29th Annual INCOSE international symposium

Orlando, FL, USA
July 20 - 25, 2019

Experience from a program for accelerating the creation of T-shaped technical leaders

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Agenda

- Introduction – why complex product development is so complicated
  (from Saab Aeronautics' point of view)
- What is a T-shaped technical leader?
- How to accelerate the creation of T-shaped technical leaders
  (an example from Saab Aeronautics)

The problem in complex product development

What are the factors of **personal knowledge** and **leadership** coping with these challenges?

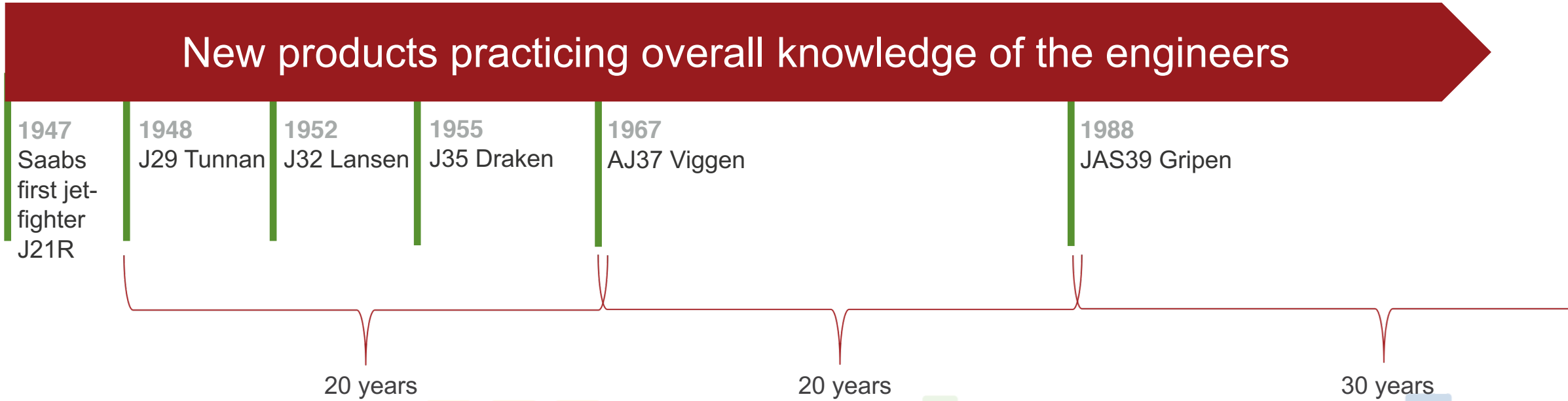
Why do engineers experience it was ”easier” to develop this aircraft…

…than this aircraft?

Example from Saab history to show the challenge

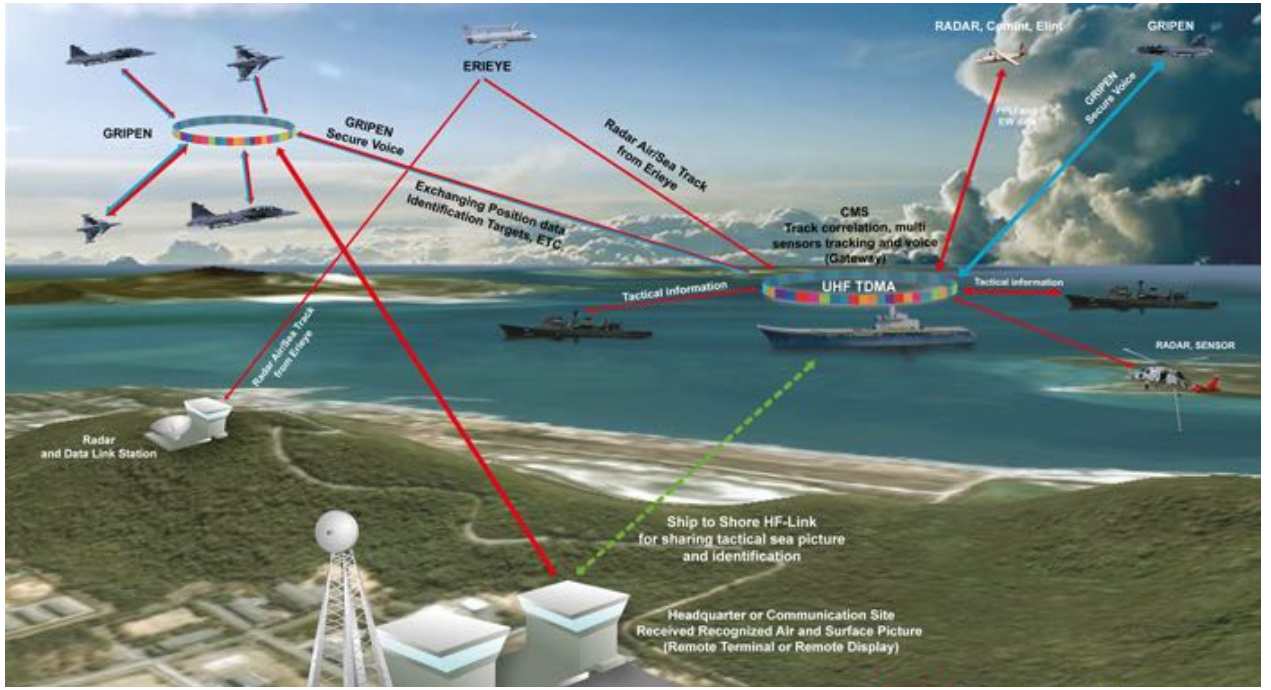
Past: An engineer could during his/her career work in *several* development projects and type of platforms

Today: Difficult to achieve experience broad enough, despite long career within the company…



Why do engineers experience it more difficult nowadays?

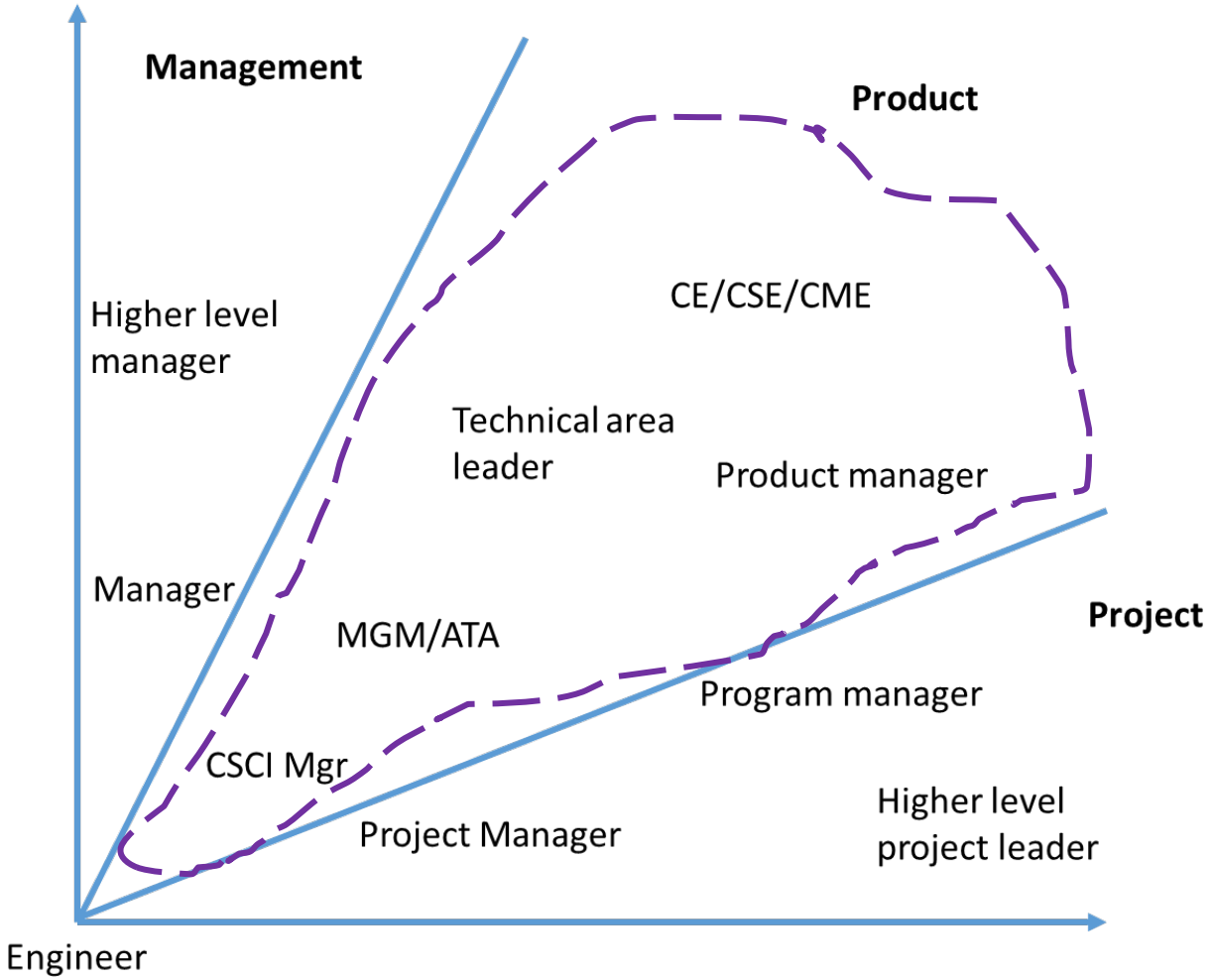
- Consequence:
  - Harder to replace older, very experienced leaders
  - Fewer younger engineers with the deep and broad experience that is needed
- Also: Complexity of systems of today and future systems is *much* higher than before
  - Increasing amount of software
  - Future systems of systems



Result:

A larger set of desired competencies today than a generation ago!

What is a technical leader? (Saab)



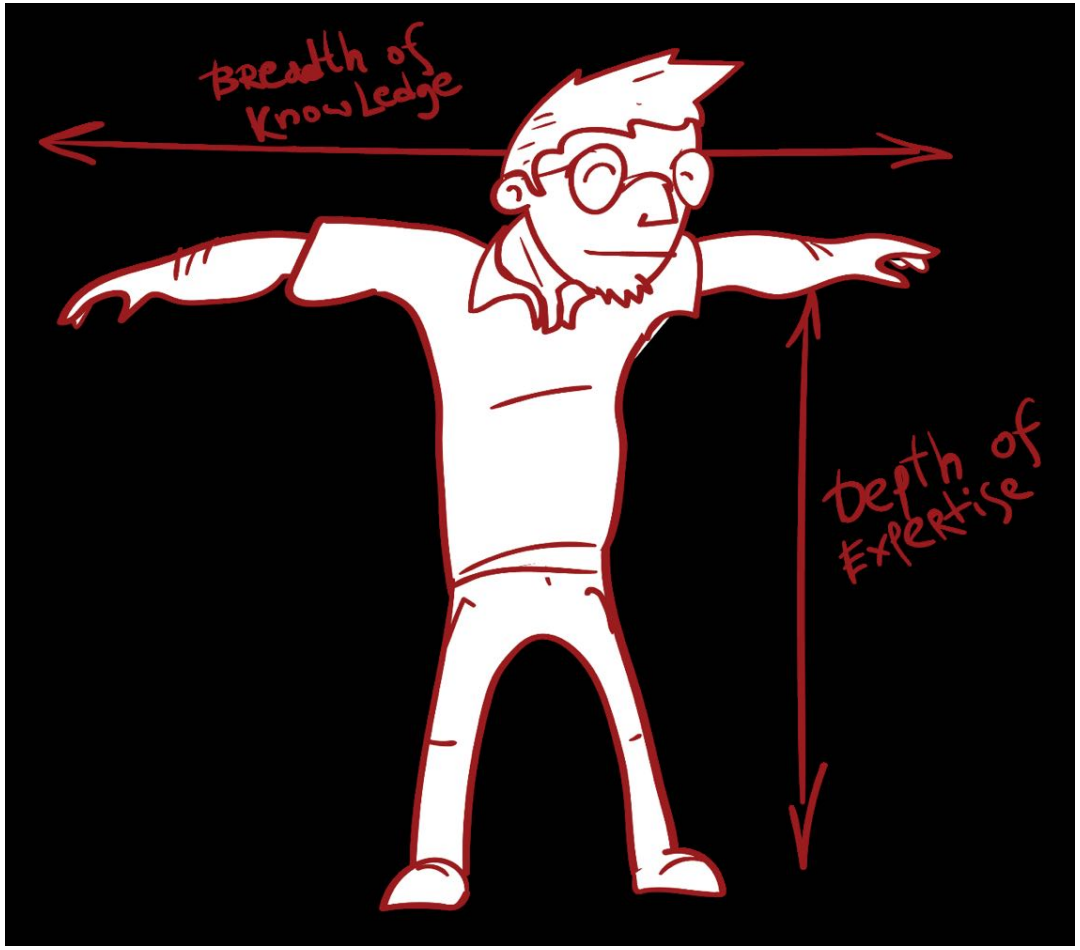
Competence levels for engineers (Saab)

