Role of Systems Architecting in Innovation

by *Gerrit Muller* University of South-Eastern Norway-NISE
e-mail: gaudisite@gmail.com
www.gaudisite.nl

Abstract

January 21, 2022
status: preliminary draft
version: 0

logo TBD

The Embedded Systems Domain

chip

GSM

MRI scanner

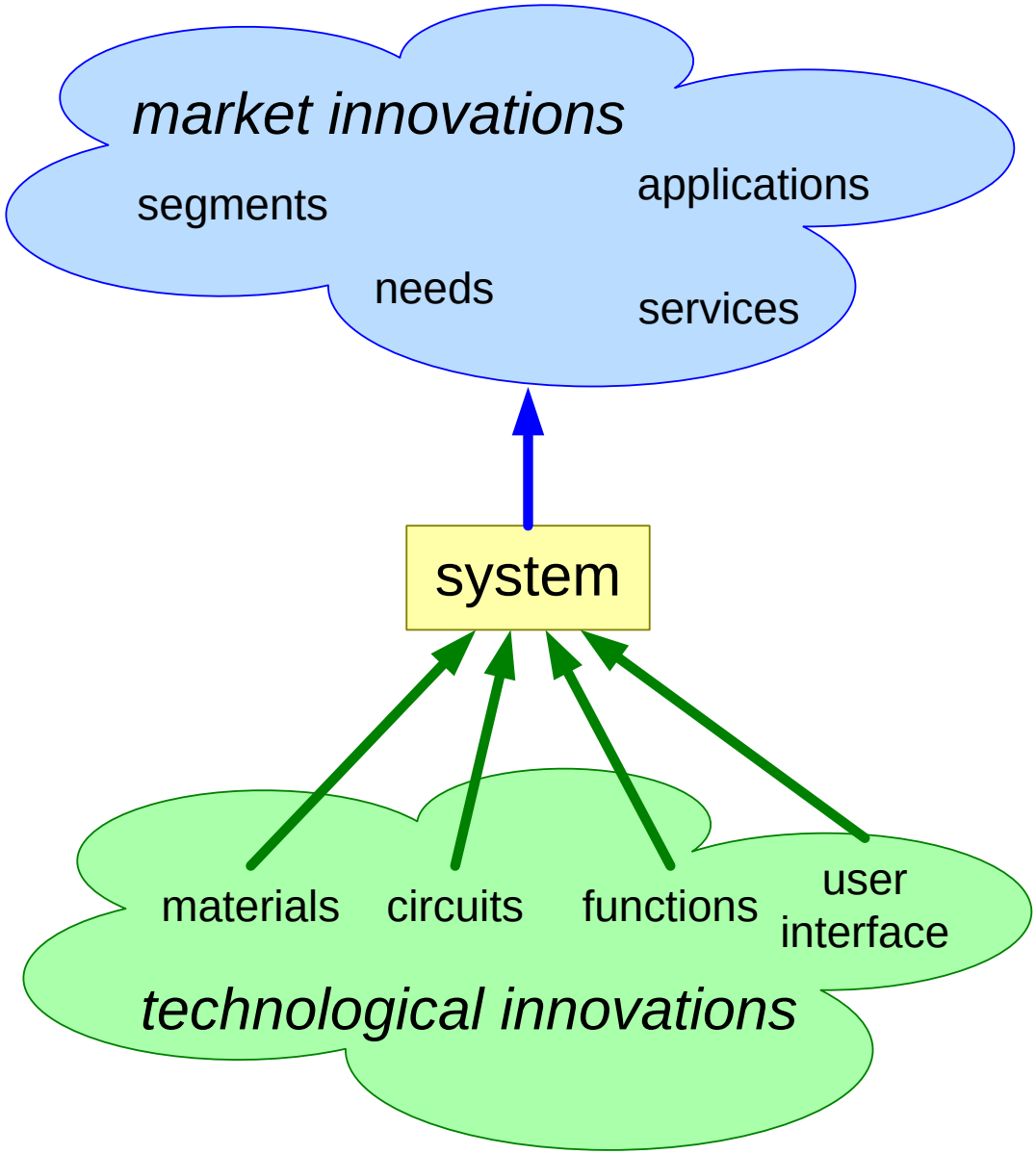
cardio X-ray system

television

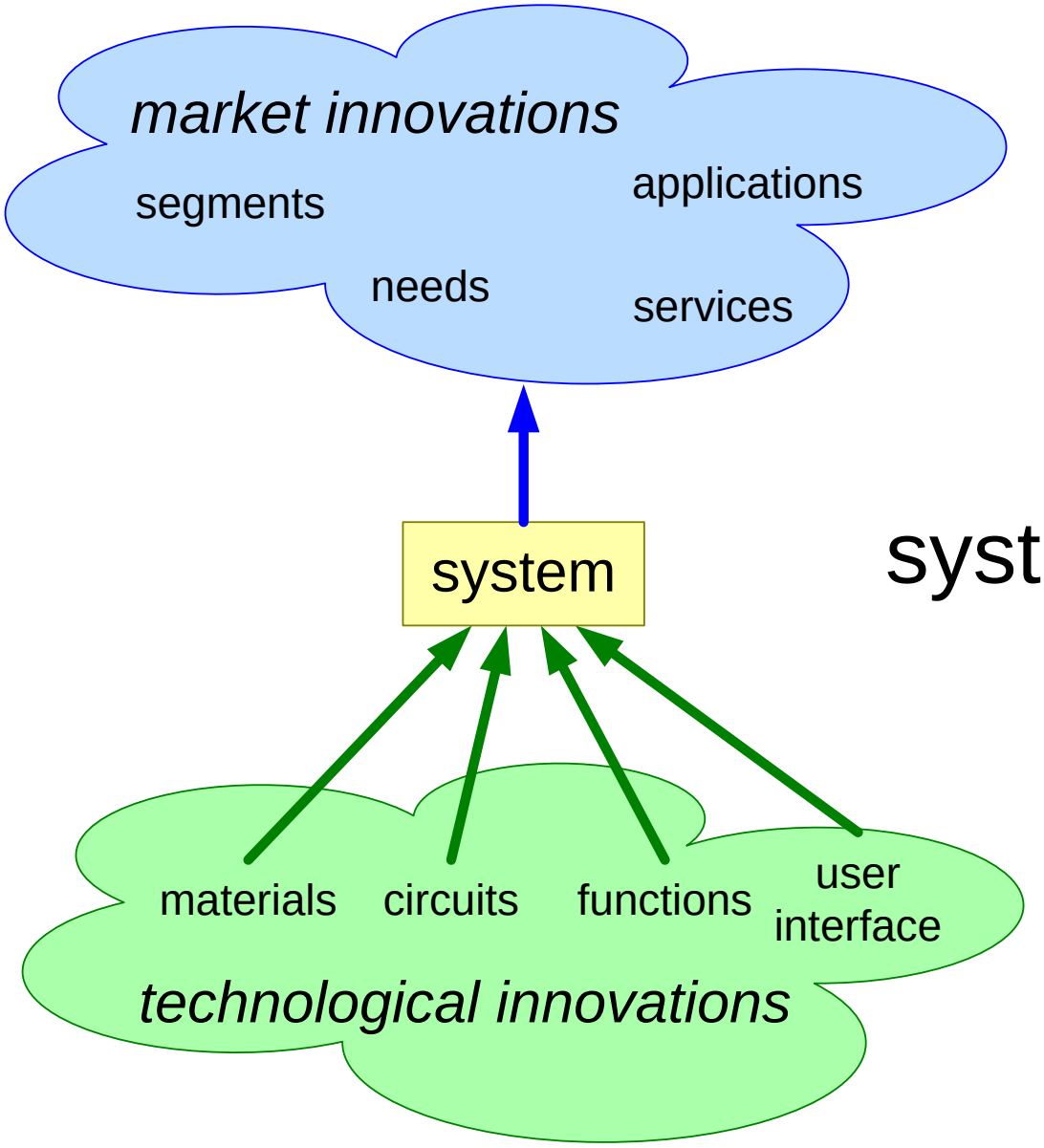
printer

waferstepper

Successful Innovation = Technological + Market



System Architect links technology and market



