



R4.2 ANNEX 2 - Workshop on the ASSETs+ Strategy for developing skills and competences for the Defence Sector and Text mining analysis on results

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Workshop on the ASSETs+ Strategy for developing skills and competences for the Defence Sector

The idea behind the Workshop

This workshop was set up to delineate the foundation for the Strategy For Developing Human Resources in the Defence Sector and enrich with concrete actions the desk work realized during the first year of the project (available in [ANNEX 1 of R4.2](#)) .

The emerging and disruptive trends related to the technological domains of Artificial Intelligence, Robotics, Autonomous Vehicle, C4ISTAR and Cybersecurity are calling for the reskilling and upskilling of professionals. This implies on one hand, the design and development of training programmes aligned with **current and future technological industrial needs** and on **Defence industry skills needs** and, on the other hand, the setting up of a **qualification system** based on the best practices in the European Defence industry. Moreover, these technologies allow leveraging on synergies between Defence and Civil sectors, to enhance Europe's technological edge and support its industrial base in line with the [Action plan on synergies between civil, defence and space industries](#).

Therefore, the scope of the workshop will be the identification of the actions and practices to achieve these goals fostering a discussion about the actions related to the pillars of the strategy, represented in the seat belt in Figure 1 (additional details in the [main part of R4.2](#)).

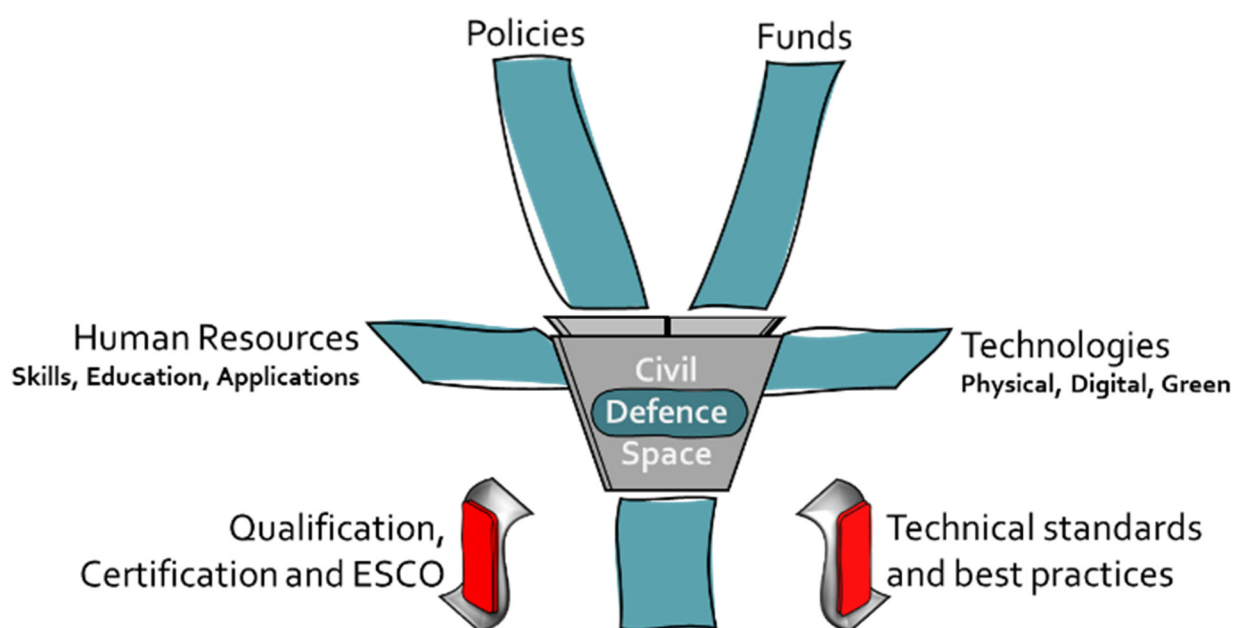


Figure 1 - Framework for the ASSETs+ strategy: 5 points security seat belt.

