

# Alliance for Strategic Skills

## Addressing Emerging Technologies in Defence

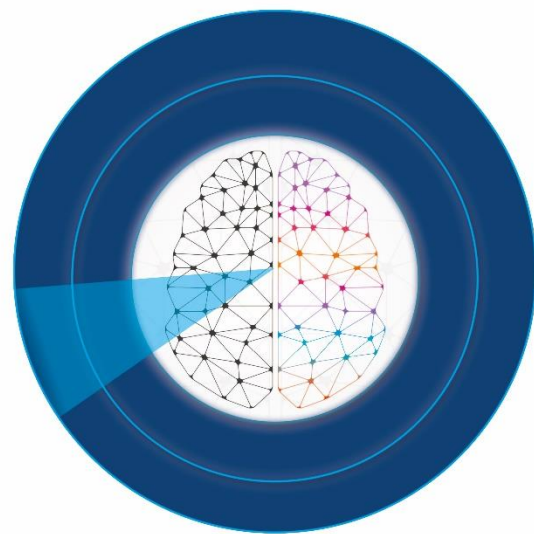
**SAM WEBINARS**

ACROSS THE AM INDUSTRY:  
THE REQUIRED SKILLS-SET BY THE DIFFERENT SECTORS

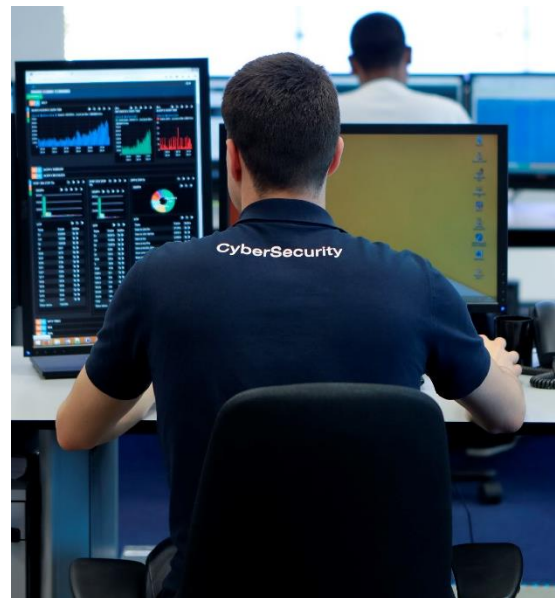
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**SAM** SECTOR SKILLS STRATEGY  
IN ADDITIVE MANUFACTURING

  22<sup>th</sup> October  10:00 - 12.00 CET

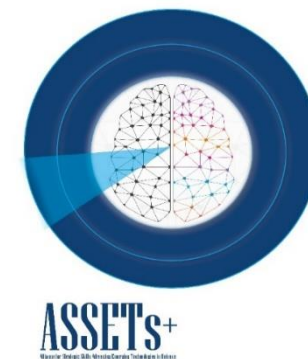


**ASSETs<sup>+</sup>**  
Alliance for Strategic Skills Addressing Emerging Technologies in Defence

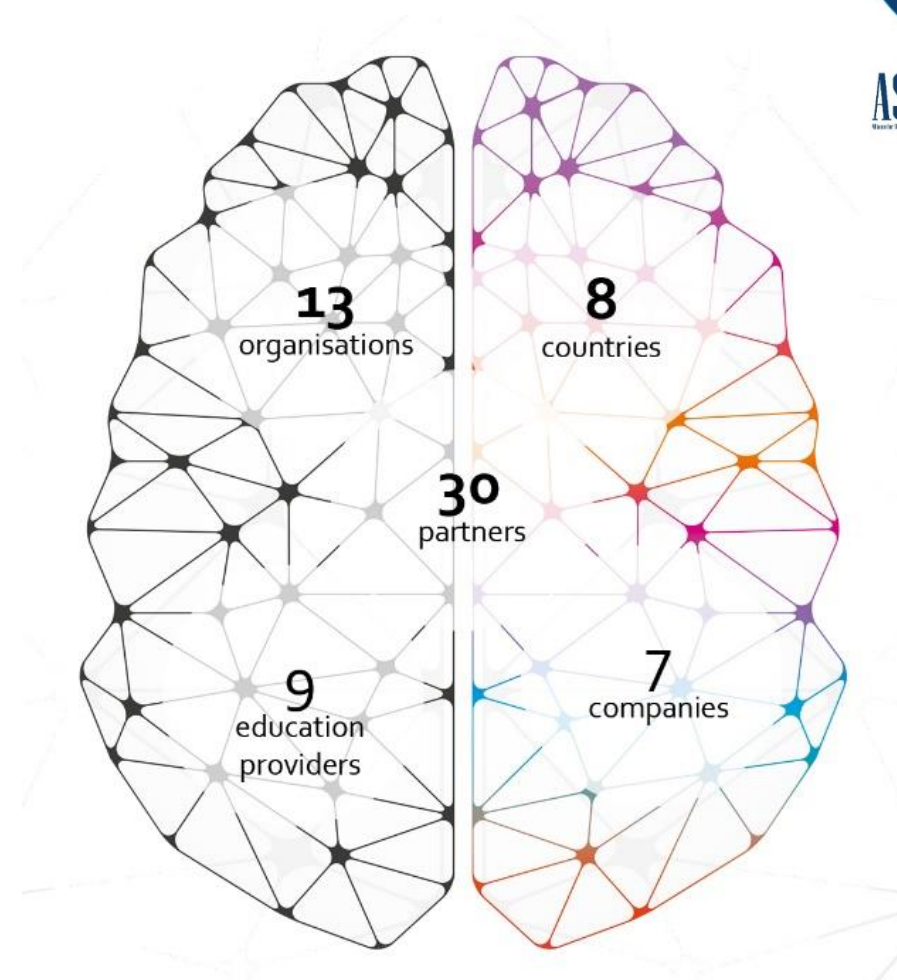


**Project Coordinator:**  
**Prof. Gualtiero Fantoni, University of Pisa**

# ASSETs+ Consortium



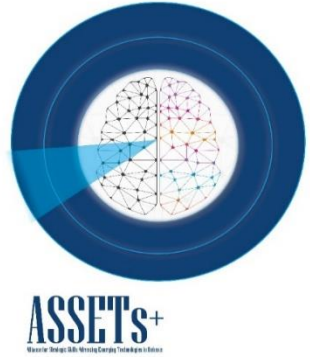
Associated partners:  





# ASSETs+ Core values

Building a sustainable human resources supply chain for the European defence industry within



**Our goal is  
to understand, anticipate  
and formalize Defence skill needs  
in ever-changing technological fields  
for designing training courses  
and developing a European  
Defence Qualification System**



Co-funded by the  
Erasmus+ Programme  
of the European Union

# ASSETs+

Our aim is to understand, anticipate and formalize Defence skill needs...



## *Understand:*

Collect **industrial**  
needs

Meet **educational**  
requirements

## *Anticipate:*



Rely on **AI** and **human** expertise

Map **technological** evolution



## *Formalize:*

Extract **skills** needs related to  
the identified technologies

Group skills in **job profiles**

# ASSETs+

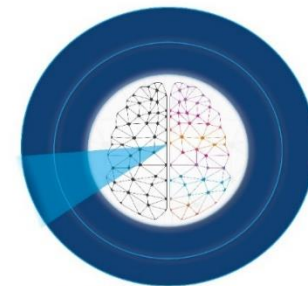
... in ever-changing technological fields...

Robotics, Autonomous vehicles,  
Artificial intelligence

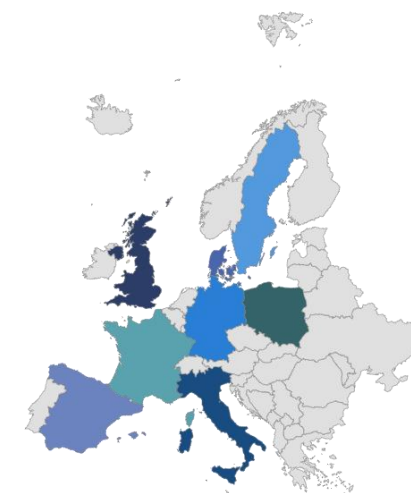
**C4ISTAR**

(Command, Control, Communications, Computers, Intelligence,  
Surveillance, Target Acquisition and Reconnaissance)

Cybersecurity



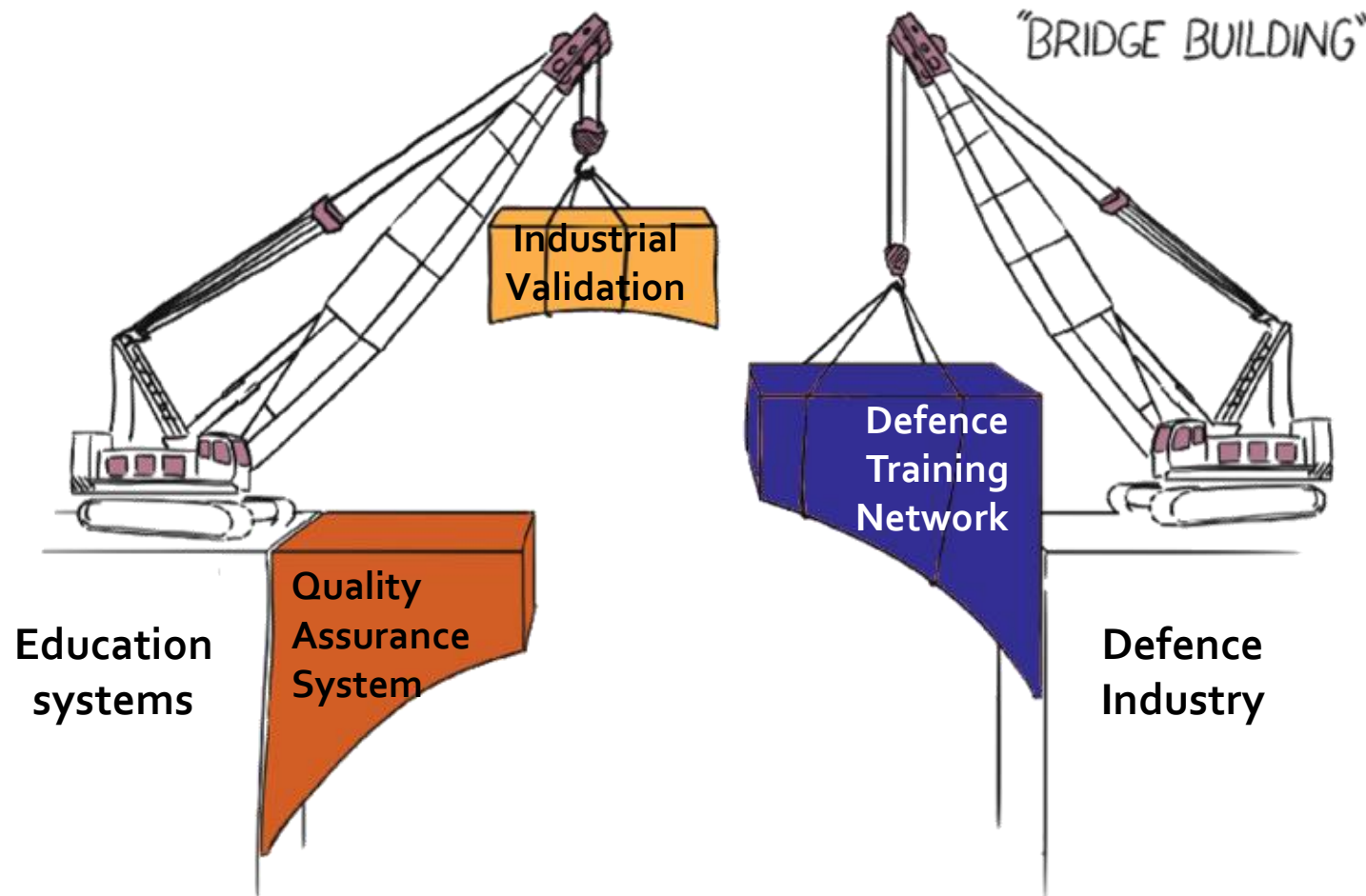
ASSETs+  
Advanced Systems Engineering Technology & Science



Universities, VET  
Providers, Industry,  
Research foundation and  
Sectoral organization

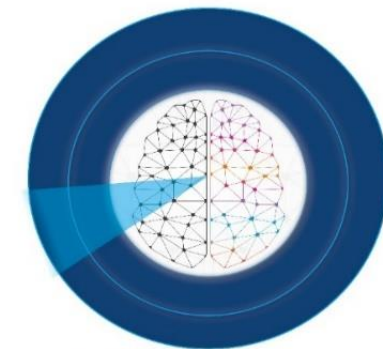
# ASSETs+

... for designing training courses and developing an European Defence Qualification Systems.

