DBIS EXPERIENCE
processes for a flexible world

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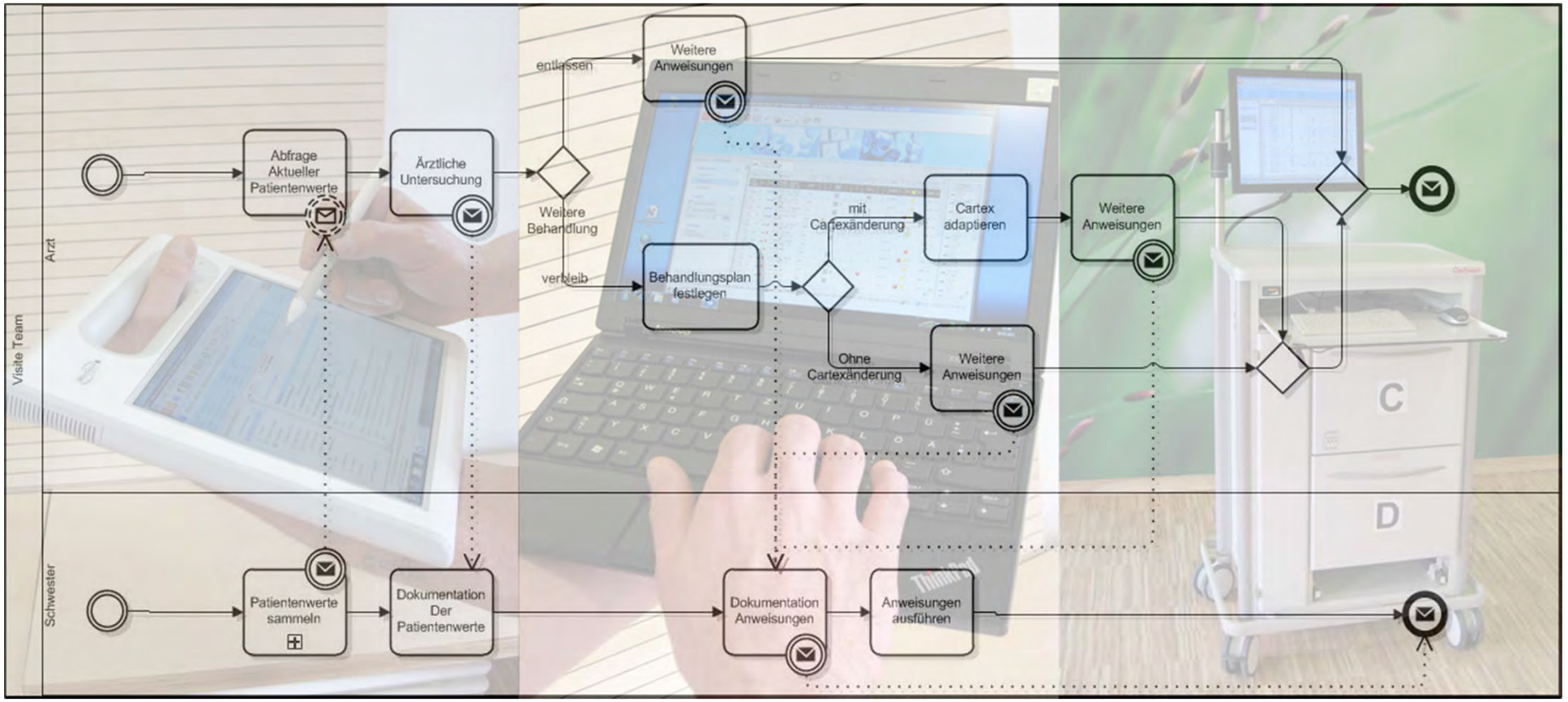


Enabling Flexibility in Process-aware Information Systems

Prof. Dr. Manfred Reichert

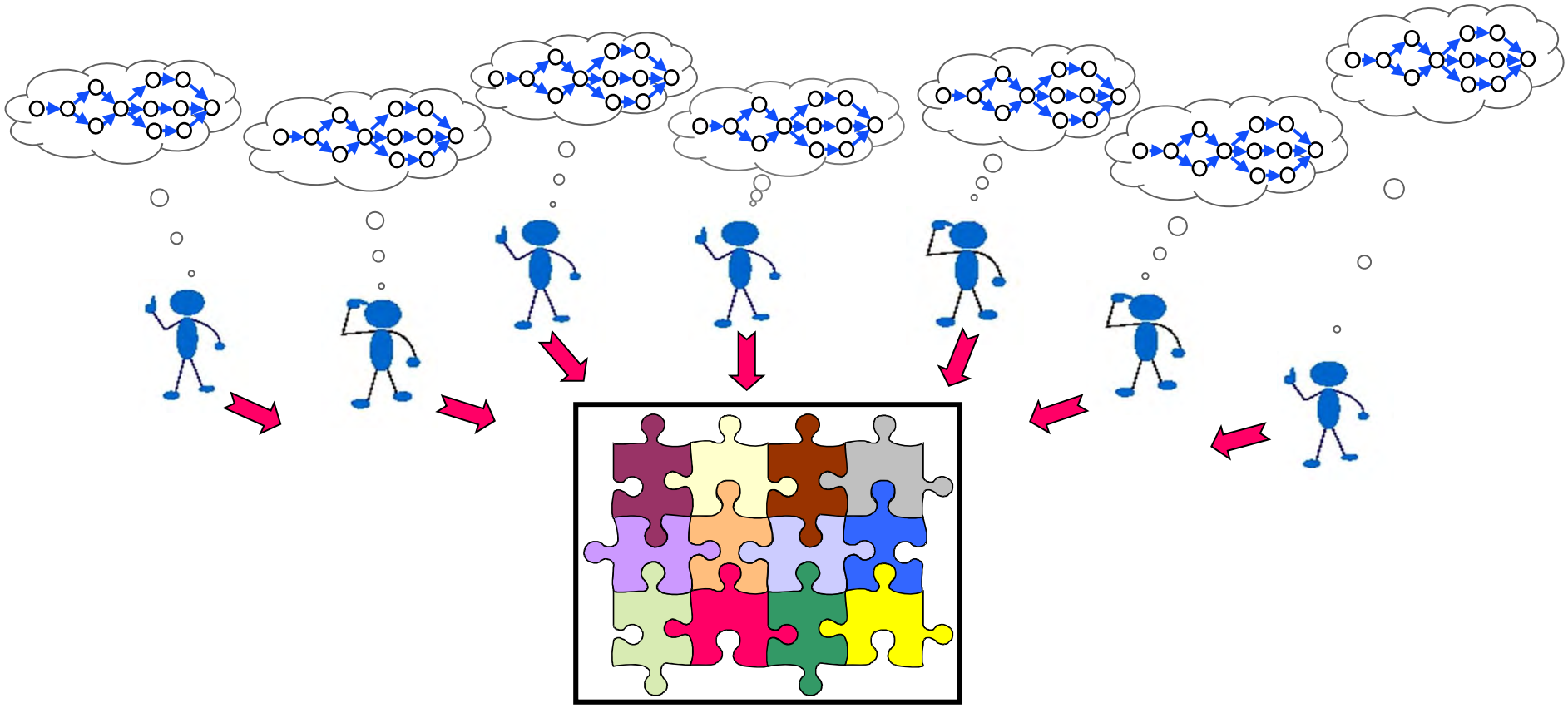
Agenda

- Motivation
- Process-Aware Information System (PAIS)
- PAIS Flexibility Support
- Comparison of Different PAIS Flexibility Frameworks
- A new Project: C^{3}Pro
- Conclusions

Motivation

Current Situation in many Companies

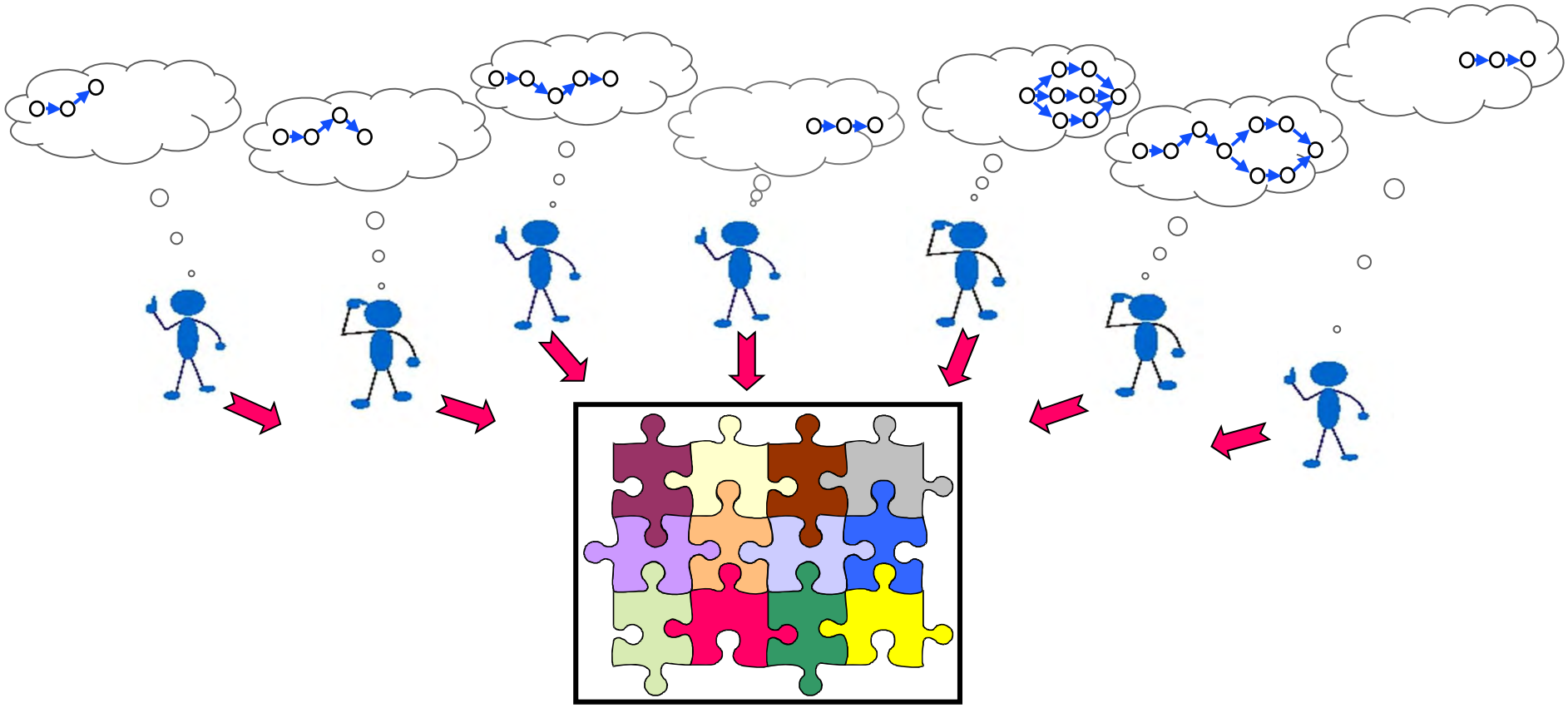
- users interact with monolithic, function-oriented application systems
- processes only in the users' minds– with only partial knowledge of the process



Motivation

SOC Paradigm

- loosely-coupled application services



Motivation

SOC Paradigm

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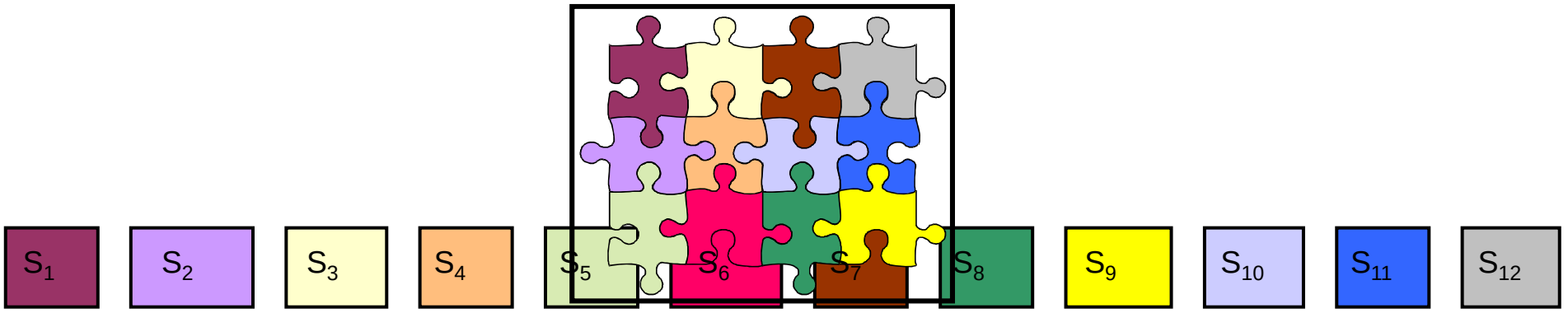
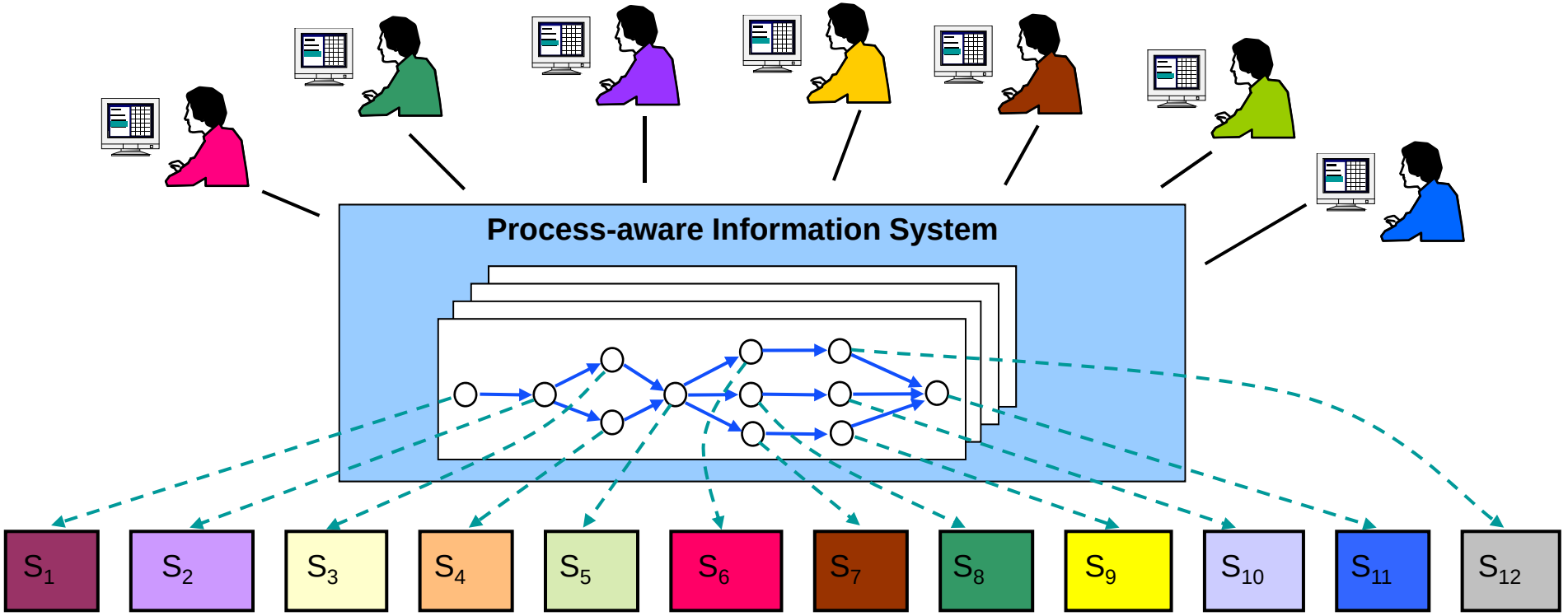