- Detailed steps
- More suitable for deeper analysis of a person's competence

- Need a *simple, illustrative* model as a complement!
  - Easy to use
  - Give a broad picture of a person's/group's competence
  - Inspiration to broaden own knowledge

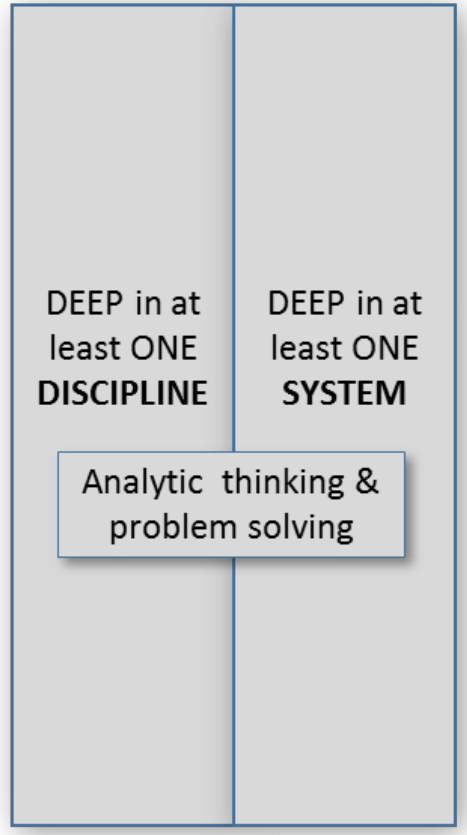
	Apprentice Engineer	Engineer	Senior Engineer	Principal Engineer	Distinguished Engineer
Level	**0**	**1**	**2**	**3**	**4**
Catchword	"New at SAAB"				"Develop system of systems from blank sheet"
Role	Software Systems Design Analysis				Chief Engineer Chief Test Engineer CVM Fellow/"Expert" Chief Systems Engineer
Min Years	0 – 2				10 –
Author-ized by	Employment	Line manager	Area Manager & Technology leader	Area Manager, Authorization board, Chief Engineer, CVM	Authorization board, Specialist council, Head of Design

T-shaped technical leader



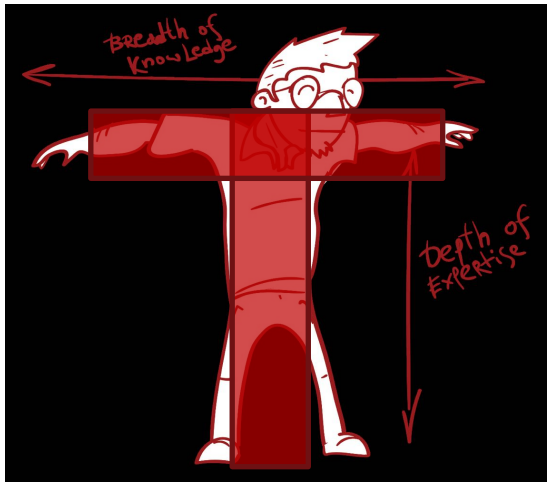
I-shaped engineer

- A typical I-shaped engineer knows his/her system and discipline, and has deep knowledge within this area
- Feels at home only in this discipline/system
- Need a translator/bridge-builder
  - To spread knowledge
  - Understand other peoples' ideas and thoughts

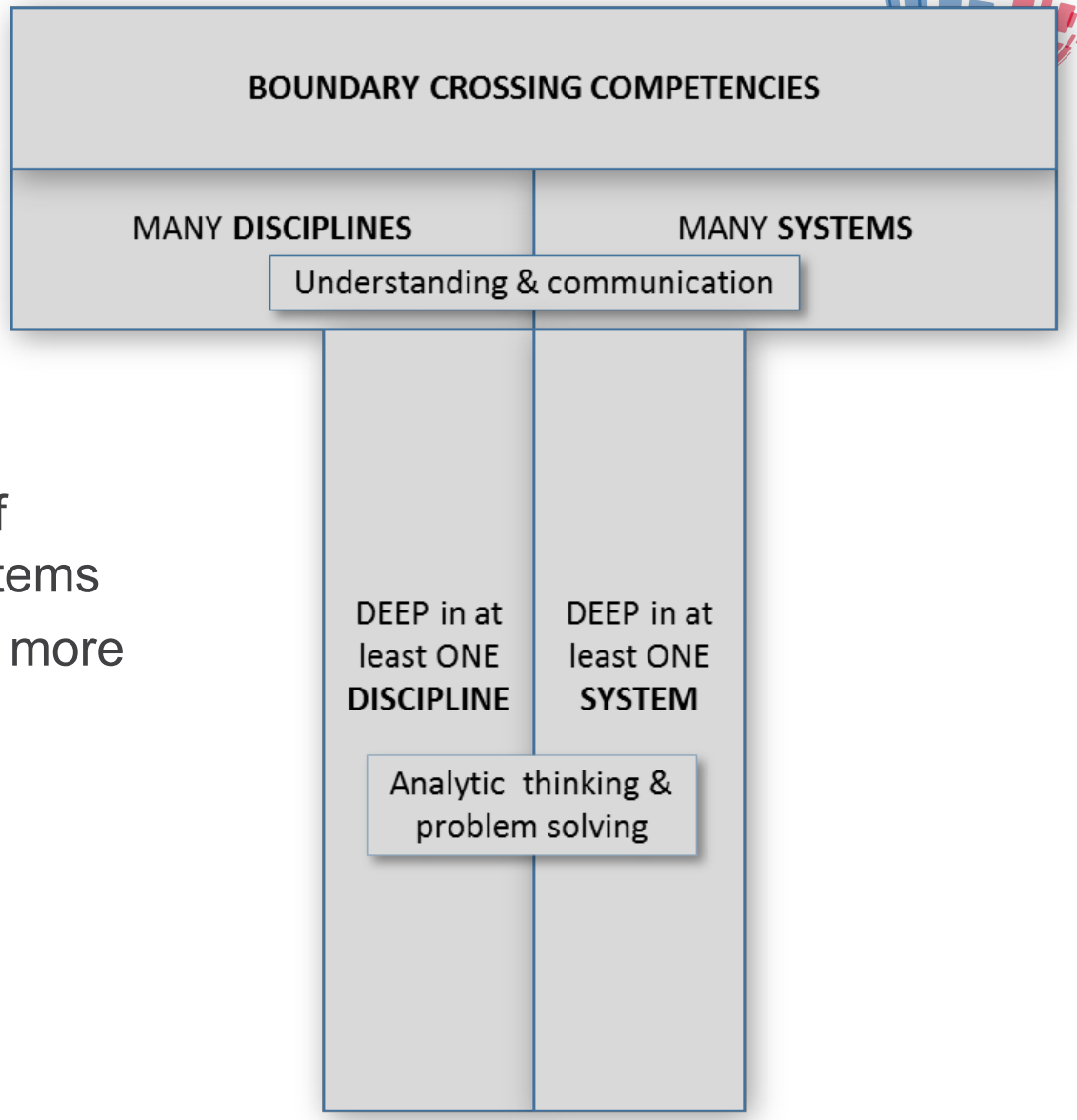


T-shaped engineer

- The T-shaped engineer has at least one system/discipline of **expertise**
- The T-shaped engineer also has strong **broadening** knowledge



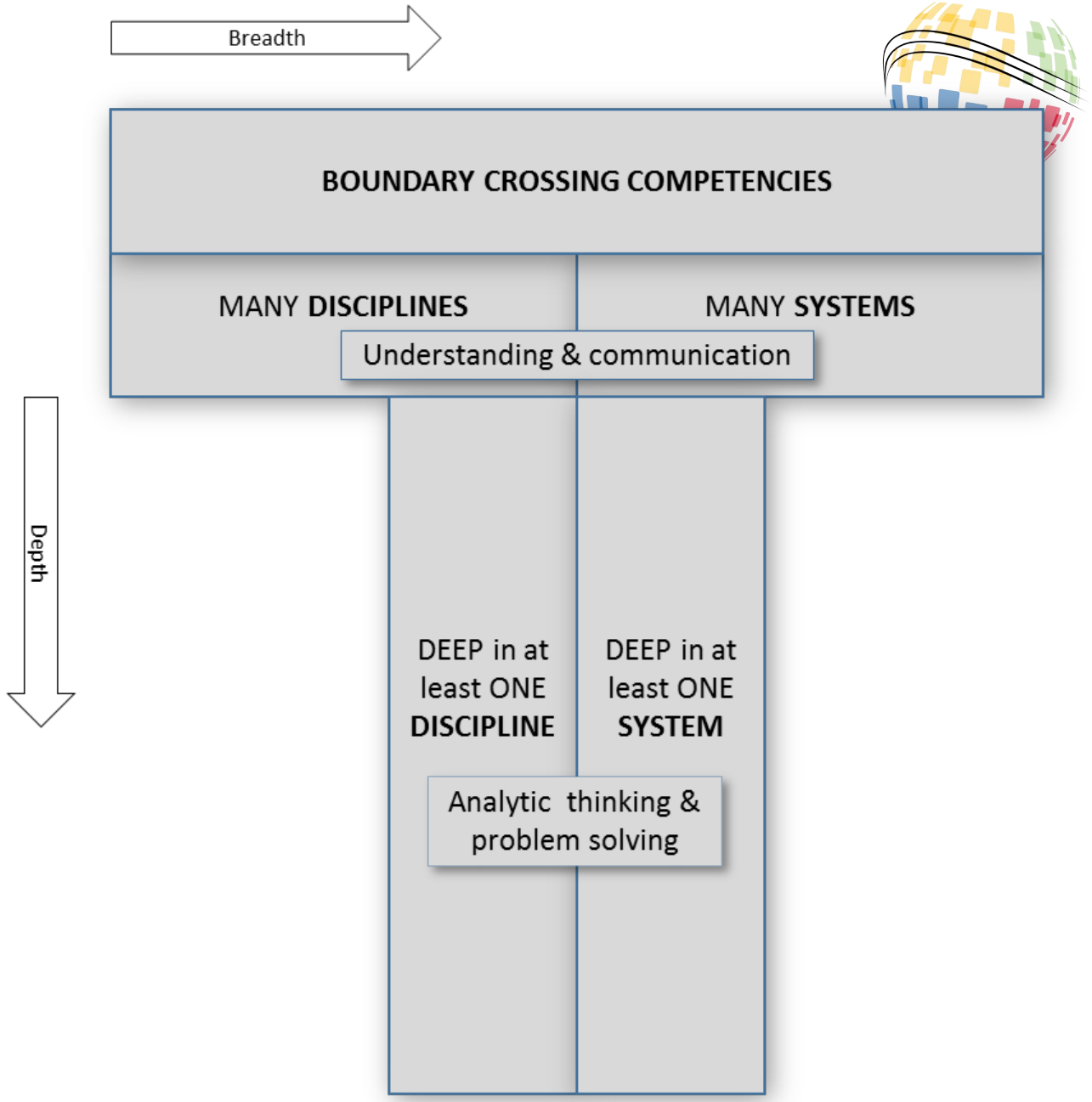
- Great understanding of several disciplines/systems
- Many competencies of more general character



T: Depth and breadth

The two variables DEPTH and BREADTH are equally important!