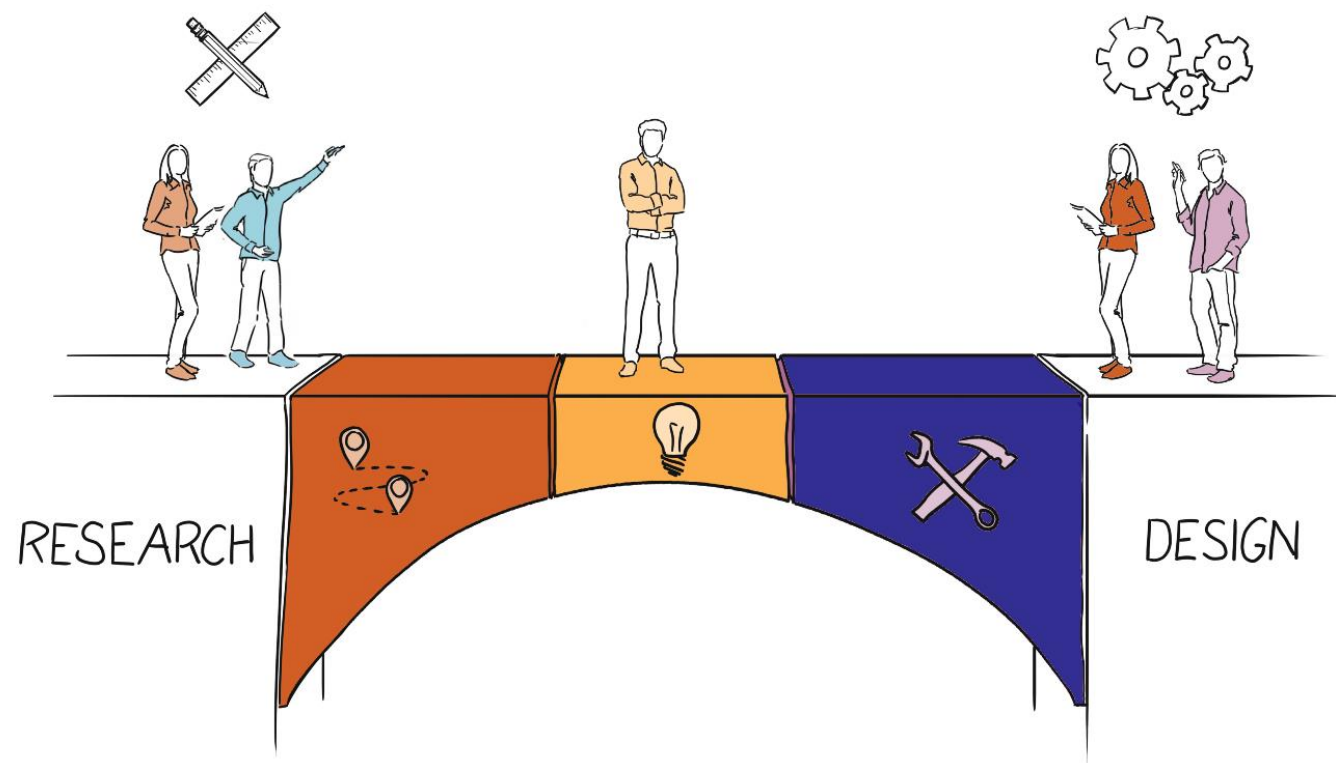




# ASSETs+ objective

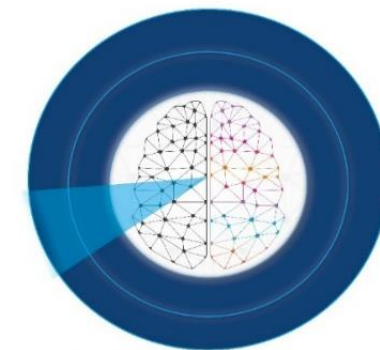


ASSETs+  
Master Strategic Skills, Winning Emerging Technologies in Defence



**Harmonized  
Training Courses  
and Qualifications  
designed and developed  
for Defence**

# ASSETs+ approach

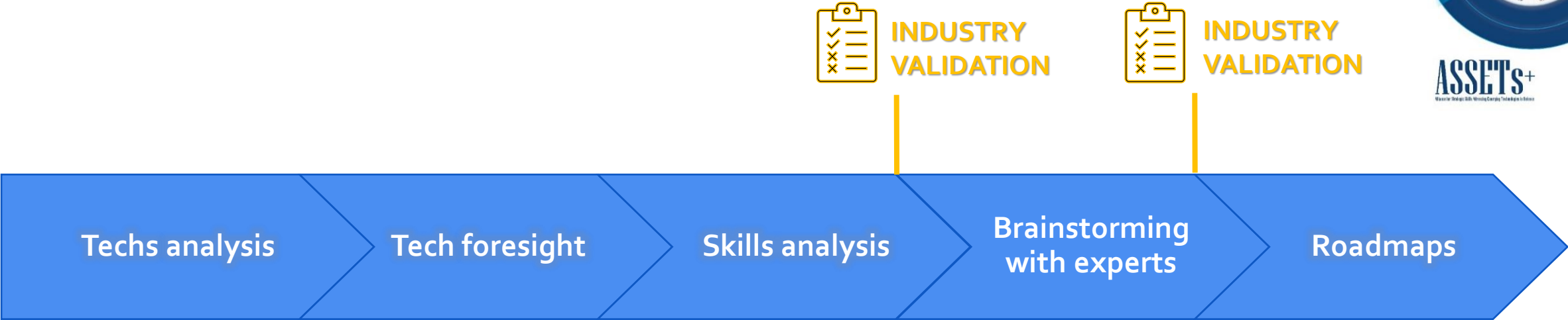
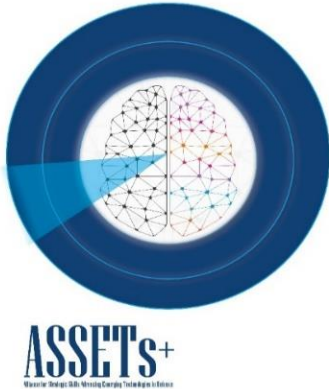


ASSETs+  
Maximise Strategic Skills - Maximising Capacity - Maximising Innovation

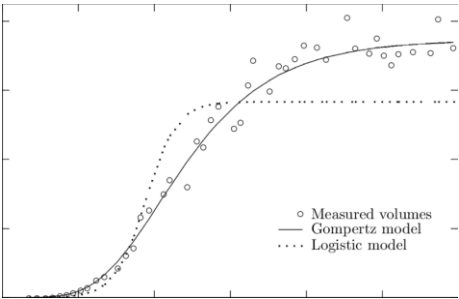




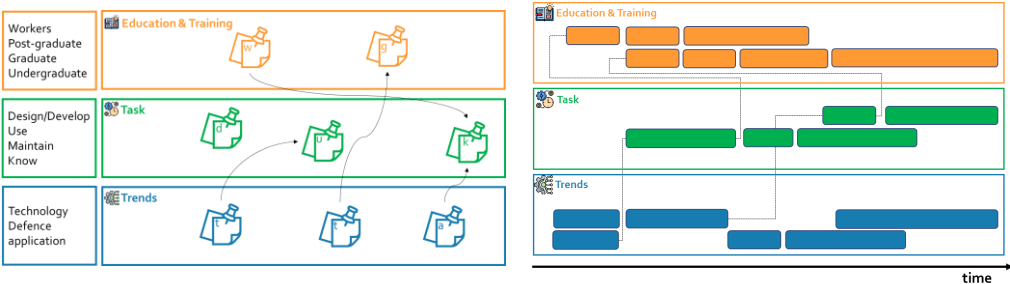
# Alliance for Strategic Skills Addressing Emerging Technologies in Defence



500k  
analyzed documents

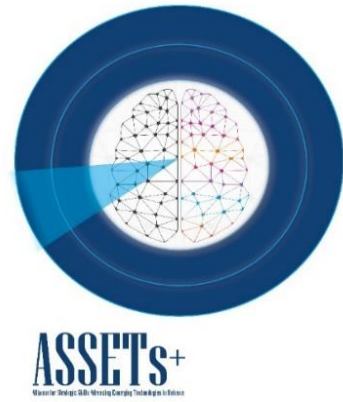


## Skill2ESCO

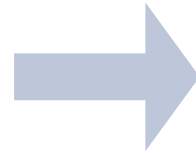
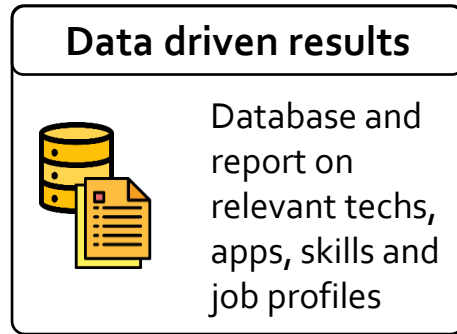
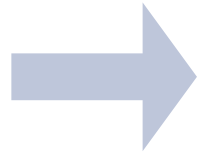


# ASSETs+ approach

With the support of the  
Erasmus+ Programme  
of the European Union



**Automatic  
analysis** on  
the **current**  
situation in  
Defence



**97** technologies classified

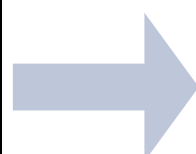
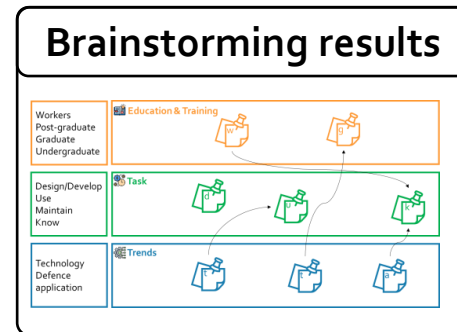
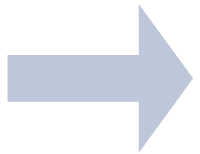
**59** applications identified

**3** technological domains

**172** skills classified

**181** job profiles identified

**Expert  
knowledge**  
on **future**  
oriented  
time-framed  
events.



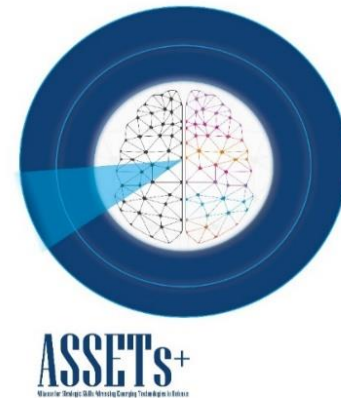
**3** sessions

**~50** ideas generated per  
session

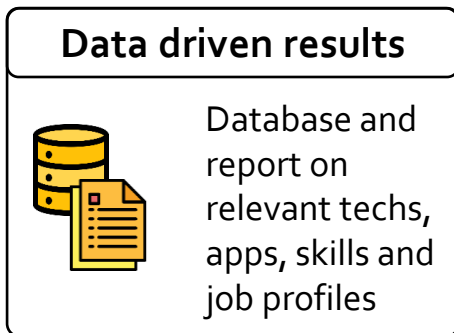
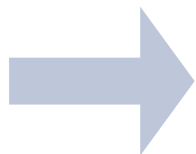
**3** perspectives explored:

- Technologies and applications
- Job activities
- Education & training

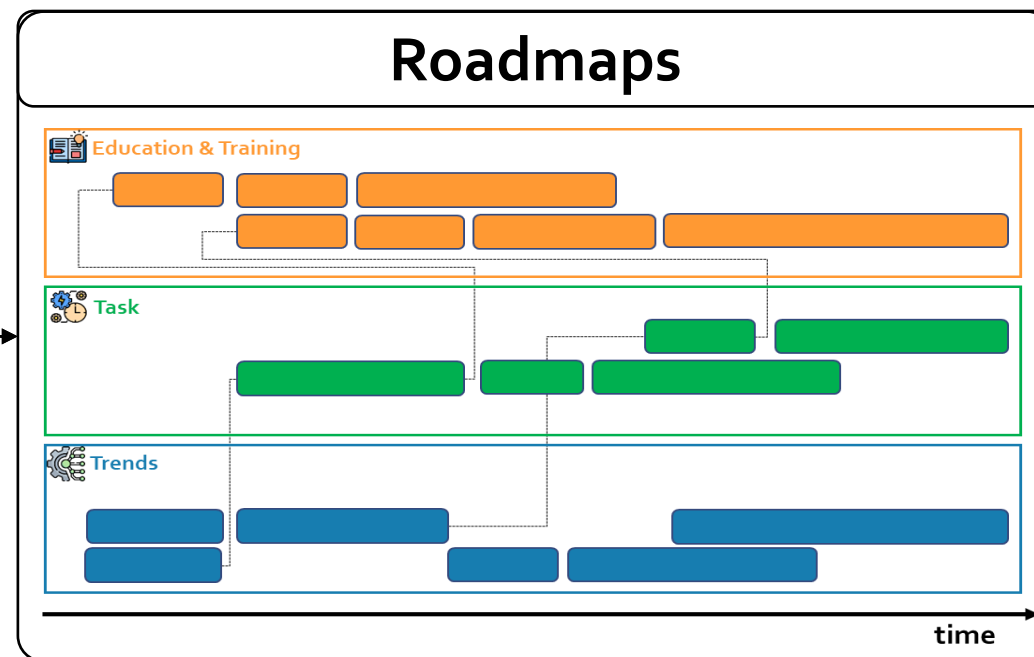
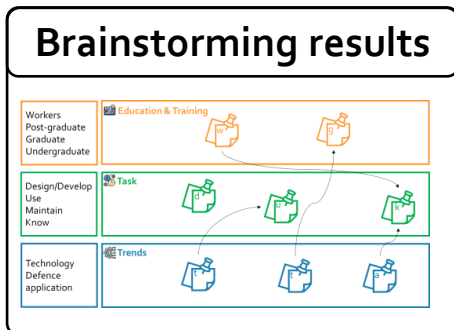
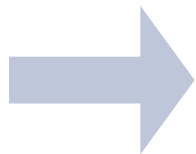
# ASSETs+ approach



**Automatic analysis** on the **current** situation in Defence



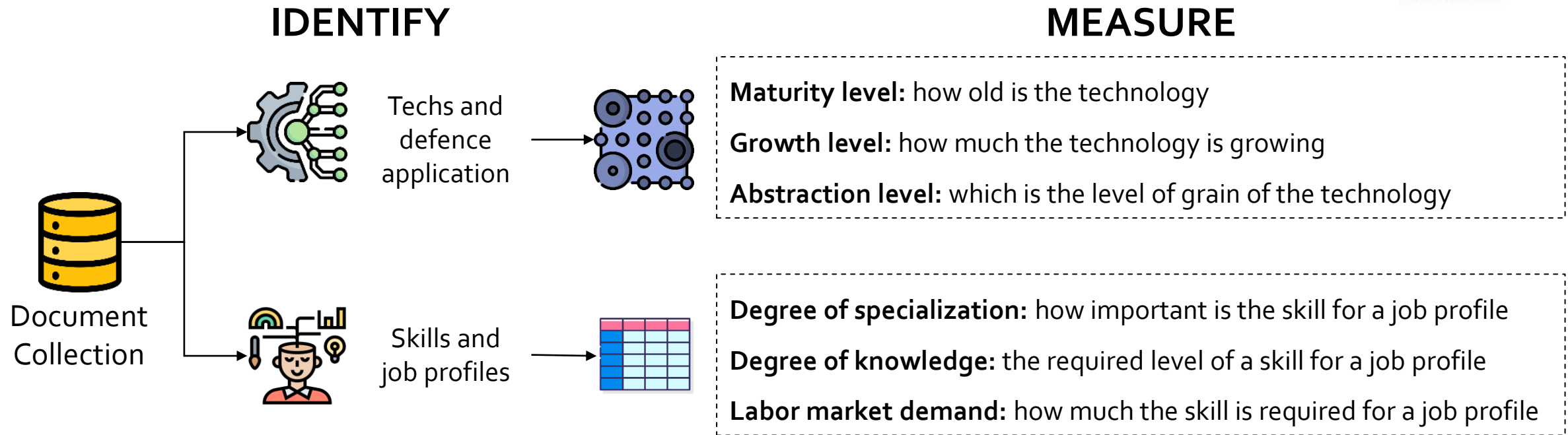
**Expert knowledge** on **future** oriented time-framed events.



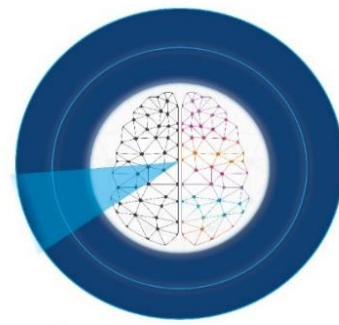


# Technologies and skills analysis - Quantitative

## Document analysis



# Technologies and skills analysis - Quantitative

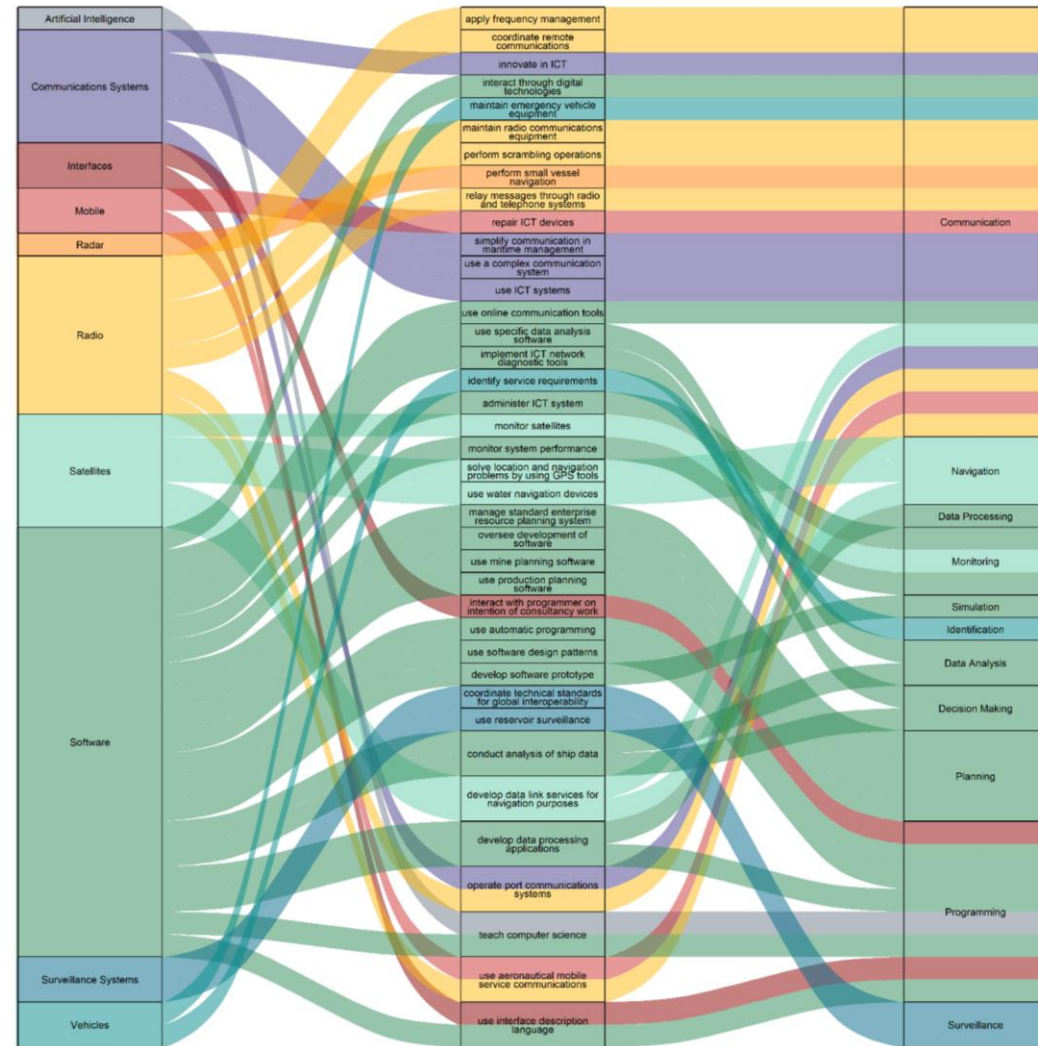


ASSETs+  
Source: Design: SD-WirelessTelecommunications

## Results

Entities relations can be visualized in a **network**

The connections derive from the **co-occurrence** of the entities in the database of knowledge, skills and abilities of **ESCO**



Technologies

Skills

Applications

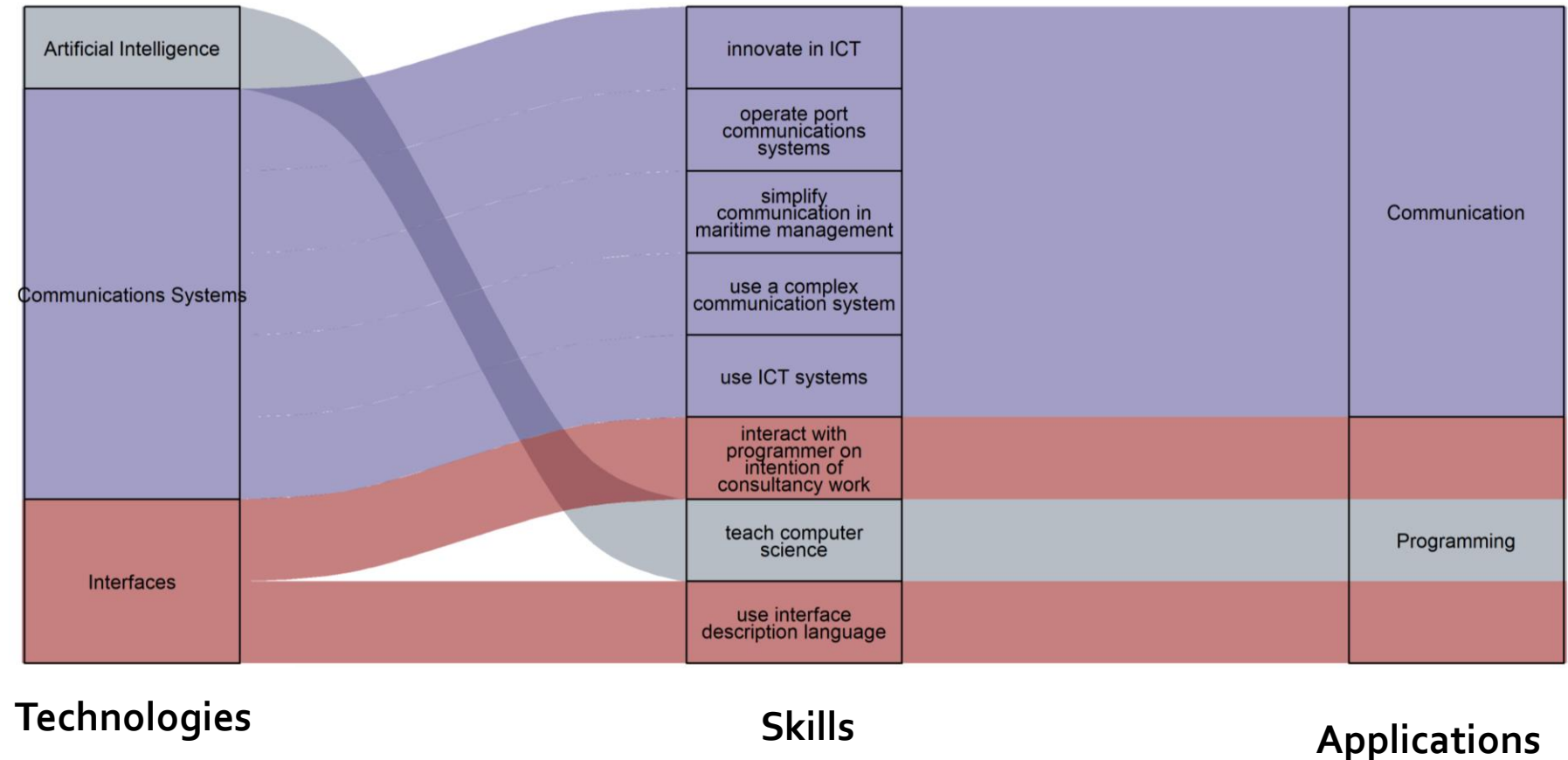


# Technologies and skills analysis - Quantitative

## Results

Entities relations can be visualized in a **network**

The connections derive from the **co-occurrence** of the entities in the database of knowledge, skills and abilities of **ESCO**





