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The 4+1 View Model of Industry–Academia Collaboration – Experiences

PER RUNESON @ TAIC PART 2015

It takes two to tango

Testing:

Academic &

Industrial

Conference

Practice

and

Research

Techniques

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Industry-academia anti-patterns

1. academia always behind
2. research then transfer
3. research on demand
4. the blame game

The 4+1 Model

[RUNESON & MINÖR, 2014]

The 4+1 View Model of Architecture

PHILIPPE B. KRUCHTEN, *Rational Software*

◆*The 4+1 View Model organizes a description of a software architecture using five concurrent views, each of which addresses a specific set of concerns. Architects capture their design decisions in four views and use the fifth view to illustrate and validate them.*

We all have seen many books and articles in which a single diagram attempts to capture the gist of a system architecture. But when you look carefully at the diagram's boxes and arrows, it becomes clear that the authors are struggling to represent more in one diagram than is practical. Do the boxes represent running programs? Chunks of source code? Physical computers? Or merely logical groupings of functionality? Do the arrows represent compilation dependencies? Control flows? Dataflows? Usually the answer is that they represent a bit of everything.

Does an architecture need a single architectural style? Sometimes the software architecture suffers from system designers who go too far, prematurely partitioning the software or overemphasizing one aspect of development (like data engineering or runtime efficiency), development strategy, or team organization. Other software architectures fail to address the concerns of all "customers."

Several authors have noted the problem of architectural representation, including David Garlan and Mary Shaw,[1] Gregory Abowd and Robert Allen,[2] and Paul Clements.[3]

The 4 + 1 View Model was developed to remedy the problem. The 4 + 1 model describes software architecture using five concurrent *views*. As Figure 1 shows, each addresses a specific set of concerns of interest to different stakeholders in the system.

♦ The *logical* view describes the

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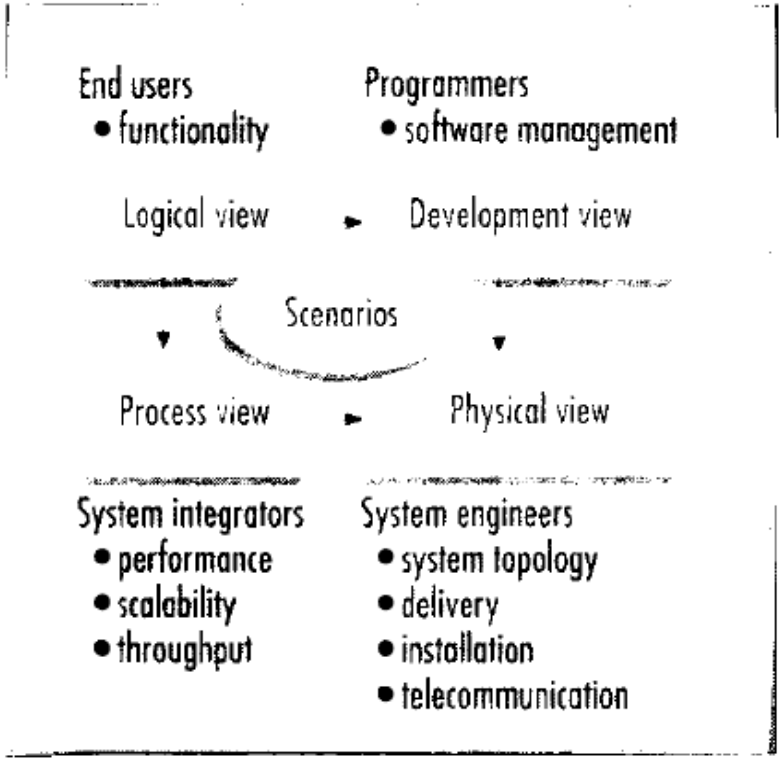

***Figure 1.** The 4+1 View Model is used to organize the description of the architecture of a software-intensive system.*

