

# Context-Aware Agile Business Process Engine:

Foundations and Architecture

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# Outline

- Agile Business Process Management: what's new?
  - Example: agile patient care
- Forms of process agility
- How to achieve: (magic potion)
  - Declarative process modeling
  - Formal concept analysis
  - Dynamic context modeling
- CAPE

# Agile Business Process Management:

what's new?

## Example: Agile Patient Care



*“a situation, set of circumstances or initiative that requires a set of actions to achieve an acceptable outcome or objective. ...”*

# Let's make it a Process:



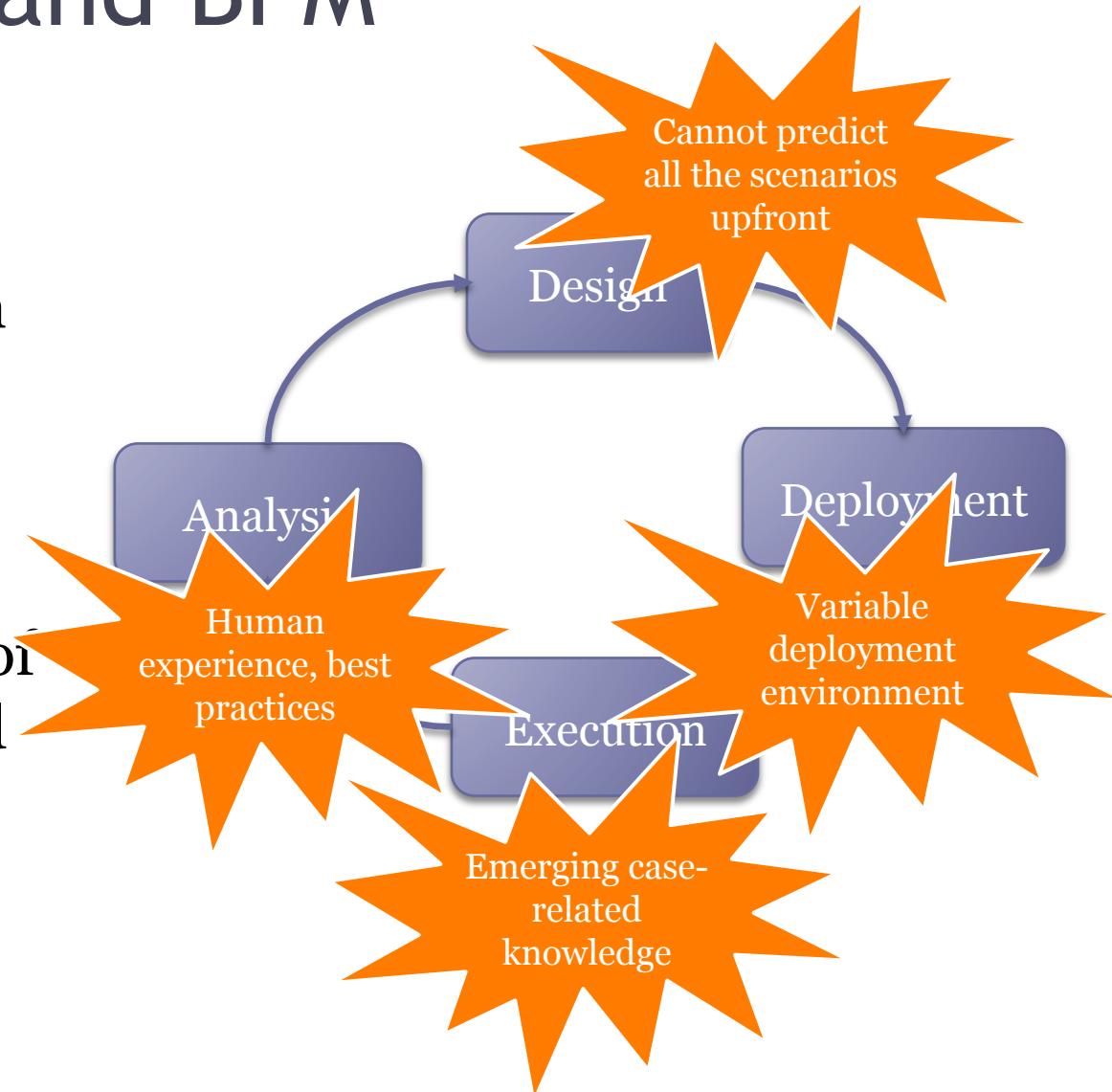
- Physical examination
- Laboratory tests
- Specific tests
- Spontaneous improvement/ degradation

