

# Researching how to Connect Business and Customer World to Engineering World

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## **Abstract**

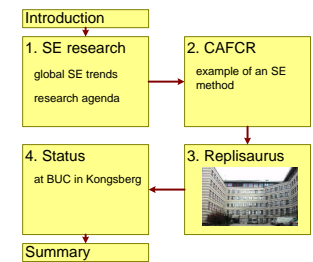
The purpose of most engineering activities is to create a system that satisfies needs of a customer and that satisfies business objectives. However, the engineering world is technical oriented, where technical decisions tend to be made on technical trade-offs. The business and customer worlds are social 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.

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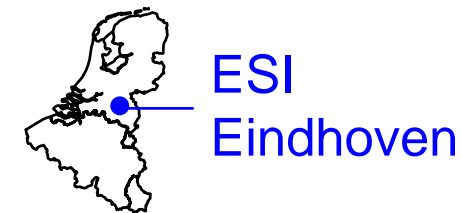
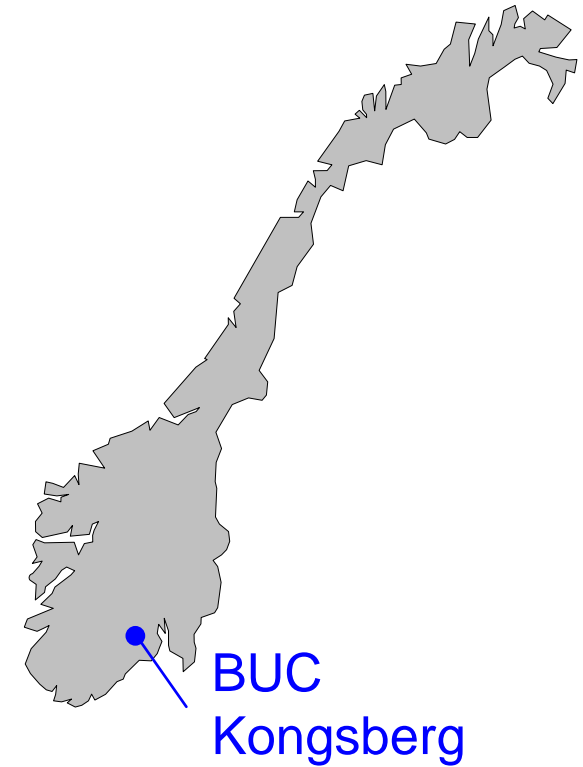
# Coordinates of the Speaker



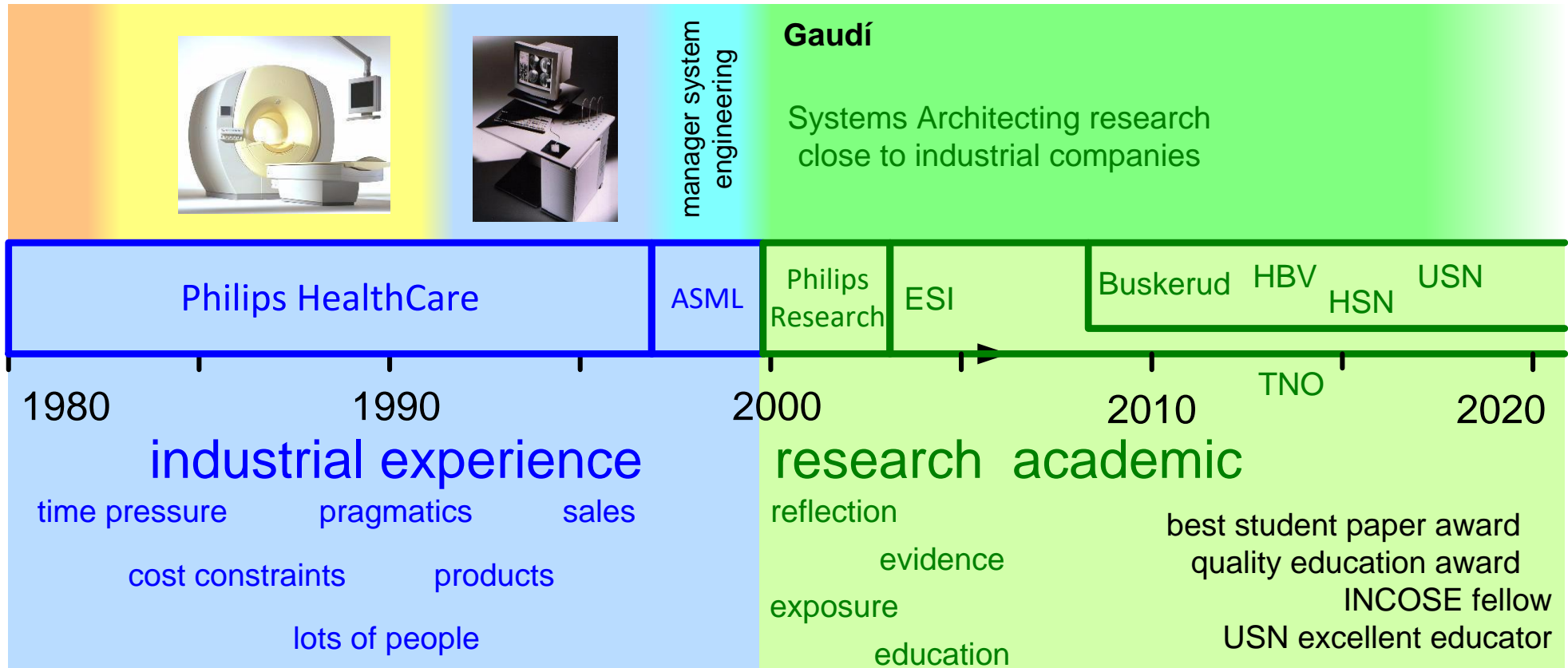
Høgskolen i Buskerud (HiBu)  
Buskerud University College (BUC)



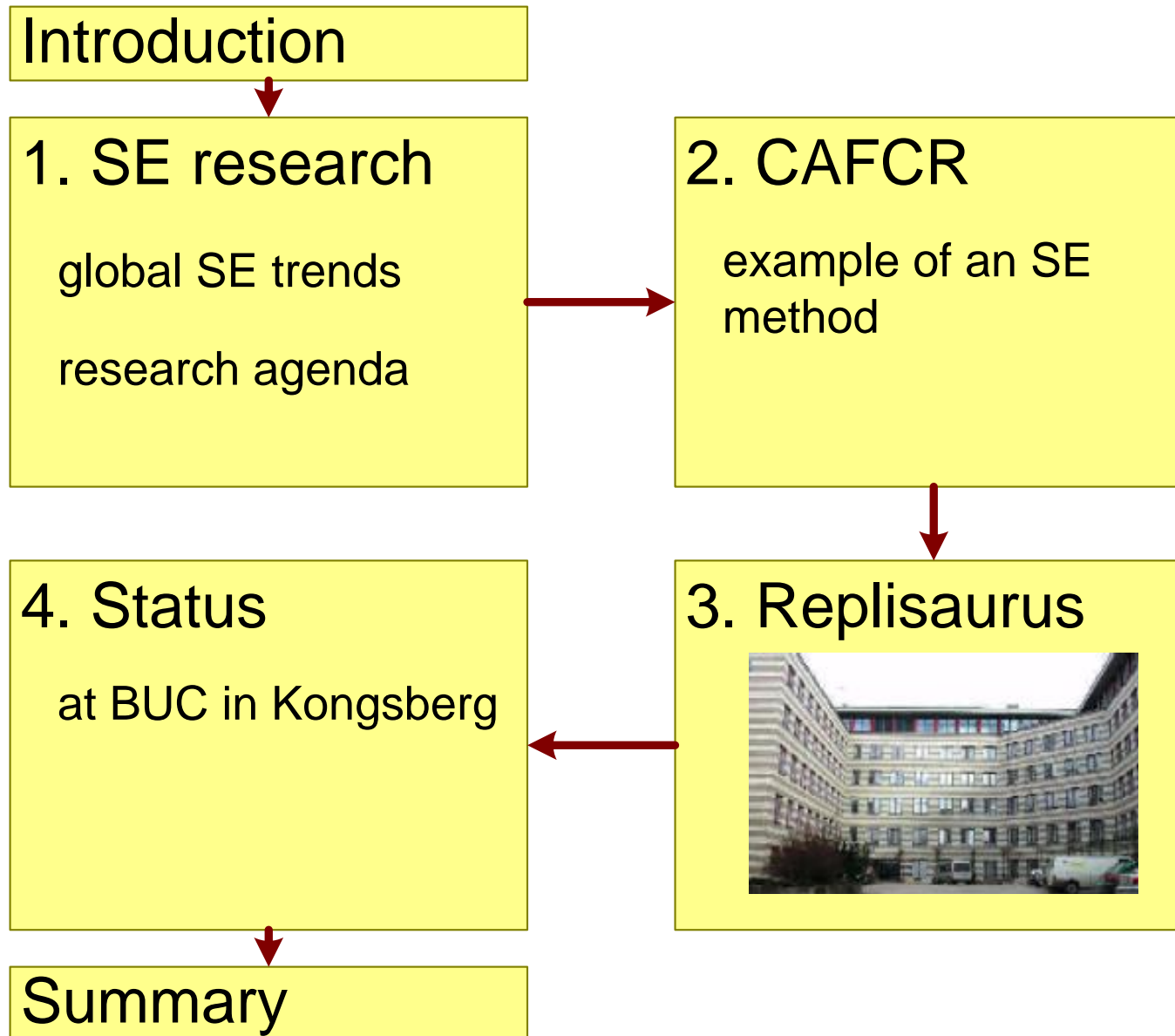
Embedded Systems Institute (ESI)



