Challenges in High-Tech, illustrated in the medical domain

by *Gerrit Muller*   Buskerud University College

e-mail: gaudisite@gmail.com

www.gaudisite.nl

Abstract

A short description is given of the medical domain, which is used to illustrate what technical challenges are present in high-tech development organizations.

A top list of technical challenges: Market dynamics, reliability, interoperability, security, power and creativity is presented and every challenge is briefly discussed.

The potential roles for new technical people are described and the future career possibilities.

June 23, 2016
status: concept
version: 1.0

discover latent needs
enable emergence
where is the business

creativity   market dynamics

globalization
hype waves
Moore's law

security   interoperability

privacy, DRM
versus usability

emerging behavior, future vs legacy
heterogeneous vendors

power consumption   reliability   complexity

weight, cost, performance

heterogeneity
#engineers involved
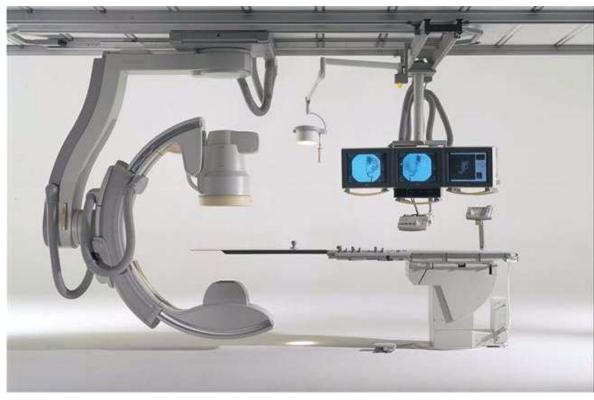
Conventional X-ray systems
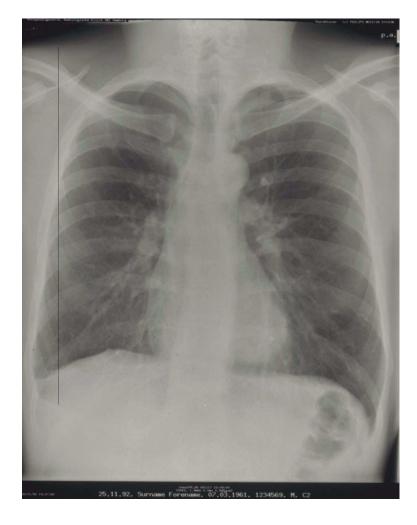
EasyDiagnost URF

Integris Allura Cardio-Vascular

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DYOFxraySystems
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Typical X-ray results

