D4.7 Data Scientists Mobility Programme Framework

Abstract: The present document defines Data Scientist Mobility Programme Framework, detailing the Industry Internship portal and the framework for mobility for Data Scientists. The report will detail the implementation plan for the application of the framework.
## History

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# Definitions, Acronyms, and Abbreviations

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<th>Acronym</th>
<th>Title</th>
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<tr>
<td>SME</td>
<td>Small and medium-sized enterprise</td>
</tr>
<tr>
<td>PPP</td>
<td>Public-Private Partnership</td>
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<td>BDVe</td>
<td>Big Data Value Ecosystem</td>
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<td>ESRi</td>
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*Table 1 Definitions, Acronyms, and Abbreviations*
Executive Summary

This present document describes the activities performed for defining a Mobility programme framework and a job mobility portal concept that would facilitate the mobility within the BDV PPP projects for Data Science researchers, students and professionals.

After an in depth analysis of the landscape already existing in Europe both for the mobility programmes and mobility portals, gaps were identified and – based on comparison matrixes – concepts for both activities were created.

In the case of the mobility framework, the elaborated concept foresees the creation of co-located team within BDV PPP projects facilitating the geographical mobility of skilled resources in Data Science that put their expertise at the disposal of projects partners addressing multidisciplinary Big Data topics.

Concerning the Job Mobility Portal, a set of functionalities and services has been defined that such specific Data Science portal should have. The concept was completed with the portal structure definition and sub functionalities for each macro service and a mock-up was created with the aim to have a preliminary vision of the final user experience.

Based on these concepts potential next steps are identified.
1 Introduction

The present document defines the framework and the implementation plan to support a Data Scientist Mobility Programme for the Big Data PPP. The work was done within the BDVe project in collaboration with the following Work Packages:

- Work Package 4 “SKILLS. Skills, Education, and Centers of Excellence”,
- Work Package 3 “ECOSYSTEM. Community building and engagement”, and
- Work Package 5 “MARKETING. Communicating and disseminating PPP results under a recognised brand”

but also leveraging the Big Data Value Association (BDVA) Task Forces:

- “Community TF3”,
- “Communication TF4” and
- “Skills and Education TF9”.

As stated in the BDVe Grant Agreement ANNEX 1 (Description of Action), three target groups of stakeholders were defined:

- researchers/students (internship and/or job placement);
- professionals (job placement);
- employers/industries (provide internship opportunities and/or job positions).

The objective of such Data Scientist Mobility Programme Framework is to facilitate the mobility of researchers, students and professionals within the BDV PPP funded projects, mainly through internship programs, verify the feasibility to create co-located teams of professionals skilled resources from the different organizations executing those BDV PPP projects (usually geographically distributed in Europe), and provide an operational instrument, a Mobility Portal that permits the companies to post their open positions or internship positions and the students/researchers and professionals to promote their acquired Data Scientist competencies and skills through an online guided CV. An automatic matchmaking will put together demand and offer.

During the initial phase of the project, the work has focused on the following three actions:

- state-of-the-art analysis – how other similar EU initiatives (such as e.g., the Innovative Training Network of the Marie Curie program) are addressing the need to fulfil the digital skills gap and more specifically, how to create widespread knowledge and competencies around the Big Data topics. For this action we did an extensive assessment of similar initiatives such as the traineeship/internship done in the EIT Digital Master Schools,

- Provide a concept for market place/portal for internship positions and mobility opportunities at industries, targeting data scientists, students and
professionals, that match make the skills and education of the seekers with the industries’ needs related to the Big Data topics. This one-stop portal is created with the cooperation of several actors, i) the BDV PPP projects partners and the BDVA members, that would provide information placement and recruitment services to employers and jobseekers (students, researchers and professionals) ii) the BDVe partners that provide information about Data Science courses, certifications and Data Science skill taxonomy, that will be part of the jobseeker CV, and iii) external Job Portal Organizations providing useful practical and administrative info for who wants to move in other countries for job/internship opportunities. Moreover, differently from the other generalist Job Portals already available, this Data Science Job Mobility Portal wants to be a trusted broker offering besides valid information about the whole Data Science ecosystem through blog, wiki, and social media also an active matchmaking: a one-stop portal for Data Science.

- **Mobility framework concept definition and implementation plan:** i) what are the actions to sustain job mobility for the Big Data domain within an enlarged ecosystem (universities for their role as Data Science skill provider, industries/SMEs in their role of creating job/internship opportunities to favour a mobility programme in the Data Science environment and re-focusing the Big Data market needs, and finally the governmental institutions in policy making and supporting job mobility programmes specialized in the Big Data topics) and ii) what are the future policies and technology trends helpful to have a successful and efficient Mobility Framework.