Motivation

SOC Paradigm

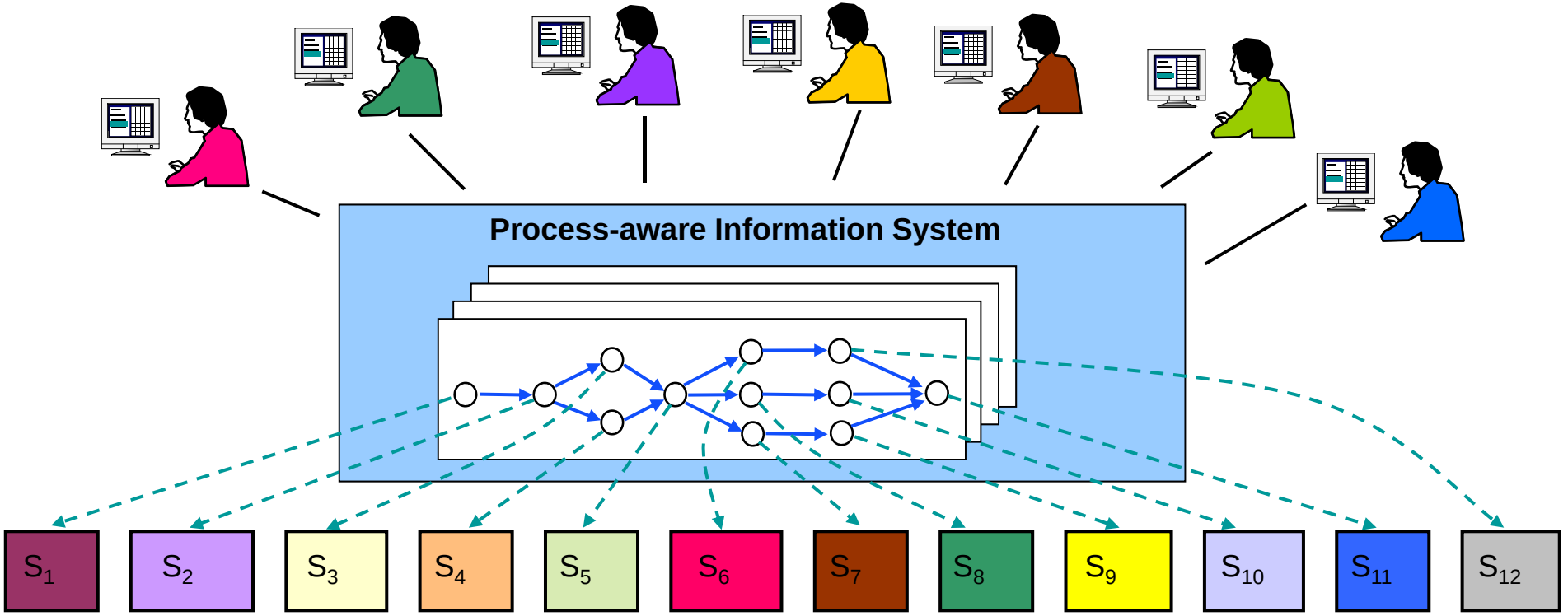
- loosely-coupled application services
- service composition based on process models
- model execution driven by a process-aware information system



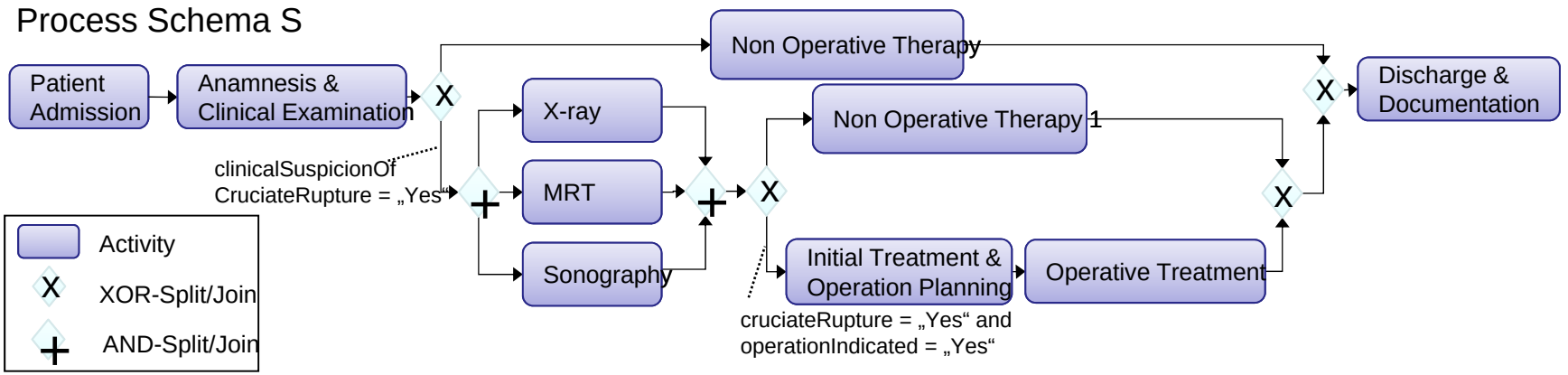
Motivation

SOC Goals

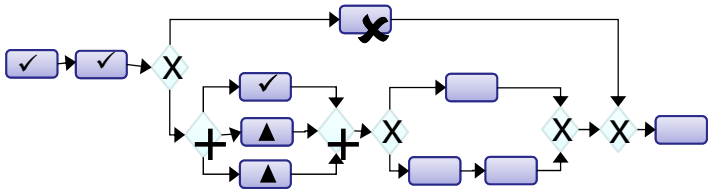
- improved *process quality*
- increased *flexibility*
- …



Process-Aware Information System (PAIS)

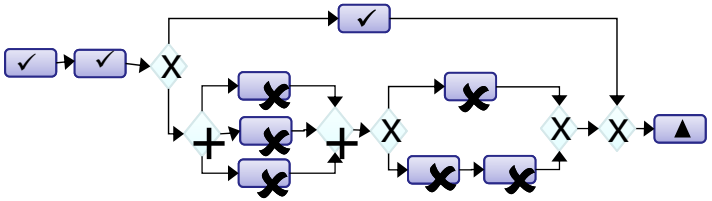


Process Instance I1



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

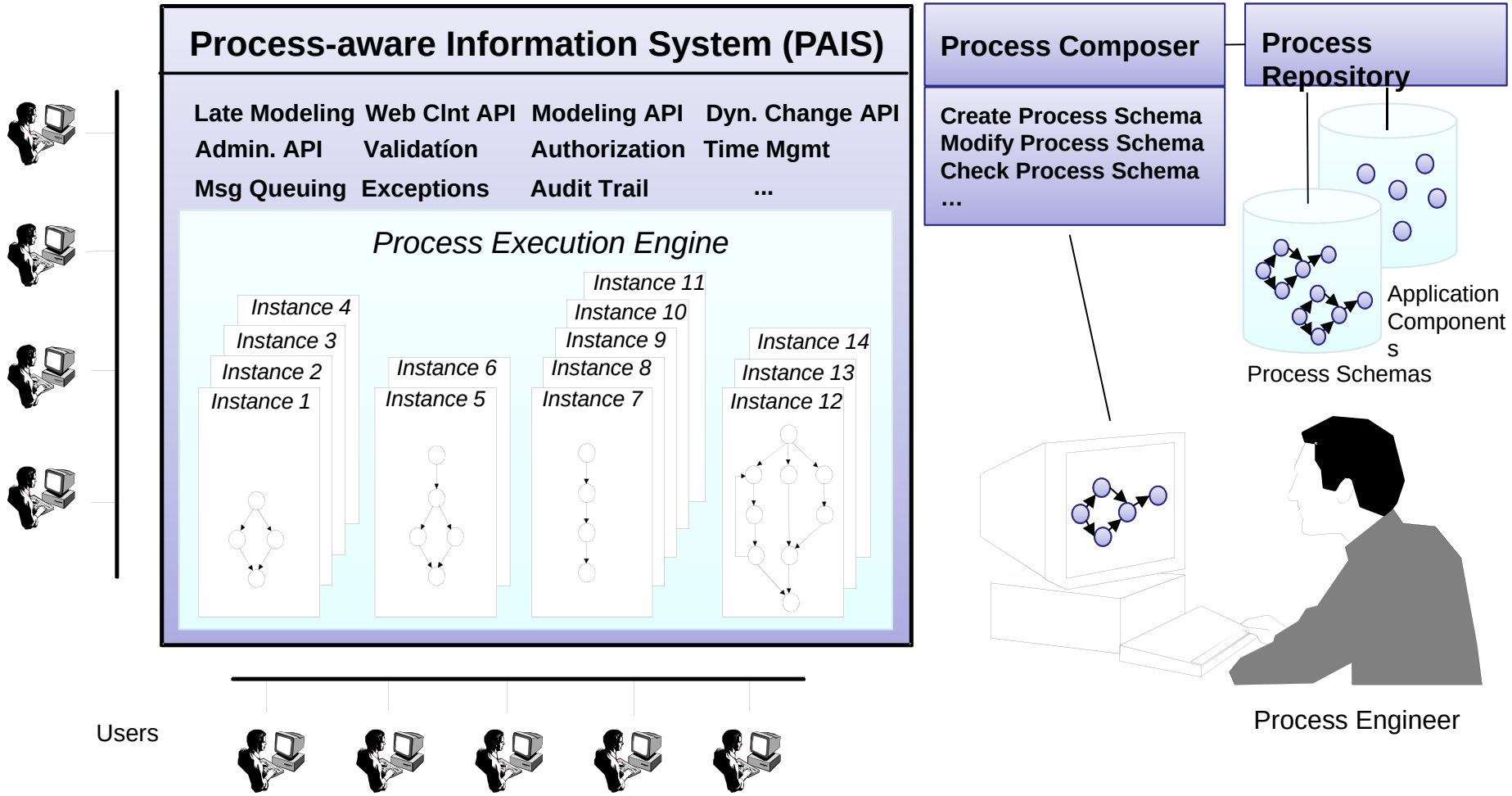
Process Instance I2



Execution Trace:
σ_2 = < „Patient Admission“, „Anamnesis & Clinical Examination“, „Non Operative Therapy“>

Activity States: ▲ Activated ✓ Completed ✘ Skipped

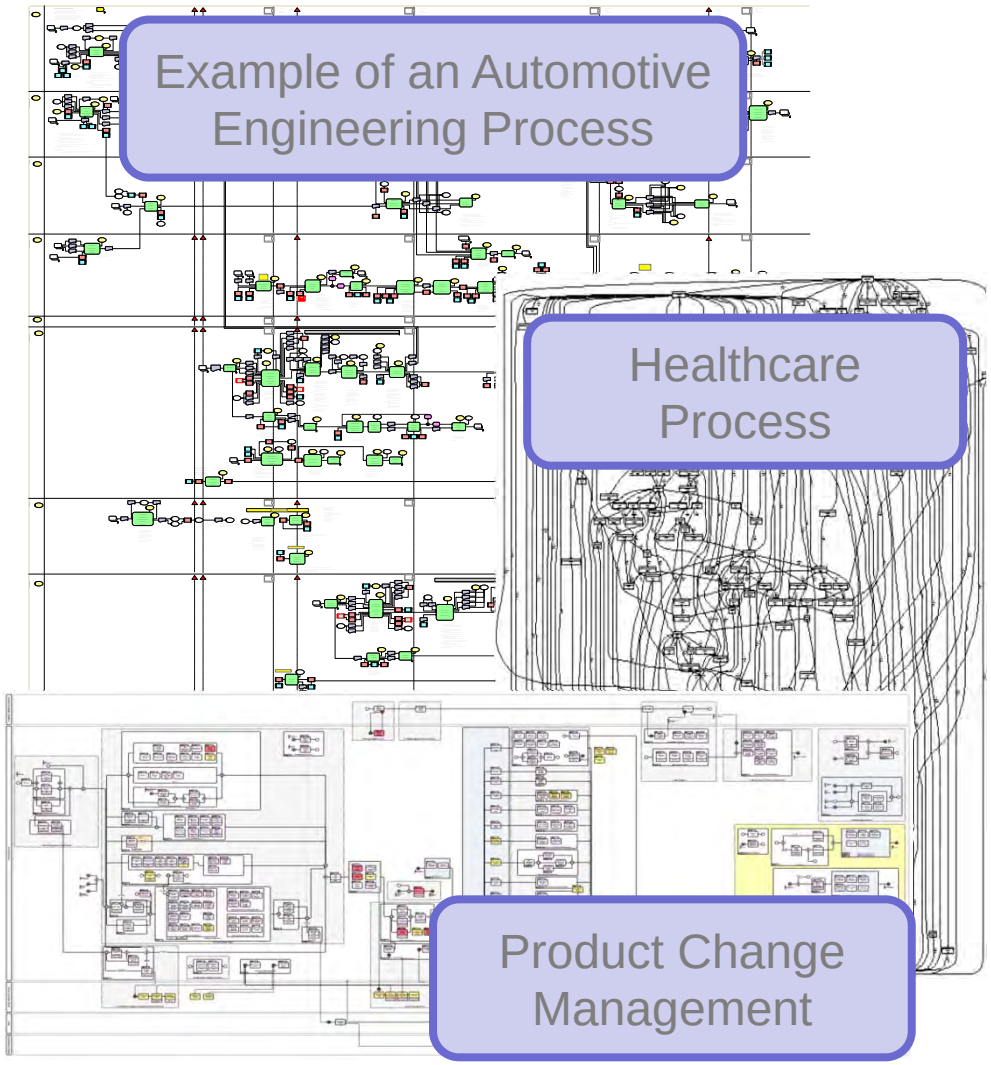
Process-Aware Information System (PAIS)



Process-Aware Information System (PAIS)

Processes in the Wild World:

- Business processes can be very large and complex
- Thousands of concurrently executed process instances
- High need for configuration, flexibility and evolution
- Feedback and learning from real process executions
- PAIS correctness and robustness are fundamental



PAIS Flexibility Support

Different Perspectives on Process Flexibility

Design Time Flexibility

Run-time Flexibility

How to quickly implement and configure processes with some built-in flexibility? ✔

How to deal with uncertainty and exceptional situations?

PAIS Flexibility Support

Ad-hoc Changes at the Process Instance Level

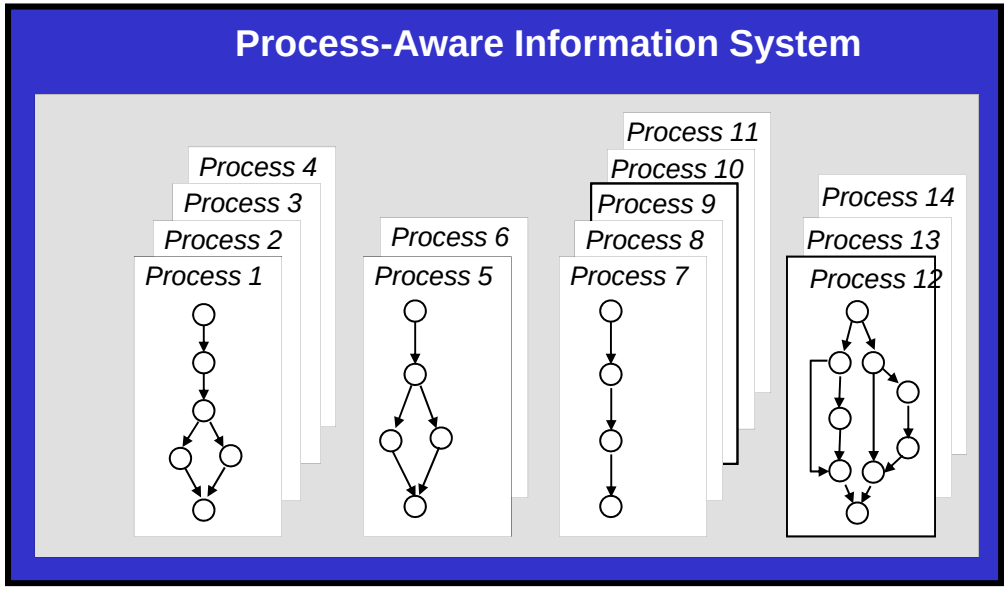
- ❑ Adding new Tasks
- ❑ Deleting Tasks
- ❑ Shifting Task Orders
- ❑ ...

} for running process instances!