# Technologies and skills analysis - Quantitative



## Results

Not only  
**technological skills**  
and **technical job profiles**

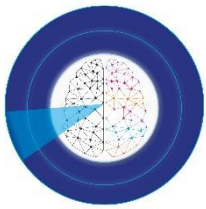


But also  
**defence related** and **transversal**  
**skills** and **occupations**



# Technologies and skills analysis - Quantitative

With the support of the  
Erasmus+ Programme  
of the European Union



## Defence related job profiles



Robotics, AI and Autonomous-Systems domain

**117** job profiles



C4ISTAR domain

**69** job profiles



Cybersecurity domain

**31** job profiles

A survey to the industrial partners allows to identify the **most relevant job profiles** to include in the design of edu-training activities.

Aerospace Engineer  
Database Designed  
Marine Engineer  
Software Analyst

Software Architect

Data Scientist  
Database Administrator  
Ict System Administrator  
Optoelectronic Engineer

Chief Ict Security Officer  
Cyber Defense Analyst  
Cyber Defense Incident Responder  
Information Systems Security Developer  
Security Architect

# Technologies and skills analysis - Quantitative

Skills2ESCO

**14** new skills proposed

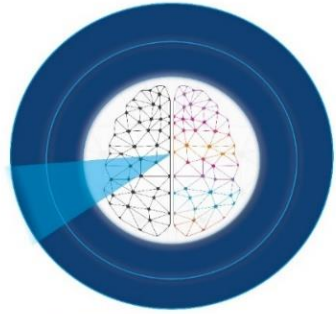
**8** skills'updates proposed

**4** job profiles'updates proposed

**1** new job profile proposed and integrated



**ESCO** European Classification of Skills/Competences, Qualifications and Occupations



**ASSETs+**  
Assessing Skills, Enhancing Employability and Training in the Future

Print

Full concept and hierarchy

## ICT security engineer

English (en)

### Description

ICT security engineers advise and implement solutions to control access to data and programs and ensure the protection of the organization's mission and business processes. ICT security engineers are the gatekeepers of information within an organization or product by being responsible for the protection and security of the related systems. They are in charge of the network and systems in a security capacity and design, plan and execute the system's security architecture, including reference models, segment and solution architectures, and security policies and procedures. They update and upgrade the security systems in response to security-related incidents. ICT security engineers collaborate with the security team to identify, validate, and levy requirements and to participate in target selection, validation, synchronization and execution of cyber actions. They collaborate with other planners, operators and or analysts to provide post-event analysis.

### Alternative label

security architect  
IT security expert  
ICT security advisor  
ICT security architect  
information communications technology security consultant  
ICT security consultant  
IT security advisor  
IT security consultant  
consultant in ICT security activities  
information technology security consultant

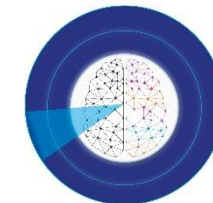










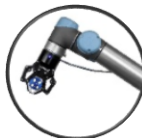

# Technologies and skills analysis - Qualitative

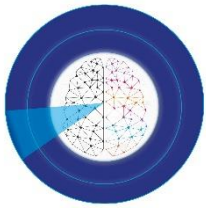
C4aiD: Our Framework to Look Forward with panel of experts



With the support of the  
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of the European Union



<b>C4AID</b> Command Control Communication Cybersecurity Artificial Intelligence Defence (Intelligence, Surveillance, Target Acquisition, Reconnaissance)		Defence Areas					
		Factory 	Land 	Sea 	Air 	Space 	Cyberspace 
Technologies	Artificial Intelligence 	Third session					
	Cybersecurity 	Second session					
	Robot 			First session			
	Autonomous Systems 						



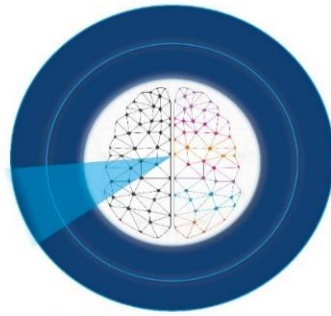
# Technologies and skills analysis - Qualitative



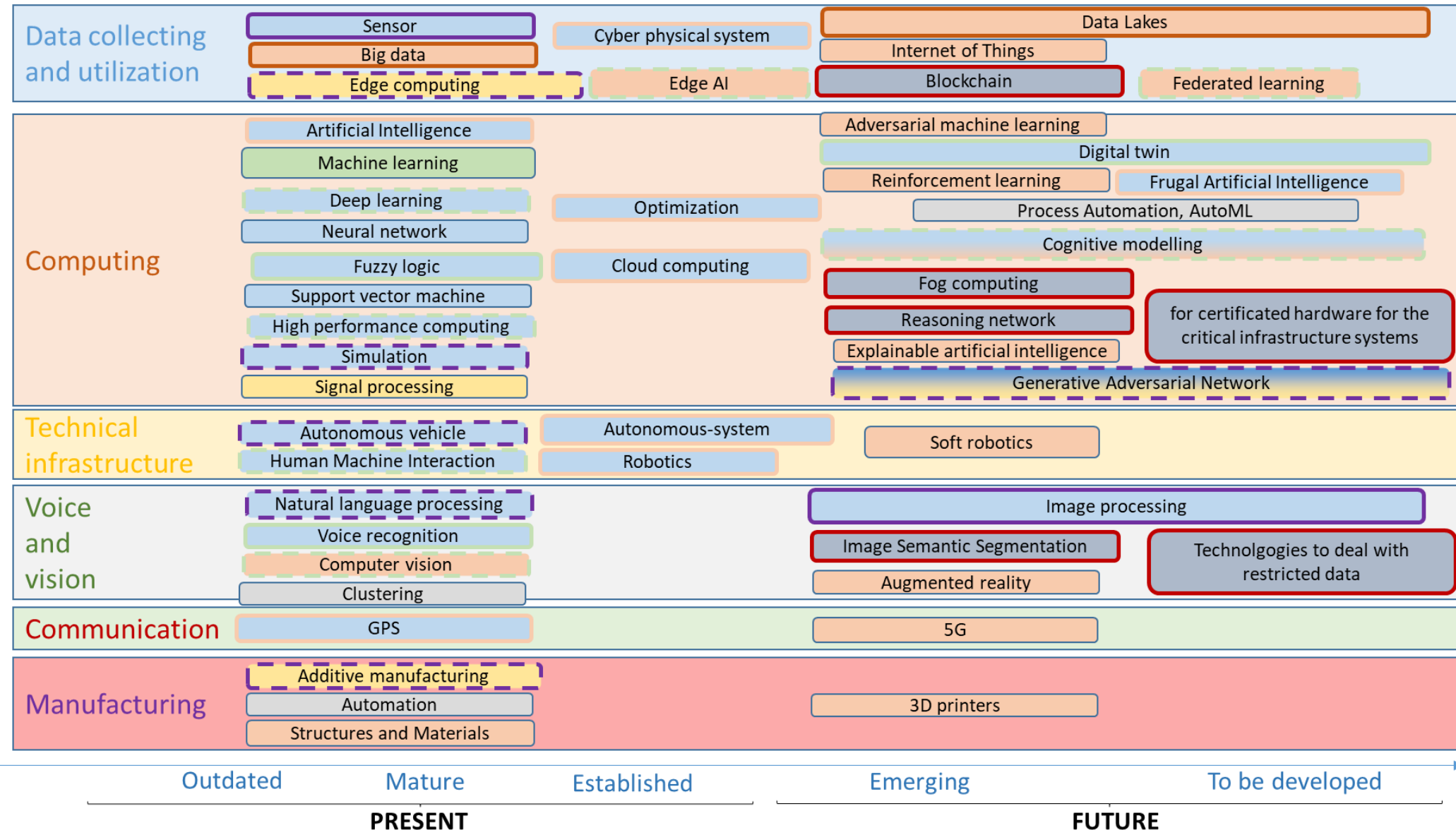
	<b>First brainstorming:</b> The impact of AI, Robotics and AV in the Sea Defence Area	<b>Second brainstorming:</b> The impact of Cybersecurity in the Defence Areas	<b>Third brainstorming:</b> The impact of AI in the Defence Areas
<b>Technologies and Applications</b>	Machine learning on the edge and its trade off	Open-source and quantum computing	Standardization
<b>Job Activities</b>	Mix AI with business and engineering process	Needs of Cybersecurity Architects, Chief Product Security Officer and SecDevOps	Collaboration with end-users and technologies
<b>Education and Training</b>	Multidisciplinary & soft-skills	Agile and short courses Lifelong learning Gamification	Awareness of Defence needs



