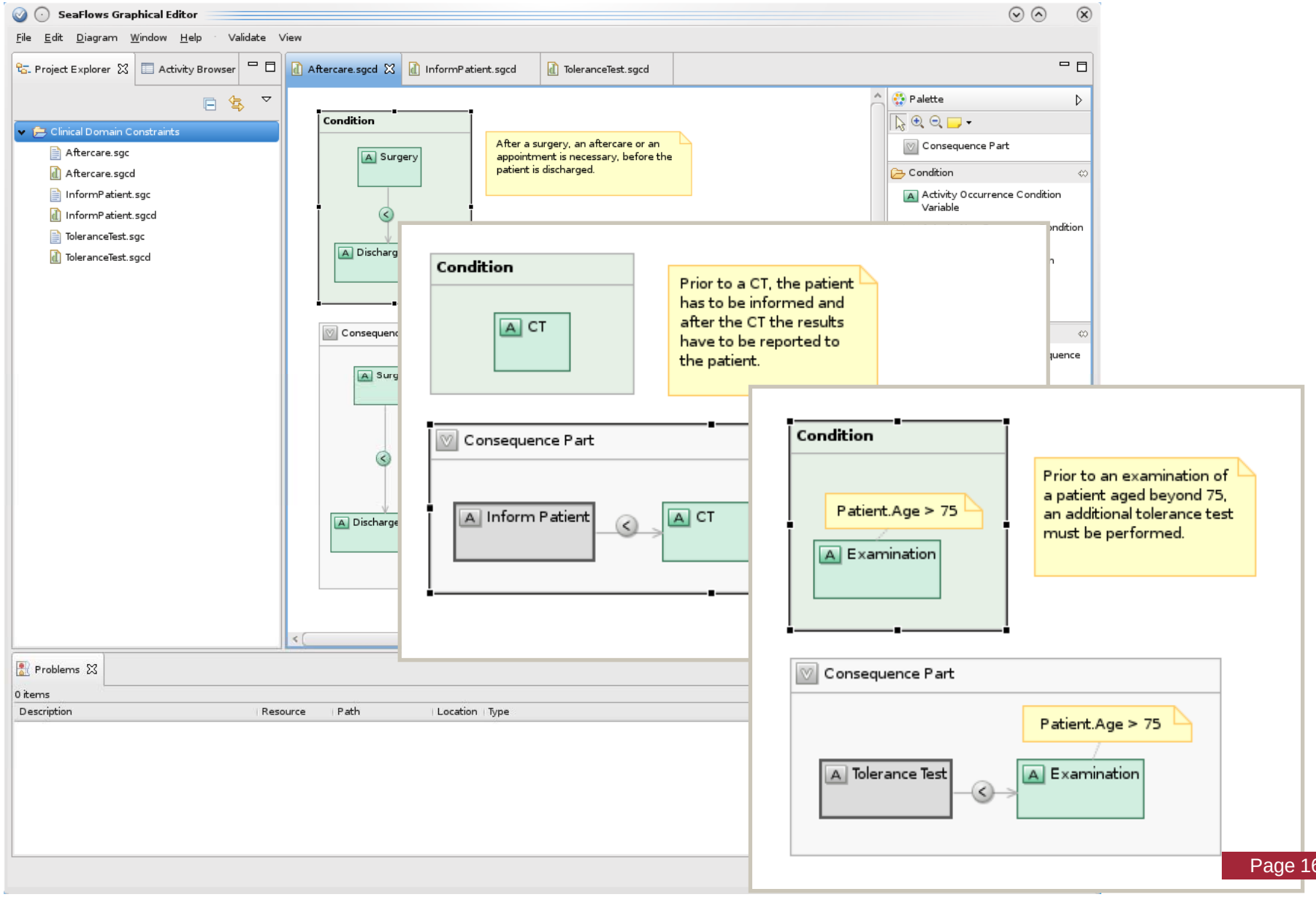
Activity Specification:

- Automated or manual activity?
- Actor / Role assignment?
- Form / service to be invoked?
- Input / output parameters
- …

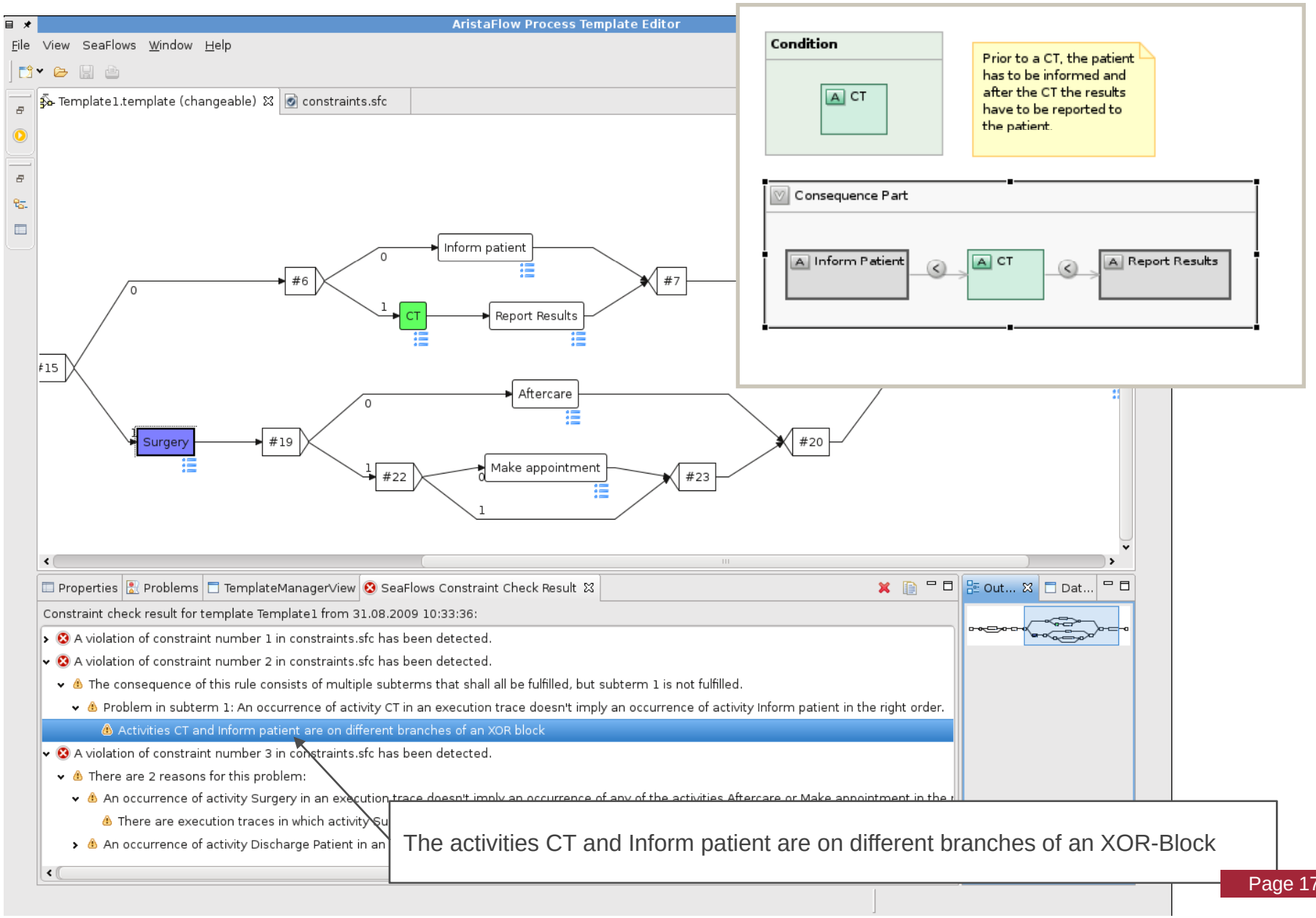




Process Modeling:
Ensuring Business Compliance (Semantic Constraints)

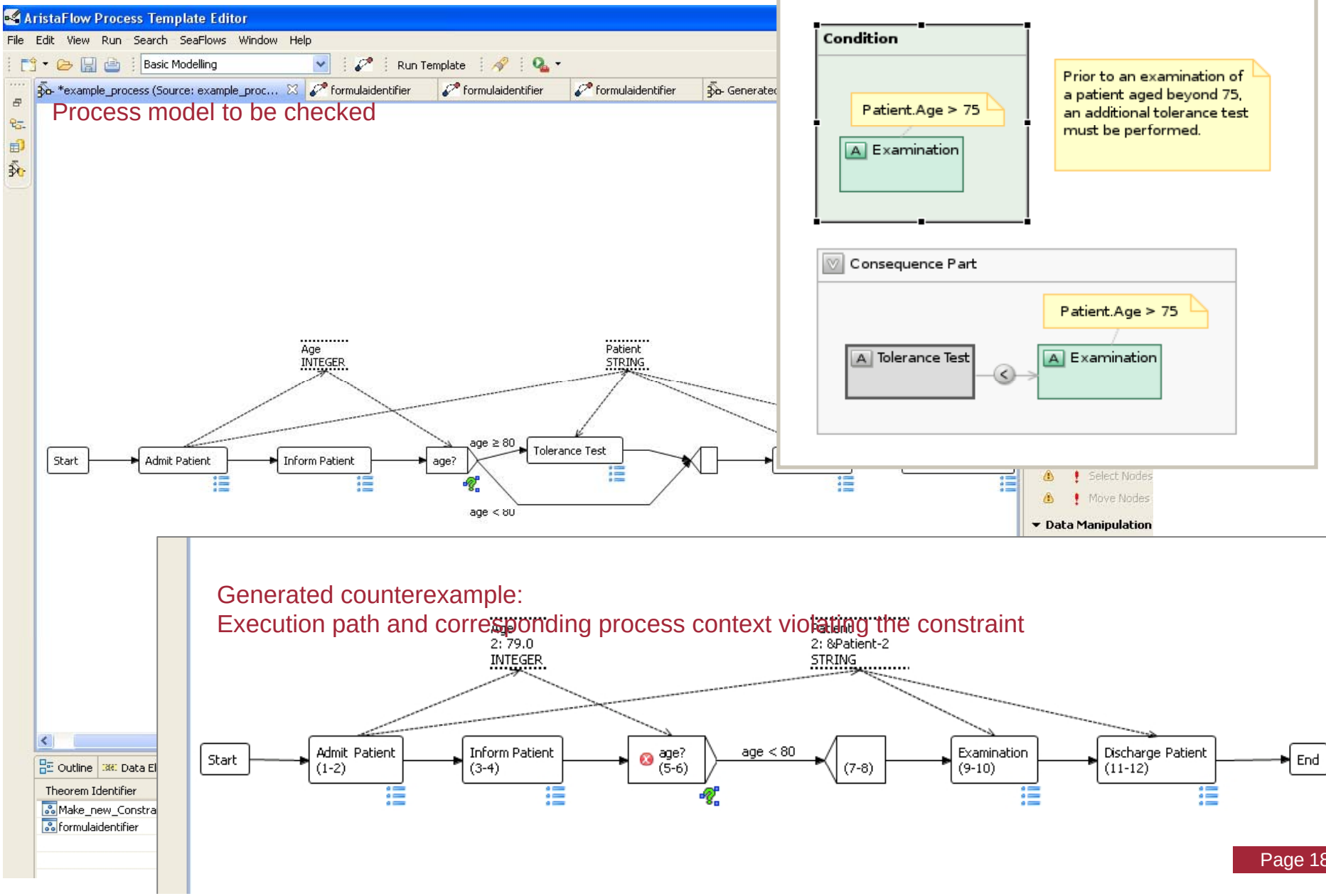


Process Modeling:
Ensuring Business Compliance (Semantic Constraints)

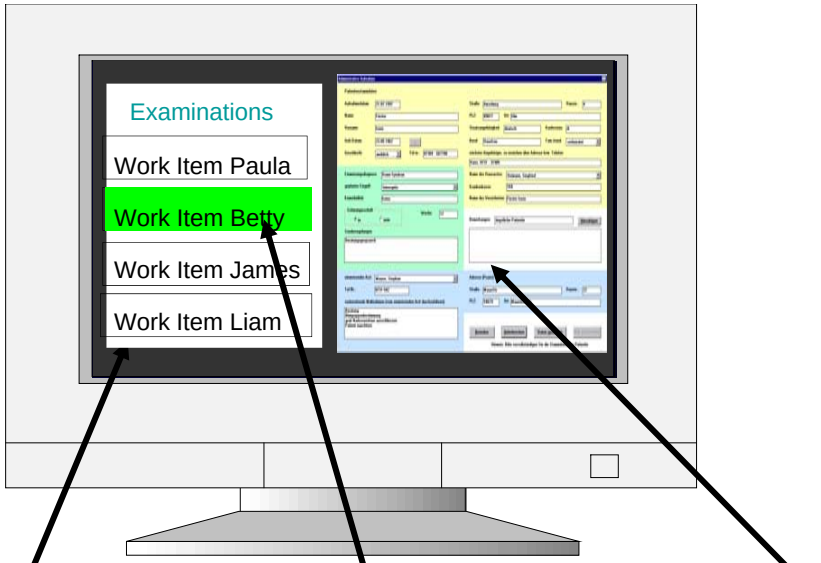


The activities CT and Inform patient are on different branches of an XOR-Block

Process Modeling:
Ensuring Business Compliance (Semantic Constraints)



PAIS: Process Execution (End User Perspective)



User Worklists

Selection

Automatic Invocation of the Corresponding Application Program (incl. Provison of Input Parameters)

Stationsarbeitsplatz - Stationskraft

Datei Hilfe

Stationsübersicht

Zimmer 57


Fr. Hansen


Zimmer 58


Fr. Breitinger
dg/op Hysteroskopi
Im OP

Patientin stationär aufnehmen

Aufnehmen | Unterbrechen

Name	Förster	Komorbidität	keine
Vorname	Irene	Schwangerschaft	ja
Geb.Datum	23-05-1962	Eingriff	
		OP-Termin	21.07.1997, 00:00 Uhr

Diagnose

Bemerkungen | Hinzufügen

ängstliche Patientin

Scanner

Einbestellungsplan GYN IV

Montag, 21. Juli 1997

Patientin	Diagnose-OP	Tel.Nr.
Fr. Hansen (Stationaere Aufnahme)		07321/45677
Fr. Förster (Ueberpruefung der Befunde)		07304 - 667788
Fr. Breitinger (Abruf)	dg/op Hysteroskopie	

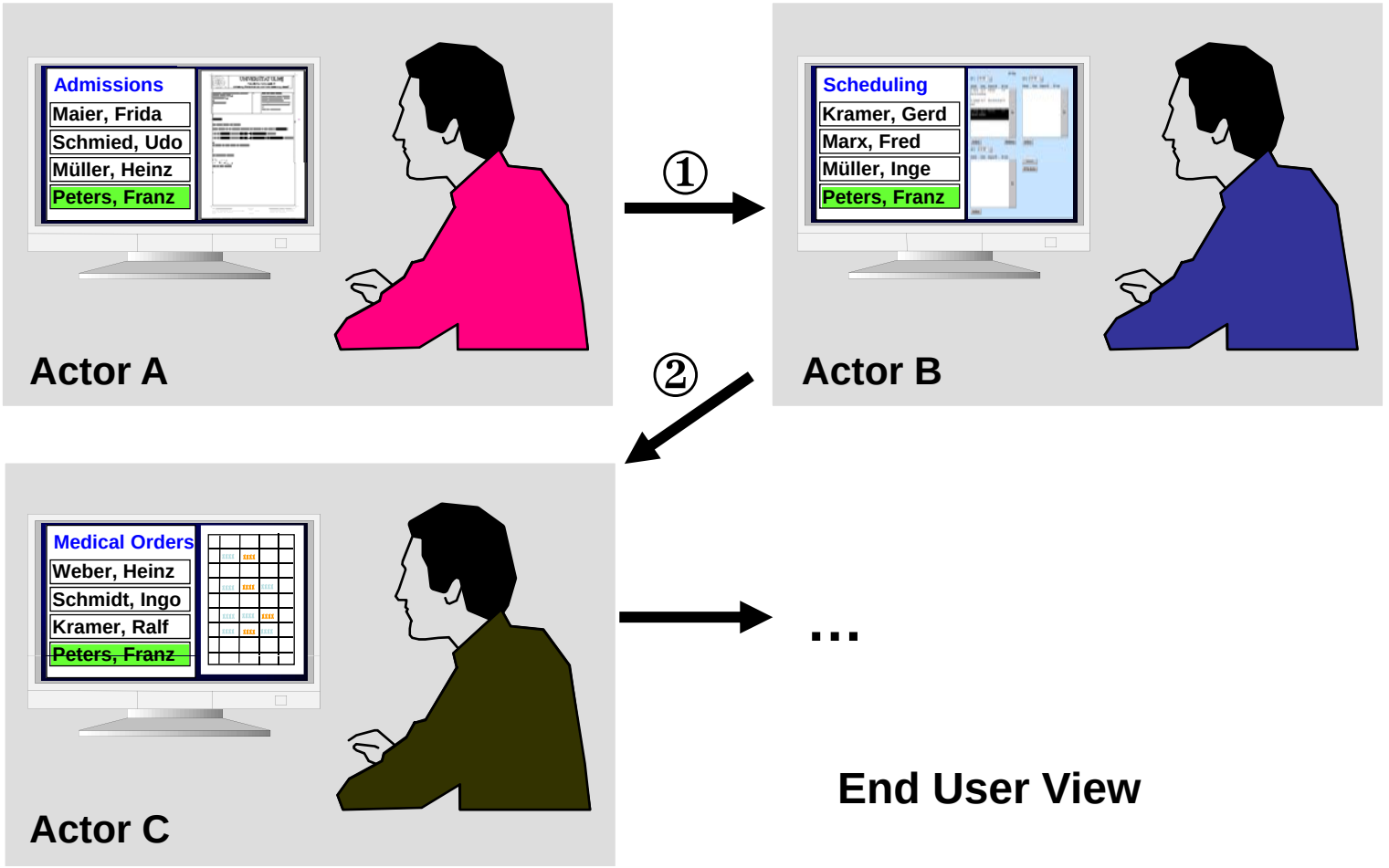
<< Info >>

Tag | Woche | Monat

neuer Termin | Termin verschieben

Termin sperren | Termin löschen | Patientenstammdaten

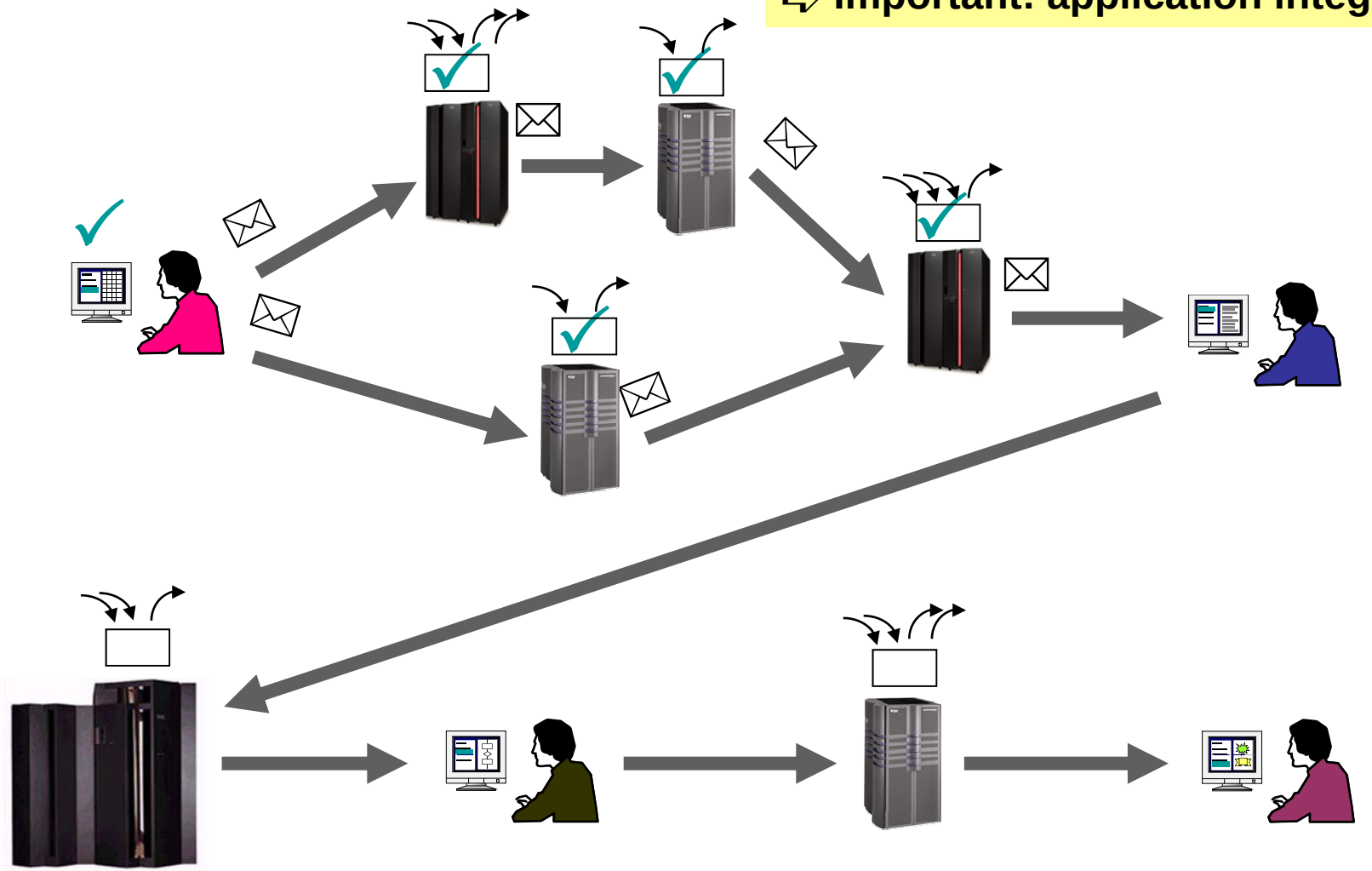
PAIS: Process Execution (End User Perspective)



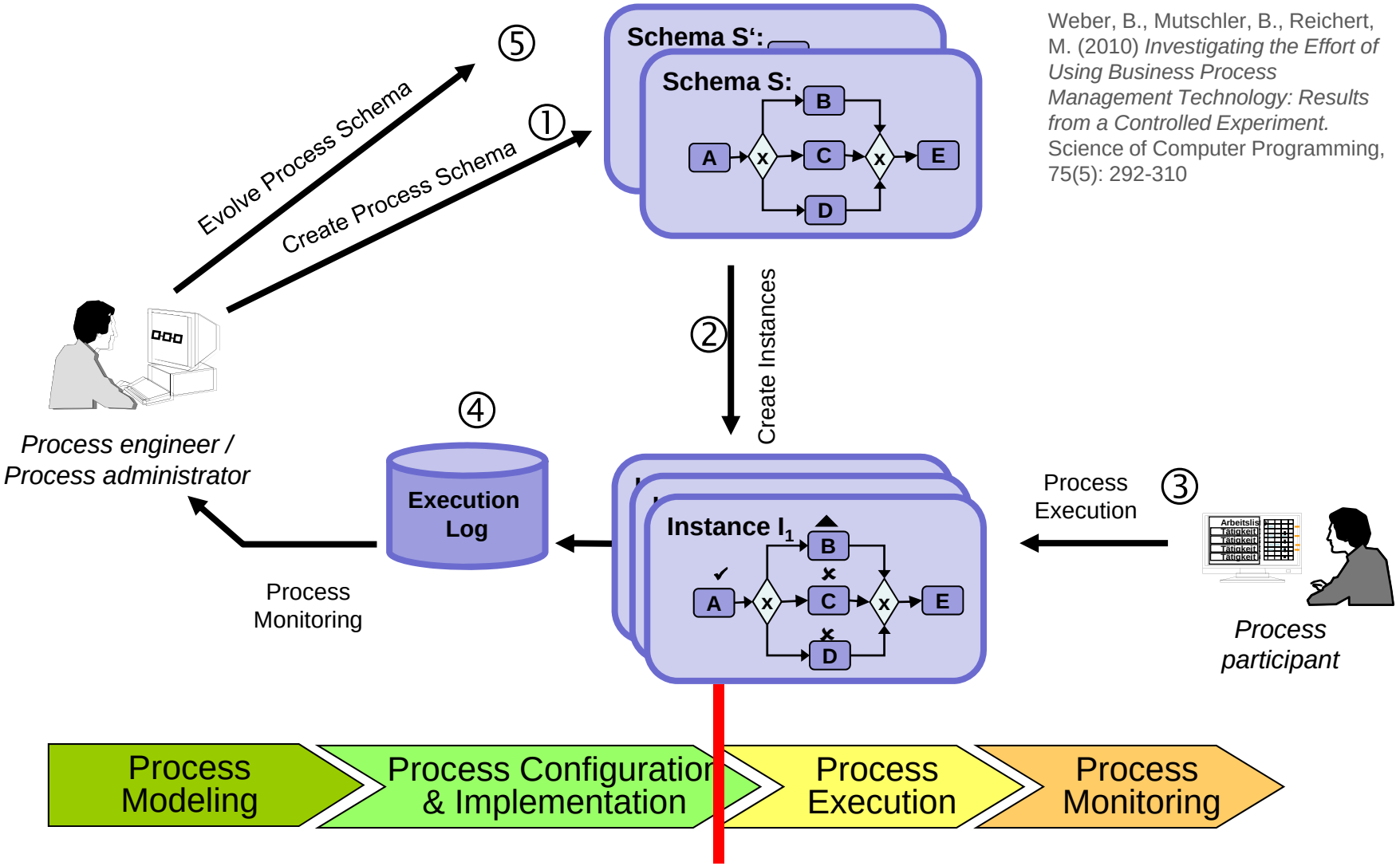
PAIS: Process Execution (System Perspective)

... and beneath the surface

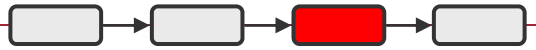
- **Includes automated steps**
- **Important: application integration**



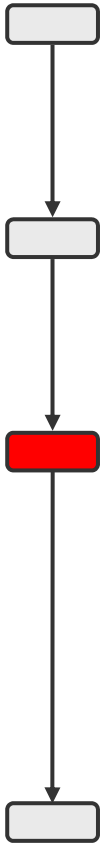
PAIS: The Process Lifecycle



Weber, B., Mutschler, B., Reichert, M. (2010) *Investigating the Effort of Using Business Process Management Technology: Results from a Controlled Experiment.* Science of Computer Programming, 75(5): 292-310