PAIS Flexibility Support: Ad-hoc Changes

The ADEPT Approach:

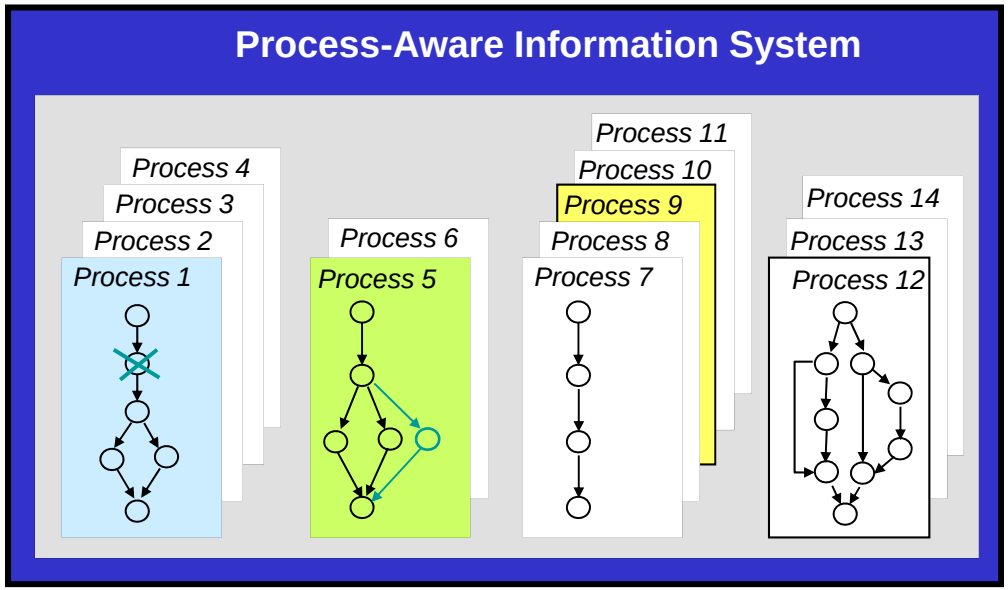
Individually adaptable Process Instances



PAIS Flexibility Support: Ad-hoc Changes

The ADEPT Approach:

Individually adaptable Process Instances

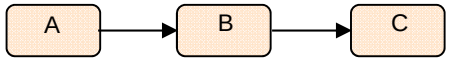


Achievements:

- 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

PAIS Flexibility Support: Tracing Changes

Original Schema S

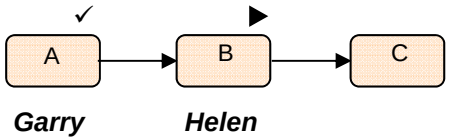



```
Instance 4711
Activity  Event            User    Timestamp
          Instance Started Garry   2007/09/08 15:00
A         Started          Garry   2007/09/08 15:30
A         Completed        Garry   2007/09/08 15:45
B         Started          Helen   2007/09/10 11:00
X         Started          Fritz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

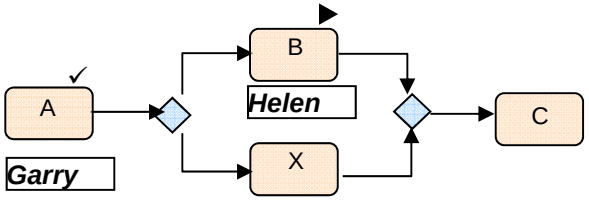
```
Change Log Instance 4711 on Schema S

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

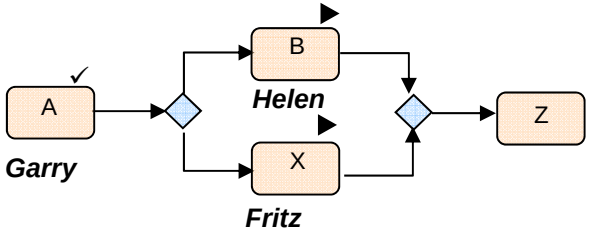
2007/09/10 11:00



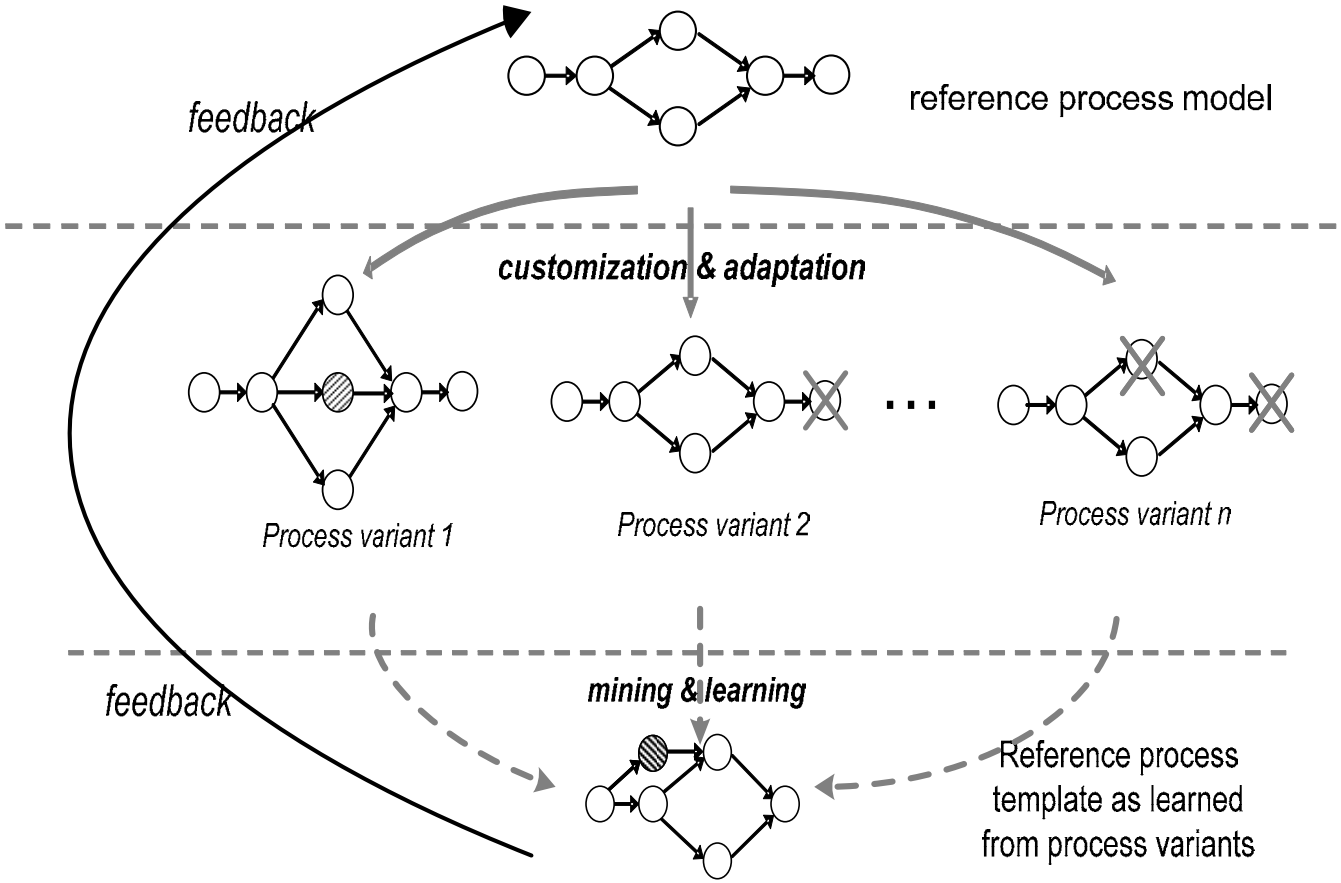
2007/09/10 13:00



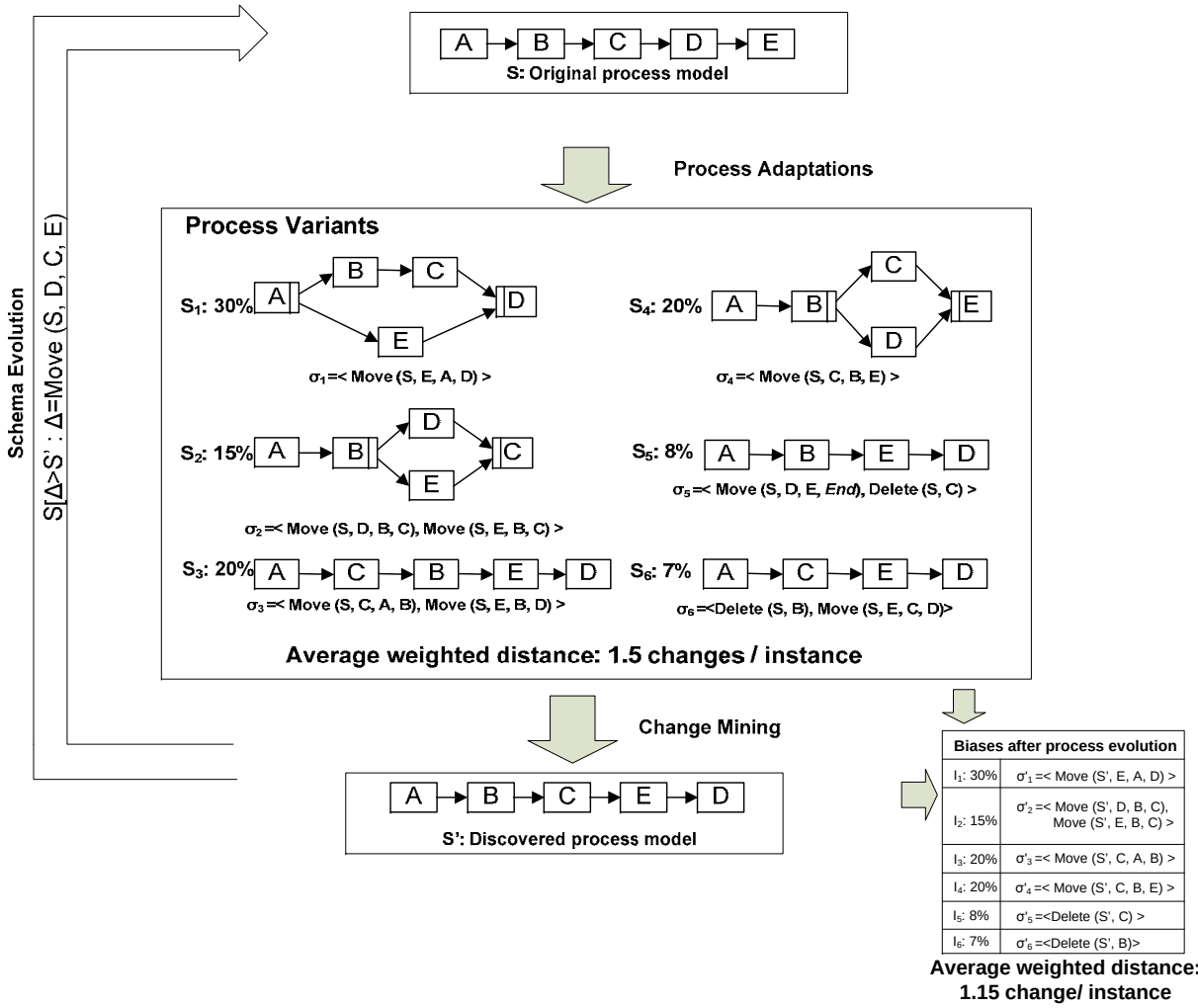
2007/09/11 10:00



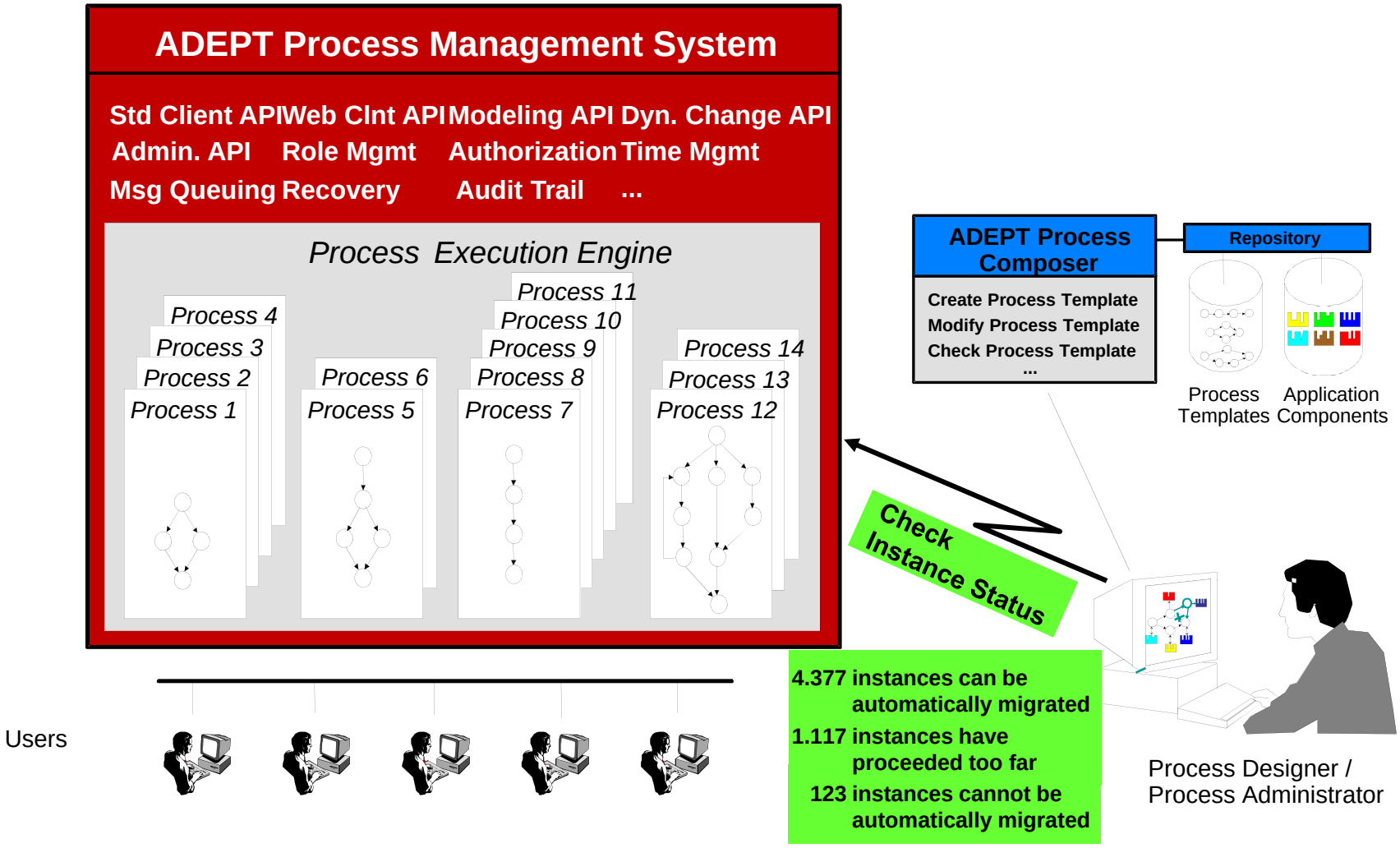
PAIS Flexibility Support: Mining Changes