# AI, Robotics, Autonomous Systems - Technology & Applications Roadmap

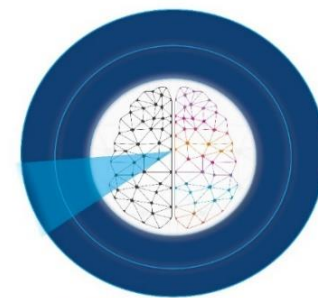


**ASSETS+**  
Advanced Systems for the  
Resilient and Secure  
Transportation of  
Sustained  
Talent

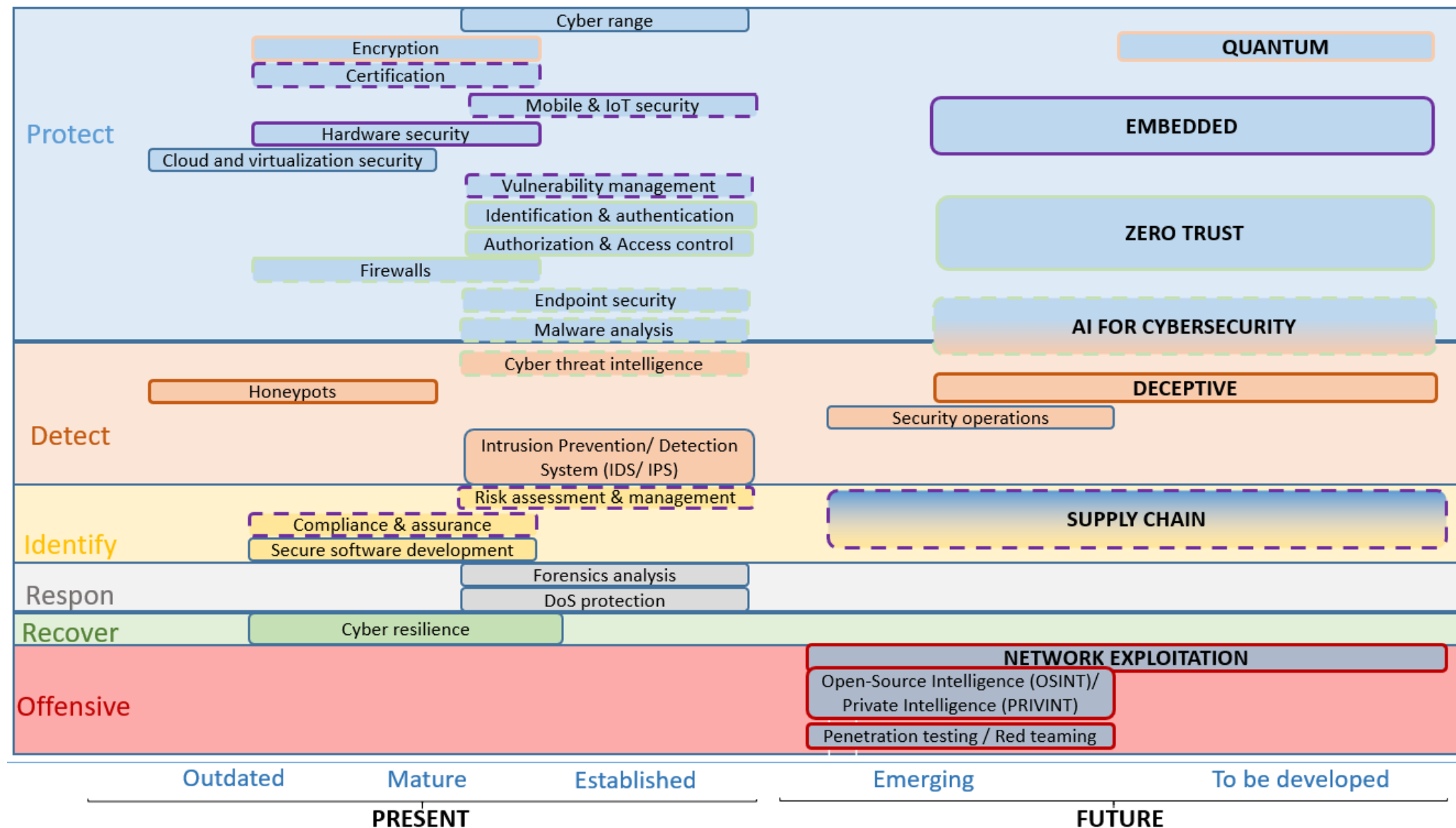




# Cybersecurity - Technology & Applications Roadmap

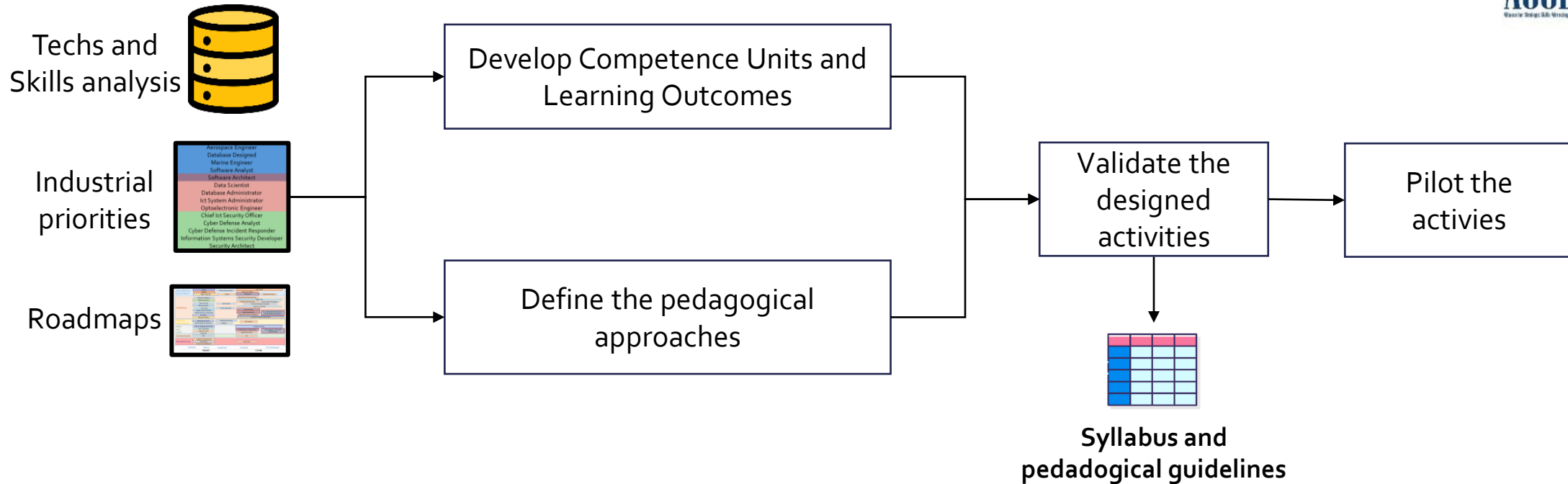


ASSETs+  
Secure Assets - Smart Environments - Trusted Systems - Cybersecurity - Digital Assets

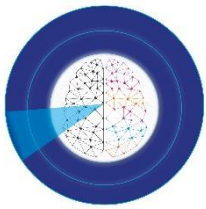


# From design to implementation: training courses for the Defence Industry

## From industrial needs to designed prototypes to pilots - Method



# From design to implementation: training courses for the Defence Industry

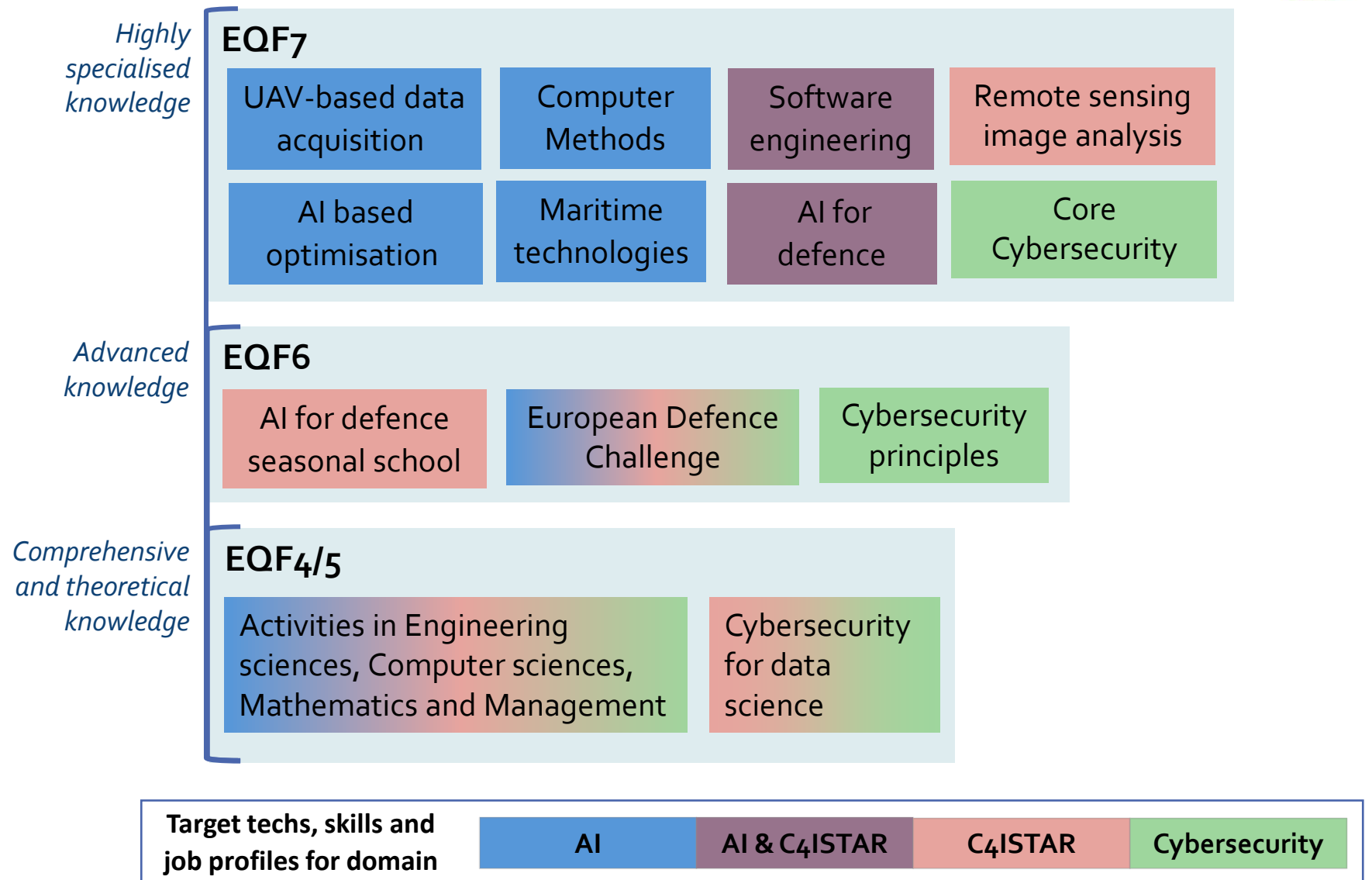


## Results

**+100** ECTS prototyped

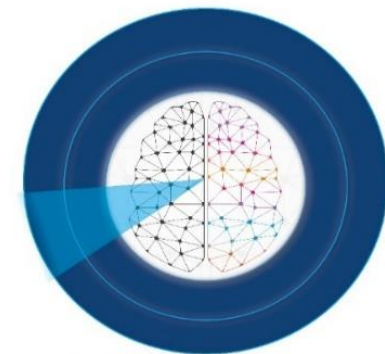
**56** education&training activities designed

for upskilling and reskilling



# The results in our research

*We share with you the articles in which our partners have participated as co-authors.*



**ASSETs+**  
Measuring Skills, Measuring Emerging Technologies in Industry



Chiarello, F., Fantoni, G., Hogarth, T., Giordano, V., Baltina, L., & Spada, I. (2021). Towards ESCO 4.0—Is the European classification of skills in line with Industry 4.0? A text mining approach. *Technological Forecasting and Social Change*, 173, 121177.



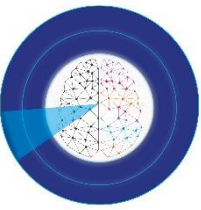
Giordano, V., Chiarello, F., Melluso, N., Fantoni, G., & Bonaccorsi, A. (2021). Text and Dynamic Network Analysis for Measuring Technological Convergence: A Case Study on Defense Patent Data. *IEEE Transactions on Engineering Management*.

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of the European Union

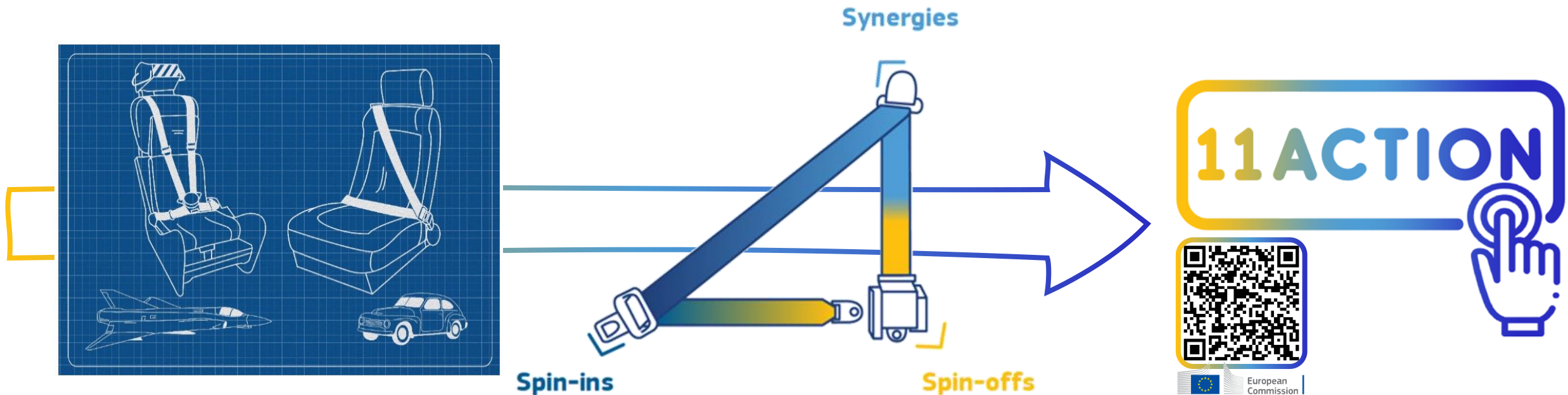




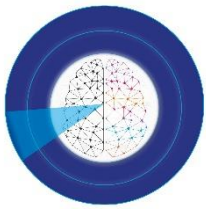
# Action plan on synergies between civil, defence and space industries



European plan to enhance **Europe's technological edge** and support its industrial base.