The present document describes the already existing mobility frameworks, and mobility portals in the EU scenario and how the implementation of the mobility framework within the BDV PPP ecosystem including the BDVA members themselves could be done with the aim to support professional mobility of resources skilled on Big Data topics among different actors (SMEs, Industries and academia institutions).

Quite extensive work has been done in analysing the situation of Labour Mobility and internship in Europe as well as on the analysis of the existing programmes in this field in Europe to provide the overall context for the mobility framework described in this document. For the sake of completeness and to enable the fluent reading of this document, we attached all detailed information gathered into the Annexes.
2 Mobility Framework

Several Job Mobility initiatives have been analysed with the scope to identify common macro services and to whom they are addressed. The research is not exhaustive and continuous screening will be performed during the BDVe project duration.

The work has been divided in two phases:

- **Definition of the macro services** that a valuable mobility framework should have in order to fulfil the requirements to promote exchange of data scientists among European BDV PPP projects partners and BDVA members.
- **Analysis of the most representative existing programmes**, essentially dedicated to Industrial Internship, identification of the most suitable ones for the promotion of data scientist exchange and make their programmes available to all BDV PPP members.

In the **first phase** we have identified and grouped the macro services in following categories:

- People addressed (Students, Professionals, researchers)
- Partnership with multi stakeholders (academia, governments, industries, etc.)
- Best practices exchange
- Use of Public Funds
- Traineeship
- Focus on Data Science skills

Starting from those macro services we have built a framework that could address, in short term, the necessity to have resources, skilled on Data Science topics, that move geographically between BDV PPP projects partners (SMEs, Industries, Academia) facilitating the transfer of competencies. In this way we create a sort of “circular knowledge”, a concept where a continuous process of “learning, applying and teaching” is set, inspiring collaboration and interaction across industrial sectors and across public and private organizations.

We have therefore identified as possible solution that could be implemented quite shortly the creation of co-located team where resources internally in a project consortium will, for a defined period, work physically at the same place of the hosting partner, sharing their technical, societal or business competencies on Big Data with the aim to provide more valuable results to the project, with a “high quality learning on the job” approach. The resources could be either internal employees and/or internships that the partners have in house.

In Figure 1, a graphical representation of the concept is described. This concept may address both intra and inter BDV PPP projects exchanges; we believe that the ‘inter’ approach would be more effective due to the multidisciplinary aspects of Big Data.
However, mobility between projects may cause IPR issues and raises the problem of the expenses for the stay of this person in another location as an exchange programme between projects is not included into the single Grant Agreement. Therefore, we would like to focus on the intra-project ecosystem where mobility and logistics and IPR are better addressed.

Mobility Programme Framework: proposal

- Involvement of Universities eventually granted by ITN Funds or Erasmus+
- IPR managed by the CA and by bilateral agreement between partners.

Figure 1 – BDV PPP projects co-located team

It would be possible to define a more structured approach where other stakeholders will be part of the elaborated framework, such as the European Commission, that could embed the mobility programme in the next BDV PPP projects and generic Big Data project with a dedicated budget and specific KPI to monitor the increase in Data Science skill, and the reduction of the gap between Data Scientist offering and Data Scientist demand. Obviously for this latter a more integrated approach with the Educational programmes and Digital Skill programmes is needed.

Moreover, a better exchange between Universities and Industries/SMEs may benefit from specific actions reinforcing existing programmes. When looking at Marie Curie programme, a good example is the RISE action (as described in Annex 2- Mobility Programmes: EU state-of-the-art), even if this action does not foresee mobility between same kinds of organizations (for example an Industry employee, skilled on Big Data, that could move to an SME helping them to raise competence and working on a common project).

Figure 2 illustrates the approach described above.
In the second phase we have concentrated our analysis on the major known initiatives that facilitate the job mobility and the internship adoption: Marie Sklodowska Curie, EDISON, Digital Skill and Job Coalition, DSM/Internship and Erasmus+.

For each of them in 0 can be found a brief description of the program that provided us with useful information to identify a possible new and dedicated (Big Data) mobility framework. The analysis performed gave us a global picture and the pros and cons of each analysed programme. We have compared our concept, as described above, with the already existing programmes using the macro services as comparison parameters, with the scope to verify how much is the added value of our concept with respect to the other programmes, and if there are differentiating functionalities.

Figure 3 shows a matrix of the existing analysed mobility programmes and the proposed BDVe Mobility Framework. The comparison is based on the services identified to fulfil the requirements of the DoA: “provide a framework that facilitates the mobility of researchers, students and professionals in the Data Science area, within the BDV PPP funded projects (i.e. Lighthouses, i-Spaces, etc.)”. The Figure below is divided into two parts: the upper part addresses the general criteria and the underpart addresses the specific criteria for Data Science.
Figure 3 - Data Scientist Mobility Programmes comparison

The orange mark means partially fulfilled whilst the green totally fulfilled.