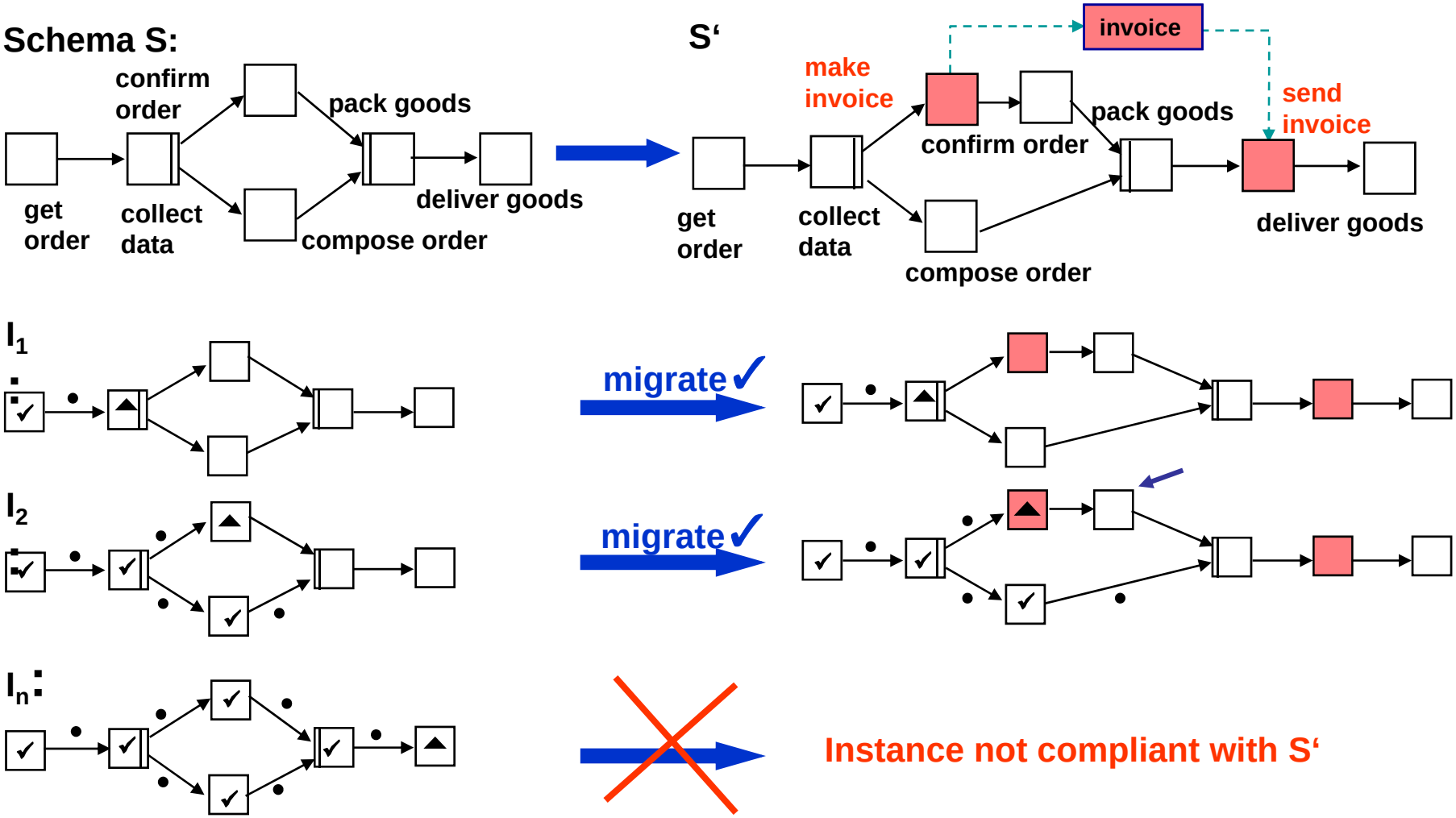
PAIS Flexibility Support: Mining Changes



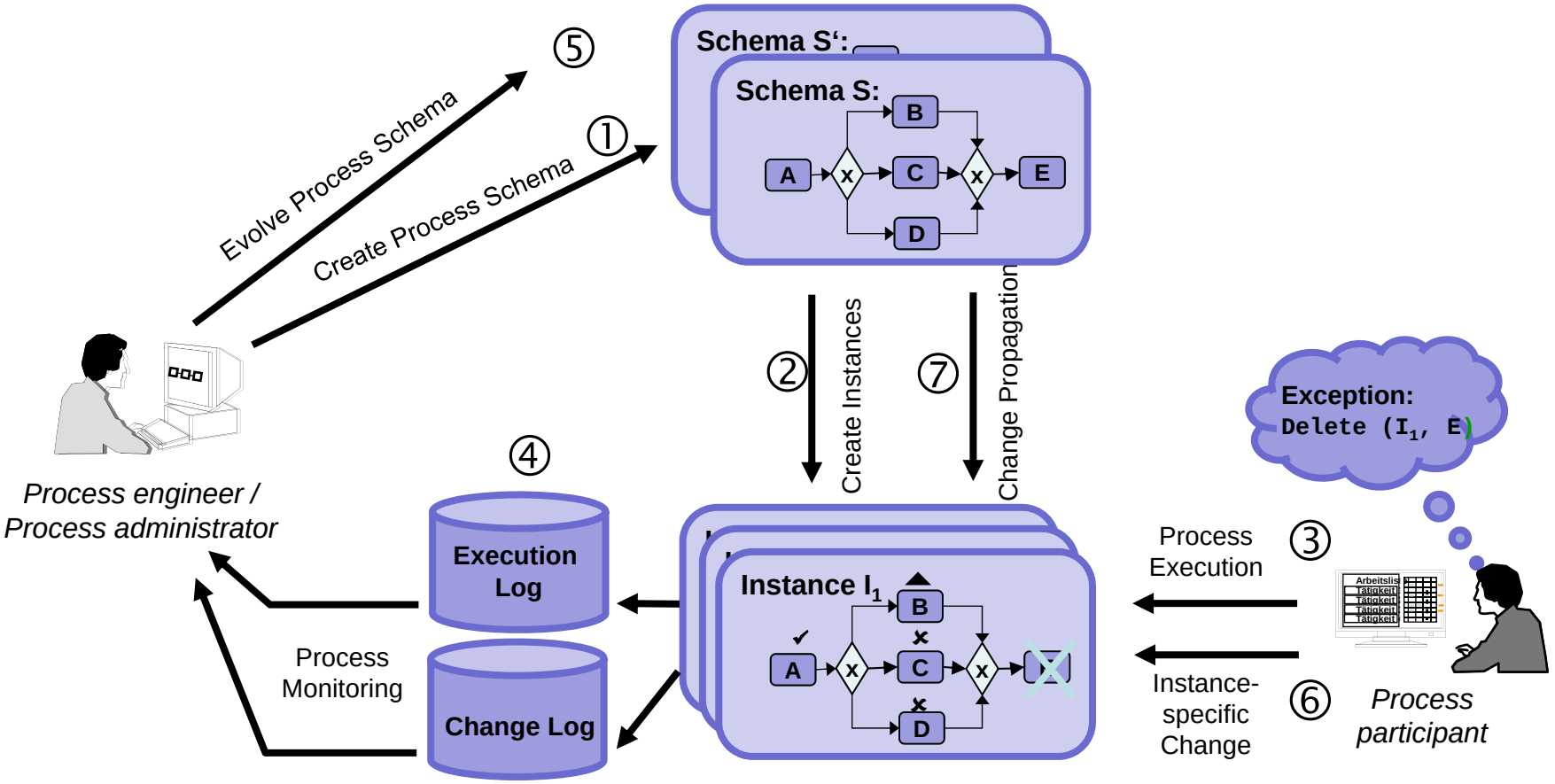
PAIS Flexibility Support: Schema Evolution



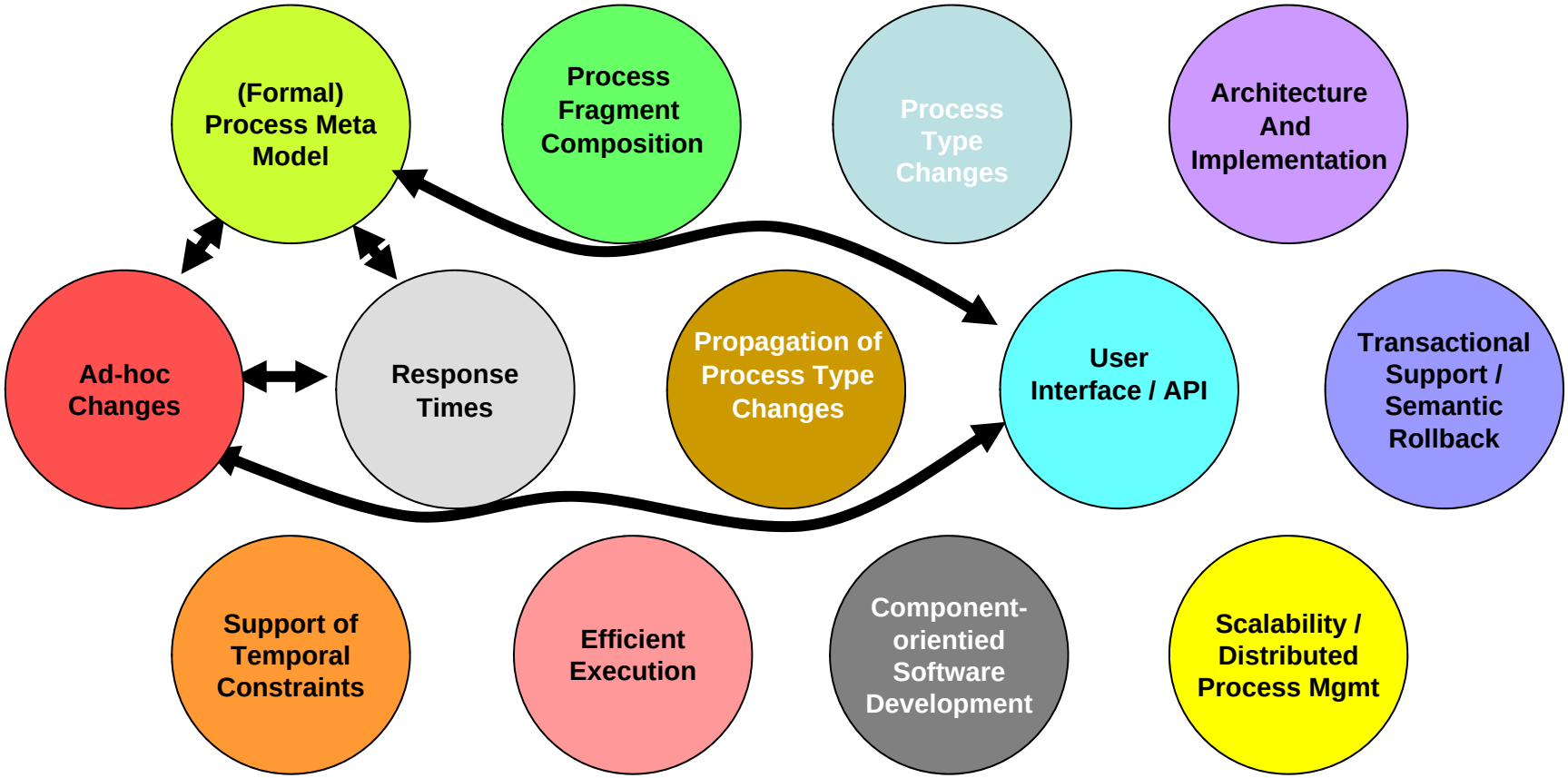
PAIS Flexibility Support: Schema Evolution



PAIS Flexibility Support: Integrated Lifecycle Support



PAIS Flexibility Support:
Not as easy as it looks like at first glance …



PAIS Flexibility Support:
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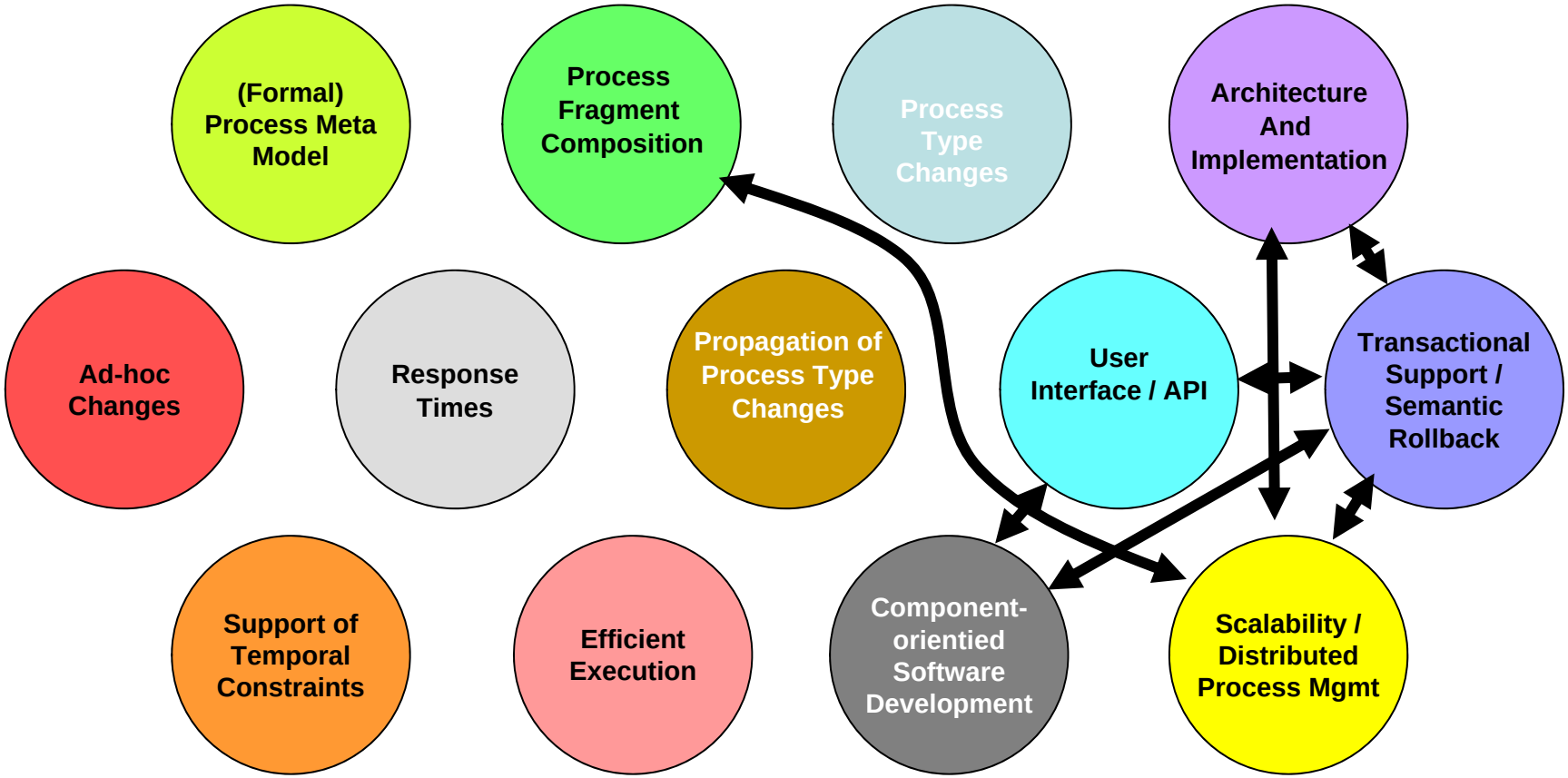
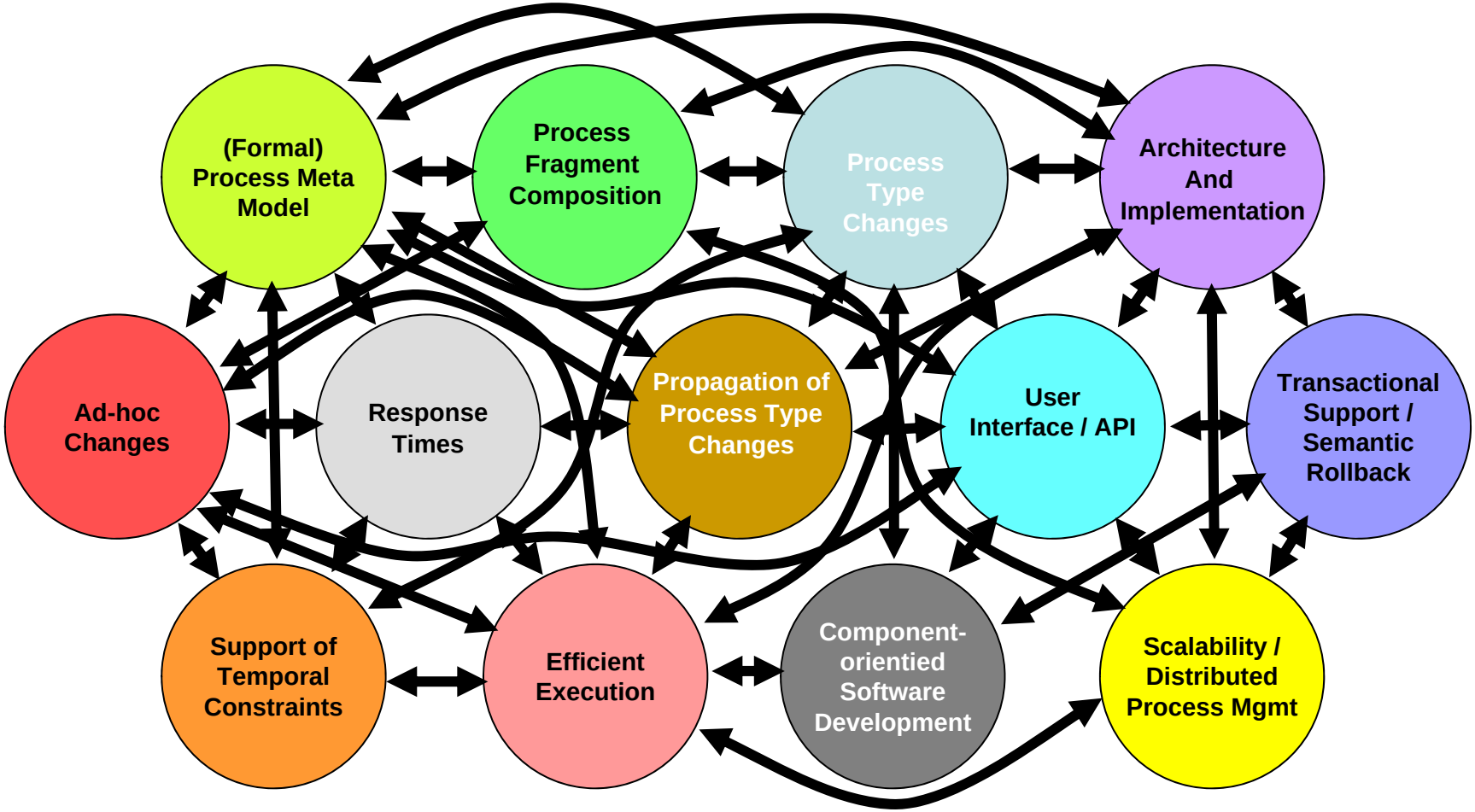
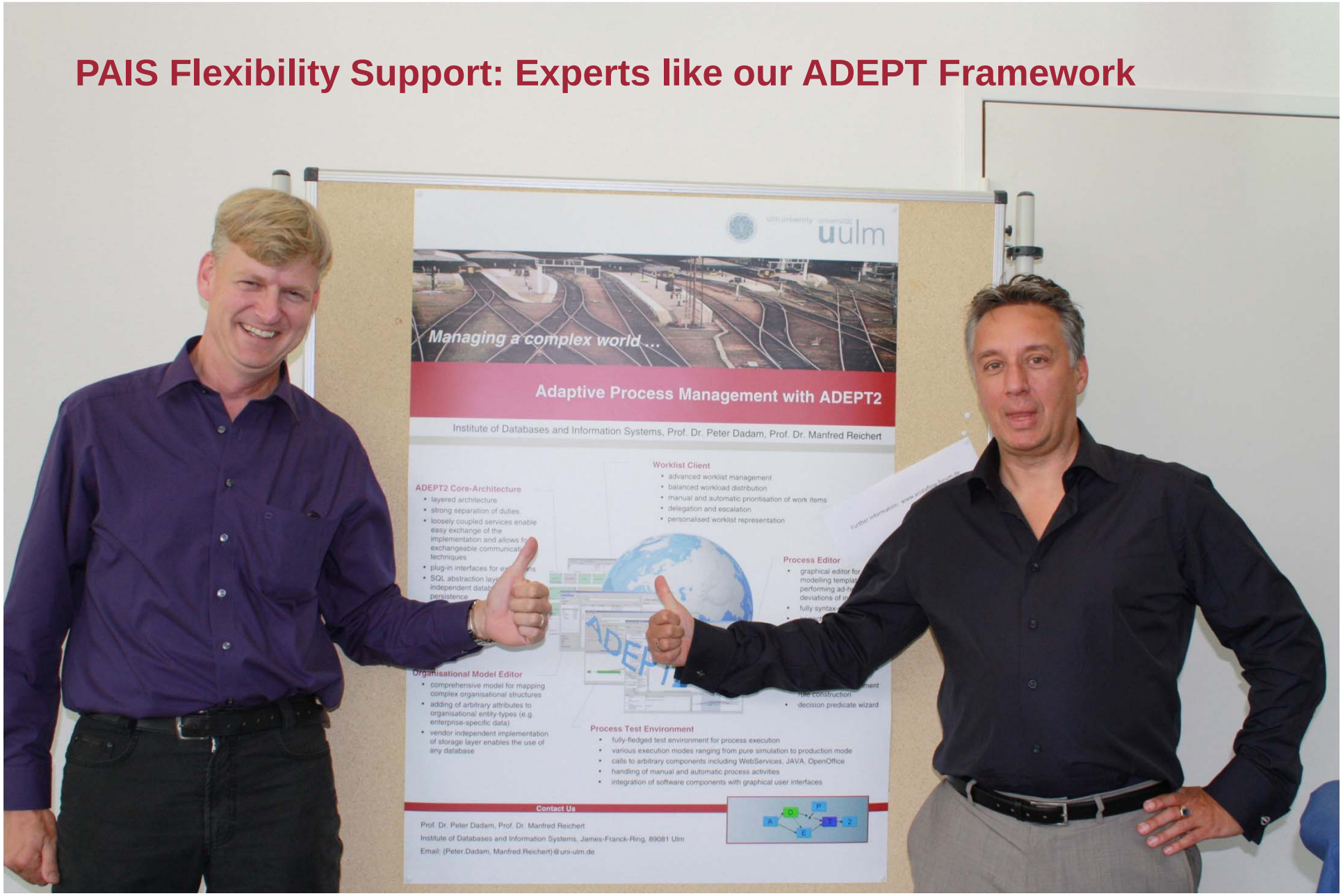


