



Study on Fostering Industrial Talents in Research at European Level

Case Studies Report



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1 INTRODUCTION

This report contains the five case studies developed through the study. The purpose of the case studies is to present examples of different forms of intersectoral mobility between academia, industry and the third sector and to shed light on the characteristics of different types of mobility taking place at international, national, regional, bilateral and sectoral levels. In addition, good practices have been identified and an assessment undertaken as to how far particular schemes are replicable and transferable.

Following consultation with the European Commission, it was agreed that since no individual mobility scheme is able to provide the recipe for successful ISM, the case studies instead adopt a cross-comparative approach. They examine ISM mobility schemes of different types, but focus in more detail on either a single scheme, or two schemes. An overview of the case studies – and of the individual scheme(s) in focus, and other schemes covered - is presented in the following table:

Table 1 - Case studies

Case studies	Main ISM scheme(s) in focus	Other ISM schemes covered
1. Mobility between academia and industry	DoRa Programme in Estonia 2008-2015 which was implemented by the Archimedes education foundation.	<ul style="list-style-type: none"> • Denmark - the Industrial Postdoc Programme • Estonia – the Smart Specialisation scholarships scheme for PhD students 2016-2022 • France – the CIFRE Scheme • Luxembourg - Industrial Partnership Block Grant (IPBG) • Poland - Industrial PhD programme (Doktorat wdrożeniowy). • Spain - Spanish Industrial Doctorates • Spain - Industrial Doctorates Plan of the Government of Catalonia • Several Industrial Fellowship Schemes (e.g. the Industry Fellowships Scheme, Royal Society, the Industrial Innovation Fellowships (NERC), and the RAEng Industrial Fellowships - Royal Academy of Engineering
2. Mobility between academia and the public sector	The 'New Foundations' scheme and the MSCA-co-funded CAROLINE initiative – 'Collaborative Research Fellowships for a Responsive and Innovative Europe' both being implemented by the Irish Research Council.	<ul style="list-style-type: none"> • There are then a number of further ISM schemes that are not targeted explicitly at the third sector, but which allow NGOs and other third sector organisations to participate. Examples are: • DoRa programme in 2008-2015 in Estonia • NEWFELPRO fellowships in Croatia • A scheme to Strengthen Research Departments in Enterprises (KROP) in Slovenia • Knowledge Economy Skills Scholarships (KESS 2) scheme, which covers the third sector and social enterprises • Mobility for Growth programme operated by VINNOVA, Sweden • The Catalan Industrial Doctorates from Spain
3. Mobility between academia and the third	Public sector PhD scheme (OFFPHD) in Norway being implemented by the	<ul style="list-style-type: none"> • Bank of Italy - two types of scholarship schemes for PhD and Masters' level economists • Policy Secondment Programme, UK.

Case studies	Main ISM scheme(s) in focus	Other ISM schemes covered
sector	Norwegian Research Council.	<ul style="list-style-type: none"> • UK's Parliamentary POST (Parliamentary Office of Science and Technology) • POST Fellowships Scheme (open to PhD students) and the Parliamentary Academic Fellowship Scheme (for experienced researchers and academics). • The Industrial Postdoc Researcher in the Public Sector in Denmark • The 'Visiting Fellowships in Canadian Government Laboratories Program' in Canada
4. Mobility by researcher target group (tools and incentives)	Royal Society Industrial Fellowships	<ul style="list-style-type: none"> • Norway - Dual Professor concept • UK - "entrepreneur in residence" scheme, Royal Society • Belgium - Industrial Liaison Scheme at Ghent University • Sweden - "Strategisk Mobilitet" – strategic mobility • Ireland - The Irish Research Council 'New Foundations' scheme
5. Preparation for mobility (e.g. professional development, entrepreneurs hip) – focused on R1 / R2 levels	The Vitae Researcher Development Framework (RDF) and initiatives to improve the preparation of researchers for mobility and to strengthen their professional development and skills for employability.	<ul style="list-style-type: none"> • The French Association Bernard Gregory (ABG) • The skills framework in France, MyDocPro • "Omkadering voor Jonge Onderzoekers" (Support for young researchers) in Flanders

The five case studies are now presented in Sections 2-6.

2 CASE STUDY 1 - MOBILITY BETWEEN ACADEMIA-INDUSTRY

The case study is divided into three parts:

- **Section 2.1** – sets out the introduction and case study scope, outlines the rationale for ISM schemes for this type of mobility, and outlines the drivers and obstacles of ISM;
- **Section 2.2** – outlines the approach to scheme management and implementation, including funding aspects, support structures, training and skills and scheme outcomes, monitoring and evaluation; and
- **Section 2.3** – outlines good practices, lessons learned and the necessary framework conditions for such schemes to flourish.

2.1. Introduction and scope

This case study focuses on mobility between academia and industry, the most common type of ISM scheme identified through this study. The case study also considers, *inter alia*:

- Differences between Member States as to whether there is a longstanding culture of academic-industry cooperation, and other factors determining access to intersectoral mobility (“ISM”) schemes for researchers and the extent of prevalence of domestic schemes;
- How ISM is facilitated *between* academia and industry;
- The rationale underlying targeting strategies for academia-industry schemes (*e.g. the extent to which some schemes may target SMEs or large firms, constraints on the participation of start-ups, etc.*).
- The extent to which mobility schemes may promote knowledge transfer and lead to spin-off creation and other favourable outcomes;
- What formal and informal schemes can tell us about the relationship between academia and industry;
- The extent to which researchers participating in ISM schemes have learned new skills and transferable competences during their mobility period (*e.g. general skills for employability, entrepreneurship, learning to adapt on the job etc.*).

Section 1 of this case study identifies a number of relevant schemes from academia to industry, industry to academia and schemes that operate on a bidirectional basis. It should be noted that whilst the focus is on formal mobility, examples of informal mobility between academia and industry are also considered. Section 2 focuses on the ISM component within an industrial PhD scheme, the nationally-co-financed, ESF-funded DoRa Programme in Estonia 2008-2015.

2.1.1. Rationale for setting up schemes

Since there is a wide heterogeneity of schemes, the rationale for setting up schemes to promote ISM between academia and industry was found to vary. However, in summary, there were found to be a number of reasons why such schemes are being set up, some of which overlap in a number of schemes:

- There is growing interest among industry and academia in undertaking **joint collaborative research** through ISM to foster the development of sustainable relationships between researchers and enterprises. This in turn helps to strengthen industry-academic cooperation at a more strategic level;
- Research results are often developed into **innovation outcomes outside an academic environment** (e.g. by TTOs and through university spin-offs, and through technology incubators associated with universities and research institutes and through ISM);
- Whilst there are different models for promoting technology transfer and the use of applied research results (e.g. the licensing model, venture creation model), intersectoral mobility is an important mechanism for **promoting knowledge transfer** and the use of applied research results, with both societal and commercial benefits;
- Universities also offer such schemes because they contribute to **strengthening skills development and the future employability of their PhD students and post-doctoral researchers**. This is seen as also being in the strategic interest of universities themselves, in

terms of demonstrating accountability towards government, funders, tax payers, and current PhD students;

- There is growing awareness in industry, at least among larger companies, of the need to **actively recruit the brightest research talents**. Participating in ISM schemes is a means of identifying such talent both by engaging with individual researchers and by establishing relationships with academic institutions able to provide a source of future recruits over the medium-longer term through ISM, and other forms of collaborative research;
- ISM gives private companies **direct access to the latest, most up-to-date scientific knowledge**, and therefore a valuable competitive advantage – even if they don't employ the PhD candidate afterwards; and
- From a national policy perspective, schemes to promote ISM can **strengthen the 'knowledge triangle'** i.e. the interaction between higher education, research and industry through increased collaboration between universities and industry.

2.1.2. Drivers and obstacles of ISM

The main drivers and obstacles of ISM schemes between academia and industry are now examined.

Regarding the **drivers**, among universities and research institutes, there is strong awareness of the need for institutions to generate more income themselves to self-fund at least part of their activities. ISM is therefore acknowledged as being among a number of mechanisms to develop sustainable relationships with industry at an institutional level. This is seen as potentially contributing to generating income over time, e.g. through joint IP generation, shared licensing income, the spin-off creation etc.

