

Module 31, Architectural Reasoning Case Exploration

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Abstract

This module introduces the case exploration used in the course Architectural Reasoning using Conceptual Modeling.

Distribution

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August 16, 2025

status: preliminary

draft

version: 1.0

SEMA Methods Overview

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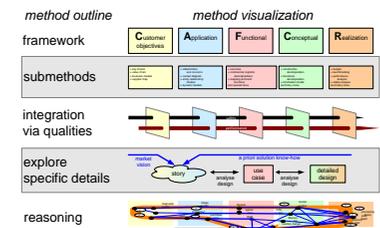
Abstract

This presentation provides an overview of the SEMA course: Architectural Reasoning Using Conceptual Modeling. This course uses the CAFCR+ model with 6 views. Qualities connect all views. Threads-of-reasoning capture the architectural reasoning across views and qualities. Conceptual models visualize and capture the context, the system and its design. Quantification is a means to make problem and solution space tangible.

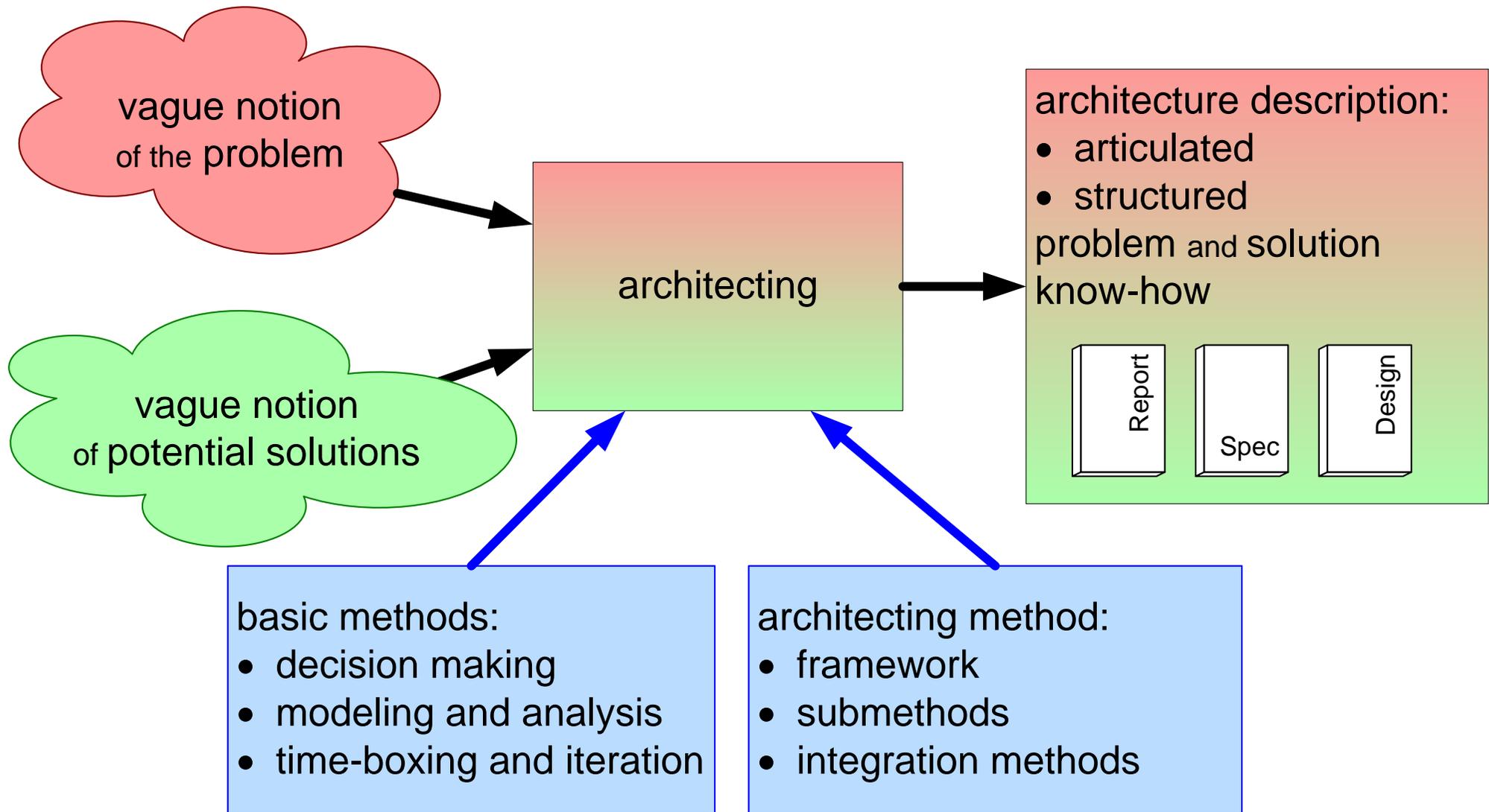
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From vague notions to articulate and structured