Thorax rad-image

Cardio Vascular images on monitors

Magnetic Resonance Imaging, MRI scanners

Intera MR scanner

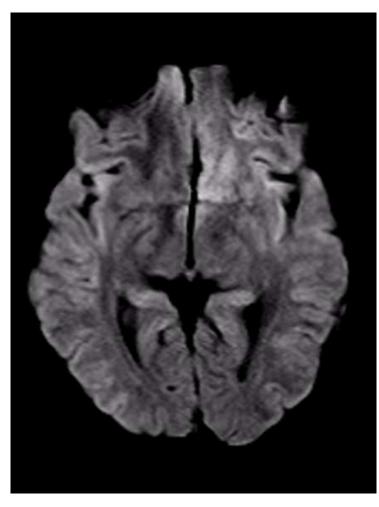

Gyroscan NT

Results from CT and MRI scanners

virtual endoscopy based
on CT images

MRI image
of the brain

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Hit list of challenges

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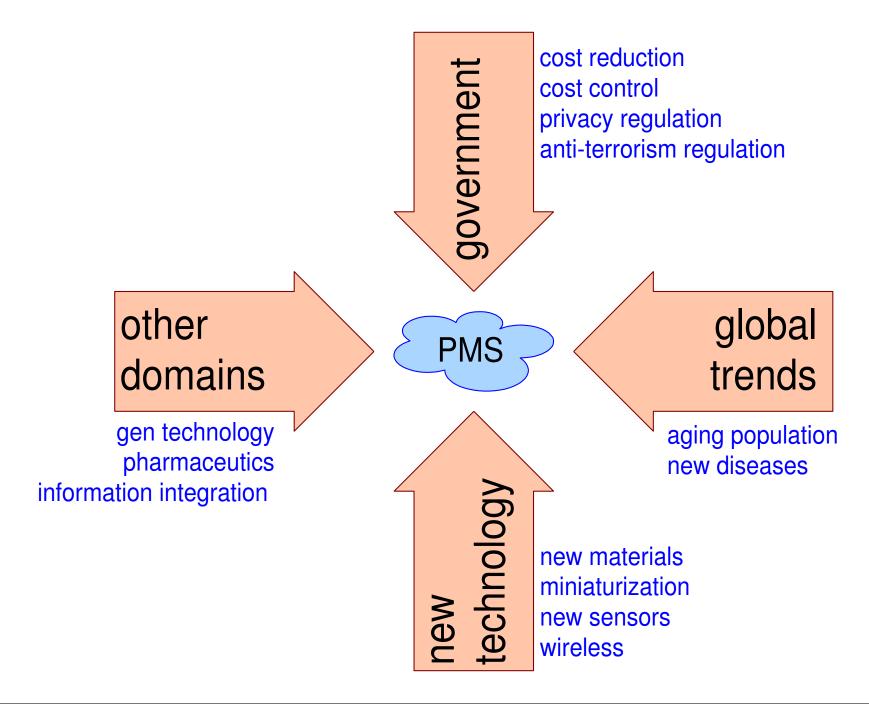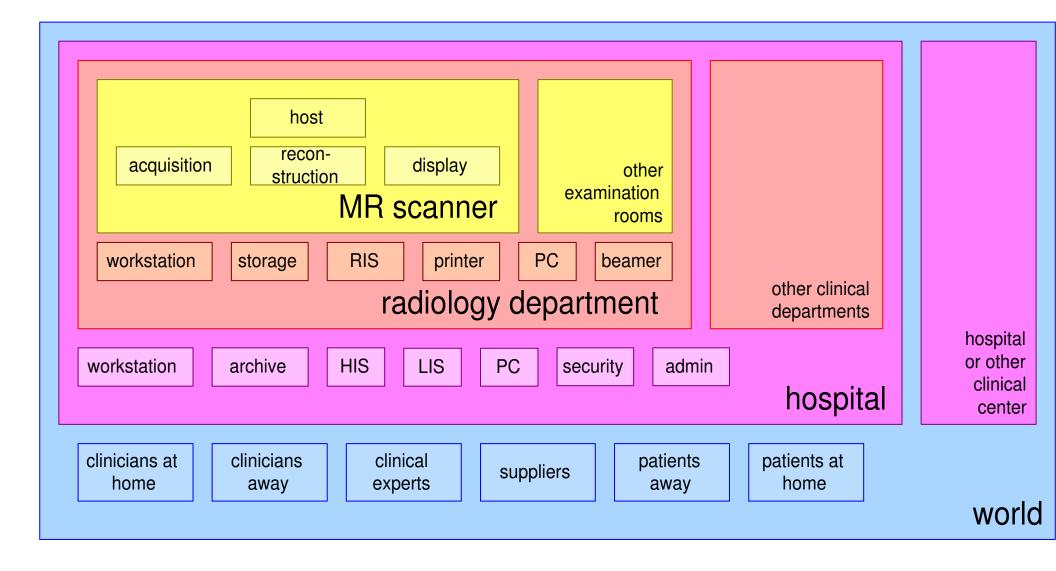
Market dynamics in medical

government

cost reduction
cost control
privacy regulation
anti-terrorism regulation

other domains

PMS

global trends

gen technology
pharmaceutics
information integration

aging population
new diseases

new technology

new materials
miniaturization
new sensors
wireless

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Interoperability: systems get connected at all levels

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Multi dimensional interoperability

