Paradigm-shifting Concepts enabling Networked Enterprise Design and Operation

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Purpose

1. Understand the Nature of Enterprise Knowledge and paradigm-shifting Concepts
2. Exploiting the properties of Knowledge-spaces and Workspaces
3. Agile Approach - modeling for workspace execution & emergence
4. Holistic Enterprise Design – exploiting the concepts & properties
5. What Architecting teams need to capture:
    - Work-centric context and dependencies?
    - Rules for self-adjustment and autonomous capabilities?
6. How to support Continuous Learning and Innovation?
7. Towards a multi-dimensional layered Enterprise Knowledge Modelling and Management Framework
8. What are the added capabilities and opportunities?

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First Industrial prototype – KASH platform

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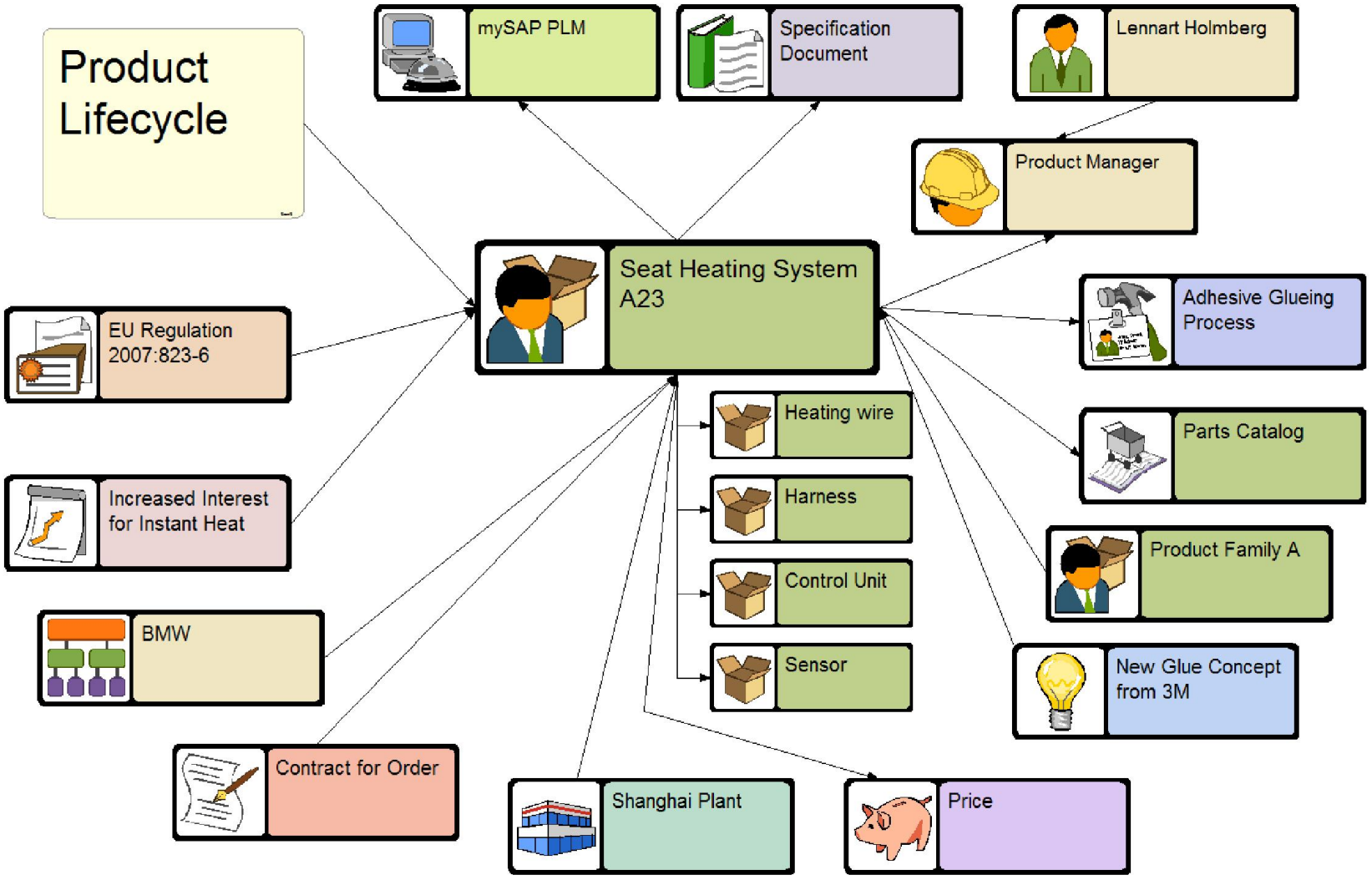
Seat-heating design - knowledge aspects



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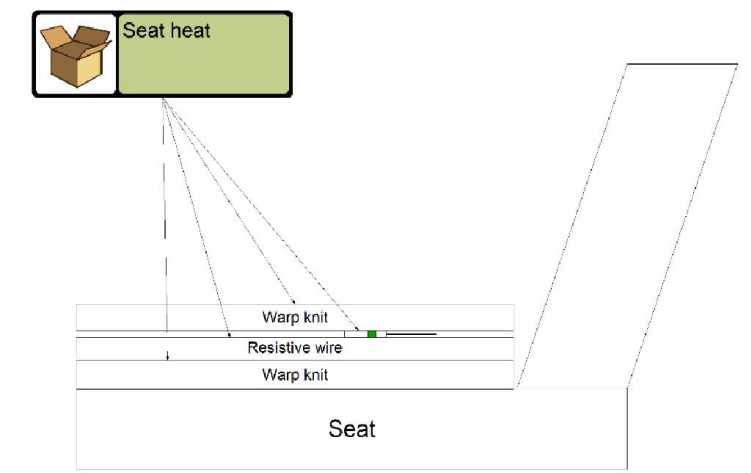
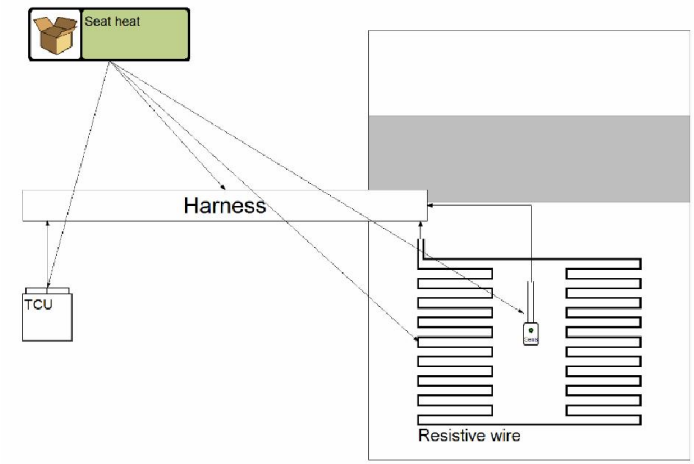
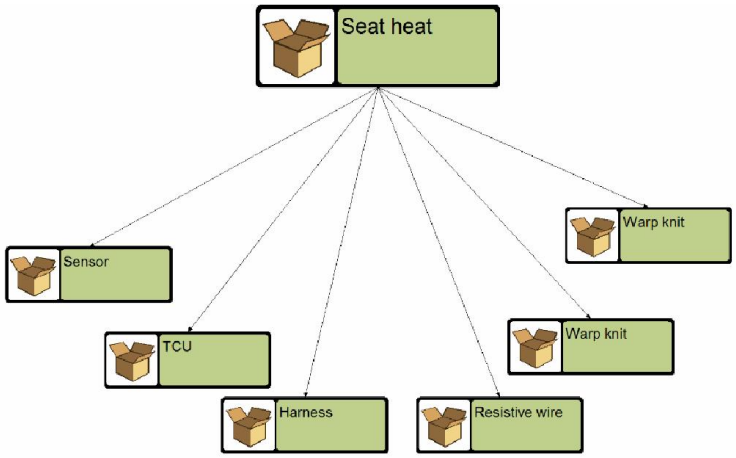
Seat-heating Design – Product structures







The figure upper left shows a design principle view, the above is a functional view, and the left a product structure supporting a multitude of model views.
Data-,role-, task-, and view-handling are core constructs in modeling, using and managing active knowledge models.