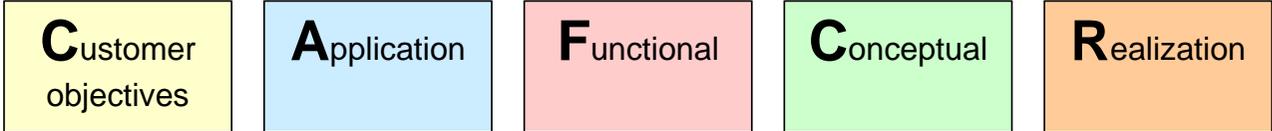


Overview of architecting method

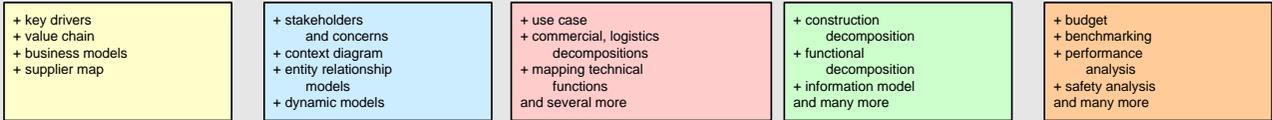
method outline

method visualization

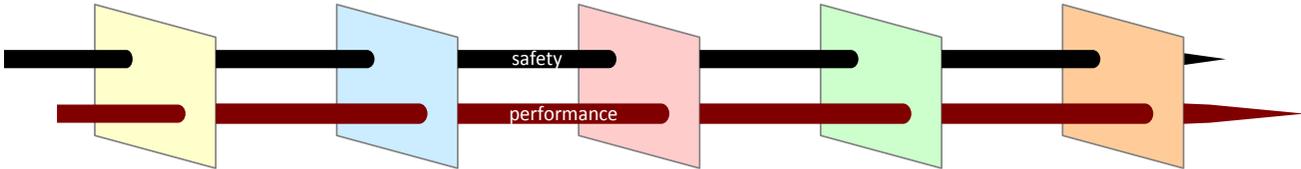
framework



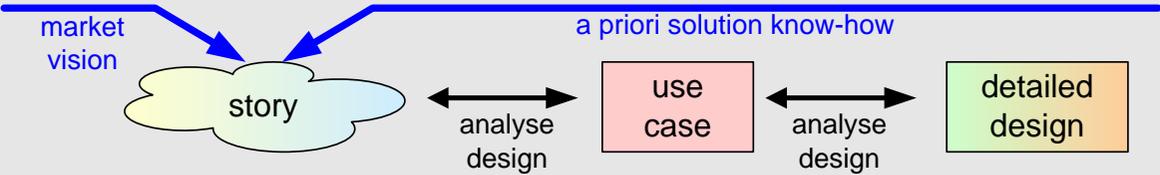
submethods



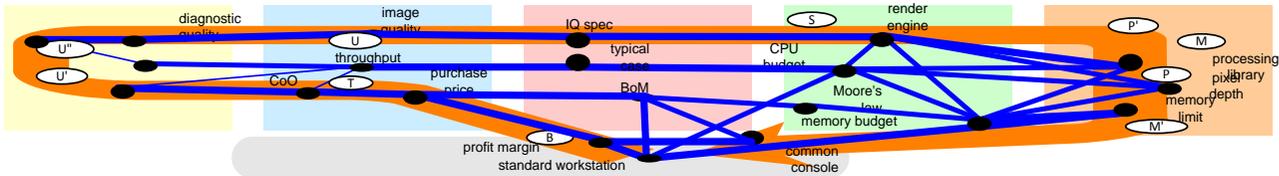
integration via qualities



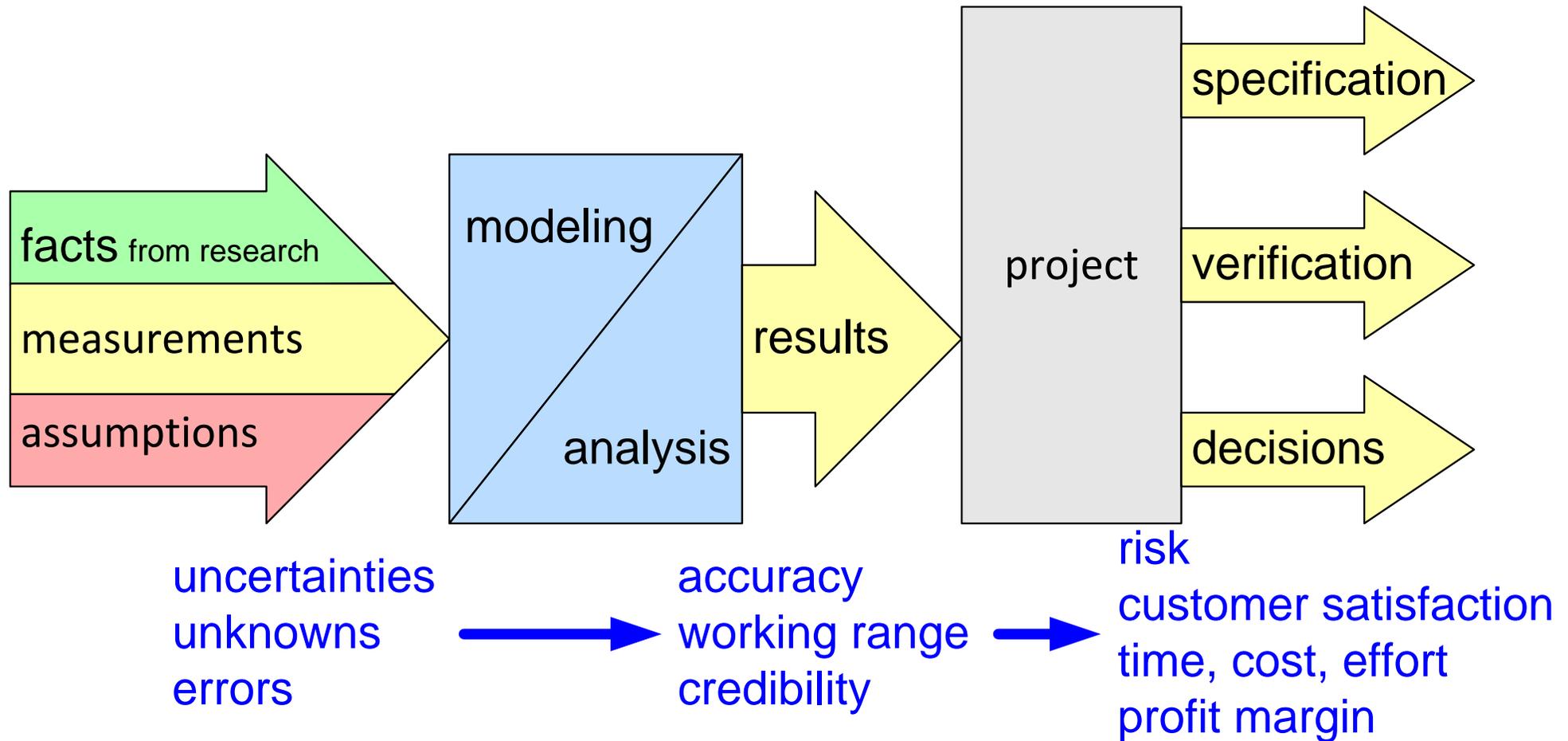
explore specific details



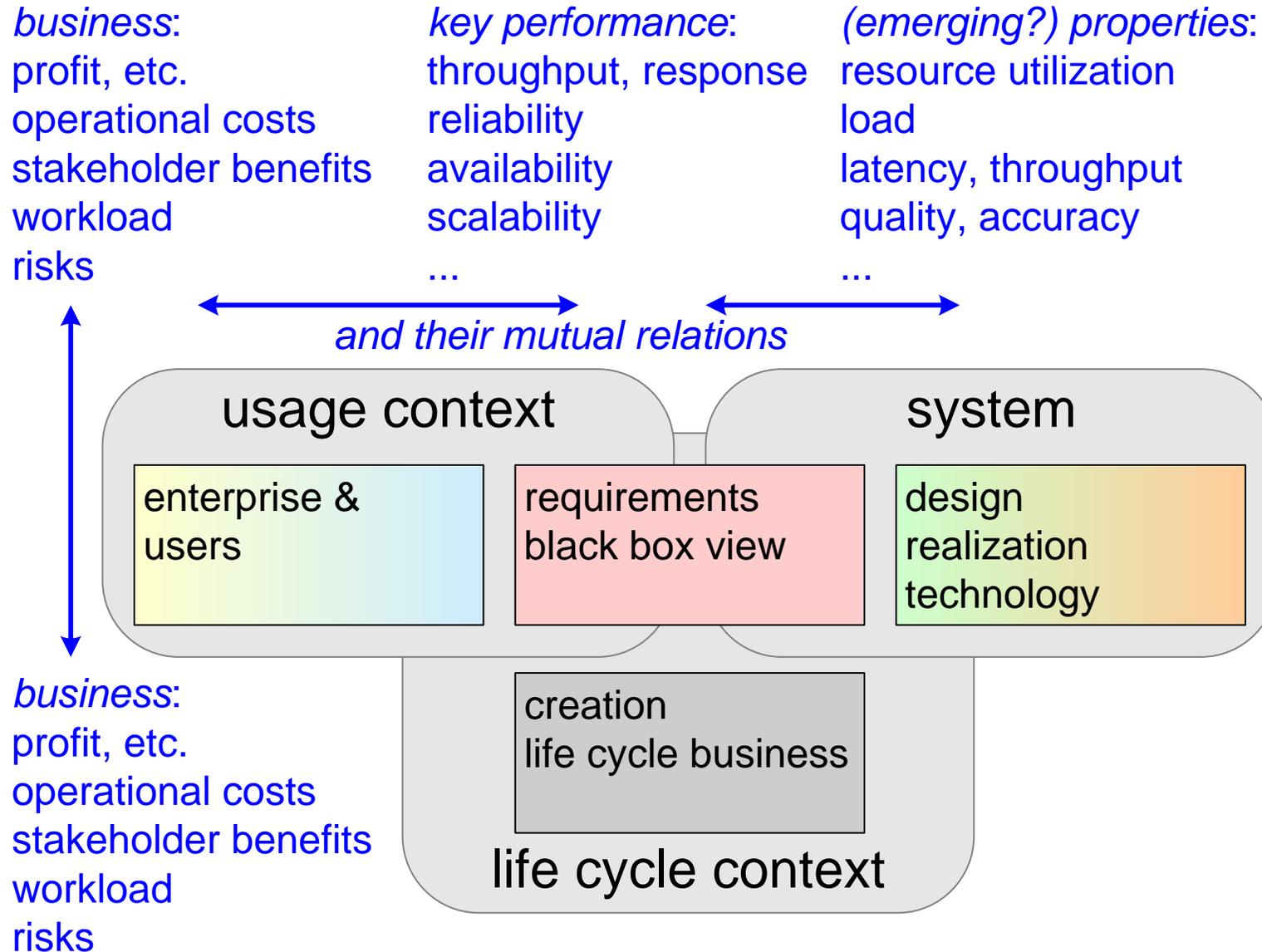
reasoning



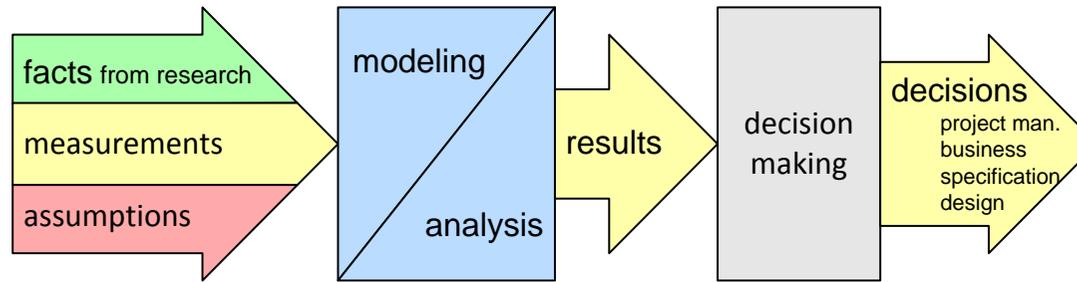
Purpose of Modeling



What to Model?

