

Gerrit's 44 Year Career

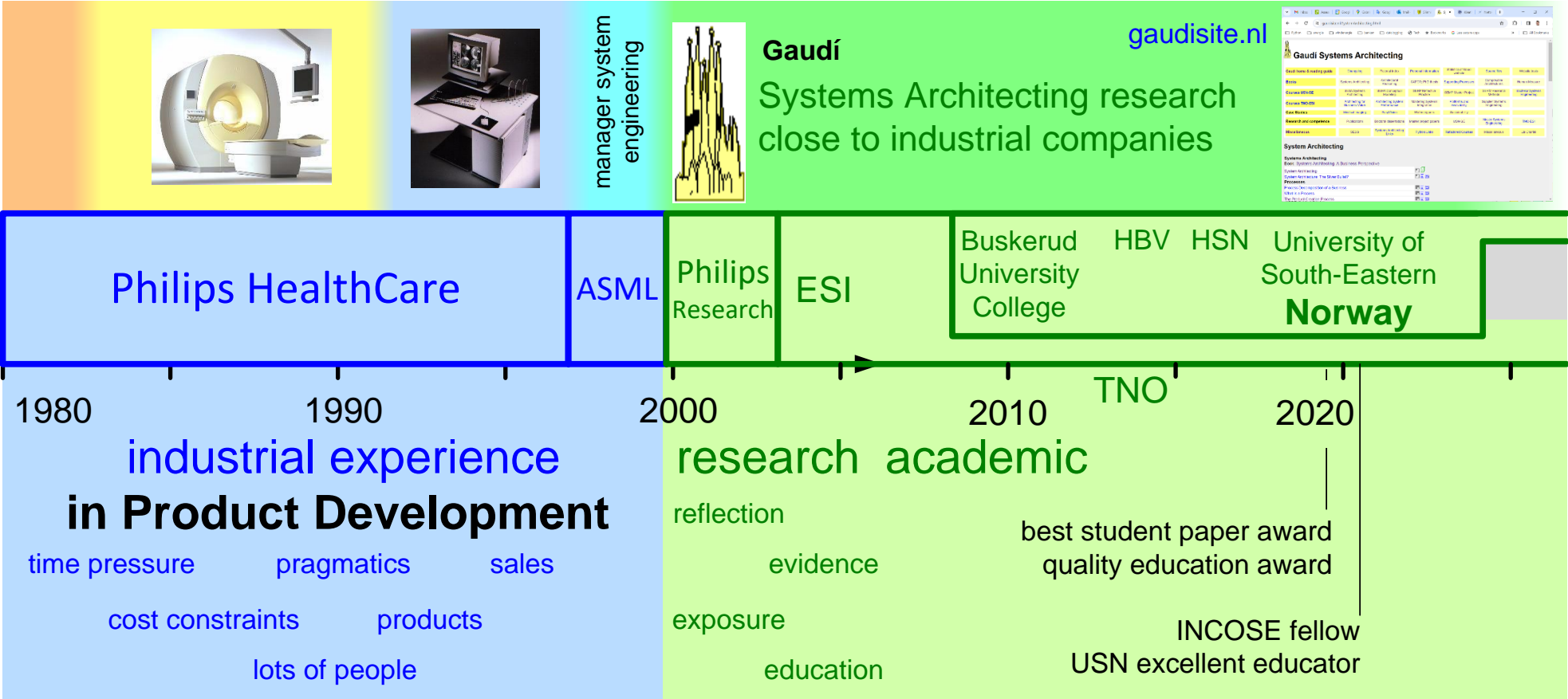
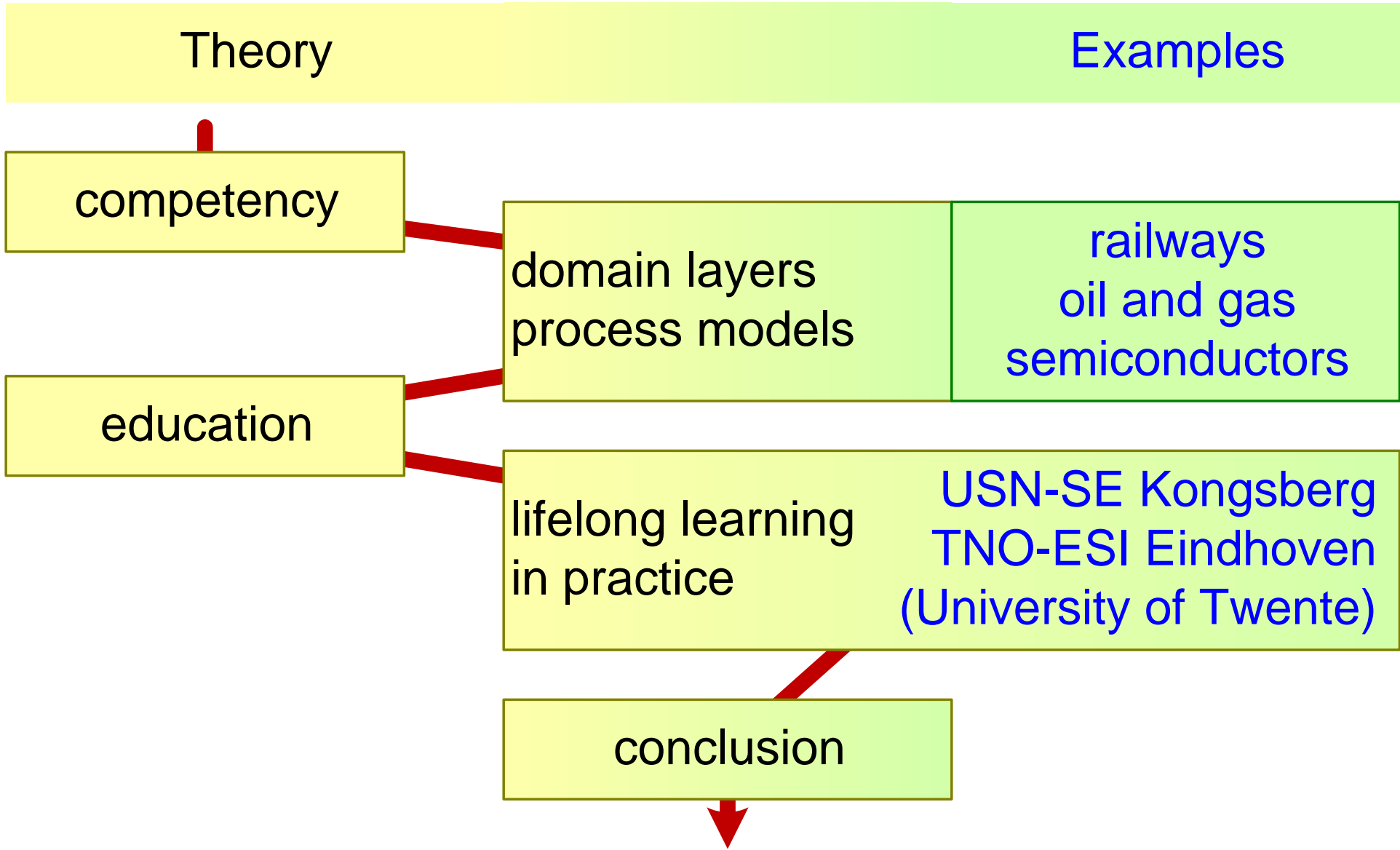
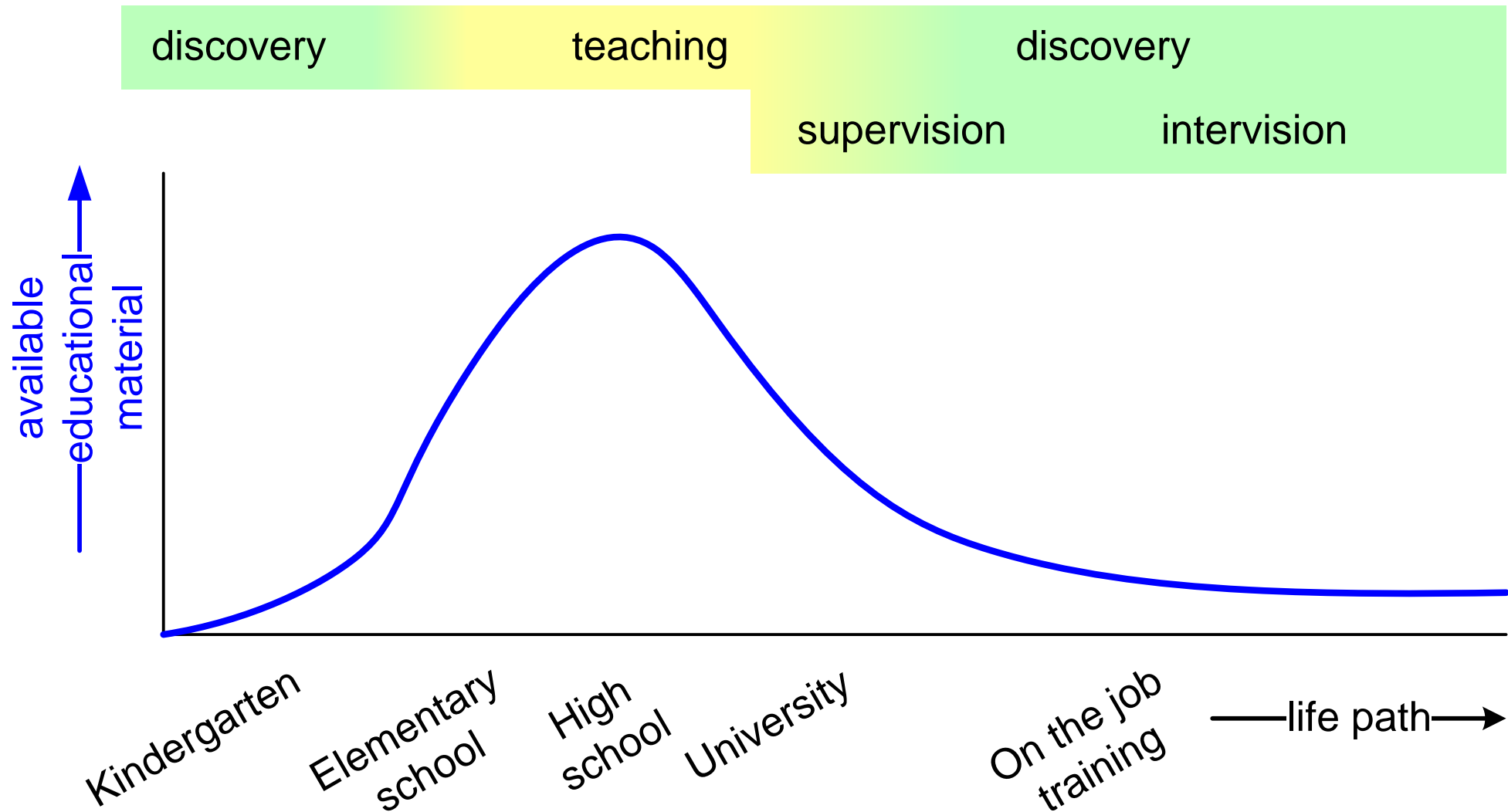


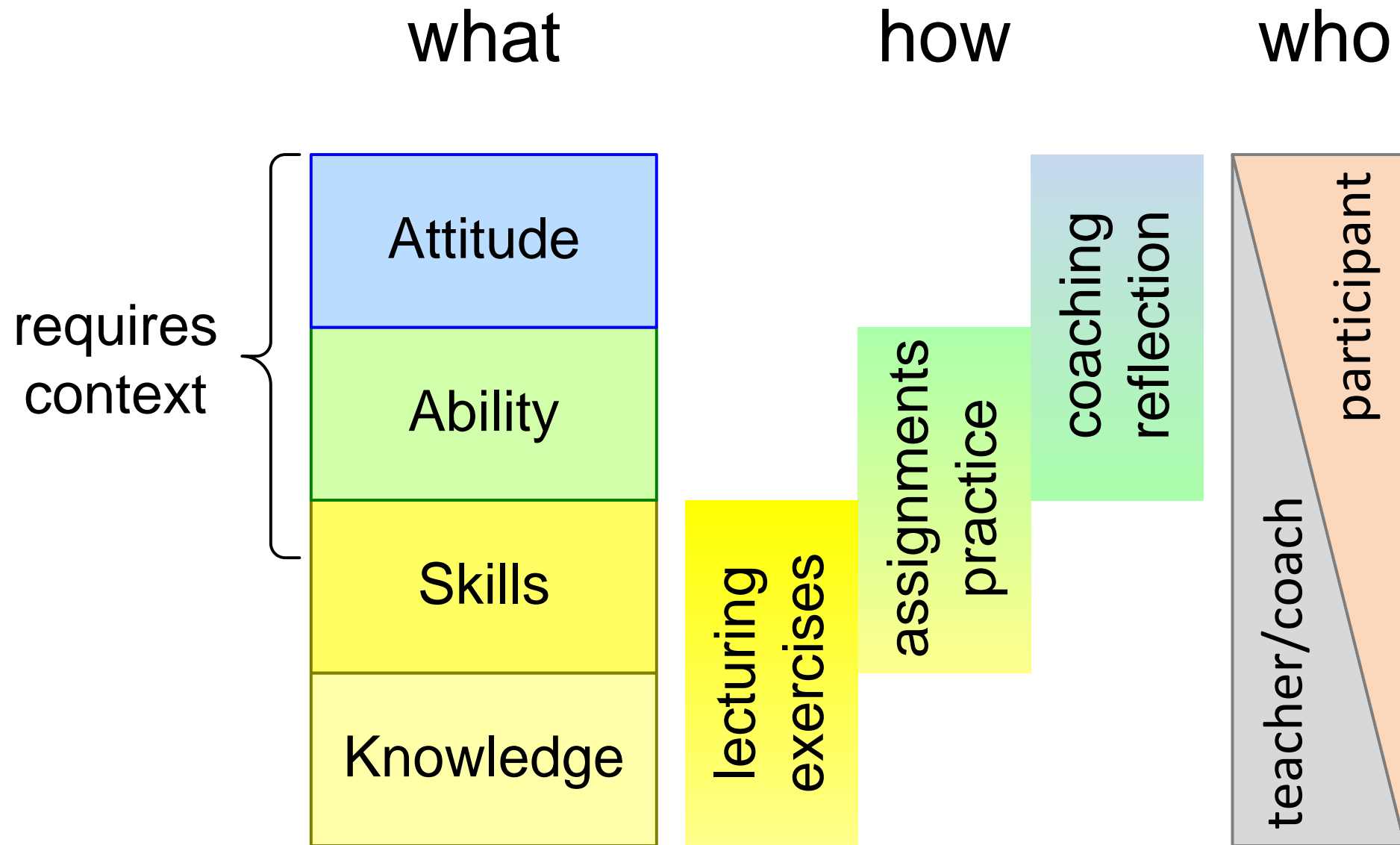
Figure to Help You with Viewpoint Hopping



