

Researching how to Connect Business and Customer World to Engineering World

by *Gerrit Muller* Buskerud University College

e-mail: `gaudisite@gmail.com`

`www.gaudisite.nl`

Abstract

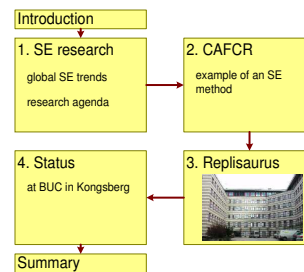
The purpose of most engineering activities is to create a system that satisfies needs of a customer and that satisfies business objectives. However, the engineering world is technical oriented, where technical decisions tend to be made on technical trade-offs. The business and customer worlds are social and economical by nature. One of the objectives of Systems Architecting is to make design decisions in the technical world that are appropriate in the social and economical world.

Our research first of all tries to understand the current practice. The longer term goal is to enhance the current practice such that we can teach methods and techniques that actually improve current practice. We use the CAFCR model as a model to understand current practice and as model to develop methods and techniques.

Distribution

This article or presentation is written as part of the Gaudí project. The Gaudí project philosophy is to improve by obtaining frequent feedback. Frequent feedback is pursued by an open creation process. This document is published as intermediate or nearly mature version to get feedback. Further distribution is allowed as long as the document remains complete and unchanged.

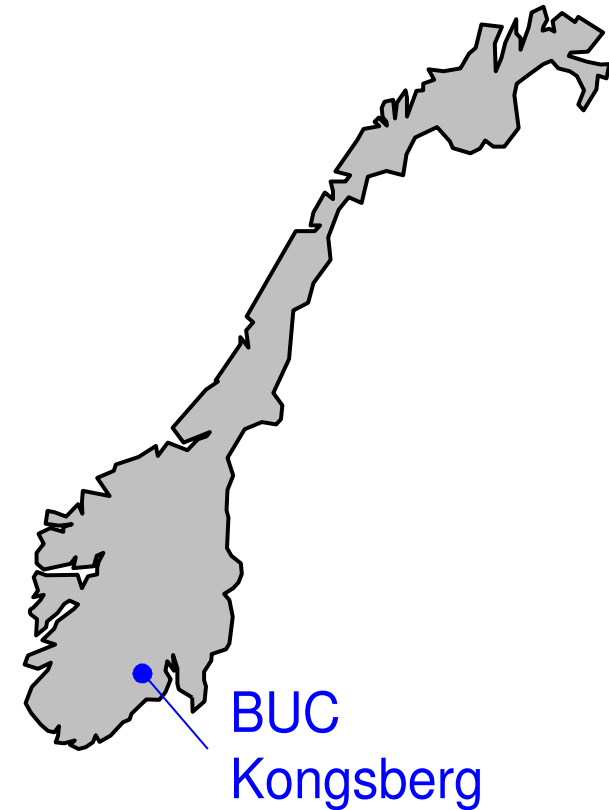
October 20, 2017
status: preliminary
draft
version: 0.1



Coordinates of the Speaker



Høgskolen i Buskerud (HiBu)
Buskerud University College (BUC)



Embedded Systems Institute (ESI)



Industrial + Academic Experience

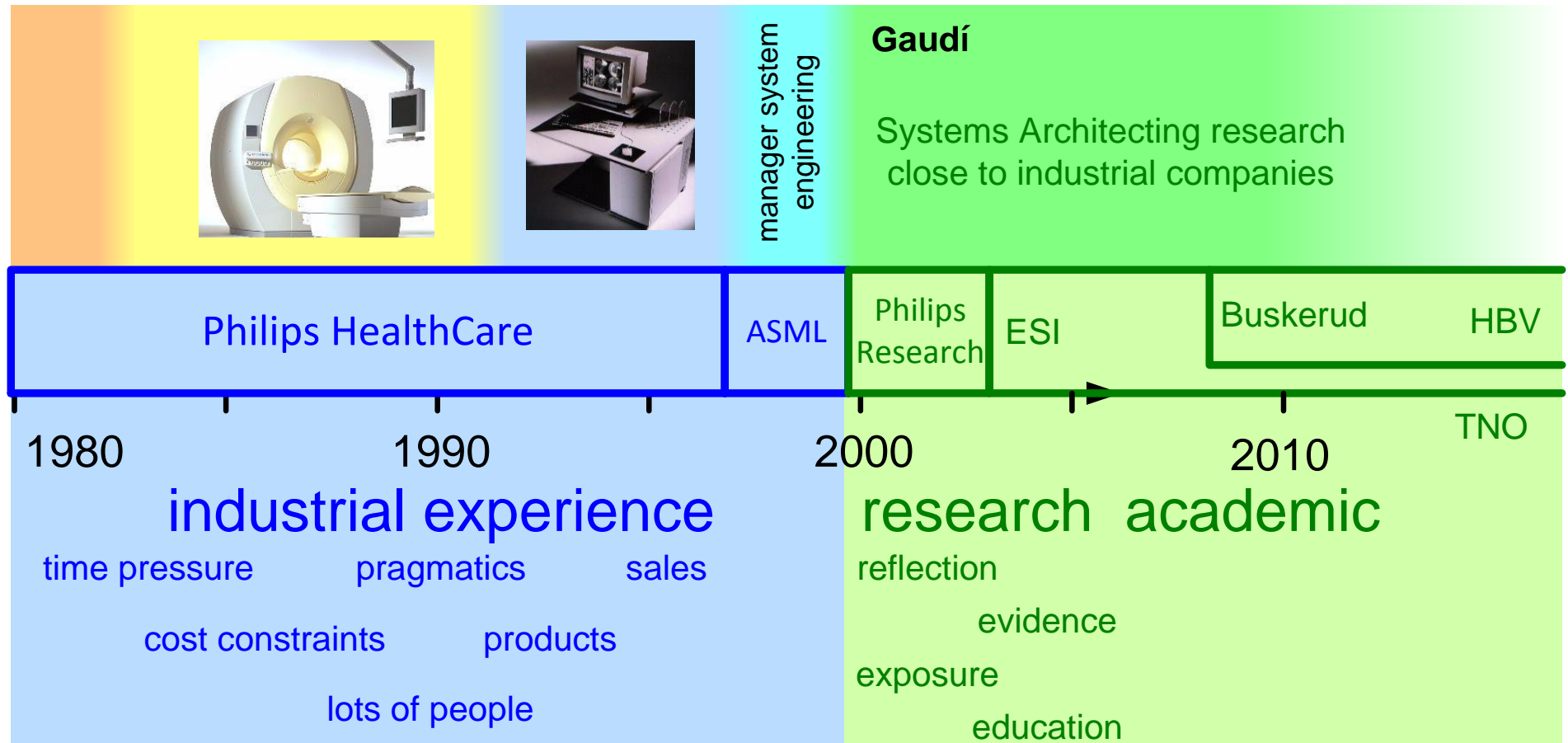
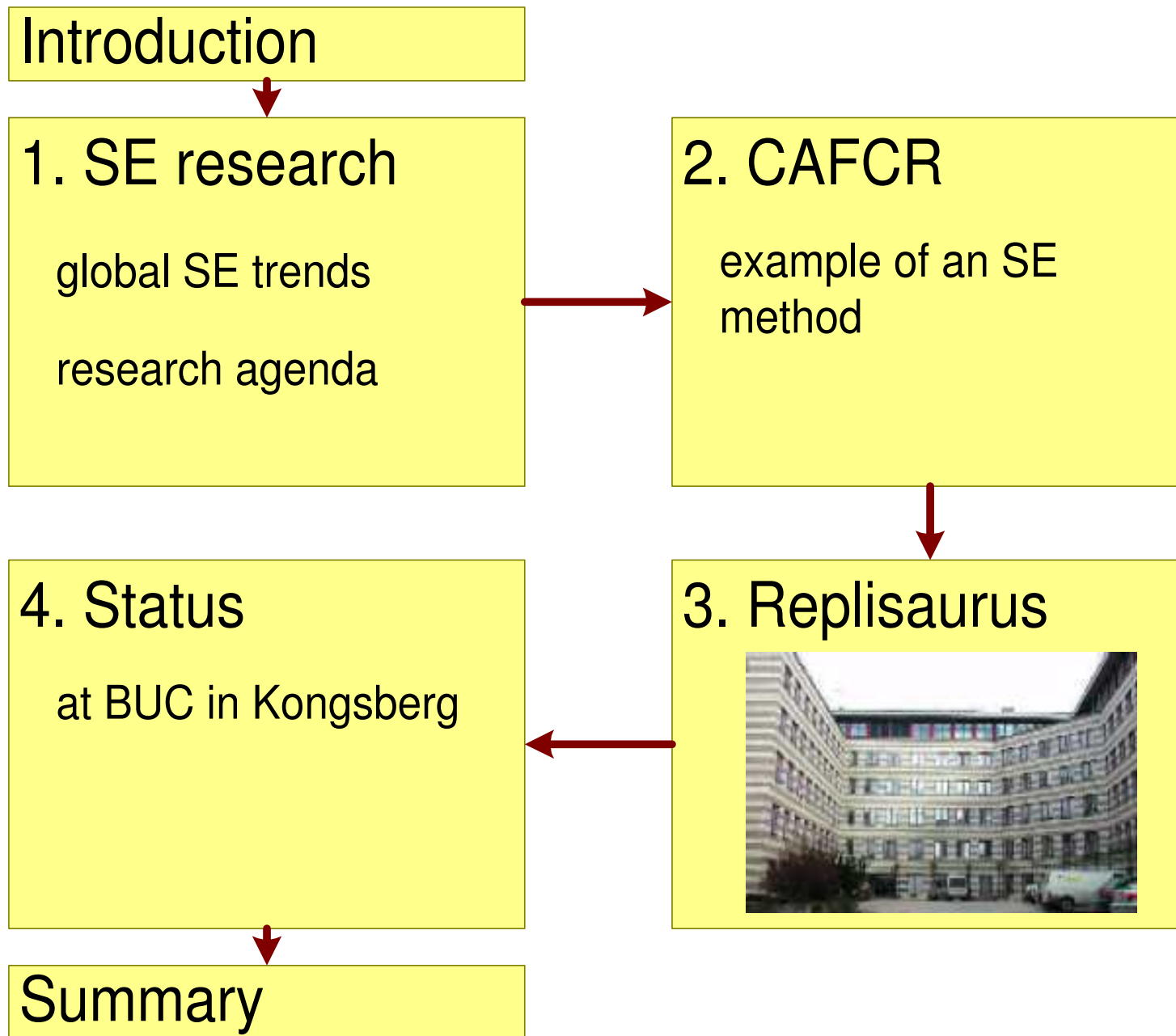
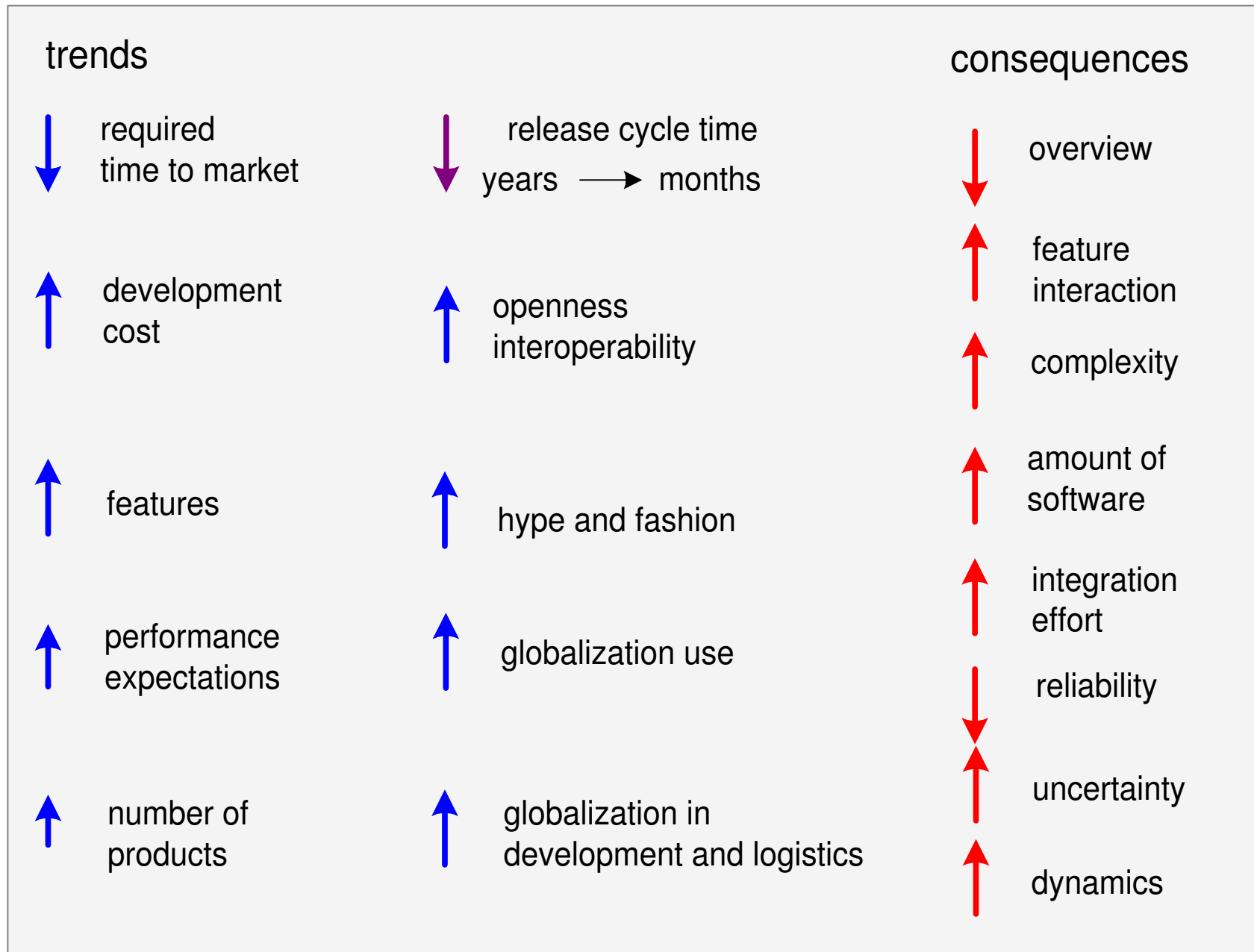