# Action plan on synergies between civil, defence and space industries



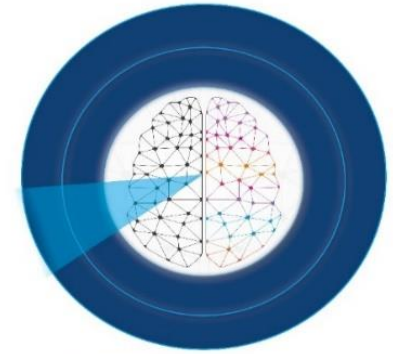
## 11 ACTION



1. Foster capability driven approaches across security sectors
2. Promote synergies and coordinate EU programs and instruments
3. Raise awareness about EU funding programs for start-ups, SMEs and RTOs in defence, security, space and relevant civil markets.
4. Develop roadmaps to boost innovation on critical techs
5. Promote hybrid civil/defence standards
6. Launch an innovation incubator hub to support dual-use innovations
7. Set up the Cybersecurity Competence Centre
8. Fund programs for disruptive technologies
- Launch flagships projects on:
9. EU drone technologies,
10. EU space-based global secure communication systems
11. Space Traffic Management

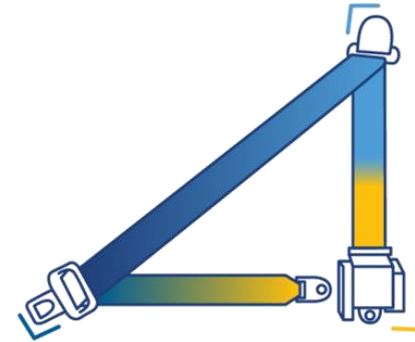


# Action plan on synergies between civil, defence and space industries



ASSETs+  
Minister Strategic Skills Working Group Technology & Future

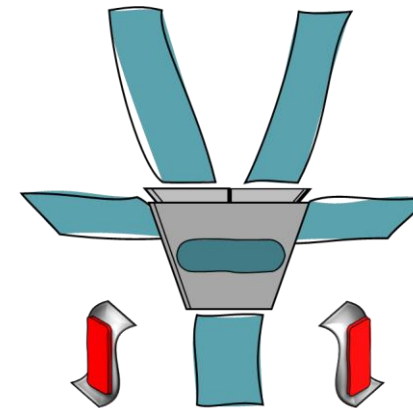
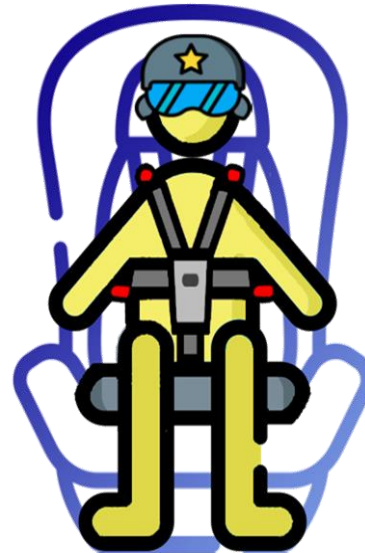
Ordinary



High  
value



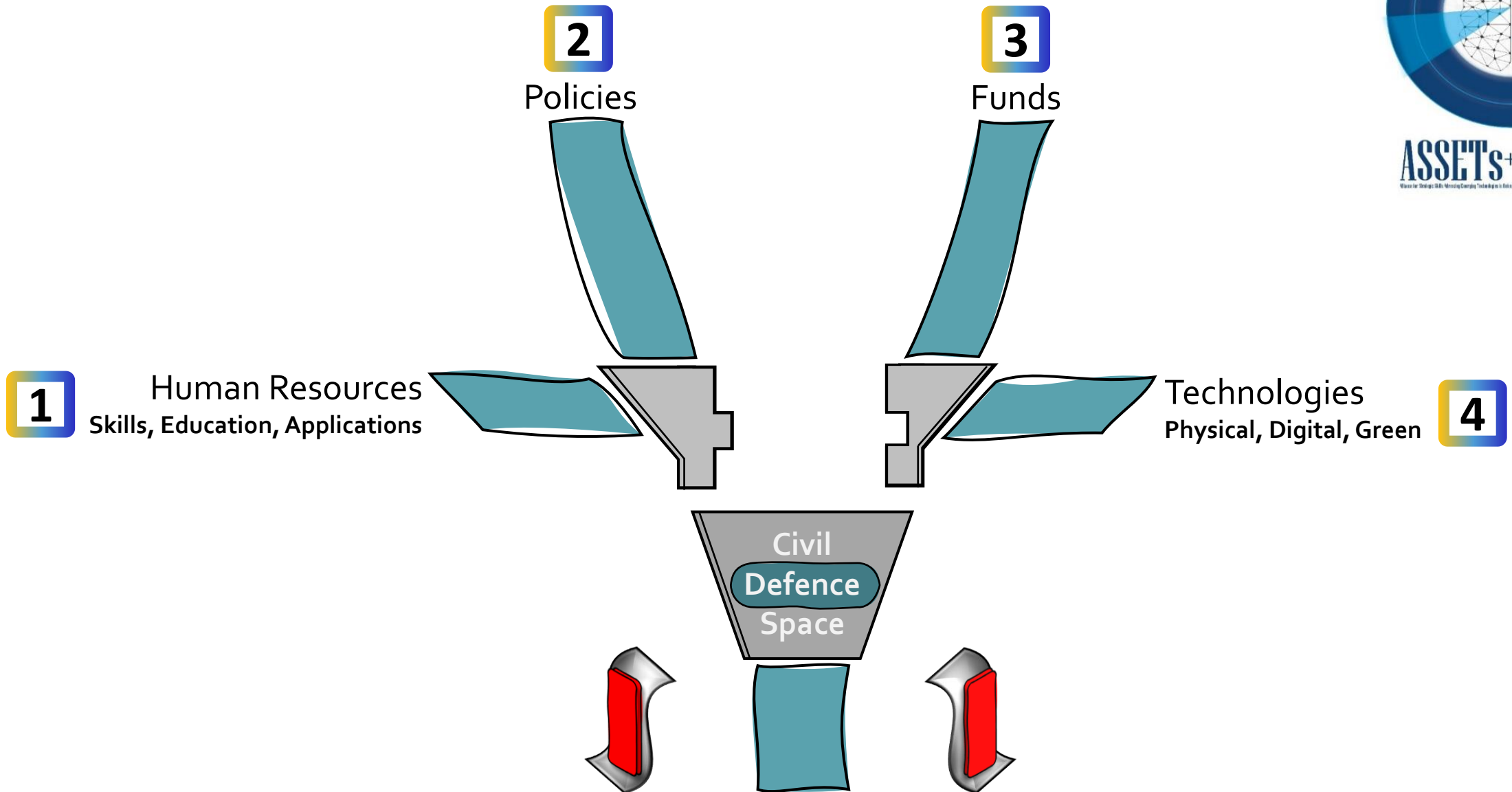
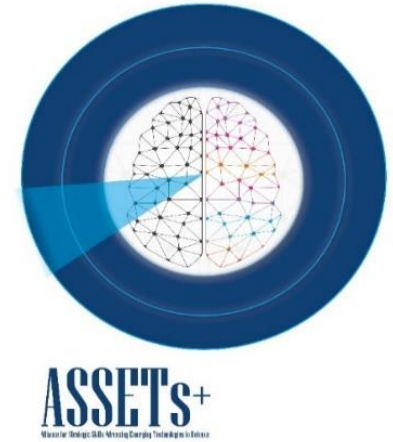
High  
risk



Protect  
what you  
care!

