INCOSE-NL SIG education September 2025

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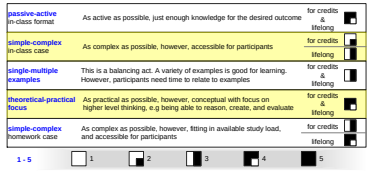
Abstract

How do we effectively help people to develop systems engineering competencies? Who needs to developthem? What compeetmcies do they actually need? An open discussion on these questions, and pedagogic approaches that fit to the audience.

October 4, 2025
status: concept
version: 0.2



Introduction to Session Format

In this session, I ask participants to use
a **real or fictive case** of
educating people in
systems engineering.
Each individual uses this case to
help thinking and discussing
education context,
audience and **desired competence**,
and **teaching format**

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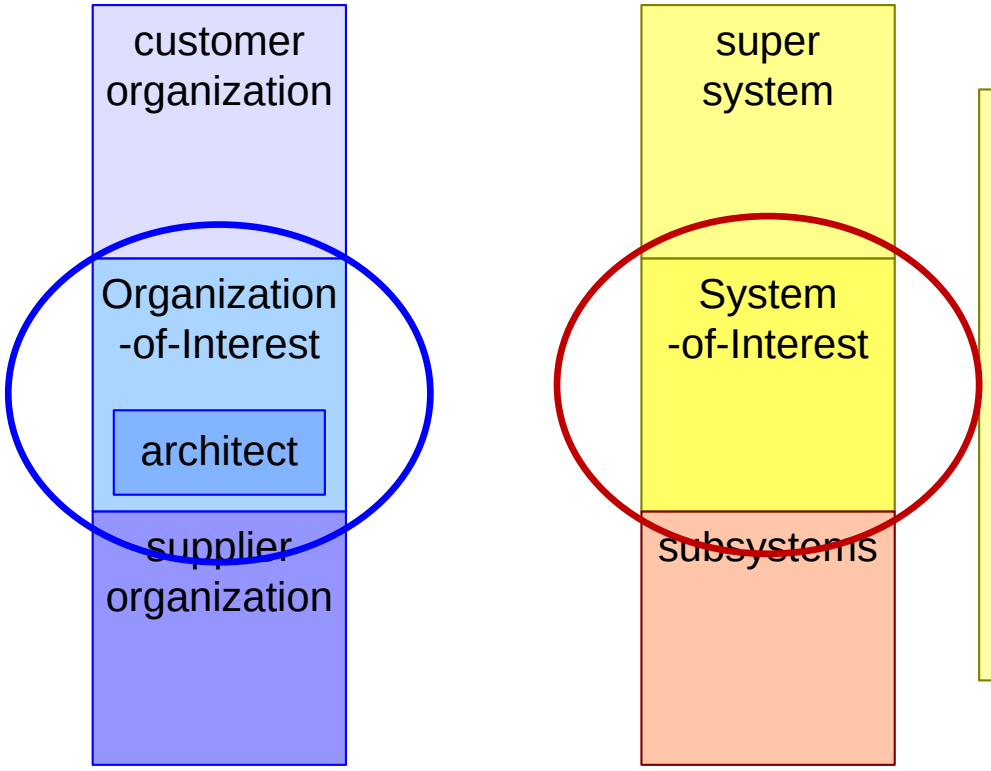
https://www.menti.com/albjae7mjg3j

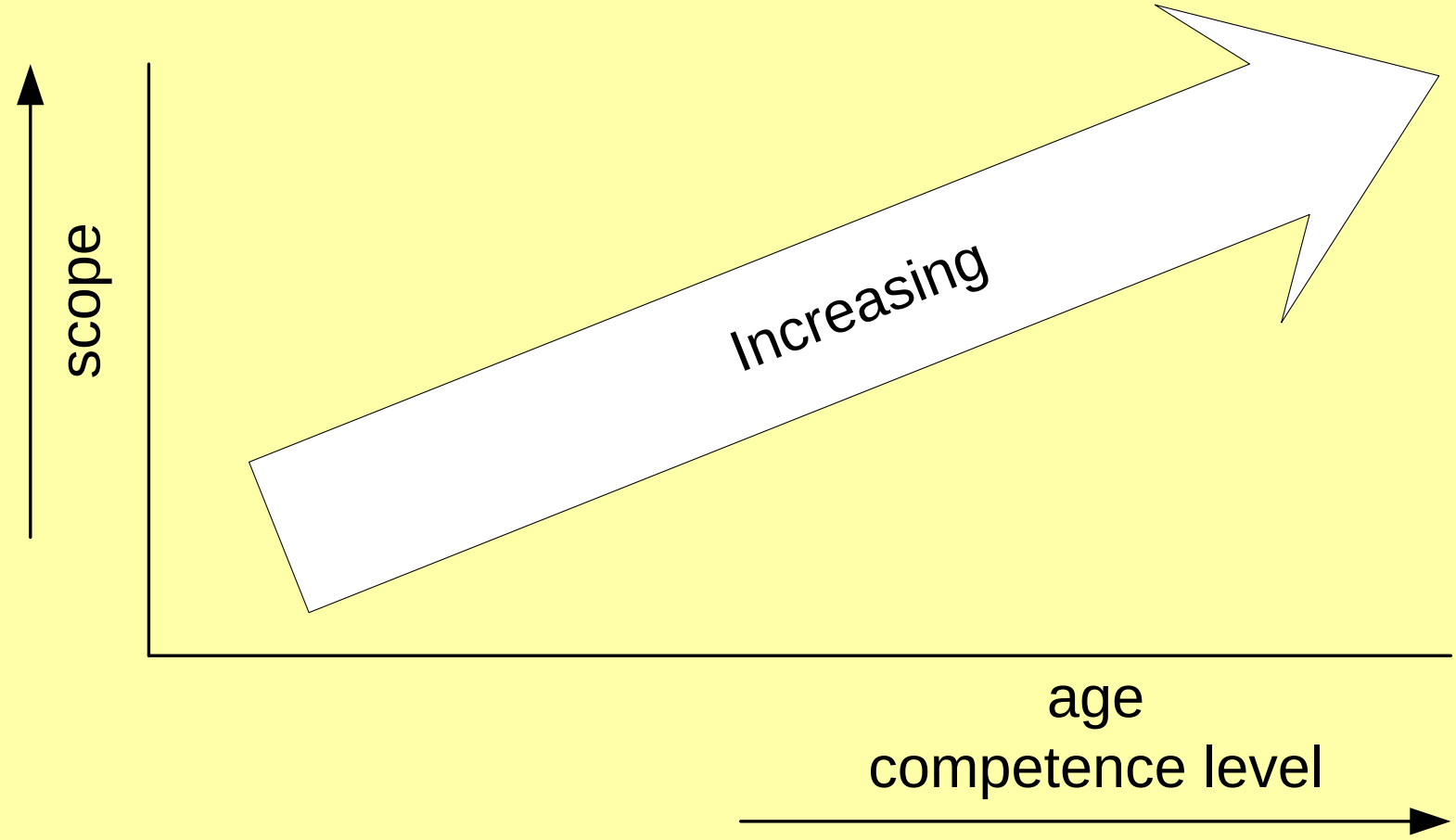
What Context will you use for this SIG?



