Module Modeling and Analysis course info

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Abstract

This module provides the information about the "Modeling and Analysis" course.

September 9, 2018
status: planned
version: 0.2

Modeling and Analysis Overview Content

goal of this module

Provide overview and context for complete course.

Understand and experience the connection between problem and solution.

content of this module

Positioning of Modeling and Analysis (M&A)

Why, what and how of M&A

Program of the complete course

Overview of M&A approach

exercise

Quick scan of one case

Electronic Patient Record, Video on Demand, or Health Care Archive

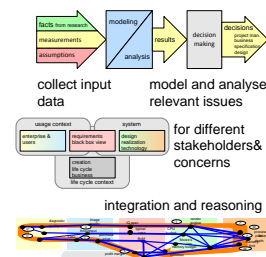USN ESI

Modeling and Analysis Overview

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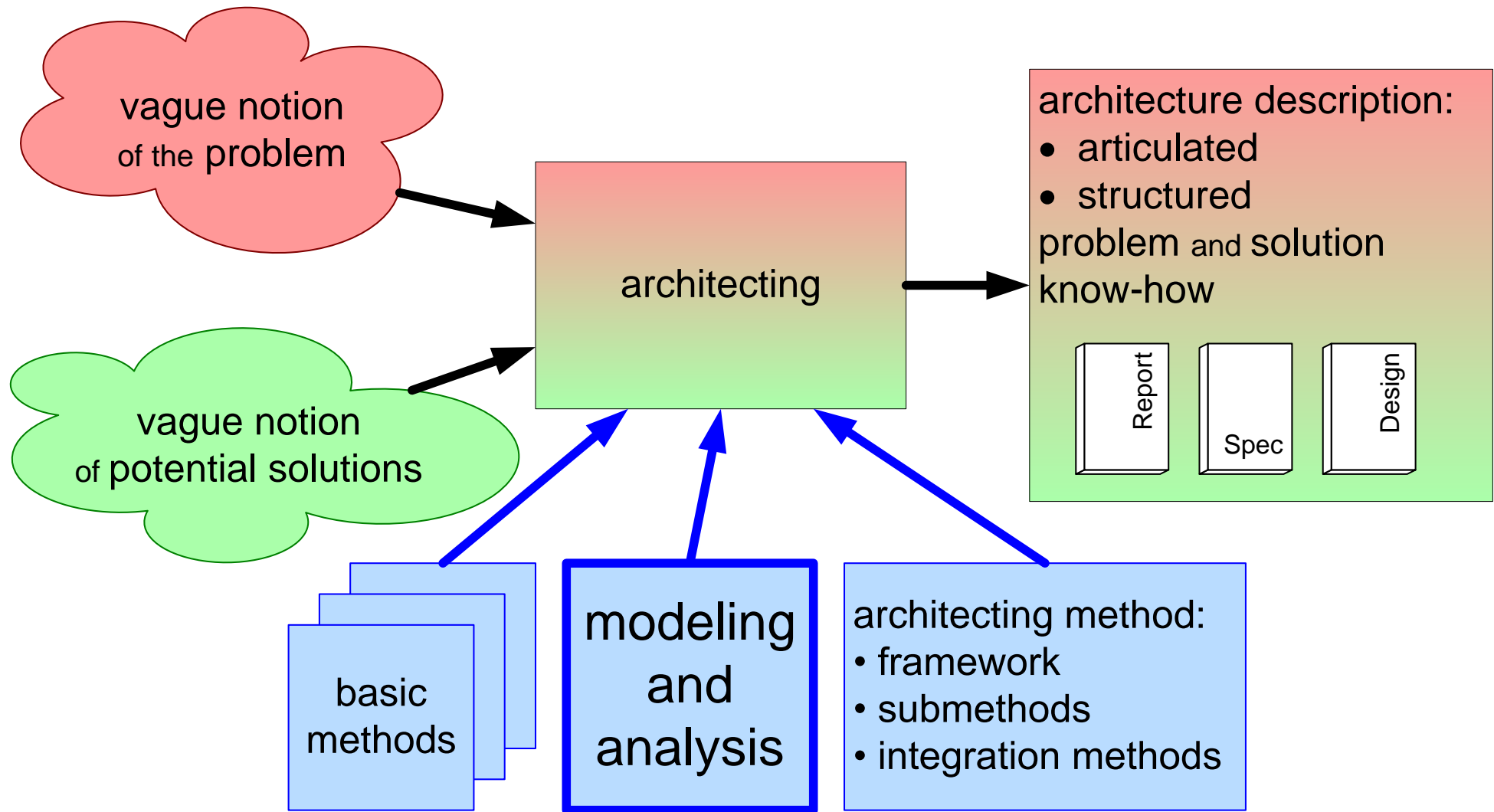
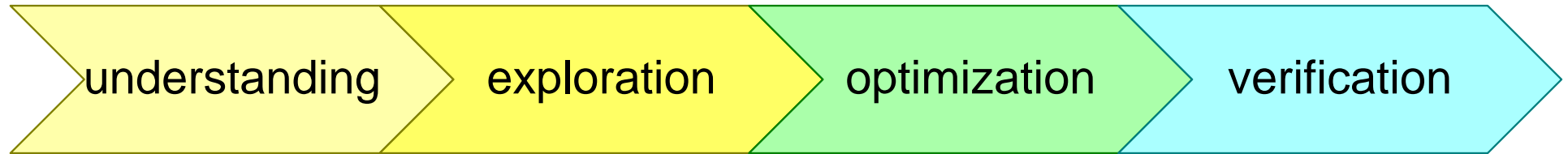e-mail: `gaudisite@gmail.com`