At the level of individual researchers, there is increased demand for industrial PhDs, reflecting their growing reputation for enhancing employability and being a passport towards developing a career as an industrial researcher. Whereas in the past, many PhD researchers mainly considered academic careers as PhD graduates, they are increasingly interested in a broader range of career possibilities, including in industry. This drives demand to participate in ISM schemes, with growing recognition among researchers that undertaking internships and industry placements will make them more employable and provide them with the transferable skills necessary to succeed in the labour market. This is partly out of necessity given the over-supply of post-doctoral researchers seeking a full-time academic job in some countries (e.g. the UK, France).

There are also a number of drivers for industry, such as deriving additional competitive advantage from being able to access top industrial talents, gaining access to scientific knowledge, providing a shortcut for the recruitment of the most talented researchers, and building relationships with academia.

Among the main drivers of participation by individual researchers in the Estonian DoRa programme (the scheme in focus in this case) was that they were already working in an enterprise setting, but wanted to combine work and study. Moreover, there was a strong funding incentive since the scholarship available through DoRa is more generously funded than the comparable national scholarship scheme available to all PhD students in Estonia. The DoRa programme was in effect a double scholarship scheme, since recipients received both DoRa funding and national PhD funding. This made applying for the DoRa scheme more competitive than was the case for the national PhD schemes, which has fostered scientific excellence.

However, there are also **obstacles** to participating in ISM schemes. The research found evidence that large firms tend to be more willing to participate compared with their smaller counterparts.

Large firms have considerable managerial resources at their disposal, so more commonly recognise the need to engage with local universities and publicly funded research institutes and wider research actors to foster industrial research talents. They are therefore more likely either to engage with, and participate in formal ISM schemes and to provide funding support through sponsorship. Large firms are able to provide secondment opportunities to researchers since they have the necessary research infrastructure in-house (e.g. laboratory space, equipment) to accommodate additional researchers and to embed these within established research teams relatively easily.

Conversely, in **small and medium sized enterprises (SMEs)**, it can be difficult to take part in ISM schemes for a number of reasons, such as: lack of managerial time to plan, design and operate an ISM scheme, lack of a dedicated research team (since some SMEs may wish to carry out research but not currently have anyone performing that function) and having financial resource constraints. There may also be specific reasons why specific types of SMEs cannot take part, especially start-ups, such as the lack of a sufficient business track record to be able to support a PhD student undertaking their PhD in an enterprise setting since the duration of a PhD is 4 years, which may deter start-ups and early growth stage firms from making a long-term commitment. In addition, from the perspective of a start-up there may be limited scope for risk-taking (co-investing in PhD research provides no guaranteed successful outcome) while large firms engage in enough different projects to spread the risk and thereby allow room for failure.

In **Estonia**, for instance, the DoRa Programme operated from 2008-2015 (2007-2013) and included an ISM component which provided support for industrial PhDs (described later in the case study). A number of obstacles were identified that prevented **start-ups and early-stage growth firms** from participating in ISM. Programme managers interviewed from the Archimedes education foundation involved in delivering DoRa noted that there were constraints that prevented them from making start-ups eligible to participate in the scheme. Given high failure rates among business start-ups, start-ups were not eligible. One of the eligibility criteria to participate in the scheme was that researchers applying to do a 4 year PhD within industry must already have a permanent employment contract to guarantee that their employer is committed to the four year lifetime of the PhD programme.

However, in some countries, and in some ISM schemes, an effort has been made to overcome such constraints. Several examples of schemes targeted at **start-ups and early-stage growth firms in ISM schemes** were identified. Some schemes explicitly targeted SMEs, using the ESF, such as the KESS I and II schemes in **Wales, UK**, implemented in 2007-2013 and 2014-2020 respectively. These were both implemented using the ESF and sought to build relationships with micro, small, medium, large-sized companies in the local business community and with third sector representatives. Among the objectives of KESS 2 are to i) increase the research capacity of SMEs by linking with a PhD / Masters project ii) provide businesses with research support to strengthen their knowledge base in areas of identified business need and iii) encourage SMEs to engage in research activities and in innovation so as to strengthen their competitiveness and iv) encourage them to consider the recruitment of PhD level and post-doctoral researchers. The scheme was adapted to attract micro and small firms to participate. Rather than seconding doctoral and post-doctoral researchers for a fixed period, more flexible arrangements were developed for SMEs whereby the researcher is able to work on helping the firm to address specific research challenges or problems, but only spends a limited amount of time on-site, for instance, one day a week.

The **InnoBooster programme in Denmark** is also explicitly targeted at SMEs. This programme translates knowledge into value through investment in SMEs, thereby creating growth and employment. It requires an innovative idea that can significantly improve a company's competitiveness. Funding for between DKK 50,000 and 5 million can be sought, and projects can be supported for up to 3 years.

At EU level, the **SME Associate Scheme¹** targets SMEs who could potentially benefit from having a PhD level researcher available to them for a period. The scheme is currently being piloted, and the duration of the pilot is for a 12 month period. The pilot will support 90 SMEs to hire a researcher to bring their research ideas to fruition. However, since an evaluation has only recently been commissioned (with the research commencing in January 2018), there are no materials available as to how effective the new pilot is. The scheme seeks to recruit highly skilled researchers who are seeking to develop their innovation and business management skills. A distinction with the other schemes mentioned above is that being an EU scheme, a transnational dimension is required, with the mobile researcher spending 12 months in another EU country.

Whilst the scheme may prove to be successful, previous research – confirmed through our study - has identified challenges for researchers in engaging in transnational mobility (e.g. transferability

¹ <https://ec.europa.eu/easme/en/h2020-sme-innovation-associate>

of pensions, social security and healthcare benefits during a period of mobility, practical obstacles such as family commitments preventing a mobility period abroad). Moreover it can take time for researchers to integrate themselves into professional networks when embarking in an intersectoral mobility experience. Moreover, many of the networking benefits from academia-industry collaboration through ISM have been found in previous studies to occur at a relatively localised level. The sustainability of impacts at a more strategic level of this pilot scheme might therefore be questioned, however, given the absence of evaluation evidence or sufficient numbers of participants at this stage in the pilot's implementation, it is too premature to judge the pilot's success.

2.1.3. National support for mobility between academia-industry

Several types of ISM scheme between academia and industry were identified operating in a wide range of EU countries, and these are examined in the following sub-sections.

2.1.3.1. Preparing PhD and postdoc researchers to become intersectorally-mobile

PhD degrees are increasingly seen as more than just a means of developing an academic career, but as a stepping stone towards strengthening career prospects, either in academia or industry.

The types of PhDs available to students have themselves changed, for instance through an increase in the provision of Industrial PhDs and other types of PhD programmes, for instance those in STEM subjects², that involve close cooperation and research collaboration between industry and academia.

In parallel, there is increased awareness among HEIs, research institutes and other actors about the need to foster **skills development to make academic graduates more employable across a range of sectors**. At EU level, the **New Skills Agenda for Europe**, one of the Europe 2020 flagship initiatives stresses the importance of skills development to enhance employability. The **2016 Bratislava Declaration of Young Researchers** calls for "*sustainable and transparent career trajectories in order to secure a sustainable future for young researchers, with clear and structured career paths in both the public and private sectors*".

The strong focus on **enhancing employability through transferable skills acquisition** is a reflection of the fact that only approximately 50% of PhD researchers will succeed in obtaining a post-doctoral academic research position. It is therefore necessary to ensure that young researchers at the R1 level in particular open their horizons beyond focusing on an academic career alone, and actively consider the possibility of becoming an industrial researcher. The unemployment rates among PhDs holders are low compared to untrained school leavers, BA-degree and MA-degree holders. However, these graduates might not find employment as quickly and as easily as they had hoped without support to help them to develop the practical skills necessary to succeed in different sectors, for instance in becoming an industrial researcher. It was pointed out by a PhD student interviewed that "it is important that PhD students are given an opportunity to acquire managerial, communications and negotiation skills either through preparatory training or during an intersectoral mobility experience".

In a limited number of countries, such as **France**, there are high levels of unemployment among post-doctoral researchers due to the lack of academic research positions, and in some cases a reluctance among researchers themselves to make the transition to industry. Clearly, the provision of pathways to employment through the acquisition of transferable skills through ISM is one way in which researchers holding a PhD can become more attractive potential recruits to industry.

