Exploring Product Line Opportunities

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Abstract

Many companies struggle to benefit from similarities between products they sell. The challenge is to find these commonalities that can be shared between products, while the product value for different customers is not (too much) compromized.

We will discuss a method understand the playing field both in marketing and technology, and we discuss a process to quickly explore this playing field by workshops and fast iteration over views and considerations.

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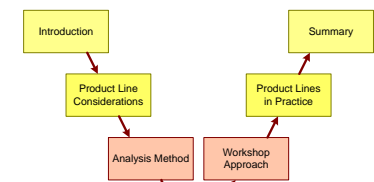
Figure Of Contents™

The "CAFCR" model

drives, justifies, needs →

← enables, supports

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

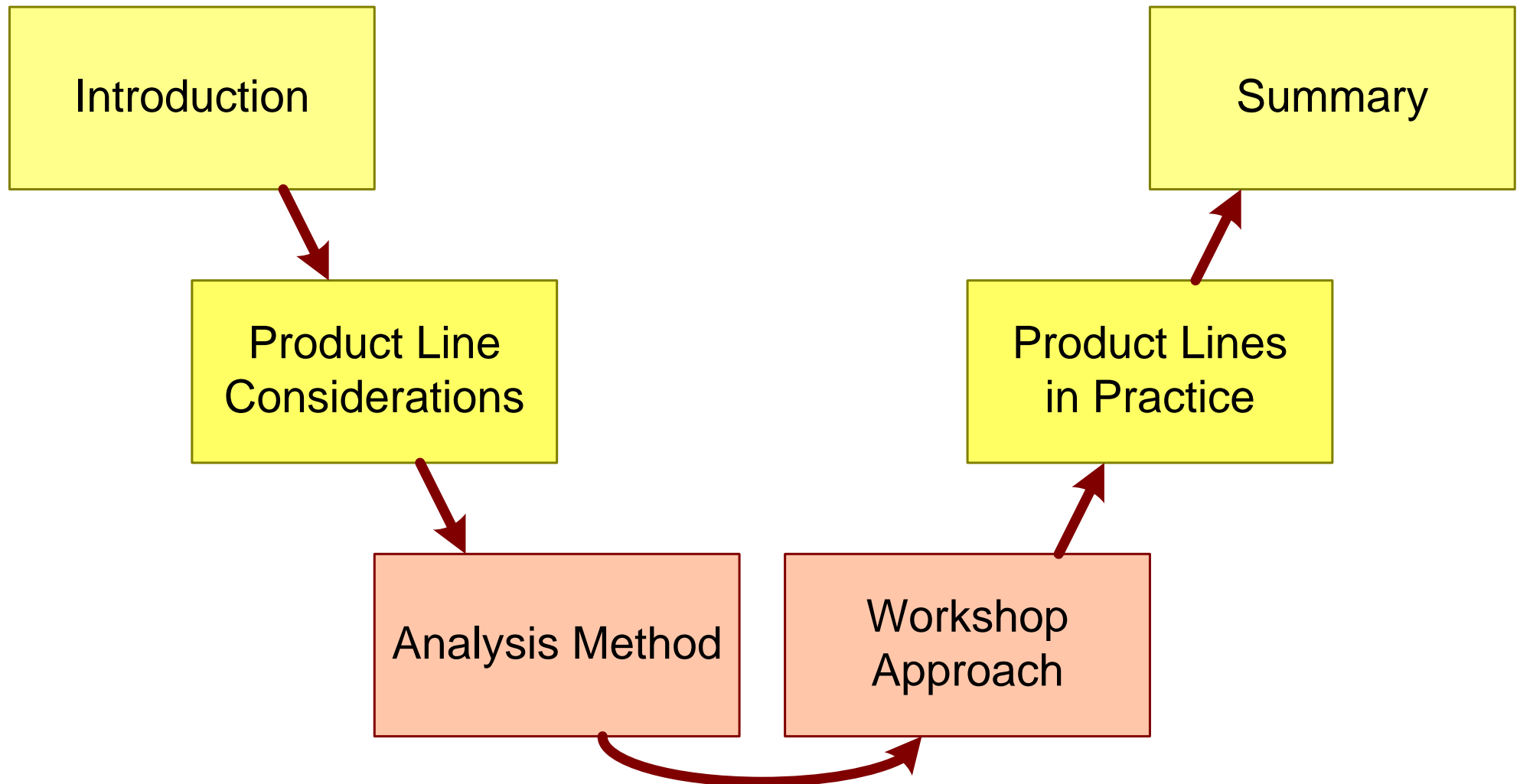| Customer **What**	Customer **How**	Product **What**	Product **How**	
Customer objectives	**A**pplication	**F**unctional	**C**onceptual	**R**ealization

USN   ESI
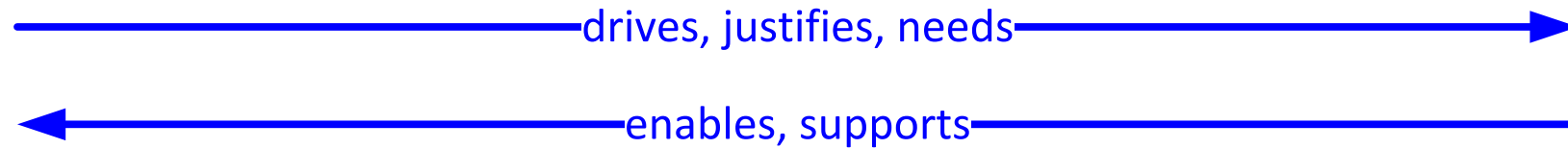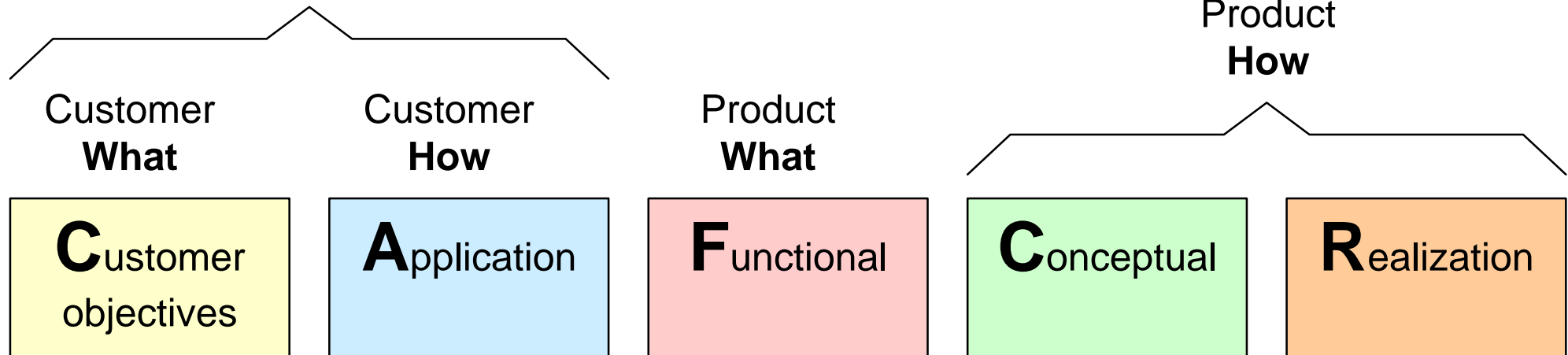
CAFCR can be applied recursively

Consumer

Drives

Enables

Customer's
Customer
Business

Drives

Enables

Customer
Business

Drives

Enables

System
(producer)

