Module Requirements

by *Gerrit Muller* Embedded Systems Institute
e-mail: gerrit.muller@embeddedsystems.nl
www.gaudisite.nl

Abstract

This module addresses requirements: What are requirements? How to find, select, and consolidate requirements?

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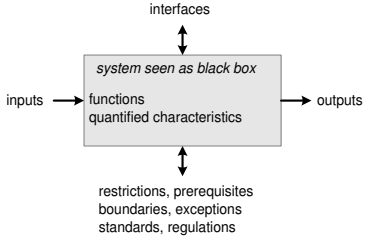
Fundamentals of Requirements Engineering

by *Gerrit Muller* Buskerud University College
e-mail: gerrit.muller@embeddedsystems.nl
www.gaudisite.nl

Abstract

Requirements engineering is one of the systems engineering pillars. In this document we discuss the fundamentals of systems engineering, such as the transformation of needs into specification, the need to prescribe *what* rather than *how*, and the requirements when writing requirements.



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Definition of “Requirement”

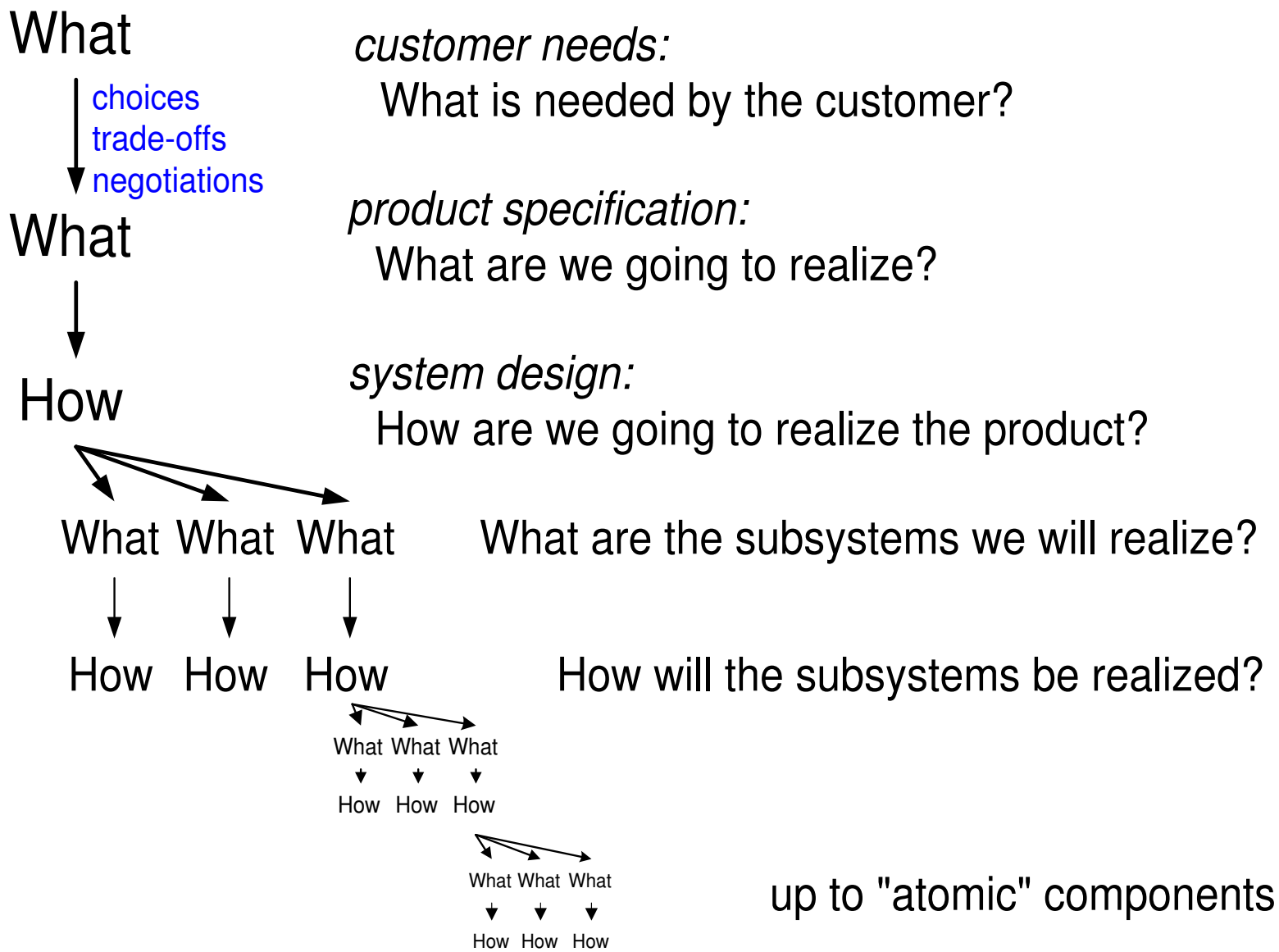
Requirements describing the needs of the customer: *Customer Needs*

Requirements describing the characteristics of the final resulting product: *Product Specification*