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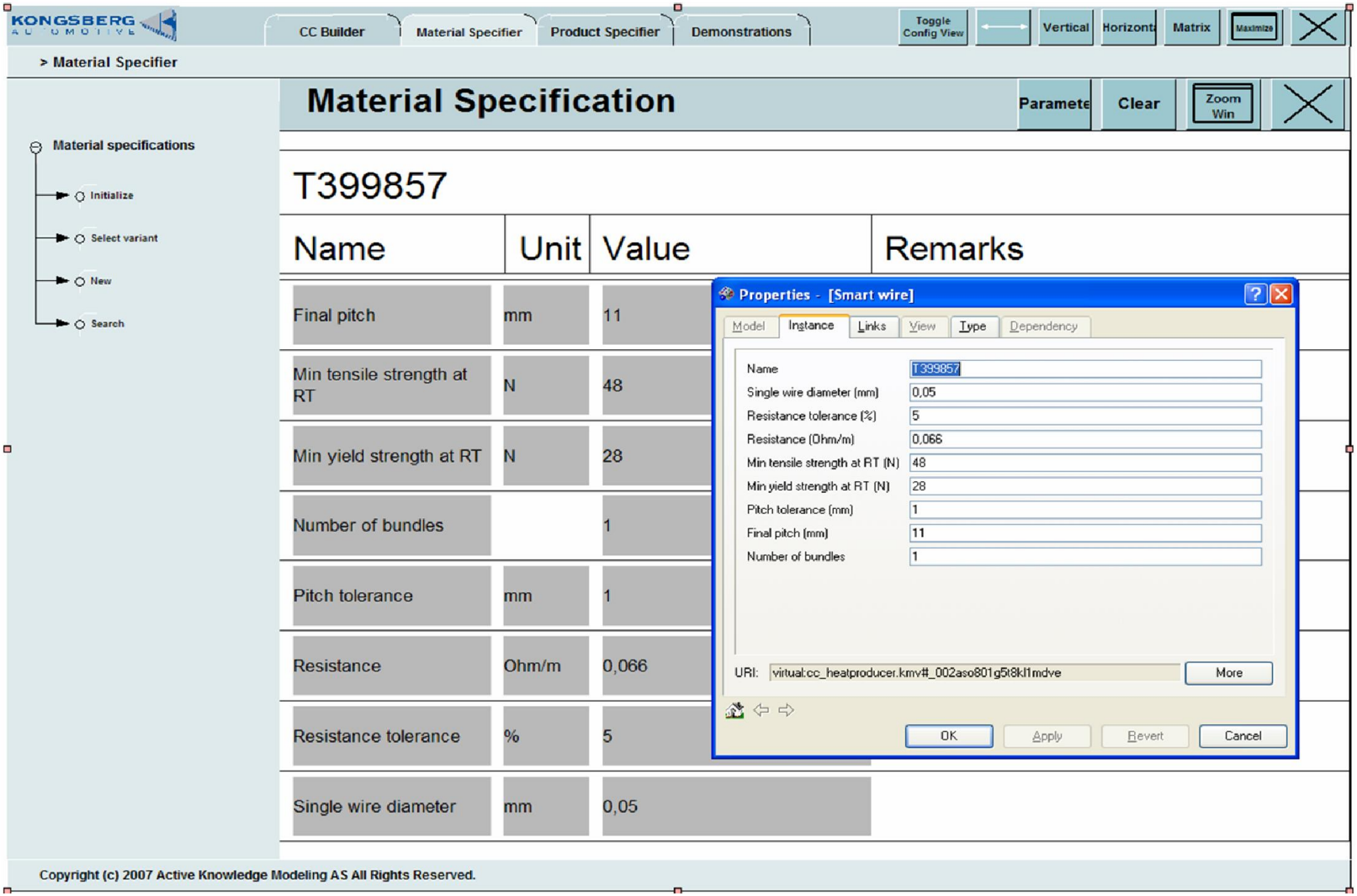
Workplaces for Material Specification



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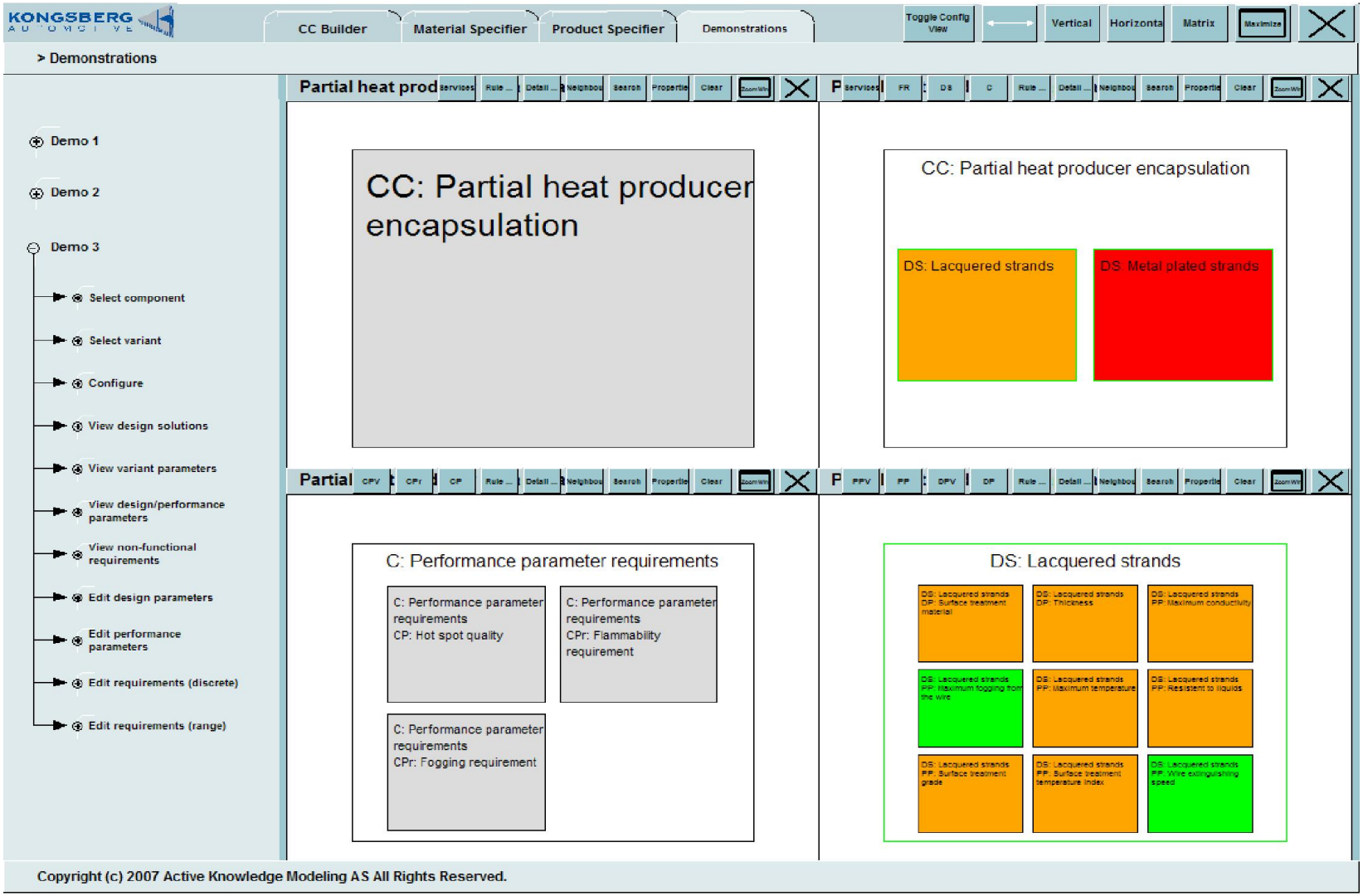
Workplace for seat-heating design



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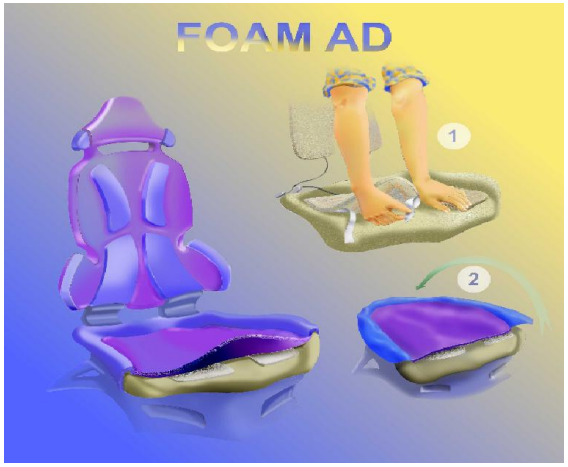
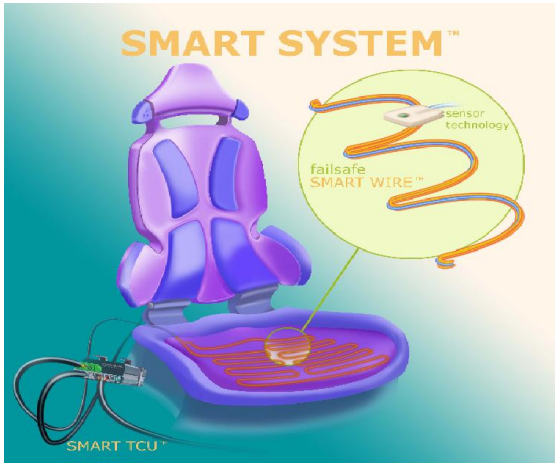
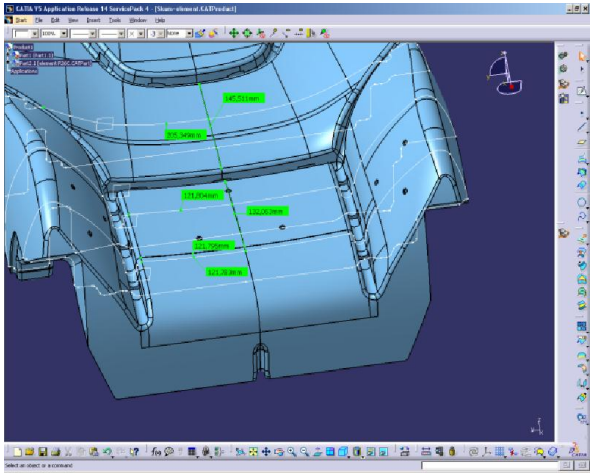
Role-based Modelling Approach



