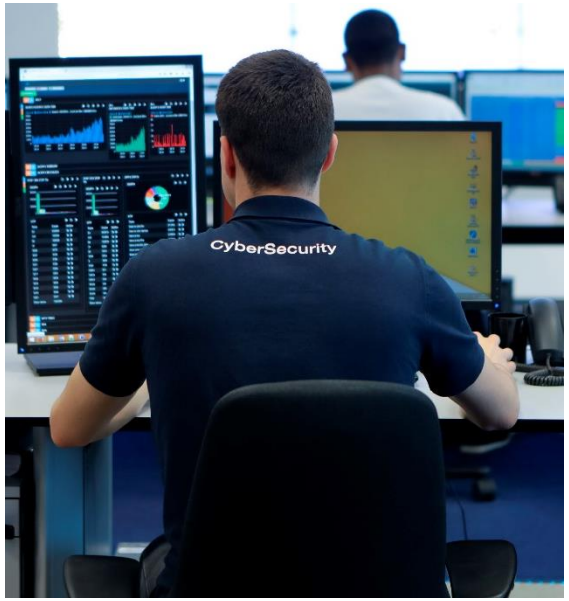
Alliance for Strategic Skills Addressing Emerging Technologies in Defence

ASSETs+

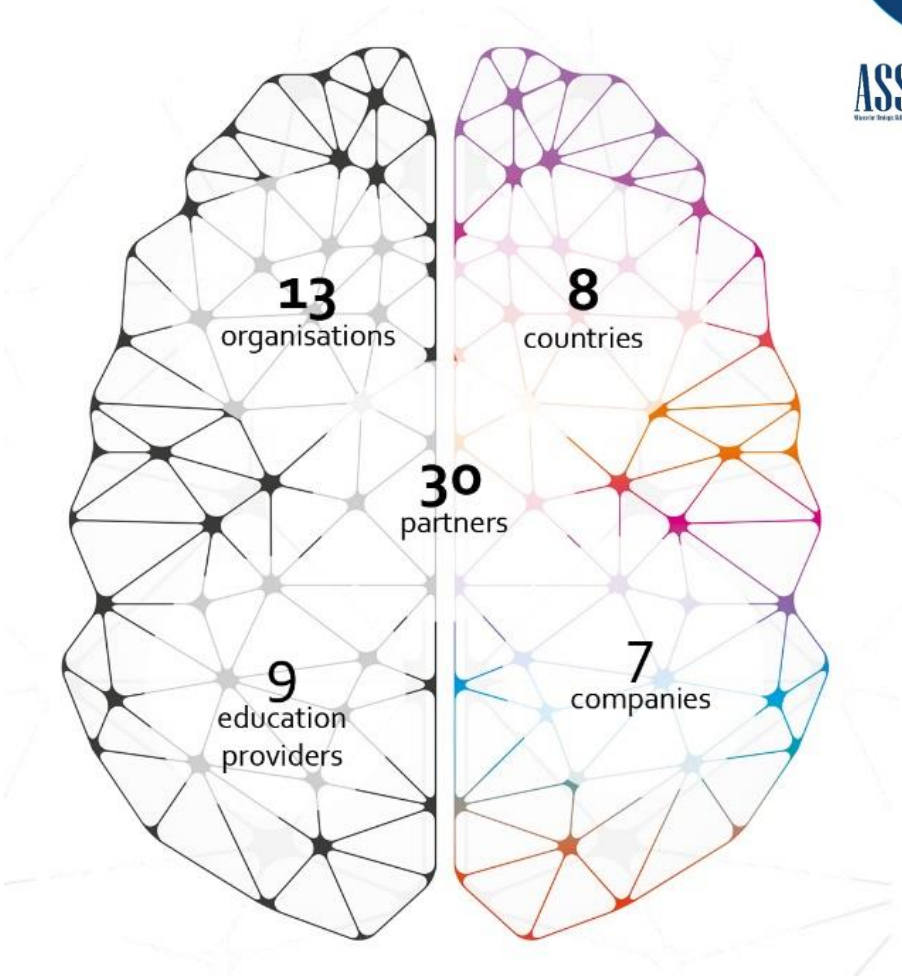
Alliance for Strategic Skills Addressing Emerging Technologies in Defence



Erasmus+

Project Coordinator:
Prof. Gualtiero Fantoni, University of Pisa

ASSETs+ Consortium



Associated partners: eupportunity reportbrain

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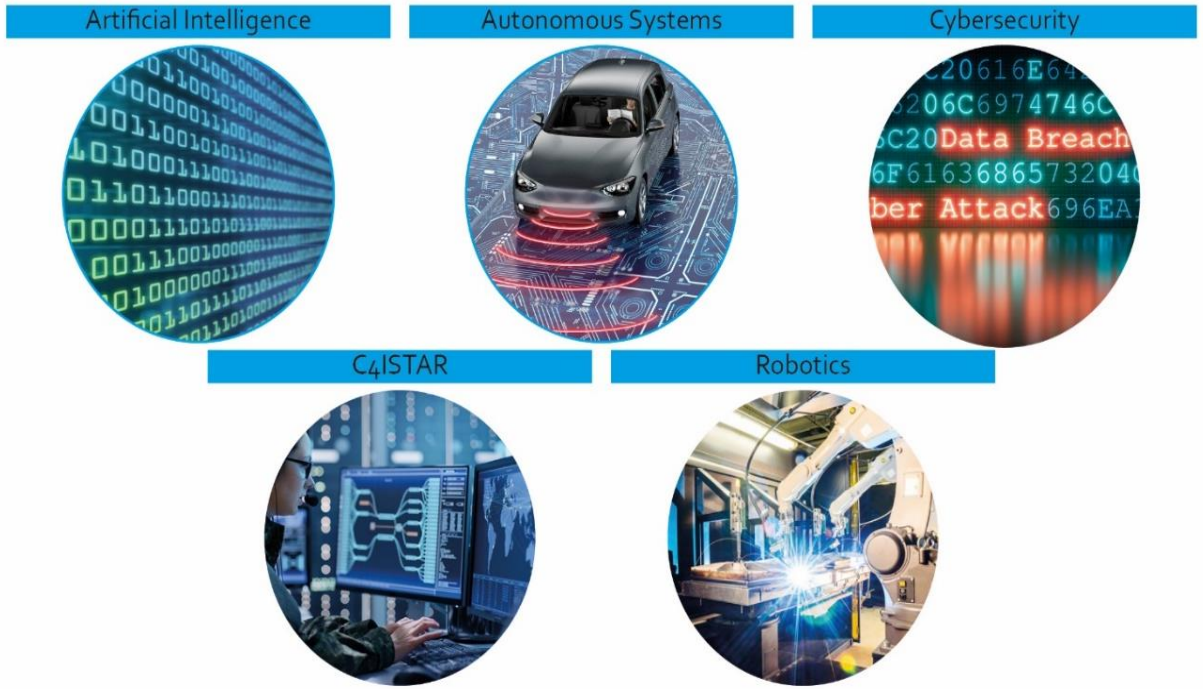
ASSETs+ Core values

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

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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**

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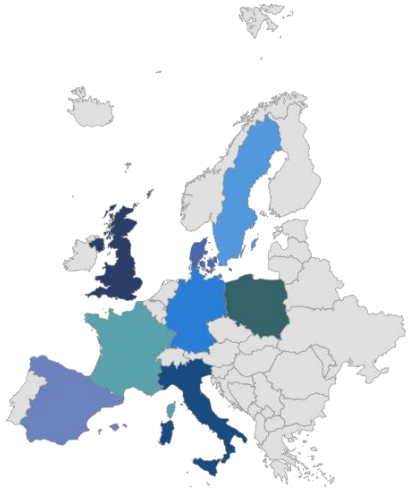
… in ever-changing technological fields…

Robotics, Autonomous vehicles, Artificial intelligence

C4ISTAR
(Command, Control, Communications, Computers, Intelligence, Surveillance, Target Acquisition and Reconnaissance)