There is a growing emphasis on **investing in industrial talents and strengthening the researcher base** and "brainpower" as a major resource to foster a knowledge-based economy. As a result, government investments in PhD degrees exceed the needs of the academic labour market, especially in some countries (e.g. France). In tandem with this broadening career destination, there is the realisation that researchers can no longer prepare "on the job" for a

² STEM subjects (science, technology, engineering and mathematics) are an important foundation for entering many different industries.

predictable academic career. In the last two decades in particular, the level of formal or informal skills-based training (sometimes defined as “employability skills”, but more often as “research skills”, “soft skills” or “transferable skills”) increased rapidly across the higher education sector.

The importance of ISM in promoting soft skills acquisition and in strengthening employability is confirmed in wider literature. The EUA’s report on Doctoral Education³, which is based on questionnaires to map the diffusion of doctoral training in Europe notes that *“doctorate holders who graduated from a collaborative scheme had more job opportunities in the non-academic sector than doctorate holders who graduated from a traditional programme. The ability to be “bilingual”, bridging the academic and business sectors, and the development of transferable skills, were identified as the main reasons accounting for the enhanced employment prospects of doctorate holders in the non-academic sector”*.

Reference should be made to the detailed findings presented in the dedicated case study on preparing for ISM, case study 5 (see Section 6.1). This focuses on ISM schemes that foster the professional development of researchers.

2.1.3.2. Academia-to-industry schemes

Academia-to-industry schemes typically involve physical mobility from academia to industry for a period of time, typically 6-12 months, but with variations depending on the type of scheme in question, since some Industrial PhDs involve spending 4 years based in industry with only limited time in a university setting. They may also involve collaboration between academia and industry, without physical mobility taking place. Different types of PhD schemes within scope are now examined. It should be noted however that not all schemes involve extensive mobility, since some joint PhDs may require the researcher to spend most of their time at a university or research institute.

2.1.3.3. Industrial PhDs and postdoc positions

There are three main types of Industrial PhD schemes which collectively can be grouped together under the term “industrial PhD”. These are:

- PhDs primarily embedded in an industrial partner environment (fully fledged Industrial PhDs).
- PhDs partly embedded in an industrial partner environment (industrial fellowship schemes)
- PhDs mainly carried out in a university but with close connection to industry (industry-academia joint PhDs).

Taken together, the three sub-categories of ISM schemes account for up to three-quarters of the total ISM schemes identified through this study. Industrial PhD programmes are becoming more common since they provide a viable alternative to the traditional PhD for **students who want to develop their career as an industrial, rather than an academic researcher**. Industrial PhDs play a role in providing researchers with the opportunity to strengthen their qualifications whilst working in a company environment, and gain first-hand experience of working in an industrial environment and knowledge of current industry practices.

From an industry perspective, firms either sponsoring industrial PhDs or being willing to host such PhDs gain through the ability to produce applied scientific research results and to strengthen their competitiveness through innovation. Research knowledge accumulated during an industrial PhD can also be transferred back to academia, although there may be IPR restrictions as to what knowledge a PhD student working in industry is able to share with their academic institution. With regard to how companies are involved in ISM, some companies offer PhD studentships either directly in the case of Industrial PhDs or via a university partner in the case of other types of schemes, such as industrial fellowship schemes.

Examples of industrial PhDs identified through the research are summarised below:

³ Collaborative Doctoral Education in Europe: Research Partnerships and Employability for Researchers, Report on Doc-Careers II project, by Lidia Borrell-Damian, Rita Morais and John H. Smith, 2015

Table 2 - Industrial PhD Programmes identified in mapping exercise*

- **Austria - Industrial PhD Programme** aims to systematically build-up and improve the qualifications of R&I staff in companies and non-university research institutions.
- **Belgium – Doctiris** - links research carried out during a full PhD course at a specific company to the planned development of a new good or service.
- **Denmark - the Industrial Postdoc Programme** is a 3-year PhD managed by the Innovation Fund Denmark. It offers doctoral training through cooperation between industry and the university sectors.
- **Estonia – the DoRa Programme (2008-2015)**. Industrial PhDs were made available for the duration of the 4 year PhD. Researchers must spend 5 months undertaking a mobility period abroad during their PhD.
- **Estonia – the Smart Specialisation scholarships scheme for PhD students 2016-2022**. This industrial PhD scheme contributes to capacity-building in research-intensive industry sectors as identified in Estonia’s national Smart Specialisation strategy.
- **France – the CIFRE Scheme**, funded by the Ministère de la Recherche, allows PhD students to carry out their PhD research either within industry or in a public lab (university or research institute).
- **Ireland - the Industry Fellowships programme** facilitates the mobility/transfer of people at all levels between academia and Industry both in Ireland and abroad
- **Luxembourg - Industrial Partnership Block Grant (IPBG)** fosters cooperation between Luxembourg-based companies active in R&D and public research institutions. It awards a block allocation of PhD and/or Postdoc grants in which Luxembourg-based industrial partner(s) take the lead in arranging a research programme with a public research institution in a research relevant strategic priority area.
- **Netherlands - Professional Doctorate in Engineering PDEng** is a practical graduate research programme in engineering which is adapted to the direct needs of industry.
- **Poland - Industrial PhD programme (Doktorat wdrożeniowy)** is implemented by the Ministry of Science and Higher Education and consists of financing full-time doctoral studies.
- **Spain - Spanish Industrial Doctorates:** available to companies willing to integrate a PhD student in the company for the development of a research project of 3 years and obtain their PhD degree in parallel.
- **Spain - Industrial Doctorates Plan of the Government of Catalonia:** this programme implemented at regional level fosters cooperation between academia and non-academic organisations and professionals.
- **Spain - Industrial Doctorates programme from the region of Cantabria:** The programme allows PhD students to obtain their PhD degree in a specific research field available at the University, by integrating a company to implement the research project of 3 or 5 years.
- **UK - Industrial Doctorate Centres - EPSRC-funded centres for doctoral training provide a supportive and exciting environment for students.** A four-year programme combines PhD-level research projects with taught courses, and students spend about 75% of their time working directly with a company.
- **UK – several examples of Fellowships Schemes.** Examples are: the Industry Fellowships Scheme, Royal Society, the Industrial Innovation Fellowships (NERC), RAEng Industrial Fellowships - Royal Academy of Engineering and NPIF Industrial Innovation Fellowships - <http://www.nerc.ac.uk/funding/available/fellowships/iif/>

** Note - the mapping exercise has sought to identify as many schemes as possible, but is non-exhaustive*

It should be noted that the terms used to describe the different types of PhD schemes identified earlier which fall within the broad category of an **industrial PhD** may differ across countries and types of schemes. There are however some distinct features of these schemes in terms of the duration of mobility, how and where mobility takes place, and as to whether this is in an industrial or academic setting or combine both. These are now examined.

Fully-fledged **industrial PhD schemes** differ from traditional, university-based PhDs and are either exclusively, or mainly spent in an industry environment for the full duration, which is commonly either 3 or 4 years, with the researcher spending occasional periods in a university environment for taught courses and academic supervision relating to the industrial PhD. Examples are the Industrial Postdoc Programme in Denmark, the Industrial PhD programme in Poland, the

Industrial PhD Programme in Austria and the DoRa Programme in Estonia, where in each case the PhD is spent largely in an industrial research environment within a company setting.

Industrial fellowship schemes involve joint collaborative research between academia and industry, but typically involve a shorter mobility period of 6-18 months (a 12 month placement is commonplace). Award holders in Fellowship Schemes are typically at the R2 and R3 levels and award holders are given freedom to determine which research activities they will pursue. In some cases, Industry Fellowship schemes were found to have set themselves ambitious strategic objectives as to the expected outcomes at the level of academic-industry cooperation, which extends well beyond the benefits associated with individual researchers and enhances knowledge transfer in science and technology between industry and research/higher education institutions. Several examples were identified in this regard, for instance the Industry Fellowships Scheme, managed by the Royal Society (UK), the Enterprise Fellowships scheme (Scotland), the CIFRE Fellowships in France, the Irish Research Council's Enterprise Partnership Scheme Postdoctoral Fellowship, and the Israeli Tech Challenge (ITC) Fellows Program, an accelerated professional development programme, which provides training in Data Science and Cyber Security.

Whilst **industry-academia joint PhDs** may involve an internship in industry, they primarily take place at the university's premises or in a co-location centre, such as a science park or technology incubator.