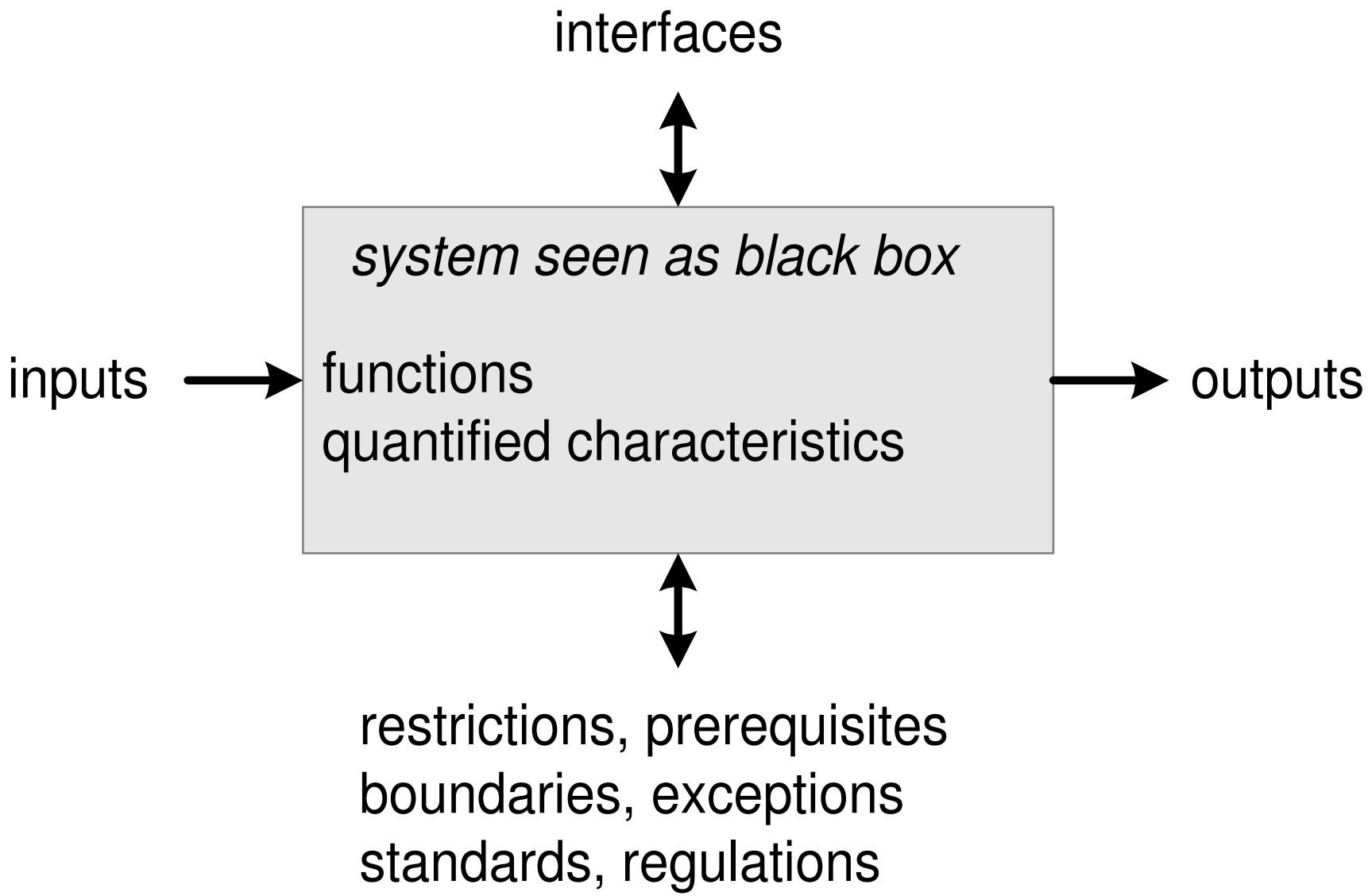
The requirements management process recursively applies definition 2 for every level of decomposition.

Requirements describing the needs of the company itself over the life cycle: *Life Cycle Needs*

