Abstract
Modeling of Systems and their context is done to support communication with stakeholders, to facilitate reasoning about system requirements and design, to support decision making, and in general to create and maintain understanding, insight, and overview. The challenge in modeling is to find an appropriate abstraction level, and to make sufficient progress.

In this paper we discuss how time-boxing and iteration over multiple views and models helps to address both challenges. Time-boxing and iteration fit in a broader modeling method that we will discuss briefly to provide background.
Guidelines from Modeling and Analysis Course

**objectives**
- support communication
- facilitate reasoning
- support decision making
- create understanding
- maintain overview

**principles**
- use feedback
- work incremental
- work evolutionary
- be explicit
- make issues tangible

**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

translate into
help to achieve
translate into
### Flip-overs of one week course

<table>
<thead>
<tr>
<th>Customer objectives</th>
<th>Application</th>
<th>Functional</th>
<th>Conceptual</th>
<th>Realization</th>
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- **Customer objectives**
- **Application**
- **Functional**
- **Conceptual**
- **Realization**

Modeling and Analysis: Iteration and Time-boxing

Gerrit Muller

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MAITflipovers
Schematic flow

- **Session 1**: Fast scan
- **Session 2**, **3**: Visual elaboration
- **Session 4**, **5**: Quantification
- **Session 6**: Life cycle
- **Session 7**: Iteration
- **Session 8**: Threads
- **Session 9**, **10**: Analysis, reflection

The diagram outlines a flow from **Customer Objectives** through **Application**, **Functional**, **Conceptual**, and finally **Realization**.

**Legend**:
- **C**: Customer objectives
- **A**: Application
- **F**: Functional
- **C**: Conceptual
- **R**: Realization
Time-boxes and Iteration

bottom-up top down

second iteration

story -> use case

shared overview

improved overview

depth insight

1st big picture

day 1
day 2
Initial 2D Model

arrival → receiving raw materials → check quality → process → acceptance → delivery

measuring
4 persons

process 1
1 person

process 2
1 person

process 3
1 person

T = Truck

T = Truck

T = Truck
Lead-time Model

\[ t_{lead\ time} = t_{processing\ total} + t_{handling} \]

\[ t_{processing\ total} = \sum_{\text{all processes}} t_{processing\ process} \]

\[ \text{e.g. } t_{drill\ 1..n} + t_{grind\ 1..m} + \ldots \]
Life Cycle Model
Models in CAFCR+

- **Customer objectives**
  - factory
  - lead time
  - cyclic market
  - ramp up new products

- **Application**
  - component factory
  - lead time
  - input variations
  - resource variations
  - cost, space constraints

- **Functional**
  - machines
  - storage
  - transport
  - measurements
  - operators
  - supervisors
  - planners
  - ERP
  - PDM
  - CAD-M

- **Conceptual**
  - evolution
  - process
  - people
  - infrastructure
  - finance

- **Realization**

Component qualities: safety, reliability, robustness, liability
Factory qualities: predictable, traceable, timely

Life cycle:
- evolution
- process
- people
- infrastructure
- finance
Modeling and Analysis: Iteration and Time-boxing

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HTEEsummary

Summary

Customer objectives

Application

Functional

Conceptual

Realization

Life cycle

Time box

Iterate

Visualize

Be specific

Quantify

Validate

2D model

Each block contains operation steps

Operation steps

Colors are used to encode type of operation

Tduration in minutes

Operations

1-5
6-9
10-15
16-19
20-23
24-27
28-31
32-35
36-39
40-43
44-47
48-51
52-55

Tprocessing total = \sum Tprocessing process

e.g. Tdrill 1..n + Tgrind 1..m + ...

Lead time = Tprocessing total + Thandling