Cybersecurity



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

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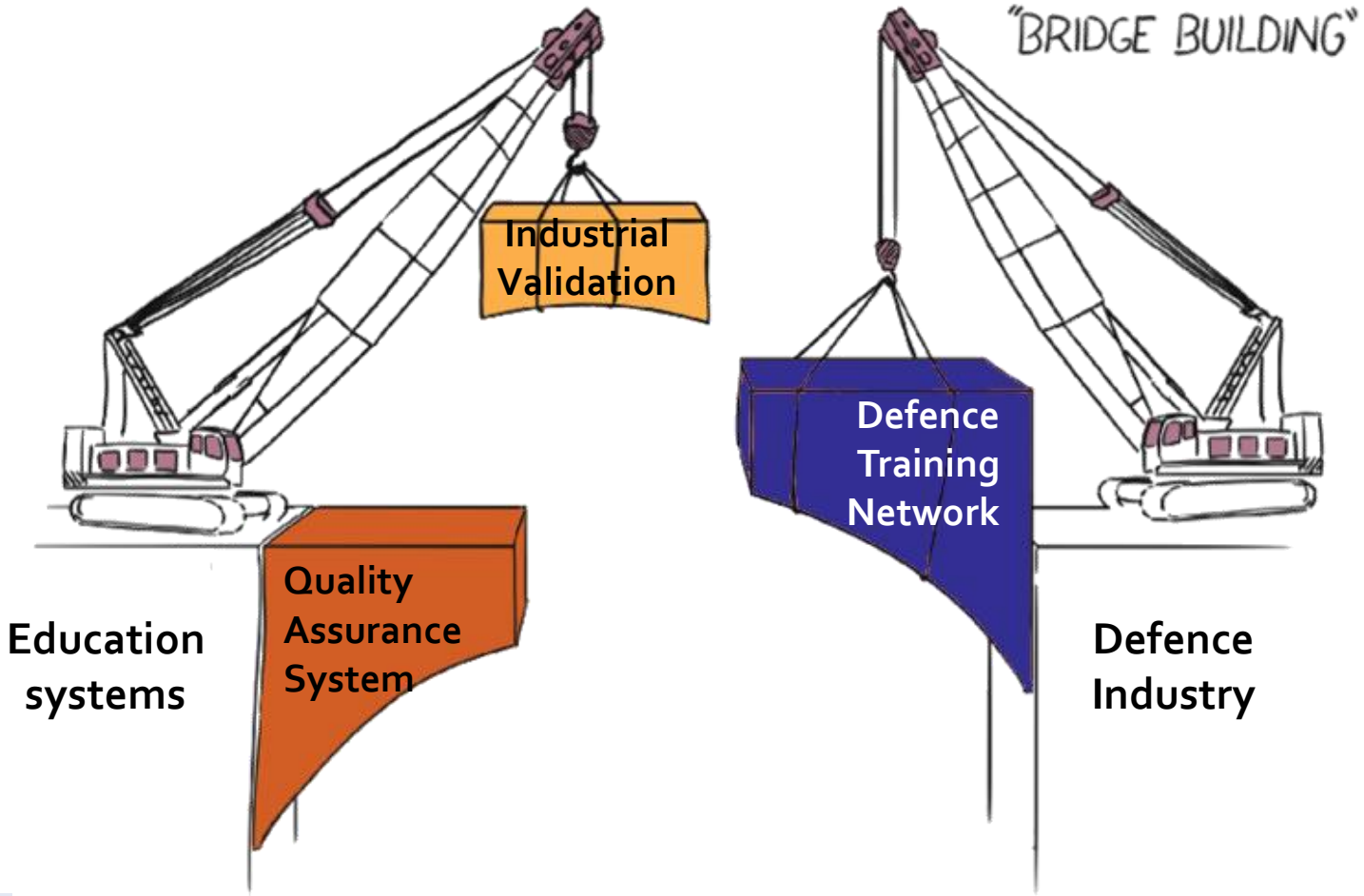
… for designing training courses and developing an European Defence Qualification Systems.



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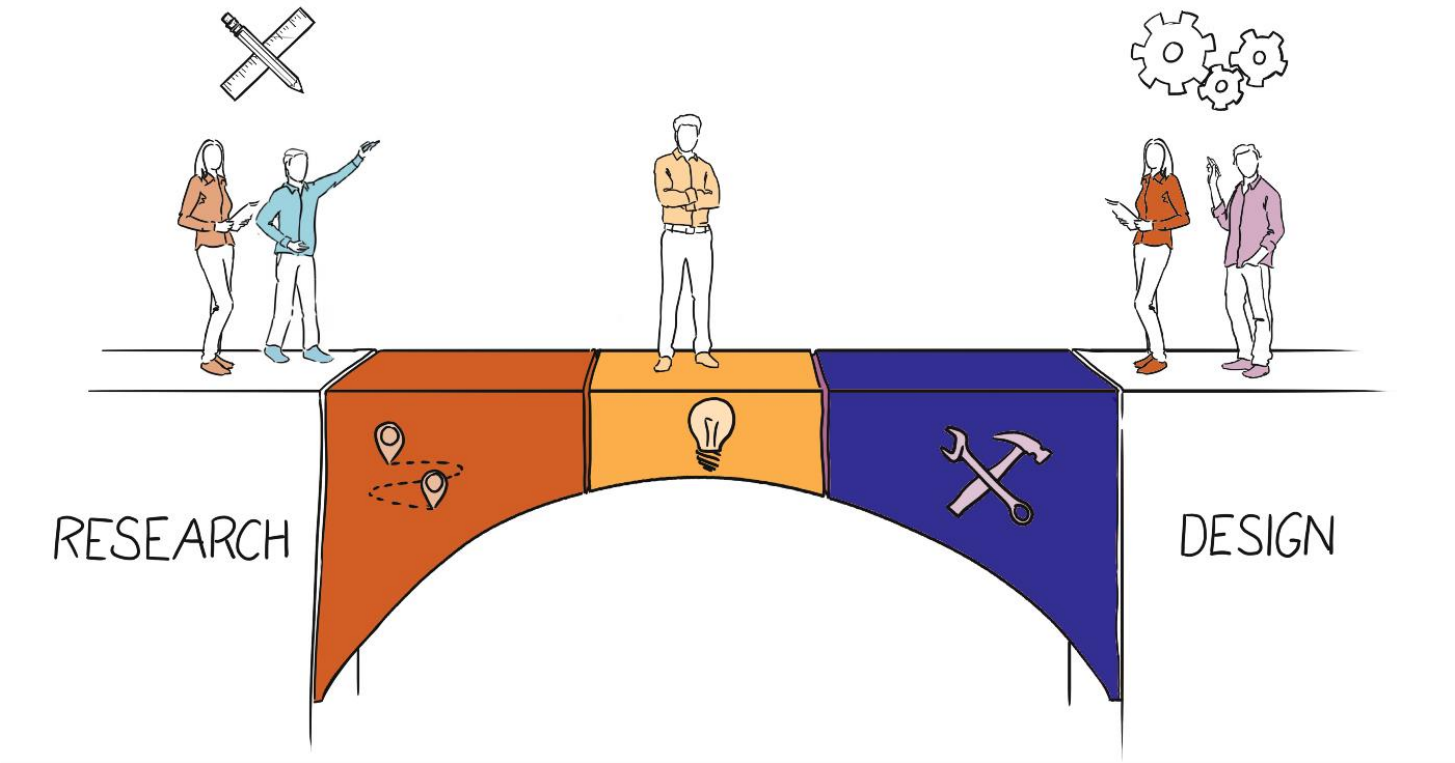
ASSETs+ objective



Harmonized Training Courses and Qualifications designed and developed for Defence

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

ASSETs+ approach

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

Alliance for Strategic Skills Addressing Emerging Technologies in Defence

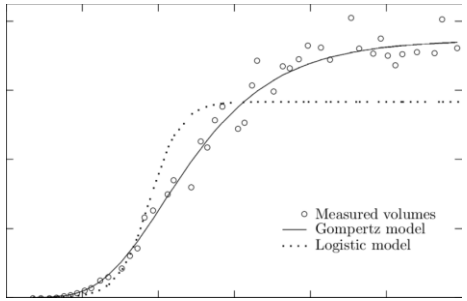
INDUSTRY VALIDATION

INDUSTRY VALIDATION

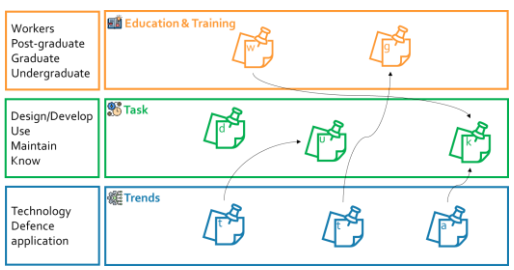
Techs analysis → Tech foresight → Skills analysis → Brainstorming with experts → Roadmaps

500k

analyzed documents



Skill2ESCO



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ASSETs+ approach

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

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

Data driven results

Database and report on relevant techs, apps, skills and job profiles

3 technological domains

97 technologies classified

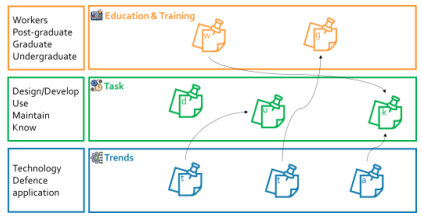
172 skills classified

59 applications identified

181 job profiles identified

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

Brainstorming results



3 sessions

~50 ideas generated per session

3 perspectives explored:

- Technologies and applications
- Job activities
- Education & training

ASSETs+ approach

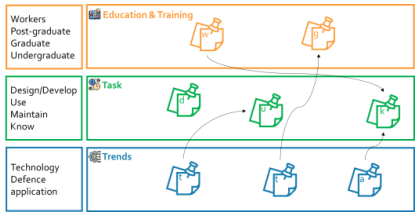
Automatic analysis on the **current** situation in Defence