It is quite evident from this comparison matrix that few existing programmes are fully devoted to Data Science skills, some of them address more Digital Skills in
general, and most programmes facilitate the mobility mainly for students/researchers but not for professional resources. As a long-term approach, we could envision to support the introduction of this concept in EU programmes already existing by suggesting actions that will improve the mobility between companies and not only between universities or at most between academia and companies. Most of the programmes analysed address Internship that is a good instrument to apply theoretical competences to the real working environment, but the re-skilling should also be one interesting aspects to take into account the increasing importance of Data Science in domain specific areas that are likely to be impacted by the digitalisation.
3 Job Mobility Portal

The implementation of a long-term Data Science Mobility Framework that facilitates the mobility of researchers, students and professionals also beyond the BDV PPP funded projects needs in addition the support of a tool that provides a marketplace/portal for internship positions and mobility opportunities at industries, targeting students, researchers and professionals in Data Science.

We started therefore defining the functional specifications and the services that such specific portal should have and subsequently we made an analysis of the state-of-the-art in Europe in order to identify pros and cons for each solution already available.

The primary objective in defining the functional specifications of a Data Science Mobility Portal is to provide information to students, researchers and professionals of the opportunities existing in the market (industries), from internship to job recruitment with the specific interest from employers to get personnel with distinct skills in Big Data topics. This information will be available in a dedicate Mobility Portal where an automatic fine-grained matchmaking will permit to fulfil the market demands related to Big Data topics with the aim to facilitate recruitment increasing job and internship opportunities.

The key actors of the Job Mobility Portal will be:

From Supply Side:
- Researchers: academic persons that want to transfer their theoretical skills into the operational environment;
- Students that have followed a dedicated Big Data academic curriculum and want to add an internship experience or find a job opportunity;
- Professionals: technical or business experts that want to bring their “on field” experience to other companies even outside their countries for growth opportunity.

From Demand Side:
- Industries/Companies: that need resources that have Big Data skills to drive their transformation;
- SMEs/Startups: that need specialized skills and experiences to boost their go-to-market.

Starting from the objectives described above, we have identified a Mobility Portal structure, as shown in Figure 4, that will be part of the BDV PPP portal.
This structure has been transformed into a preliminary mockup (Figure 5) with the aim to define the look and feel of the pages and the navigation structure between the pages to better understand the user experience and collect feedbacks.
A detailed Functional Specification document has been produced and the identified functionalities have been used as requirements for a comparison matrix with existing Job Mobility Portals.

We have therefore analysed how similar EU initiatives (such as e.g., EURES or ERASMUS) are addressing the topic to have a database of job/internship opportunities for the Data Science competencies allowing students, researchers and professionals to create their own specific -Big Data related- profile that will match
the needs of the industries. A non-exhaustive analysis has been done, because the number of job mobility portals available is huge. We have focused our concept on a portal that should address both jobseekers and employers and that provide also additional useful information about job placement process (contractual, administrative, practical info, etc.).

The following Job Portals have been selected and a short description for each of them can be found in Annex 0.

- Data Science Pro (EDISON)
- European Mobility
- EINS
- EURAMUS
- IAESTE
- Erasmusintern.org
- EURES
- EURAXES
- Made in Germany
- ResearchGate
- Tyba
- EuroJobs

The results of the comparison (Figure 6) show us that only a few of the existing portals can fulfil the identified functionalities and just one (DataSciencePro) is focused on Data Science skills and job/internship opportunities but is partially missing some specific functionalities like CV placement/find a candidate.
Figure 6 - Job Mobility Portal comparison

Based on this comparison it became clear that – as the existing portals cannot fulfil the needs of the BDV PPP – a new portal or the extension of an existing one is needed.
4 Conclusions

After having analysed the vast landscape of existing mobility portals (some of them have come up in the past years in addition to the already existing ones and could not be considered at the time of the preparation of this project), the BDVe project concluded that it would not make sense to create just another portal that would in addition consume many efforts in the project to develop basic services while these resources could be used more efficiently to address their weaknesses and to develop new features such as a smart – Data Science specialized - matchmaking component. The suggestion is therefore to build on an existing portal, in particular, on the EDISON Data Science Pro community portal, extending it with the missing functionalities identified in this document.

Concerning the mobility framework, the setting of a co-located team inter projects might cause IPR issues. The resolution of the issue could be solved by a bilateral agreement between projects or between partners involved in the exchange. In the mobility framework we will not impose any solution but we will propose templates to solve the above-mentioned issues.