integrating **multiple**

applications

cilinical analysis
clinical support
administrative
financial
workflow

in **multiple**

languages
cultures

USA, UK,
China, India,
Japan, Korea
France, Germany
Italy, Mexico

delivered by **multiple**

vendors

Philips
GE
Siemens

based on **multiple**

media, networks

DVD+RW
memory stick
memory cards
bluetooth
11a/b/g
UTMS

and **multiple**
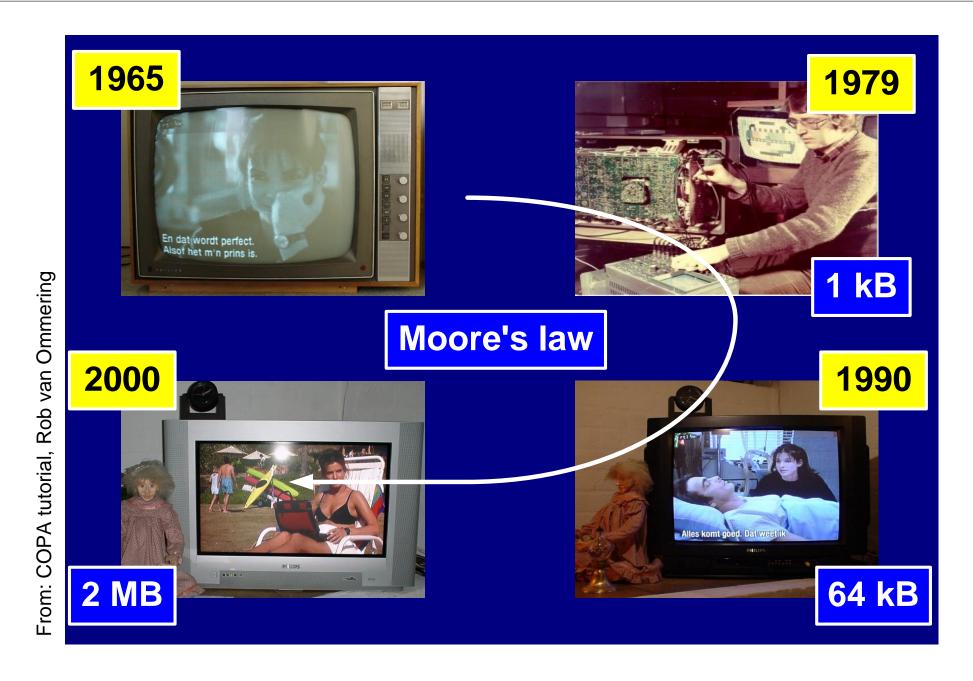
standards

Dicom
HL7
XML

and **multiple**

releases

R5
R6.2
R7.1

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DYOFmultiInteroperability

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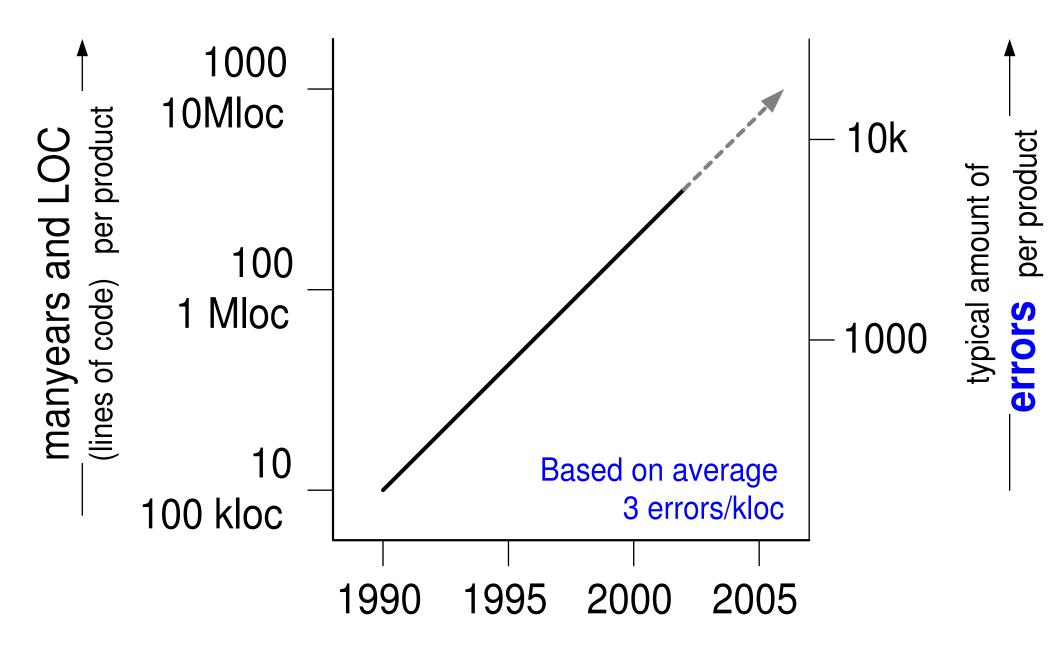
SW increase in televisions

1965

1979

1 kB

Moore's law

2000

1990

2 MB

64 kB

From: COPA tutorial, Rob van Ommering

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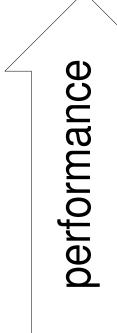
Increase of software threatens Reliability

