



Grant Agreement No.: 101083805  
Call: DIGITAL-2021-SKILLS-01  
Topic: DIGITAL-2021-SKILLS-01-ANALYSIS  
Type of action: DIGITAL-CSA



# D2.1 PROGRAMME AND COURSE ANALYSIS AND MAPPING

Version: v.1.0

|                         |  |
|-------------------------|--|
| <b>Work package</b>     | WP 2   |
| <b>Task</b>             | Task 2.1   |
| <b>Due date</b>         | 31/05/2023   |
| <b>Submission date</b>  | 31/05/2023   |
| <b>Deliverable lead</b> | Maggioli   |
| <b>Version</b>          | 1.0  |
| <b>Authors</b>          | Theofanis Orphanoudakis (MAG), Spiros Borotis (MAG),<br>Christopher Karachristos (MAG)   |
| <b>Contributors</b>     | Ana Moreno (UPM), Julie Byrne (TCD), Flora Josette<br>Thibaudeau (TCD), Alba Balla (IDC), Patricia Bianca Lyk (SDU),<br>Jacob Nielsen (SDU), Bjarke Pedersen (SDU), Zuzana Kušíková<br>(BLU), Martín Robles (BLU), Brendan Rowan (BLU) |
| <b>Reviewers</b>        | Ernestina Menasalvas (UPM) , Mattia Trino (BDVA)   |

|                 |  |
|-----------------|--|
| <b>Abstract</b> | <p>The deliverable D2.1 Programme and Course Analysis and Mapping presents the structured dataset of the training offerings and education courses on advanced digital skills that are offered in the EU. The current document is a supplement to the aforementioned dataset, explaining the procedure followed for the training offerings and education courses identification and selection.</p> <p>In detail, the LeADS taxonomy developed in WP1 was exploited in the selection of University and VET ADS courses, adequately representing all the EU countries. Next, these courses were mapped to the ADS technologies identified under the WP1 and the subsequent skills pockets, and were analysed accordingly. The study took as input the detailed programme outlines and related data, guiding the project partners to the analysis and mapping the contents they identified. The study was also extended to classify the educational and training methodologies (on-campus education, online/distance learning hybrid education including opportunities for hands-on training, access to physical and virtual laboratories etc.) The outcome of the analysis will provide useful insights to stakeholders in terms of data tables and visual representations of the mapping associated with quantitative and qualitative indicators that define the state of play in this field as a dataset.</p> |
| <b>Keywords</b> | Advanced Digital Skills, Supply Mapping, Course Analysis   |

## DOCUMENT REVISION HISTORY

| Version | Date       | Description of change   | List of contributor(s)  |
|---------|------------|---|---|
| V0.1    | 01/01/2023 | 1st version of the template for comments                                | Theofanis Orphanoudakis (MAG), Spiros Borotis (MAG), Christopher Karachristos (MAG) |
| V0.2    | 15/01/2023 | Revision of the methodology with partners and incorporating the changes | All partners (check full list of authors and contributors)                          |
| V0.3    | 01/02/2023 | Pilot testing of the methodology  | All partners (check full list of authors and contributors)                          |

|       |            |   |   |
|-------|------------|---|---|
| V0.4  | 15/02/2023 | Revision of the methodology with partners and incorporating the changes | Theofanis Orphanoudakis (MAG), Spiros Borotis (MAG), Christopher Karachristos (MAG) |
| V0.51 | 01/03/2023 | Pilot testing of the methodology  | All partners (check full list of authors and contributors)                          |
| V0.52 | 15/03/2023 | Revision of the methodology with partners and incorporating the changes | Theofanis Orphanoudakis (MAG), Spiros Borotis (MAG), Christopher Karachristos (MAG) |
| V0.61 | 01/04/2023 | Internal version release  | Theofanis Orphanoudakis (MAG), Spiros Borotis (MAG), Christopher Karachristos (MAG) |
| V0.62 | 15/04/2023 | Internal review   | Theofanis Orphanoudakis (MAG), Spiros Borotis (MAG), Christopher Karachristos (MAG) |
| V0.7  | 29/05/2023 | Final release   | Theofanis Orphanoudakis (MAG), Spiros Borotis (MAG), Christopher Karachristos (MAG) |
| V0.8  | 30/05/2023 | Revisions and comments from peer reviews                                | Ernestina Menasalvas (UPM)  |
| V1.0  | 31/05/2023 | Public release  | Theofanis Orphanoudakis (MAG), Spiros Borotis (MAG), Christopher Karachristos (MAG) |

## DISCLAIMER

The information, documentation and figures available in this deliverable are written by the "Leading European Advanced Digital Skills" (LEADS) project's consortium under EC grant agreement 101083805 and do not necessarily reflect the views of the European Commission.

The European Commission is not liable for any use that may be made of the information contained herein.

## COPYRIGHT NOTICE

© 2022 - 2024 LEADS Consortium

| Project co-funded by the European Commission in the Horizon Europe Programme |   |          |
|--|---|----------|
| <b>Nature of the deliverable:</b>  | DATA  |          |
| Dissemination Level  |   |          |
| <b>PU</b>  | <i>Public, fully open, e.g. web</i>                                   | <b>x</b> |
| <b>SEN</b>   | <i>Sensitive, limited under the conditions of the Grant Agreement</i> |          |
| <b>Classified R-UE/ EU-R</b>   | <i>EU RESTRICTED under the Commission Decision No2015/ 444</i>        |          |
| <b>Classified C-UE/ EU-C</b>   | <i>EU CONFIDENTIAL under the Commission Decision No2015/ 444</i>      |          |
| <b>Classified S-UE/ EU-S</b>   | <i>EU SECRET under the Commission Decision No2015/ 444</i>            |          |

- \* *R: Document, report (excluding the periodic and final reports)*  
*DEM: Demonstrator, pilot, prototype, plan designs*  
*DEC: Websites, patents filing, press & media actions, videos, etc.*  
*DATA: Data sets, microdata, etc*  
*DMP: Data management plan*  
*ETHICS: Deliverables related to ethics issues.*  
*SECURITY: Deliverables related to security issues*  
*OTHER: Software, technical diagram, algorithms, models, etc.*



## EXECUTIVE SUMMARY

The identification of education and training opportunities in the field of Advanced Digital Skills (ADS) in the EU is of paramount importance in supporting the continued growth and success of the European digital economy. It is a key pillar in enabling the upskilling and re-skilling of professionals currently employed across various economic sectors, in which ADS are, and will continue to be, of high relevance to their roles. Additionally, it will support academic and training institutions in the elaboration of curricula and courses aligned with the market demand and trends, addressing of current gaps and exploration of new collaboration opportunities.

A key step in this process is specifying a methodology for identifying and reviewing existing educational and training programmes in key technological areas and sectors related to ADS. This ensures consistency, clarity, standardised evaluation criteria, thorough data collection and analysis, stakeholder involvement, transparency, accountability, and opportunities for continuous improvement. It also enhances the rigour and credibility of the review process and helps achieve the intended objectives of evaluating and enhancing educational programmes effectively. As such, a methodological approach was developed for identifying ADS courses offered by Higher Education Institutions (HEI) and VET providers. This considered the results derived from the activities in WP1, which identified key technology areas and their respective skills pockets. Those results facilitated the identification and assessment of ADS coverage of the current HEI and VET training offerings.

Interim results from HEIs courses analysis indicate that, in the sample selected, almost 28.5% of the courses fell into the 'Advanced Digital Skills' category, laying the foundation for further exploration through the gaps analysis. The overall objective of this approach is to identify potential gaps between the supply and demand of ADS, to identify ways to bridge such gaps and enable greater employment and the overall growth and success of the European digital economy. This is done with a particular focus on the aforementioned provision of appropriate training offers from both HEIs and VET providers.

## TABLE OF CONTENTS

|          |   |           |
|----------|---|-----------|
| <b>1</b> | <b>OBJECTIVES AND COURSE LOCATING METHODOLOGY .....</b>                             | <b>13</b> |
| 1.1      | Objectives and outcomes of the task.....  | 13        |
| 1.2      | Target Audience .....   | 14        |
| 1.3      | Content and relationship to other parts of the project.....                         | 15        |
| 1.4      | Measure of success (Initial target).....  | 15        |
| 1.5      | Link to deliverables .....  | 15        |
| <b>2</b> | <b>METHODOLOGY.....</b>   | <b>16</b> |
| 2.1      | Preliminaries: ADS Description and Educational Offer Analysed .....                 | 17        |
| 2.2      | Country allocation to partners.....   | 18        |
| 2.3      | Supply mapping through desk research: Knowledge sources .....                       | 18        |
| 2.4      | Mapping process for HEIs per country.....   | 19        |
| 2.4.1    | <i>HEIs searching in each country .....</i>   | <i>19</i> |
| 2.5      | Mapping process for VET per country and beyond .....                                | 27        |
| 2.5.2    | <i>VET searching among global VET providers that offer trainings in Europe.....</i> | <i>29</i> |
| 2.5.3    | <i>VET searching among global distance learning platforms .....</i>                 | <i>31</i> |
| 2.5.4    | <i>Structure of the dataset for Vet .....</i>                                       | <i>32</i> |
| 2.5.5    | <i>Mapping categories and mapping process.....</i>                                  | <i>34</i> |
| <b>3</b> | <b>DESCRIPTION OF THE DATASETS.....</b>   | <b>39</b> |
| <b>4</b> | <b>CONCLUSIONS .....</b>  | <b>43</b> |

## LIST OF FIGURES

|  |    |
|--|----|
| FIGURE 1: STEPS OF HEI COURSES METHODOLOGY .....                             | 17 |
| FIGURE 2: LEADS ADS FRAMEWORK WITH TECHNOLOGY AREAS AND SKILLS GROUPINGS ... | 17 |
| FIGURE 3: METHODOLOGY FOR VET COURSES IDENTIFICATION .....                   | 28 |
| FIGURE 4: METHODOLOGICAL APPROACH TO VET IN EACH COUNTRY .....               | 29 |
| FIGURE 5: METHODOLOGICAL APPROACH TO "POPULAR" VET PROVIDERS.....            | 29 |
| FIGURE 6: METHODOLOGICAL APPROACH TO MAIN DISTANCE LEARNING VET PROVIDERS .  | 31 |