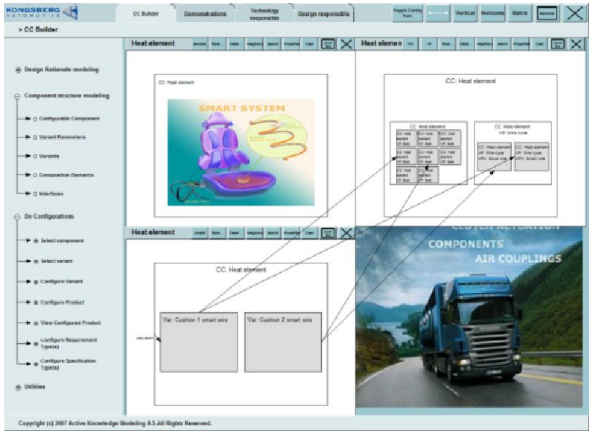
Product Manager



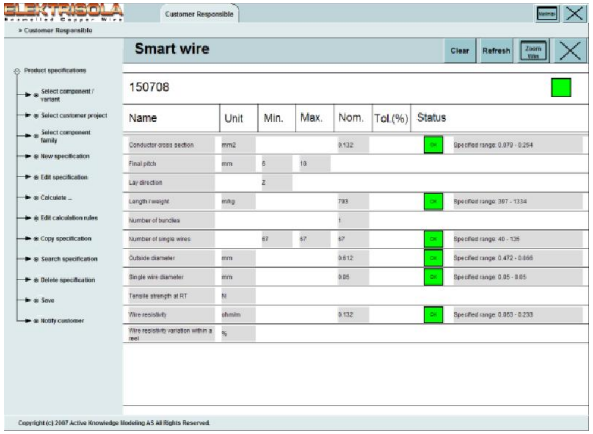
Chief designer



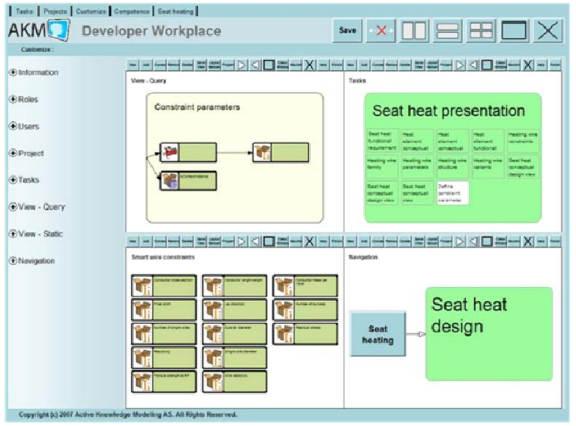
Customer Responsible



Product family designer



Supplier Responsible



Product Architect

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Automotive Seat-heating Design

The main challenges were to:

- Capture and correctly interpret customer requirements, material specifications, and design solutions
- Create role-specific, simple to use and re-configurable workplaces,
- Create effective shared workplace views and services for parameter balancing,
- Improve the quality of specifications and design for customers and suppliers,
- Improve communications, coordination and instant collaboration among stakeholders,
- Find a good methodology for product design, using task-patterns for automating most of the customized product design and engineering.

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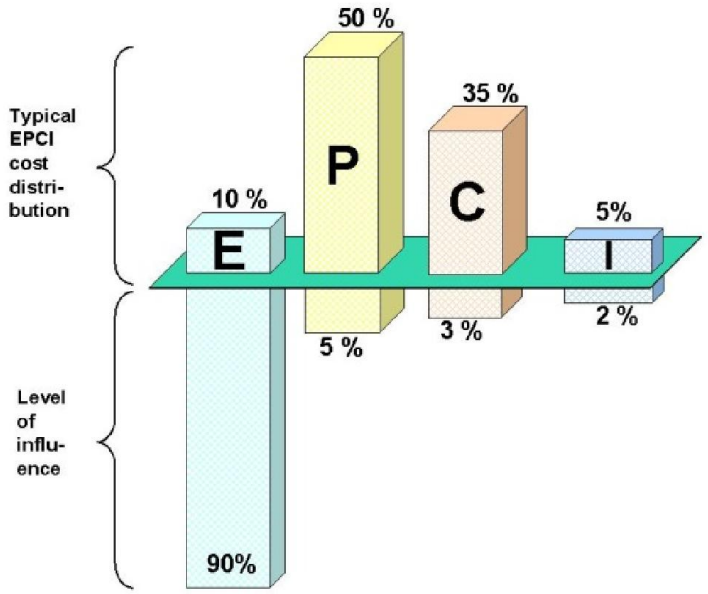
Akers Solutions - Pilot Demonstrator

- Start with concept definition of a subsystem involving 2-4 discipline teams
  - The subsystem should have some complexity of CTR parameter sets
- Restructure the PEM into a PEAK architecture
  - In particular reduce the complexity of Control and Execution level processes through role specific view
  - Capture and utilize contexts for parameters as relationships between work processes and knowledge areas / control objects / quality level parameters
  - Improve the PEM improvement process with patterns and templates



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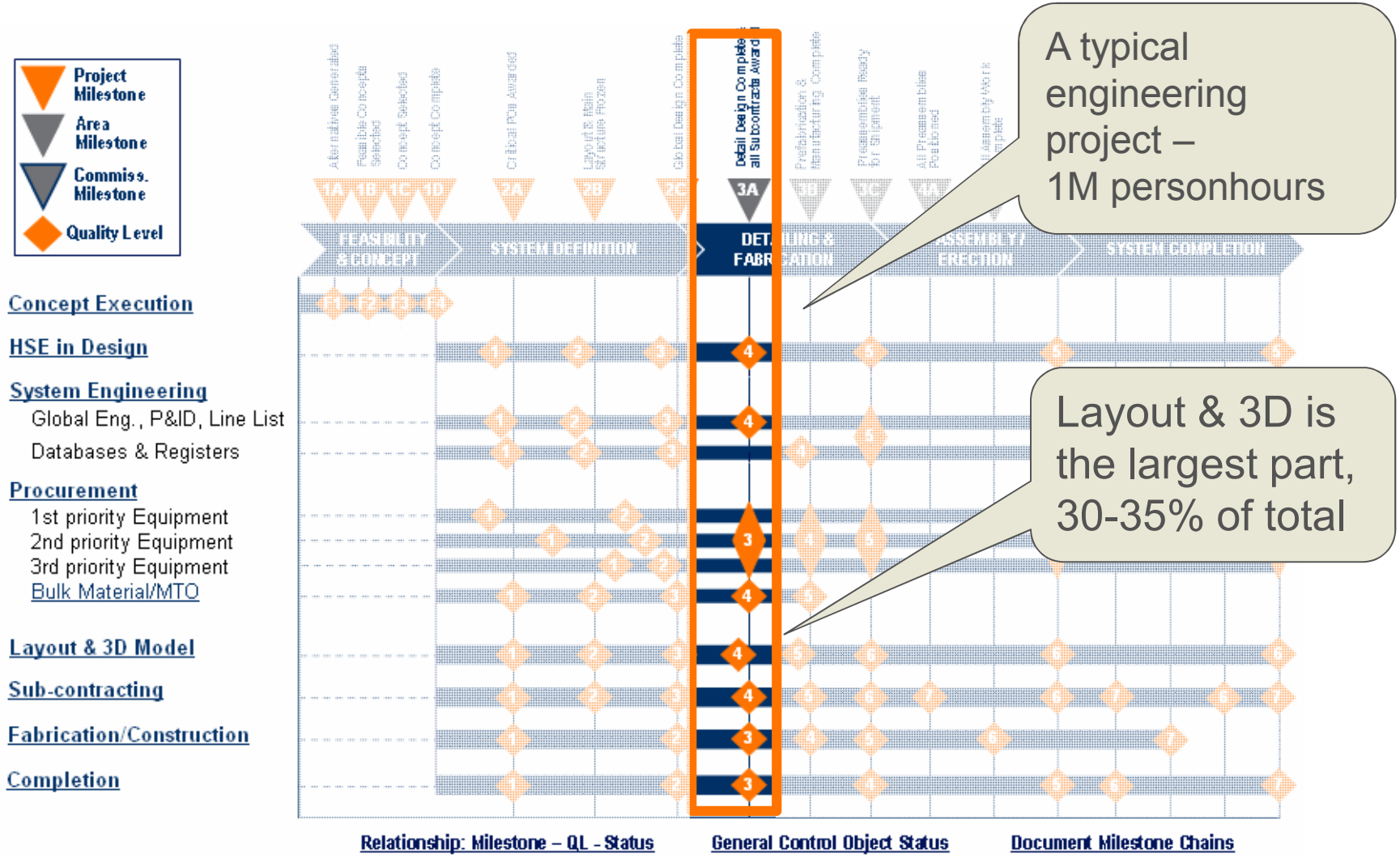
Scope: Stage 2C Global Design Completion



