Enhancing Competence and Industry Integration

by *Gerrit Muller* USN-SE
e-mail: gaudisite@gmail.com
www.gaudisite.nl

Abstract

Systems Engineering education and research requires a close relation with a context. This is a case study of the way that USN-SE runs a program that enhances competence and integrates with industry.

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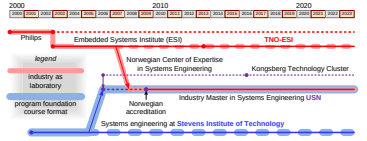
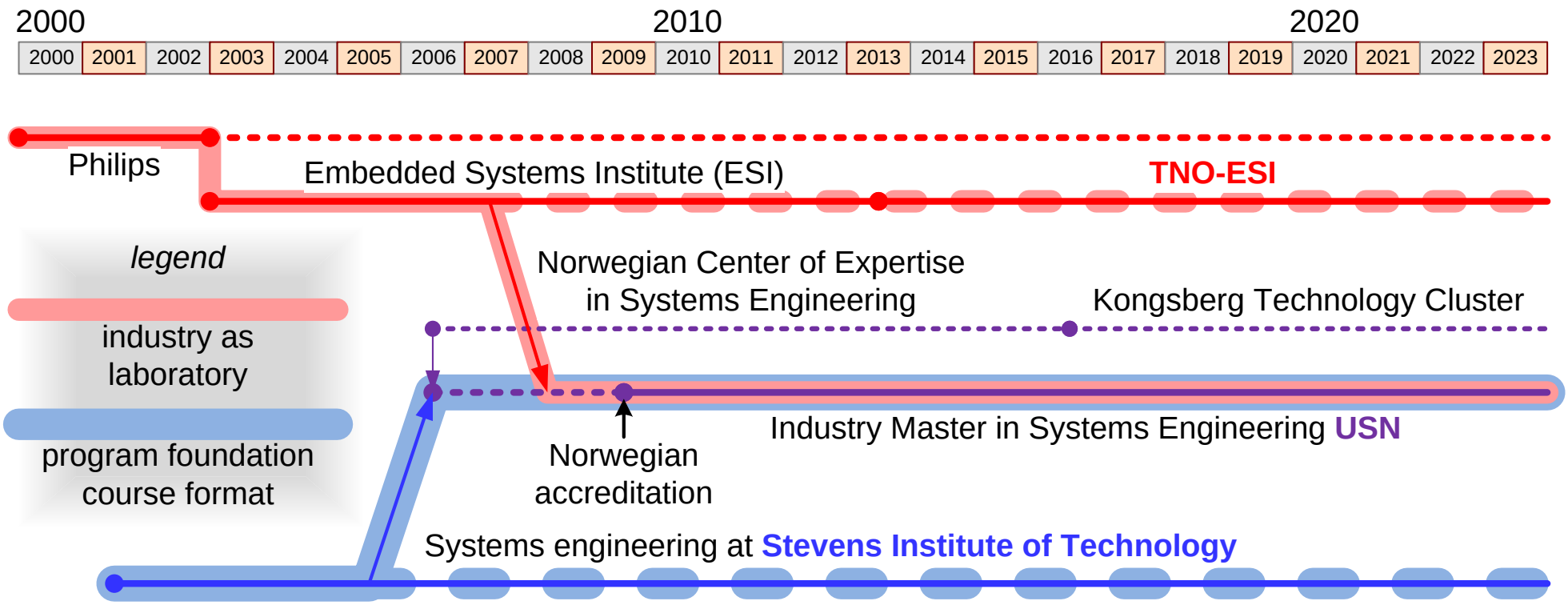
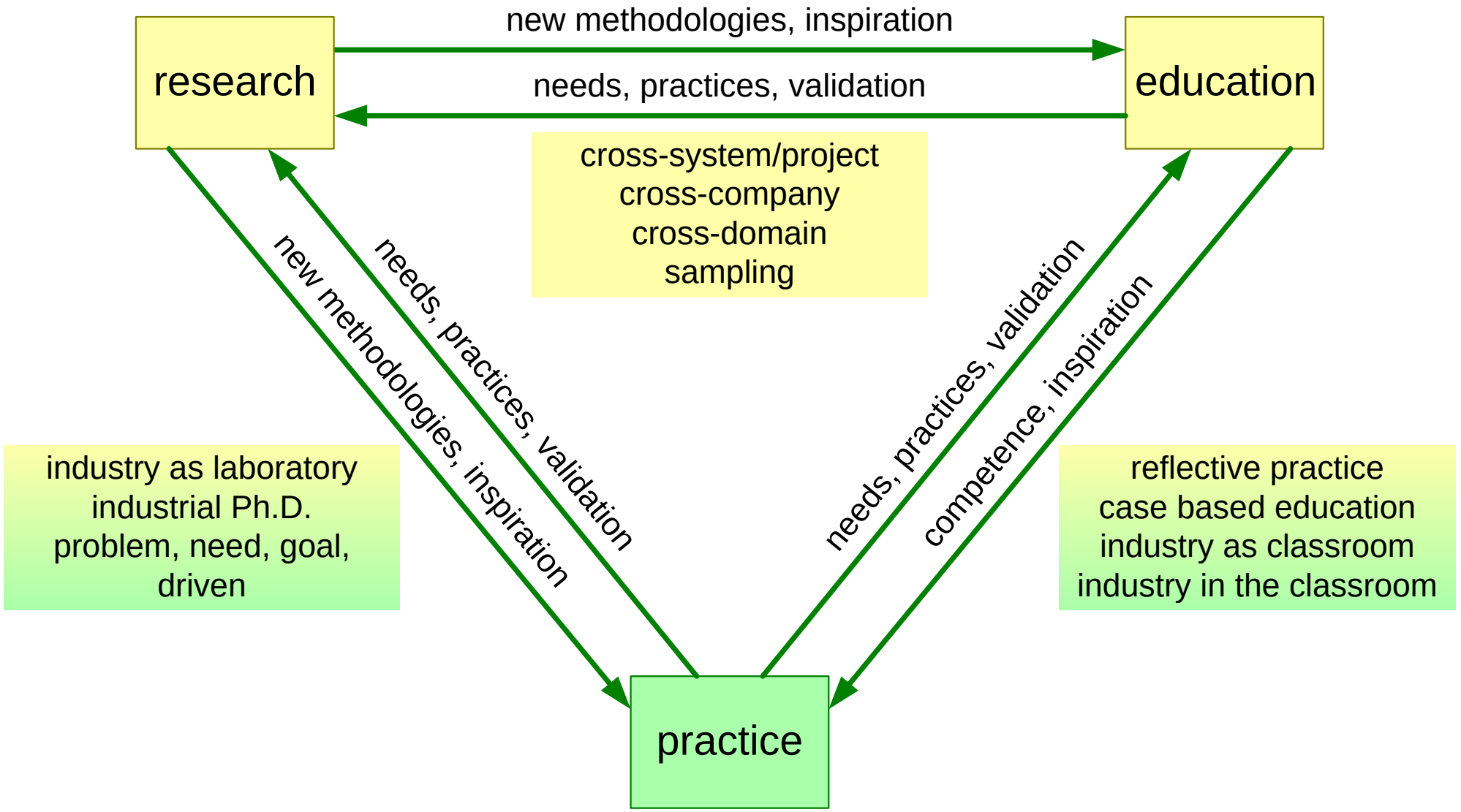