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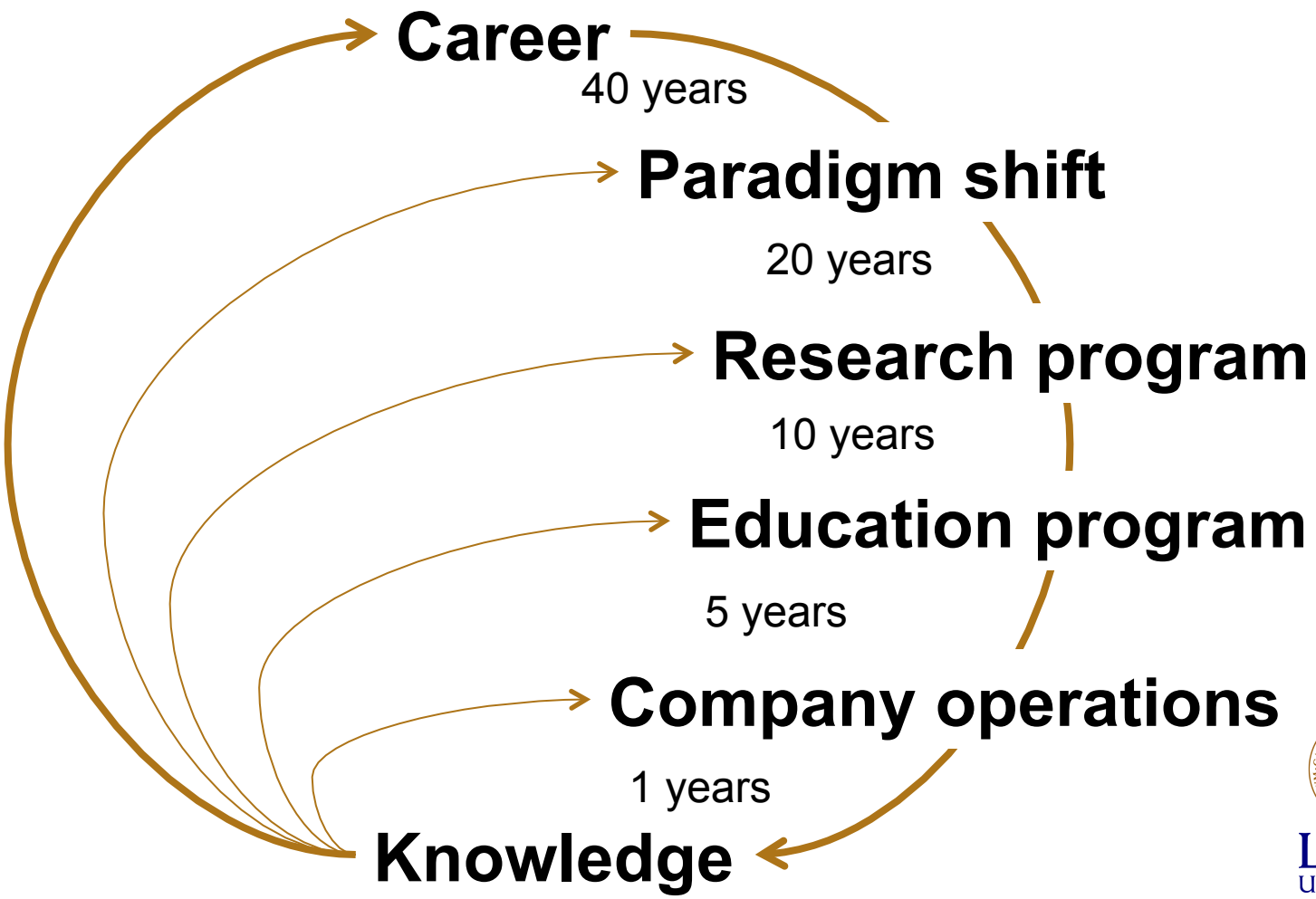
4+1 model of industry-academia collaboration

1. Time view (when)
2. Space view (where)
3. Activity view (how)
4. Domain view (what)

+ 1 use case view – collaboration scenario

Knowledge cycles



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Time horizons

Table 1: Typical time horizons in industry–academia collaboration (years)

Area	*Industry*	*Academia*
Contracts	1 – 3	3 – 5
Goals	1/4 – 3	3 – 5
Results	0 – 3	3 – 10
Organization	1 – 3	5 – 10
Work practice	0 – 1/2	0 – 3

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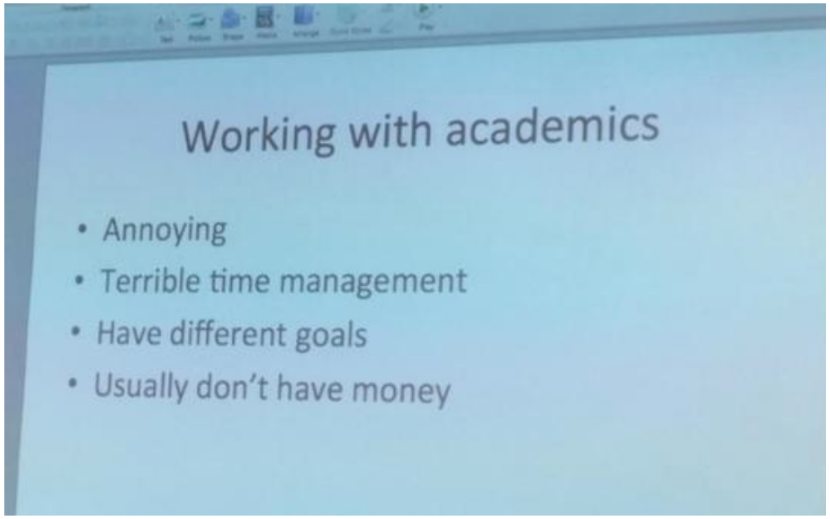
Doomed to fail?