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

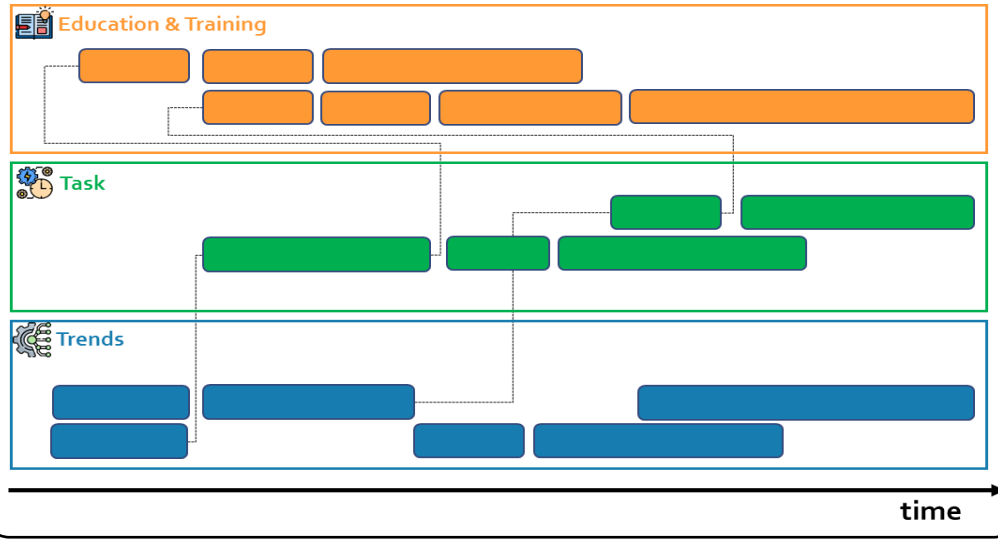
Data driven results

Database and report on relevant techs, apps, skills and job profiles

Brainstorming results



Roadmaps



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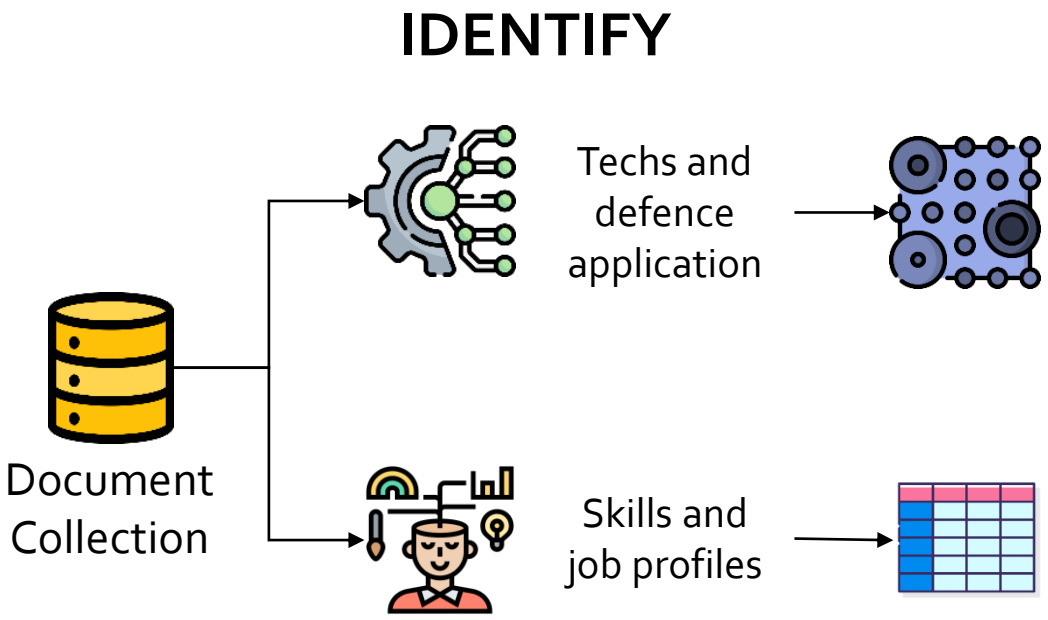
Technologies and skills analysis - Quantitative

Document analysis



MEASURE

Maturity level: how old is the technology

Growth level: how much the technology is growing

Abstraction level: which is the level of grain of the technology

Degree of specialization: how important is the skill for a job profile

Degree of knowledge: the required level of a skill for a job profile

Labor market demand: how much the skill is required for a job profile

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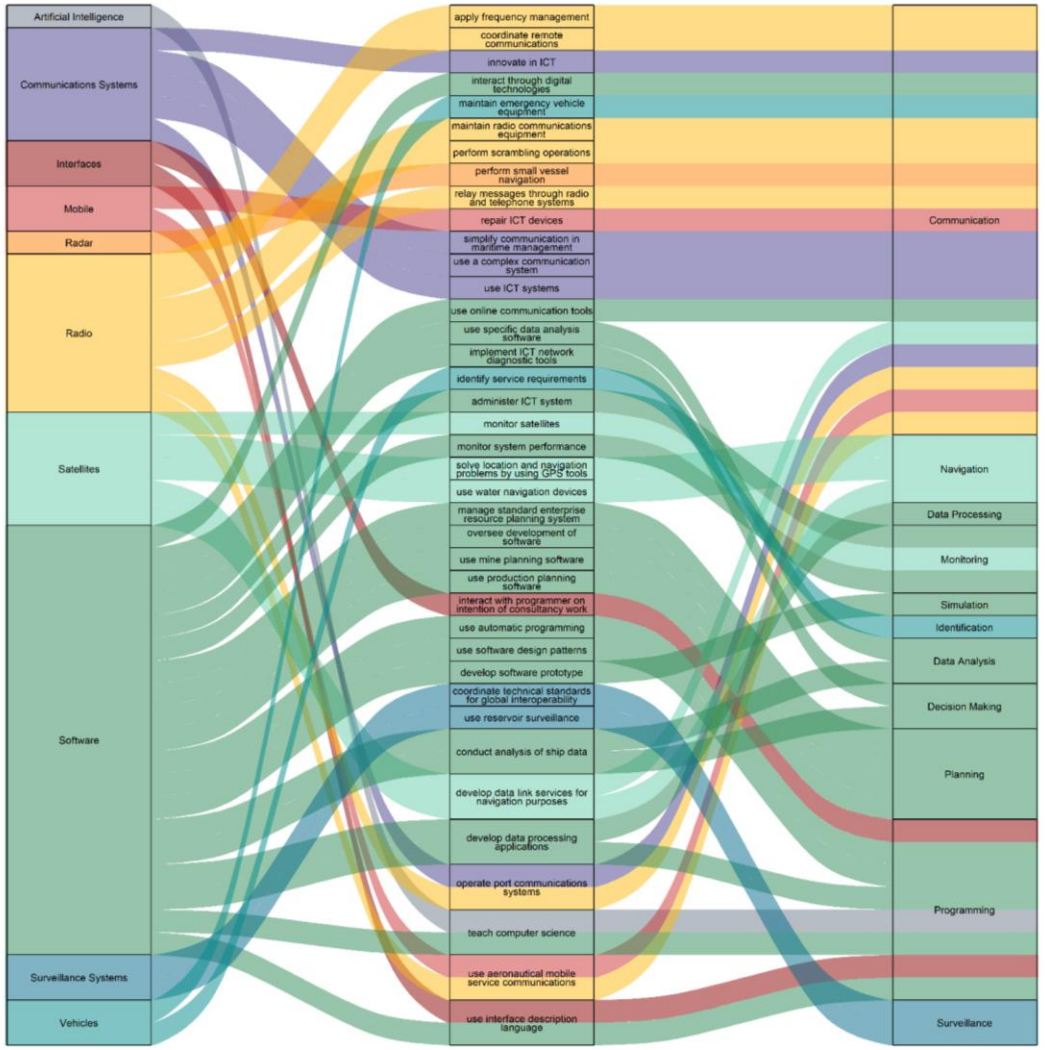
Technologies and skills analysis - Quantitative

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 **Skills** **Applications**

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

Technologies and skills analysis - Quantitative

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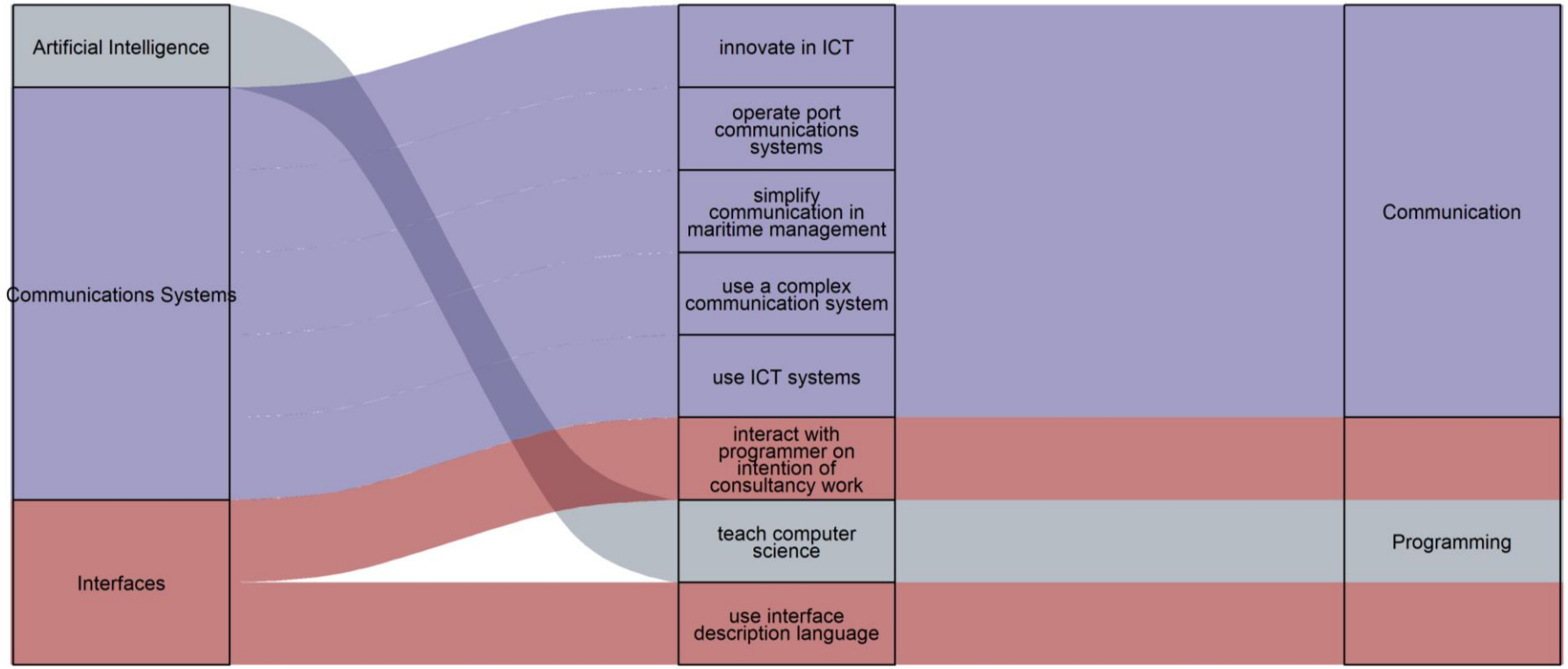