## LIST OF TABLES

|   |    |
|---|----|
| TABLE 1: COUNTRIES ALLOCATION TO PARTNERS.....  | 18 |
| TABLE 2: LIST_1 (INSTITUTES) WITH THE HEIS WITH COMPUTER SCIENCE AND ENGINEERING SCHOOLS.....                           | 20 |
| TABLE 3: MINIMUM AND MAXIMUM PROGRAMMES AND ADS COURSES PER COUNTRY.....  | 21 |
| TABLE 4: LIST_2 (PROGRAMMES) WITH THE PROGRAMMES SELECTED FROM THE ABOVE COMPUTER SCIENCE AND ENGINEERING SCHOOLS.....  | 23 |
| TABLE 5: LIST_3 (COURSES) WITH THE TITLES OF THE COURSES (ADS-ORIENTED AND NOT)   | 24 |
| TABLE 6: : LIST_4 (MAPPING PROCESS) WITH THE ICT TECHNOLOGIES INCLUDED IN THE MAPPING PROCESS.....                      | 24 |
| TABLE 7: LIST_4 (MAPPING PROCESS) WITH THE ARTIFICIAL INTELLIGENCE SKILL AREAS INCLUDED IN THE MAPPING PROCESS.....     | 25 |
| TABLE 8: LIST_4 (MAPPING PROCESS) WITH THE BUSINESS INTELLIGENCE SKILL AREAS INCLUDED IN THE MAPPING PROCESS.....       | 26 |
| TABLE 9: LIST_4 (MAPPING PROCESS) WITH THE CLOUD TECHNOLOGIES SKILL AREAS INCLUDED IN THE MAPPING PROCESS.....          | 26 |
| TABLE 10: LIST_4 (MAPPING PROCESS) WITH THE SECURITY TECHNOLOGIES SKILL AREAS INCLUDED IN THE MAPPING PROCESS.....      | 27 |
| TABLE 11: LIST_4 (MAPPING PROCESS) WITH THE INTERNET OF THINGS (IOT) SKILL AREAS INCLUDED IN THE MAPPING PROCESS.....   | 27 |
| TABLE 12: LIST WITH POPULAR” VET PROVIDERS FOR CORPORATE TRAINING.....  | 31 |
| TABLE 13: MAIN DISTANCE LEARNING VET PROVIDERS.....   | 31 |
| TABLE 14: ALLOCATION OF TECHNOLOGIES TO PARTNERS FOR VET.....   | 32 |
| TABLE 15: LIST_1 (INSTITUTES) WITH THE VTS WITH COMPUTER SCIENCE AND ENGINEERING SCHOOLS.....                           | 32 |
| TABLE 16: LIST_2 (PROGRAMMES) WITH THE PROGRAMMES SELECTED FROM THE ABOVE COMPUTER SCIENCE AND ENGINEERING SCHOOLS..... | 34 |
| TABLE 17: LIST_3 (COURSES) WITH THE TITLES OF THE COURSES (ADS-ORIENTED AND NOT)  | 34 |
| TABLE 18: LIST_4 (MAPPING PROCESS) WITH THE ICT TECHNOLOGIES INCLUDED IN THE MAPPING PROCESS.....                       | 35 |
| TABLE 19: LIST_4 (MAPPING PROCESS) WITH THE ARTIFICIAL INTELLIGENCE SKILL AREAS INCLUDED IN THE MAPPING PROCESS.....    | 36 |
| TABLE 20: LIST_4 (MAPPING PROCESS) WITH THE BUSINESS INTELLIGENCE SKILL AREAS INCLUDED IN THE MAPPING PROCESS.....      | 36 |
| TABLE 21: LIST_4 (MAPPING PROCESS) WITH THE CLOUD TECHNOLOGIES SKILL AREAS INCLUDED IN THE MAPPING PROCESS.....         | 37 |



TABLE 22: LIST\_4 (MAPPING PROCESS) WITH THE SECURITY TECHNOLOGIES SKILL AREAS INCLUDED IN THE MAPPING PROCESS ..... 38

TABLE 23: LIST\_4 (MAPPING PROCESS) WITH THE INTERNET OF THINGS (IOT) SKILL AREAS INCLUDED IN THE MAPPING PROCESS ..... 38

TABLE 24: BASIC INFORMATION ABOUT THE HEI DATASETS PER COUNTRY..... 40

TABLE 25: BASIC INFORMATION ABOUT THE VET DATASETS PER COUNTRY AND VET PROVIDER  
41

TABLE 26: BASIC INFORMATION ABOUT THE DATASETS FOR VET PROVIDERS THAT OFFER TRAININGS IN EUROPE..... 42

TABLE 27: BASIC INFORMATION ABOUT THE DATASETS FOR GLOBAL DISTANCE LEARNING VET PROVIDERS..... 42



## ABBREVIATIONS

|                |  |
|----------------|--|
| ADS            | Advanced Digital Skills                                |
| AIOTI          | Alliance for the Internet of Things Innovation         |
| AI             | Artificial Intelligence                                |
| Austria        | AT   |
| Belgium        | BE   |
| Bulgaria       | BG   |
| BDVA           | Big Data Value Association                             |
| BI             | Business Intelligence                                  |
| CSV            | Comma-separated values                                 |
| CS             | Computer science                                       |
| Cyprus         | CY   |
| Czech Republic | CZ   |
| Germany        | DE   |
| DoA            | Description of the action                              |
| Denmark        | DK   |
| ECF            | e-Competence Framework                                 |
| Estonia        | EE   |
| ES             | Engineering science                                    |
| Spain          | ES   |
| EADTU          | European Association of Distance Teaching Universities |
| EC             | European Commission                                    |
| ECTS           | European Credit Transfer and Accumulation System       |



|            |  |
|------------|--|
| EU         | European Union                             |
| EU         | European Union                             |
| EUA        | European University Association            |
| Finland    | FI   |
| France     | FR   |
| Greece     | GR   |
| HPC        | High Performance Computing                 |
| HEI        | Higher Education institution               |
| Croatia    | HR   |
| Hungary    | HU   |
| Ireland    | IE   |
| ICT        | Information and Communication Technologies |
| IT         | Information Technologies                   |
| IoT        | Internet of Things                         |
| Italy      | IT   |
| KPI        | Key performance indicator                  |
| Lithuania  | LT   |
| Luxembourg | LU   |
| Latvia     | LV   |
| ML         | Machine Learning                           |
| MS         | Member State                               |
| Malta      | MT   |
| NPVT       | National Public Vet Providers              |



|             |                                   |
|-------------|-----------------------------------|
| NQF         | National Quality Framework        |
| Netherlands | NL                                |
| Poland      | PL                                |
| P           | Programme                         |
| Portugal    | PT                                |
| Romania     | RO                                |
| Sweden      | SE                                |
| Slovenia    | SI                                |
| Slovakia    | SK                                |
| VET         | Vocational education and training |
| WP          | Work Package                      |



# 1 OBJECTIVES AND COURSE LOCATING METHODOLOGY

## 1.1 Objectives and outcomes of the task

The objective of the task T2.1 Programme and course mapping is to perform an extensive review of existing educational and training programmes offered by universities, business schools, vocational institutions, etc. in key technological areas and sectors in the domain of ADS. The LeADS project is responsible for mapping the supply of education and training courses and programmes and observing the skills contained within learning outcomes, formats and certification or accreditation basis.

Performing an extensive review of existing educational and training programmes offered in key technological areas and sectors across Europe related to advanced digital skills is important for several reasons:

- **Alignment with Industry Demands:** The field of technology and advanced digital skills is constantly evolving. By reviewing existing programmes, educational institutions can ensure that their offerings are aligned with the latest industry demands and trends. This helps students acquire skills that are relevant and in-demand, increasing their employability.
- **Quality Assurance:** Conducting a review allows educational institutions to assess the quality of their programmes. They can evaluate the curriculum, teaching methodologies, faculty expertise, and learning outcomes to ensure that the programmes are of high quality and meet the standards set by industry and regulatory bodies.
- **Identification of Gaps:** A thorough review helps identify any gaps or deficiencies in the existing programmes. This enables institutions to update or develop new courses to address those gaps and provide a comprehensive learning experience for students. It ensures that students receive training in the most relevant and up-to-date technologies and skills.
- **Recognition of Emerging Technologies:** Technological advancements are occurring rapidly, and new technologies often emerge. By reviewing existing programmes, educational institutions can identify emerging technologies and incorporate them into their curriculum. This ensures that students are exposed to cutting-edge technologies and are prepared to work with the latest tools and techniques in their respective fields.
- **Collaboration Opportunities:** Reviewing existing programmes provides an opportunity for collaboration between educational institutions, businesses, and industry professionals. By engaging in discussions and partnerships, universities and vocational programmes can leverage the expertise of industry experts to enhance their programmes. This collaboration ensures that educational offerings are closely aligned with industry needs and can lead to internships, apprenticeships, and job placement opportunities for students.
- **Continuous Improvement:** A review process allows for continuous improvement of educational programmes. Feedback from students, faculty, and industry professionals can be gathered and incorporated into programme updates. This iterative approach helps institutions stay relevant, adapt to changing market dynamics, and improve the overall learning experience.

In summary, reviewing existing educational and training programmes in key technological areas and sectors related to advanced digital skills is crucial in ensuring alignment with industry demands, maintaining programme quality, identifying and addressing gaps, recognising emerging technologies, fostering collaboration, and driving continuous improvement.

The work under this task considers the results of the work conducted under the WP1 Skills Profiling and Demand Mapping. One of the products of this work package was the LeADS Advanced Digital Skills Framework, which managed to identify a set of technologies and the subsequent skills (organized into skills pockets). These results were used from Task 2.1 in order to identify and select advanced digital skills offered through HEI and VET courses, and additionally to assess the coverage they provide to those skills.

The expected outcomes of this task are the following:

- Development of a representative mapping of ADS opportunities across educational and training contexts.
- Definition of current immediate needs and upcoming supply gaps on a medium-term/5-year basis.

## 1.2 Target Audience

The main outcome of this deliverable is a database of courses, comprising both masters and bachelors, from EU universities, alongside courses offered by VETs in the field of computer science that have been mapped with the ADS that were identified in WP1 of LEADS project.

This mapping is the first attempt in highlighting the existing gap between the offer and the demand in Europe corresponding to ADS.

Consequently, this deliverable targets multiple audiences, including policymakers within the European Union, education leaders, local governing bodies with responsibilities in education and members of the technology industry community who are interested in the future of the IT education industry. The project aims to provide these stakeholders with insights into the gaps between the offer and the demand for a set of identified advanced digital skills (see definition of advanced IT skills on D1.1) and to help them understand where the European Commission and MS should focus their efforts to develop policies that will support the growth of IT education in the regions.

The project is particularly relevant for policymakers within the EU who are responsible for shaping the education policies and digital agendas of their countries. The LEADS project and in particular the analysis that has been performed to produce this deliverable can help these individuals to identify potential gaps in the IT education industry and develop policies that will address these gaps. Additionally, education leaders and local governing bodies can use the insights provided by the project to make informed decisions about the allocation of resources and the development of IT education programs that will meet the needs of their local communities. Ultimately, the LEADS project can help ensure that the IT education industry in the European Union is better equipped to meet the demands of the future and mitigate potential bottlenecks in the education system.

