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# Analysing Enterprise Models from a Fractal Organisation Perspective – Potentials and Limitations

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## Overview

Motivation

Background

- Enterprise Modeling
- Fractal Organizations

Operationalization of Fractal Organization Properties

- Questions to investigate
- Business Analysis Process

Application of the Operationalization

- Public Authority Case
- Industrial Case

Summary and Future Work

## Motivation

Many enterprises/industries act in turbulent business environments

- requires such features as agility and viability.
- requires means for achieving a good balance between complexity and simplicity in organizational management and operations

Fractal organisation structures

- received much attention manufacturing industries or enterprise engineering
- advantages of fractals:  
flexibility, robustness and easy adaptation to new business challenges

Questions to investigate:

- Does it make sense to apply fractal organisation principles when analysing businesses? Does this give useful results pertinent to analysis purpose?
- What are the potential benefits and limitations of doing this?

## Background: Enterprise Modeling

### Enterprise modeling

- traditional application purpose:  
understand the current situation in an enterprise in order to identify or explain business problems and to propose improvements
- many methods, approaches, tools and work practices exist, e.g. in
  - business process reengineering,
  - process improvement,
  - enterprise knowledge modelling,
  - organisational renewal,
  - information systems development.

### Focus of this paper:

- **business analysis**, i.e. analysing enterprise models to identify organisational improvement potential

## Background: Fractal Organisations

### Fractal:

- independently acting corporate entity whose goals can be precisely described

### Properties of fractal organizations

- Self-similarity:  
structures repeat on different scales and/or different dimensions
- Self-organization: fractals restructure, regenerate and dissolve themselves;  
basis is dynamic process for goal formulation and decision about internal and external contacts
- Goal orientation: goals from individual fractal is free from contradiction and must serve objective of achieving corporate goals
- Dynamics and vitality: performance is subject to constant assessment

### Other properties

- Emergence
- Connectivity
- Co-evolution
- Simple rules
- Sub-optimality
- Requisite variety



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## Fractal Organisation Properties for enterprise model analysis

Aim: adaptation of fractal organisation properties for use in business analysis

- How to interpret the property in the context of business analysis?
- How to operationalize this interpretation for practical use, i.e.
  - what questions to investigate in an actual analysis case and
  - how to perform the analysis?

Assumption:

- the “as is” situation in an enterprise already has been captured and documented in a model, i.e. we focus on analysis of models rather than on developing them

## Self-Similarity

Repetition of a particular pattern of organization structure at different scales of a particular organizational dimension or at different scales of several organizational dimensions simultaneously.

- ***SS-1:** Do organisation patterns repeat on different scales of the organisation in the dimension "organisation structure"? If so, does the repeating pattern have advantages compared to other structures and should be implemented on all scales?*
- ***SS-2, SS-3, and SS-4:** Same as SS-1, but for product structure (SS-2), process structure (SS-3), resources structure (SS-4).*

Information should no longer be monopolized, but be made generally available

- ***SS-5:** Is the information system structure included in the model? If so, do all organisation units have access to essential information systems?*

## Self-Organisation

Fractals restructure, regenerate and dissolve themselves based on goals in a dynamic process and internal and external contacts.

- *SO-1: Is delegation of responsibilities in the organization reflected in the model? If so, do continuous improvement and adaptation processes exist?*
- *SO-2: Have organizational roles responsible for continuous improvement been established?*

“Process patterns” characterizing fractal organisations are described (e.g. monitoring, analyzing, reporting, planning, executing)

- *SO-3: Can all processes from the process pattern be found in the enterprise model under consideration? If so, can additional properties of fractal organisations be identified?*
- *SO-4: Can the majority of the sub-processes of the process pattern be found in the model? If so, are the missing processes – if not named in a different way - the starting point for improving the organisation into this direction?*

## Goal Orientation

Goals of individual fractals are free of contradictions from the goals of the overall organization, serve the objective of achieving corporate goals and involve all units concerned.