Daniel Lemire retweetade

SubMedina @SubMedina · 8 tim

LOL'ing so hard. RT @aimsinpeng At a tech startup talk. This is what the about working w academics

Visa översättning



RETWEETS 234 FAVORITER 292

01:11 - 31 mar 2015 · Detaljer

Martin Glinz: why academia and industry did not succeed to work together. @WC_REFSQ

Visa översättning

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18:19 - 25 mar 2015

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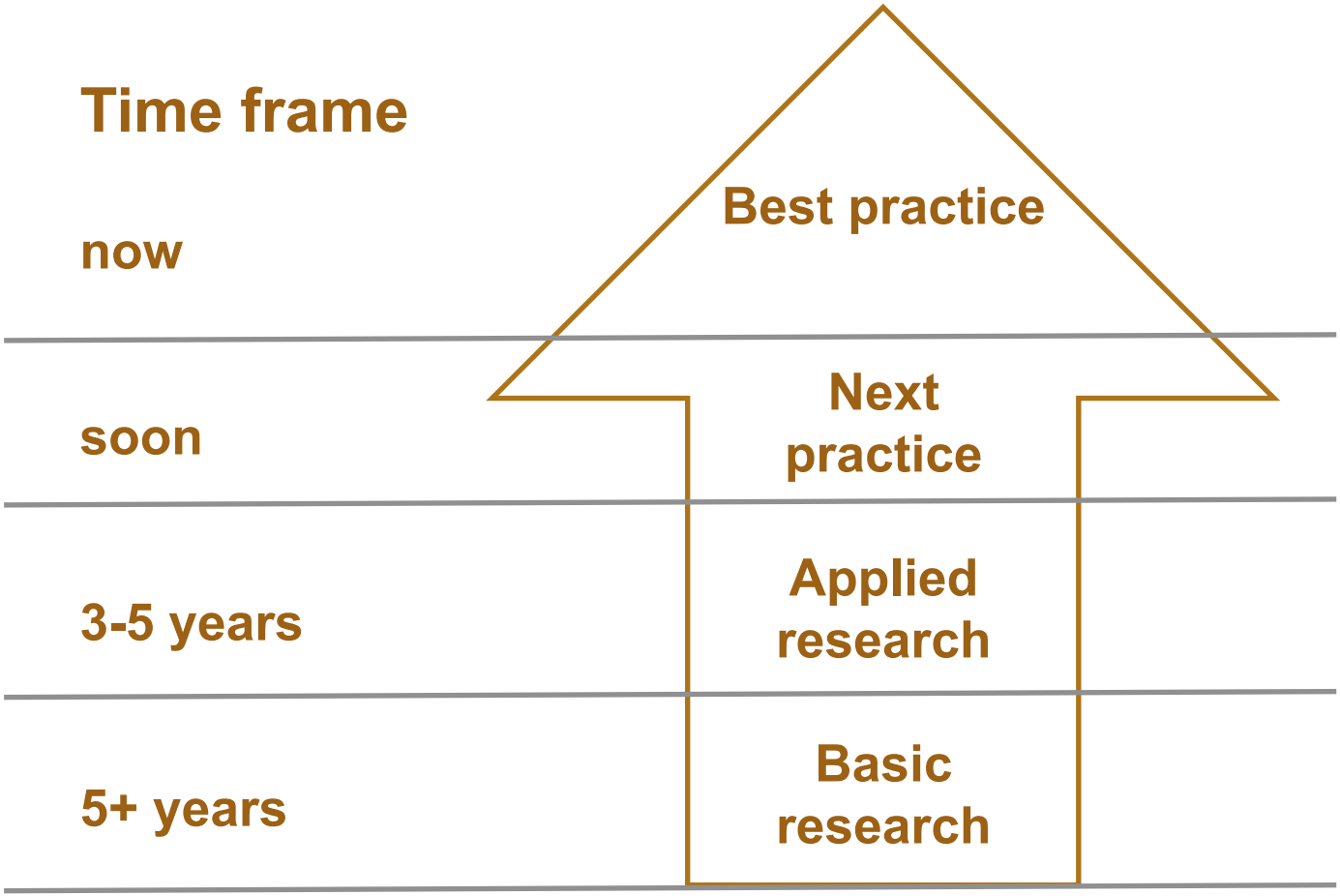
Time view (when)



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Time practicalities

Researchers make commitments far ahead of time for e.g. conference organization and teaching, while industry staff re-plan their commitments on daily, or even hourly basis, for higher management.

[Runeson 2012]