### 1.3 Content and relationship to other parts of the project

This deliverable builds on the output of D1.2, which defined the skill framework that will be used to analyse the selected courses.

The methodology that has been followed covers courses offered both by HEIs and VETs across Europe. Using the expertise and knowledge of the different partners the offer, in several EU languages, has been thoroughly analysed.

This is an important intermediate step in the project, as it provides the input so the gap analysis can be performed.

Beyond the work developed in WP2, the offer analysis, in which the ICT educational landscape across the region has been analysed, this WP will end with a gap analysis between market demand for certain advanced digital skills and subjects being covered in higher education and specialised IT training courses.

Results uncovered by the work developed within WP1 and WP2 will then be used for the provision of recommendations and guidelines in WP3 to bolster the quality of ICT education programs across European Member States, to increase collaboration between education stakeholders, industry, and government, and to help improve the attractiveness of the technology sector for learners, in order to mitigate future skills bottlenecks.

### 1.4 Measure of success (Initial target)

According to the Description of the action (DoA) of the LeADS project and the respective KPIs, a minimum of 30 entries (courses) from each Member State should be identified. Thus, the minimum number of courses that should be analysed was 600 courses from 27 countries across Europe. This KPI was greatly exceeded as evident from the following sections of this report.

### 1.5 Link to deliverables

The final deliverable of this task, D2.1 Programme and course analysis and mapping, is a database of training and education programmes aligned with ADS skills profiles and categorized by principal parameters. A structured dataset in CSV format of the training offerings and education courses was produced.

This deliverable received input from the D1.1 Demand Assessment Framework, adopting the identified technologies in scope and the subsequent skills pockets. It will provide input mainly to the D2.2 leADS Gap analysis. Parts of its results may be exploited under various training and communication activities implemented through other work packages (e.g. WP3, WP4, WP5).

## 2 METHODOLOGY

Specifying a methodology for reviewing existing educational and training programmes in key technological areas and sectors related to advanced digital skills is important for the following reasons:

- **Consistency and Replicability:** A specified methodology ensures that the review process is consistent and replicable. It provides a structured framework that can be followed consistently across different programmes and institutions. This helps ensure that the evaluation criteria and processes are applied uniformly, allowing for fair and reliable comparisons between different programmes.
- **Clear Objectives and Scope:** A methodology helps define the objectives and scope of the review. It establishes the specific goals and outcomes that the review aims to achieve. This clarity is essential in identifying the key aspects to be assessed, such as curriculum, faculty qualifications, learning resources, and programme outcomes.
- **Standardized Evaluation Criteria:** A methodology enables the development of standardized evaluation criteria. These criteria can be tailored to the specific needs and requirements of advanced digital skills in different sectors. Having predefined evaluation criteria ensures that the review is comprehensive and covers all relevant aspects of the programmes under assessment.
- **Stakeholder Involvement:** A methodology allows for the involvement of various stakeholders, such as experts, in the review process. It outlines the mechanisms for gathering input and feedback from these stakeholders, ensuring their perspectives are considered. This inclusive approach leads to a more holistic and well-rounded evaluation.
- **Transparency and Accountability:** By specifying a methodology, the review process becomes transparent and accountable. The methodology provides transparency by documenting the steps and procedures followed during the review. It also ensures accountability by establishing clear roles, responsibilities, and timelines for conducting the review. This transparency and accountability build trust and credibility in the review outcomes.
- **Continuous Improvement:** A well-defined methodology facilitates a cycle of continuous improvement. It allows for feedback and lessons learned from the review process to be incorporated into future iterations of the methodology. This iterative approach ensures that the review process itself evolves and becomes more effective over time.

The methodology established for this purpose includes mainly the following steps: (a) Define selection criteria for educational / training programmes on various levels; (b) Identify programmes and course following the criteria defined; (c) categorize courses identified to non-ADS and ADS; (d) analyze ADS courses.



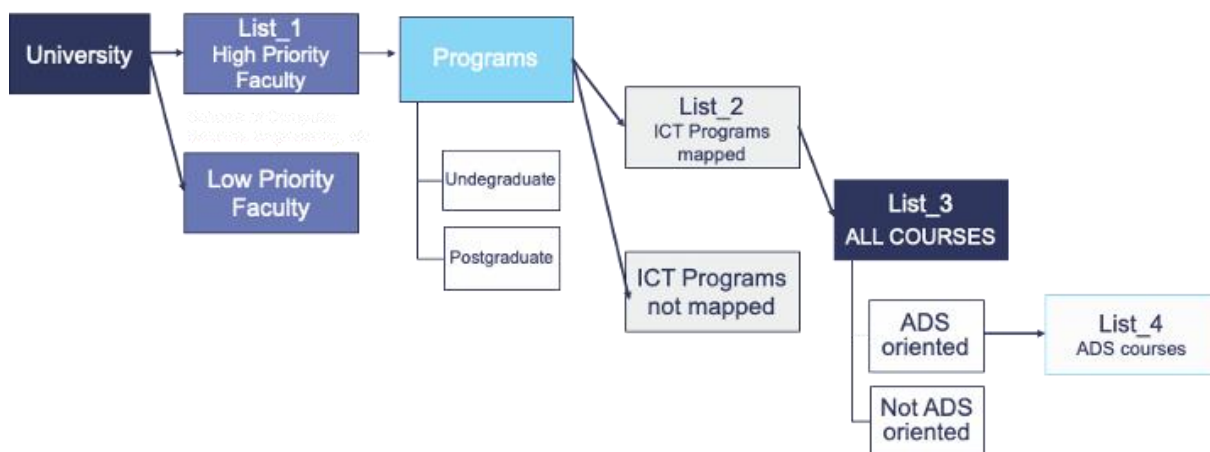


Figure 1: Steps of HEI courses methodology

## 2.1 Preliminaries: ADS Description and Educational Offer Analysed

Figure 2 represents a comprehensive picture of the ADS Framework proposed by LEADS and used in this task. The ADS framework works with a set of six Technology Areas (green colour) and 29 Skills pockets (as we refer to groupings of skills, orange colour).

### High-level view of the ADS Framework (Technology Areas and Skills groupings)

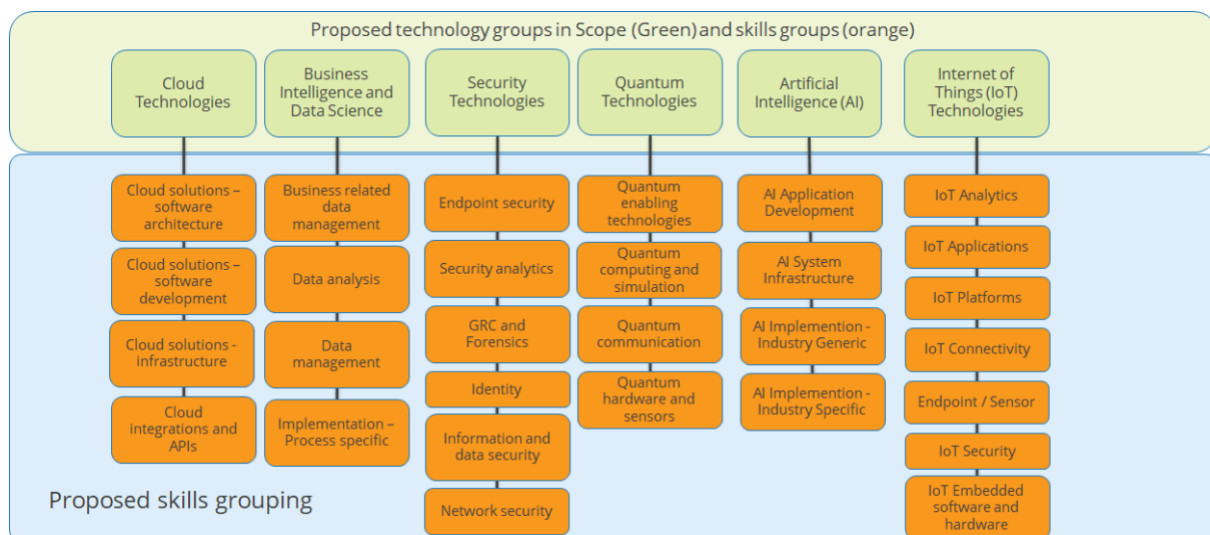


Figure 2: LEADS ADS Framework with Technology Areas and Skills groupings

In this task we will analyze to what extent the educational offer covers such technology areas and skills pockets.

This educational offer has been analyzed from different perspectives:

- High Education Institutions (HEI): Officially recognized (national level) institution of higher education and research which awards academic degrees (undergraduate and

postgraduate) in different academic disciplines. In order to scrutinize the HEI offer, this task has covered Bachelor and Master programs in the different technology areas.

- National Public Vet Providers (VET): Public and private vocational training providers at national level, as well as global VET providers well recognized by industry (e.g. CISCO).

In all cases, the ADS related programs have been identified and each subject has been considered a course, for which a detailed analysis has been provided.

## 2.2 Country allocation to partners

Country allocation is a process aimed at identifying and assigning specific countries to partners for conducting comprehensive course and programme mapping. This allocation is driven by various factors such as language comprehension by the partners, country's population, country's educational system and estimated budget per partner for this task. By carefully considering these aspects, project teams can ensure that partners are aligned with the targeted countries and possess the necessary resources to conduct thorough searches. Through a collaborative approach, partners are assigned countries where they can leverage their knowledge, networks, and specialized skills and deliver high-quality results. The country allocation process facilitates a targeted and efficient search, enabling partners to delve deep into their allocated countries and provide valuable information that contribute to the task's target. In the **Error! Reference source not found.** the country allocation is presented according to the aforementioned criteria.

| Partner                | Countries  |
|------------------------|--|
| <b>P1 – BLUSPECS</b>   | Czechia, Latvia, Romania, Slovakia                                   |
| <b>P2 – MAGGIOLI</b>   | Cyprus, Estonia, Greece, Italy, Netherlands, Slovenia, Sweden, Malta |
| <b>P3 – IDC ITALIA</b> | Austria, Bulgaria, Croatia, Finland, France, Lithuania               |
| <b>P5 – UPM</b>        | Hungary, Portugal, Spain   |
| <b>P6 – TCD</b>        | Belgium, Ireland, Poland   |
| <b>P7 – SDU</b>        | Denmark, Germany, Luxembourg   |

*Table 1: Countries allocation to partners.*

## 2.3 Supply mapping through desk research: Knowledge sources

Searching for the right sources is important when reviewing existing educational and training programmes in key technological areas and sectors related to advanced digital skills for several reasons.