2.1.3.4. Nature of involvement by companies in academia-industry schemes and targeting strategies to attract private participation

With regard to how companies are involved in ISM, companies either participate in schemes once approached by a university, or they may offer PhD studentships directly in the case of Industrial PhDs or via a university partner in the case of industrial fellowship schemes.

Different targeting strategies were identified in terms of whether particular academia to industry ISM schemes are focused on attracting **large firms, SMEs or start-ups** to participate, or a combination of these. Since **large firms** have more managerial resources at their disposal, it is more common for them to recognise the need to engage with local universities and with publicly funded research institutes and wider research actors to foster industrial talents. They are therefore more likely to engage with formal ISM schemes, for example through sponsorship. Large firms are also better able to provide secondment opportunities to researchers since they have the research infrastructure to accommodate additional people relatively easily.

Some schemes are not aimed at a particular category of firm, but rather are aimed at firms in general, including SMEs. For example, the aim of the Industrial Fellowships programme in Luxembourg is to foster cooperation between Luxembourg-based companies active in R&D and public research institutions in Luxembourg and/or abroad. The scheme awards PhD and Postdoc grants to researchers who carry out their PhD and/or postdoc training in collaboration with a company in Luxembourg. Regarding projects carried out in Luxembourg through the "IN strand" (mobility taking place in Luxembourg) require that researchers spend more than 50% of their research time in Luxembourg, and this must be under an employment contract.

In some countries, evidence was identified of longstanding cooperation between universities and industry. In other countries, joint research collaboration and close cooperation are a relatively recent and emerging phenomenon. A key lesson in previous literature – corroborated through the interview programme with key stakeholders engaged in intersectoral mobility – is that it may take years for a collaborative culture to materialise, which impacts the ability of some countries to get ISM schemes off the ground.

2.1.3.5. Less formal ISM schemes

Some schemes are **less formally structured** and result from on-going relationships between academia and industry, often at a departmental level. University departments can simply ask their industry partners if they are prepared to host researchers for varying amounts of time or otherwise co-operate with the university department on a particular area of research. Conversely, enterprise partners may approach their university partner to see if they can get help with a specific

problem they are facing. Such help might include seconding a research student or member of staff.

A number of schemes have been identified whose **primary focus is not on facilitating ISM** *per se*, but rather on strengthening technology transfer and bi-directional cooperation between academia, research and industry. Such schemes sometimes included a minor or a major mobility dimension.

The role of **informal schemes in encouraging PhD students to consider a career as an industrial researcher** should be highlighted. In Iceland, a small Horizon 2020 associated country, for example, there are no official "intersectoral mobility" schemes. However, Matís, a research institute specialised in biotech and food science, tries to connect PhD students and representatives of local industry by inviting relevant industry representatives to supervise the PhDs of students in Iceland. This enables industry to keep abreast of current developments in academic research and gives students the opportunity to get to know the available opportunities, and to develop research which could be applied in an industrial context. This often leads to post-doc jobs in the companies involved.

Promoting researcher mobility between industry and academia is a public policy objective in a few EU Member States (e.g. **Denmark, Norway, Sweden** and the **UK**), but is less explicitly a priority in others. It is worth pointing out that there are differences in the expectations of participants in informal and formal schemes and this can sometimes lead to tensions due to differences between cultures in academia and industry. For example, in order to award a doctoral degree, there is a need to ensure that the award of a doctoral degree leads to the advancement of knowledge whereas the priorities of engaging intersectorally mobile researchers from an industry perspective include, among others, obtaining the necessary human resources and skills to solve problems, developing new products and processes and implementing existing solutions more efficiently.

If the problems are complex enough, highly knowledgeable staff are required and these can be provided by an ISM scheme. However, this is just one solution. An alternative is to improve the skills of staff already employed and the enterprise may look to universities to assist with this. Furthermore, the precise needs may vary over time.

An acute problem in implementing an innovation may call for external expertise, but once the issue has been resolved, ongoing development and improvements can often be handled internally. This suggests that in responding to the real needs of industry, universities often need to be more flexible than formal ISM schemes of fixed duration permit, especially when it comes to interacting with smaller firms, whose horizons tend to be shorter-term.

This explains why some schemes are less structured than others and why these often have to be seen as part of a much wider relationship between enterprises and academic departments with a culture of working with industry. The engineering department at the University of Aalborg in Denmark, for instance, has active collaborative relationships with many engineering firms, which influences the teaching of practical engineering skills and affords the possibility for students to work directly in industry for varying amounts of time from first degree level, through the Masters to PhD levels.

Whereas some universities have historically focused on fundamental research, and others more on applied research, there is growing emergence of **collaborative research projects between academia, publicly funded research and industry** focused on 'close to the market' demonstration projects and the development of prototypes. ISM is a useful mechanism for bringing academia and industry closer together through joint research projects to work on the commercialisation of new products and innovations involving near to market research. This is more common in some countries, such as in Ireland, the UK and in Scandinavia than in others, reflecting the tradition of strong industry-academic cooperation. In a number of cases, PhD researchers may be hired to support these activities. In other cases, more advanced researchers (R2 or R3 level) may drop their academic focus in favour of an applied one, with a view to creating a spin-off or applying for a patent. The more collaborative and innovative the mind-set, the more likely ISM becomes a way to facilitate these knowledge exchanges.

2.1.4. Geographic focus of ISM schemes and gaps in country coverage

Most academia-to-industry schemes identified through the research have a domestic focus, although some **combine intersectoral researcher mobility with international mobility opportunities**, or are open to recruiting international candidates for their domestic ISM schemes. For example, the Industrial Fellowships programme in Luxembourg mentioned above has both an IN and an OUT strand, corresponding to mobility undertaken in-country and abroad. The DoRa programme in Estonia is domestically-focused only, but requires PhD students to spend 5 months abroad.

A complication in cross-border intersectoral mobility is the increased administrative burden, which is sometimes related to a lack of familiarity with another country's social security, insurance and tax system, but also often due to major differences between these systems. Solving these problems requires patience and determination, or alternatively a generous funding scheme presenting obvious and immediate benefits to the industry partner, academia and the mobile researcher. This may explain why the majority of ISM schemes which also involve international mobility are funded through EU programmes, such as the MSCA programme, the new SME Associate Pilot and ERA-LEARN 2020, a support action (CSA) funded by Horizon 2020.

There is a question mark as to the sustainability of programming measures and initiatives to strengthen academic-industry cooperation if EU funding were to be reduced in future. If a funding gap were to emerge, this raises questions as to whether there are alternative possible of national funding support. The dependency on generous EU funding however raises questions about the sustainability of these sometimes fragile partnerships if funding were to be removed. Putting in place a more sustainable longer-term co-funding set-up with a combination of international and national/local resources could have a more effective and long-lasting impact on industry-academic relations and a welcoming environment for ISM than one-off funding for an initial period of several years but with uncertainty as to possible funding follow-up.

The research identified **gaps in the availability of domestically funded ISM schemes** in some countries, especially in EU-13 countries that joined the EU in either 2004 or 2007. In many Central and Eastern, as well as South-Eastern European countries, there was found to be a **lack of domestically-funded ISM schemes that facilitate mobility from academia to industry**. Although it is widely recognised among policy makers in such countries that international researcher mobility is important, less attention has been given to promoting intersectoral mobility, with few dedicated schemes identified. This is partly a reflection of the **lack of a culture of joint cooperation and collaborative research efforts between industry and academia in many EU countries**, especially those that perform less well on the European Innovation Scoreboard. The lack of cooperation between publicly funded research and the private sector may extend back historically and reflect factors in the evolution of the country concerned and of its R&D&I and higher education system. A further issue is that the framework conditions prevailing in less advanced countries in the field of R&D&I may be less conducive to facilitating industry-academic cooperation. Although in the newer Member States, there is often policy support and programming initiatives to strengthen cooperation across the knowledge triangle, there remains a cultural gap between education, research and industry.