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Space distances

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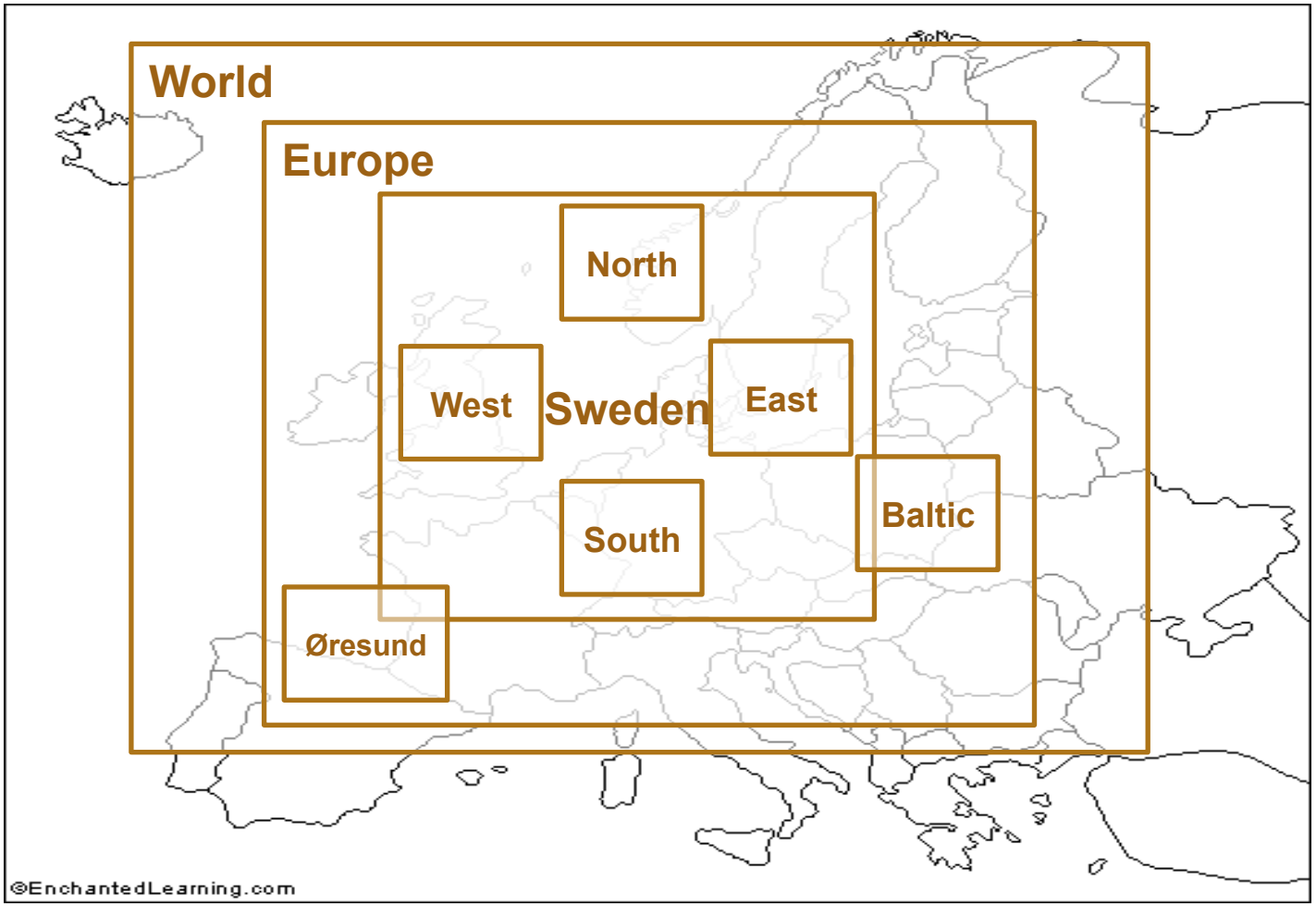
Space view (where)



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Traveling

Why does space matter?

Collaboration involves meetings = traveling:

Local – almost no traveling time

Regional – traveling time of 1-2 hours, i.e. a meeting takes at least half a day

National – traveling of 2+ hours, i.e. any meeting takes a full day

International – traveling takes more than one day

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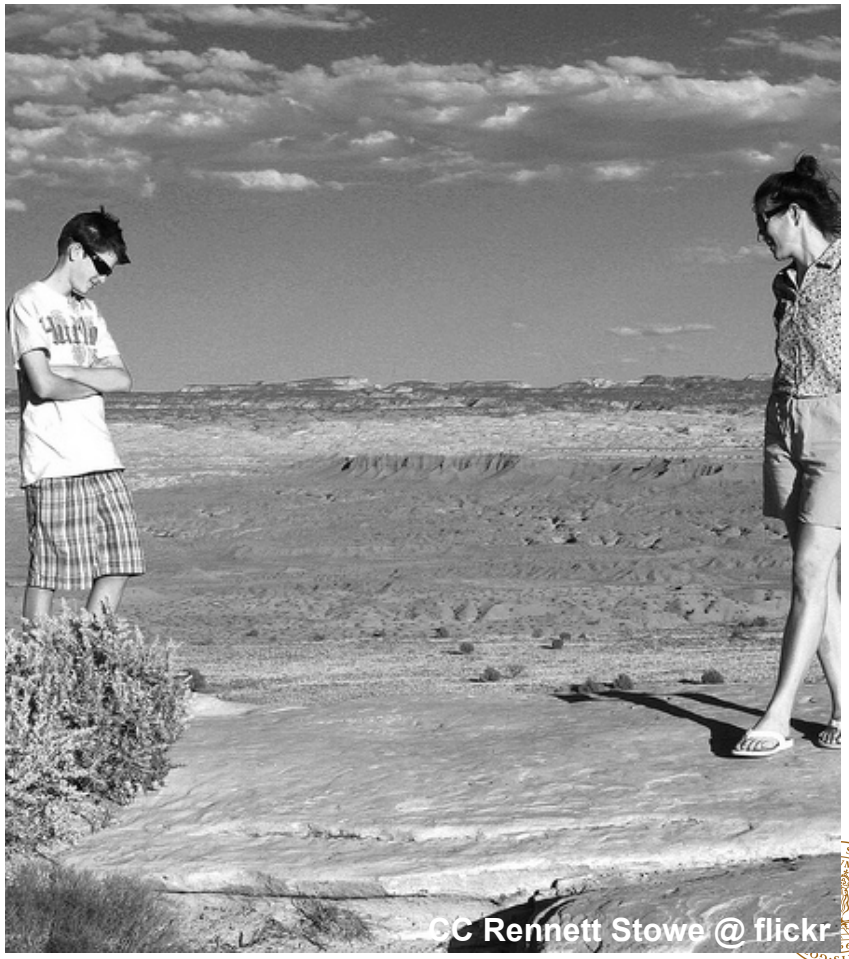
There are other distances…