The workshop is organized in 6 parallel sessions, each one focuses on one pillar. The workshop was a blended event, realized online on MSTeams and in presence at the University of Pisa (find agenda below in Table 1).

The expected result was a series of recommendations for each action proposed in the discussion table.

A good quality of the results could be achieved only with a strong cooperation among all the stakeholders involved. Therefore, the involvement of external experts, such as policy makers (at European, National and Local levels), SMEs, Standard bodies, Workers and Learners, will strengthen the heterogeneous ASSETs+ Consortium (that includes Universities, VET providers, Companies, Sectoral Organizations, and Accreditation, certification, qualification and research foundation).



16 December 2021



Introductory session chaired by prof. Gualtiero Fantoni, University of Pisa, ASSETs+ Project coordinator

6 Parallel sessions: brainstormings and discussion tables, chaired by ASSETs+ Partners:

- QUALIFICATIONS: European Welding Foundation
- POLICIES: Fondazione Giacomo Brodolini
- FUNDS: Rzeszow University of Technology
- TECHNOLOGIES: University of Pisa
- HR: University of Bordeaux
- TECHNICAL STANDARDS AND BEST PRACTISE: Industrial Partners

Final session chaired by prof. Gualtiero Fantoni, University of Pisa, ASSETs+ Project coordinator.

Table 1 - Agenda of the workshop.

The results of the Workshop

More than 80 experts participated in the sessions, generating above 280 ideas.

The chairs in each session were supported by hosts from University of Pisa, as indicated in Table 2.

Session	Chair		Host (University of Pisa)
Qualifications, Certifications and Esco	European Welding Foundation	Susana Nogueira	Giovanni Puccetti
Policies	Fondazione Giacomo Brodolini	Liga Baltina	Irene Spada
Projects And Funds	Rzeszow University of Technology	Dorota Stadnicka	Elena coli
Technologies	University of Pisa	Filippo Chiarello	Anastasia Dotolo
Human Resources	University of Bordeaux	Eric Grivel	Vito Giordano
Technical Standards and Best Practise	Leonardo Company	Massimo Scalvenzi	Nicola Melluso

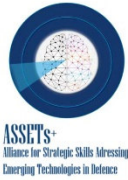
Table 2 - Management of the sessions.

Each session was organized in a structured brainstorming. The titles, intended outcomes and parts of the 6 parallel sessions are presented in the Figures 2-7.

Workshop on the ASSETS+ Strategy for developing skills and competences for the Defence Sector



Session on QUALIFICATIONS, CERTIFICATIONS AND ESCO
chaired by European Welding Federation

Title: Qualifying and Certifying Personnel for the Defence sector: what must be considered?



During this meeting we will focus on identifying which are the trending skills and the specific areas in Defence that have an urgent need for Education and Training Programmes. Moreover, we will discuss about certification and qualification linked to Defence industry's skills needs.



3 parts Brainstorming:

- Part 1: Trending Skills in Defence**
- Part 2: Education and Training Programmes**
- Part 3: Qualification and Certification: Recommendations from Experts**

Figure 2 - Organization of the session Qualification, Certification and ESCO.

Workshop on the ASSETS+ Strategy for developing skills and competences for the Defence Sector



Session on POLICIES

chaired by Fondazione Giacomo Brodolini



Title: What policies and coordination mechanisms for building Defence related skills?



During this meeting we will focus on defining a set of supporting actions and implementing activities focused at policy level thus to be implemented by European and national policy makers.



2 parts Brainstorming:

Part 1: What policies would facilitate building (technology and) skills intelligence for Defence sector?

Part 2: How to enhance collaboration and build synergies?

Figure 3 - Organization of the session Policies.

Workshop on the ASSETS+ Strategy for developing skills and competences for the Defence Sector



Session on PROJECTS AND FUNDS

chaired by Rzeszow University of Technology



Title: What is needed to support upskilling/reskilling process?