Value Chain
larger scope has smaller
influence on architecture

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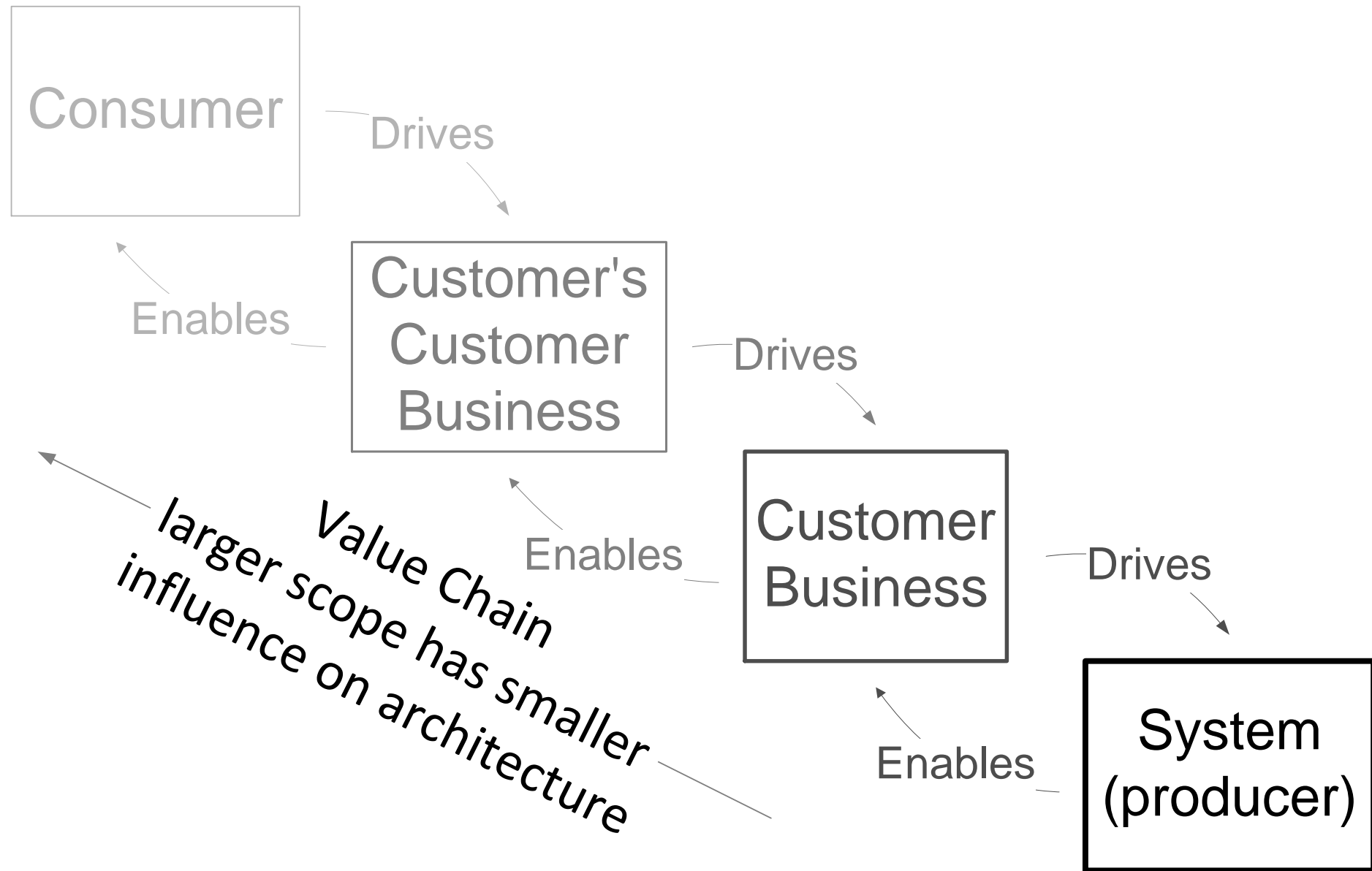
CAFCR+ model; Life Cycle View

Customer objectives

Application

Functional

Conceptual

Realization

Life cycle

operations
maintenance
upgrades

development
manufacturing
installation

sales, service, logistics, production, R&D

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Product Line Considerations

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Multiple Markets

Customer **What**	Customer **How**	Product **What**	Product **How**	
Customer objectives	**A**pplication	**F**unctional	**C**onceptual	**R**ealization

Multiple markets:
   different customers
   different applications
   different products

electron microscopes:
   material sciences
   life sciences
   manufacturing, e.g. semiconductors

Shared platform:
   shared concepts
   shared technology

electron microscopes:
   e-beam sources, optics
   vacuum
   acquisition control

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Complementing Systems for Same Market

Customer
What

Customer
How

Product
What

Product
How

Customer objectives	**A**pplication	**F**unctional	**C**onceptual	**R**ealization
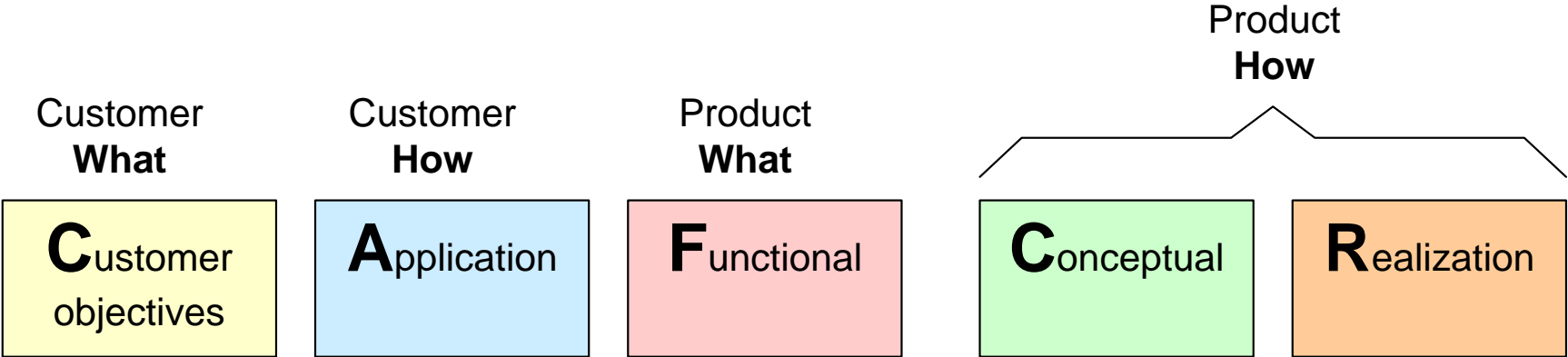
Single market:
 different stakeholders
 different applications
 interoperable products

health care, e.g. cardiology:
 analysis
 diagnosis
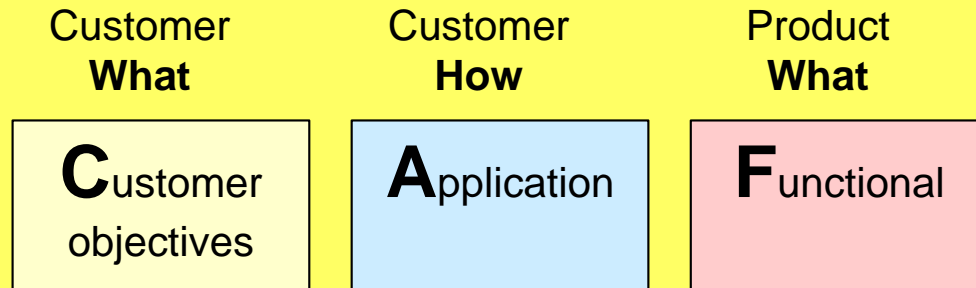 treatment
 administration

Shared components:
 shared concepts
 shared technology

health care, e.g. cardiology:
 patient support
 patient information
 image information
 storage & communication
 user interface