- Physical examination
- Laboratory tests
- Specific tests
- Psychological evaluation
- Patient history analysis
- Case Assessment
- Therapy prescription

- Therapy
- Recovery therapy
- Physical examination
- Laboratory tests
- Specific tests
- Spontaneous improvement/ degradation
- Secondary effects
- Allergies
- Re-assessment

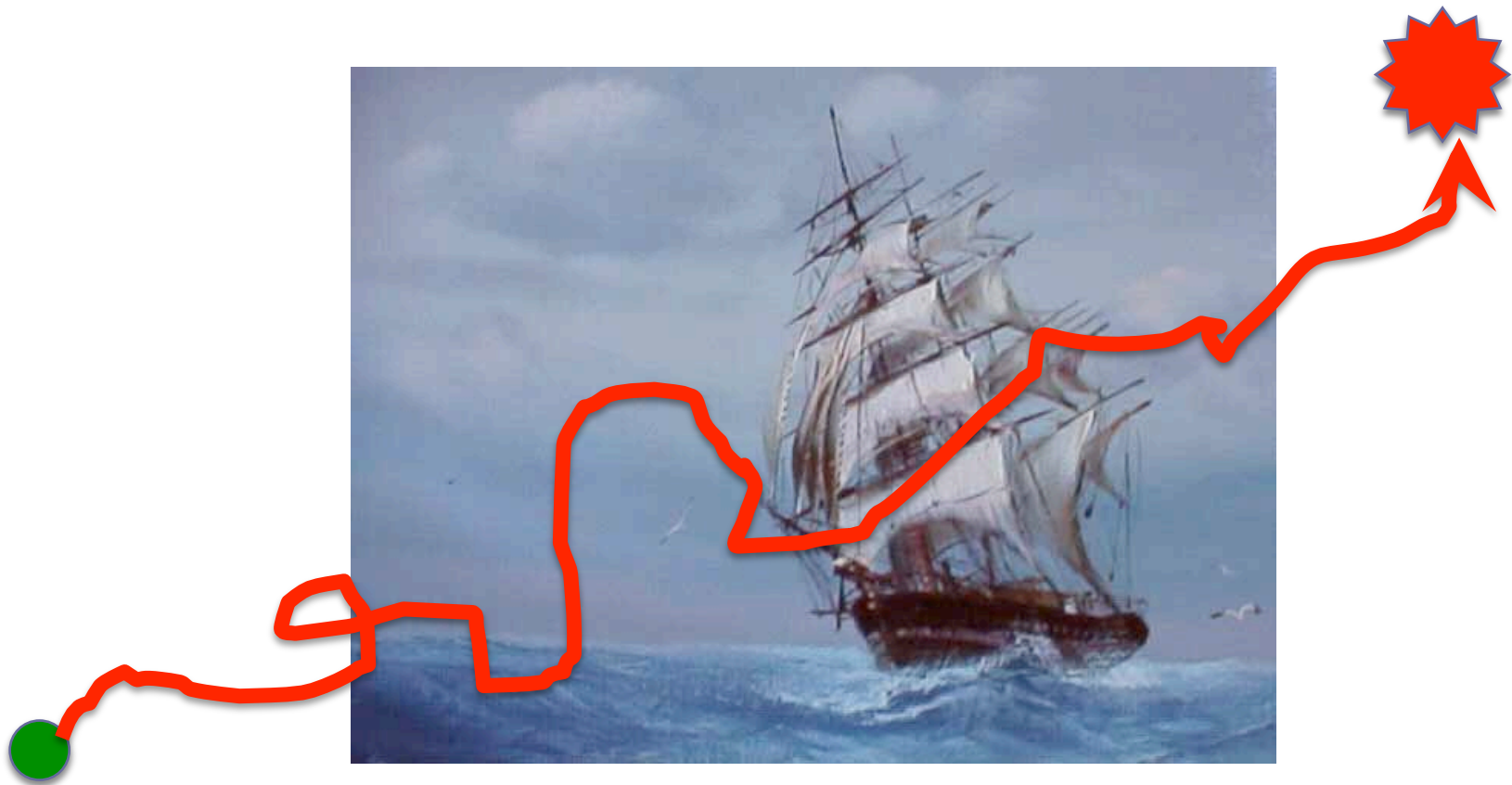
# Agile Process and BPM

- Largely based on the expertise of a human actor rather than predefined rules
- Should anticipate evolving conditions of a client (patient) and of the environment
- **CANNOT BE AUTOMATED**



# Two Forms of process agility

What do we call an “agile” process?