During this meeting we will focus on identifying what kind of actions can be done in different organizations and what are the needs for the external funds.



2 parts Brainstorming:

Part 1: How your organization can be realistically involved in upskilling/reskilling process?

Part 2: What you need external funds for to support upskilling/reskilling process?

Figure 4 - Organization of the session Project and Funds.

Workshop on the ASSETS+ Strategy for developing skills and competences for the Defence Sector



Session on TECHNOLOGIES
chaired by University of Pisa

Title: How data driven approaches can support the future studies in Defence?



During this meeting we will focus on the barriers and drivers for collaboration among Academia, Industry and policy makers to boost technological innovation across Europe and to achieve technological sovereignty.



2 parts Brainstorming:

Part 1: What are the current barriers in the collaboration among universities, industries, policy makers in the technical foresight in the Defence sector?

Part 2: what could be the future drivers to smooth the collaboration among universities, industries, policy makers in the technical foresight in the Defence sector?



Figure 5 - Organization of the session Technologies.

Workshop on the ASSETS+ Strategy for developing skills and competences for the Defence Sector



Session on HUMAN RESOURCES
chaired by University of Bordeaux

Title: Challenges for HEI, VET and Industry: how to ensure the alignment of current and future HR with the labour market needs?



During this meeting we will focus on the internal and external barriers and drivers that HEI, VET and companies are experiencing at local, national and European levels to ensure that there can be sufficient human resources with skills meeting the needs.



2 parts Brainstorming:

Part 1: What are the current barriers for education and industry in defining and implementing the HR strategy?

Part 2: What could be the future drivers for education and industry in defining and implementing the strategy for developing HR?

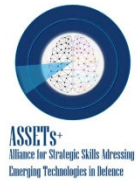


Figure 6 - Organization of the session Human Resources.

Workshop on the ASSETs+ Strategy for developing skills and competences for the Defence Sector



Session on TECHNICAL STANDARDS AND BEST PRACTICE
chaired by Leonardo Company



Title: Dual Use regulation: booster or blocker?



During this meeting we will focus on new international standards for dual use technologies, for Explainable Artificial Intelligence, Cyber Security, Drones, trying to gather best practices from Industries and contribution from Academia concerning the foreseen impact on Education.



2 parts Brainstorming:

Part 1: the new Dual Use standards.

Part 2: Explainable Artificial Intelligence, Cyber Security, Drones.

Figure 7 - Organization of the session Technical Standards and Best Practices.

At the end of the sessions, the chairs with the support of their hosts summarized and presented the shared ideas, as reported in Figures 8-13.

Workshop on the ASSETs+ Strategy for developing skills, competences and capabilities for the Defence Sector



QUALIFICATION, CERTIFICATIONS AND ESCO
chaired by European Welding Federation

Qualifying and Certifying Personnel for the Defence sector:
What must be considered?



11 internal and external experts

40 ideas generated



Increase knowledge and awareness around Cyber Security



Raise Companies involvement in the Defence Sector



Disseminate the opportunities in the Defence Sector to attract more people at all levels

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Figure 8 - Results of the session Qualification, Certification and ESCO.

Workshop on the ASSETs+ Strategy for developing skills, competences and capabilities for the Defence Sector



POLICIES
chaired by **Fondazione Giacomo Brodolini**

What policies and coordination mechanisms for building Defence related skills?



10 internal and external experts

40 ideas generated



Policies improving **mobility** of students, researchers and employees



#smaller initiatives to motivate and engage stakeholders to collaborate and #annual industry **wish list**



Use better the **already established** networks and actions

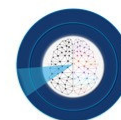
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Figure 9 - Results of the session Policies.

Workshop on the ASSETs+ Strategy for developing skills, competences and capabilities for the Defence Sector



PROJECT AND FUNDS
chaired by **Rzeszów University of Technology**

How your organization can be realistically involved in upskilling/reskilling process for the Aerospace and Defence industry? What external funds do you need to support this process?