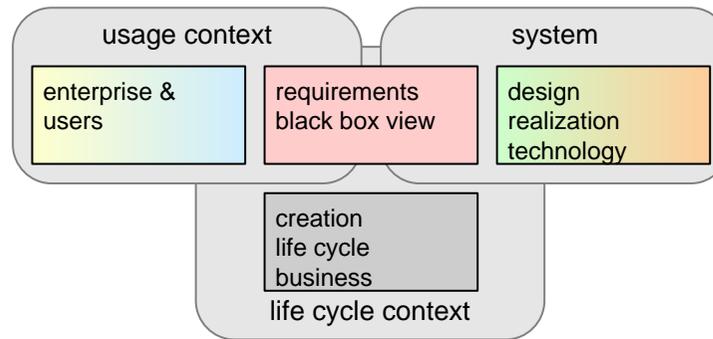


Overview of Modeling Approach



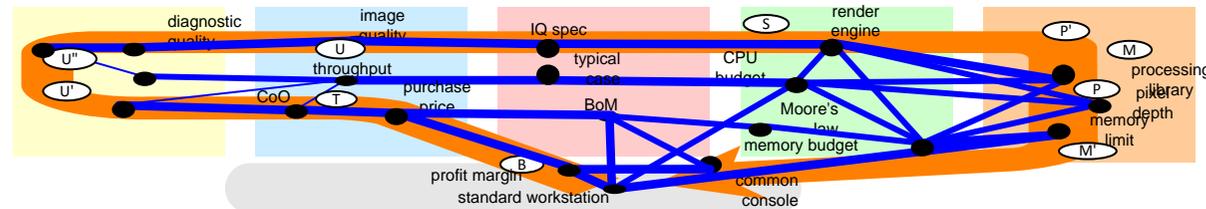
collect input data

model and analyse relevant issues



for different stakeholders & concerns

integration and reasoning



Short introduction to basic “CAFCR” model

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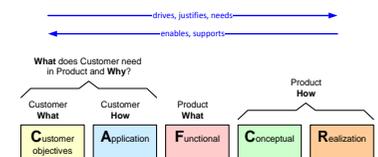
Abstract

The basic “CAFCR” reference model is described, which is used to describe a system in relation to its context. The main stakeholder in the context is the customer. The question “Who is the customer?” is addressed.

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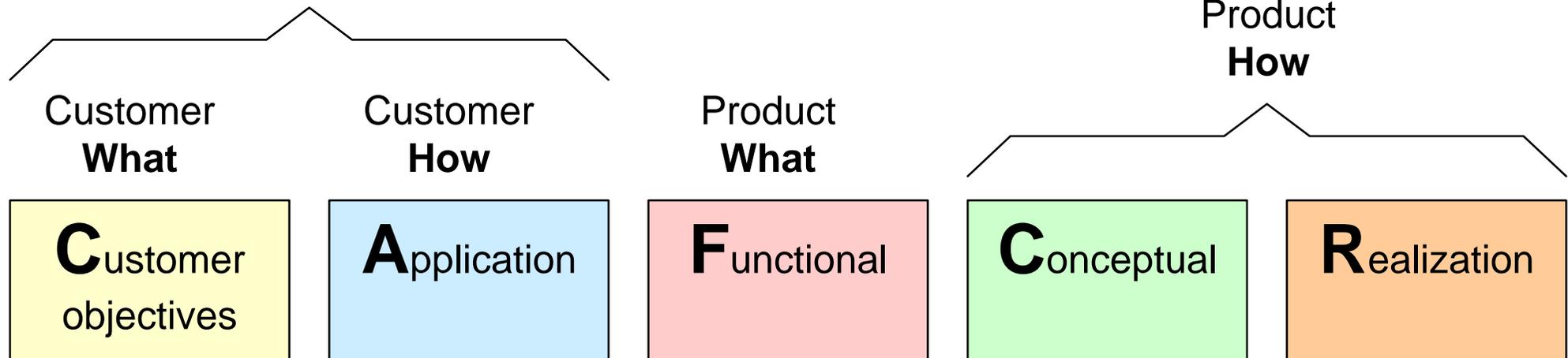
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The “CAFCR” model