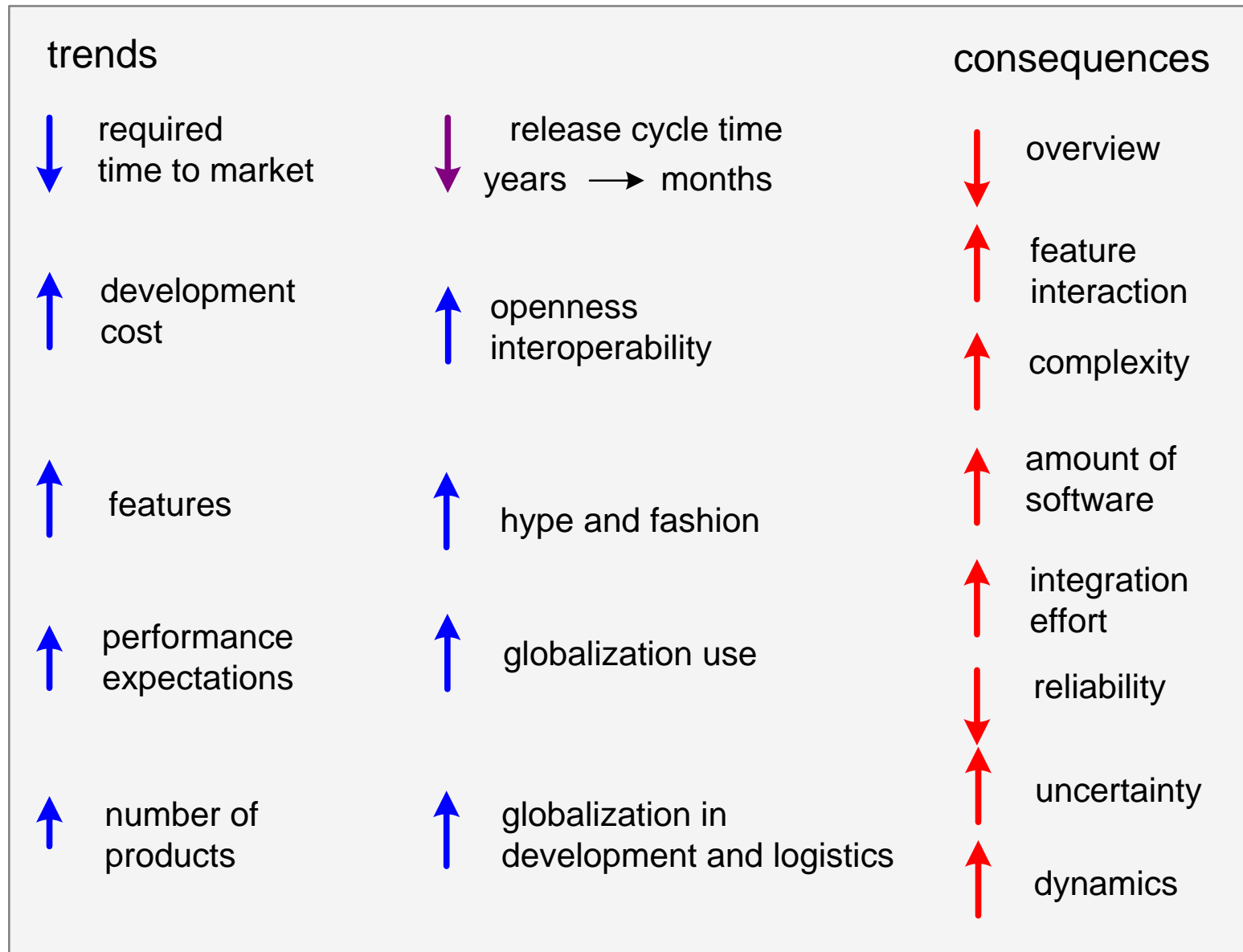
# Industrial + Academic Experience



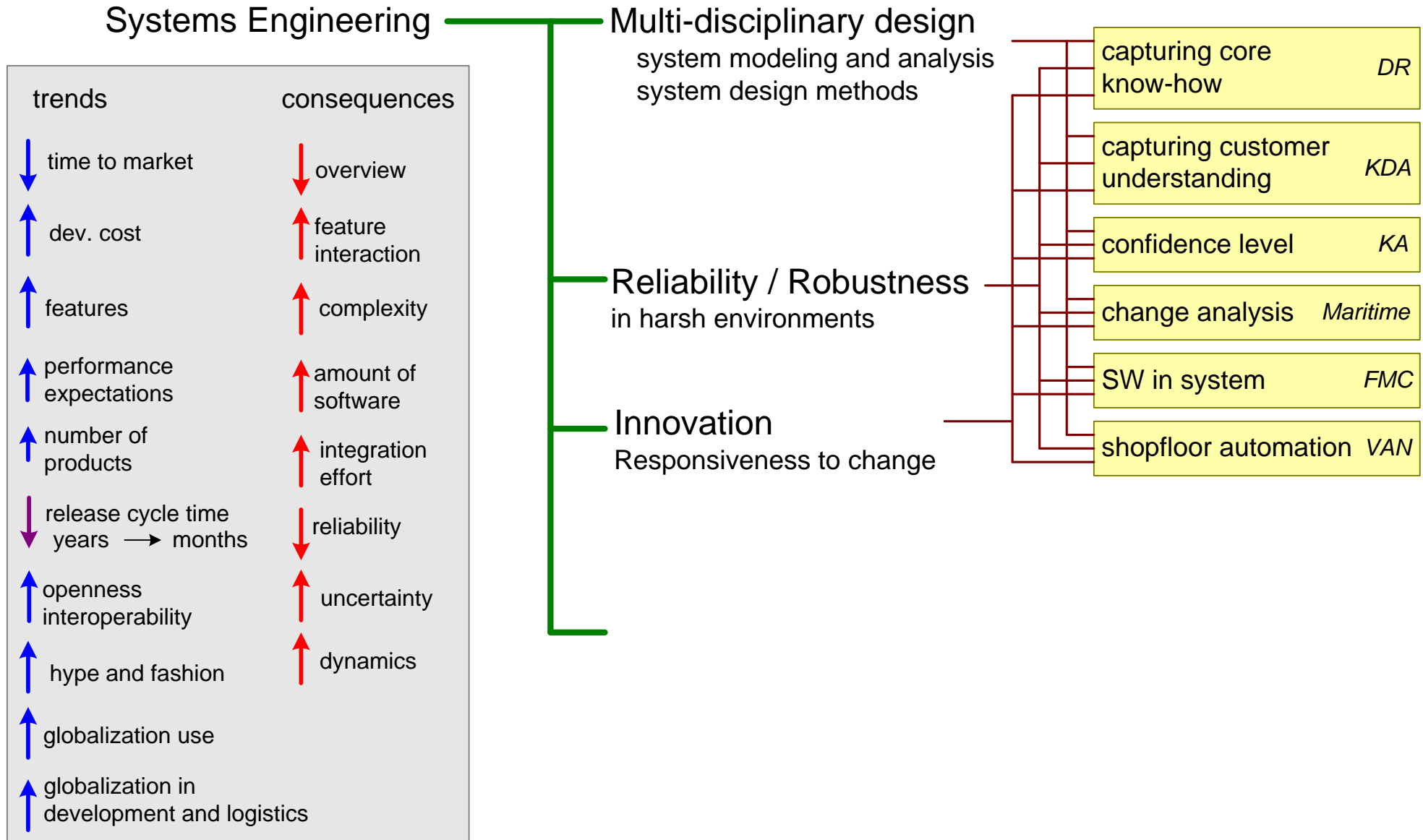
# Figure Of Contents™



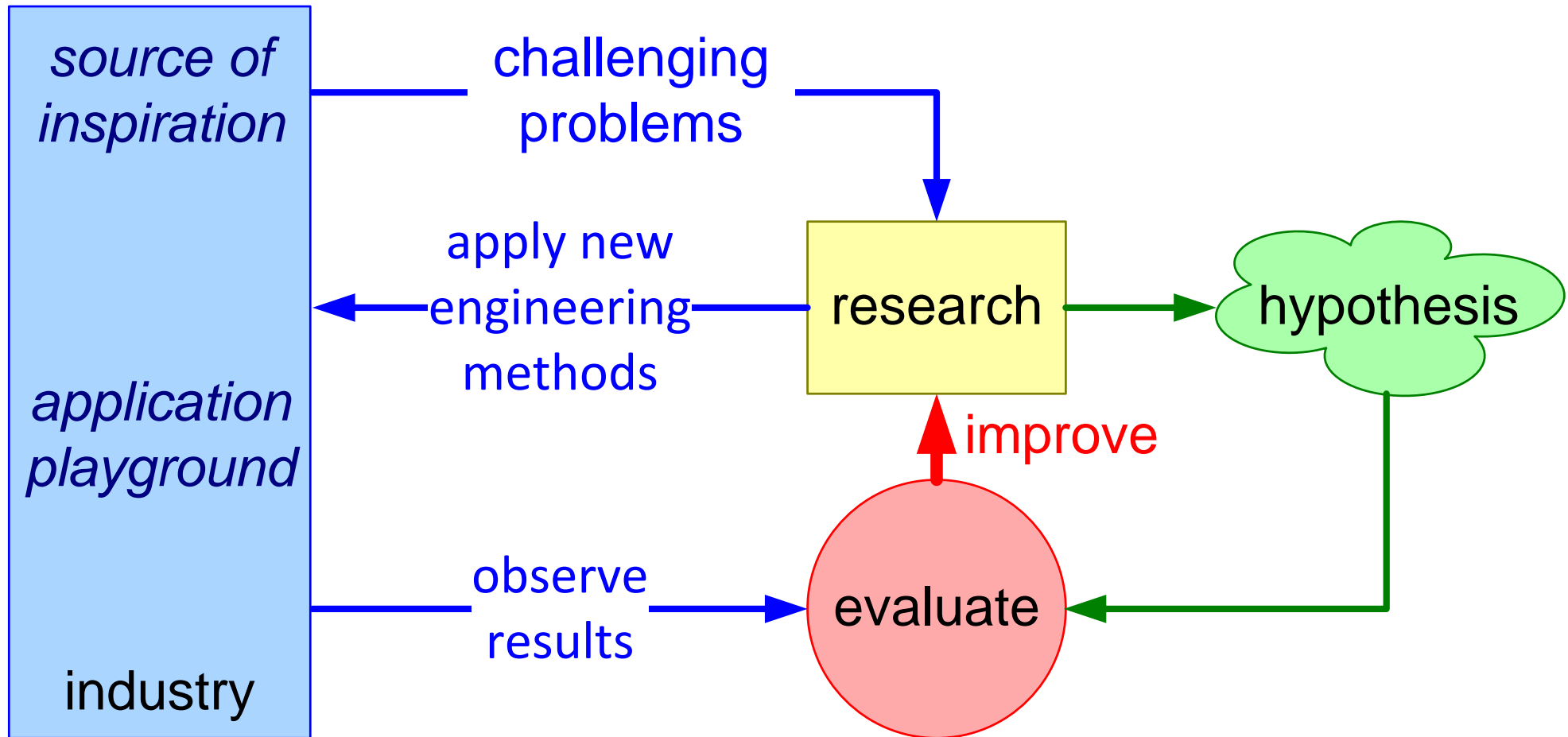
# Today's Industrial Trends



# Buskerud research agenda as graph



# Industry as Laboratory



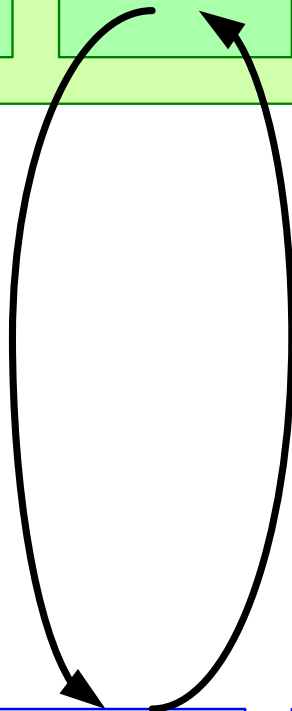
# Industry as Laboratory (2)

intended dissemination and research partners

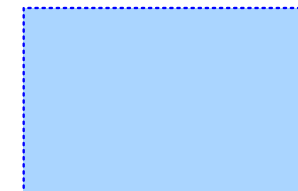
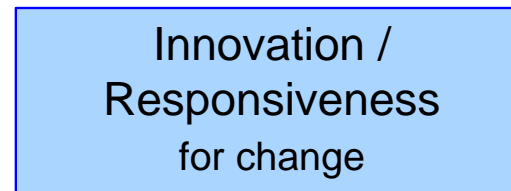
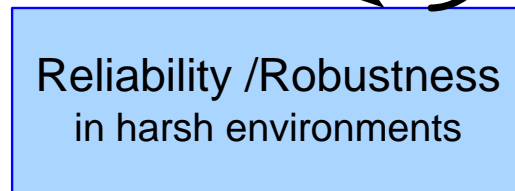