- *GO-1: Are the enterprise's goals included in the enterprise model? If so, are the goals broken down for use in different organisational units?*

## Dynamics and vitality

Property/operationalization overlaps with *SO-1*, *SO-2*, *SS-5*, and *GO1*.

Additionally, fractals with identical goals and input and output variables can have quite different internal structures.

- *DV-1: Do different processes, activities, or tasks with identical input/output variables exist in the model? If so then if they have different internal structures, is there a superior one performing better?*

## Analysis Process

**Team:** at least one expert in fractal organisation properties familiar with the questions and one enterprise modelling expert familiar with the model

**Process:** start with an introduction of scope and purpose of the model, the method and notation used, and a walk-through of the actual model

**Questions** are analysed as follows:

- SS-1 to SS-4: the analysis team jointly browses different perspectives (process, organization, product, resources) of the enterprise model on different levels. Similarities are documented as pattern candidates.
- SO-1, SO-2 and GO-1: the analysis team checks the meta-model for entity types or relationships types matching the wanted ones
- SO-3 and SO-4: the analysis team browses the instances of the process-related entity-types
- DV-1: same procedure as for SS-1 to SS-4, but limited to those parts of the model containing processes, activities or tasks.



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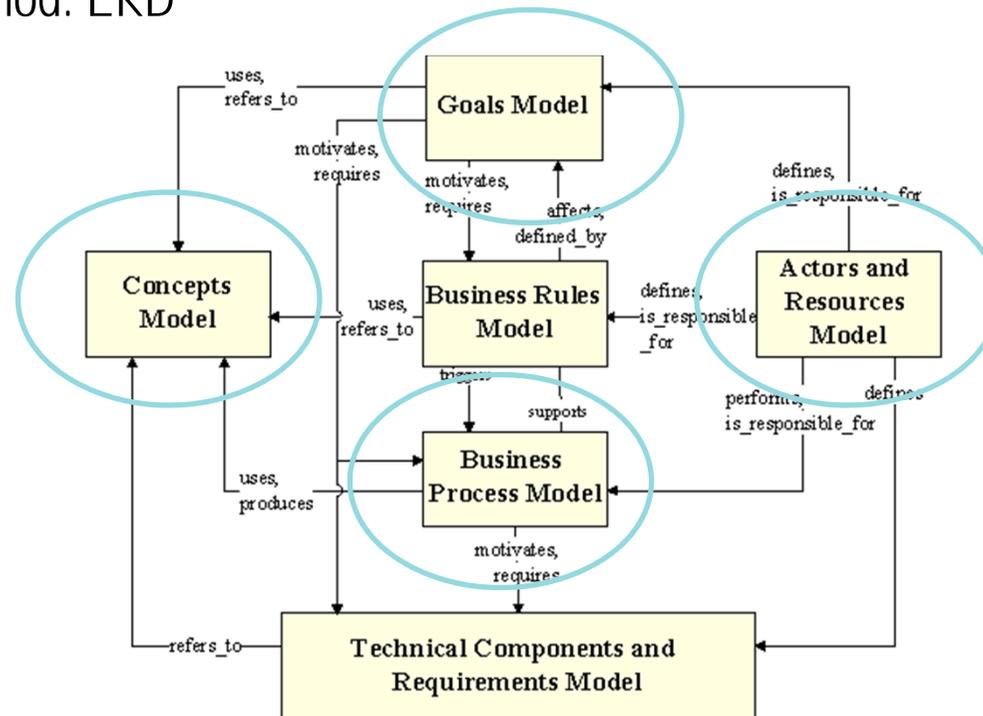
Summary and Future Work

## Public Authority Case

The model was made in 2005.