Genealogy of the Industrial Driven Approach



Evolve Research Education, and Practice Together



Systems Architecture Forum: Best Practices

One of several *prerequisites* for *architecture creative synthesis* is the definition of *5-7 specific key drivers* that are *critical for success*, along with the *rationale* behind the selection of these items

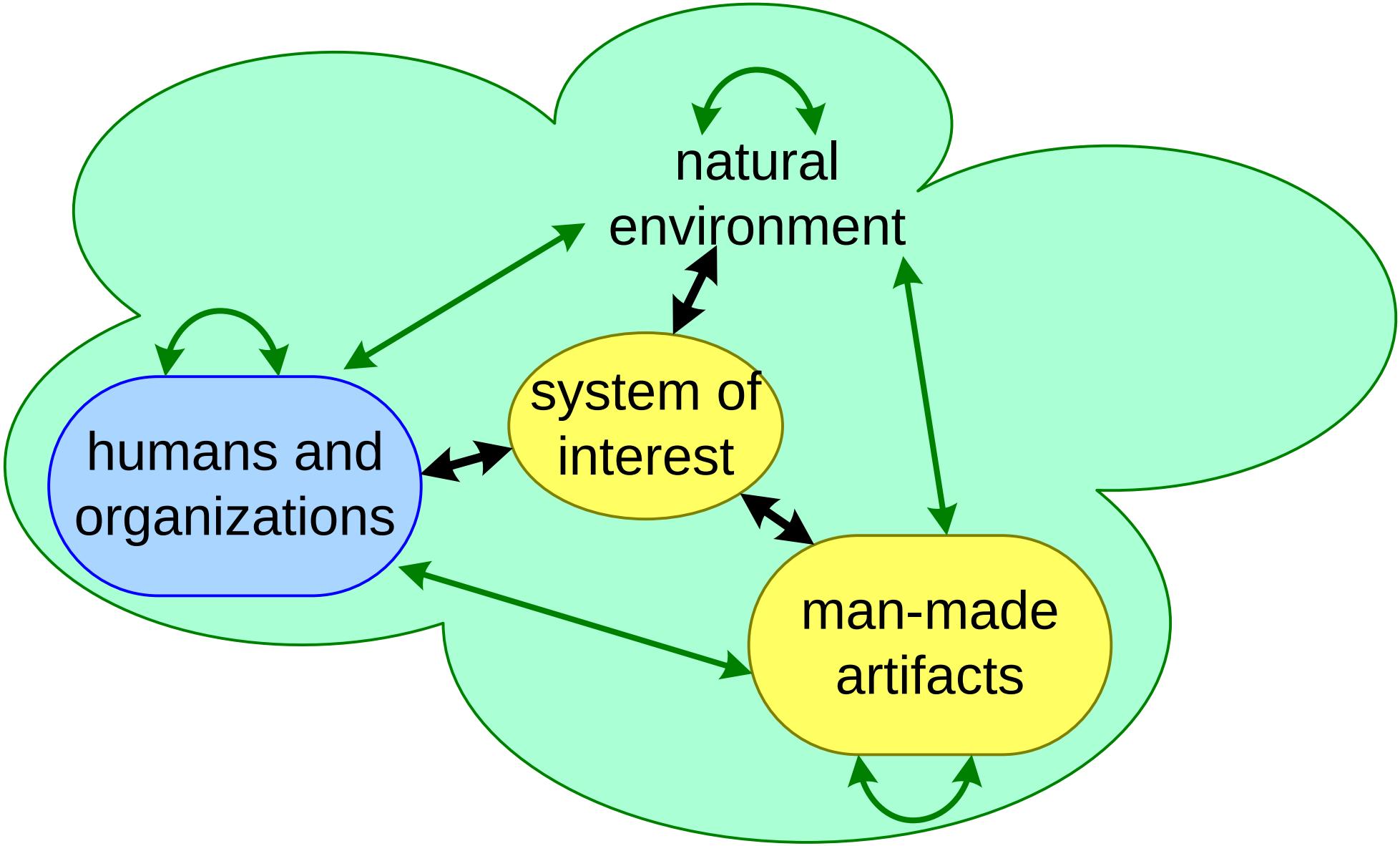
The *essence* of a *system* can be captured in about *10 models/views*

A *diversity* of *architecture descriptions* and *models* is needed:
languages, schemata and the degree of formalism.

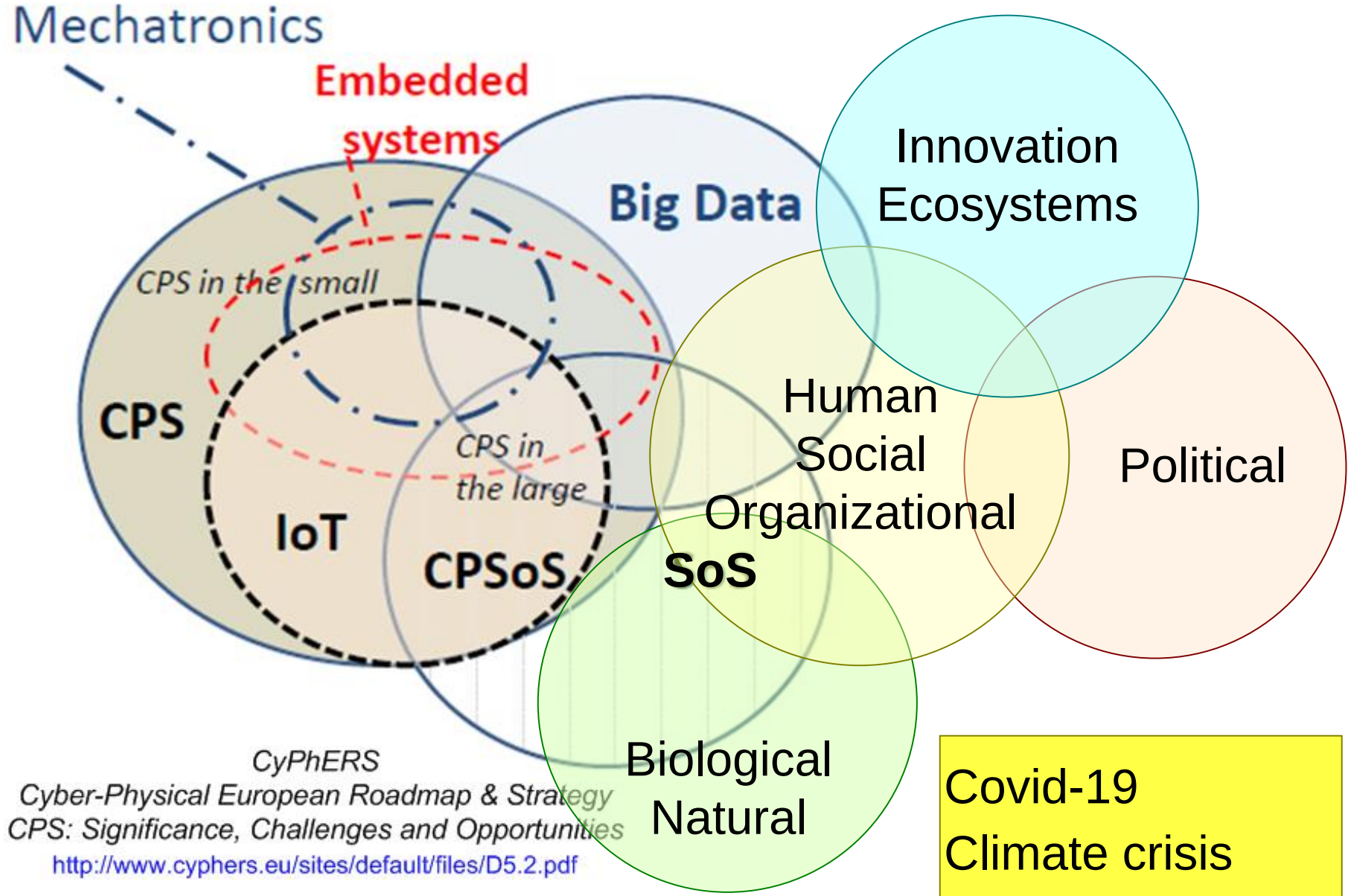
The *level of formality* increases as we move closer to the implementation level.