Using reliable and accurate sources ensures that the information gathered during the review process is trustworthy. It helps to avoid inaccuracies, misconceptions, or outdated information that could potentially lead to flawed evaluations or decisions. Technology and digital skills evolve rapidly, and new developments occur frequently. Searching for the right sources allows reviewers to access the most up-to-date information and industry trends. This ensures that the review process considers the latest advancements and aligns with the current state of the field. Reviewing programmes in technological areas and sectors necessitates understanding their alignment with industry needs and requirements. Utilizing the right sources helps reviewers gain insights into the specific technological skills, tools, and knowledge that are currently in demand in the industry. It allows for a more accurate assessment of programme relevance and effectiveness. The right sources provide access to diverse perspectives and opinions from experts, practitioners, and thought leaders in the field.

Engaging with a variety of sources enables reviewers to consider different viewpoints, best practices, and emerging trends. This enriches the review process and facilitates a comprehensive understanding of the subject matter. Searching for the right sources allows also for benchmarking against established best practices and standards. Reviewers can compare the programmes under assessment with similar offerings at other institutions or recognized benchmarks in the field. This helps identify areas of strength and areas for improvement, leading to valuable insights for programme enhancement.

Finally, when reviewing educational programmes, ethical considerations come into play, such as ensuring inclusivity, diversity, and accessibility. Searching for the right sources helps reviewers access guidelines, research, and case studies that address these ethical dimensions. It ensures that the review process considers important aspects beyond technical skills, fostering a more inclusive and equitable learning environment.

Leveraging content from online sources, the LeADS approach complements educational offering web sources with data from:

- European University Association (EUA), European Association of Distance Teaching Universities (EADTU), Leading institutional university networks for online, open and distance higher education.
- Offerings developed in the framework of DIGITAL-2021-SKILLS-01-SPECIALISED
- National bodies implementing NQFs.
- Similar offerings in the EU HE landscape, alliances founded through the Erasmus+ initiative, and the European Forum of Technical and Vocational Education and Training.
- Certification bodies (e.g., iSQi Group, Certiport etc.).
- Eurostat, OECD.

## 2.4 Mapping process for HEIs per country

### 2.4.1 HEIs searching in each country

Partners searched among the most “popular” HEIs in every country with focus on “Computer Science” and “Engineering” schools. Popularity of an institution is considered according to:

- Its position in the International University Rankings (more specifically we used QS ranking 2022 with subject option: Engineering and Technology).
- The popularity of its ICT programmes (e.g., in Greece because there is an admission system to public universities through written exams, the “popularity” is determined by the law of supply and demand directly related to the ranking of the mean score students are accepted by each HEI).
- The number of students studying in it (mostly in cases of VETs).
- Other (e.g., EU/International funding, its reputation within the country limits and beyond (broadly and in relevance to its Faculty of CS or ES)).

Output of this step is the List\_1 (INSTITUTES) tab in the dataset file with the HEIs with Computer Science and Engineering Schools (**Error! Reference source not found.**). Below you can find an example of the List\_1 (INSTITUTES) tab with some dummy data. In the real dataset there is an entry for each university in the corresponding tab.

| Property     | Example   |
|--------------|---|
| Country      | Greece  |
| Institute no | GR001   |
| Name of HEI  | National Technical University of Athens                                     |
| Link         | <a href="https://www.ntua.gr/el/schools">https://www.ntua.gr/el/schools</a> |

Table 2: List\_1 (INSTITUTES) with the HEIs with Computer Science and Engineering Schools.

#### 2.4.2 Screening HEIs' programmes

Each partner had to search the HEIs selected in the previous step for all computer science degree programmes (undergraduate and postgraduate). The HEIs search includes the following:

- Schools of Computer Science and Engineering (search with high priority in relation to other Schools that offer graduate and postgraduate programmes)
- Undergraduate, postgraduate and (if applicable) doctoral programmes
- Other Schools that offer graduate and postgraduate programmes (with low priority)
- Undergraduate, postgraduate, and doctoral programmes
- The rules for searching per country are the following:
  - At least one undergraduate programme per country should be investigated (see table below).
  - At least one postgraduate programme per technology area (see table below)/per country should be investigated (see table below). The maximum number of postgraduate programmes depends on the cluster the country belongs to.

- If the necessary number of ADS-oriented courses to a technology area could not be found in one programme, we should move on to the next programme within the university or we should move on to the next university/programme etc.
- If we won't be able to find the courses needed within the first cluster (Cluster\_1: 5, Cluster\_2: 4, Cluster\_3: 3, Cluster\_4: 2, Cluster\_5: 1) universities, the searching process stops<sup>1</sup>.
- We accept programmes and courses with description not in English and we a) use Google translate, b) checkpoint it to the corresponding column in LIST\_3 (COURSES) in the dataset file.
- We record in the LIST\_3 (COURSES) all the courses of a programme regardless of whether it is an ADS-oriented course or not. We use an extra column titled "ADS or not" with the options "YES"/"NO". If the chosen option is "YES" this course should be mapped in LIST\_4 (MAPPING PROCESS) tab.
- If the indicator of e.g. 5 ADS courses is achieved in one programme, but the programme has more ADS courses, we analyze all ADS courses of this programme and not a part of them (for coherence reasons).

Below (**Error! Reference source not found.**) you can find a table with the minimum and maximum programmes and ADS courses per country.

| Country clusters   | Min undergraduate programmes investigated | Min ADS courses analyzed |
|--|---|--------------------------|
| Cluster 1: Germany, France, Italy, Spain, Poland, Romania          | 1   | 5                        |
| Cluster 2: Netherlands, Belgium, Greece, Czechia, Sweden, Portugal | 1   | 4                        |
| Cluster 3: Hungary, Austria, Bulgaria, Denmark, Finland, Slovakia  | 1   | 3                        |

*Table 3: Minimum and Maximum programmes and ADS courses per country.*

Outputs of this step are:

- List\_2 (PROGRAMMES) with the programmes selected from the above resources and relative data. In the table below (**Error! Reference source not found.**) you can find an

---

<sup>1</sup> The EU27 countries were separated into 5 clusters. Cluster 1 included the bigger countries, i.e. Germany, France, Italy, Spain, Poland and Romania; Cluster 2 included the Netherlands, Belgium, Greece, Czechia, Sweden and Portugal; Cluster 3 included Hungary, Austria, Bulgaria, Denmark, Finland and Slovakia; Cluster 4 included Ireland, Croatia, Lithuania, Slovenia, Latvia and Estonia; Last, Cluster 5 included Cyprus, Luxembourg and Malta.

example of the List\_2 (PROGRAMMES) tab with some dummy data. In the real dataset there is an entry for each selected programme in the corresponding tab.

| Property   | Example or possible options  |
|--|--|
| <b>Institute No</b>  | <i>GR001</i>   |
| <b>Programme No</b>  | <i>P001</i>  |
| <b>Code</b>  | <i>GR001P001</i>   |
| <b>Is an Artificial Intelligence programme?</b>  | <i>YES/NO</i>  |
| <b>Is a Business Intelligence programme?</b>   | <i>YES/NO</i>  |
| <b>Is a Cloud Technologies programme?</b>  | <i>YES/NO</i>  |
| <b>Is a Security Technologies programme?</b>   | <i>YES/NO</i>  |
| <b>Is an IoT programme?</b>  | <i>YES/NO</i>  |
| <b>Training programme title</b>  | <i>Electrical and Computer Engineering</i>   |
| <b>School and / or Department (e.g., School of Sciences / Department of Informatics)</b> | <i>School of Electrical and Computer Engineering</i>   |
| <b>Training programme delivery mode</b>  | <ul style="list-style-type: none"> <li>- <i>On-campus.</i></li> <li>- <i>Distance / eLearning.</i></li> <li>- <i>Hybrid.</i></li> </ul>  |
| <b>Training programme type</b>   | <ul style="list-style-type: none"> <li>- <i>Formal education (Includes primary, secondary, tertiary education, including vocational and university education that culminate in the achievement of a 22ecognized certification, diploma, degree or professional qualification, e.g. Tertiary education degree, Post-secondary non-tertiary, etc.).</i></li> <li>- <i>Non formal training (Non–formal education is any type of structured and organized learning which is intentional and planned by an educational provider, but which does not lead to formal qualifications recognized by the relevant national education authorities, e.g. workplace training, a training programme by Cisco leading to CCNA, etc.).</i></li> <li>- <i>None of the above.</i></li> </ul> |

|   |   |
|---|---|
| <b>Programme ECTS points (only for EQF6-8 programmes)</b> | 90  |
| <b>EQF level</b>  | 7   |
| <b>link</b>   | <a href="https://dsml.ece.ntua.gr">https://dsml.ece.ntua.gr</a> |
| <b>No of courses included (ADS-orientated and not)</b>    | 26  |
| <b>No of courses included (ADS-orientated)</b>            | 13  |

Table 4: List\_2 (PROGRAMMES) with the programmes selected from the above Computer Science and Engineering Schools

- LIST\_3 (COURSES) with the title of the courses (ADS-oriented and not) included in the above programmes. In the table below you (**Error! Reference source not found.**) can find an example of the LIST\_3 (COURSES) tab with some dummy data. In the real dataset there is an entry for each selected course (ADS-oriented and not) in the corresponding tab.

| <b>Property</b>  | <b>Example or possible options</b>   |
|--|--|
| <b>Institute no</b>  | GR001  |
| <b>Programme No</b>  | P001   |
| <b>Course No</b>   | C001   |
| <b>Description in English</b>  | YES/NO   |
| <b>ADS or not</b>  | YES/NO   |
| <b>Compulsory or not</b>   | YES/NO   |
| <b>Code</b>  | GR001P001C001  |
| <b>Course title</b>  | <i>Patterns Recognition</i>  |
| <b>Course delivery mode</b>  | <ul style="list-style-type: none"> <li>- <i>On-campus.</i></li> <li>- <i>Distance / eLearning.</i></li> <li>- <i>Hybrid.</i></li> </ul>  |
| <b>ECTS points (only for courses included in EQF 6-8 programmes)</b> | 5  |
| <b>Skills developed through practical experience</b>                 | <ul style="list-style-type: none"> <li>- <i>The course includes hands-on training in physical laboratories.</i></li> <li>- <i>The course includes hands-on training in virtual laboratories.</i></li> <li>- <i>The course includes practical exercise.</i></li> <li>- <i>The course includes work-based learning.</i></li> <li>- <i>The course does not include any type of practical experience.</i></li> </ul> |

|           |   |
|-----------|---|
| EQF level | 7   |
| Link      | <a href="https://dsml.ece.ntua.gr/studies/courses/anaqnorise-protypon">https://dsml.ece.ntua.gr/studies/courses/anaqnorise-protypon</a> |

Table 5: LIST\_3 (COURSES) with the titles of the courses (ads-oriented and not)

### 2.4.3 Mapping categories and mapping process

From the LIST\_3 (COURSES) we select only the ADS-oriented courses, and we start the mapping process in the LIST\_4 (MAPPING PROCESS) tab. For a programme we have selected we must map all the ADS-oriented courses.