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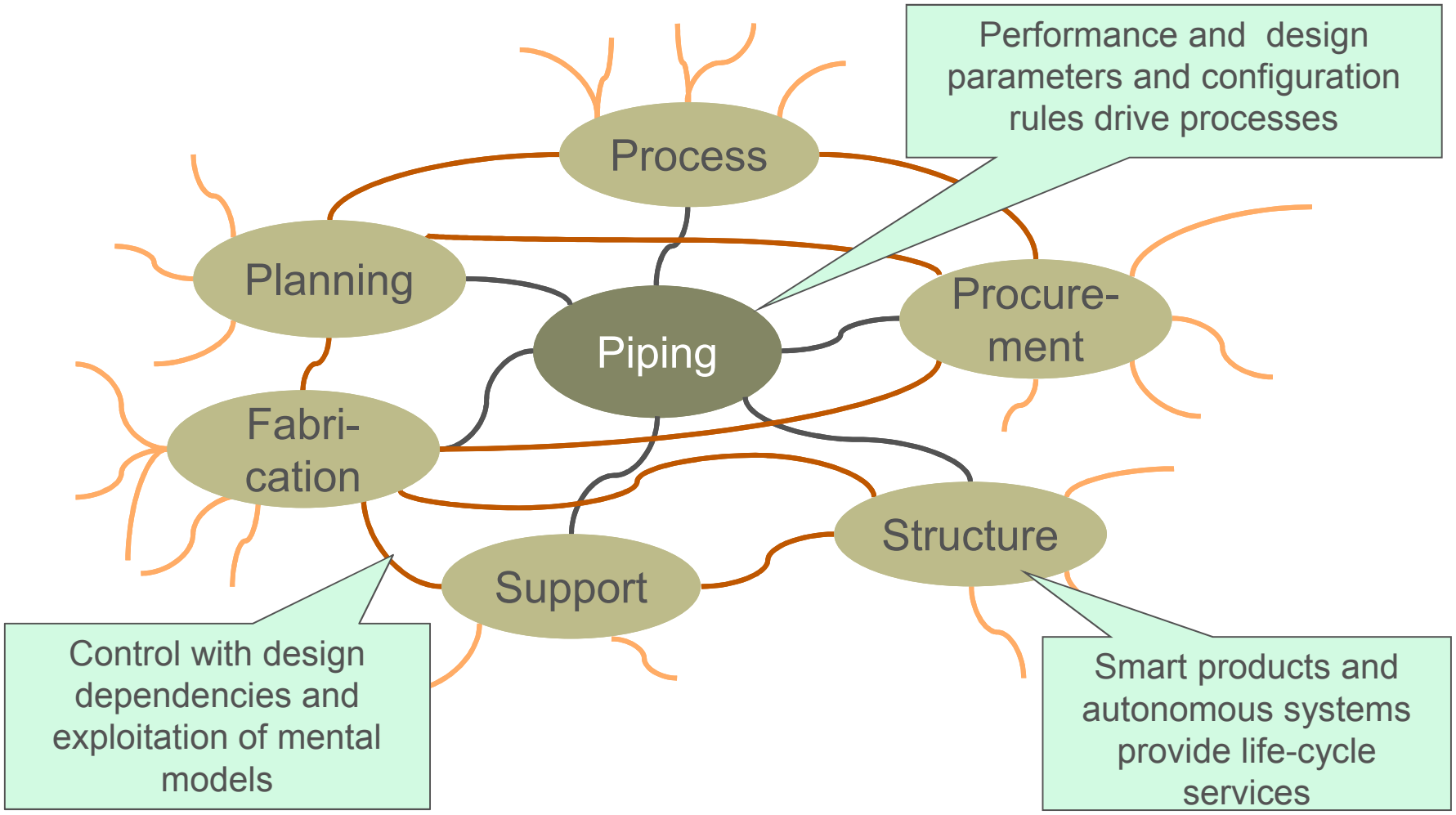
Knowledge-space & Workspace properties



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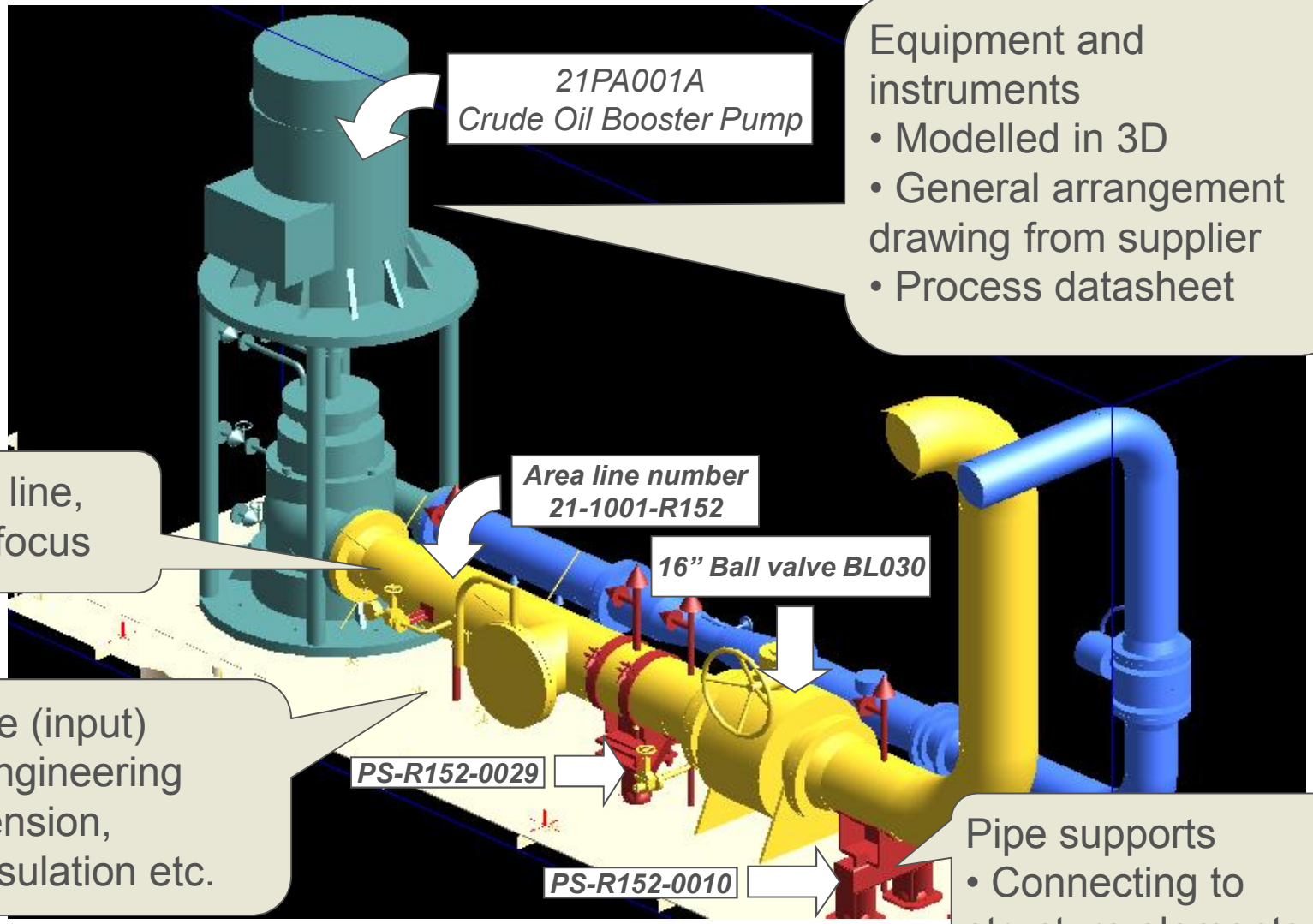
Example of Pipe- area designer tasks



Equipment and instruments
- Modelled in 3D
- General arrangement drawing from supplier
- Process datasheet

Pipe area line, our main focus

Process line (input)
- System engineering
- Pipe dimension, material, insulation etc.