Architecting education must be *framework and standard* *agnostic*,
but architects must have seen or used *multiple frameworks* and *standards*.

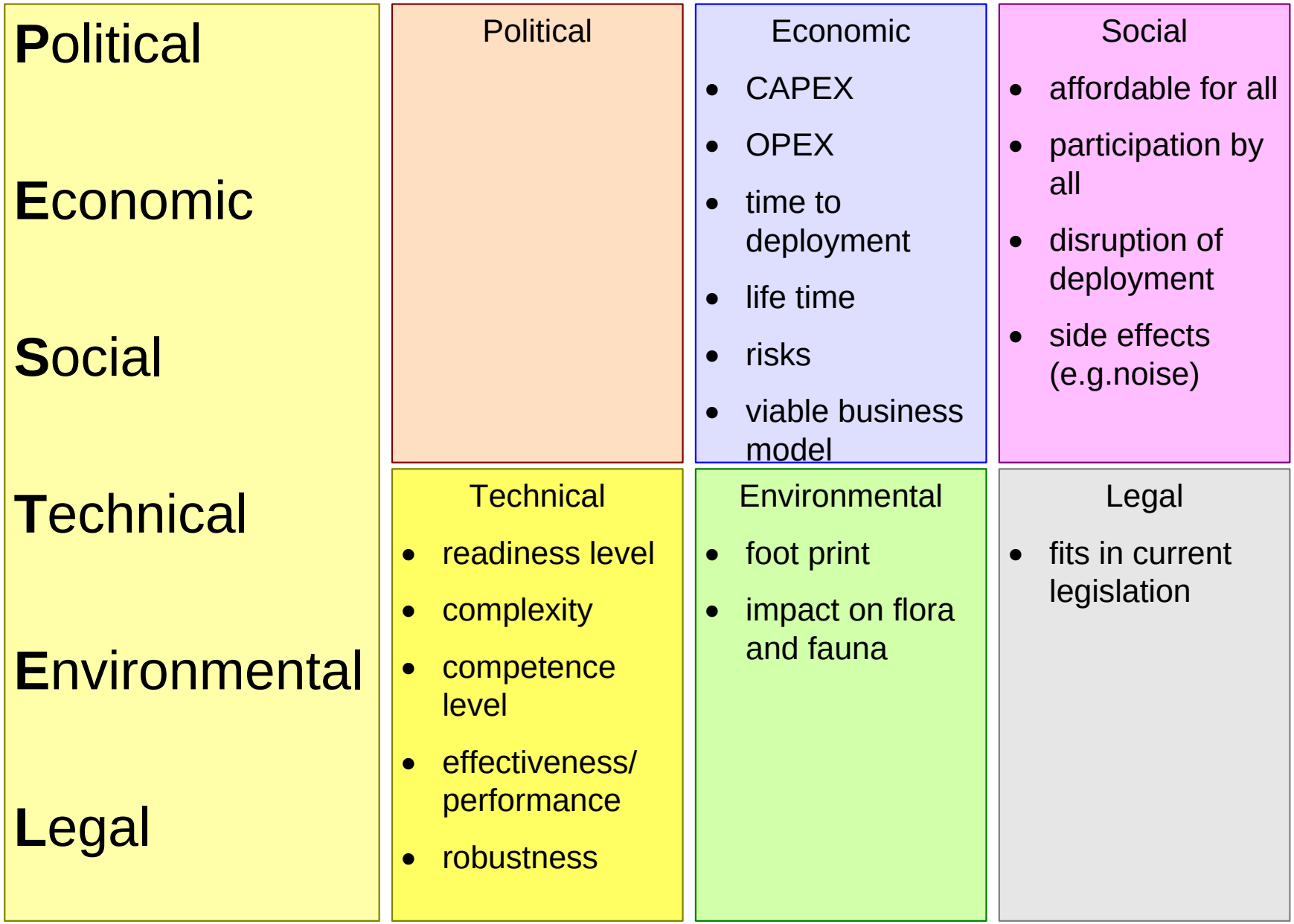
Various Types of Systems Form More Complex Systems



How Far Do We Expand Our Scope?