Overview



Motivation

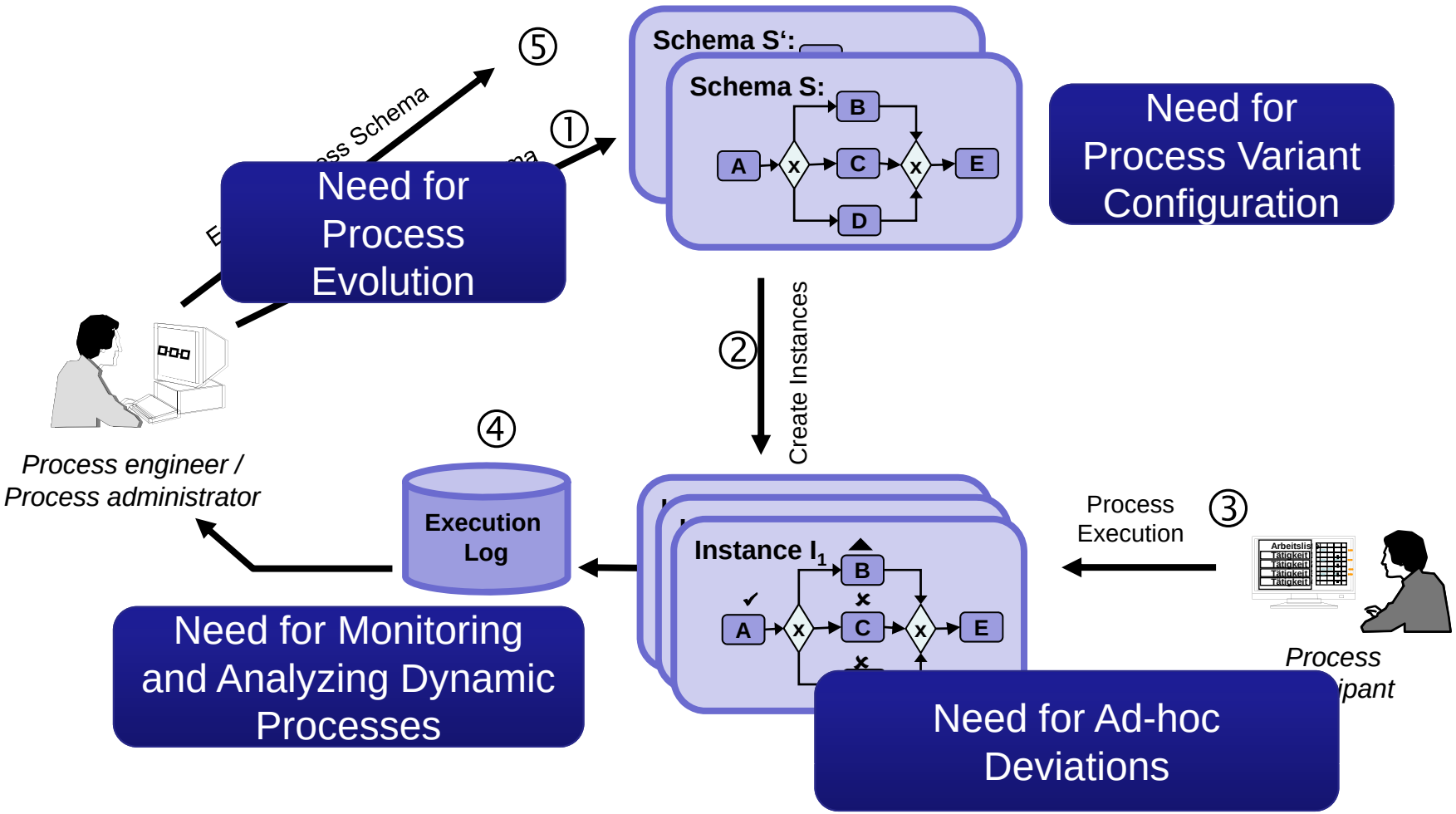
Process-aware Information Systems (PAIS)

Adaptive PAIS

- Ad-hoc Deviations
- Process Evolution
- User Assistance
- Mining Process Logs
- Process Configuration

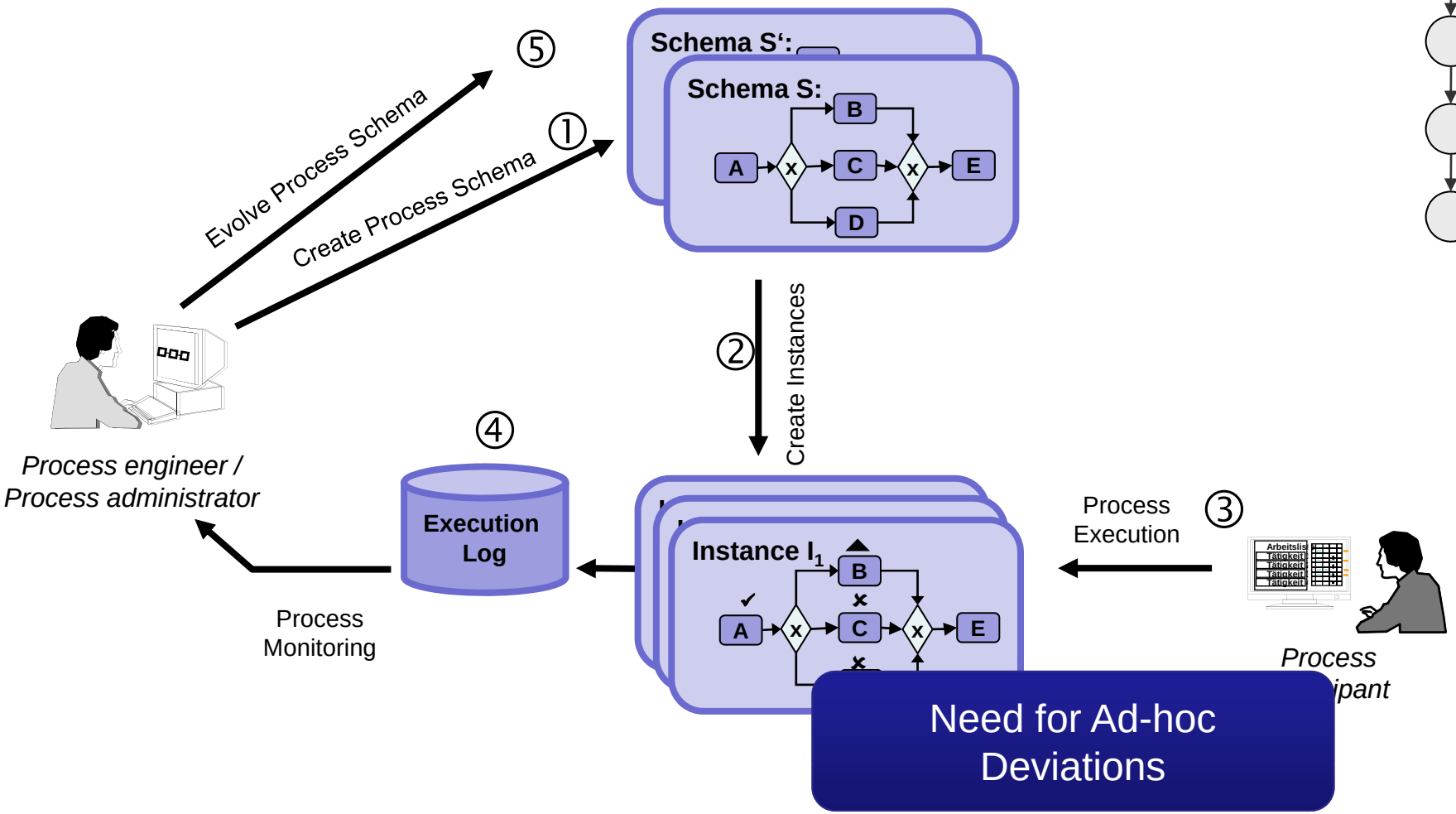
Summary & Outlook

Adaptive PAIS: Need for Flexibility Support

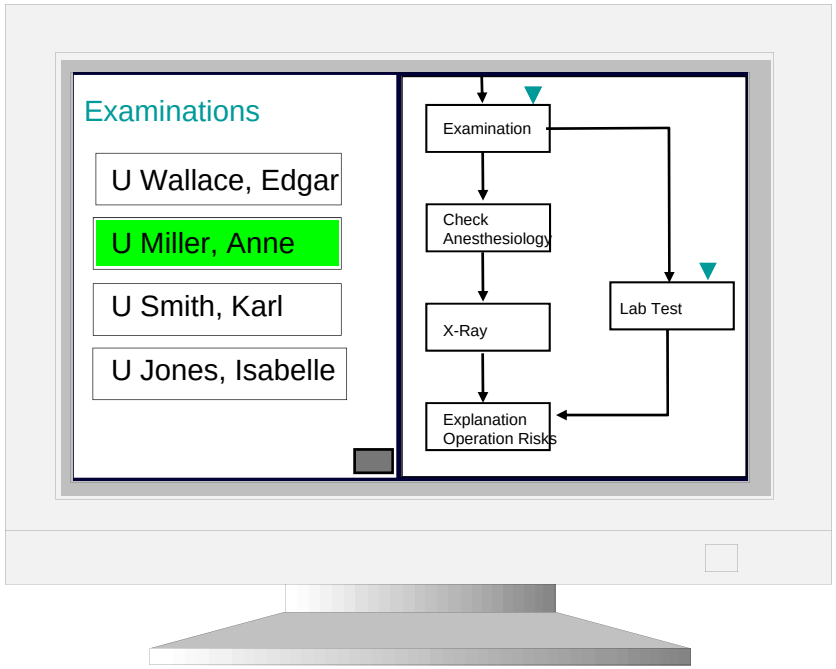


Reichert, M., Rinderle-Ma, S., Dadam, P. (2010) *Flexibility in Process-aware Information Systems.* LNCS Transactions on Petri Nets and Other Models of Concurrency, Vol. 2, pp. 115-135

Adaptive PAIS: Enabling Ad-hoc Changes



Adaptive PAIS: Enabling Ad-hoc Changes



The Users' View

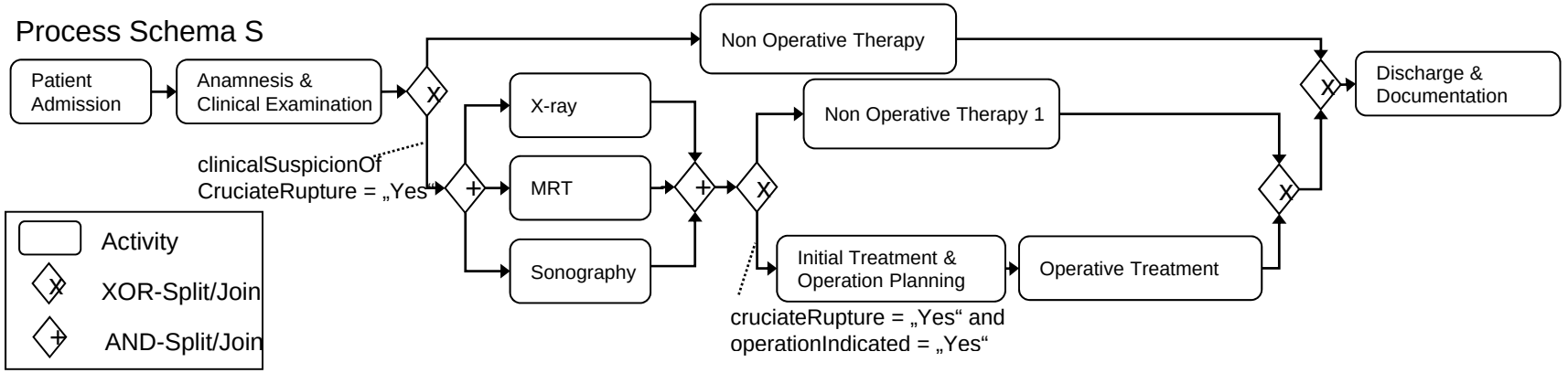
Reichert, Manfred and Dadam, Peter (1998) *ADEPTflex-Supporting Dynamic Changes of Workflows Without Losing Control.* Journal of Intelligent Information Systems, Special Issue on Workflow Management Systems, 10(2): 93-129, Kluwer

Adaptive PAIS: Enabling Ad-hoc Changes

System's View

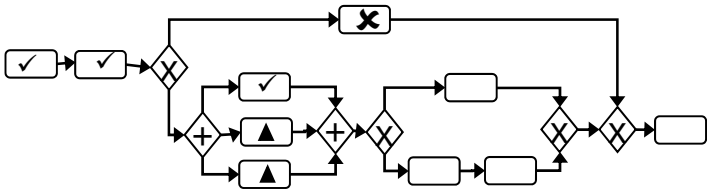
Process Type Level

Process Schema S



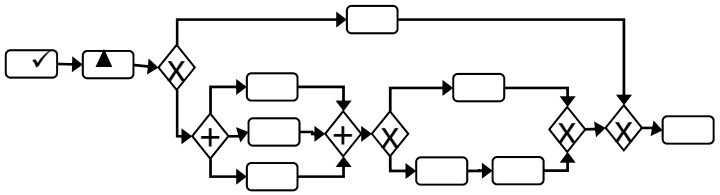
Process Instance Level

Process Instance I1



Execution Trace:
σ_1 = < „Patient Admission", „Anamnesis & Clinical Examination", „X-ray">

Process Instance I2



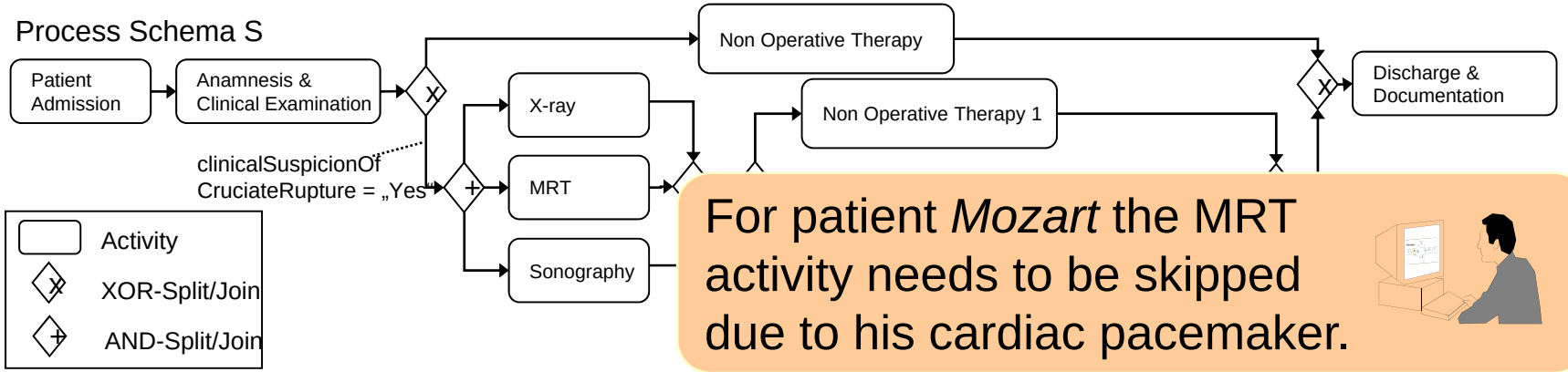
Execution Trace:
σ_2 = < „Patient Admission">

Adaptive PAIS: Enabling Ad-hoc Changes

System's View

Process Type Level

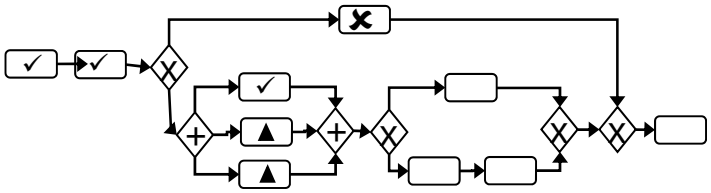
Process Schema S



For patient *Mozart* the MRT activity needs to be skipped due to his cardiac pacemaker.

Process Instance Level

Process Instance I1



Execution Trace:
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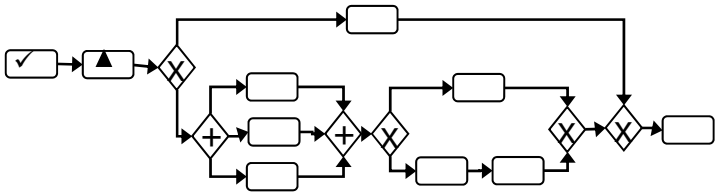
Process Instance I2



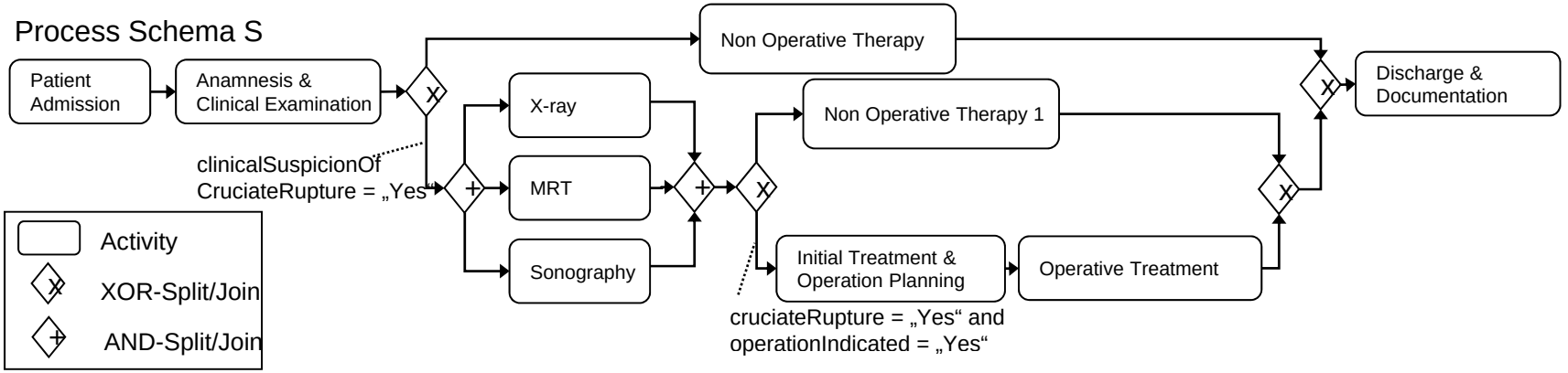
Execution Trace:
σ_2 = < „Patient Admission">

Adaptive PAIS: Enabling Ad-hoc Changes

System's View

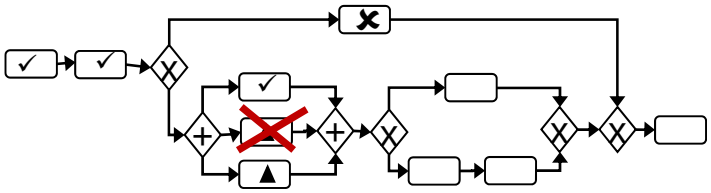
Process Type Level

Process Schema S



Process Instance Level

Process Instance I1



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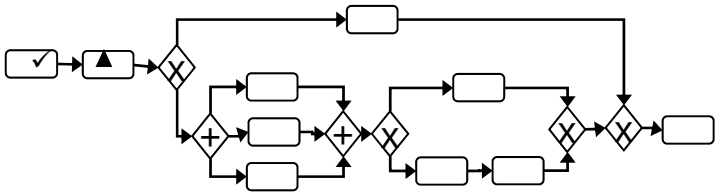
Process Instance I2



Execution Trace:
σ_2 = < „Patient Admission">

Adaptive PAIS: Enabling Ad-hoc Changes

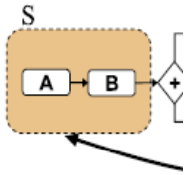
Change Patterns

Pattern AP5: SWAP Process Fragment

Description Two existing process fragments are swapped in process schema S.

Example Regarding a particular delivery process the order in which requested g
delivered to two customers has to be swapped

Problem



Implementation

Related Patterns

Pattern AP1: INSERT Process Fragment

Description A process fragment X is added to a process schema S.

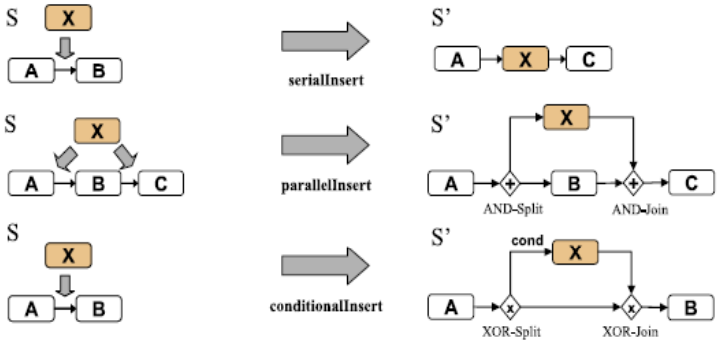
Example For a particular patient an allergy test has to be added to his treatment process due to a drug incompatibility.

Problem In a real world process a task has to be accomplished which has not been modeled in the process schema so far.

Design Choices (in addition to those described in Fig. 6)

C. How is the new process fragment X embedded in the process schema?

1. X is inserted between two directly succeeding activities (`serial insert`)
2. X is inserted between two activity sets (`insert between node sets`)
   a) without additional condition (`parallel insert`)
   b) with additional condition (`conditional insert`)



Implementation This adaptation pattern can be realized by transforming the high level insertion operation into a sequence of low level change primitives (e.g., add node, add edge).

Pattern PP3: Late Composition of Process Fragments

Description At build-time a set of process fragments is defined from which the schema of a concrete process instance can be composed during run time. This can be achieved by dynamically
l by specifying the control dependencies between them on the fly.

cal examinations are accomplished in a hospital. The exact
lied to a particular patient and the order in which they are performed are
individually depending on his/her medical problems.

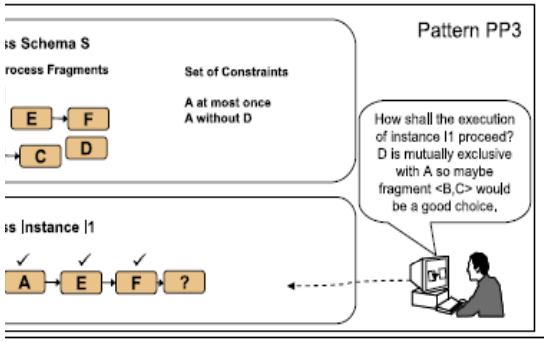
ants of how process fragments can be composed. To reduce the number
e specified by the process engineer during build time, process instances
sed from a given set of fragments.

building blocks for late modeling?

agments from the repository can be chosen.

based subset of the process fragments from the repository can be

s or process fragments can be defined.



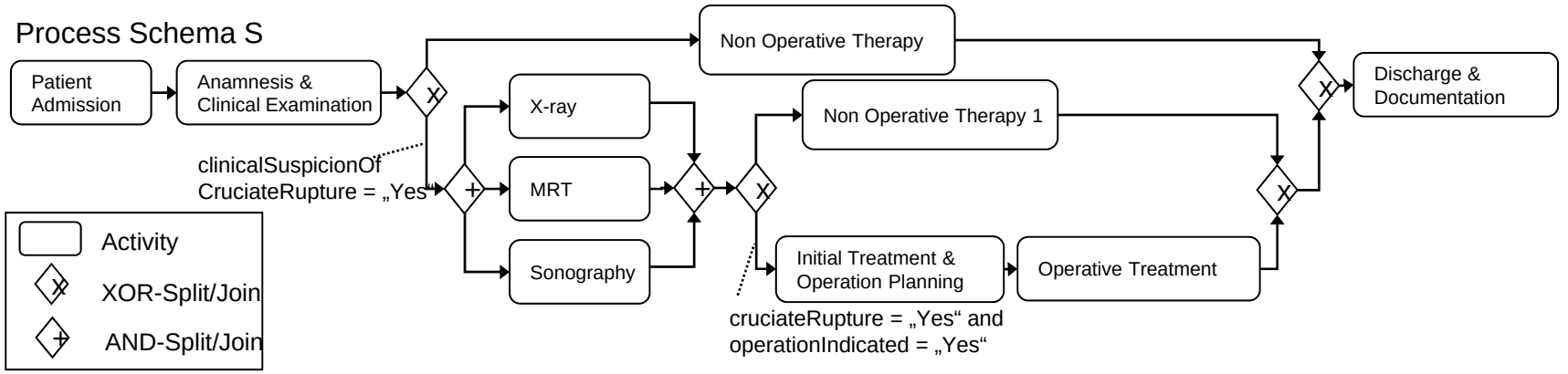
Weber, Barbara and Reichert, Manfred and Rinderle-Ma, Stefanie (2008) *Change Patterns and Change Support Features - Enhancing Flexibility in Process-Aware Information Systems .* Data and Knowledge Engineering, 66(3): 438-466, Elsevier Science

Adaptive PAIS: Enabling Ad-hoc Changes

Correctness Constraints

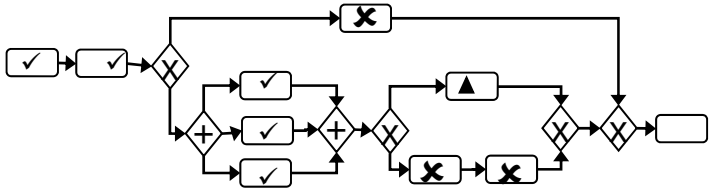
Process Type Level

Process Schema S



Process Instance Level

Process Instance I3

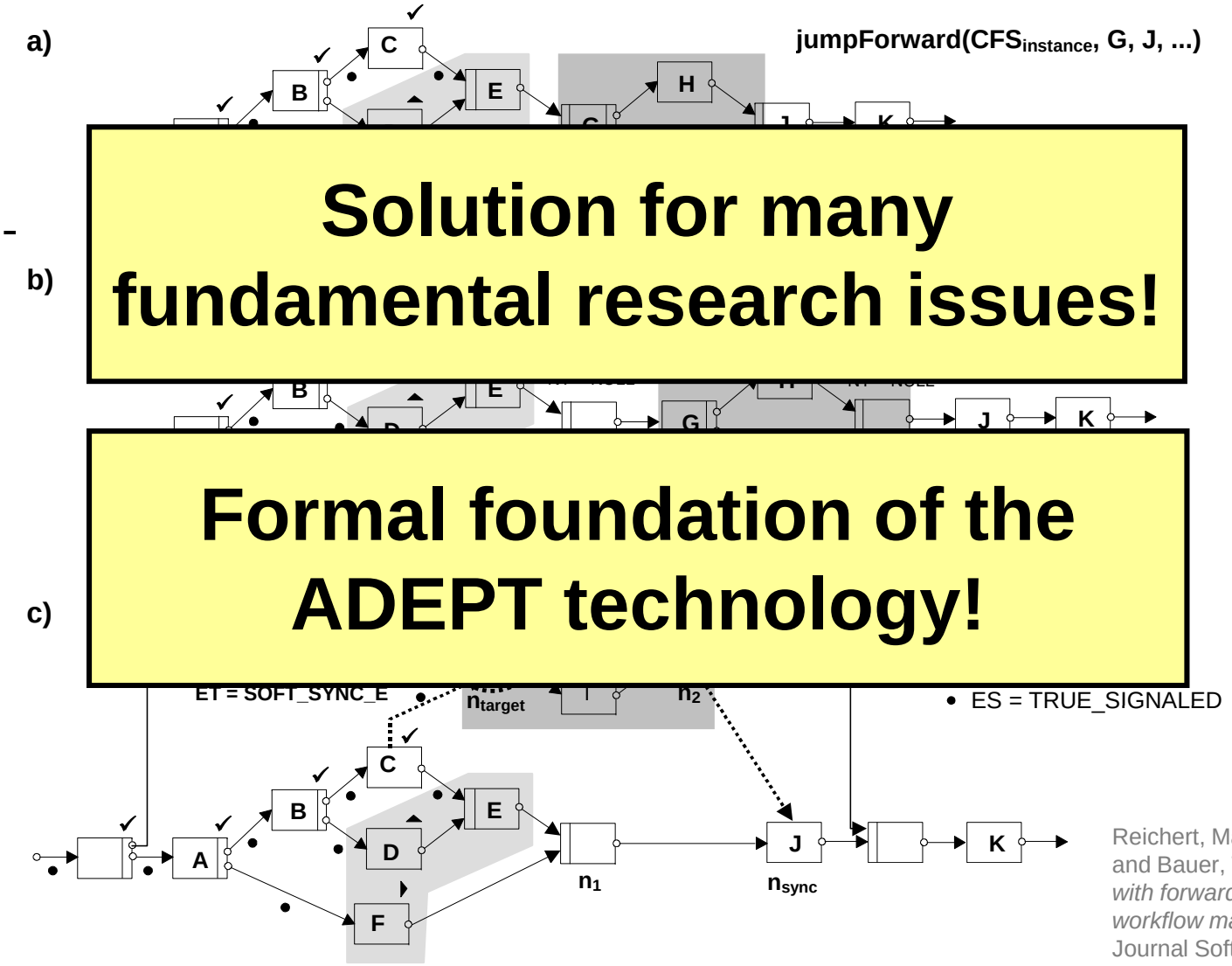


Execution Trace:
σ_3 = < „Patient Admission", „Anamnesis & Clinical Examination", „MRT", „X-ray", „Sonography">