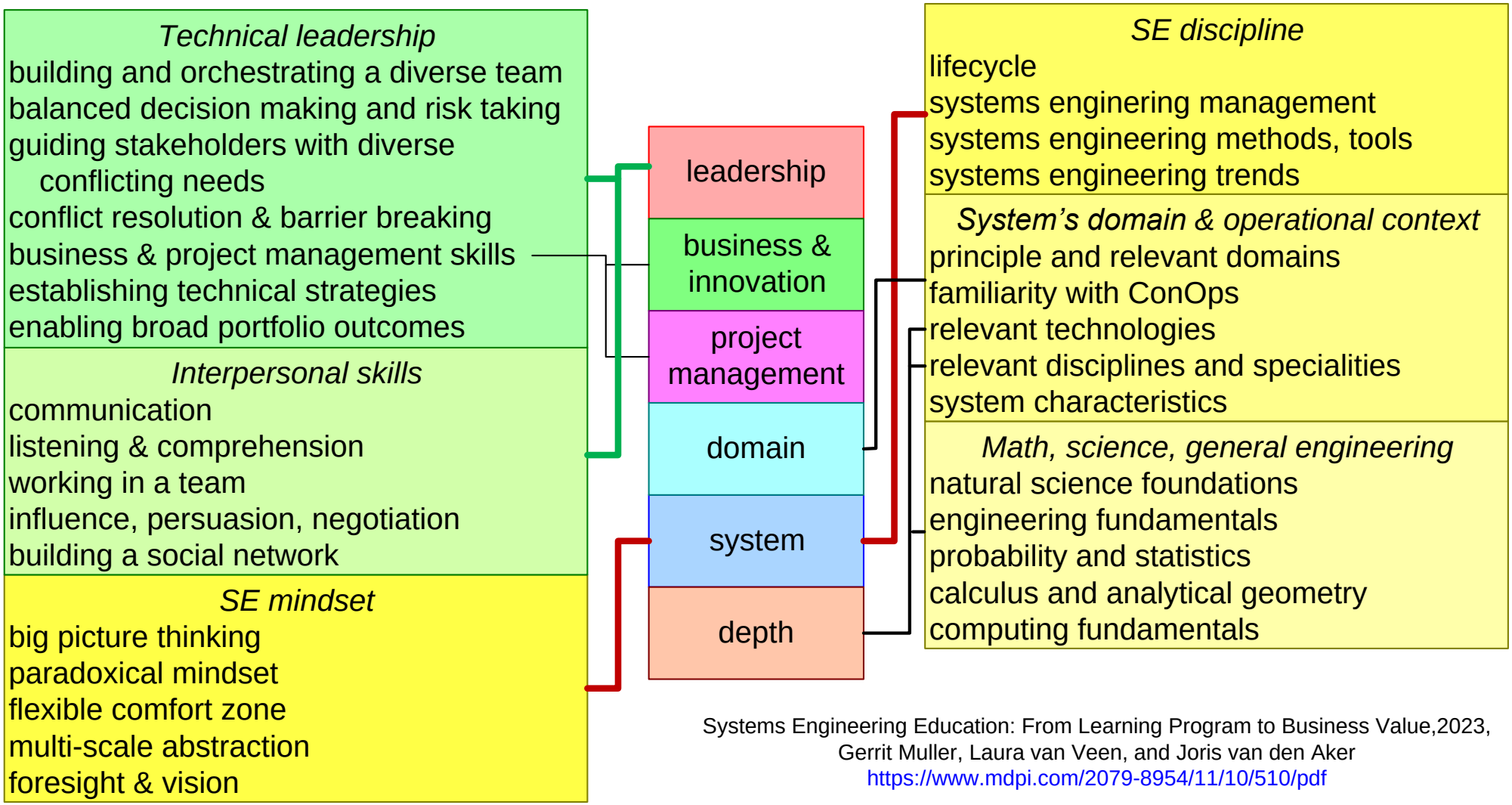
What **System-of-Interest** (SoI) and **Organization-of-Interest** (OoI) will you use for this SIG

Context considerations

- The System-of-Interest and Organization-of-Interest must be recognizable for the participants
- Increase scope based on maturity level

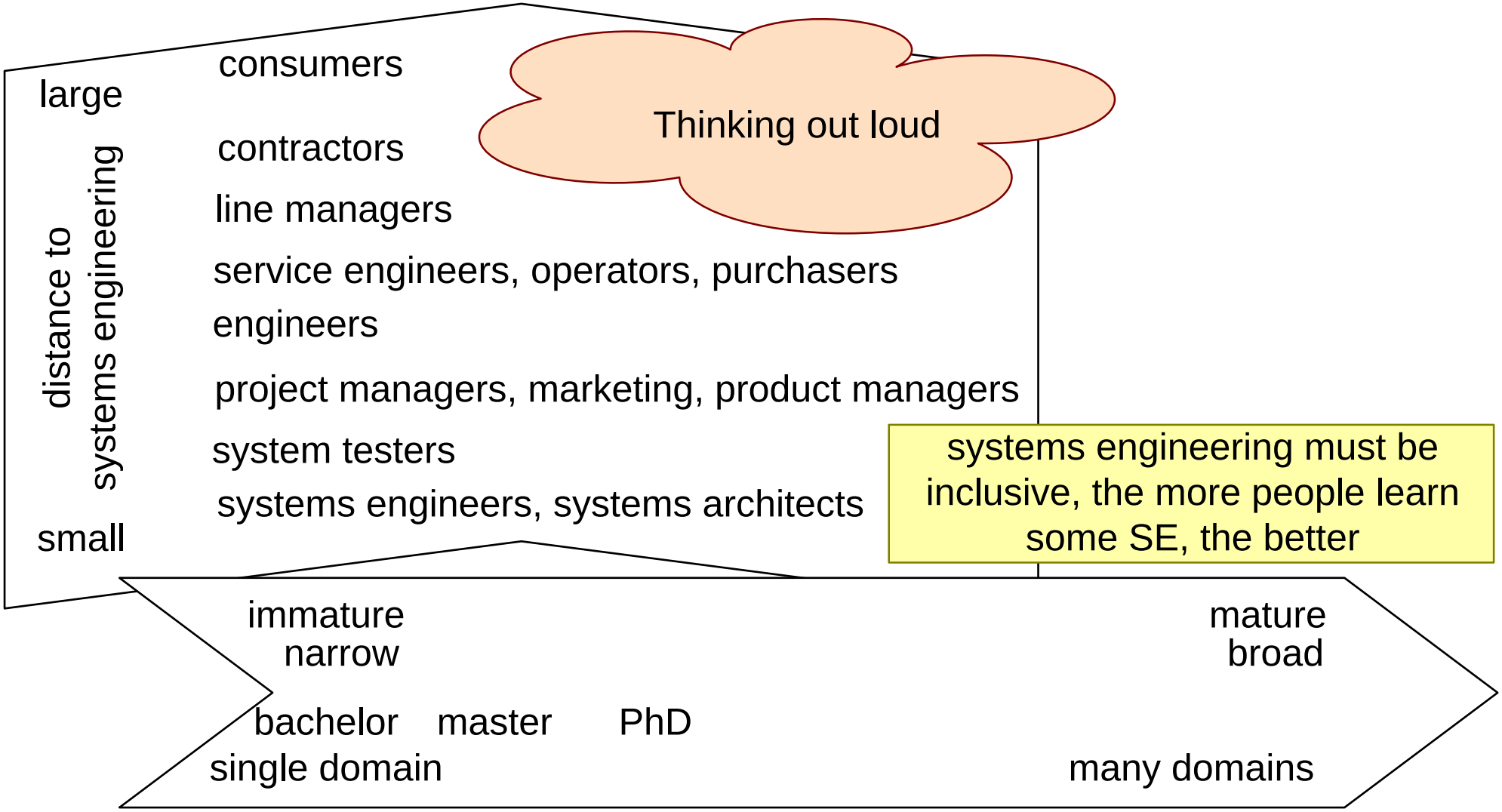


Who do you want to help develop what competence?