For this reason, our suggestion is to contribute to the creation of a new framework addressing the disconnection between the data science needs and expectations of enterprises and the current skills of today’s scientists, mathematicians and engineers by transforming the current knowledge-driven approach into an experience driven one (industry driven through internship programs) that can fulfil industry’s needs for individuals capable of shaping the data driven enterprise. This could be achieved through the promotion of already existing internship programmes within the BDV PPP through workshops, knowledge exchange events, inter-project meetings that explain the benefits to use such programmes (evangelism) and acting as interlink between the BDV PPP and the originators of the EU internship programmes to better support their adoption.

As an initial step we will put the list of existing programmes on the BDVe portal.
References and Bibliography

[18] https://ec.europa.eu/programmes/erasmus-plus/node_en
Annexes

Annex 1- Labour mobility and Internship in the EU

Introduction
Freedom of movement of people is what gives substance to the notion of a European citizenship as first introduced in the Maastricht Treaty. While intangible for most citizens, it is nevertheless a major achievement in the pursuit of EU integration.

Furthermore, labour mobility has an important role to play if the EU wants to achieve its ambitions, internally and globally, particularly in view of the 2020 targets in the areas of employment and competitiveness. A dynamic labour market that is unfettered by national boundaries and where labour and skills are allocated more efficiently is important for companies’ ability to grow and invest, not at least in light of the increasing competition from other regions of the world. Equally important is the development of a single market for services that facilitates specialisation and spurs innovation.

The state-of-art of the labour market mobility
The primary goal of labour mobility in the EU is to contribute to economic convergence between the member states. However, labour mobility can also help mitigate shocks by allowing workers to leave the disadvantaged region and prevent the emergence of unemployment.

Labour market mobility in the European Union is increasing (Figure 7), but it remains too low to dampen asymmetric shocks in the euro area (when events primarily affect individual economies and not the entire currency area)\(^1\). In Spain, for example, the number of unemployed persons of working age increased by a total of 3.5 million between 2008 and 2013. This growth was accompanied by intense net outward migration to other European countries. Between the financial crisis and 2013, however, net migration from Spain was a mere 180,000 persons. Migration thus did not make a significant contribution to eliminating unemployment. Against this backdrop, the growing mobility of young Europeans is cause for optimism. But migratory movements are still too moderate overall.

\(^1\) KfW Research Focus on Economics, No. 156, 18 January 2017
Therefore, labour markets in the euro area play a crucial role for different reasons as following stated.

**Importance of labour mobility:**

**Natural rate of unemployment.** If labour is immobile, an economy is likely to face higher rates of structural unemployment. In a period of declining manufacturing employment, labour mobility is important for determining whether workers can relocate to newer jobs in the service sector.

**Rapid technological change.** Across the Western world we have seen a decline in manufacturing employment levels. This is due to rising labour productivity, and outsourcing of production to lower labour cost economies. Protecting these jobs from the onset of technological change is to fight a losing battle. The real solution is to improve the ability of workers to relocate and find new jobs in the service sector.

**Economic growth.** High labour mobility may increase the productive capacity of the economy, it will be easier for firms expanding in new markets to attract qualified labour. Without labour mobility, innovation and expansion will meet supply constraints.

**Wages.** High degrees of immobility may put upward pressure on wages in labour markets where there is a shortage of labour. This could even lead to a wage-price spiral. Greater mobility enables a more competitive labour market.

**The need:**

The rapid technological change reflects on the problem that today most jobs need digital skills and more than half of ICT specialists work outside the ICT sector. 40% of
enterprises – mostly small and medium businesses – need ICT specialists (technicians, professionals (both 50%) and managers (30%) are required to have specialist digital skills), and find it difficult to recruit them 2.

The aim of the recent initiatives, such as New Skills Agenda for Europe 3, would like to give students of all disciplines experience in fields that are demanded by companies, especially small and medium businesses. Internships could focus on "deep-tech" skills. Cyber-security and web/mobile development are the most important digital competencies today, but “Big data” will top the list by 2018 (Figure 8).

The shift towards big data was especially marked among manufacturing executives, as they try to excel in so-called Industry 4.0 — the age of complex “cyber-physical” systems such as the Internet of Things and smart products.

“Big data” and predictive analytics have become integral to 21st-century business, from consumer trend-spotting to genome sequencing. With over 2.5bn gigabytes of data created daily, companies face the daunting task of understanding, interpreting and reacting to this flood of information. 4

The European Commission has recently addressed the digital skills and learning issues through an interesting initiative, the Digital Skills and Job Coalition, which will be addressed later in this document (Annex 2- Mobility Programmes: EU state-of-the art).