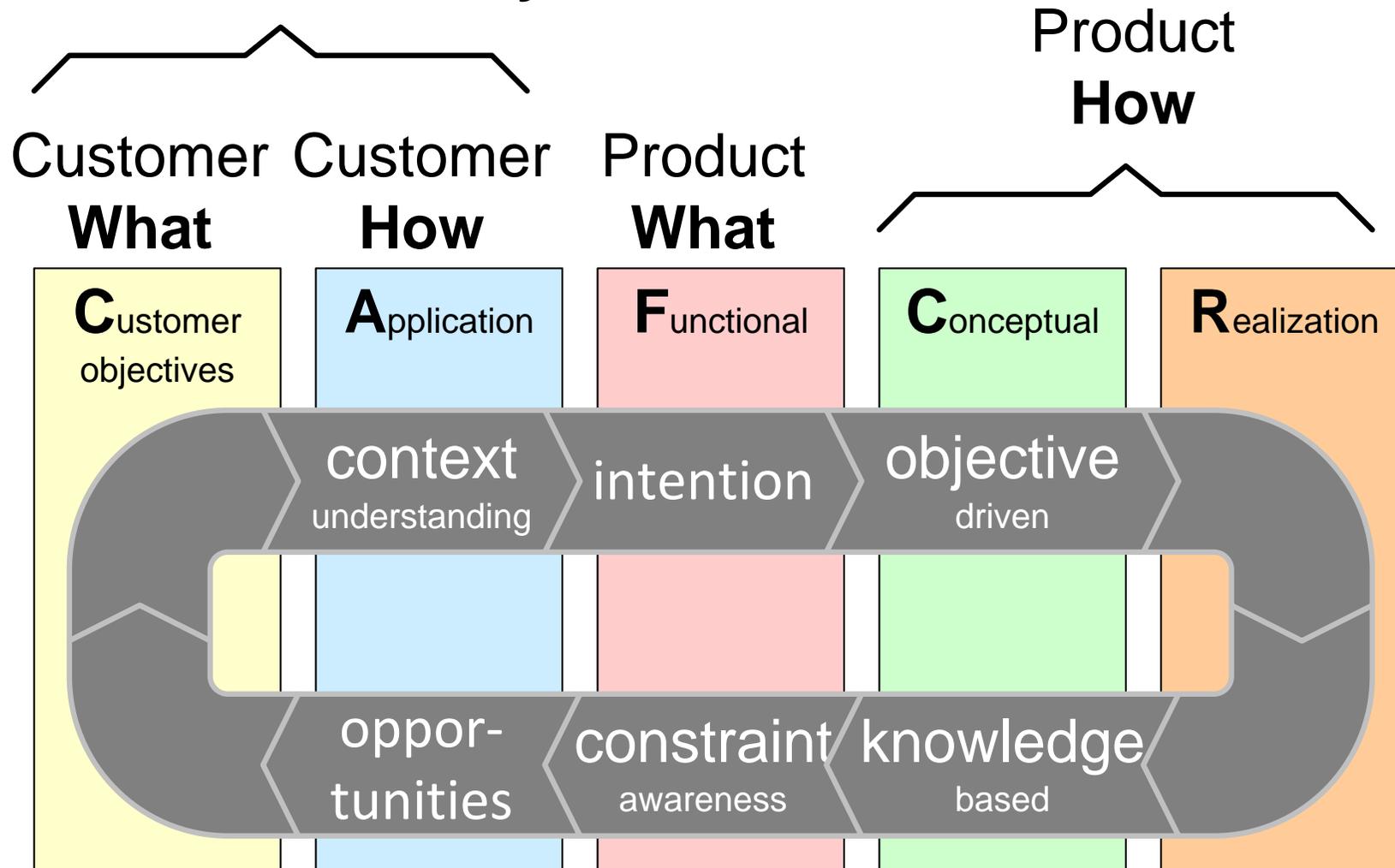


What does Customer need
in Product and **Why?**

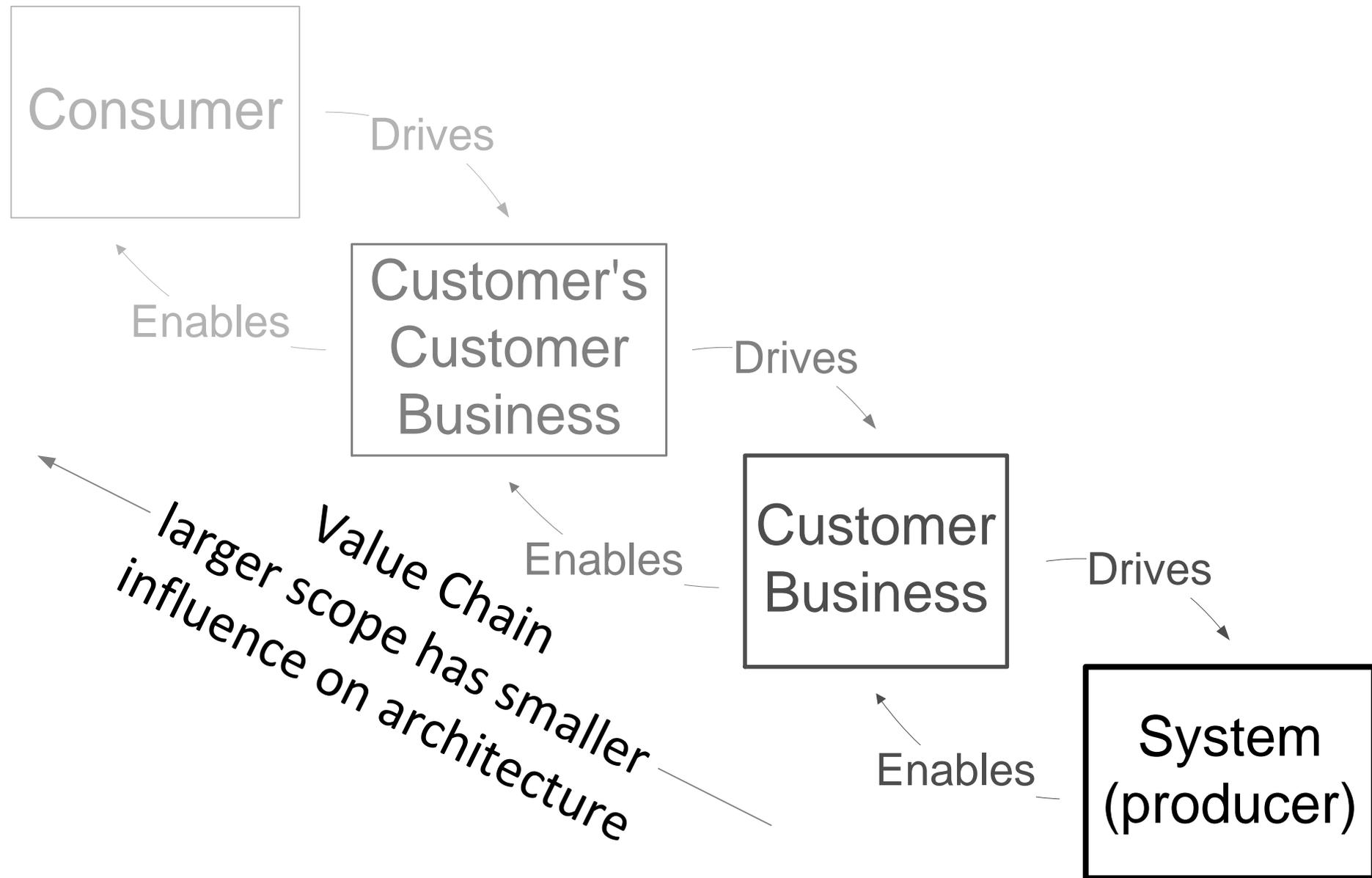


Integrating CAFCR

What does Customer need
in Product and **Why?**



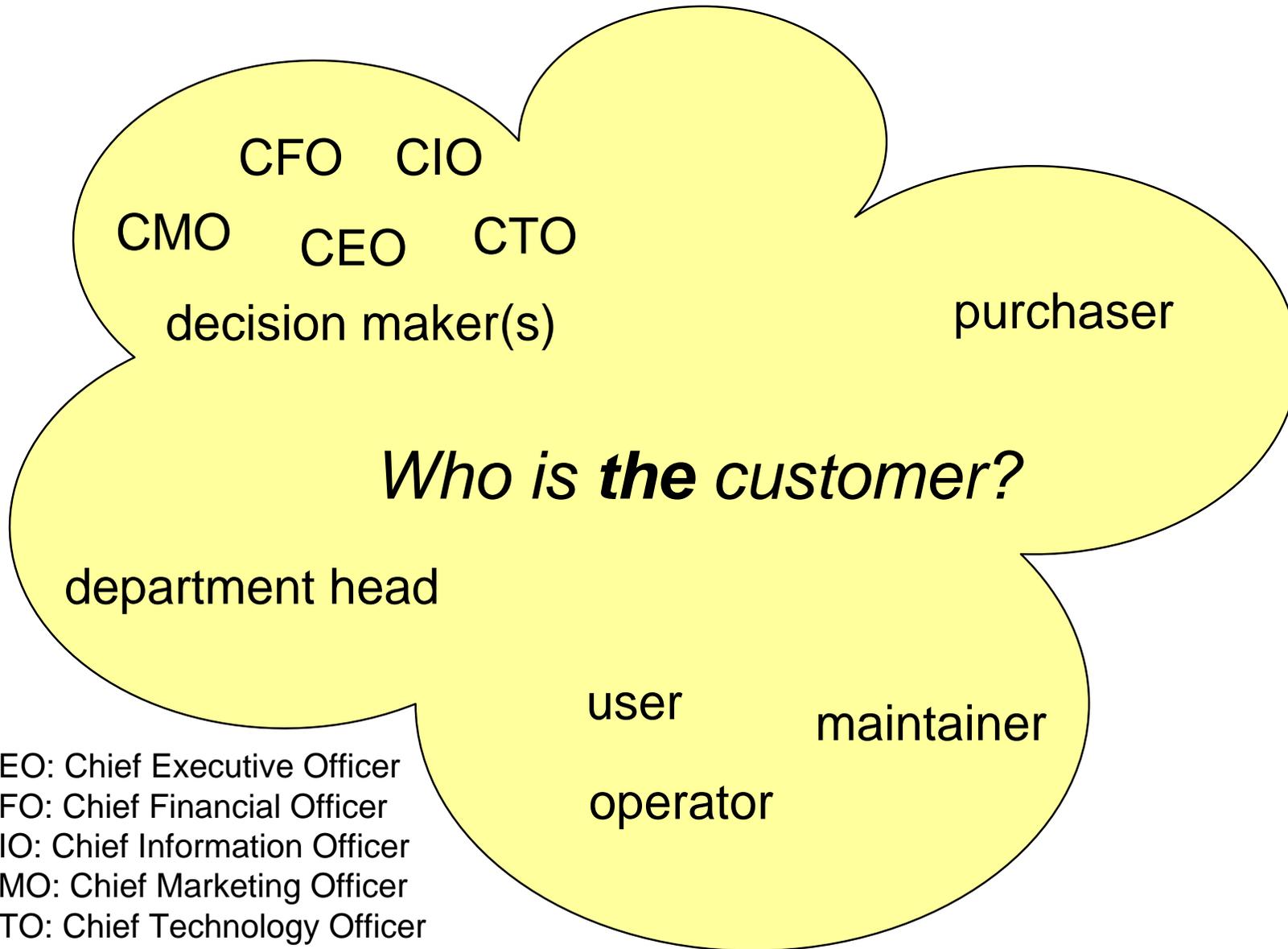
CAFCR can be applied recursively



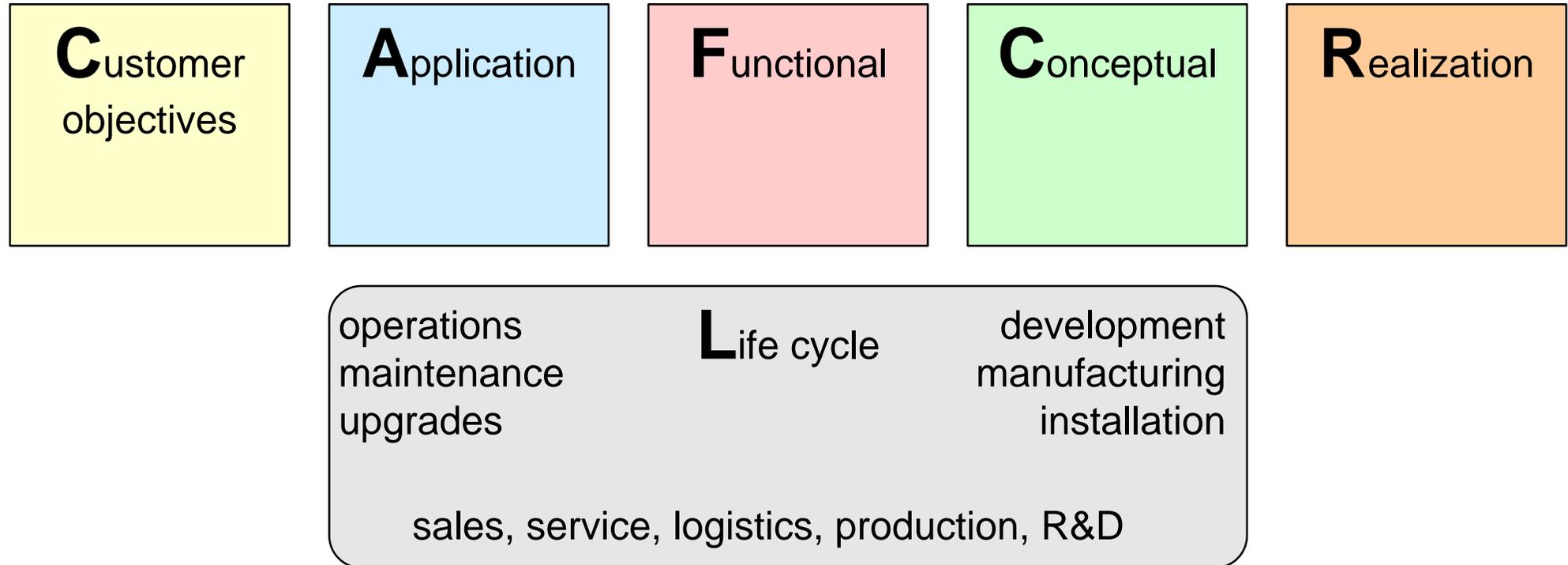
Market segmentation

| segmentation axis | examples |
|-------------------|--|
| geographical | USA, UK, Germany, Japan, China |
| business model | profit, non profit |
| economics | high end versus cost constrained |
| consumers | youth, elderly |
| outlet | retailer, provider, OEM, consumer direct |

Example of a small buying organization



CAFCR+ model; Life Cycle View



Initial CAFCR scan

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Abstract

This presentation guides a team through a quick CAFCR scan. Such quick scan with typically 15 minutes per view helps to build an initial overview of the problem and solution space.

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make a bottom-up analysis of your product:

1. realization
2. conceptual
3. functional
4. application
5. customer objectives
6. qualities

use time boxes of 15 minutes per view

show the most dominant decomposition of that view, as diagram or as a list, some more guidance will be given per step.