Output of this step:

- LIST\_4 (MAPPING PROCESS) with the ADS-oriented courses (produce the final dataset by joining all the individual lists together) and all the information about the kind of skills they cover. In the tables below you can find an example of the LIST\_4 (MAPPING PROCESS) tab with some dummy data. In the real dataset there is an entry for each selected ADS-oriented course in the corresponding tab.

In the table below (**Error! Reference source not found.**) the analyst should choose the ICT technologies that the course is categorized.

| <b>ADS course code:</b><br>e.g. GR001P001C001  | <b>ICT Technologies</b>  | <b>Possible options</b>  |
|--|--------------------------|--|
| According to your review, to which of the following ICT Technologies this course relates to? | Artificial Intelligence  | - Not at all.<br>- Average.<br>- Fully.<br>- I do not know / answer. |
|  | Business Intelligence    | - Not at all.<br>- Average.<br>- Fully.<br>- I do not know / answer. |
|  | Cloud technologies       | - Not at all.<br>- Average.<br>- Fully.<br>- I do not know / answer. |
|  | Security technologies    | - Not at all.<br>- Average.<br>- Fully.<br>- I do not know / answer. |
|  | Internet of Things (IoT) | - Not at all.<br>- Average.<br>- Fully.<br>- I do not know / answer. |

Table 6: : LIST\_4 (MAPPING PROCESS) with the ICT Technologies included in the mapping process

For each technology from the previous table the analyst should choose the skill areas that the course is categorized. Below (**Error! Reference source not found. - Error! Reference source not found.**) you can find the skill areas for each technology. In the Annex 1 at the end of the report you can find the skill details for each technology area. This table was used by the



analysts as the basic mapping tool in order to categorize ADS-oriented courses to skill areas by matching the description of the courses with the skill details for each technology area. The table of the Annex 1 is part of the deliverable [D1.1 Demand Assessment Framework](#).

| <i>ADS course code:<br/>e.g. GR001P001C001</i>  | <b>Artificial Intelligence</b>        | <i>Possible options</i>  |
|---|---------------------------------------|--|
| Please review the degree of support the course provides to the development of the following skill areas in the area of <b>“Artificial Intelligence”</b> | AI Application Development            | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|   | AI System Infrastructure              | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|   | AI Implementation – industry generic  | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|   | AI Implementation – industry specific | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |

Table 7: LIST\_4 (MAPPING PROCESS) with the Artificial Intelligence skill areas included in the mapping process

| <i>ADS course code:<br/>e.g. GR001P001C001</i>  | <b>Business Intelligence</b>      | <i>Possible options</i>  |
|---|-----------------------------------|--|
| Please review the degree of support the course provides to the development of the following skill areas in the area of <b>“Business Intelligence”</b> | Business related data management  | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|   | Data analysis                     | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|   | Data management                   | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|   | Implementation – Process specific | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |



Table 8: LIST\_4 (MAPPING PROCESS) with the Business Intelligence skill areas included in the mapping process

| <b>ADS course code:<br/>e.g. GR001P001C001</b>   | <b>Cloud Technologies</b>               | <b>Possible options</b>  |
|--|---|--|
| Please review the degree of support the course provides to the development of the following skill areas in the area of <b>“Cloud Technologies”</b> | Cloud solutions – software architecture | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|  | Cloud solutions – software development  | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|  | Cloud integrations and APIs             | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|  | Cloud solutions – infrastructure        | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |

Table 9: LIST\_4 (MAPPING PROCESS) with the Cloud Technologies skill areas included in the mapping process

| <b>ADS course code:<br/>e.g. GR001P001C001</b>  | <b>Security technologies</b>  | <b>Possible options</b>  |
|---|-------------------------------|--|
| Please review the degree of support the course provides to the development of the following skill areas in the area of <b>“Security technologies”</b> | Endpoint security             | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|   | Security analytics            | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|   | GRC and Forensics             | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|   | Identity                      | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|   | Information and data security | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> </ul>  |



|  |                  |  |
|--|------------------|--|
|  |                  | <ul style="list-style-type: none"> <li>Fully.</li> <li>I do not know / answer.</li> </ul>  |
|  | Network security | <ul style="list-style-type: none"> <li>Not at all.</li> <li>Average.</li> <li>Fully.</li> <li>I do not know / answer.</li> </ul> |

Table 10: LIST\_4 (MAPPING PROCESS) with the Security technologies skill areas included in the mapping process

| <b>ADS course code:<br/>e.g. GR001P001C001</b>   | <b>Internet of Things (IOT)</b>    | <b>Possible options</b>  |
|--|------------------------------------|--|
| Please review the degree of support the course provides to the development of the following skill areas in the area of <b>“Internet of Things (IOT)”</b> | IoT Analytics                      | <ul style="list-style-type: none"> <li>Not at all.</li> <li>Average.</li> <li>Fully.</li> <li>I do not know / answer.</li> </ul> |
|  | IoT Applications                   | <ul style="list-style-type: none"> <li>Not at all.</li> <li>Average.</li> <li>Fully.</li> <li>I do not know / answer.</li> </ul> |
|  | Sus                                | <ul style="list-style-type: none"> <li>Not at all.</li> <li>Average.</li> <li>Fully.</li> <li>I do not know / answer.</li> </ul> |
|  | IoT Security                       | <ul style="list-style-type: none"> <li>Not at all.</li> <li>Average.</li> <li>Fully.</li> <li>I do not know / answer.</li> </ul> |
|  | IoT Connectivity                   | <ul style="list-style-type: none"> <li>Not at all.</li> <li>Average.</li> <li>Fully.</li> <li>I do not know / answer.</li> </ul> |
|  | IoT Embedded Hardware and software | <ul style="list-style-type: none"> <li>Not at all.</li> <li>Average.</li> <li>Fully.</li> <li>I do not know / answer.</li> </ul> |

Table 11: LIST\_4 (MAPPING PROCESS) with the Internet of Things (IOT) skill areas included in the mapping process

## 2.5 Mapping process for VET per country and beyond

The process of VET mapping includes 3 different steps as presented in the subsections below.



Figure 3: Methodology for VET courses identification

### 2.5.1 VET searching in each country

Partners searched in each country for National Public Vet Providers (NPVPs -) with focus on “Computer Science” and “Engineering” programmes. As shown in Figure 4, the search included two possible directions:

- Search for programmes offered by institutions listed in the European Centre for the Development of Vocational Training (for more information <https://www.cedefop.europa.eu/en/tools/vet-in-europe/systems>).
- Search for programmes from other NPVP (like university VET providers etc.,).
- Through the above searching paths, we targeted:
- EQF 5 programmes categorized under the formal education system type (only programmes that offer professional rights to graduates and a degree of profession).
- Programmes or courses offered by public bodies (e.g. universities and offer a minimum number of ECTS or any other officially recognized credit system). Such programmes are classified under what is called continuous learning and usually follow the initial education that might be University degree or VET degree.

When the search with the above methods produced no results, the searching process stopped, and the partners continued with the next search option (appeared in sections 2.4.2 and 2.4.3 below) trying to cover the minimum number of courses from these two categories. The important is to gather the min number regardless of the searching method. The critical point here to decide when exactly a partner should move on to the next search options, is a combination of the time spent searching, and his/her understanding of the educational structure of VET system in every country.

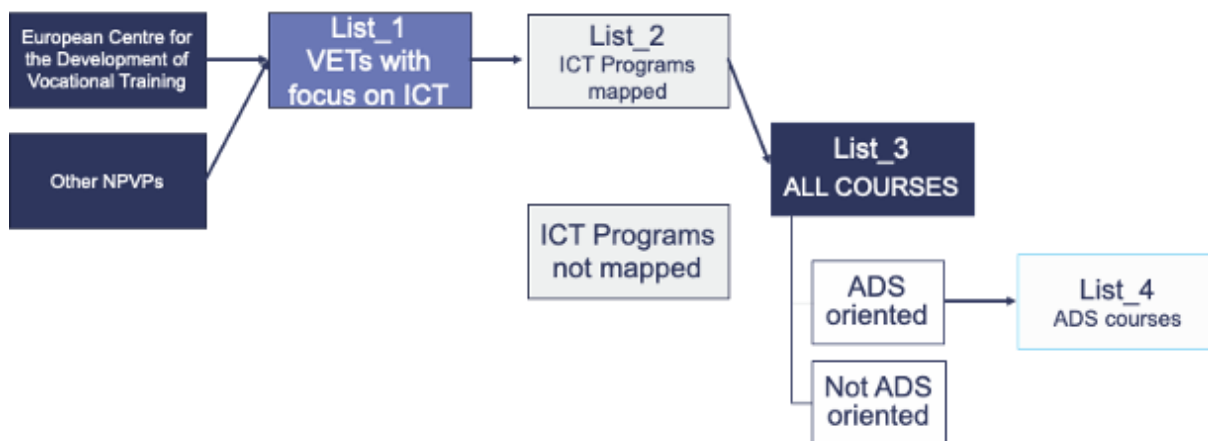


Figure 4: Methodological approach to VET in each country

### 2.5.2 VET searching among global VET providers that offer trainings in Europe

Partners also searched among the most “popular” VET providers for corporate training with focus on “Computer Science” and “Engineering”. (e.g., Cisco). The methodological approach followed the same structure as with other VET courses;

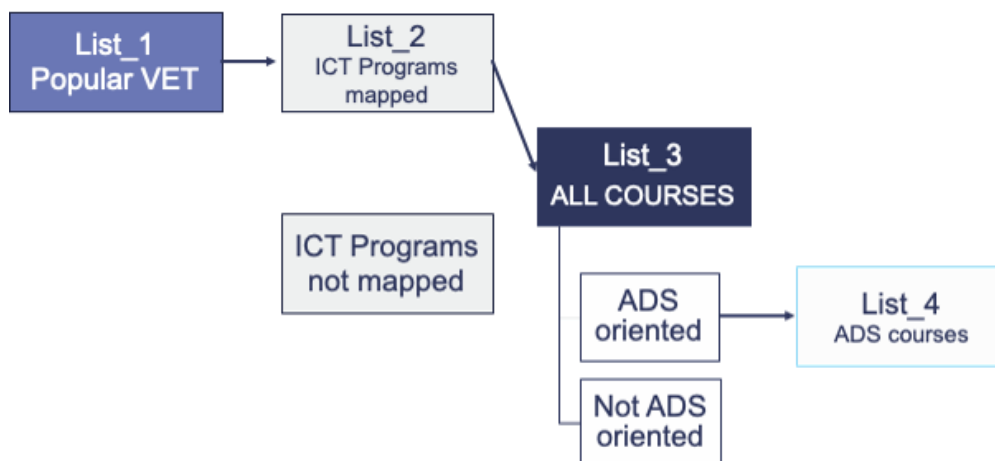


Figure 5: Methodological approach to “popular” VET providers

**Error! Reference source not found.** includes the list with some of the most known certifications (industry-recognized).