Technologies **Skills** **Applications**

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

Technologies and skills analysis - Quantitative

Results

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

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

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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

English (en)

ICT security engineer

Print

Full concept and hierarchy

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

ESCO is a Europe 2020 initiative.
Current version ESCO v1.0.8 (Last update 15/12/2020)
DG Employment, Social Affairs and Inclusion of the European Commission developed ESCO in collaboration with stakeholders and with the European Centre for the Development of Vocational Training (Cedefop).

Technologies and skills analysis - Qualitative

C4aiD: Our Framework to Look Forward with panel of experts

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C4AID	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			First session			

Technologies and skills analysis - Qualitative

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

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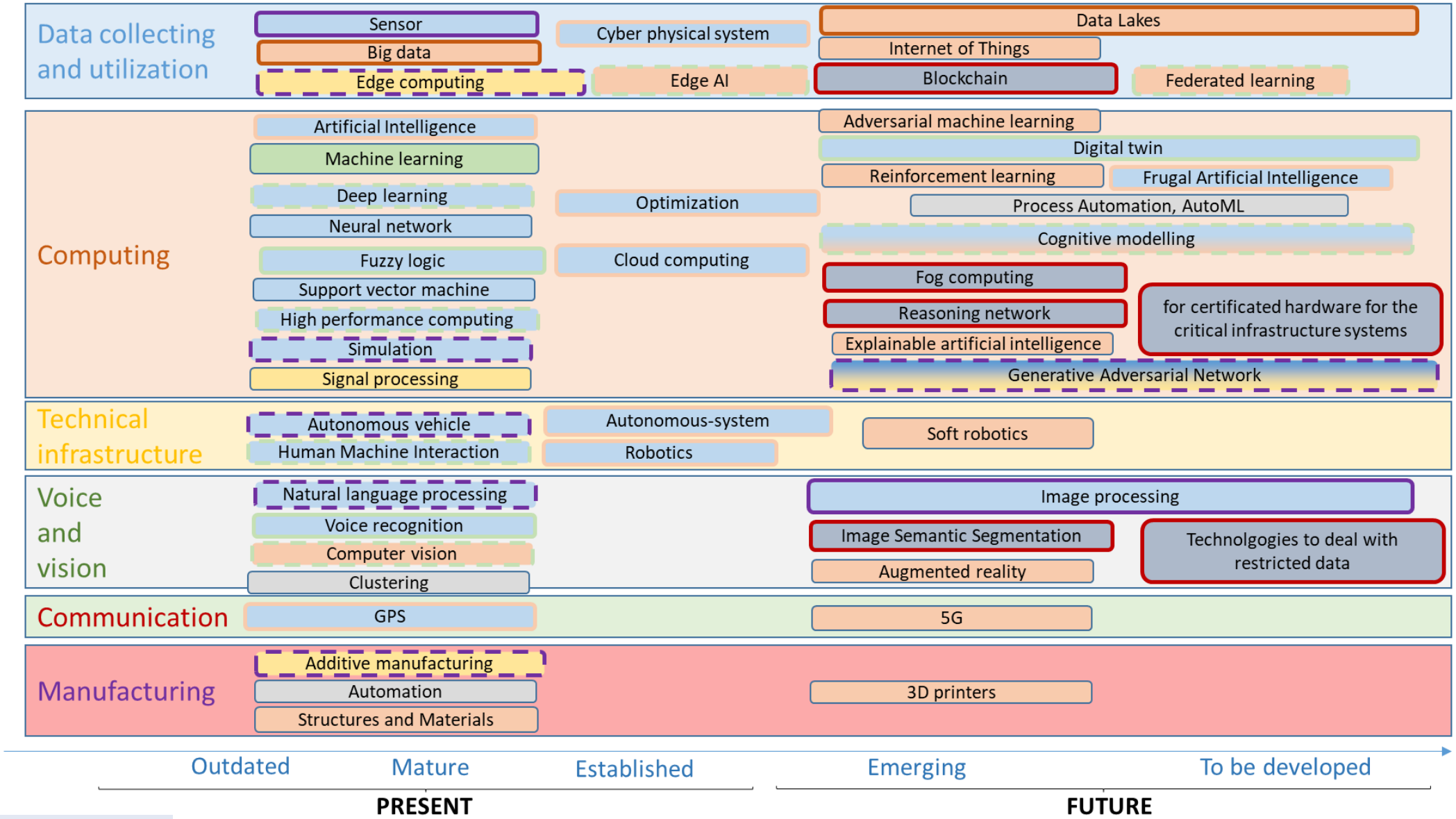
AI, Robotics, Autonomous Systems - Technology & Applications Roadmap



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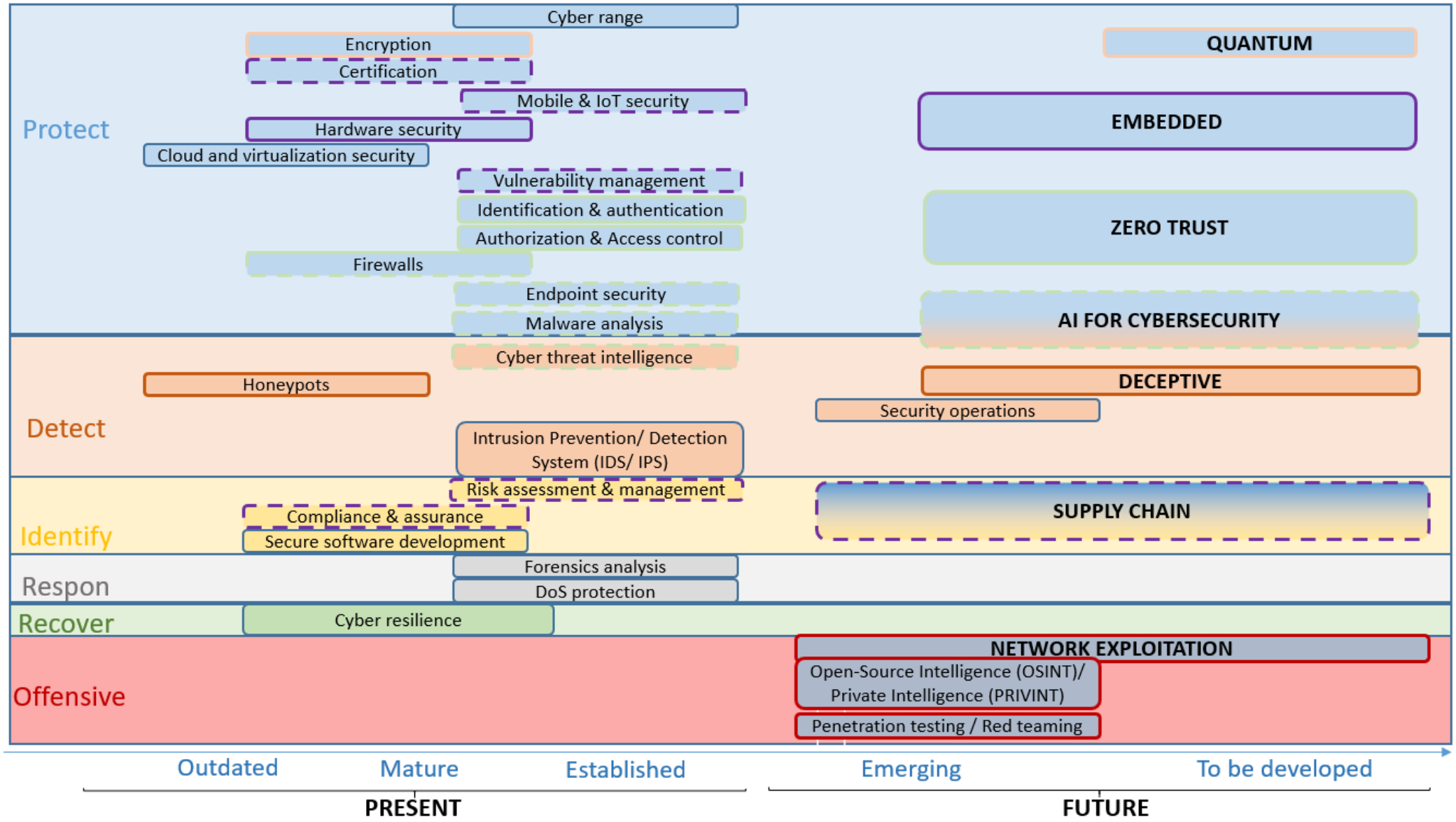
Cybersecurity - Technology & Applications Roadmap