There are however exceptions. In **Bulgaria**, for instance, a number of ISM schemes have been targeted at young scientists to stimulate interest in researcher careers among young people and to strengthen links between publicly-funded research and industry. These schemes may even be means of countering the brain drain facilitated through international mobility schemes. Several schemes were financed using EU funding especially ESIFs, but also the pre-accession instruments. In the 2007-09 period, scholarships were made available for young researchers undertaking doctoral research whilst working in a national company structure. The aim was to stimulate the renewal of scientific potential by attracting young people to work in research and to build an effective science-industry link through the active involvement of enterprises in the development of a doctoral dissertation. Actions aimed at opening up the labour market and establishing bridge structures between universities, research organizations and business structures were supported.

A contrast is discernible between the situation in countries that lack a tradition of industry-academic cooperation and Europe's innovation leaders. Although a generalisation, countries with a more highly developed R&I system performing well on the European Innovation Scoreboard typically have longer-established structures and mechanisms to facilitate industry-academic

cooperation and knowledge transfer. Accordingly, they are often better placed to set up ISM schemes.

The variable baseline situation across different countries is also linked to the duration of previous cooperation across the Triple Helix⁴. Countries with longstanding cooperation arrangements between industry and academia are more likely to have a culture within universities and publicly-funded research of bringing in industry expertise, for instance to work in Technology Transfer Offices (TTOs) and university research grants offices. Through a process of networking, incremental progress can be made in building links with industry and the wider business community. The **presence of durable relationships with industry** rather than one-off project-based links is one of the critical success factors in promoting technology transfer.

Progress has nevertheless been made in countries that lack a tradition of industry cooperation and/ or have low rates of Business Enterprise R&D Expenditure (BERD), see for example the JRC's RIO reports⁵, which list the level of BERD by country) in strengthening joint cooperation through projects in the fields of research and innovation funded through the ESIFs, and through EU-level initiatives, such as the EIT's funding of Knowledge and Innovation Communities (KICs). Examples of progress being made to improve the framework conditions for R&I cooperation between different sectors in EU-13 countries are now provided. It should be noted that these relate to strengthening cooperation between academia and industry and to promoting knowledge transfer more generally. Some schemes also focus on restricting brain drain by retaining or attracting young researchers to remain in their country and to pursue a scientific career.

Table 3 - Examples in EU-13 countries of schemes to prepare the ground for intersectoral mobility

- The **Lithuanian Ministry for Education and Science** has introduced a scheme to promote the "commercialisation of R&D results", to support entrepreneurial researchers with training and a budget to either bring their research results to the market and/or to start up a company, or to support academic and industry partners engaged in knowledge transfer.
- In the **Czech Republic**, a **Knowledge Transfer Partnership** was implemented in the 2007-2013 period as part of a pilot scheme under the ERDF-funded Enterprise and Innovation Operational Programme. The objective was to strengthen cooperation and to improve/increase the number of linkages between academia and industry, and to motivate universities to become more open to meeting the challenge of addressing industry needs. The programme stimulates knowledge transfer by supporting the employment of post-graduates and post-doc researchers in companies. Participant researchers are supervised by their university during the mobility period. Lastly, it can be noted that the scheme was adapted from the UK's Knowledge Transfer Partnership scheme, demonstrating that some schemes are transferable and can be replicated in other countries.

Since a key finding from the research is that a culture of academic-industry cooperation is a crucial prerequisite and enabling factor before it is realistic that ISM schemes can go ahead, mapping these schemes and analysing what they have achieved in terms of fostering durable cooperation between academia and industry is important.

A further finding from the research was that most schemes in EU-13 are highly dependent on EU Structural Funds (now ESIFs) support. The research would suggest that this is presently not the case, which could help to justify the rationale for EU intervention, or at least a coordination role in encouraging the Member States to invest more in ensuring that academic-industry cooperation is actively continued, with a view to creating the right framework conditions in future.

2.1.5. Industry-to-academia schemes

In relation to industry-into-academia schemes, there were a number of findings from the research, namely that some countries, such as **Denmark, Norway** and the **UK** have a strong tradition of

⁴ https://triplehelix.stanford.edu/3helix_concept

⁵ <https://rio.jrc.ec.europa.eu/>

providing pathways for senior researchers within industry to spend part of their time within academia.

A number of industry-into-academia initiatives were identified through the research. Examples include the **Dual Professor** concept in **Norway**, which consists of part-time positions in academia. By combining two different jobs, these academics continuously bring innovation skills into academia, maintain access to new knowledge, and act as intermediaries for academia-industry relations. In **Denmark too**, there are schemes which allow professors to teach part-time in a university or research institute environment.

In the **UK**, the **Visiting Professorships scheme** being administered by the Royal Academy of Engineering is an **industry-into-academia initiative**, which aims to utilise the experience of the Visiting Professors to enhance student learning as well as the employability and skills of UK engineering graduates. This scheme is not intended to support research interactions between industry and universities, for which separate schemes exist. Under this scheme, senior industry practitioners participate in course development, face-to-face teaching and mentoring of engineering undergraduates at the host university for at least 12 days a year for three years. This Award provides the university with the support necessary for the attendance of a Visiting Professor to a maximum value of £10,000 per year over three years up to a maximum of £30,000 in total. A missed opportunity can perhaps be highlighted here. If universities hire industry experts, as is the case for this and other ISM schemes, their role is often limited to teaching and does not include research activities. There is some anecdotal evidence that this is rooted in the distrust among some academics of applied / commercially-driven research.

A number of other countries have **adjunct professors** but not all countries do so. Indeed, in some countries, employment contracts are only available for full-time professors and there is a lack of flexibility in terms of being able to employ part-time professors, which limits the potential to strengthen industry-academic collaboration by bringing in top-level senior researchers to teach and / or to carry out research.

A further example of an ISM scheme to promote mobility from industry to academia is the **"entrepreneur in residence" scheme**⁶ also in the **UK**. The scheme aims to increase the knowledge and awareness in UK Universities of cutting edge industrial science, research and innovation. The scheme is being launched by the Royal Society, which is offering up to £40,000 over 2 years for experienced industry scientists and entrepreneurs to spend 20% of their time in a UK university. The objectives are to: (1) expose university staff and students to state-of-the-art industrial R&D, and the scientific challenges faced by industry, (2) provide support and expert advice aimed at promoting innovation and the translation of research by Universities (3) grow confidence in and understanding of business and entrepreneurship among staff and students and (4) provide career recognition to the award holders, and support their professional development.

The **Industrial Liaison Scheme at Ghent University, Belgium** operates somewhat differently from the conventional model. Various research teams and departments are grouped together around a particular scientific or thematic area of expertise, such as nanotechnology, food or marine science, join forces to hire a business developer with industry experience to lead the consortium, scout for development potential, nurture industry contacts, etc. Quite often, these developers are PhD graduates from the same university who have acquired a number of years' work experience in industry, and are recruited back into academia at R3 or R4 level. As business developer they rarely engage in research themselves but become the intermediary for business contacts, the trainer for entrepreneurship, or the R&D manager facilitating patent application.

In **Portugal**, the **PhD Studentships in Industry Scheme** is a national program funded by the State's Budget that allows workers from different sectors to invest and be involved in a PhD graduation by combining the advance training/specialization in a University with their research work in the company. The scheme is funded by the Portuguese national funding agency for science, research and technology (FCT – Fundação para a Ciência e Tecnologia. The project requires the establishment of agreement between the University and the participant company, but the PhD candidate (who is also an employee of the company) is the only party benefiting from

⁶ <https://royalsociety.org/grants-schemes-awards/grants/entrepreneur-in-residence/>

funding. This programme allows the best of both worlds to be combined i.e. expertise and knowledge from Higher Education institutions to address the needs/problems of companies, which is mutually beneficial since cooperation with industry provides a mechanism to deploy applied research results in a specific industry field.

It should also be recalled that **some ISM schemes are bi-directional** so industry participants have the opportunity for senior researchers to undertake joint research with universities and publicly-funded research institutions. For example, the **Industrial Fellowships scheme operated by the Royal Society** in the UK previously allows senior industrial researchers to undertake mobility periods from academia to industry and from industry to academia. The programme manager interviewed mentioned that approximately 30% of IF awardees move from industry to academia and 70% from academia to industry, although there are no fixed percentages in this regard. The type of research being undertaken is often cutting-edge. For instance, an industry recipient was recently awarded an Industry Fellowship to work on "Fundamental studies of boiling in nuclear reactors" with Imperial College London. A further fellowship awardee from industry won a fellowship to carry out research into "Optimised electrical machines through additive layer manufacturing". A third example from industry was an environmental research from industry doing a PhD in "Next Generation Auralisation for Architectural and Environmental Acoustic Design".