I3 is not state compliant with change Delete (I3, MRT)

Rinderle, Stefanie and Reichert, Manfred and Dadam, Peter (2004) *Correctness Criteria for Dynamic Changes in Workflow Systems: A Survey.* Data & Knowledge Engineering, 50(1): 9-34

Adaptive PAIS: Enabling Ad-hoc Changes

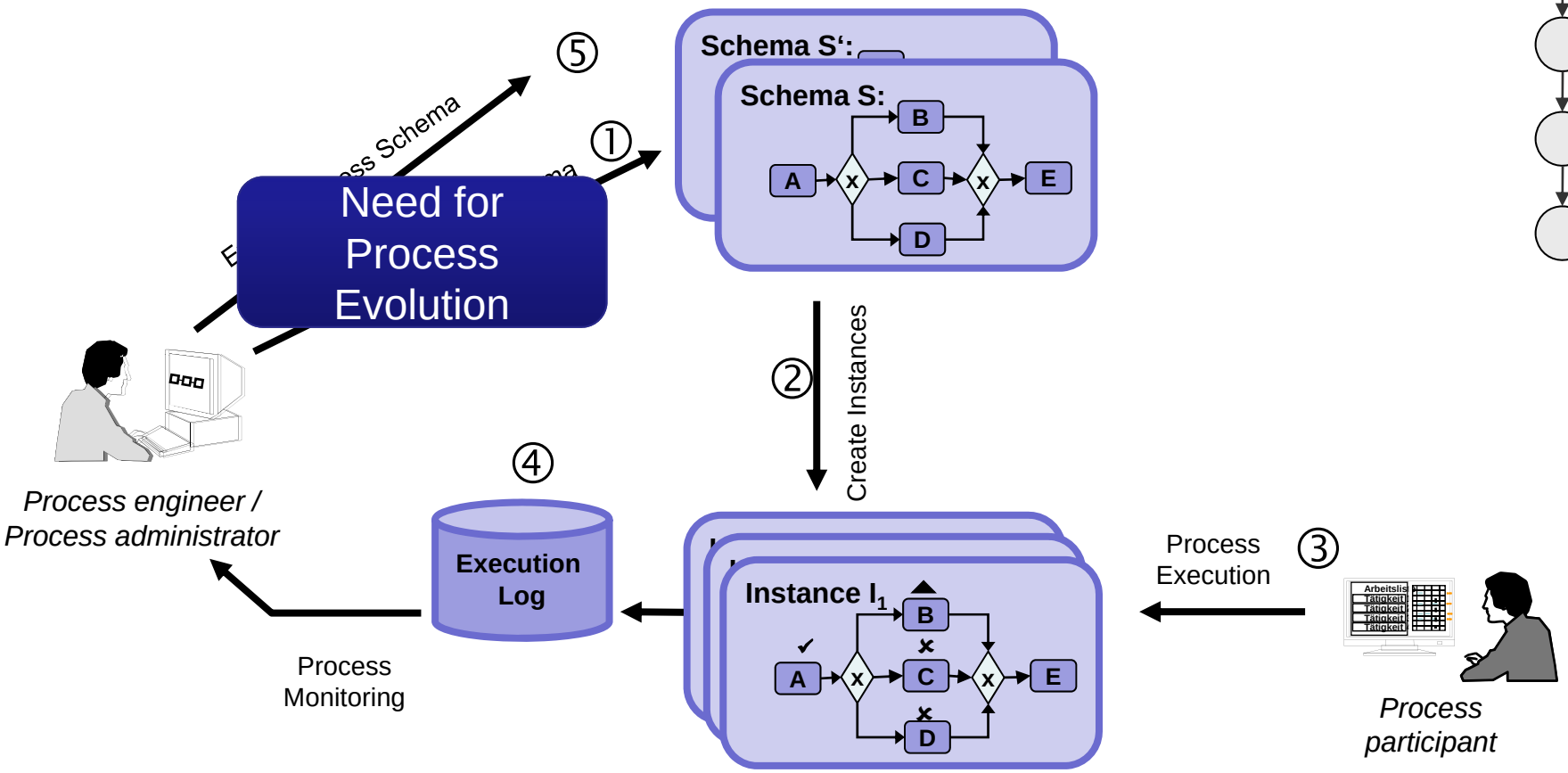


Solution for many fundamental research issues!

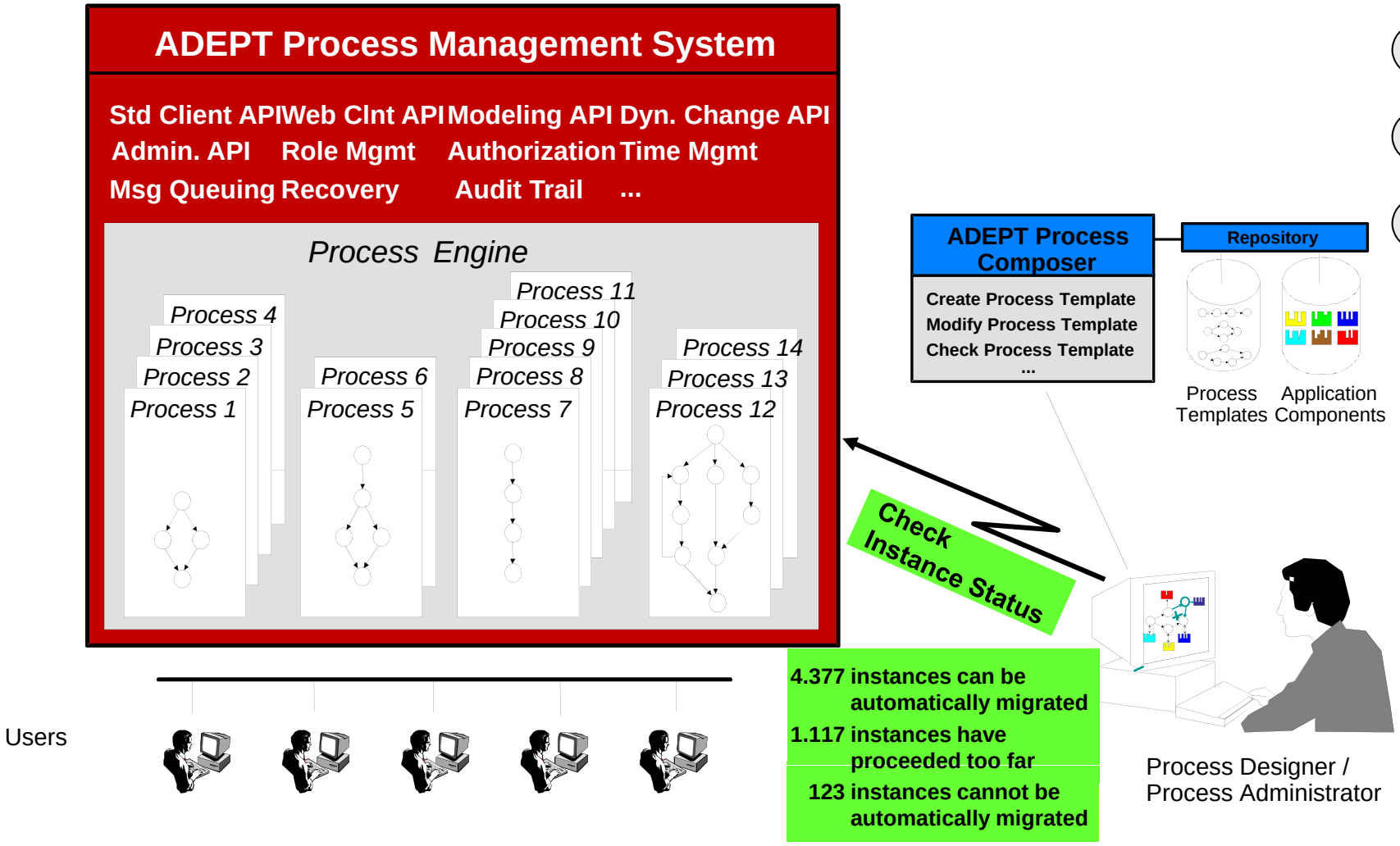
Formal foundation of the ADEPT technology!

Reichert, Manfred and Dadam, Peter and Bauer, Thomas (2003) *Dealing with forward and backward jumps in workflow management systems.* Int'l Journal Software and Systems Modeling (SOSYM), 2(1): 37-58

Adaptive PAIS: Enabling Process Evolution

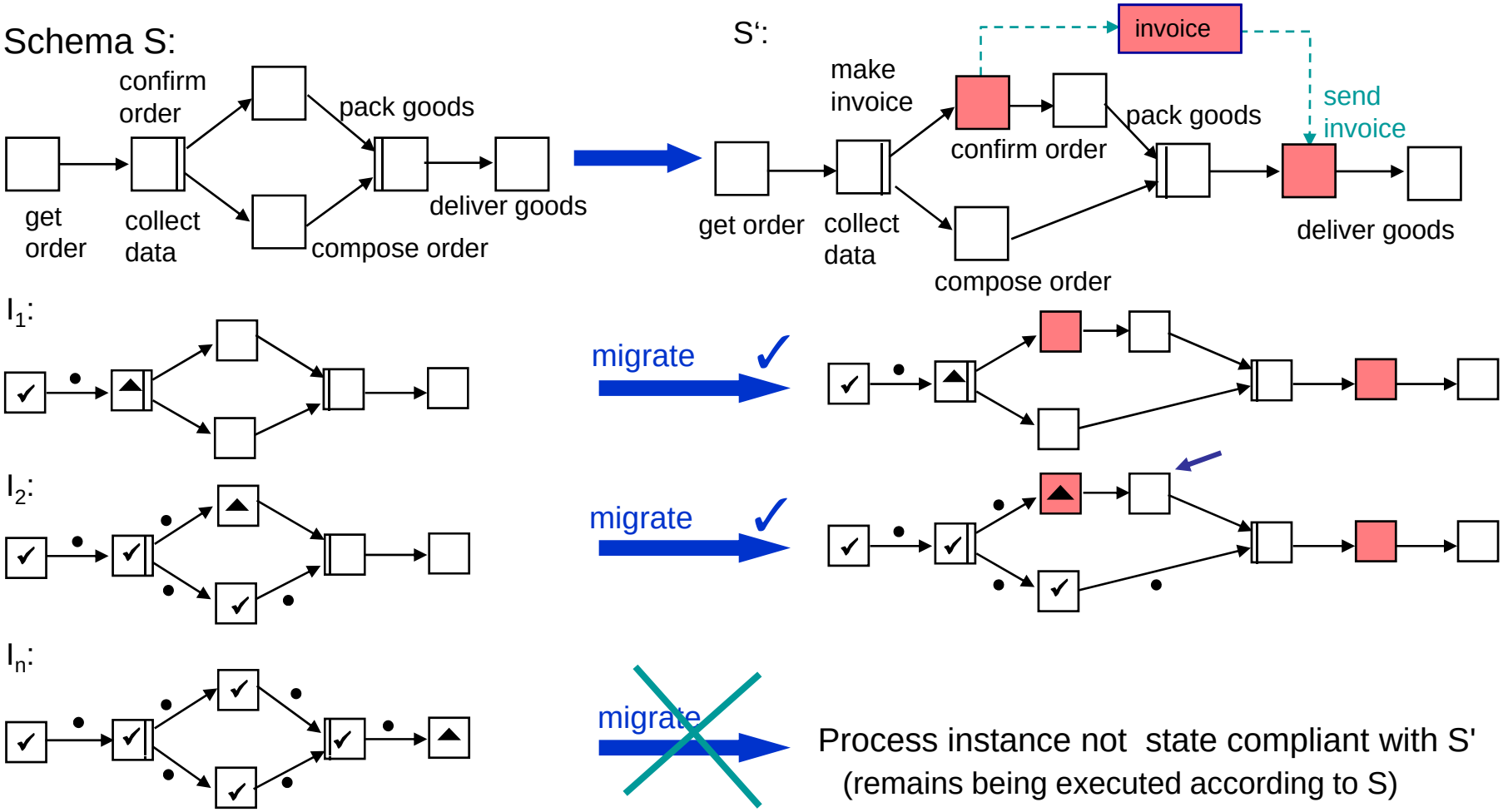


Adaptive PAIS: Enabling Process Evolution



Adaptive PAIS: Enabling Process Evolution

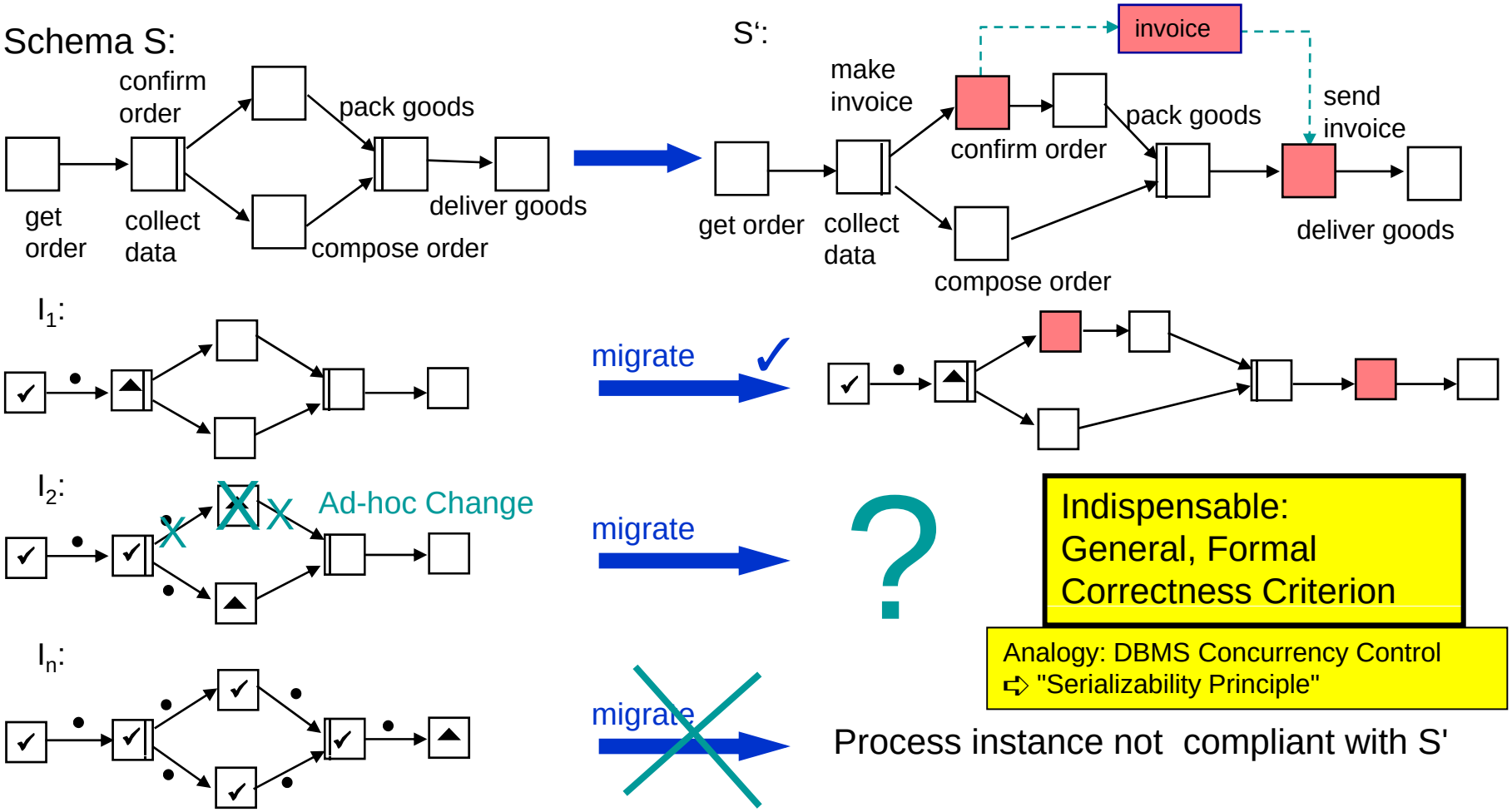
Fundamental Question: Under Which Conditions is a Migration Possible?



Rinderle, S., Reichert, M., Dadam, Peter (2004) *Flexible Support of Team Processes by Adaptive Workflow Systems.* Distributed and Parallel Databases, 16(1): 91-116

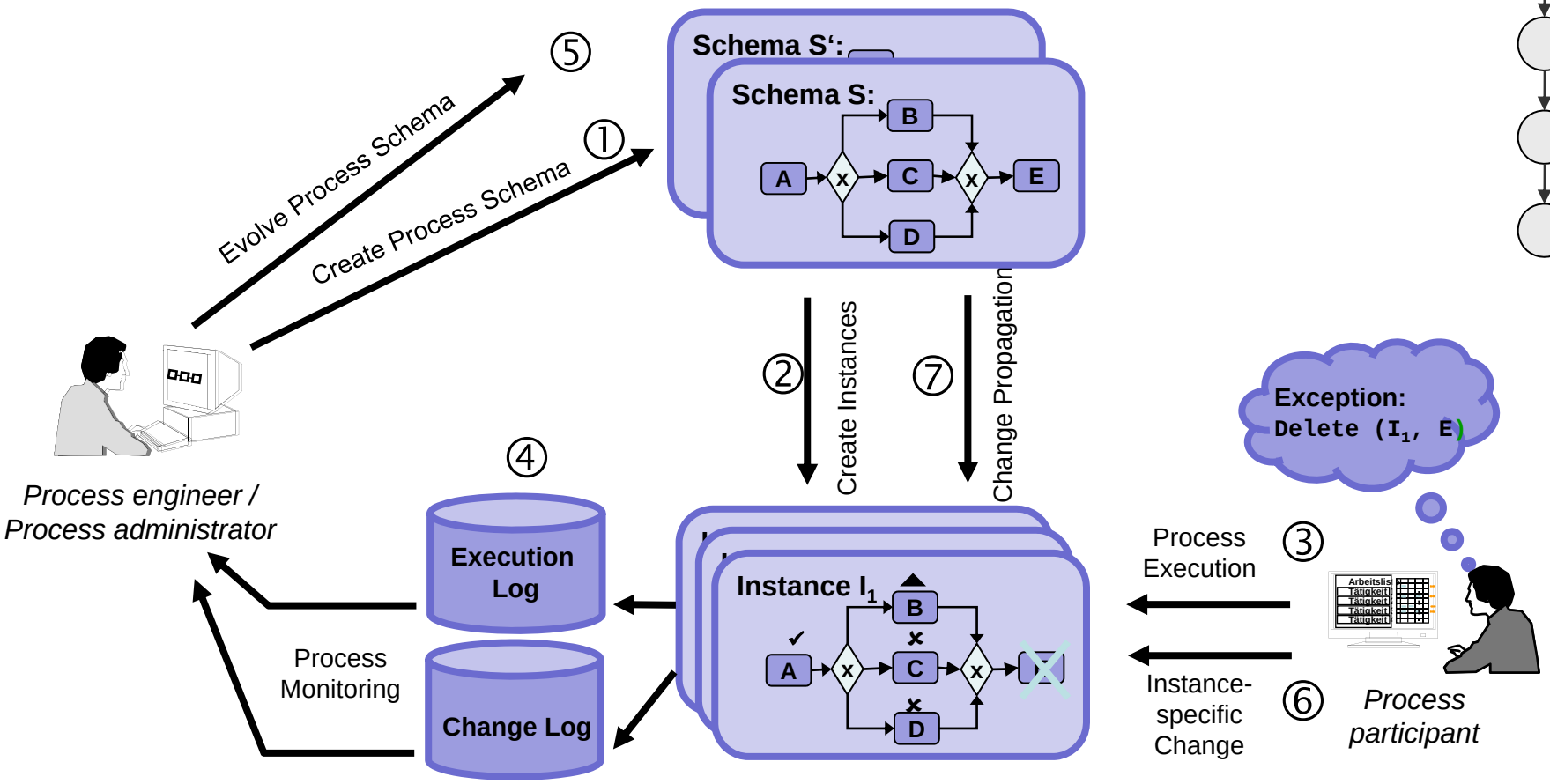
Adaptive PAIS: Enabling Process Evolution

Increased Complexity: Interplay with Ad-hoc Changes



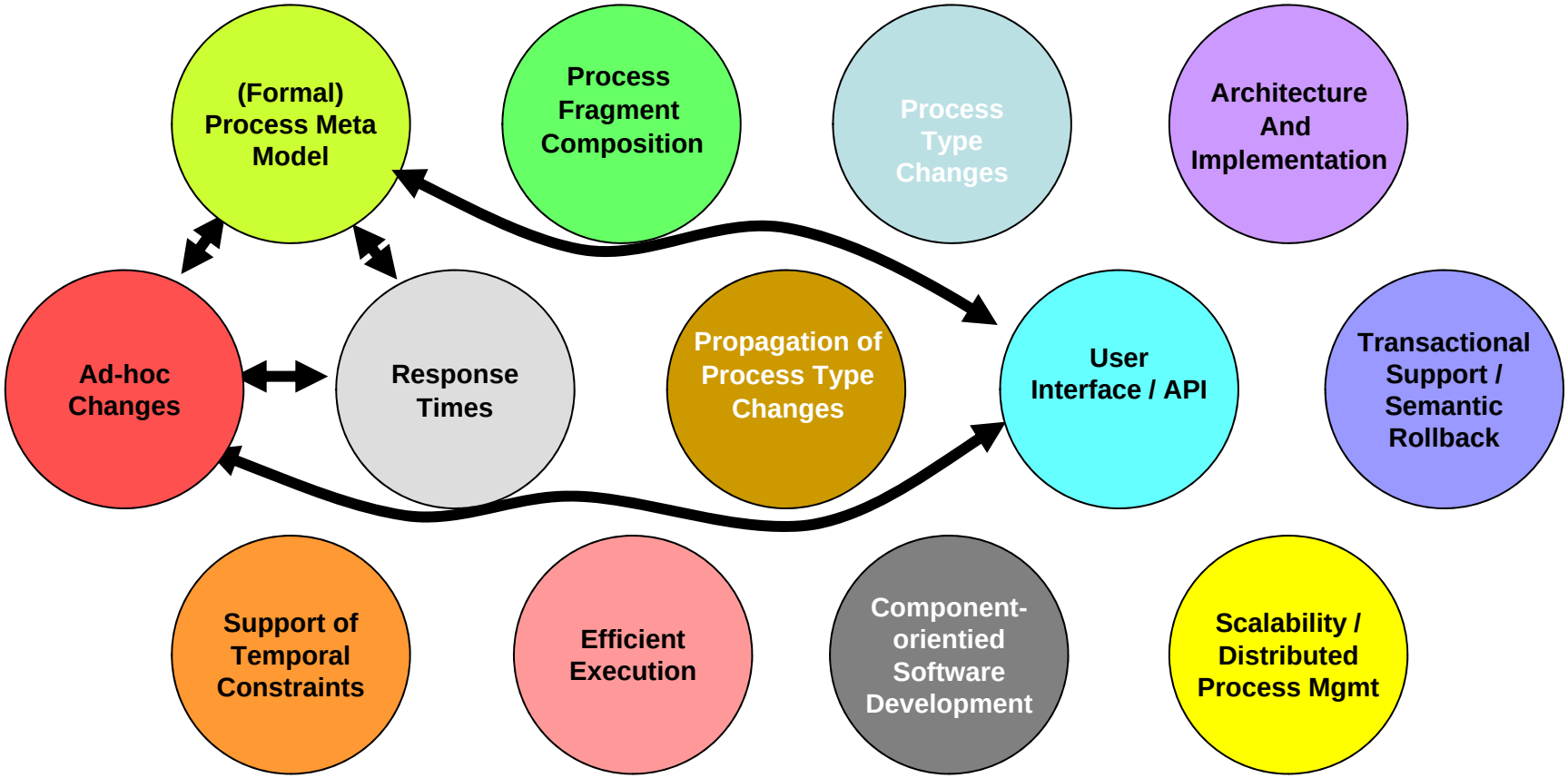
Rinderle, S., Reichert, M., Dadam, P. (2004) *Disjoint and Overlapping Process Changes: Challenges, Solutions, Applications.* In: Proc. CoopIS'04, Agia Napa, LNCS 3290,, pp. 101-121

Adaptive PAIS: Extended Lifecycle Support



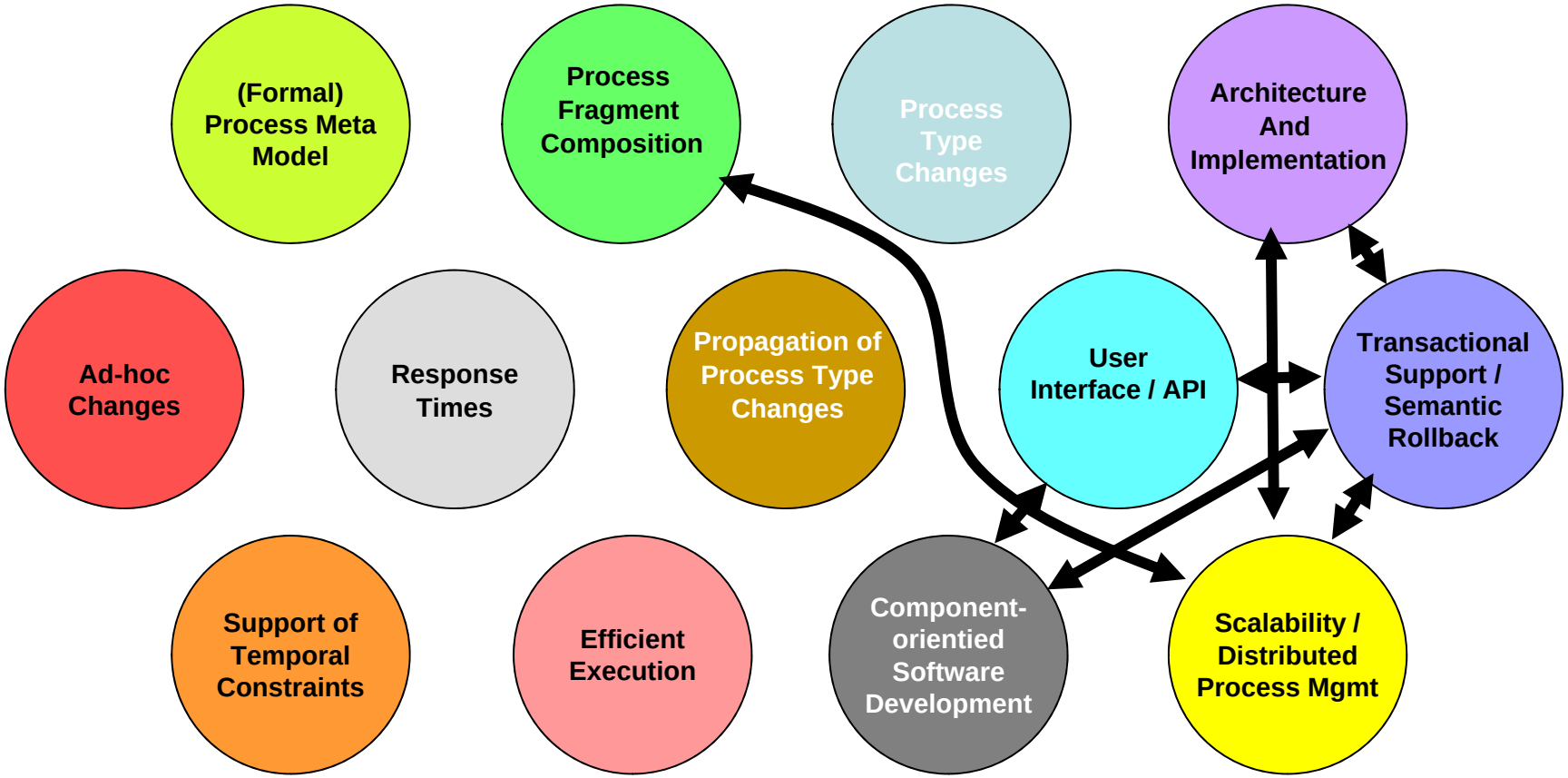
Weber, B., Sadiq, S., Reichert, M. (2009) *Beyond Rigidity - Dynamic Process Lifecycle Support: A Survey on Dynamic Changes in Process-aware Information Systems.* Computer Science - Research and Development, 23(2): 47-65, Springer.