generalization and consolidation to facilitate use in other domains

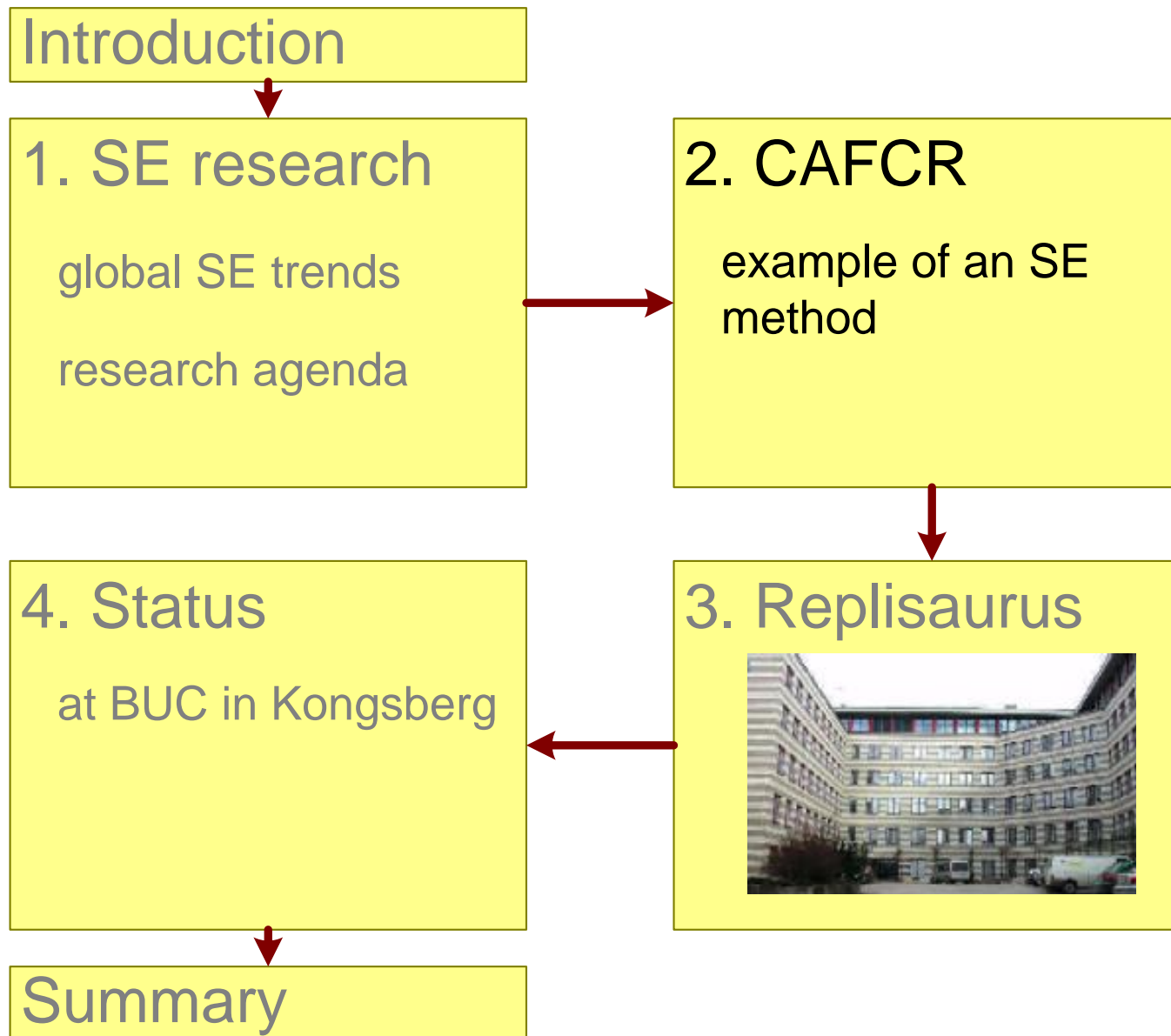
single domain research focus on industrial problem