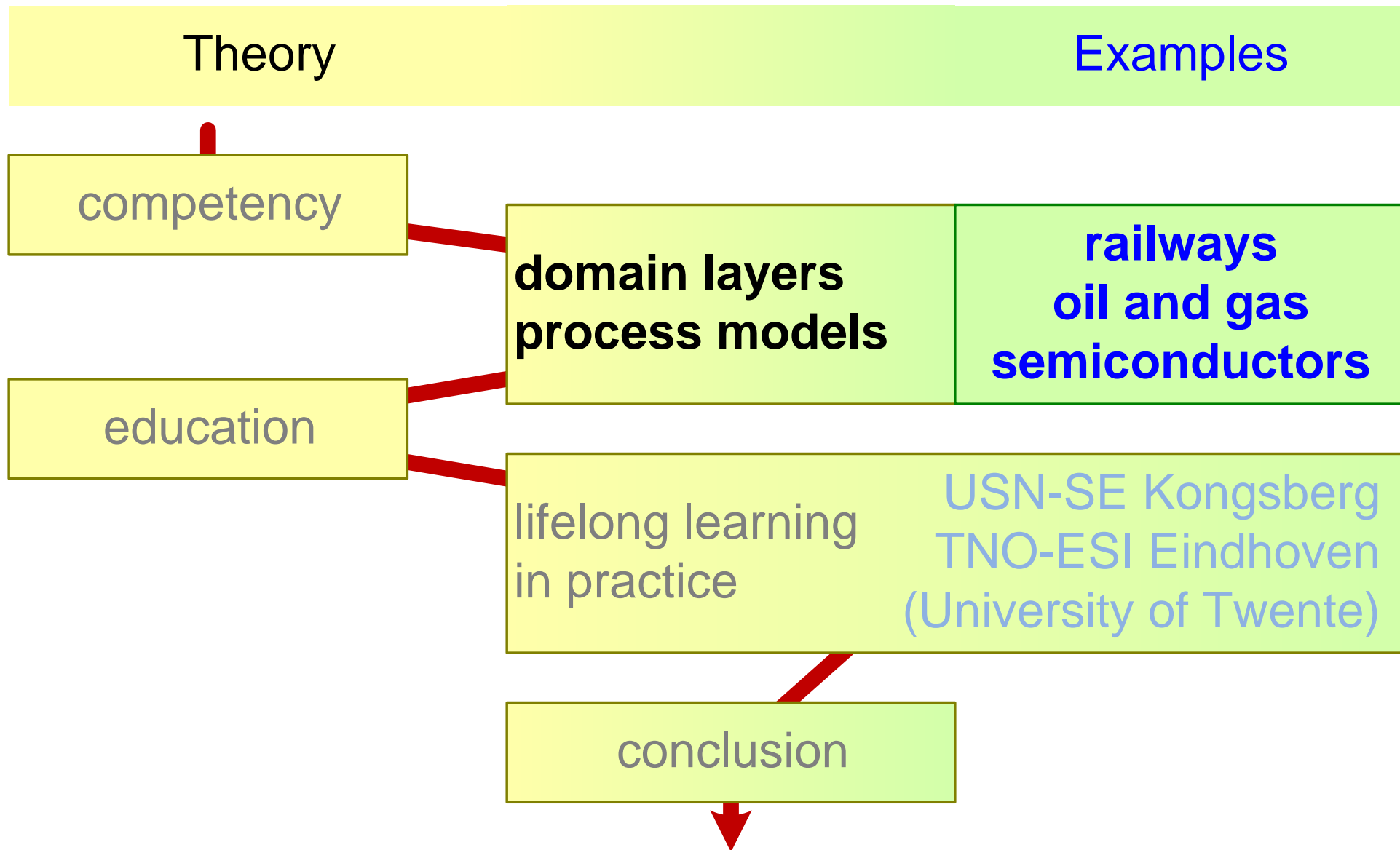
After Formal Education, Learning Depends More on Discovery



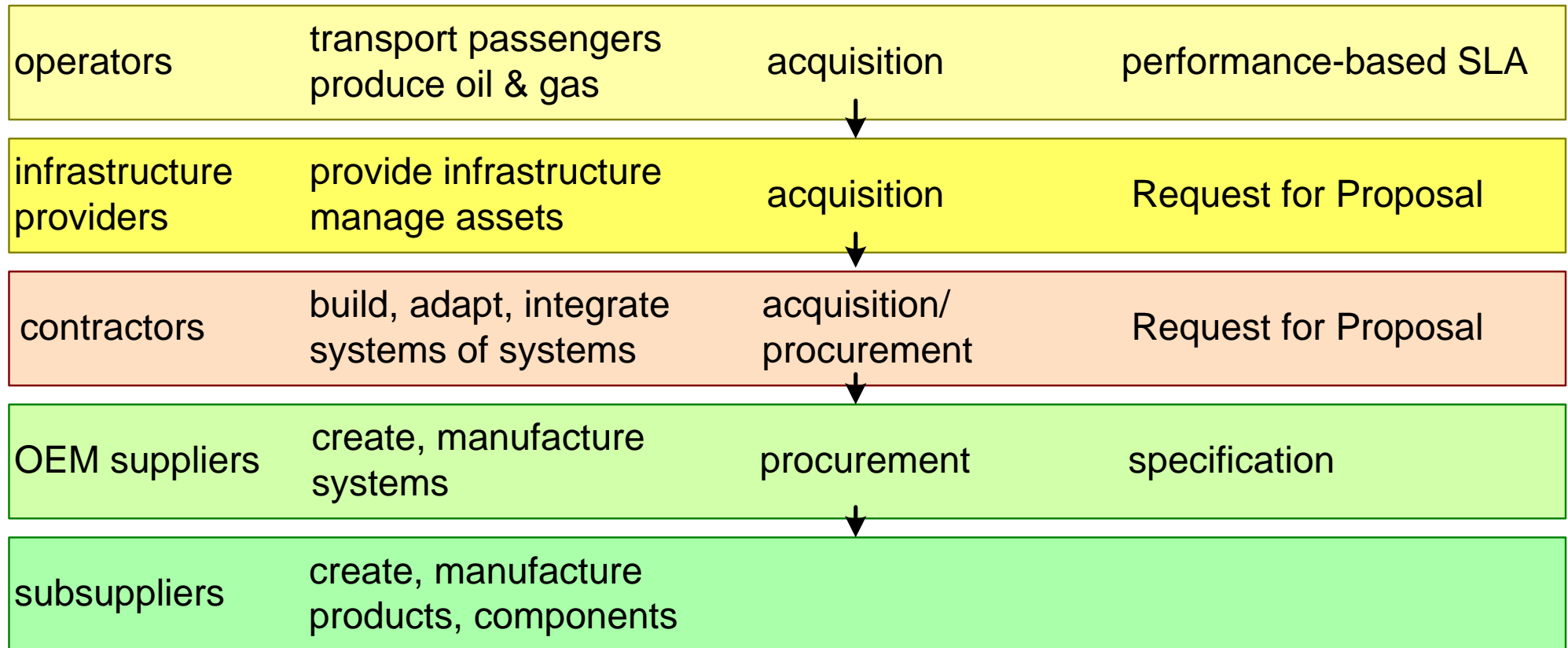
Life-Long Learning of SE Focuses on Attitude and Ability