Adaptive PAIS: The ADEPT Approach



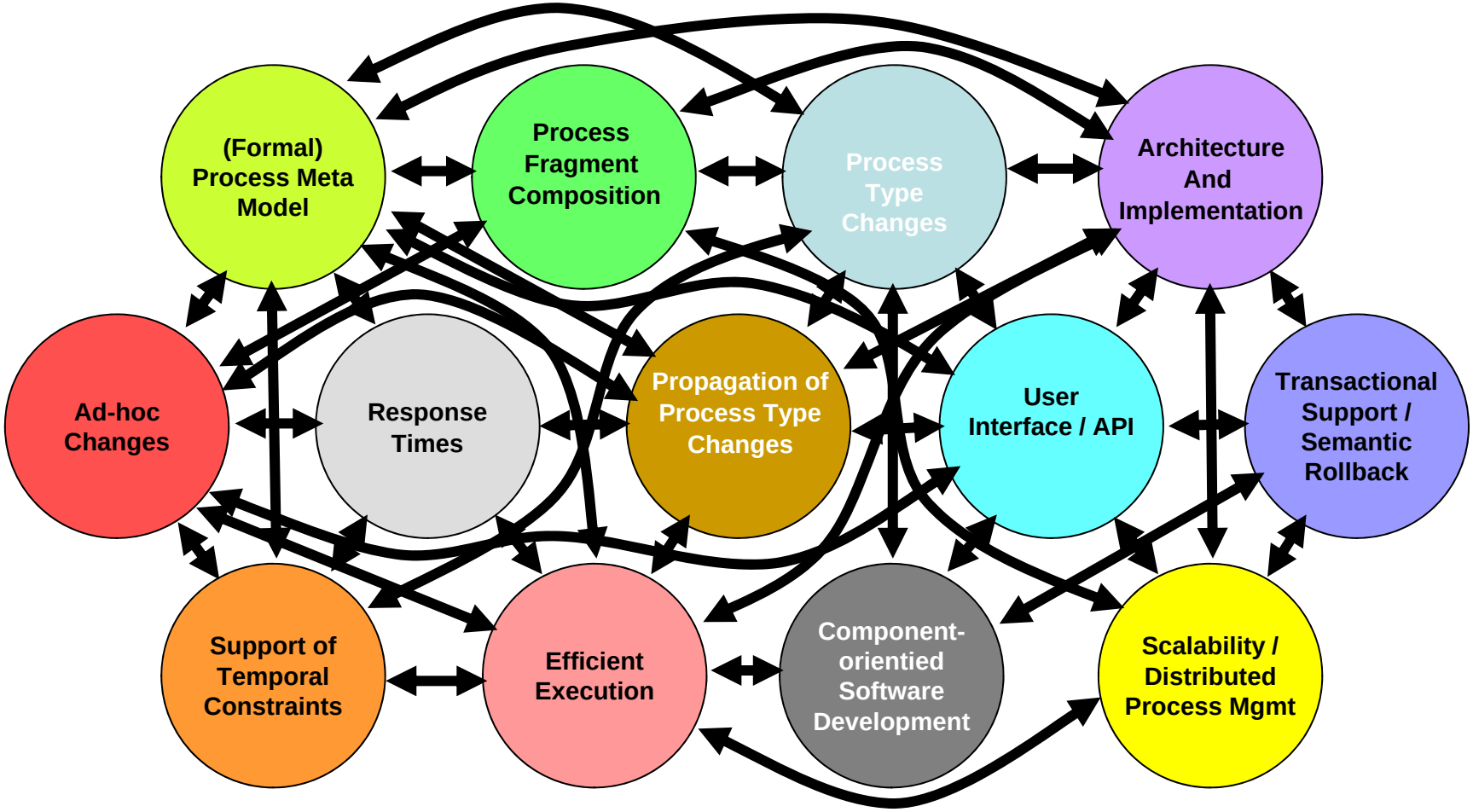
Dadam, Peter and Reichert, Manfred (2009) *The ADEPT Project: A Decade of Research and Development for Robust and Flexible Process Support - Challenges and Achievements.* Computer Science - Research and Development, Vol. 23, No. 2, pp. 81-97.

Adaptive PAIS: The ADEPT Approach



Dadam, Peter and Reichert, Manfred (2009) *The ADEPT Project: A Decade of Research and Development for Robust and Flexible Process Support - Challenges and Achievements.* Computer Science - Research and Development, Vol. 23, No. 2, pp. 81-97.

Adaptive PAIS: The ADEPT Approach



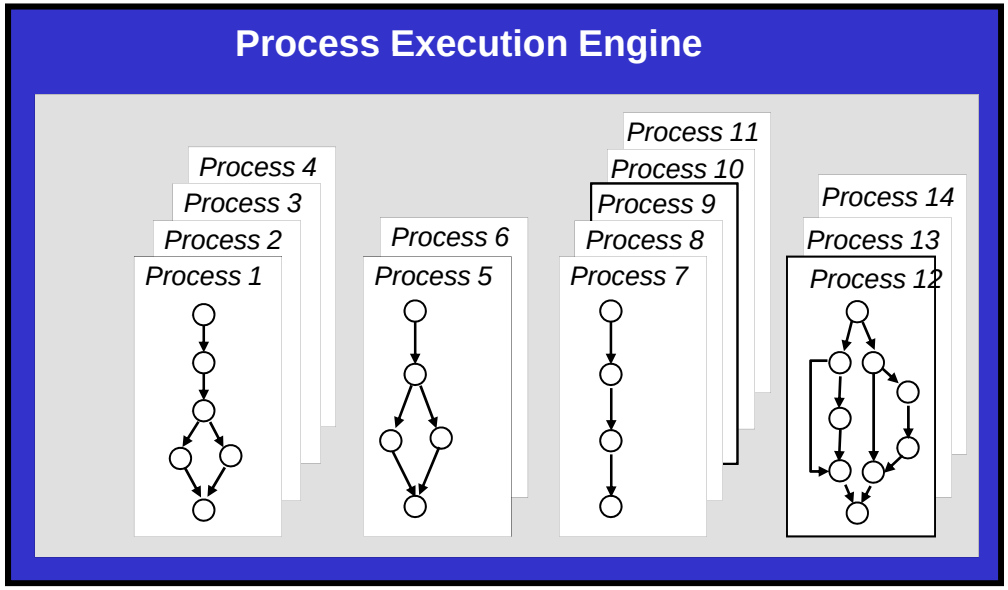
Dadam, Peter and Reichert, Manfred (2009) *The ADEPT Project: A Decade of Research and Development for Robust and Flexible Process Support - Challenges and Achievements.* Computer Science - Research and Development, Vol. 23, No. 2, pp. 81-97.

Adaptive PAIS: The ADEPT Approach

ADEPT :

Individually adaptable Process Instances

Process Instance = (individual) "Process Program"



Reichert, M., Rinderle, S., Kreher, U., Dadam, P. (2005) *Adaptive Process Management with ADEPT2.* In: Proc. ICDE'05, Tokyo,IEEE Comp. Press

Adaptive PAIS: The ADEPT Approach

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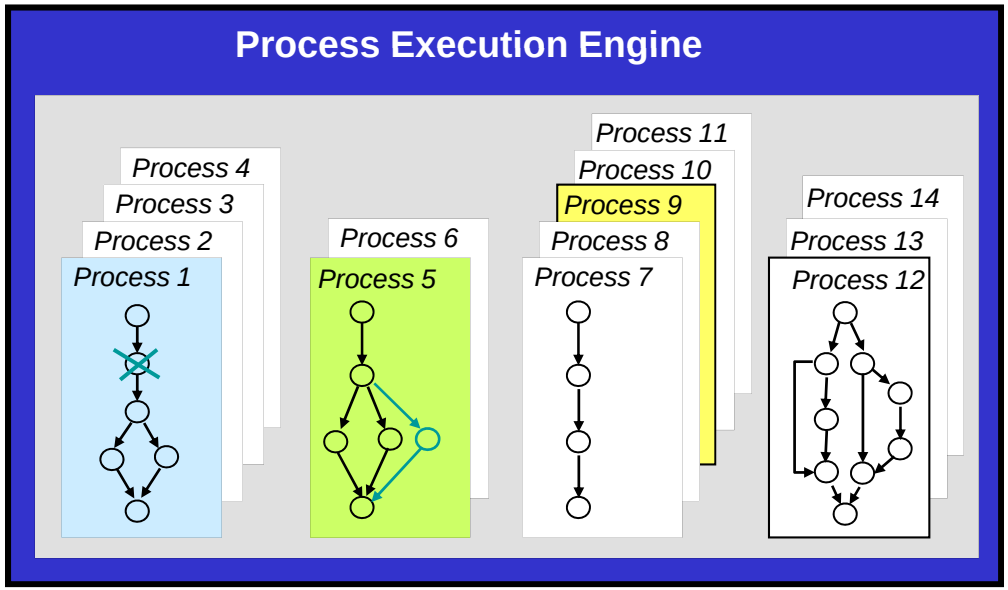
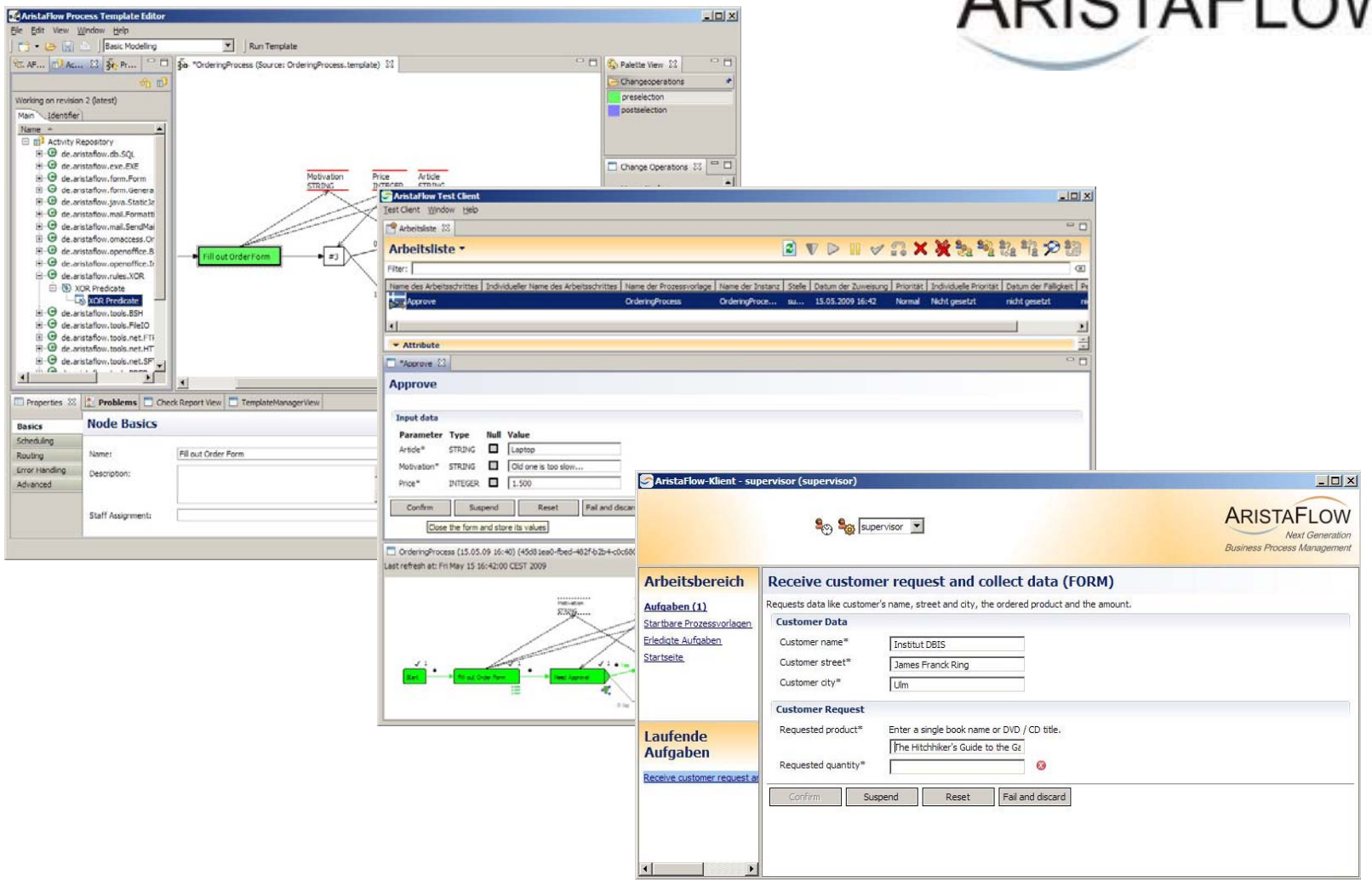


Achievements:

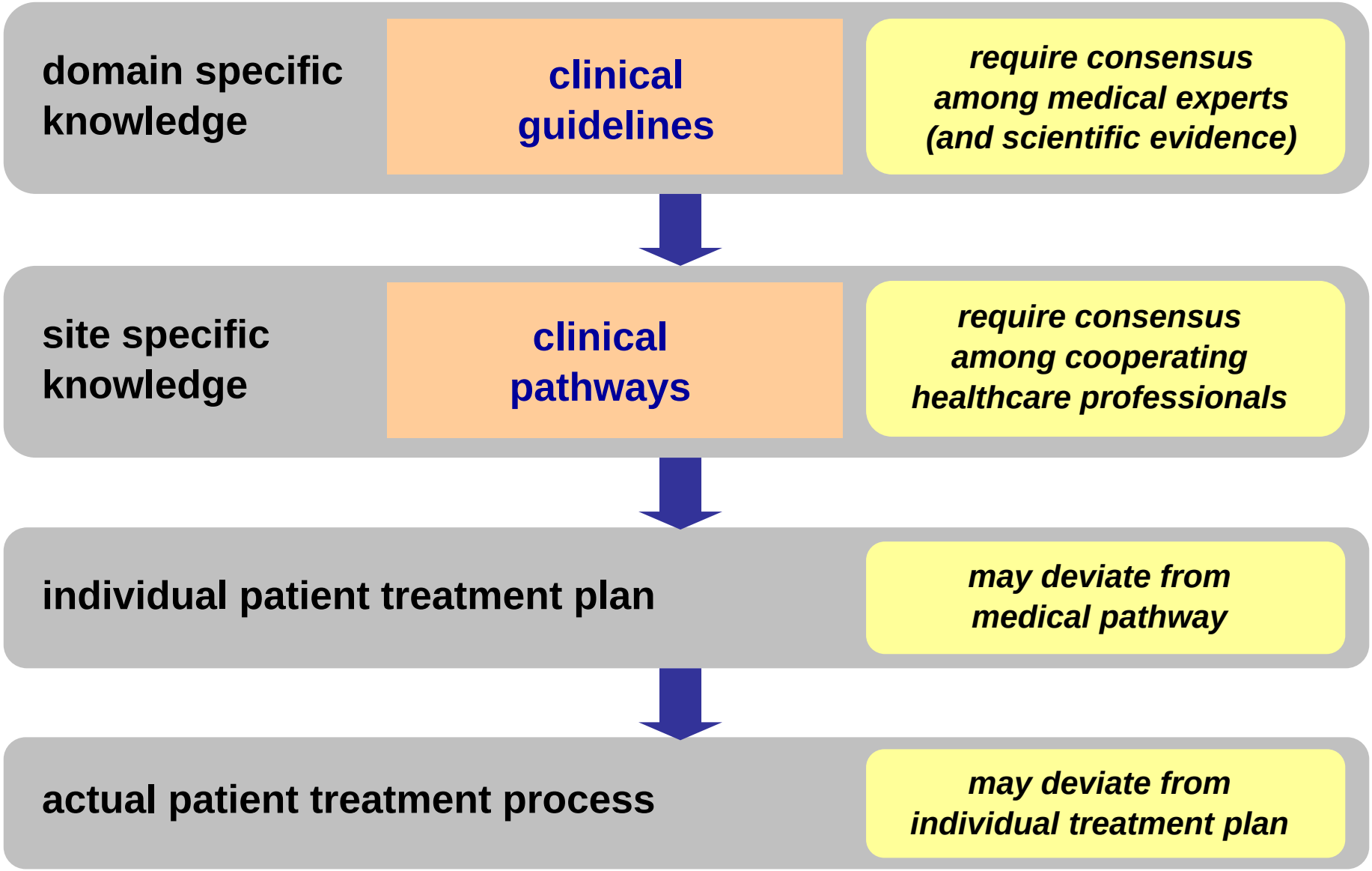
- **Formal process meta model** (expressive + restricted enough)
- **Formal Criteria for Change Correctness** (incl. „Theorems & Proofs")
- **Efficient, build-in consistency checks** („no bad surprise")
- **Support of a high number of change patterns**
- **API for accomplishing ad-hoc changes**

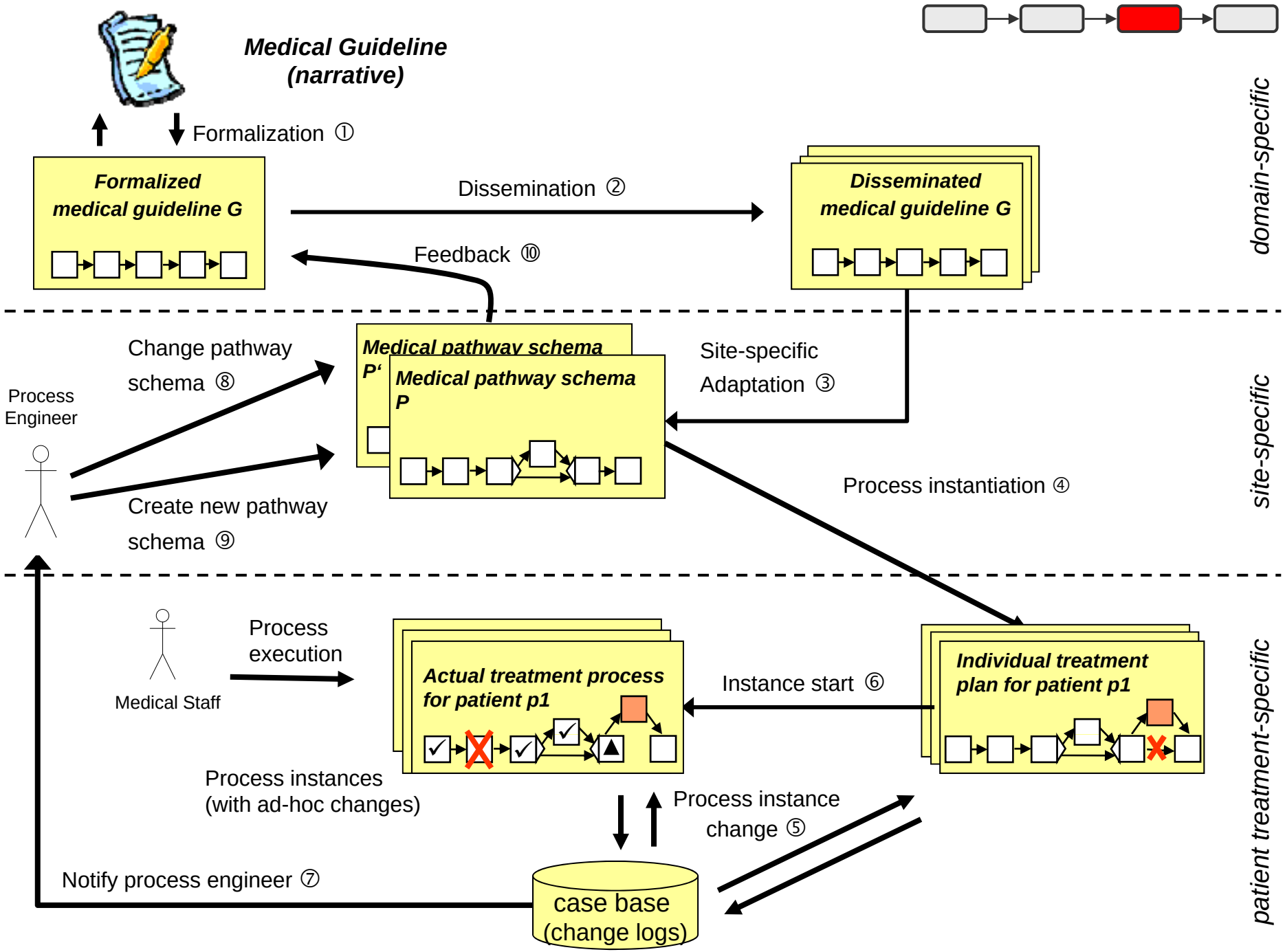


Reichert, M. et al. (2009) *Enabling Poka-Yoke Workflows with the AristaFlow BPM Suite.* In: CEUR Workshop Proceedings 489.

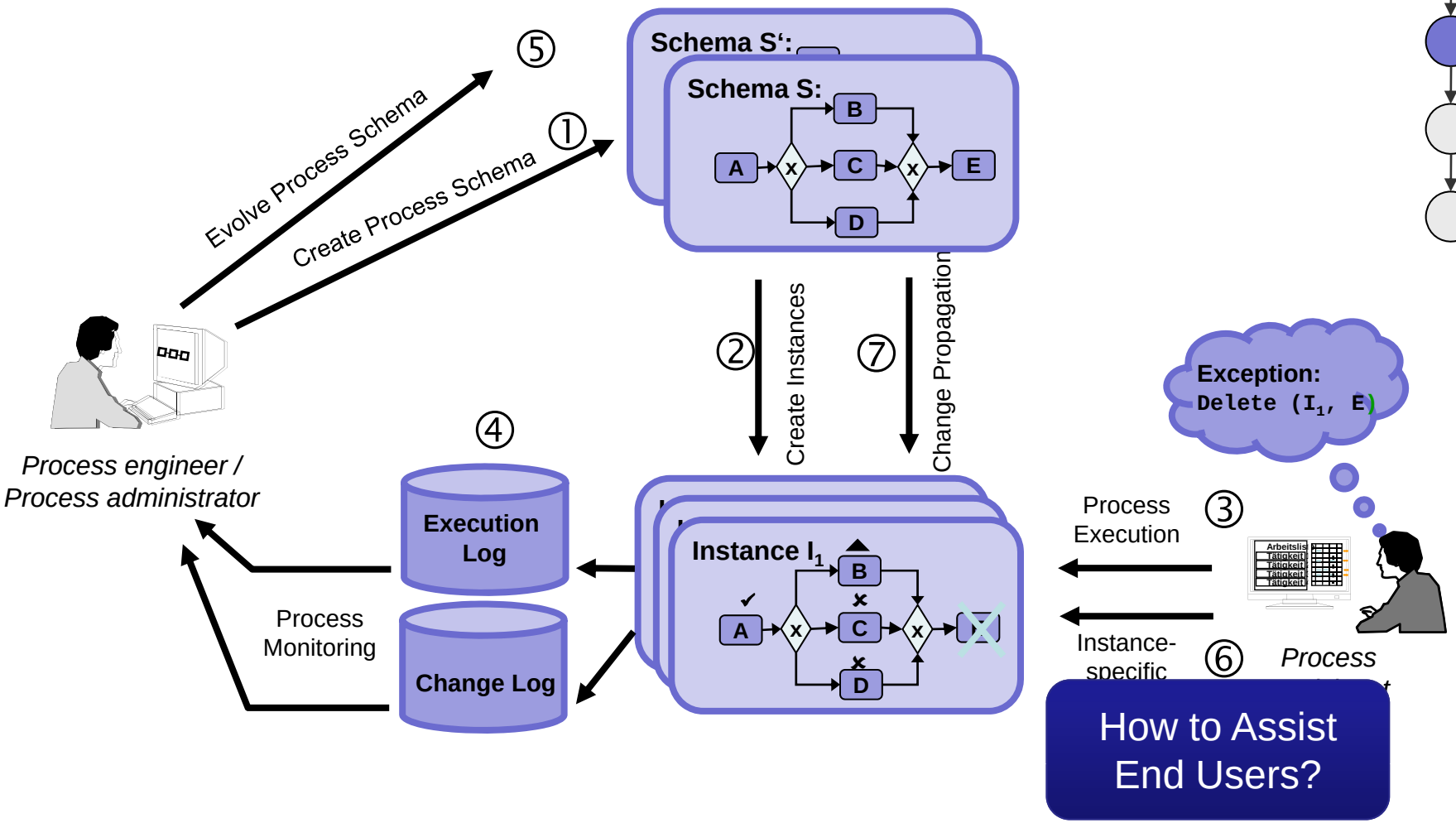
www.aristaflow-forum.de

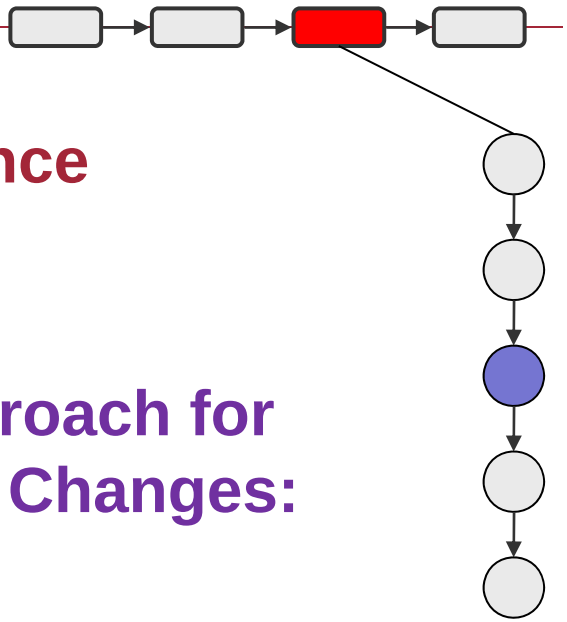
IT Support for Clinical Pathways




Medical Guideline
(narrative)
Formalization ①
Formalized
medical guideline G
Dissemination ②
Feedback ⑩
Disseminated
medical guideline G
domain-specific
Change pathway
schema ⑧
Process
Engineer
Create new pathway
schema ⑨
Medical pathway schema
P'
Medical pathway schema
P
Site-specific
Adaptation ③
Process instantiation ④
site-specific
Medical Staff
Process
execution
Actual treatment process
for patient p1
Instance start ⑥
Individual treatment
plan for patient p1
Process instances
(with ad-hoc changes)
Process instance
change ⑤
Notify process engineer ⑦
case base
(change logs)
patient treatment-specific