- Without the *depth*, the arguments don't hold up…
  The boundary crossing competencies become worthless – no credibility without expert knowledge!
- Without the *breadth,* there is no cooperation and understanding



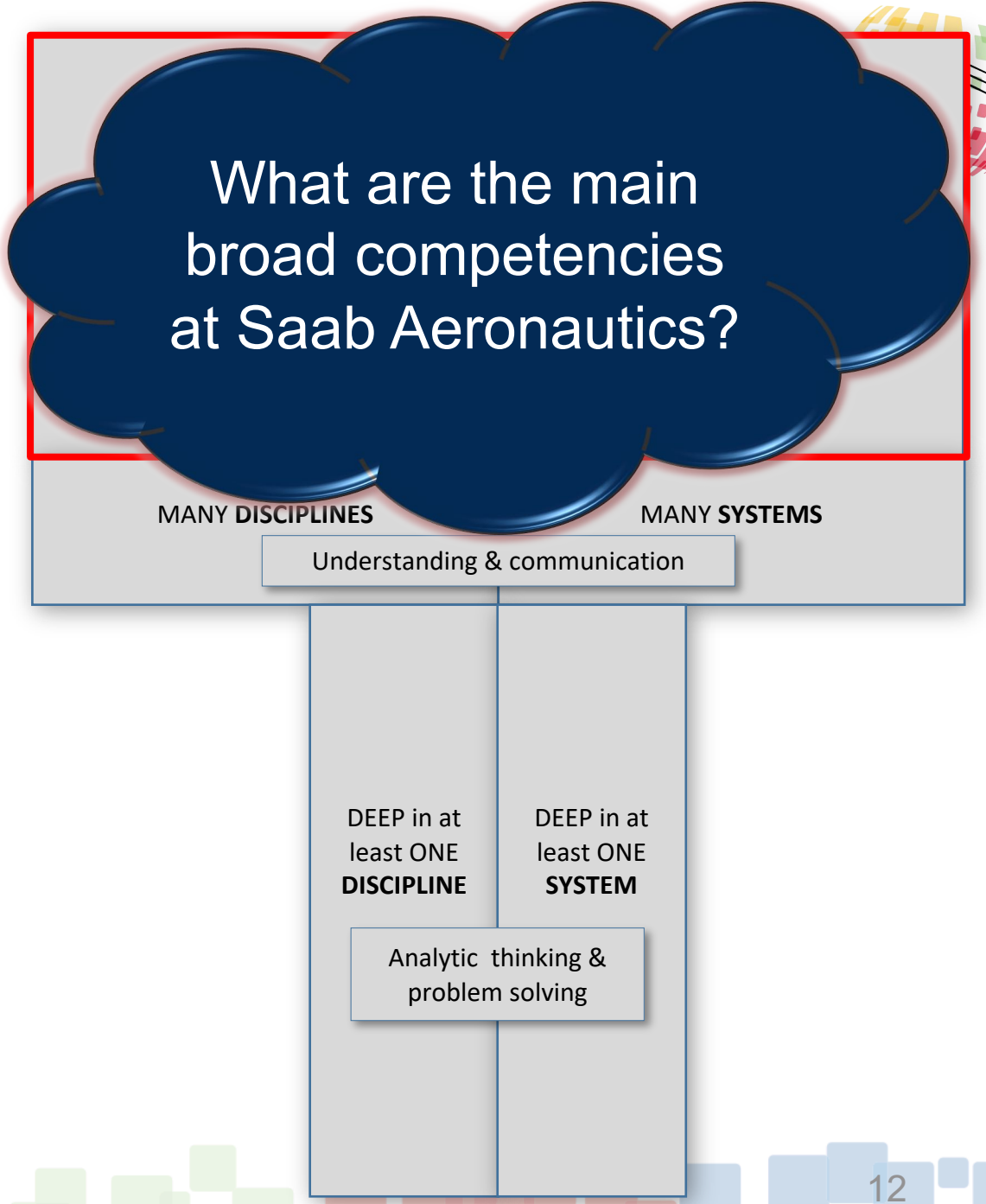
T-shaped technical leaders

Many ”heavy” ***technical competencies***

- General and cross-boundry nature, only acquired by extensive general technical experiences
- Systems engineering
- Integration
- …

Personal competencies (equally important!)

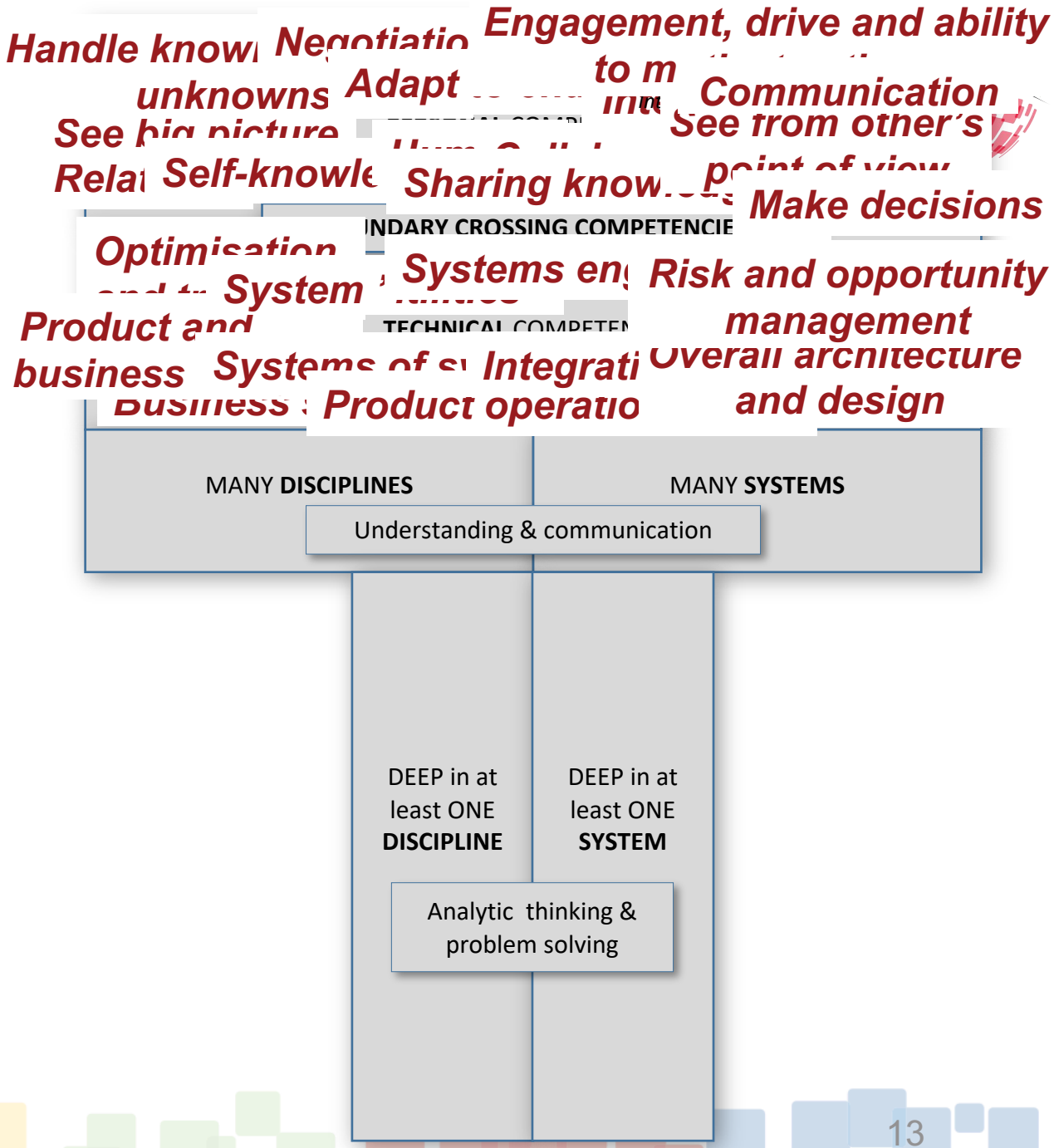
- Work as a bridge builder over the borders
- See the big picture
- …



T-shaped technical leaders: our T

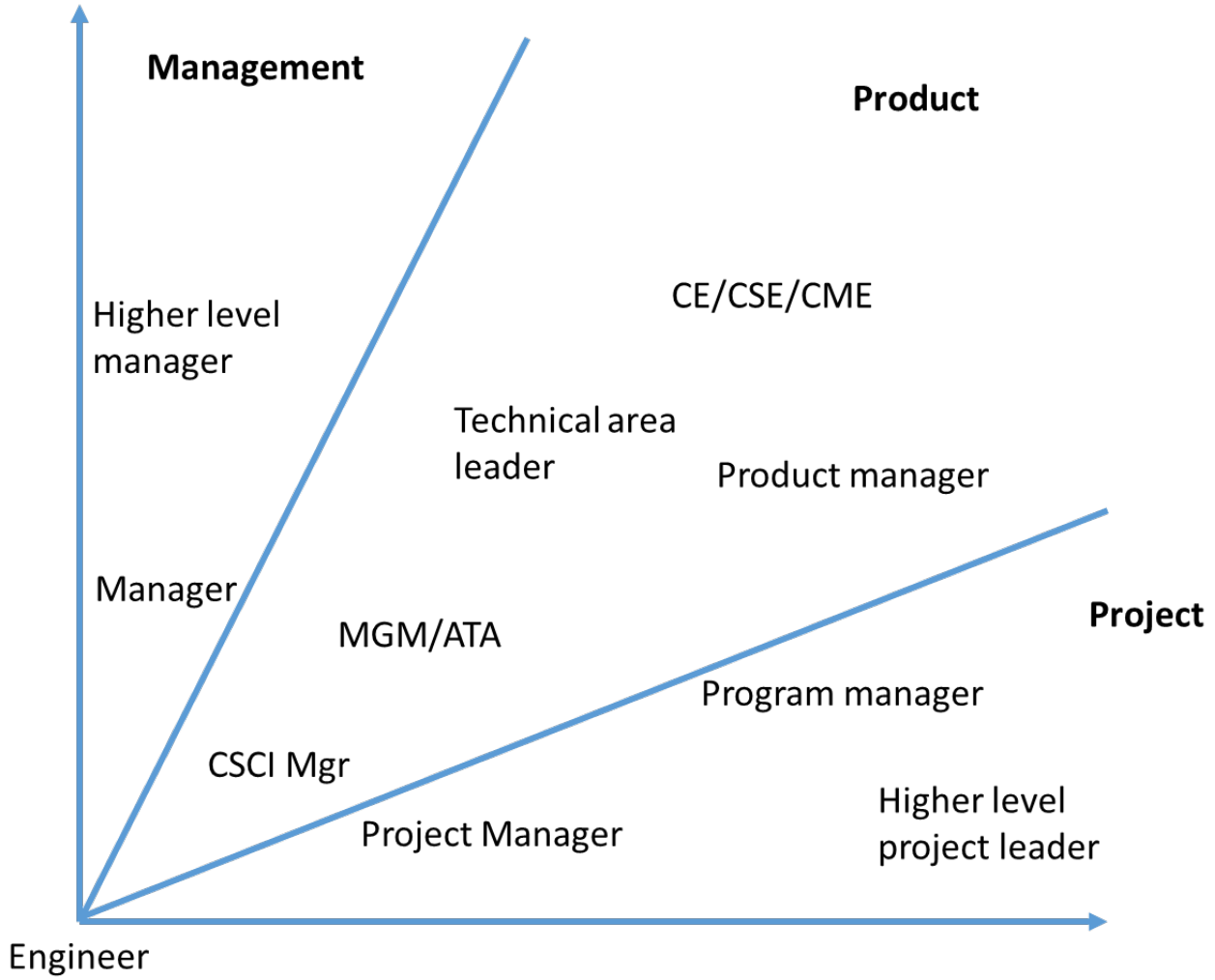
How did we develop the T?