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Abstract

The course Modeling and Analysis is described. The program consists of 10 modules. The course format, iterating theory, illustration and interaction is explained. The course heavily emphasizes the practical application of the method. This presentation shows the overview of the modeling and analysis approach and the methods and techniques that will be elaborated in the rest of the course.

collect input data   model and analyse relevant issues

for different stakeholders& concerns

integration and reasoning

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Positioning Modeling and Analysis in Architecting

vague notion of the **problem**

vague notion of **potential solutions**

architecting

architecture description:
- articulated
- structured

problem and solution know-how

Report

Spec

Design

basic methods

modeling and analysis

architecting method:
- framework
- submethods
- integration methods

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Modeling and Analysis supports:

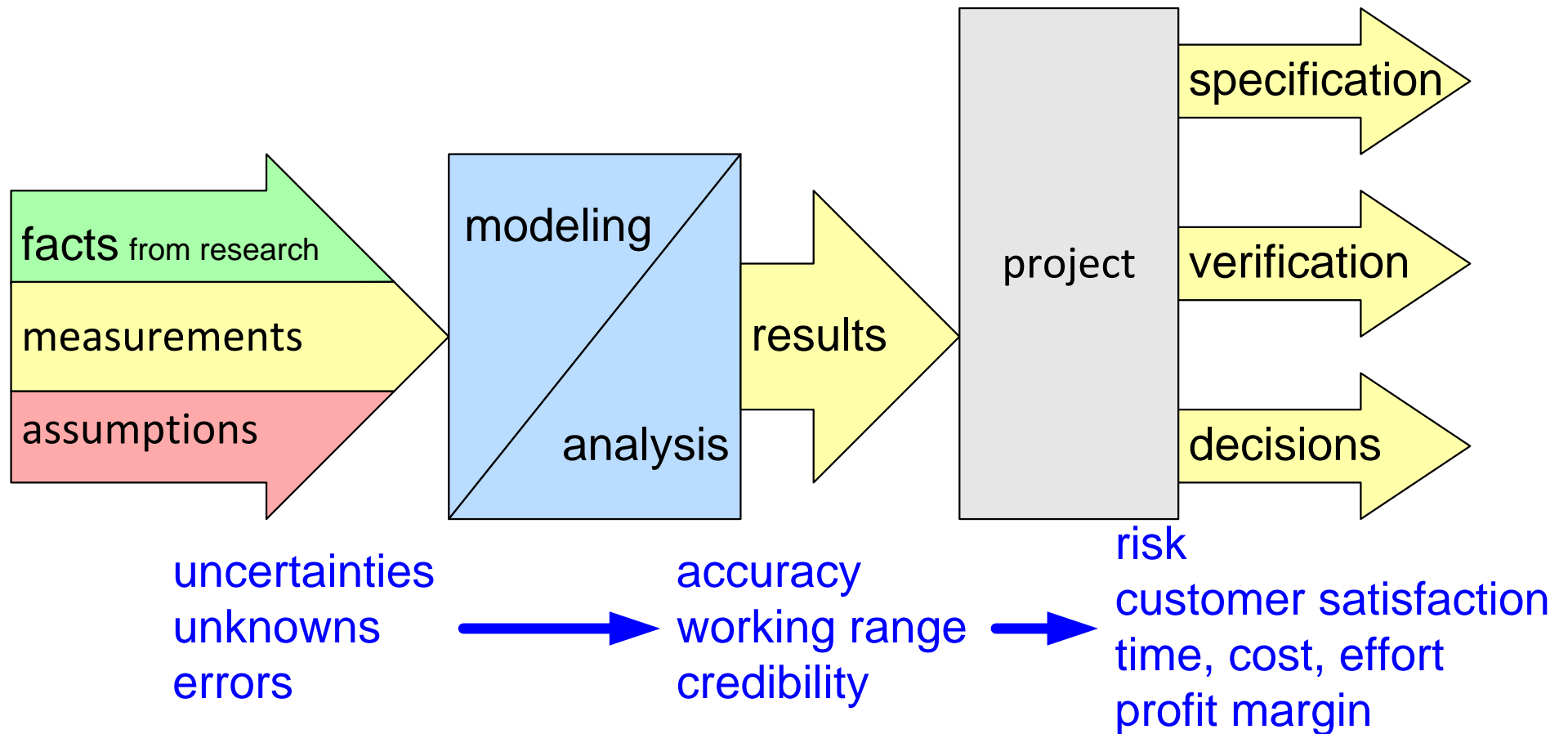understanding → exploration → optimization → verification