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Scope Analysis

market segmentation

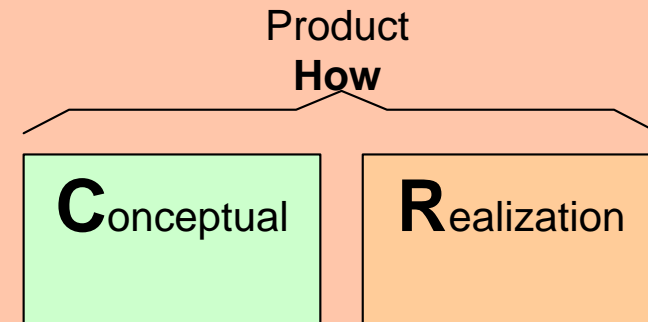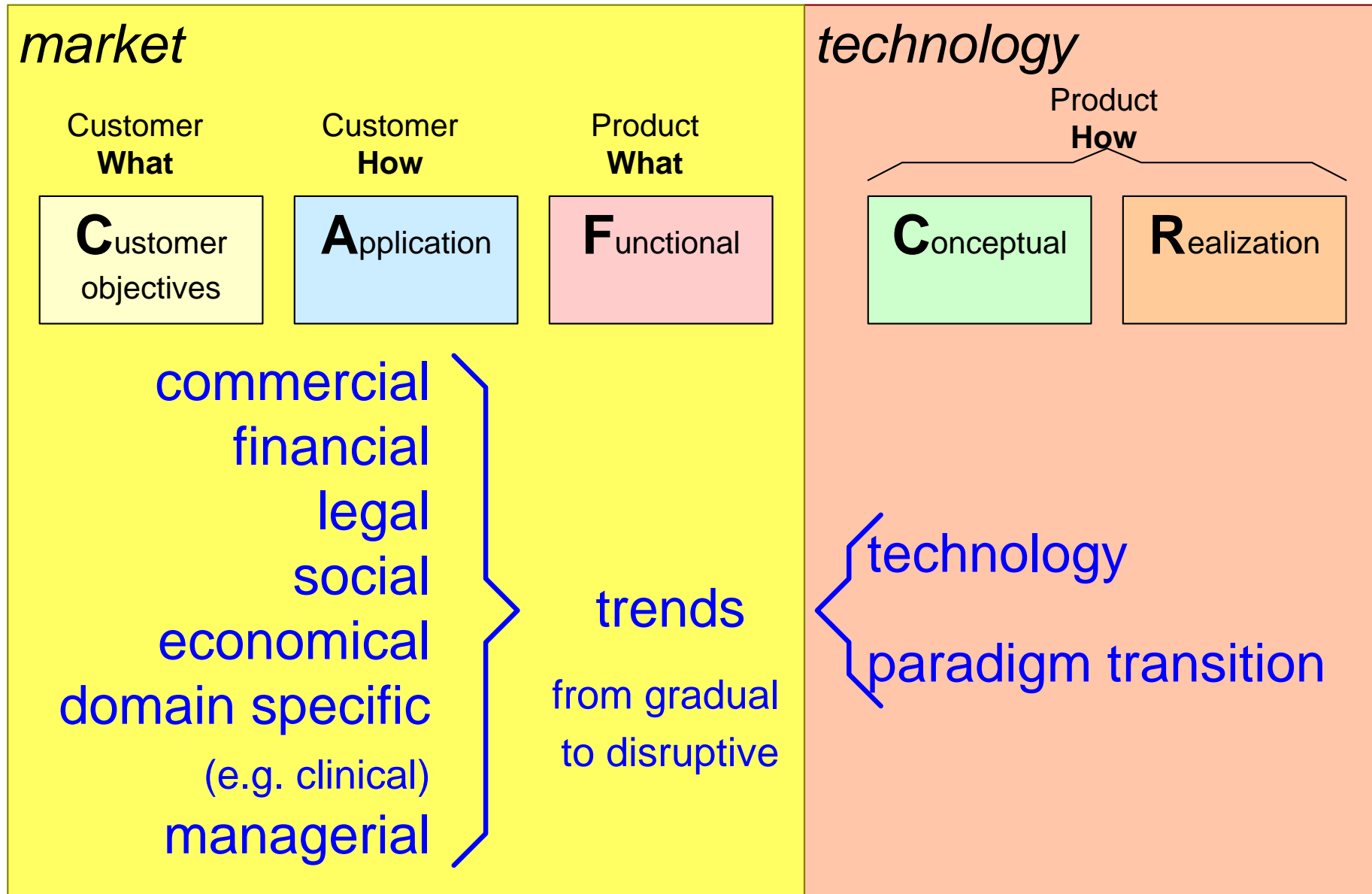| Customer **What**	Customer **How**	Product **What**
Customer objectives	**A**pplication	**F**unctional

market taxonomy

customer classification

stakeholder classification

inventarization applications

inventarization
 functions
 features
 performance

synergy analysis

Product
How

Conceptual	**R**ealization

shared functionality
 analyse characteristics
analyse differentiators
 functionality
 characteristics

Roadmapping: Impact of Future

market

Customer **What**	Customer **How**	Product **What**
Customer objectives	**A**pplication	**F**unctional

technology

Product **How**

Conceptual	**R**ealization

commercial
financial
legal
social
economical
domain specific
(e.g. clinical)
managerial

trends

from gradual
to disruptive

technology

paradigm transition

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Criteria and Forces for Synergy

unification ←

| development cost |
| development effort |
| logistics cost |

← market share
time to market
installed base evolution
future (potential) value
market approach
    (luminary sites, price fighter) →

fit to customer
fit to stakeholder
fit to application → dedication

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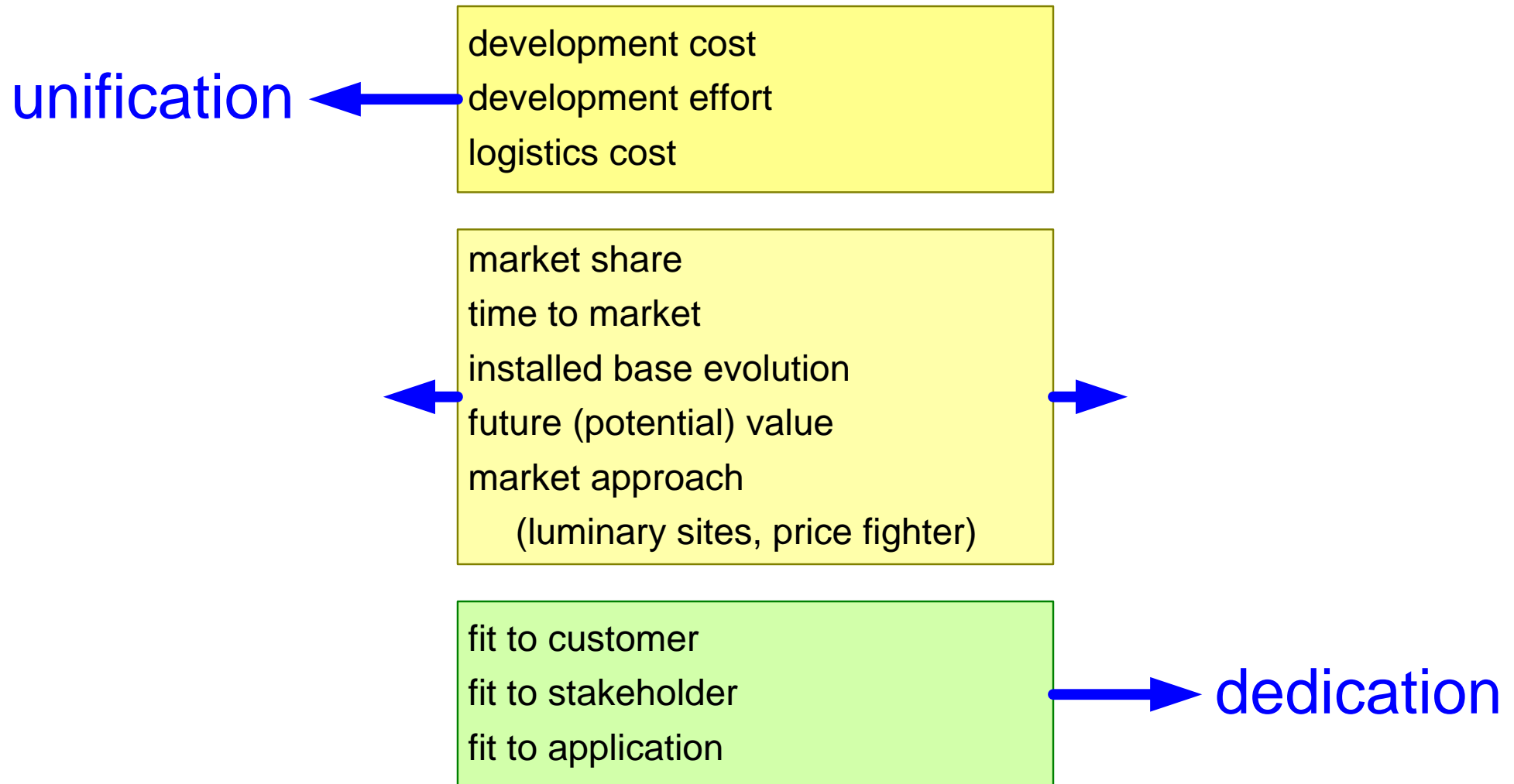
Possible Levels of Sharing