- **Geographical**
- **Organizational**
- **Psychological**
- **Cognitive**
- Adherence
- Semantic
- Navigational
- **Temporal**

[Bjarnason et al 2015]



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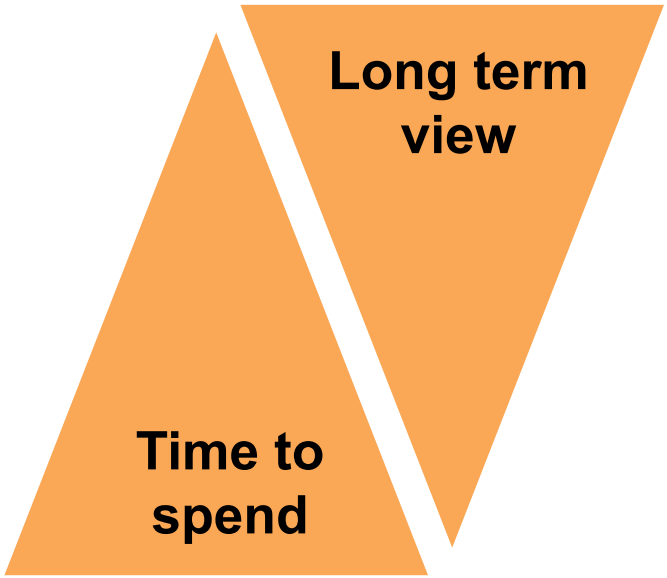
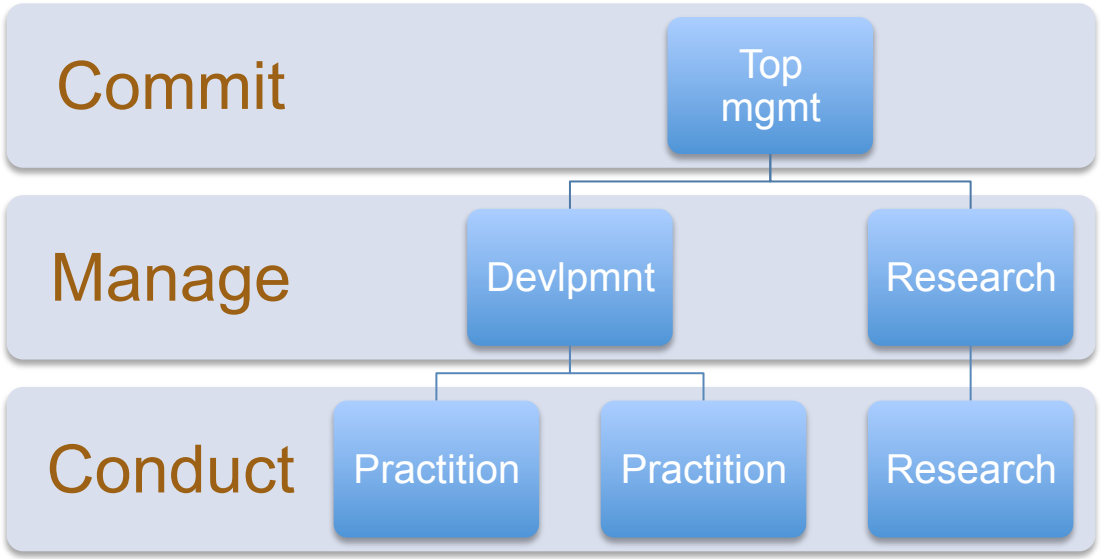
Organizational issues