Type of model depends on project phase

Models have a goal

Goals evolve and models evolve

Techniques are used to reach this goal

Purpose of Modeling

facts from research
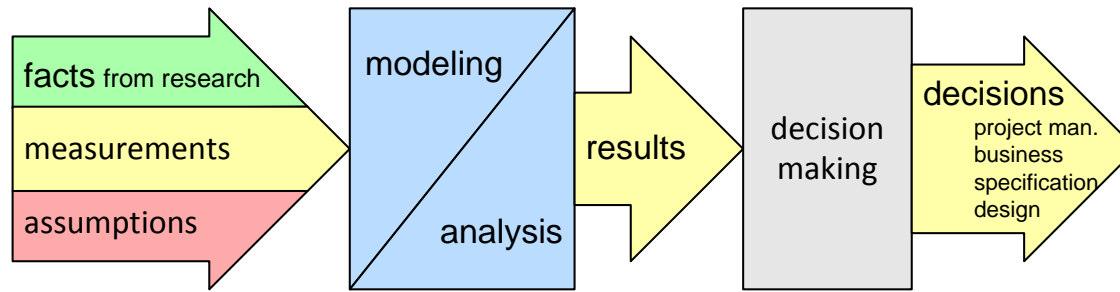measurements
assumptions

modeling / analysis

results

project

specification

verification

decisions

uncertainties
unknowns
errors

accuracy
working range
credibility

risk
customer satisfaction
time, cost, effort
profit margin

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What to Model?

business:
profit, etc.
operational costs
stakeholder benefits
workload
risks

key performance:
throughput, response
reliability
availability
scalability
...

(emerging?) properties:
resource utilization
load
latency, throughput
quality, accuracy
...

and their mutual relations

usage context

enterprise &
users

requirements
black box view

system

design
realization
technology

creation
life cycle business

life cycle context

business:
profit, etc.
operational costs
stakeholder benefits
workload
risks

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Program of Modeling and Analysis Course
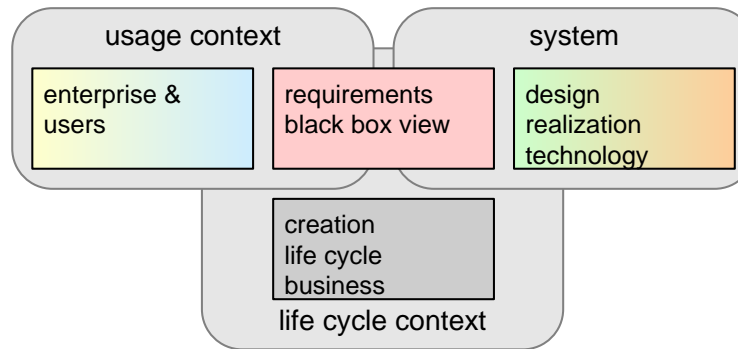
day 1	**1. overall approach** intro, overall approach, exercise overall approach
	2. input facts, data, uncertainties quantification, measurements, modeling, validation, technology background, lifecycle and business input sources

day 2	**3. system modeling** purpose, approaches, patterns, modularity, parametrization, means, exploration, visualization, micro-benchmarking, characterization, performance as example
	4. application, life-cycle modeling reiteration of modeling approach (see module 3), applied on customer application and business, and life cycle

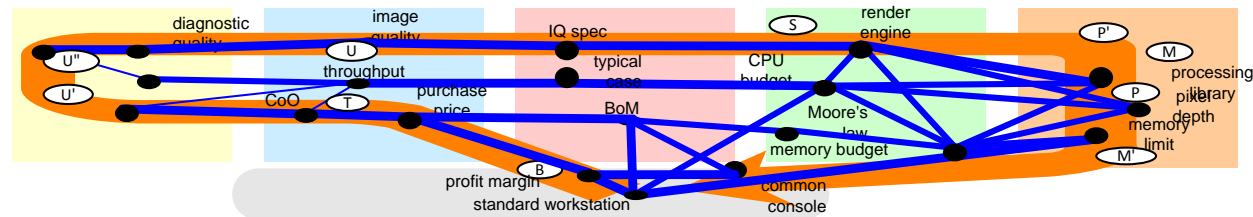|	
day 3	**5. integration and reasoning** relating key driver models to design models, model based threads of reasoning, FMEA-like approach, modeling in project life-cycle
	6. analysis, using models sensitivity, robustness, worst case, working range, scalability, exceptions, changes

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Overview of Approach

facts from research
measurements
assumptions

modeling / analysis

results

decision making

decisions
project man.
business
specification
design

collect input data

model and analyse relevant issues

usage context
enterprise & users
requirements black box view

system
design realization technology

creation life cycle business

life cycle context

for different stakeholders& concerns

integration and reasoning

diagnostic quality
image quality
IQ spec
render engine
U"
U
U'
throughput
CoO
purchase price
typical case
CPU budget
S
P'
M
processing
T
BoM
Moore's law
P
pixel library depth
memory budget
profit margin
standard workstation
B
common console
memory limit
M'