intangible assets

vision, objectives

specifications, interfaces

designs, concepts

processes

tangible assets
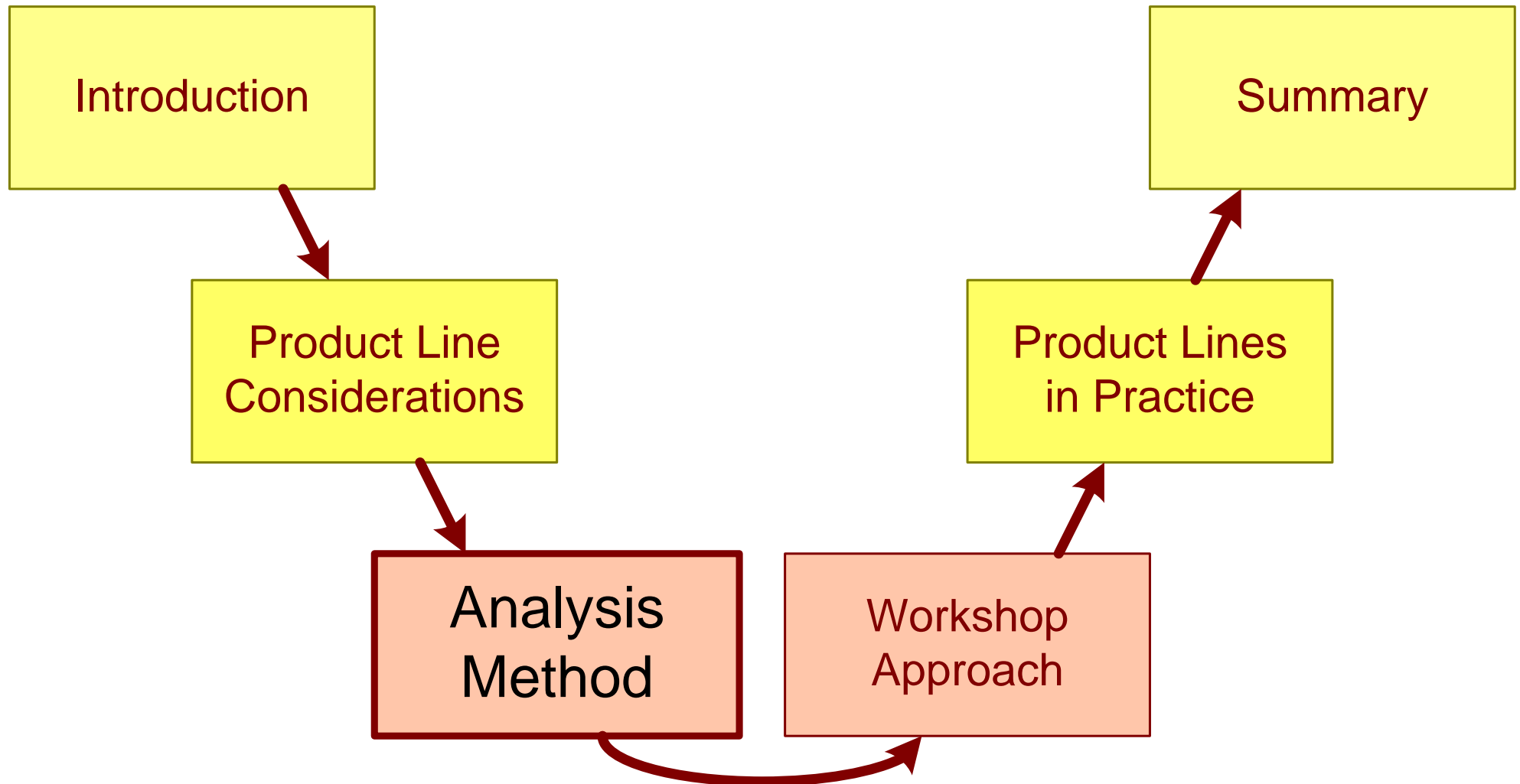
realized components

integrated (sub)systems

tools

infrastructure

test suites

Not everything that can be shared should be shared!

Analysis Method

Approach to Platform Business Analysis

explore markets, customers, products and technologies

share market and customer insights

identify product features and technology components

make maps:

  market segments - customer key drivers
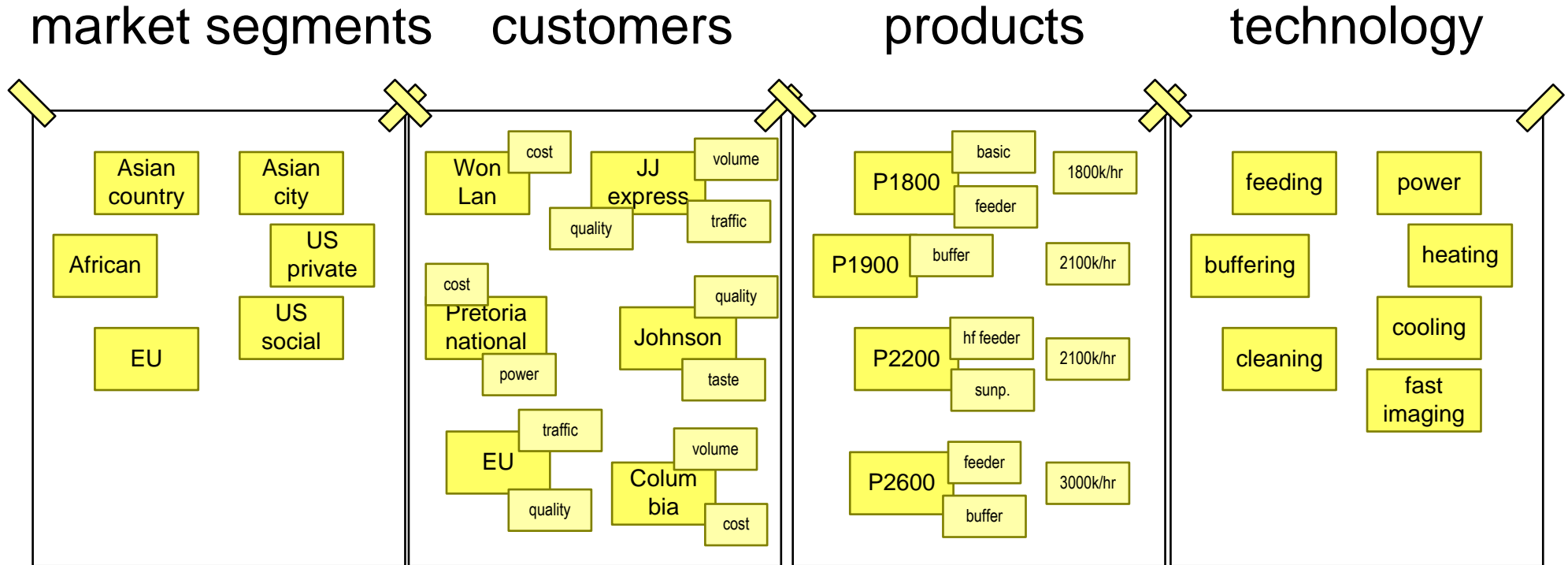 customer key drivers - features
  features - products
  products - components

discuss value, synergy, and (potential) conflicts
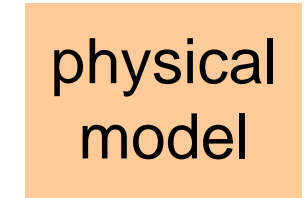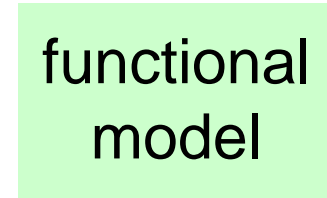
create long-term and short-term plan