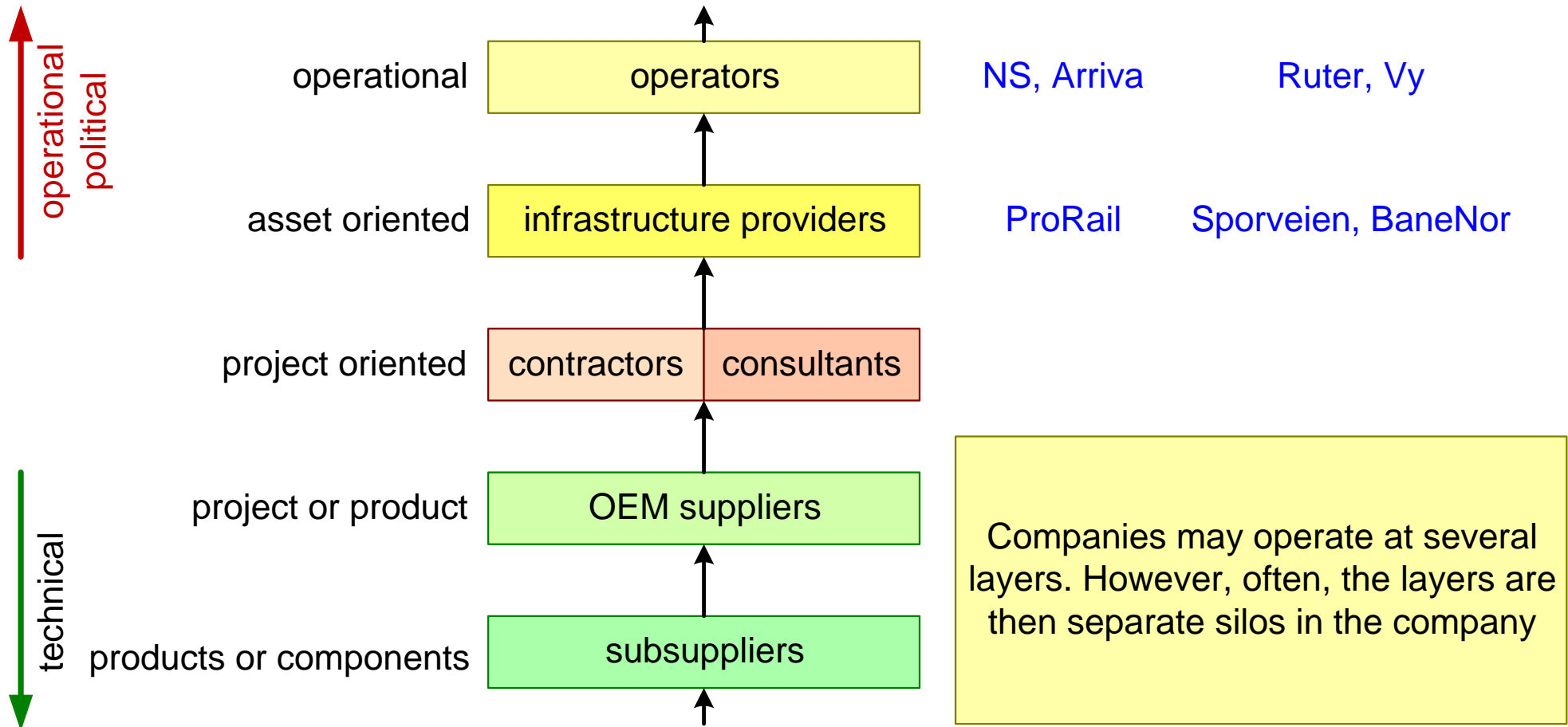
Layers of Domains and Their Processes



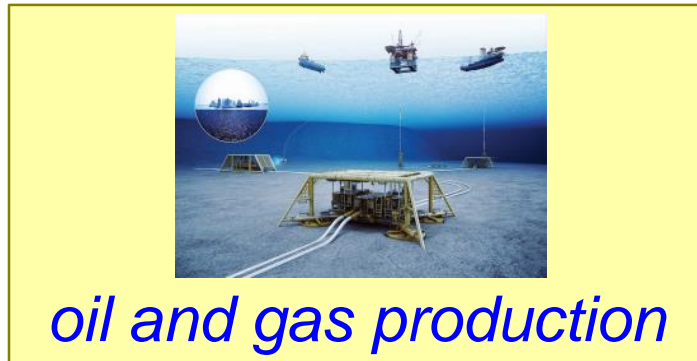
Characterization of Domain Layers



Positions in the Value Network Differ in Nature

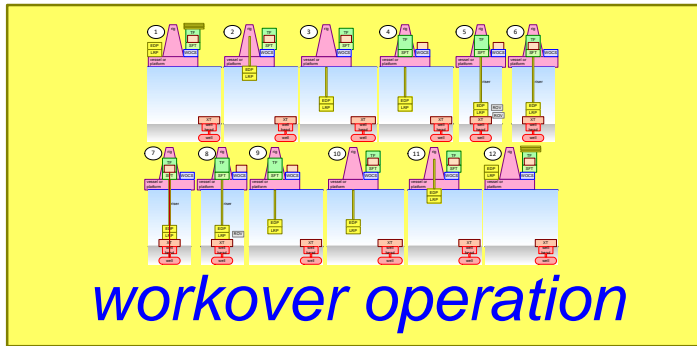


Example in Oil and Gas Offshore



operational

Equinor, Shell



asset oriented

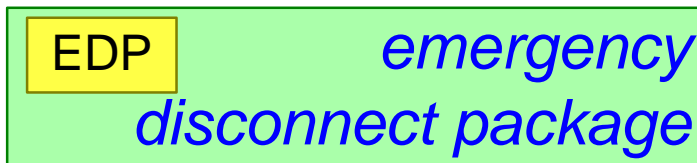
Equinor, Shell

TechnipFMC



project or product

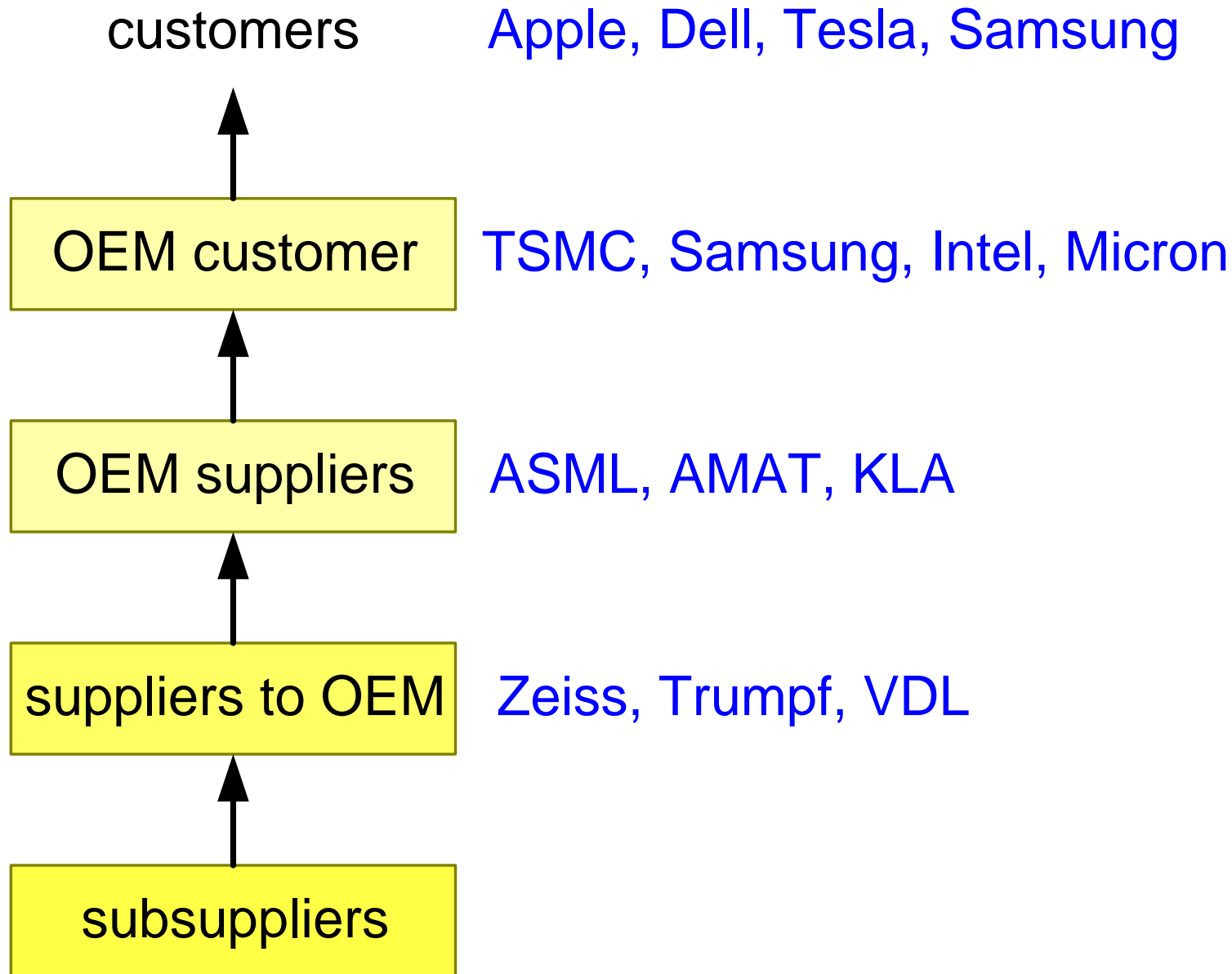
TechnipFMC



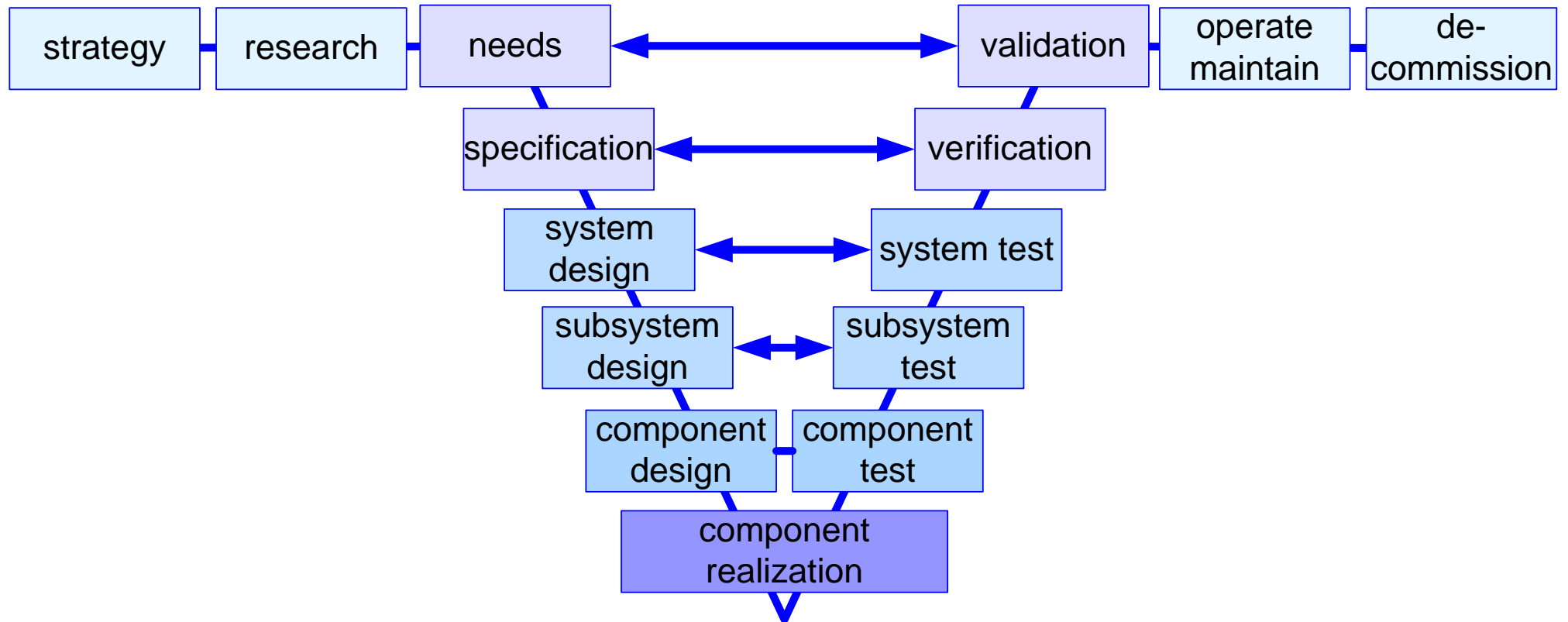
product

TechnipFMC

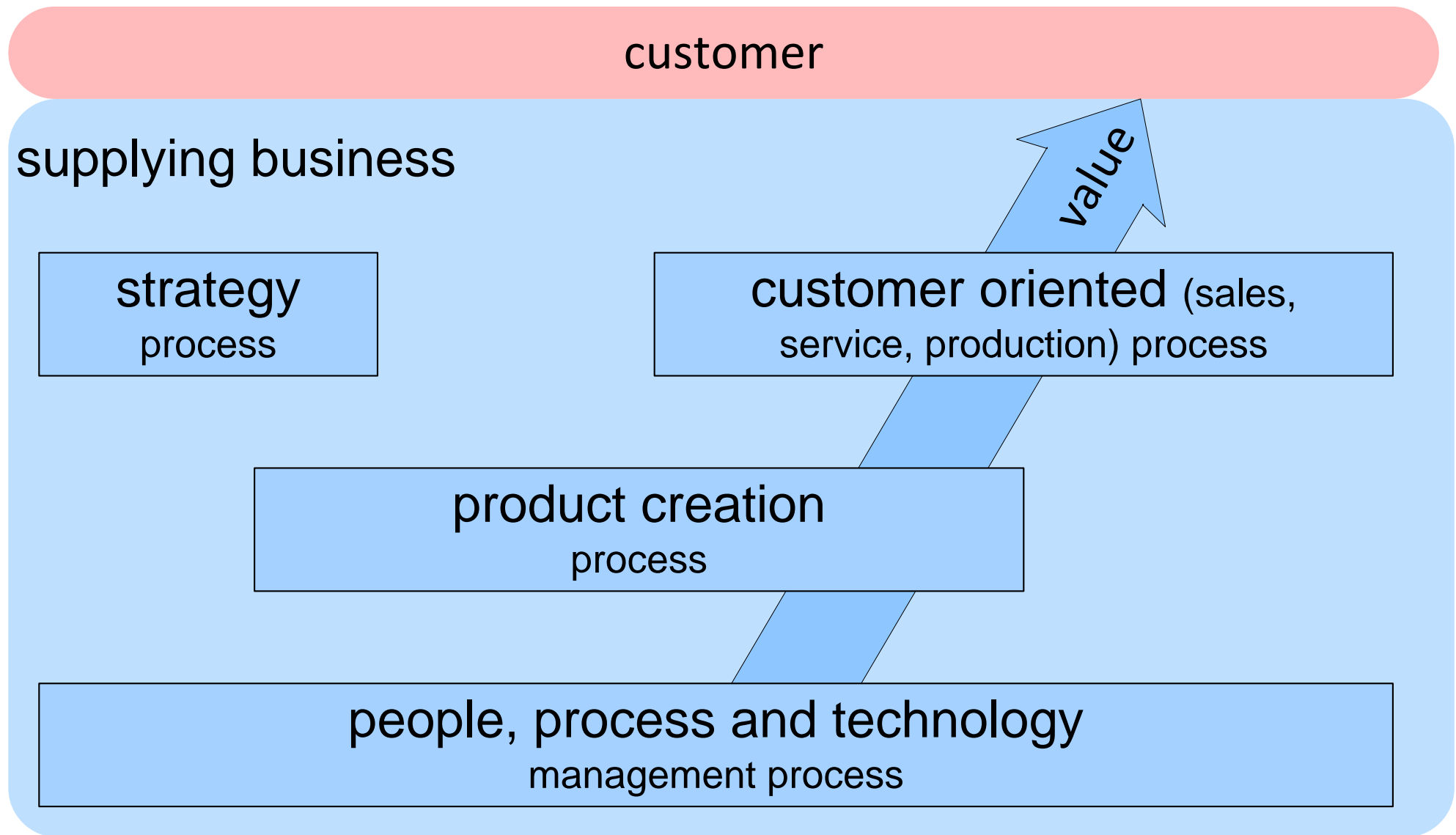
Example in Semiconductor Industry



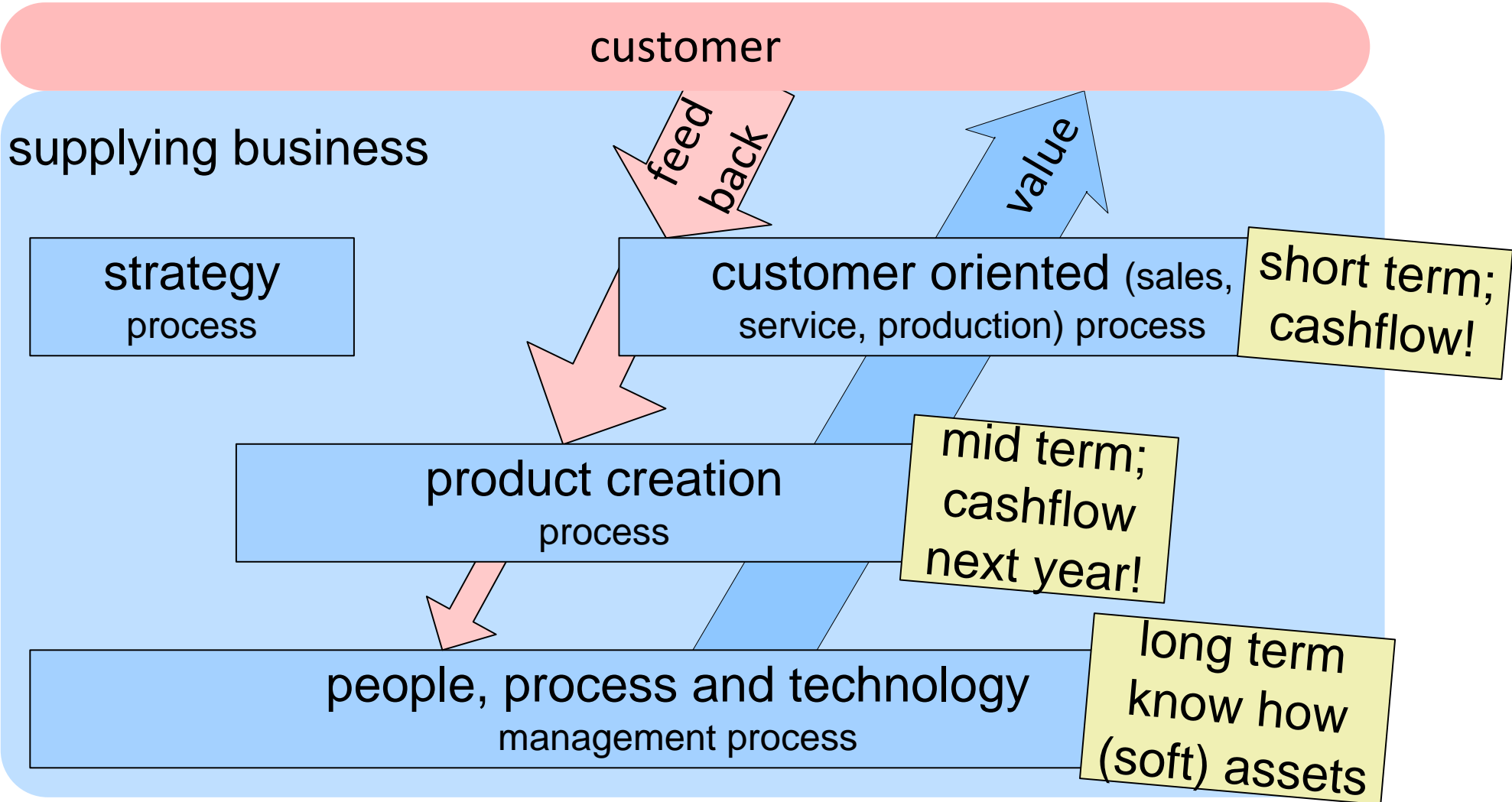
Most Organizations are Familiar with the V-Model