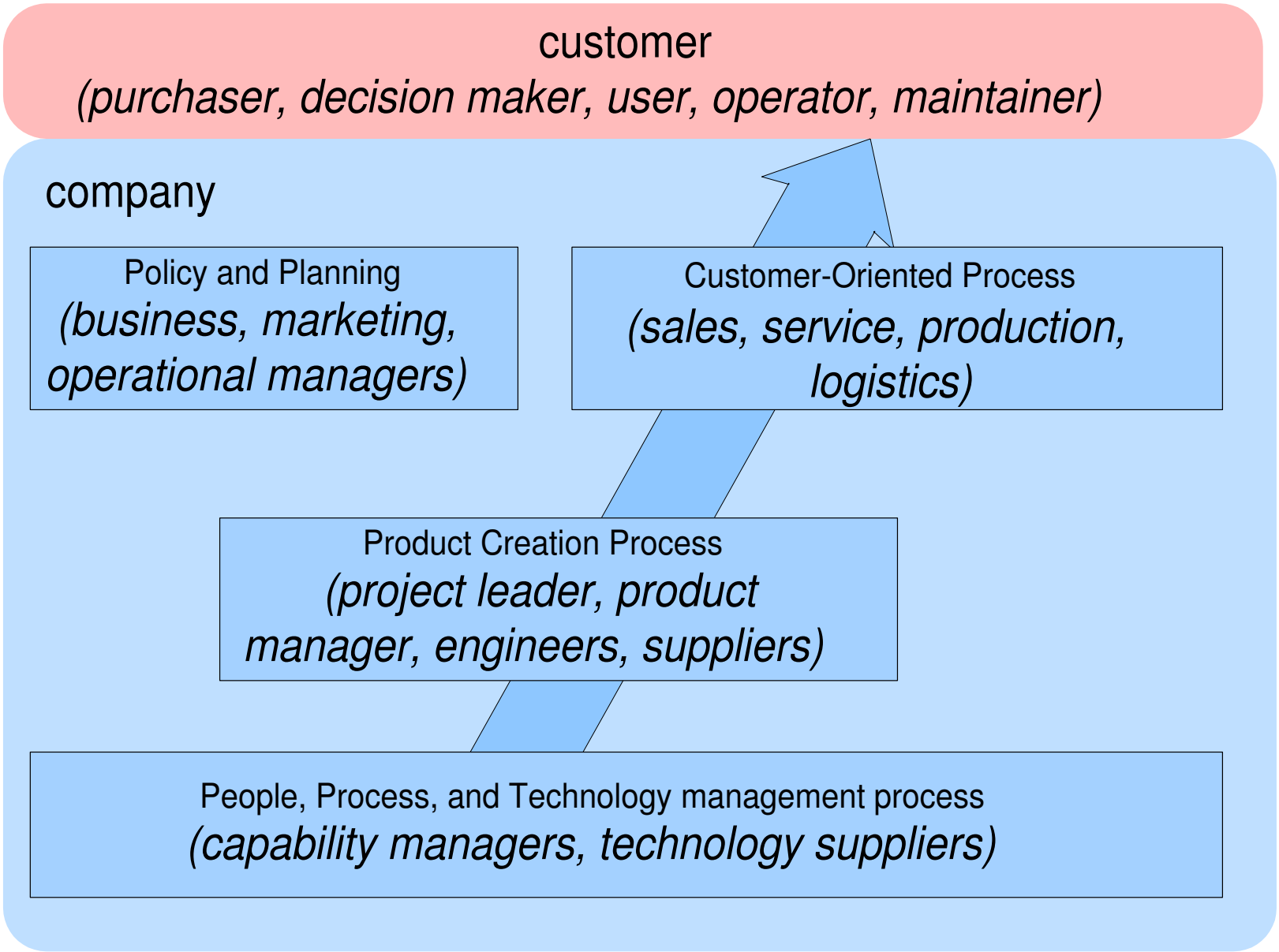
Flow of Requirements



System as a Black Box



Stakeholders w.r.t. Requirements



The “Formal” Requirements for Requirements

Specific

Unambiguous

Verifiable

Quantifiable

Measurable

Complete

Traceable

The Requirements to Enable Human Use

Accessible

Understandable

Low threshold

Short introduction to basic “CAFCR” model