9 internal and external experts

65 ideas generated



1. Short advanced (2-3 days) trainings for lecturers and qualified technical staff to increase the number and improve qualifications



2. More funds for PhDs (current funding processes are very complex)



3. Supporting upskilling/reskilling with internships for students and technical schools, who can then get a job

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Figure 10 - Results of the session Project and Funds.

Workshop on the ASSETs+ Strategy for developing skills, competences and capabilities for the Defence Sector



TECHNOLOGIES
chaired by University of Pisa

How data driven approaches can support the future studies in Defence?



10 internal and external experts

46 ideas generated



Clear targets and aims for EU defence



Exploit dual-use technology possibilities



EU guidelines for ethical AI: focus on defence sector

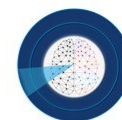
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Figure 11 - Results of the session Technologies.

Workshop on the ASSETs+ Strategy for developing skills, competences and capabilities for the Defence Sector



HUMAN RESOURCES
chaired by University of Bordeaux

Challenges for HEI, VET and Industry: how to ensure the alignment of current and future HR with the labour market needs?



15 internal and external experts

76 ideas generated



Reinforcing the synergy between Company (SMEs) and Academia



Promoting Interdisciplinary and collaborative (international, different actors and so) work



Better manage HR in short-long term

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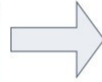
Figure 12 - Results of the session Human Resources.

Workshop on the ASSETs+ Strategy for developing skills, competences and capabilities for the Defence Sector



TECHNICAL STANDARDS AND BEST PRACTICES chaired by Leonardo Company

Dual-use of standards and Explainable Artificial Intelligence,
Cyber Security, Drones



5 internal and external experts

12 ideas generated



Standards need to be carefully implemented as actionable knowledge (and not PDFs...)



Cybersecurity threats should be prevented by design, including regulations and training courses



Being able of explaining in the "domain words" every part of AI algorithm and results

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Figure 13 - Results of the session Technical Standards and Best Practices.

Text mining analysis on results of the workshop

The 284 collected ideas have been analysed with the support of Natural Language Processing techniques to frame concrete actions and recommendations for a sustainable strategy.

Methodology

The textual data were first manually pre-processed to correct typos. Then, we performed Topic Modelling with Latent Dirichlet Allocation approach (Blei et al., 2003).

Topic Modelling is a machine learning technique for scanning a set of documents and identifying words and phrases which best represent the content of the documents. The technique is based on a clustering approach. The aim is to define groups of similar documents and to detect recurring word patterns, intended as topics.

Latent Dirichlet Allocation (LDA) is a Topic Modelling algorithm which, through a generative statistical model, treats each document as a probability distribution on the various topics and groups documents based on the percentage of common textual schemes.

It is necessary to train multiple LDA models to select one with the best performance. The selection of an LDA model requires the definition of two parameters: the number of topics (K) and the concentration measures (α and η). The optimal values for concentration measures are $\alpha = 50/K$ and $\eta = 0.01$ (Steinberger & Griffiths, 2007). While the number of topics depends on the specific case. The package *ldatuning* (Nikita, 2016) implemented in R (R Core Team, 2020) provides four tools to identify the best value of K .

1. **Griffith2004** computes the probability of a set of models with respect to all the words of the corpus, and so the likelihood of a word to represent a given topic $\Pr(w|K)$. The higher the value, the greater the likelihood of the number of topics (Griffiths & Steinberger, 2004).
2. **CaoJuan2009** selects the best model based on the density of clusters (topics). The distance is calculated for each model between the topics through the average similarity of the cosine (r). The best value of K is reached when r between topics is at a minimum, that is when the distance is maximum (Cao et al., 2009).
3. **Arun2010** calculates the symmetric Kullback-Leibler divergence between the distributions of the singular values of the Topic-Word matrix and the distributions of singular values of the Document-Topic matrix of a topic. The best number of topics is identified when the value of the divergence between these two measures in each topic is minimal (Arun et al., 2010).
4. **Deveaud2014** exploits the Jensen-Shannon divergence to determine that value of K that maximizes the distance between each pair of topics (Deveaud et al., 2014).