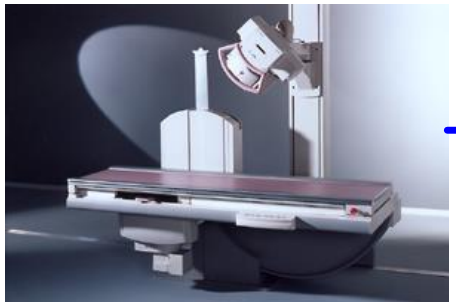
marketeers

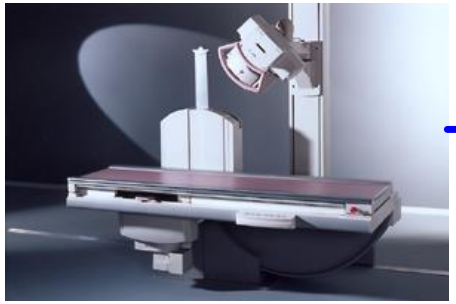
systems architect

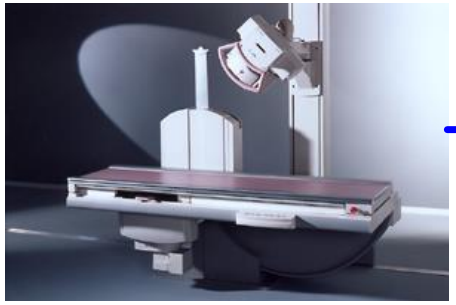
engineers

inventors

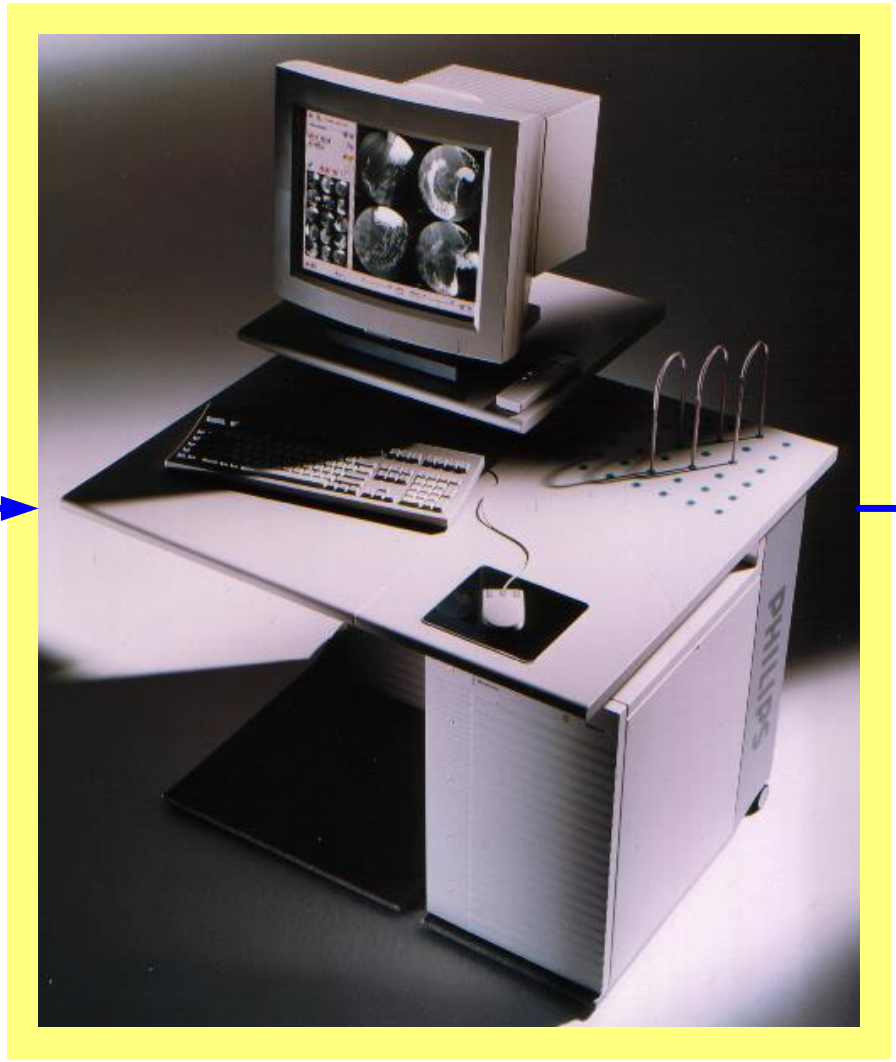
Example: Easyvision serving three URF examination rooms







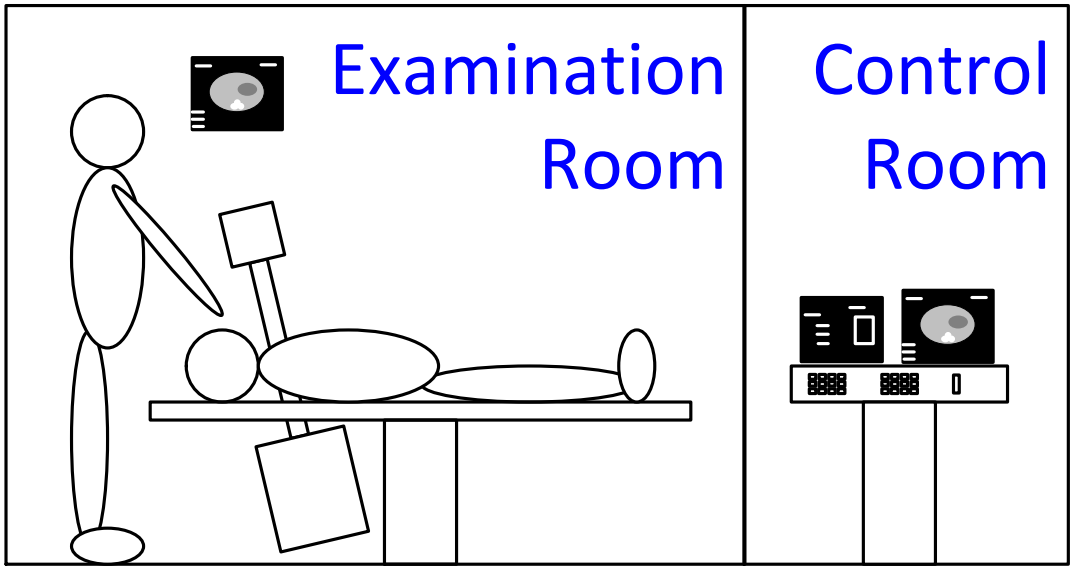
URF-systems

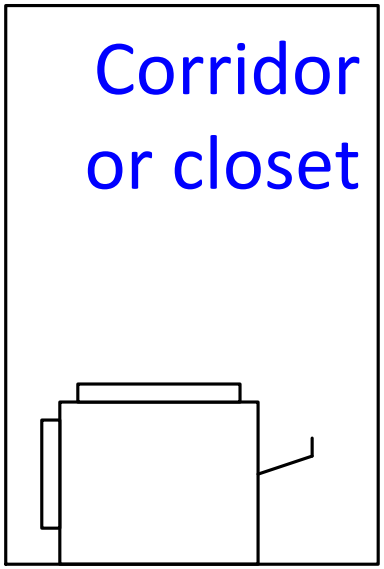


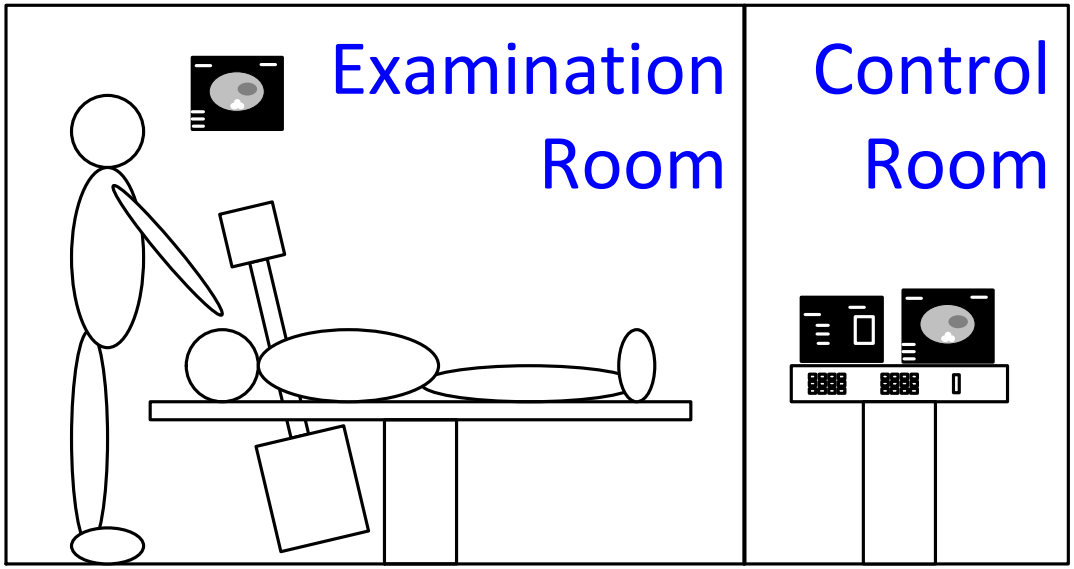
EasyVision: Medical Imaging Workstation

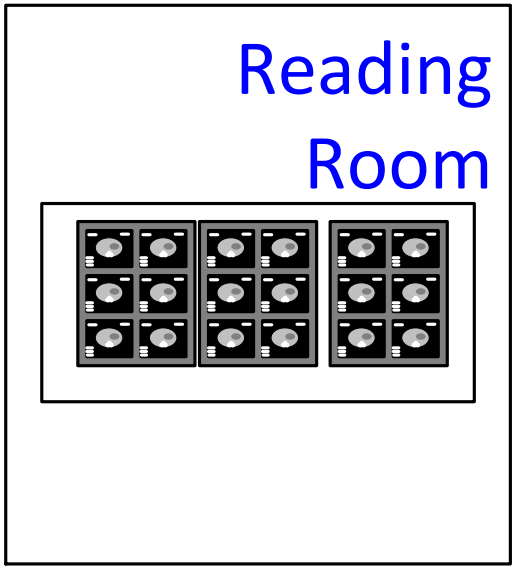
typical clinical image (intestines)