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version: 1.0
September 9, 2018
MAOoverview
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Iteration over viewpoints

usage context

enterprise & users

requirements black box view

system

design realization technology

context understanding

intention

objective driven

oppor-tunities

constraint awareness

know how based

creation life cycle business

life cycle context

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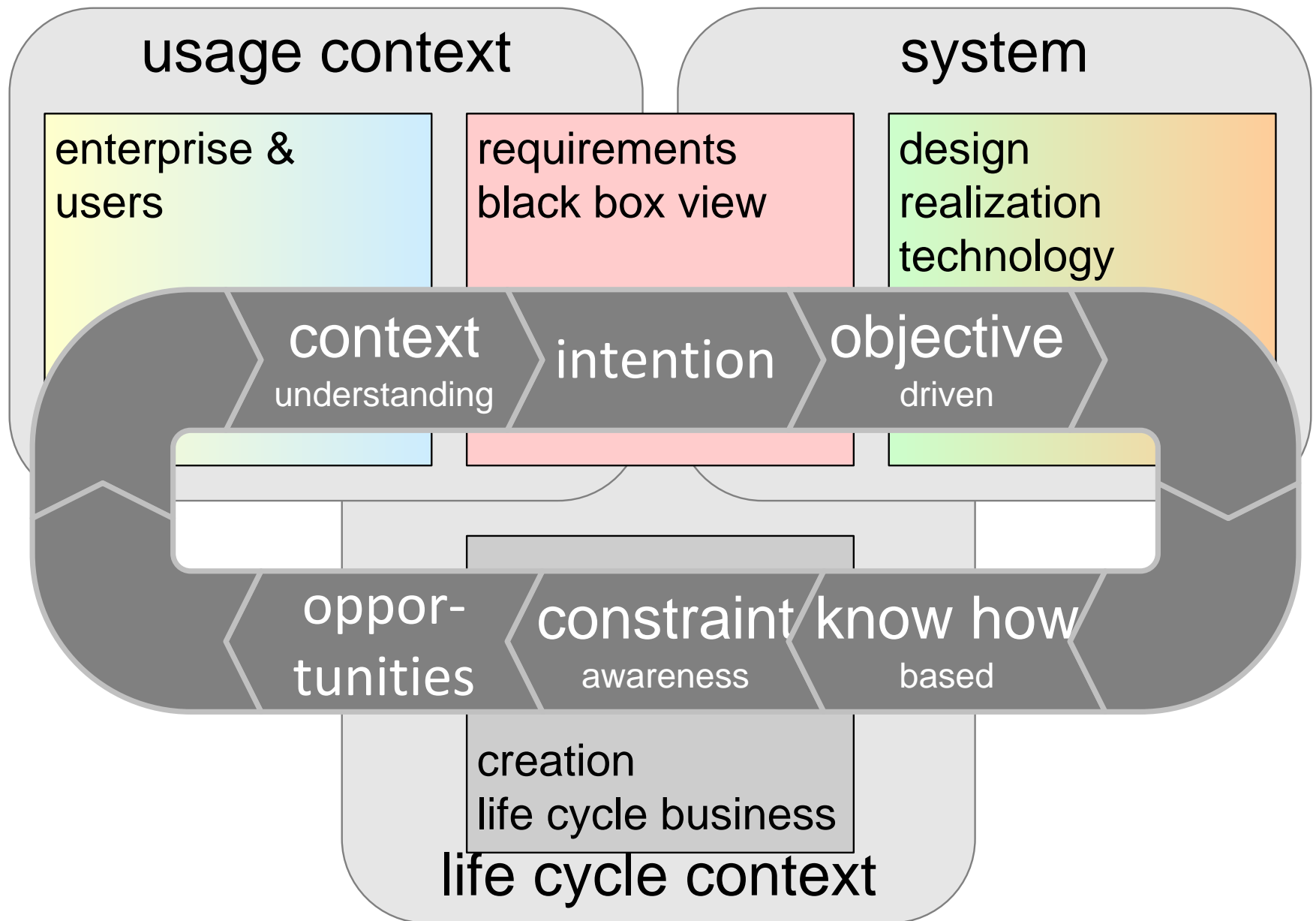
Modeling and Analysis: Background of the Course