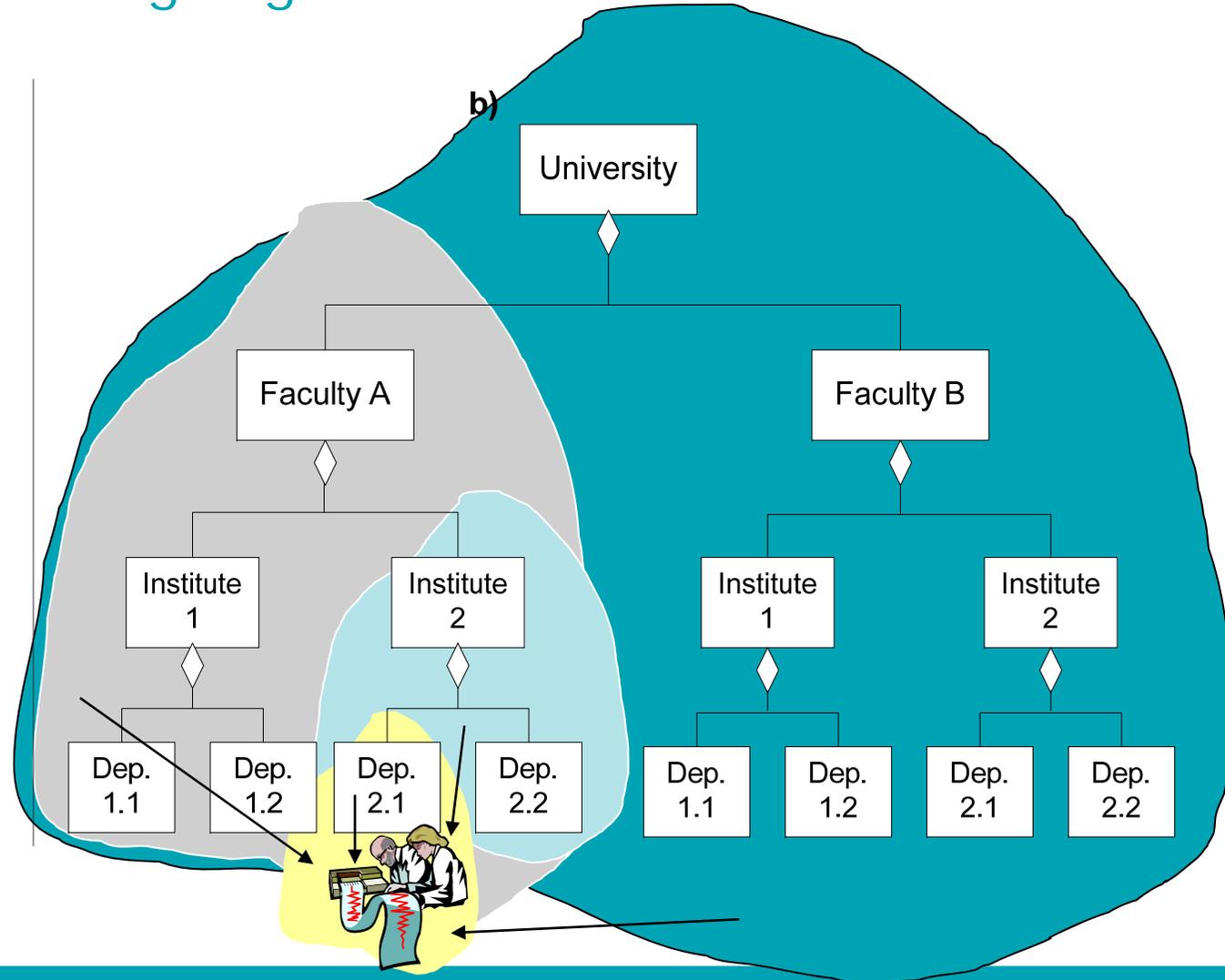
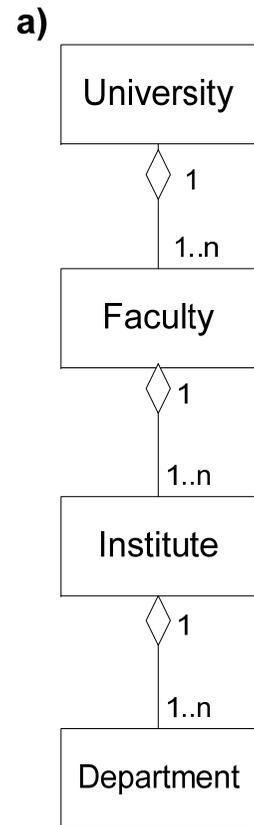
Purpose: to establish a vision of new information systems of a university