Pipe supports
- Connecting to structure elements

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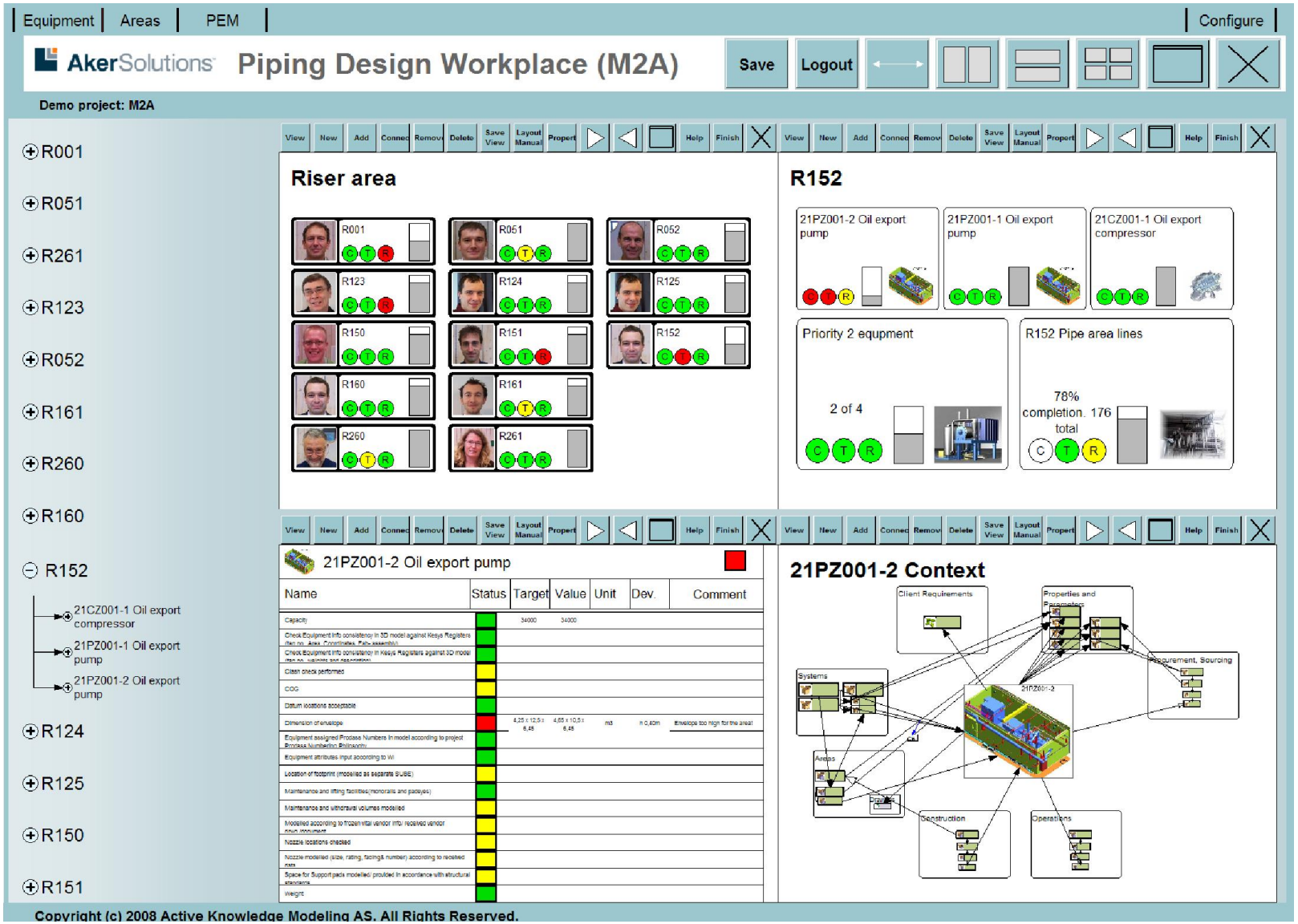
Architecting and Design Workplace early version



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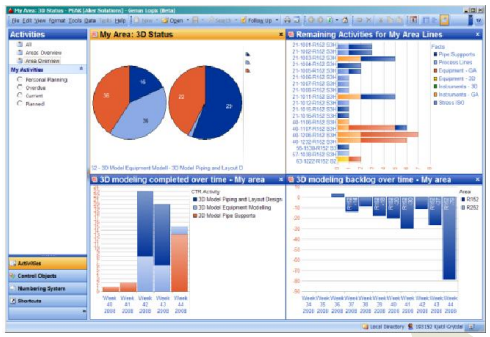
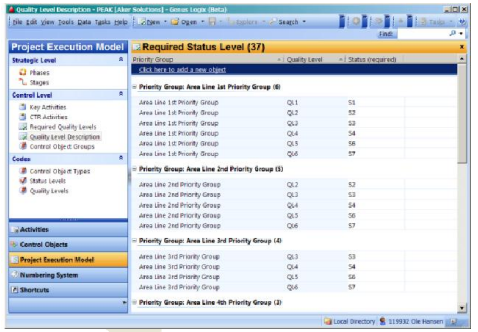
Solution Architecture

Workplaces for roles





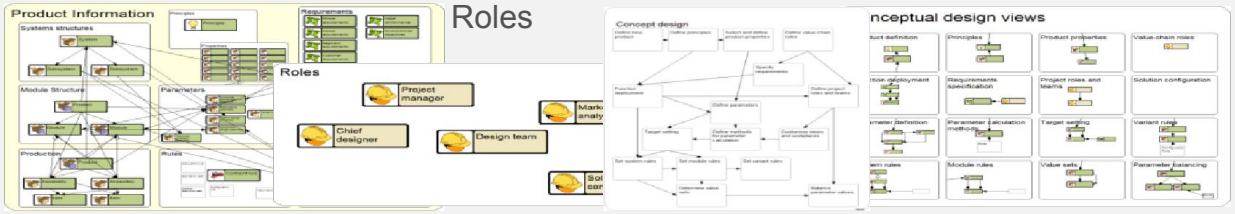
Active Knowledge Architecture

Products

Organization Roles

Processes, Tasks

Systems, Views



Planning and project mgmt

Product speci- tions

3D CAD

Systems engineering

Document mgmt.

Excel planning sheets

Project Execution Model

Engineering Numbering System

The Paradigm-shifting Concepts

1. *Role-oriented Organizations* - capturing work-centric contexts
2. *Multi- dimensional Knowledge Spaces* - simplifying collaboration and property parameter management
3. *Holistic Design Methodology*– working top-down, bottom-up and middle-out
4. *Context-rich Workspaces* - enabling model execution and model-based workplaces
5. *Active Knowledge Architecture* - integrating approaches, methods, services and systems
6. *Model-based, Architecture-driven Workplaces* - configuring agile workplaces and solutions
7. *Concurrent Modeling and Operation* – close the gaps between design and execution
8. *Workplace Visual Landscape* – simplifying networked collaboration

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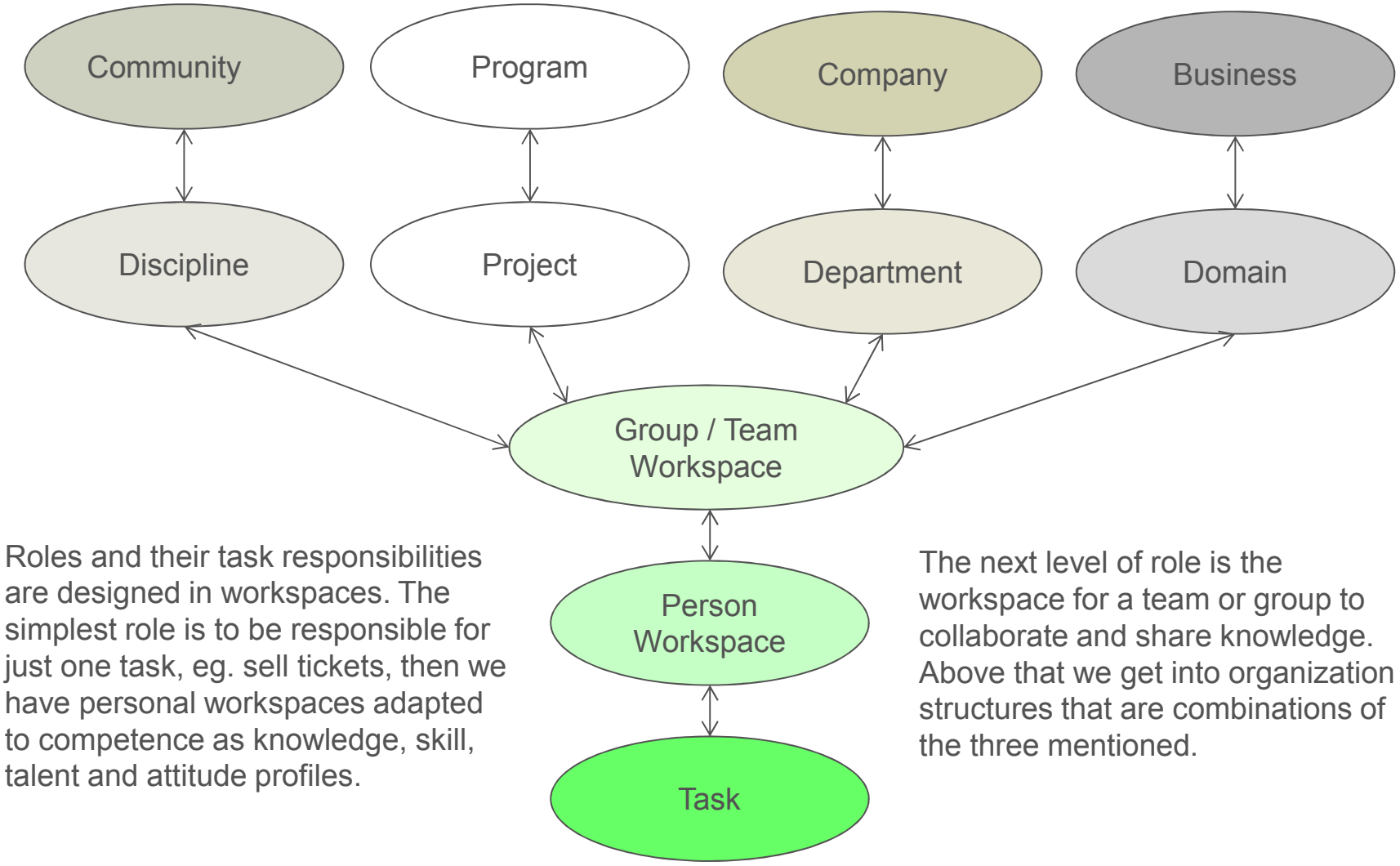
Generic Types of Roles

