

A modern interior space with a stone wall, a wooden bench, and a large window. The room is bright and minimalist, with a concrete floor and a white ceiling. The stone wall is made of light-colored, rectangular blocks. The wooden bench is dark and has a simple, functional design. The large window on the left side of the room allows natural light to enter, creating a bright and airy atmosphere.

# Business Technologies

A Modeling Centered,  
Application Oriented  
Course @AAU

# The Message

Any informatics program must teach **modeling and abstraction**

**For:**

- Modeling is the key ability of humans to understand and master their environment
- Models are essential instruments for targeted human action
- Informatics is the science and technique of Modeling, Analyzing, Designing, Implementing and Running Processes in an environment

⇒ **Mastering abstraction and understanding modeling methods and their underlying backgrounds are essential for informaticians**

# The Message

Introducing a modeling course in a program:

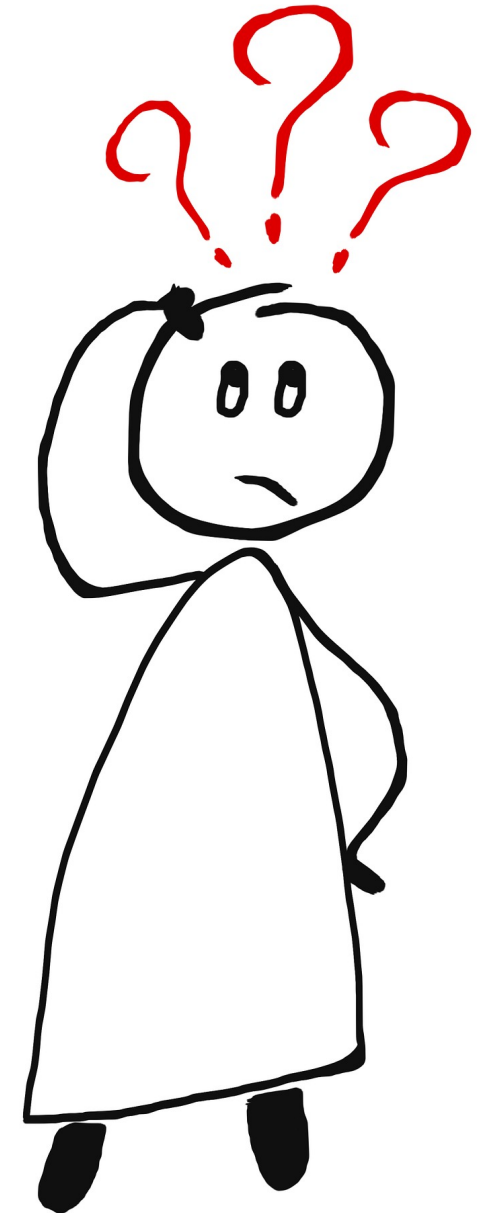
sounds simple ----

---- but it is not



# The Crux Questions

- When, i.e. in which semester ?
- What ?
  - Fundamentals (mathematics, epistemology, model theory)
  - Methods, languages, architectures
  - Domain specificity
  - Techniques
  - Application domains (structures, functions, processes)
  - ??
- How ?



# Our 1<sup>st</sup> attempt 2001-2006

„Einführung in die Modellierung“ (Fundamentals of Modeling)

2nd semester in the informatics and information systems programs

## Description 2001

„Die Studierenden sollen das Wesen der Modellierung und der damit verbundenen Abstraktionstechniken verstehen.

Aufbauend auf diesem Verständnis sollen sie die wesentlichen Modellierungsbereiche der Angewandten Informatik, verbreitete Metamodelle und Modellierungsverfahren kennen und anwenden können.

Praktische Fertigkeiten werden durch die Arbeit mit Softwarewerkzeugen wie Rational Rose (UML), ARIS-Toolset, INCOME erarbeitet.“

## x45 min Plan 2001

- 1 Erkenntnistheoretische Grundlagen der Modellierung
- 2 der Modellbegriff in der Informatik, Klassifikation Modellierungsbereiche und Modellierungsebenen
- 3 Graphentechnologien als Grundlage informatischer Modellierungsverfahren
- 4 Grundkonzepte der Theorie nichtsequentieller Prozesse
- 2 Warteschlangenmodelle
- 3 Prologik/Methoden der Anforderungsermittlung und -analyse
- Metamodelle, Sprachkonzepte, a priori Semantik, UML, Analyseverfahren und Modellabbildungen zur Struktur-, Funktions- und Verhaltensmodellierung
- 1 Grundsätze ordnungsmäßiger Modellierung (GOM)