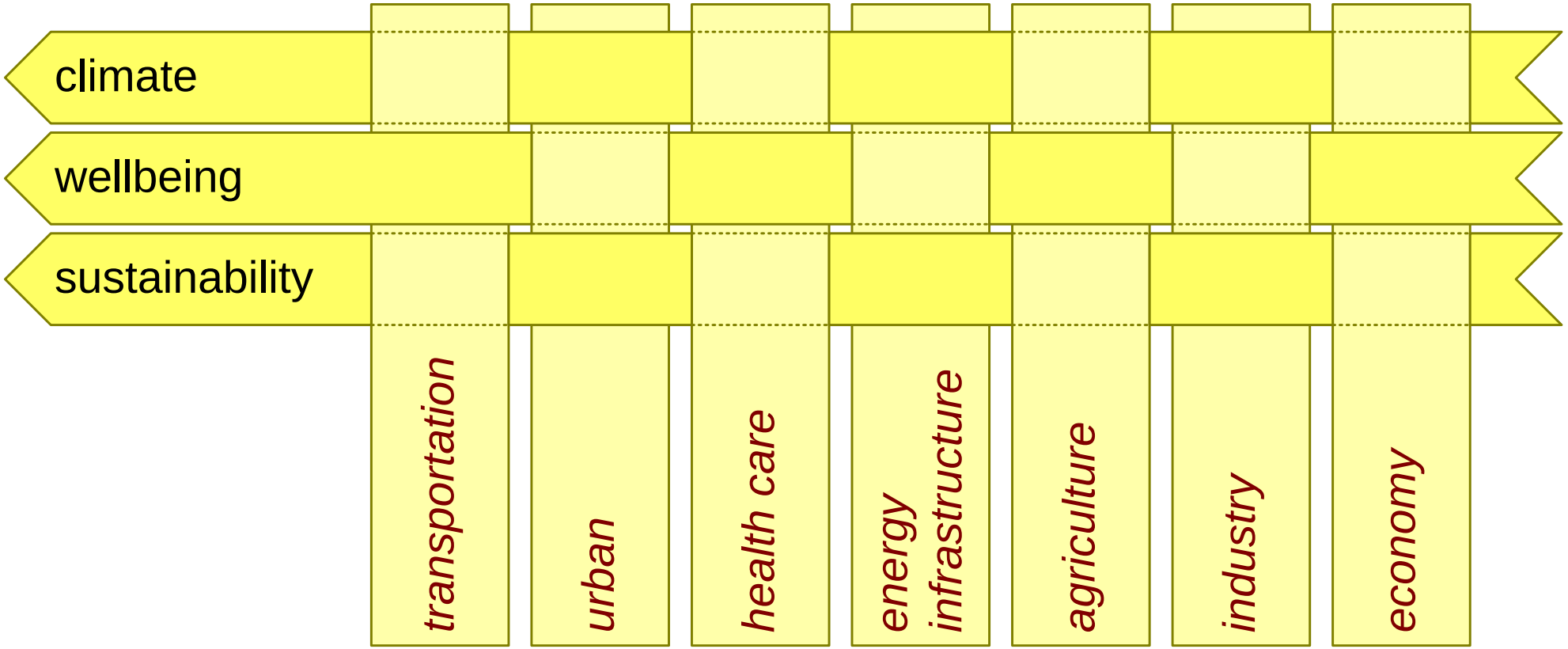


Relevant Social, Political, and Legal Perspectives



Especially in Society's Major Challenges

Transdisciplinary competence integrates many disciplines
to achieve objectives with desired quality attributes