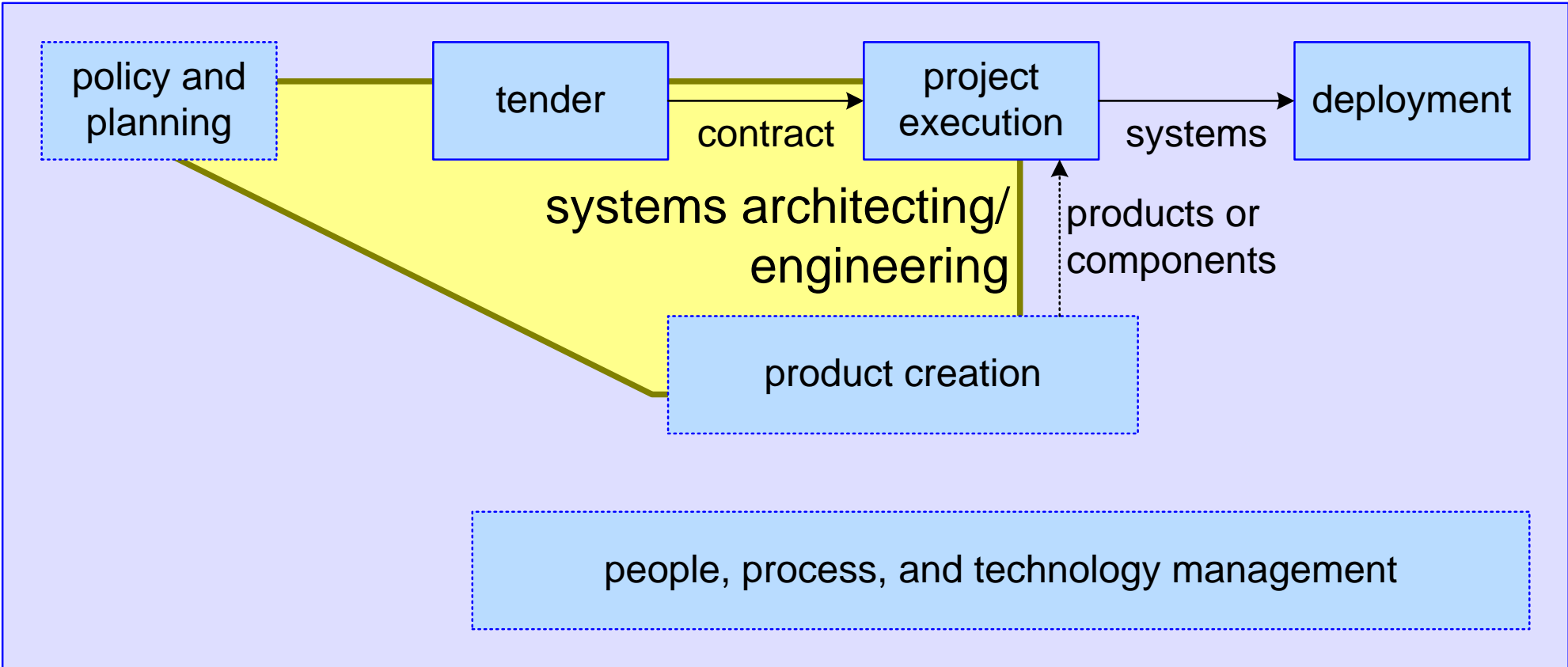
Simplified Process View Products to Gain Insight



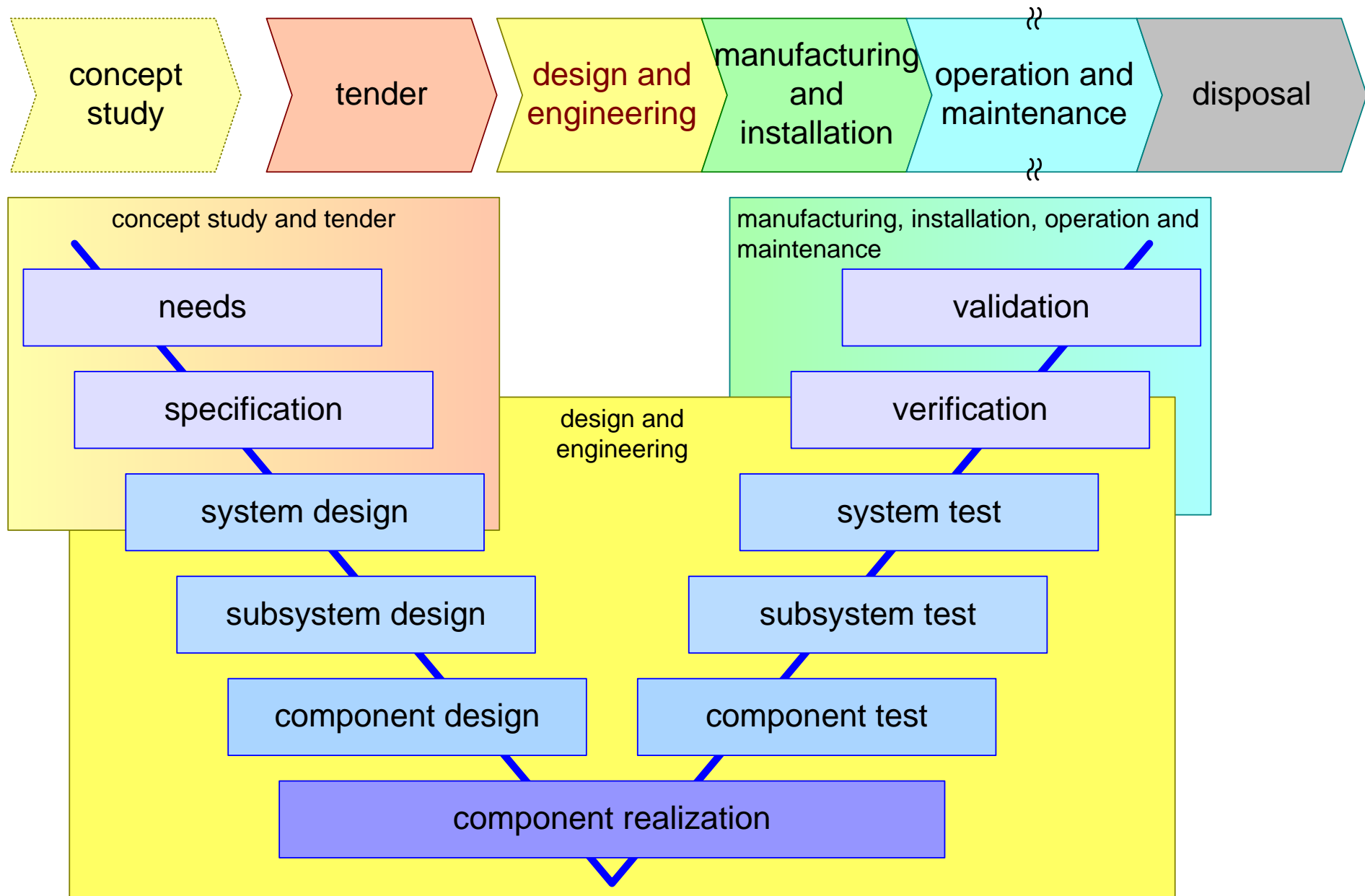
Healthy Tension between Processes and Time Scales



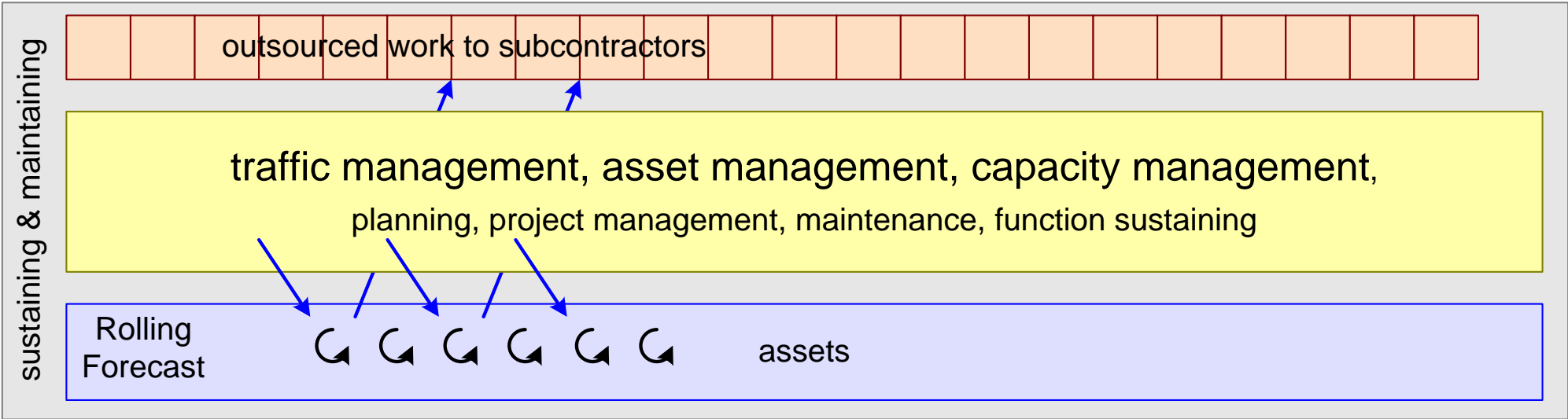
Projects Split Tendering and Project Execution



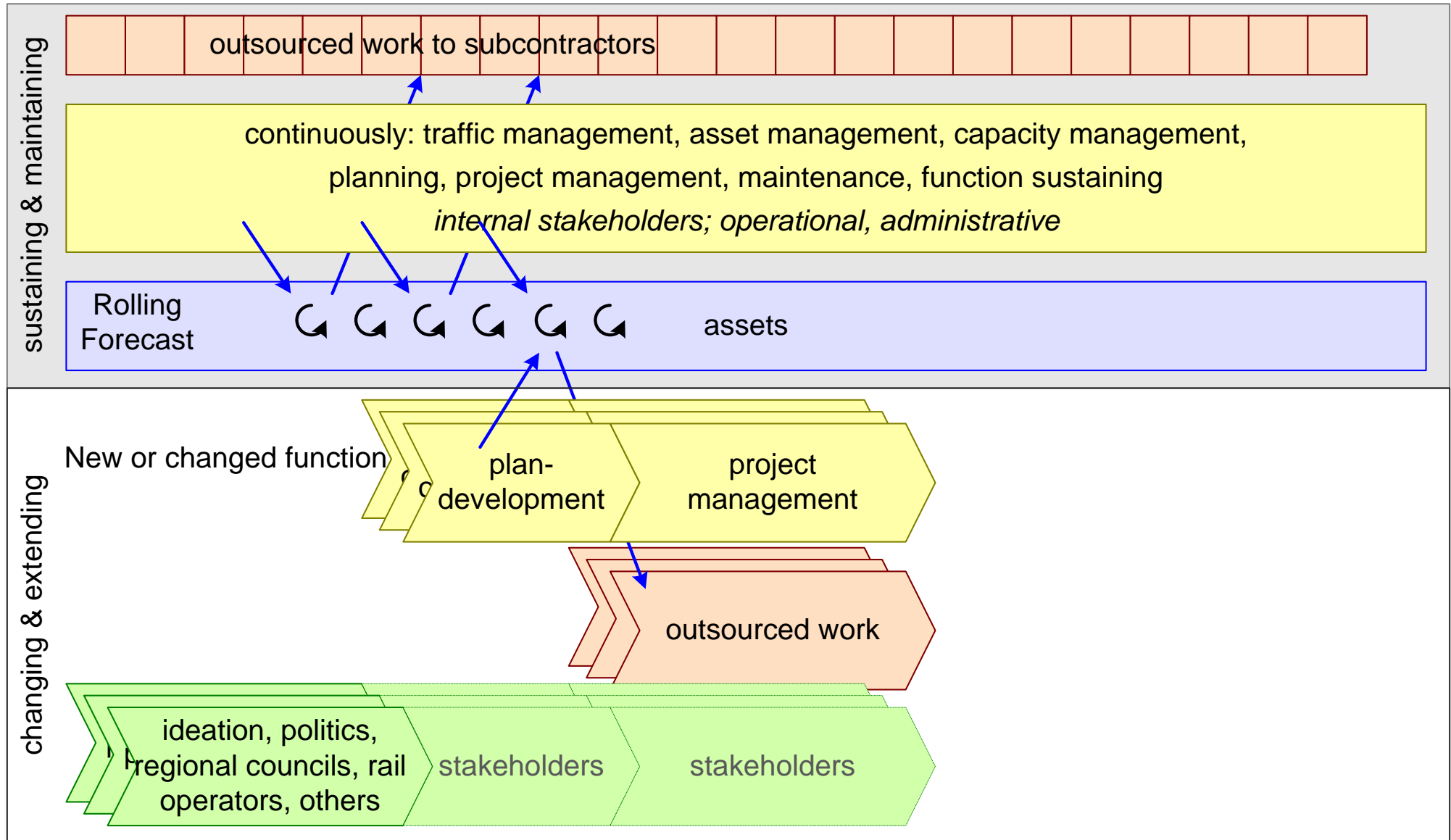
Tendering Limits Crucial Feedback



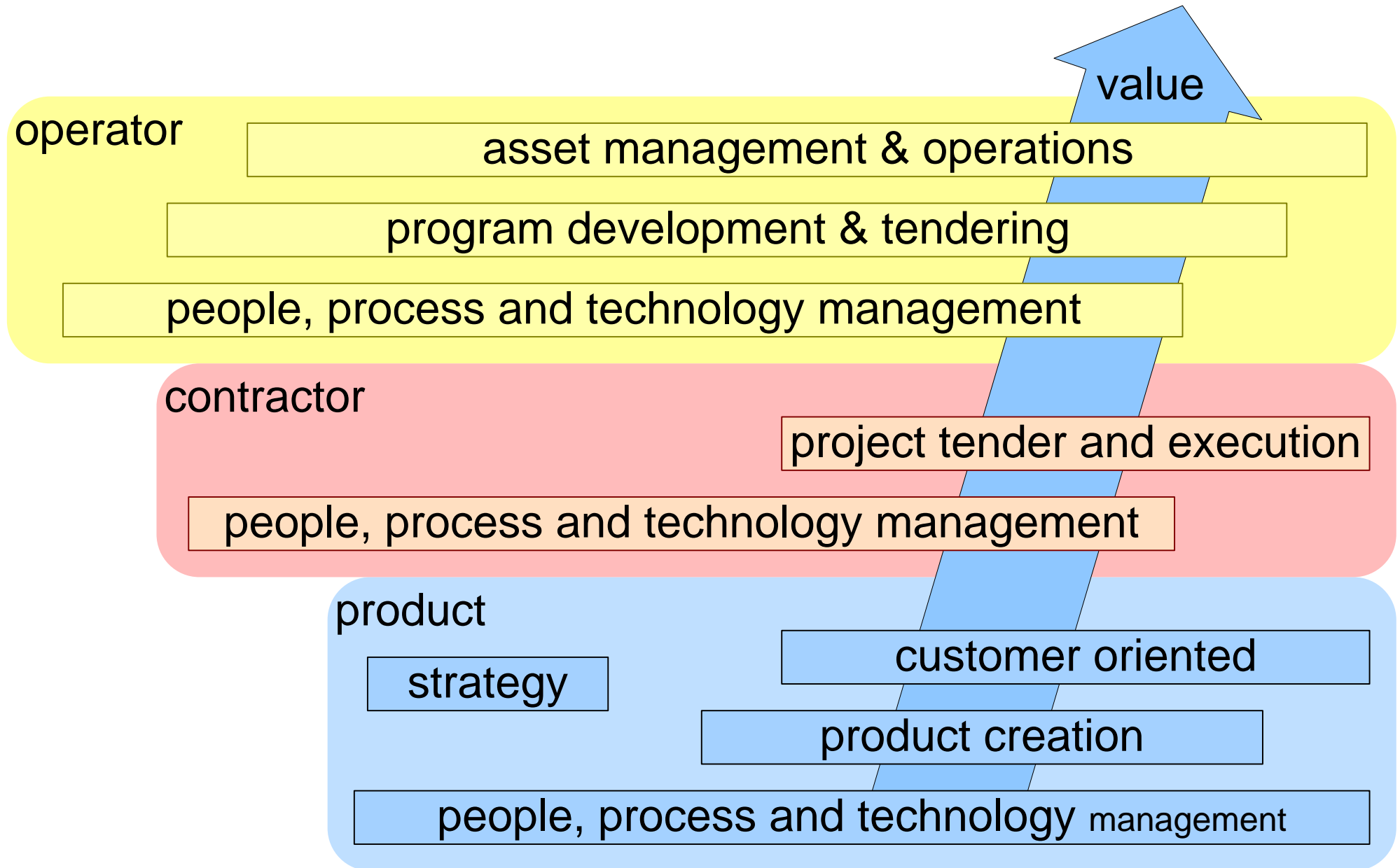
Railways Provider: Focus on Assets and Traffic