X-ray rooms from examination to reading around 1990

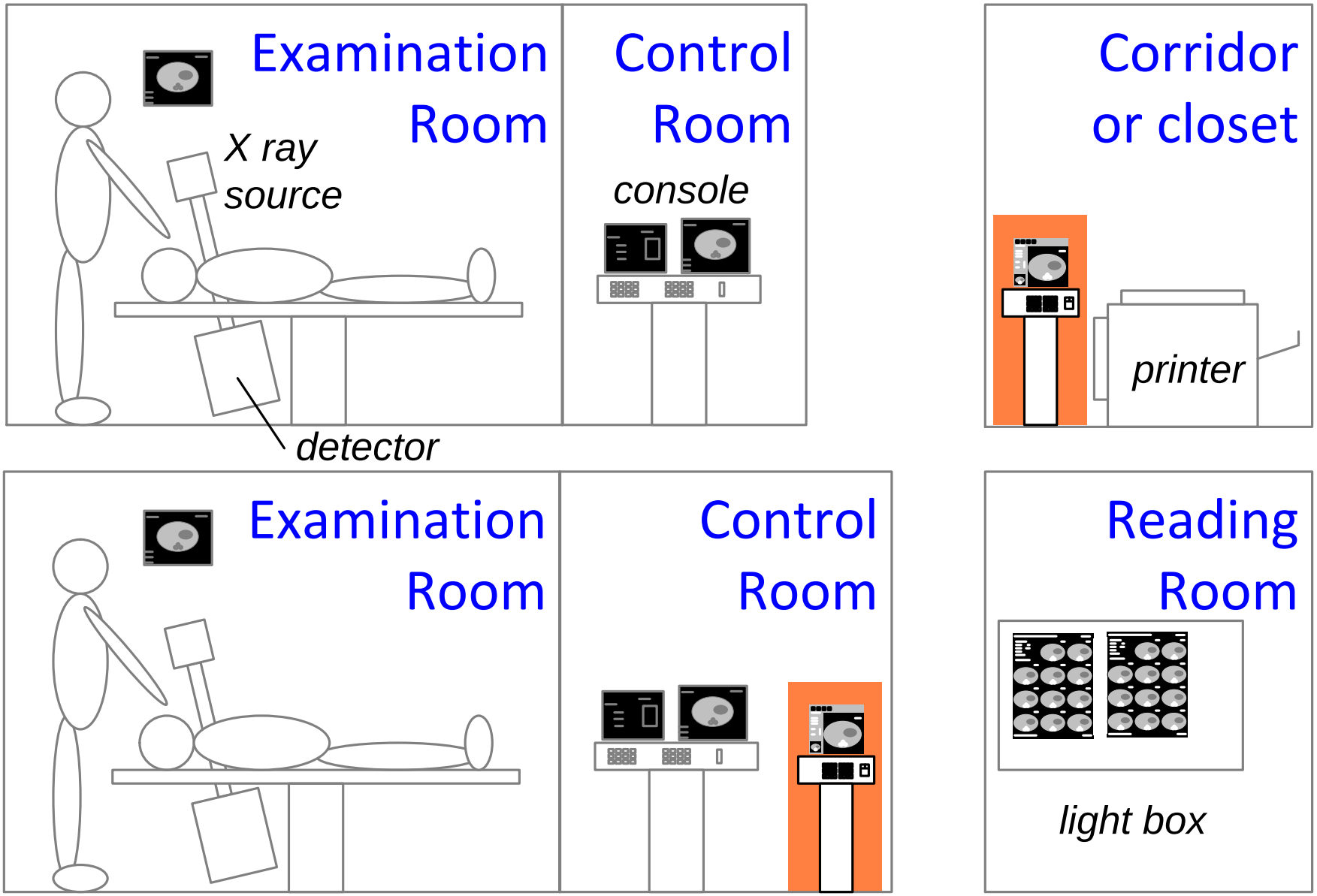




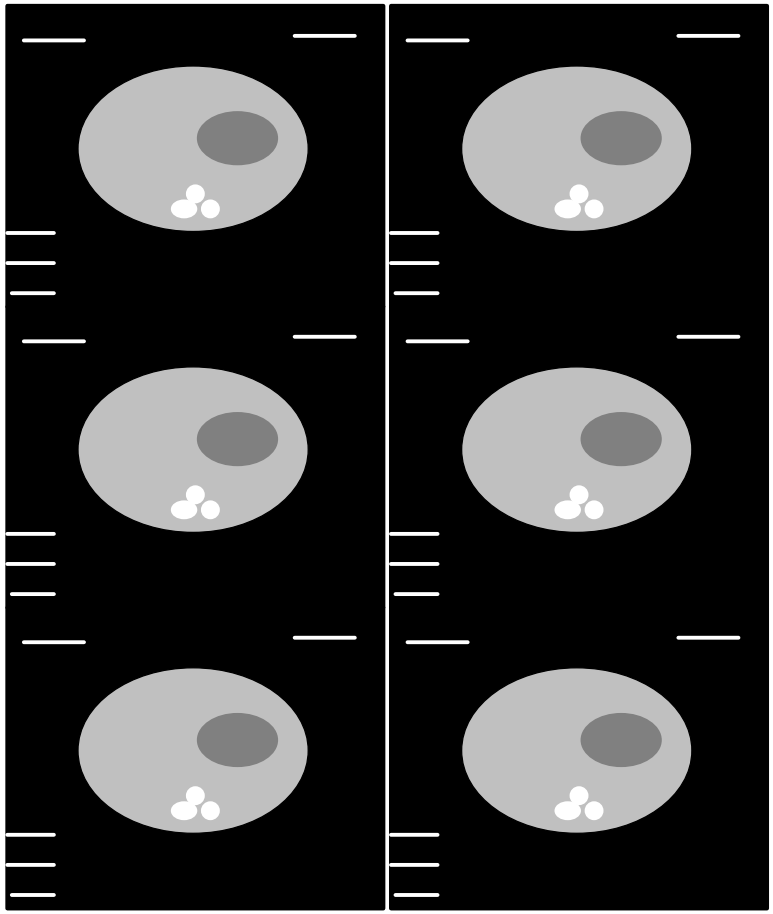




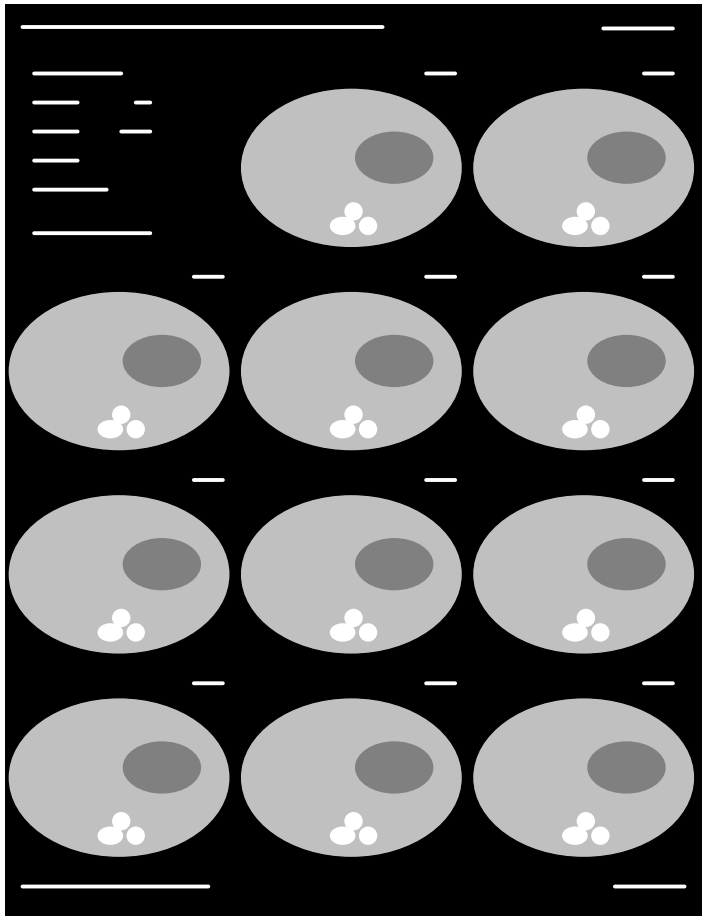
Product Innovation: Easyvision applied as printserver