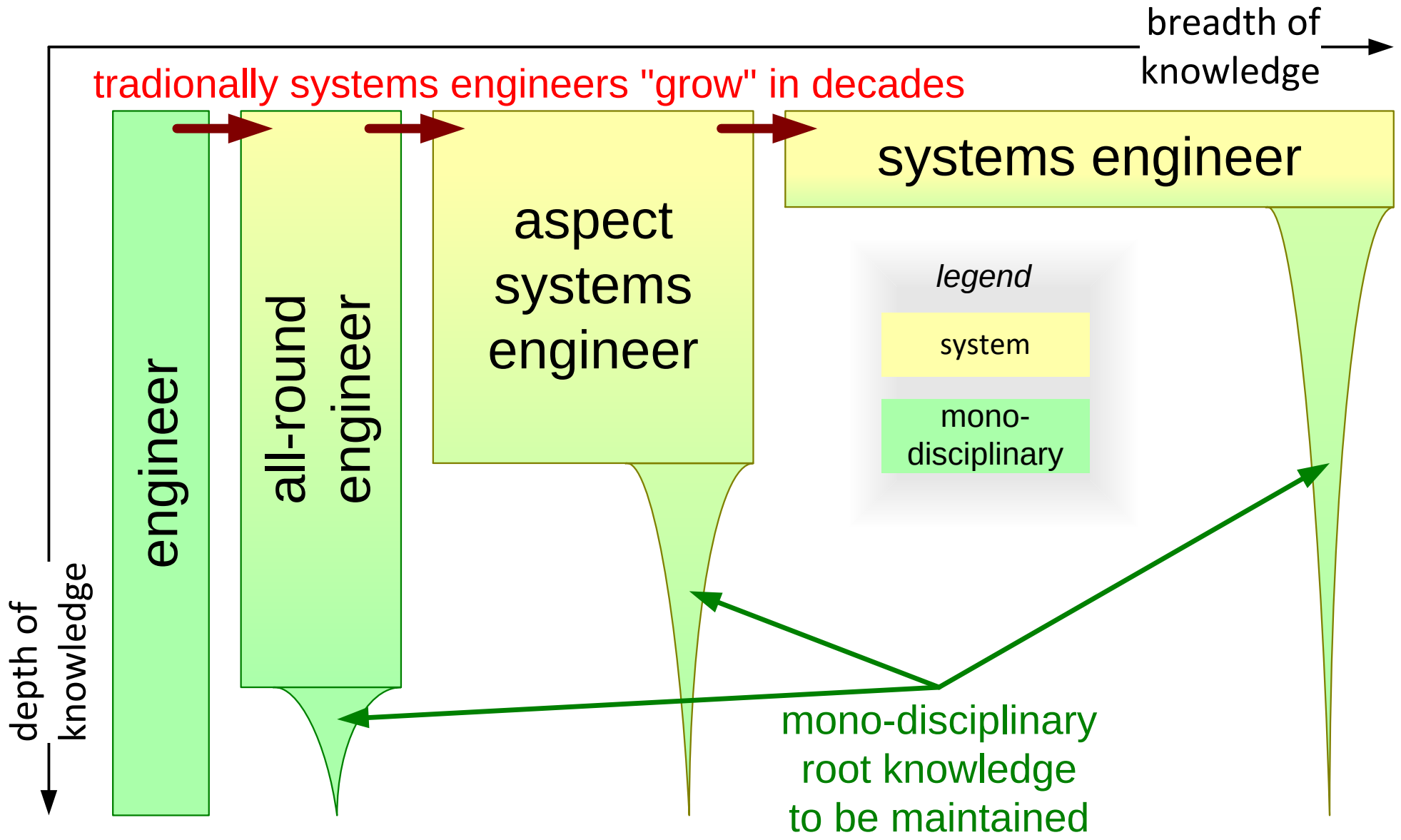


Vision behind the Industry Master

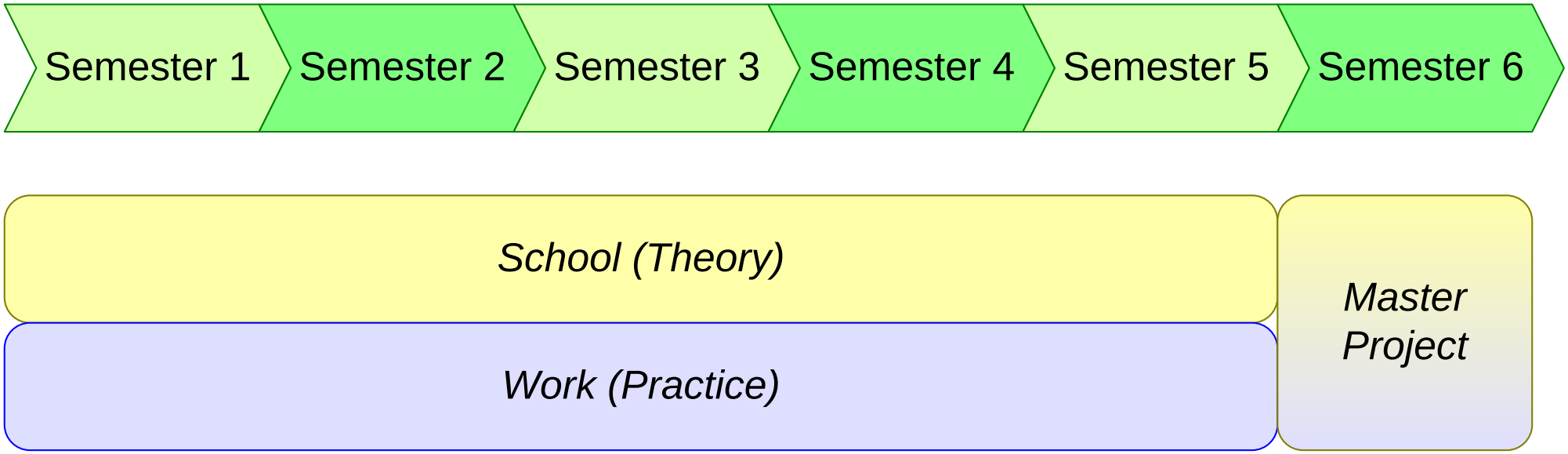
The objective of the industry master in systems engineering is to **accelerate** the **competence development** of new systems engineers, from e.g. 10..20 years in the past to 5..10 years.

Core of the acceleration is **experiential learning**, where offering **theory** and building up **experience** happens **concurrently** and is used to **reinforce learning**.

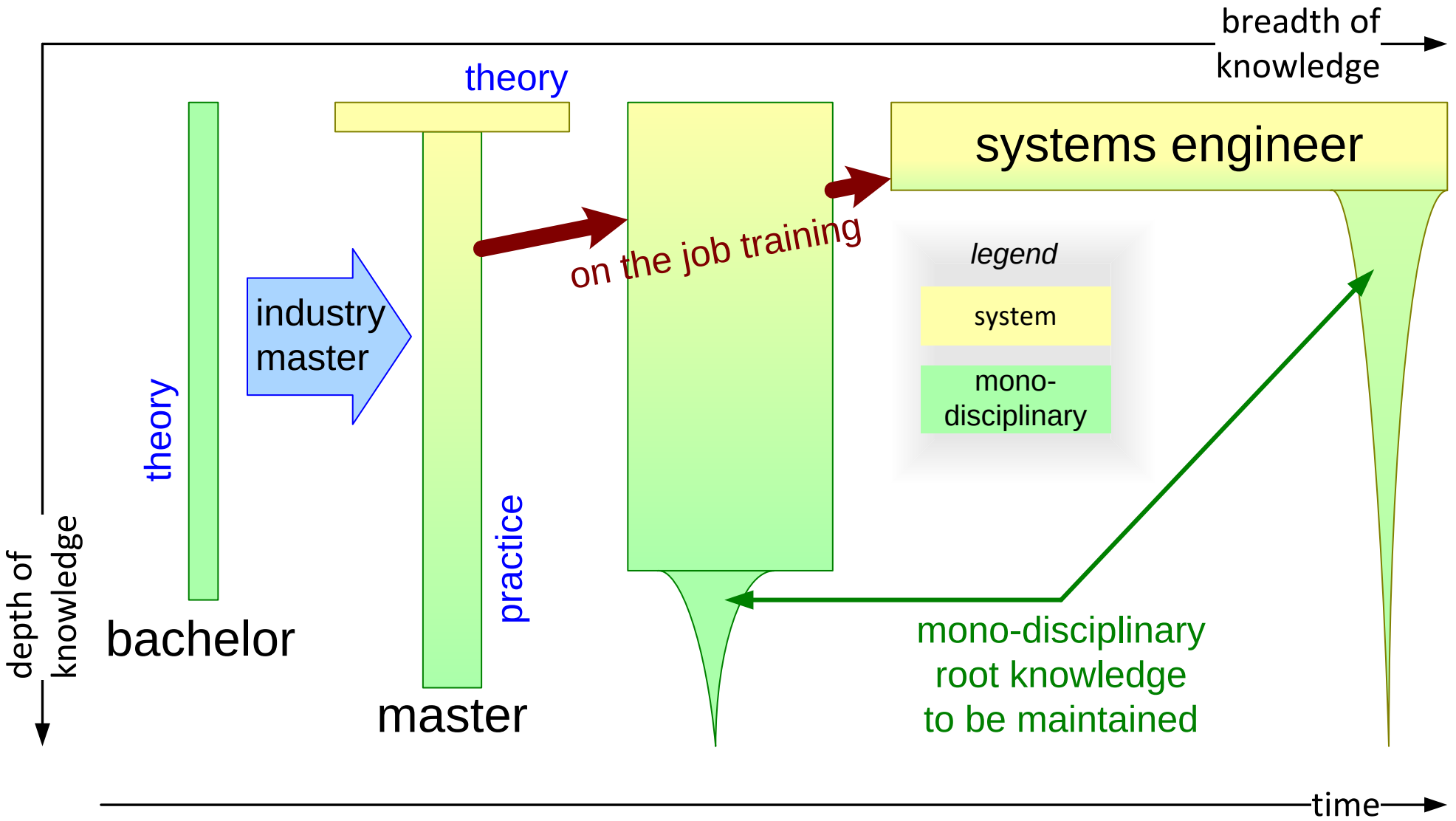
Historical: Growing Systems Engineers Takes Decades