Based on average
3 errors/kloc

Power consumption and dissipation

heat dissipation
stand by time
operational time
acoustic noise
power supply cost

power ↓

performance ↑

faster
more

examples

3G phone
standby time
operational time
wireless video

data centers
insufficient power in
Amsterdam
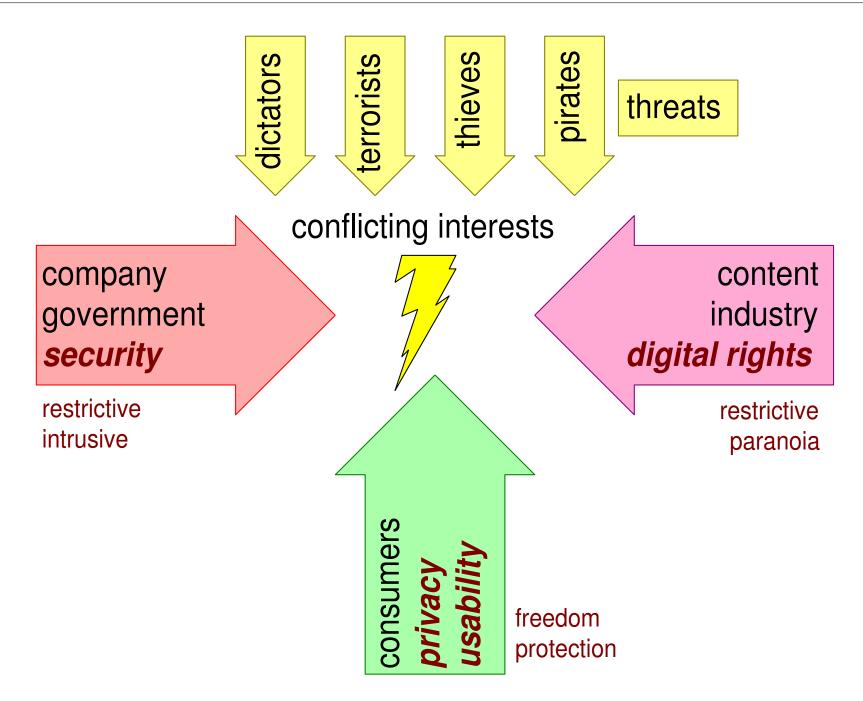
desktop
silent fanless
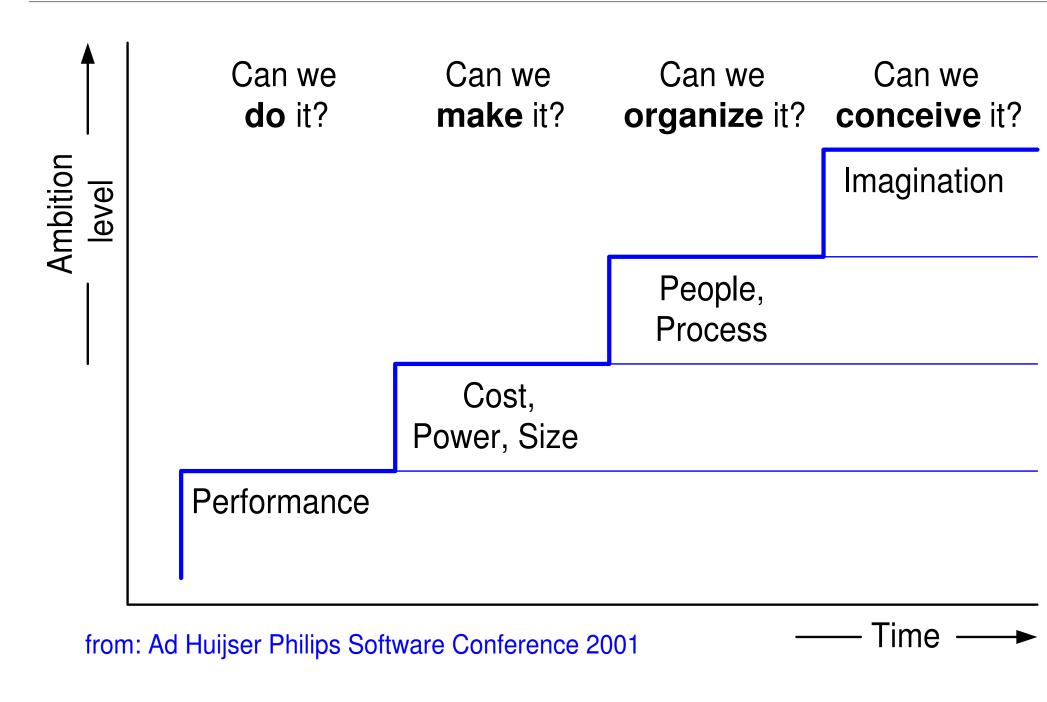
MRI gradients : 66 mT/m
kWatts: cost, noise, heat