The graph in Figure 14 presents the metrics for the number of topics, on the x-axis is reported the number of topics and on the y-axis the corresponding values of metrics.

Considering the metrics **Deveaud2014** and **CaoJuan2009** the number of topics was set to 9.

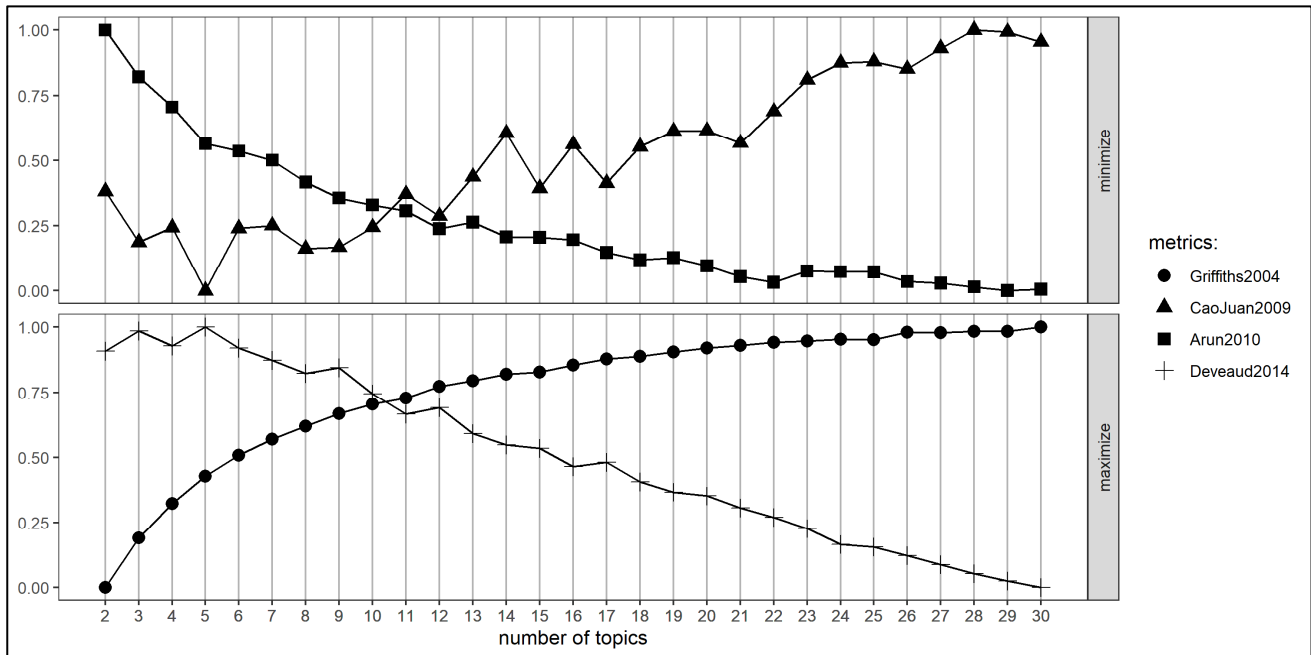


Figure 14 - Performance metrics for the number of topics.

Results

The results of the LDA Topic Modelling are reported in Figure 15, which presents:

- The ideas generated in the brainstorming session on the left, two examples are reported
- The topic detected with the LDA algorithm on the right
- Each idea is connected to a given topic by a line
- The colors of the lines represent the sessions of the workshop in which a given idea was generated

The name of the cluster (i.e., the topics) have been defined by analyzing the most recurrent words in each group. The chart of the top 10 terms per topic is presented in Figure 16, where the title of each topic is reported in correspondence of the given group.