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Abstract

The background ideas of the Modeling and Analysis course are collected in a number of diagrams. These diagrams are provided solely as background and probably should not be shown during the course itself.
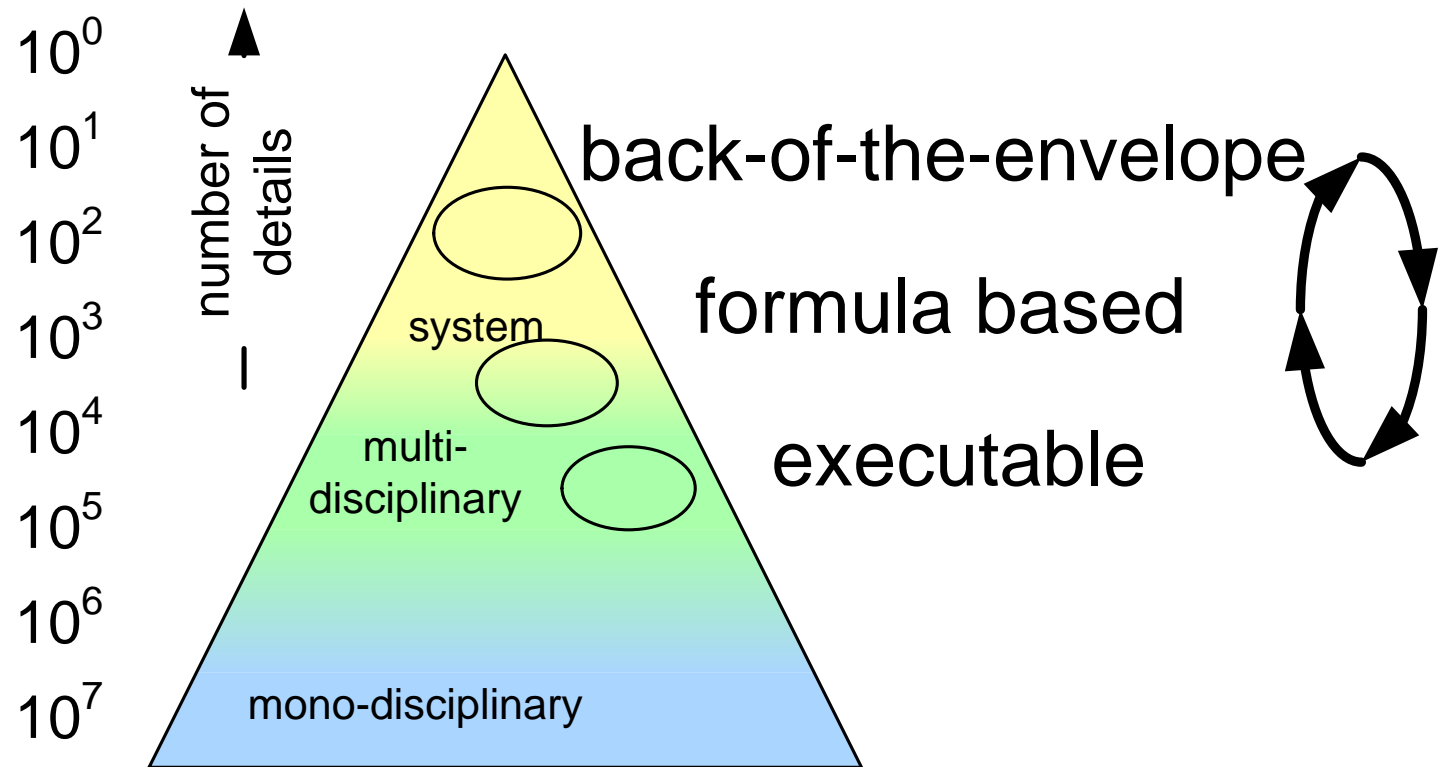
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logo
TBD

How to Model?