Market innovation: optimized film



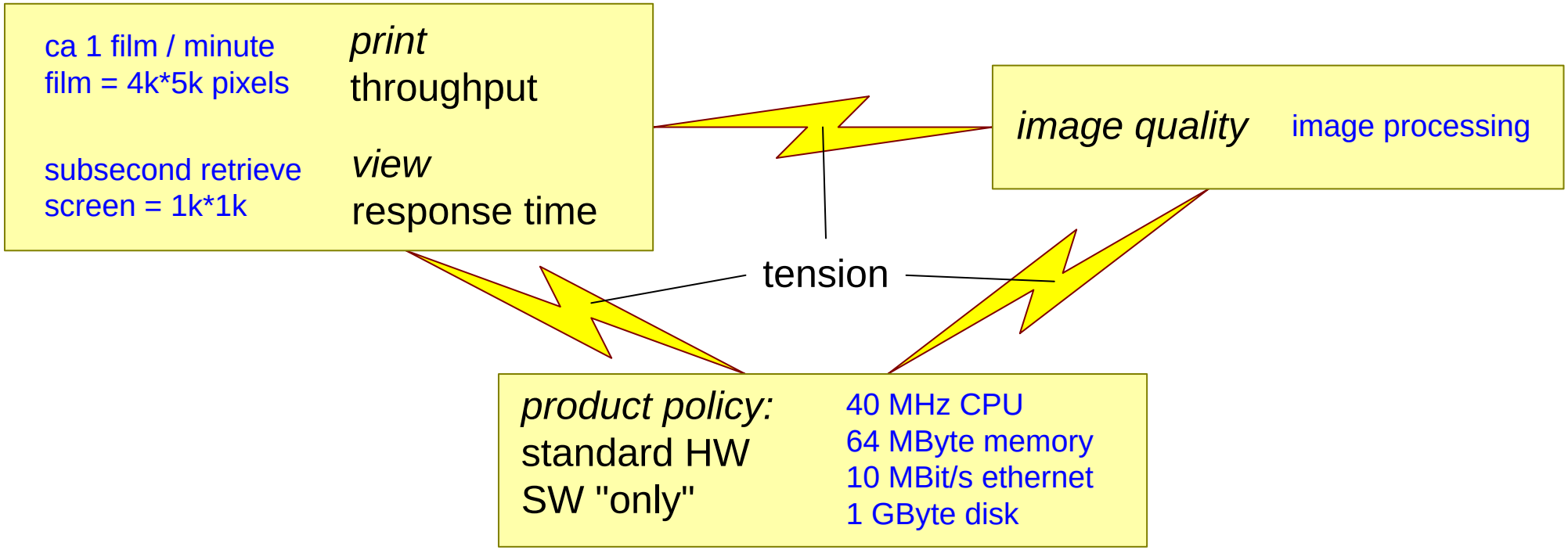
old: screen copy



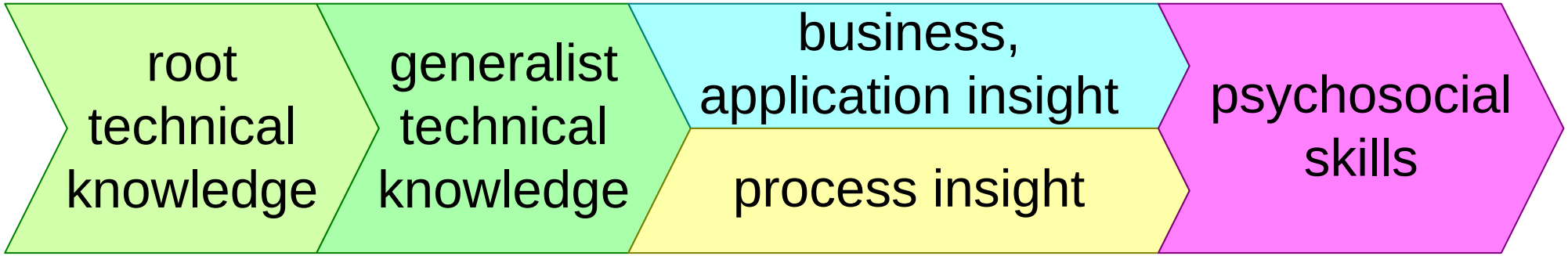
new: SW formatting

20 to 50% less film needed

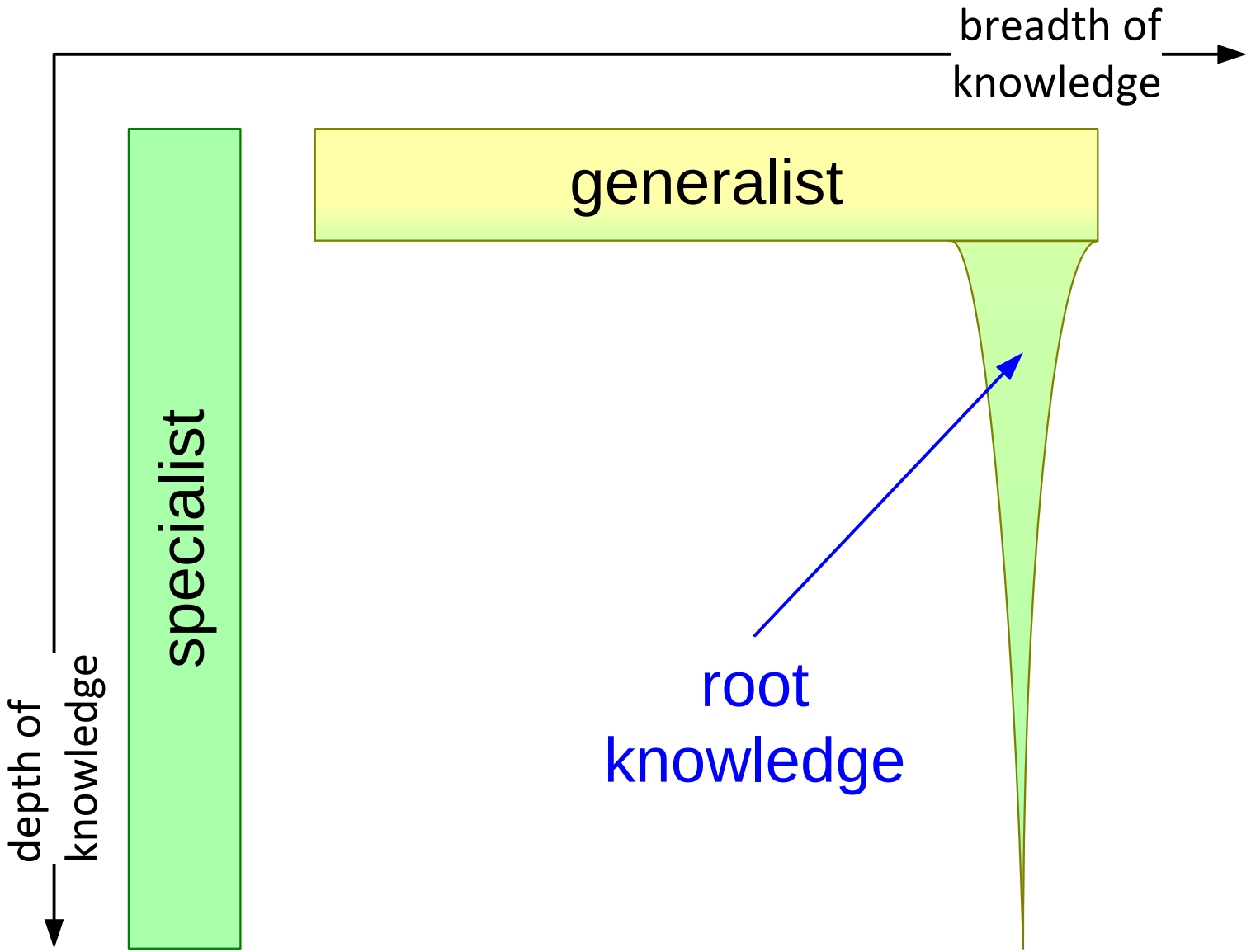
Technology innovation challenges



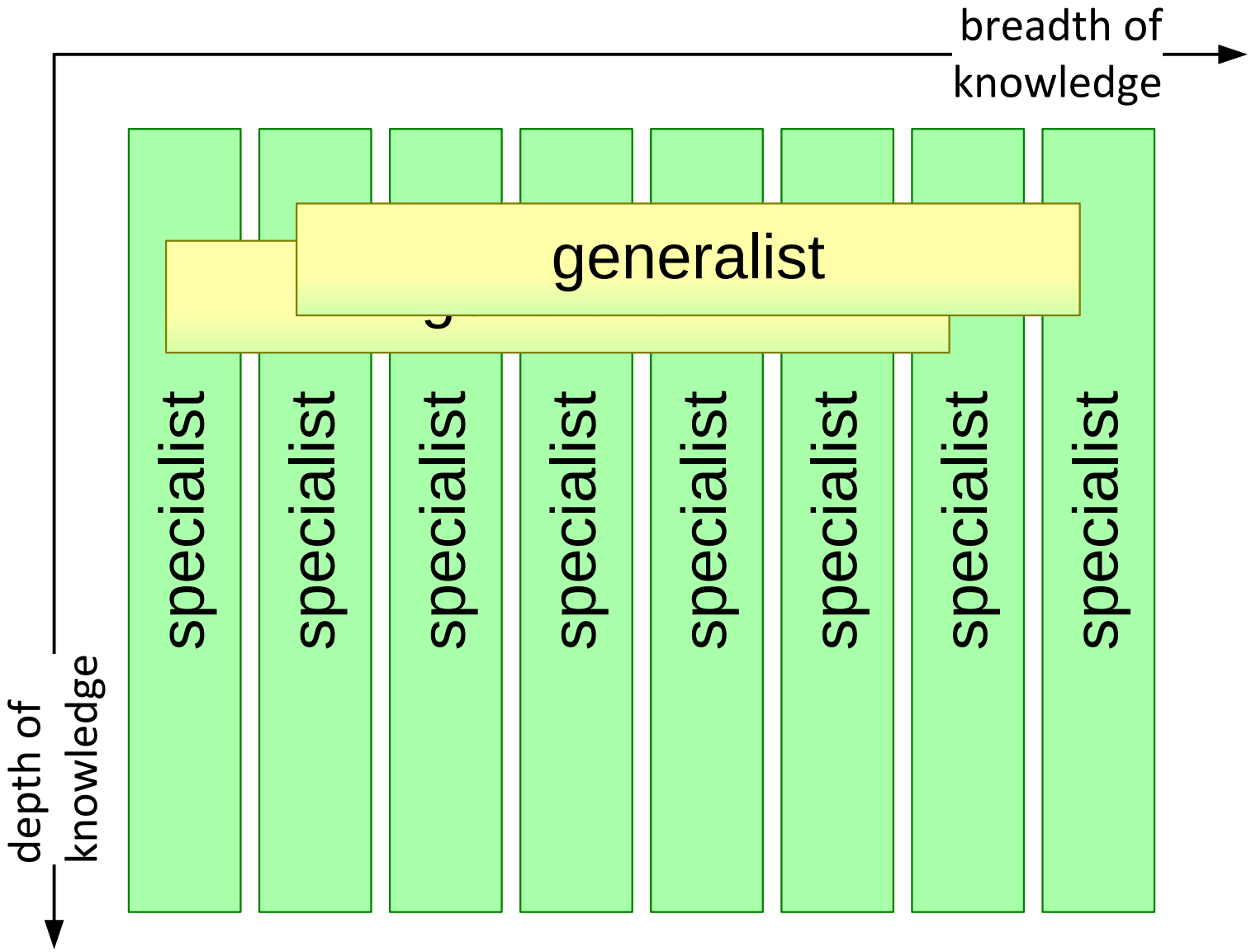