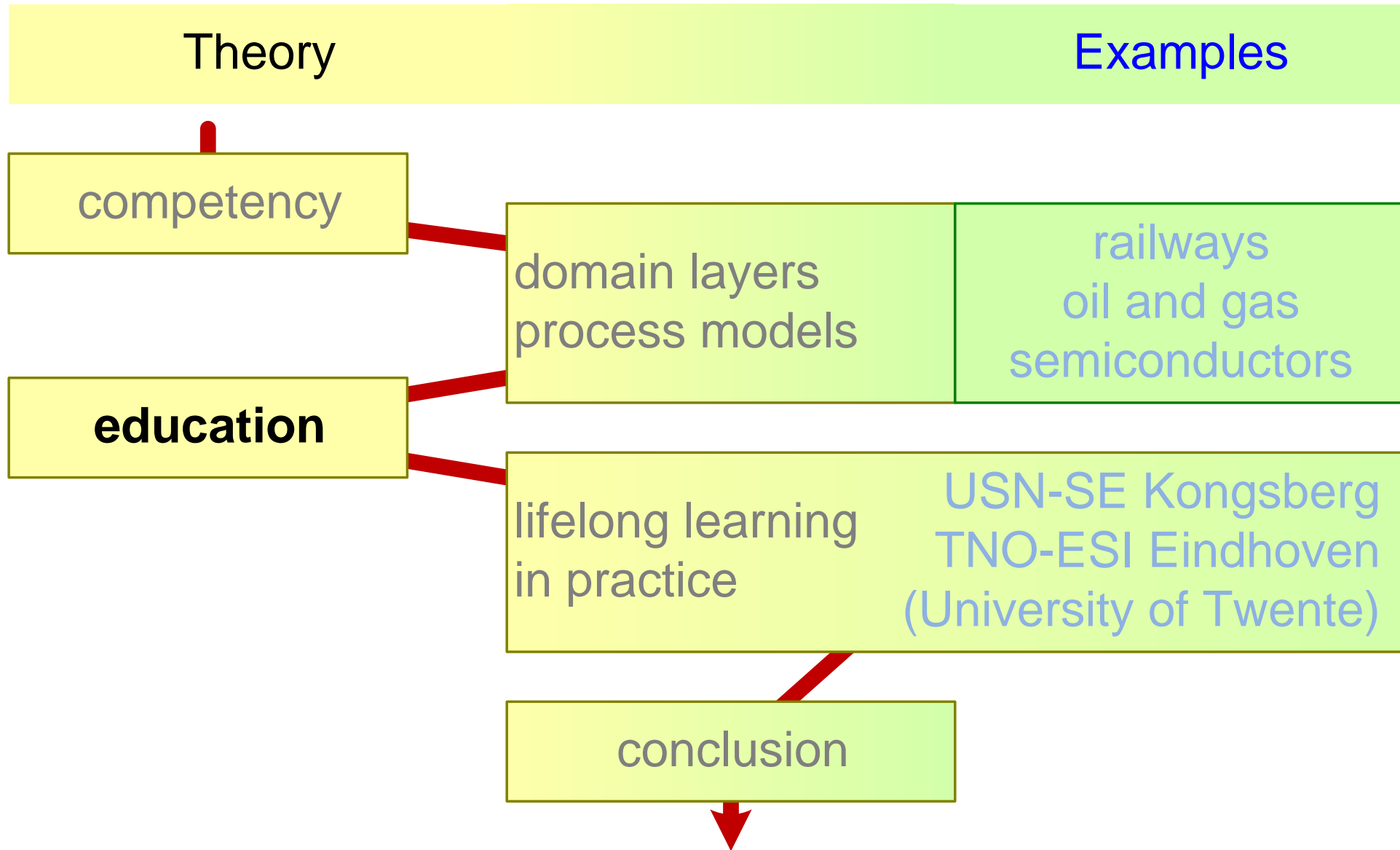
Railways Provider: Program Development



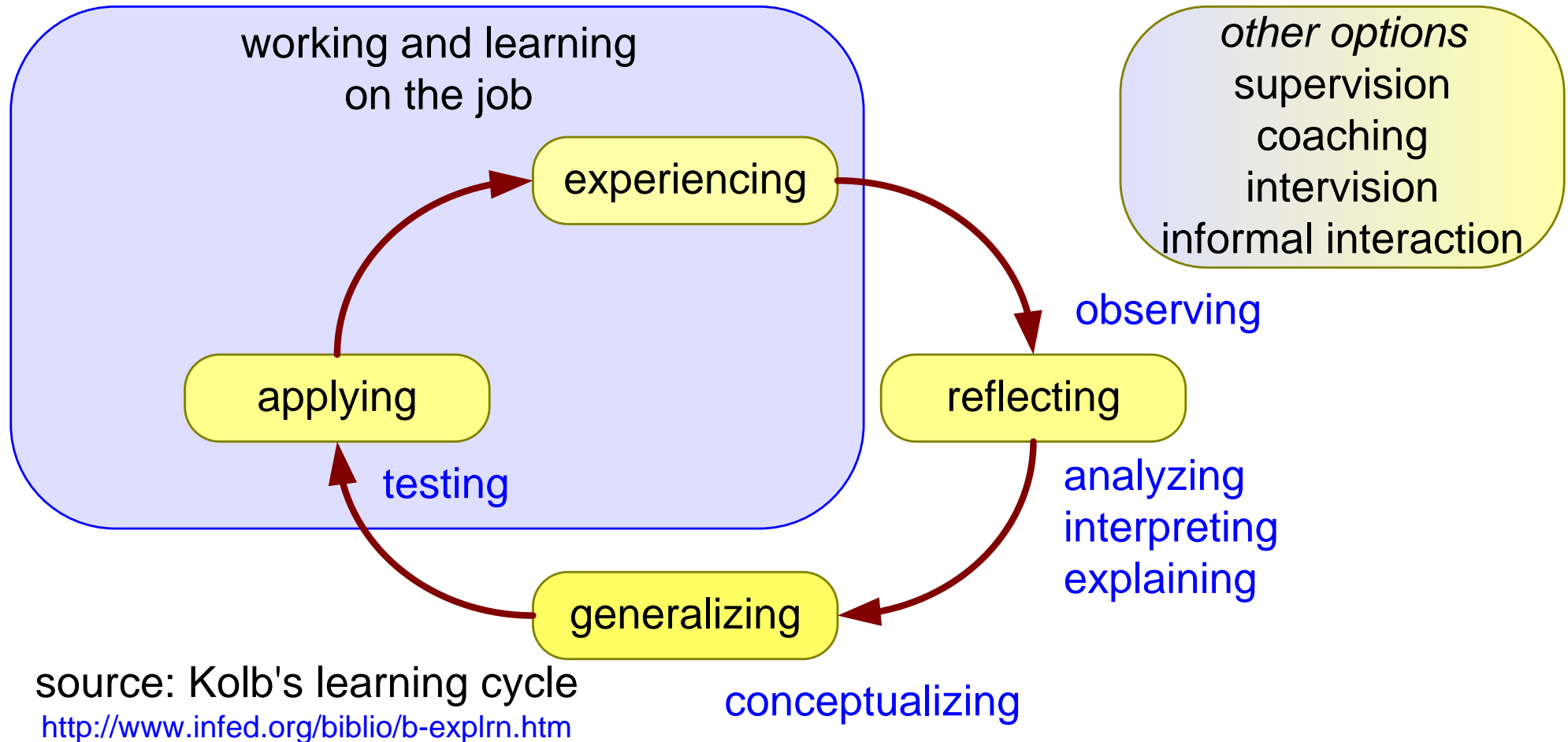
The Value Chain across the Layers



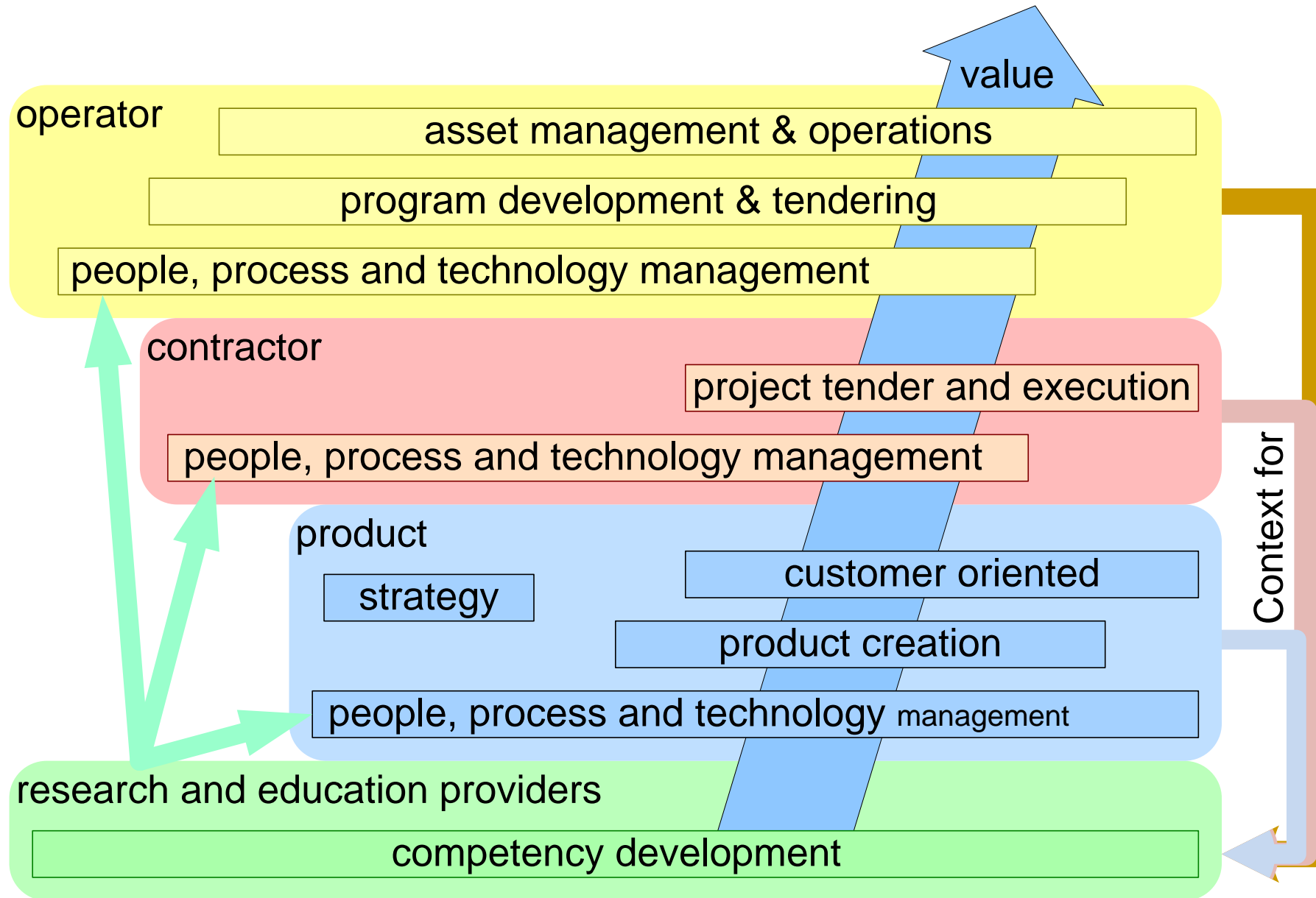
Education



On the Job Learning is Most Effective, If ...