- Publications about knowledge accelerators for senior systems engineers
- Interviews, surveys and discussions with Saab engineers and technical leaders at various levels…



Competencies dependent on role

- Broad technical roles – far away from ”origin” need broad and general knowledge
- ***Dependent*** on leadership area: ***different*** technical knowledge
- ***Independent*** on leadership area: ***same*** personal knowledge



How to accelerate the creation of T-shaped technical leaders

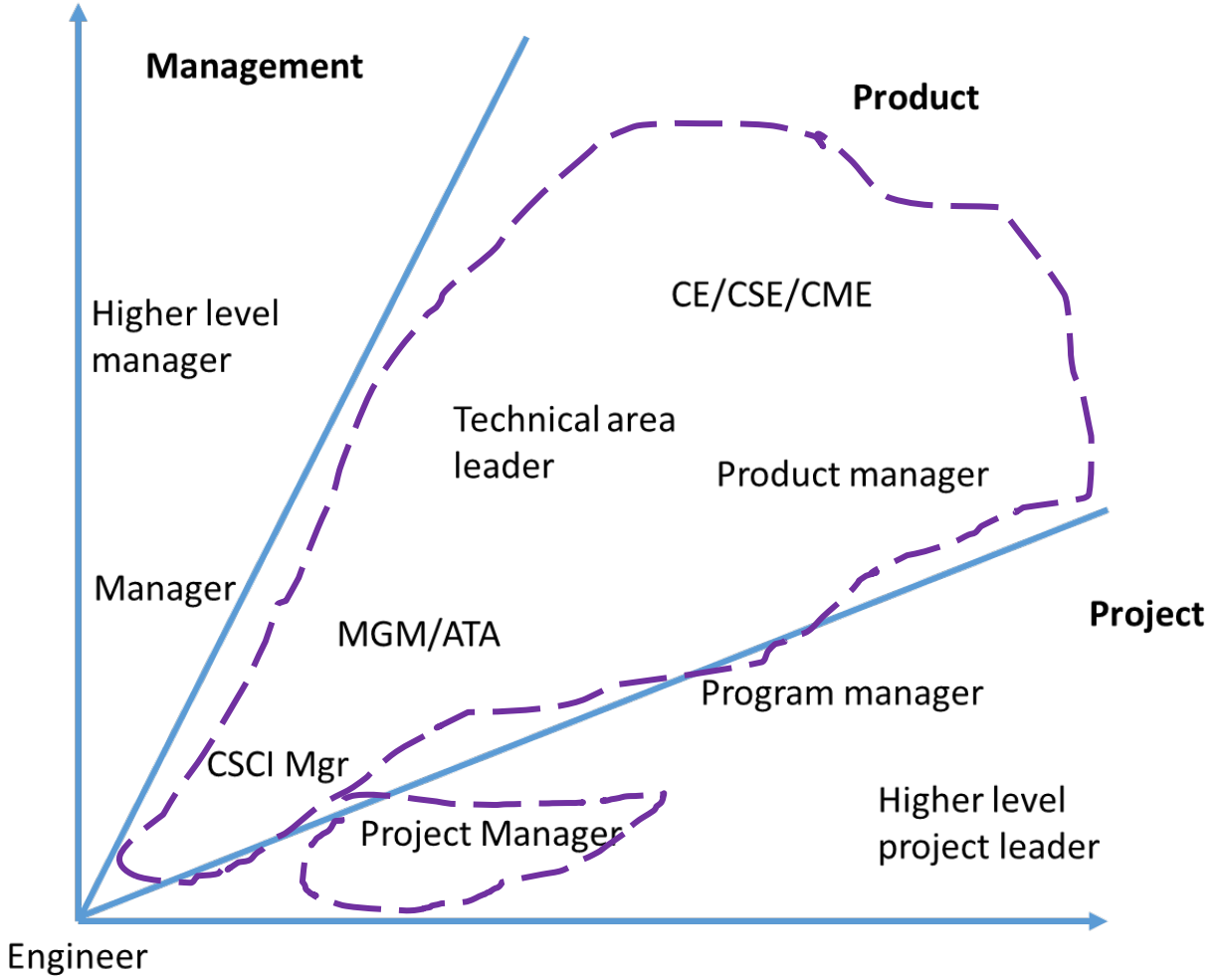
Experiences from Saab Aeronautics Advanced Engineering Training Program

Aeronautics Advanced Engineering Training Program (AAETP)

Purpose: Prepare engineers for *future leading roles requiring a broad technical competence*

- Chief engineer (CE),
  Chief systems engineer (CSE),
  Chief manufacturing engineer (CME)
- Systems architect
- Concept engineer
- Product manager
- Project manager

The program runs for 2.5 years



Program description

Goals:

- Broad technical understanding (work rotations)
- Good knowledge about general system development and increased product knowledge
- Good knowledge about the development process and all aspects of the product lifecycle
- Personal maturity

Content:

- Work rotations
- Mentorship
- Courses, seminars and study visits
- Group tasks

Common for all program batches

- Three program batches (2009, 2012, 2016)
- In common for all participants:
  - Have a clear engineer identity before the program
  - Genuine interest in learning new things
  - Already act as T-engineers – the program accelerates this process
- Desired characteristics for the group:
  large spreadth in age, gender, education, organisational belonging, personality!

A typical program – who are the participants?

Average age

43 years

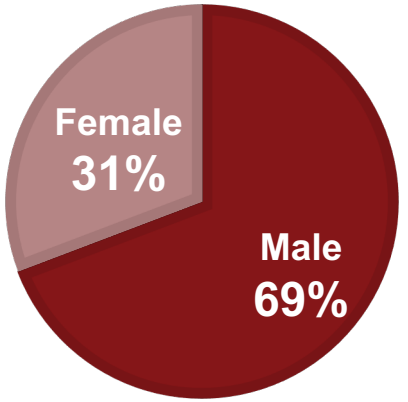
(from 32 to 50 years)

Work life

138 years at Saab
218 years in total

Education

BSc	5
MSc	6
PhD	2

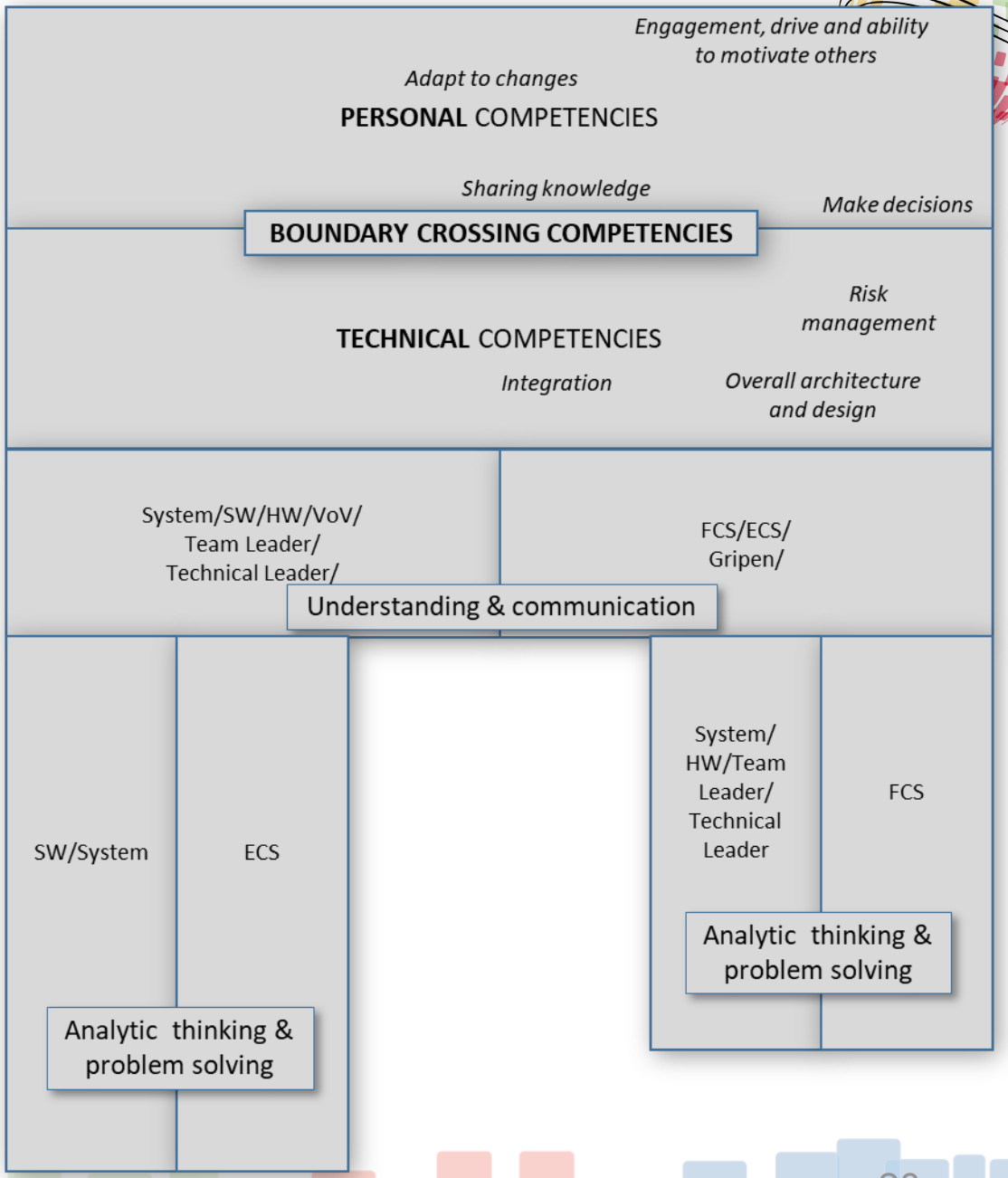


80

Work rotations
(6,2 rotations/person)

T-competencies before the program

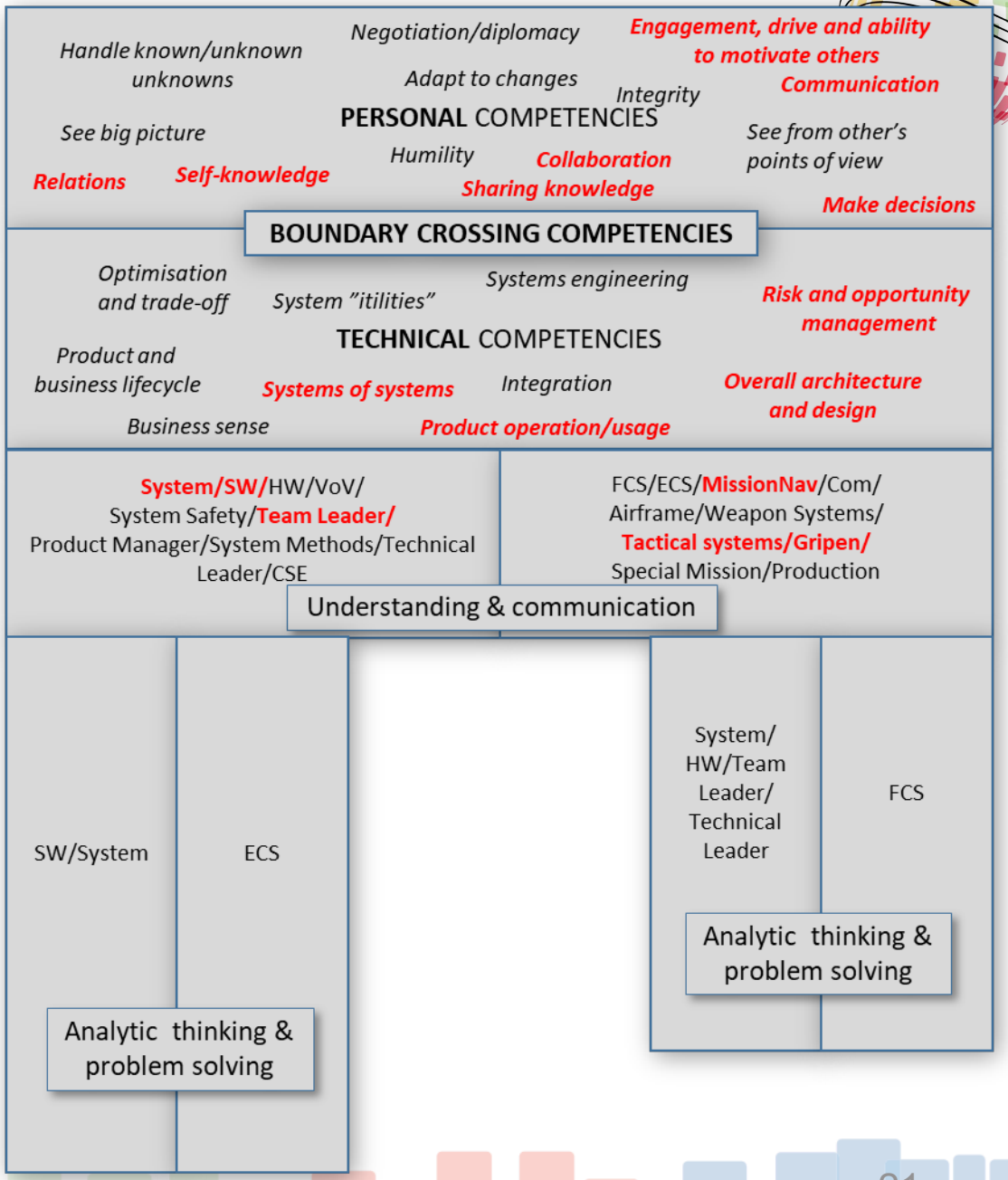
- T-shape before the program for a participant