Typical Growth of a System Architect



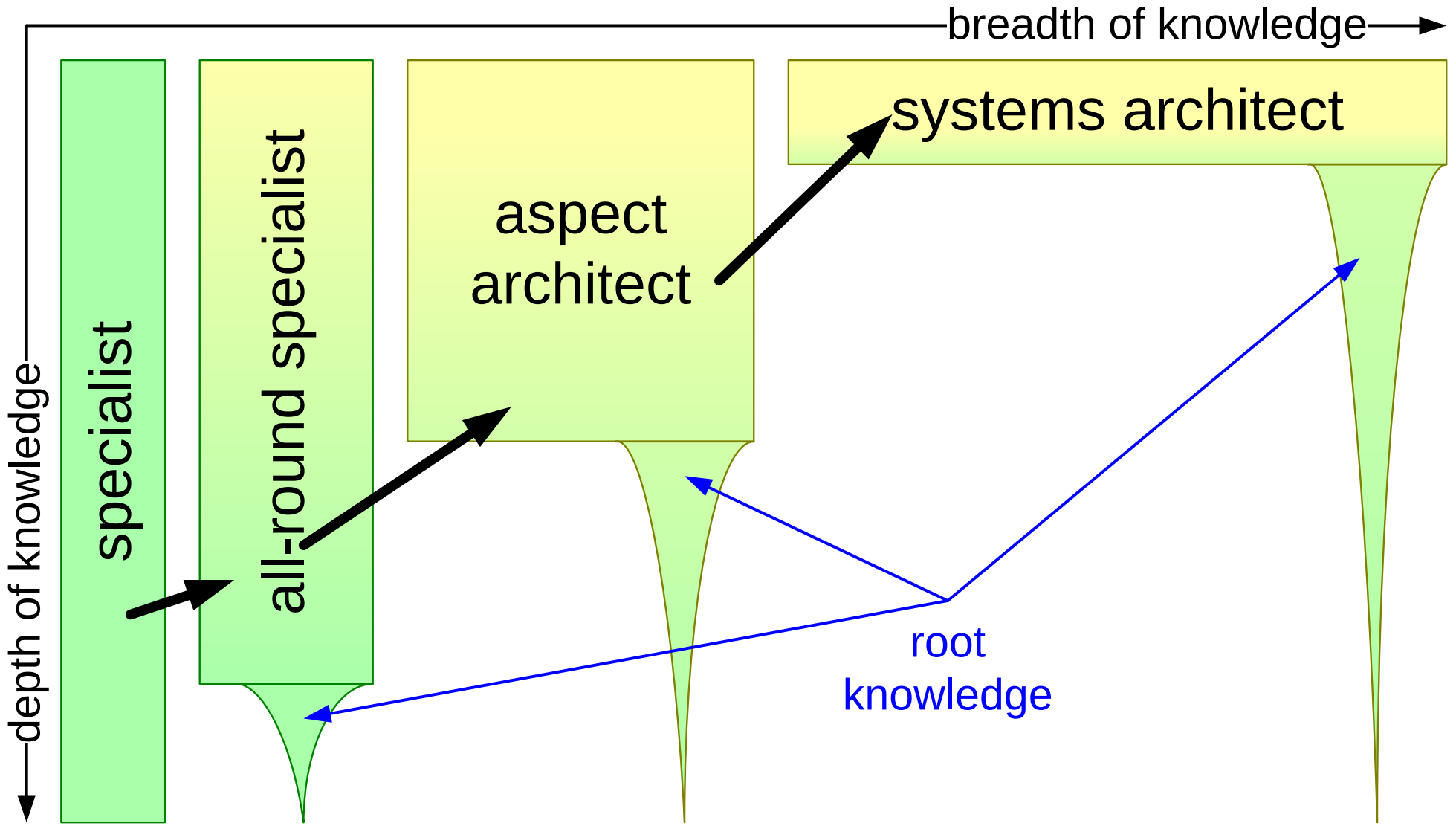
Generalist versus Specialist



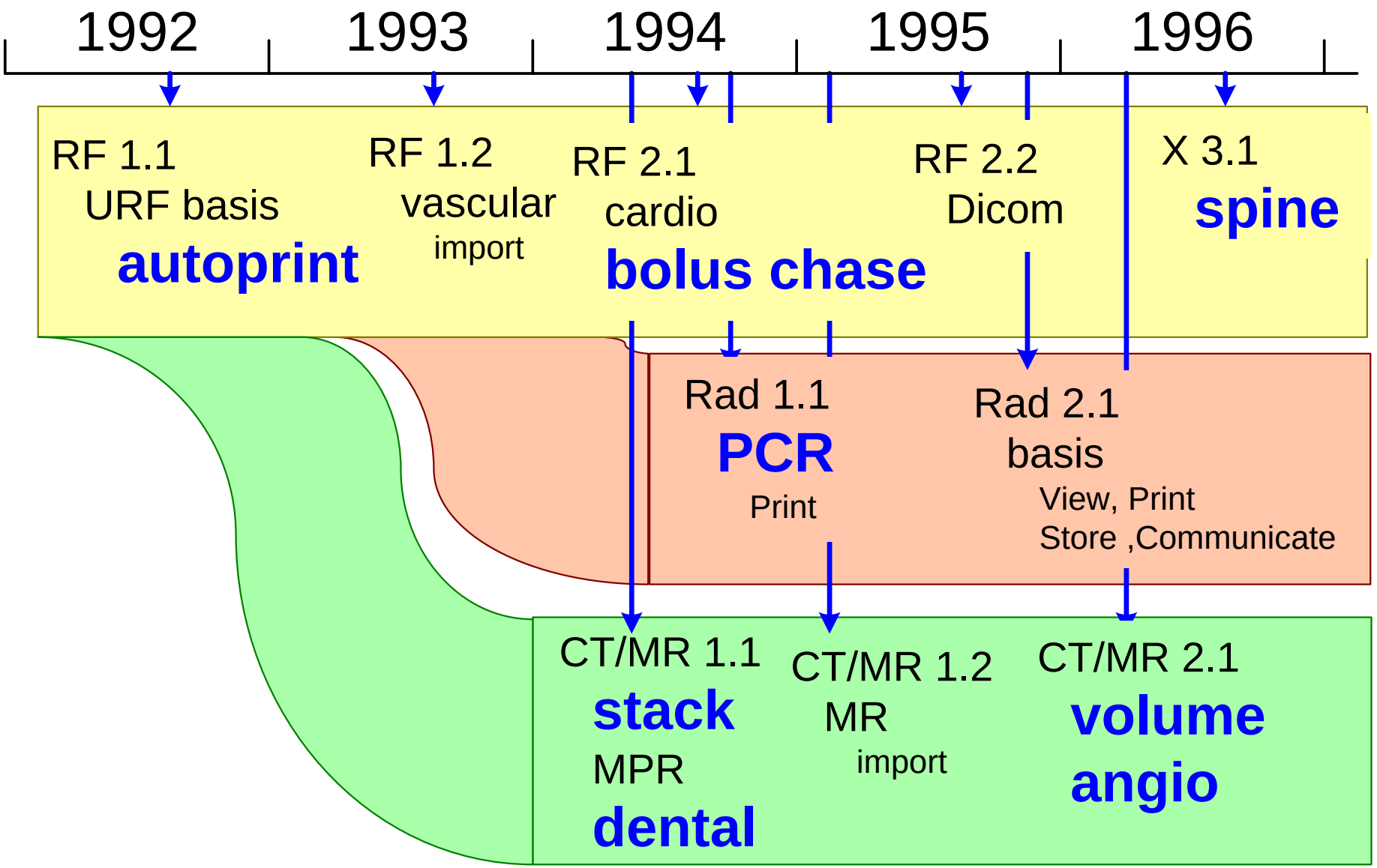
Generalists and Specialists are Complementary



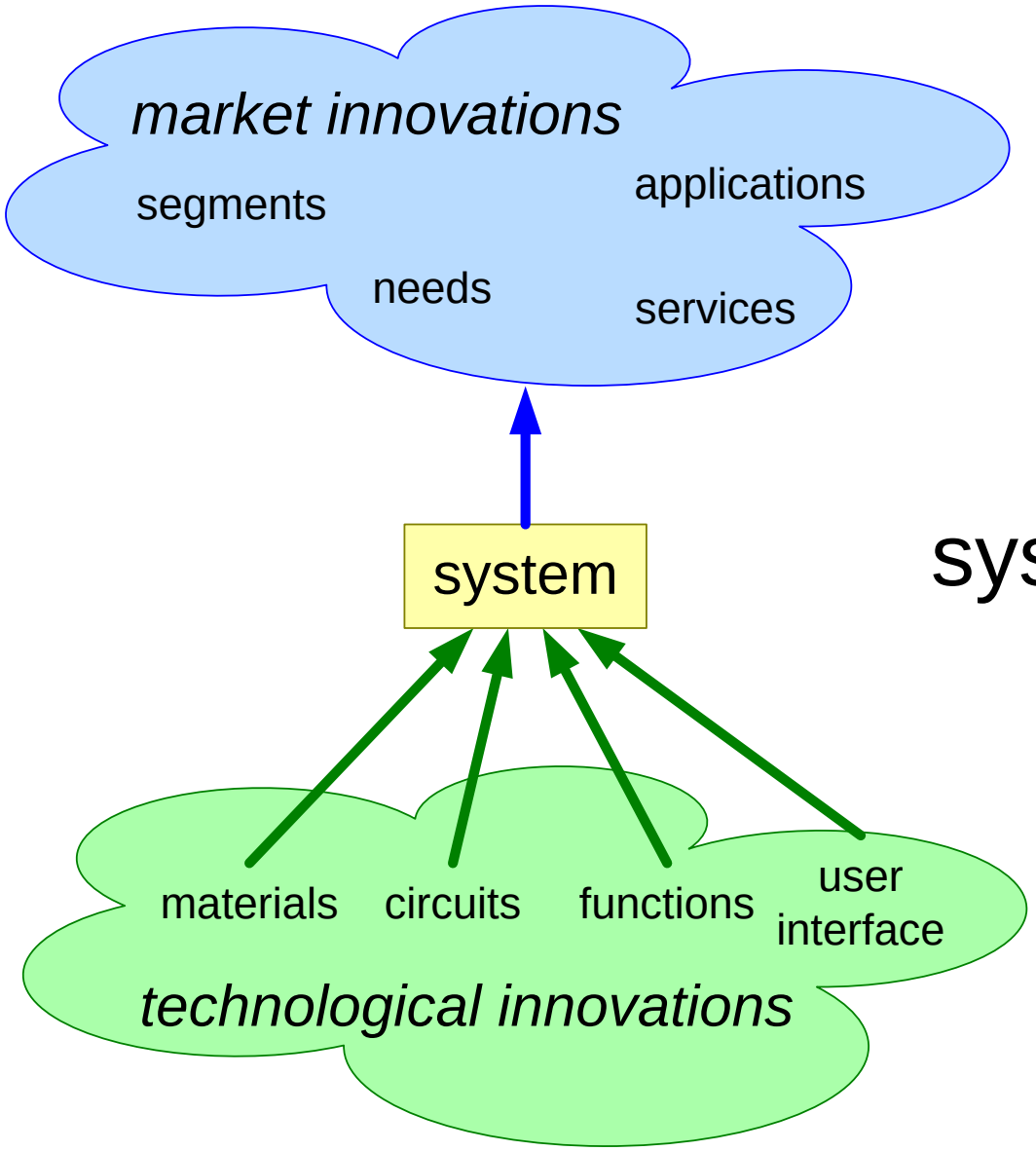
Spectrum from Specialist to System Architect