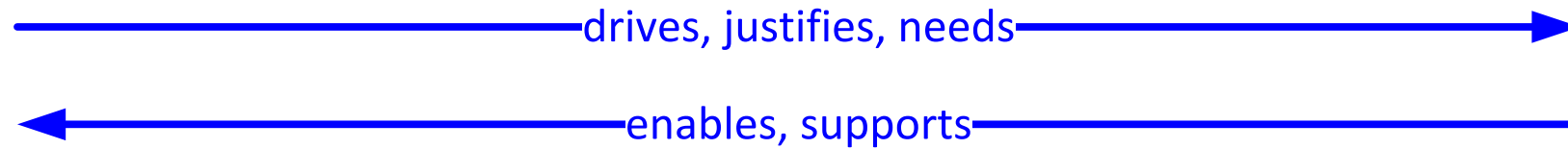
multi-domain research and expertise



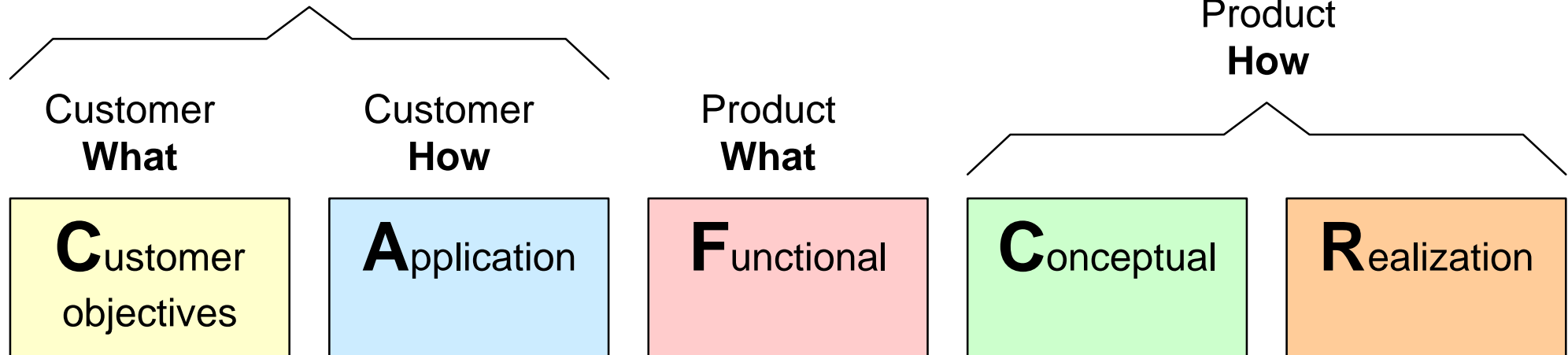
# Method Example: CAFCR



# The “CAFCR” model

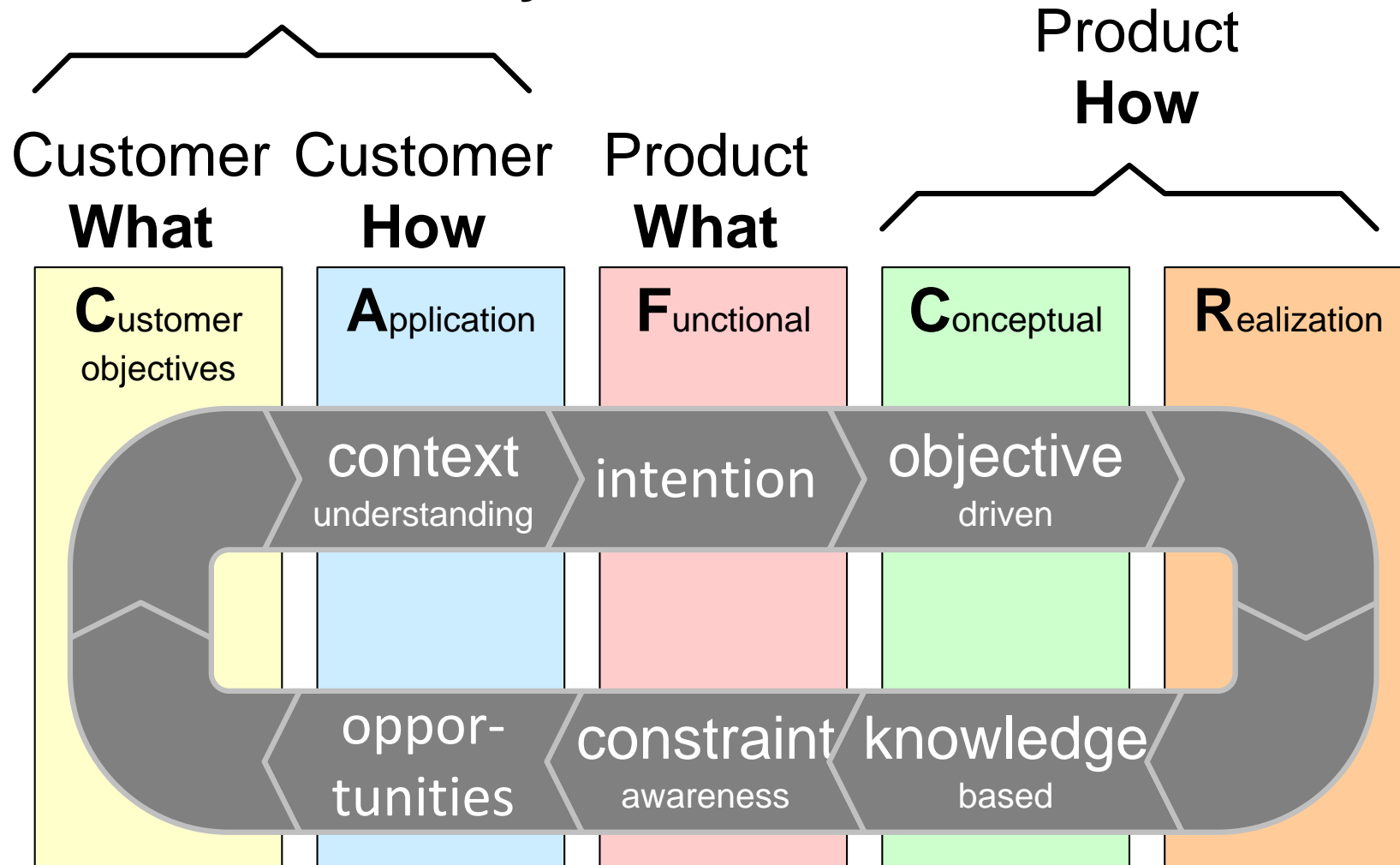


**What** does Customer need  
in Product and **Why?**

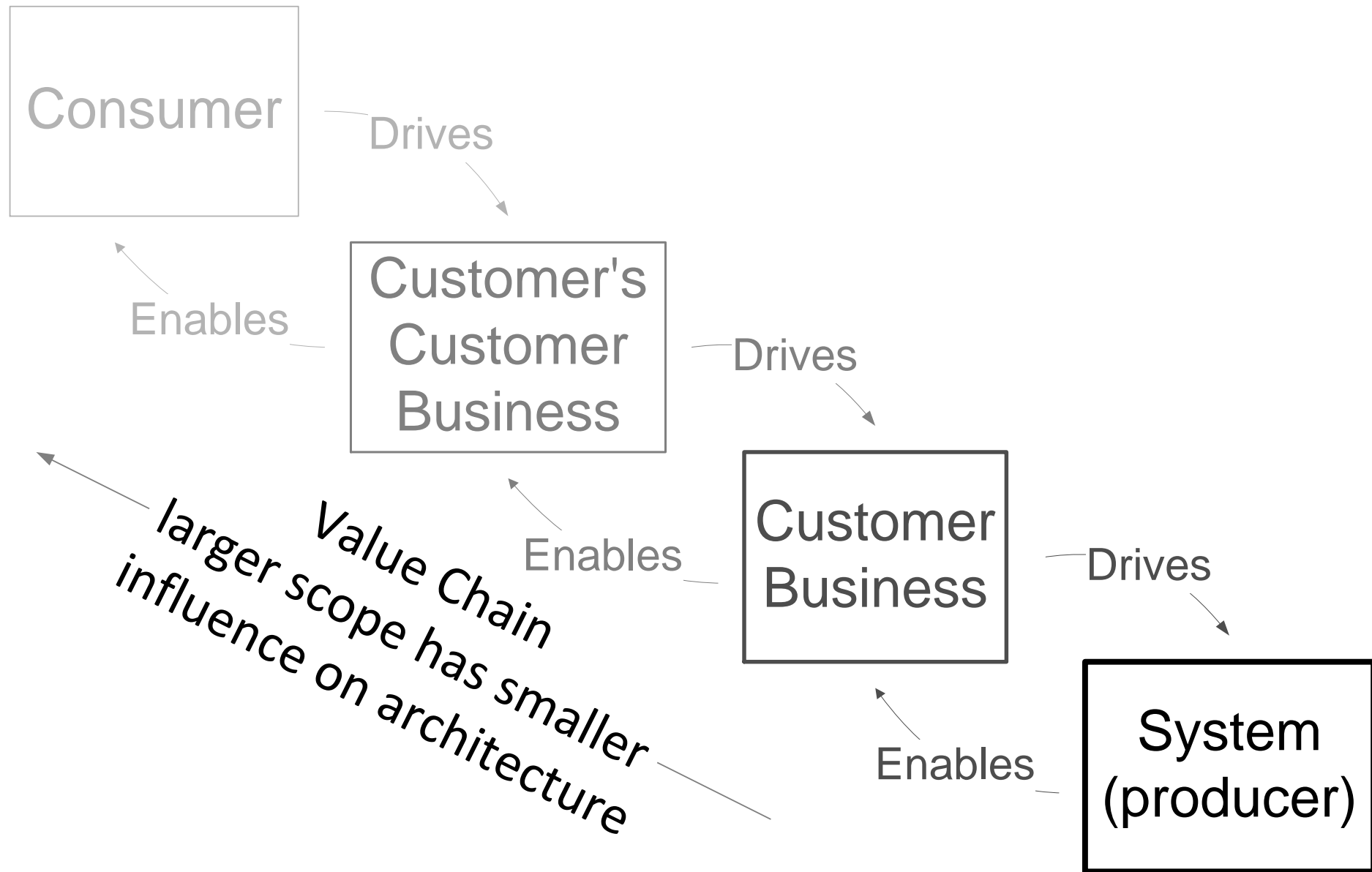


# Integrating CAFCR

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

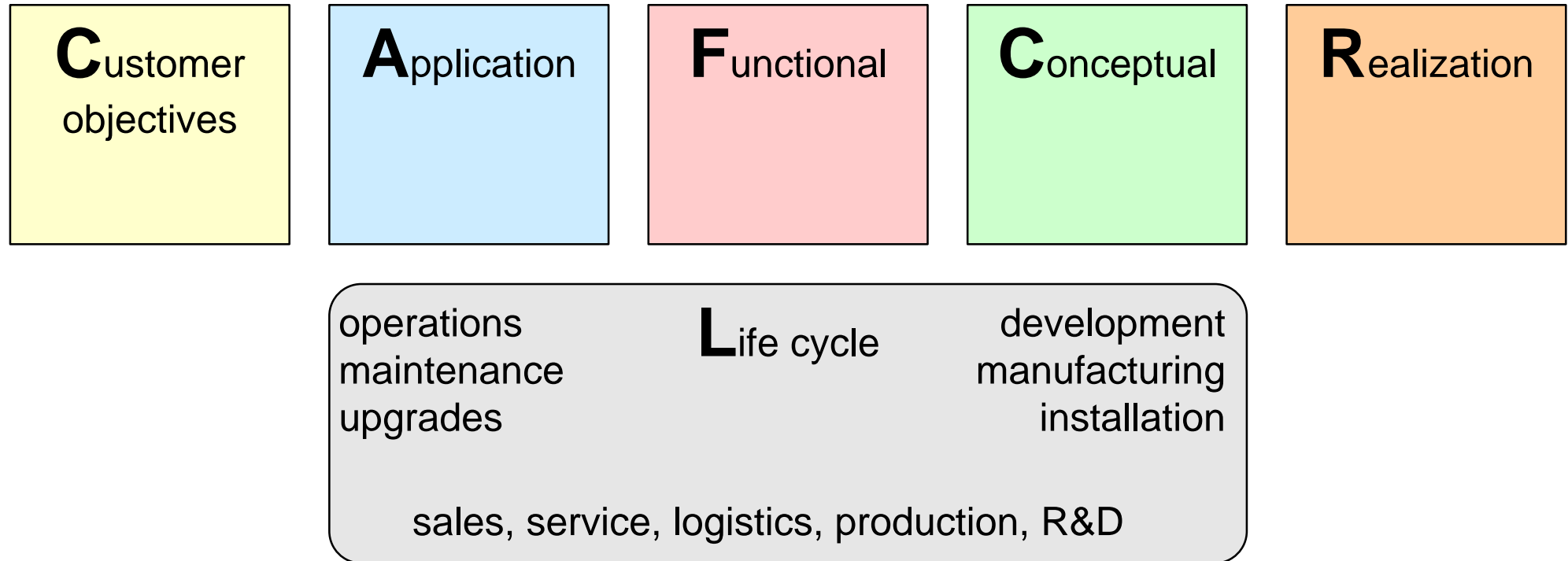


# CAFCR can be applied recursively

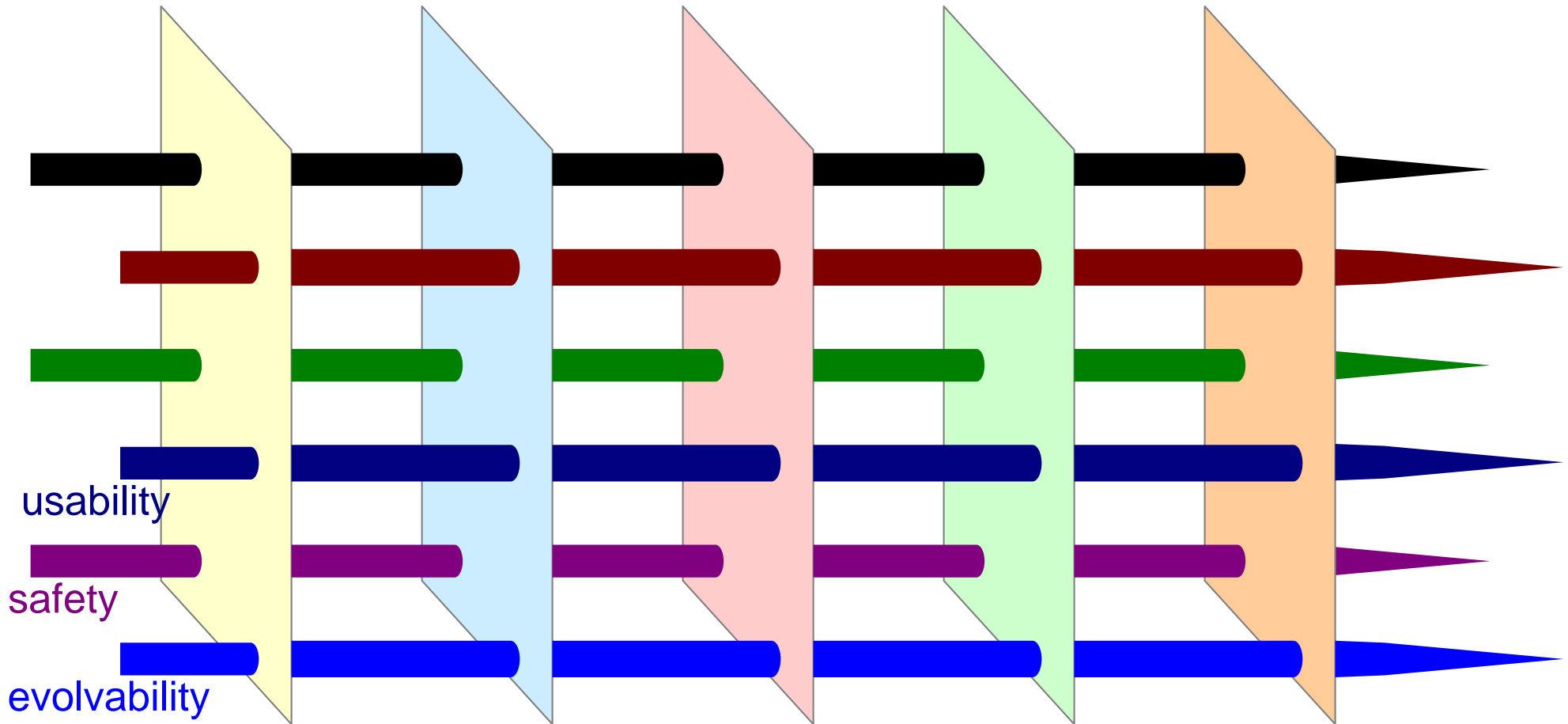