by *Gerrit Muller* Embedded Systems Institute
e-mail: gerrit.muller@embeddedsystems.nl
www.gaudisite.nl

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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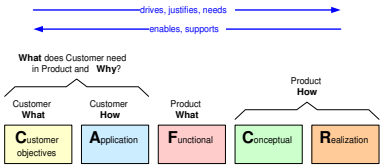
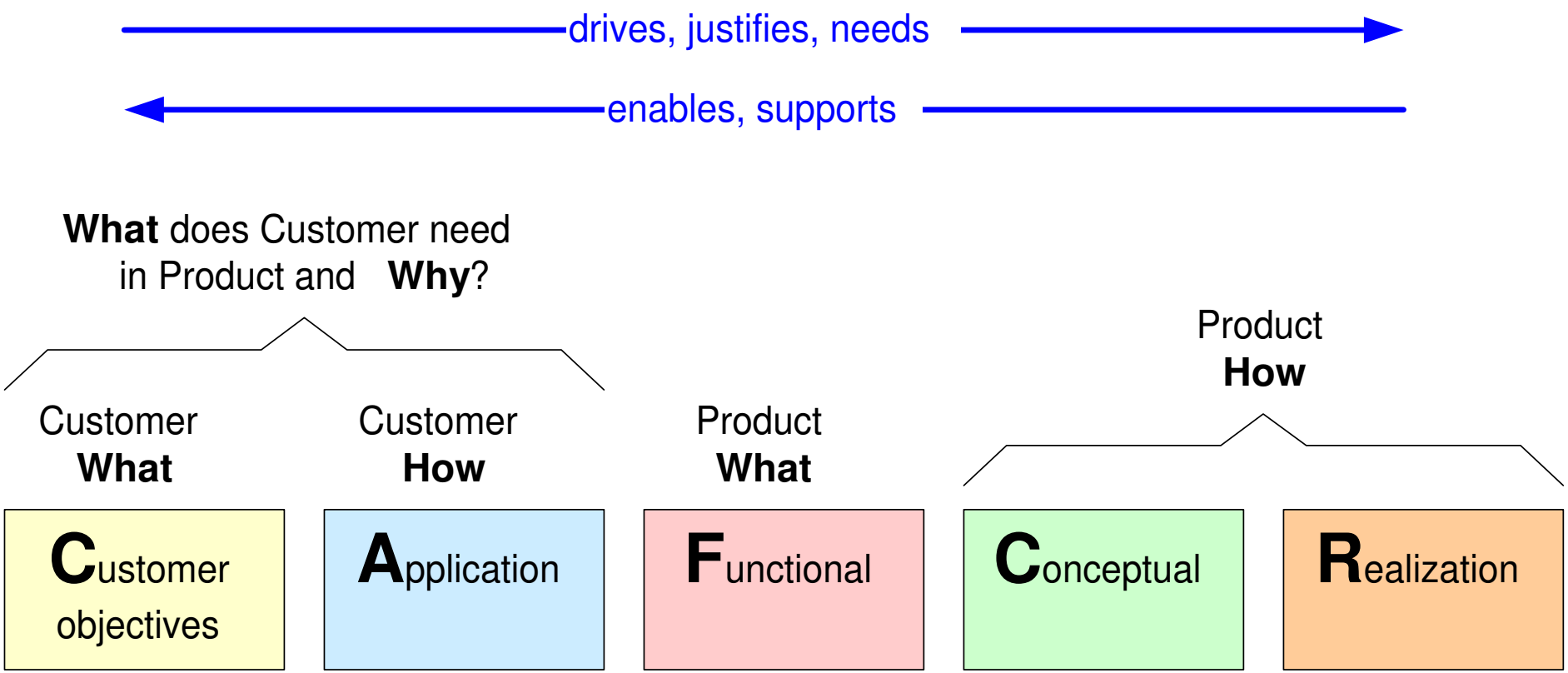
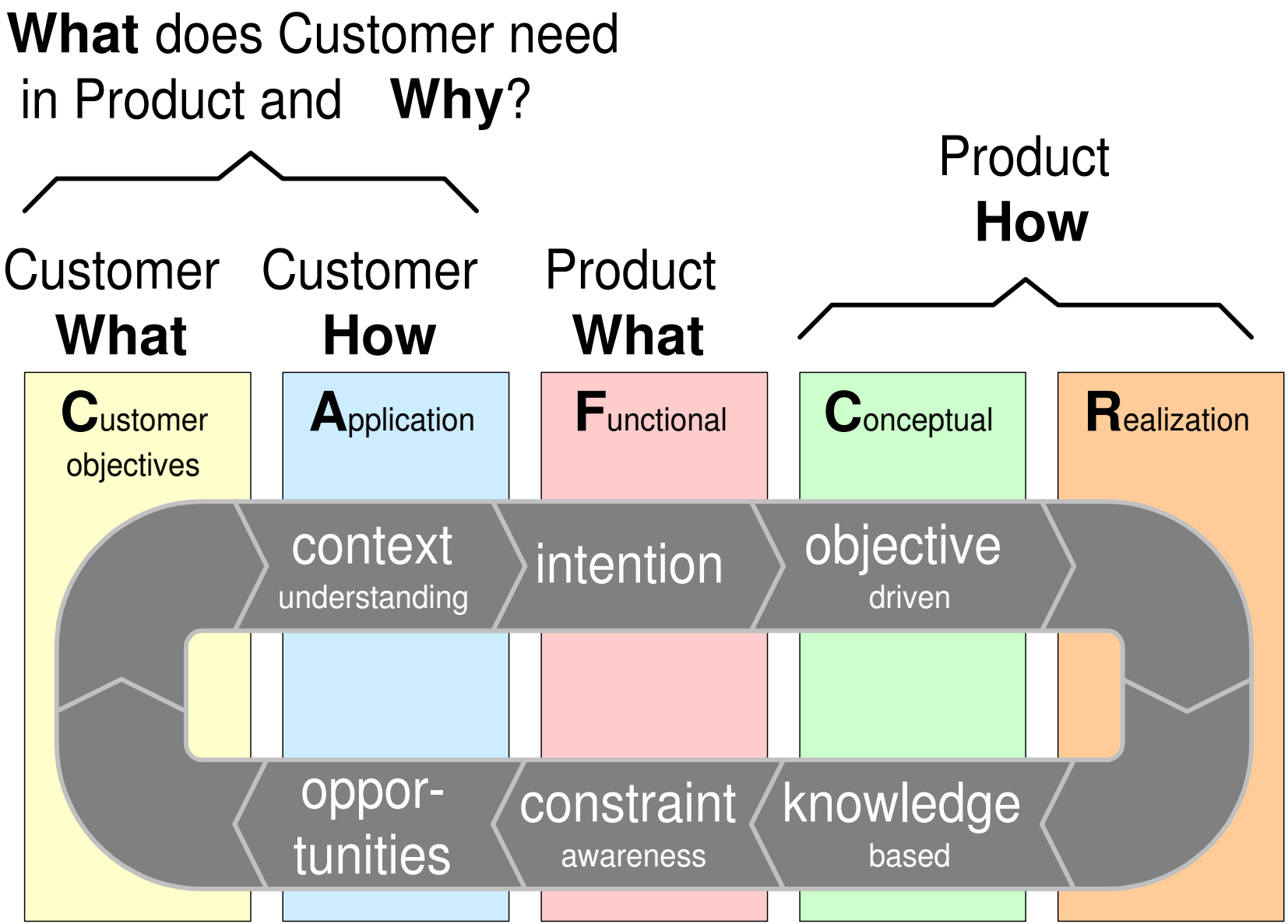