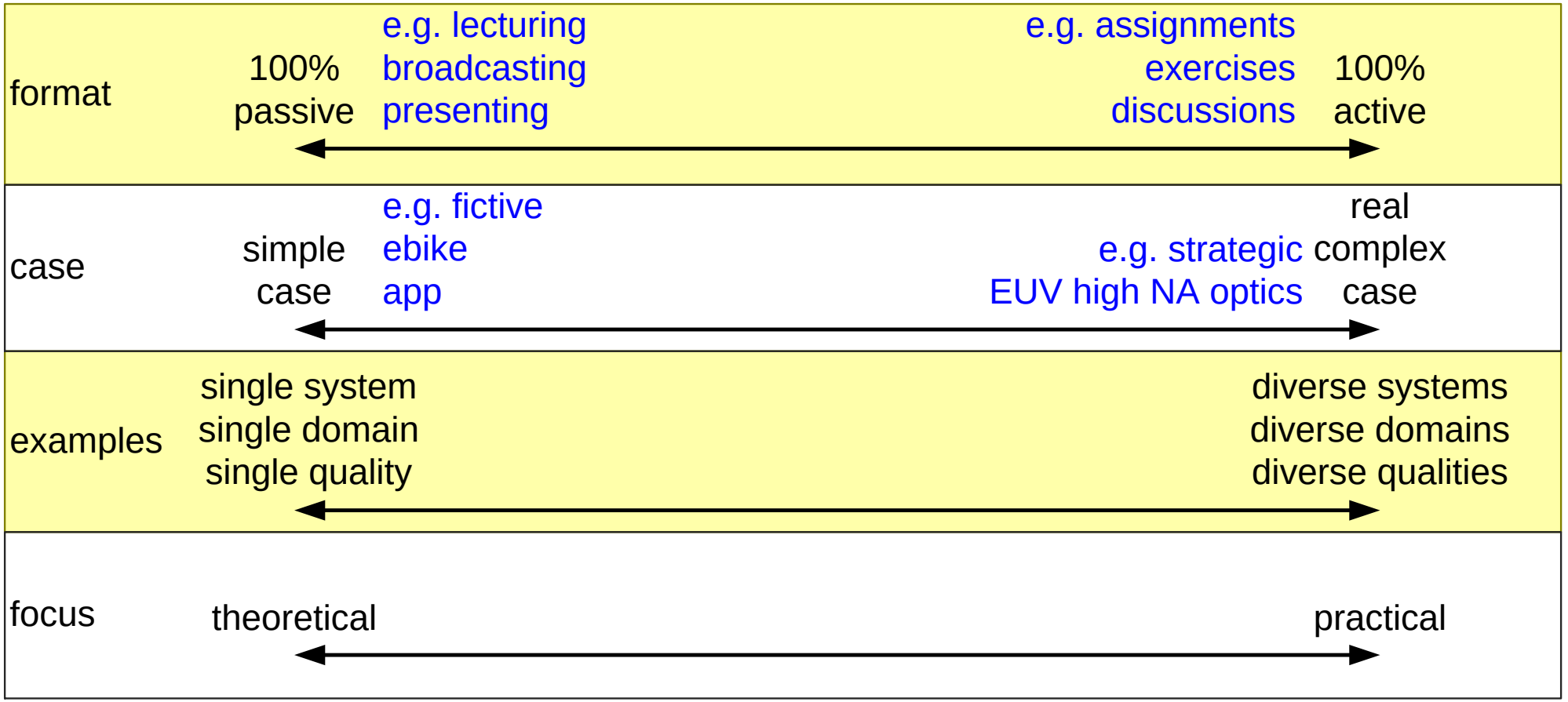


Systems Engineering Education: From Learning Program to Business Value,2023,
Gerrit Muller, Laura van Veen, and Joris van den Aker
https://www.mdpi.com/2079-8954/11/10/510/pdf

The Target for Systems Engineering Education is Diverse



What type of Teaching do you propose:



Gerrit's Teaching Preferences

1 - 5	**passive-active** in-class format		**simple-complex** in-class case		**single-multiple** examples		**theoretical-practical** focus		**simple-complex** homework case	
	for credits	lifelong	for credits	lifelong	for credits	lifelong	for credits	lifelong	for credits	lifelong
systems and leadership										
SESA systems architecting										
SEMA architectural reasoning										
SESI systems integration										
SERP reflective practice										
SERM research methods										
Bachelor systems engineering										

legend 1 2 3 4 5

Recommendations For Teaching

passive-active in-class format	As active as possible, just enough knowledge for the desired outcome	for credits & lifelong 
simple-complex in-class case	As complex as possible, however, accessible for participants	for credits  lifelong 
single-multiple examples	This is a balancing act. A variety of examples is good for learning. However, participants need time to relate to examples	for credits & lifelong 
theoretical-practical focus	As practical as possible, however, conceptual with focus on higher level thinking, e.g being able to reason, create, and evaluate	for credits & lifelong 
simple-complex homework case	As complex as possible, however, fitting in available study load, and accessible for participants	for credits  lifelong 