## First form of agility:

- The ship relies on a skillful skipper and his capacity to select a right action to ensure that no incorrect scenario is executed
- The process = a set of activities that can be dynamically assembled at run time into one of the (non-forbidden) process scenarios.

## Second form of agility

- The ship relies on the capacity of the skipper to select a right action at the right moment, and with respect to the current situation
- The process = the ability to monitor and manage the process context and to dynamically select and/or alter the execution scenario accordingly.

# How to achieve:

(magic potion)

# 1. Declarative modeling

From Activity-oriented to state-transition view

# Process Modeling Styles

## Imperative

- A process can be simulated:  
*“Given X and Y, what the process flow will be?”*
- Model is deterministic
- Allow process automation
- Graphical notations: UML, BPMN

## Declarative

- A process properties can be analyzed: “Given X and Y, can I guarantee Z ? “
- Model is non-deterministic
- Allow decision making support
- Graphical notations: no mainstream notation

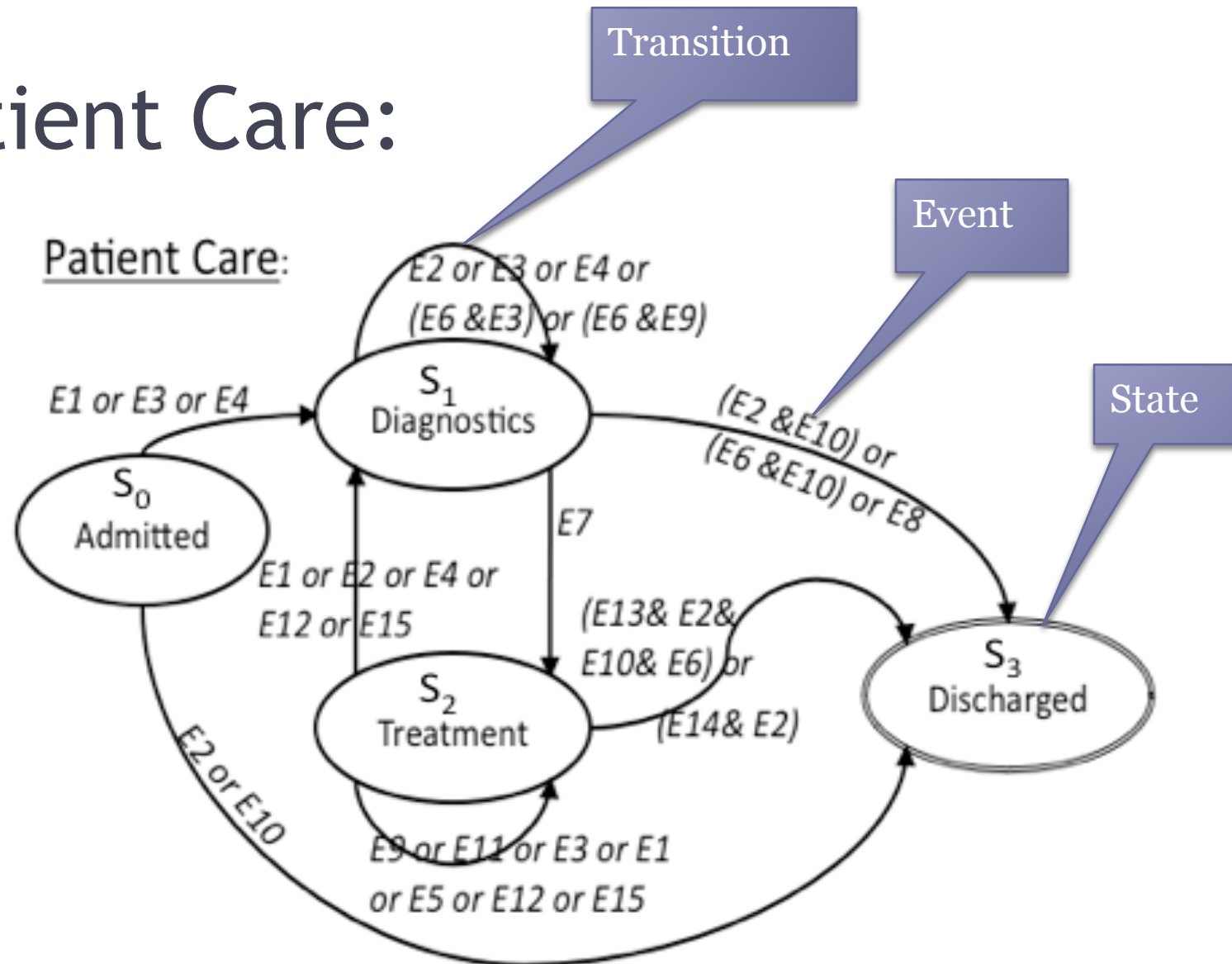
# By train or by sea?