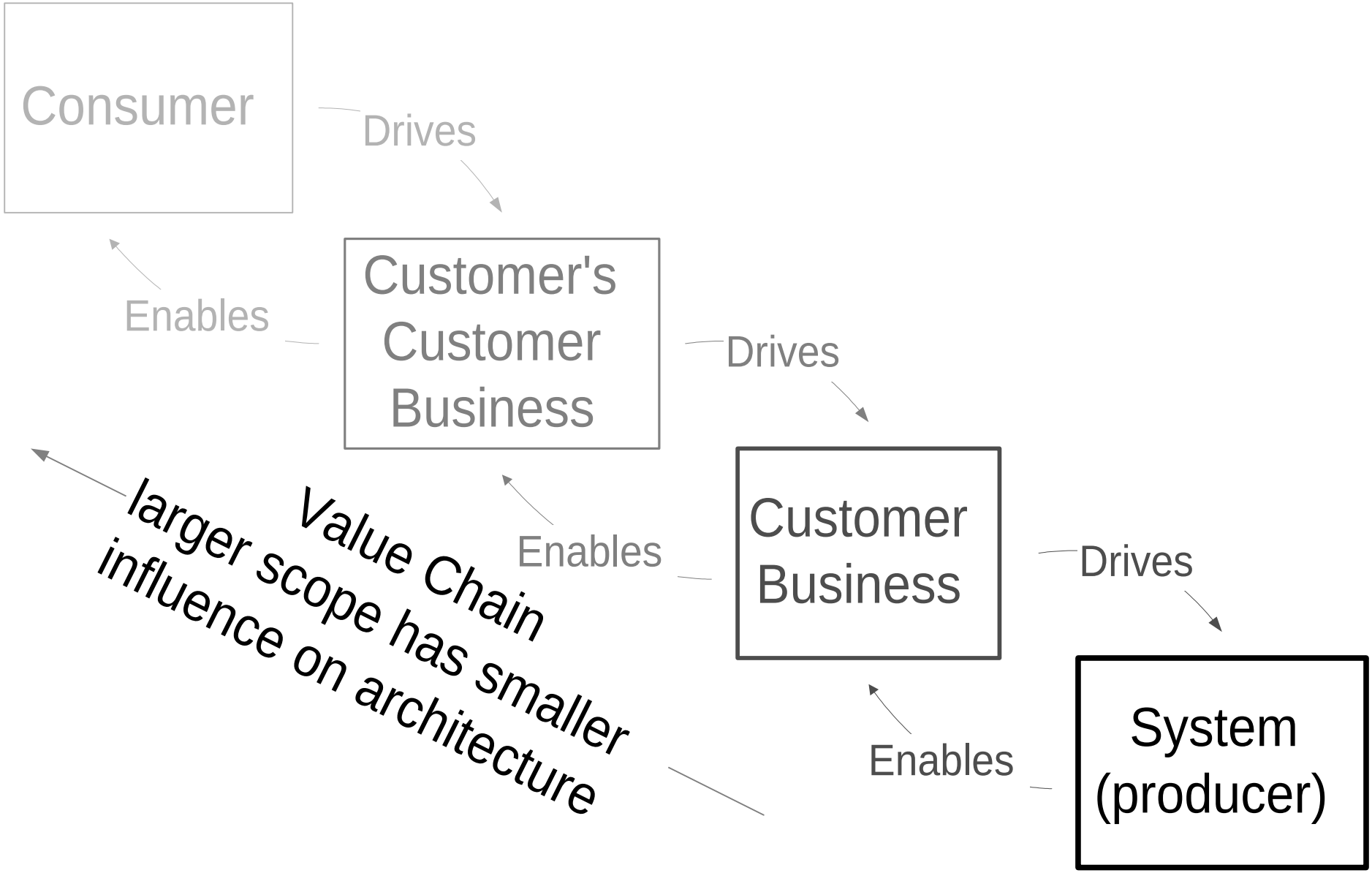
The “CAFCR” model



Integrating CAFCR



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

CFO CIO

CMO CEO CTO

decision maker(s)

purchaser

Who is ***the*** *customer?*

department head

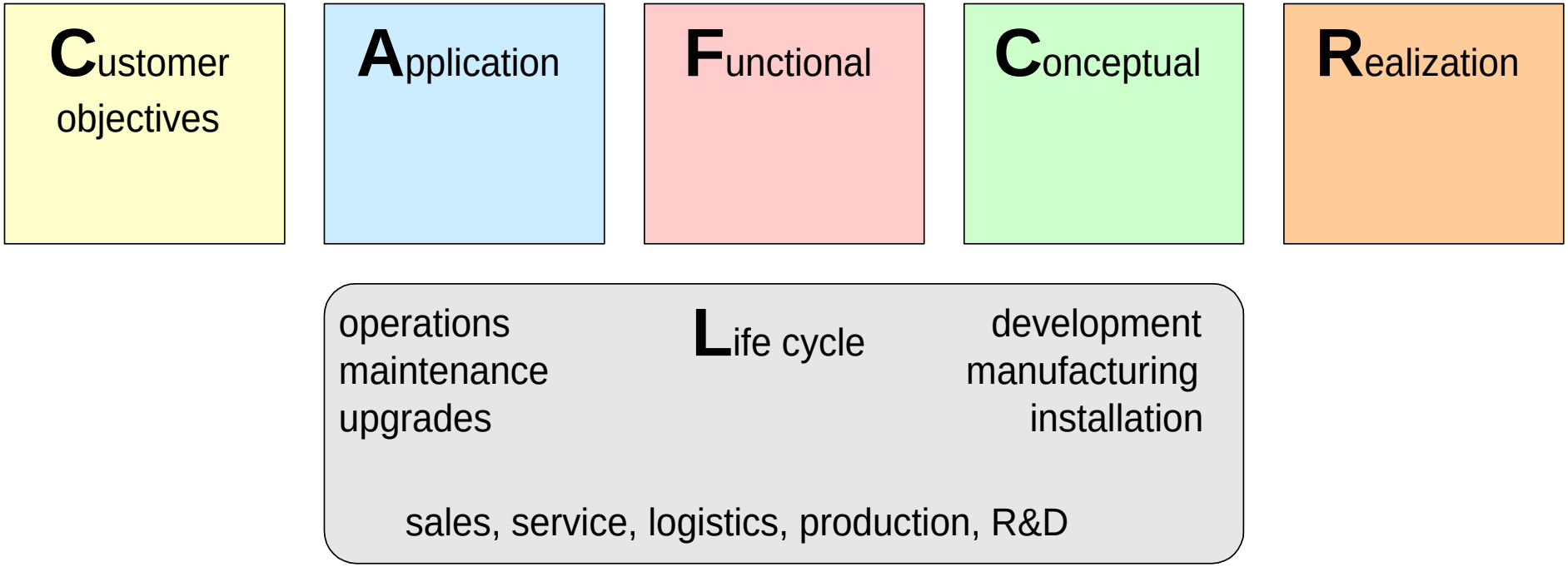
user

maintainer

operator

CEO: Chief Executive Officer
CFO: Chief Financial Officer
CIO: Chief Information Officer
CMO: Chief Marketing Officer
CTO: Chief Technology Officer

CAFCR+ model; Life Cycle View

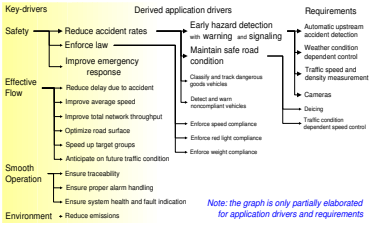


Key Drivers How To

by *Gerrit Muller* Buskerud University College
e-mail: gerrit.muller@embeddedsystems.nl
www.gaudisite.nl

Abstract

The notion of ”business key drivers” is introduced and a method is described to link these key drivers to the product specification.