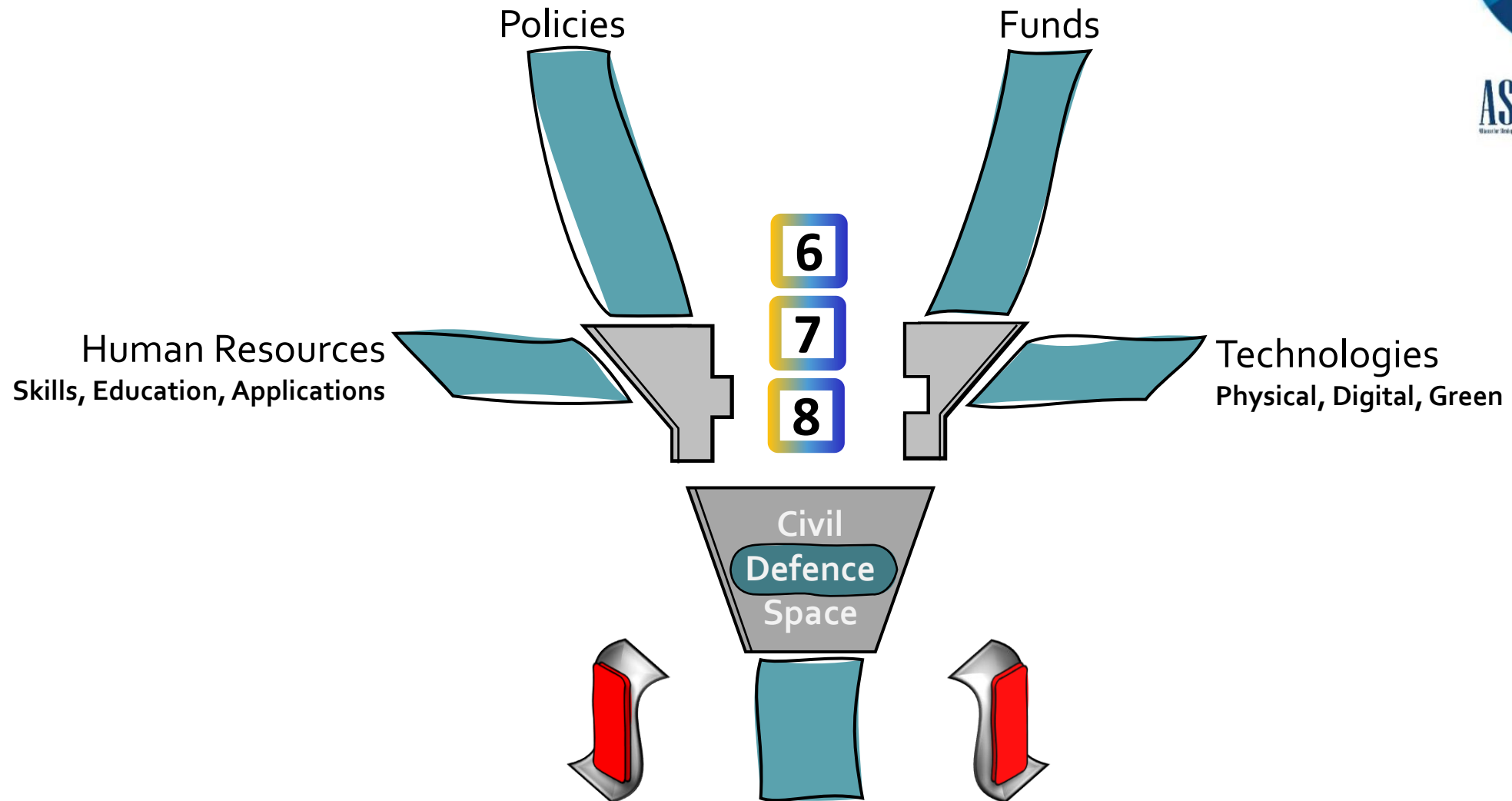
Extra-  
Ordinary

# Integration of EU Action Plan & ASSETs+ goals

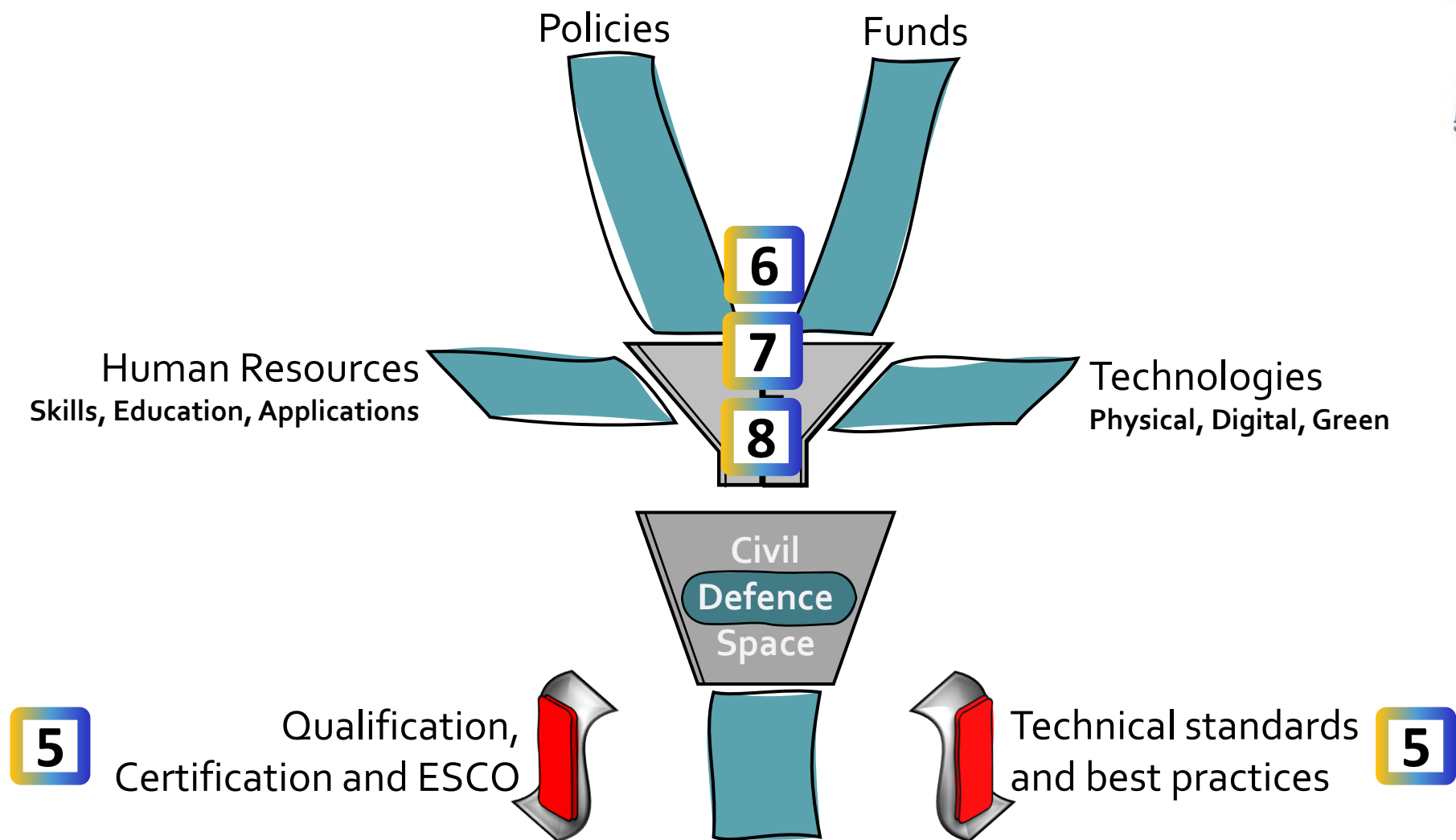
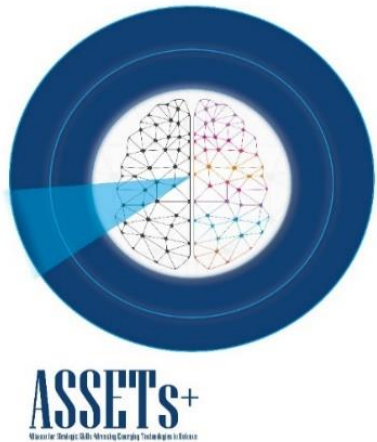




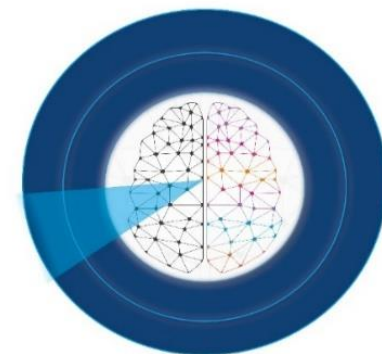
# Integration of EU Action Plan & ASSETs+ goals



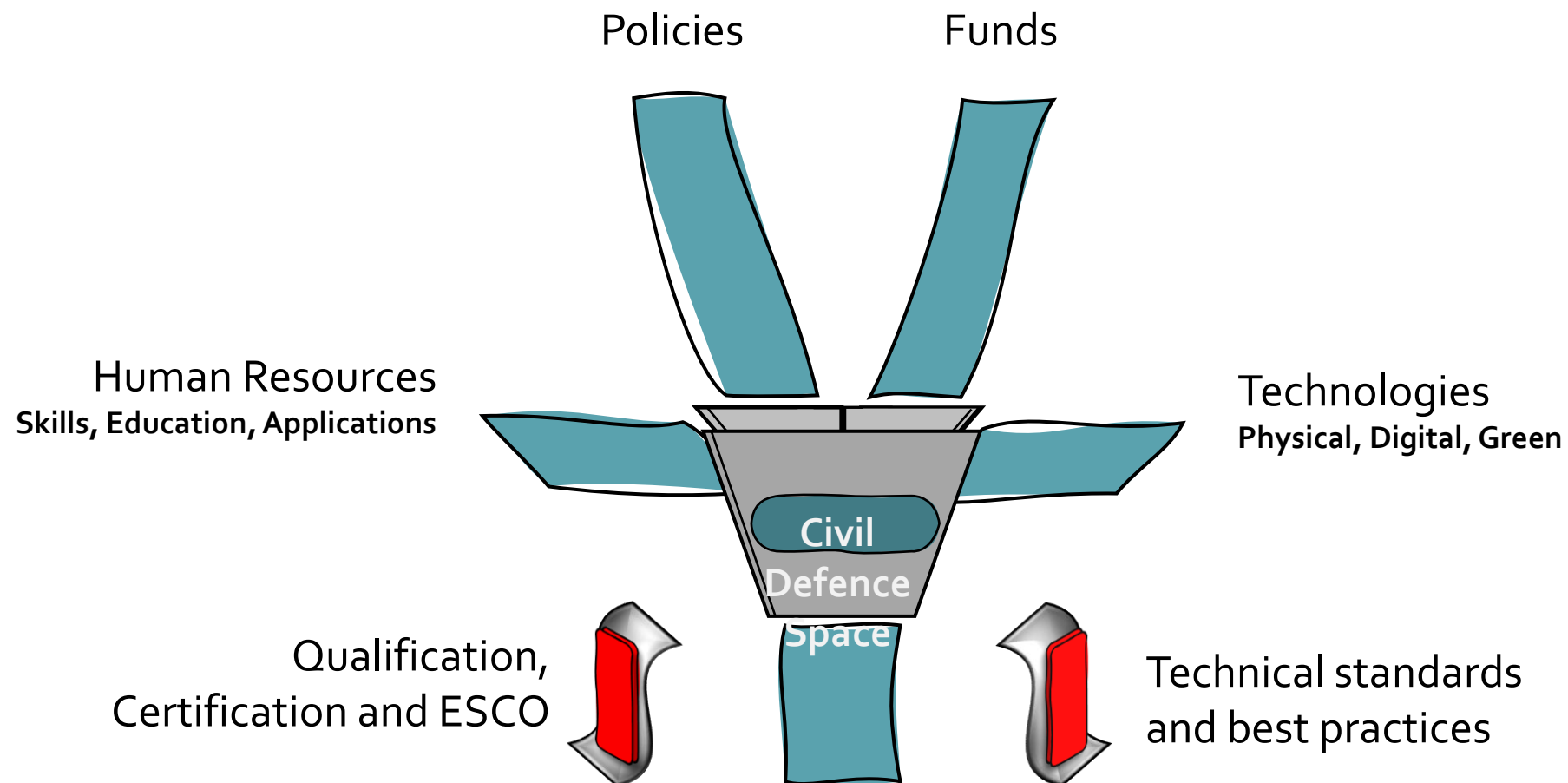
# Integration of EU Action Plan & ASSETs+ goals



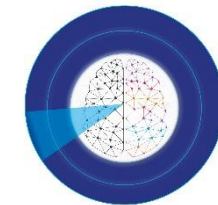
# Integration of EU Action Plan & ASSETs+ goals



ASSETs+  
Minister for Strategic Skills, Minister for Energy, Minister for Digital Skills



# Actors along Technological Readiness Levels



EU Member States, Citizens,  
EU Institutions, EU Agencies,  
Large Enterprises

**TRL9:** Actual system proven in operational environment  
**TRL8:** System complete and qualified  
**TRL7:** System prototype demonstration in operational environment

Digital Innovation Hubs,  
Technology Transfer Centres,  
CNR, TNO

**TRL6:** Technology demonstrated in relevant environment  
**TRL5:** Technology validated in relevant environment  
**TRL4:** Technology validated in lab

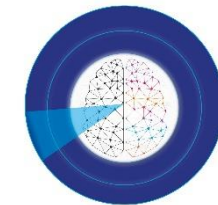
Start-ups, Spin-offs,  
Innovative SMEs, Universities  
(applied and basic research)

**TRL3:** Experimental proof of concept  
**TRL2:** Technology concept formulated  
**TRL1:** Basic principles observed

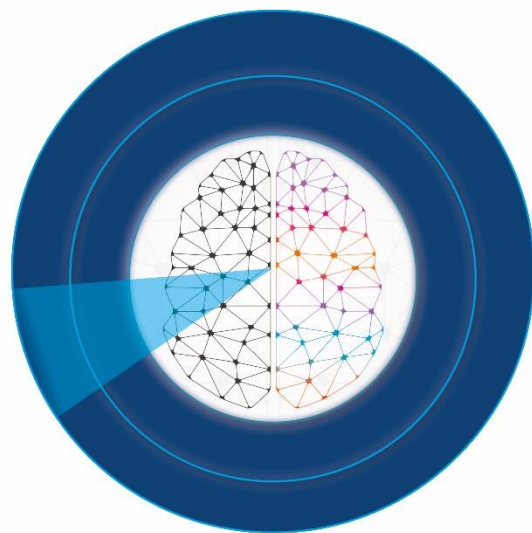


EU Funds  
Investment  
Investment fund  
Research funding  
Equity fund  
Trust Fund  
Mutual fund  
Seed money  
Micro finance  
Peer-to-peer lending  
Crowdfunding  
Foundation (non-profit)