- A preordered set of activities
- Predefined scenarios
- Forking/merging mechanisms for combining scenarios



- A set of states (situations) and triggering conditions
- A set of activities that MAY (or may not..) result in a desired state transition
- No predefined scenarios

# Patient Care:



## 2. Context-awareness

Dynamic context modeling



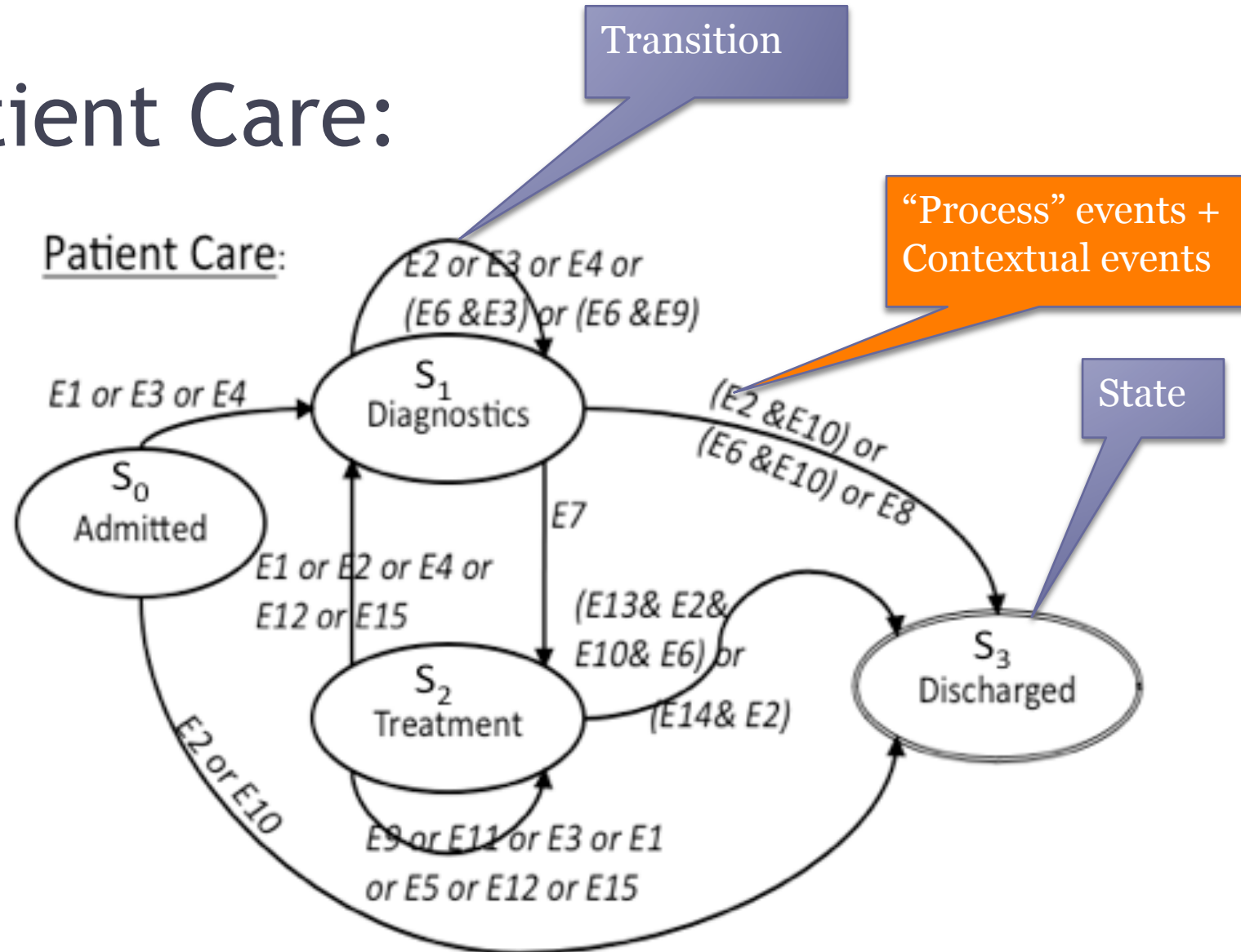
# The Power of Context

- *“.. any information that can be used to characterize the situation of an entity. An entity is a person, place or object that is considered relevant to the interaction between a user and an application, including the user and applications themselves.” Dey.*