This graph perfectly matches with the idea of the framework of the security seat belt in representing the strategic actions: the straps work properly only when act as a whole system. Indeed, the sessions were not self-standing, the generated ideas blurry the boundaries of a given brainstorming including elements which are relevant also for other sessions. Therefore, a comprehensive overview from a wider perspective could enable the delineation of the strategic actions.

The actions and the recommendations of the ASSETs+ strategy for developing a sustainable Human Resources supply chain in the Defence sector have been defined analyzing each idea in the cluster. We defined **9 actions** and **48 recommendations** for the **6 pillars** of the ASSETs+ Strategy for developing skills in Defence. The summary of the number of item per pillar is presented in Figure 17 and the full list of actions and the recommendations is reported in the [main part of R4.2](#).

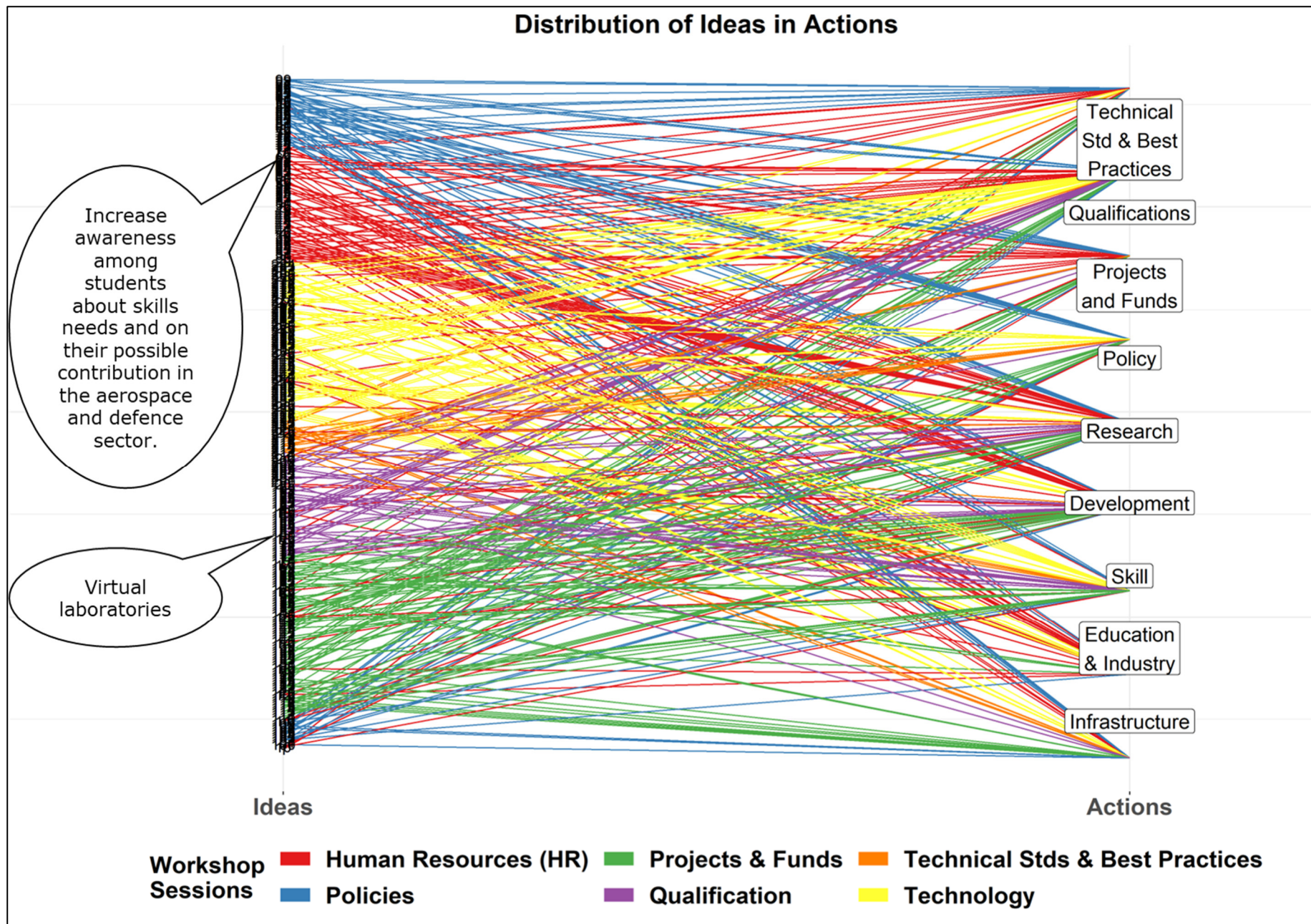


Figure 15 - Distribution of ideas of brainstorming sessions in the topics identified with LDA algorithm.