The importance of being flexible in setting eligibility criteria – for instance in respect of subject disciplines - was emphasised as a critical success factor in many industry-academia schemes. The IF scheme covers a broad range of disciplines across the life and physical sciences, including engineering, but excluding clinical medicine. A broad range of industry sectors have been supported, covering for example the automotive sector, additive manufacturing (3D printing), research into new materials, the energy sector (oil and gas) through to the creative arts.

2.1.6. Role of industry in promoting mobility between industry and academia

The role of industry, as opposed to publicly-funded research institutes in promoting applied research approaches can be highlighted. Industry participation may take place at different levels:

- Private sector funding of intersectoral mobility including at the scheme level, and through the sponsorship of places on industrial PhD programmes by large companies, such as Microsoft, IBM, Volkswagen, Rolls Royce.
- The setting up and operation of schemes by private research foundations and funding support (e.g. the Wellcome Trust, Microsoft, Volkswagen etc.).
- The formation of partnerships between industry and academia through the active engagement and participation in ISM schemes by the private sector.

The benefits of private sector participation in doctoral training were highlighted in a study by the EUA mentioned earlier on Collaborative Doctoral Education in Europe⁷. This noted that irrespective of the type of company participating, "*collaborative doctoral training was beneficial for all knowledge-based companies, irrespective of their size, i.e., whether they were large companies or SMEs*".

Some industrial PhD and industrial fellowship schemes have succeeded in attracting private funding through corporate sponsorship. Examples where the private sector has played a role in funding and in actively supporting the ISM scheme were identified. For example, the **IF Fellowship Scheme managed by the Royal Society** in the UK has been successful in attracting private funding from a major automotive and engine designer and manufacturer, although information on what percentage of the total costs had been assumed by the Royal Society and the private sector respectively was not available due to confidentiality reasons.

A second example of a scheme which requires a private sector contribution is the **National Research Fund in Luxembourg**, which set up a new Public-Private partnership with 15% (domestic companies) to 30% (international companies) co-funding from industry. Most

⁷ Collaborative Doctoral Education in Europe: Research Partnerships and Employability for Researchers, Report on Doc-Careers II project, by Lidia Borrell-Damian, Rita Morais and John H. Smith, 2015

partnerships are domestic since differences in social security, tax regulations, and additional administrative burdens complicate cross-border participation, while the co-funding share needs to be larger.

Previous research suggests that the private sector has a tolerance threshold in terms of how much they are generally willing to pay to participate in ISM schemes of up to 25% (which is a common co-financing rate on some EU R&I programmes), with some variation depending on whether the project is a CSA (Coordination and support action) or a RIA (Research and Innovation action). Requiring funding contributions above that level may make it difficult to attract private sector participation, especially among SMEs. This finding will need to be taken into account in designing any future funding scheme that may require any private co-funding contributions for industry participation. An alternative is that the cofunding rate could be staggered so that there is a differential between SMEs and large firms, as is already the case for the EU R&D Framework Programmes.

However, there are examples of ISM schemes where the private sector puts in a higher percentage of funding. For example, in Austria, the COMET programme is funded by approximately 50% by the public sector (out of which one third is accounted for by the Ministry of Transport Innovation and Technology and another third by the Ministry of the Economy, with the last third is provided by regional Länder governments) and close to 50% by the private sector. Out of the private sector contribution, 50% comes in the form of cash payments. Universities also usually contribute up to 5%. In addition, the industrial PhD programme in Austria, supports firms directly (rather than individuals) and funds 50% of project costs for PhD projects – the other 50% are paid for by the company.

By comparison, the Flemish Baekeland PhD scheme requires 20% to 50% co-funding – 20% in the case of SME's & multi-partner collaborations; and 50% in the case of large firms and purely bilateral university-academia schemes, and there is a requirement that these must be Flemish companies and Flemish universities.

In some cases, confidentiality rules make it difficult to obtain the precise financial breakdown. For example, the Industrial Fellowship scheme run by the Royal Society in the UK is mainly funded by the Royal Society, but with significant funding support from a corporate sponsor, Rolls Royce. However, the extent of financial contribution is confidential.

The important role of private research foundations in financing ISM schemes should be stressed. This is covered in detail in the main report (see section on funding). There are examples of schemes where the private firm or private research foundation established by a large corporate provides most or all of the scheme funding. For example, VW run a scheme to support PhD candidates in the humanities in transitioning to the non-academic sector which they fund 100%. Indeed, several mobility programmes targeted at large firms were identified. In addition, examples of ISM schemes whose establishment was driven by large firms were identified. Examples of private sector support for intersectoral mobility are now considered.

- **Volkswagen** provides support for ISM through a more traditional fixed term secondment arrangement, which is suitable for large firms, but which may not be suitable for either SMEs or start-ups.
- **IBM's** new \$90 million nanotechnology centre in Zurich, the Binnig and Rohrer Nanotechnology Centre is the cornerstone of a 10-year strategic partnership in nanoscience between IBM and the Swiss Federal Institute of Technology (ETH Zurich) whose aim is to advance energy and information technologies. This development should create intersectoral mobility opportunities for researchers and it is the result of longstanding cooperation between the public sector and industry.

2.1.7. EU support for mobility between academia-industry

Having examined different types of domestic schemes, it is worth briefly summarising existing provision at EU level. The EU provides funding support for a number of programmes to improve the mobility of researchers between academia and industry, such as the **SME Associate Pilot** and the well-known **Marie Skłodowska-Curie Actions (MSCA)**. In the case of the MSCA, there is scope through the Marie-Curie Innovative Training Networks (ITN) to participate in mobility to

industry. In particular, there are two especially relevant schemes to ISM within Marie-Curie ITN, firstly the **European Industrial Doctorates** and secondly the **European Joint Doctorates (see Annex)**.

However, these programmes require international mobility, but *welcome* intersectoral mobility, whereas in many cases demand for PhD and post-doctoral level researchers from industry is more localised and many of the ISM schemes identified being supported domestically operate at a national level (although there are also examples of schemes involving at least some form of transnational mobility). A more detailed assessment of EU schemes is provided in the main report.

2.2. Case study 1 - ESF-funded DoRa Programme in Estonia

As noted in the introduction, this case study focuses on an industrial PhD scheme, the nationally co-financed, ESF-funded DoRa Programme in **Estonia**. Where relevant similar models in different countries are also highlighted. The reason the scheme was selected is that although the scheme was mainly domestic, it involves a period of mobility for 5 months in a foreign country. It is also an example of a successful scheme in an EU-13 country, and one which has been followed up with a new successor programme in the 2014-2020 period. It has also previously been evaluated.

2.2.1. Scheme design and set-up phase

The **DoRa industrial PhD scheme** was part of the wider **Doctoral Studies and Internationalisation Programme "DoRa"** programme in Estonia, which operated for 7 years (2008-2015). Only Activity 3 - Training doctoral students in cooperation with businesses - involves intersectoral mobility. The aim of the programme more broadly is to support other forms of mobility and measures to stimulate the internationalisation of the Estonian research and innovation system.

The specific objectives are to:

- Fund the creation of doctoral student places to assist innovative companies that are successfully applying research results and integrating new technologies and innovations into their services and products; and
- Facilitate the training by universities of doctoral students working in businesses. Partnerships between academia and industry participants are meant to help strengthen the link between research activities and practical problem-solving and ensure that the research results produced have practical applications.

With regard to **scheme design**, the industrial PhD scheme within the DoRa programme involves PhD students spending the 4 year duration of their PhD in an enterprise setting. They spend the great majority of their time carrying out research at the firm which employs them. Only limited time during the PhD is spent at a university only to receive training and skills development courses and for academic PhD supervision purposes. One way in which scheme design could be improved was that there was a strict 4 year limit on the duration of an ESF-funded industrial PhD whereas in practice, many of those enrolling needed more time to complete their PhD. There was a lack of sufficient flexibility for many female participants to complete a PhD within the 4 year specified timeframe. This was problematic for female PhD students who left on maternity leave, and were left with insufficient time to be able to graduate. Using ESF funding was insufficiently flexible to allow female researchers to return and complete their PhD post-maternity leave.