Companies that want to find the digital skills, needed for developing their business, have started moving on several fronts: at present, 55% make training courses on

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2 Eurostat – November 2016


4 https://www.eiuperspectives.economist.com/sites/default/files/Questfordigitaltalent_0.pdf
digital-related materials to their staff, while 47% choose outsourcing. New trends seem to be consolidating, for example partnerships with technology companies, opening up new locations where there is more workforce availability with digital skills, company acquisitions to detect not just the business as well as the skills owned by the employees.

By 2018, 48% of the surveyed companies estimate an increase in the preponderance of Big Data’s skills and activities compared to the current 40%.

**Job opportunities in the Data Science**

Data Science is an interdisciplinary field of study useful to extract knowledge from the analysis of data of various nature, shape and size. It includes various themes such as Statistics, Data Mining, Machine Learning, Operations Research, Information Theory, Programming, Artificial Intelligence and **Big Data**.

Data Science has been defined by Jim Gray as a "fourth paradigm" of science that can be empirical, theoretical, computational and now with the advent of digital and the exponential growth of information available, led by data analysis.

Data Science grows fast, earning positions on the job market, as Big Data, data analysis, data mining, machine learning and artificial intelligence become more and more relevant to the IT industry. In the top 10 places of the rankings (Figure 9) we have all professions related to Analytics, Big Data and Data Science.

<table>
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<th>Title</th>
<th>Job score</th>
<th>Satisfaction</th>
<th>Median Salary</th>
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<td>1</td>
<td>Data Scientist</td>
<td>4.8</td>
<td>4.4</td>
<td>$110,000</td>
</tr>
<tr>
<td>2</td>
<td>DevOps Engineer</td>
<td>4.7</td>
<td>4.2</td>
<td>$110,000</td>
</tr>
<tr>
<td>3</td>
<td>Data Engineer</td>
<td>4.7</td>
<td>4.3</td>
<td>$106,000</td>
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<td>5</td>
<td>Analytics Manager</td>
<td>4.6</td>
<td>4.1</td>
<td>$112,000</td>
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<tr>
<td>7</td>
<td>Database Admin</td>
<td>4.5</td>
<td>3.8</td>
<td>$93,000</td>
</tr>
</tbody>
</table>

*Figure 9 – Top Ranking Professions*

The skills required for this professional profile are different. In particular:

- Wide knowledge of programming languages based on data such as R, SAS, Python, SQL, Hive, Spark etc;
- Consolidated experience in distributed computing and statistical modelling;
- Skills in database architecture, process management, data modelling, data extraction and data analysis;

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5 http://www.ingenium-magazine.it/by-htm-2/
6 Jim Gray - eScience: A Transformed Scientific Method
Working knowledge of various data analysis, visualization and reporting tools;
- Solid preparation in mathematics and statistics;
- Research oriented mentality;
- Mentoring skills to provide guidance to junior team members (data engineers, analysts and statisticians).

To address correctly the demand on the Data Science topics, we intend to integrate in a unique mobility framework the skills to be acquired, the competencies recognized, who will provide such educational paths, who will acquire them and who will use it, the first three come from the activities done in the BDVe project Work Package 4 (Tasks 4.2 and 4.3), whilst the last two are the operational part of the mobility framework: the job mobility portal. An operational instrument, like a dedicated online mobility portal, will facilitate the matchmaking between the offer (that we aim will increase in the next years) and the demand that complains of a lack of resources available.

The new role of internships in the graduate labour market

The decline in the proportion of graduates entering high-skilled work has led to a rise in internships, offering interns experience in the workplace and employers a cheap form of labour.

The concept of internship is complex. Internships for professional careers are similar in some ways to apprenticeships for trade and vocational jobs, but the lack of standardization and oversight leaves the term open to broad interpretation.

Interns may be college or university students, high school students, or post-graduate adults. These positions may be paid or unpaid and are usually temporary.

Generally, an internship consists of an exchange of services for experience between the student and an organization. Students can also use an internship to determine if they have an interest in a particular career, create a network of contacts or gain school credit. Some interns find permanent, paid employment with the organizations for which they worked. This can be a significant benefit for the employer, as experienced interns often need little or no training when they begin regular employment. Figure 10 provides a graphical representation of the different options that an internship could consist of as described above.

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9 GRADual: Joint staff training event Madrid, 18-22 May, 2015
Within this challenging and competitive labour market, internships have emerged, offering young people a chance to gain experience in the workplace and employers a form of cheap labour, as well as a way to find top talent for more permanent roles. Internships offered by top graduate recruiters have consistently risen each year since 2010 (by as much as 50 per cent in total)\textsuperscript{10}. Nearly half of these employers report that candidates who have not gained work experience through an internship will ‘have little or no chance of receiving a job offer’ for their organisations’ graduate programmes, regardless of academic qualifications.

Increasing employability of young graduates is a clear priority for the European Commission, as well as for European businesses, higher education institutions, and many other organizations which support and foster schemes with this objective in mind.