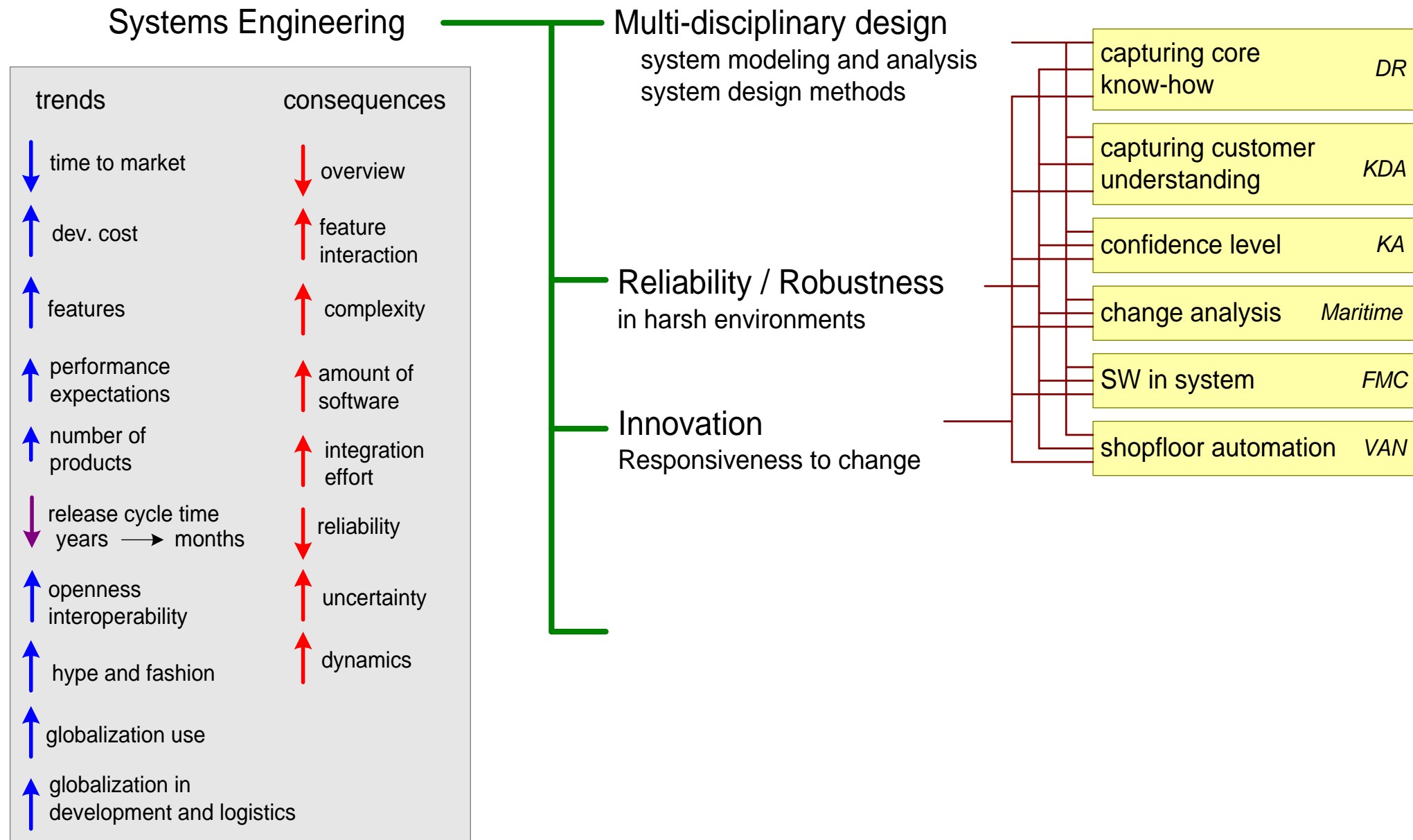
Figure Of Contents™



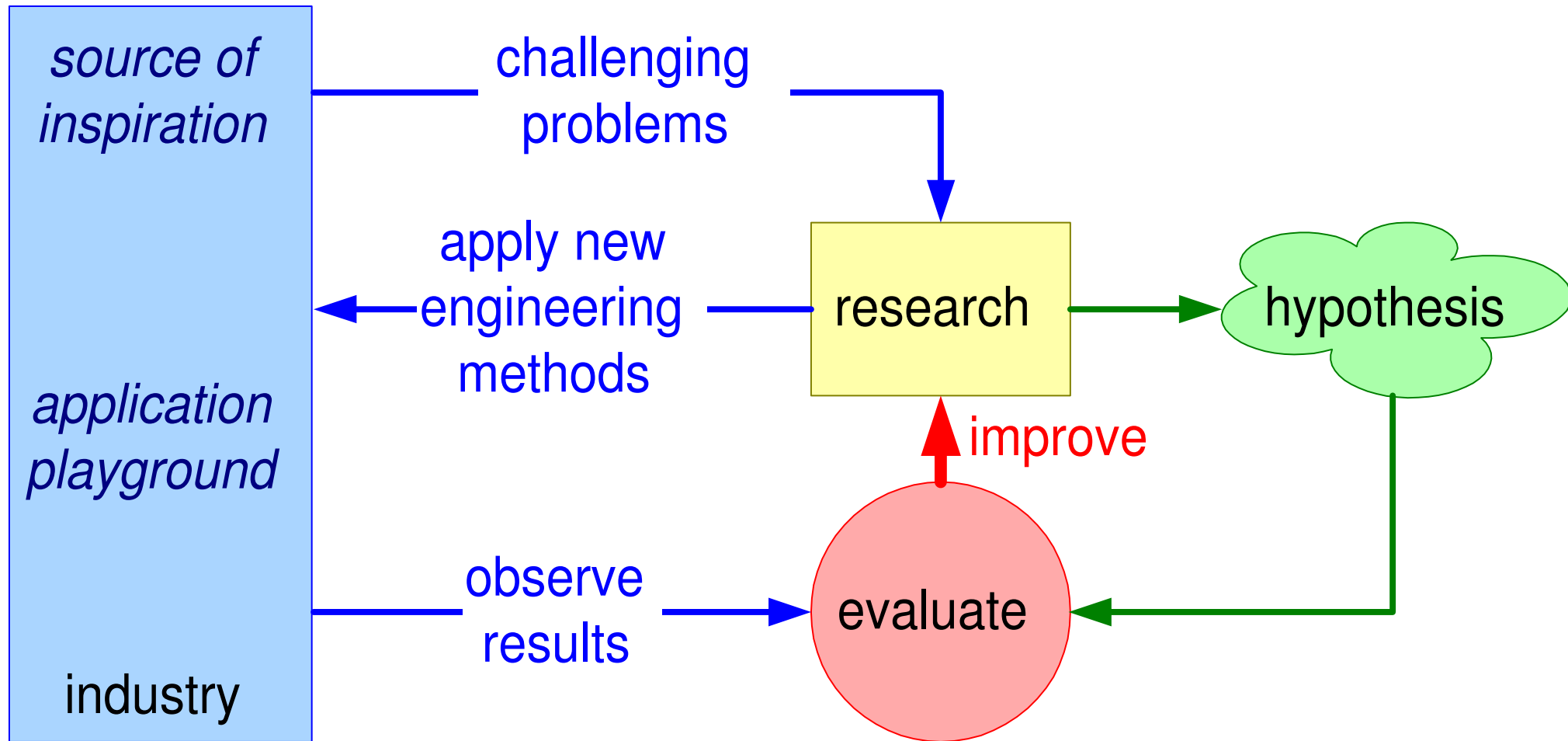
Today's Industrial Trends



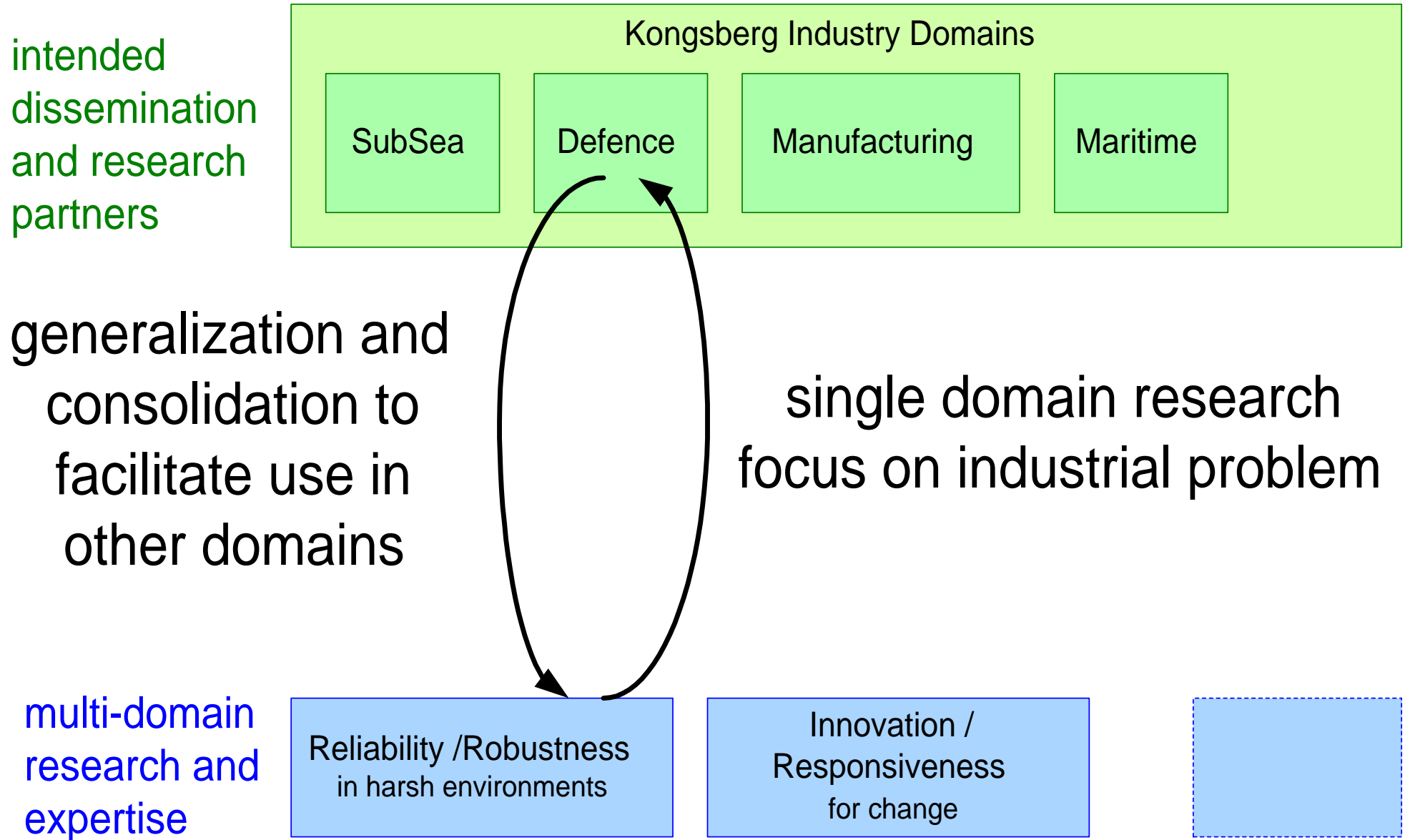
Buskerud research agenda as graph



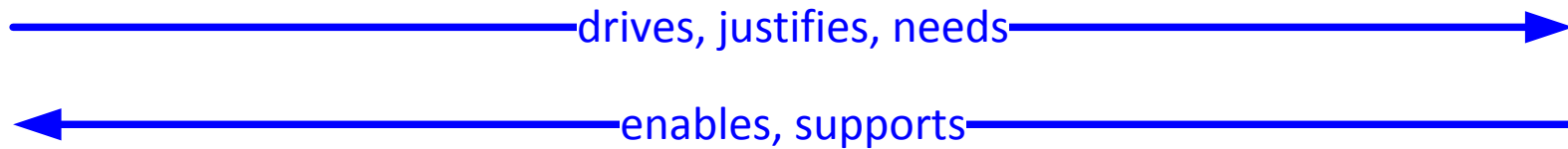
Industry as Laboratory



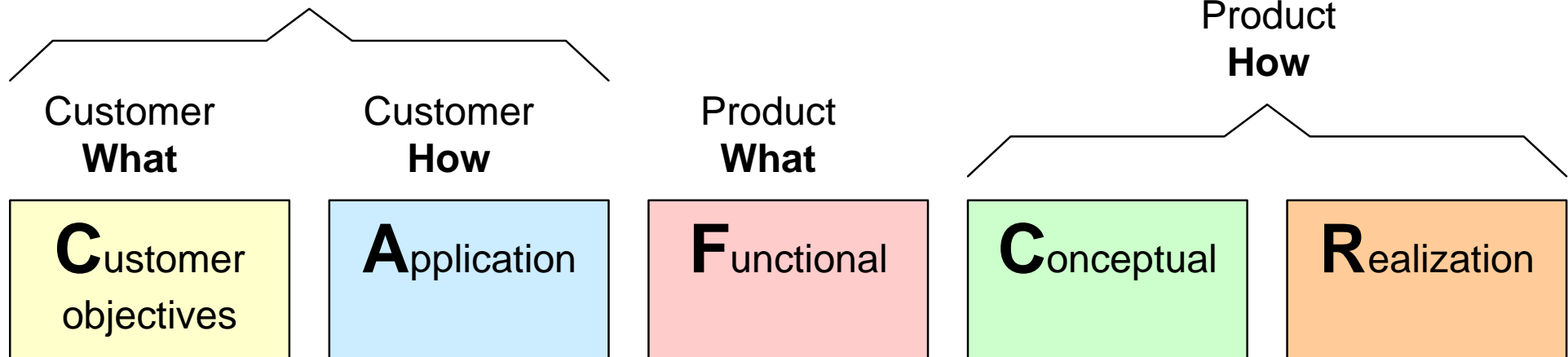
Industry as Laboratory (2)