# Patient Care: Context

- Patient:
  - Body temperature
  - Blood pressure
  - Psychological state (feeling)
  - History (what preceded the case?)
- Ward:
  - Medical equipment available
  - Personnel available
  - ...

# Patient Care:



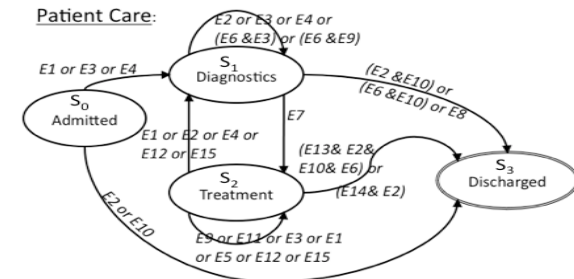
# 3. Formal Concept Analysis

Process navigation rules: “How to select the right thing to do?”

# Galois Lattice

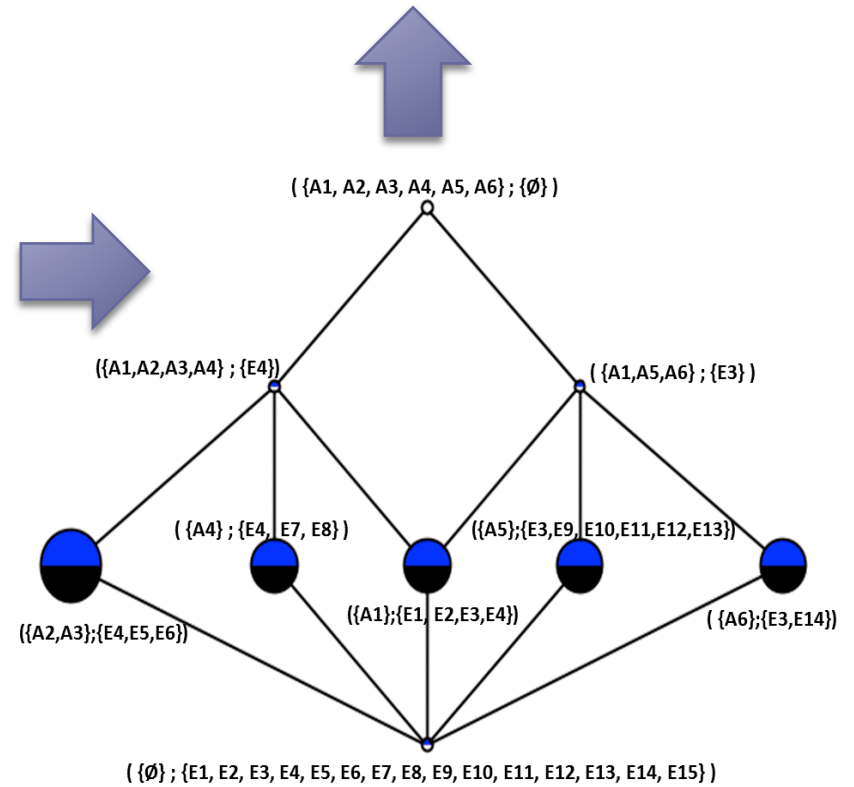
- Grouping the concepts by their similarity
- Concept analysis and recommendation
- Efficient mechanism for classification and clustering the concepts