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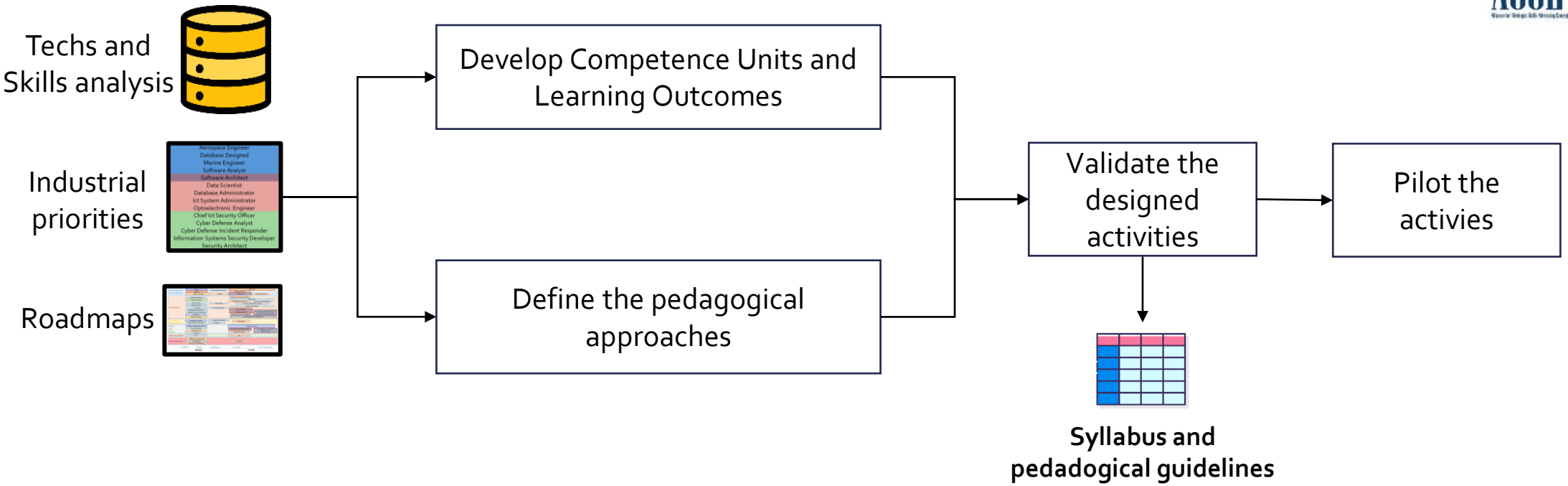
From design to implementation: training courses for the Defence Industry

From industrial needs to designed prototypes to pilots - Method



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

From design to implementation: training courses for the Defence Industry

Results

+100 ECTS prototyped

56 education&training activities designed

for upskilling and reskilling

Highly specialised knowledge

EQF7

- UAV-based data acquisition
- Computer Methods
- Software engineering
- Remote sensing image analysis
- AI based optimisation
- Maritime technologies
- AI for defence
- Core Cybersecurity

Advanced knowledge

EQF6

- AI for defence seasonal school
- European Defence Challenge
- Cybersecurity principles

Comprehensive and theoretical knowledge

EQF4/5

- Activities in Engineering sciences, Computer sciences, Mathematics and Management
- Cybersecurity for data science

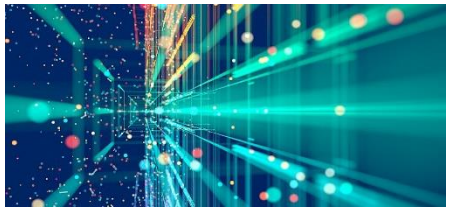
Target techs, skills and job profiles for domain

- AI
- AI & C4ISTAR
- C4ISTAR
- Cybersecurity

The results in our research

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

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.

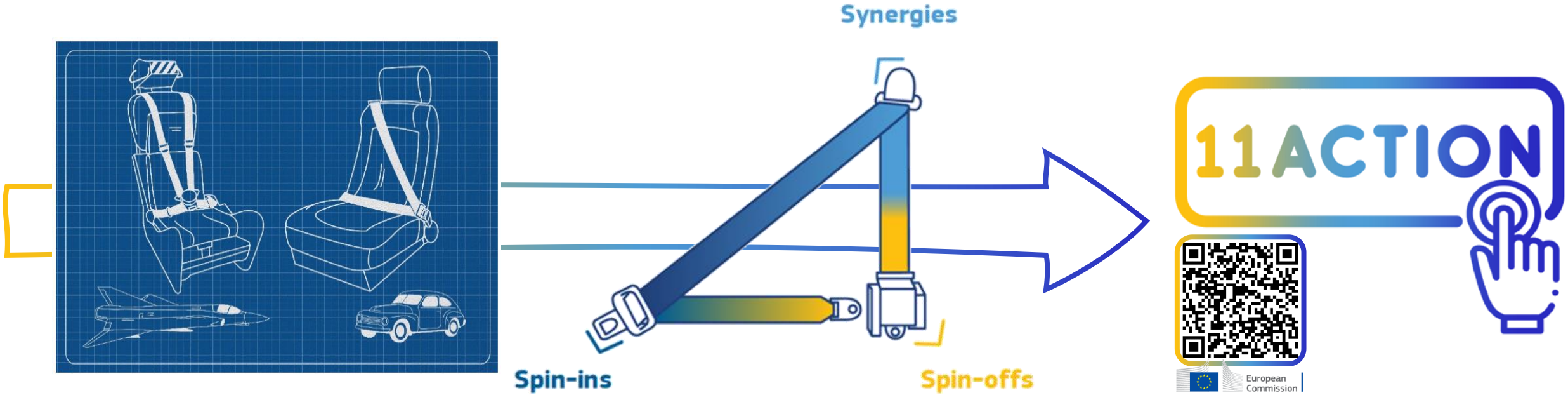


Giordano, V., Chiarello, F., Melluso, N., Fantoni, G., & Bonaccorsi, A. (2021). Text and Dynamic Network Analysis for Measuring Technological Convergence: A Case Study on Defense Patent Data. *IEEE Transactions on Engineering Management*.

With the support of the Erasmus+ Programme 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

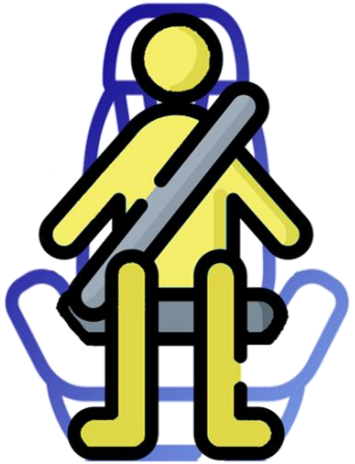
1. Foster capability driven approaches across security sectors
2. Promote synergies and coordinate EU programs and instruments
3. Raise awareness about EU funding programs for start-ups, SMEs and RTOs in defence, security, space and relevant civil markets.
4. Deveop roadmpas to boost innovation on critical 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 distruptive technologies

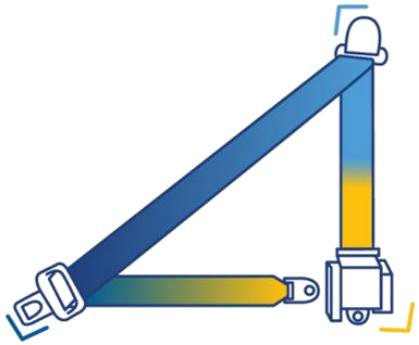
Launch flasgships projects on:

9. EU drone technologies,
10. EU space-based global secure communication systems
11. Space Traffic Management

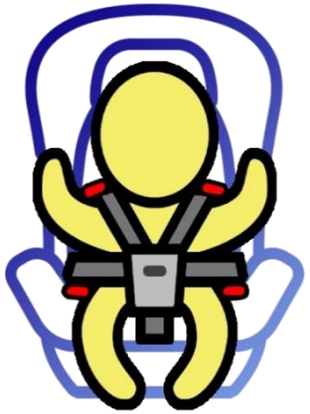
Action plan on synergies between civil, defence and space industries