The “CAFCR” model

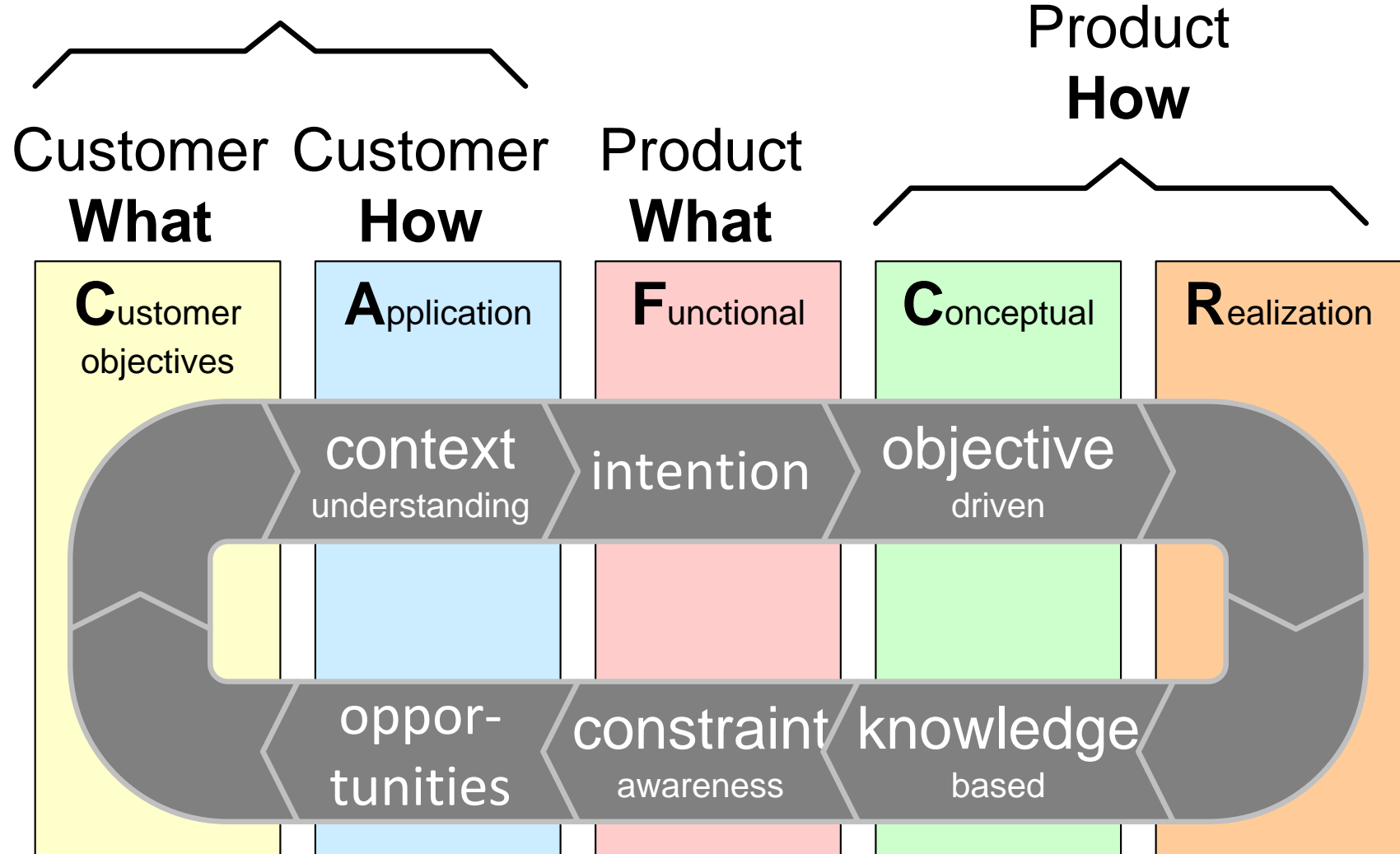


What does Customer need
in Product and **Why?**

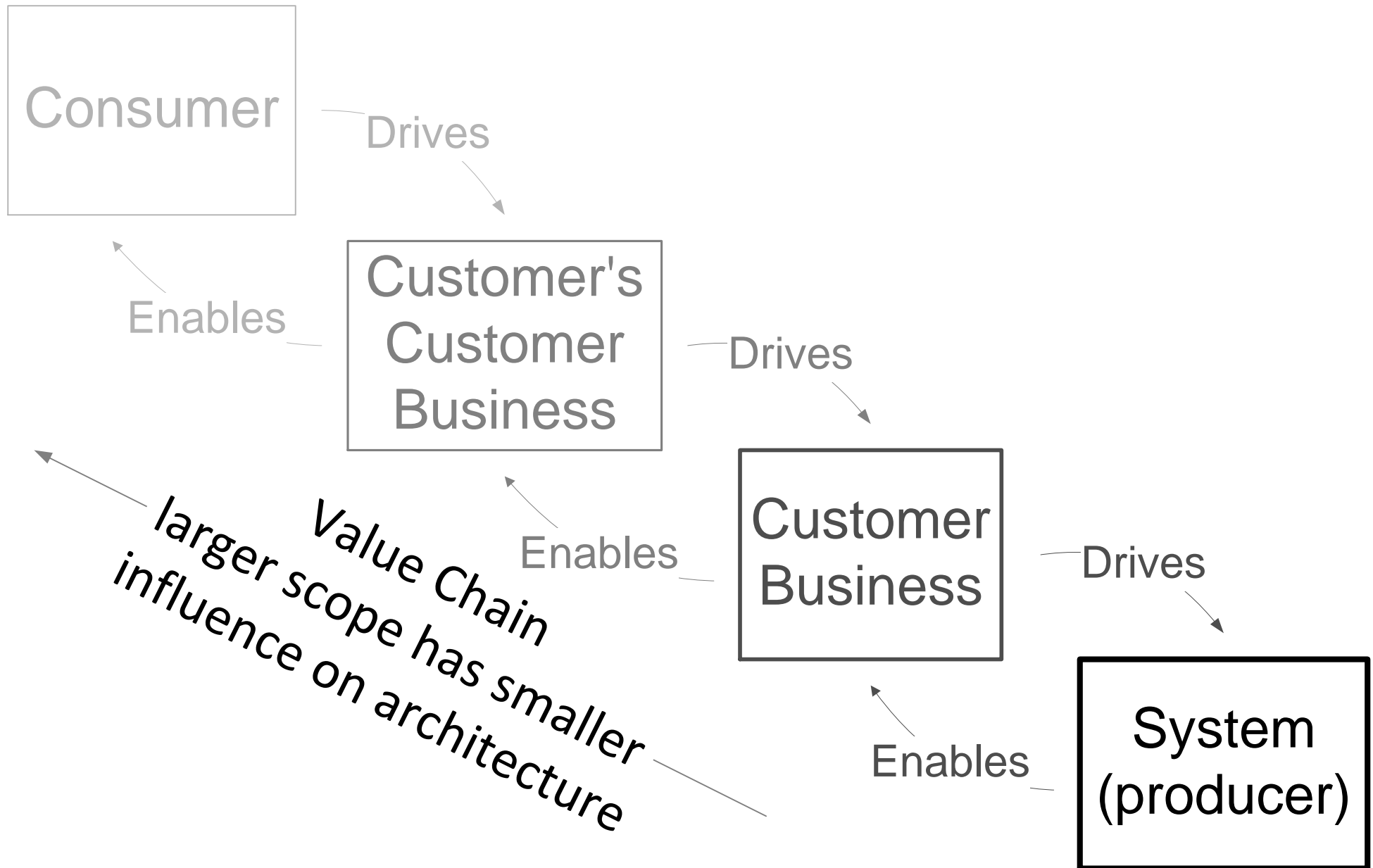


Integrating CAFCR

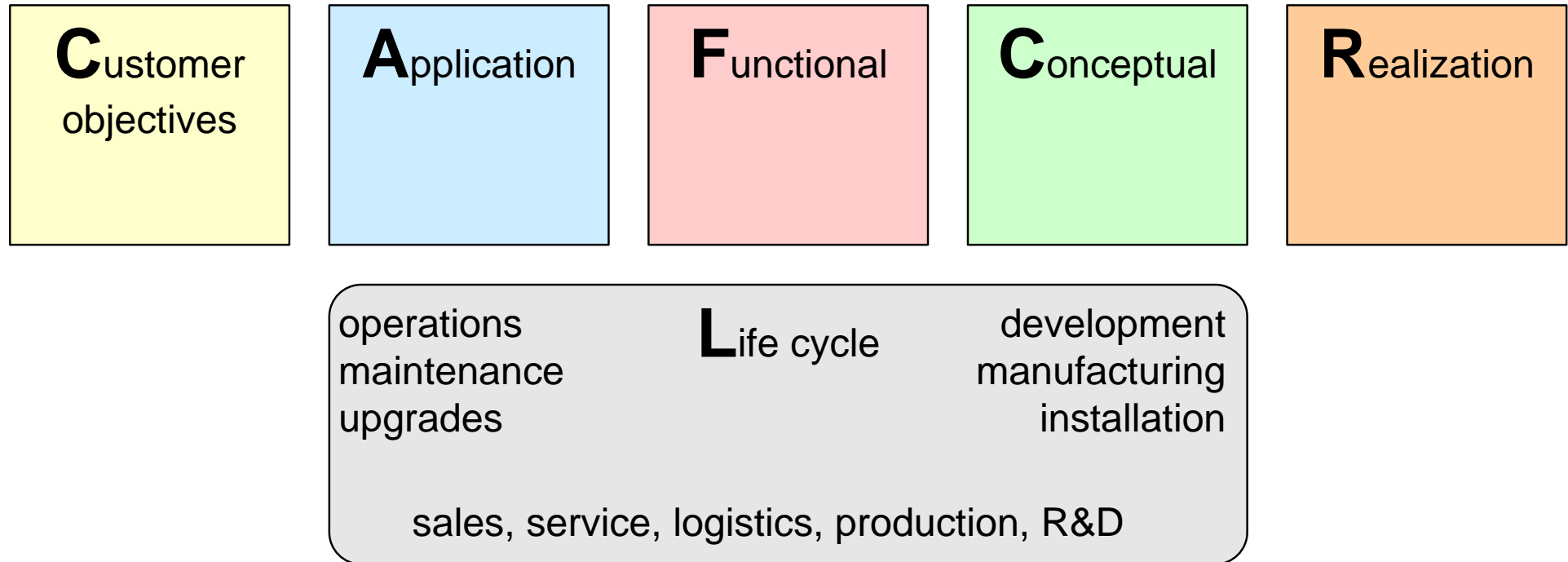
What does Customer need
in Product and **Why?**