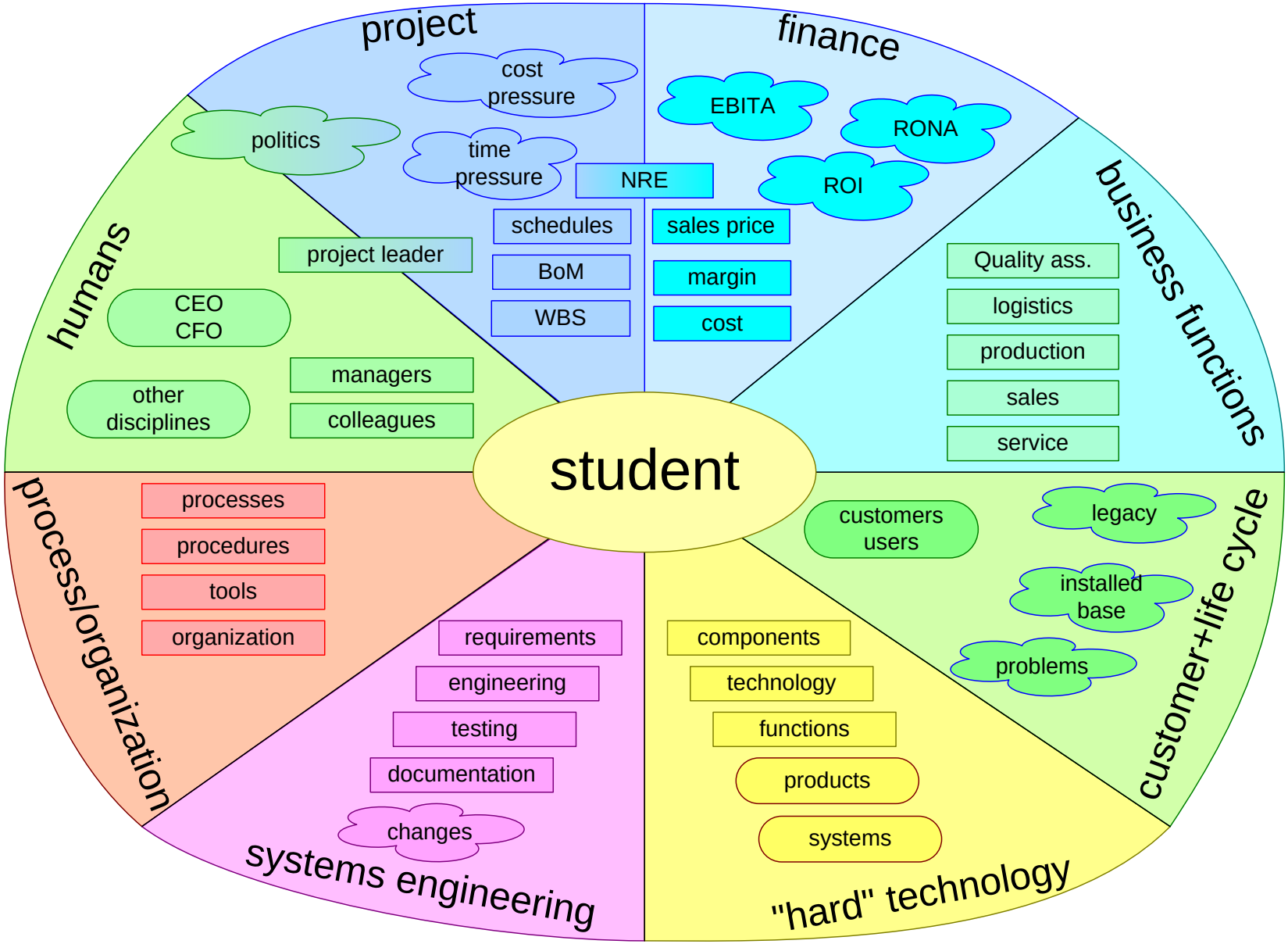
Work and Study Concurrently



Intended Growth of Industry Master students



Overload of Impressions for Fresh Bachelors

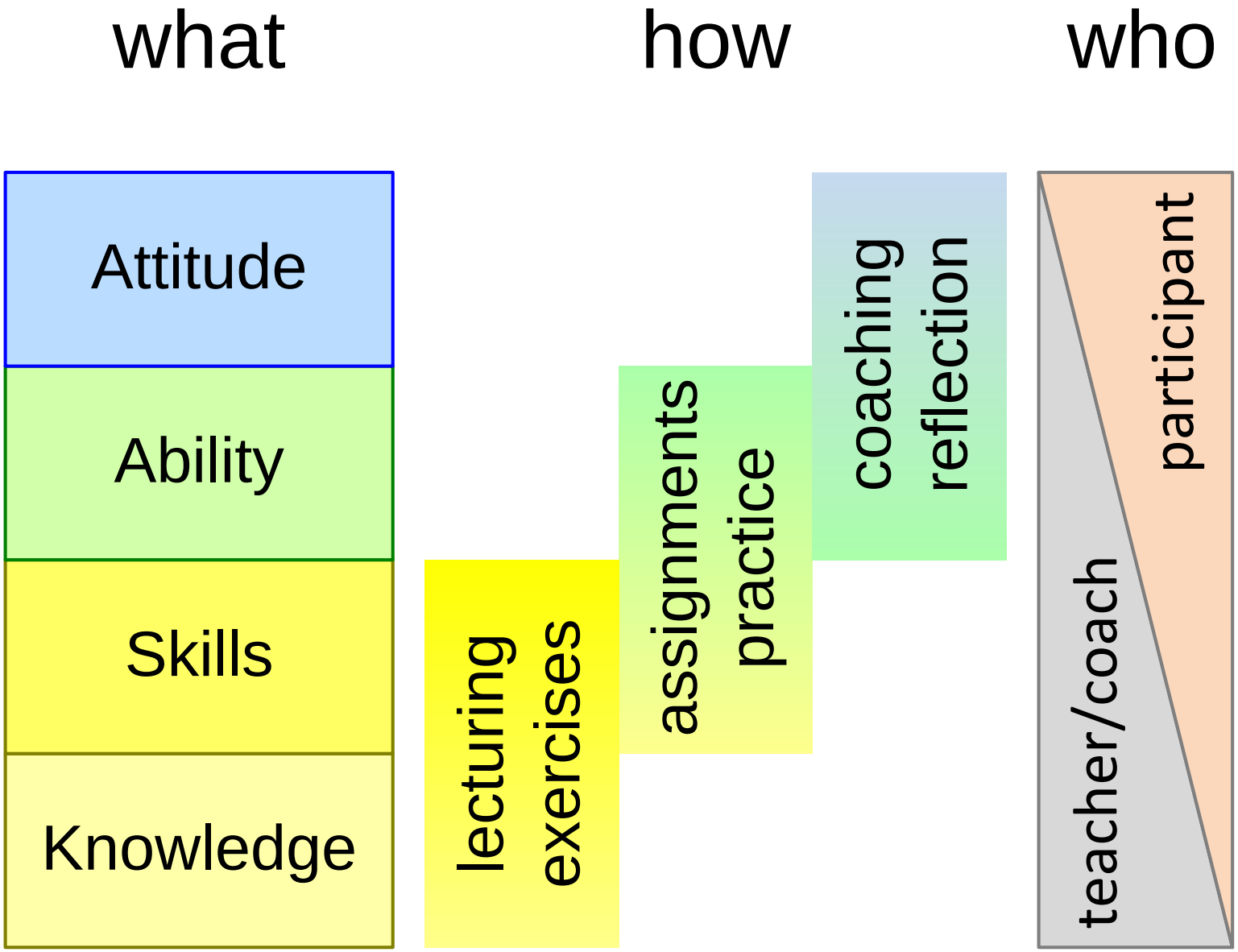


What is Competence?