Adaptive PAIS: User Assistance





Adaptive PAIS: User Assistance

The ProCycle (= ADEPT + CBRFlow) Approach for Assisting Users in Defining and Reusing Changes:

- Annotate ad-hoc changes with information about their reasons
- Support users in retrieving past ad-hoc changes applied in similar problem context
- Assist users in reusing (i.e., re-applying) a past ad-hoc change for a particular process instance when coping with an exceptional situation

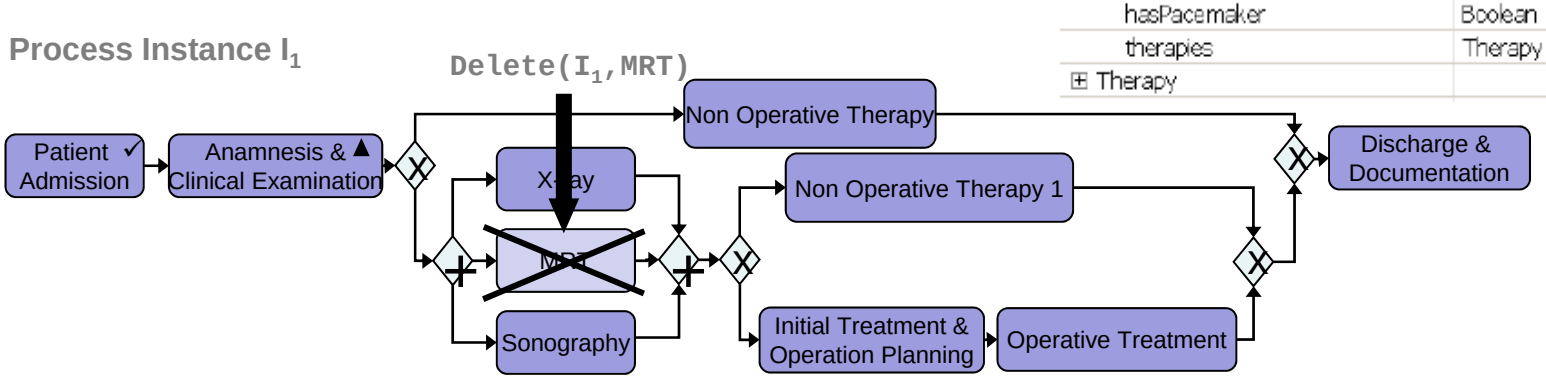
Weber, B., Reichert, M., Rinderle-Ma, S. (2009) *Providing Integrated Life Cycle Support in Process-Aware Information Systems.* Int'l Journal of Cooperative Information Systems , 18(1): 115-165

Adaptive PAIS: User Assistance

Memorizing ad-hoc deviations including their application context

Application Context Model

Object	Type	Min	Max
⊞ Diagnosis			
⊟ Patient			
age	Integer	1	1
problemList	ProblemList	1	1
weight	Integer	1	1
⊟ ProblemList			
diagnoses	Diagnosis	0	1000
hasPacemaker	Boolean	0	1
therapies	Therapy	0	1000
⊞ Therapy			



Case c_1

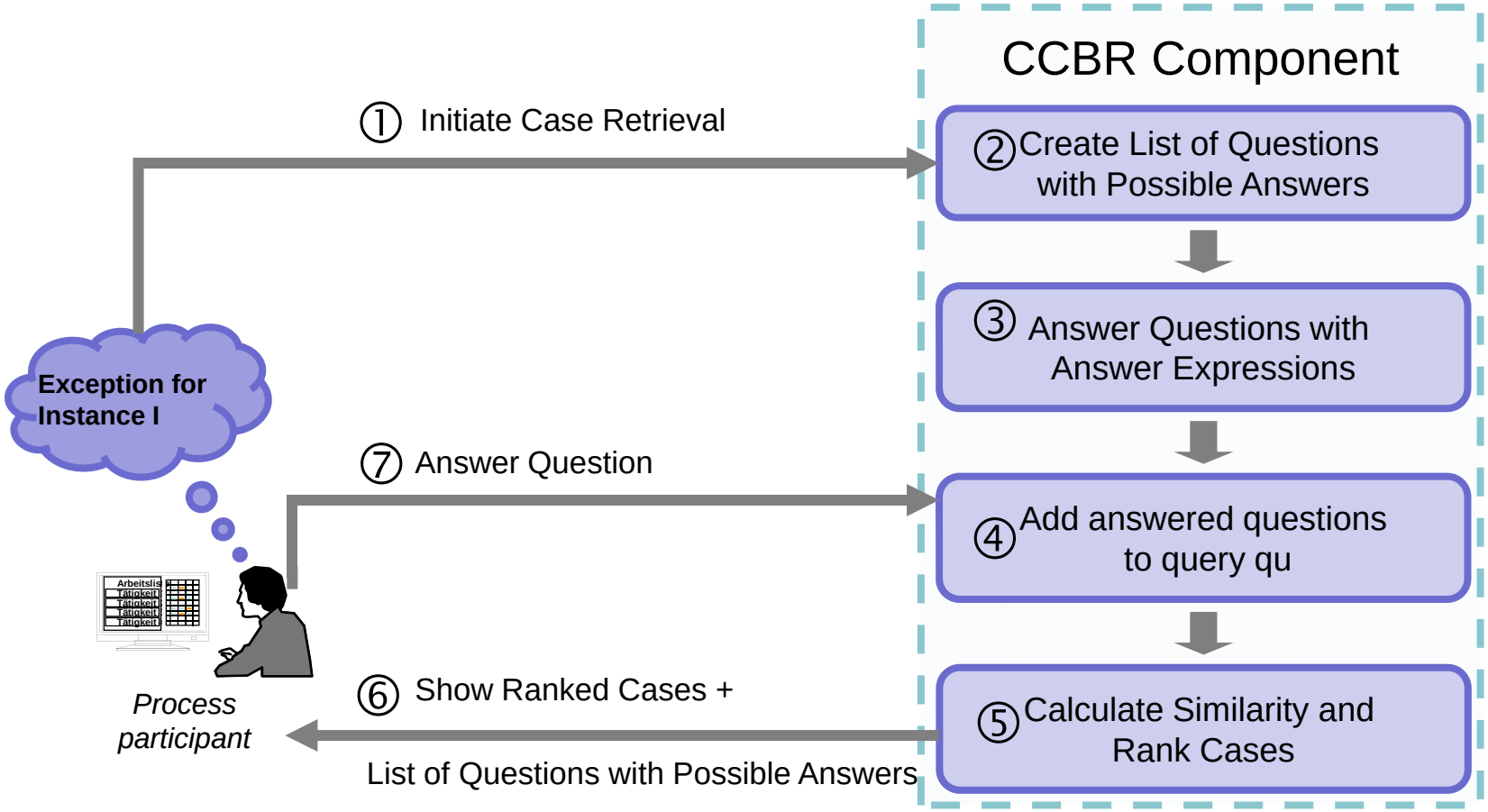
pd_{c_1} = The treatment of cruciate ruptures routinely includes a magnetic resonance tomography (MRT), an X-ray and a sonography. However, for a particular patient the MRT may have to be skipped as the respective patient has a cardiac pacemaker.

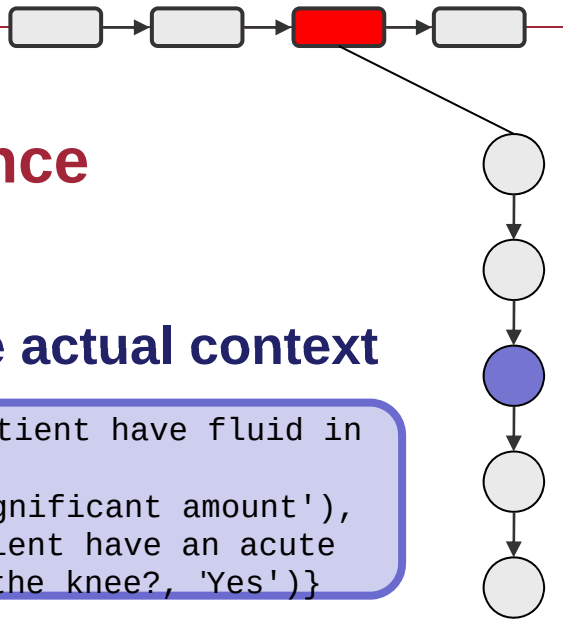
sol_{c_1} = <Delete(S_I,MRT)>

$qaSet_{c_1}$ = {(Does the patient have a cardiac pacemaker?, patient.problemList.hasPacemaker = 'Yes')}

Adaptive PAIS: User Assistance

Semi-automated retrieval of similar *instance deviations* using conversational case-based reasoning (CCBR)





Adaptive PAIS: User Assistance

Retrieving similar instance deviations based on the actual context

Case c_1

$qaSet_{c_1}$ = {(Does the patient have a cardiac pacemaker?, Patient.problemList.hasPacemaker = 'Yes')}

Case c_2

$qaSet_{c_2}$ = {(Does the patient have fluid in the knee?, 'A significant amount'), (Does the patient have an acute effusion of the knee?, 'Yes')}

List of Questions with Possible Answers	
Question	**Possible Answers**
Does the patient have a cardiac pacemaker?	{Patient.problemList.hasPacemaker = ‚Yes', OTHERANSWER}
Does the patient have fluid in the knee?	{‚A significant amount', OTHERANSWER}
Does the patient have an acute effusion of the	{‚Yes', OTHERANSWER}

②

Query qu'	
Question	**Given Answer**
Does the patient have a cardiac pacemaker?	OTHERANSWER
Does the patient have fluid in the knee?	‚A significant amount'

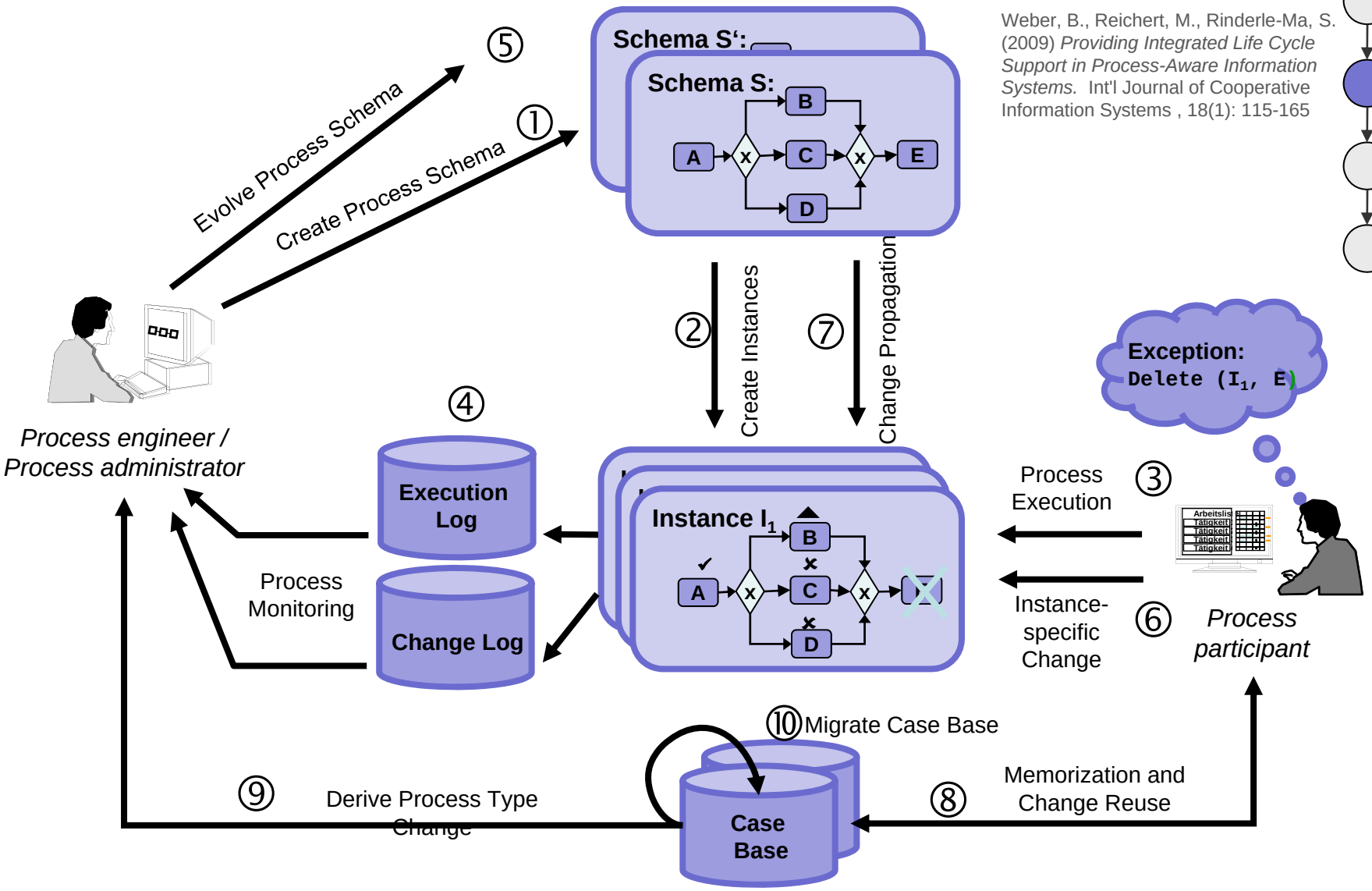
③

List of Retrieved Cases for Query qu'	
Case	**Appl. Context Similarity**
c2	50%
c1	0%

④

$$sim(qu,c) = \frac{1}{2} * \frac{same(qu, qaSet_c) - diff(qu, qaSet_c)}{|qaSet_c|} + 1$$

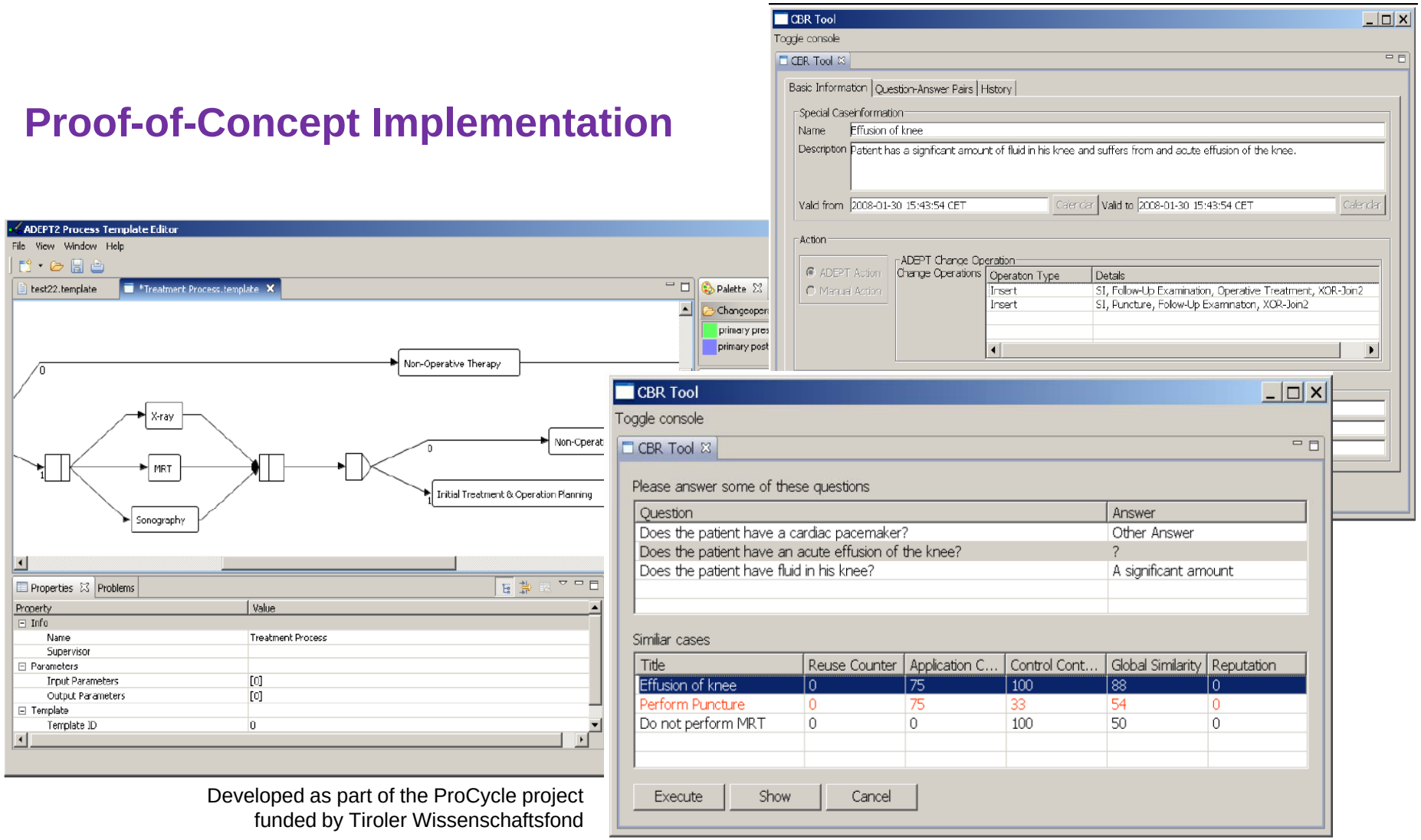
Adaptive PAIS: User Assistance



Weber, B., Reichert, M., Rinderle-Ma, S. (2009) *Providing Integrated Life Cycle Support in Process-Aware Information Systems.* Int'l Journal of Cooperative Information Systems , 18(1): 115-165

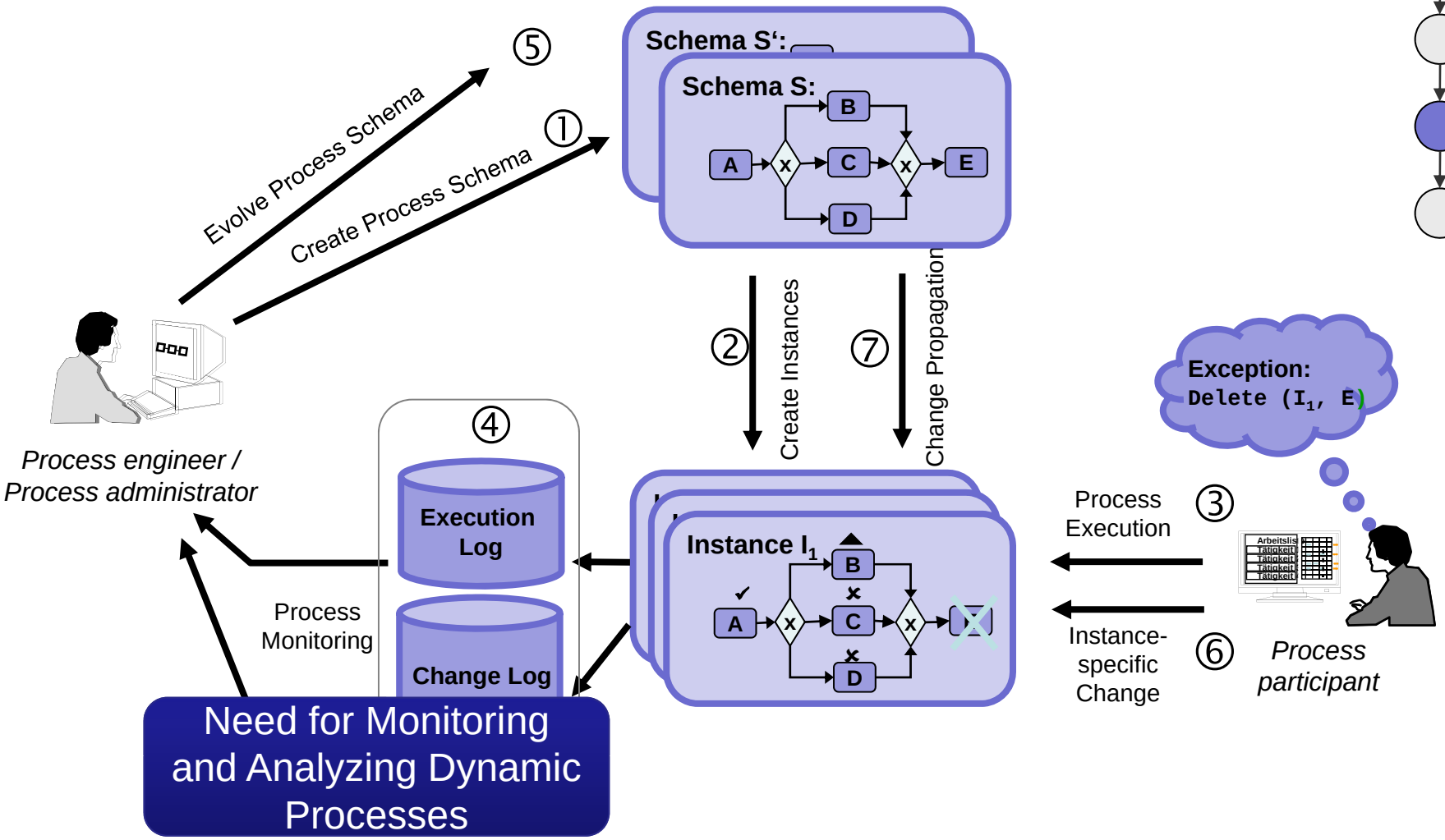
Adaptive PAIS: User Assistance

Proof-of-Concept Implementation



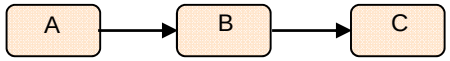
Developed as part of the ProCycle project
funded by Tiroler Wissenschaftsfond

Adaptive PAIS: Analyzing Process Logs



Adaptive PAIS: Analyzing Process Logs

Original Schema S

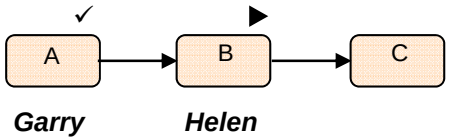



```
Instance 4711
Activity  Event             User    Timestamp
          Instance Started  Garry   2007/09/08 15:00
A         Started           Garry   2007/09/08 15:30
A         Completed         Garry   2007/09/08 15:45
B         Started           Helen   2007/09/10 11:00
X         Started           Fritz   2007/09/11 09:01
```

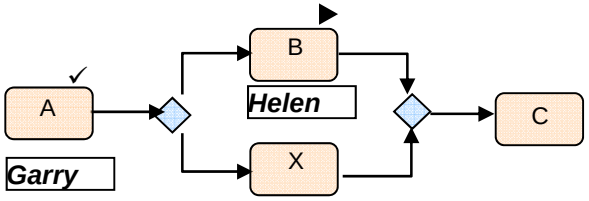
```
Change Log Instance 4711 on Schema S

Change TX Applied Changes : User:Timestamp

001 InsertFragment[S;X,A,C]:Helen:2007/09/10 12:02
002 ReplaceFragment(S;C,Z):Jim:2007/09/11 09:31
```

Process Instance 4711

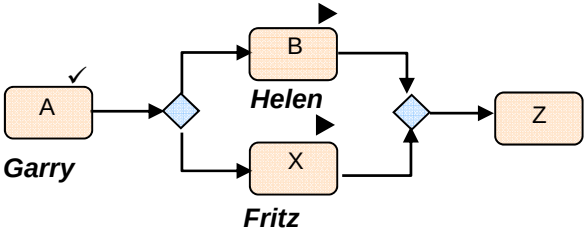
2007/09/10 11:00



2007/09/10 13:00

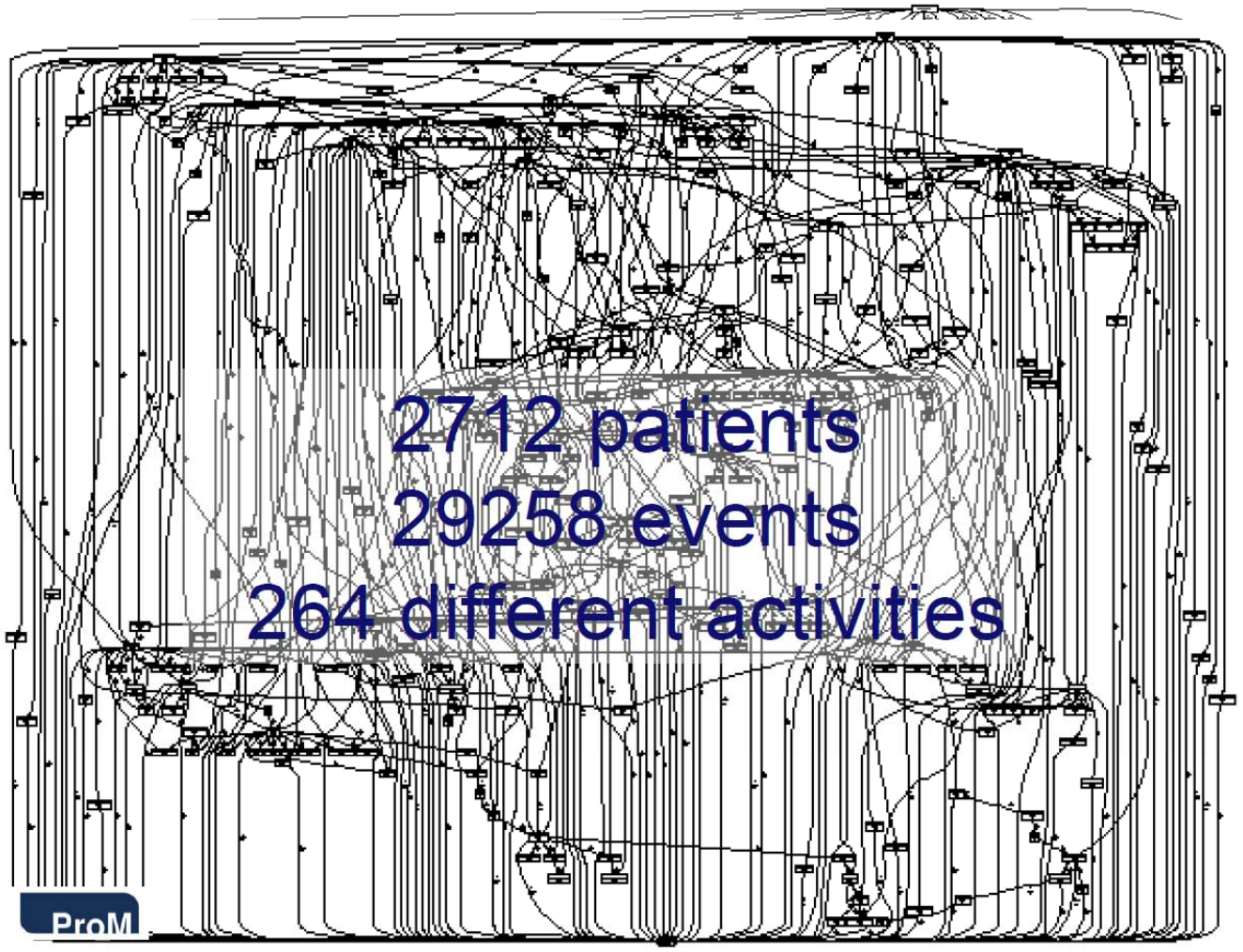


2007/09/11 10:00



Process Mining Mirrors Reality!