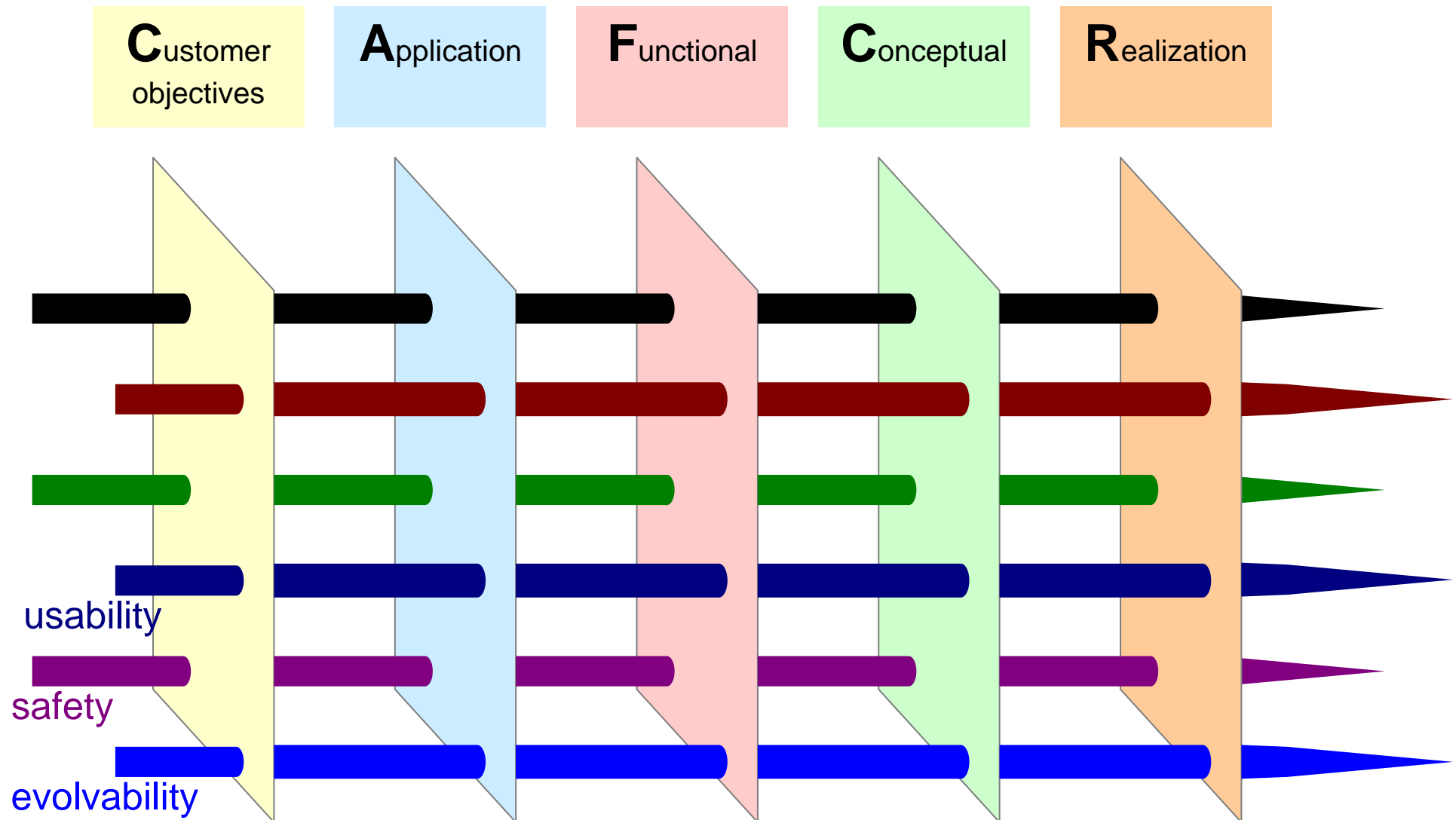
CAFCR can be applied recursively



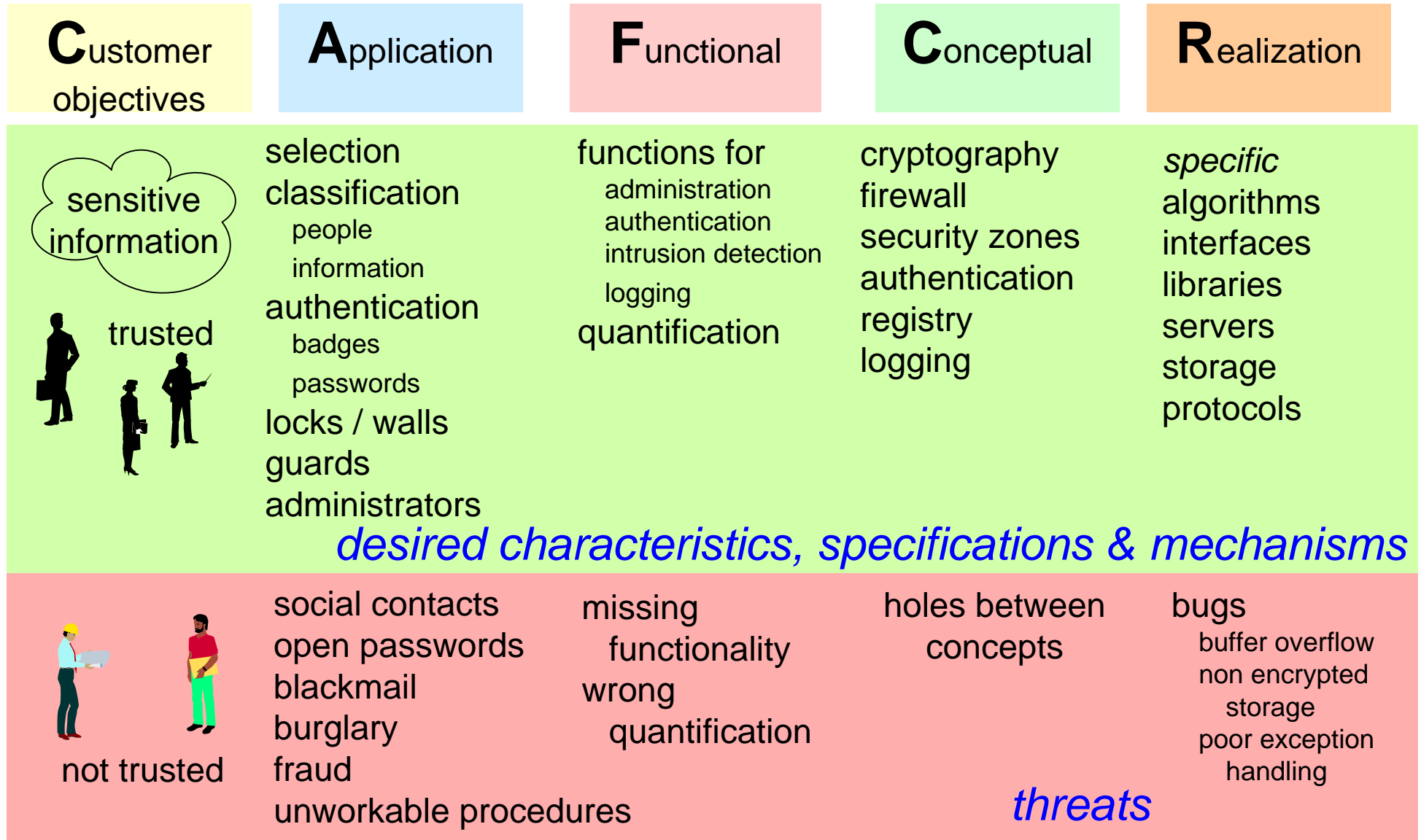
CAFCR+ model; Life Cycle View



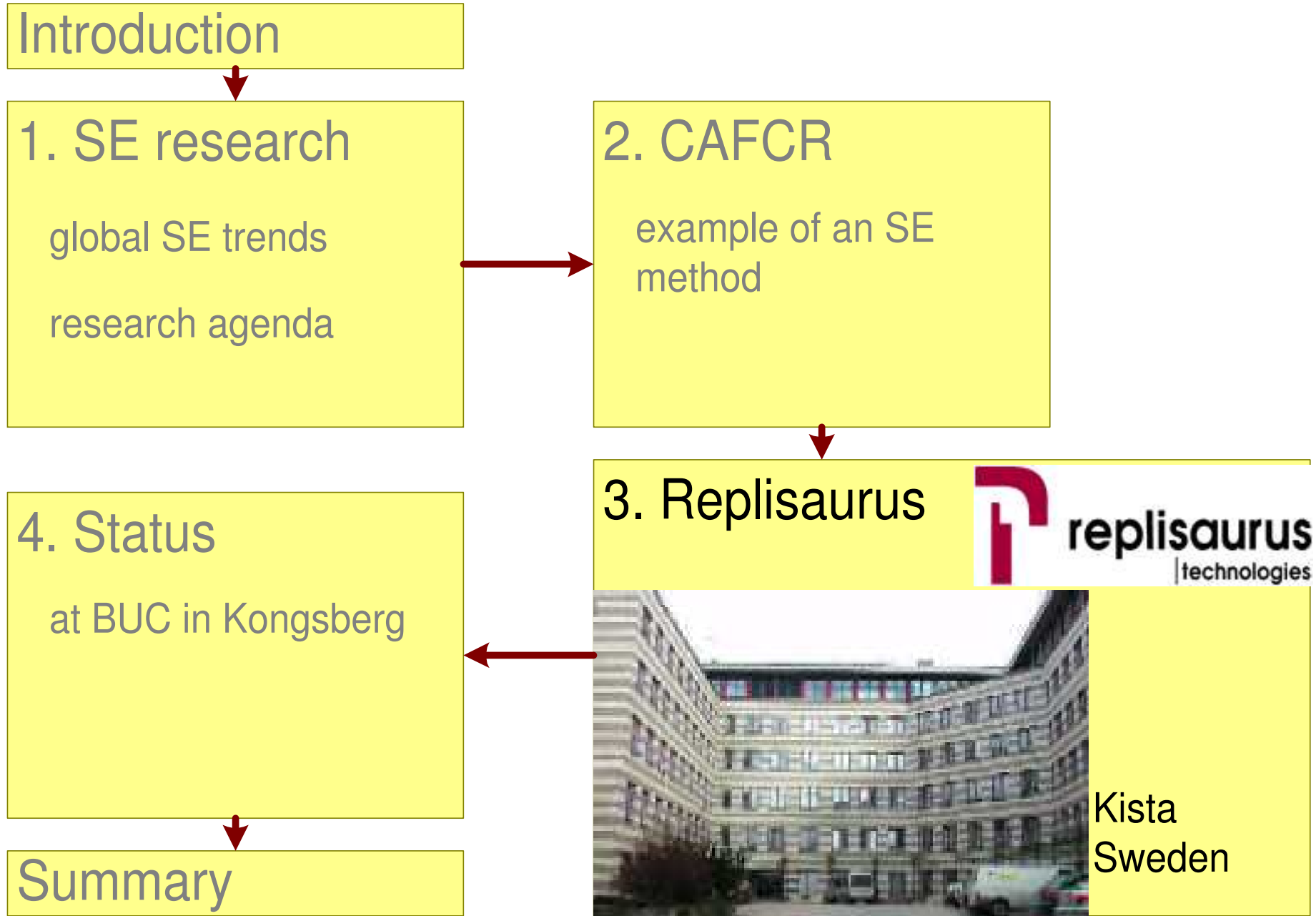
Quality needles as generic integrating concepts