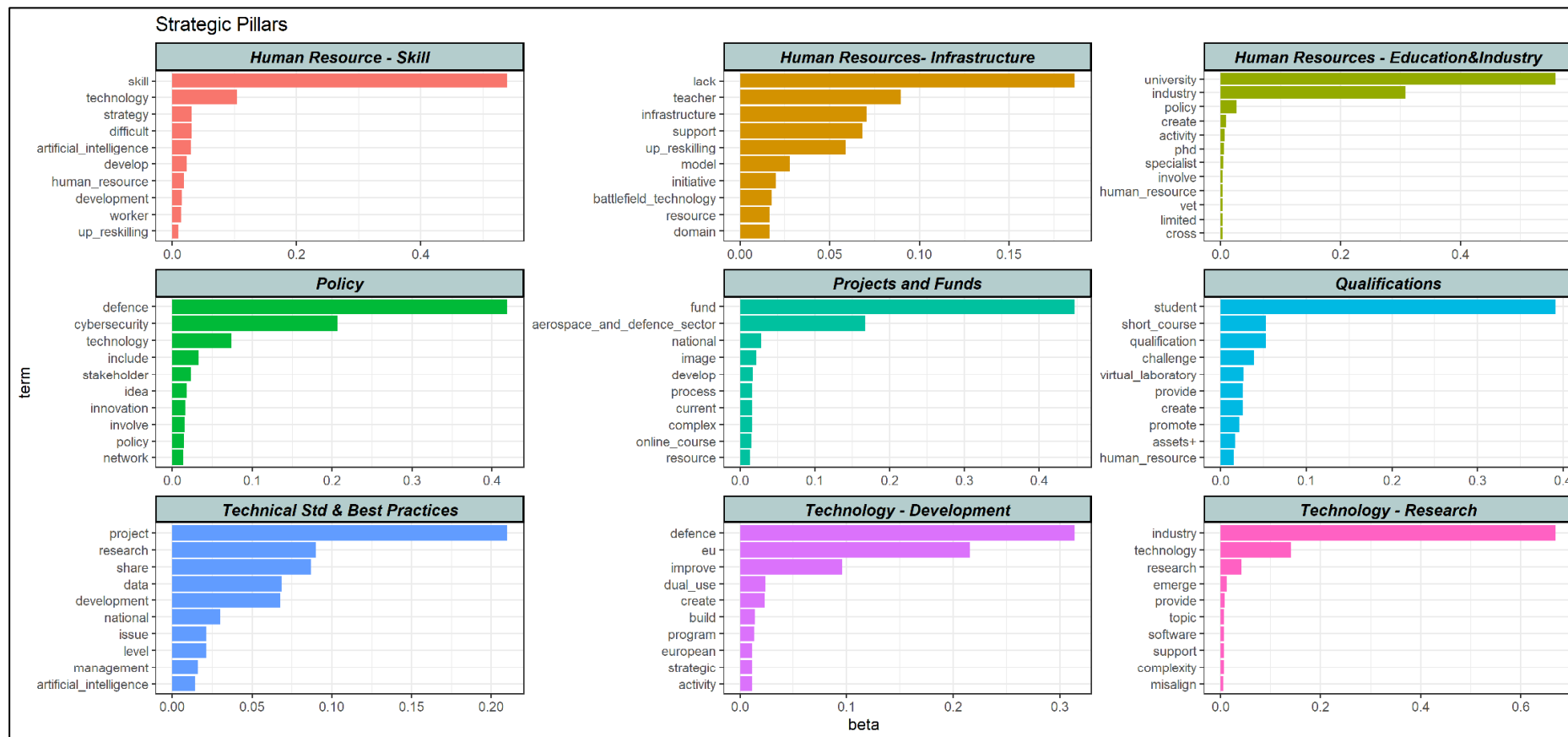


Figure 16 - Top 10 terms per topic.

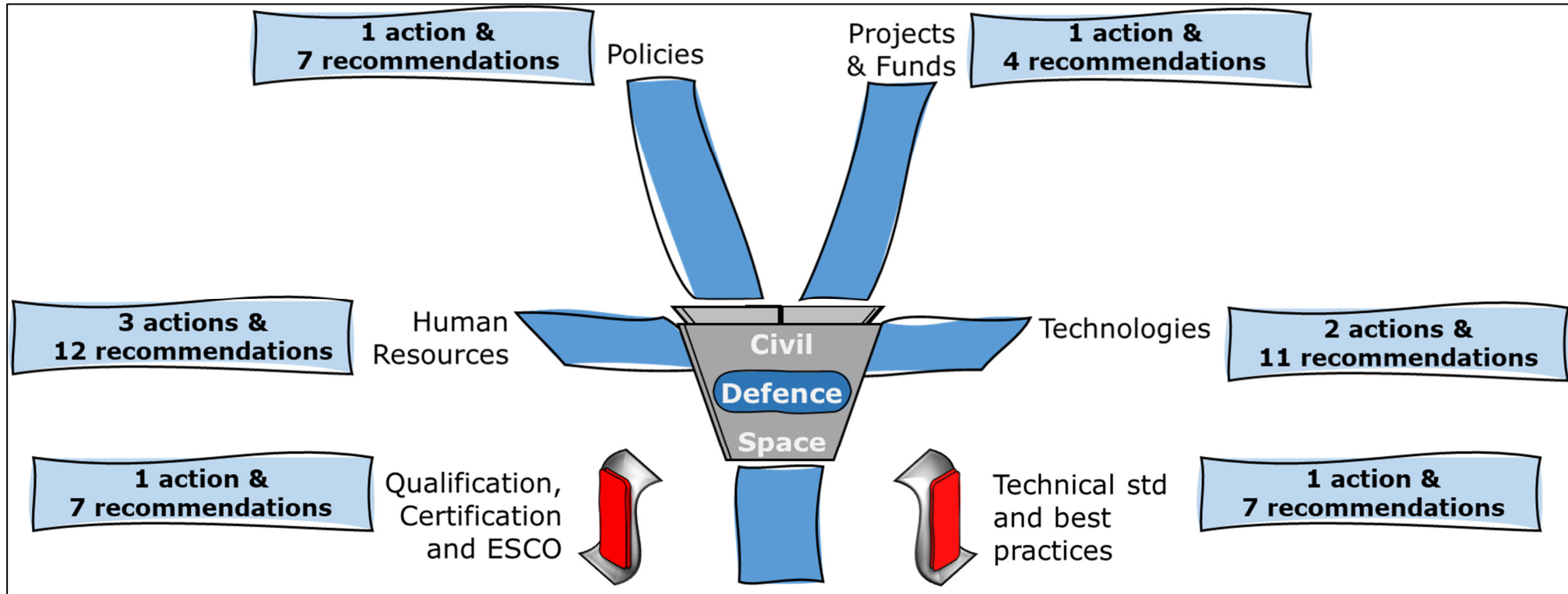


Figure 17 - Summary of number of actions and recommendations per pillar.

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