Analyzing Process Logs:
Focussing on Execution Logs

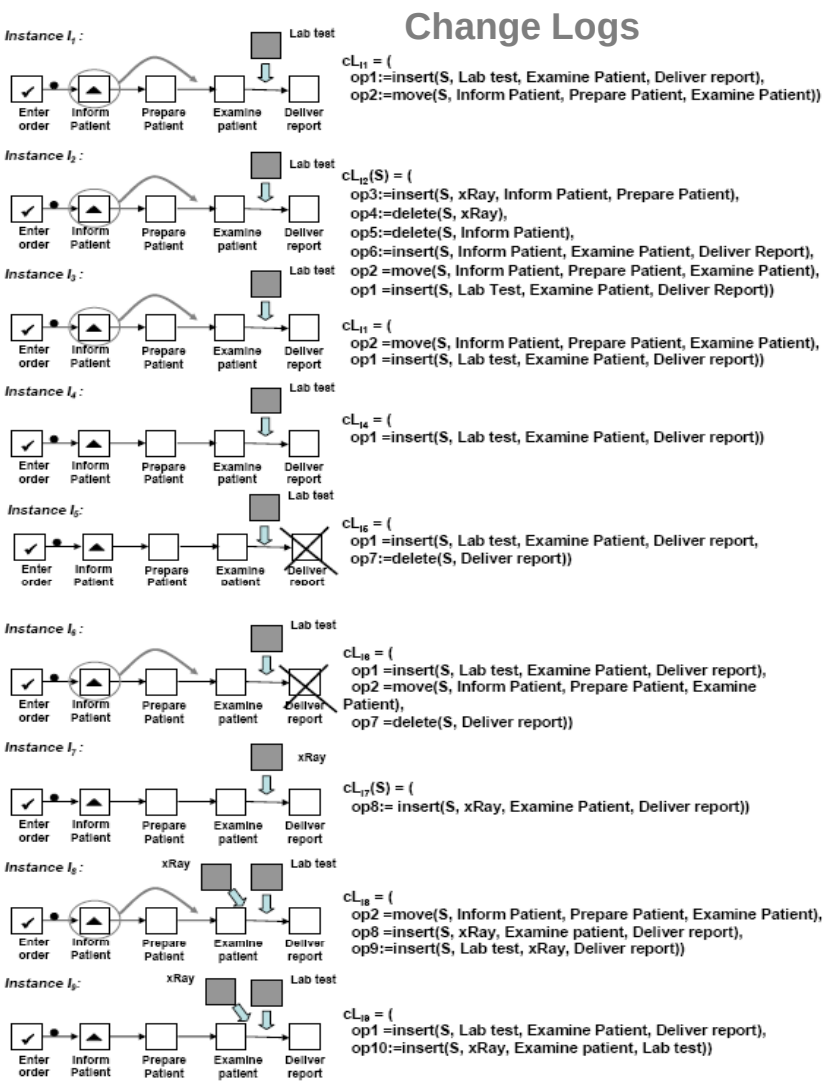


Source: www.processmining.org

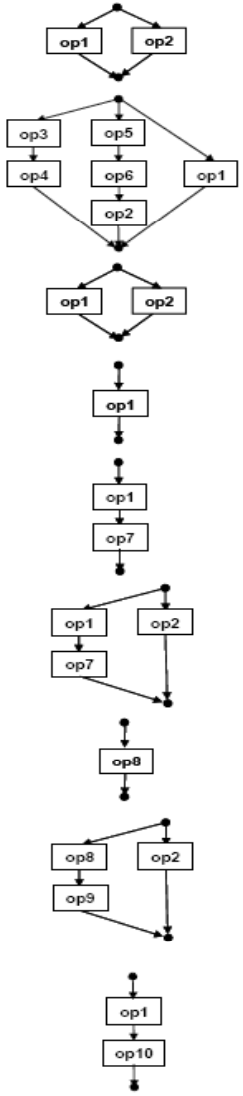
Analyzing Process Logs:
Applying Process Mining Techniques to Change Logs

Processes with instance-specific change logs

Change Logs

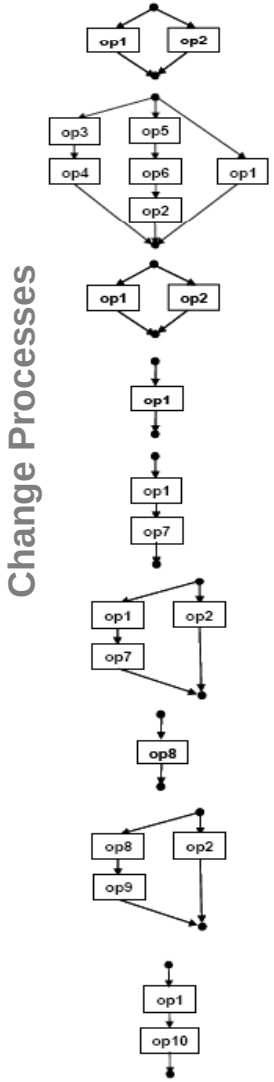


Phase I

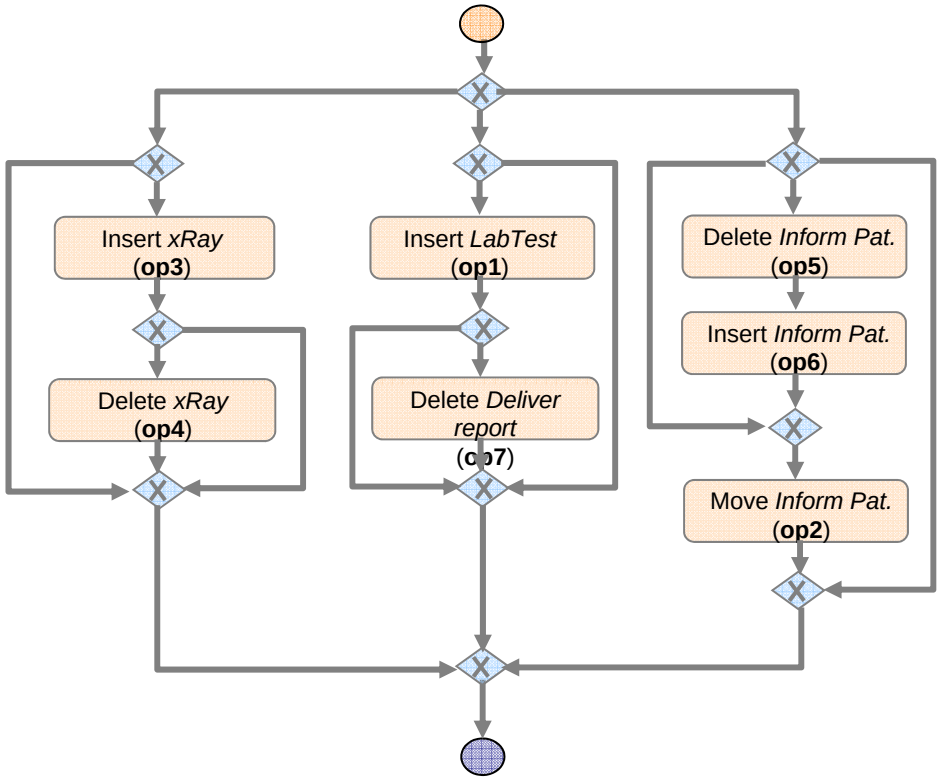


Change Processes

Analyzing Process Logs:
Applying Process Mining Techniques to Change Logs



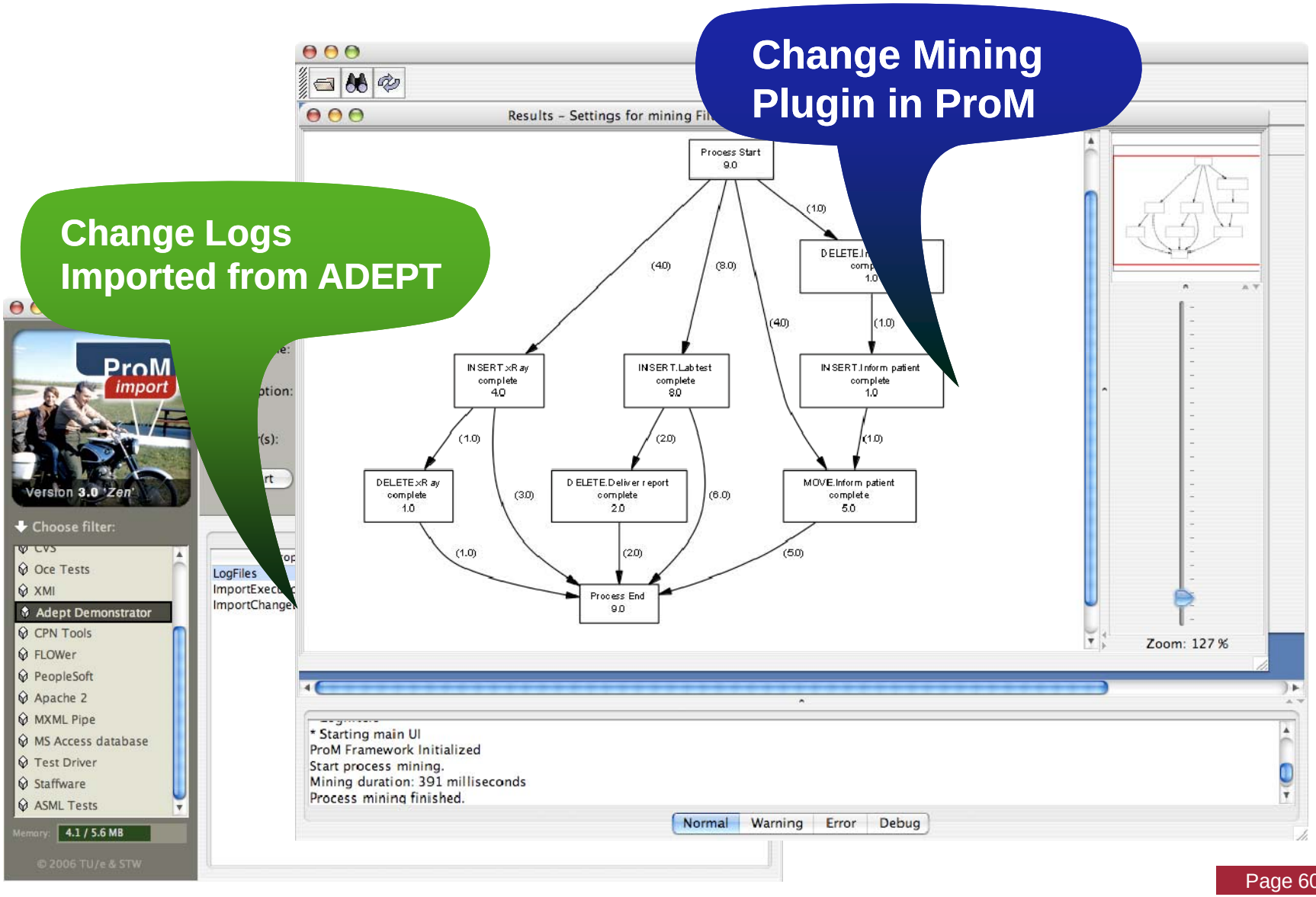
Phase II



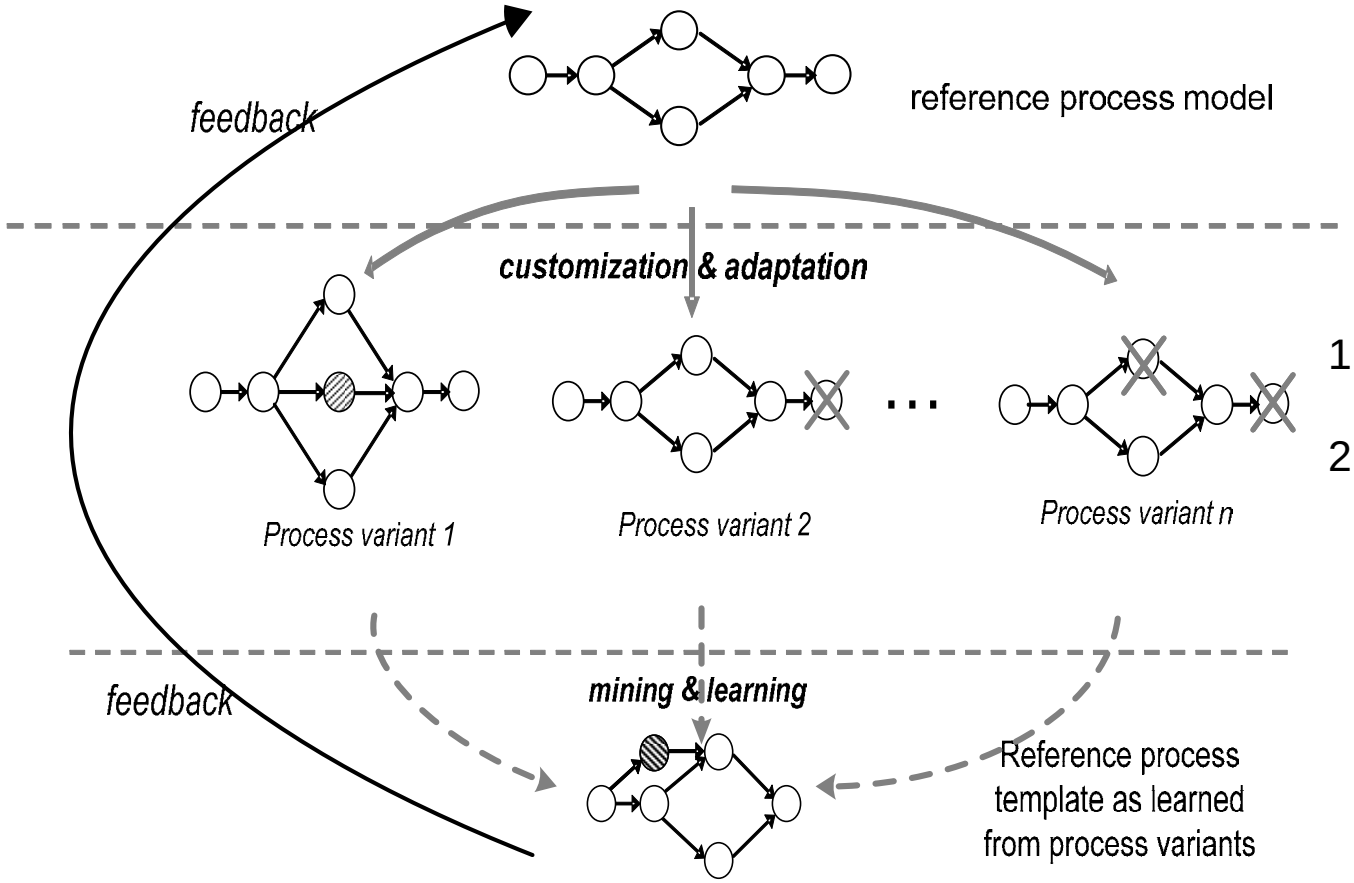
The discovered meta change process covers all changes applied to at least one of the given fluid process instances.

Günther, C.W.; Rinderle, S.; Reichert, M.; van der Aalst, W.M.P.; Recker, J. (2008): Using Process Mining to Learn from Process Changes in Evolutionary Systems. *Int'l J of Business Process Integration and Management*, 3(1):61-78

Analyzing Process Logs:
Applying Process Mining Techniques to Change Logs



Analyzing Process Logs: Process Variants Mining

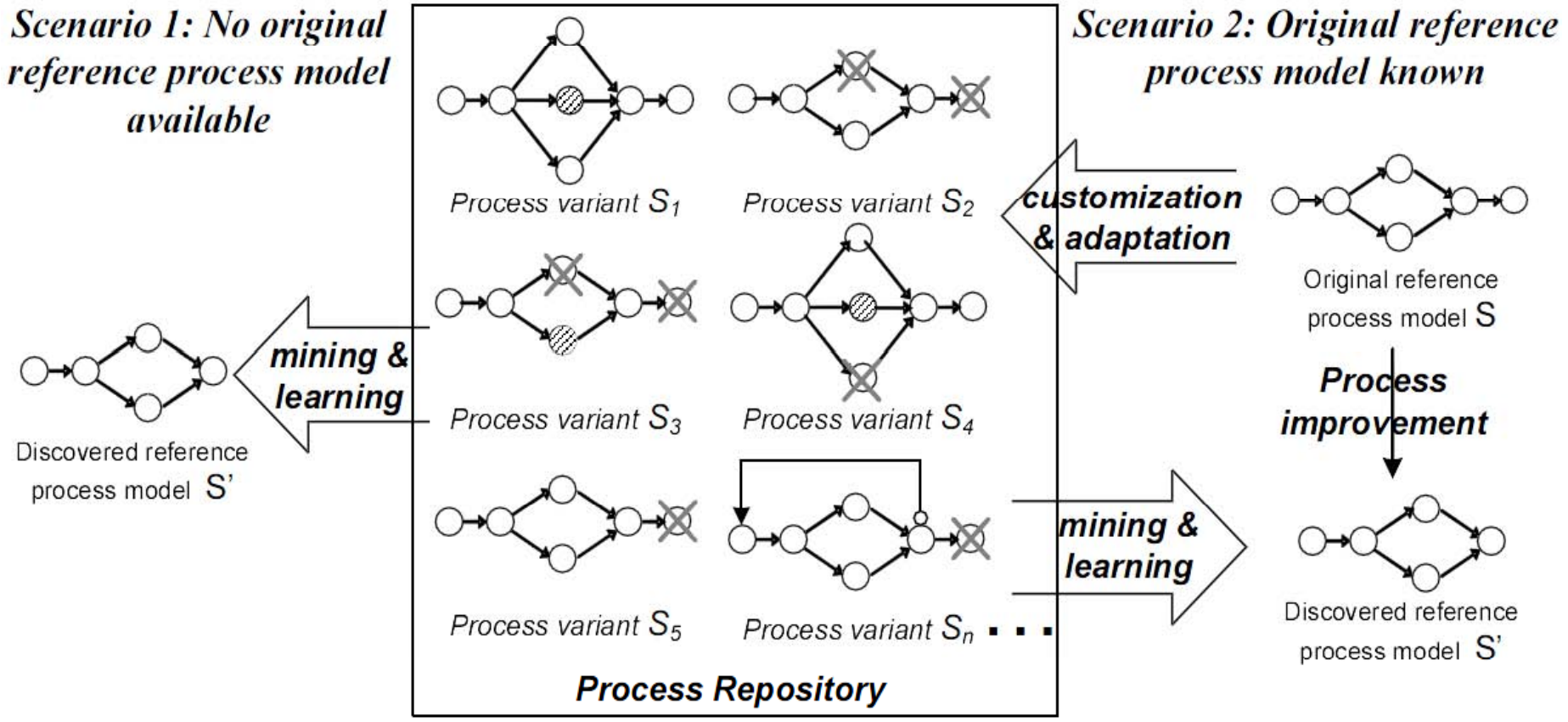


1. Configurations are very costly
2. Variants are difficult to maintain

Derive a new reference process model from the the variants such that *less adaptations are needed in future!*

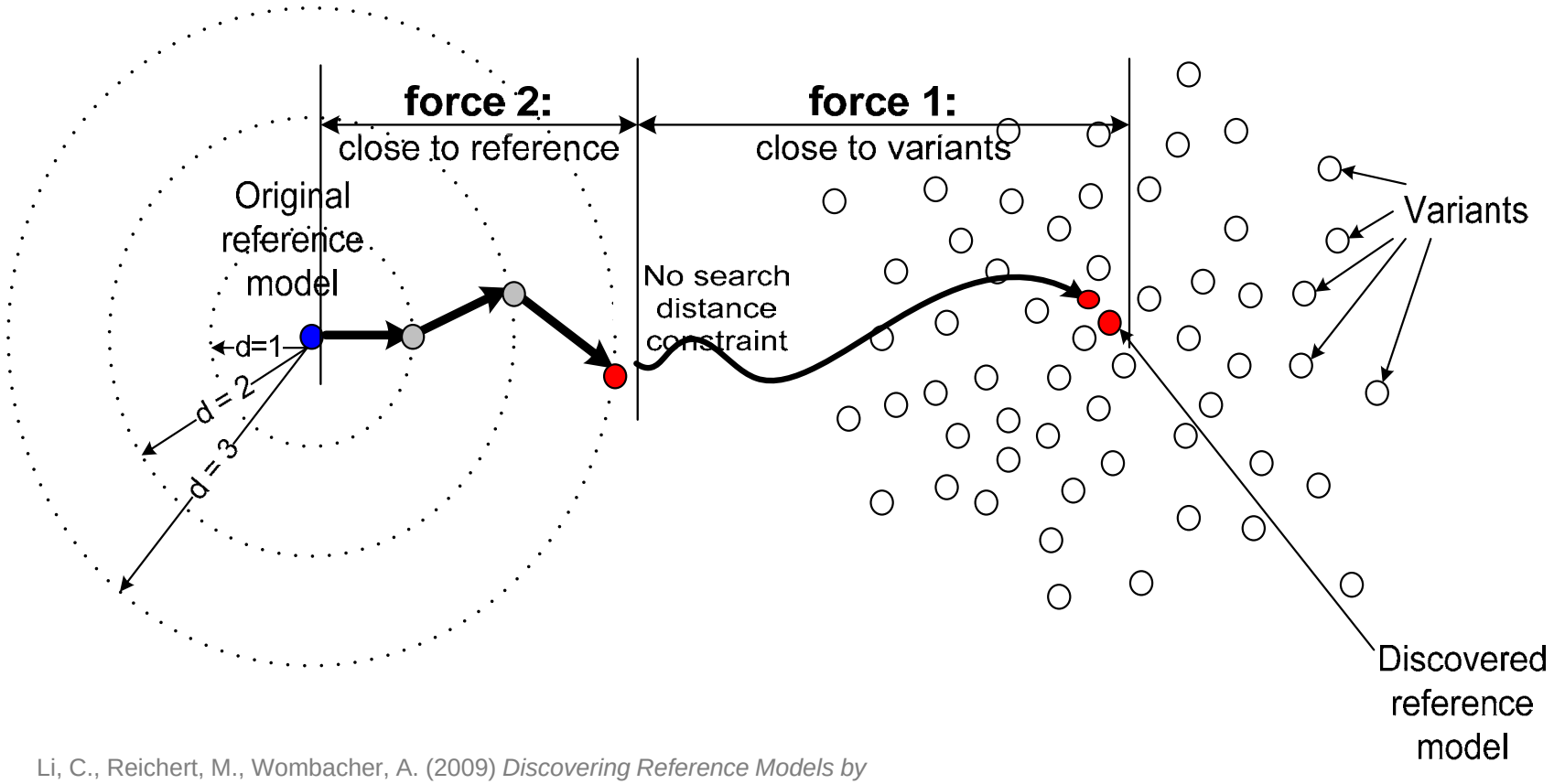
Li, C., Reichert, M., Wombacher, A. (2011) *Mining Business Process Variants: Challenges, Scenarios, Algorithms.* Data & Knowledge Engineering, Vol. 70, No. 5, pp. 409-434,

Analyzing Process Logs:
Process Variants Mining (Scenarios)



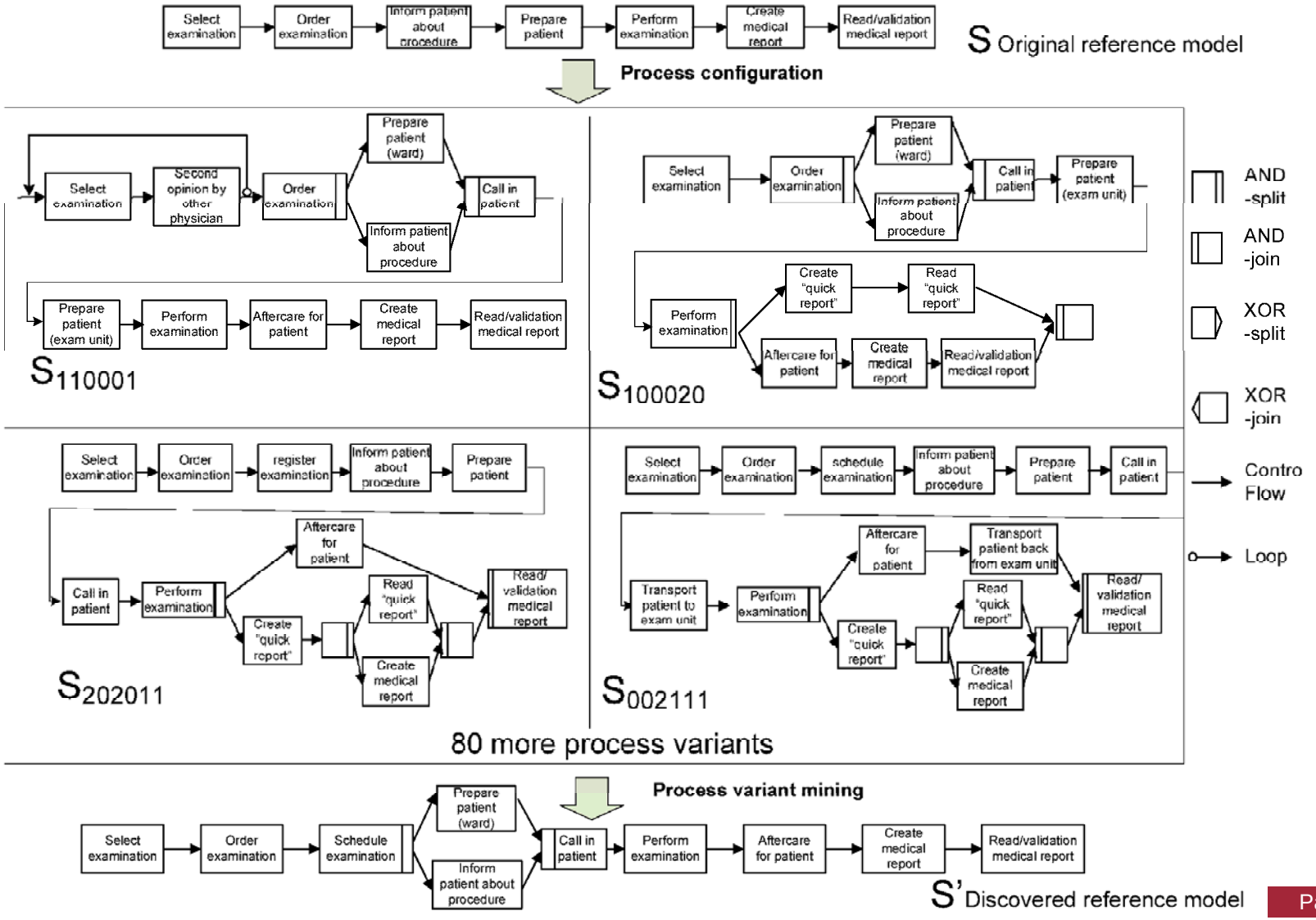
Goal: *Discover a (new) reference process model which requires less configuration efforts*

Analyzing Process Logs:
Process Variants Mining (A Heuristics Mining Technique)