More innovations in Medical Imaging



Key success factor 1: innovation by all parties



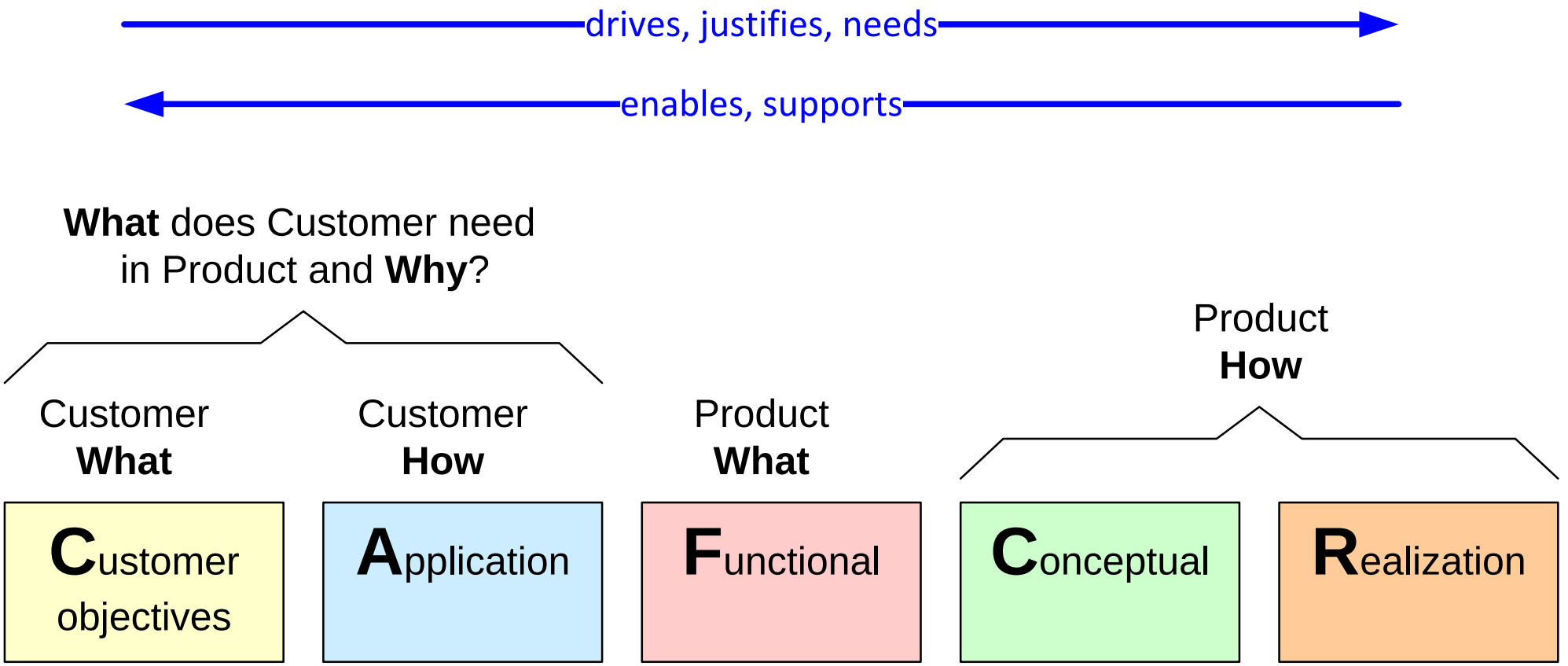
marketeers √

system architect √

engineers √

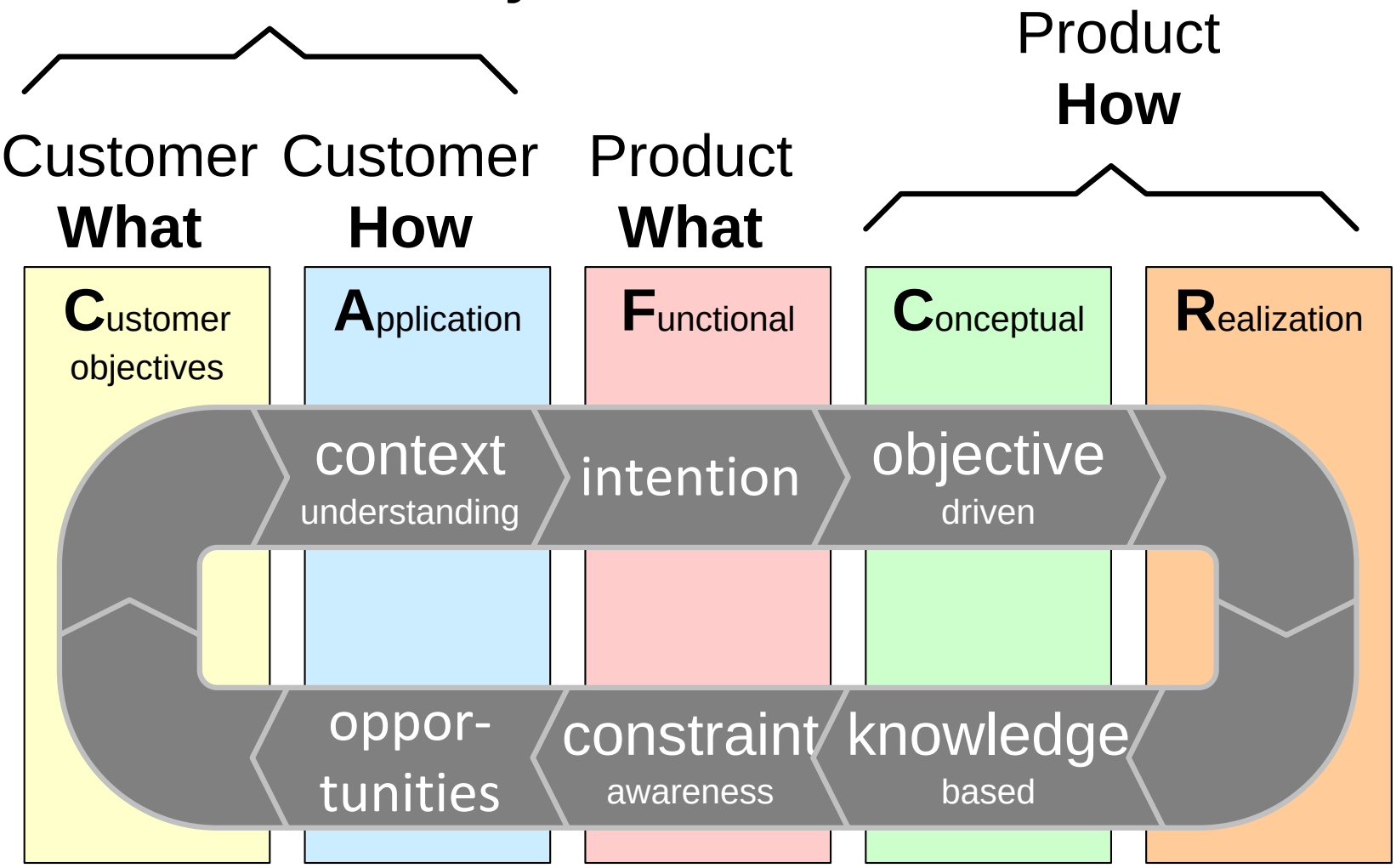
inventors √

The ”CAFCR” model

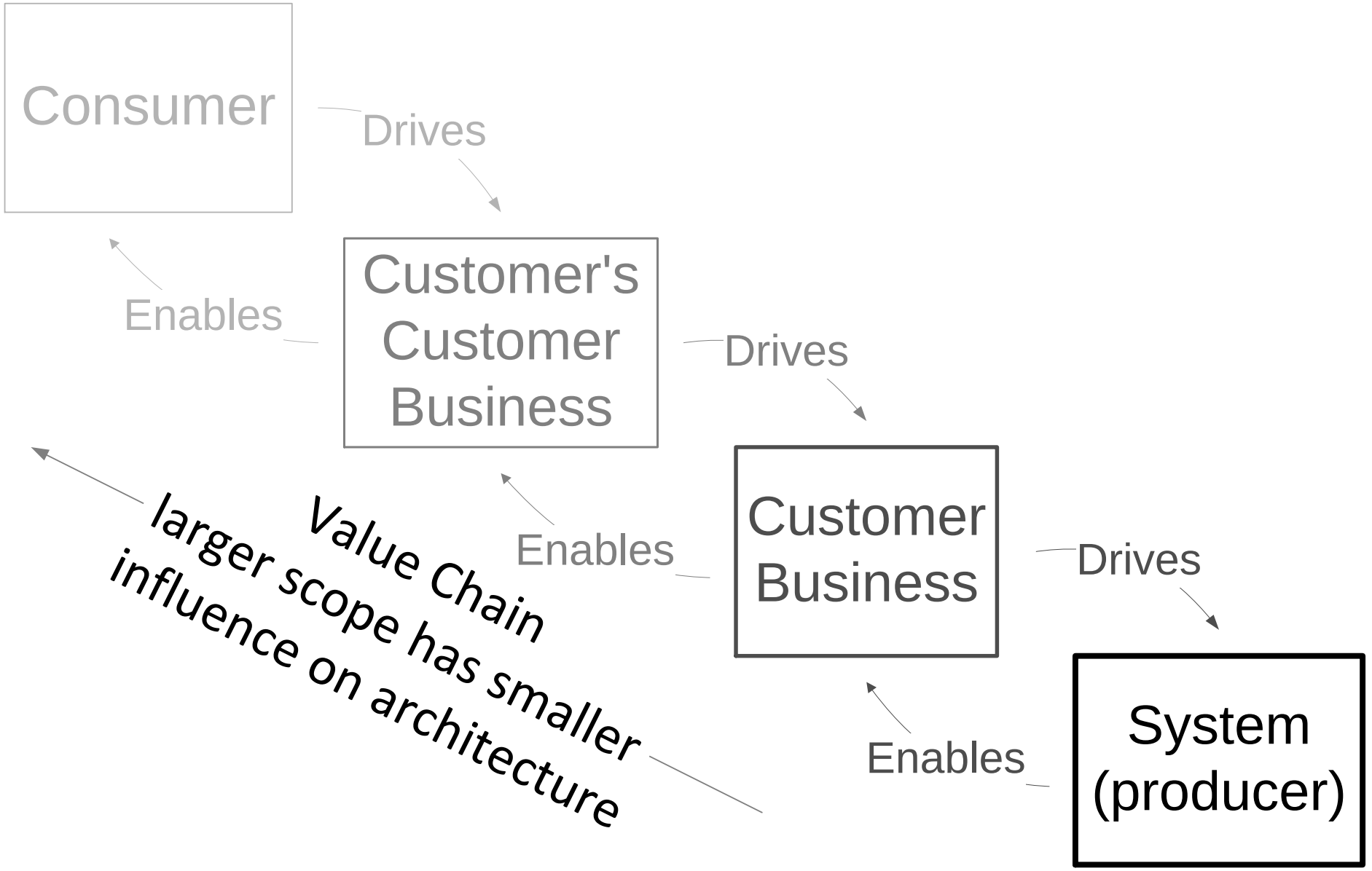


Integrating CAFCR

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



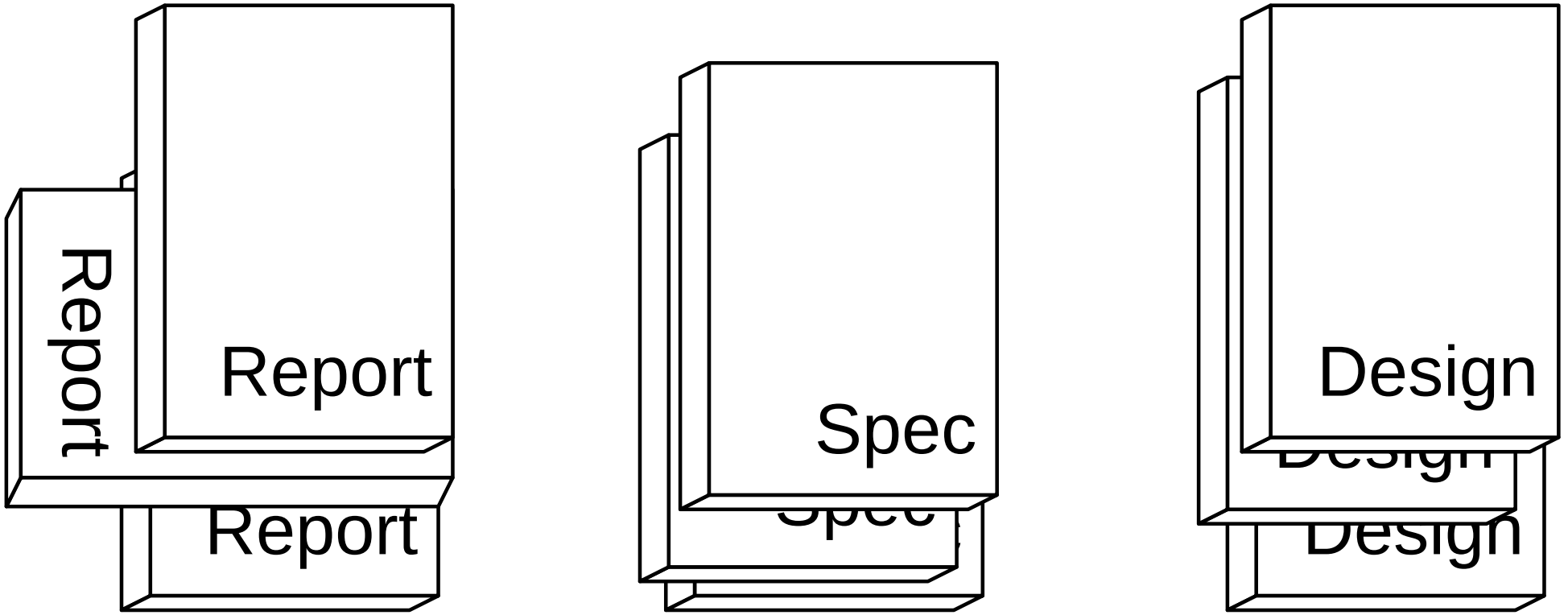
CAFCR can be applied recursively



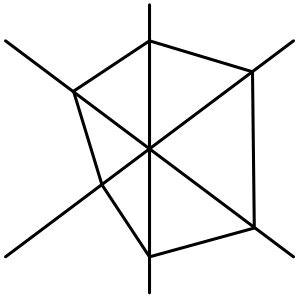
CAFCR applied on Security

Customer objectives	**A**pplication	**F**unctional	**C**onceptual	**R**ealization
sensitive information  trusted	selection classification people information authentication badges passwords locks / walls guards administrators	functions for administration authentication intrusion detection logging quantification	cryptography firewall security zones authentication registry logging	*specific* algorithms interfaces libraries servers storage protocols
	desired characteristics, specifications & mechanisms			