Exercise Bottom-up Scan CAFCR

make a bottom-up analysis of your product:

1. realization
2. conceptual
3. functional
4. application
5. customer objectives
6. qualities

use time boxes of 15 minutes per view

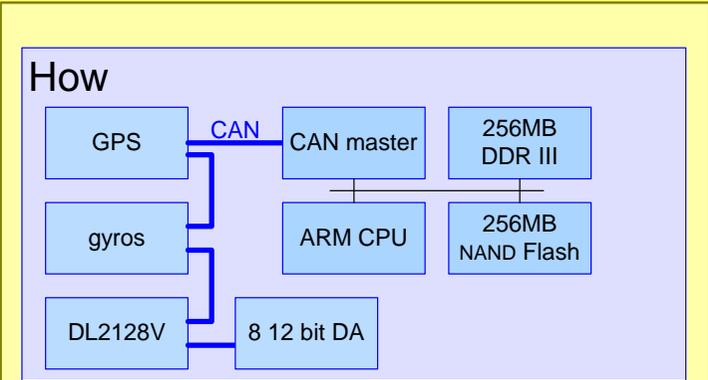
show the most dominant decomposition of that view, as diagram or as a list; some more guidance will be given per step.

Do and Don't

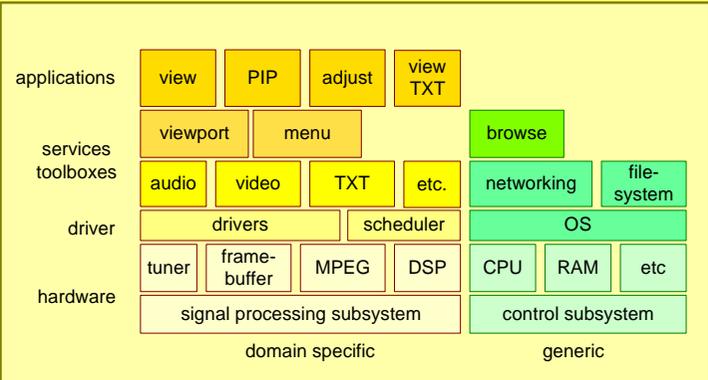
| Do | Do not | Because |
|--|--|---|
| <ul style="list-style-type: none">• start sketching/drawing as soon as possible• use shared large sheets of paper (e.g. flip-over)• number the flip-overs and add a title• annotate (add notes) during discussions• use yellow note stickers and flip-over markers• be open for ideas and surprises | <ul style="list-style-type: none">• write long texts• immediately capture electronic• have nice but volatile discussions• write with pen or pencil• Do not stick to the first solution | <ul style="list-style-type: none">• sketches stimulate sharing and discussion• sharing and discussion help to explore faster• remembering the order gets challenging• information and insight is quickly lost• stickers are easily (re)moved• you hopefully discover a lot; increased insight will change problem and solution |