how

number of details

10^0
10^1
10^2
10^3
10^4
10^5
10^6
10^7

back-of-the-envelope

formula based

executable

system

multi-disciplinary
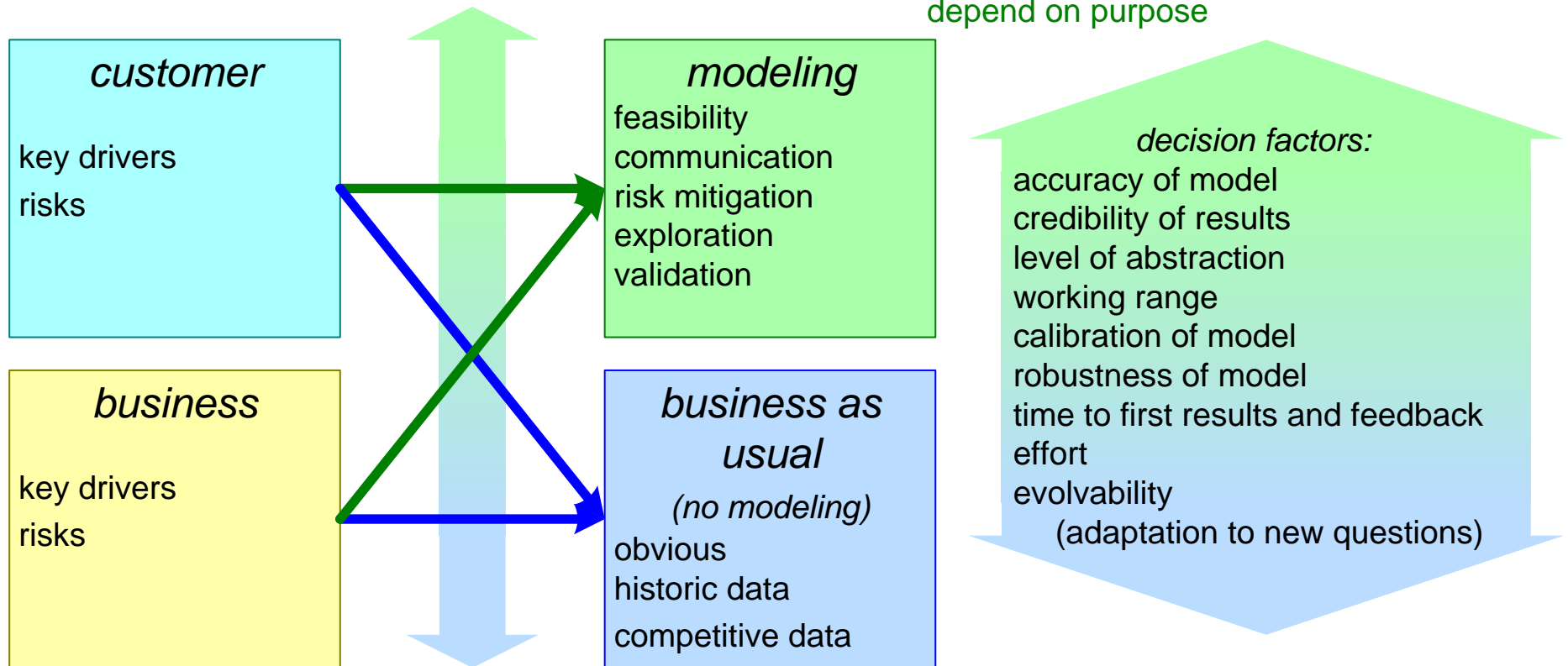
mono-disciplinary

small, simple, goal-driven models

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What and Why to Model

how well is the customer served?
how credible becomes the solution?
how much are time and effort reduced?
how much is the risk reduced?
how much is the solution improved?

purpose and type of model
depend on project life cycle

type of model and views
depend on purpose

customer

key drivers

risks

modeling

feasibility
communication
risk mitigation
exploration
validation

business

key drivers

risks

business as usual

(no modeling)
obvious
historic data
competitive data

decision factors:
accuracy of model
credibility of results
level of abstraction
working range
calibration of model
robustness of model
time to first results and feedback
effort
evolvability
     (adaptation to new questions)

how much effort is needed to create model(s)?
how much effort is needed to use and maintain model(s)?
how much time is needed to obtain useful result?

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Models, Measurements, Expectations and Assumptions
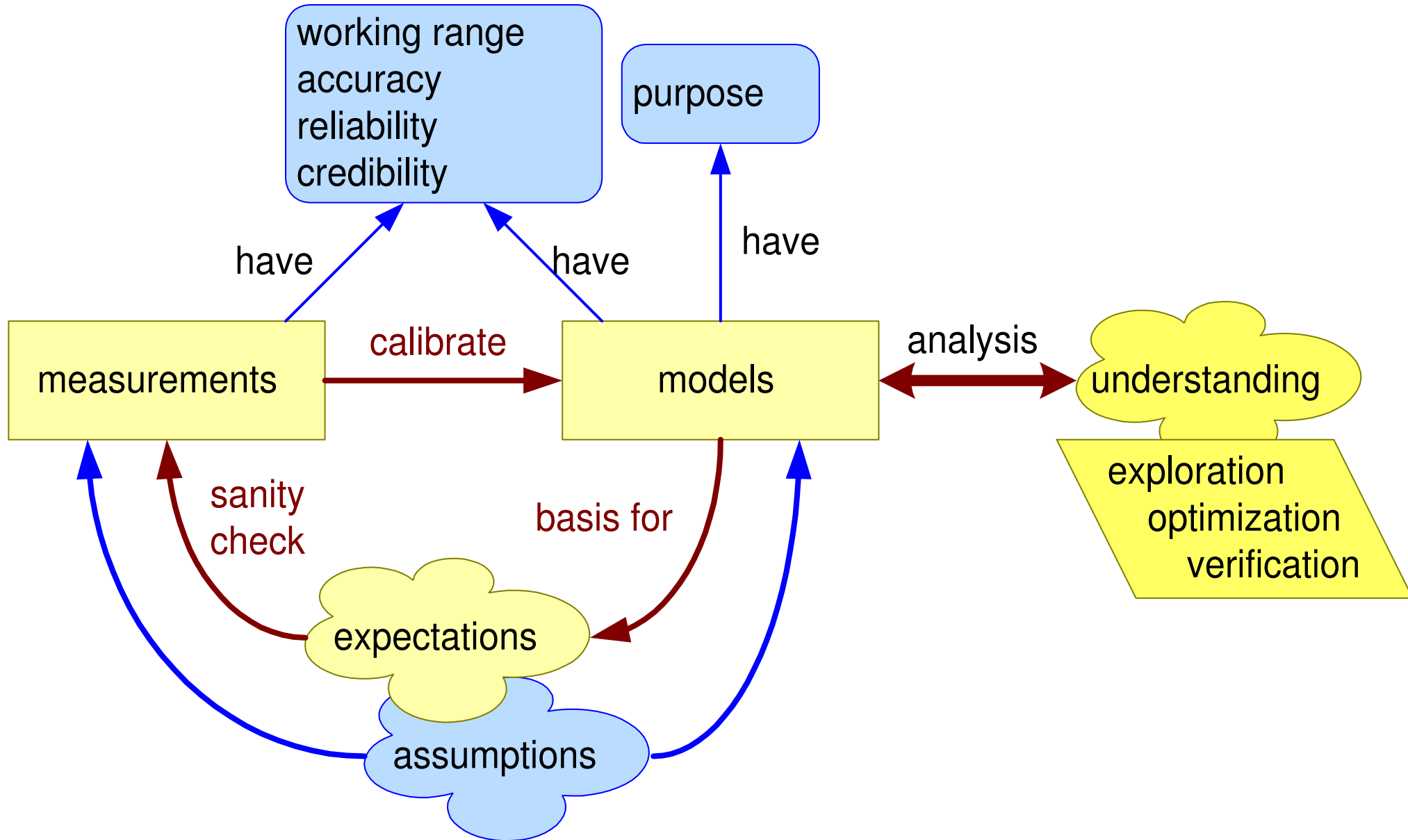
Unknowns, Uncertainties, ...