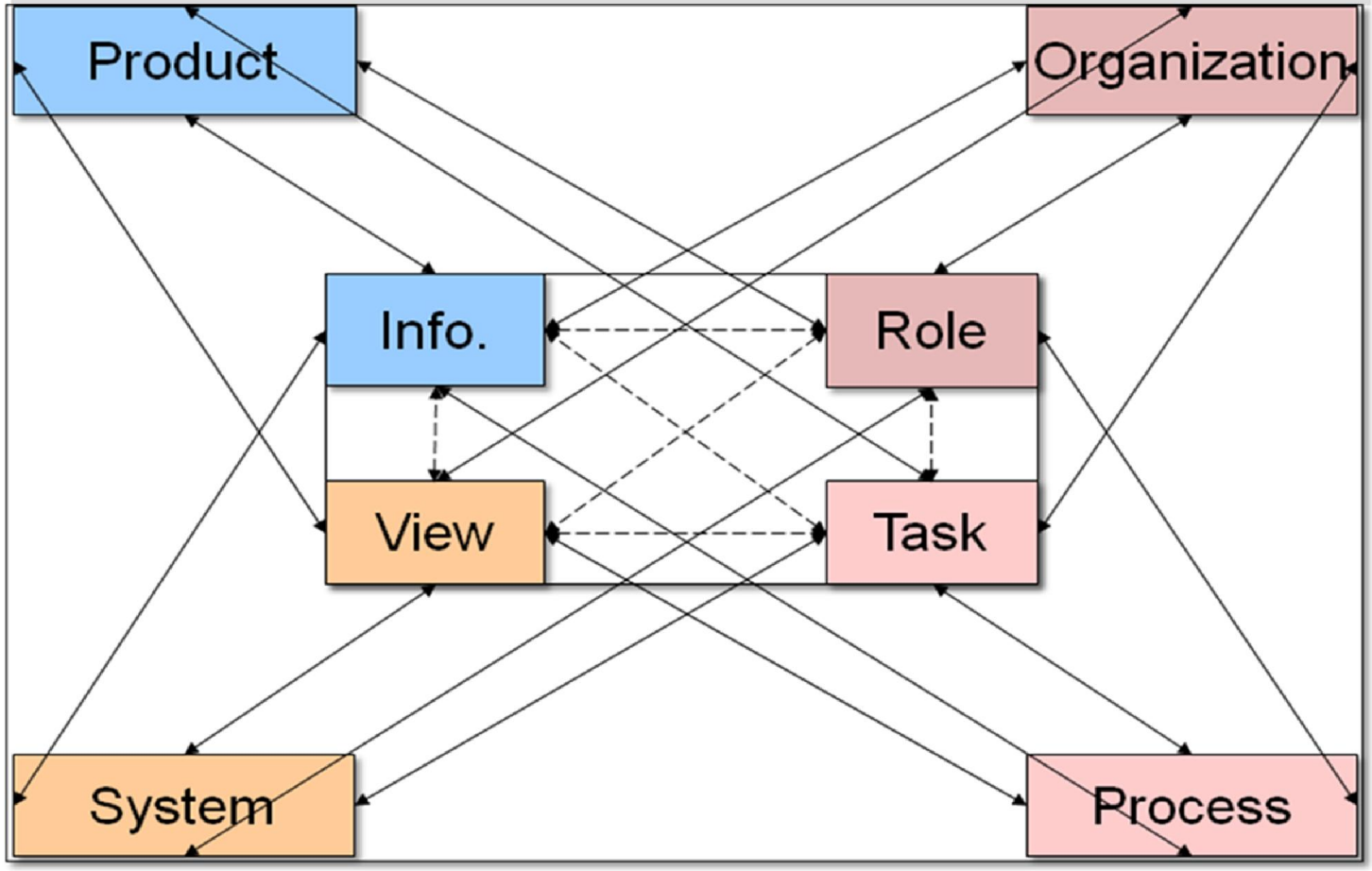


Roles and their task responsibilities are designed in workspaces. The simplest role is to be responsible for just one task, eg. sell tickets, then we have personal workspaces adapted to competence as knowledge, skill, talent and attitude profiles.

The next level of role is the workspace for a team or group to collaborate and share knowledge. Above that we get into organization structures that are combinations of the three mentioned.

Finegrained design modelling language

The key to holistic design and executable models, is the visual IRTV language, realizing innovative design principles.



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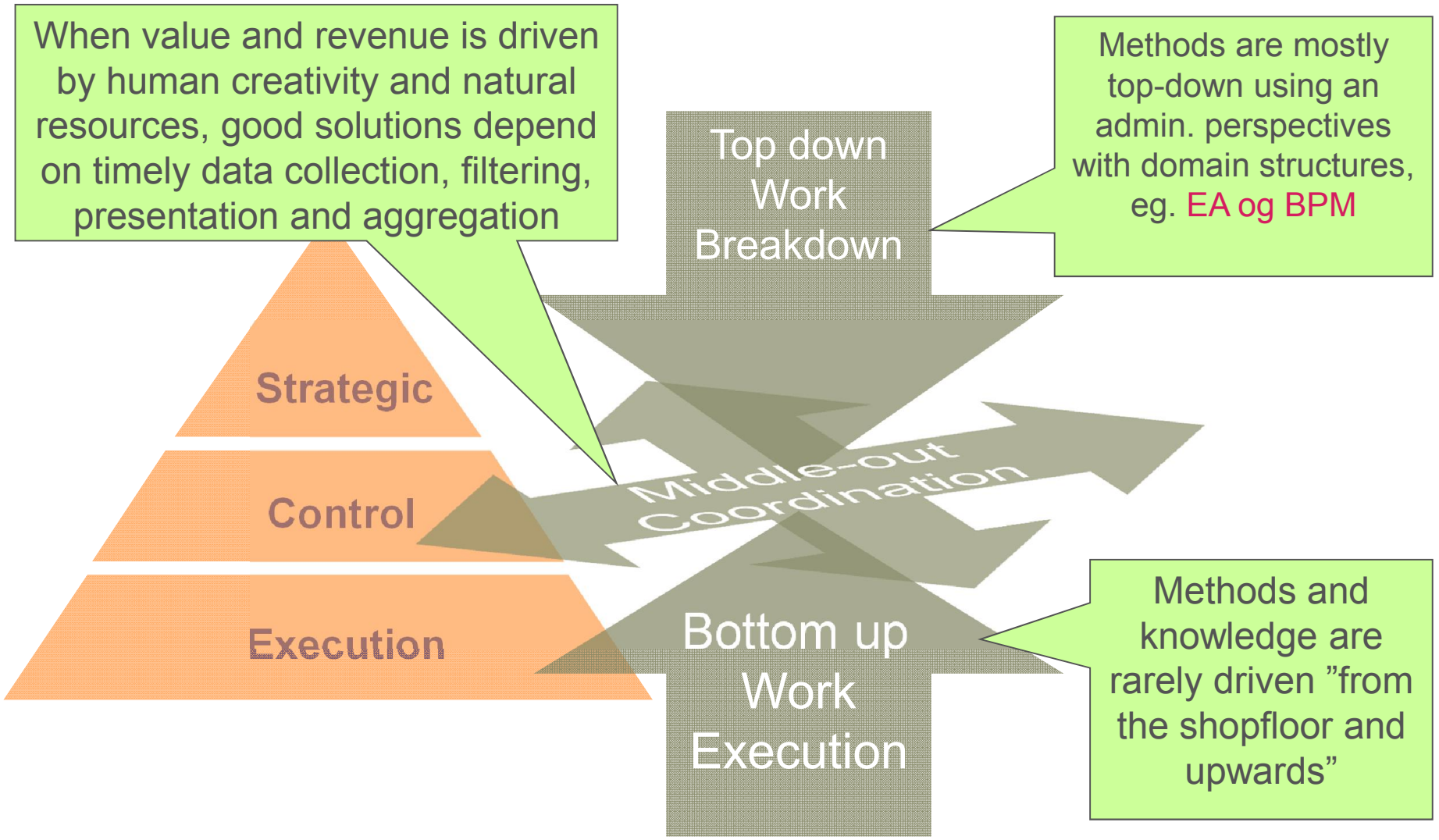
Holistic Design Methodology