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Security conflicting interests

dictators

terrorists

thieves

pirates

threats

conflicting interests

company
government
security

restrictive
intrusive

content
industry
digital rights

restrictive
paranoia

consumers
*privacy
usability*

freedom
protection

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Creativity as limiting factor

Can we **do** it? Can we **make** it? Can we **organize** it? Can we **conceive** it?

Ambition level

Imagination

People, Process

Cost, Power, Size

Performance

from: Ad Huijser Philips Software Conference 2001

Time

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What can **You** do for our ~~country~~? company
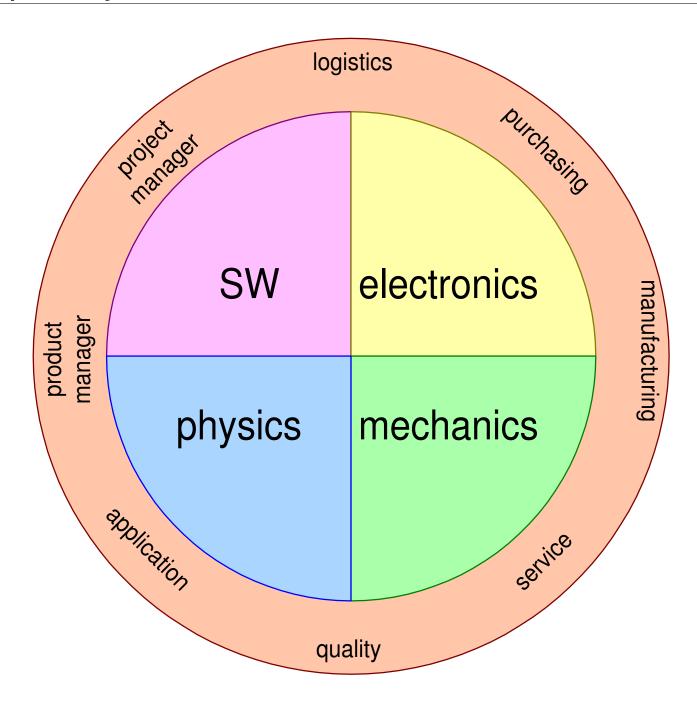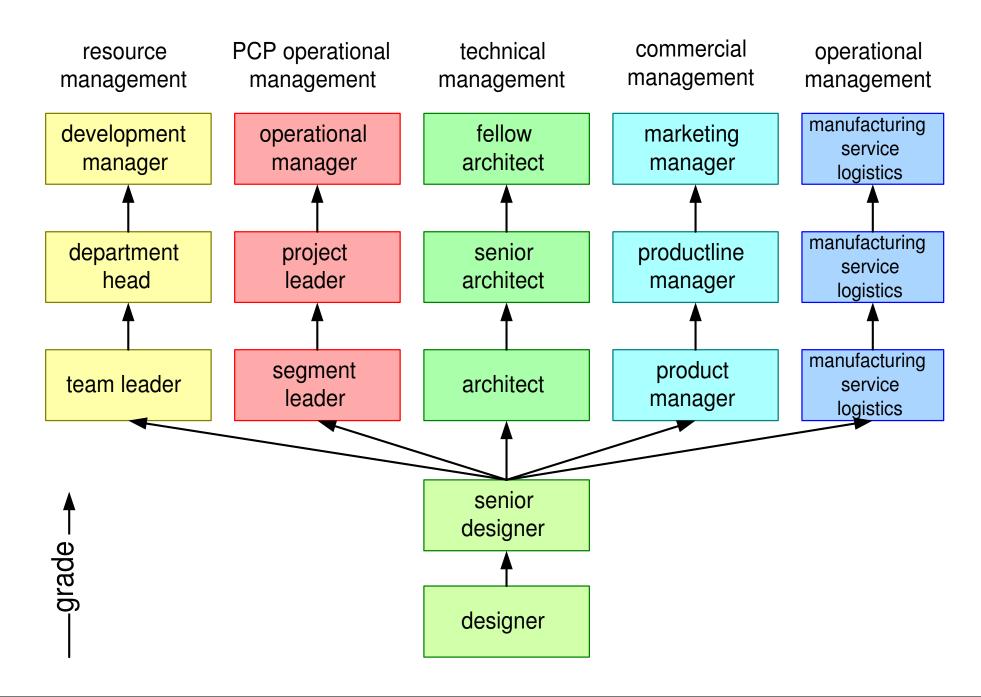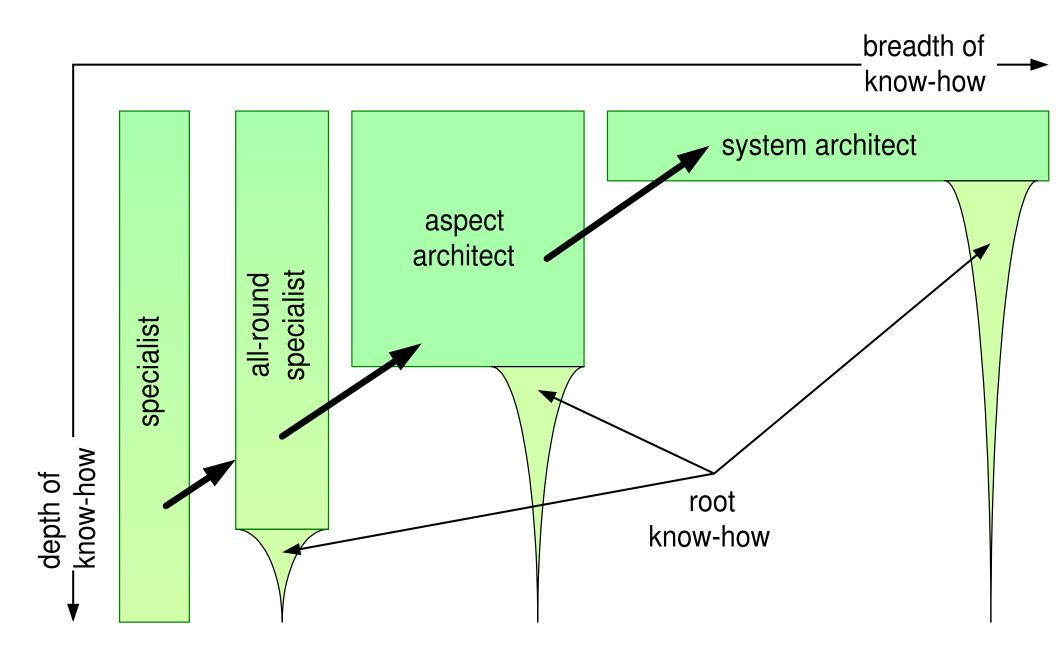
Multi disciplinary teamwork