Attitude (perseverance, faith, critical, constructive, etc.) *train*
Ability (know when to use what skill and knowledge) *apply/use often, experience*
Skills (calculate missing angle, calculate hypothenusa) *exercise*
Knowledge (triangle has 3 corners, sum of angles is 180 degrees, Pythagoras $c^2 = a^2 + b^2$) *learn*

Competence = Knowledge + Skills + Ability + Attitude

Various Ways to Develop Competence

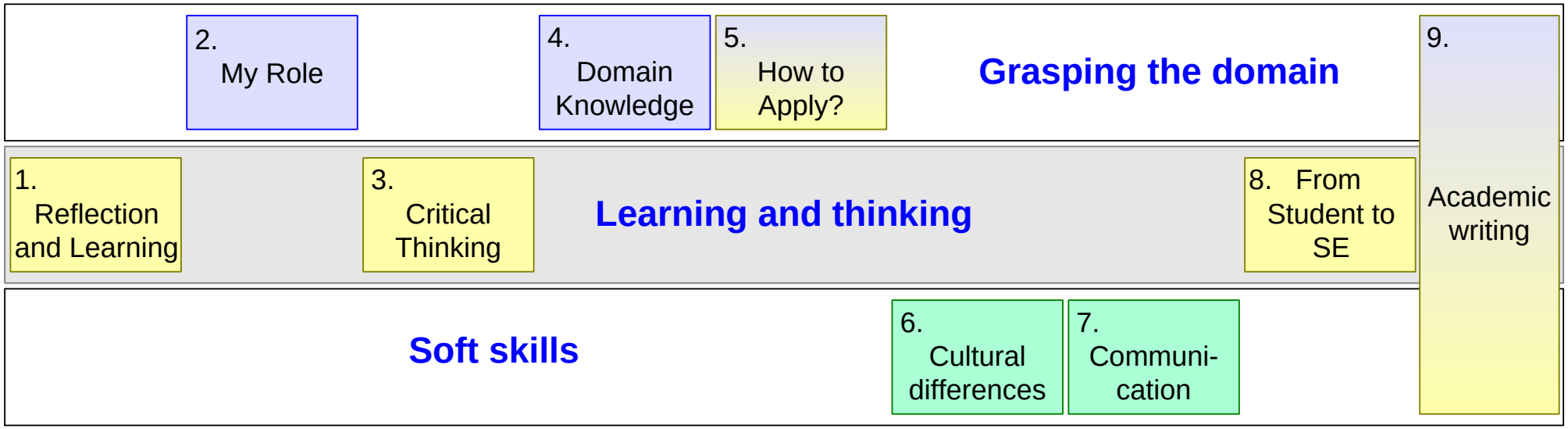


Course Format and Pedagogic

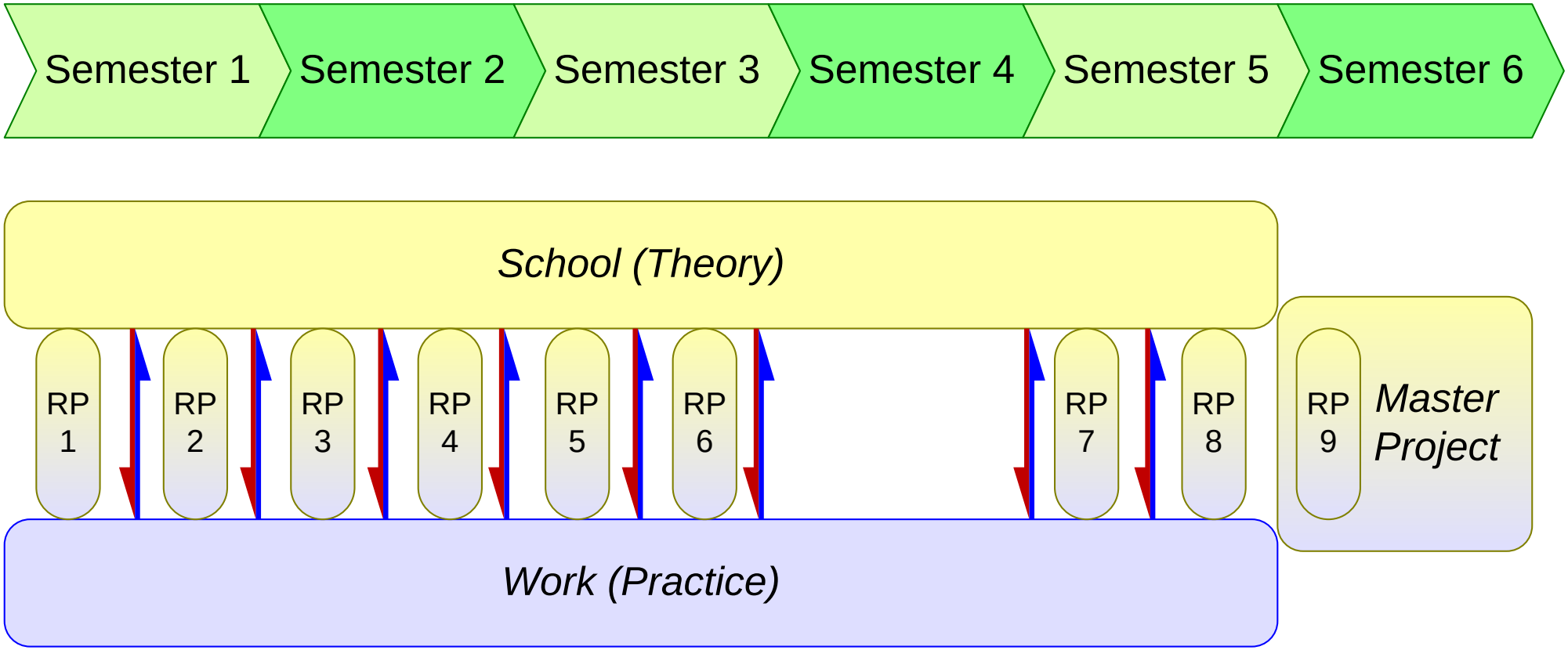
Prepare	*Intense course*	*10 week homework assignment*
e.g. reading or online	lecturing, discussion, and in-class group work	case-based, individual or group work, with supervision
0 to 20 hrs.	40 hrs.	140 to 160 hrs.

- Students travel 4 times per year
- Study and work planning is flexible
- Active learning, case-based
- Actual industry cases are possible (depends on course)