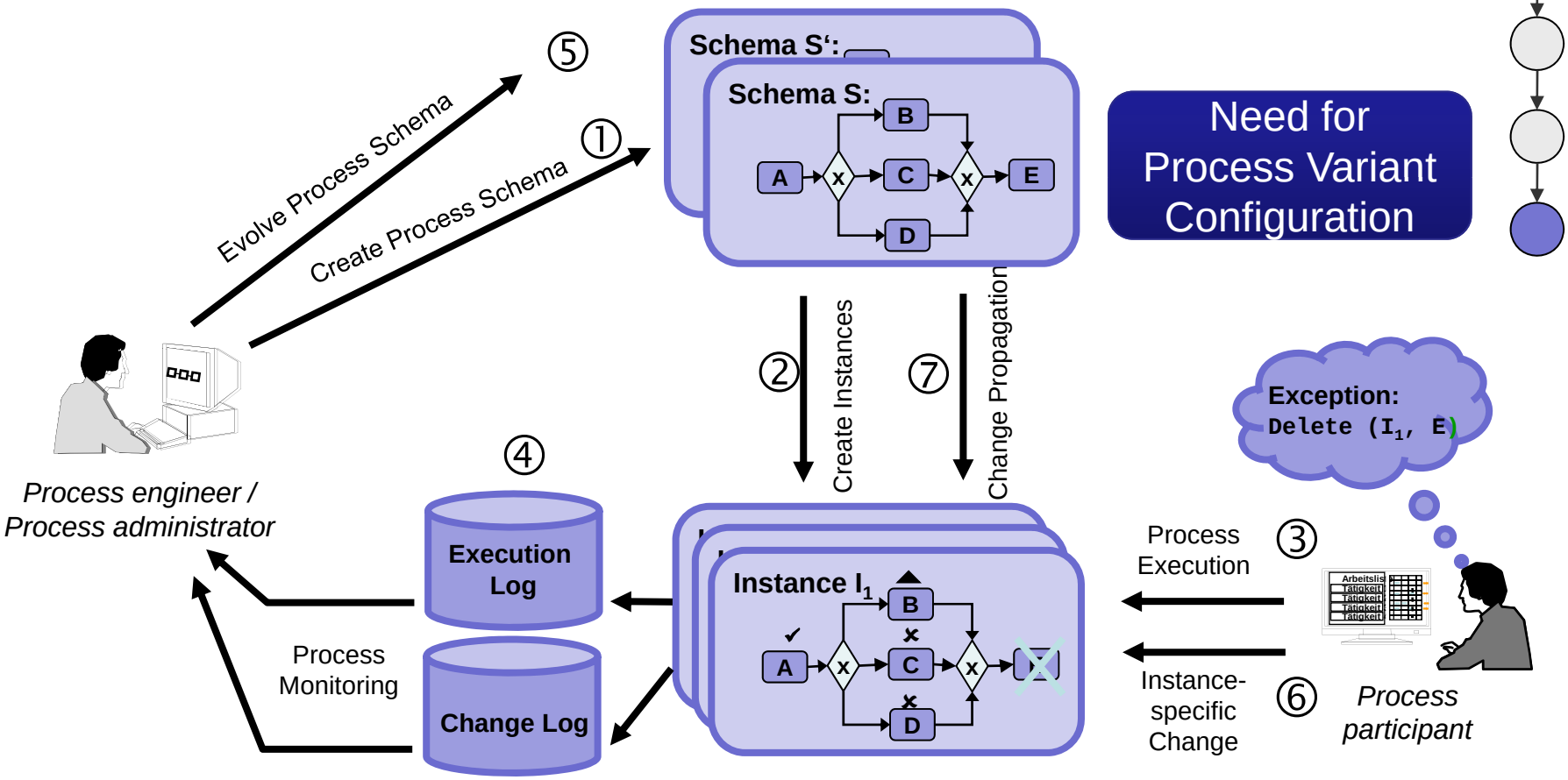


Li, C., Reichert, M., Wombacher, A. (2009) *Discovering Reference Models by Mining Process Variants Using a Heuristic Approach.* In: 7th Int'l Conference on Business Process Management (BPM'09), LNCS 5701, pp. 344-362

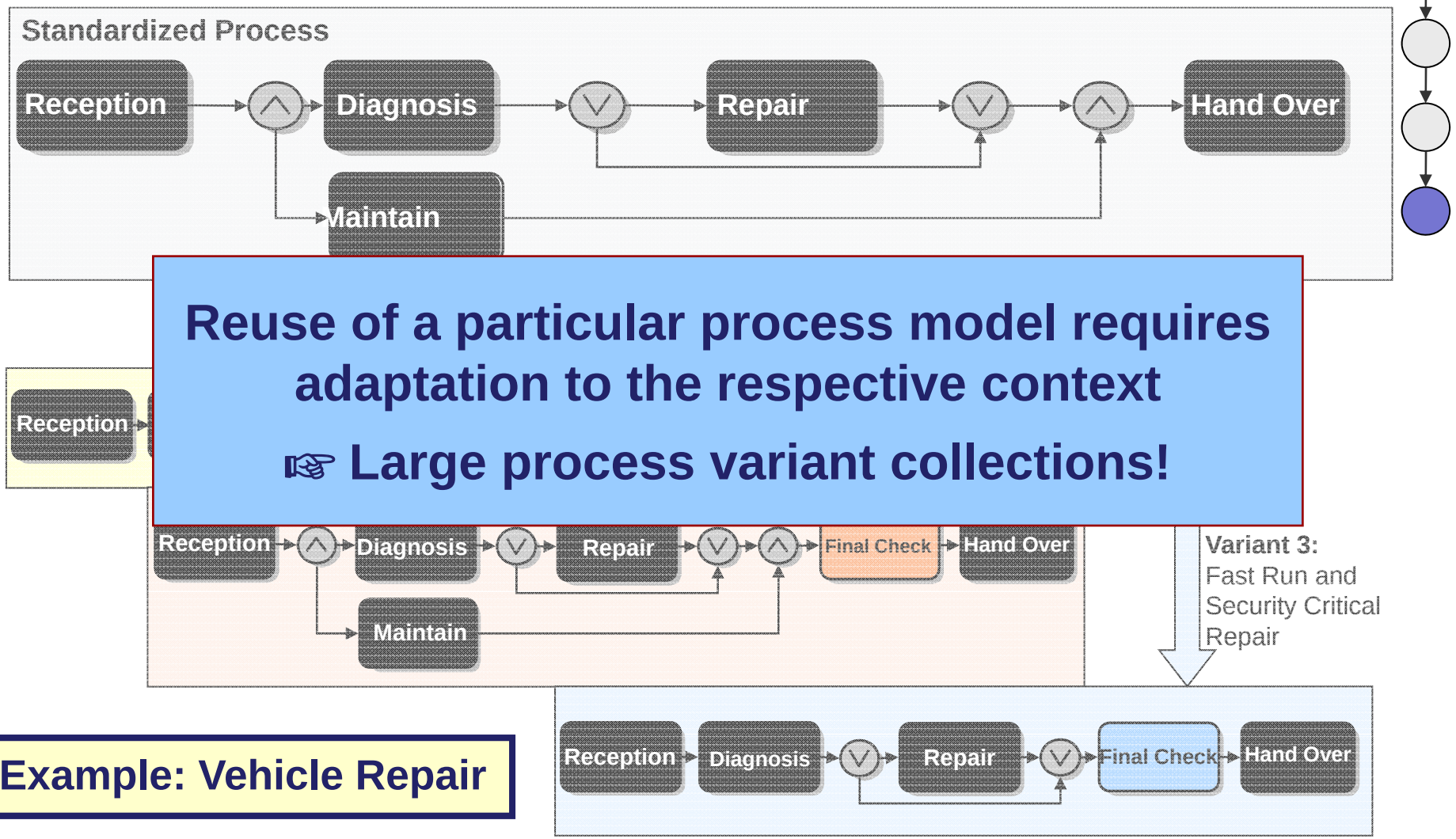
Analyzing Process Logs:
Process Variants Mining (Healthcare Case Study)



Adaptive PAIS: Configuring Process Models

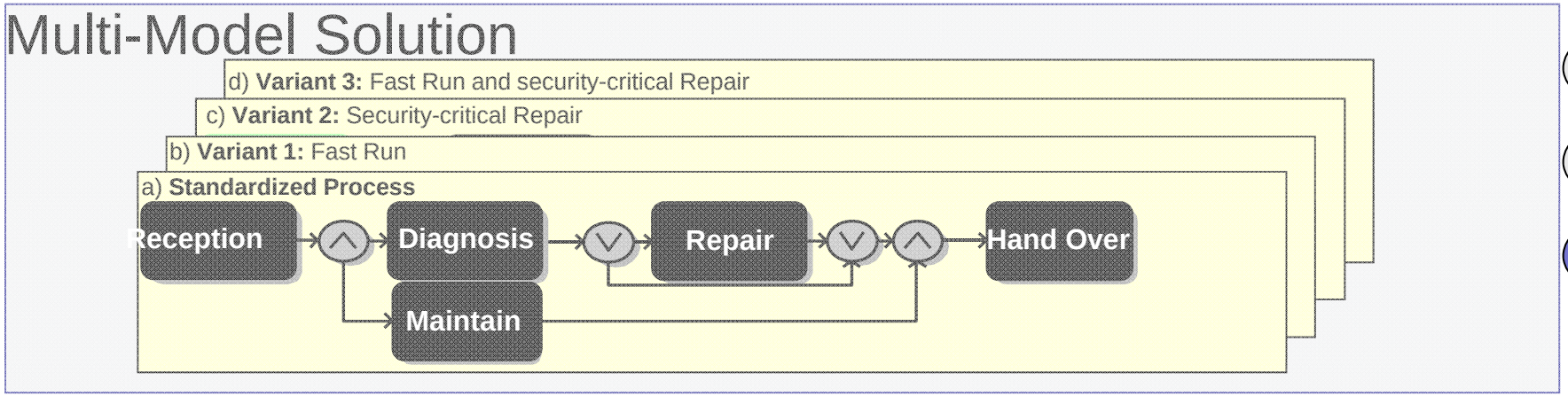


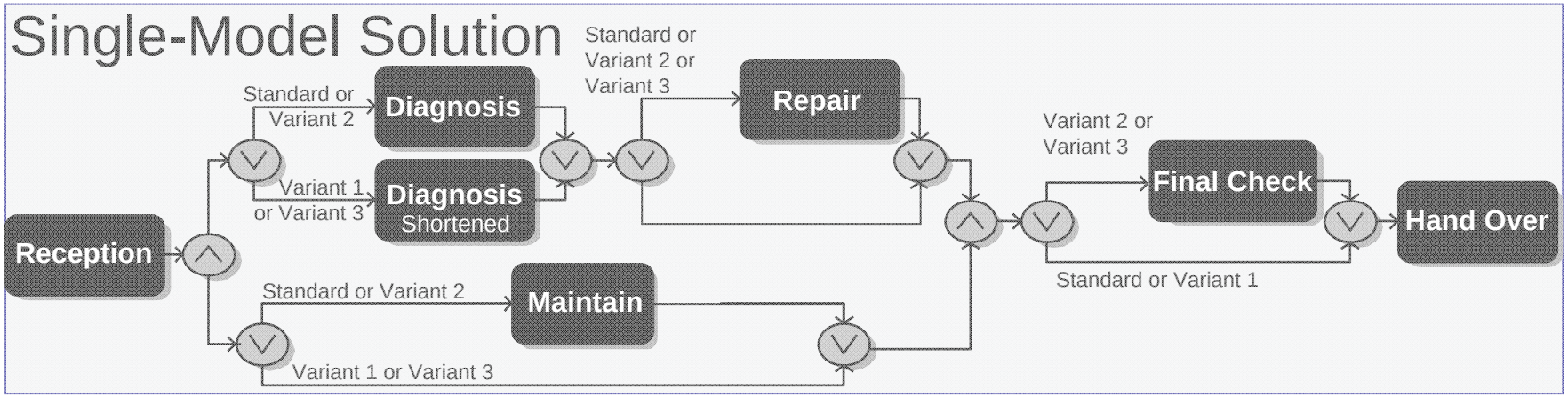
Adaptive PAIS: Configuring Process Models



Example: Vehicle Repair

Adaptive PAIS: Configuring Process Models

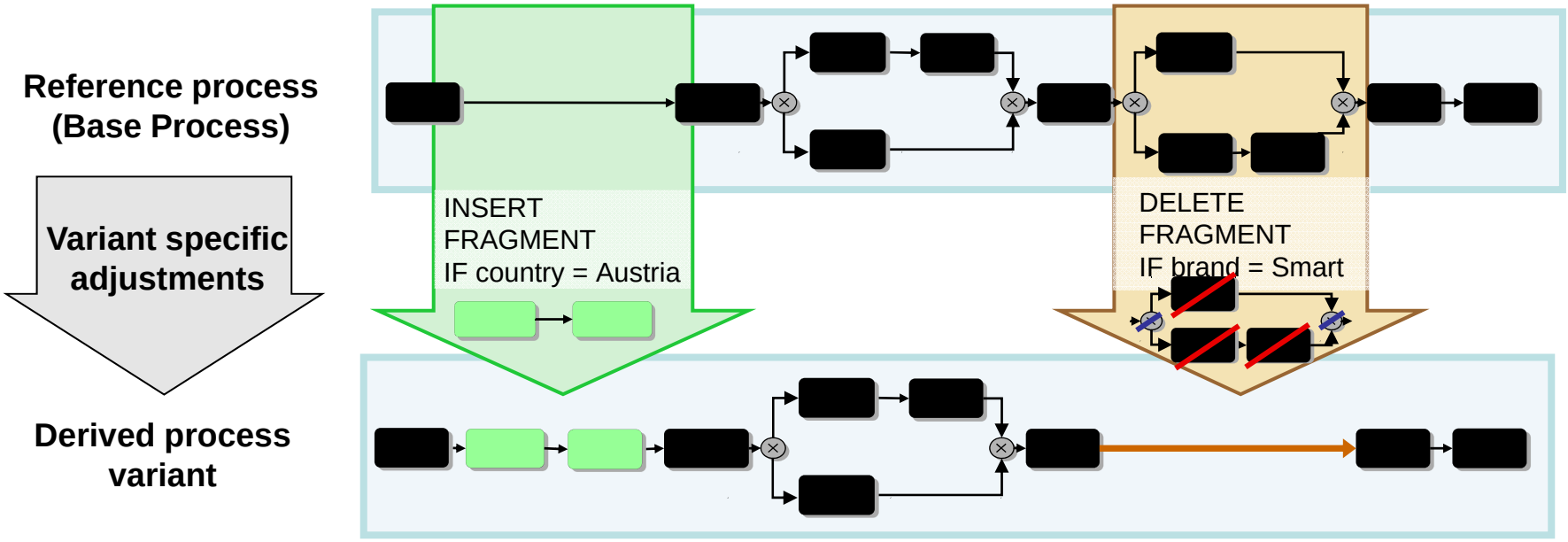




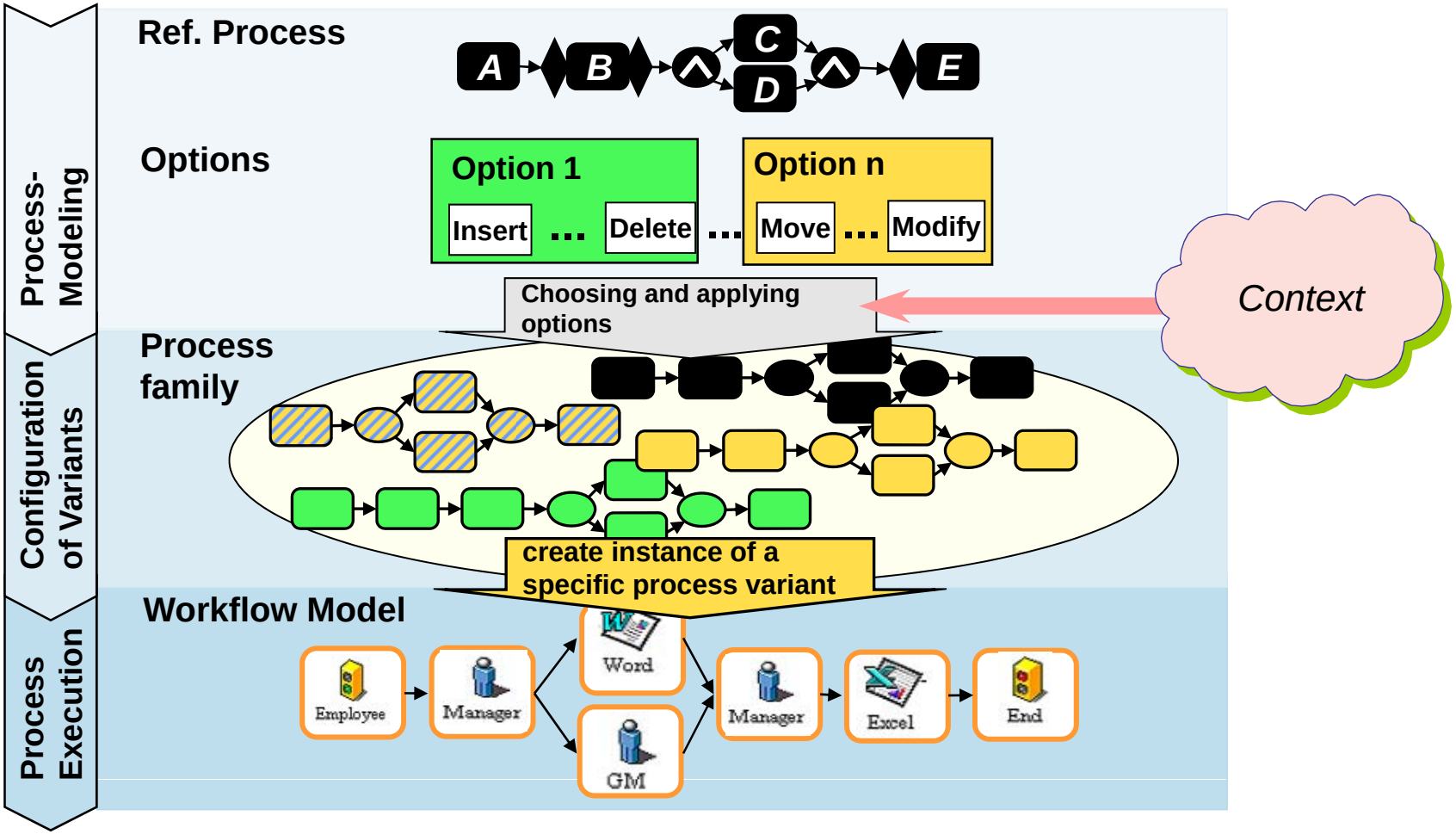
Adaptive PAIS: Configuring Process Models

General observation:

Process variants can be created by adapting a common reference model



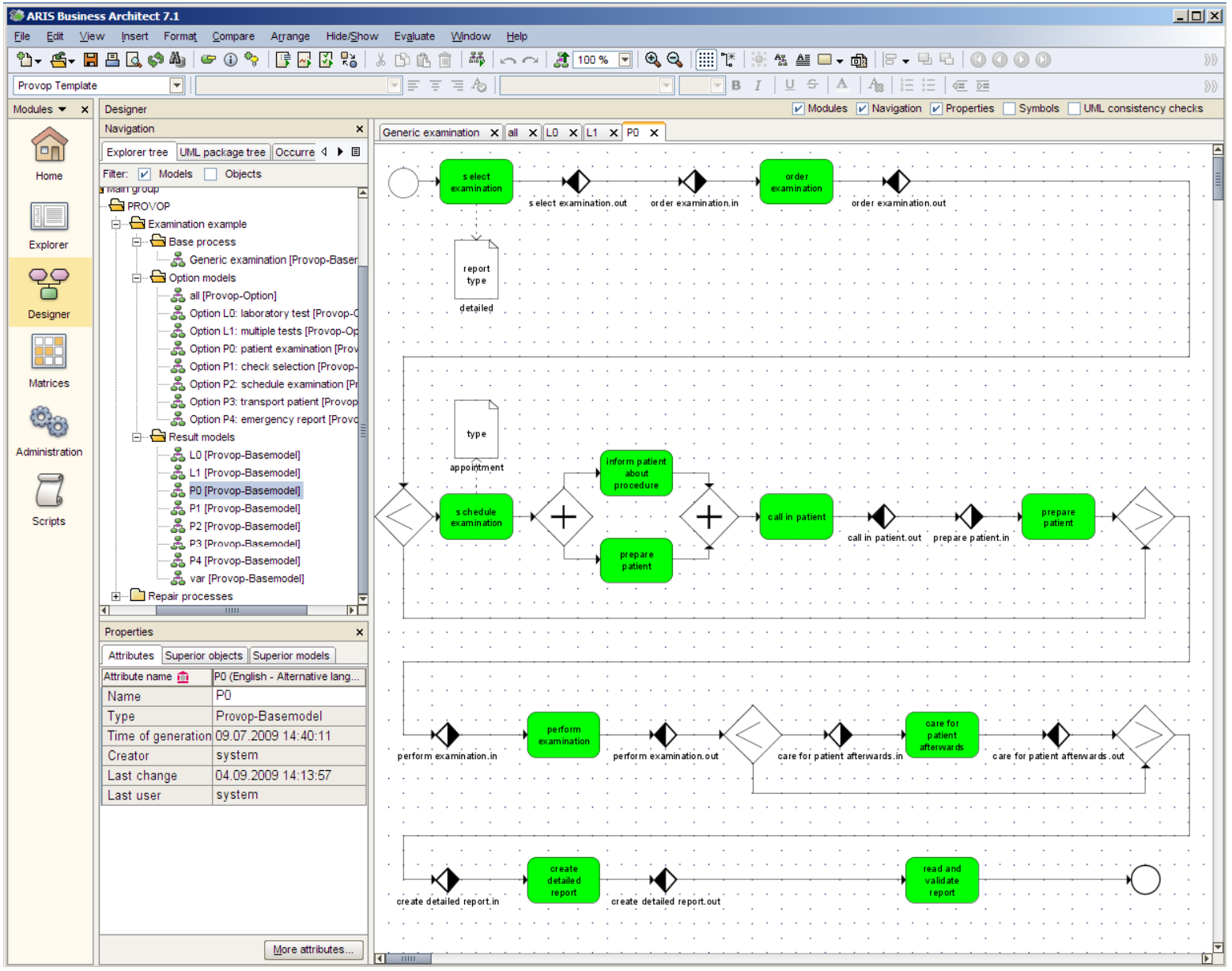
Adaptive PAIS: Configuring Process Models



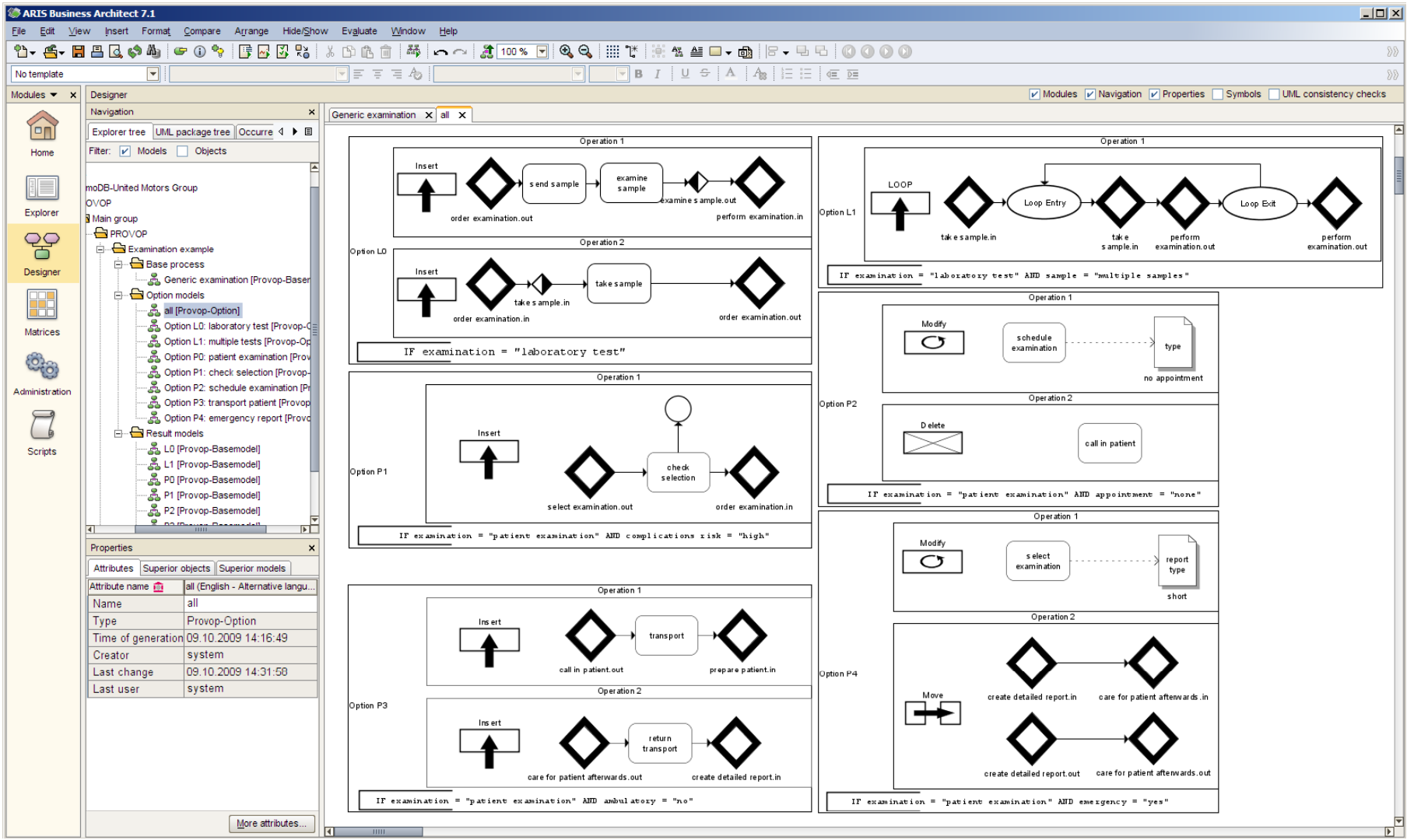
The Provop Approach

Hallerbach, A., Bauer, T., Reichert, M. (2010) *Capturing Variability in Business Process Models: The Provop Approach.* Journal of Software Maintenance and Evolution: Research and Practice, 22(6-7): 519-546