Step 1: Realization View

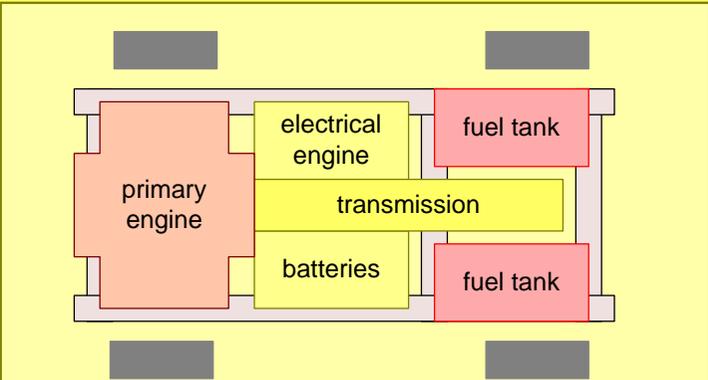
Choose 1 or 2 items from below



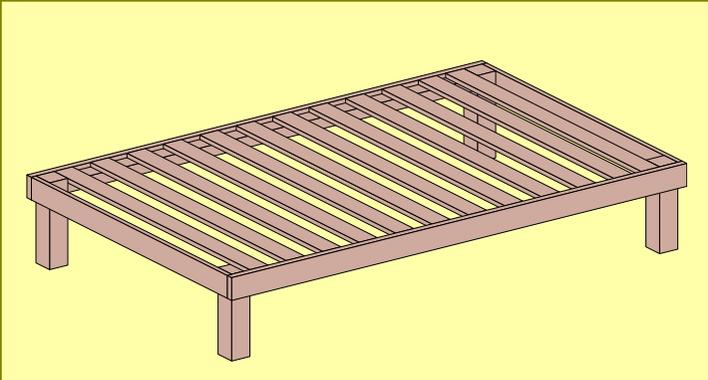
HW block diagram



SW layer diagram



2D layout of system internals



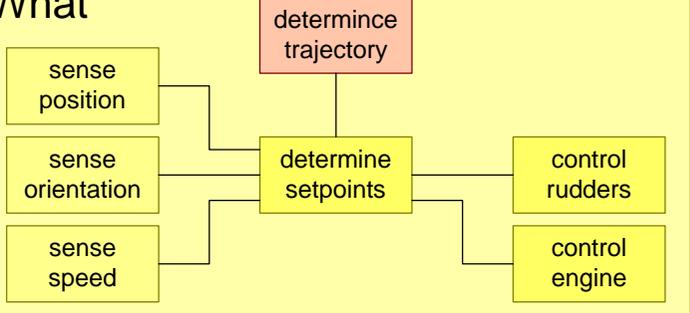
3D sketch of system internals

Annotate/mark most critical technologies or characteristics

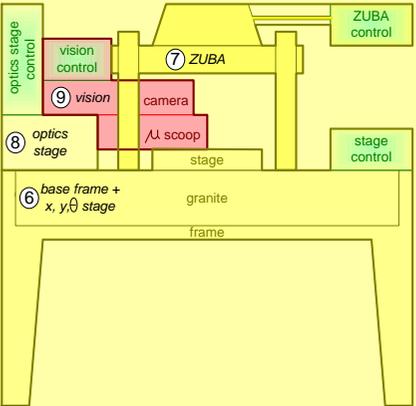
Step 2: Conceptual View

Chose 1 or 2 items from below

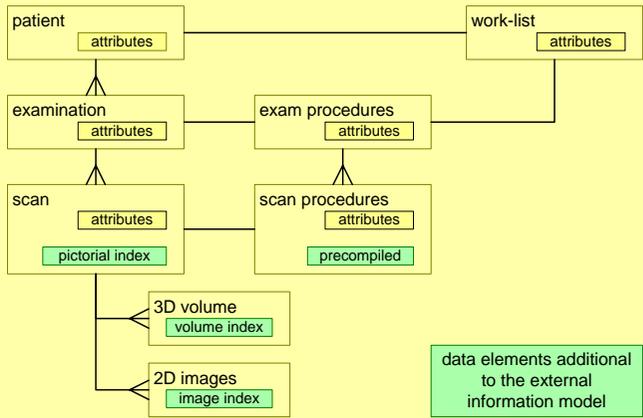
What



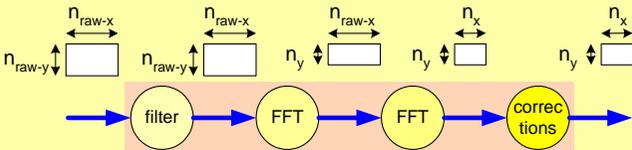
functional model



subsystem decomposition



information model

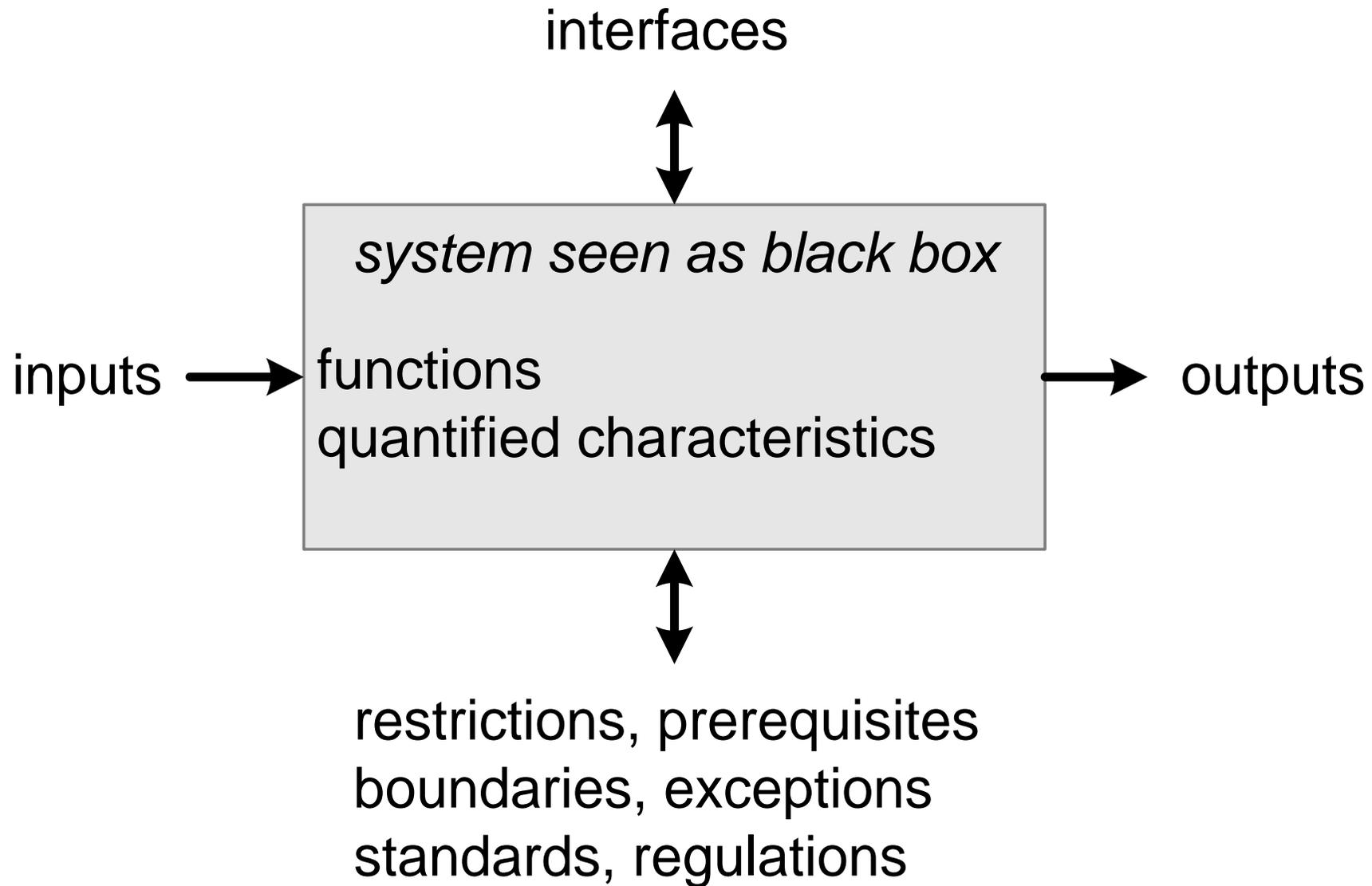


$$\begin{aligned}
 t_{recon} = & t_{filter}(n_{raw-x}, n_{raw-y}) + \\
 & n_{raw-x} * (t_{fft}(n_{raw-y}) + t_{col-overhead}) + \\
 & n_y * (t_{fft}(n_{raw-x}) + t_{row-overhead}) + \\
 & t_{corrections}(n_x, n_y) + \\
 & t_{control-overhead}
 \end{aligned}$$

