Abstract

We make models to facilitate decision making. These decisions range from business decisions, such as Service Level Agreements, to requirements, and to detailed design decisions. The space of decisions is huge and heterogeneous. The proposed modeling approach is to use multiple small and simple models. In this paper we discuss how to reason by means of multiple models.
How to use multiple models to facilitate decisions?
How to get from many fragments to integral insight?
How many models do we need?
At what quality and complexity levels?
Graph of Decisions and Models

usage context
enterprise & users

black box view

system
design

life cycle context

Legend:
- a: assumption
- i: input e.g. measurement
- d: decision
- m: model
Example Graph for Web Shop

Usage Context:
- Enterprise & Users
  - Customer Interest
  - Customer Behavior
  - Salary
  - Workflow
  - Financial
- Market Penetration
- Market Share
- Margin

System:
- Black Box View
  - Load
  - Throughput
  - Information
  - Response Time
  - Elapsed Time
  - Budget
- Design
  - Transactions
  - CPU Load
  - Network Load
  - Storage Capacity
- SLA

Life Cycle Context:
- Running Cost
- Initial Cost
- Maintenance Effort
- Changes

Legend:
- Assumption
- Input (e.g., measurement)
- Decision
- Model
Relations: Decisions, Models, Inputs and Assumptions

- **Legend:**
  - Assumption (triangle)
  - Input (circle)
  - Decision (square)
  - Model (diamond)

- **Diagram:**
  - **Assumption (a)**
  - **Input (i)**
  - **Decision (d)**
  - **Model (m)**

- **Relationships:**
  - Input (i) facilitates Model (m)
  - Model (m) feeds Assumption (a)
  - Assumption (a) triggers Decision (d)
  - Decision (d) influences Model (m)
  - Model (m) calibrates Assumption (a)
  - Assumption (a) feeds Decision (d)
  - Decision (d) feeds Model (m)
  - Model (m) feeds Input (i)

- **Triggers:**
  - Assumption (a) triggers Input (i)
  - Decision (d) triggers Assumption (a)
  - Model (m) triggers Decision (d)
  - Input (i) triggers Model (m)
Reasoning Approach

1. Explore usage context, life cycle context and system

2. Determine main Threads-of-Reasoning
3. Make main Threads-of-Reasoning SMART
4. Identify "hottest" issues
5. Model hottest, non-obvious, issues

6. Capture overview, results and decisions

7. Iterate and validate

_all steps time-boxed between 1 hour and a few days_

Early in project:
- top-down
- make main Threads-of-Reasoning SMART
- identify "hottest" issues
- model hottest, non-obvious, issues

Later in project:
- bottom-up
- "Play" with models
- investigate facts
- identify assumptions
- model significant, non-obvious, issues

learn
Frequency of Assumptions, Decisions and Modeling

- Implicit (trivial?)
- Explicit
- Try-outs
- Very simple
- Small
- Key
- Substantial

Legend:
- Assumption (a)
- Input e.g. measurement (i)
- Decision (d)
- Model (m)
Life Cycle of Models

- Understanding
- Exploration
- Optimization
- Verification

Try out models
- Most try out models never leave the desk or computer of the architect!
- Many small and simple models are used only once; some are re-used in next projects.

Simple and small models
- Archived
- Not maintained
- Re-used in next project
- Re-use

Substantial models
- Archived
- Not maintained
- Re-used in next project
- Re-use

Substantial models capture core domain knowledge; they evolve often from project to project.

Creation and evolution of intellectual property assets
Examples of Life Cycle of Models

- Understanding
- Exploration
- Optimization
- Verification

Try out models:
- Load/cost
- Function mix
- Load/cost peak impact
- Integral load model
- Global customer demographics
- Global customer distribution
- Load/stress test suite

Simple and small models:
- Webshop benchmark suite

Substantial models (IP assets):
- Web server performance
- Peak impact
- Customer global distribution
- Benchmark suite

Modeling and Analysis: Reasoning Approach
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MAREmodelLifeCycleExample