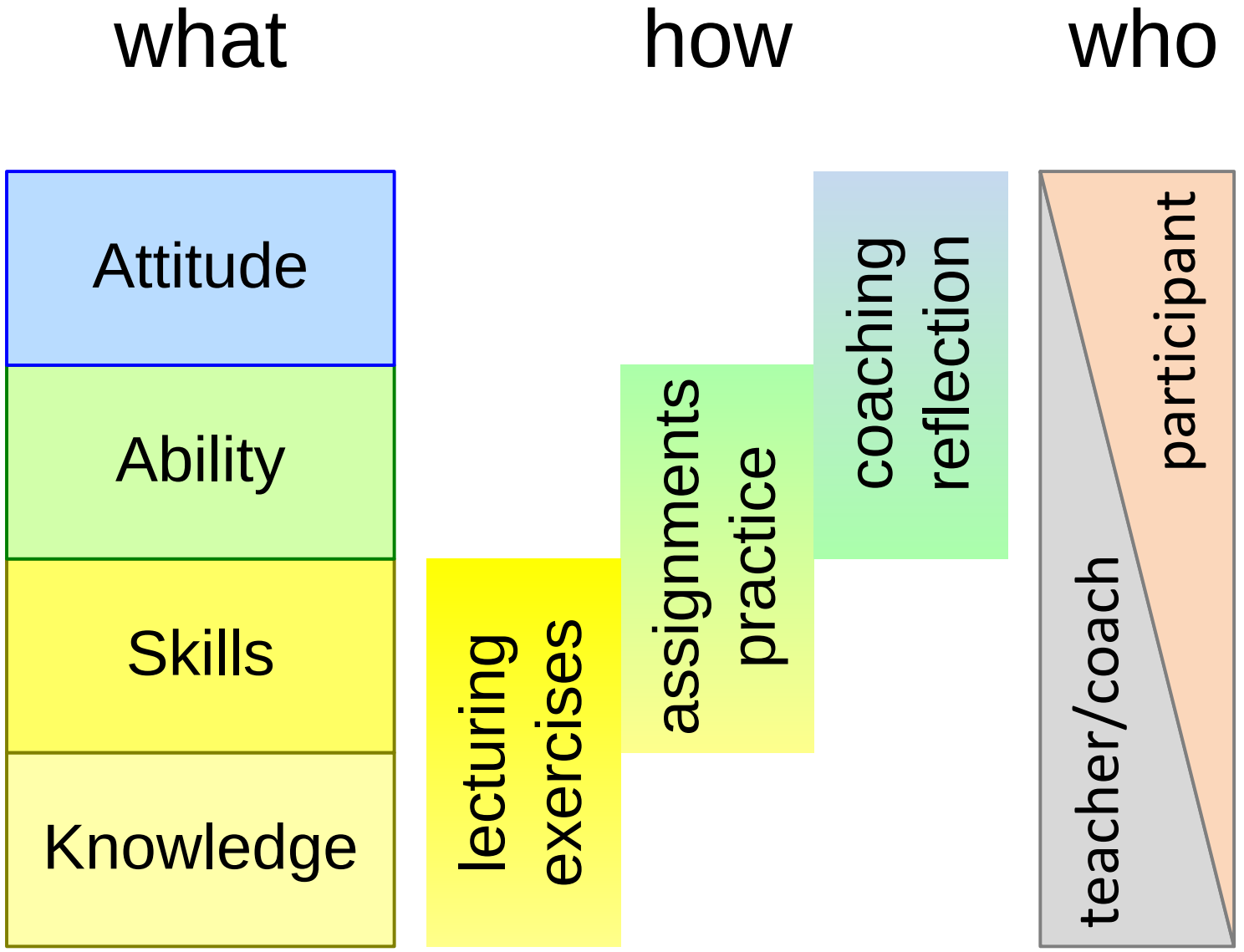
1 - 5 

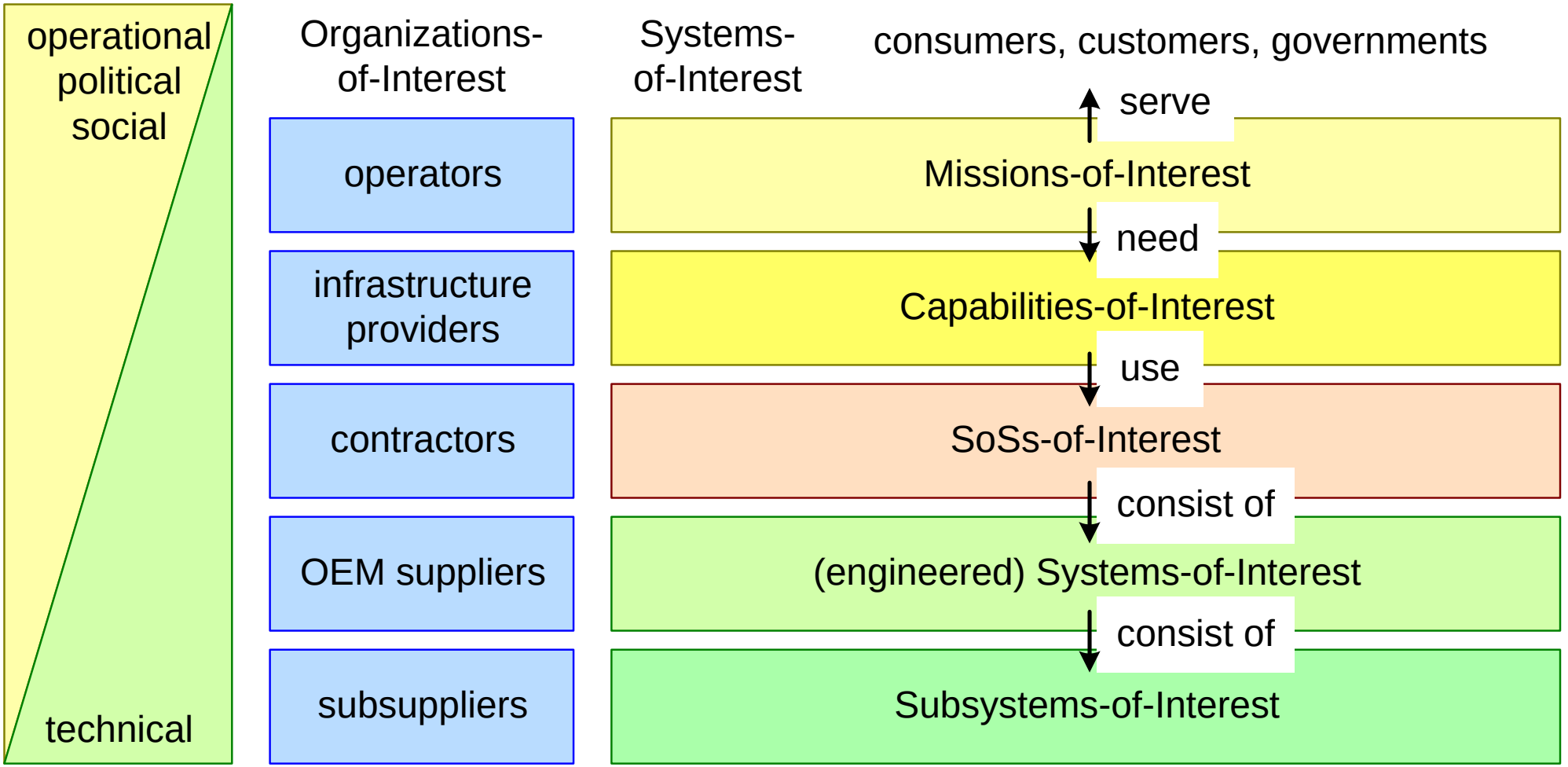
Any Comments, Benefits, Concerns

- Any Comments
- Benefits
- Concerns,
- something completely different?

Supporting Slides

Education related slides, to address potential discussion topics


what
how
who
Attitude
Ability
Skills
Knowledge
lecturing
exercises
assignments
practice
coaching
reflection
participant
teacher/coach


operational
political
social
technical
Organizations-
of-Interest
operators
infrastructure
providers
contractors
OEM suppliers
subsuppliers
Systems-
of-Interest
consumers, customers, governments
serve
Missions-of-Interest
need
Capabilities-of-Interest
use
SoSs-of-Interest
consist of
(engineered) Systems-of-Interest
consist of
Subsystems-of-Interest

research & education focus: how to develop systems effectively?

role models

systems engineering
systems architecting
systems integration
configuration man.