Different work rotations train different competencies

Work rotations

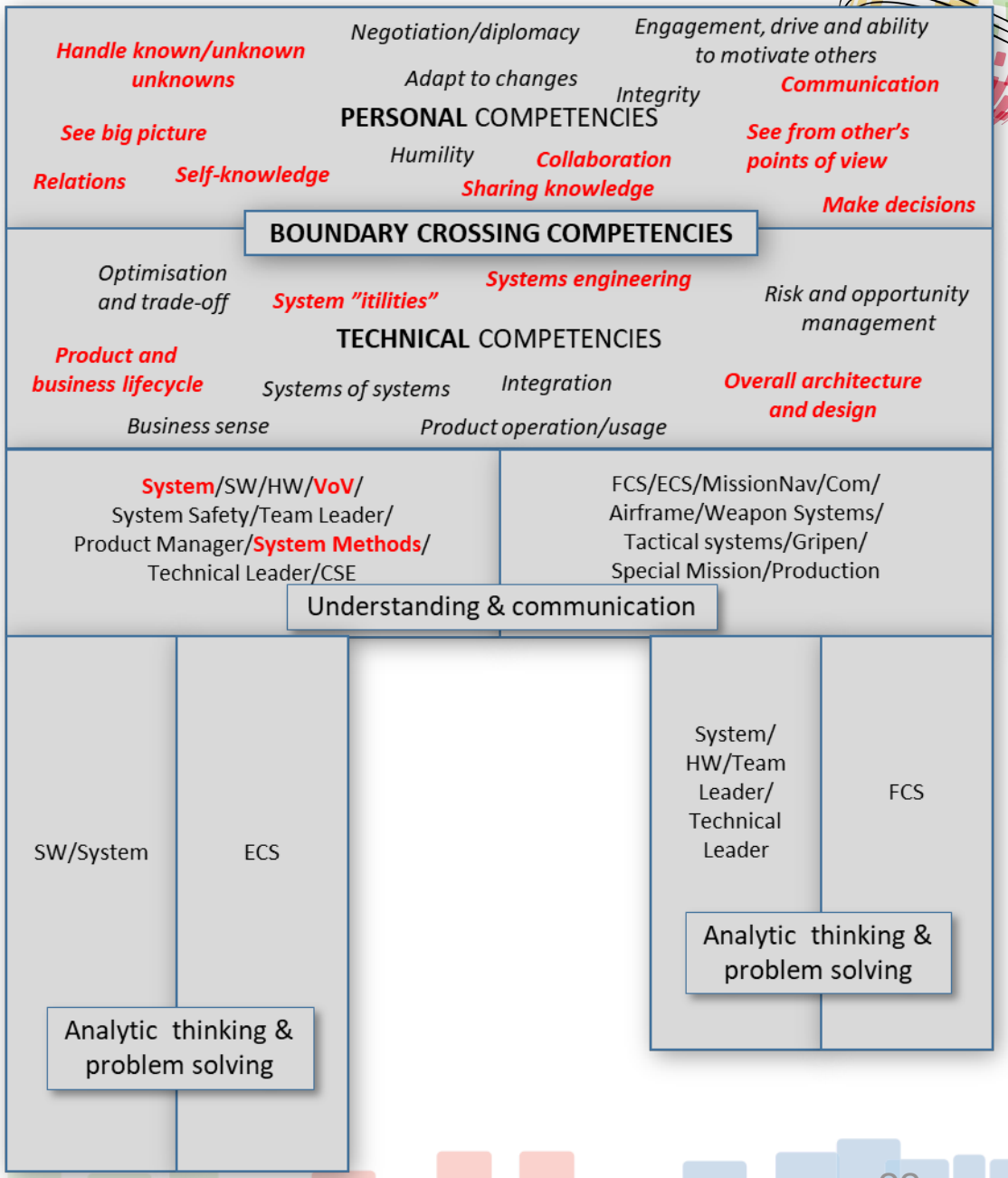
- **Teamleader Mission Navigation, Gripen E**



Different work rotations train different competencies

Work rotations

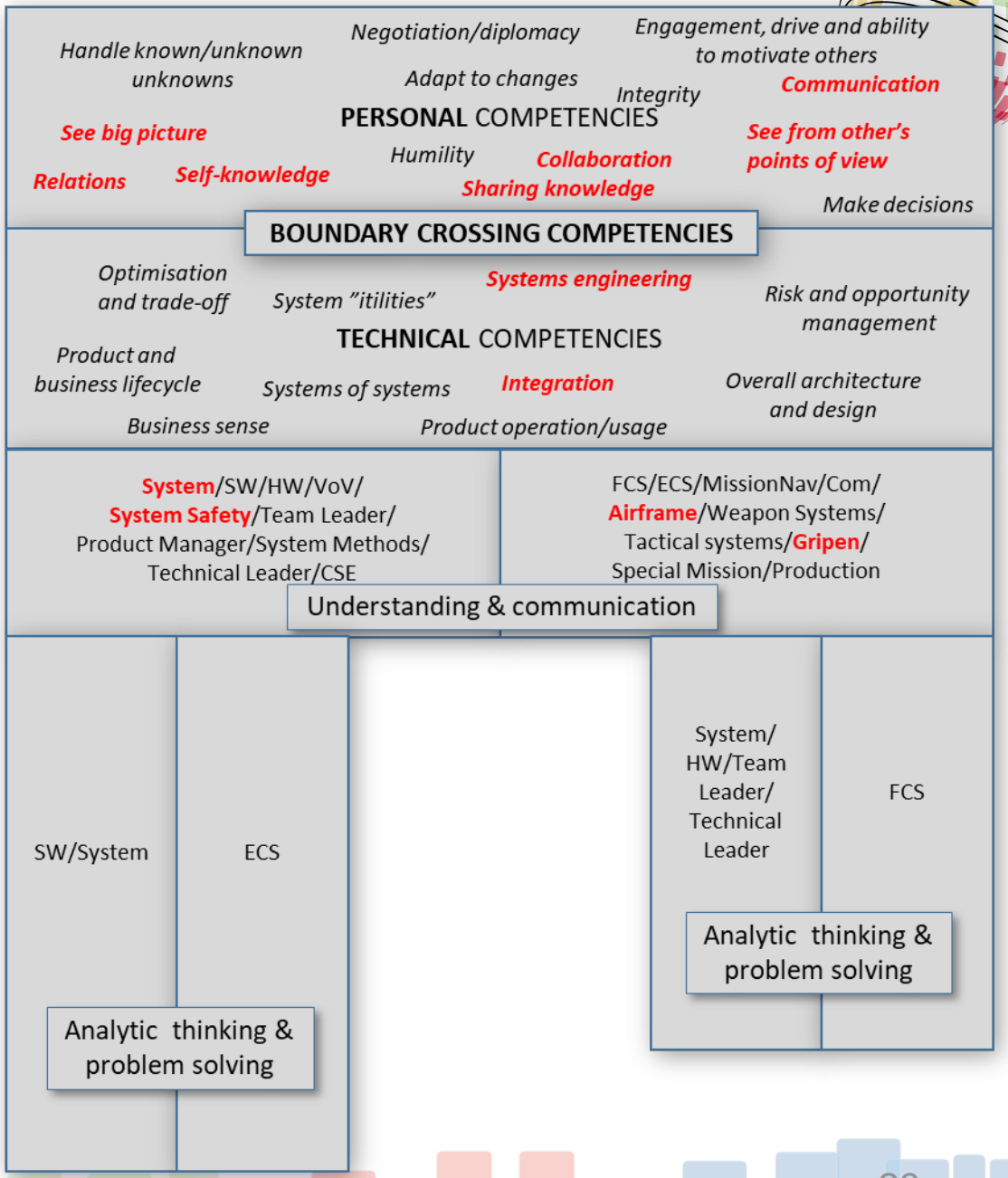
- Teamleader Mission Navigation, Gripen E
- **Systems Engineering Methods, Gripen E**



Different work rotations train different competencies

Work rotations

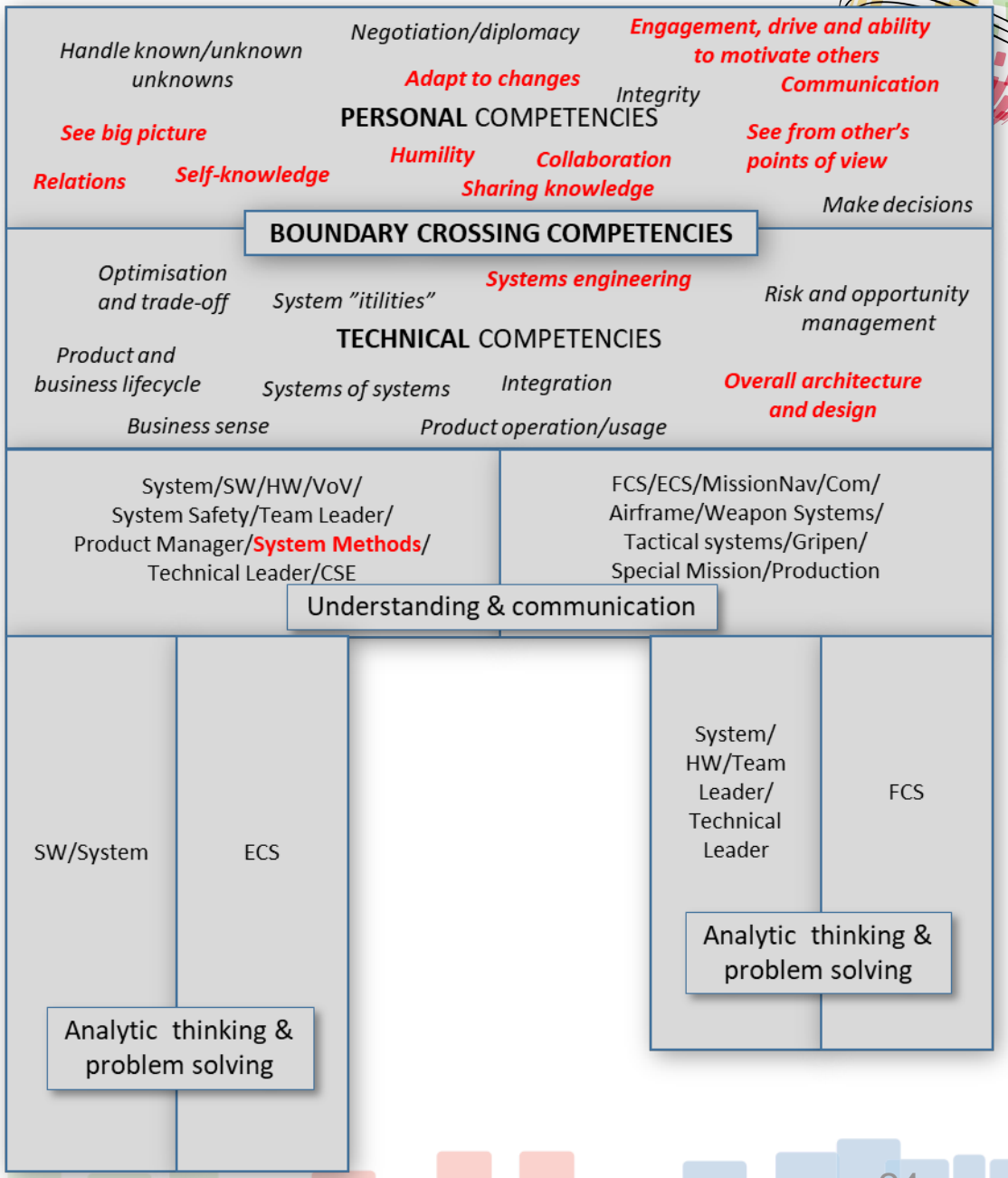
- Teamleader Mission Navigation, Gripen E
- Systems Engineering Methods, Gripen E
- **Systems Engineer Airframe Development, Gripen E**