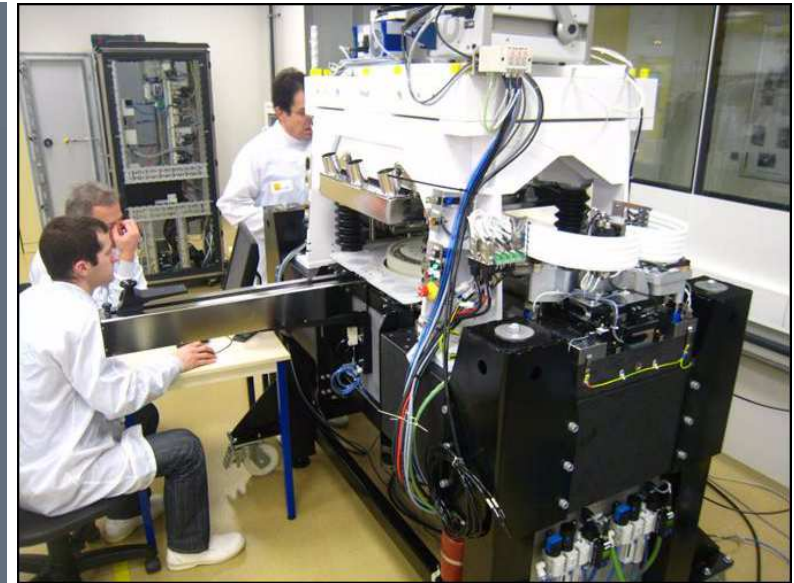
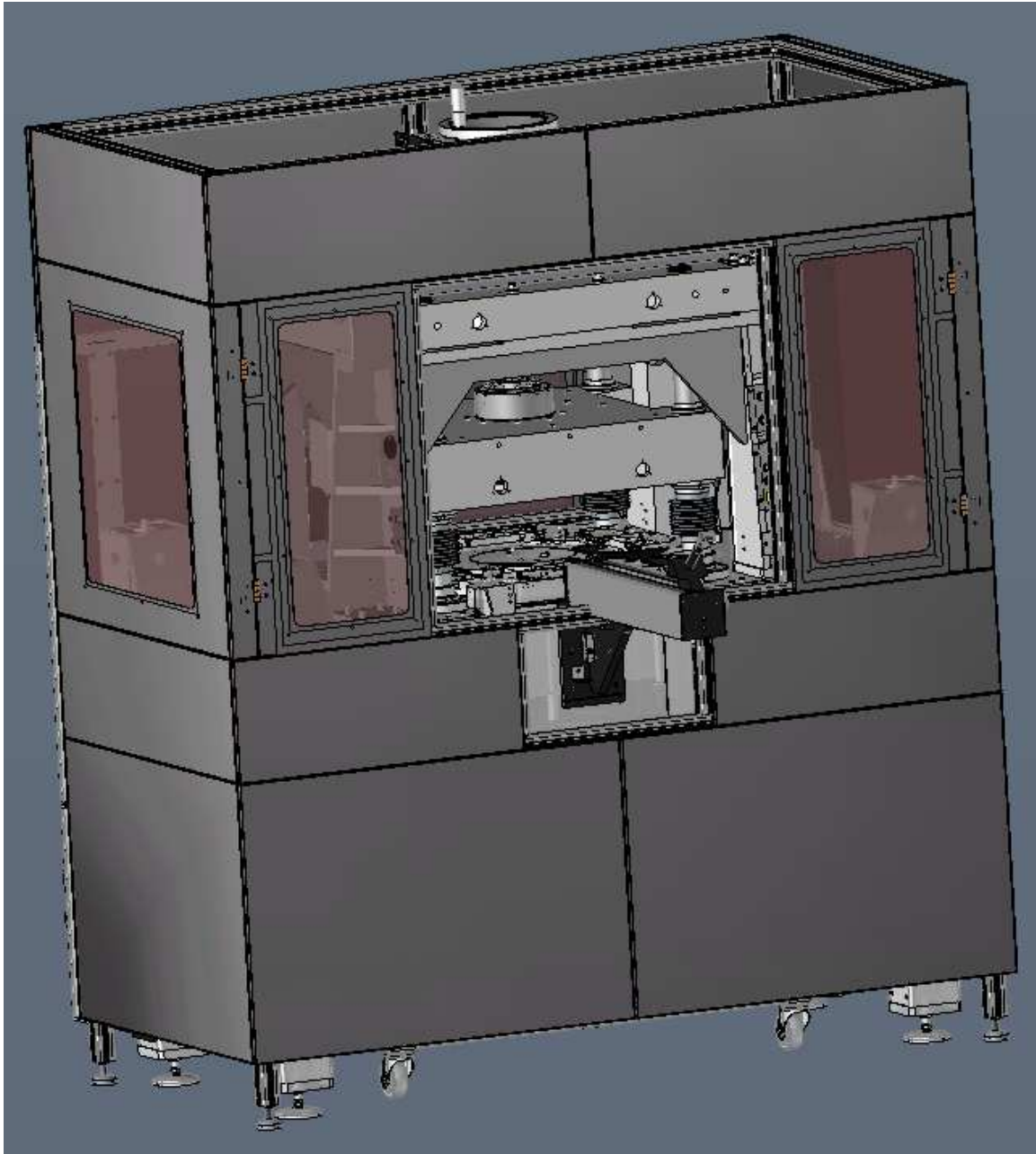
Security as example through all views



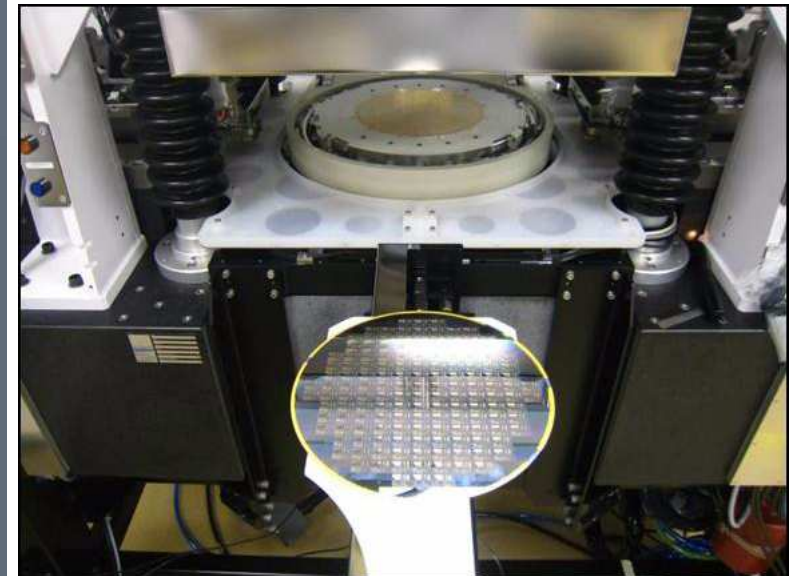
Start-Up Company Replisaurus in Kista (Sweden)