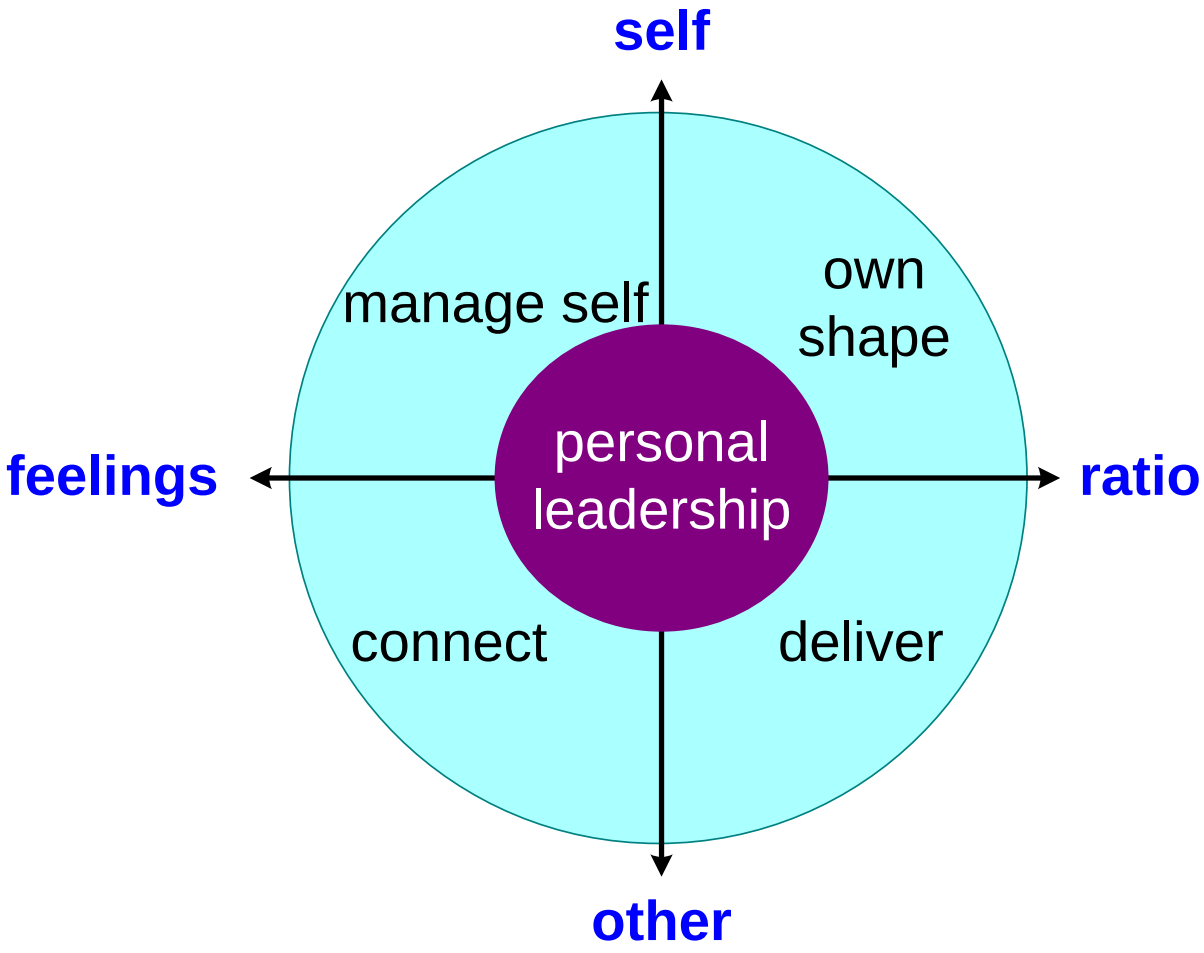
product creation
change management
quality management

repositories
access control
authentication

capabilities competencies	**process organization**	**infrastructure tools**
stakeholder engagement conceptual modeling writing requirements foundational knowledge	line management program structure	MBSE ERP CAD

social ⟷ **technical**

- **Orchestrating** is the competence to **proactively nudge** involved **parties** towards a **fitting solution**.
- Orchestrating requires the abilities:
  - to relate with a wide **variety of stakeholders**, to understand their **interests** and **concerns**, to **connect** with them such that they can **influence** them
  - to **understand** the **problem and solution space** sufficiently
  - coping with **ecosystem complexity**, **uncertainties** and **unknowns**, and helping stakeholders to navigate them
- Orchestrating requires the attitudes:
  - to see the **big picture**, while still have an eye for the devilish details
  - to **own**
  - to be **pro-active**
  - to be **genuinely interested** in stakeholders