Different work rotations train different competencies

Work rotations

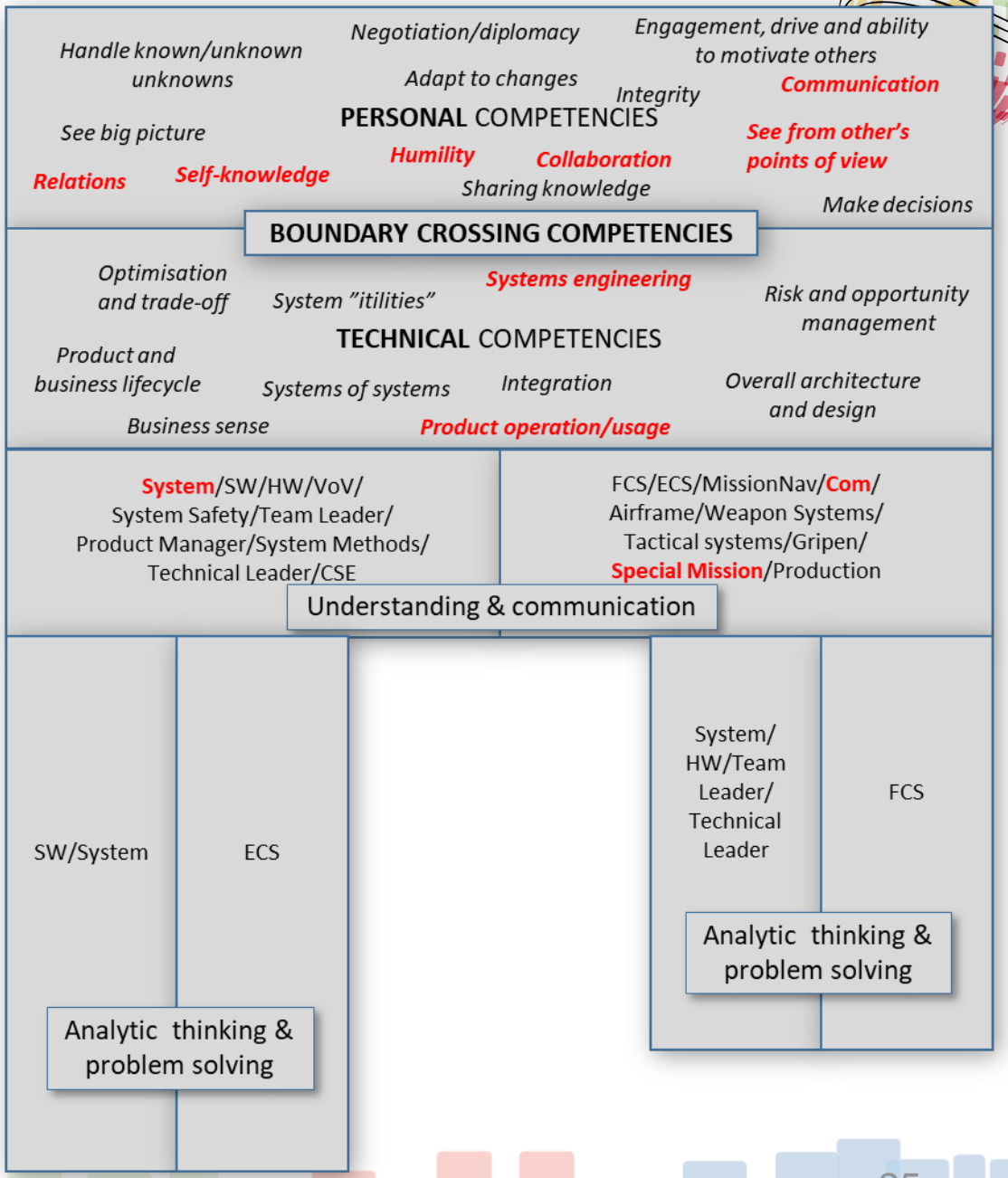
- Teamleader Mission Navigation, Gripen E
- Systems Engineering Methods, Gripen E
- Systems Engineer Airframe Development, Gripen E
- **Lead R&D departments improvement work**



Different work rotations train different competencies

Work rotations

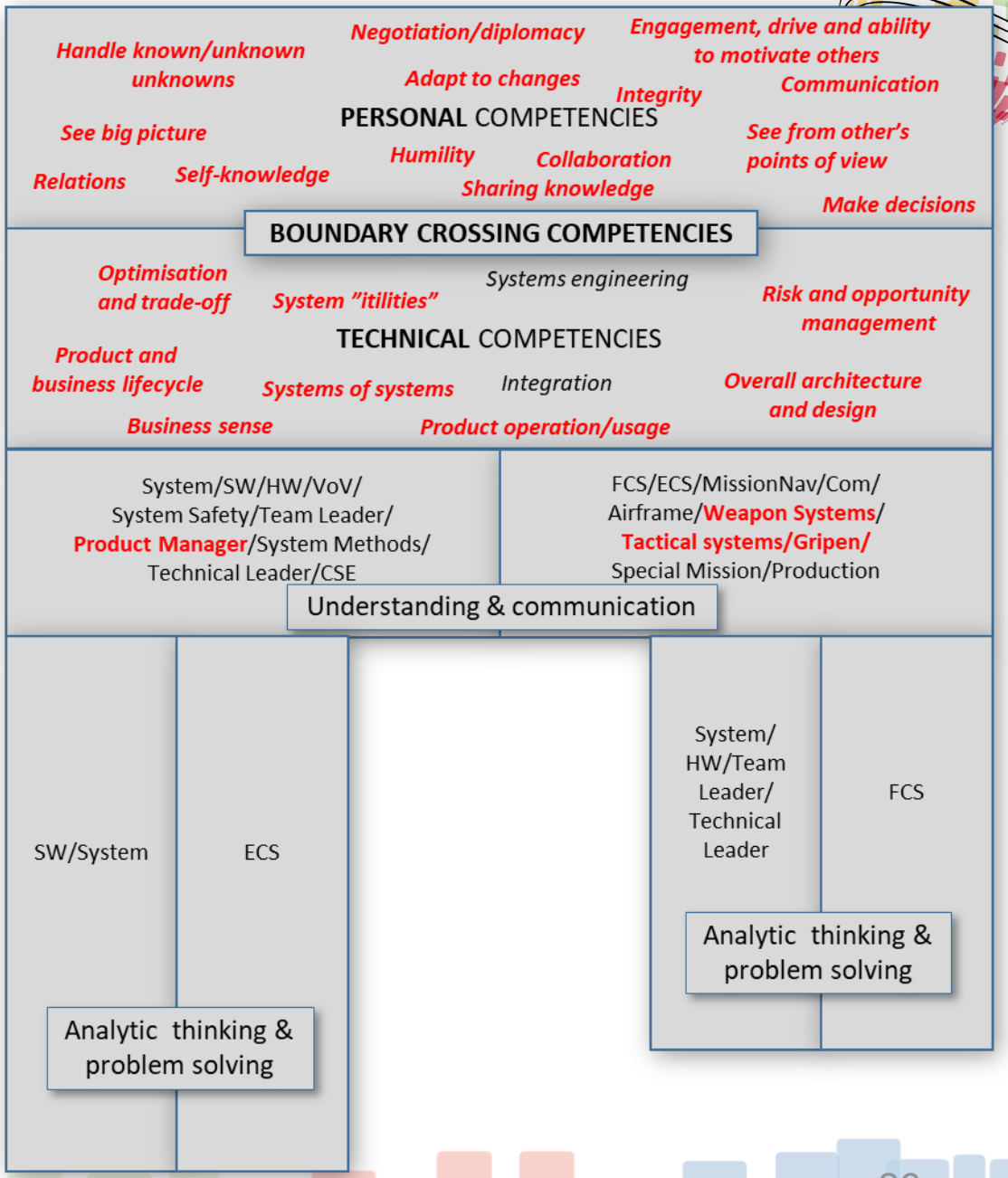
- Teamleader Mission Navigation, Gripen E
- Systems Engineering Methods, Gripen E
- Systems Engineer Airframe Development, Gripen E
- Lead R&D departments improvement work
- **Systems Engineer, Special Mission**



Different work rotations train different competencies

Work rotations

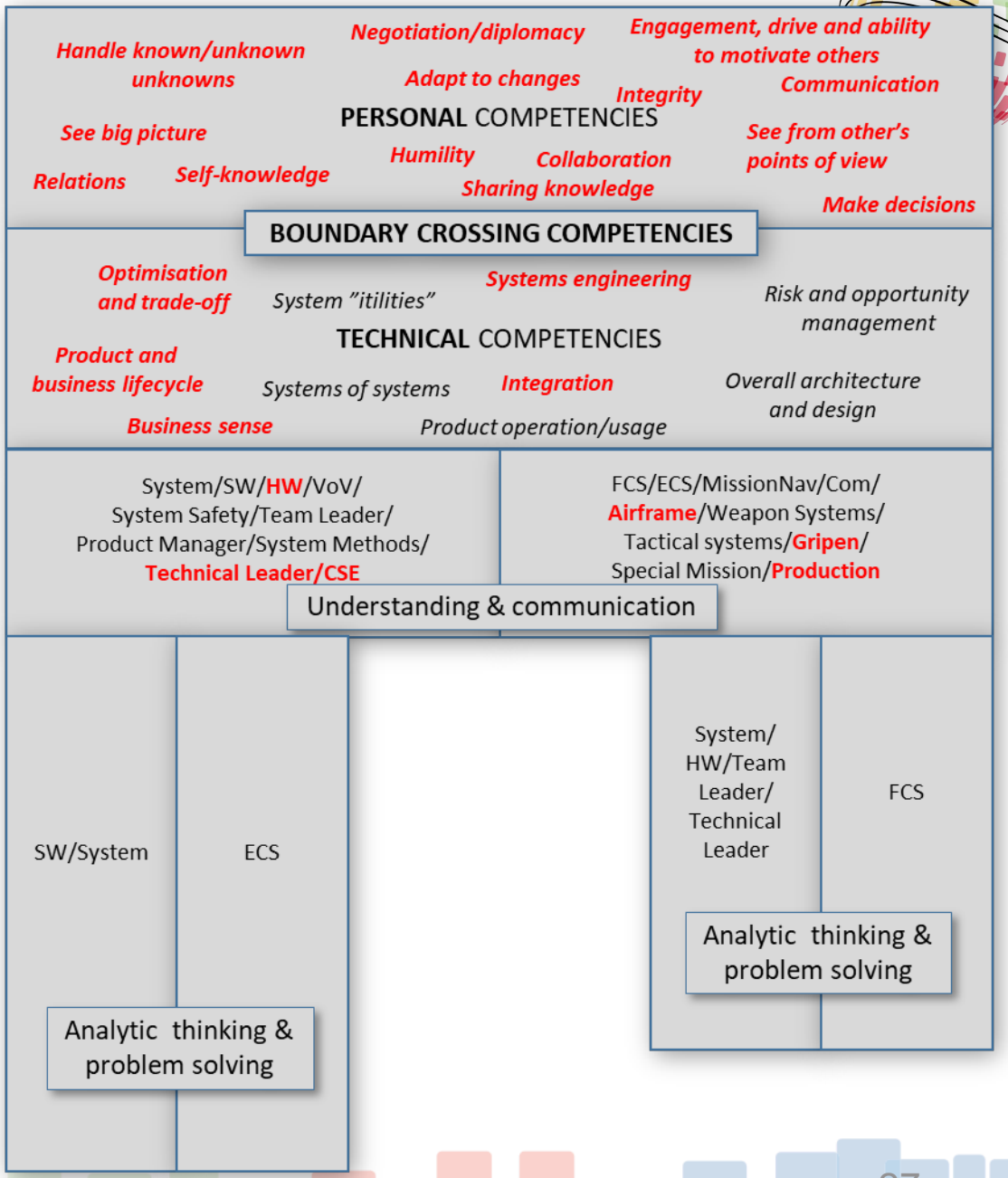
- Teamleader Mission Navigation, Gripen E
- Systems Engineering Methods, Gripen E
- Systems Engineer Airframe Development, Gripen E
- Lead R&D departments improvement work
- Systems Engineer, Special Mission
- **Product Manager, Gripen E**