## Contents 2006

- 👉 Fundamentals and basic notions
- 👉 The notion of "model" in Informatics
- 👉 Conceptual modeling using UML
- 👉 Basics of the theory of non sequential processes (Petri nets)
- 👉 Requirements modeling and analysis
- 👉 Queuing models
- 👉 Principles of orderly modeling
- 👉 Ontologies & domain models
- 👉 Examples of application modeling standards

# 2<sup>nd</sup> attempt, starting from 2013

„Business Technologies“ -- sometime in master or phd studies, 318 pp

## Course Goals

Modeling and Abstraction are key domains in Applied Informatics

Informaticiens, therefore, have to understand the nature of modeling and the related abstraction mechanisms based here-on

The students will be enabled

- to deal with, design and implement domain specific modeling languages,
- to analyze and model business processes,
- to apply a metamodeling framework as well as to configure a modeling toolset and use it in practice,
- have a comprehensive understanding of quality assurance in the context of application development processes.

# 2<sup>nd</sup> attempt Content

## Content

1. Introduction and Motivation
2. **Model and Modeling Process**
3. Metamodel Hierarchy, MCA and DSML
4. ADOxx Metamodeling
5. (Business) Process Modeling BPMN, Adonis and Horus
6. Ontologies
7. Process Quality, Quality Modeling, Principles of Ordely Modeling
8. Aligning Business Models with Business Processes
9. Foundations of Process Modeling

# 2<sup>nd</sup> Learning by Doing – Exercises Type a

## Group Assignments: Domain Specific Modeling Methods

You are requested to perform the necessary steps according to chapter 3 (p. 18 ff) for developing a (lean) domain-specific modeling method for one of the following domains:

- 1) Static and dynamic aspects in medical practices
- 2) Ambient assistance in the households of the elderly
- 3) Garden planning with 2D elements
- 4) Covid 19 Vaccination
- 5) Traffic planning of a city

There is one domain assigned per group. Intermediate states will have to be presented at the lecture.

 News forum











 Upload-Forum



# 2<sup>nd</sup> Learning by Doing – Exercises Type a

**Class hierarchy:**

- [-] Classes
  - [+] ~~X~~ \_LibraryMetaData\_
  - [+] Bedingung
  - [+] Kooperationstyp
  - [+] ~~X~~ \_ModelTypeMetaData\_
  - [+] Thing
  - [+] Person
  - [+] Service
  - [+] Reservation
  - [+] Location
  - [+] Vaccine
  - [+] Medical Staff
  - [+] Task
  - [+] Start Event
  - [+] End Event
  - [+] Vaccination
  - [+] MedicalService
  - [+] Queue
  - [+] WaitDate

FROM	TO	RELATION
 Service	 Medical Staff	----- uses
 Start	 Task	-----> miscellaneous
 Person	 Task	-----> requests
 Service	 Task	-----> workflow
 Medical Service	 Location	-----> requests

“Covid 19 Vaccination” assignment,  
implemented in Adoxx®

# 2<sup>nd</sup> Learning by Doing – Exercises Type b

## Group Assignments: Business Processes

You are requested to perform the necessary requirements elicitation and analysis, process model design and implementation for one of the following business processes:

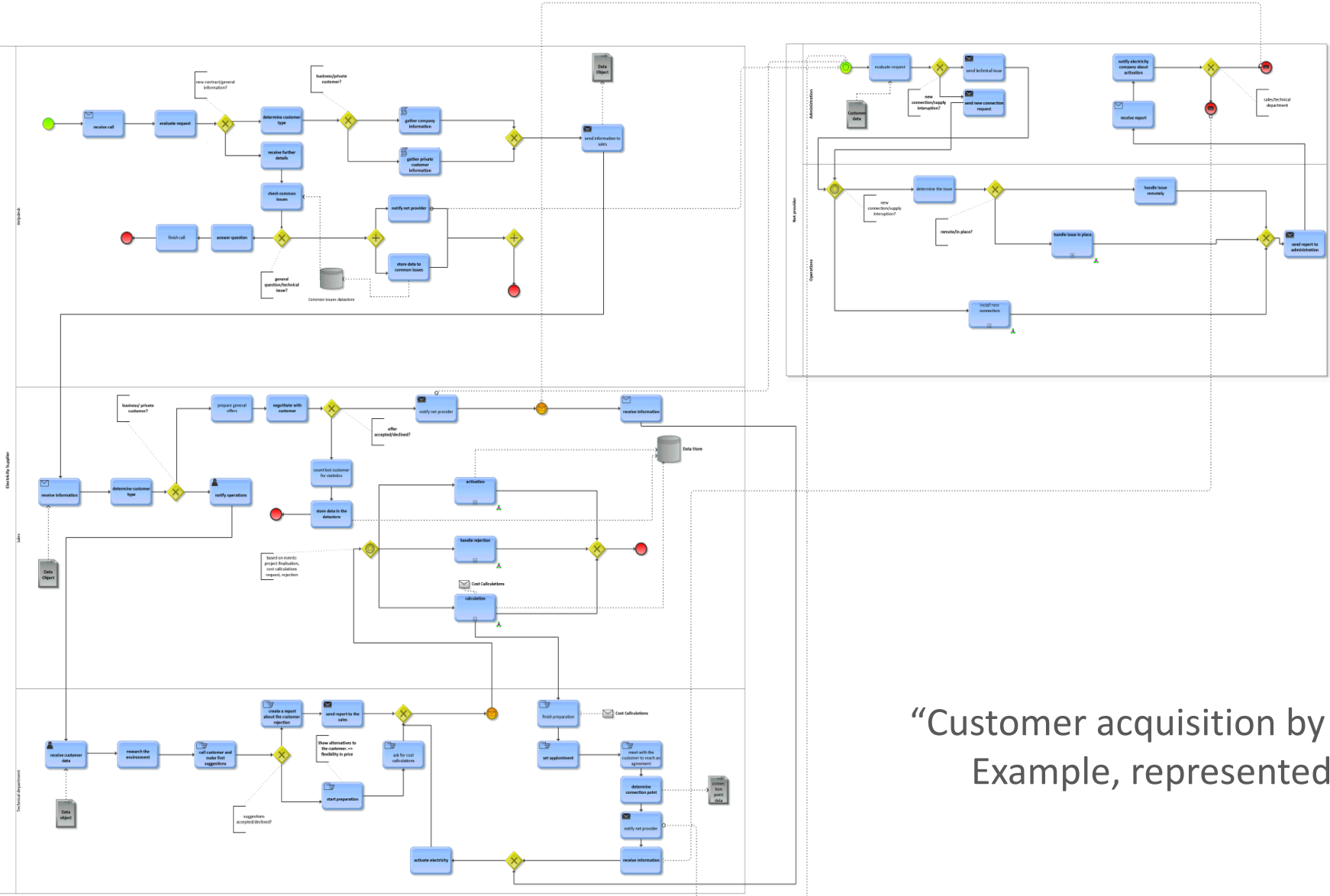
1. Purchase and registration of a company car
2. Operation of a fast food restaurant
3. Customer acquisition by an electricity supplier

There is one process assigned per group. Intermediate states will have to be presented at the lecture.

 News forum

 Upload-Forum

# 2<sup>nd</sup> Learning by Doing – Exercises Type b



“Customer acquisition by an electricity supplier”  
 Example, represented using ARIS Express

# Evaluation | 1

- Supervision during assignment processing revealed a progress in understanding modeling and thinking at different abstract levels, e.g.,
  - that models and their representations should be separated
  - that model and language hierarchies are structured differently
  - that at each model level ( $M^0$  to  $M^n$  in terms of MOF) there must be a semantic foundation if it's about “conceptual modeling”

# Evaluation | 2

- Students proved to be able,
  - to define their own modeling language and generate a modeling tool
  - to perform an extensive requirements elicitation and study, to choose a BP modeling tool and to develop an appropriate business process model.
- They were able to complete their assignments in the planned time, i.e., in approx. 60 full working hours per person.

# Evaluation | 3

- Goal of attracting students for master's theses and dissertations achieved:

## 3 related master thesis projects

- Ontology in Quality Aware Software Engineering ... completed 2016
- Informationsmodellierung für den Disaster Recovery Plan ... completed 2019
- Entwurf einer DSMM für den Bereich der Urheberrechtsverwertung ... running

## 5 related PhD thesis projects

- Kognitive Modellierung für Assistenzsysteme ... completed 2014
- Intelligent Generation of Real-World Graphs ... completed 2017
- Towards a universal Human Activity Recognition (HAR) interface for Active and Assisted Living (AAL) environments ... completed 2018
- Modellierung von Elektrofahrzeug-Prüfständen (EFP) ... to be completed in 2022
- Human emotion modeling (HEM) for active and assisted living ... to be completed in 2023



Thanks  
for your  
Attention!