PAIS Flexibility Support:
Not as easy as it looks like at first glance …

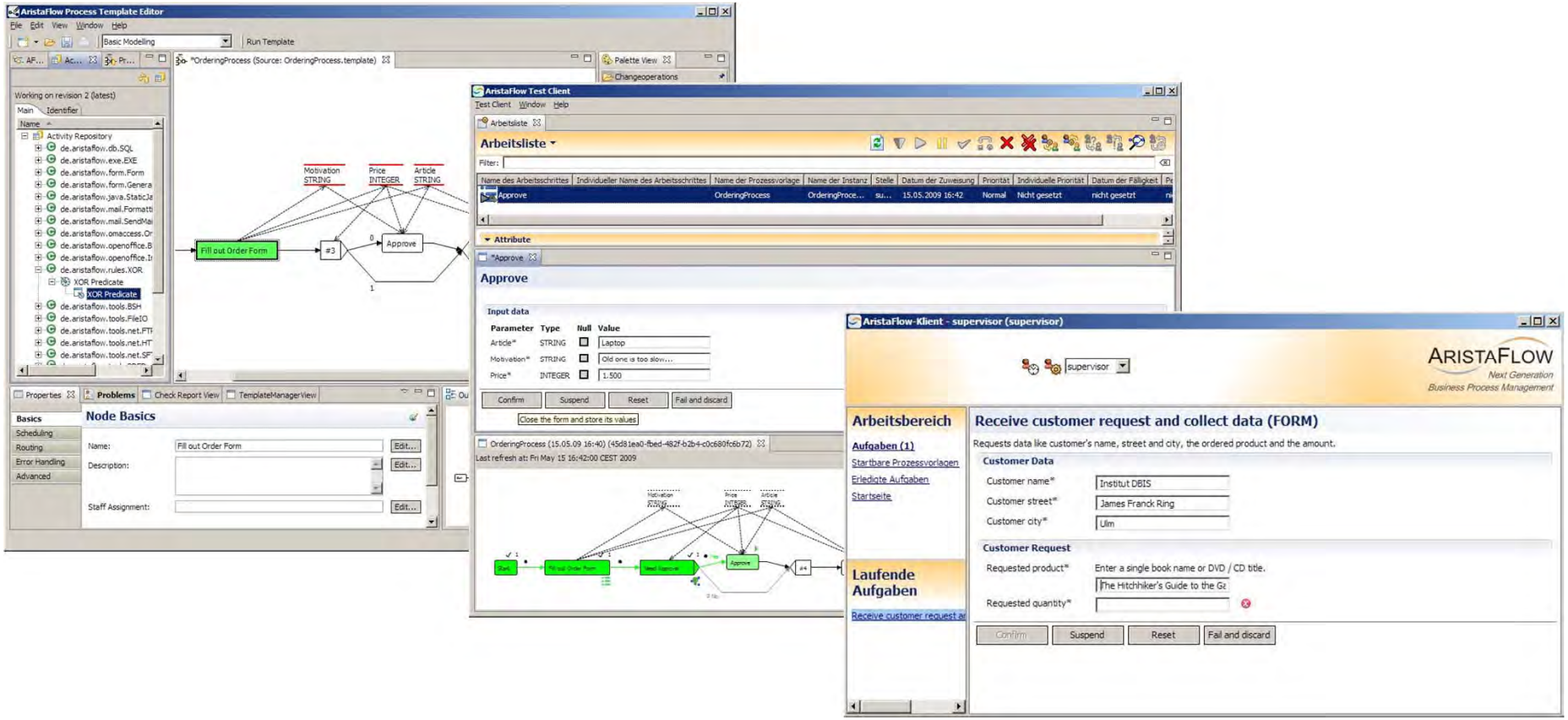


PAIS Flexibility Support: Experts like our ADEPT Framework



PAIS Flexibility Support: Technology Transfer

Transfer of the ADEPT Technology to Practice ☞ AristaFlow BPM Suite



www.aristaflow-forum.de

Comparison of Different PAIS Flexibility Frameworks

- Ability to deal with process changes is among the critical success factors for any process-aware information system (Mutschler et al. 2008)
- Several competing approaches to foster flexibility in process-aware information systems
  - Adaptive workflows (e.g., Reichert & Dadam 1998)
  - Case handling (e.g., van der Aalst et al. 2005)
  - Declarative processes (e.g., Pesic et al. 2007)
  - Late binding / Late Modeling (e.g., Sadiq et al. 2001)

☞ Lack of methods for a systematic comparison

Comparison of Different PAIS Flexibility Frameworks

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 go
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.

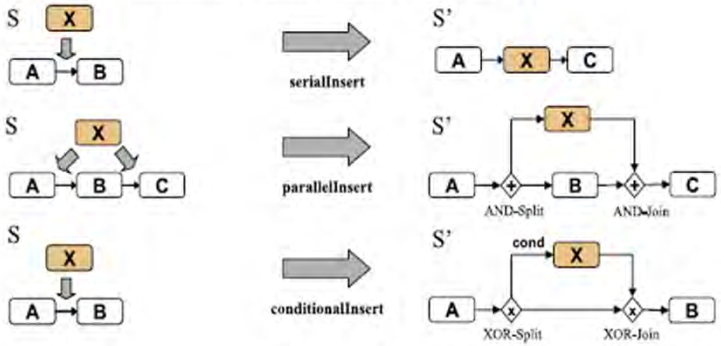
Example For a particular patient an allergy test has to be added to his treatment process due to a drug incompatibility.

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

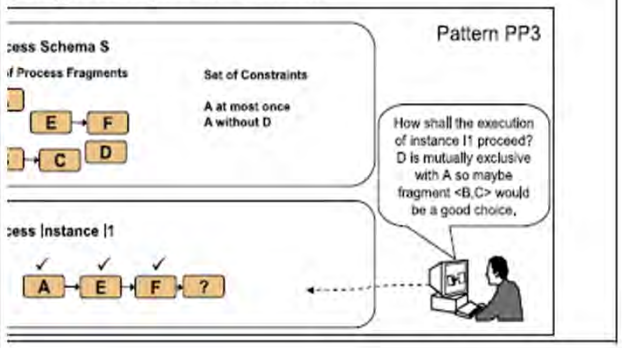
Description At build-time a set of process fragments is defined from which the schema of a concrete process instance can be composed during run time. This can be achieved by dynamically
nd by specifying the control dependencies between them on the fly.

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

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

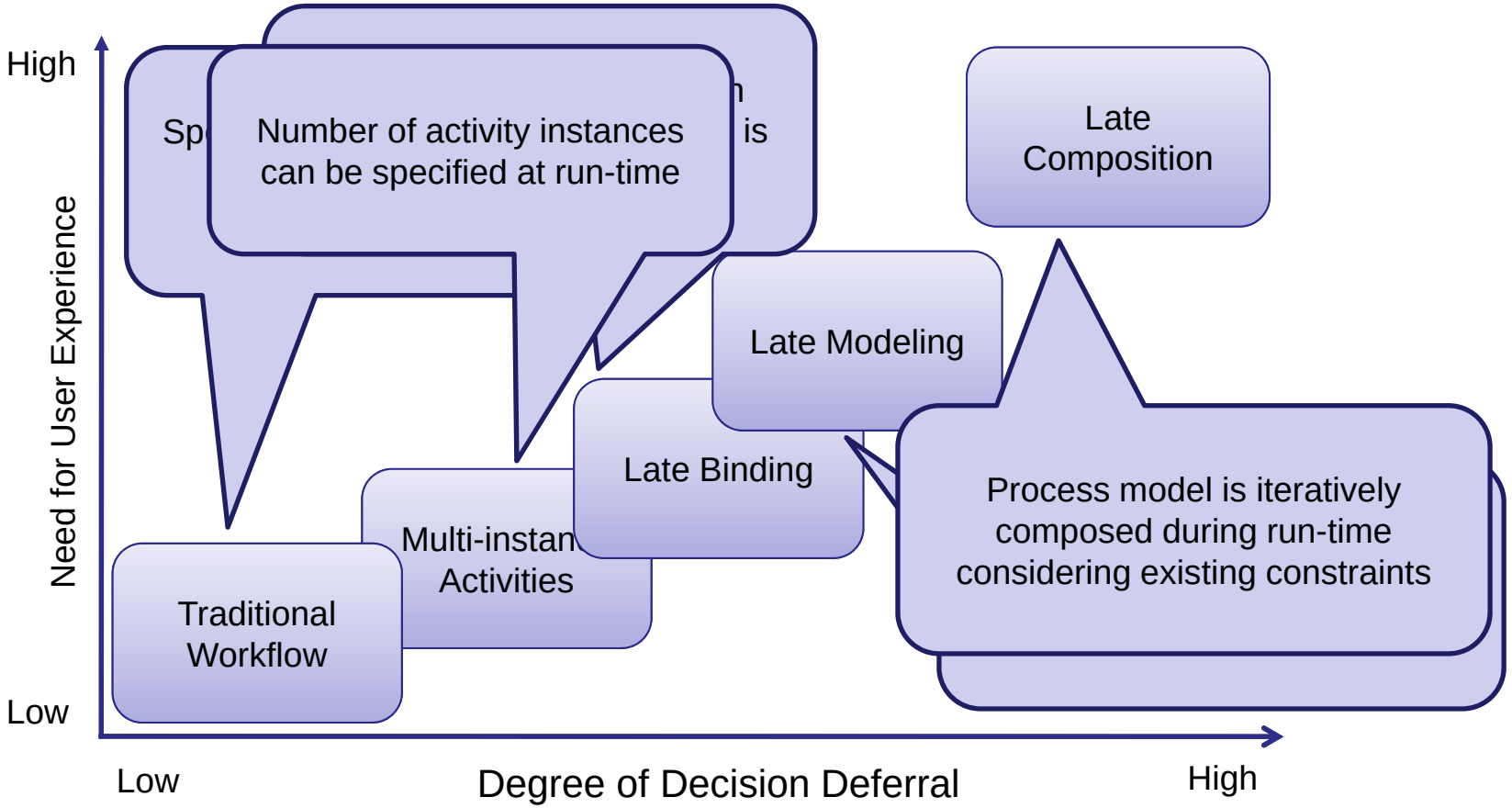
sic building blocks for late modeling?
fragments from the repository can be chosen.
t-based subset of the process fragments from the repository can be

ies or process fragments can be defined.