Method: EKD





# SS-1: Repeating Org. Structures



## Public Authority Case: Some Details

- It was not possible to detect fractal properties *SS2*, *SS4*, *SO1*, and *SO3*, **but**
  - Organisation patterns repeat on different scales in the product structure and resource structure
  - Delegation of responsibility
  - All processes from the process pattern can be found in the model
- Properties, namely, *SS3*, *SO2*, *GO1*, and *DV1*, were detected to some extent
  - Organisation patterns repeat on different scales in the process structure
  - Roles responsible for self-organization
  - Organizational goals broken down for use in different organisational units
  - processes, activities, or tasks with identical input/output variables in the model have different internal structures
- Nevertheless, the results of analysis of fractal properties showed that utilization of them in enterprise models could provide
  - richer models
  - more detailed information systems requirements

## Industrial Case: EU-FP6-project MAPPER

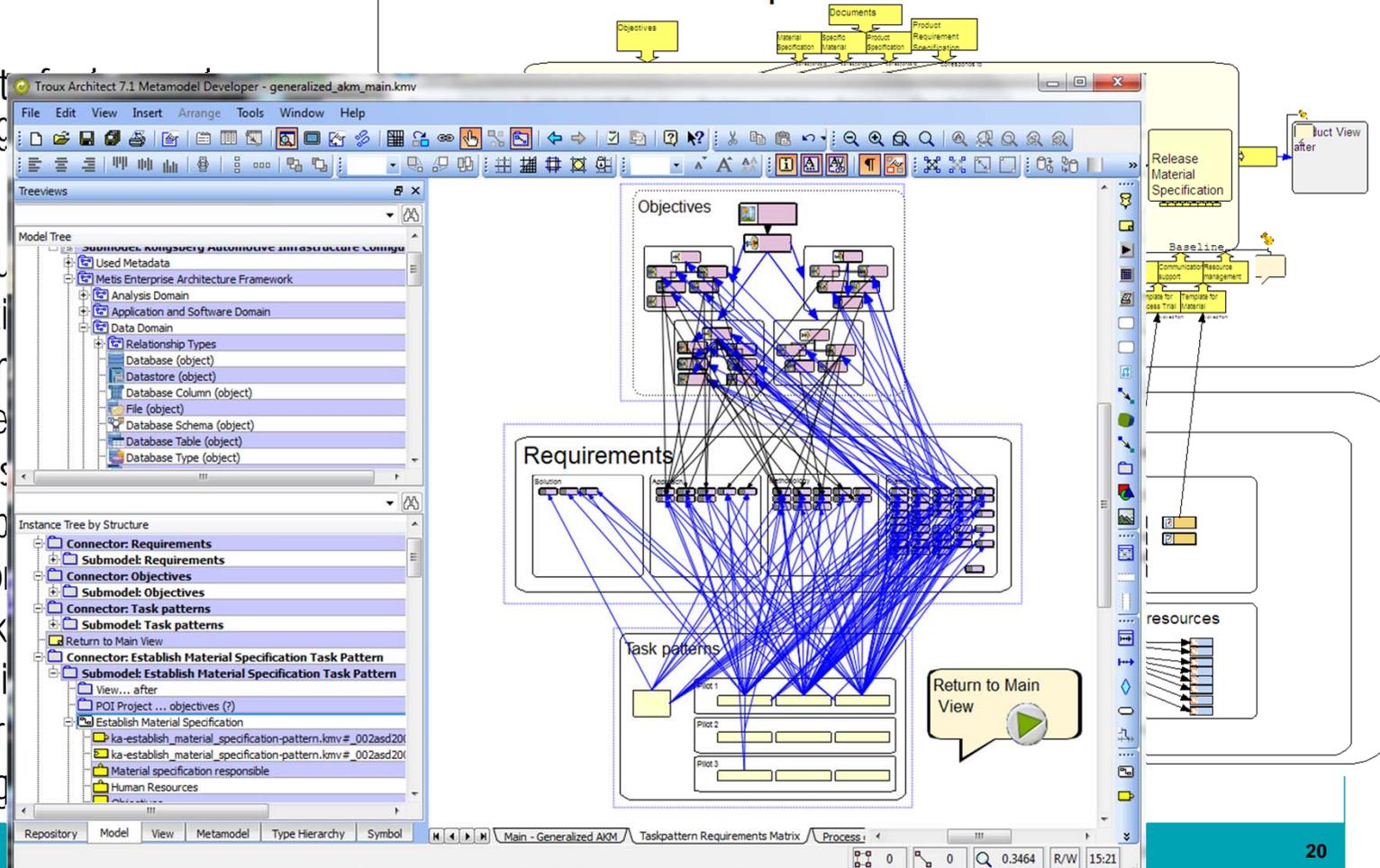
Model focus:

- department engineering innovation' supplier

Processes include:

- Target Setting
- Establish material
- Develop new
- External test
- Prototype build
- Establish process
- Benchmark
- Brainstorming
- Support for
- POI Testing

### Establish Material Specification

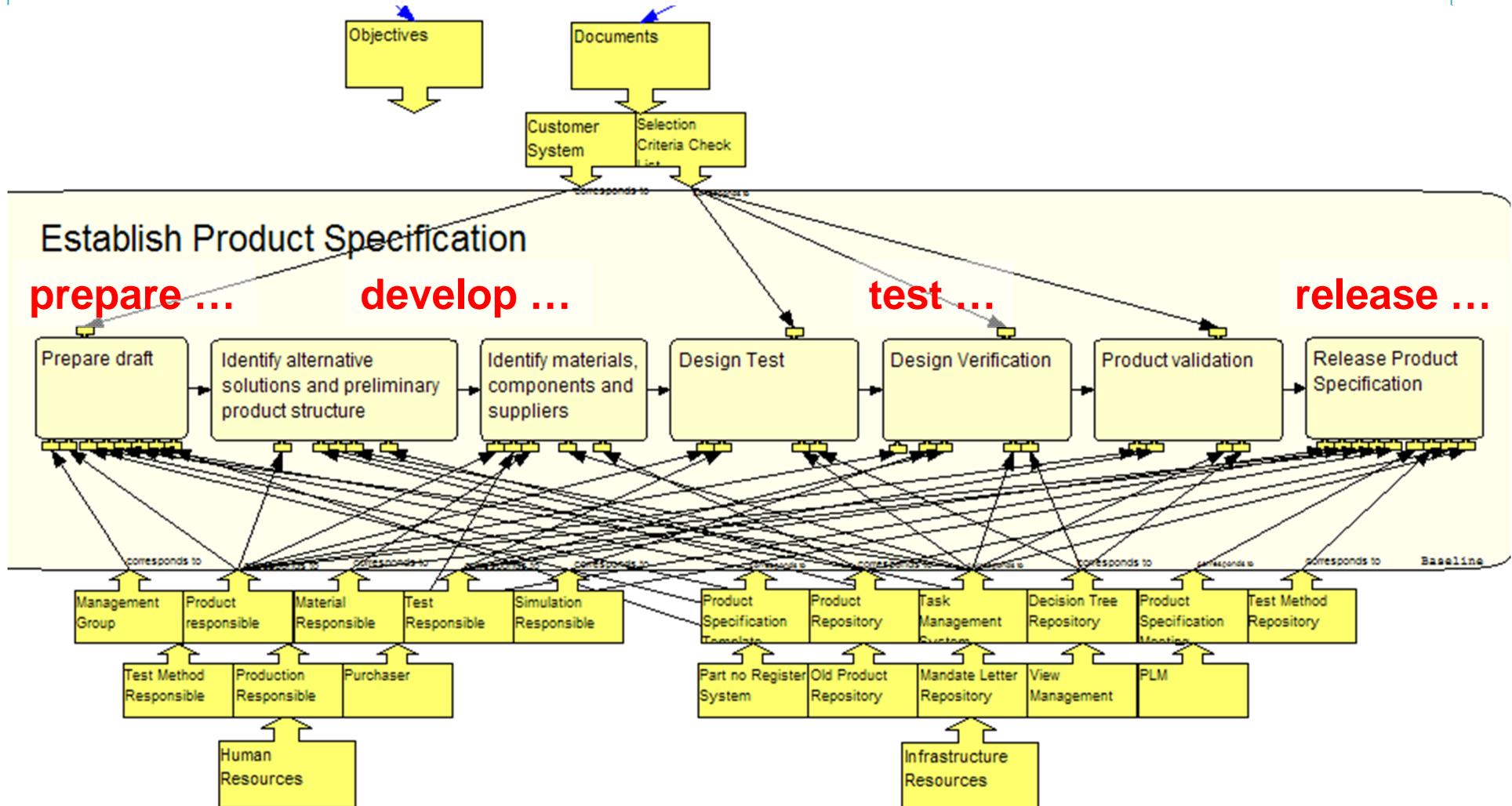


## Industrial Case: Summary of Analysis Results

Property	Applicable?	Usefulness
SS-1	Property not detected	Not applicable (property not detected)
SS-2	Property detected	Confirmation and contradiction: some part of the structures should repeat, but unification of product structures wouldn't make sense.
SS-3	Property detected	Confirmation: processes with similar structure
SS-4	Property not detected	Not applicable (property not detected)
SS-5	Property not detected	Not applicable (property not detected)
SO-1 to SO-4	unclear	Not applicable (aspect missing in the model)
GO-1	Property detected	Confirmation: goals have to be propagated in organisation structure
DA-1	Property not detected	Not applicable (aspect missing in the model)