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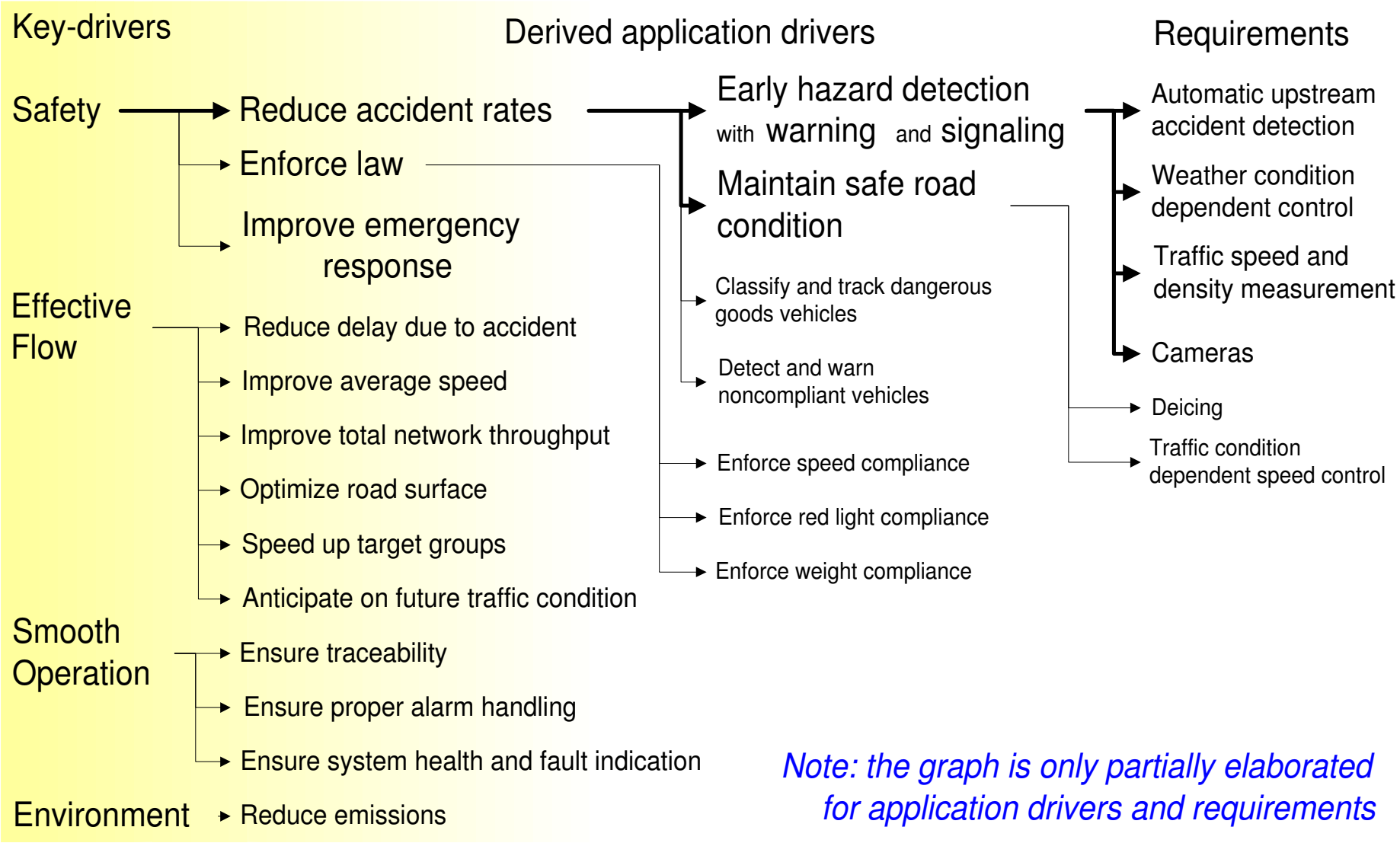
Example Motorway Management Analysis



Note: the graph is only partially elaborated for application drivers and requirements

Method to create Key Driver Graph

• Define the scope specific.	in terms of stakeholder or market segments
• Acquire and analyze facts	extract facts from the product specification and ask why questions about the specification of existing products .
• Build a graph of relations between drivers and requirements by means of brainstorming and discussions	where requirements may have multiple drivers
• Obtain feedback	discuss with customers , observe their reactions
• Iterate many times	increased understanding often triggers the move of issues from driver to requirement or vice versa and rephrasing

Recommendation for the Definition of Key Drivers

• Limit the number of key-drivers	minimal 3, maximal 6
• Don't leave out the obvious key-drivers	for instance the well-known main function of the product
• Use short names, recognized by the customer.	
• Use market-/customer- specific names, no generic names	for instance replace " ease of use " by "minimal number of actions for experienced users ", or "efficiency " by "integral cost per patient "
• Do not worry about the exact boundary between Customer Objective and Application	create clear goal means relations

Transformation of Key Drivers into Requirements

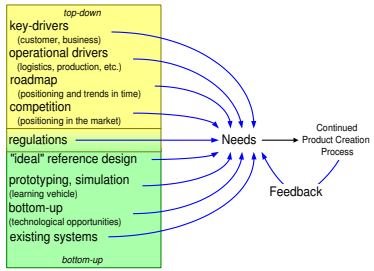
Customer **What**	Customer **How**	Product **What**
Customer objectives	**A**pplication	**F**unctional
Key (Customer) Drivers →	Derived Application Drivers →	Requirements
goal	means may be skipped or articulated by several intermediate steps	functions interfaces performance figures

Requirements Elicitation and Selection

by *Gerrit Muller* Buskerud University College
e-mail: gerrit.muller@embeddedsystems.nl
www.gaudisite.nl

Abstract

An elicitation method for needs is described using many different viewpoints. A selection process with a coarse and a fine selection is described to reduce the specification to an acceptable and feasible subset.