Different work rotations train different competencies

Work rotations

- Teamleader Mission Navigation, Gripen E
- Systems Engineering Methods, Gripen E
- Systems Engineer Airframe Development, Gripen E
- Lead R&D departments improvement work
- Systems Engineer, Special Mission
- Product Manager, Gripen E
- **Chief Systems Engineer Production, Gripen E**

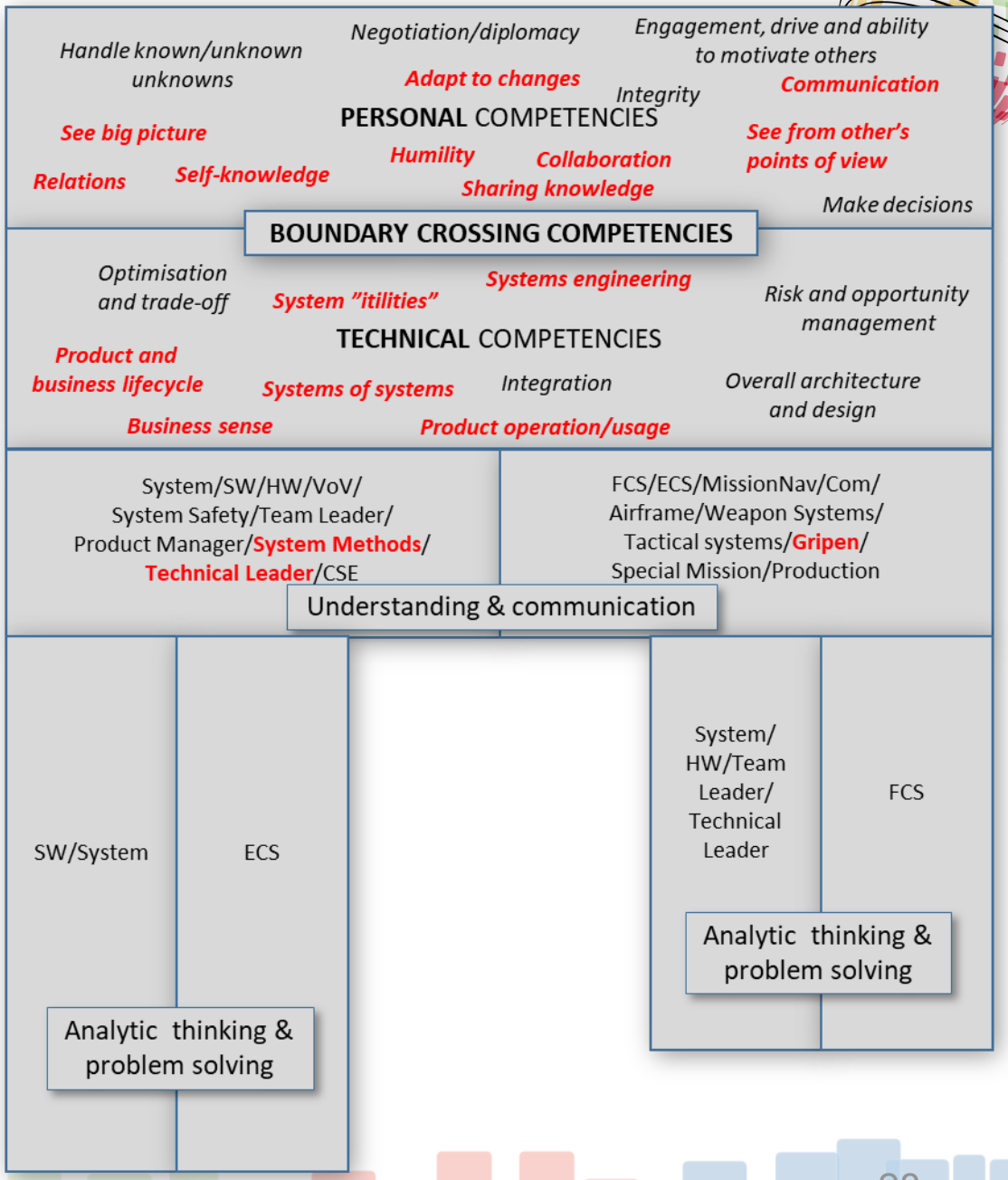


Different work rotations train different competencies

Work rotations

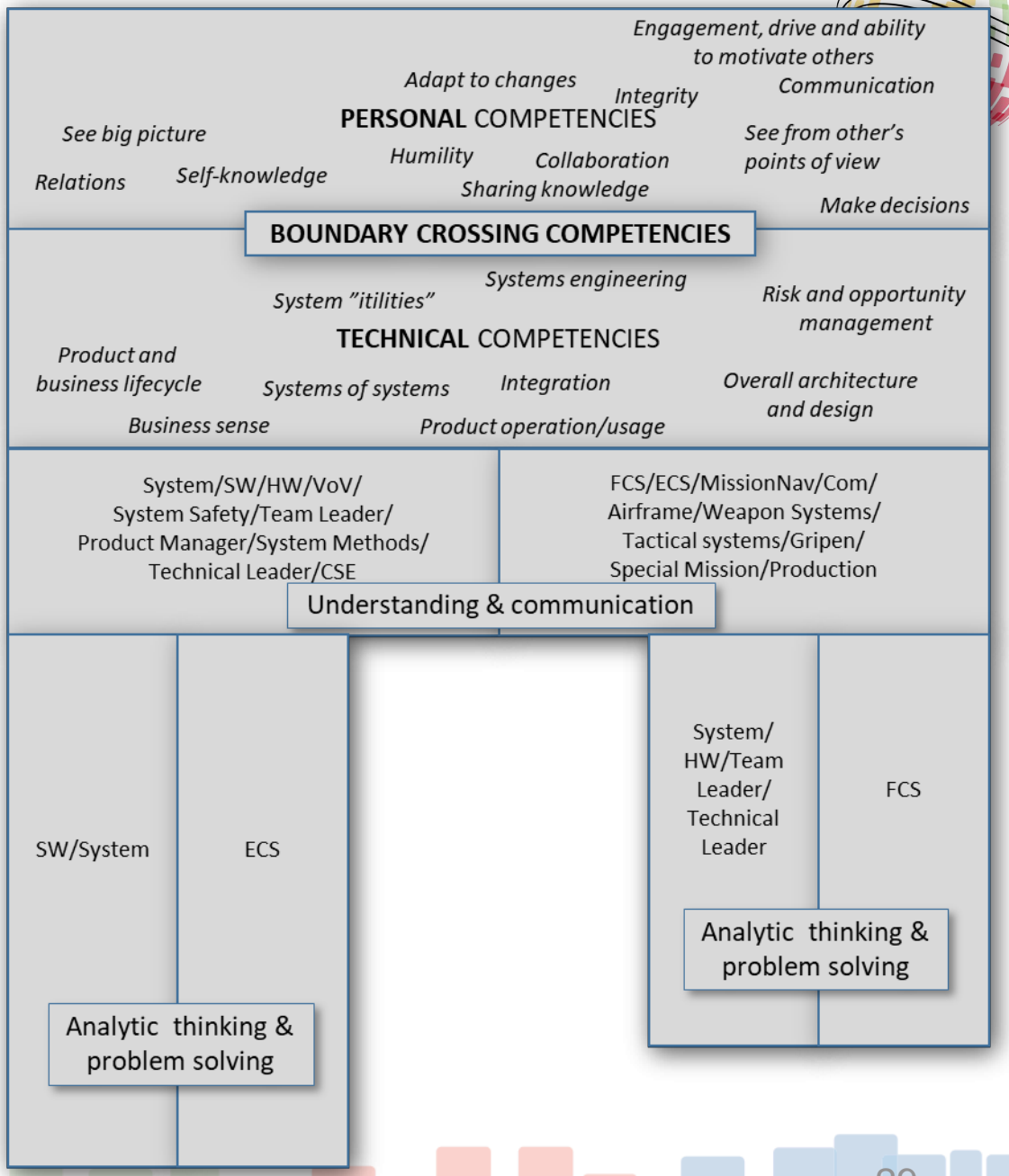
- Teamleader Mission Navigation, Gripen E
- Systems Engineering Methods, Gripen E
- Systems Engineer Airframe Development, Gripen E
- Lead R&D departments improvement work
- Systems Engineer, Special Mission
- Product Manager, Gripen E
- Chief Systems Engineer Production, Gripen E

Other competencies gained by switching places and meeting new people as well as seminars, courses etc