# CAFCR+ model; Life Cycle View

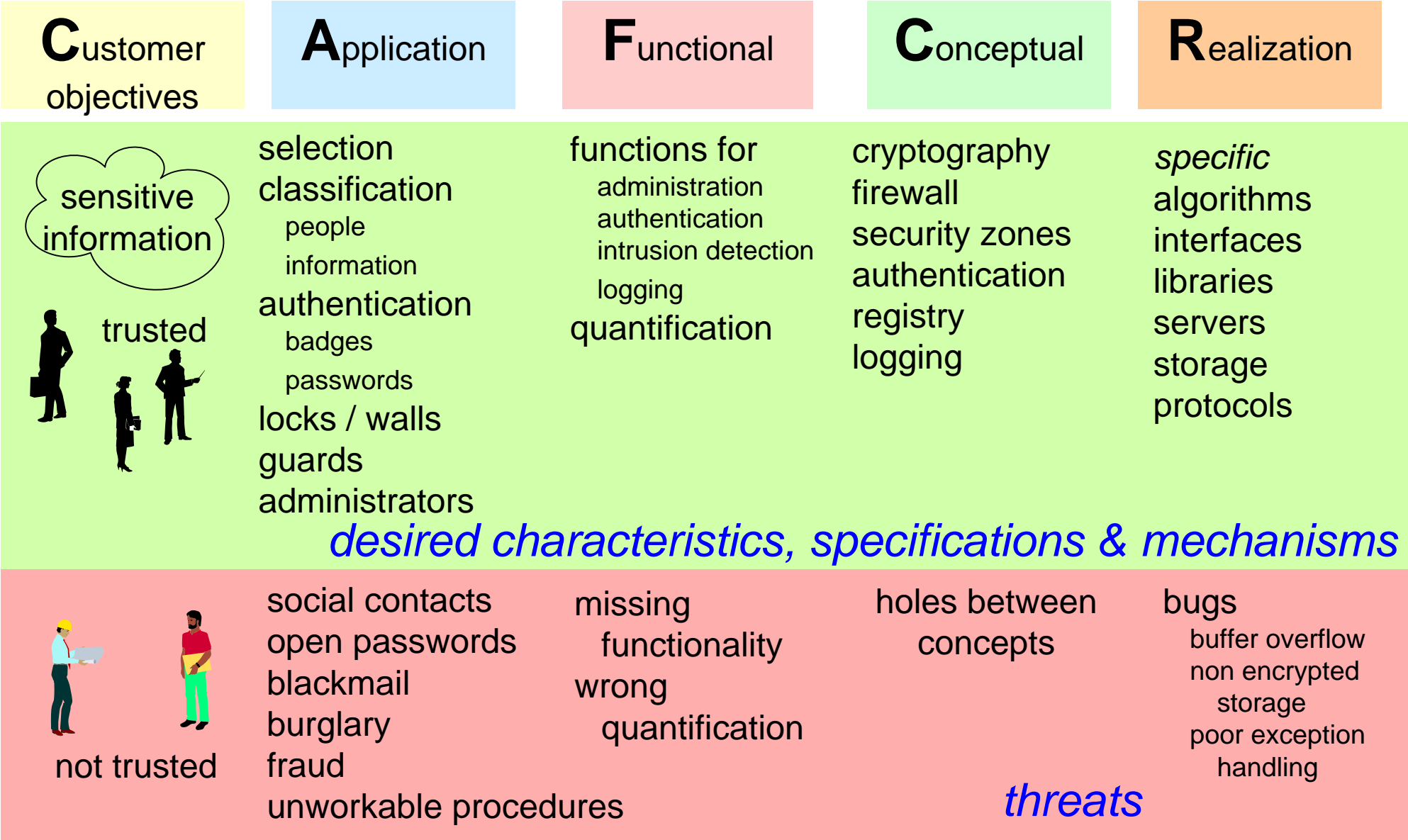
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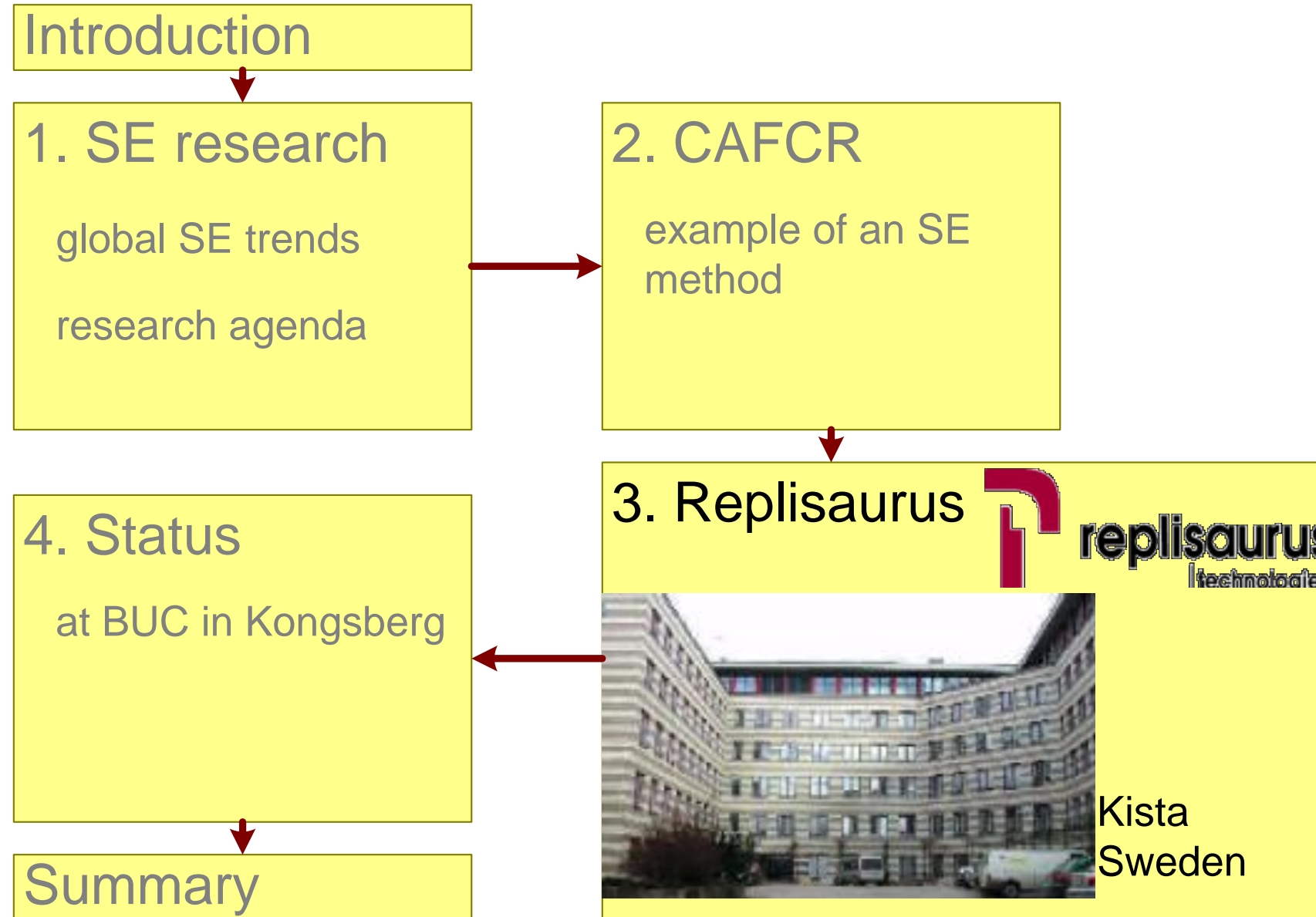
# Quality needles as generic integrating concepts



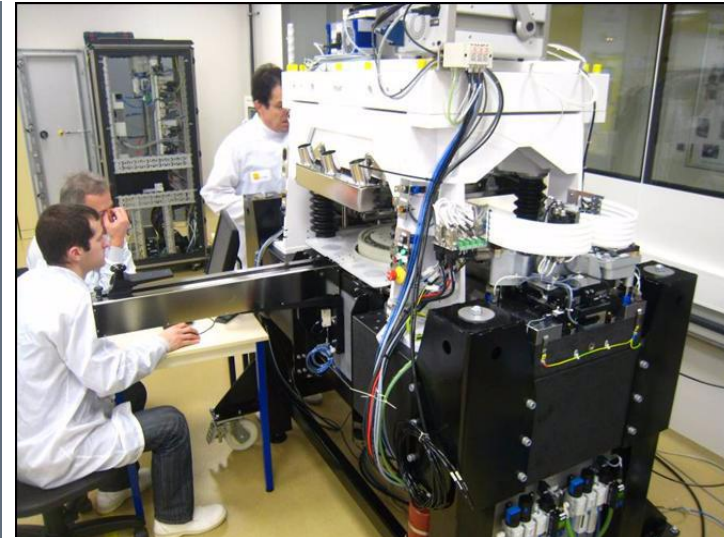
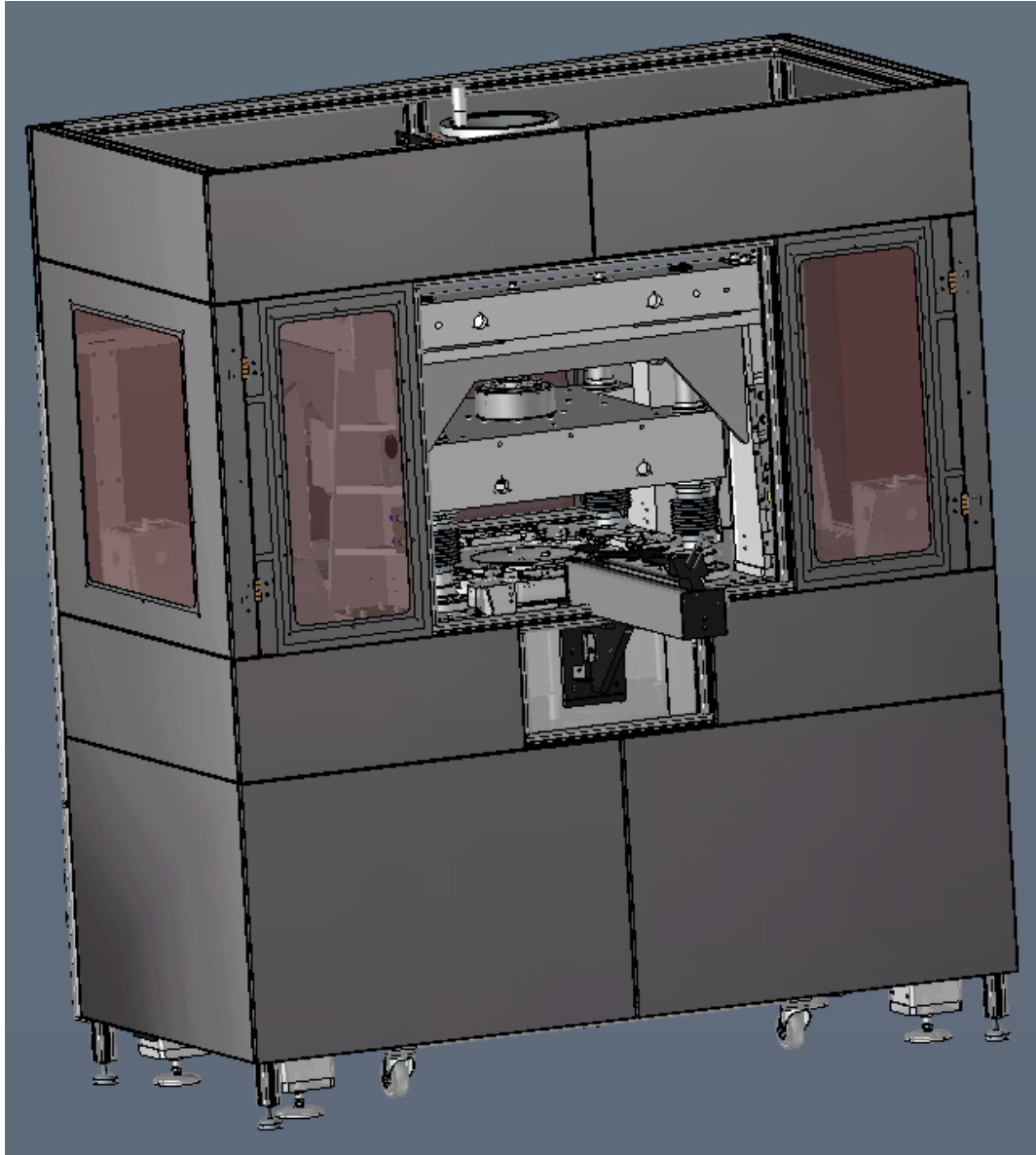
# Security as example through all views



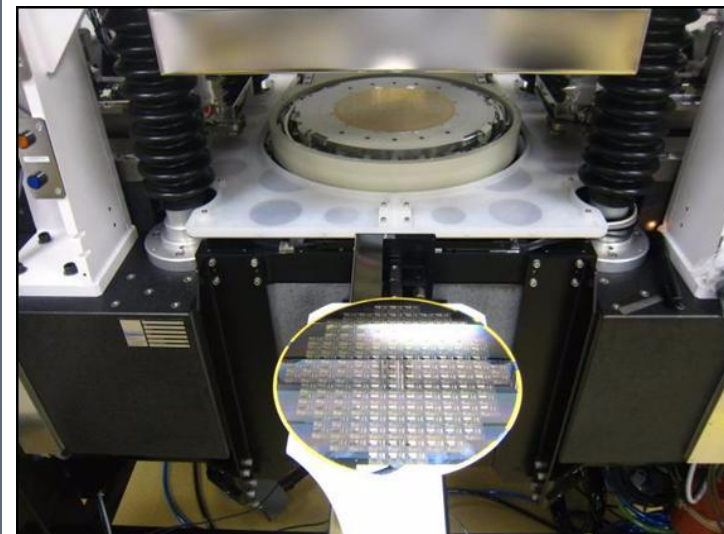
# Start-Up Company Replisaurus in Kista (Sweden)