| Title  | link  | PARTNER  |
|--|---|----------|
| AWS certified cloud practitioner<br><b>PR_VET001P001</b>             | <a href="https://d1.awsstatic.com/training-and-certification/docs-cloud-practitioner/AWS-Certified-Cloud-Practitioner_Exam-Guide.pdf">https://d1.awsstatic.com/training-and-certification/docs-cloud-practitioner/AWS-Certified-Cloud-Practitioner_Exam-Guide.pdf</a> | MAGGIOLI |
| Certified cloud security professional (CCSP)<br><b>PR_VET002P001</b> | <a href="https://www.isc2.org/Certifications">https://www.isc2.org/Certifications</a>   | MAGGIOLI |

|   |   |          |
|---|---|----------|
| Certified data privacy solutions engineer (CDPSE)<br><b>PR_VET003P001</b>           | <a href="https://www.isaca.org/credentialing/cdpse">https://www.isaca.org/credentialing/cdpse</a>   | MAGGIOLI |
| Certified data professional (CDP)<br><b>PR_VET004P001</b>                           | <a href="https://iccp.org/professionals-examinations.html">https://iccp.org/professionals-examinations.html</a>   | MAGGIOLI |
| Certified ethical hacker (CEH)<br><b>PR_VET005P001</b>                              | <a href="https://www.eccouncil.org/train-certify/certified-ethical-hacker-ceh/">https://www.eccouncil.org/train-certify/certified-ethical-hacker-ceh/</a>   | IDC      |
| Certified information security manager<br><b>PR_VET006P001</b>                      | <a href="https://www.isaca.org/-/media/files/isacadp/project/isaca/certification/exam-candidate-guides/2022/exam-candidate-guide.pdf">https://www.isaca.org/-/media/files/isacadp/project/isaca/certification/exam-candidate-guides/2022/exam-candidate-guide.pdf</a>   | IDC      |
| Certified information systems security professional (CISSP)<br><b>PR_VET007P001</b> | <a href="https://www.isc2.org/Certifications/CISSP">https://www.isc2.org/Certifications/CISSP</a>   | SDU      |
| Cisco certified internetwork expert (CCIE)<br><b>PR_VET008P001</b>                  | <a href="https://www.cisco.com/c/dam/en_us/training-events/certifications/career-path.pdf">https://www.cisco.com/c/dam/en_us/training-events/certifications/career-path.pdf</a>   | SDU      |
| Cisco certified network professional (CCNP)<br><b>PR_VET009P001</b>                 | <a href="https://www.cisco.com/c/dam/en_us/training-events/certifications/career-path.pdf">https://www.cisco.com/c/dam/en_us/training-events/certifications/career-path.pdf</a>   | BLUSPECS |
| CompTIA (A+, Cloud+, Security+)<br><b>PR_VET010P001</b>                             | <a href="https://www.comptia.org/training/by-certification">https://www.comptia.org/training/by-certification</a>   | BLUSPECS |
| Microsoft Certified Azure Solutions Architect<br><b>PR_VET011P001</b>               | <a href="https://learn.microsoft.com/en-us/certifications/azure-solutions-architect/">https://learn.microsoft.com/en-us/certifications/azure-solutions-architect/</a>   | UPM      |
| Microsoft certified solutions associate/expert (MCSA/MCSE)<br><b>PR_VET012P001</b>  | <a href="https://learn.microsoft.com/en-us/certifications/posts/mcsa-mcsd-mcse-certifications-retire-with-continued-investment-to-role-based-certifications">https://learn.microsoft.com/en-us/certifications/posts/mcsa-mcsd-mcse-certifications-retire-with-continued-investment-to-role-based-certifications</a> | UPM      |
| Oracle database and MySQL administration certifications<br><b>PR_VET013P001</b>     | <a href="https://education.oracle.com/oracle-certification-path/pfamily_406">https://education.oracle.com/oracle-certification-path/pfamily_406</a>   | TCD      |
| Salesforce certified development lifecycle and deployment designer                  | <a href="https://trailhead.salesforce.com/en/">https://trailhead.salesforce.com/en/</a>   | TCD      |

|               |   |  |
|---------------|---|--|
| PR_VET014P001 | <a href="#">credentials/developmentlifecycledeploymentarchitect</a> |  |
|---------------|---|--|

Table 12: List with popular VET providers for corporate training

### 2.5.3 VET searching among global distance learning platforms

Partners searched among the most popular distance learning platforms. Every partner had to search for the top 5 courses from each specific skill area as mentioned in Appendix 1. The selected courses should have been relevant to the ADS technologies and should have not been less than 25-30 hours duration.

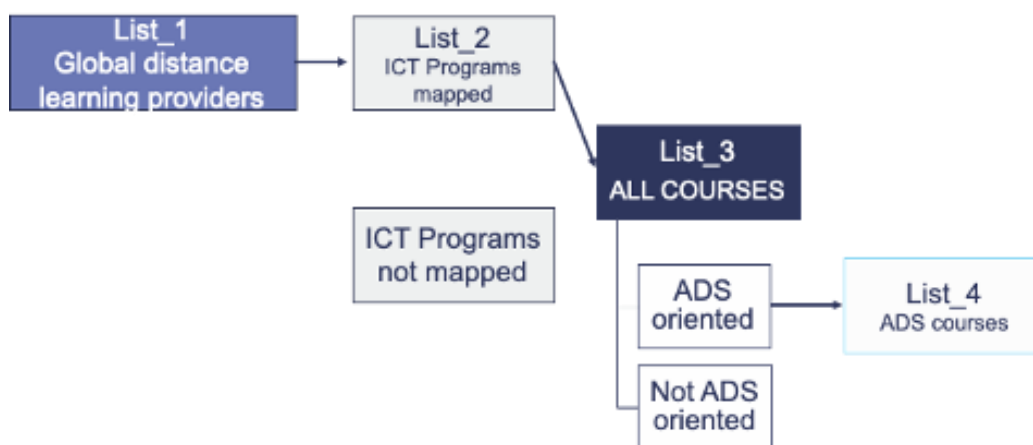


Figure 6: Methodological approach to Main distance learning VET providers

In Table 13 are listed the most know distance learning providers.

| Training provider’s name                |
|---|
| FutureLearn (OL_VET001)                 |
| XuetangX (OL_VET002)                    |
| Universite Numerique France (OL_VET003) |
| EduOpen (OL_VET004)                     |
| MiriadaX (OL_VET005)                    |
| Udemy (OL_VET006)                       |
| Udacity (OL_VET007)                     |
| edX (OL_VET008)                         |
| Coursera (OL_VET009)                    |

Table 13: Main distance learning VET providers



Table 14 includes the allocation of the technology per partner is presented. The partners had to search in all the above training providers and find at least 5 ADS-oriented courses in the allocated technology area.

| Partner       | Technology               |
|---------------|--------------------------|
| BluSpecs, TCD | Artificial Intelligence  |
| IDC           | Business Intelligence    |
| UPM           | Cloud technologies       |
| SDU           | Security technologies    |
| MAGGIOLI      | Internet of Things (IoT) |

Table 14: Allocation of technologies to partners for VET

## 2.5.4 Structure of the dataset for Vet

List\_1 (INSTITUTES) tab in the dataset file with the VETs with Computer Science and Engineering Schools. Below (Table 15) you can find an example of the List\_1 (INSTITUTES) tab with some dummy data. In the real dataset there is an entry for each university in the corresponding tab.

| Property     | Example   |
|--------------|---|
| Country      | Greece  |
| Institute no | GR_VET001   |
| Name of HEI  | General Secretariat for Vocational Education, Training, Lifelong Learning and Youth   |
| link         | <a href="http://www.gsae.edu.gr/el/epaggelmatiki-katartisi/i-e-k-institoyta-epaggelmatikis-katartisis/odigos-eidikotiton">http://www.gsae.edu.gr/el/epaggelmatiki-katartisi/i-e-k-institoyta-epaggelmatikis-katartisis/odigos-eidikotiton</a> |

Table 15: List\_1 (INSTITUTES) with the VTs with Computer Science and Engineering Schools.

List\_2 (PROGRAMMES) is the tab with the programmes selected from the above resources and relative data. In the table below (Table 16) you can find an example of the List\_2 (PROGRAMMES) tab with some dummy data. In the real dataset there is an entry for each selected programme in the corresponding tab.

| Property     | Example or possible options |
|--------------|-----------------------------|
| Institute No | GR_VET001                   |
| Programme No | P001                        |
| Code         | GR_VET001P001               |



|   |   |
|---|---|
| <b>Duration of the program (only the number)</b>  | <i>e.g. 4</i>   |
| <b>Duration of the program (measurement unit)</b> | <i>Semesters, months, hours, years</i>  |
| <b>Is an Artificial Intelligence programme?</b>   | <i>YES/NO</i>   |
| <b>Is a Business Intelligence programme?</b>      | <i>YES/NO</i>   |
| <b>Is a Cloud Technologies programme?</b>         | <i>YES/NO</i>   |
| <b>Is a Security Technologies programme?</b>      | <i>YES/NO</i>   |
| <b>Is an IoT programme?</b>                       | <i>YES/NO</i>   |
| <b>Official certification or not</b>              | <ul style="list-style-type: none"> <li>- <i>EU official (from official bodies e.g. VET centers of HEIs).</i></li> <li>- <i>Industry recognised.</i></li> <li>- <i>No certification.</i></li> </ul>  |
| <b>name of certification if applicable</b>        | <i>e.g. Certificate of Institute of vocational training</i>   |
| <b>Training programme title</b>                   | <i>"IT Applications Technician (Multimedia/ Web Designer - Developer /VideoGames)"</i>  |
| <b>Training programme delivery mode</b>           | <ul style="list-style-type: none"> <li>- <i>On-campus.</i></li> <li>- <i>Distance / eLearning.</i></li> <li>- <i>Hybrid.</i></li> </ul>   |
| <b>Training programme type</b>                    | <ul style="list-style-type: none"> <li>- <i>Formal education (Includes primary, secondary, tertiary education, including vocational and university education that culminate in the achievement of a recognised certification, diploma, degree or professional qualification, e.g. Tertiary education degree, Post-secondary non-tertiary, etc.).</i></li> <li>- <i>Non formal training (Non-formal education is any type of structured and organized learning which is intentional and planned by an educational provider, but which does not lead to formal qualifications recognized by the relevant national education authorities, e.g. workplace training, a training programme by Cisco leading to CCNA, etc.).</i></li> <li>- <i>None of the above.</i></li> </ul> |
| <b>EQF level</b>                                  | <i>e.g. 5</i>   |

|  |                         |
|--|-------------------------|
| <b>link</b>  | <i>e.g. example.com</i> |
| <b>No of courses included (ADS-orientated and not)</b> | 19                      |
| <b>No of courses included (ADS-orientated)</b>         | 0                       |