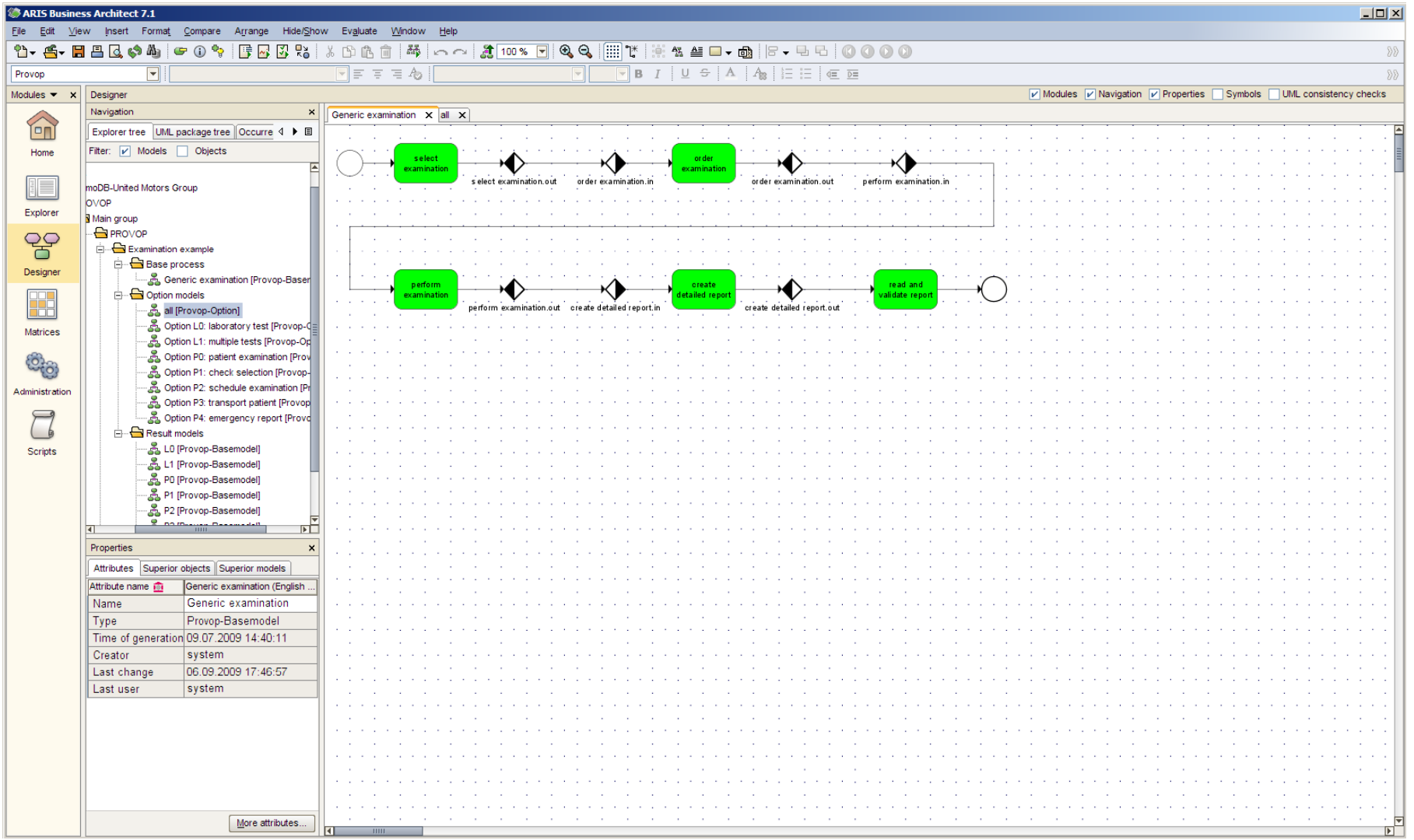
Configuring Process Models: The Provop Approach



Configuring Process Models: The Provop Approach

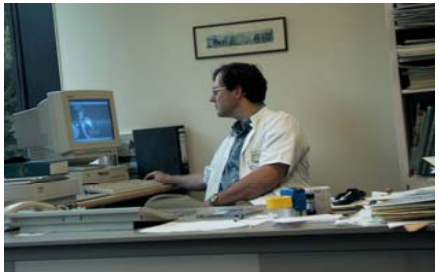


Configuring Process Models: The Provop Approach



Hallerbach, A, Bauer, T., Reichert, M. (2009) *Guaranteeing Soundness of Configurable Process Variants in Provop.* In: 11th IEEE Conference on Commerce and Enterprise Computing , Vienna, pp. 98-105

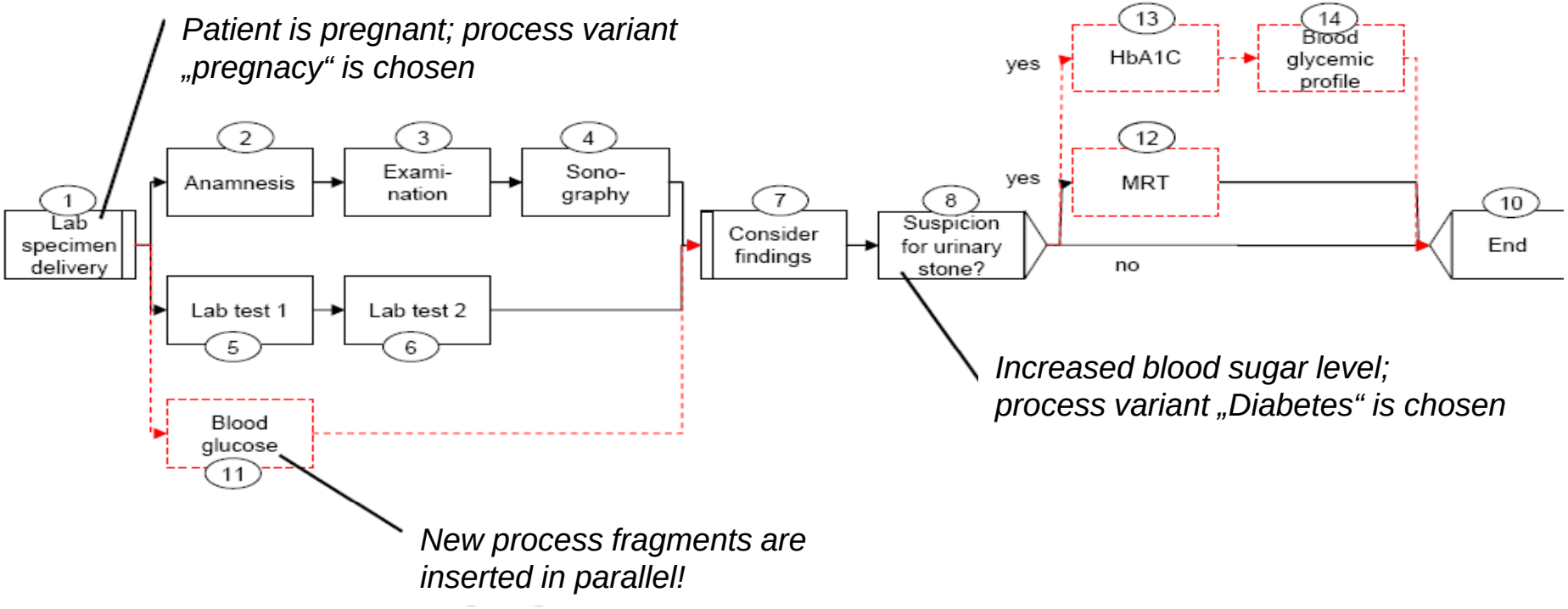
Configuring Process Models: The Spot Approach



Confugarable Pathways

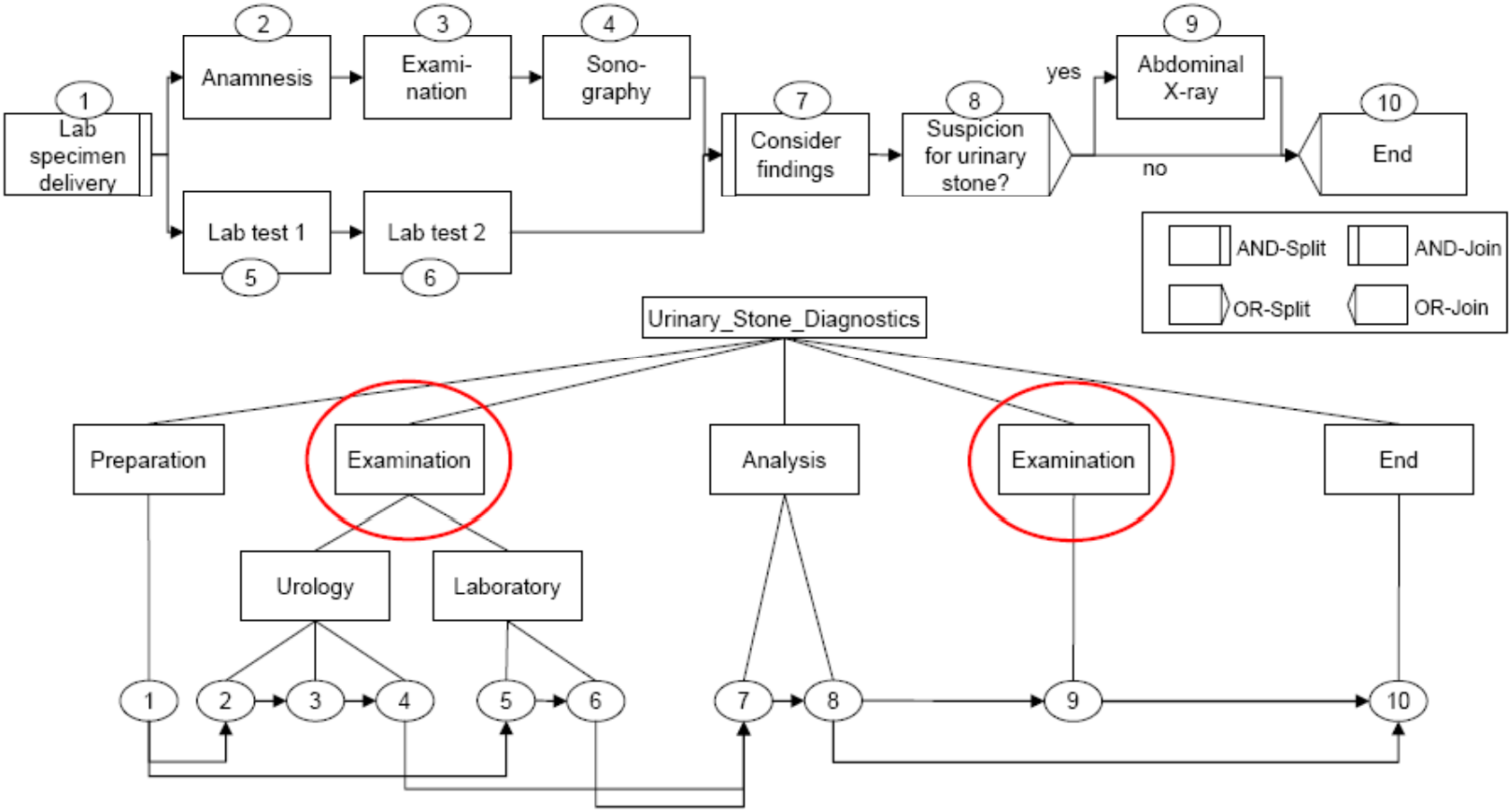
Partners:

J. Neuhaus, C. Reuter
Fraunhoferinstitut Dortmund



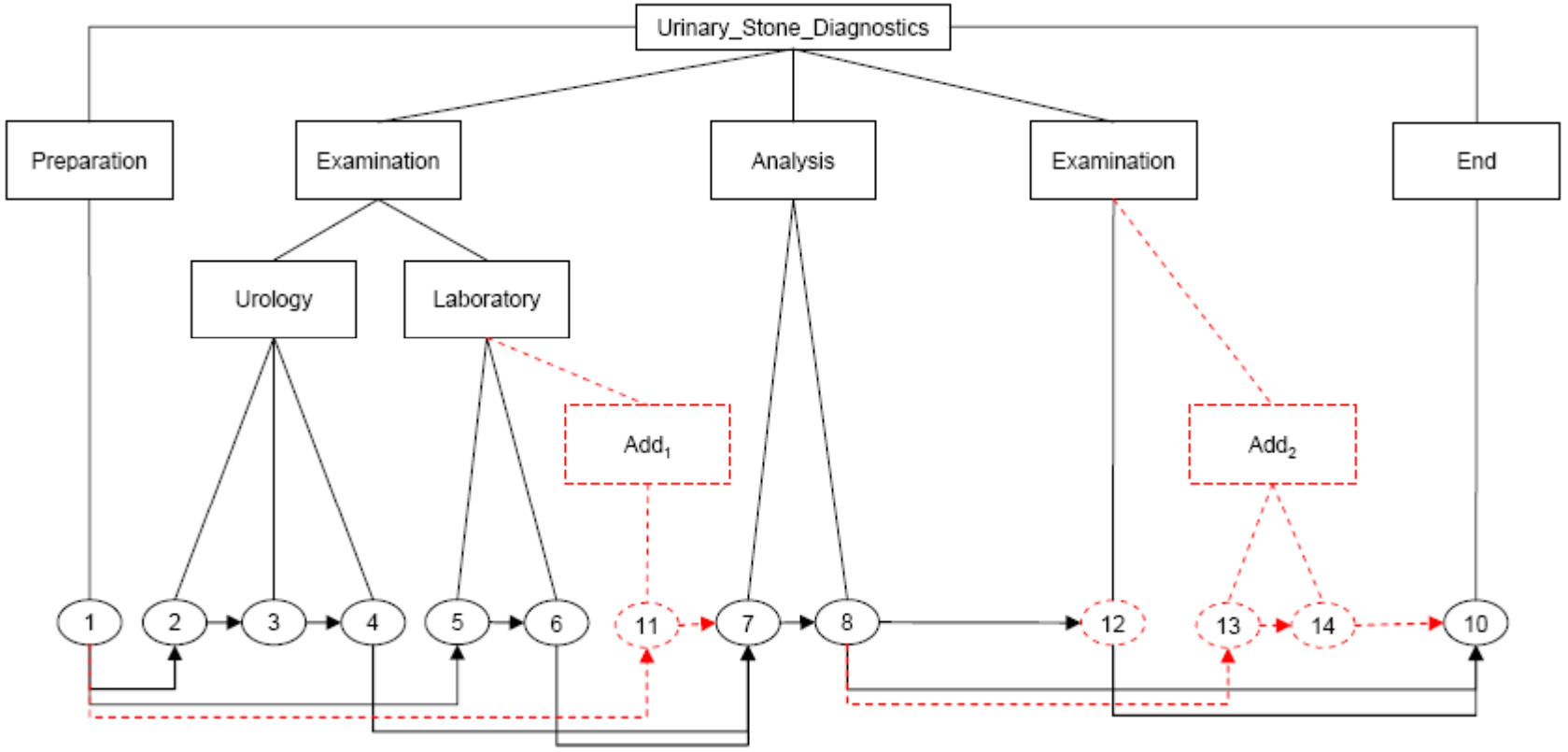
Configuring Process Models: The Spot Approach

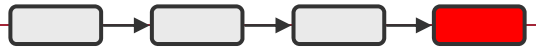
The *Process Structure Tree* - Providing abstraction to end users



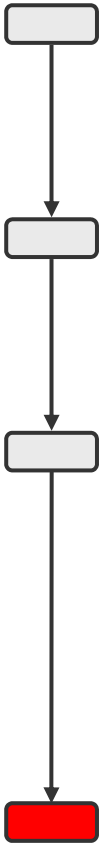
Configuring Process Models: The Spot Approach

The *Process Structure Tree* representing the patient-specific pathway!





Overview



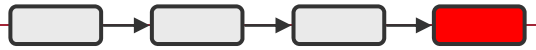
Motivation

Process-aware Information Systems (PAIS)

Adaptive PAIS

- Ad-hoc Deviations
- Process Evolution
- User Assistance
- Mining Process Logs
- Process Configuration

Summary & Outlook

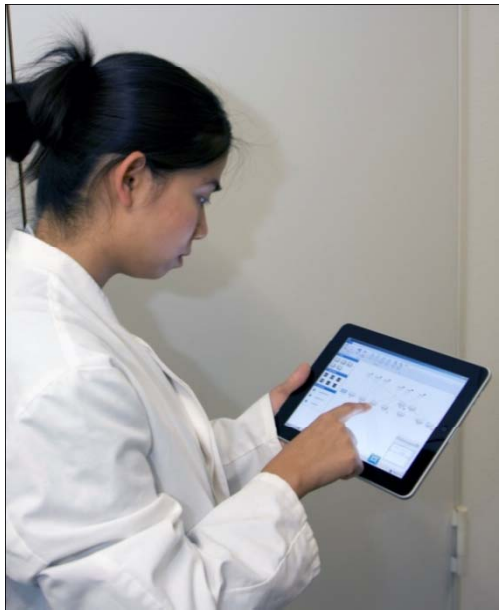


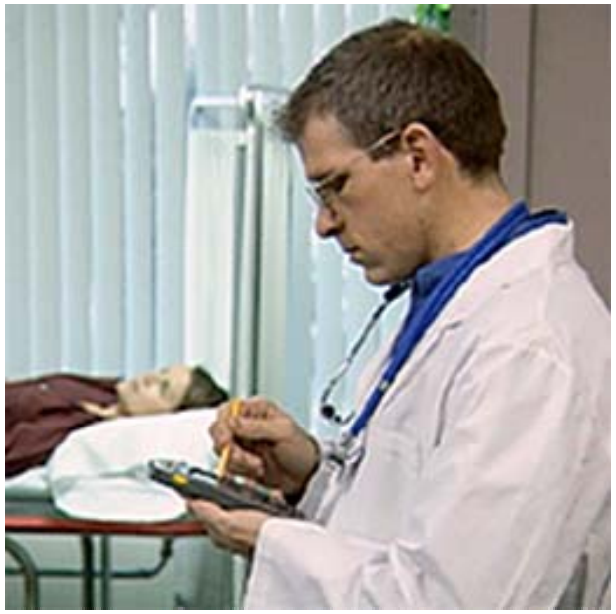
Summary

We are confronted with ...	We need ...
Cross-departmental & -organizational Processes	Integrated PAIS
Changing Processes New Evidence	Evolutionary & Adaptive PAIS
Organization-specific Processes	Configurable & Adaptive PAIS
Increasing Mobility & Emergence of Smart Devices	Mobile Services & Processes

High potential for Process Management Technology when being adapted to the socio-technical context of HC organizations

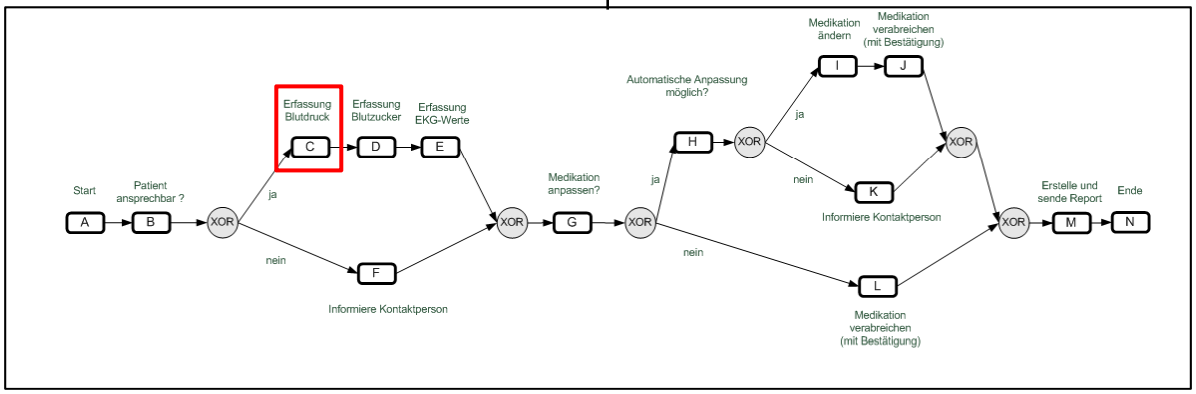
Outlook: Integrating PAIS with Mobile Devices





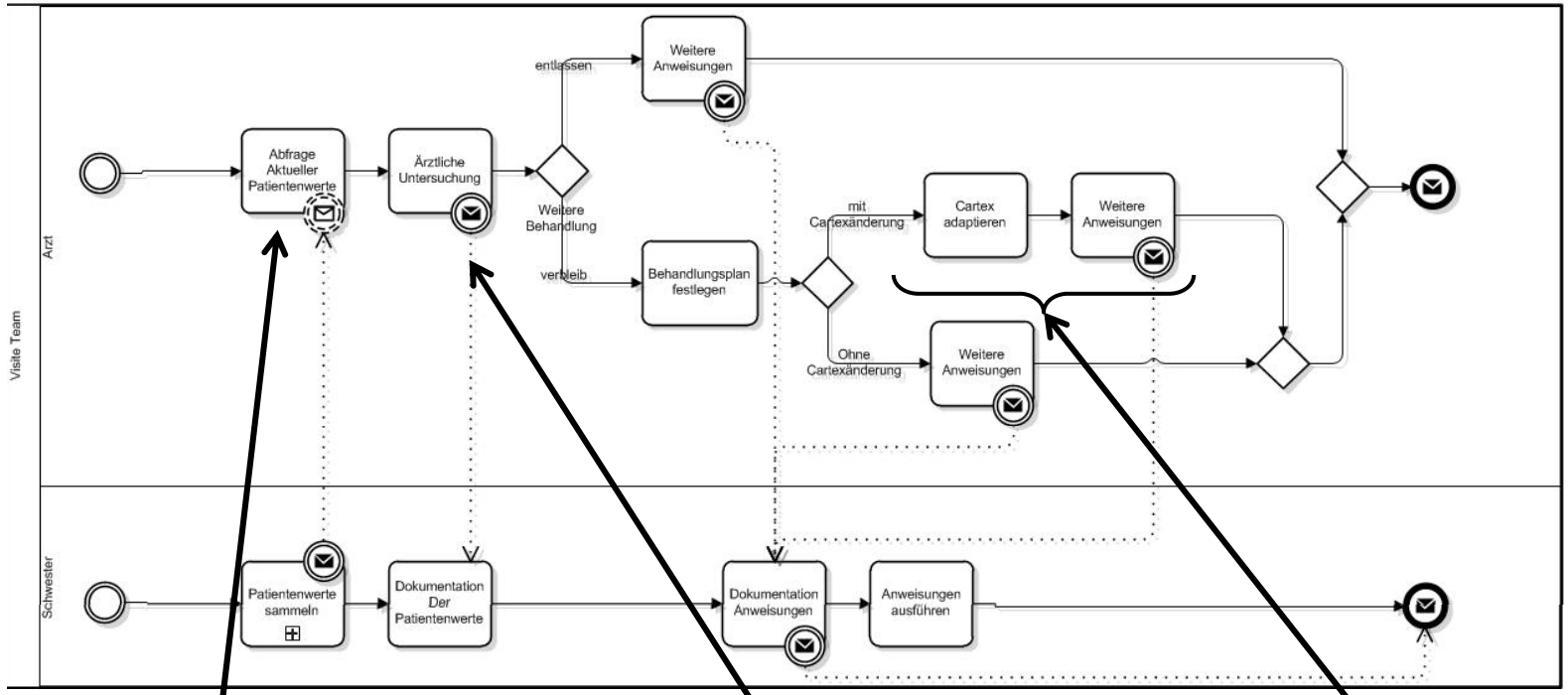
Outlook: Integrating PAIS with Mobile Devices

Prozess Patient Mayer

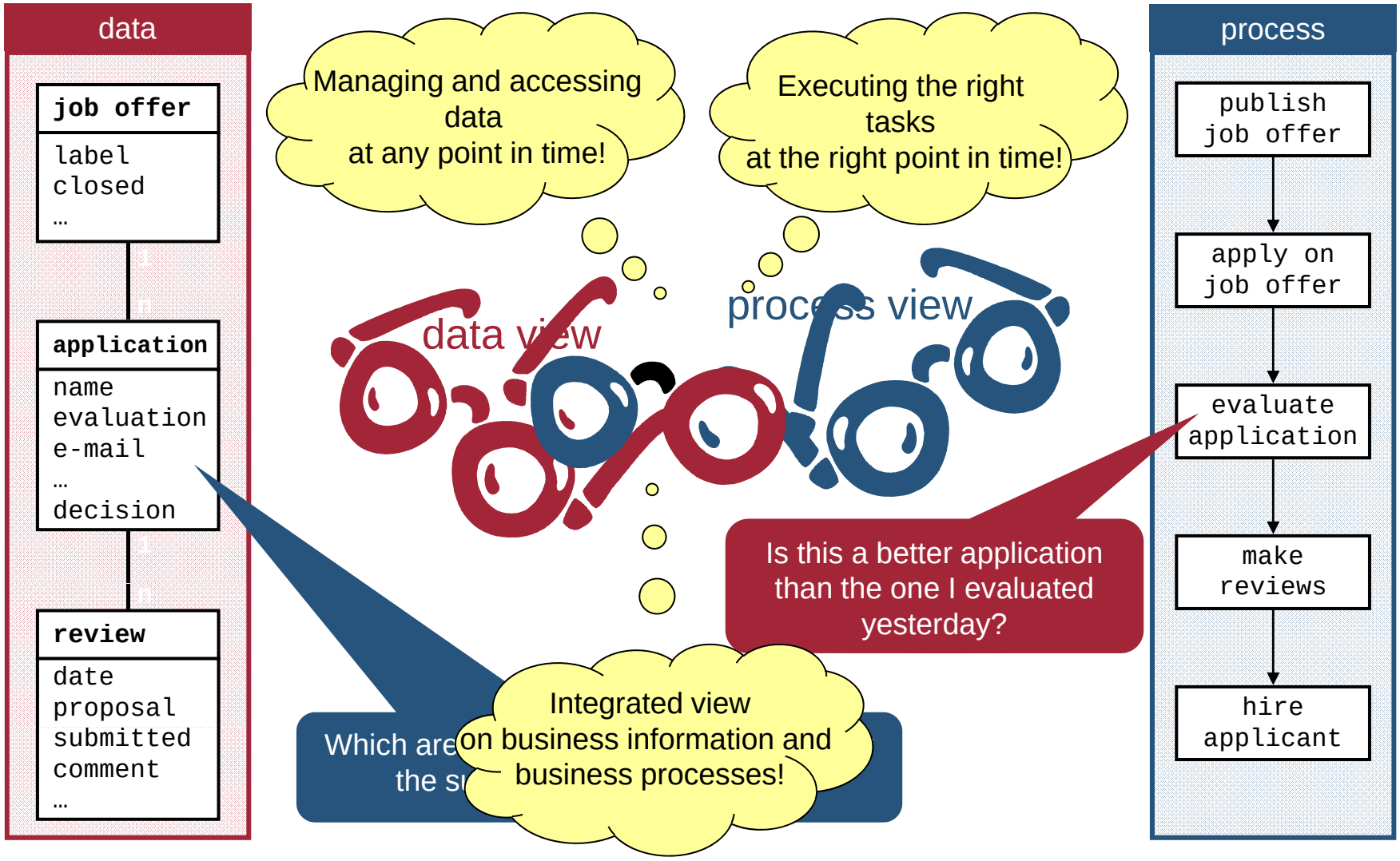


PDA #2

Pryss, Rüdiger and Tiedeken, Julian and Kreher, Ulrich and Reichert, Manfred (2010) *Towards Flexible Process Support on Mobile Devices.* In: Proc. CAiSE'10 Forum - Information Systems Evolution, Hammamet, Tunisia, June 2010, LNBIP 72, Springer, pp. 150-165


Visite Team
Arzt
Schwester
Abfrage Aktueller Patientenwerte
Ärztliche Untersuchung
Weitere Behandlung
entlassen
Weitere Anweisungen
verbleib
Behandlungsplan festlegen
mit Cartexänderung
Cartex adaptieren
Weitere Anweisungen
Ohne Cartexänderung
Weitere Anweisungen
Patientenwerte sammeln
Dokumentation Der Patientenwerte
Dokumentation Anweisungen
Anweisungen ausführen

Outlook: Integrated View on Processes and Data



References to DBIS Projects

ADEPT2/AristaFlow	Next Generation Prozess Management Technology)
SeaFlows	Semantic Constraints in Prozess Management Systems
MinAdept	Mining Prozess Variants & Prozess Changes
Provop	Prozess Variants by Options
MARPLE	Managing Robust Mobile Prozesses in a Complex World
ENPROSO	Enhanced Prozess Management through Service Orientation
MoDe4SLA	Monitoring Dependencies for SLAs
Proviado	Prozess Visualization in the Automotive Domain
niPRO	Personalized and Intelligent Prozess Portals
Corepro	Data-driven Prozess Structures
PHILharmonic Flows	Linking Prozesses, Humans and Information
Q-Advice	Quality ADVisory Infrastructure for Collaborative Engineering

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