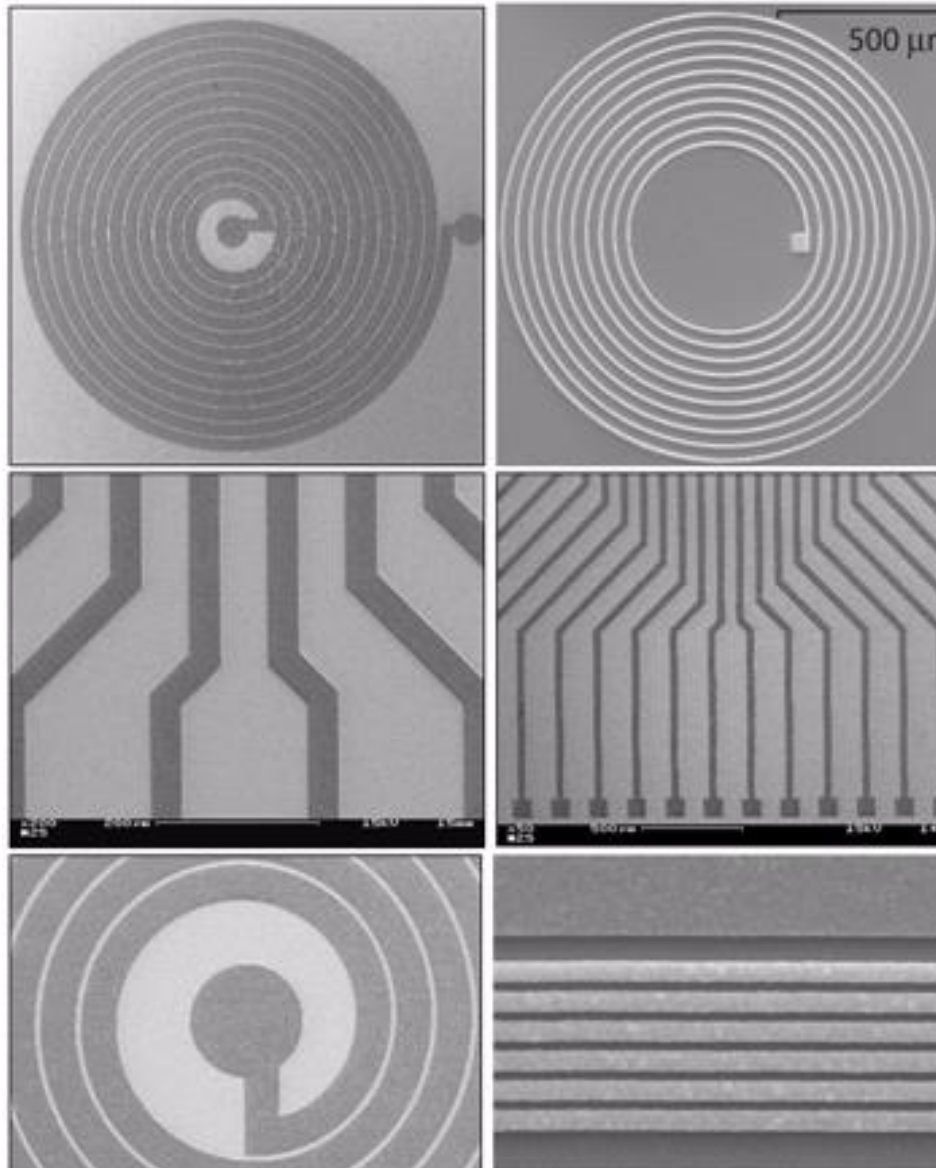
# The Copper Printer



courtesy Replisaurus  
[www.replisaurus.com](http://www.replisaurus.com)



# Example of printed copper structures

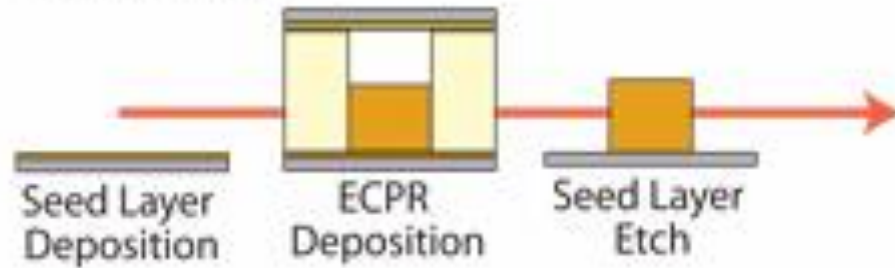


courtesy Replisaurus  
[www.replisaurus.com](http://www.replisaurus.com)

# ECPR technology replaces 6 process steps by 1 step

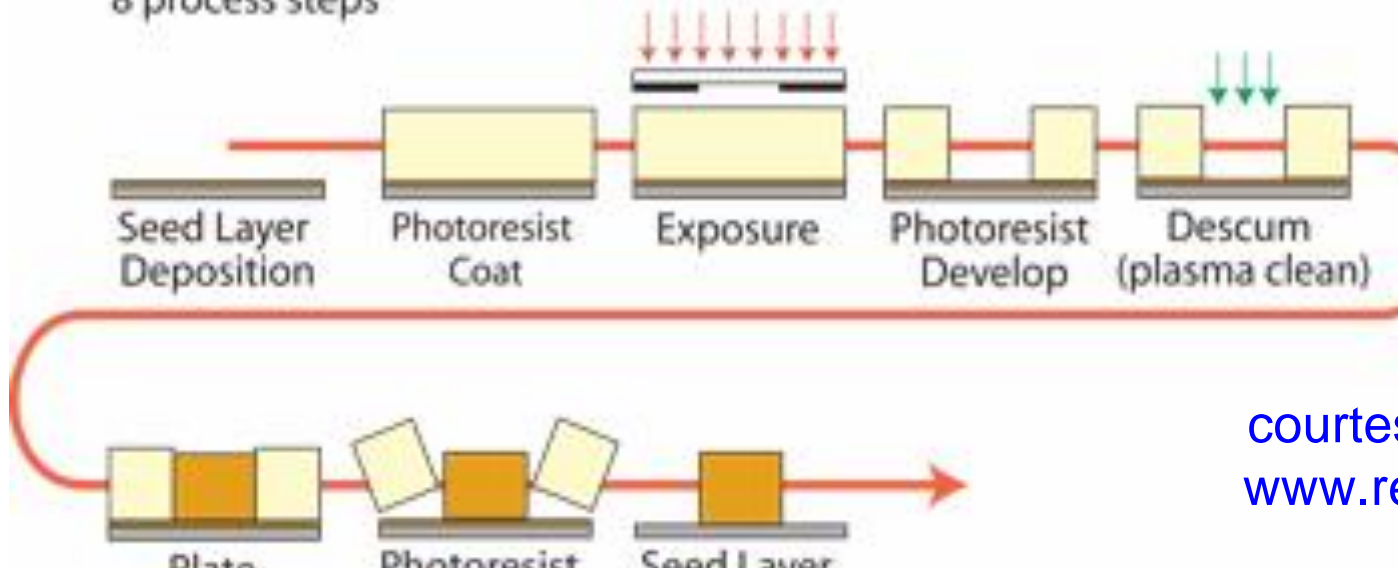
## ECPR - ElectroChemical Pattern Replication

3 process steps



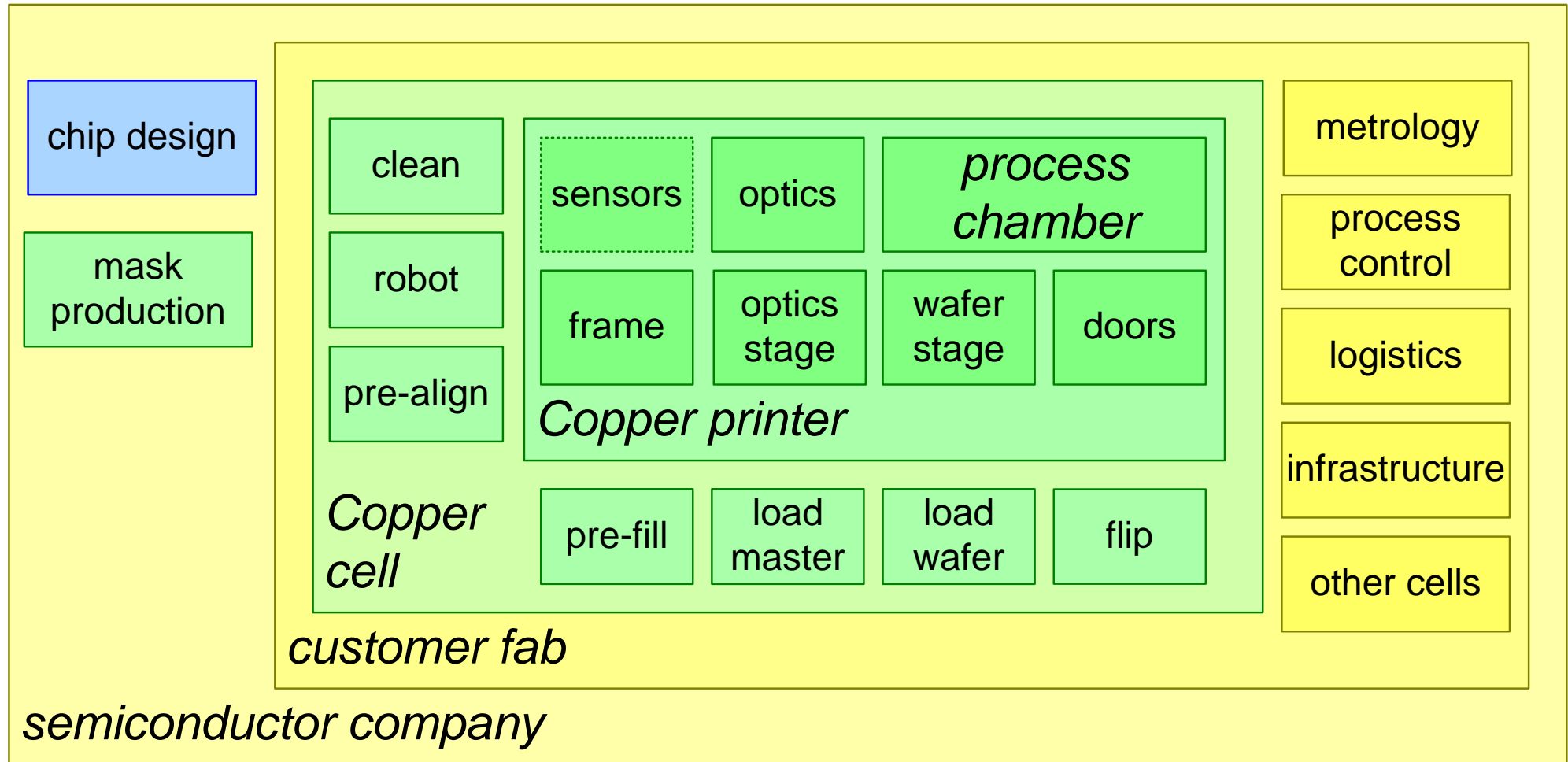
## Conventional lithography based metallization