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Explore Markets, Customers, Products and Technologies

market segments

- Asian country
- Asian city
- African
- US private
- US social
- EU

customers

- Won Lan — cost, quality
- JJ express — volume, traffic
- Pretoria national — cost, power
- Johnson — quality, taste
- EU — traffic, quality
- Columbia — volume, cost

products

- P1800 — basic, feeder — 1800k/hr
- P1900 — buffer — 2100k/hr
- P2200 — hf feeder, sunp. — 2100k/hr
- P2600 — feeder, buffer — 3000k/hr

technology

- feeding
- power
- buffering
- heating
- cleaning
- cooling
- fast imaging

brain storm and discuss time-boxed

Study one Customer and Product

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

Customer **What**	Customer **How**	Product **What**	Product **How**	
Customer objectives	**A**pplication	**F**unctional	**C**onceptual	**R**ealization

key-driver graph

configuration

functional model

physical model

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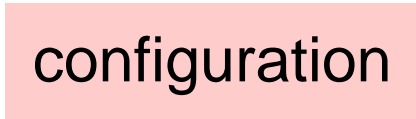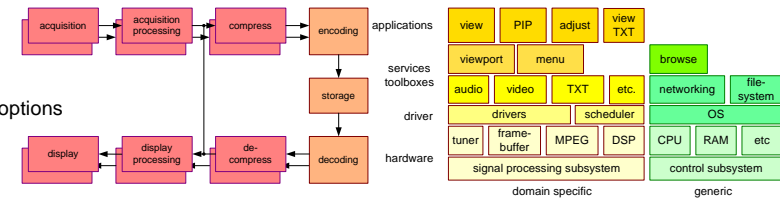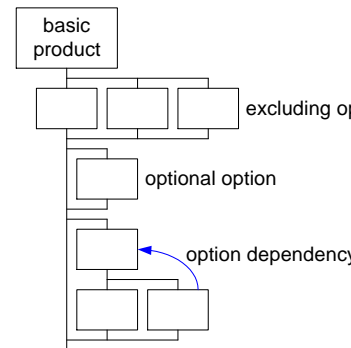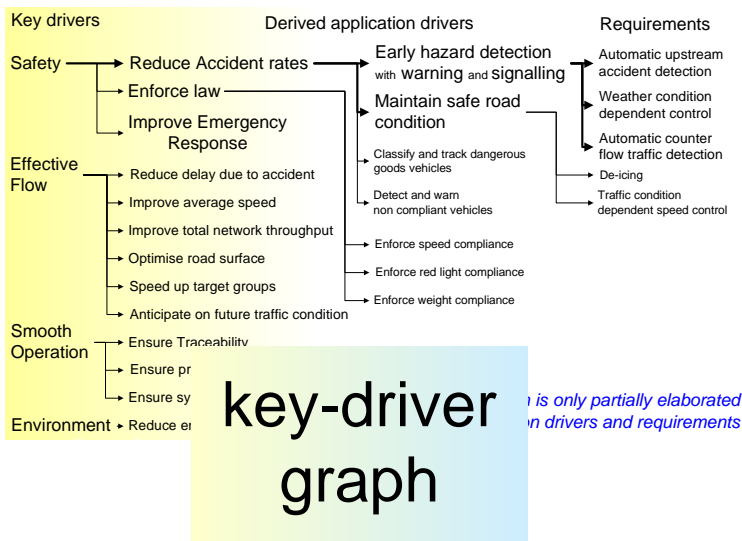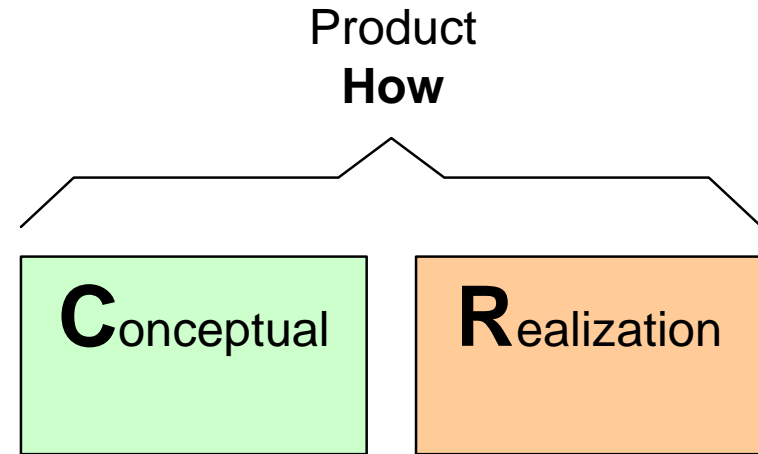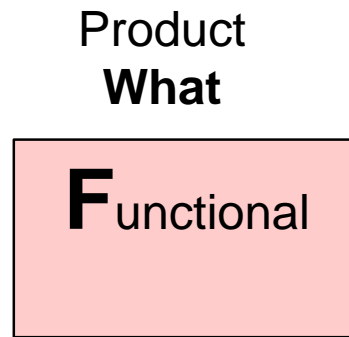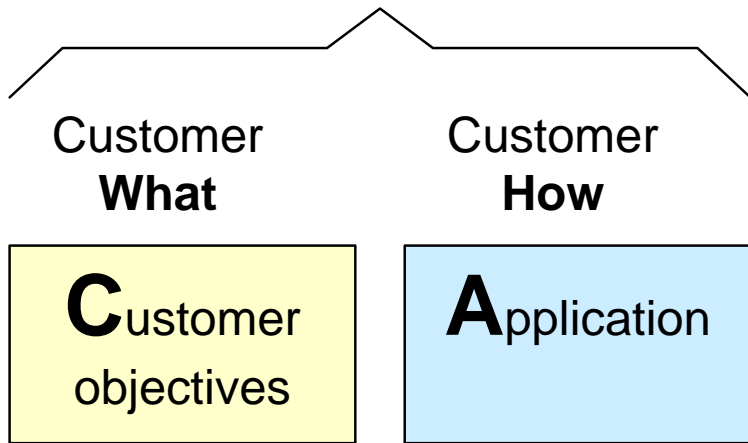
Work Flow Analysis for Different Customers/Applications

accessory cabinet

3

magnet

patient table

4 2

5

cabinets

technical room

console
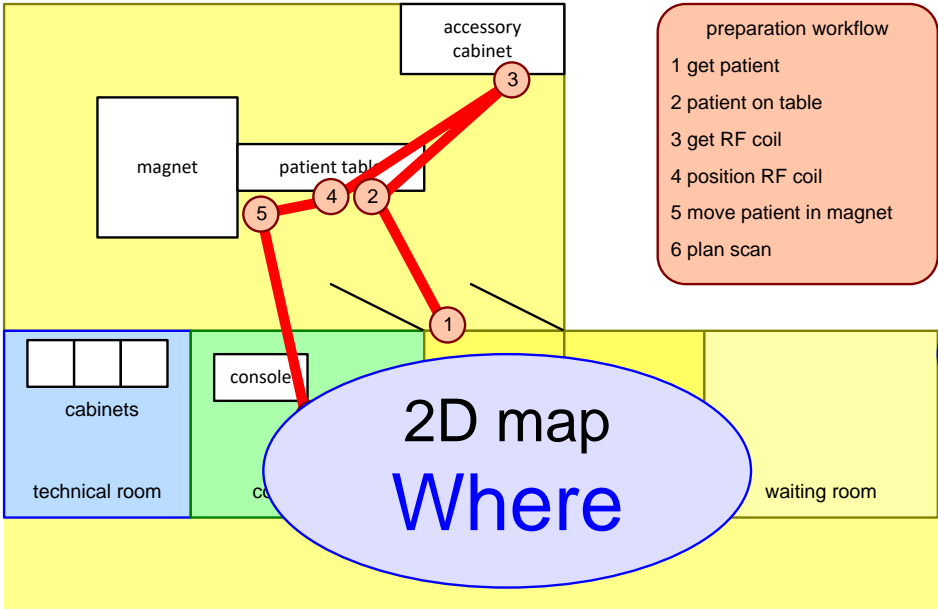
preparation workflow
1 get patient
2 patient on table
3 get RF coil
4 position RF coil
5 move patient in magnet
6 plan scan