The **eligibility** requirements for different participant stakeholders are as follows:

- Eligible partners are Estonian universities offering accredited PhD programmes in the priority areas. Universities must find a suitable partner in industry and assume responsibility for monitoring the quality and progress of PhD students during their studies;
- Businesses must be engaged in applied research and development activities. Companies must also show their willingness to conclude an employment contract with the doctoral student while paying at least the legal minimum wage;
- The scheme must involve carrying out research in Estonia, the business must be well-established (micro firms were excluded, since at least 11 people must work in the firm), and the firm must have been established more than 3 years ago); and

- Researchers must be employed by businesses in eligible priority sectors throughout their studies: ICT and health, biotech, energy, materials technology and environmental technology as specified in Estonia's national RD&I strategy. They must also spend part of their time at an Estonian university.

It should be noted that the scheme is not limited to academia to industry mobility, since some of the participating higher education institutions are cultural oriented. There is therefore scope for participants to work in the cultural and creative sectors.

The duration of the **application and selection process** is up to 6 months, which is similar to that of other industrial PhD schemes analysed (typically, selection decisions are made within 3-6 months of the application deadline. In terms of how the application and selection process is managed, the majority of activities allow final beneficiaries to apply directly to the partner institution who manages the selection process for applications received. For some research activities however, final beneficiaries have to submit their application directly to the Centre for Higher Education Development (CHED). The DoRa programme was managed in the 2008-2015 period by the Archimedes Foundation Education Agency⁸, an independent education agency established by the Estonian government with the objective of coordinating and implementing different national and international programmes in the fields of training, education and research. Its role in relation to scheme management and implementation is explained below.

All PhD students were guaranteed the opportunity to study abroad for 5 months minimum. However, whereas the majority of the PhD was carried out at an Estonian enterprise, the international mobility element involves student exchanges from Estonia to international universities and vice versa. In other words, the international mobility element of the PhD was separate from the intersectoral mobility aspect which takes place at national level. This approach was consistent with the finding from our study that most intersectoral mobility takes place domestically.

2.2.2. Scheme funding and incentives

The DoRa programme was funded under the Operational Programme for Human Resource Development 2007-2013, which was funded through the European Social fund (ESF) and national co-funding. The budget spent through the Industrial PhD Programme (under Activity 3) was 2 million euros.

Eligible expenditure under Activity 3 includes the student's tuition fees, a monthly stipend and the remuneration of the student's co-supervisor at the company. Doctoral student places supported are being funded on the same terms that apply in relation to doctoral studies under the funding scheme established in Estonia in relation to government-funded provision of higher education. In terms of incentives, The DoRa scheme involved the award of a double scholarship in which the ESF-financed scholarship provided funding to complement the modest funding available under Estonia's national PhD scholarship scheme. Successful applicants received both a DoRa scholarship and the equivalent amount of monthly funding of the national scholarship that they would have received if they had applied for a PhD under the national PhD scholarship programme (national funding is limited however to €423 / month). The "double scholarship" made the industrial PhD more attractive to potential applicants, and encouraged greater competition for places.

2.2.3. Scheme management and implementation

Archimedes played a crucial role in establishing partnerships by actively promoting participation in Activity 3 of the DoRa programme and by establishing relationships with academic institutions and industry interested in participation. A proactive approach to targeting possible participants was viewed as having been crucial during the set-up phase. A number of managerial challenges were discussed during the interview with scheme managers, such as the need to be flexible when setting the eligibility criteria and the importance of flexibility during scheme implementation. A challenge identified was that a handbook with supporting guidelines for scheme participants had to be developed. This was more resource-intensive and time-consuming to develop than expected.

⁸ <http://archimedes.ee/en/archimedes-foundation/>

2.2.4. Support structures

Given the individualised nature of PhDs, it was determined by Archimedes that support should be tailored to the PhD student in question. Support for participant PhD students was therefore provided by ensuring that students have access to both an industry supervisor and an academic supervisor to provide advice and mentoring support for their research project.

Both industry and academic supervisors were funded through the DoRa programme and it was stressed that both play an important role in nurturing the professional development of researchers. Their role was to guarantee access to industry resources, such as laboratories and equipment and to monitor the progress of PhD students working in an enterprise setting during their PhD. The role of supervisors combines both practical and advisory support.

It was observed that there are variations in terms of how supervisory support works, reflecting the scheme's inherent flexibility. Some instances were identified where academic and industry supervisors had never met, and others where they met and coordinated on a regular basis. Sometimes it was noted that there is less interest from supervisors from universities than from industry. There could be a link between the extent of cooperation between supervisors and effectiveness but this was difficult to determine conclusively, according to those interviewed.

2.2.5. Training and skills provision

Training for this Industrial PhD scheme consists of both "on-the-job" training which is appropriate since the industrial PhD takes place in an industrial setting. This was seen as being sufficient to enable researchers to acquire the necessary business, entrepreneurial and project management skills that they need in the workplace. However, in addition, this was supplemented by formalised training at the university and through academic supervision taking place in parallel during the PhD. Conversely, it has not been possible in the successor programme in 2014-2020, the ERDF- funded Smart Specialisation Growth Scholarships Scheme to identify sufficient funding to support taught university courses. Lack of funding for the university sector has made it more difficult to attract universities to take part in the new scheme.

2.2.6. Scheme outcomes, monitoring and evaluation

The scheme promoted the development of industrial research capacity in Estonia through the recruitment of early-stage researchers. The Estonian scheme also helped to prepare young scientists to acquire the necessary skills and competences for a career as an industrial researcher. The quantitative outputs were:

- The original aim of funding 35 industrial PhD students, of whom 20 were expected to graduate. 52 PhD students were funded over the 7 year implementation period but only 11 managed to graduate before the end of the funding period, due to inflexibility under the way in which ESF rules were interpreted at national level, which did not allow adequate flexibility in terms of the duration of funding support. In order to graduate from the DoRa industrial PhD scheme, participants had to meet the formal requirement of having had three articles published, but this was not a mandatory requirement imposed by the scheme itself but rather required under the Estonian law on PhDs.
- 47 different enterprises hosted the 52 students meaning that most enterprises had a single PhD researcher funded for four years.
- Most students were enrolled to the PhD programmes in physical sciences (ISC44) (15 students), engineering and engineering trades (ISC52) (12 students) and computing (ISC48) (8 students).
- The majority of students studied at Tallinn University of Technology (54%) and the University of Tartu (38%).

There was a lack of detailed information on scheme outcomes, but many participant PhD students successfully gained their PhD, although not all, since there was a particular issue around gender equality (described earlier under scheme design). Students also benefited from participation since

they gained access to specialist laboratory equipment necessary for carrying out scientific research.

Regarding employment outcomes, there is a lack of data available on the employment destinations of participant PhD students, but programme managers interviewed believe that most students upon becoming post-doctoral researchers remained at their industry employer.

An independent programme evaluation was carried out by Praxis in 2016 (available only in Estonian but with an executive summary in English). This found that among the scheme's strengths were the ability to offer attractive financial incentives to PhD students to take part in the scheme. However, the survey found low additionality in that 50% of participants would have taken up the PhD anyway without additional funding support because participants in the DoRa programme had already expressed interest in doing a PhD, and could therefore have applied either through the national PhD scheme or through the new DoRa industrial PhD scheme.

A further evaluation finding was that universities and industry differ in their expectations from taking part in the Industrial PhD scheme. Enterprises were found to be generally more engaged in the scheme than universities, reflecting the fact that PhD students were estimated to spend 95% of their time in industry over a 4 year period and only limited time in an academic setting.

Whilst the scheme has been successful overall, there are ways in which it could be further improved, such as: involving more companies that have not previously participated in EU funding schemes or cooperated closely with universities before. A further finding was that universities appear to feel under-involved in this scheme, since the PhD student does not spend much time at all there. This impacted on the university's expectations from participation. This could be overcome in various ways such as ensuring that PhD students spend more time physically at the university and / or inviting representatives from the universities such as the research supervisor to visit the researcher at the company's location, in order to make industry-academic cooperation more embedded at an institutional and company level.

2.2.7. Follow-up to the DoRa programme

A key issue investigated through the case study is how far there has been any follow-up to the industrial PhD scheme, since this can potentially shed light on the scheme's sustainability from a financial and operational continuity perspective.