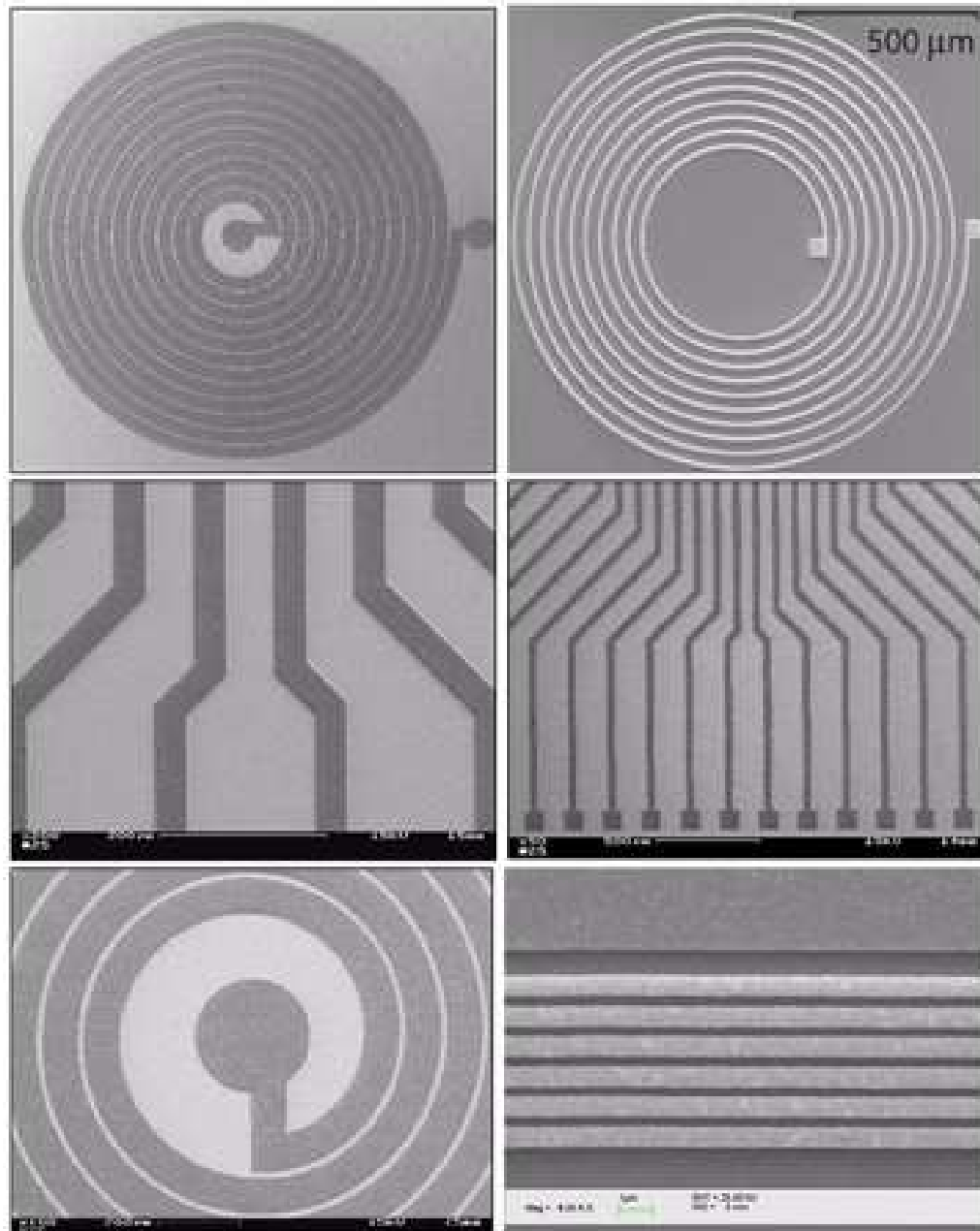
The Copper Printer



courtesy Replisaurus
www.replisaurus.com



Example of printed copper structures

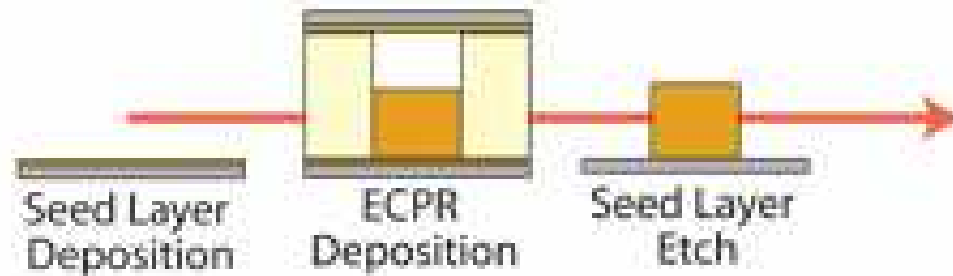


courtesy Replisaurus
www.replisaurus.com

ECPR technology replaces 6 process steps by 1 step

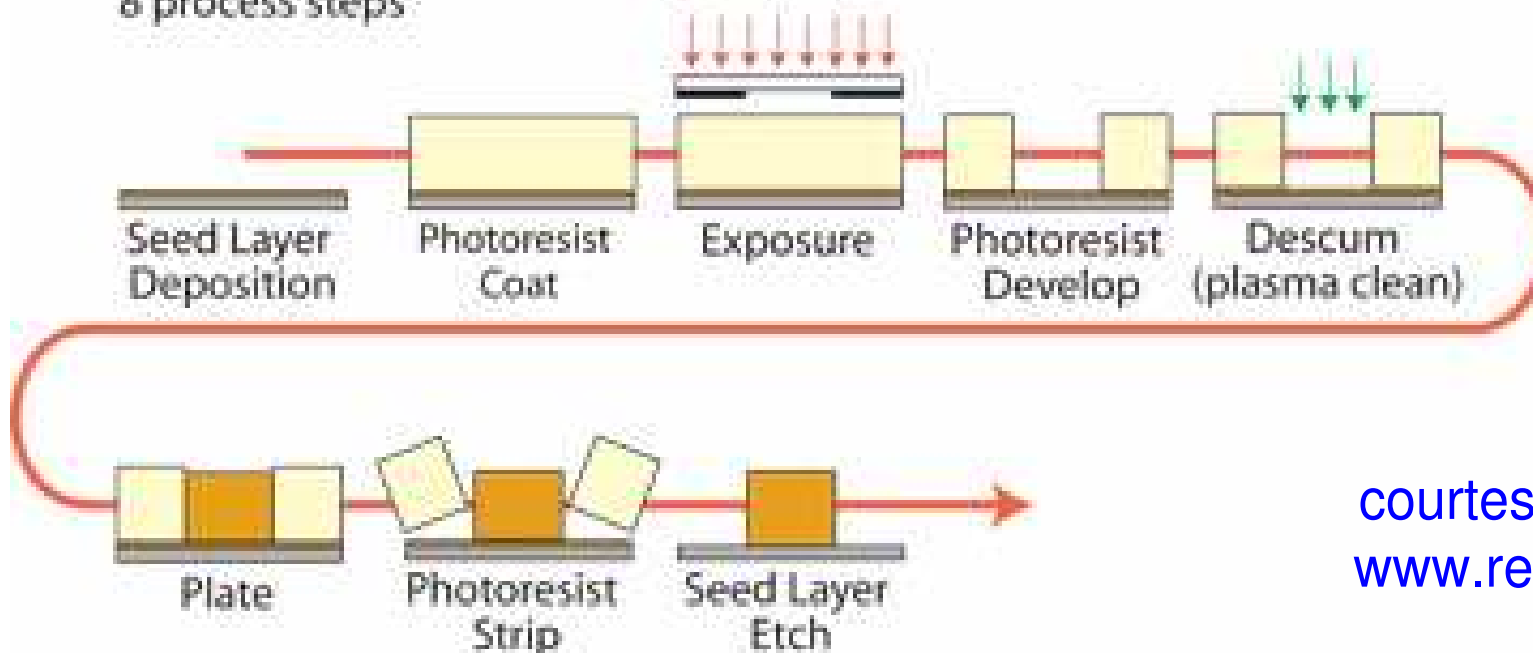
ECPR - ElectroChemical Pattern Replication

3 process steps



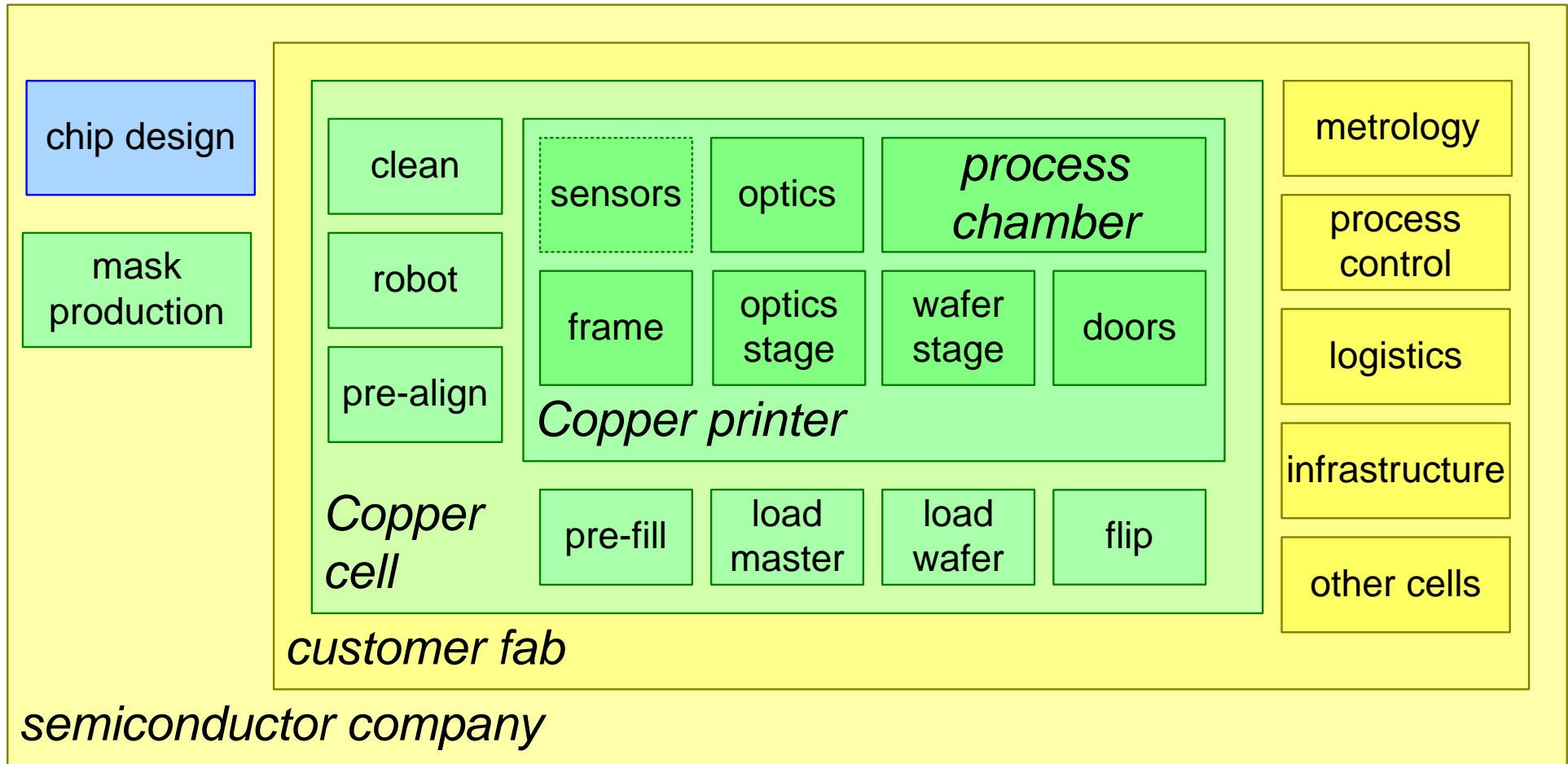
Conventional lithography based metallization