nurse   physician

patient

stakeholders
Who

admin

2D map
Where

waiting room
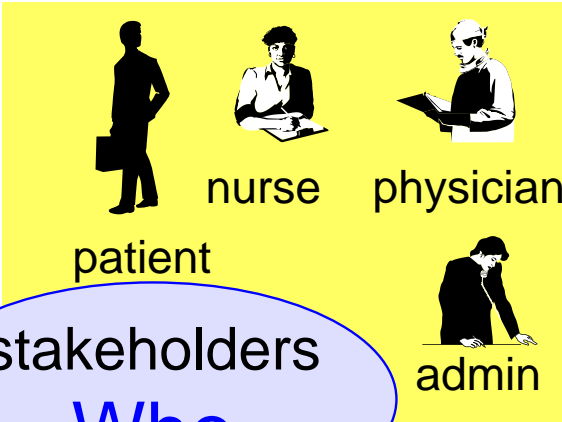
workflow
What

walk fr

sit on tab

move table upwar

position coils and connect

move table and patient into magnet

make plan scan

sketch

sketch
How

walk	sit, position	table up	*talk*	coils

time line
When

14:15

14:20

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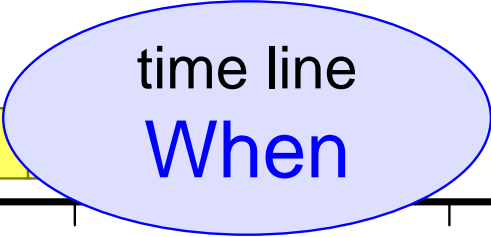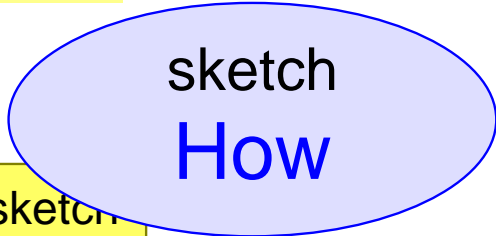
Make Map of Customers and Market Segments

Identify Product Features and Technology Components

features

basic

1800k/hr 2100k/hr 3000k/hr

buffer

sunp.

feeder   hf feeder

	domain specific				generic
applications	adjust	order	workflow		
services toolboxes	prepare	packing	process	browse	fast imaging
	buffering cooling	heating	cleaning feeding	networking	file-system
driver	drivers	drivers	scheduler	OS	
	store	conveyor	robot	CPU RAM etc	
hardware	climate subsystem	handling subsystem	power	control subsystem	

domain specific   generic

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Mapping From Markets to Components

market segments

features

components

customer key drivers

products

mature performing
changing performing
mature cost
changing cost

basic
1800k/hr
2100k/hr
3000k/hr
buffer

cost
power
traffic
volume

P1800
P1900
P2200

adjust
order
workflow
prepare
packing
process
buffering
cooling
heating
cleaning
feeding
drivers
drivers
scheduler
store
conveyor
climate subsystem
handling subsystem
browse
fast imaging
networking
file-system

1
2
3
4

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Example Criteria for Determining Value

- Value for the customer

- (dis)satisfaction level for the customer

- Selling value (How much is the customer willing to pay?)

- Level of differentiation w.r.t. the competition

- Impact on the market share

- Impact on the profit margin

Use relative scale, e.g. 1..5 1=low value, 5 -high value

Ask several knowledgeable people to score

Discussion provides insight (don't fall in spreadsheet trap)

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Determine Value of Features

	P1800			P1900			P2200		
features	satisfaction customer	sales price	market share	satisfaction customer	sales price	market share	satisfaction customer	sales price	market share
feeder	1	5	4	3	4	4	4	5	5
hf feeder									
buffer	4	3	4	5	3	4	4	3	4
sunpower	2	2	1	2	2	1	2	2	4

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Example Platform Scoping

intelligent buildings

motorway management

heterogeneous domains and application

railway stations

airport terminals

shared core technology

Closed Circuit TV

audio broadcasting

access control

networking
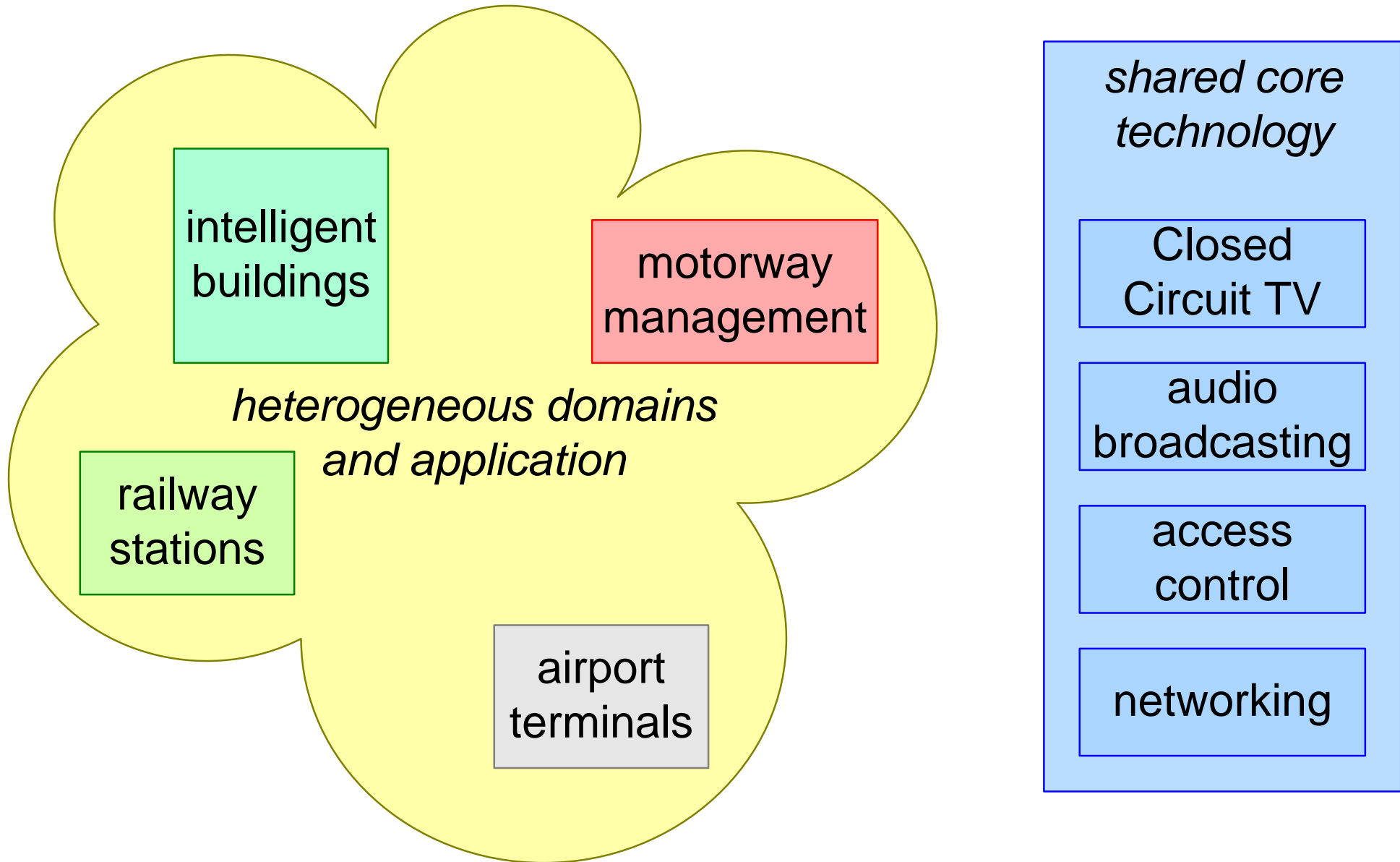
Workshop Approach
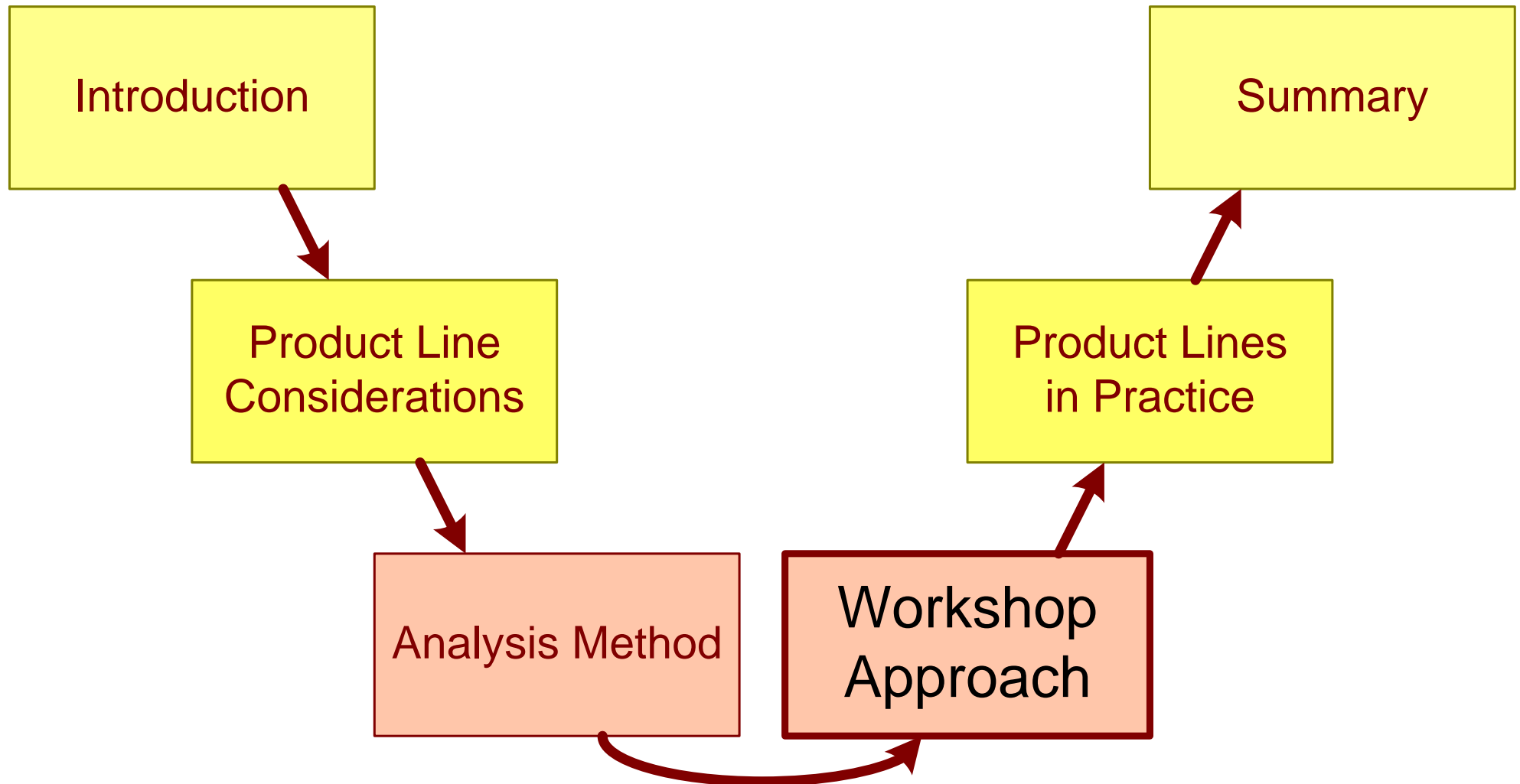
Foundation must be in order