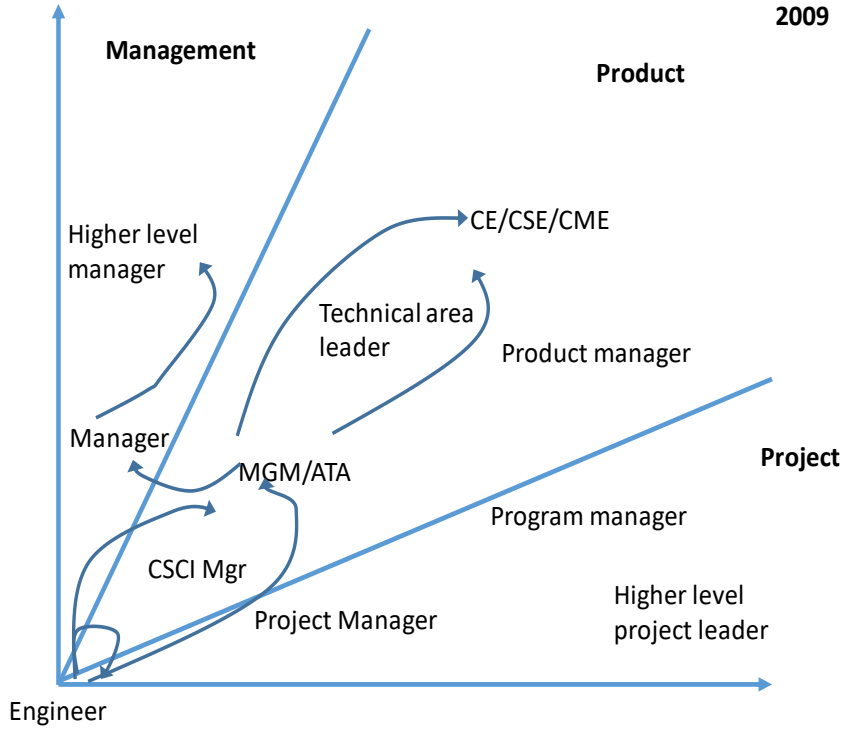


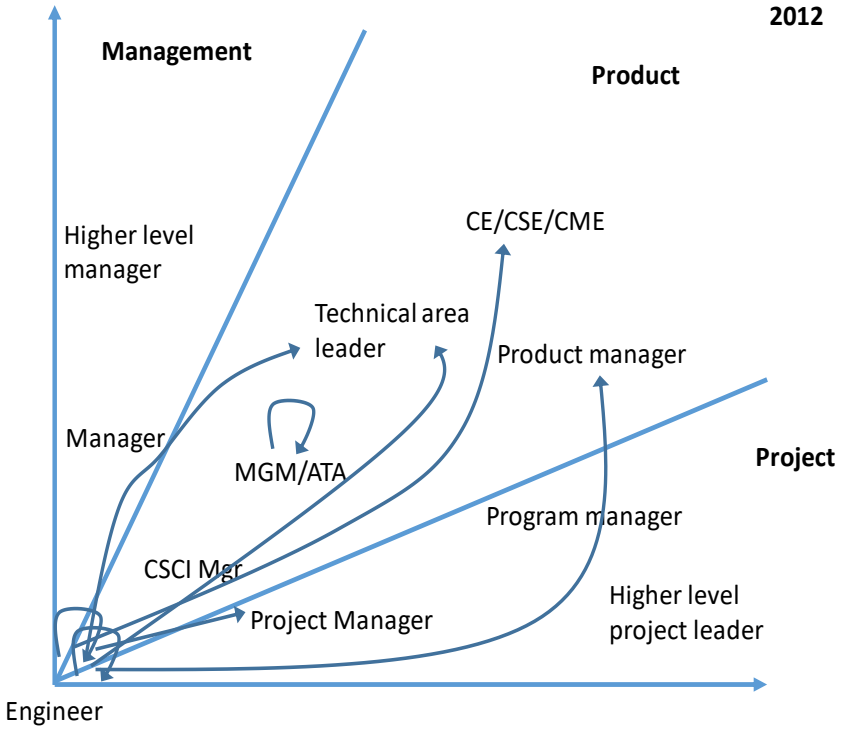
Resulting T-shape after the program

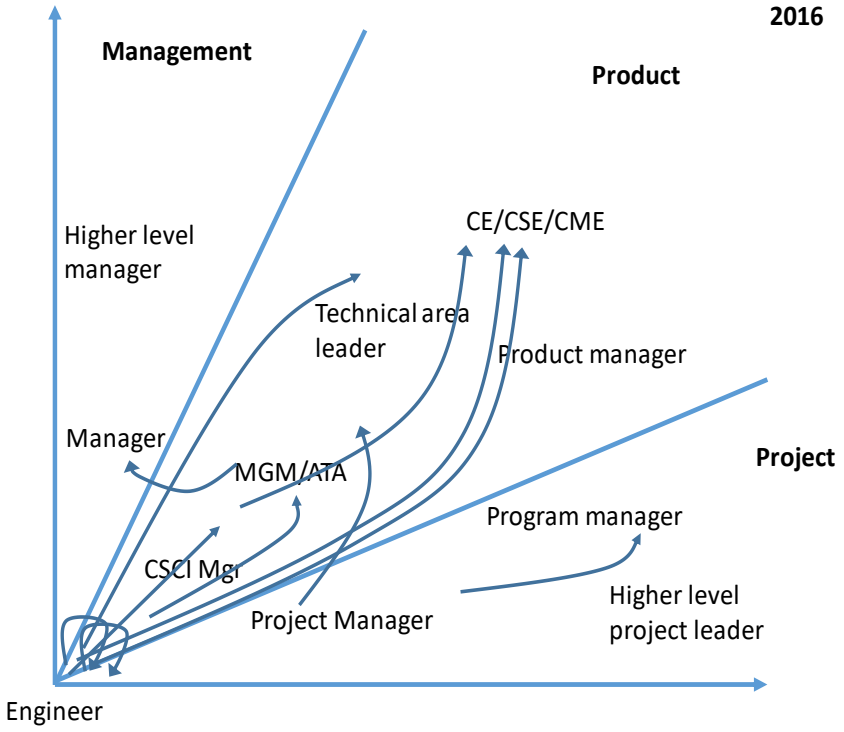
- The program gives valuable training on the boundary crossing competencies!
- New competencies within both personal and technical competencies



Roles before/after program – the results

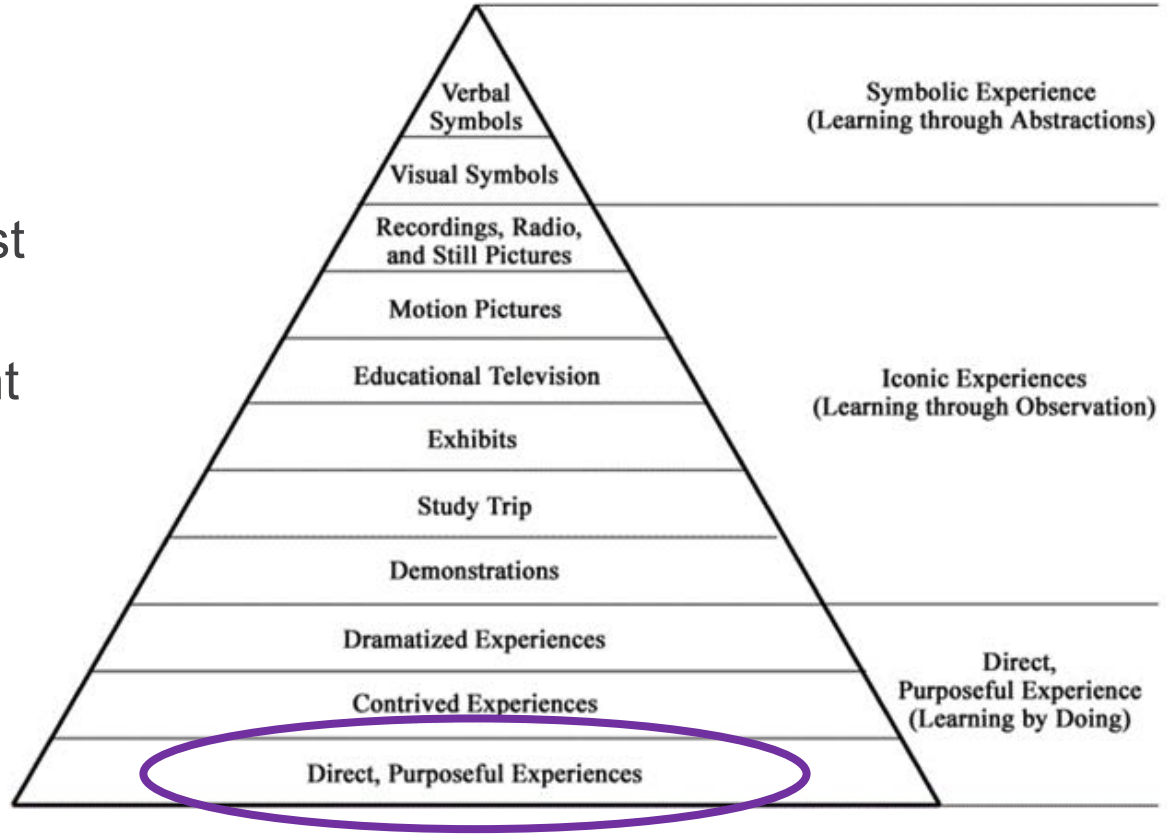






Basis – the work rotations!

- Rotations far away give the most valuable hands-on experiences
- Broad rotations and rotations with customer/user perspective give the most
- The *change* itself (teams/areas/organisations) is important for the participants



The role of the mentor

- Share his/her personal network
- Ideas for suitable work rotations
- Give courage and stability during the program
- Act as a sounding board to discuss thoughts and experiences
- An important part of the discussion of technical leadership and future roles/places

”Very good with an experienced mentor to plan the program and discuss ideas for work rotations.

Also interesting to get to know a senior technical leader.

At the end of the program the mentor also was a good sounding board to discuss how Saab works with technical leadership.”

Benefits from the program

Personal

- Personal network
- Self-knowledge
- Training in communication/collaboration
- Possibility to test roles and work tasks normally not reachable
- Broader picture of system development

”Before the program I thought the technical breadth would give me the most value. Afterwards, I rather value the personal network, better understanding of the organisation as a whole, and personal development (enter/leave teams) the most”

”The most valuable experience from my work rotations is the importance of collaboration and dialogue to be able to reach a common goal”

Organisational

- Participants are valuable observers of the organisation
- Sharing knowledge and encourage collaboration
- The program creates engineers and technical leaders with a strong T-shape, with the possibility to see the big picture

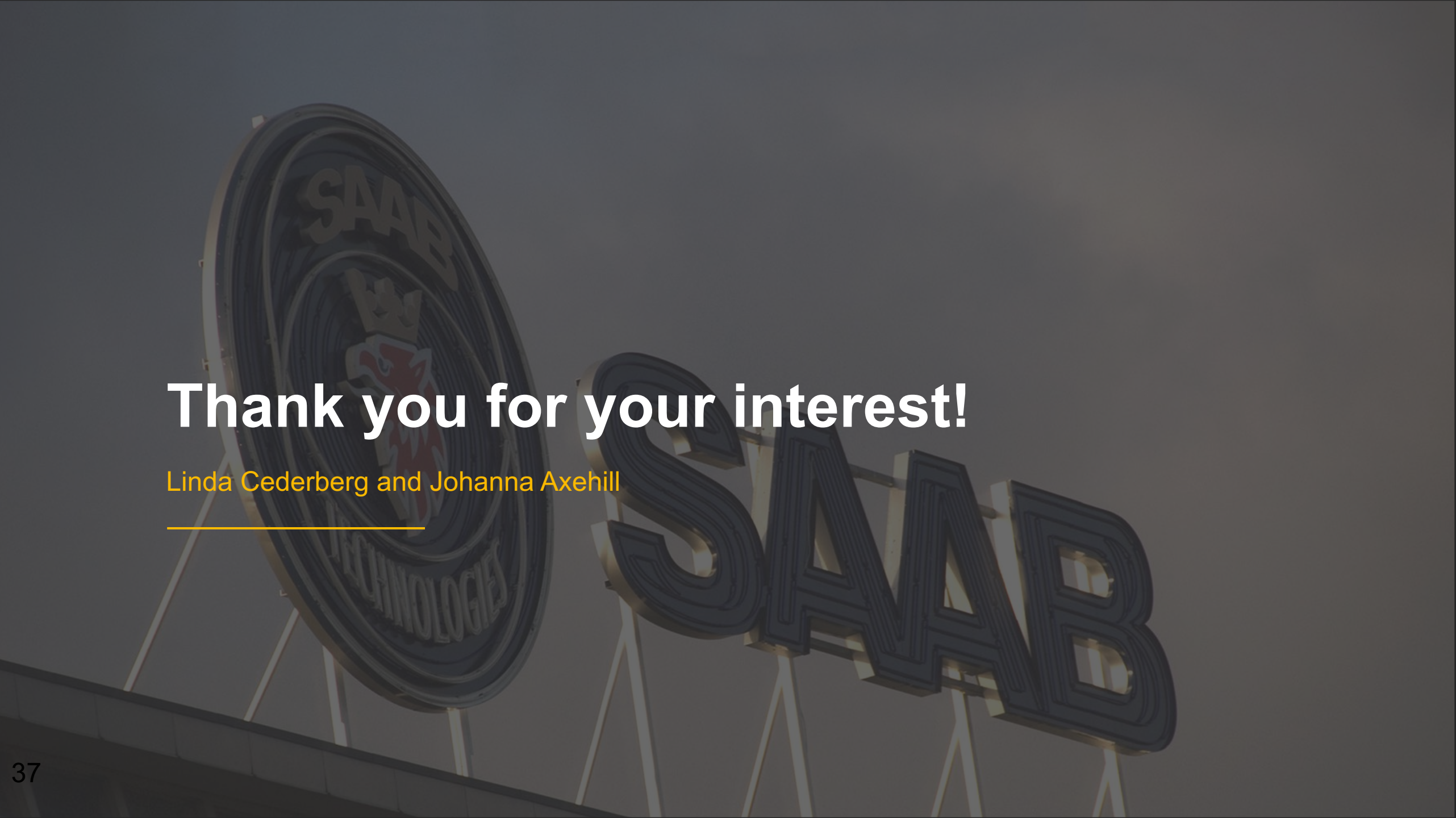
Suggestions for program improvements

- More **external** input
  - Strengthen the theoretical parts
  - International ”best practise” (complex systems development, leadership)
- Clarify **competencies** needed for technical leadership roles
  - Initial T-profile for participants -> structured plan
- Organise a clear **program ending**
  - Line organisation + HR to match to future positions

Conclusions

Conclusions and recommendations

- T-shaped model: clear and simple when describing breadth and depth of technical leaders
- Saab's AAETP program drastically increases broadening competencies – creates people with a strong T-shape and ability to see the big picture
- Larger benefit of the program if you have a clear identity as an engineer
- Potential for program improvements
- The program is highly recommended by all participants and will continue with new groups starting all over Saab Group



Thank you for your interest!

Linda Cederberg and Johanna Axehill