8 process steps

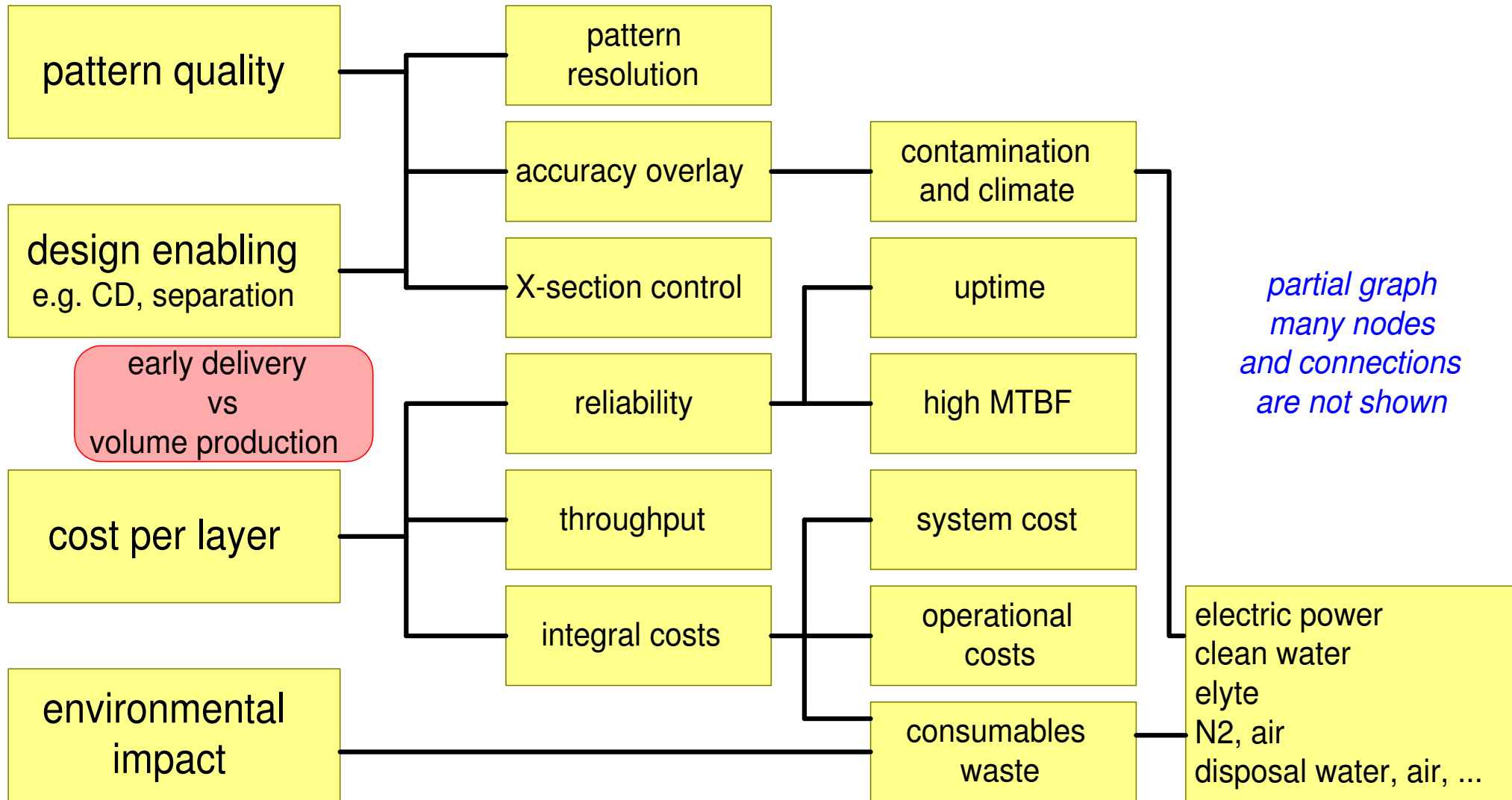


courtesy Replisaurus
www.replisaurus.com

Overview of the different scopes

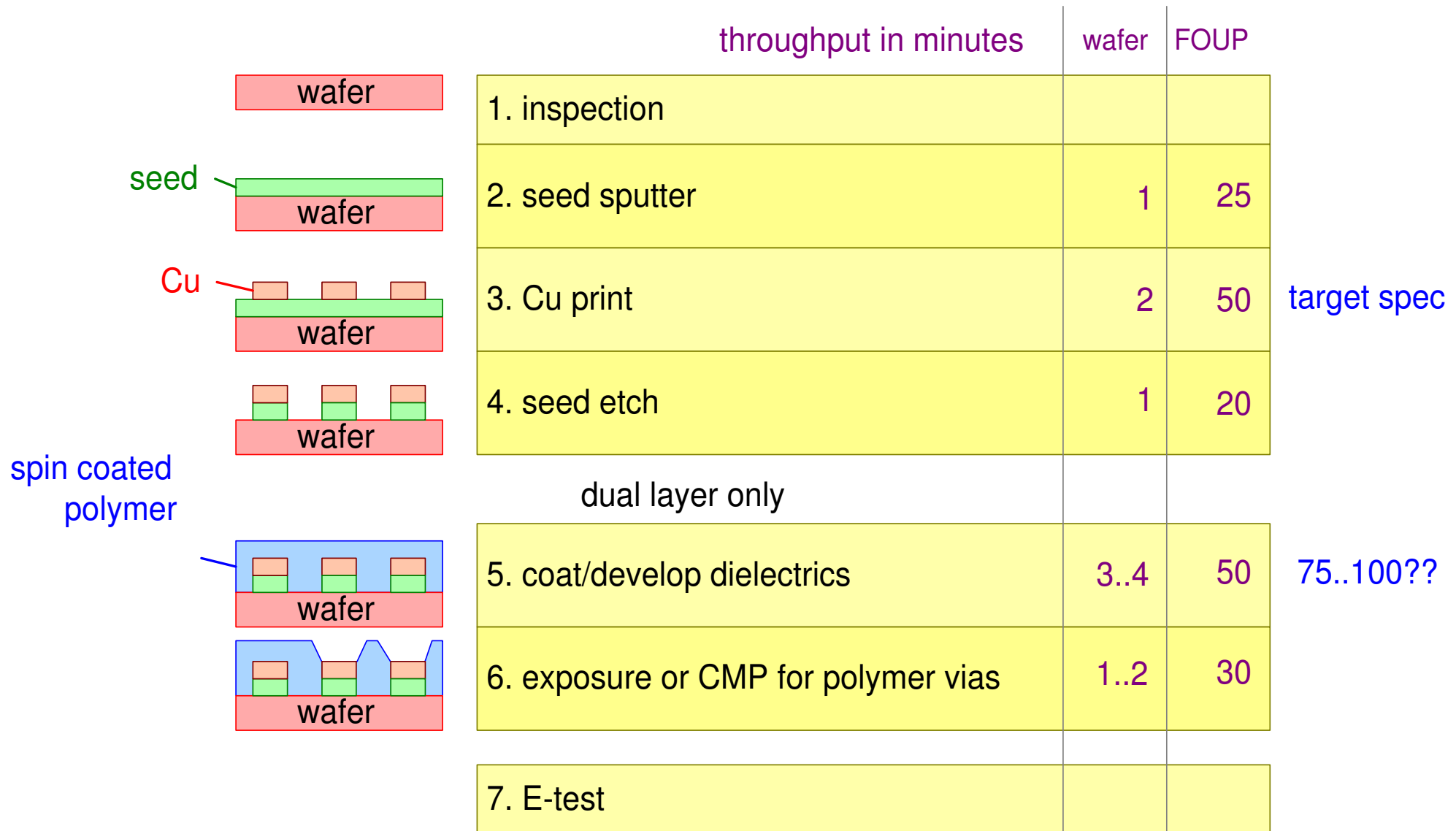


Customer key driver graph



*partial graph
many nodes
and connections
are not shown*

Process flow at fab level, from inspection until testing



Work flow in the Copper Printer

0. Loading Master&substrate

1. Close doors

2. Align

3. Move to proximity

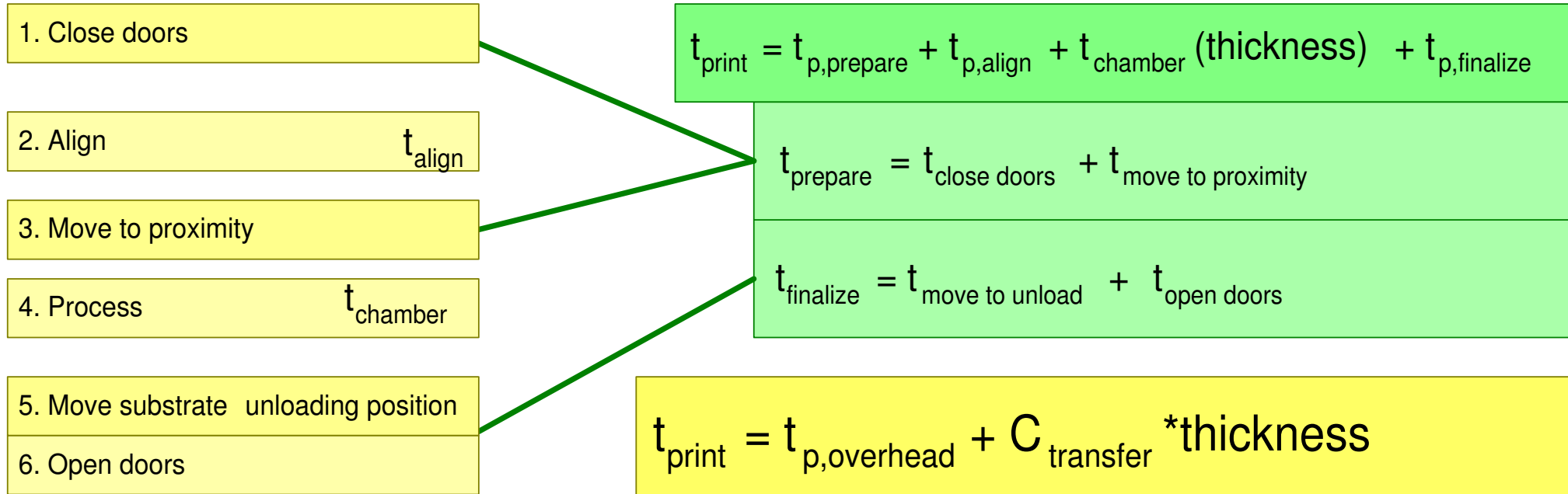
4. Process incl. rinse&dry

5. Move substrate unloading position

6. Open doors

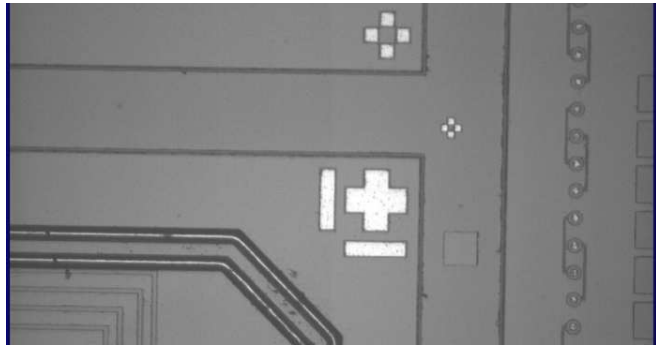
7. Unloading Master&substrate

Formula of printer throughput time



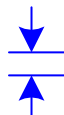
note: original diagram was annotated with actual performance figures for confidentiality reasons these numbers have been removed