Work-based learning enhances the employability of the learners by providing the right set of skills needed in the labour market and society at large. Also, it introduces the learner to the specific character of a sector or profession.

“Traineeships are essential to ensure smooth school to work transitions. However, they are of value to young people only if they offer quality learning content and safe working conditions. Trainees should not be used as a free or cheap source of labour; they should not replace permanent workers. Instead, traineeships should be considered as an investment, being of value to the employer and the trainee.”

\textit{László Andor, European Commissioner for Employment, Social Affairs and Inclusion}\textsuperscript{11}

\textsuperscript{10} IPPR – Institute for Public Policy Research April 2017
\textsuperscript{11} European Economic and Social Committee (EESC) 14th December, 2016
Annex 2- Mobility Programmes: EU state-of-the art

**Marie Skłodowska Curie**: support industrial doctorates, combining academic research study with work in companies, and other innovative training that enhances employability and career development. The MSCA (Marie Skłodowska Curie Action) objective is to ensure optimum development and dynamic use of Europe’s intellectual capital in order to generate new skills, knowledge and innovation. MSCA is composed of four main initiatives: ITN, IF, RISE and CoFund.  

**ITN** (Innovative Training Network) offers high-quality research training delivered through international and interdisciplinary networks, industrial doctorates or joint doctorates. Usually to such action will apply mainly international network of research organizations from the academic sectors.

The ITN program will provide funding for researchers at doctoral level. This initiative is mainly dedicated to academia researchers that use only the final part of the programme, that usually last between 12 and 24 months, to have an industry experience, whilst the initial part of the granted period is mainly spent in other academic institutions that are part of the project consortium.

There are 3 types of ITN schemes: a) **ETN** (European Training network), where participants implement a joint research programme, EID (European Industrial Doctorates) that activate doctoral training with the non-academic sector (for example SMEs or Companies) and **EJD** (European Joint Doctorates) that provide Doctoral programmes to deliver joint degrees.

**IF** (Individual Fellowship) offers opportunities to work on personal research projects by moving between countries and possibly sectors to acquire new skills. Normally individual researchers apply together with the host organizations; it is dedicated to postdoctoral researchers. The grant provides an allowance to cover your living, **travel and family costs**. The grant is awarded to your host organisation, usually a university, research centre or a company in Europe. The research costs and overheads of the host organisation(s) are also supported.

**RISE** (Research and Innovation Staff Exchange) offers the exchange of staff members involved in research and innovation to develop sustainable collaborative objects and the transfer of knowledge. This action is targeted at organizations, such as universities, research centers or companies, which offer short-term exchanges for their staff. Proposals must include at least three partners, which may be universities, research institutes, or non-academic organizations. The participation of small and medium-sized enterprises (SMEs) is encouraged. The partners get together and propose a common project. Proposals must highlight opportunities for networking, information exchange and skills development for staff members.

In the Figure 11 the RISE objectives are shown.

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It is interesting to highlight that, as shown in the following Figure 12, seconding staff is not allowed between same kind of organizations. This means that for promoting professional job mobility between companies this programme could not be used.

**Figure 12 - RISE eligibility of secondments**

**COFUND** offers regional, national or international programmes to foster excellence in researchers’ training, mobility and career development. It is directed to organization funding or managing doctoral programmes or fellowship programmes and devoted to researchers at doctoral and postdoctoral level. Each COFUND proposal must involve a single participant, for example a ministry, a regional agency, a funding agency, a university, a scientific organization, a research institute or a company. Co-financing supports the training and professional development of both doctoral candidates and expert researchers. The participating organizations receive a fixed amount for each researcher supported, as a contribution to the monthly allowance paid to him and the costs of running the programme.
**EDISON** is a 2-year EU-funded project (started September 2015) with the purpose of accelerating the creation of the Data Science profession. The EDISON Project is putting in place foundation mechanisms that will speed-up the increase in the number of competent and qualified Data Scientists across Europe and beyond. The EDISON initiative is doing this through various measures aimed at reducing the gap between the supply side of educators and trainers and the demand side of employers. The EDISON Data Science Framework (EDSF) is based around a group of tightly related documents namely the Competence Framework, the Body of Knowledge and the Model Curriculum; the various processes that exist to keep the information within these documents fresh and relevant are almost equally as important.

EDISON is using the detailed and comprehensive research completed to date to **develop a range of tools that will support** the work of employers, recruiters and managers of Data Science professions. These will range from simple artefacts such as job descriptions and compatible team roles, to suggested recruitment strategies and tools for managing career progression.