$$t_{fft}(n) = c_{fft} * n * \log(n)$$

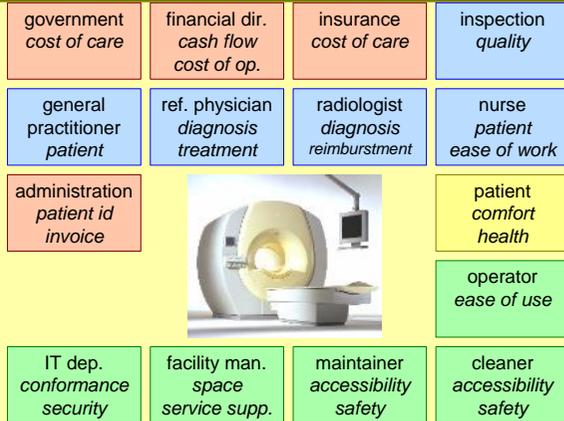
performance model

Step 3: Functional View; Top level Spec

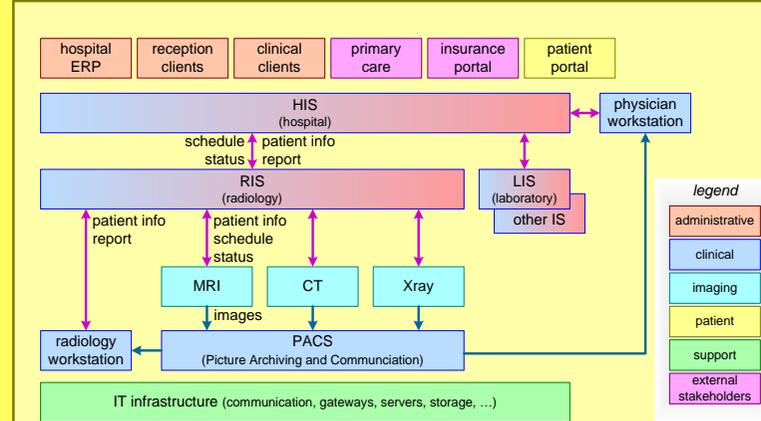


Step 4: Application View

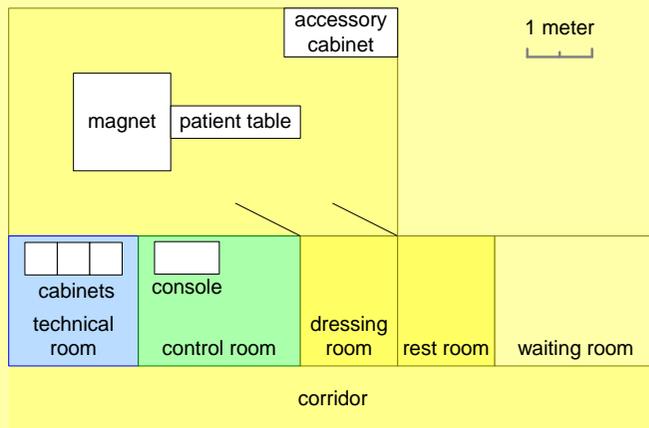
Chose 1 or 2 items from below



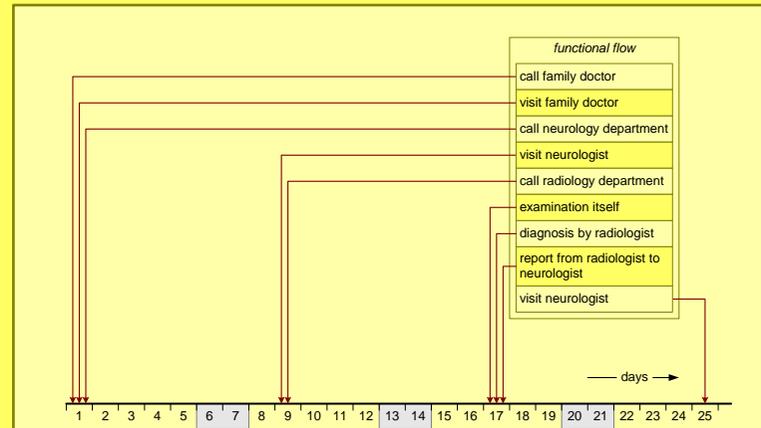
stakeholders and concerns (who)



system context

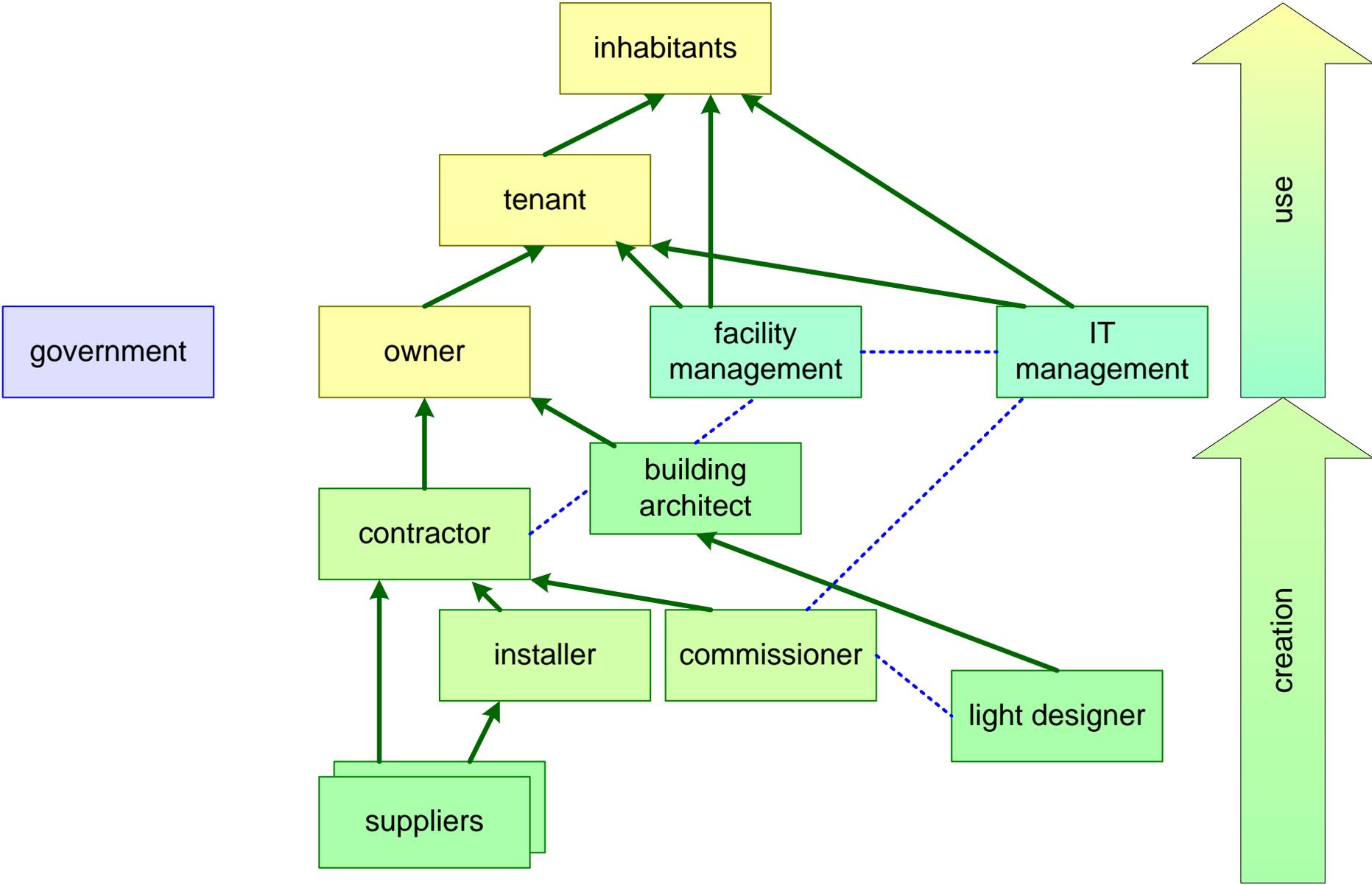


2D map (where)



work flow & time line (what, when)

Step 5: Customer Objectives View; Value Network



Step 6: Qualities

Determine the 5 most relevant qualities from the checklist

- Make the chosen qualities as specific as possible
- Explain for each quality why it is relevant