usage context

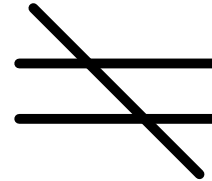| enterprise & users	requirements black box view

unexpected use
assumptions
uncertainties
unknowns
dynamics
interference

system

design
realization
technology

hidden properties
assumptions
unknowns
uncertainties
dynamics
interference

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Model versus Reality

reality $\neq$ model

complex
full of surprises

simplifications
assumptions
implementation

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Starting Points of the Course

practical, immediately applicable in day-to-day work

(inter)active: daily hands-on exercises on case(s)

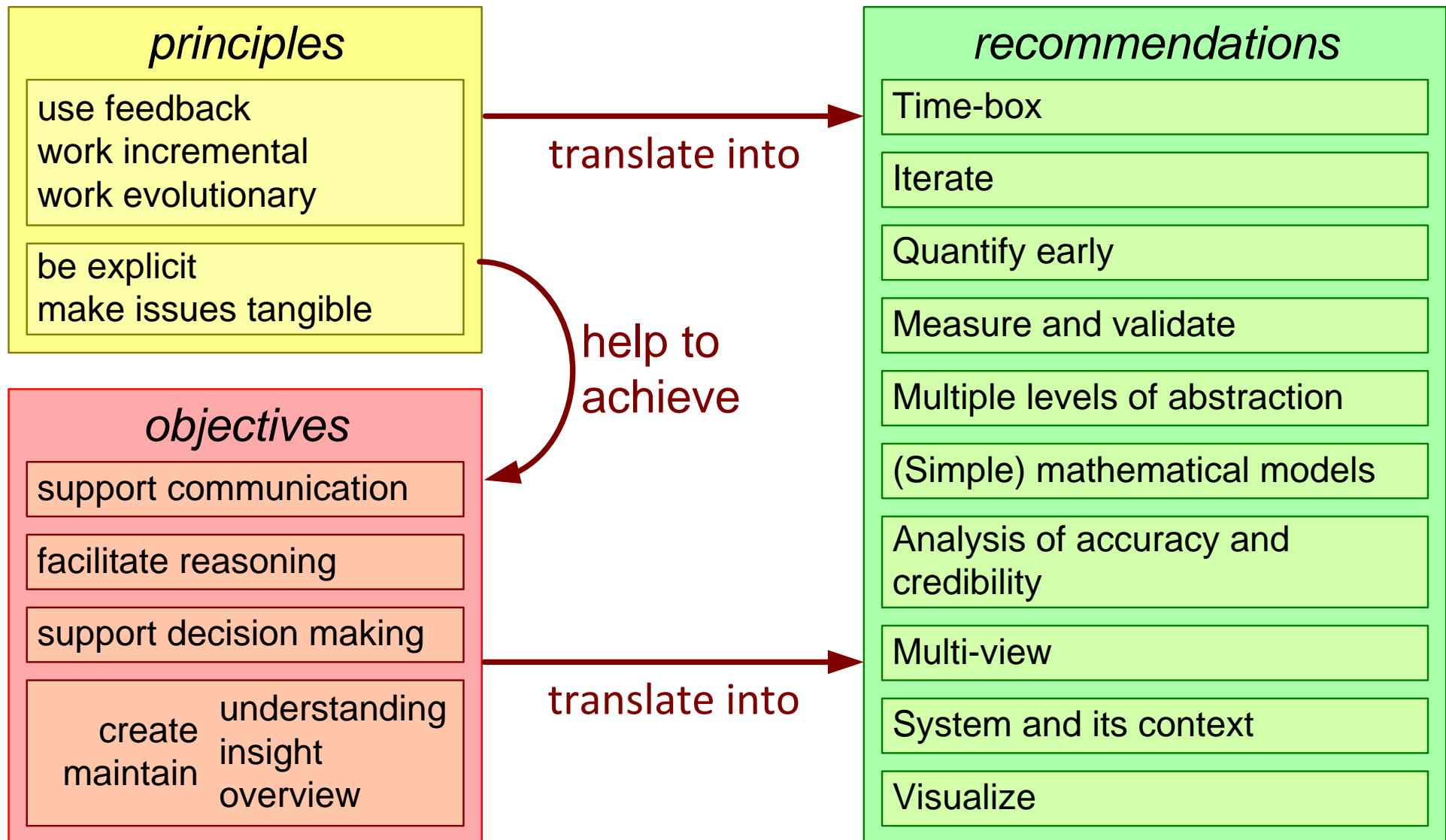target: understanding, insight; way-of-working

method, tool, language and domain agnostic

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Modeling and Analysis Questions

1. Why do we model? - what are indicators that modeling and analysis beyond "business as usual" architecture is needed. What questions trigger M & A.