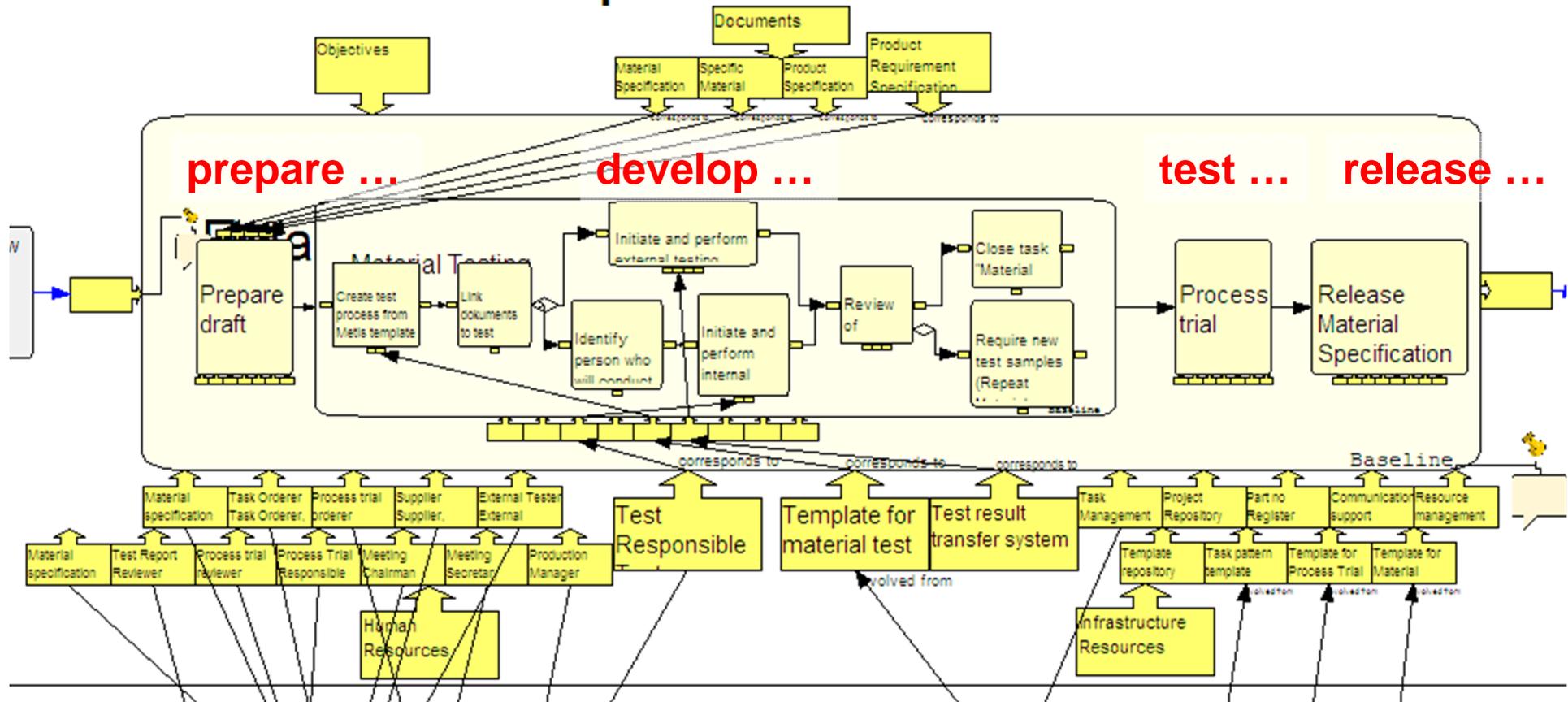
- it was possible to apply the operationalization; only self-organization could not be utilized
- most of the properties were not detected in the model, indicating that the enterprise does not show many characteristics of a fractal organization