multi-site
multi-supplier
multi-vendor

evolvable product family
architecting

responsiveness
anticipated trends
disruptive change

product family
architecting

value propositions
market segmentatiion
portfolio management
synergy

mono-system
architecting

user context
product life cycle
stakeholders

mono-system
design

multi-disciplinary
abstraction
synthesis

mono-disciplinary
engineering

repositories
baselines
change procedures
release management
quality assurance

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Jojo over Views

knowledge learning curve

learning

more learning

abstraction, consolidation

business analysis
feature exploration

scoping

specification and design

Customer architecture

Application architecture

Functional architecture

Conceptual architecture

Realization architecture

1st prototype 1st product 1st family definition time →

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Iterations During M&A Course

bottom-up *top down* *second iteration* *story ->use case*

shared overview

improved overview

depth insight   1st big picture

← day 1 →   ← day 2 →
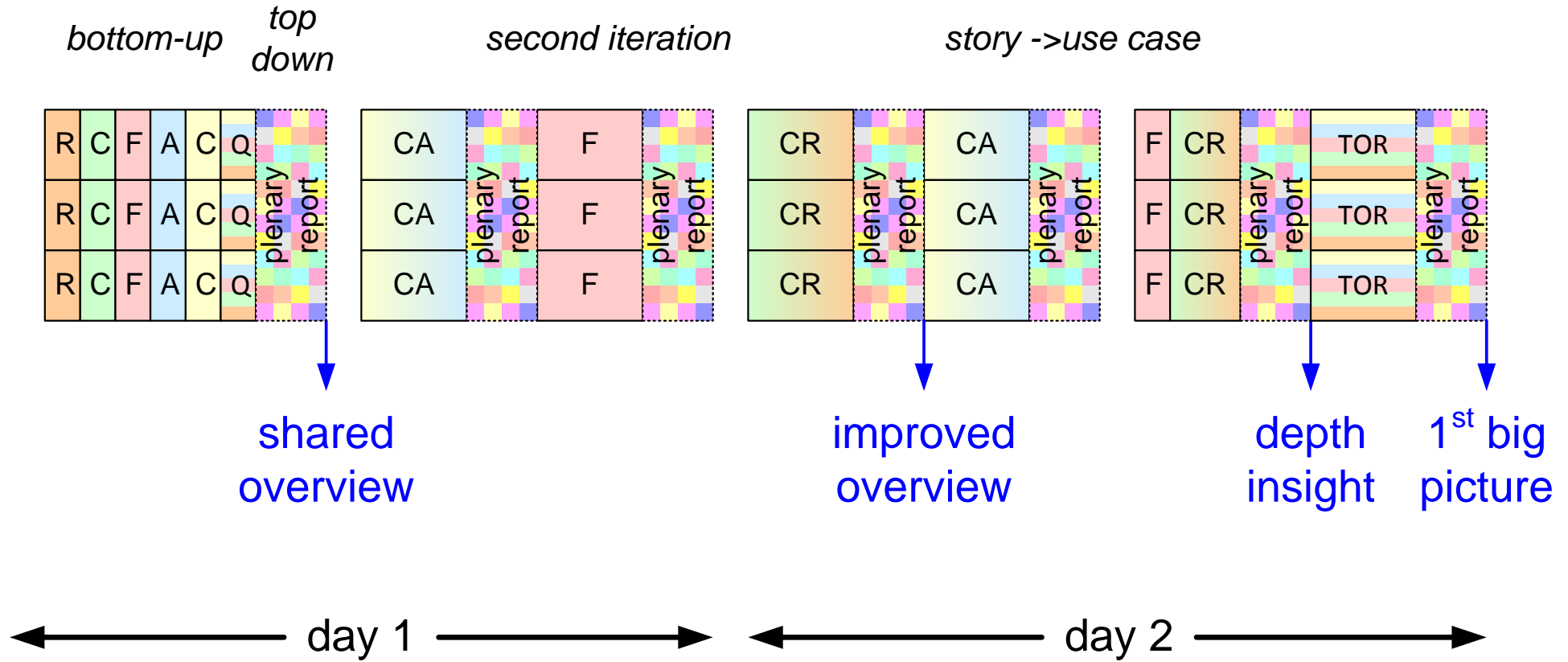
Product Lines in Practice
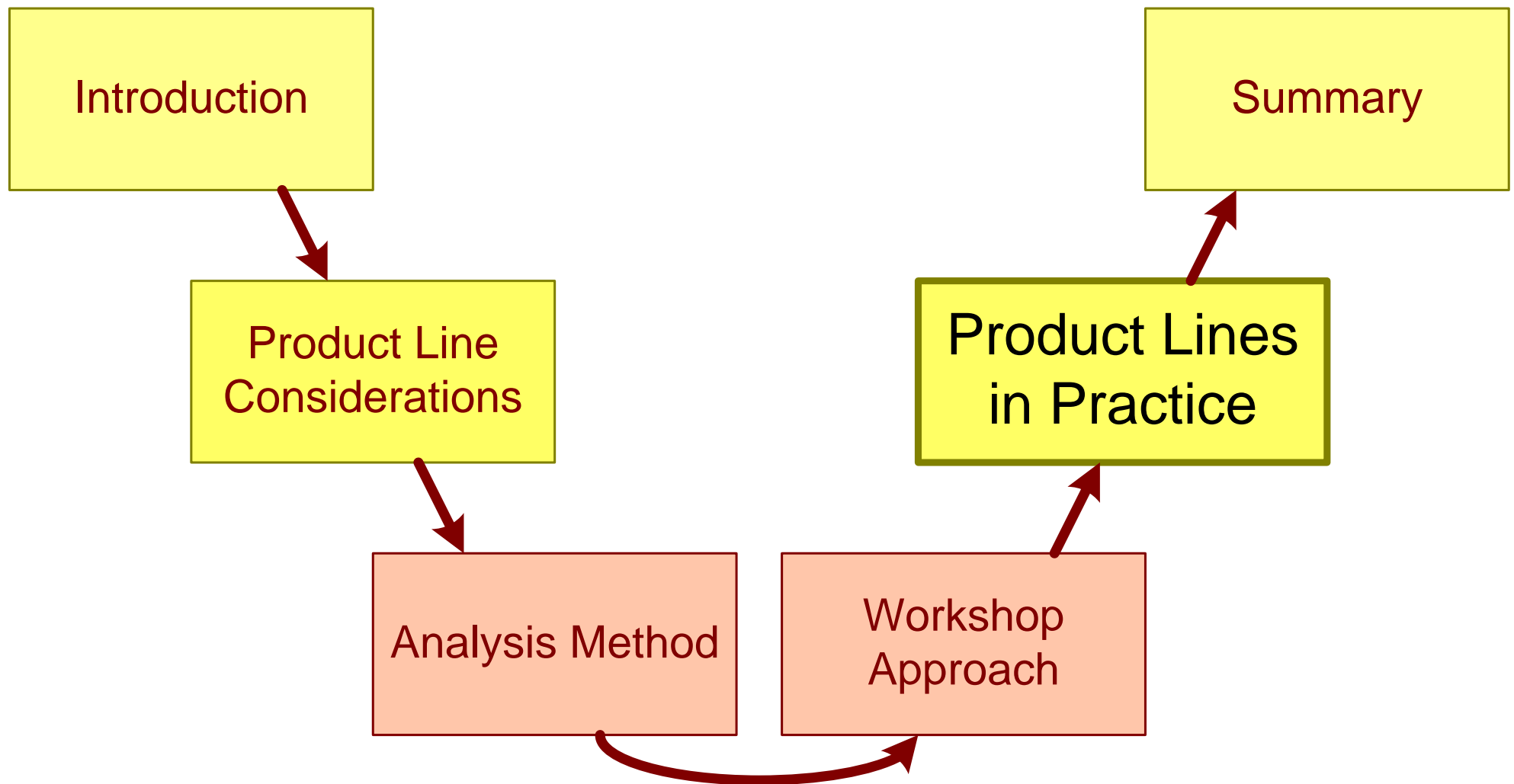
Experiences with reuse, from counterproductive to effective