Comparison of Different PAIS Flexibility Frameworks

Patterns for Decision Deferral

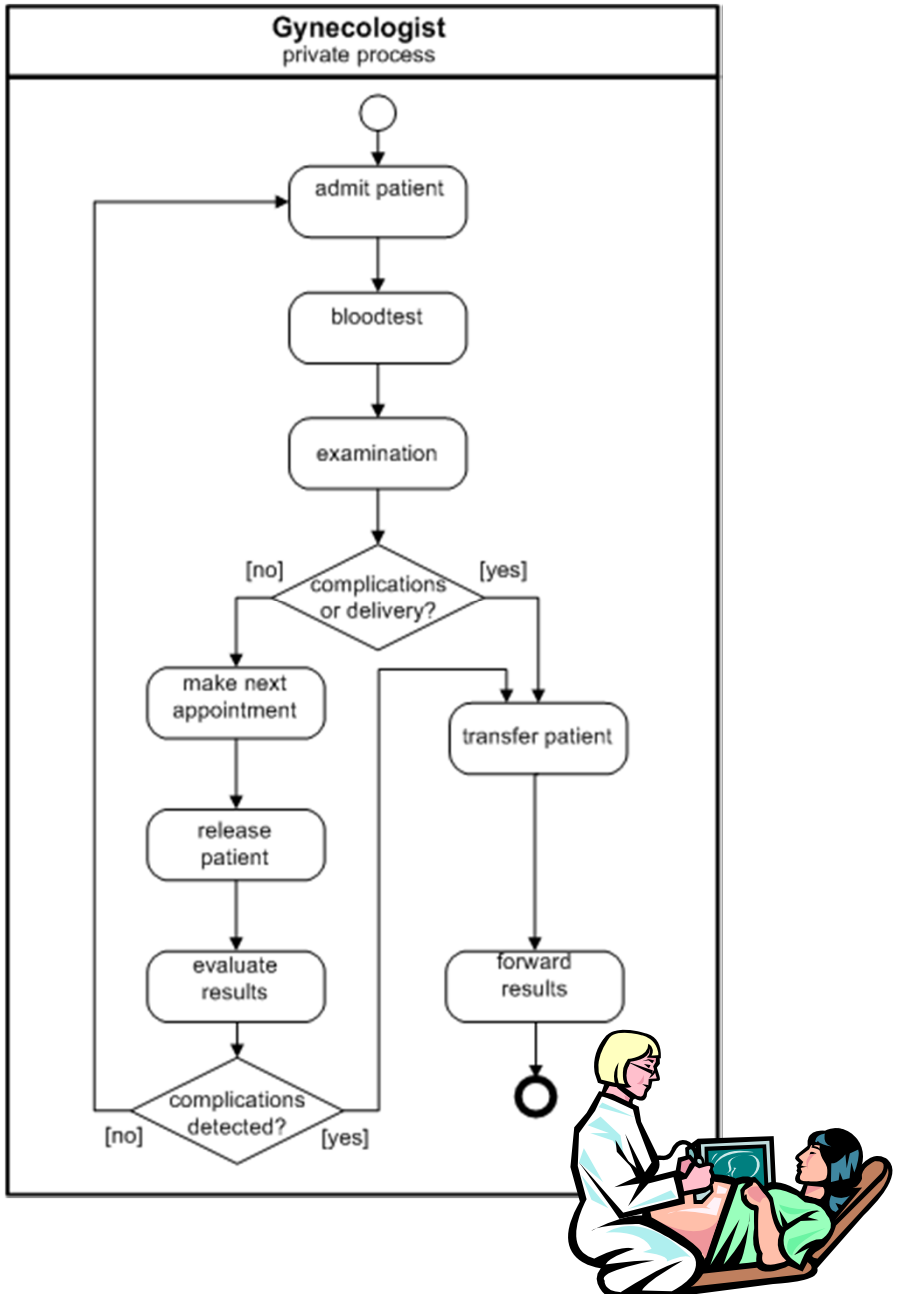


Comparison of Different PAIS Flexibility Frameworks

Change Support Features

- Schema Evolution, Version Control and Instance Migration
- Support for Instance-Specific Changes
- Correctness of Changes
- Traceability and Analysis of Changes
- Access Control of Changes
- Change Reuse
- Change Concurrency Control
- Refactoring Support for Process Models

A new Project: C³Pro



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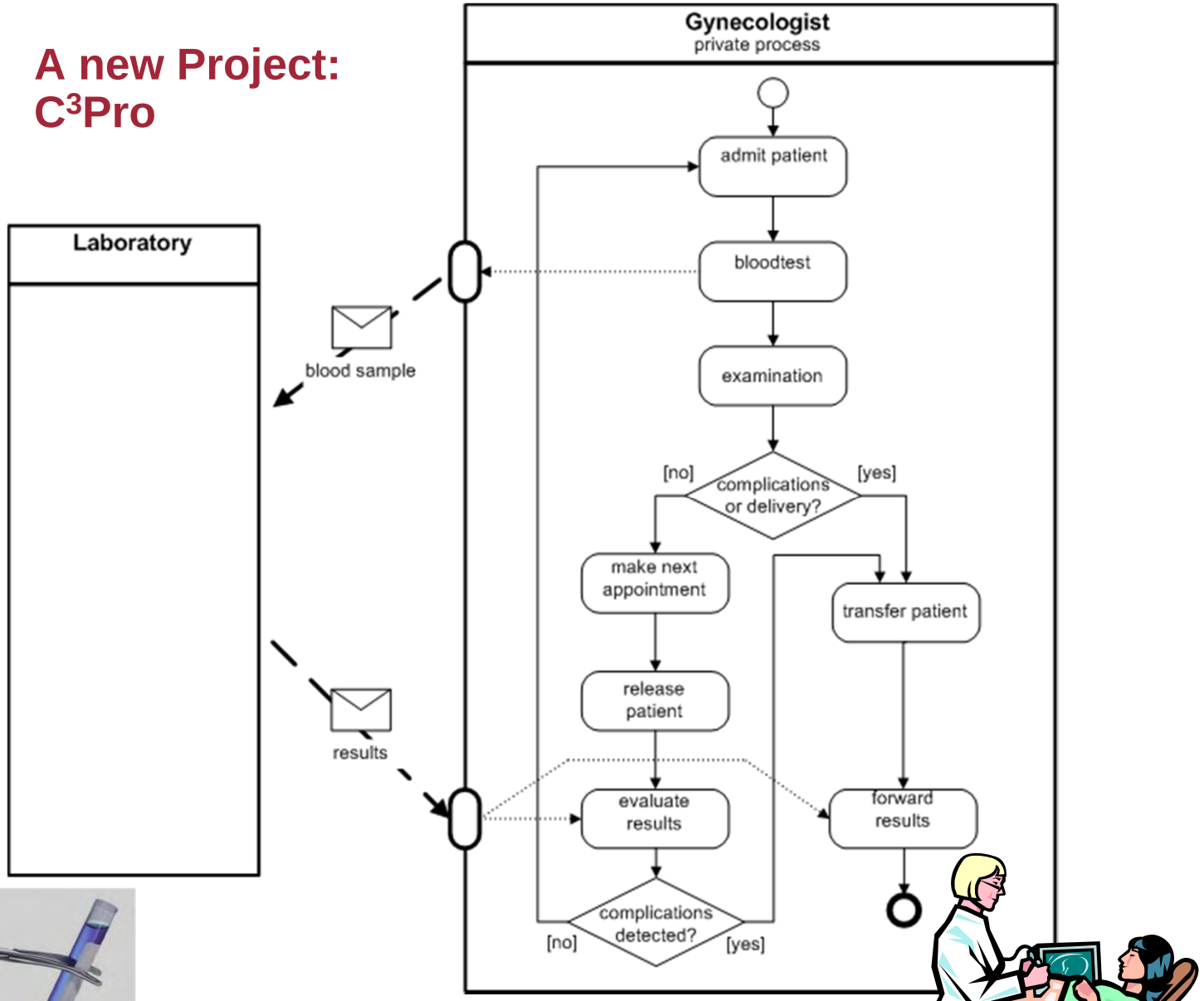

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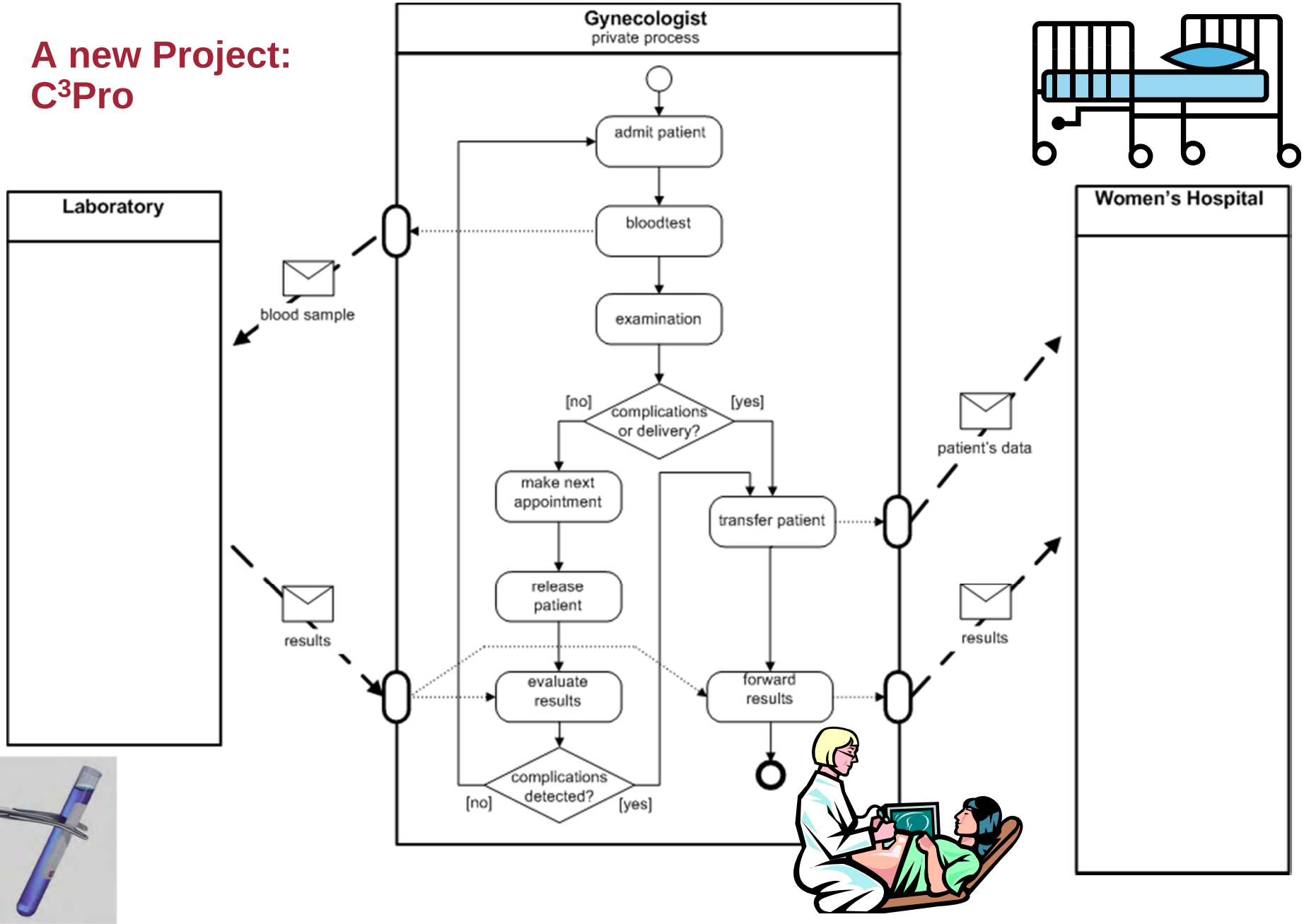

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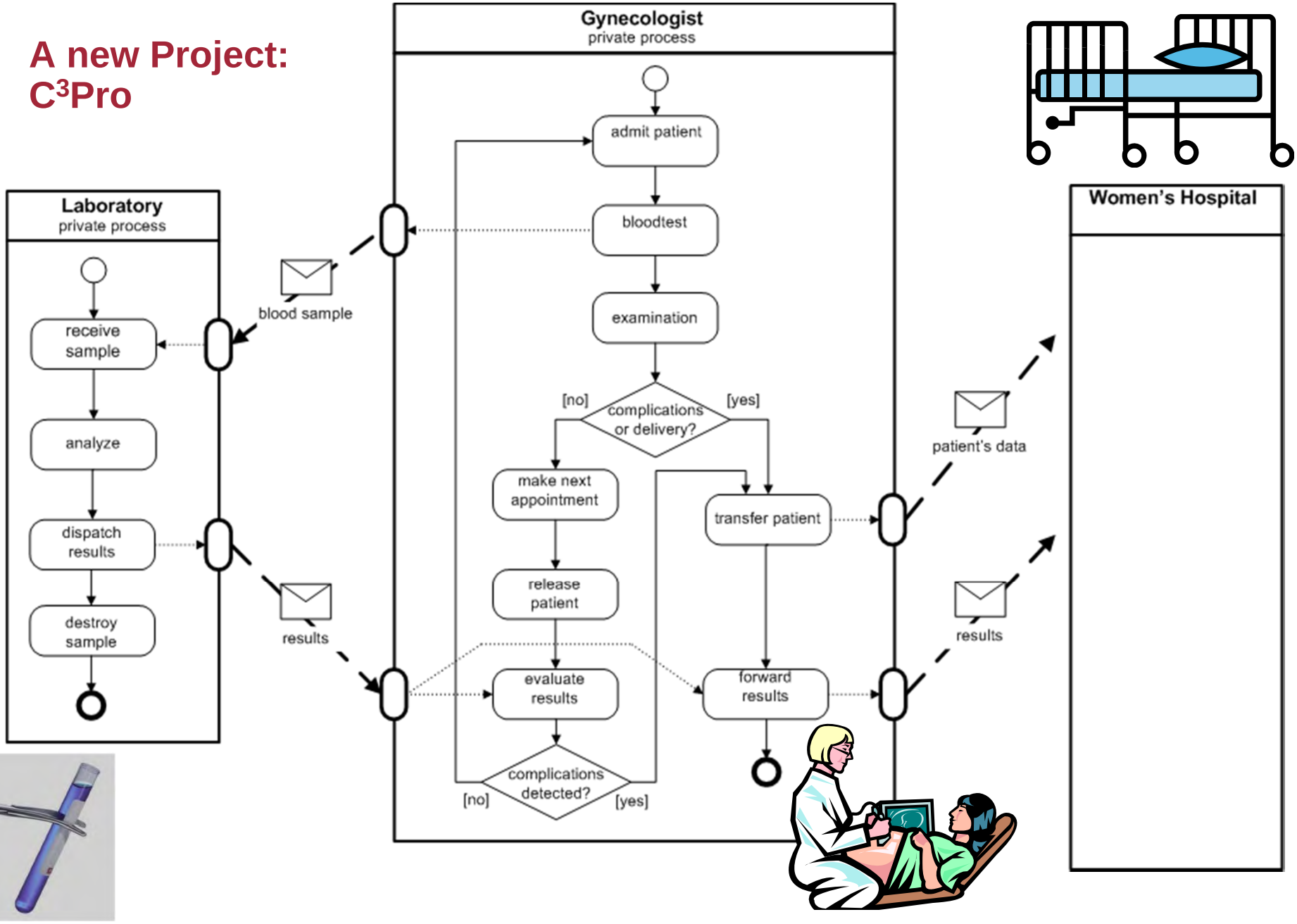