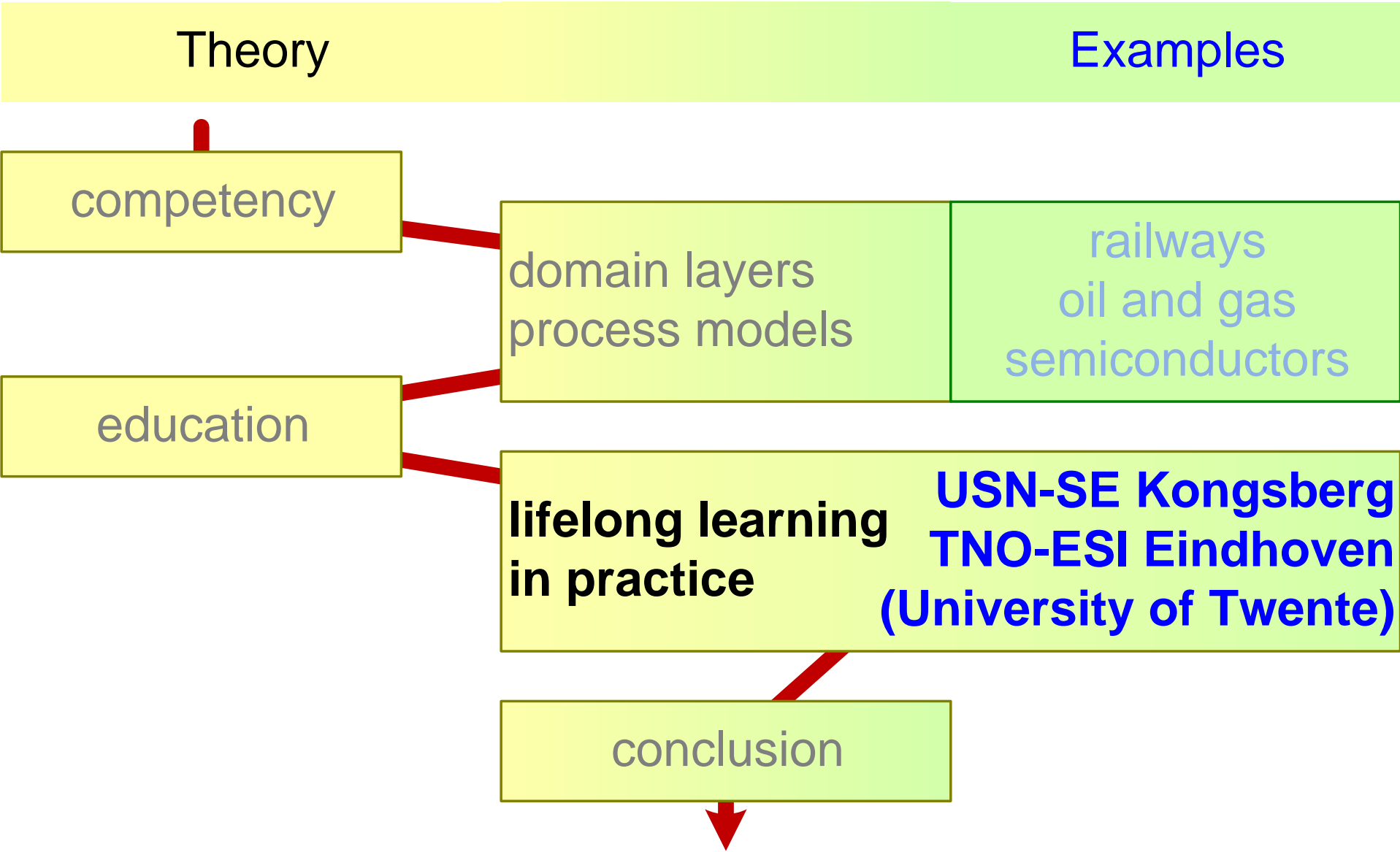
Research and Education as Long-Long-Term Process



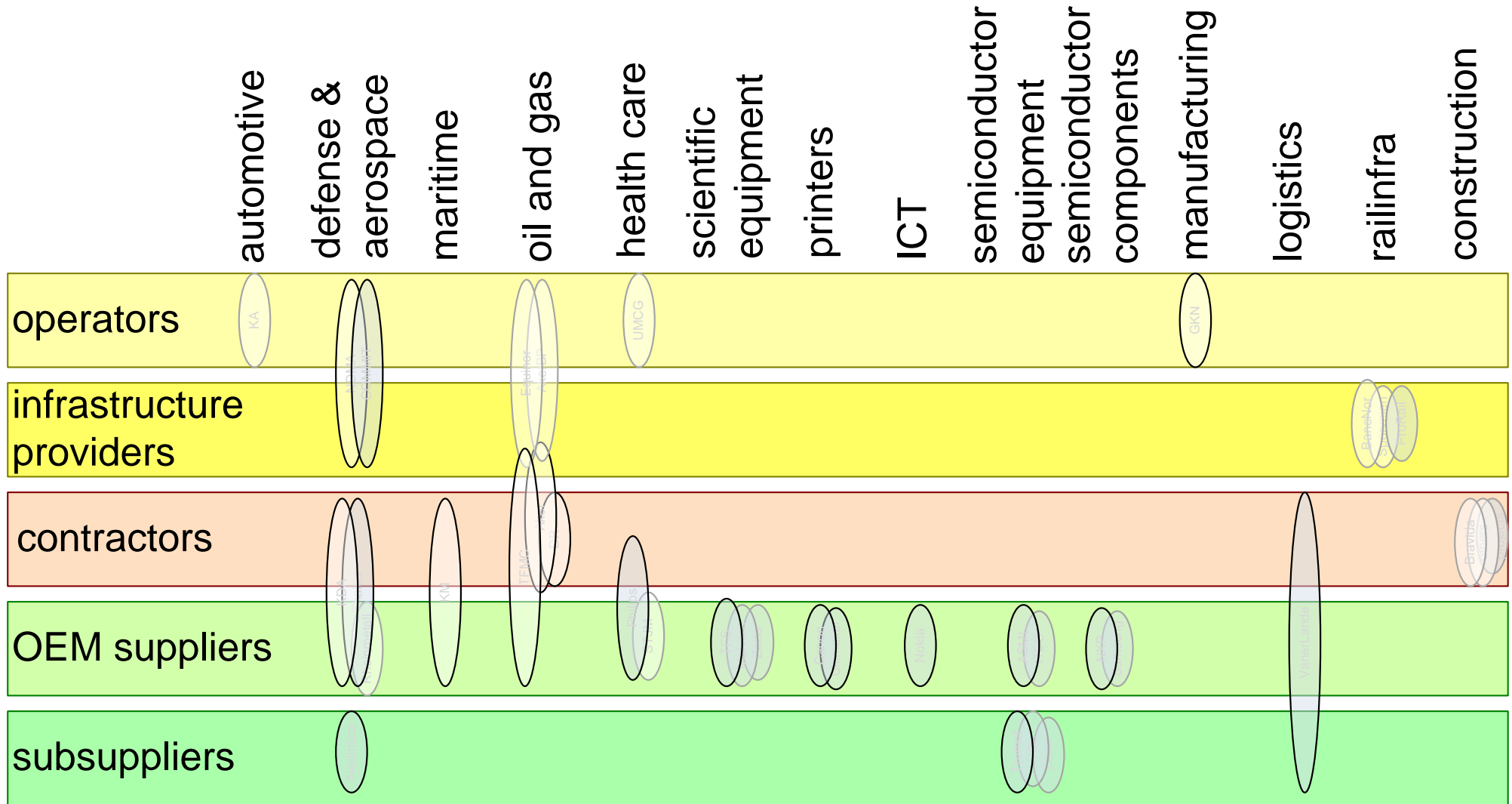
Types of Education Vary in Study Load and Impact

education type	study load	duration	learning outcome	when applicable
intervision	1..2 hrs	1..2 hrs	learning	all career
supervision	1..2 hrs	1..2 hrs	learning	early career
event	1..8 hrs	1..8 hrs	refresh	all career
course	2..5 days	2..7 days	expand knowledge or skills	early & mid career
program	20..40 days	6..12 months	boost competence	mid career
bachelor study	3..4 years	3..5 years	lay foundation	before career
master study	1.5..2 years	2..6 years	expand foundation	before or during career
PDeng	2 years	2 years	change mindset	before or during career
industrial PhD	3..4 years	4..6 years	change mindset	before or during career