Table 16: List\_2 (PROGRAMMES) with the programmes selected from the above Computer Science and Engineering Schools

LIST\_3 (COURSES) is the tab with the courses (ADS-oriented and not) included in the above programmes. In the table below (Table 17) you can find an example of the LIST\_3 (COURSES) tab with some dummy data. In the real dataset there is an entry for each selected course (ADS-oriented and not) in the corresponding tab.

| <b>Property</b>                                      | <b>Example or possible options</b>  |
|--|---|
| <b>Institute no</b>                                  | <i>GR_VET001</i>  |
| <b>Programme No</b>                                  | <i>P001</i>   |
| <b>Course No</b>                                     | <i>C001</i>   |
| <b>Description in English</b>                        | <i>YES/NO</i>   |
| <b>ADS or not</b>                                    | <i>YES/NO</i>   |
| <b>Code</b>  | <i>GR_VET001P001C001</i>  |
| <b>Course title</b>                                  | <i>Patterns Recognition</i>   |
| <b>Course delivery mode</b>                          | <ul style="list-style-type: none"> <li>• On-campus.</li> <li>• Distance / eLearning.</li> <li>• Hybrid.</li> </ul>  |
| <b>Skills developed through practical experience</b> | <ul style="list-style-type: none"> <li>• The course includes hands-on training in physical laboratories.</li> <li>• The course includes hands-on training in virtual laboratories.</li> <li>• The course includes practical exercise.</li> <li>• The course includes work-based learning.</li> <li>• The course does not include any type of practical experience.</li> </ul> |
| <b>Link</b>  | <i><a href="https://example.com">https://example.com</a></i>  |

Table 17: LIST\_3 (COURSES) with the titles of the courses (ads-oriented and not)

### 2.5.5 Mapping categories and mapping process

From the LIST\_3 (COURSES) we have selected only the ADS-oriented courses, and we have started the mapping process in the LIST\_4 (MAPPING PROCESS) tab. For a programme we have selected we must map all the ADS-oriented courses.

Output of this step:

- LIST\_4 (MAPPING PROCESS) with the ADS-oriented courses (produce the final dataset by joining all the individual lists together) and all the information about the kind of skills they cover. In the tables below (Table 18 - Table 23) you can find an example of the LIST\_4 (MAPPING PROCESS) tab with some dummy data. In the real dataset there is an entry for each selected ADS-oriented course in the corresponding tab.

In the table below the analyst should choose the ICT technology/ies that the course is categorized.

| <b>ADS course code:<br/>e.g. GR_VET001P002C016</b>   | <b>ICT Technologies</b>  | <b>Possible options</b>  |
|--|--------------------------|--|
| According to your review, to which of the following ICT Technologies this course relates to? | Artificial Intelligence  | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|  | Business Intelligence    | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|  | Cloud technologies       | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|  | Security technologies    | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|  | Internet of Things (IoT) | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |

Table 18: LIST\_4 (MAPPING PROCESS) with the ICT Technologies included in the mapping process

For each technology from the previous table the analyst should choose the skill areas that the course is categorized. Below you can find the skill areas for each technology. In the Annex 1 at the end of the report you can find the skill details for each technology area. This table was used by the analysts as the basic mapping tool in order to categorize ADS-oriented courses to skill areas by matching the description of the courses with the skill details for each technology area. The table of the Annex 1 is part of the deliverable [D1.1 Demand Assessment Framework](#).

| <b>ADS course code:<br/>e.g. GR_VET001P002C016</b> | <b>Artificial Intelligence</b> | <b>Possible options</b> |
|--|--------------------------------|-------------------------|
|--|--------------------------------|-------------------------|



|   |                                       |  |
|---|---------------------------------------|--|
| Please review the degree of support the course provides to the development of the following skill areas in the area of " <b>Artificial Intelligence</b> " | AI Application Development            | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|   | AI System Infrastructure              | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|   | AI Implementation - industry generic  | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|   | AI Implementation - industry specific | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |

Table 19: LIST\_4 (MAPPING PROCESS) with the Artificial Intelligence skill areas included in the mapping process

| <b>ADS course code:<br/>e.g. GR_VET001P002C016</b>  | <b>Business Intelligence</b>      | <b>Possible options</b>  |
|---|-----------------------------------|--|
| Please review the degree of support the course provides to the development of the following skill areas in the area of " <b>Business Intelligence</b> " | Business related data management  | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|   | Data analysis                     | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|   | Data management                   | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|   | Implementation - Process specific | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |

Table 20: LIST\_4 (MAPPING PROCESS) with the Business Intelligence skill areas included in the mapping process

| <b>ADS course code:<br/>e.g. GR_VET001P002C016</b> | <b>Cloud Technologies</b> | <b>Possible options</b> |
|--|---------------------------|-------------------------|
|--|---------------------------|-------------------------|



|  |   |  |
|--|---|--|
| Please review the degree of support the course provides to the development of the following skill areas in the area of " <b>Cloud Technologies</b> " | Cloud solutions - software architecture | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|  | Cloud solutions - software development  | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|  | Cloud integrations and APIs             | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|  | Cloud solutions - infrastructure        | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |

Table 21: LIST\_4 (MAPPING PROCESS) with the Cloud Technologies skill areas included in the mapping process

| <b>ADS course code:<br/>e.g. GR_VET001P002C016</b>  | <b>Security technologies</b>  | <b>Possible options</b>  |
|---|-------------------------------|--|
| Please review the degree of support the course provides to the development of the following skill areas in the area of " <b>Security technologies</b> " | Endpoint security             | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|   | Security analytics            | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|   | GRC and Forensics             | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|   | Identity                      | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|   | Information and data security | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> <li>• Fully.</li> <li>• I do not know / answer.</li> </ul> |
|   | Network security              | <ul style="list-style-type: none"> <li>• Not at all.</li> <li>• Average.</li> </ul>  |



|  |  |   |
|--|--|---|
|  |  | <ul style="list-style-type: none"> <li>Fully.</li> <li>I do not know / answer.</li> </ul> |
|--|--|---|

Table 22: LIST\_4 (MAPPING PROCESS) with the Security technologies skill areas included in the mapping process

| <b>ADS course code:<br/>e.g. GR_VET001P002C016</b>   | <b>Internet of Things (IOT)</b>    | <b>Possible options</b>  |
|--|------------------------------------|--|
| Please review the degree of support the course provides to the development of the following skill areas in the area of " <b>Internet of Things (IOT)</b> " | IoT Analytics                      | <ul style="list-style-type: none"> <li>Not at all.</li> <li>Average.</li> <li>Fully.</li> <li>I do not know / answer.</li> </ul> |
|  | IoT Applications                   | <ul style="list-style-type: none"> <li>Not at all.</li> <li>Average.</li> <li>Fully.</li> <li>I do not know / answer.</li> </ul> |
|  | Sus                                | <ul style="list-style-type: none"> <li>Not at all.</li> <li>Average.</li> <li>Fully.</li> <li>I do not know / answer.</li> </ul> |
|  | IoT Security                       | <ul style="list-style-type: none"> <li>Not at all.</li> <li>Average.</li> <li>Fully.</li> <li>I do not know / answer.</li> </ul> |
|  | IoT Connectivity                   | <ul style="list-style-type: none"> <li>Not at all.</li> <li>Average.</li> <li>Fully.</li> <li>I do not know / answer.</li> </ul> |
|  | IoT Embedded Hardware and software | <ul style="list-style-type: none"> <li>Not at all.</li> <li>Average.</li> <li>Fully.</li> <li>I do not know / answer.</li> </ul> |

Table 23: LIST\_4 (MAPPING PROCESS) with the Internet of Things (IOT) skill areas included in the mapping process



### 3 DESCRIPTION OF THE DATASETS

In this section one may find some basic information about the data collected about HEIs per country. **Error! Reference source not found.** presents the summary of the information collected from HEIs. In this table, the following columns can be found: (a) Country, (b) No. of Universities, (c) No of Programmes, (d) No of courses recorded (ADS and Non-ADS), (e) No of courses mapped ADS only), (f) Partner responsible.

| Country          | No of Universities | No of programmes | No of courses recorded (ADS and not ADS) | No of courses mapped (ADS only) | Partner  |
|------------------|--------------------|------------------|--|---------------------------------|----------|
| Greece (GR)      | 4                  | 6                | 185                                      | 43                              | MAGGIOLI |
| Sweden (SE)      | 2                  | 6                | 208                                      | 42                              | MAGGIOLI |
| Netherlands (NL) | 3                  | 6                | 179                                      | 45                              | MAGGIOLI |
| Cyprus (CY)      | 1                  | 3                | 99                                       | 43                              | MAGGIOLI |
| Estonia (EE)     | 2                  | 3                | 115                                      | 13                              | MAGGIOLI |
| Italy (IT)       | 2                  | 6                | 233                                      | 47                              | MAGGIOLI |
| Malta (MT)       | 1                  | 2                | 61                                       | 7                               | MAGGIOLI |
| Slovenia (SI)    | 1                  | 3                | 54                                       | 14                              | MAGGIOLI |
| Hungary (HU)     | 2                  | 6                | 91                                       | 49                              | UPM      |
| Portugal (PT)    | 1                  | 6                | 117                                      | 56                              | UPM      |
| Spain (ES)       | 1                  | 6                | 118                                      | 77                              | UPM      |
| Belgium (BE)     | 1                  | 6                | 220                                      | 31                              | TCD      |
| Ireland (IE)     | 2                  | 6                | 160                                      | 27                              | TCD      |
| Poland (PL)      | 2                  | 9                | 159                                      | 34                              | TCD      |
| Denmark (DK)     | 2                  | 4                | 81                                       | 41                              | SDU      |
| Germany (DE)     | 2                  | 2                | 227                                      | 74                              | SDU      |

|                 |           |            |             |            |     |
|-----------------|-----------|------------|-------------|------------|-----|
| Luxembourg (LU) | 1         | 3          | 105         | 43         | SDU |
| Latvia (LV)     | 1         | 3          | 70          | 29         | BLU |
| Romania (RO)    | 1         | 2          | 97          | 26         | BLU |
| Slovakia (SK)   | 1         | 2          | 60          | 23         | BLU |
| Czechia (CZ)    | 1         | 9          | 149         | 30         | BLU |
| Austria (AU)    | 3         | 5          | 136         | 56         | IDC |
| Bulgaria (BG)   | 1         | 3          | 20          | 19         | IDC |
| Croatia (HR)    | 1         | 3          | 62          | 8          | IDC |
| Finland (FI)    | 2         | 3          | 109         | 13         | IDC |
| France (FR)     | 1         | 7          | 26          | 25         | IDC |
| Lithuania (LT)  | 2         | 5          | 53          | 63         | IDC |
| <b>TOTAL</b>    | <b>44</b> | <b>125</b> | <b>3194</b> | <b>978</b> |     |

Table 24: Basic information about the HEI datasets per country

Therefore, in the EU 27 countries, the research was conducted totally in 44 universities, in 125 academic programmes, where 3194 courses were recorded. We found that a total of 978 are ADS related courses what represents the 30.6% of the analysed courses.