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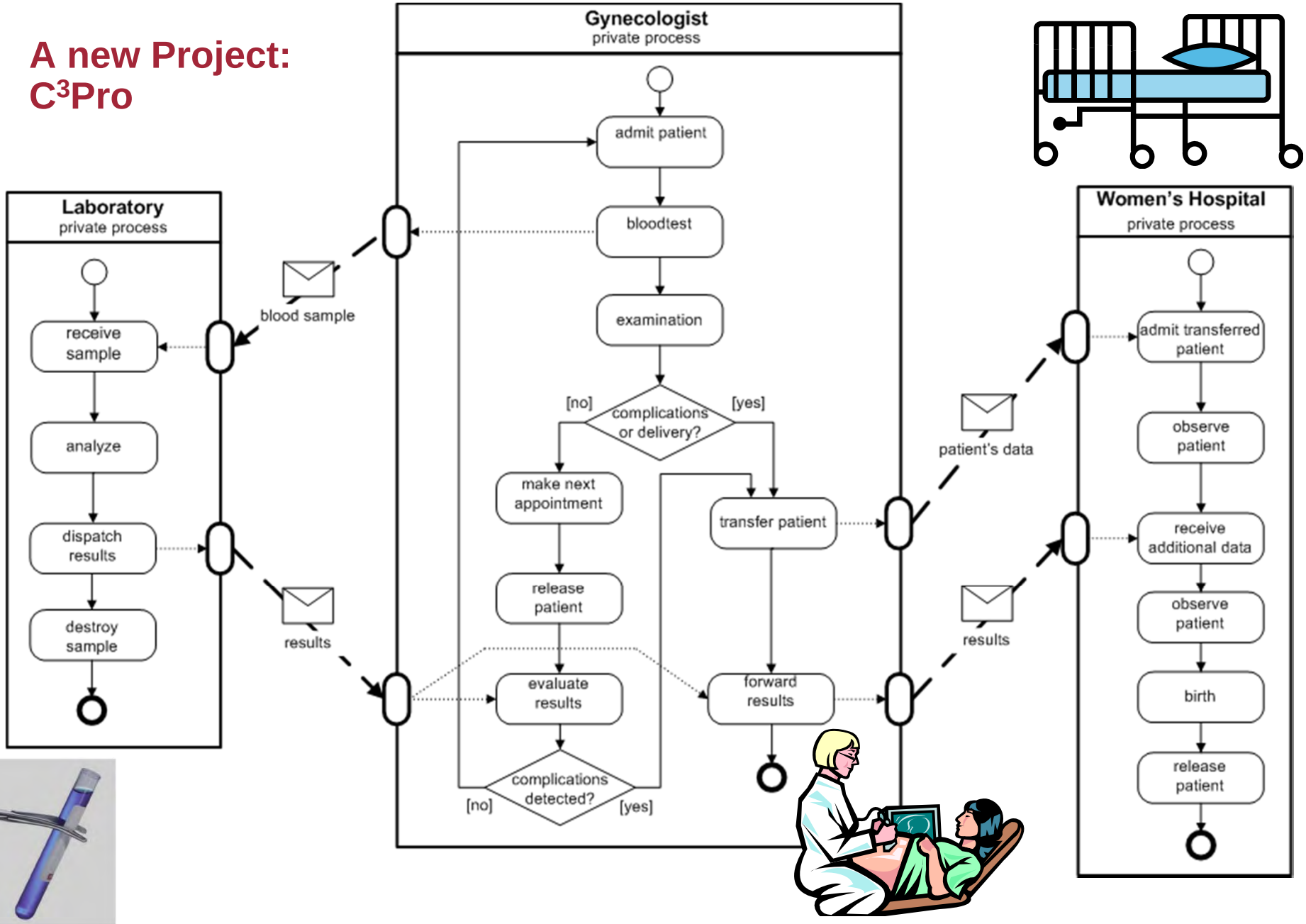

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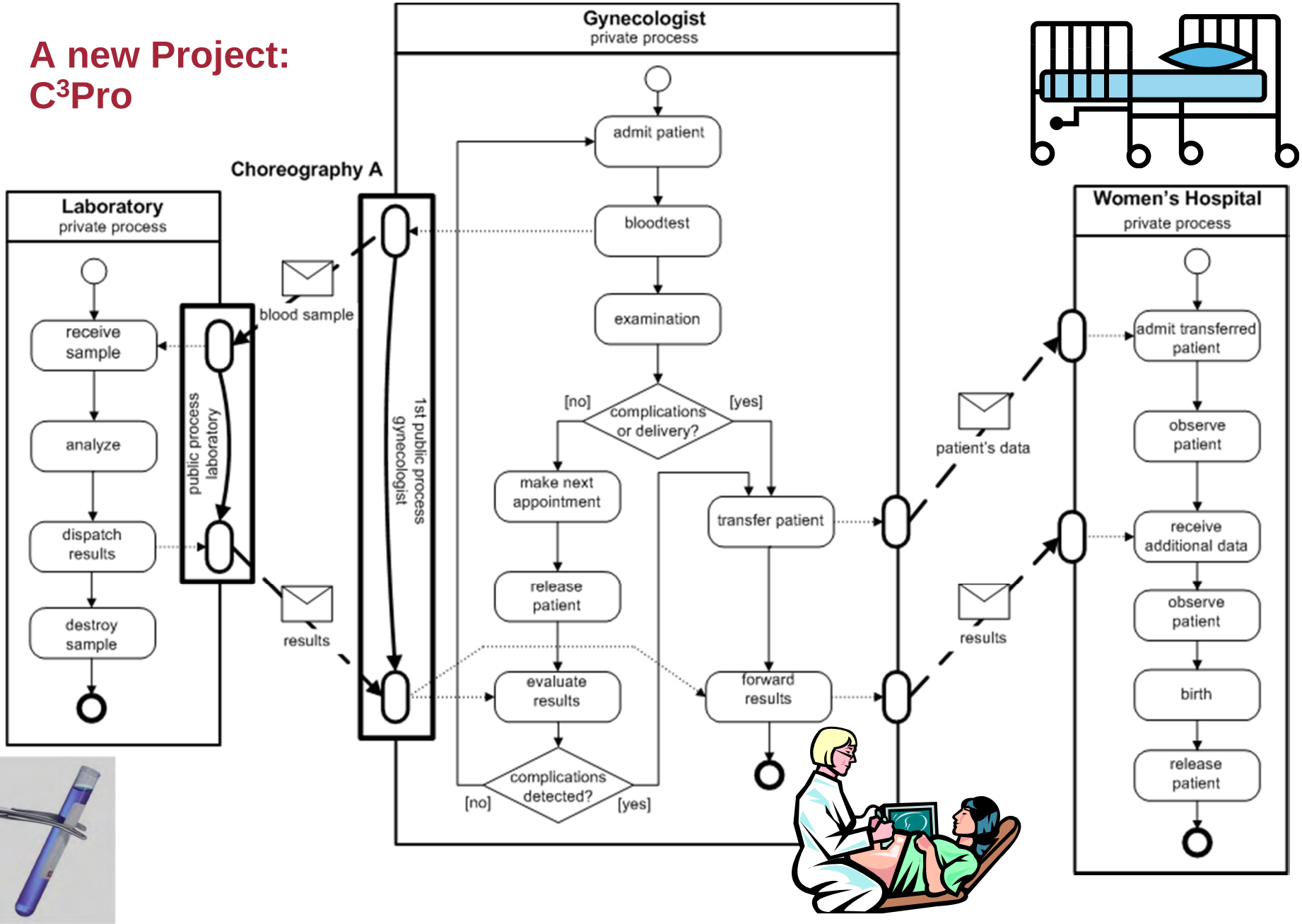

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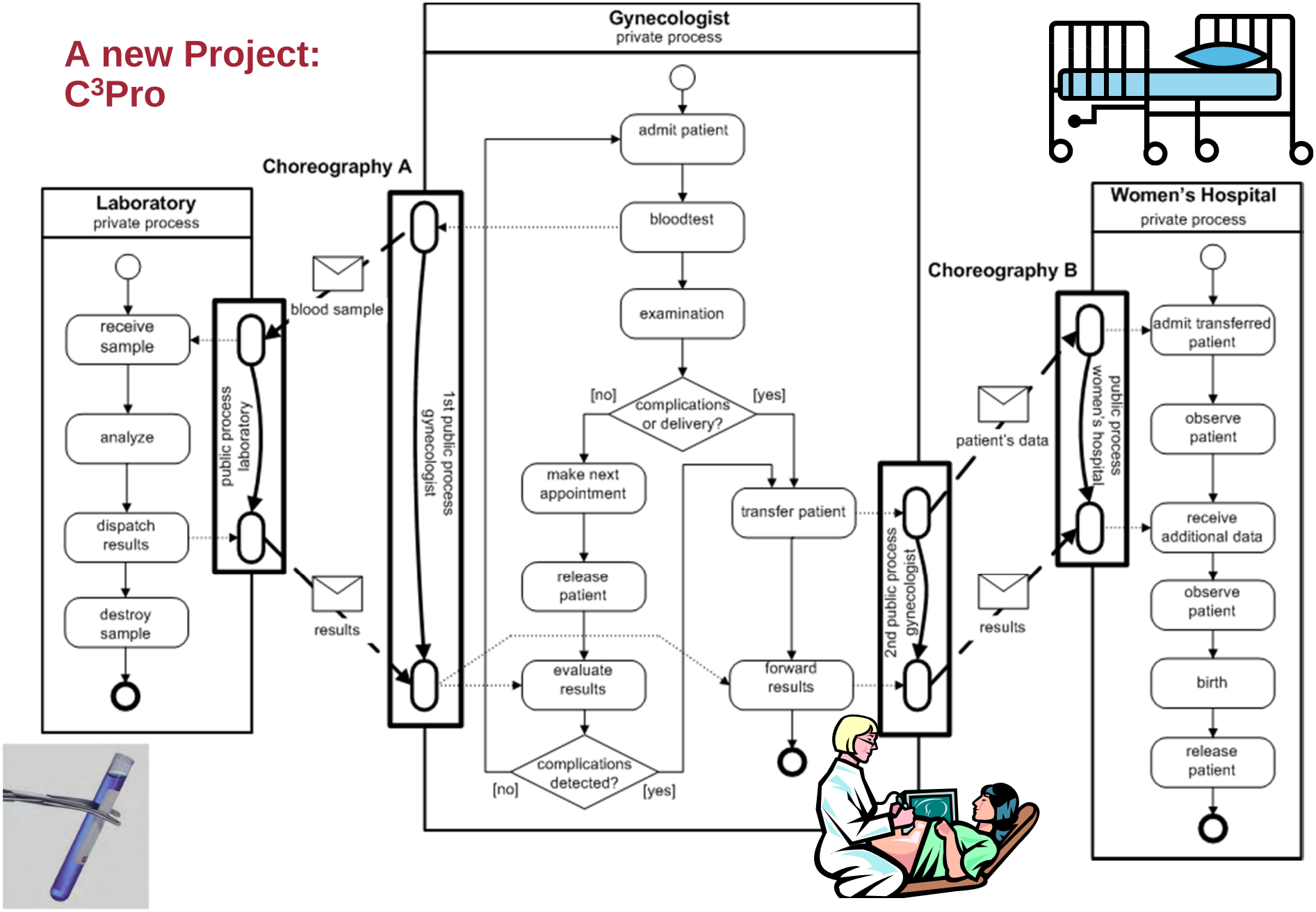

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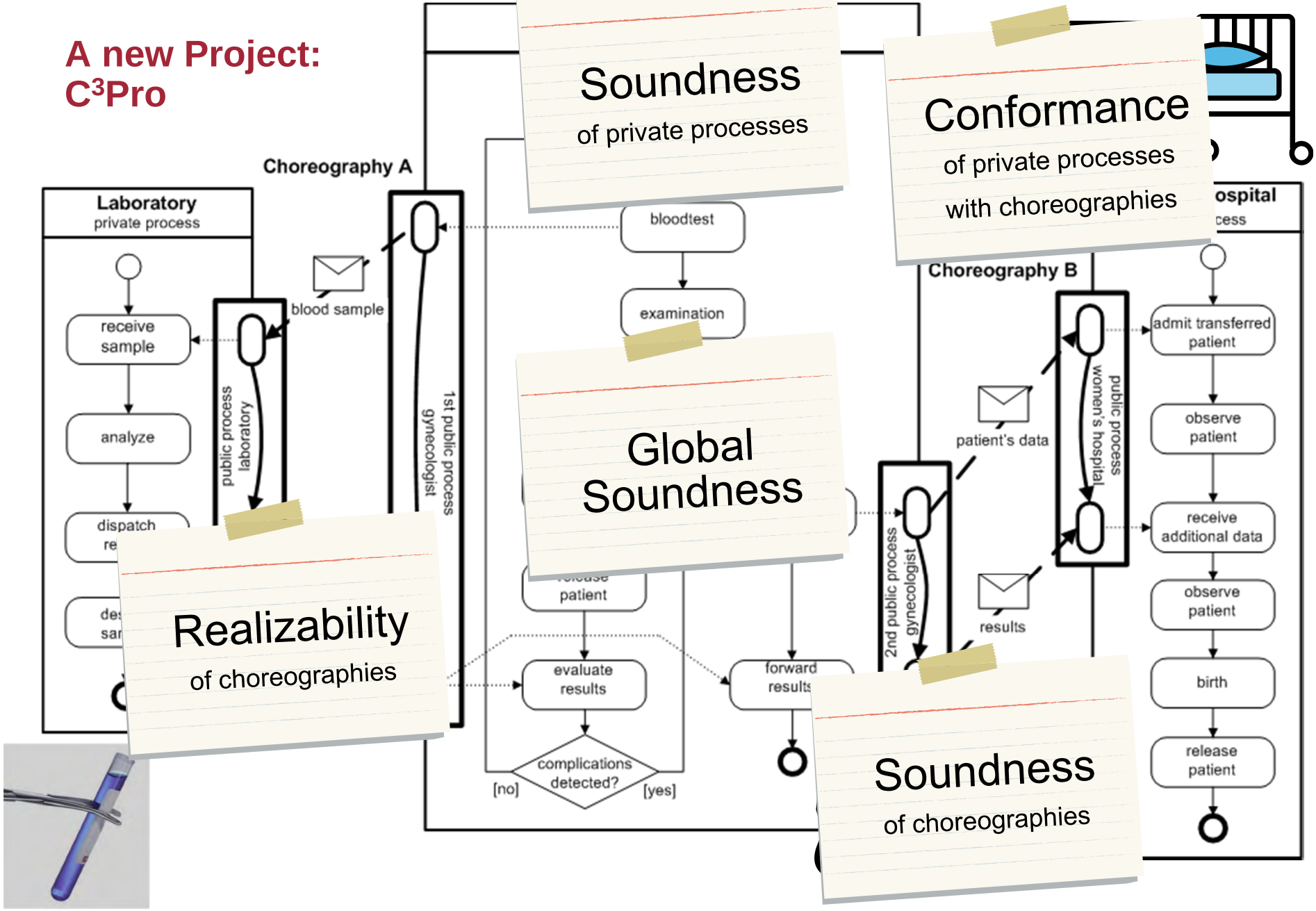
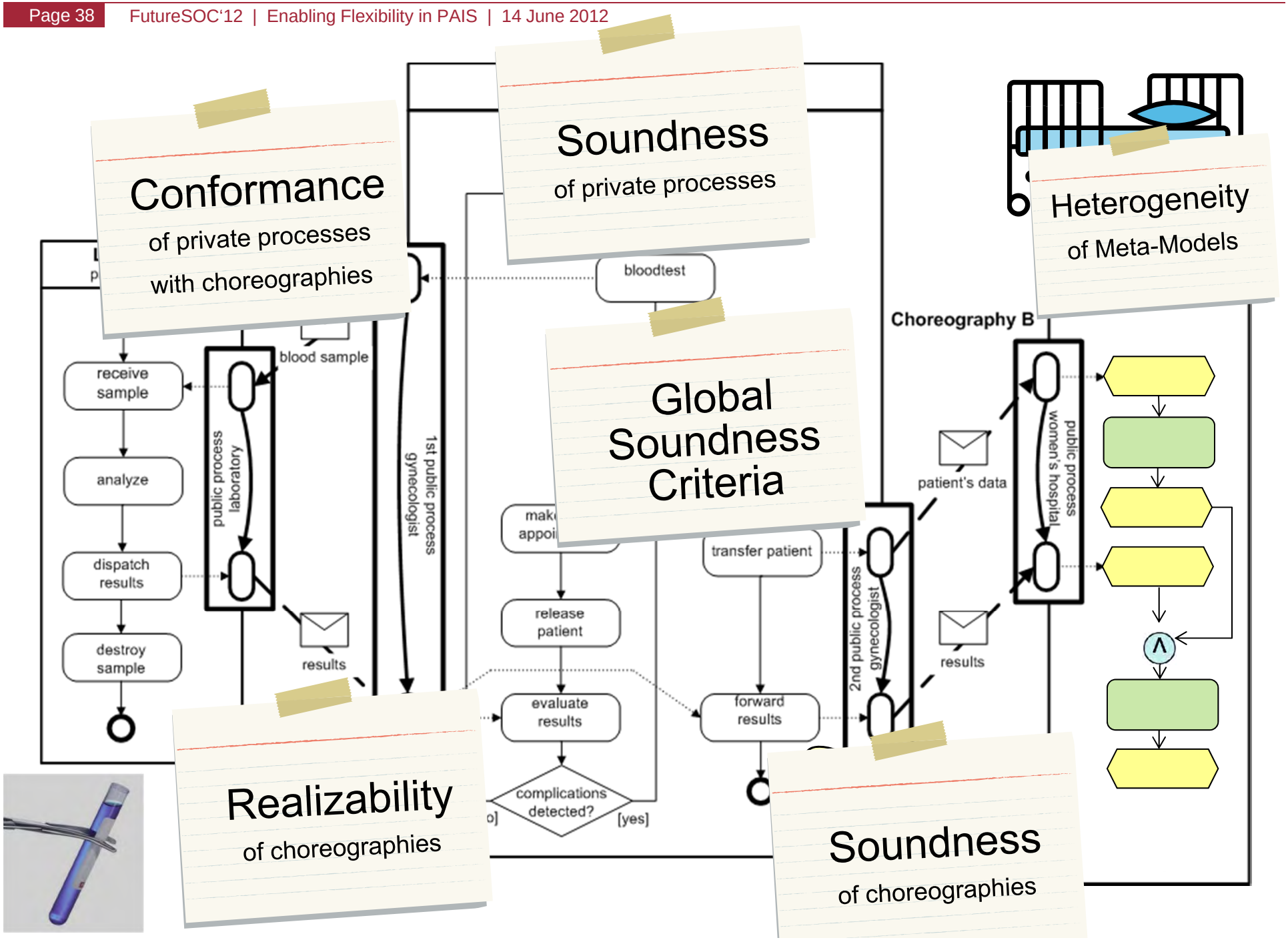
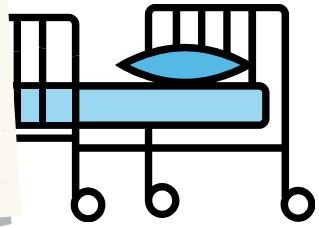