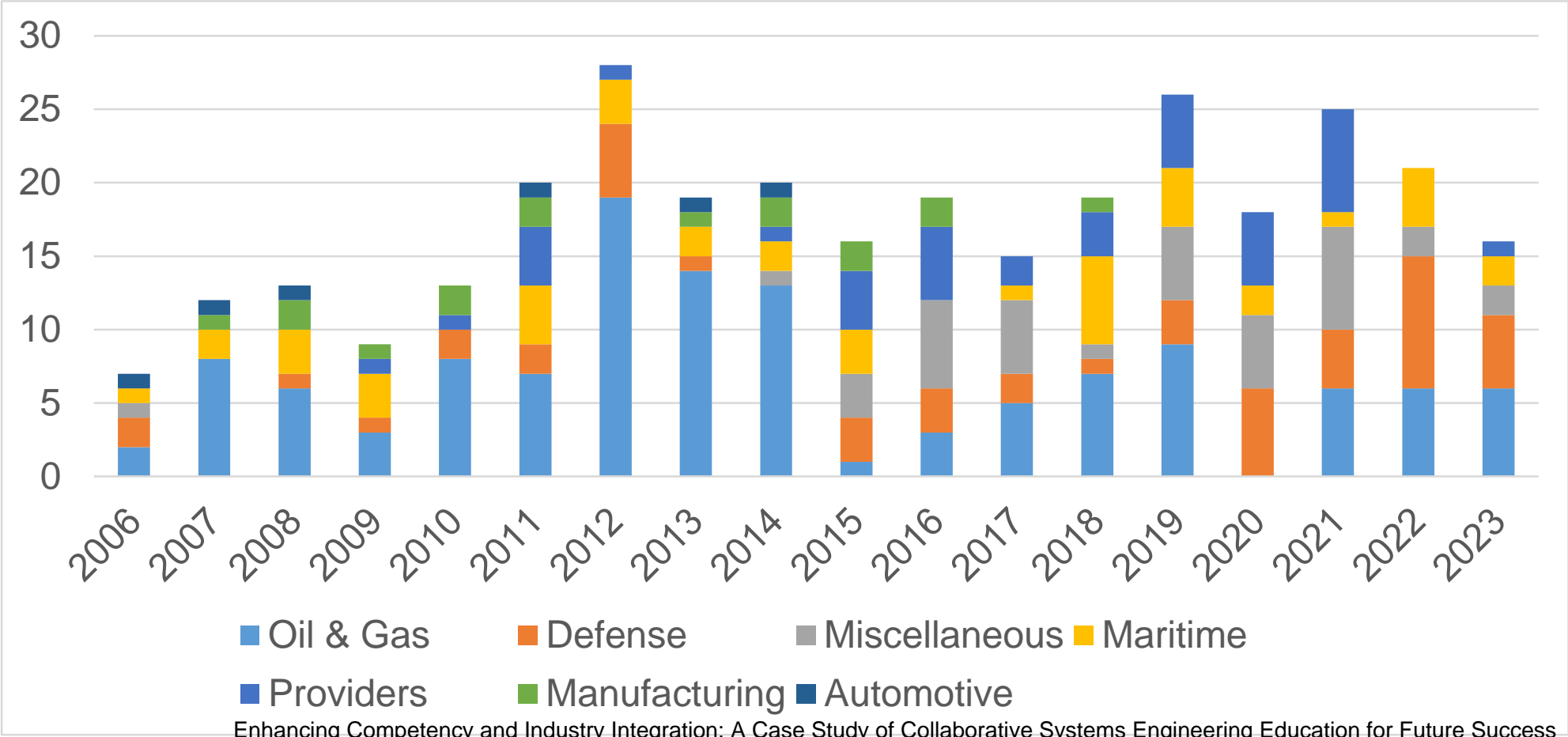
Lifelong Learning in Practice



USN-SE and TNO-ESI Experience past 24 Years

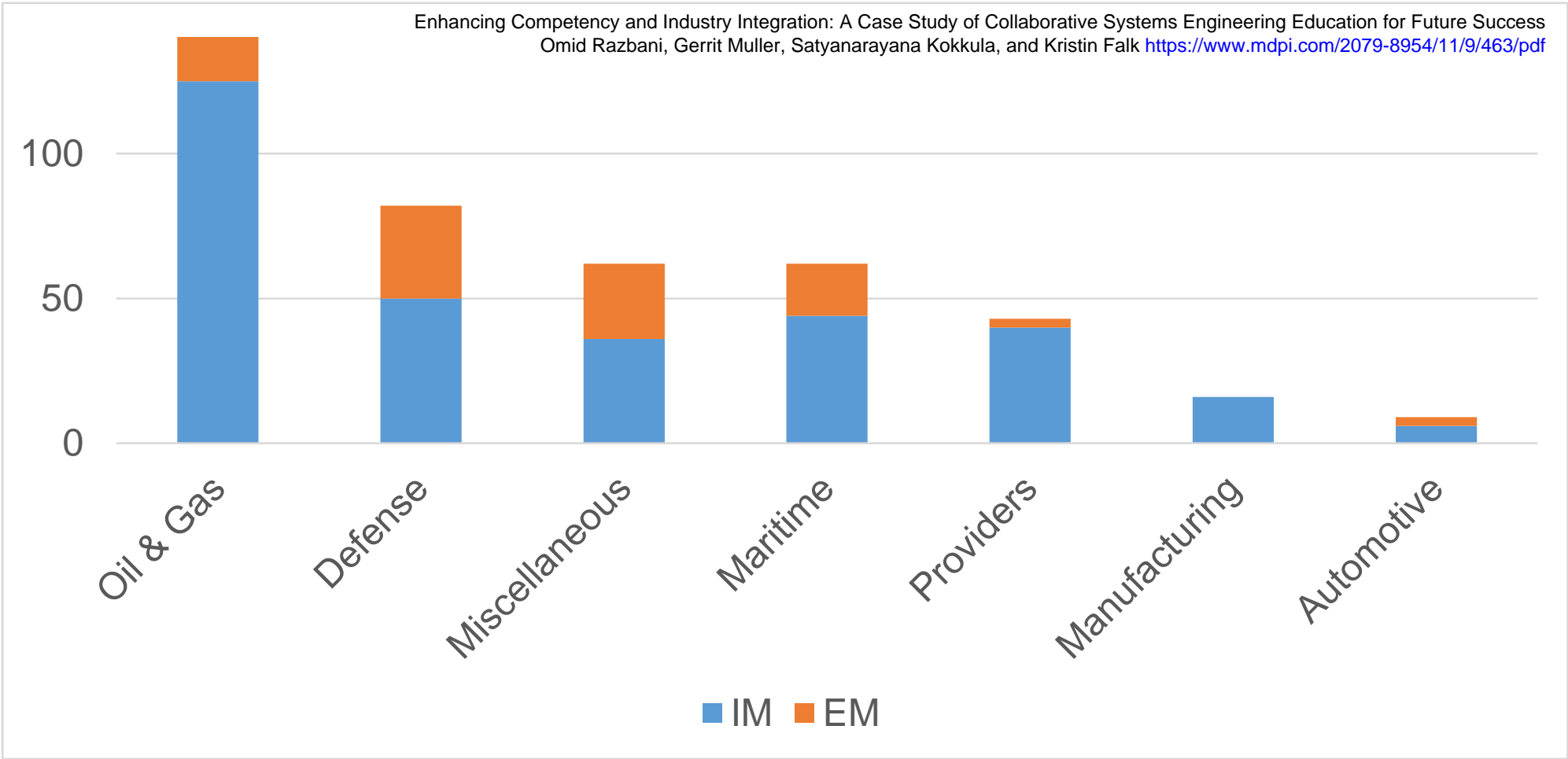


Number of Starting Industry Master Students per Domain

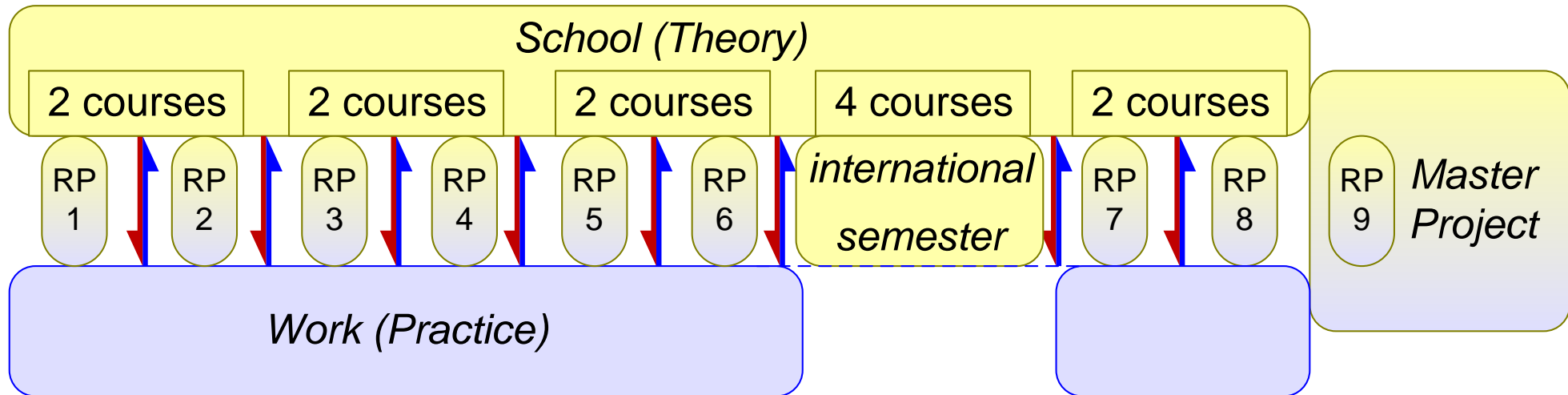
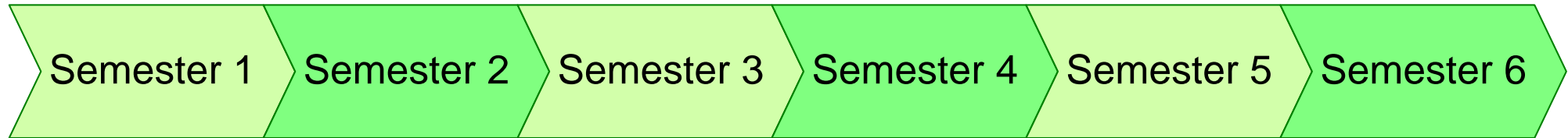


Enhancing Competency and Industry Integration: A Case Study of Collaborative Systems Engineering Education for Future Success
 Omid Razbani, Gerrit Muller, Satyanarayana Kokkula, and Kristin Falk <https://www.mdpi.com/2079-8954/11/9/463/pdf>

Distribution of Students over Domains



The USN-SE Industry Master Format Fits Industry Needs



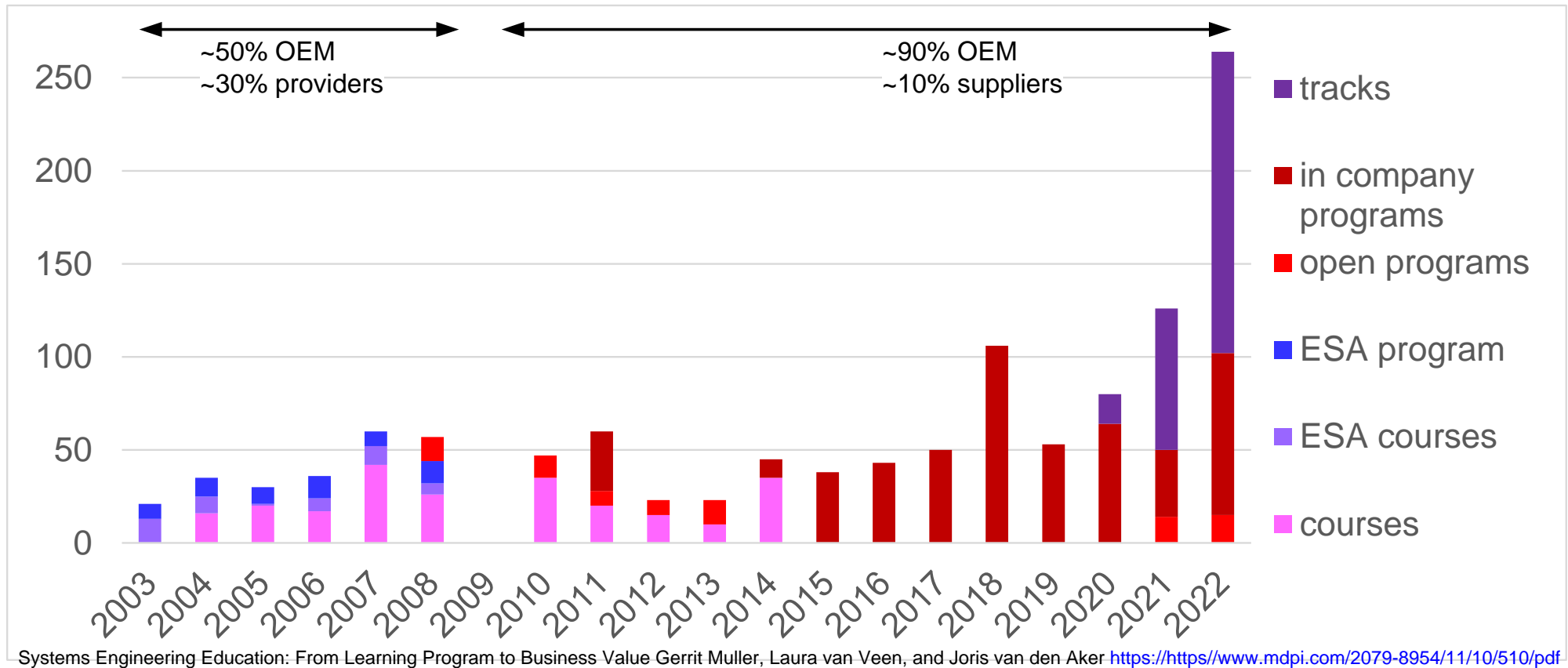
RP = ½ day workshop Reflective Practice

The Format Limits the Time that Employees are Absent

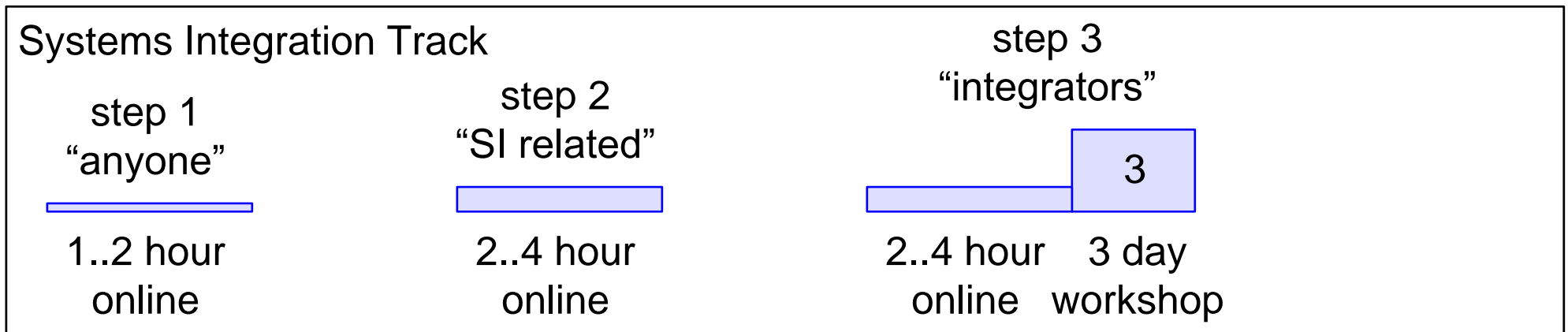
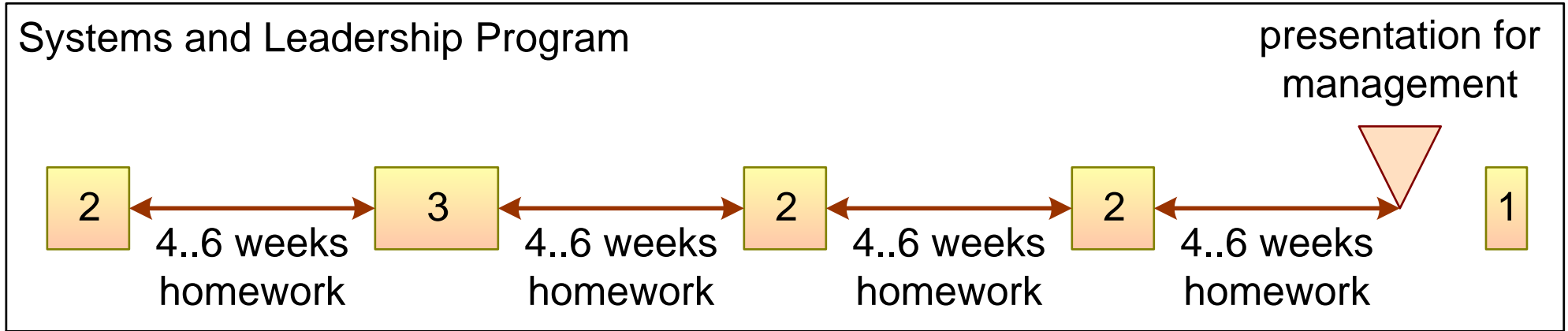
<i>Prepare</i> e.g. reading or online 0 to 20 hrs.	<i>Intense course</i> lecturing, discussion, and in-class group work 40 hrs.	<i>10 week homework assignment</i> case-based, individual or group work, with supervision 140 to 160 hrs.
---	---	--

- Students travel 3 to 6 times per year
- Study and work planning is flexible
- Active learning, case-based
- Actual industry cases are possible (depends on course)