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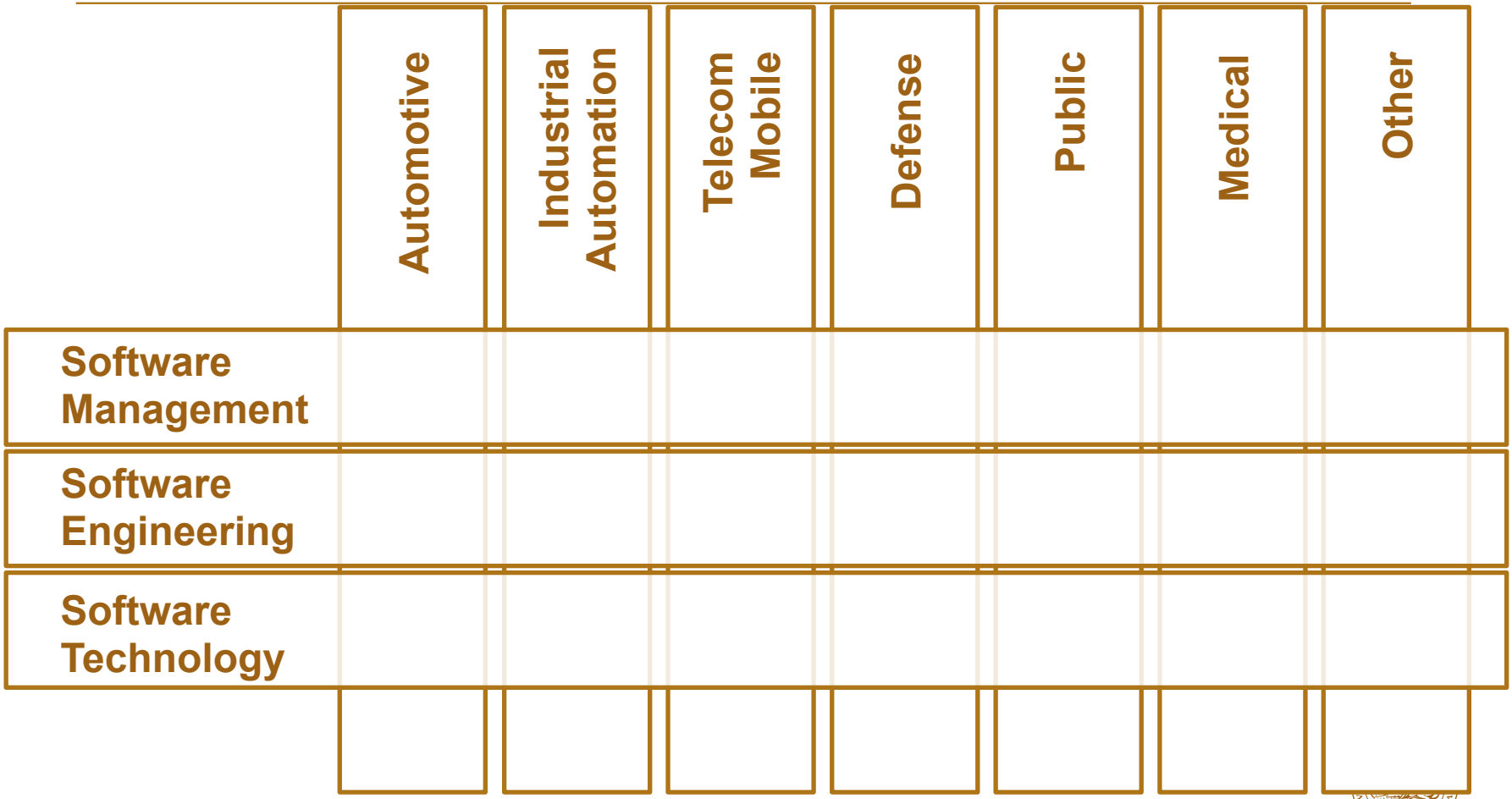
Domain view (What)



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Industry: Silos —> Cross domain

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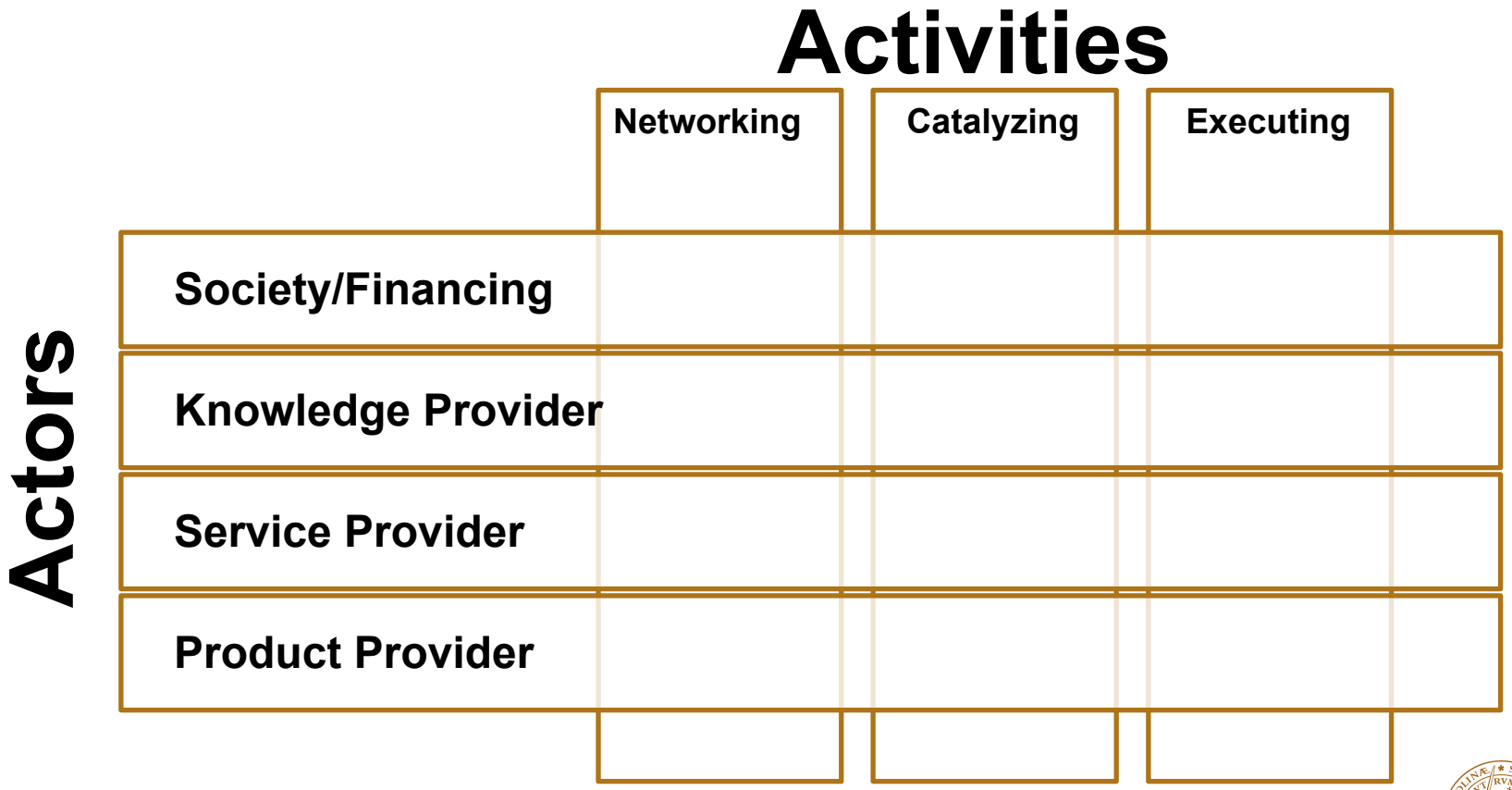
Activity view (how)