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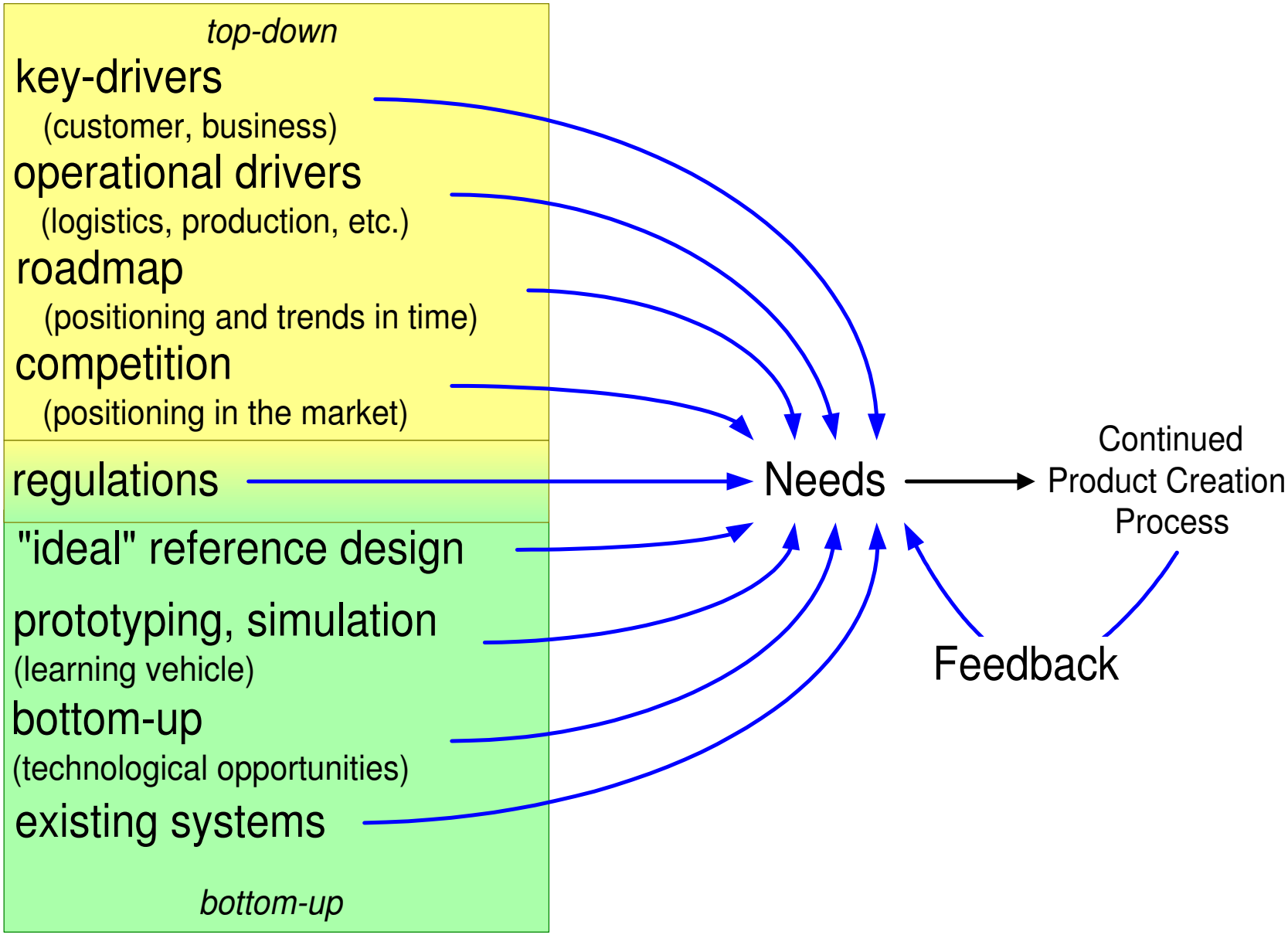
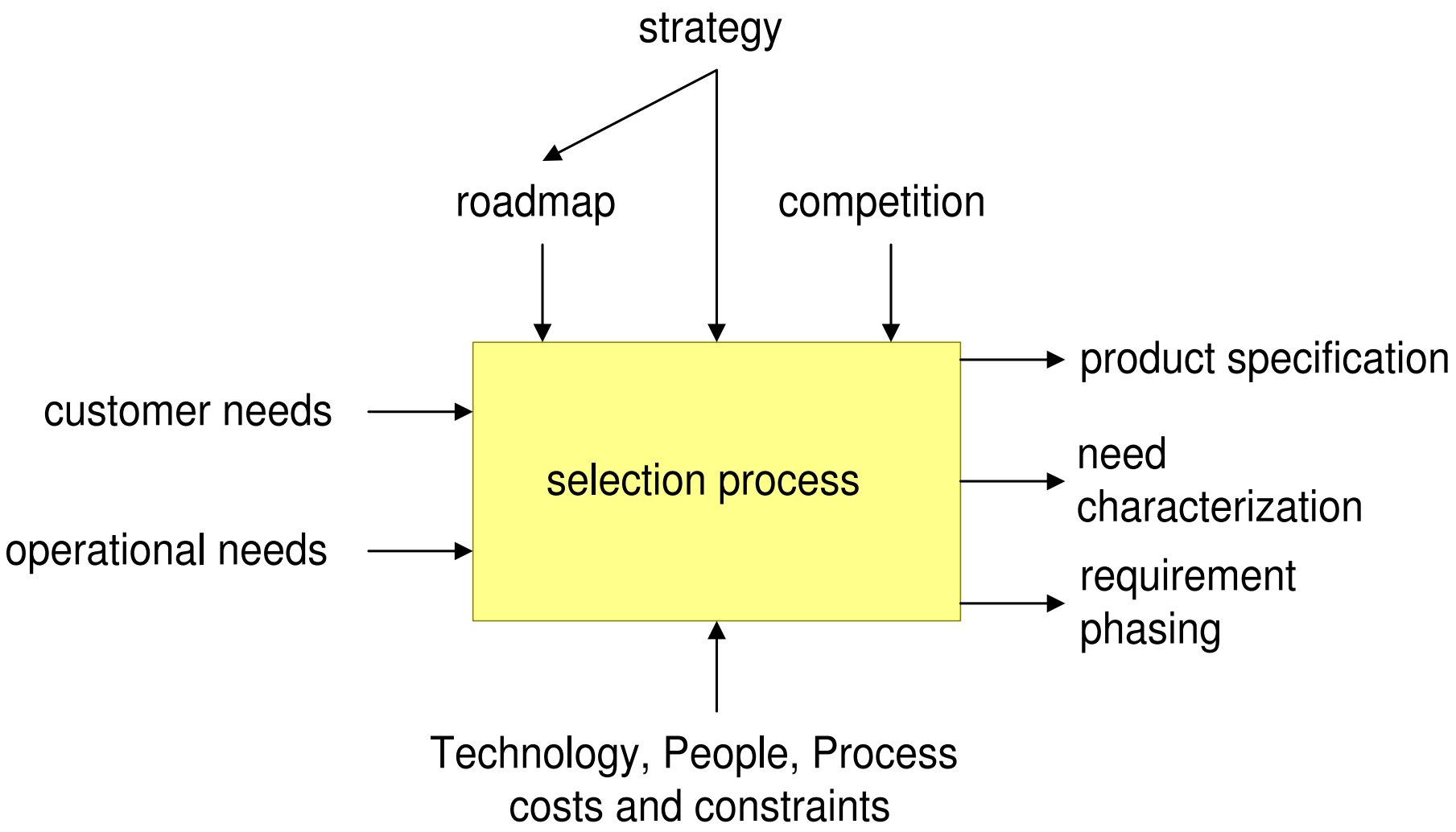
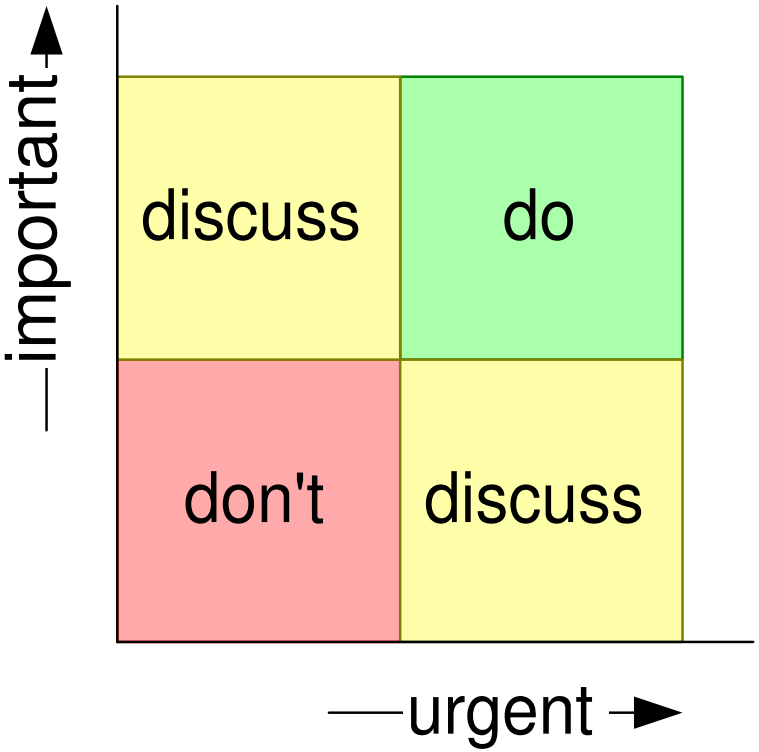
Complementary Viewpoints to Capture Requirements