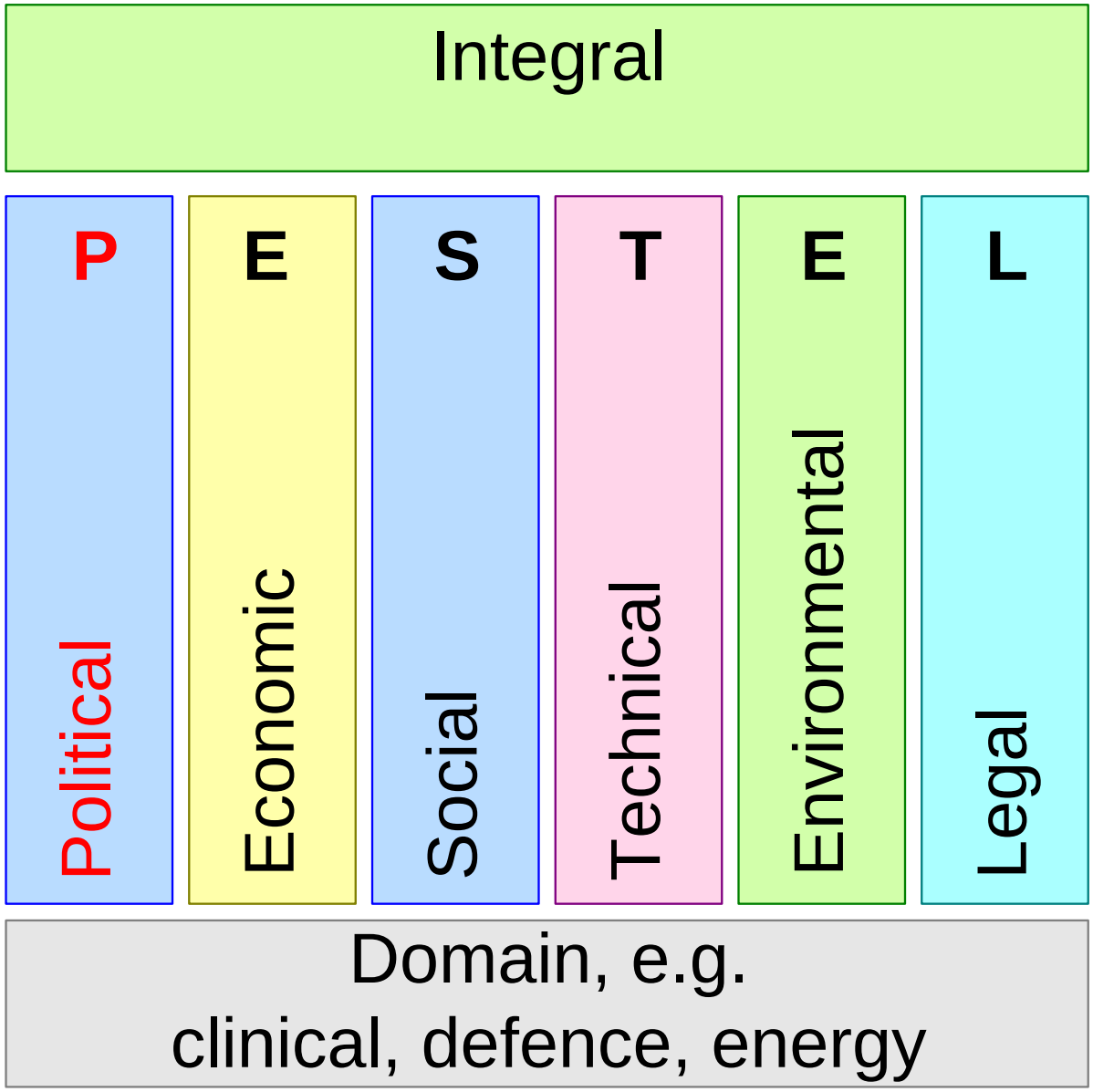
when stuck, change level

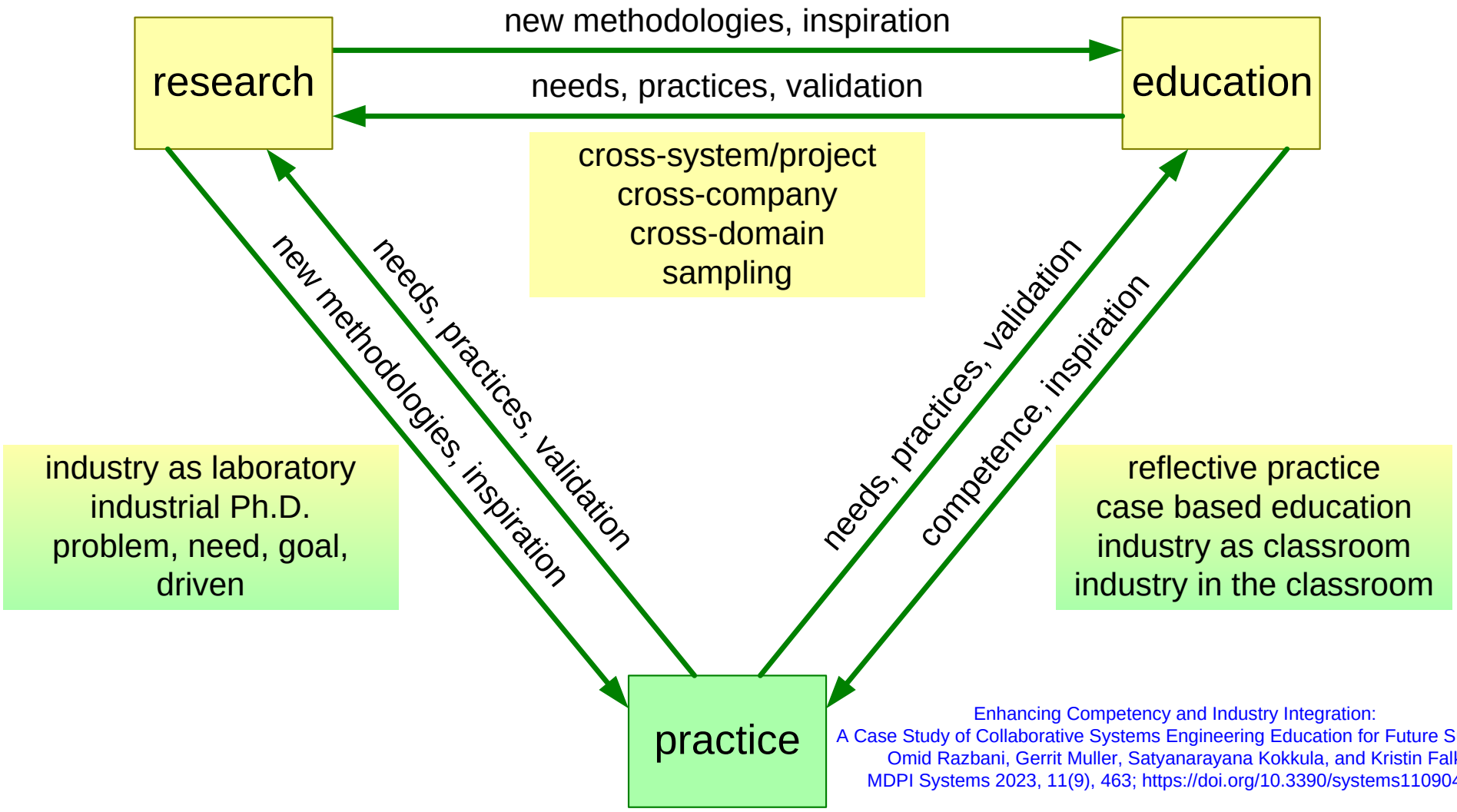
content

process

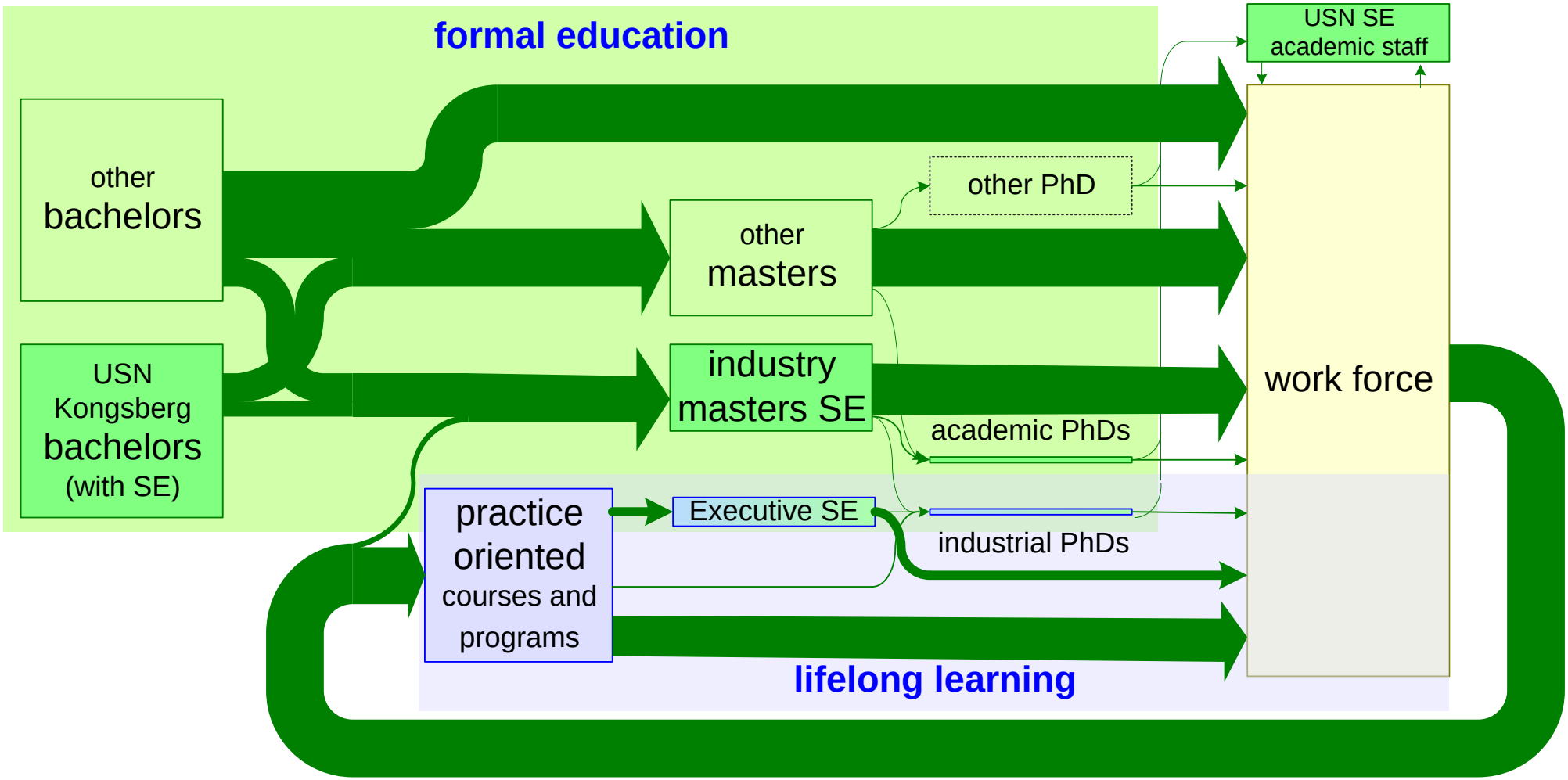
relation