**Digital Skills and Job Coalition**

The coalition for digital skills and occupations is one of the ten key initiatives put by the European Commission last June on the agenda for new skills for Europe. Today, a range of partners, including more than 30 organizations and groups such as the European Digital SME Alliance, ESRI, SAP ECDL and Google are working to reduce skill gaps at all levels – from the highest ICT specialist to the basics necessary for every European citizen to live, work and participate in a digital economy and society.

From now to 2020 up to 750 thousand places for ICT professionals will be vacant: this is the European Commission's estimate based on the lack of personnel with the necessary digital skills. Furthermore, in Europe youth unemployment aged between 15 and 24 has already risen to 20%. More than a third of the workforce and around 45% of European citizens do not go beyond basic digital skills.

The Digital Skills and Jobs Coalition is one of the ten initiatives proposed by the Commission in the context of the new skills agenda for Europe, presented in June 2016.

The commitment (pledge) of all coalition members is aimed at reducing the digital skills deficit at all levels, from specialized and high level ICT skills to the skills necessary for all European citizens to live, work and participate in an economy and a digital society, to ensure not only the competitiveness of European industry in the

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13 http://edison-project.eu
16 http://eur-lex.europa.eu - Situation of young people in the EU
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face of the rapid progress of its competitors but also the inclusion of all citizens in the digital age.

The pledge should address one or more of the four target groups:

- **Digital skills for all** – developing digital skills to enable all citizens to be active in our digital society
- **Digital skills for the labour force** – developing digital skills for the digital economy, e.g. upskilling and reskilling workers, jobseekers; actions on career advice and guidance
- **Digital skills for ICT professionals** – developing high level digital skills for ICT professionals in all industry sectors
- **Digital skills in education** – transforming teaching and learning of digital skills in a lifelong learning perspective, including the training of teachers

At the moment, there are 89 pledges for 328 members participating to the initiative. By 2020, these initiatives should enable the training of 1 million unemployed young people for digital jobs available through internships / traineeships, apprenticeships and short-term training programmes; supporting the improvement of skills and retraining of the workforce and, in particular, adopting concrete measures to support SMEs that face specific challenges to attract and retain digital talent and to retrain their staff; modernize education and training to give all students and teachers the opportunity to use digital tools and materials in their teaching and learning activities and to develop and improve their digital skills; re-orientate and use the funds available to support training courses in digital skills and carry out awareness campaigns on the importance of digital skills for employability, competitiveness and participation in society.

**Digital Single Market/Internship**

A recent initiative in supporting digital skills through traineeships is the Horizon 2020 funded Digital Opportunity pilot project\(^\text{17}\). This Pilot Project will provide working experience in the digital field for 5,000-6,000 graduate students in 2018-2020. The paid 4-5 months internships will be available for students of all disciplines. Internships could focus on "deep-tech" skills such as cybersecurity, big data, quantum or artificial intelligence, as well as web design, digital marketing, software development, coding or graphic design.

Companies that are members of the [Digital Skills and Jobs Coalition](https://ec.europa.eu/digital-single-market/en/news/commission-announces-pilot-project-boost-digital-skills-through-internships) and businesses active in [Horizon 2020](https://ec.europa.eu/digital-single-market/en/news/commission-announces-pilot-project-boost-digital-skills-through-internships), the EU’s Research and Innovation programme, will be at the core of the pilot project, but also all companies in the digital field are eligible to offer internships and train students. The first internships should start in autumn of 2018 and it is foreseen that the interns will receive a stipend of around 500 EUR per month. The pilot will run from 2018 to 2020.

ERASMUS+: is the EU's programme to support education, training, youth and sport in Europe. Its budget of €14.7 billion will provide opportunities for over 4 million Europeans to study, train, gain experience, and volunteer abroad.

The integrated programme provides an overview of the available grant opportunities, aims to facilitate access and promotes synergies between the various sectors by removing the barriers between the various types of projects; it also wants to attract new actors from the working environment and civil society and stimulate new forms of cooperation.

The programme is for individual and organisations, where organisations may engage in a number of development and networking activities, including strategic improvement of the professional skills of their staff, organisational capacity building, and creating transnational cooperative partnerships with organisations from other countries in order to produce innovative outputs or exchange best practices.

Erasmus+ is part of a socio-economic context that sees almost 6 million unemployed young Europeans, with levels that in some countries exceed 50%. At the same time there are over 2 million job vacancies and a third of employers report difficulties in recruiting staff with the required qualifications. This demonstrates the existence of important skills shortages in Europe.

For the first time, the Programme grants funding not only to universities and training institutions, but also to innovative partnerships, the so-called "knowledge alliances" and "sectorial skills alliances", which will constitute synergies between the world of education and the working environment by enabling higher education institutions, trainers and enterprises to foster innovation and entrepreneurship and to develop new programmes and qualifications to fill skill gaps.