Table 25 summarises the information collected on the supply of ADS courses within VET providers. The summary table includes the (a) Country or VET provider, (b) No. of VET providers (c) No of Programmes, (d) No of courses recorded (ADS and Non-ADS), (e) No of courses mapped ADS only), (f) Partner responsible.

| Country          | No of VET providers | No of programmes | No of courses recorded (ADS and not ADS) | No of courses mapped (ADS only) | Partner  |
|------------------|---------------------|------------------|--|---------------------------------|----------|
| Greece (GR)      | 2                   | 7                | 65                                       | 4                               | MAGGIOLI |
| Sweden (SE)      | 1                   | 2                | 26                                       | 4                               | MAGGIOLI |
| Netherlands (NL) | 1                   | 2                | 8  | 8                               | MAGGIOLI |



|               |           |           |            |            |          |
|---------------|-----------|-----------|------------|------------|----------|
| Cyprus (CY)   | 1         | 1         | 13         | 1          | MAGGIOLI |
| Estonia (EE)  | 1         | 1         | 13         | 2          | MAGGIOLI |
| Italy (IT)    | 2         | 2         | 13         | 7          | MAGGIOLI |
| Slovenia (SI) | 1         | 1         | 1          | 1          | MAGGIOLI |
| Hungary (HU)  | 2         | 2         | 26         | 6          | UPM      |
| Portugal (PT) | 1         | 1         | 25         | 11         | UPM      |
| Spain (ES)    | 2         | 2         | 13         | 12         | UPM      |
| Belgium (BE)  | 2         | 4         | 12         | 7          | TCD      |
| Ireland (IE)  | 2         | 2         | 32         | 7          | TCD      |
| Poland (PL)   | 2         | 2         | 13         | 5          | TCD      |
| Latvia (LV)   | 1         | 5         | 5          | 5          | BLU      |
| Romania (RO)  | 3         | 6         | 6          | 6          | BLU      |
| Slovakia (SK) | 1         | 3         | 49         | 18         | BLU      |
| Czechia (CZ)  | 4         | 6         | 40         | 9          | BLU      |
| AI various    | 1         | 5         | 5          | 5          | TCD      |
| Oracle        | 1         | 2         | 32         | 3          | TCD      |
| Salesforce    | 1         | 1         | 11         | 0          | TCD      |
| CISCO         | 1         | 5         | 29         | 18         | BLU      |
| CompTIA       | 1         | 3         | 3          | 3          | BLU      |
| AI various    | 2         | 5         | 5          | 5          | BLU      |
| Other         | 6         | 8         | 8          | 8          | UPM      |
| <b>TOTAL</b>  | <b>42</b> | <b>78</b> | <b>453</b> | <b>155</b> |          |

Table 25: Basic information about the VET datasets per country and VET provider

Concerning, VET (**Error! Reference source not found.**), totally 42 VET providers were reviewed, 78 training programmes and 453 courses were recorded. The 155 of them were

identified as advanced digital skills courses, therefore the 34.3%. These results will feed into the gap analysis and validation that will be conducted under the tasks T2.2 Gap analysis and T2.3 Validation, whereas the corresponding results will be presented under the deliverable D2.2 LeADS gap analysis.

In the tables below (Table 26-27) you can find a summary of key information about the data collected about VETs per country, per provider etc.

|              | No of VET providers | No of programmes | No of courses recorded (ADS and not ADS) | No of courses mapped (ADS only) | Partner |
|--------------|---------------------|------------------|--|---------------------------------|---------|
| <b>TOTAL</b> | 29                  | 49               | 360                                      | 113                             | All     |

Table 26: Basic information about the datasets for VET providers that offer trainings in Europe

|              | No of online VET providers | No of programmes | No of courses recorded (ADS and not ADS) | No of courses mapped (ADS only) |
|--------------|----------------------------|------------------|--|---------------------------------|
| <b>TOTAL</b> | 13                         | 29               | 93                                       | 42                              |

Table 27: Basic information about the datasets for global distance learning VET providers

## 4 CONCLUSIONS

The identification and categorization of training programmes offered by HEIs and VET providers in the EU was conducted based on the Demand Assessment Framework produced by the LeADS project. This framework identifies a set of six emerging Technologies in scope, which were used for the mapping of the identified training offers. The results identified will feed into the implementation of a validated gap analysis, a comparative study identifying potential gaps and mismatches in the relevant offerings.

Supply results from the HEIs so far revealed that around 30% of the digital skills courses offered belong to the category of advanced digital skills; this is not necessarily bad, as the objective of training programmes offered is not to deliver only advanced digital skills. The critical question that must be answered is whether the training offerings will fulfil the upcoming market demands, and if not, what must be changed.

## ANNEX 1: SKILL DETAILS FOR EACH TECHNOLOGY AREA

| Area  | Skills in the area                    | Skill Details for the technology area               |
|---|---------------------------------------|---|
| Artificial Intelligence                           | AI Application Development            | AI Regulation and Compliance                        |
|   |                                       | AI Development and deployment                       |
|   |                                       | AI Lifecycle management                             |
|   |                                       | AI Architecture                                     |
|   |                                       | AI Ethics   |
|   |                                       | Deep learning algorithm and architecture            |
|   |                                       | Natural Language Processing                         |
|   |                                       | Image Processing                                    |
|   |                                       | Intelligent knowledge processing                    |
|   |                                       | Federated AI  |
|   | AI System Infrastructure              | AI Server and Storage deployment                    |
|   | AI Implementation - industry generic  | Customer service agents and chatbots                |
|   |                                       | Adaptive Learning                                   |
|   |                                       | Process Automation                                  |
|   |                                       | Intelligent logistics and supply management         |
|   |                                       | Intelligent networks                                |
|   |                                       | Digital assistants and twins                        |
|   |                                       | AI enhanced security management                     |
|   |                                       | AI Sustainability                                   |
|   | AI Implementation - industry specific | Transportation - Asset/Fleet and Freight Management |
| Banking & Insurance - Claims and Fraud management |                                       |   |
| Retail - channel optimization                     |                                       |   |
| Healthcare - diagnosis and treatment              |                                       |   |
| Manufacturing - intelligent operations            |                                       |   |
| Business Intelligence                             | Business related data management      | Data governance                                     |
|   |                                       | Data visualization                                  |
|   | Data analysis                         | Data curation                                       |
|   |                                       | Data analysis                                       |
|   |                                       | AI enhanced data analysis                           |



|                                |  |   |
|--------------------------------|--|---|
|                                | <b>Data management</b>                         | Data quality  |
|                                |  | Data collection                                       |
|                                |  | Data interoperability and master data management      |
|                                | <b>Implementation - Process specific</b>       | Image processing                                      |
|                                |  | Customer Relationship Analysis                        |
|                                |  | Enterprise Performance Management                     |
|                                |  | Production Planning                                   |
|                                | Services Operations Analysis                   |   |
| Cloud technologies             | <b>Cloud solutions - software architecture</b> | Cloud agile development methodologies                 |
|                                |  | Microservices orchestration                           |
|                                | <b>Cloud solutions - software development</b>  | Cloud specific application development                |
|                                |  | Cloud performance management                          |
|                                |  | Cloud security  |
|                                |  | Identity management                                   |
|                                |  | Cloud application migration                           |
|                                | <b>Cloud integrations and APIs</b>             | Multi/Hybrid cloud interoperability and orchestration |
|                                | <b>Cloud solutions - infrastructure</b>        | Cloud storage and data center development             |
|                                |  | Cloud specific network management                     |
| Cloud Sustainability           |  |   |
| Cybersecurity/data security    | <b>Endpoint security</b>                       | Endpoint protection and response                      |
|                                | <b>Security analytics</b>                      | Vulnerability analysis                                |
|                                |  | Security breach detection                             |
|                                |  | Risk management and assessment                        |
|                                |  | Security compliance and governance                    |
|                                | <b>GRC and Forensics</b>                       | Threat intelligence                                   |
|                                |  | Detection response                                    |
|                                |  | Audit and regulatory management                       |
|                                | <b>Identity</b>                                | Identity management                                   |
|                                | <b>Information and data security</b>           | Application and information protection and response   |
|                                |  | Application and information protection and response   |
| Security strategy and planning |  |   |
| Security architecture design   |  |   |



|                                 |  |   |
|---------------------------------|--|---|
|                                 |  | Incident management                                   |
|                                 | <b>Network security</b>                          | Network security management                           |
| <b>Internet of Things (IoT)</b> | <b>IoT Analytics</b>                             | IoT Analytics   |
|                                 | <b>IoT Applications</b>                          | IoT Application Development                           |
|                                 |  | IoT Architecture                                      |
|                                 |  | IoT Application Orchestration                         |
|                                 |  | Agriculture - IoT implementations                     |
|                                 |  | Transportation and Logistics - IoT implementations    |
|                                 |  | Healthcare - IoT implementations                      |
|                                 |  | Construction and Utilities - IoT implementations      |
|                                 |  | Sustainability and Traceability - IoT implementations |
|                                 | Maintenance and Operations - IoT implementations |   |
|                                 | <b>Sus</b>                                       | IoT Modules & Sensors                                 |
|                                 | <b>IoT Security</b>                              | IoT Security  |
|                                 |  | IoT Data Management & Storage                         |
|                                 | <b>IoT Connectivity</b>                          | IoT Connectivity                                      |
|                                 | <b>IoT Embedded Hardware and software</b>        | IoT Embedded Hardware and Software                    |
|                                 |  | IoT Distributed Ledger Technologies                   |
| Robotics                        |  |   |