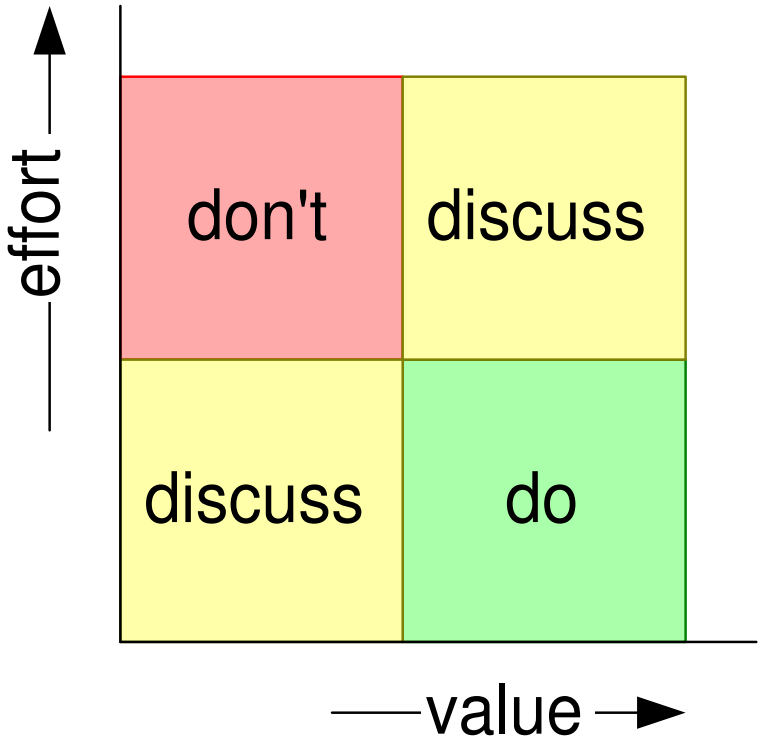


Requirement Selection Process



Simple Qualification Method





Examples of Quantifiable Aspects

- 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)

Exercise Requirements Capturing

- Determine the key drivers for one particular product family.
- Translate these drivers into application drivers and derive from them the requirements.