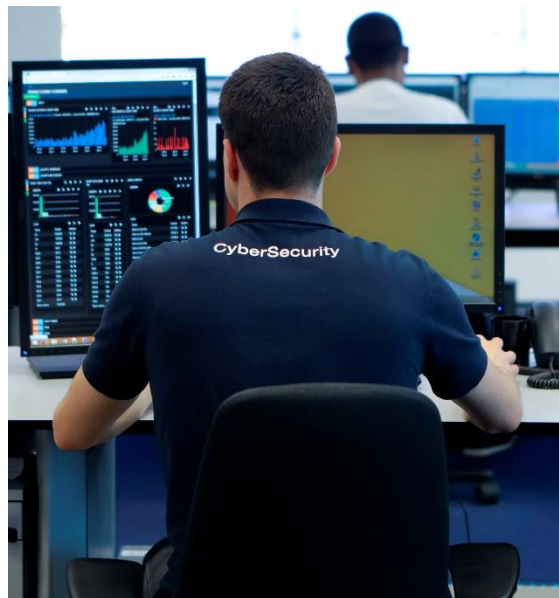




# THANK YOU!



**ASSETs<sup>+</sup>**  
Alliance for Strategic Skills Addressing Emerging Technologies in Defence



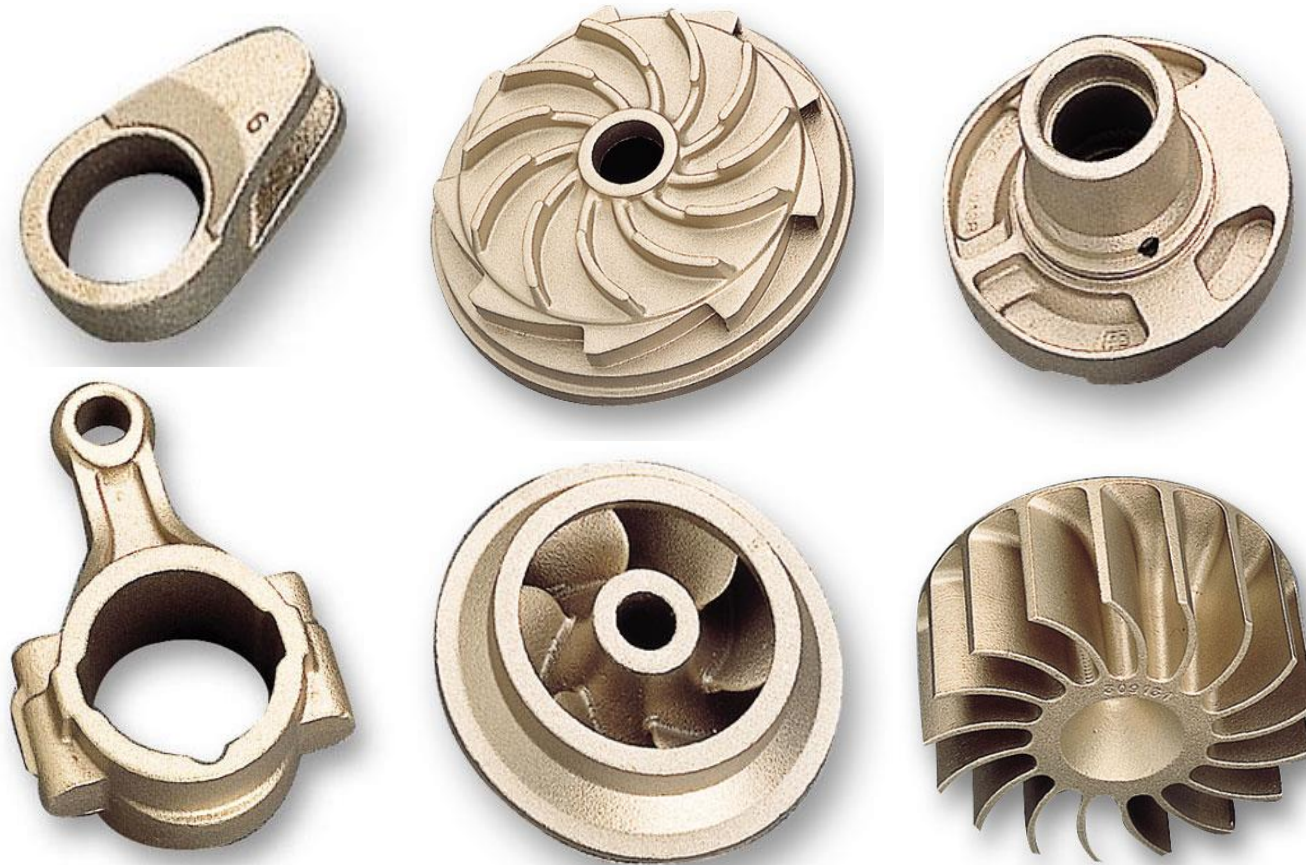
[www.assets-plus.eu](http://www.assets-plus.eu)



Erasmus+



My targets: static and rotary components in superalloys



Dec 2012 FabLabPisa

SLS AM machine  
in my department  
in 1998

Data: martedì 09.04.2013

LA NAZIONE  
**PISA**

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**L'UNIVERSITA'**  
ALL'INTERNO DELLA FACOLTA' DI INGEGNERIA  
E' NATO ORMAI DA TRE MESI IL «FAB LAB»  
OVVERO IL LABORATORIO PER GLI INVENTORI

**IL LICEO**  
COME OGNI ANNO TORNA AL LICEO «DINI»  
L'APPUNTAMENTO CON LA SETTIMANA  
DELLA SCIENZA: LA SCUOLA SI APRE ALLA CITTA'

## Ecco dove le invenzioni si trasformano in realtà

### Contatti-boom per Fab Lab

*I prototipi, la nuova frontiera del laboratorio pisano*

di ANDREA VALTRIANI

**LA TECNOLOGIA** continua a far passi da gigante ma per fortuna i ragazzi del FabLab di Pisa riescono a «tenere il ritmo», grazie a idee innovative e passione da vendere, così da rendere la vita più facile agli inventori. Carmelo De Maria, Daniele Mazzei, Salvatore Balestrino e Gualtiero Fantoni,

**GUALTIERO FANTONI**

**Nel nostro metodo di lavoro cerchiamo di conciliare la filosofia del «creare da soli» con la condivisione delle risorse e dei pensieri**

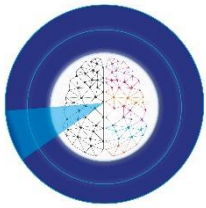
a quella della condivisione di risorse e di pensieri. Basta andare sul sito [www.fablabpisa.org](http://www.fablabpisa.org), per rendersi conto di quanto sia semplice ed efficace il nostro metodo di lavoro.

**INSOLITI TRE** mesi il FabLab ha prodotto centinaia di idee, molte delle quali riconosciute a livello internazionale. «Da pochissimo,

Teaching AM from  
2009 in my course  
of Non-  
Conventional  
Machining

Additive manufacturing for:

- Prototyping (also for space)
- Shell-moulding
- Lost Wax



# My two cents (I): «Still» Prototyping or static parts

Metal SLS, SLM or DMLS ...



Customer: Baker-Huges

Aeronautics componets in steel,  
aluminum, nickel alloys,  
titanium alloys, etc..

Laser: 500W

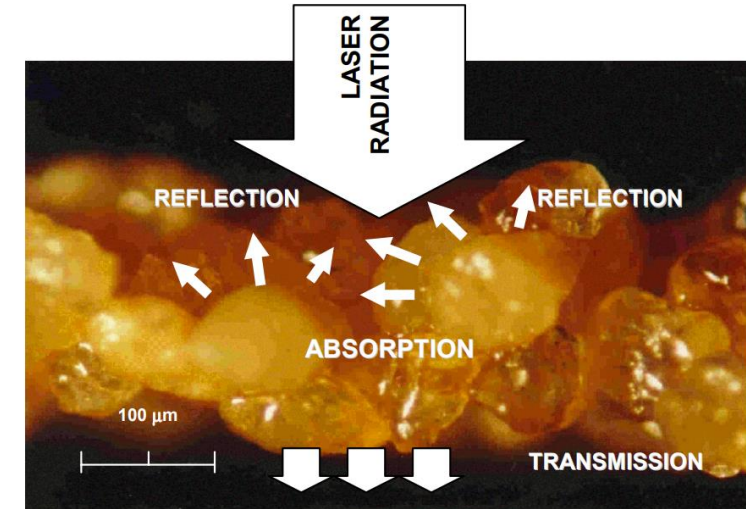
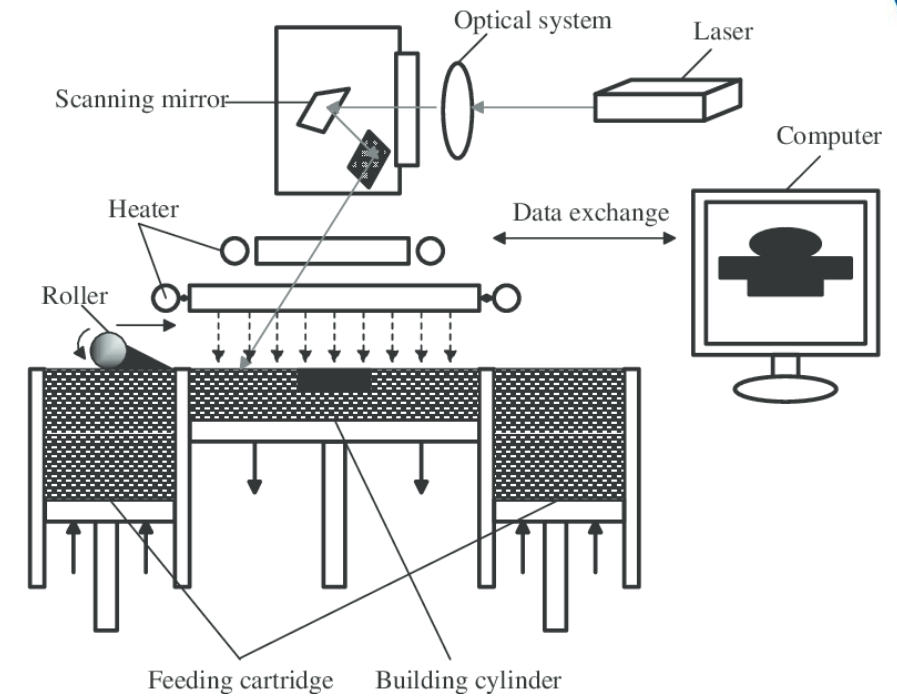
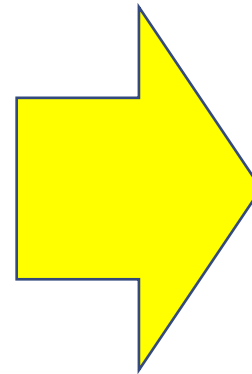
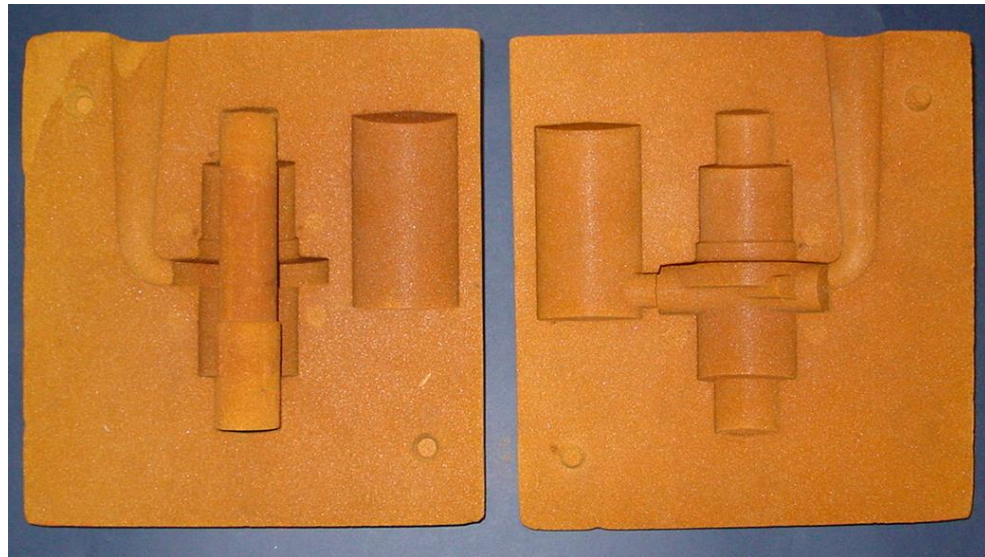
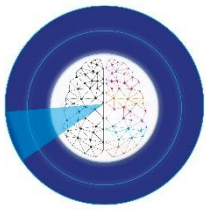
Souce: solid state laser (Yb)

Volume: 250 x 250 x 350 mm

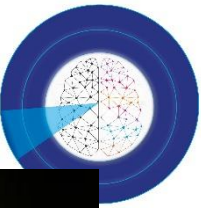
O<sub>2</sub> in the chamber < 10 ppm



# My two cents (2): selective laser sintering (SLS) of pre-coated sands for shell-moulding



# My two cents (3): metal casting



Investment Casting



Lost wax casting



Precision casting