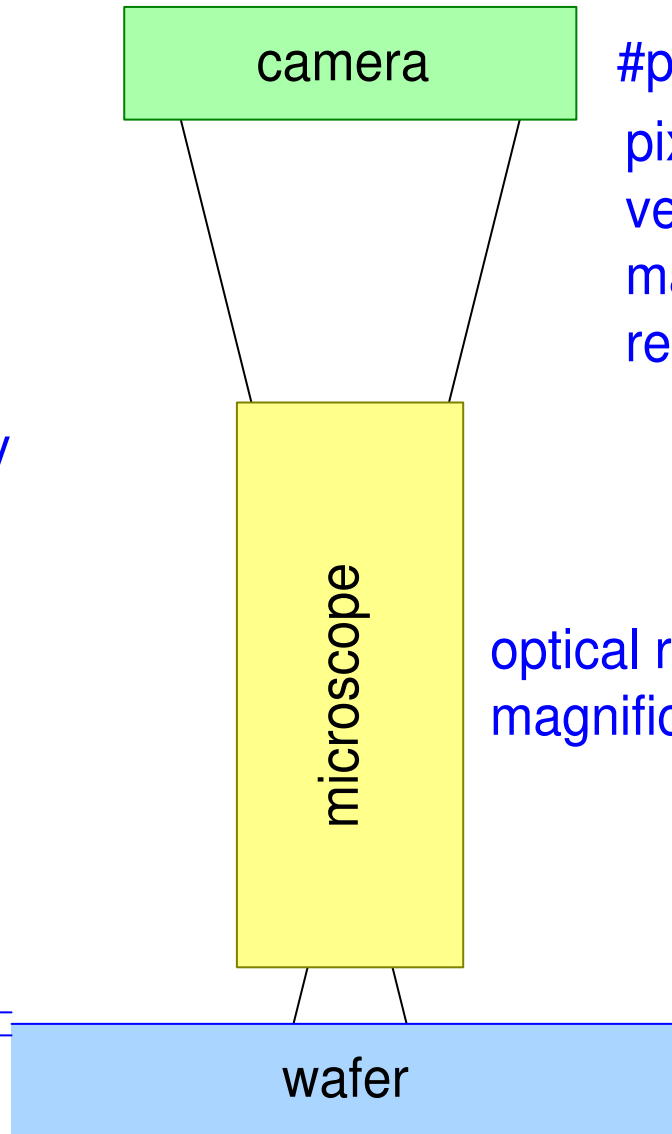
Optical path to measure marker position



measurement accuracy
determines
required resolution



DoF 

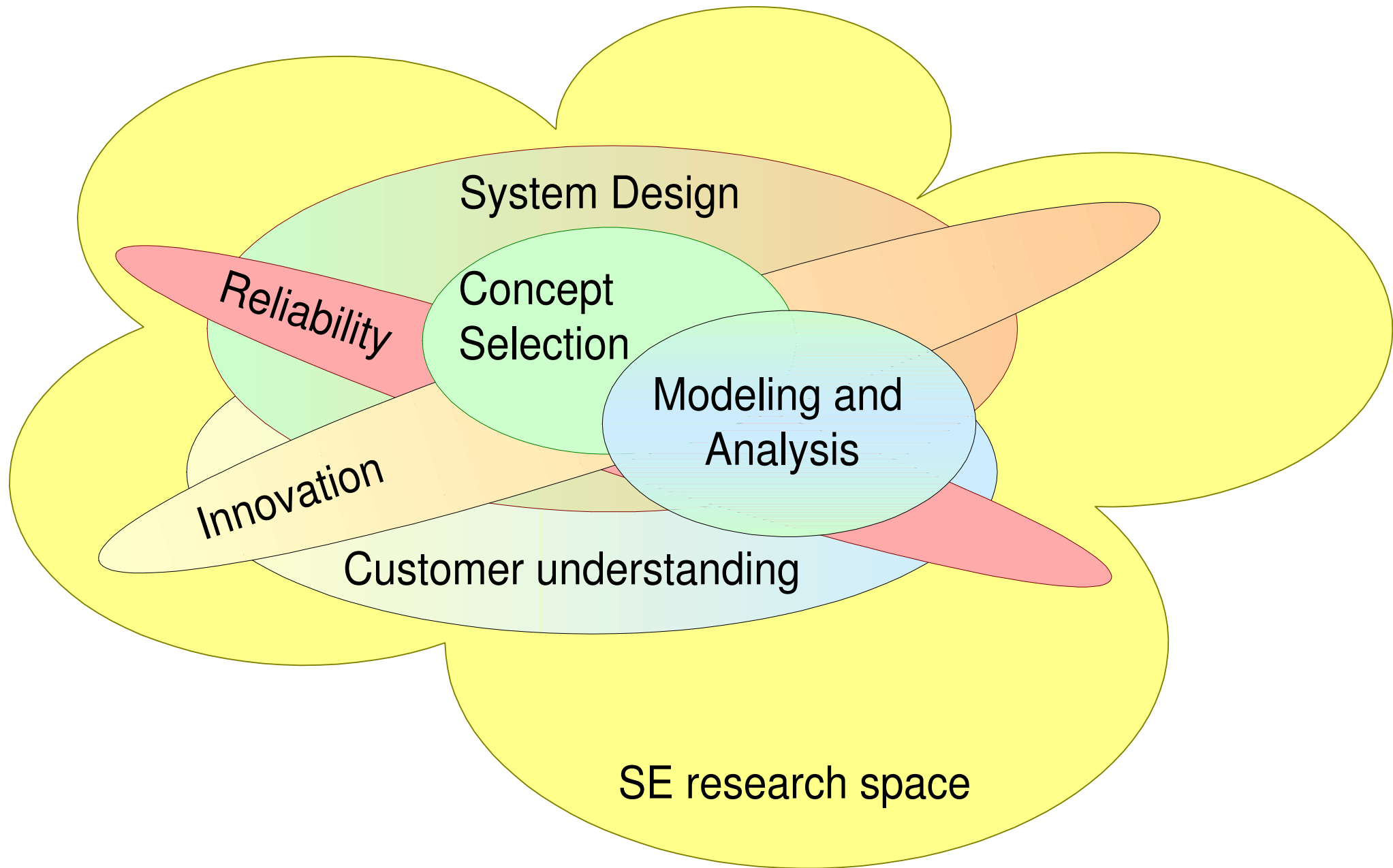


#pixels \sim 5M
pixel resolution
versus
maximum Field of View
read-out and processing time

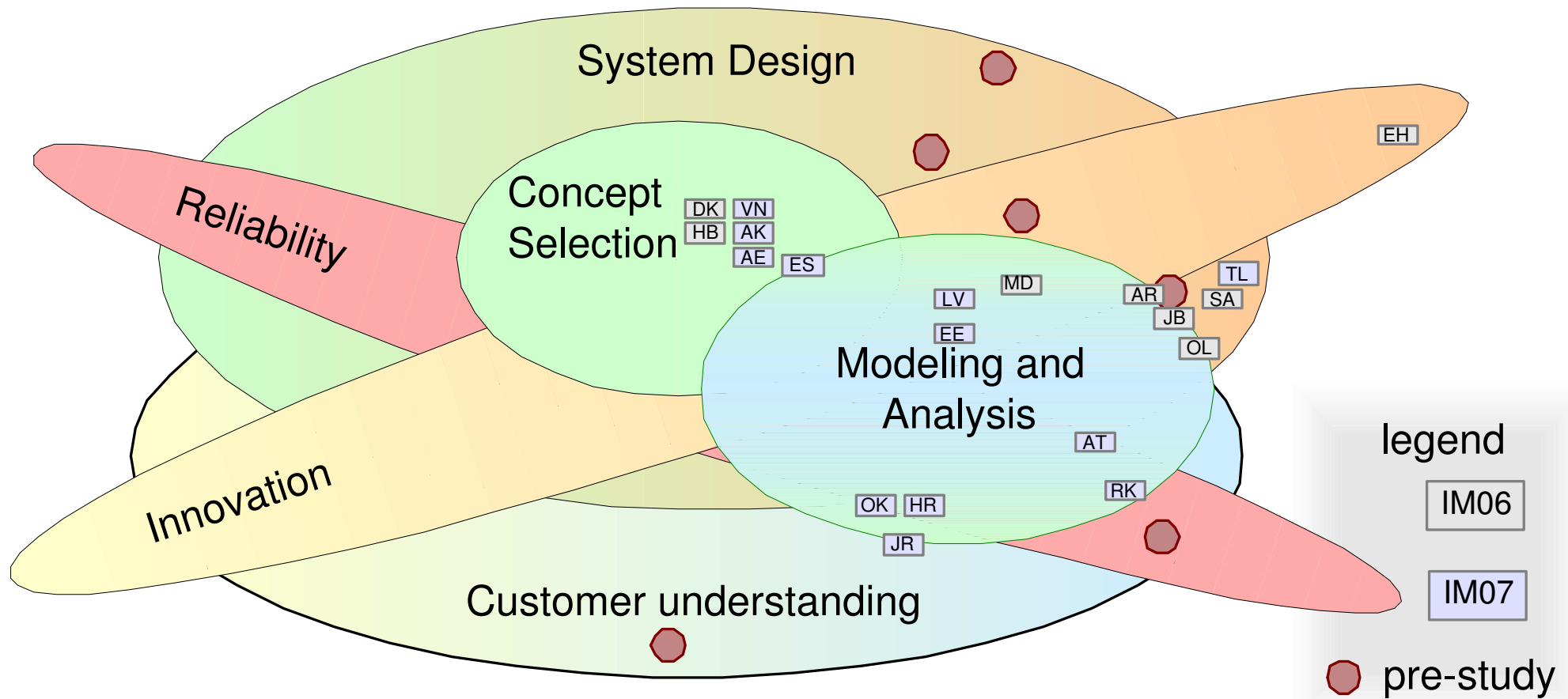
optical resolution
magnification

displacement
determines
required Field of View

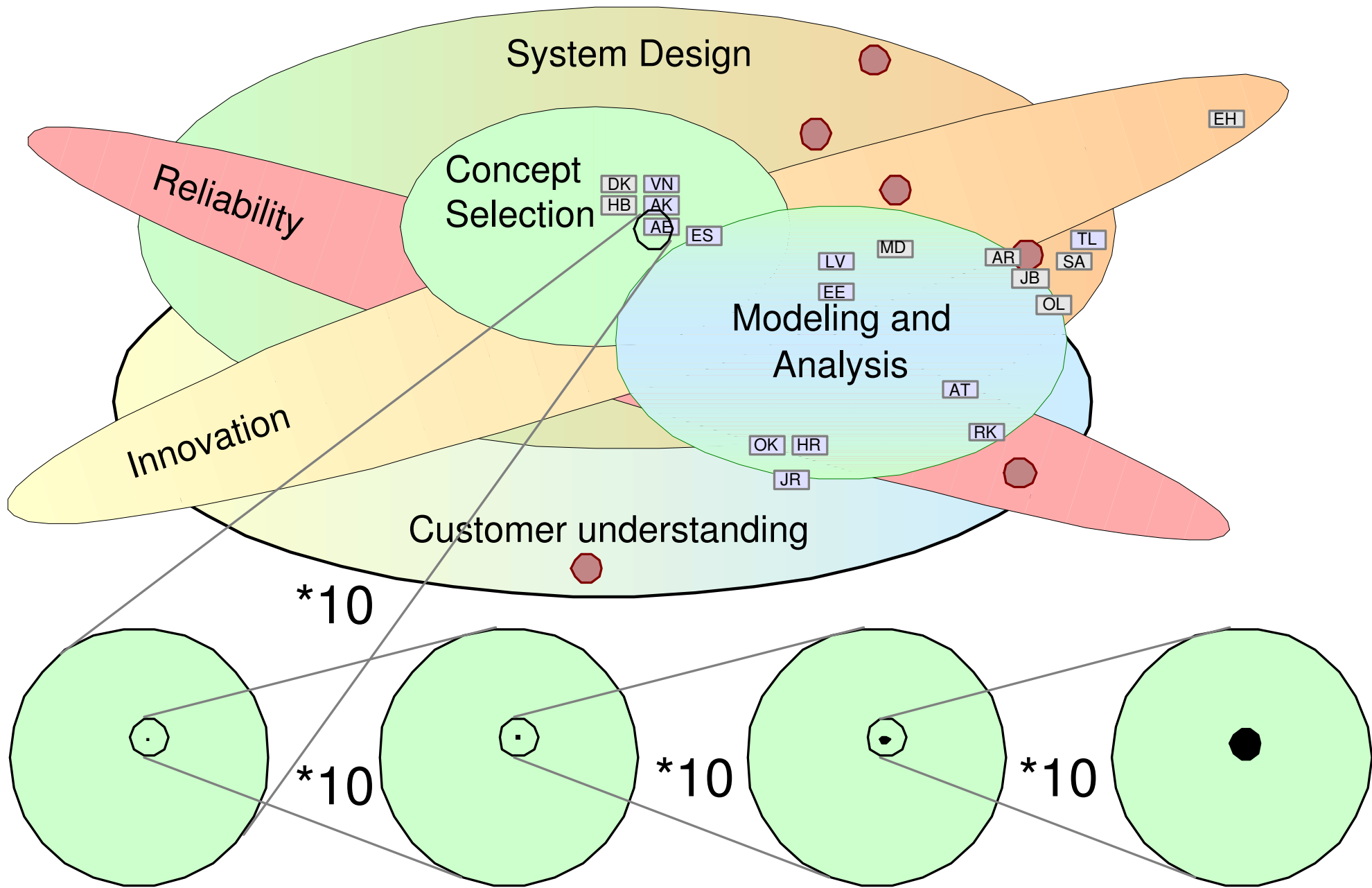
Alternate Research Agenda Visualization



Actual Projects 2008-2010



Small Dots in Huge Research Space



Summary

faster
more complex
more integration
modeling&analysis
robustness
innovation

Introduction

1. SE research

global SE trends
research agenda
industry as laboratory

2. CAFCR

example of an SE
method

multi-view
goals-means
iteration
recursion

4. Status

at BUC in Kongsberg

3. Replisaurus



Cu printer:
understand
design in
fab context

Summary

small dots
in huge
research space