8 process steps

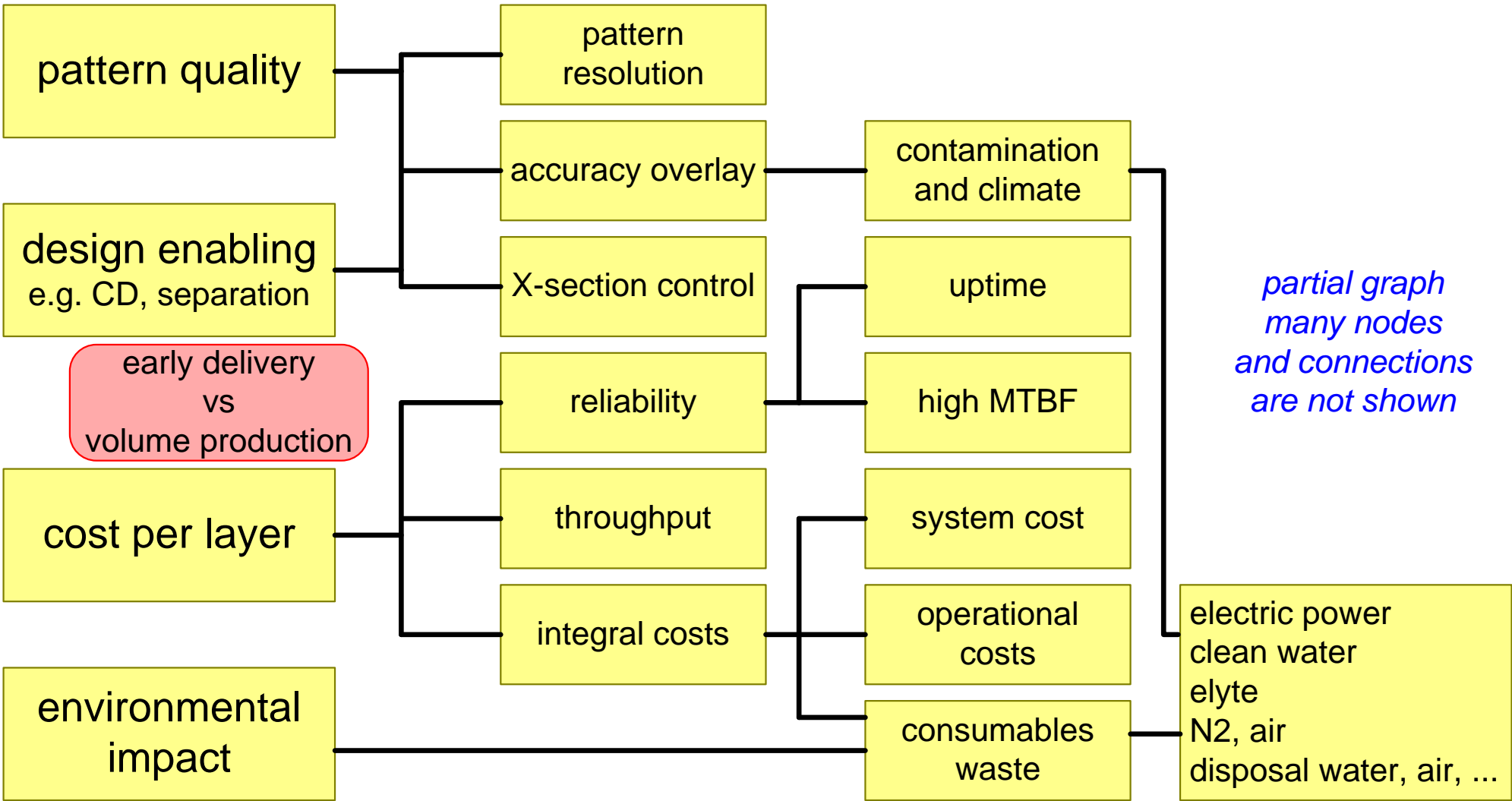


courtesy Replisaurus  
[www.replisaurus.com](http://www.replisaurus.com)


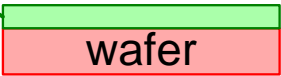
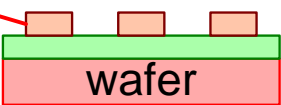
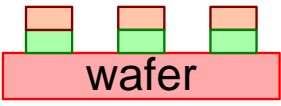
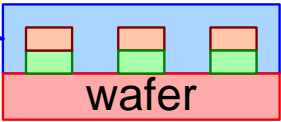
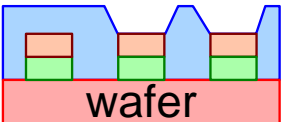
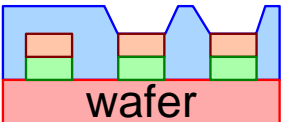
# Overview of the different scopes



# Customer key driver graph



# Process flow at fab level, from inspection until testing

		throughput in minutes	wafer	FOUP	
		1. inspection			
seed		2. seed sputter	1	25	
Cu		3. Cu print	2	50	target spec
		4. seed etch	1	20	
<p>spin coated polymer</p> 		dual layer only			
		5. coat/develop dielectrics	3..4	50	75..100??
		6. exposure or CMP for polymer vias	1..2	30	
		7. E-test			

# Work flow in the Copper Printer

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0. Loading Master&substrate

1. Close doors

2. Align

3. Move to proximity

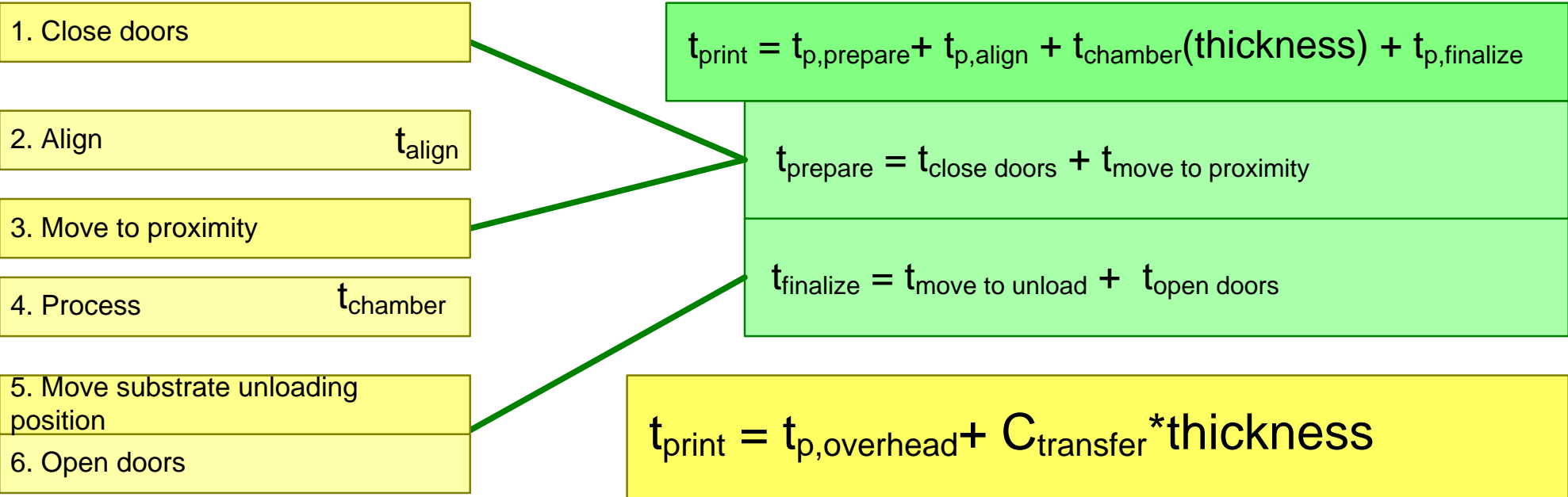
4. Process incl. rinse&dry

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*

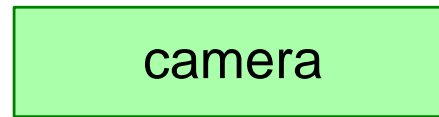
# Optical path to measure marker position



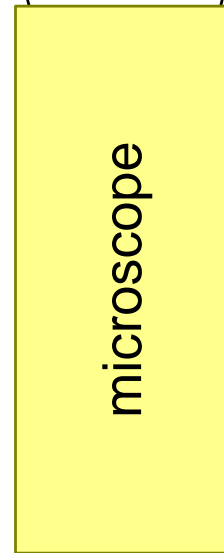
measurement accuracy  
determines  
required resolution