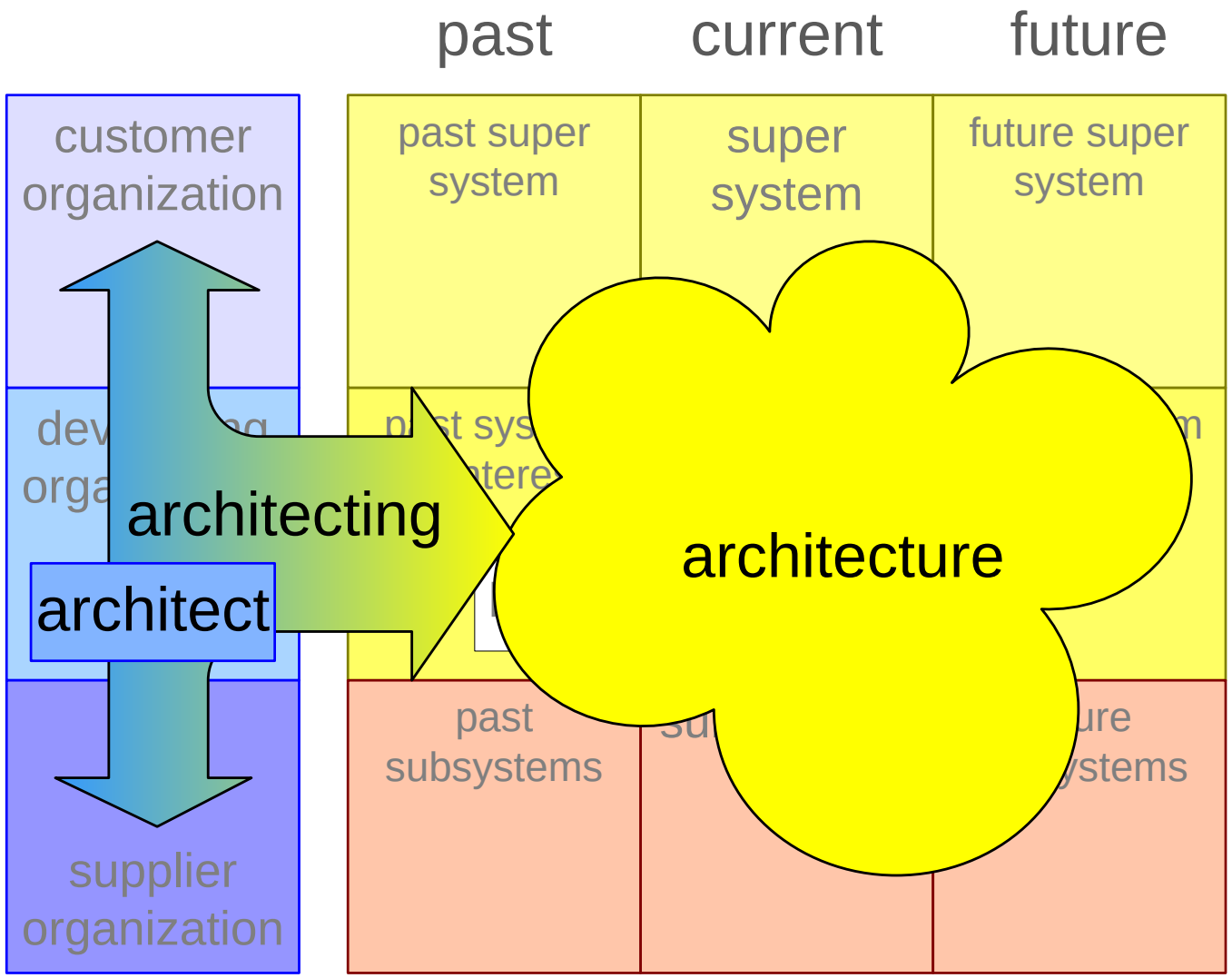
source: the LMS group
https://thelmsgroup.nl/en/


Integral
P
Political
E
Economic
S
Social
T
Technical
E
Environmental
L
Legal
Domain, e.g.
clinical, defence, energy