Ordinary

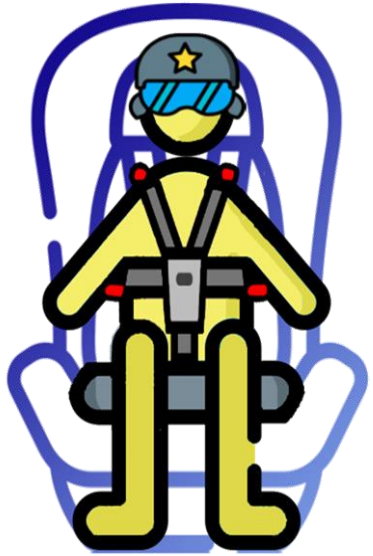


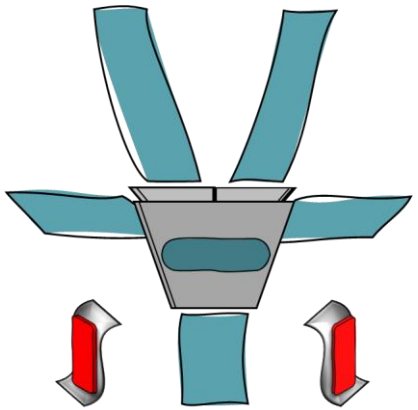


High value



High risk

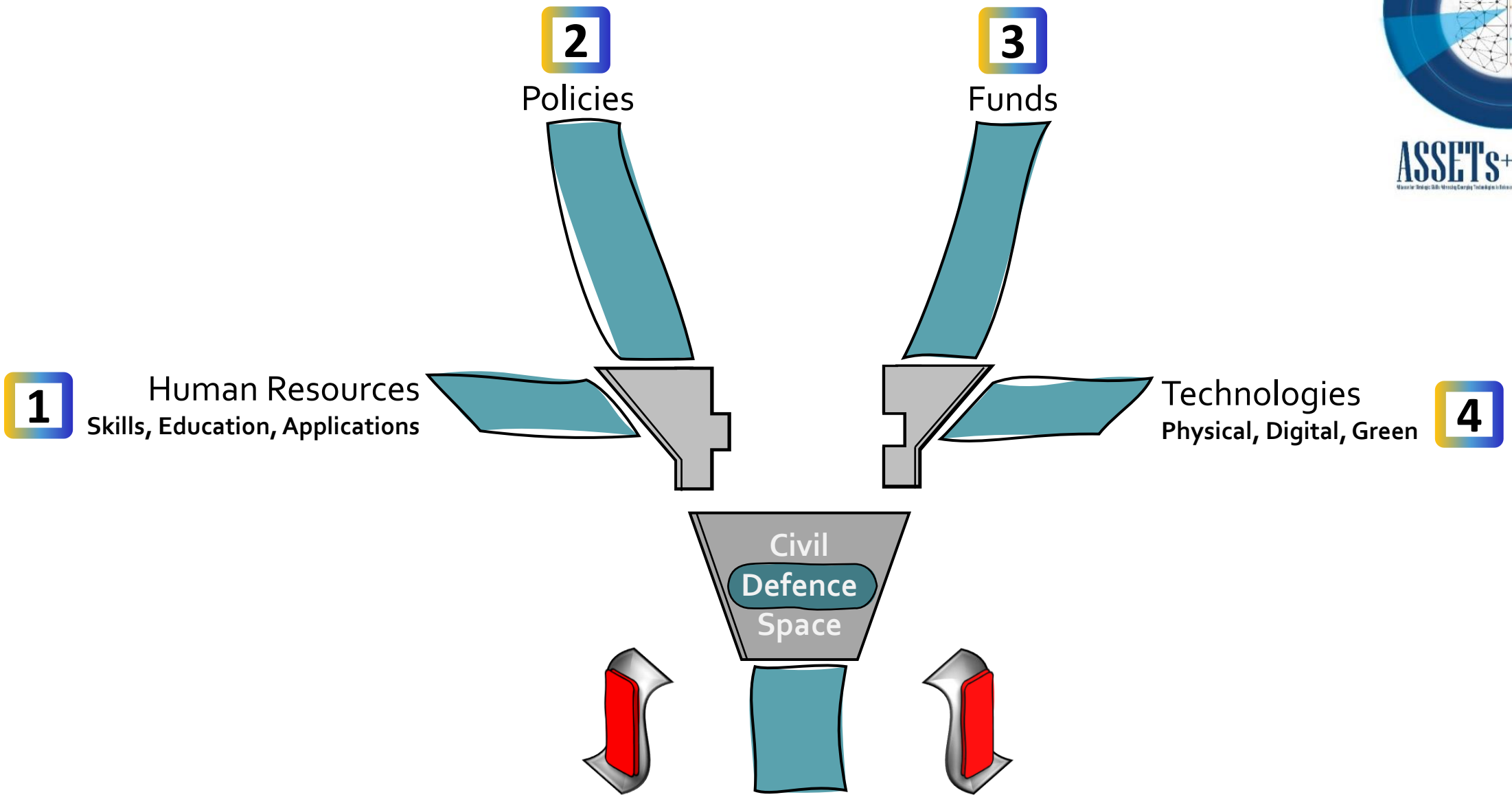




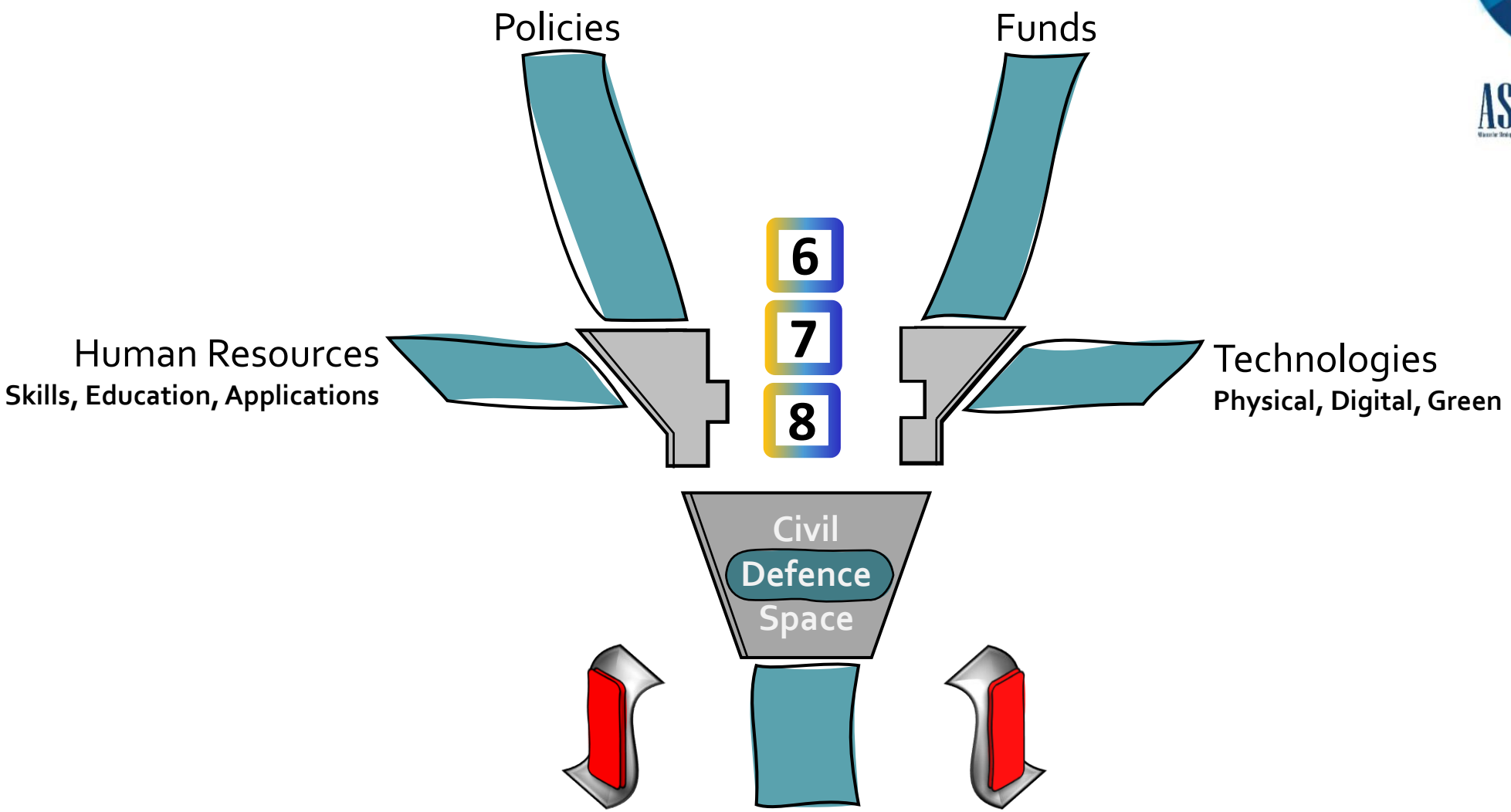
Extra-Ordinary

Protect what you care!