Step 6: Qualities Checklist

usable

usability
attractiveness
responsiveness
image quality
wearability
storability
transportability

dependable

safety
security
reliability
robustness
integrity
availability

effective

throughput or
productivity

interoperable

connectivity
3rd party extendible

liable

liability
testability
traceability
standards compliance

efficient

resource utilization
cost of ownership

consistent

reproducibility
predictability

serviceable

serviceability
configurability
installability

future proof

evolvability
portability
upgradeability
extendibility
maintainability

logistics friendly

manufacturability
logistics flexibility
lead time

ecological

ecological footprint
contamination
noise
disposability

down to earth attributes

cost price
power consumption
consumption rate
(water, air,
chemicals,
et cetera)
size, weight
accuracy

Presentation

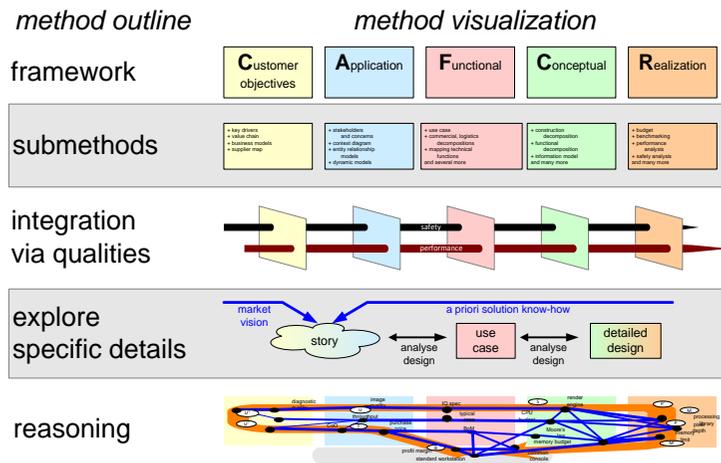
Present the results top-down

Use two to three flip charts of the six that have been created.

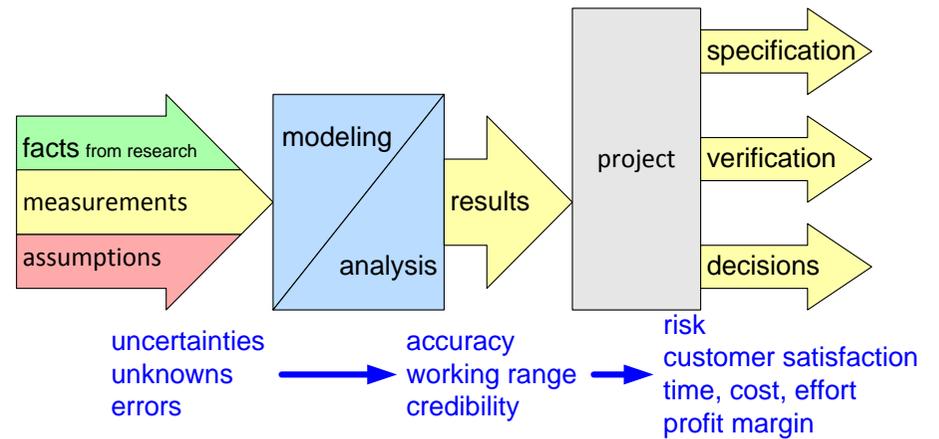
Explain in five minutes the needs of the customer, the system, and the major design choices.

Method Overview

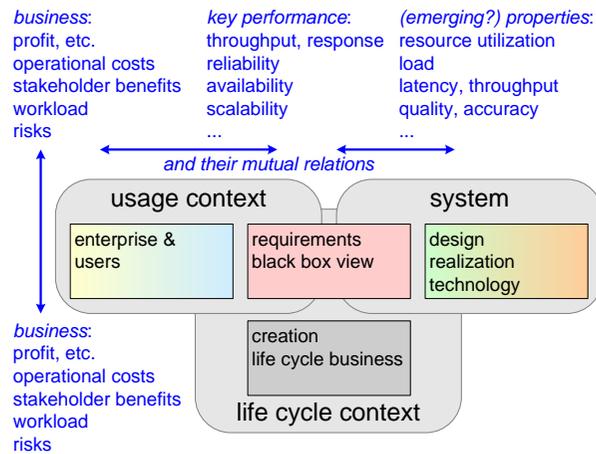
Architecting Method Overview



Modeling Method Overview

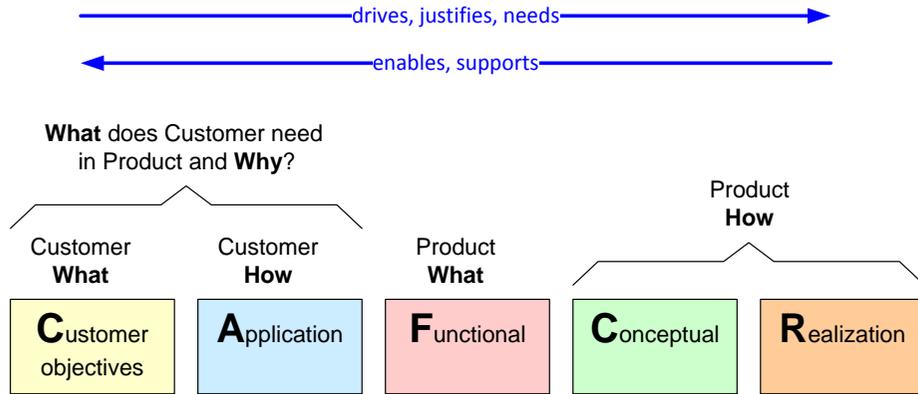


Modeling Scope

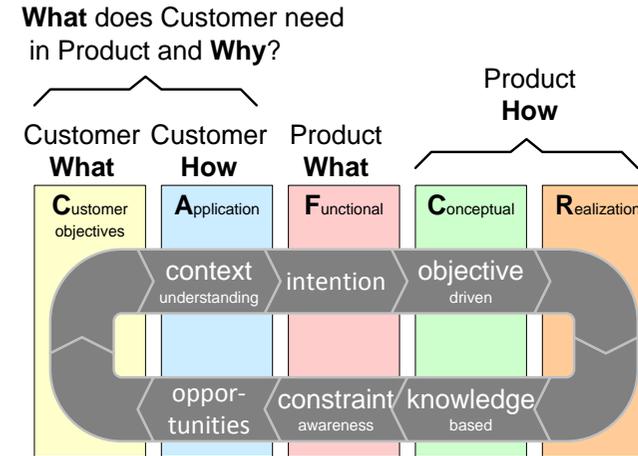


intentionally left blank

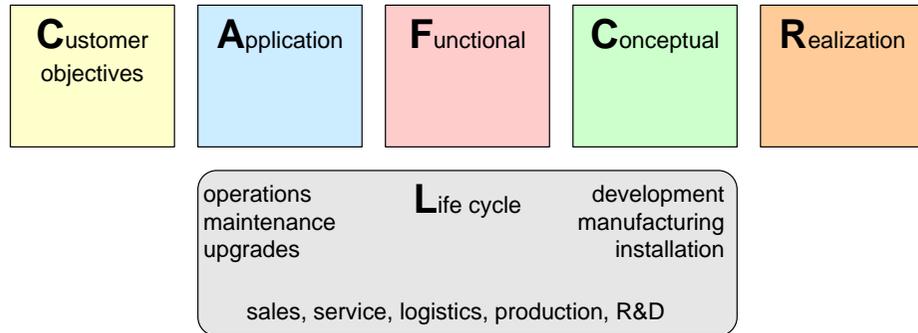
CAFCR views



Integrate and Iterate



Plus Life Cycle view



Sketch on Flips, Use Note stickers

| Do | Do not | Because |
|---|--|--|
| <ul style="list-style-type: none"> start sketching/drawing as soon as possible use shared large sheets of paper (e.g. flip-over) number the flip-overs and add a title annotate (add notes) during discussions use yellow note stickers and flip-over markers be open for ideas and surprises | <ul style="list-style-type: none"> write long texts immediately capture electronic have nice but volatile discussions write with pen or pencil Do not stick to the first solution | <ul style="list-style-type: none"> sketches stimulate sharing and discussion sharing and discussion help to explore faster remembering the order gets challenging information and insight is quickly lost stickers are easily (re)moved you hopefully discover a lot; increased insight will change problem and solution |