 not trusted	social contacts open passwords blackmail burglary fraud unworkable procedures	missing functionality wrong quantification	holes between concepts	bugs buffer overflow non encrypted storage poor exception handling
			threats	

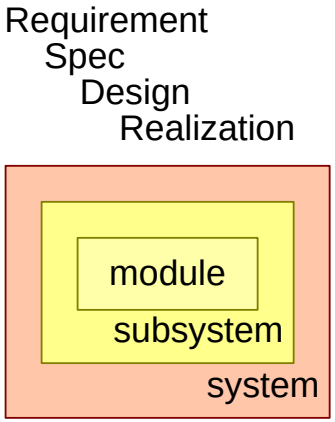
Deliverables of the System Architect



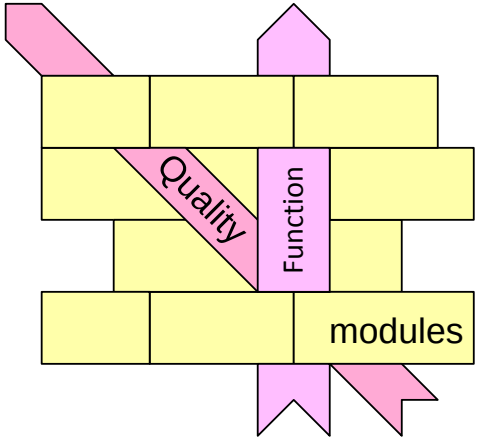
Responsibilities of the System Architect



Balance

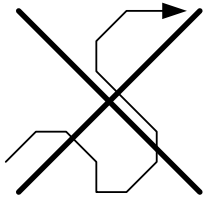


Consistency



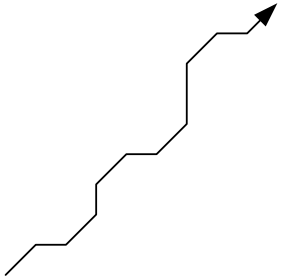
Decomposition
Integration

Overview

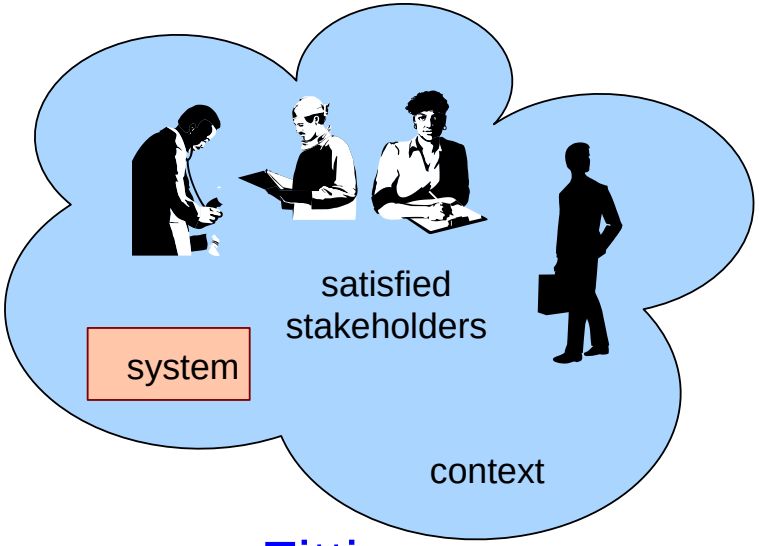


KISS

Elegance
Simple

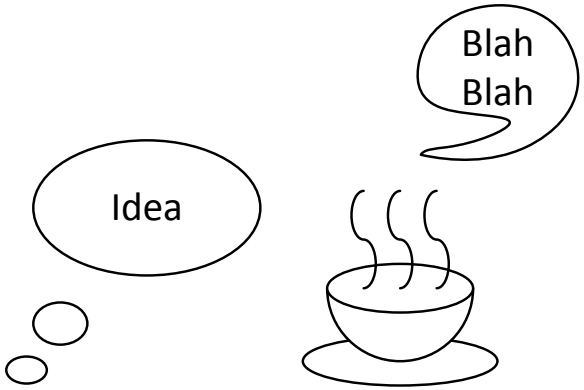


Integrity



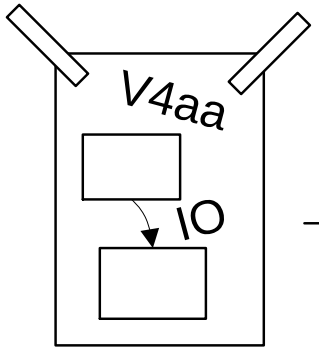
Fitting

What does the System Architect **do**?

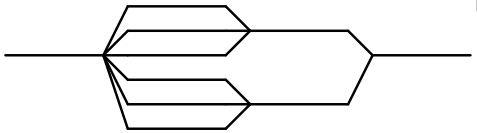


think, analyze

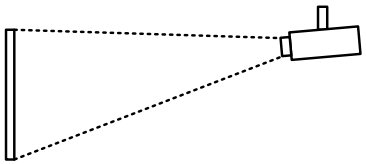
listen, talk, walk around



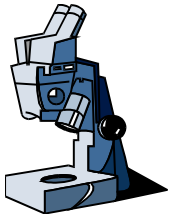
design, brainstorm, explain



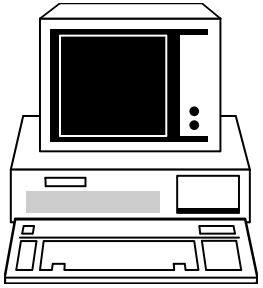
assist project leader with work breakdown, schedule, risks