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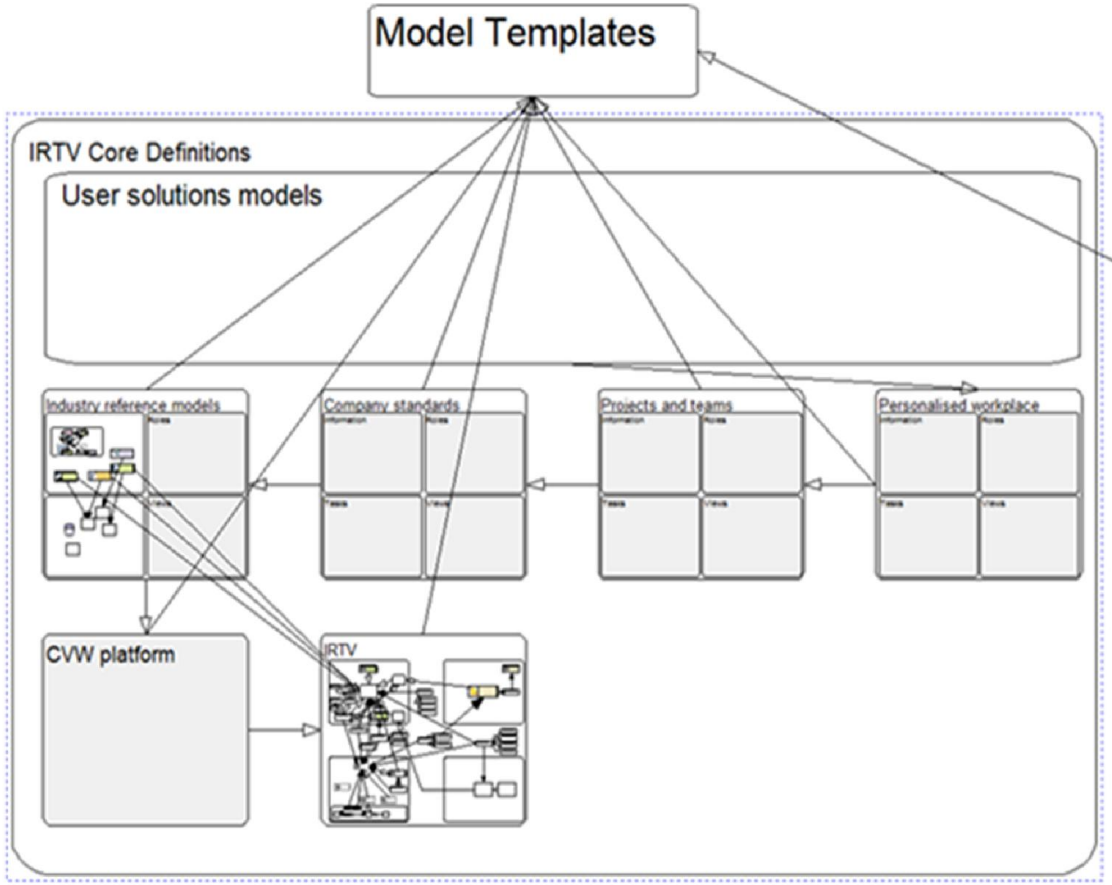
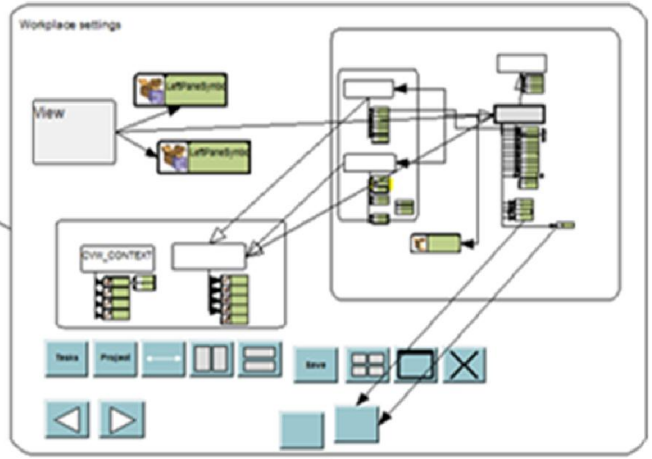
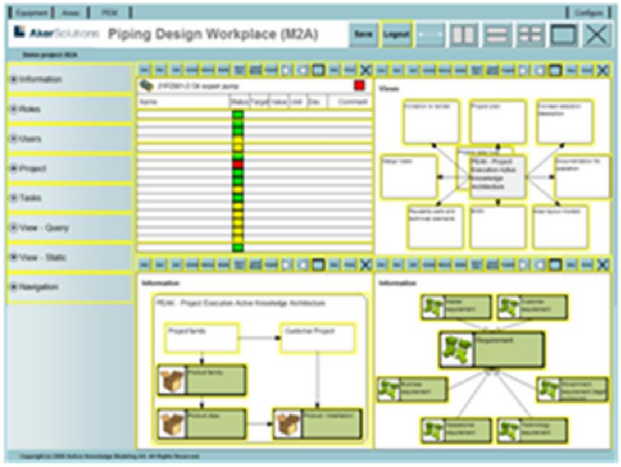
Model-based, Architecture-driven Solutions





Model-based ⇕ Workplaces



The framework is composed of enterprise knowledge and role-oriented workspace, and workplace models.

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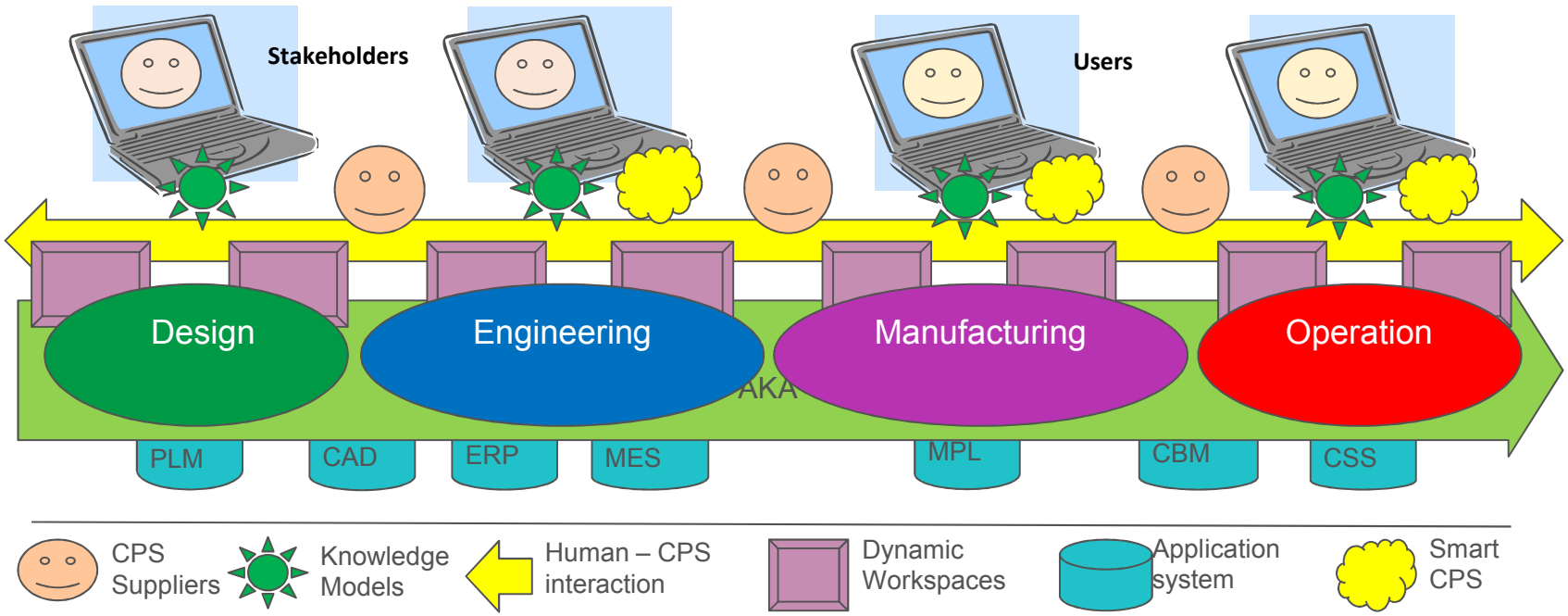
Ongoing Research - Scientific Approach



The knowledge base is the Active Knowledge Architecture (AKA)