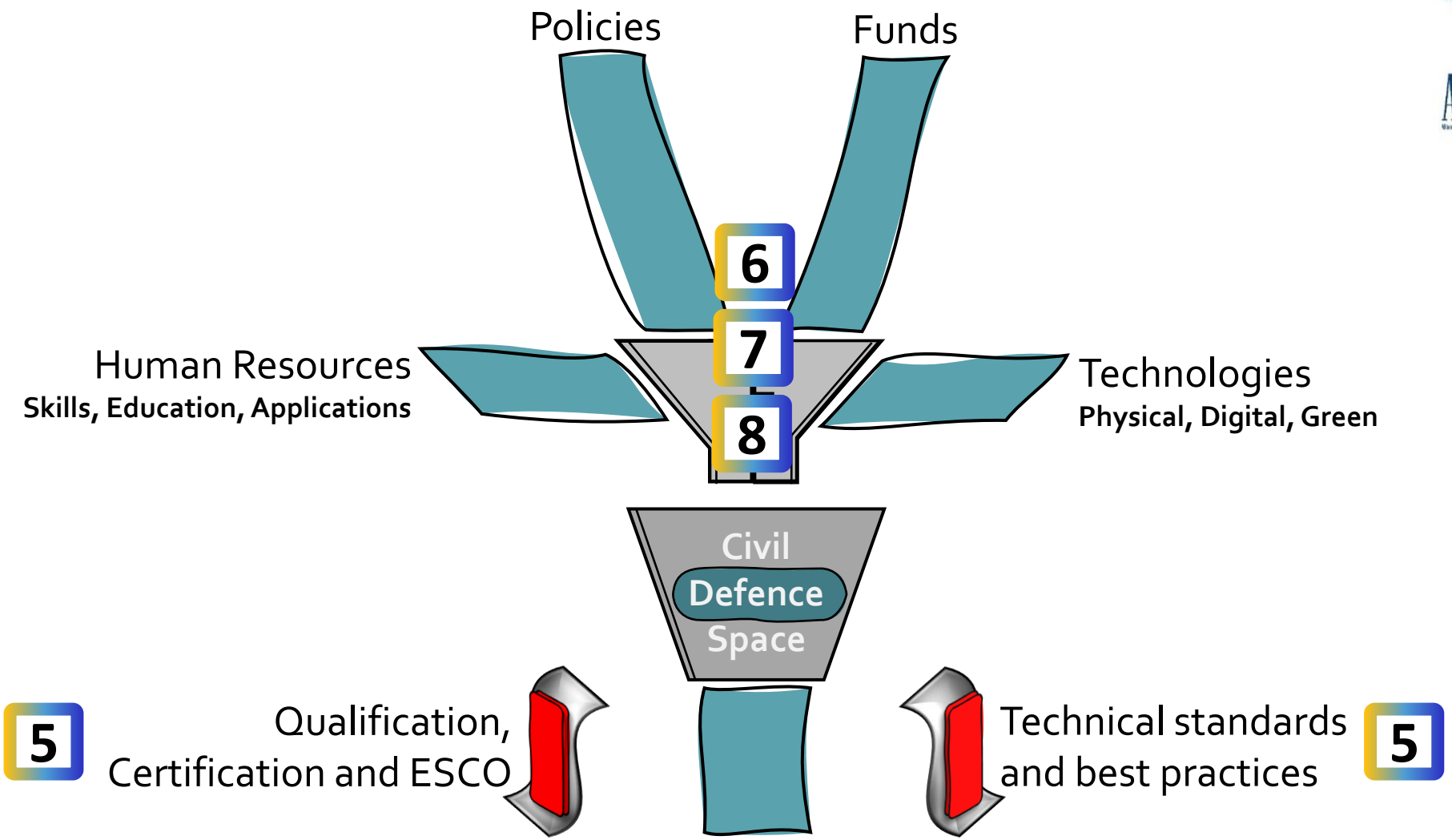
Integration of EU Action Plan & ASSETs+ goals



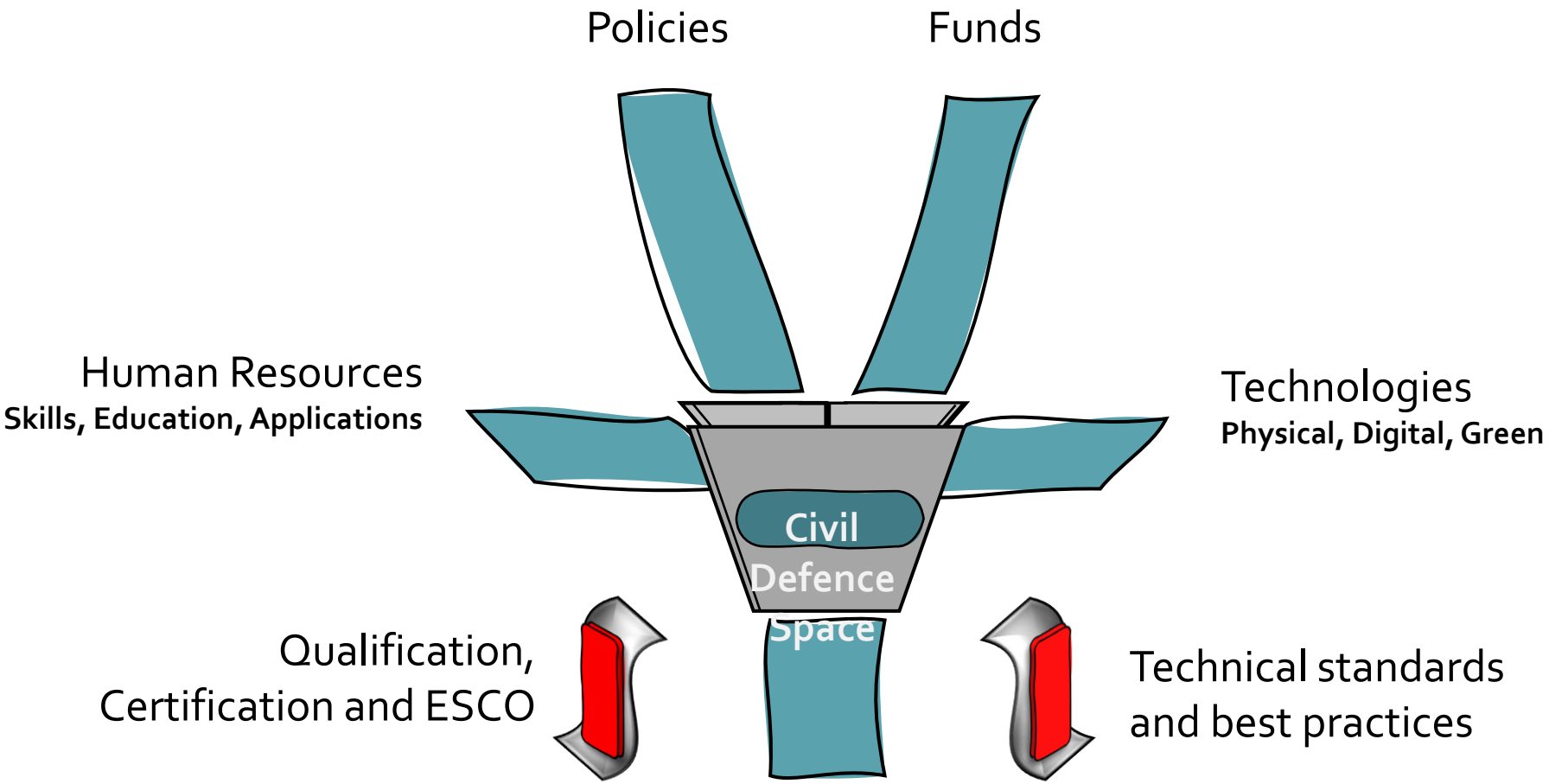
Integration of EU Action Plan & ASSETs+ goals



Integration of EU Action Plan & ASSETs+ goals



Integration of EU Action Plan & ASSETs+ goals



Actors along Technological Readiness Levels

EU Member States, Citizens, EU Insititutions, 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)

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

THANK YOU!