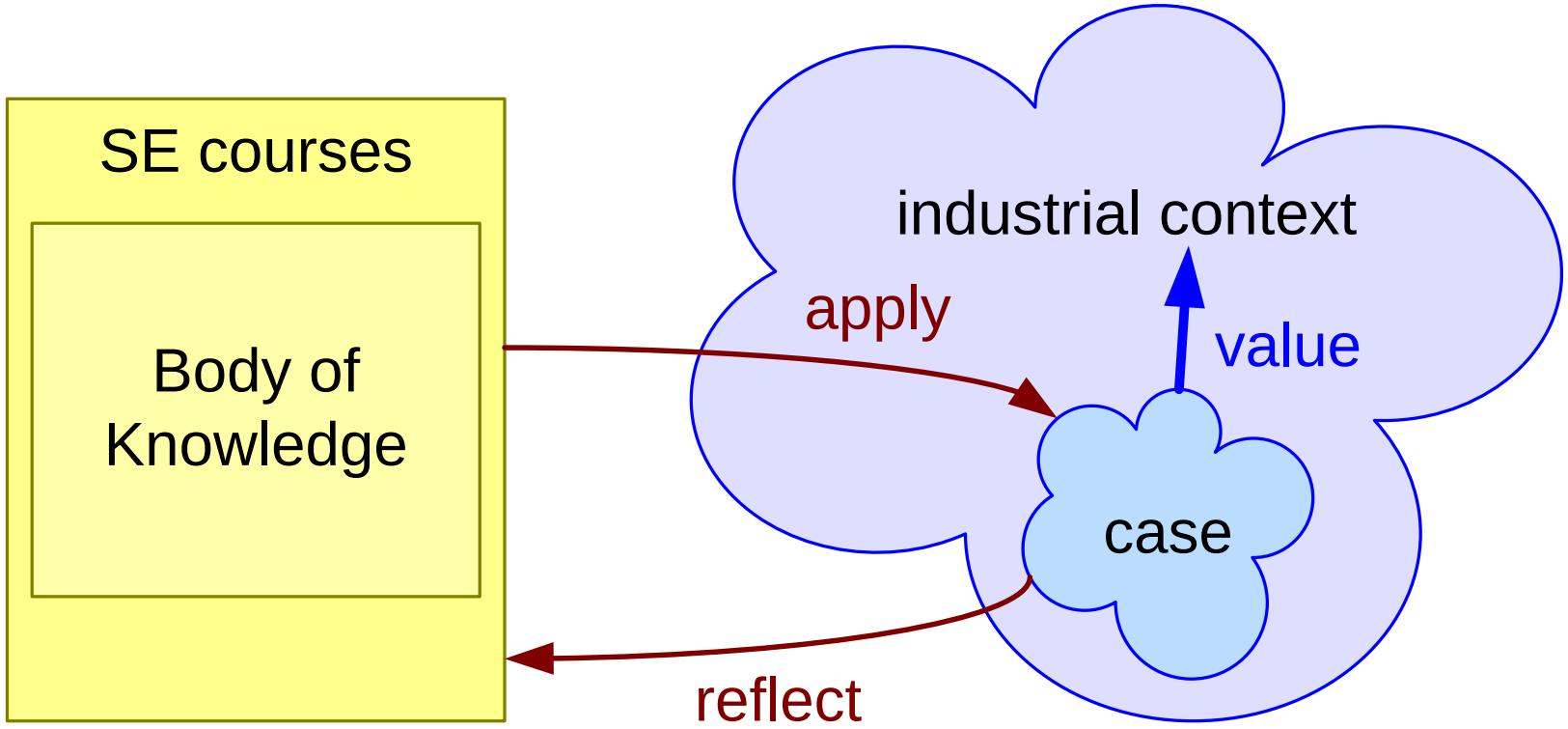
Reflective Practice; 9 Workshops in 3 Years



Reflective Practice Connects Study and Work



Objectives of Master Project



Apply part of the SE body of knowledge in practice and **evaluate** and **reflect** on its application, while **providing value** to the industrial sponsor

Industrial Networking

formal boards

strategic decision makers

Industrial Advisory Board

tactical subject matter experts

Reference group

operational HRM

HR forum

events

KSEE
June

SESG
November, February

Xmas party

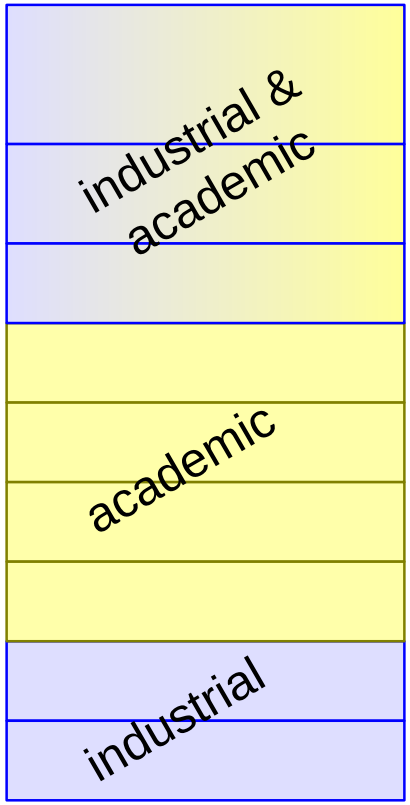
Research & Education

in-company courses

research

and a large amount of informal contacts

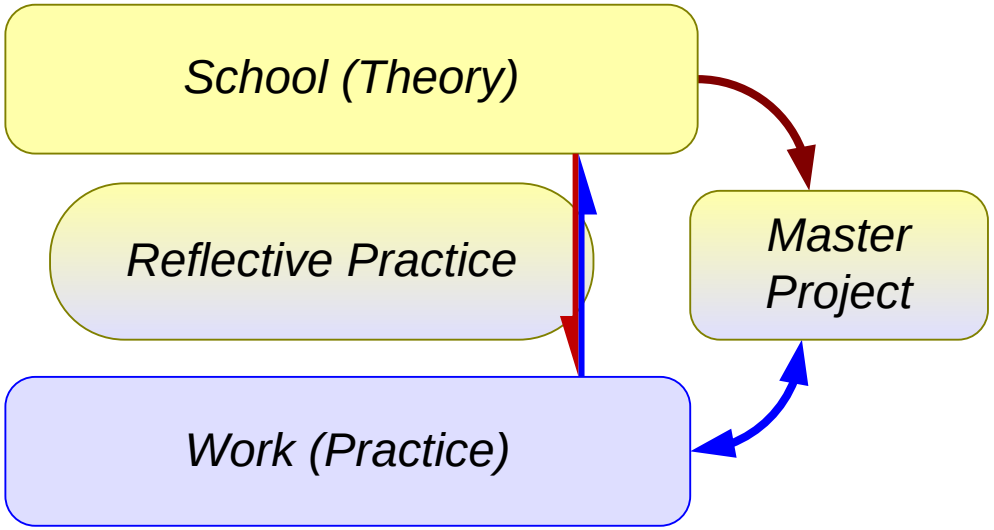
Challenge: Recruiting Industrial and Academic Staff



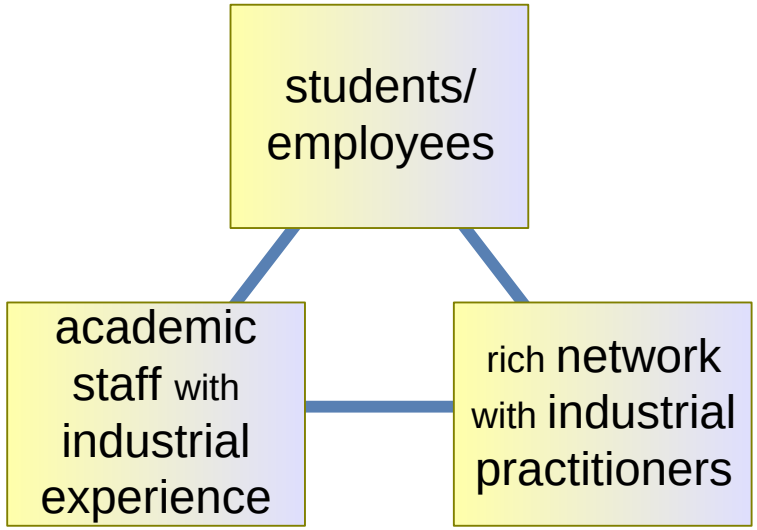
part-time academic staff

- highly experienced
- recognized
- broad coverage

Summary



Studying and working concurrently
Format and pedagogic of courses fits industry
Reflective Practice connects study and work
The master project is the closure



Continuous investment in industrial relations
Offering an inspiring environment and network
for practitioners, students, and staff