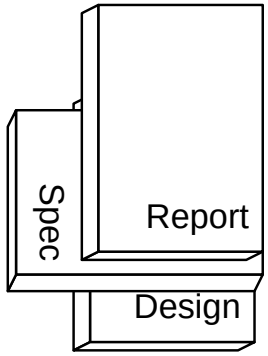
present, meet, teach, discuss



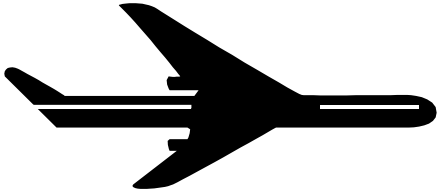
test, integrate



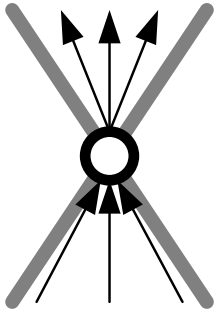
write, consolidate, browse



read, review

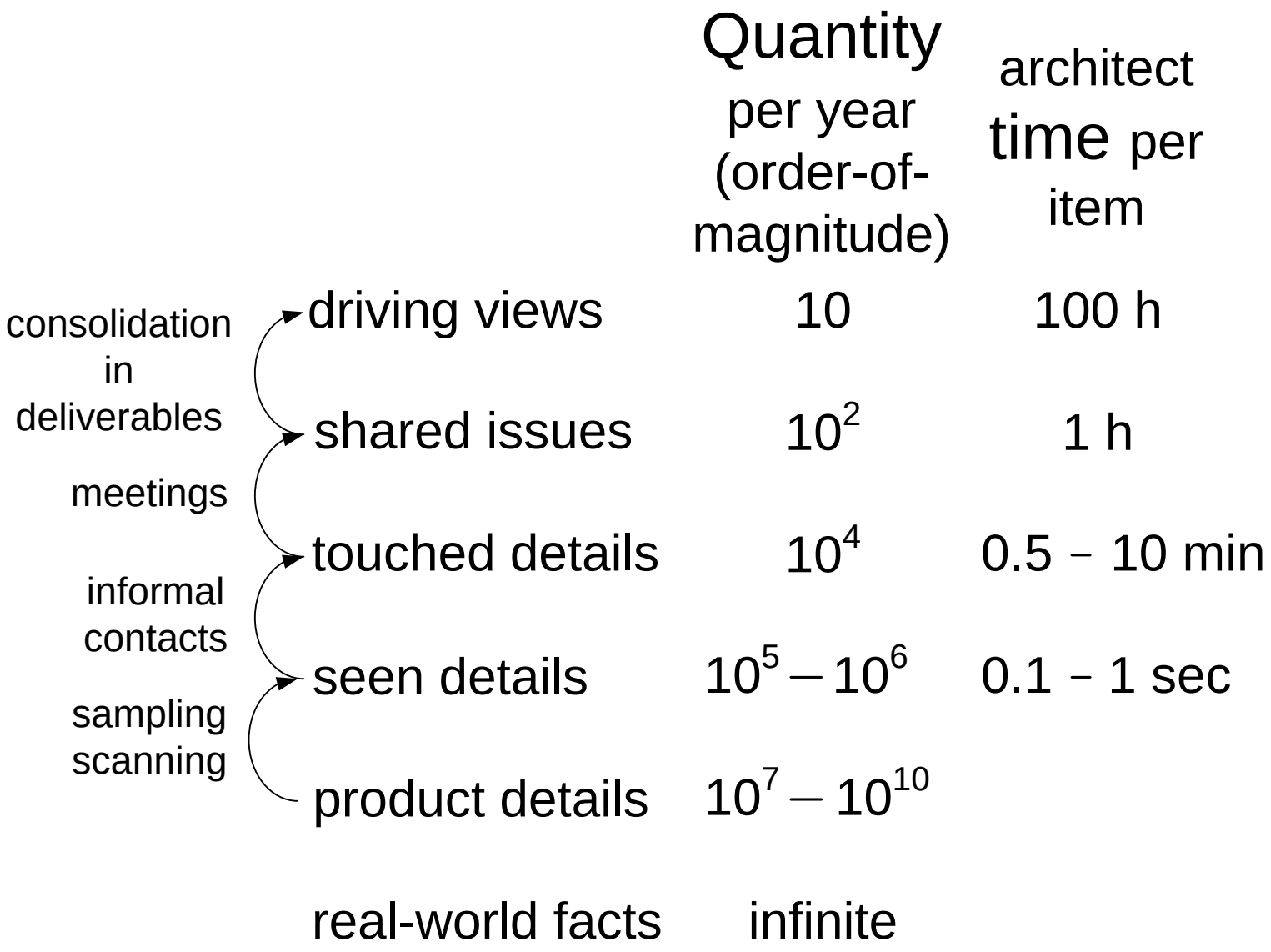


travel to customer, supplier, conference

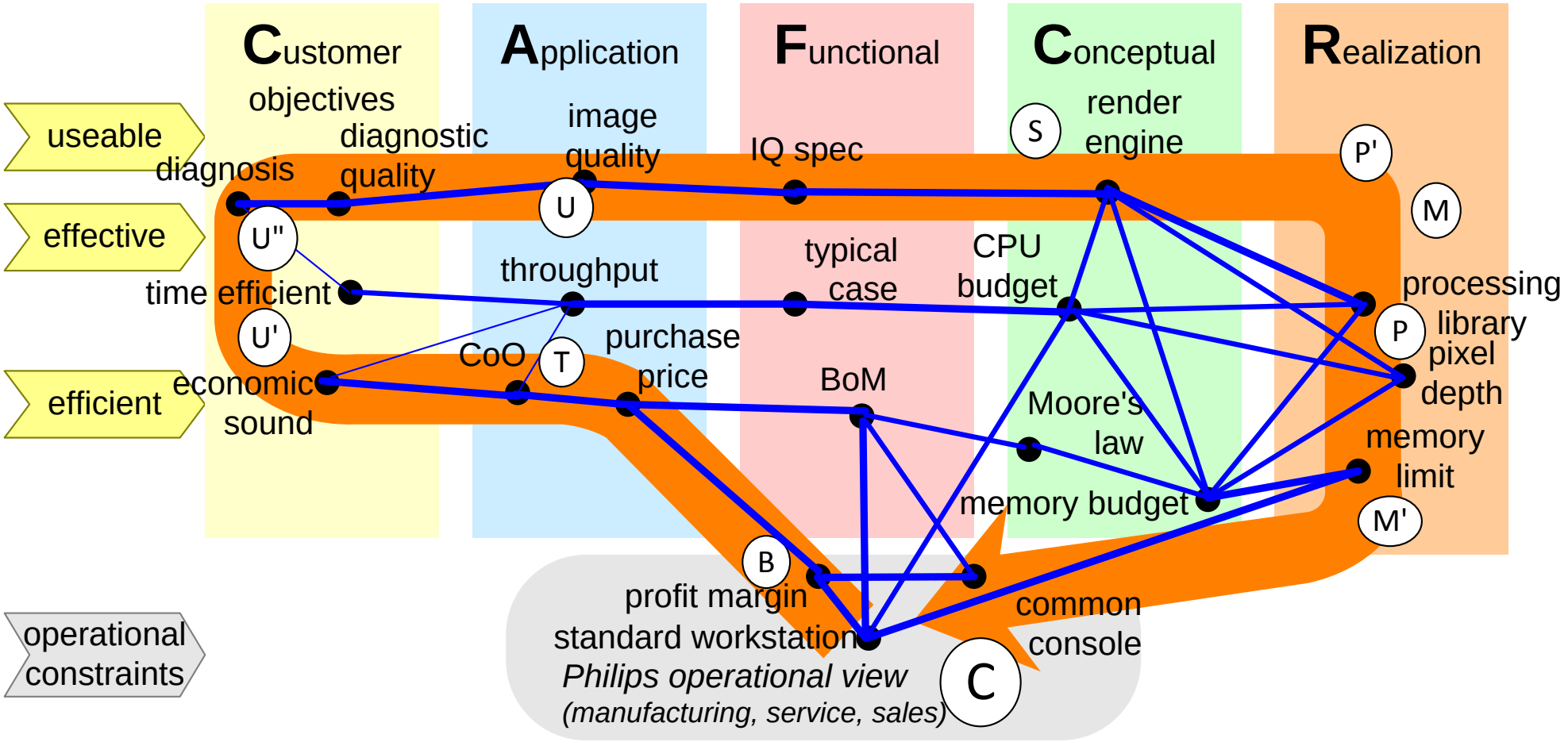


provide vision and leadership

From Detail to Overview

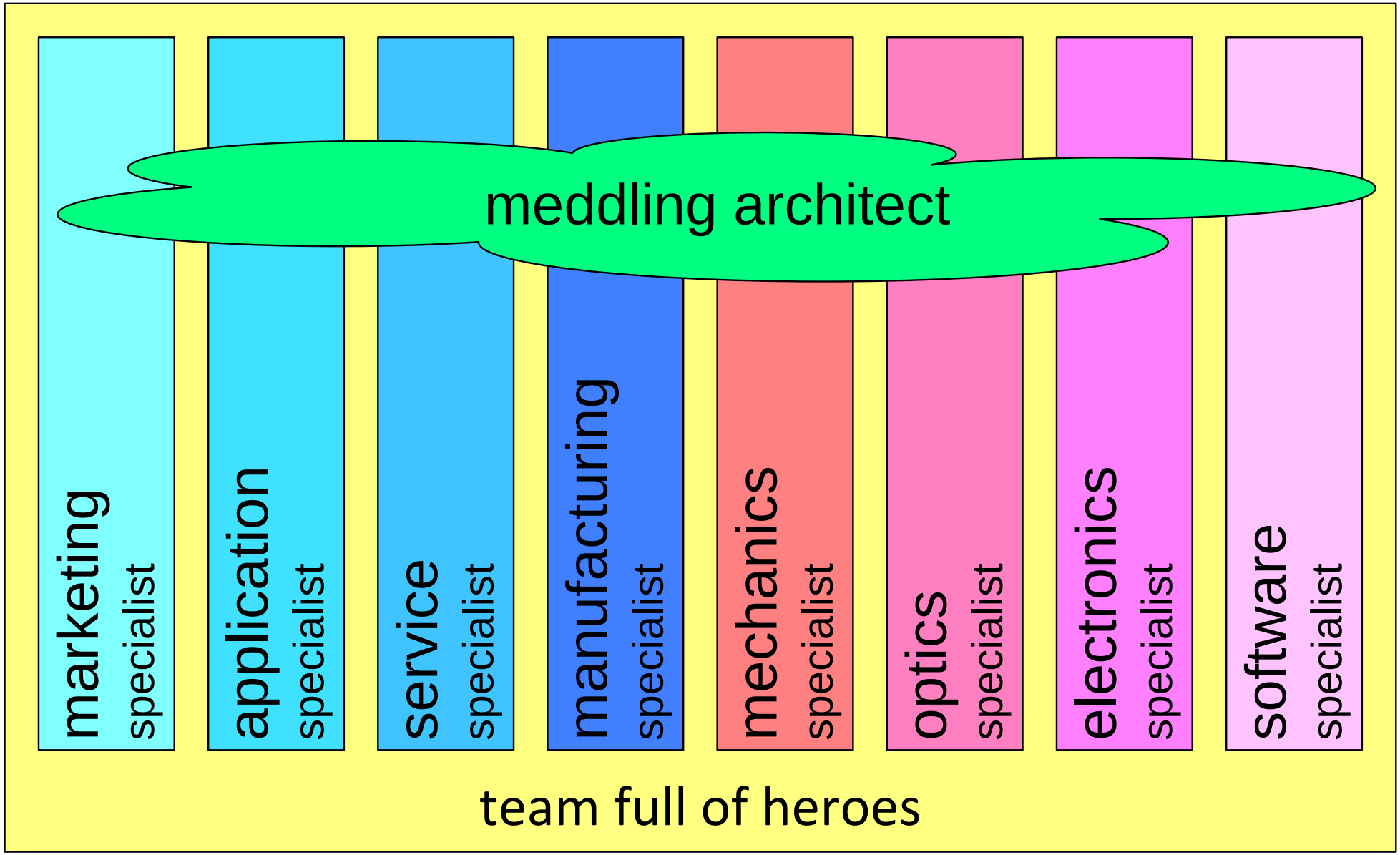


Key Success Factor 2: highly iterative

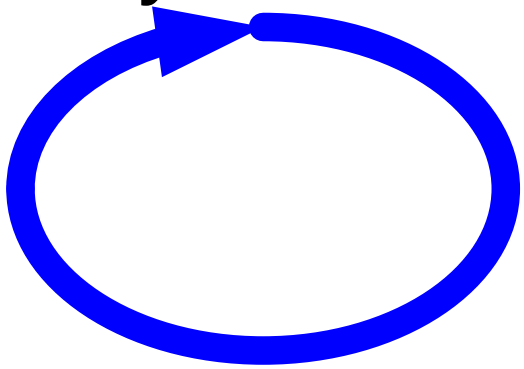


cost revisited in context of clinical needs and realization constraints; note: original threads are significantly simplified

Key Success Factor 3: Architect as Integrator



Innovation Challenges in Embedded Systems



discover latent needs
enable emergence
where is the business

creativity

market dynamics

globalization
hype waves
Moore's law

security

privacy, DRM
versus usability

interoperability

emerging behavior, future vs legacy
heterogeneous vendors

power consumption

weight, cost, performance

reliability

complexity
heterogeneity
#engineers involved