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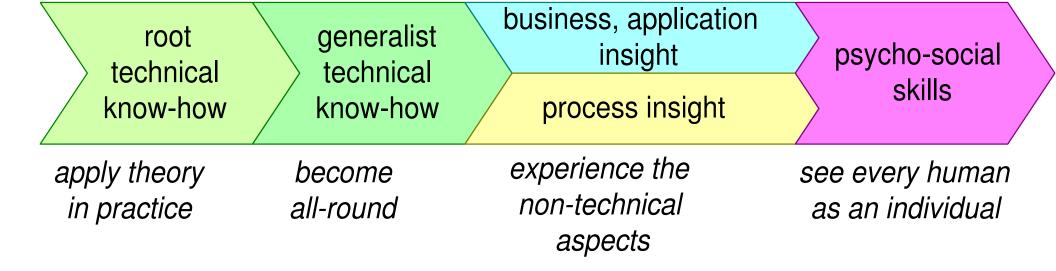
Multi ladder career paths

resource management	PCP operational management	technical management	commercial management	operational management
development manager	operational manager	fellow architect	marketing manager	manufacturing service logistics
department head	project leader	senior architect	productline manager	manufacturing service logistics
team leader	segment leader	architect	product manager	manufacturing service logistics

senior designer

designer

grade →

Technical specialists and generalists are needed

Growth Path Architect

root technical know-how	generalist technical know-how	business, application insight	psycho-social skills
		process insight	
apply theory in practice	*become all-round*	*experience the non-technical aspects*	*see every human as an individual*

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DYOFgrowth

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More designers are needed all the time (unless..)

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Conclusion

Use your brains to   **Design Your Own Future**

We can use your brains!