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18 [https://ec.europa.eu/programmes/erasmus-plus/node_en](https://ec.europa.eu/programmes/erasmus-plus/node_en)
Annex 3- Job Mobility Portal: EU state-of-the art

**Data Science Pro**: Is the EDISON collaborative Data Science Portal, integrating community collaboration and management. The community portal will maintain the user profiles as well as subcomponents with the following capabilities:

- **Training marketplace** – one stop shop for training offerings by different stakeholders (universities, certification bodies, projects, companies) on the supply side and adaptive and smart presentation of offerings to researchers/students on the demand side. The marketplace will follow the taxonomy in better mapping of offering and demand side.

- **Competence benchmarking tool** – an interactive part of the community portal that is able to assess the individual competence profile and to create and manage a tailored Data Science training programme based on the offerings in the training marketplace. It provides a result with an intuitive visualization based on a comparison between self-declared competences and the Data Science competence framework (CF-DS).

- **Virtual labs** – give students/trainees access to virtual laboratories equipped with the DS tools and datasets for training purposes.

- **Resources** – Community and project related materials linked to the Data Science Profession:
  - Challenges
  - Job advertisements
  - Consultancy services
  - Expert articles
  - Interviews
  - Blogs

The Portal Structure is the following:

**Profile**
- MANAGE your Profile
- Assess your Competences

**Factory**
- BECOME a Data Scientist
- Examination Center
- Virtual lab
- eLearning platform

**WORK as DS**
- Challenges
- Job Center

**ASK for Consultancy**
- Consulting services

**Atlas**
- LEARN about DS
- Encyclopedia
European Mobility: is a EU funded project that aims to create customized contractual agreements in the apprenticeship or vocational training between the parties and for different countries. Is not an educational programme, but could be useful to be linked by other mobility programmes. It is for students/researcher/professional but ONLY WITH Contractual Supporting Functionalities.

EINS: this Research Mobility Programme will foster research collaboration internationally, and enhance knowledge and technology transfer between industry and academia. This Programme targets both EINS members, as well as researchers not affiliated with any of the consortium partners. Priority will be given to PhD students and early career researchers interested in undertaking an internship or placement at one of the EINS partners. It was a EU funded project under FP7, the database of the opportunities for the different competence topics is poor and seems that is not filled with new exchange programmes. Is dedicated to the Internet topics.\(^\text{19}\) Is devoted to students & researcher (essentially closed Group among EINS partners).

EURASMUS: Europe-internship.com connects hundreds of thousands of young people with over 30,000 companies from all over the world. They help students easily apply online for internships or placements all over Europe in just 3 clicks. They also help companies find and recruit young talent. Is essentially dedicated to students... no researcher, no professionals Is a generalist portal for job placement.

IAESTE: has been providing young science and engineering students from around the world with paid, course related work experience. Similarly, IAESTE has been a source of high quality trainees for companies and institutions in more than 80 countries.

worldwide.
Is essentially dedicated to students... no researcher, no professionals
They match their students’ competencies to Company job requirements. There is no
online portal that match make demand/offer. The IAESTE country office that will
address the internship has to be contacted.

Erasmusintern.org is the place where interns and internships meet. Here students
that would like to do an internship abroad can have their profiles online, search for
internships and apply. On the other hand, Companies and Organisations that are
offering internships can post for free their vacancies, search for interns and see if the
applications they received are suitable for the position that they have opened.
The fields of studies are generalist, is essentially dedicated to students, no
researchers, no professionals.

EURES (European Employment Services) is the EU tool for finding a job in the EU and
EFTA countries. It is based on a cooperation network formed by public employment
services. It helps job seekers to find job vacancies in Europe.
Is for youth and jobseeker, and it helps companies to advertise their job request and
find the right candidate. Is the Portal that has most of the functionalities identified
for the BDVe Mobility Portal even if it is generalist and does not focus on the Data
Scientists topics in terms of skills and competencies.

EURAXESS – Researchers in Motion
"EURAXESS" is a platform for researchers, entrepreneurs, universities and businesses
to interact with each other. Packed with information, EURAXESS covers mobility
issues for researchers and entrepreneurs, allows universities and businesses to find
the right talent, and connects people, projects and funding.

Make it in Germany is the official multilingual website for international qualified
professionals. It informs people interested in migrating to Germany how to
successfully plan their move – from the preparations in their home country right
through to their arrival and first steps in Germany.

A one-stop shop for job hunters: The Make it in Germany job listings help qualified
professionals search for suitable vacancies and find out which sectors and regions
lack qualified staff. Only for people that move inside GERMANY.

ResearchGATE runs a research-focused job board for scientists worldwide. You can
filter by keyword, discipline and country. Is a very poor portal just a job database for
researchers.