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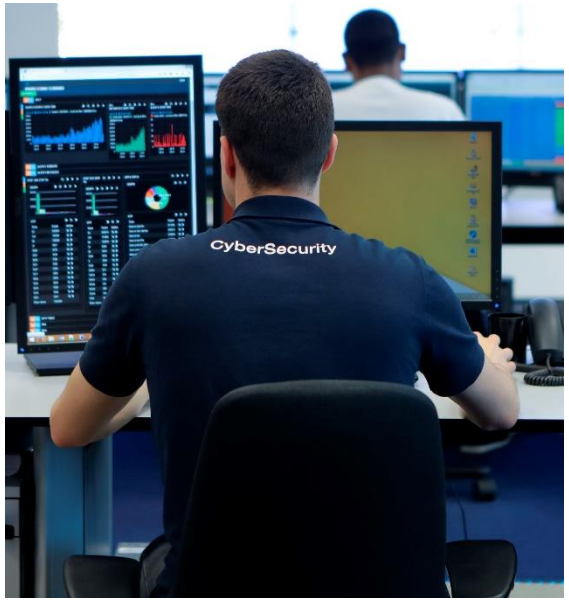
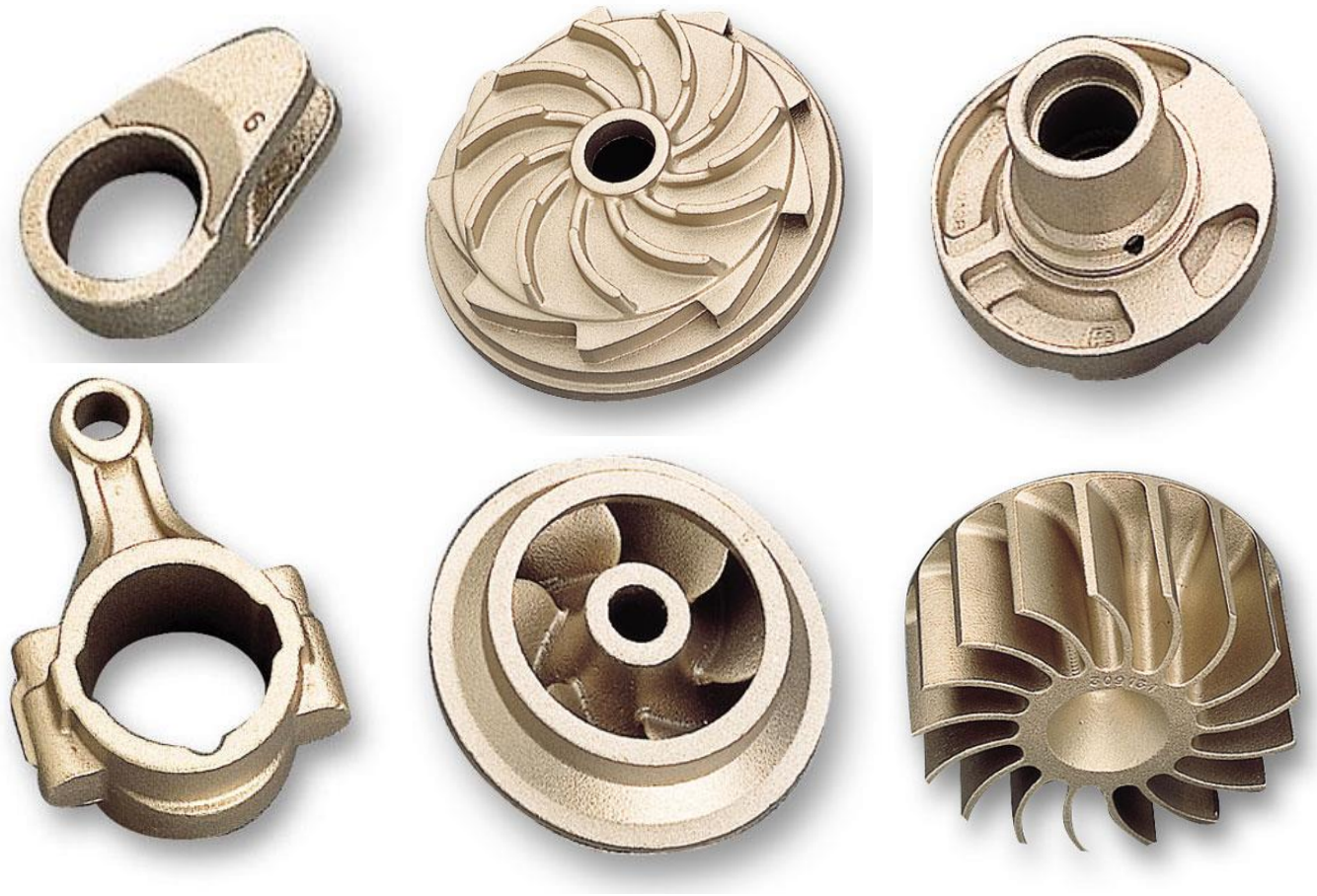
Alliance for Strategic Skills Addressing Emerging Technologies in Defence



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

Estratto da Pagina: 3

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, per rendersi conto di quanto sia semplice ed efficace il nostro metodo di lavoro».

IN SOLI 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

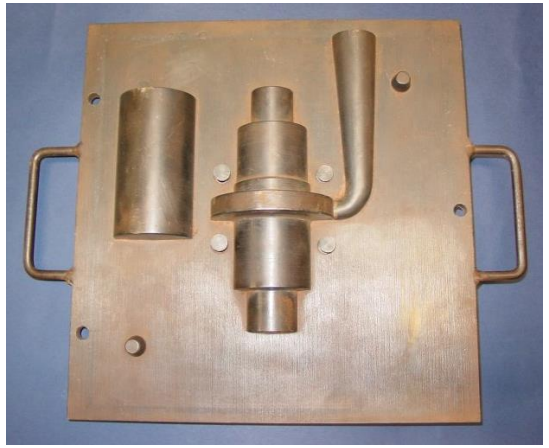
Metal SLS, SLM or DMLS …

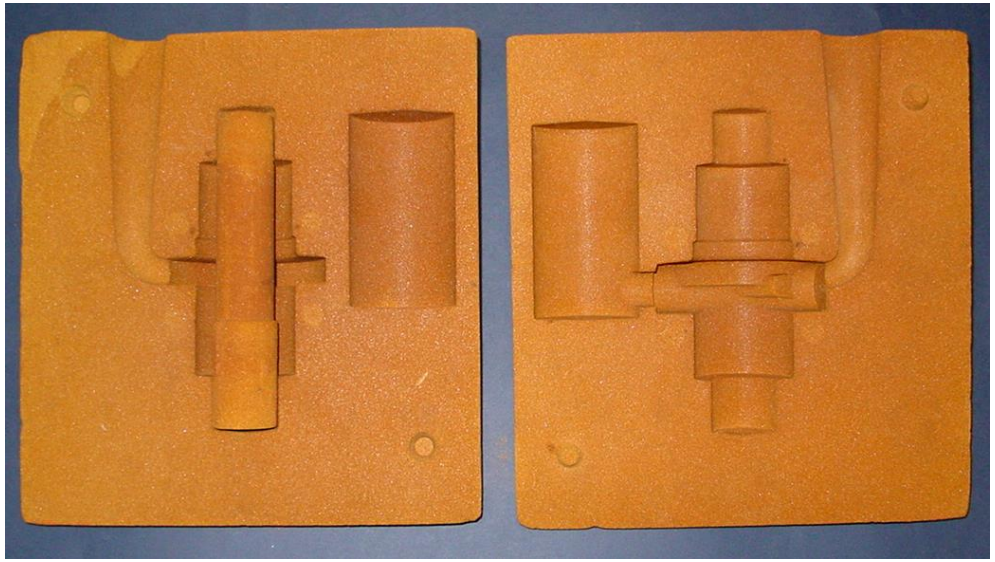
Customer: Baker-Huges

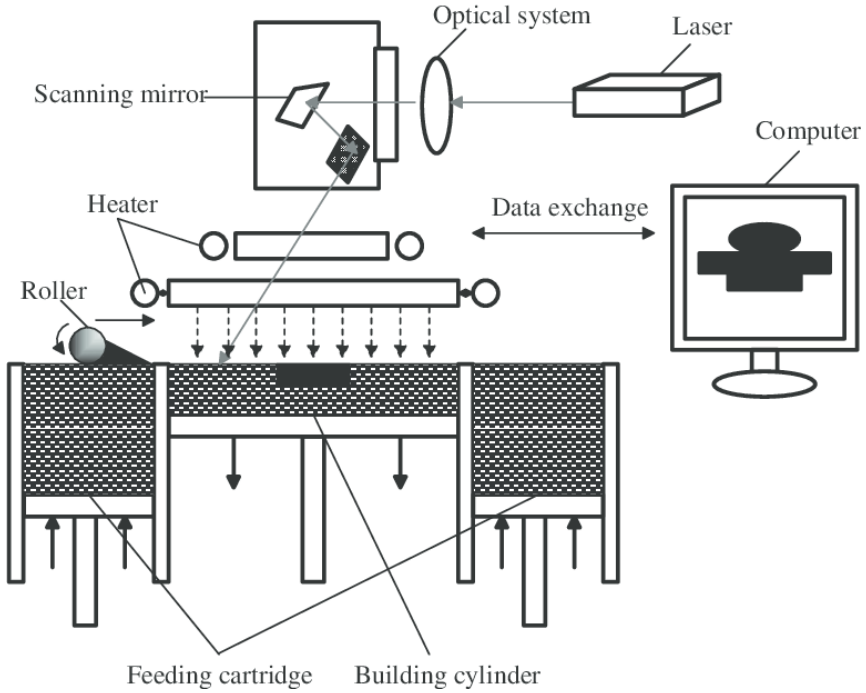
Aeronautics componets in steel, aluminum, nickel alloys, titanium alloys, etc..

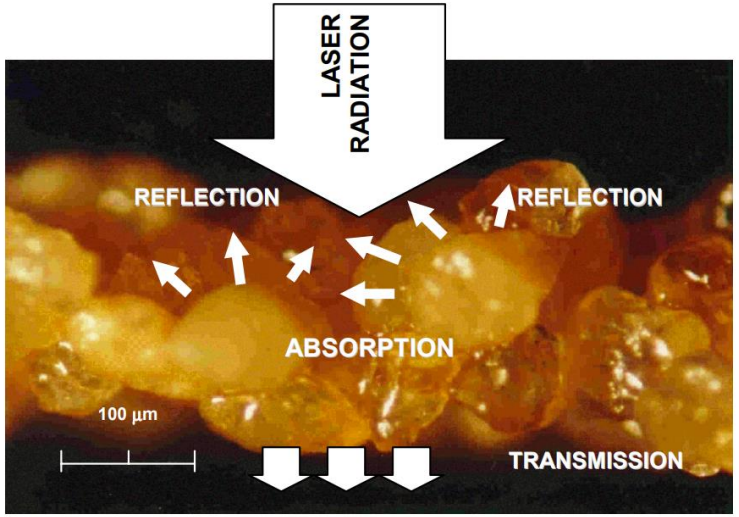
Laser: 500W
Souce: solid state laser (Yb)
Volume: 250 x 250 x 350 mm
O2 in the chamber < 10 ppm

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