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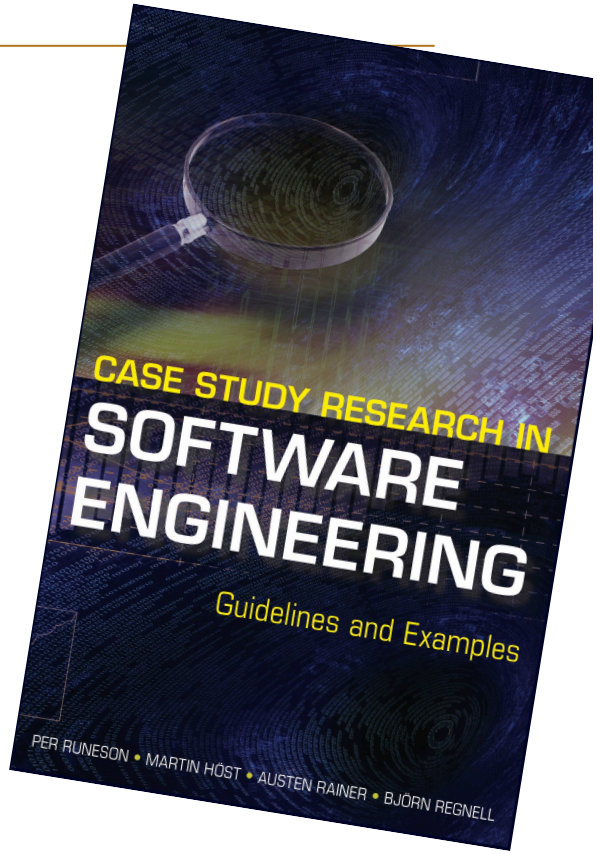
Industry-academia win-win

Case study … investigate one instance … of a **contemporary software engineering phenomenon within its real-life context**, especially when the boundary between phenomenon and context cannot be clearly specified



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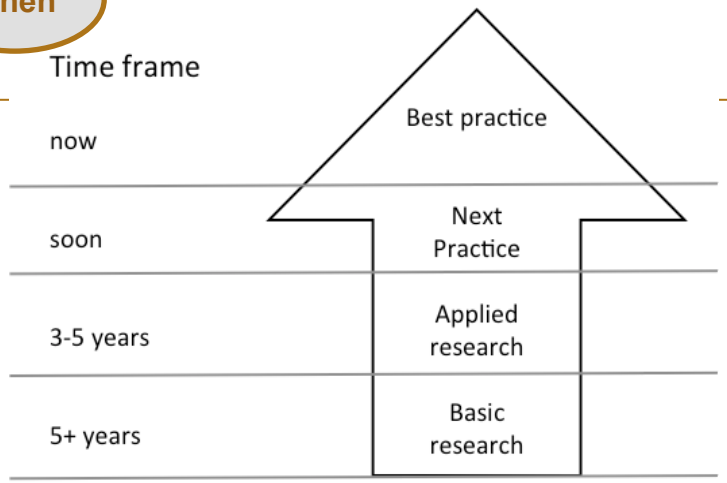
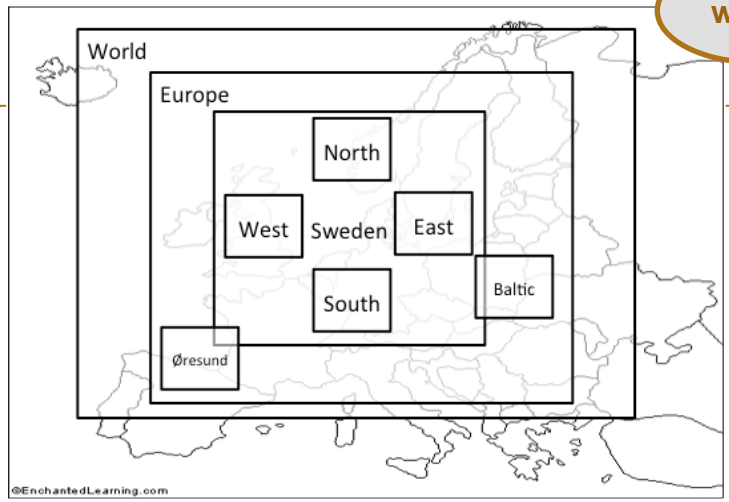
+1

when



where



what

	Automotive	Industrial Automation	Telecom Mobile	Defence	Public	Medical	Other
Management							
Engineering							
Technology							

how

	Networking	Catalyzing	Executing
Society/Financing			
Knowledge provider			
Service Provider			
Product Provider			