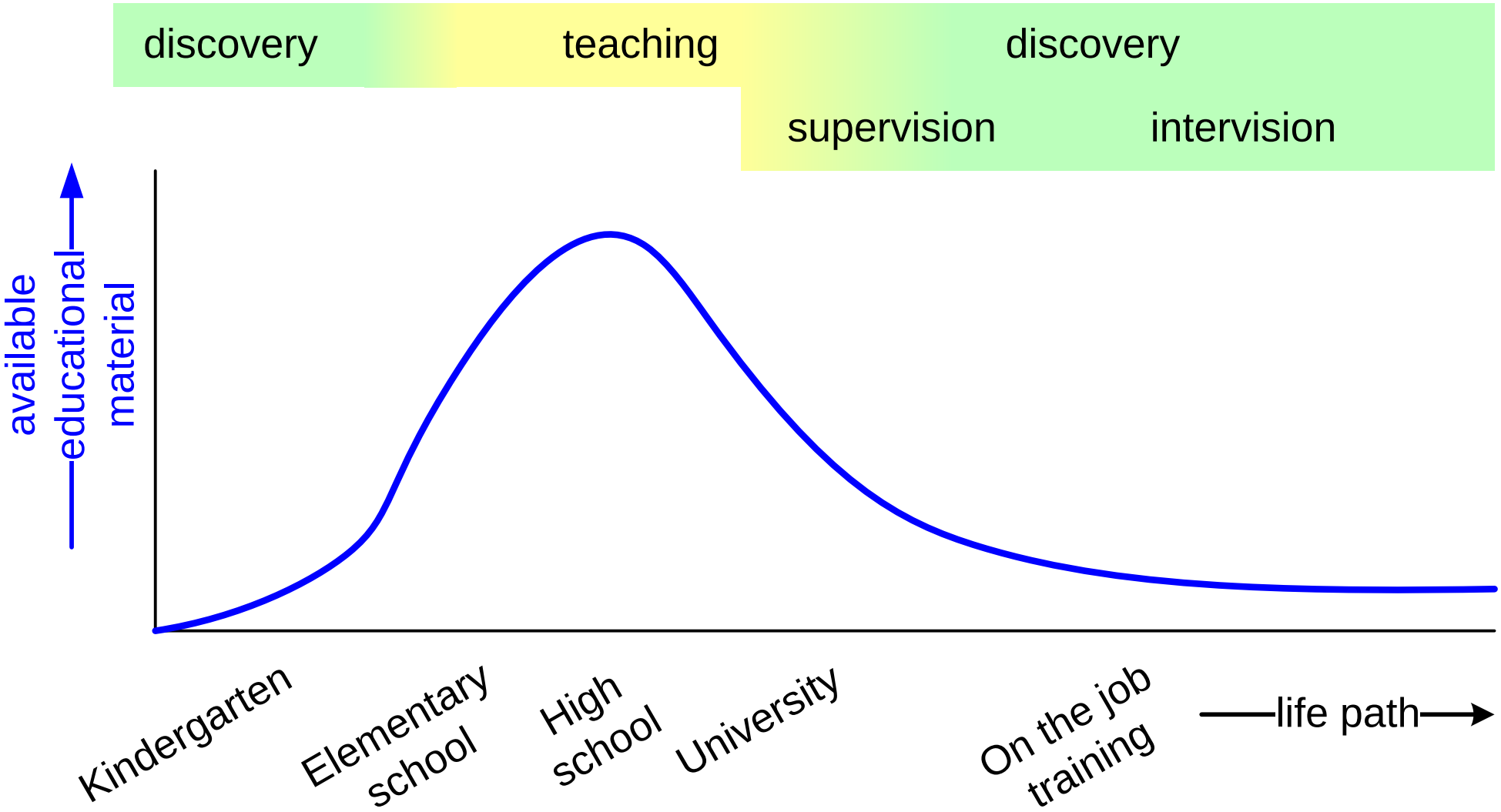


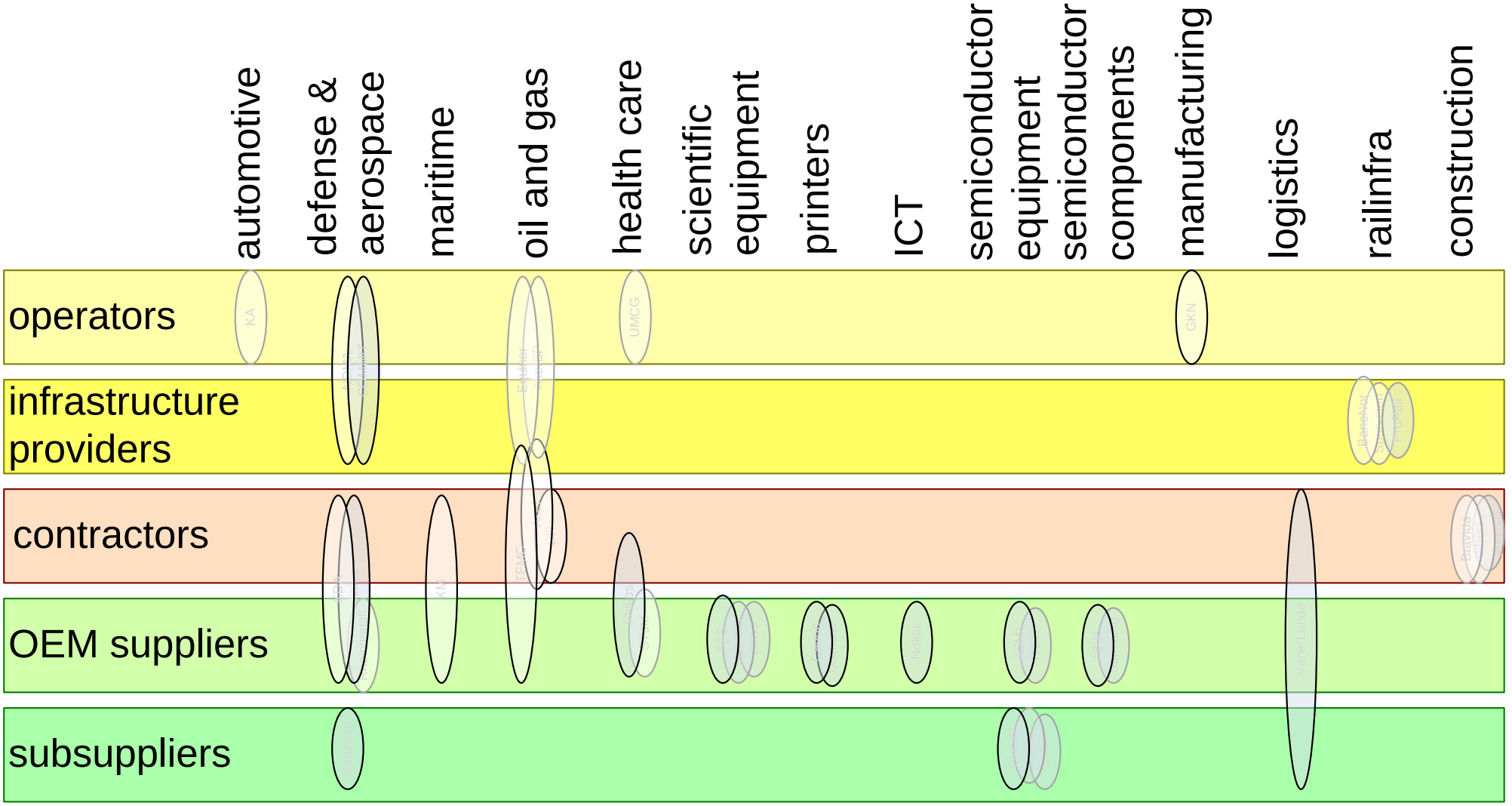
Enhancing Competency and Industry Integration:
A Case Study of Collaborative Systems Engineering Education for Future Success
Omid Razbani, Gerrit Muller, Satyanarayana Kokkula, and Kristin Falk
MDPI Systems 2023, 11(9), 463; https://doi.org/10.3390/systems11090463


formal education
other
bachelors
USN
Kongsberg
bachelors
(with SE)
other
masters
industry
masters SE
other PhD
academic PhDs
industrial PhDs
practice
oriented
courses and
programs
Executive SE
lifelong learning
USN SE
academic staff
work force



based on TRIZ


discovery
teaching
discovery
supervision
intervision
available educational material
Kindergarten
Elementary school
High school
University
On the job training
life path


automotive
defense & aerospace
maritime
oil and gas
health care
scientific equipment
printers
ICT
semiconductor equipment
semiconductor components
manufacturing
logistics
railinfra
construction
operators
infrastructure providers
contractors
OEM suppliers
subsuppliers
KA
UMCG
GKN
Nokia
VanerLanda