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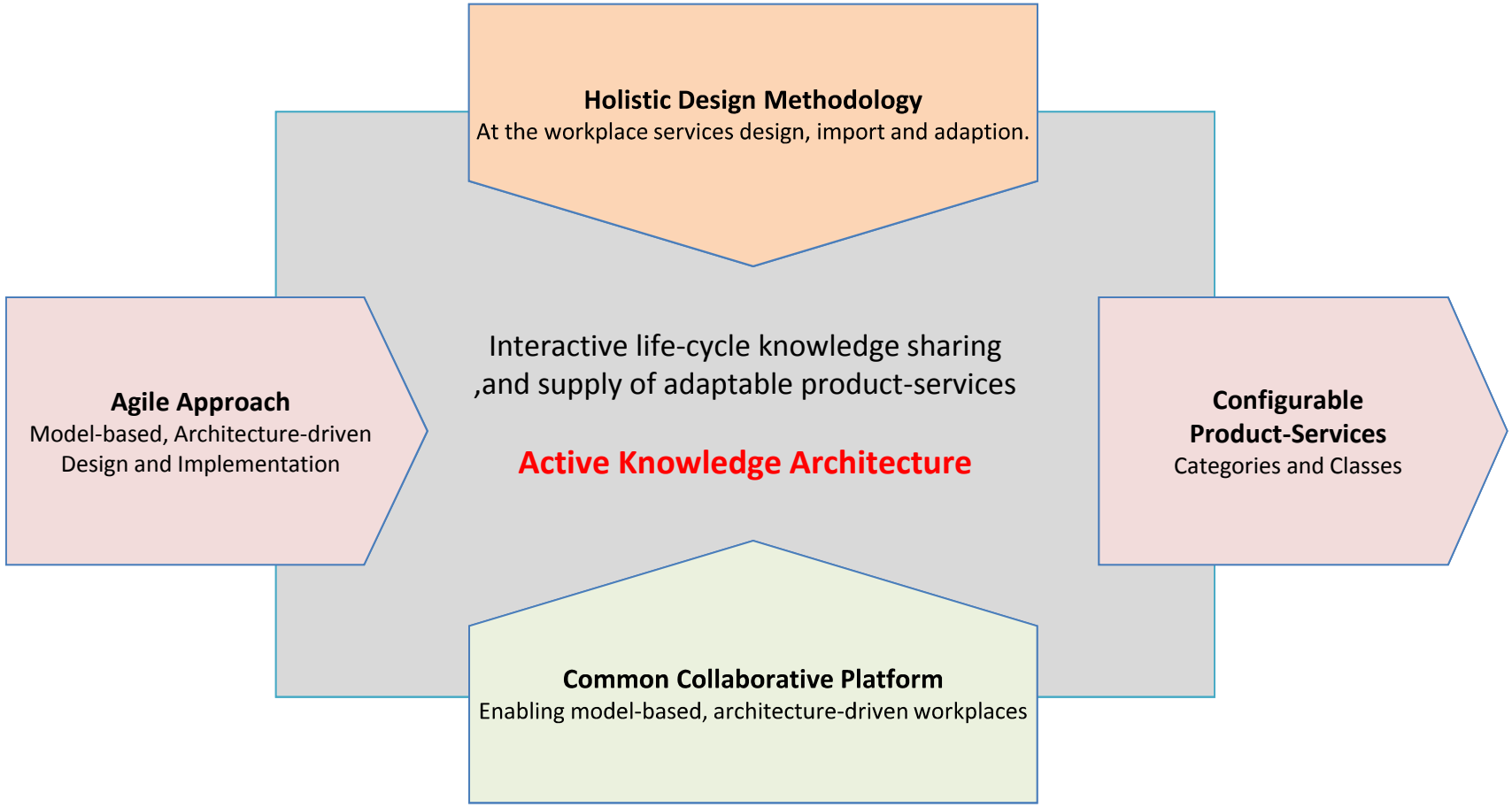
Framework for Knowledge Modelling and Execution



Exploiting Enterprise Knowledge Spaces and Workspaces and their properties

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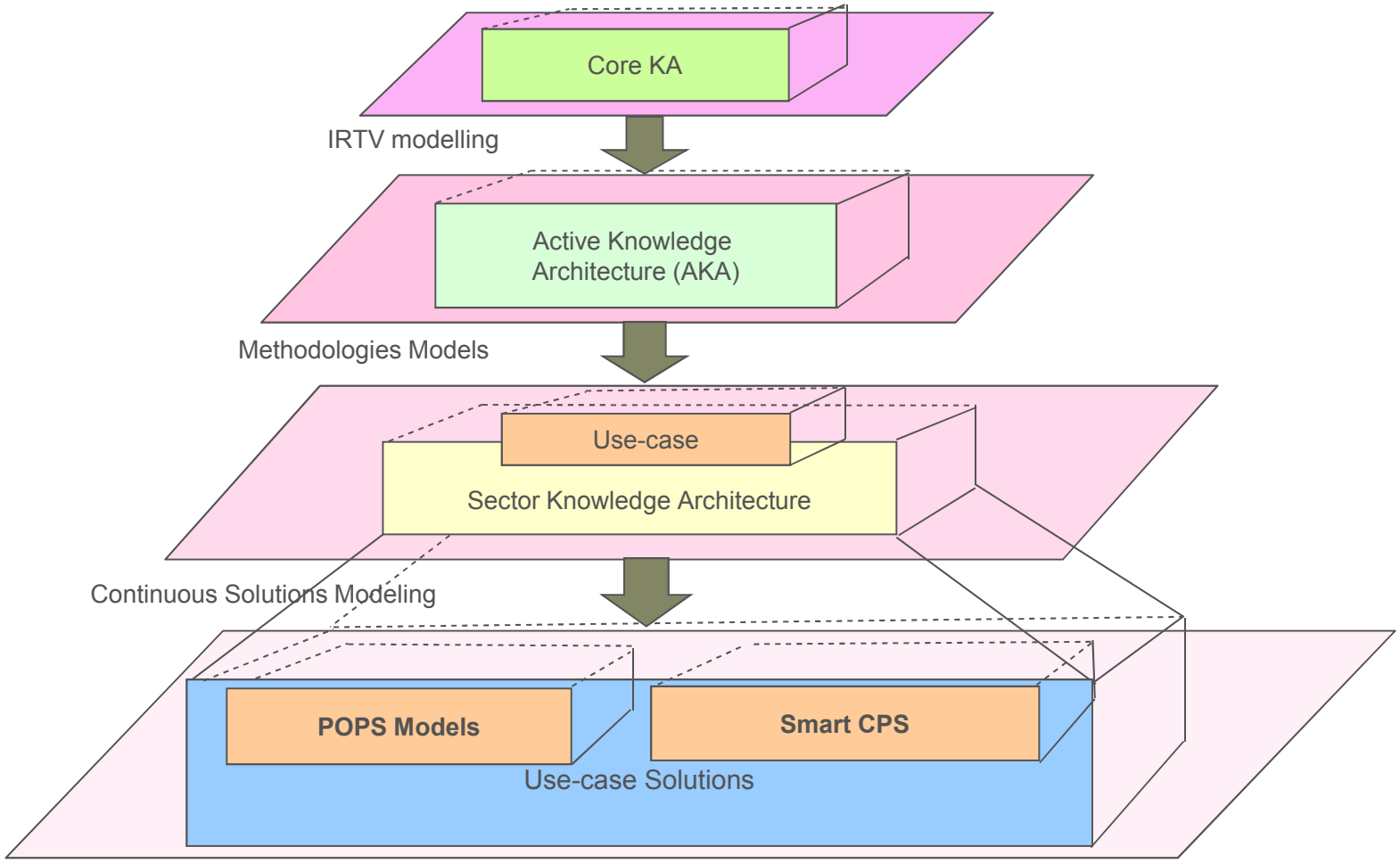
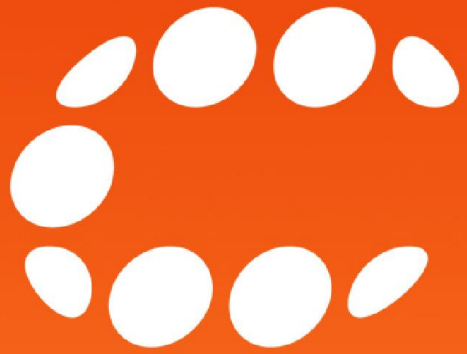
Enterprise Active Knowledge Architectures



Knowledge Architectures supporting Smart CPS design and execution

Added Capabilities and Benefits

1. Enable collaborative model-based execution and design
2. Support work in context, modeling knowledge spaces
3. Support roles and model-generated workspaces
4. Capture local nuances, practices and rules and rich context
5. Giving users control over data, information flows and viewing
6. Closing the gap between design and execution
7. Extend networking platforms to invite new partners
8. Extend and integrate method base with pragmatics
9. Integrate and provide role-specific operational views
10. Give control of IT solutions and services to practitioners
11. Draw on the best from mental and digital models
12. Produce event- and situation-driven communications and views



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