bad	good
longer time to market	reduced time to market
high investments	reduced investment
lots of maintenance	reduced (shared) maintenance cost
poor quality	improved quality
poor reliability	improved reliability
diversity is opposed	easier diversity management
lot of know how required	understanding of one base system
predictable too late	improved predictability
dependability	larger purchasing power
knowledge dilution	means to consolidate knowledge
lack of market focus	increase added value
interference	enables parallel developments
but integration required	free feature propagation

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Successful examples of reuse

homogeneous domain	cath lab MRI television waferstepper
hardware dominated	car airplane shaver television
limited scope	audio codec compression library streaming library

Limits of successful reuse

struggle with integration/convergence with other domains

    TV: digital networks and media
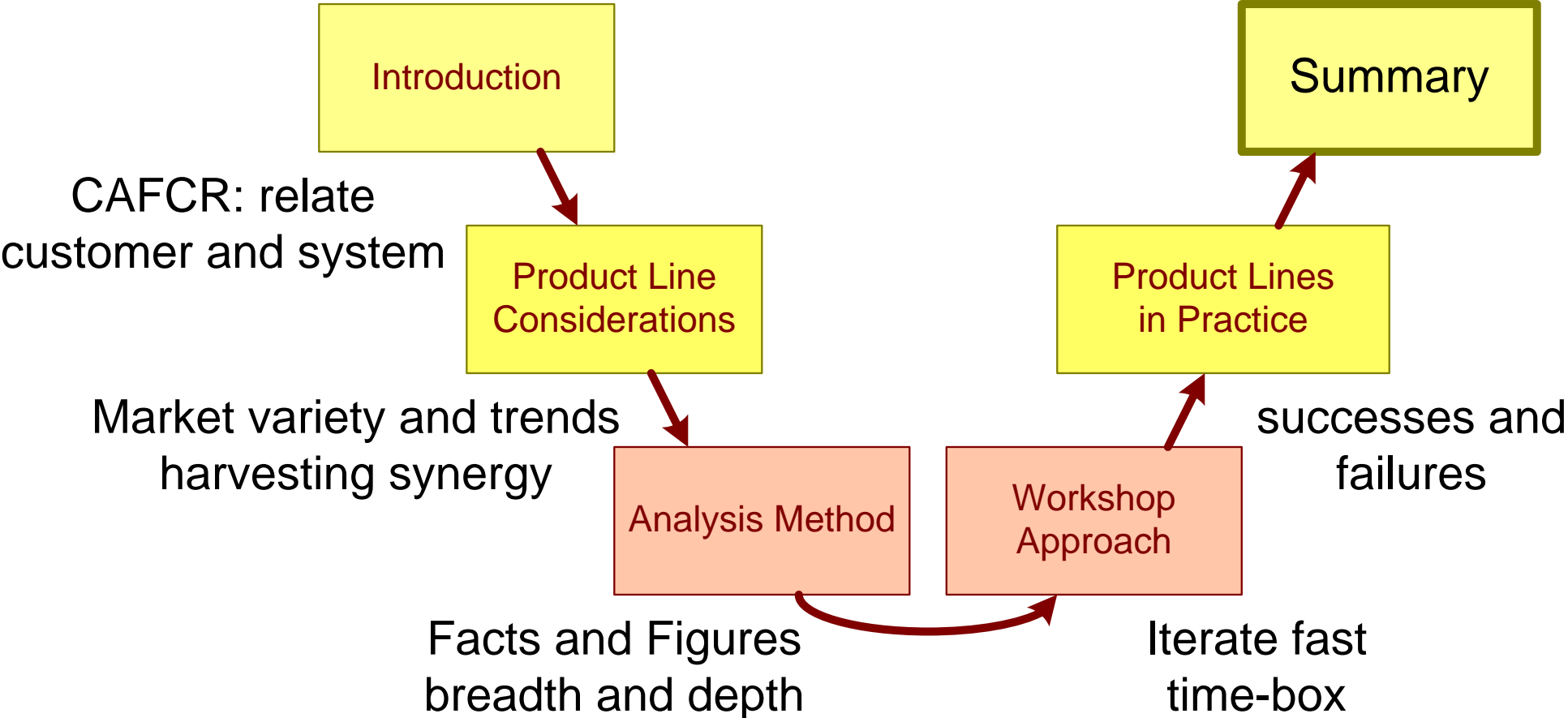   cath lab: US imaging, MRI

poor/slow response on paradigm shifts

    TV: LCD screens
    cath lab: image based acquisition control

software maintenance, configurations, integration, release

    MRI: integration and test
    wafersteppers: number of configurations

how to innovate?

Summary

CAFCR: relate
customer and system

Introduction

Summary

**Product Line
Considerations**

Market variety and trends
harvesting synergy

**Product Lines
in Practice**

successes and
failures

Analysis Method

**Workshop
Approach**

Facts and Figures
breadth and depth

Iterate fast
time-box

Links

CAFCR background

`www.gaudisite.nl/ArchitecturalReasoning.html`

key driver graph paper

`www.gaudisite.nl/KeyDriversHowToPaper.pdf`

key driver graph slides

`www.gaudisite.nl/KeyDriversHowToSlides.pdf`

roadmapping

`www.gaudisite.nl/TutorialRoadmappingForStrategySupportPaper.pdf`

Gaudí site

`www.gaudisite.nl`

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