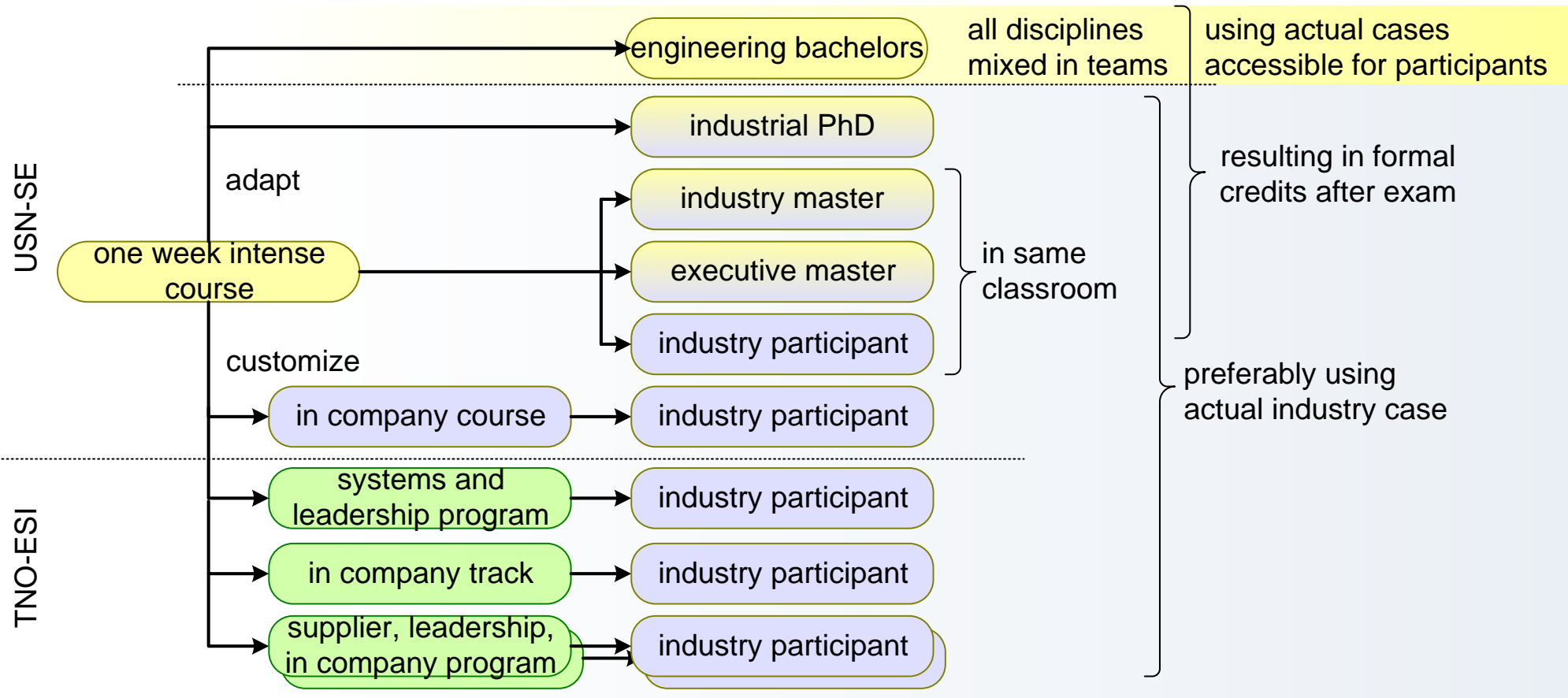
ESI Participants per Year



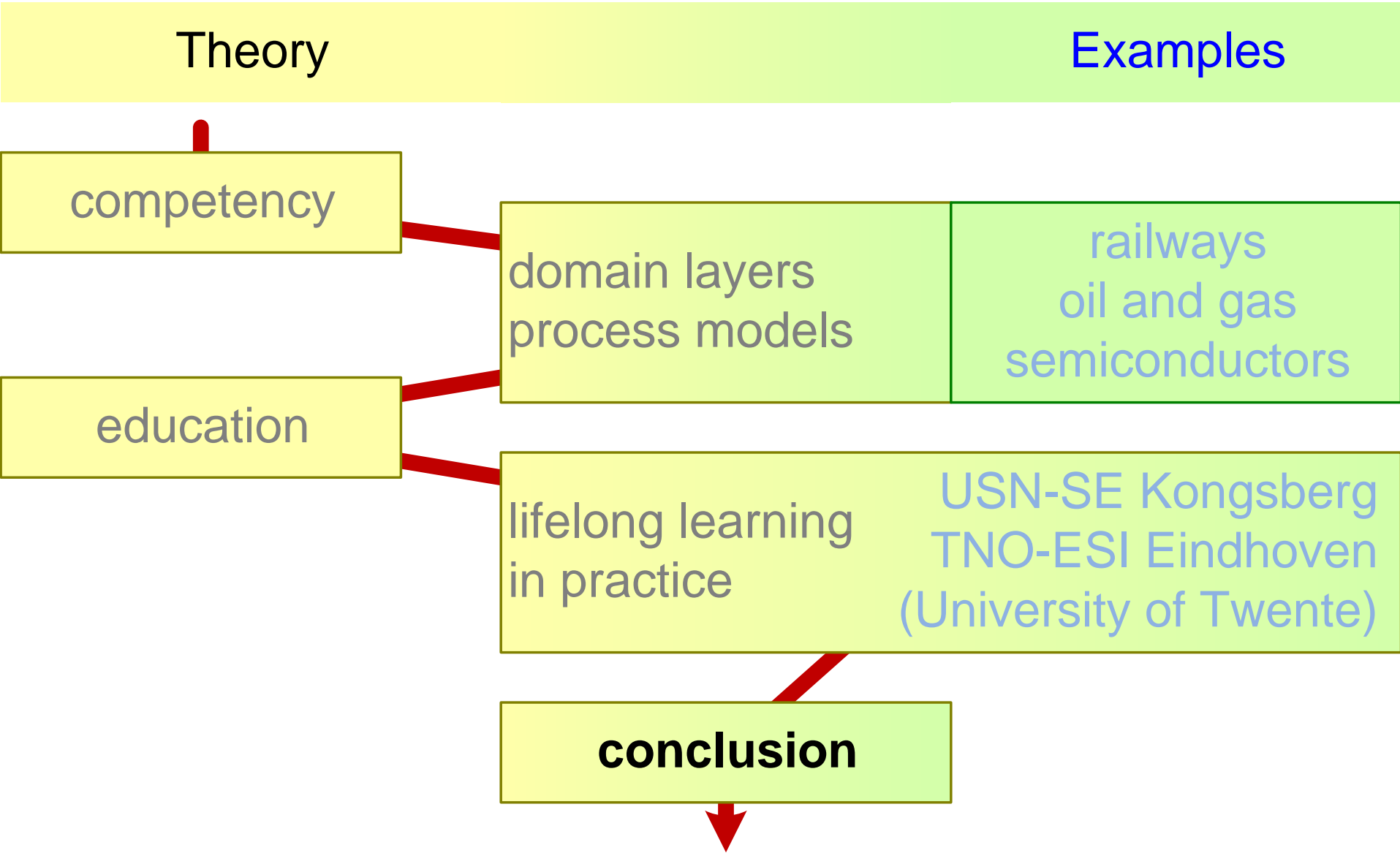
ESI Uses Programs and Tracks



There is Significant Synergy between the Education Types



Conclusion



Conclusion for Life-Long Learning

domains and layers

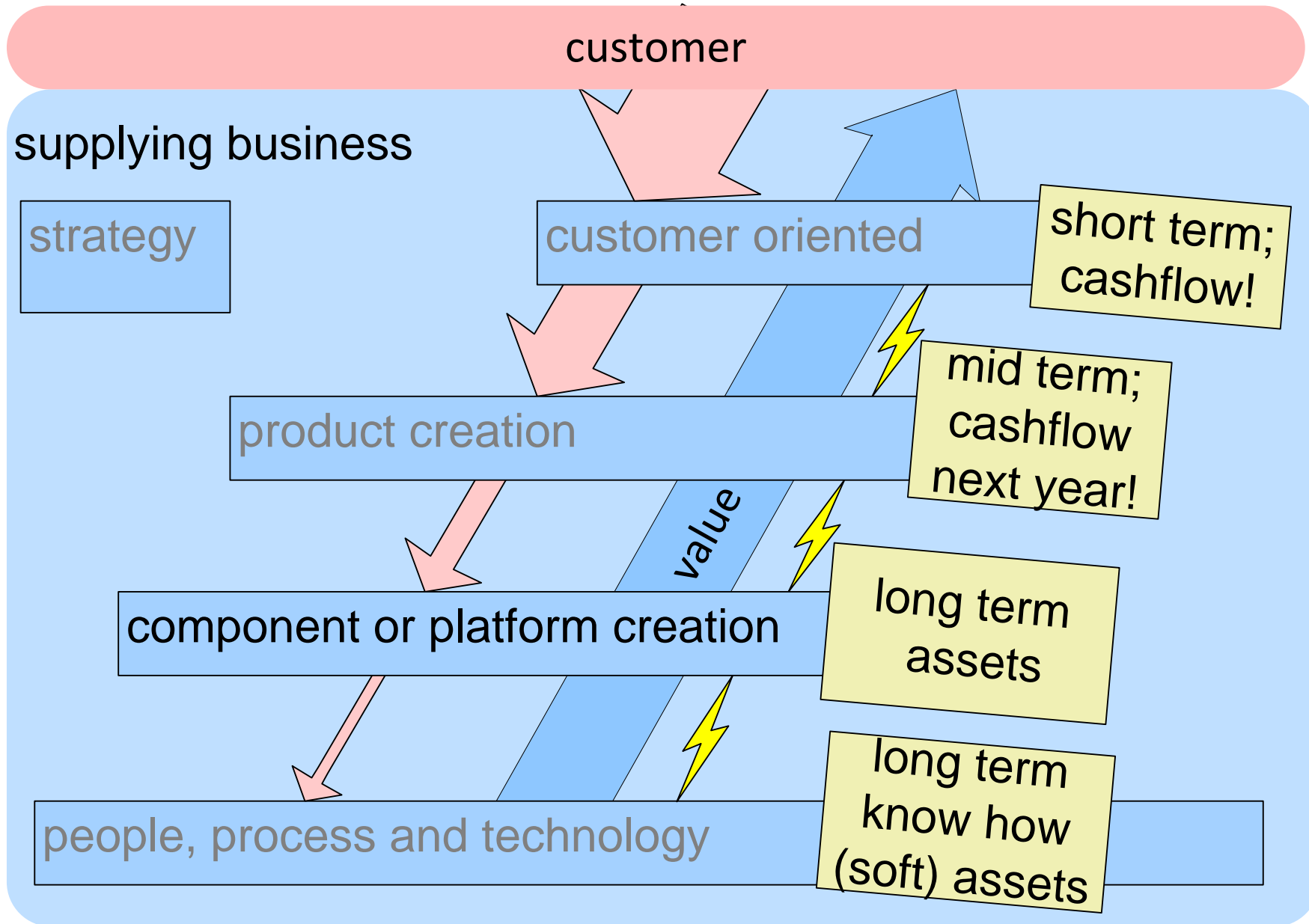
- share the same knowledge and skills
- differ in ability and attitude
- can learn from other domains and layers

education and research providers

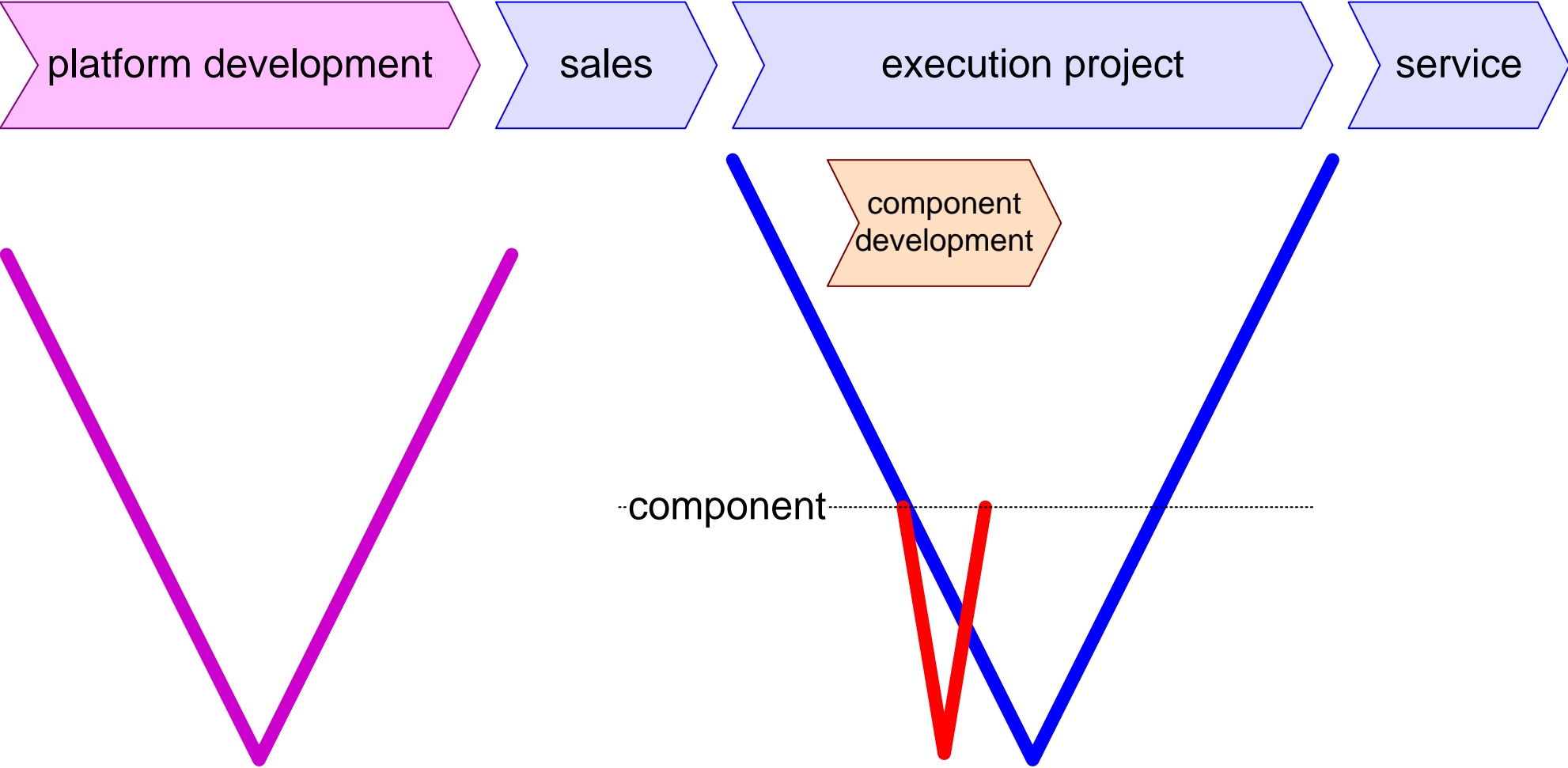
- must cooperate closely with industrial partners
- adapt each course to its participants and their context
- can learn much from teaching and closely cooperating

questions
are
welcome!

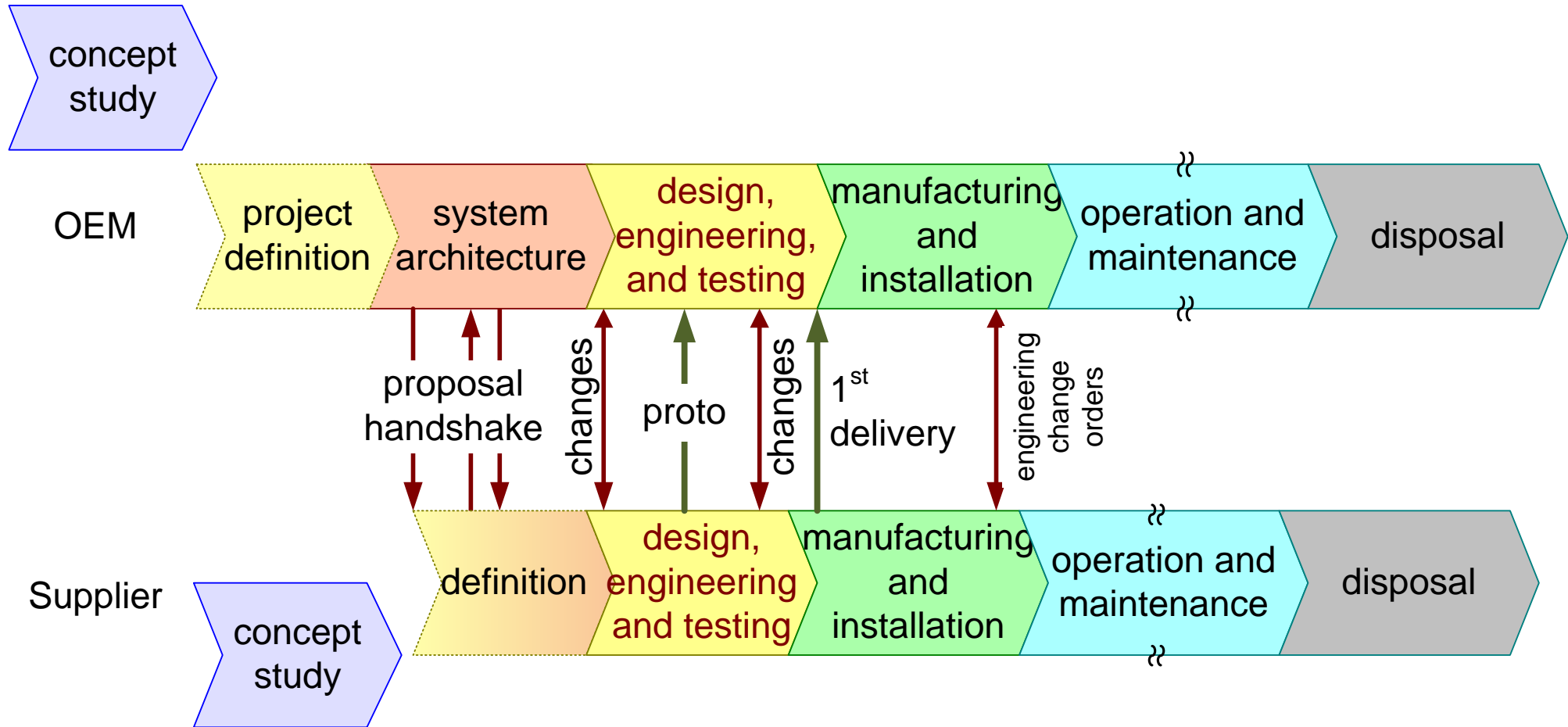
Platforms Increase Length of Value and Feedback Chain



Platform + Project -> 2.5 Vs



(Sub)suppliers in Tight Relation with Customer



Applying Systems Engineering on Education: Modularity