# Industrial Case: Repeating process patterns (1)

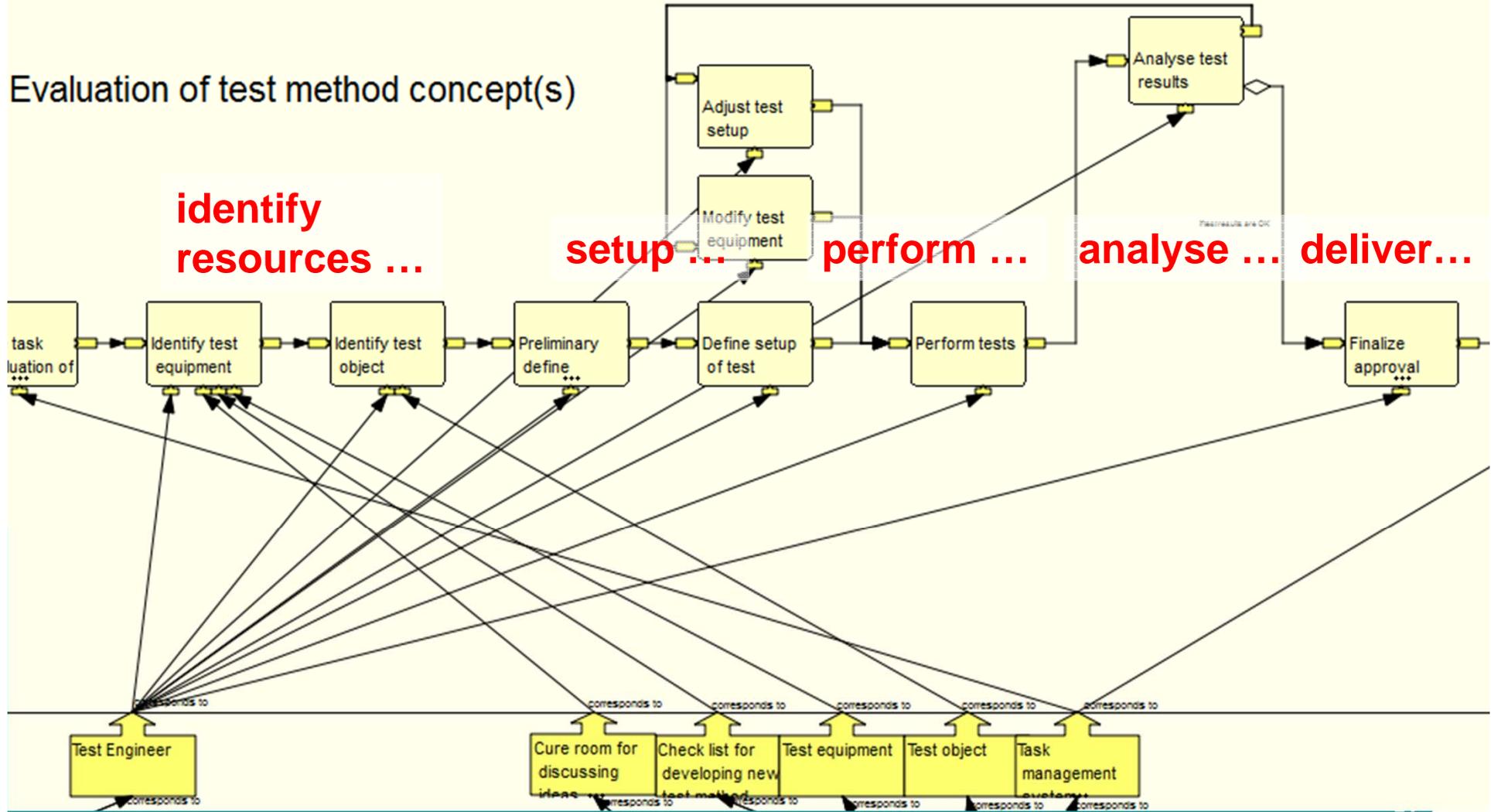


## Industrial Case: Repeating process patterns (2)

# Establish Material Specification



## Industrial Case: Repeating process patterns (3)



## Conclusions

Observations from the cases

- Public authority case showed many properties of fractal organizations and led to new insights regarding further improvement potential
- Industrial case showed the applicability of the properties and importance of properties, like goal orientation and self-similarity.

Potential would probably be bigger if we started to use them already when capturing the “as is” situation in an enterprise

- could help to avoid certain shortcomings in analysis models, like missing delegation relations between roles or improvement processes,
- methods for enterprise modeling might have to be adapted
- for business analysis and process design activities, it might be beneficial to raise awareness for advantages of fractal organization forms and to offer additional method support



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### Main contributions

- (1) to adapt fractal organisation properties for use in analysis of enterprise models,
- (2) to present practical examples from industrial cases showing the pertinence of the fractal organisation properties, and
- (3) to identify potentials and limitations of using the fractal organisation perspective in enterprise model analysis

## Limitations and Future Work

### Main limitation

- small number of cases considered in the evaluation and the limited number of fractal organisation properties applied
- we should not even try to generalize these results.

### Future work

- identify characteristics of cases or organisations, where the use of fractal organisation properties in business analysis can be recommended
- operationalization has to be subject to a more thorough quality check
  - do we need to include more properties or a different interpretation of fractal organisation properties?
  - can the operationalization be made more precise, complete and easier to apply?



Thank you for your time and attention!

**Questions?**