Conformance
of private processes
with choreographies
Soundness
of private processes
Heterogeneity
of Meta-Models
Global
Soundness
Criteria
Realizability
of choreographies
Soundness
of choreographies
bloodtest
receive sample
analyze
dispatch results
destroy sample
blood sample
public process laboratory
1st public process gynecologist
results
release patient
evaluate results
complications detected?
[yes]
transfer patient
forward results
2nd public process gynecologist
Choreography B
patient's data
public process women's hospital
results

Current Projects: C³Pro

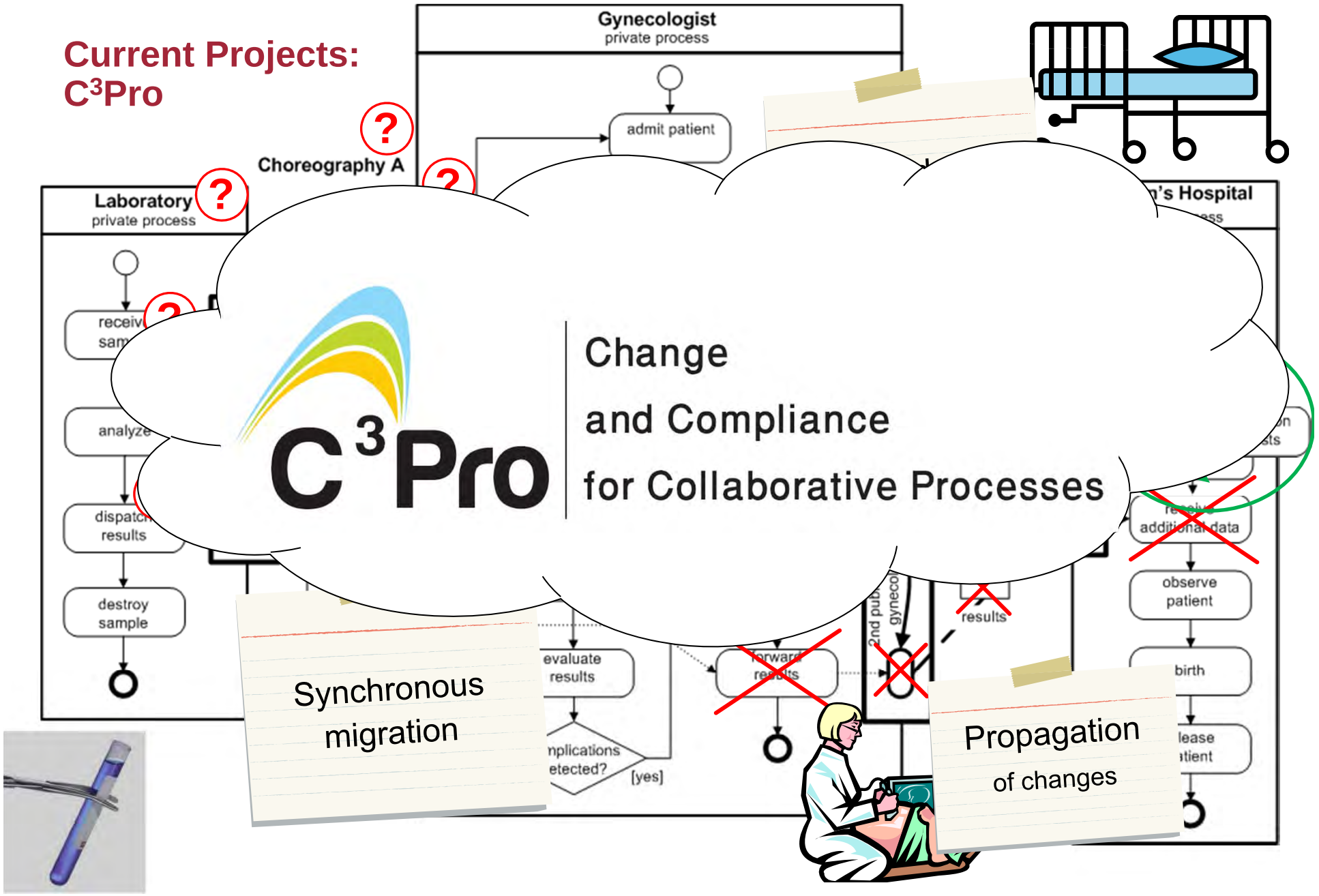
Rule 1: After a blood-test the bloodsample has to be destroyed.



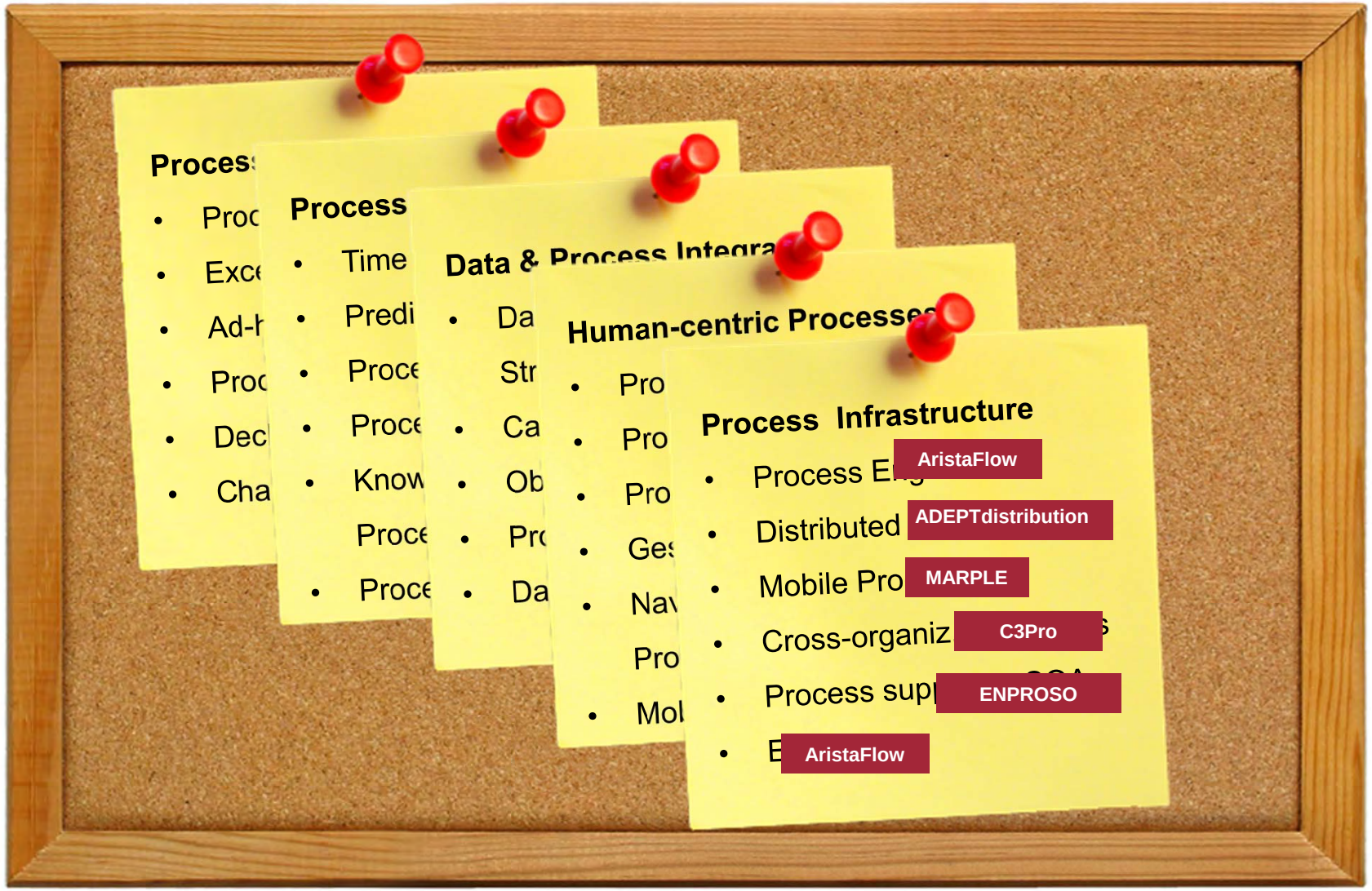
Rule 2: If complications are detected the patient has to be transferred to the hospital and be observed

Privacy

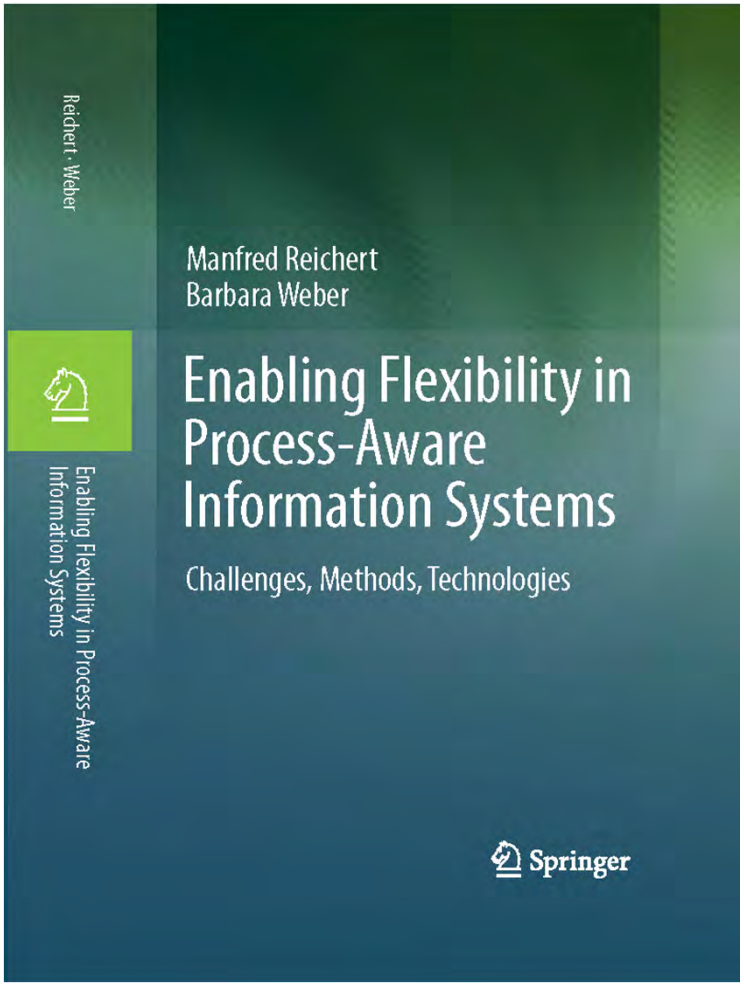
Current Projects: C³Pro



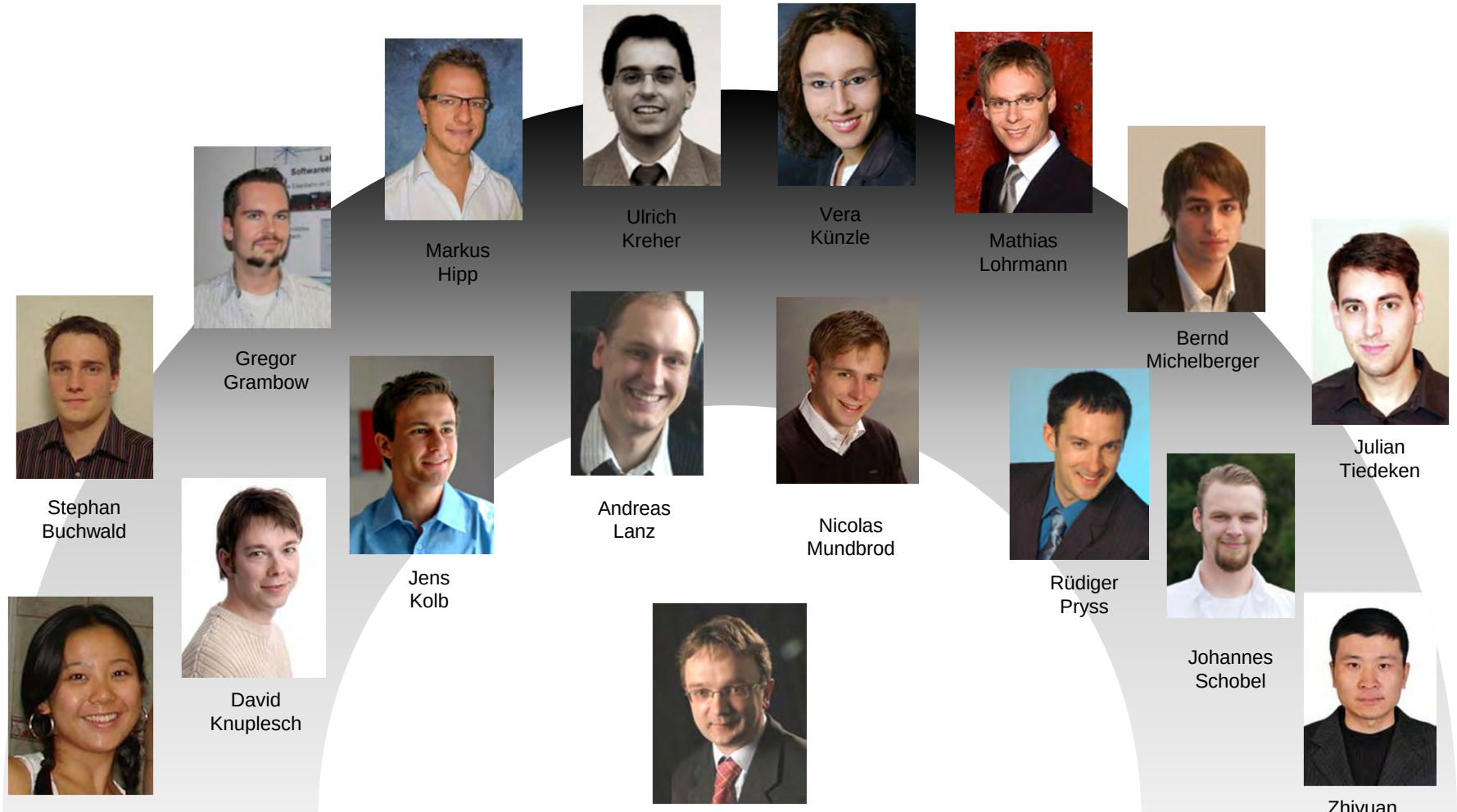
Our Project Portfolio



New Book on PAIS Flexibility



My team


Markus Hipp
Ulrich Kreher
Vera Künzle
Mathias Lohrmann
Bernd Michelberger
Julian Tiedeken
Gregor Grambow
Stephan Buchwald
Jens Kolb
Andreas Lanz
Nicolas Mundbrod
Rüdiger Pryss
Johannes Schobel
David Knuplesch
Carolina Chiao
Zhiyuan Sui
Prof. Dr. Manfred Reichert