2. What do we model? - what kinds of views do we need to consider (4+1, IBM GS Method, Zachman, CAFCR)

3. When do we model? - what models are needed at various points in the project lifecycle.

4. What is the appropriate type of model? - formula, visualization, executable, simulation

5. What is the required accuracy of the model? - when do we achieve the desired risk mitigation

6. What is the appropriate level of abstraction? - how much details have to be taken into account, versus how much effort can we afford

7. How to calibrate models? - models are based on facts and assumptions. The model outcome deppends strongly on these input data. Note again the tension between effort to make and calibrate versus the value in terms of risk mitigation.

8. How to use models?

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Recommendations as Red Thread

principles

use feedback
work incremental
work evolutionary

be explicit
make issues tangible

translate into

objectives

support communication

facilitate reasoning

support decision making

create / maintain — understanding / insight / overview

help to achieve

translate into

recommendations

Time-box

Iterate

Quantify early

Measure and validate

Multiple levels of abstraction

(Simple) mathematical models

Analysis of accuracy and credibility

Multi-view

System and its context

Visualize

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Cases for exercise

Electronic Patient Record:

+ relevant health care related information available at the right place for the right person
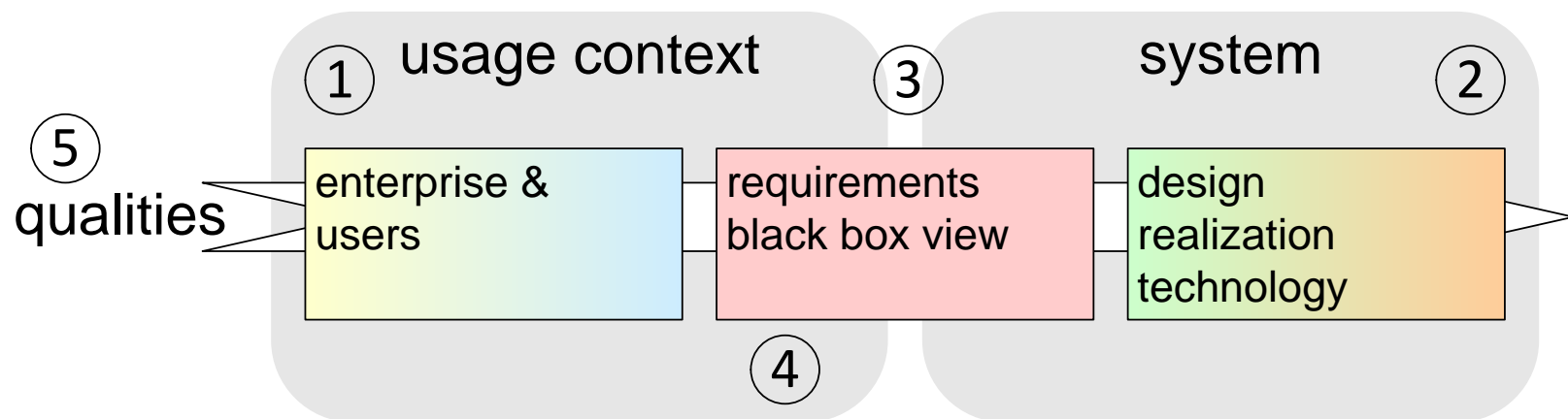
Long Term Health Care Archive:

+ extreme robust, persistent, high availability archive for large chain of hospitals

Video on Demand Backoffice:

+ large scale content database with fast response download capability including billing, DRM et cetera

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Modeling and Analysis Exercise

- make a quick scan over the following views: ⓪
0. what is this exercise about?
1. context: stakeholders, concerns, application
2. system design and realization
3. requirements
4. operational context
5. qualities
- use time boxes of 15 minutes per view
- show the most dominant decomposition(s) of that view, as diagram or as a list; quantify whenever possible

① usage context   ③   system ②

⑤
qualities

enterprise & users

requirements black box view

design realization technology

④

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Reflection on Exercise

+ collectively we know quite a lot
+ broad overview in short amount of time

~ some "hot" issues appear to be less relevant

- #questions >> #answers

baseline for next refining steps

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Modeling and Analysis Summary

Conclusions

Modeling and Analysis must provide more *in-depth* answers for questions that are *breadth* relevant.

Modeling and Analysis is a means that supports *requirements* management, *architecting* and *project* management.

Modeling and Analysis ranges from *business* aspects to *technical* decisions.

Good models are *small*, *simple* and *goal-driven*.

Techniques, Models, Heuristics of this module

Context viewpoints

Fast iteration based on time-boxing

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