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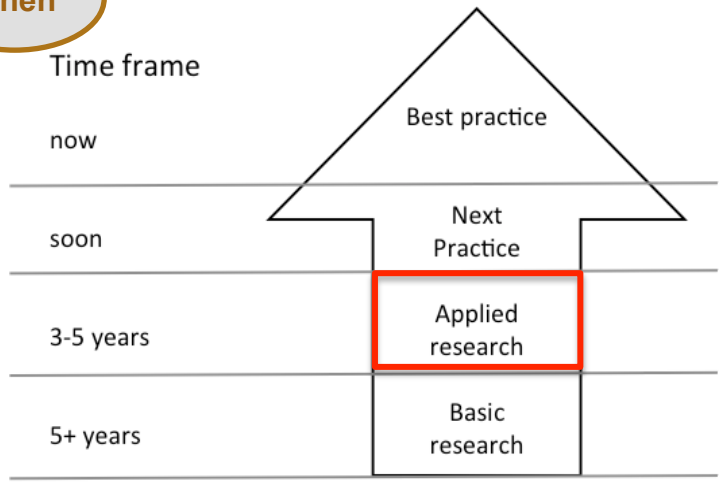
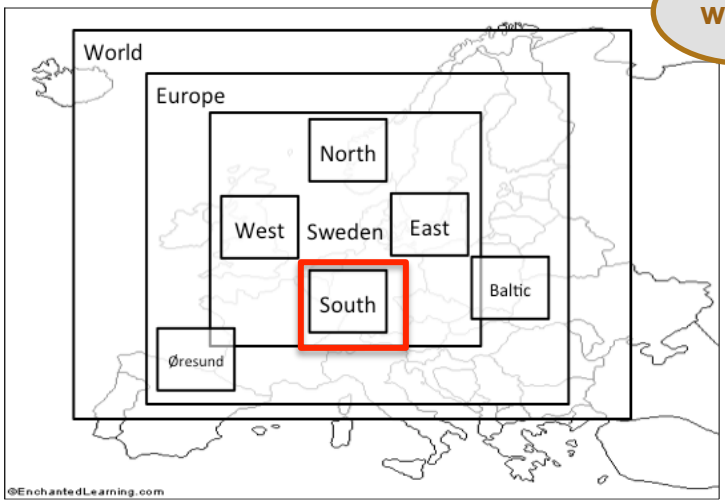
Example: Industrial Excellence Center on Embedded Applications Software Engineering

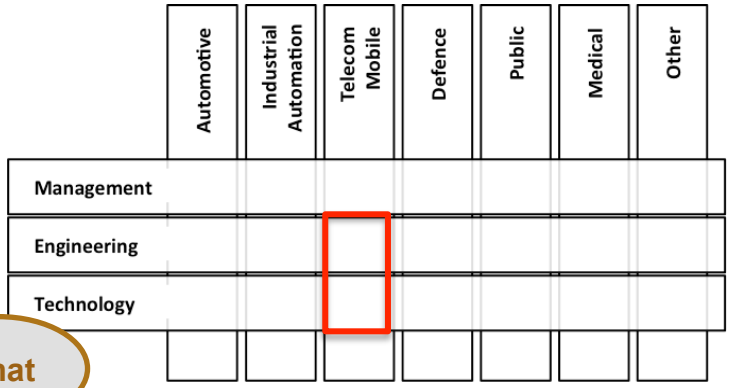
when



where



what



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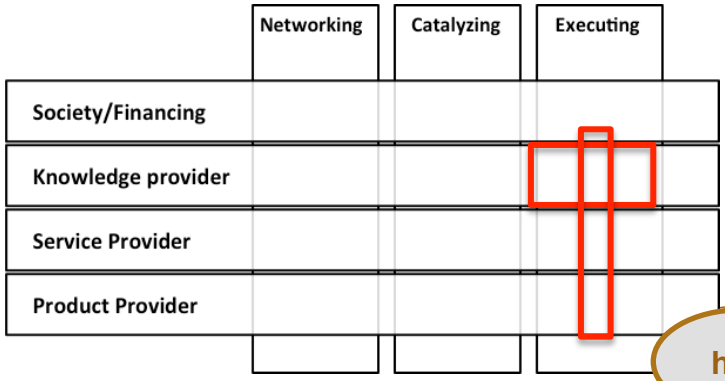

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”Buth what…it is good for”

Engineer at Advanced Computing Systems Division of IBM, 1968

- Negotiating new collaboration
  - Setting expectations right
- Analyzing ongoing collaboration
  - Understanding success & failure
- Identifying missing collaboration
  - Improving for the future

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What did we learn?

Time – the need for long term relations, the acceptance of different time scales

Space – physical distance plays a role also in the digital world

Activity – the collaboration may include several kinds of activity for mutual benefit

Domain – industries in different domains may learn from each other, catalyzed by academic research

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