# Patient Care:



## Navigation Rules

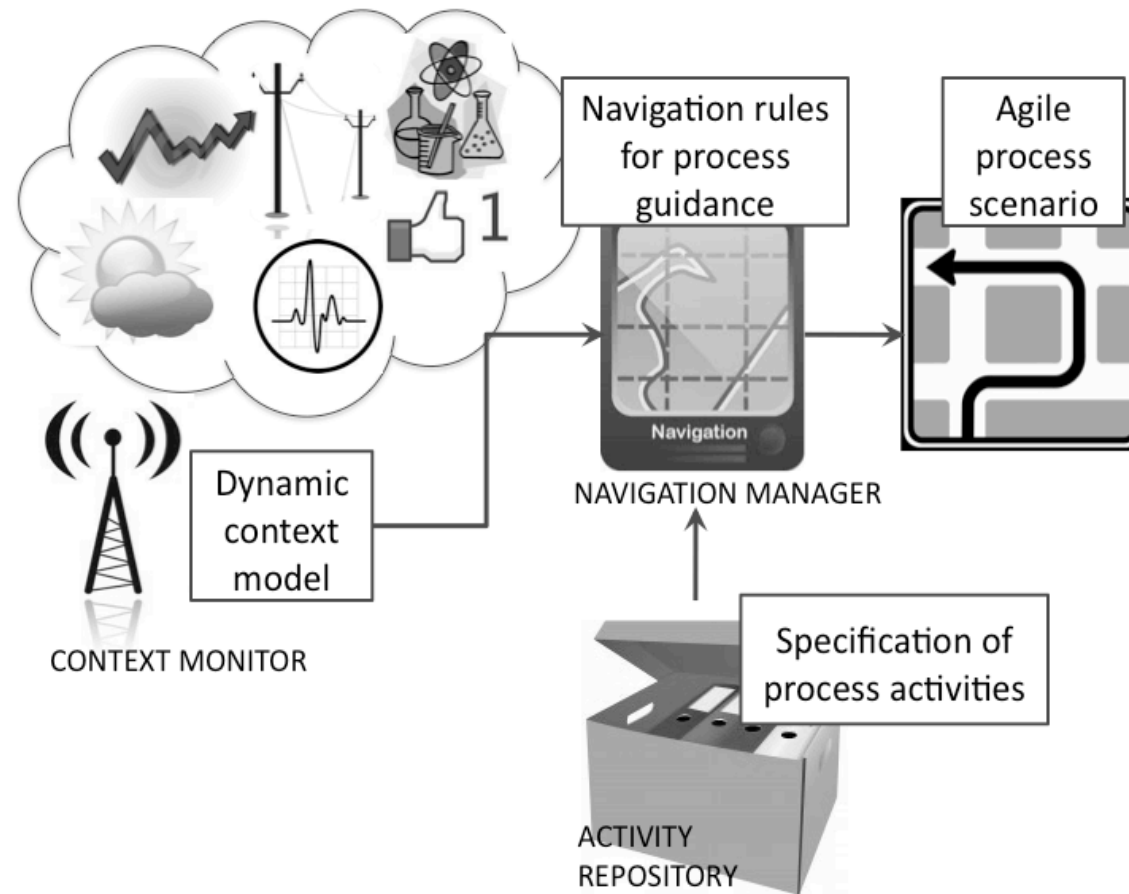
Activity	Avail. at:	Process events (Activity outcomes):
A1 Physical examination	S0, S1, S2	E1 Confirms the declared symptoms E2 No problem found E3 New symptoms emerged E4 Supplementary medical tests are required
A2 Medical laboratory test	S1, S2	E5 Positive results (anomalies detected) E6 Negative results (no anomalies detected) E4 Supplementary medical tests are required
A3 Specific medical tests	S1, S2	E5 Positive results (anomaly detected) E6 Negative results (no anomaly detected) E4 Supplementary medical tests are required
A4 Case Assessment	S1	E7 Diagnose confirmed, treatment assigned E8 Diagnose not confirmed, patient discharged E4 Supplementary medical tests are required
A5 Therapy	S2	E9 Condition declined (e.g. symptoms increasing) E10 Condition improved (e.g. symptoms decreasing) E11 Side effects emerged E3 New symptoms emerged E12 Stable situation E13 End of therapy
A6 Recovery	S2	E3 New symptoms emerged E14 End of recovery therapy
<b>Context events:</b>		
	E15	New medical / personal evidence received
	E3	New symptoms emerged
	E9	Condition declined, (e.g. symptoms increasing)
	E10	Condition improved (e.g. symptoms decreasing)



## Conclusion:

- Two forms of agility
- From imperative to declarative
- Events instead of Activities: transparent treatment of context
- Analysis and navigation rules based on FCA

# CAPE: Context-aware process engine





## “So what?” slide

- We are not going to replace an expert by a program, but to help this expert to learn quicker and to make better decisions faster



**Thank you for your  
attention!**