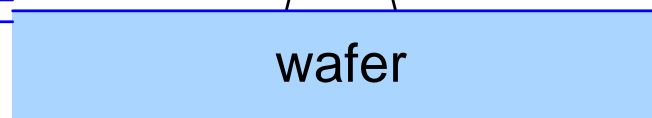
DoF 



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

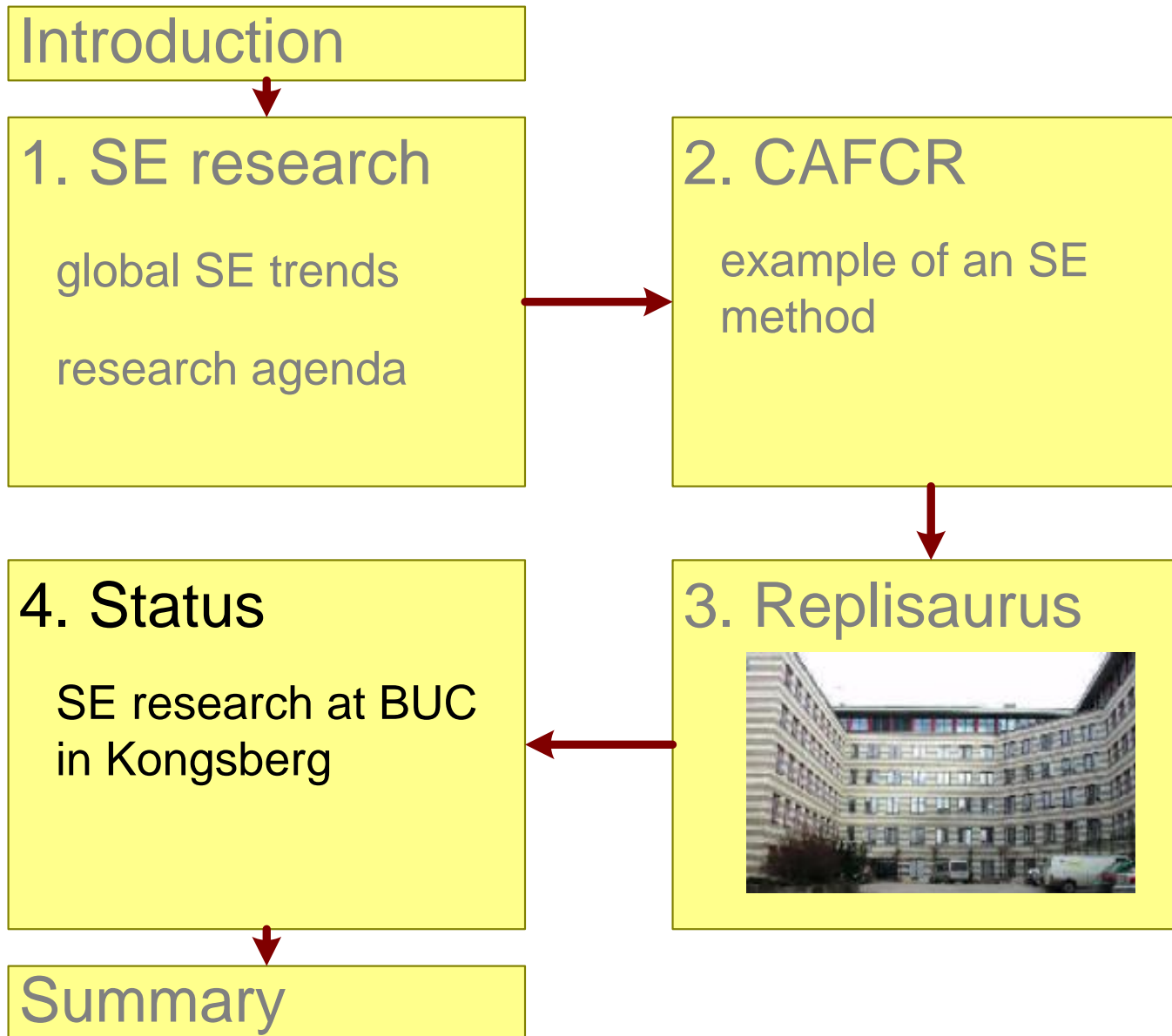


optical resolution  
magnification

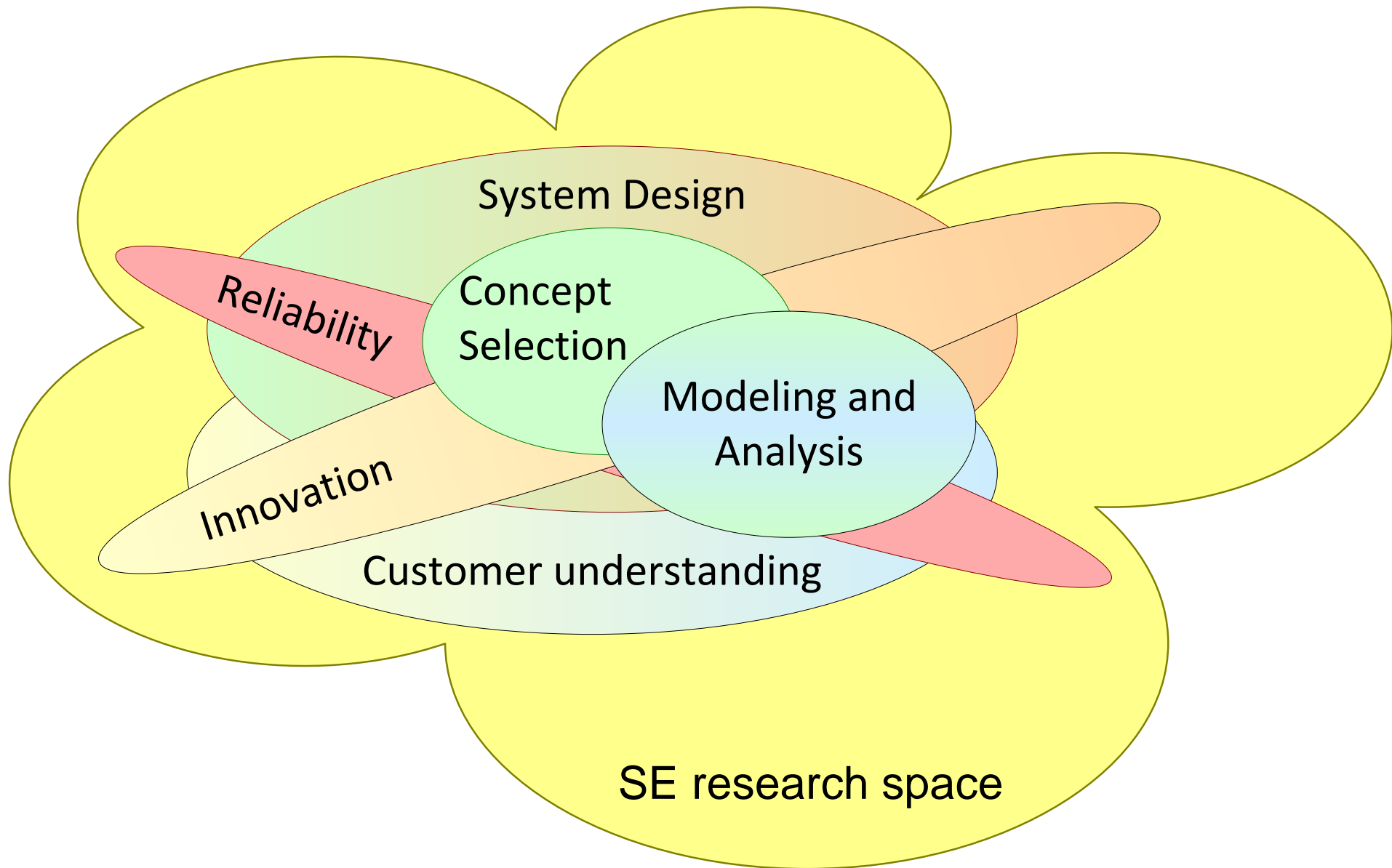


displacement  
determines  
required Field of View

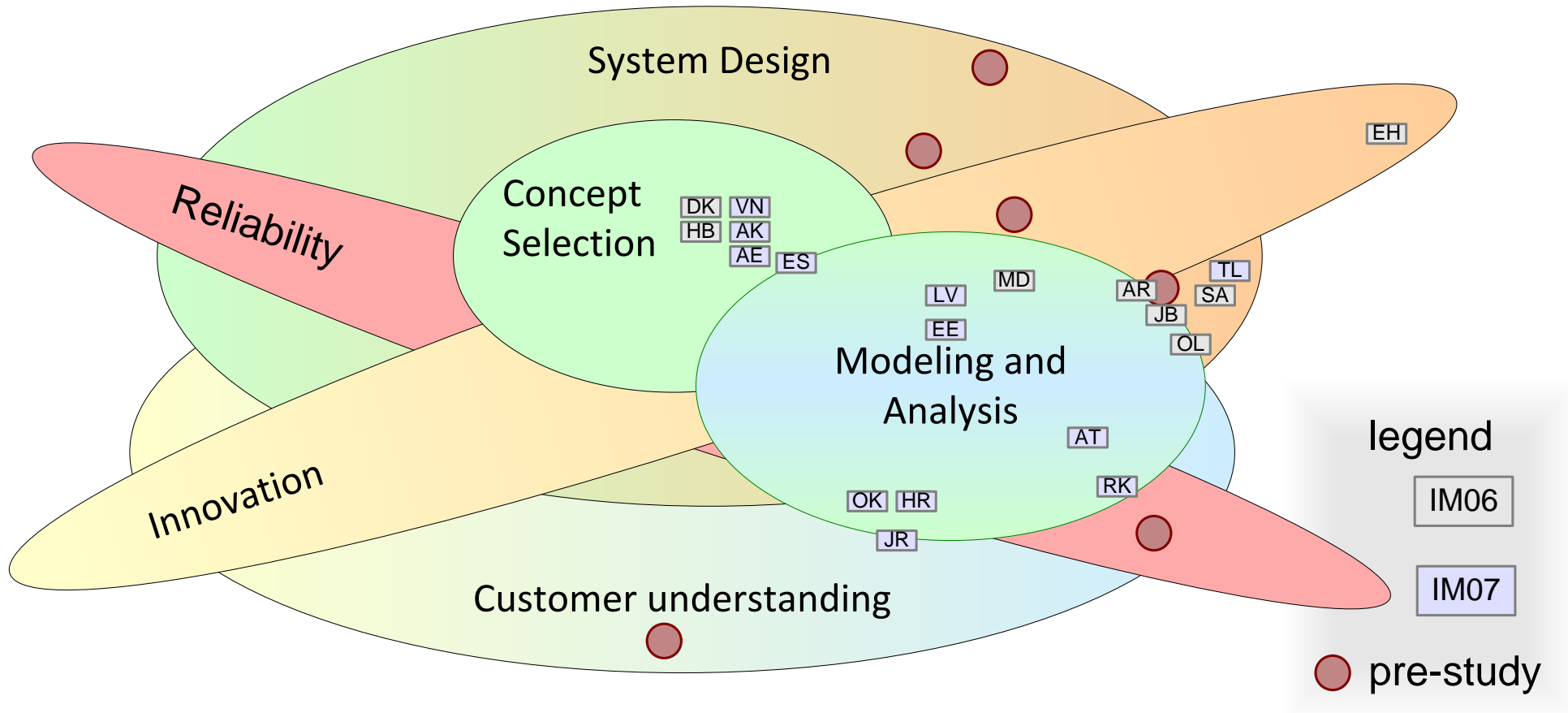
# Research Status as Buskerud University College



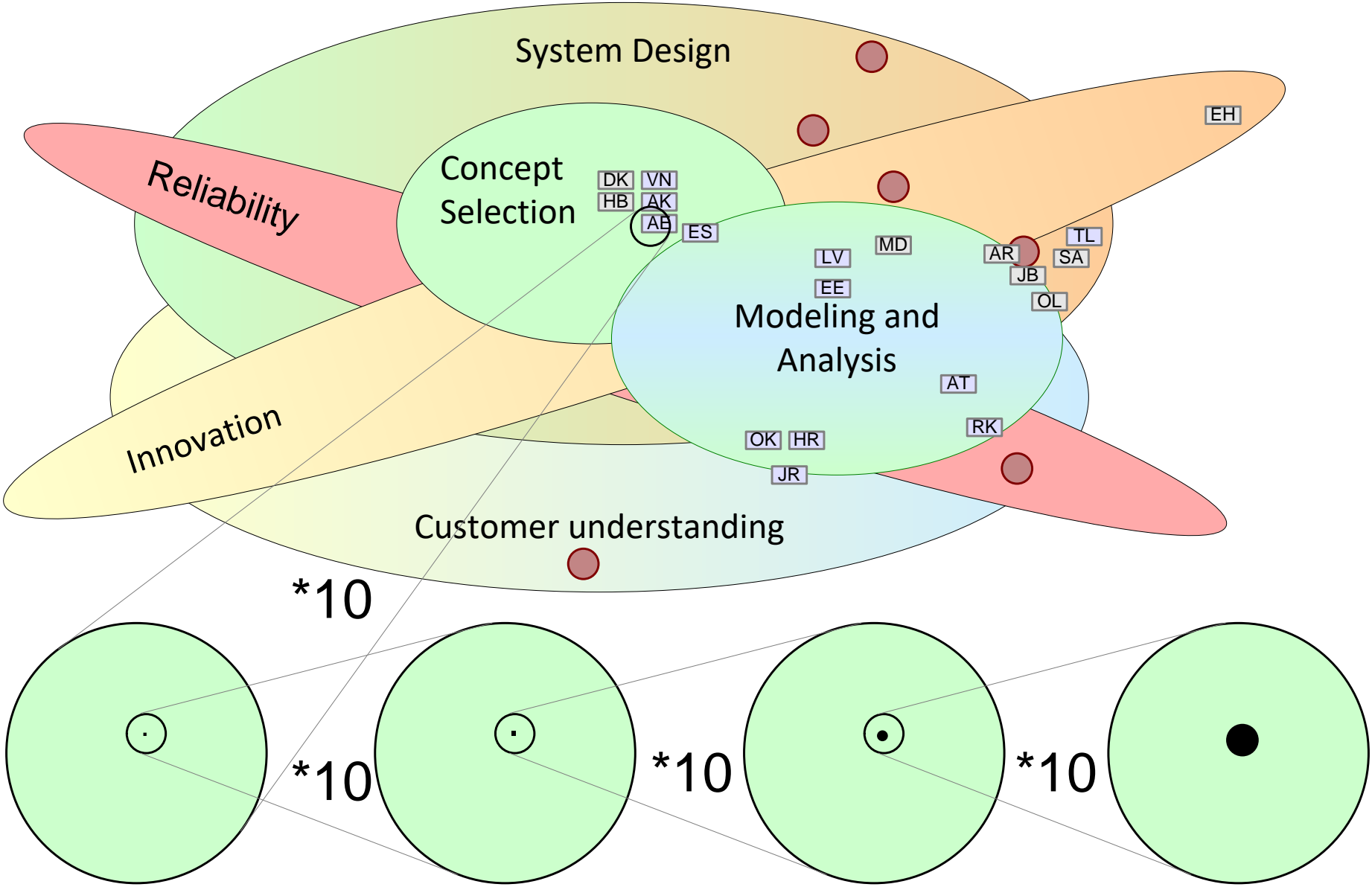
# Alternate Research Agenda Visualization



# Actual Projects 2008-2010



# Small Dots in Huge Research Space



# Summary