A follow-up of the DoRa programme is being funded, the Dora Plus programme in 2014-2020. The main aim of both Dora and Dora Plus is to increase the quality of higher education through internationalisation. However, the industrial PhD within DoRa in 2008-2015 was different from the new programme in that it included a separate activity focused on intersectoral mobility only indirectly linked to international cooperation. In the new programming period, it was decided to make the new DoRa programme solely focused on the internationalisation of researchers. A separate Smart Specialisation scholarships scheme was instead set up which will operate from 2016-2022 using ERDF funding. A distinction with the predecessor industrial PhD scheme within DoRa is that the new scheme is closely tied into Estonia's national priority sectors for Smart Specialisation, which are: ICT (including growth of the digital sector), healthcare (including e-health and biotechnology), resources (materials science including nanotechnology and the chemical industry) and cleantech.

Both Dora Plus and the Smart Specialisation scholarships are still implemented by Archimedes, but the regulations and governing bodies differ. The governing body for the Smart Specialisation scholarships is much wider involving more representatives from professional and employers' organisations.

2.2.8. Similar models in different countries

There are examples of other industrial PhD schemes being supported in different EU countries. These were highlighted in further detail in Section 2.1.3.3 on Industrial PhDs and postdoc positions. The Spanish Industrial Doctorates programme allows PhD students to carry out a research project for their PhD in a company for 3 years. The Industrial PhD programme scheme in Poland also allows scope for the possibility of carrying out the PhD whilst working in industry.

Similarities and differences between the DoRa programme and other schemes can be identified. No other schemes were identified where the PhD itself takes place solely within industry but the mobility period abroad takes place in a university setting. However, other schemes share similar characteristics.

For example, several other countries are using ESIF funding to support ISM, such as the Knowledge Economy Skills Scholarships schemes in Wales, UK (KESS I and KESS2). Like the DoRa programme and its successor, the Smart Specialisation Growth Scholarships Scheme, these have been financed using Structural Funds. These schemes are managed by Bangor University on behalf of the University of Wales, which encompasses all the universities in Wales. A key difference with the Welsh schemes is that they also allow the participation of micro firms and start-ups which were ineligible under DoRa.

2.3. Good practices and lessons learned

A number of good practices were identified through the analysis of individual schemes. In relation to the DoRa programme, among the good practices identified were:

- The scheme combines elements of international and intersectoral mobility, since all PhD students are guaranteed the opportunity to study abroad for a minimum period of 5 months.
- The importance of incorporating flexibility into scheme design, management and implementation.
- Securing early interest from both academic and industry and regular engagement with prospective and current partners in the programme was viewed as being crucial to the scheme's success.

In relation to lessons learned, the importance of being flexible and adaptable during scheme implementation was stressed. The eligibility criteria were therefore kept as broad as possible so as not to be overly prescriptive and risk limiting possible participation in intersectoral mobility. This was seen as being especially relevant for SMEs to maximise the possibility for them to take part. A further lesson was that the preparation of guidelines for scheme participants should start as soon as possible.

In smaller countries, support for ISM schemes was seen as being advantageous in contributing to the wider strategic objective of promoting the internationalisation of research. It was also viewed as being useful to align the eligibility criteria for schemes to prioritise key sectors of importance to the national economy.

Turning to good practices identified through the review of wider schemes, one of the challenges of ISM is that it can be difficult to identify and access opportunities available for internships and placements for doctoral and post-doctoral researchers within industry. This is compounded by the fact that many academia-to-industry schemes are small-scale and quite fragmented. To address this problem, Luxembourg's National Innovation Portal provides a list of national partners⁹, which researchers can use to search for industry partners. This networking facility can be considered a good practice since it addresses one of the principle barriers for researchers in participating in academia-to-industry mobility. This approach could be replicated in other countries.

2.4. Assessment of replicability / transferability

There is scope for the ESF-funded DoRa programme to be replicated in other countries. Indeed, the fact that there are other Structural Funds supported schemes that promote ISM such as in Wales, UK, suggests that this approach could be rolled out more widely. There is perhaps greatest scope to transfer this scheme to other EU-13 countries which receive larger volumes of Structural Funds compared to the former EU-15 countries. Indeed, as noted earlier in the section on the geographic unevenness of schemes, there is a lack of dedicated ISM schemes in EU-13, although

⁹ List of national partners - www.innovation.public.lu/en/cooperer/trouver-partenaires/index.php

there are many initiatives that seek to bring academia and industry together more closely through collaborative research and other types of initiatives.

The follow-up programme to DoRa, the ERDF funded Smart Specialisation scholarships scheme, has now been set up. This has extended funding support to include Masters and Bachelors students not only at the PhD level. In the 2014-2020 period, given the possibility of tying in funding for intersectoral mobility with the Smart Specialisation agenda, countries considering adapting a DoRa-type model will need to consider whether ESF or ERDF funding is the most appropriate funding source.

2.5. Framework conditions

Regarding framework conditions specific to the DoRa programme, a number of observations were made earlier that pertain to ensuring that the necessary enabling conditions are in place. For instance, there have been challenges in ensuring the full buy-in of universities to the scheme compared with say international mobility schemes between academic institutions. The reason for this is that they are less directly involved in implementation, since PhD students carry out most of their research in industry. The sustainability of the cooperation between academia and industry fostered through the DoRa programme can be questioned in the successor programme since there is no funding available for university participation in delivering training. Mechanisms therefore need to be found to ensure that academic-industry cooperation at a more strategic level is able to continue, otherwise the scheme will not achieve its objectives.

It was recognised by wider interviewees such as the Estonian Research Council, which operates its own mobility scheme, *Mobilitas Pluss*, that further work is needed to strengthen industry-academic cooperation. Whilst the mobility scheme started off as being solely focused on international mobility, an effort has been made to open up the scheme to intersectoral mobility experiences. However, it has not proved possible to attract industry participants. This lack of interest was attributed in part to the lack of a strong tradition and culture of academic-industry cooperation.

Improving framework conditions was also seen as crucial to the success of the follow-up programme to the DoRa programme.

3 CASE STUDY 2 - MOBILITY FROM ACADEMIA-NGOS/ THE THIRD SECTOR

3.1. Type of mobility in focus

This case study focuses on intersectoral mobility between academia and the third sector, for instance to Community Voluntary Organisations (CVOs) and non-governmental organisations (NGOs). Mobility from academic and research institutions to the third sector is a feature of only a small percentage of the total number of more than 250 domestic schemes identified in this study. Where it does arise, a distinction can be made between two main different types of schemes:

- ISM schemes that are expressly designed to provide a mechanism for researchers to undertake a period of intersectoral mobility in the third sector; and
- General ISM schemes for researcher that allow for mobility from academia to industry, but which are also potentially open for young researchers to move to industry or to government or the third sector.

It should furthermore be noted that Intersectoral mobility also takes place outside of formal schemes i.e. it is relatively common for researchers to work in an NGO environment at some point in their careers or to move from a third sector organisation to undertake a period of further study.

The case study examines a number of issues, namely:

- What are the main types of intersectoral mobility (ISM) schemes that facilitate mobility between academia and the third sector? Are these formal or informal schemes?
- What are the specific benefits of participating in such mobility for academia and the third sector respectively?
- Is there geographic evenness in terms of access to such ISM schemes across the EU-28 or are these schemes more prevalent in some countries than in others?
- From which subject backgrounds are PhD students and post-doctoral researchers typically drawn (e.g. social sciences and humanities, STEM subjects, other?)
- Is there sufficient funding to promote ISM between academia and the third sector?

3.2. Rationale for setting up schemes

The rationale differs depending on the type of scheme in question. The rationale for ISM schemes that explicitly target the third sector is as follows:

- From a researcher perspective, NGOs and the third sector provide a range of alternative employment opportunities to a career in academia, in particular in the field of Social Sciences and Humanities;
- From a NGO perspective, there is a need to recruit top-class research talents to strengthen their internal research capabilities and thereby address their research needs. This is crucial in terms of creating the conditions for the promotion of internal innovation and improving the ability of NGOs to contribute policy-relevant research towards tackling societal challenges;
- There are often broader strategic objectives of ISM schemes targeting the third sector that extend beyond goals relating to the benefits for individual researchers. Examples are developing networks and encouraging knowledge exchange between academia and civic society groups in the community and voluntary sectors.
- From a university point of view, fostering ISM to the third sector could help to facilitate "better recognition of activities related to the universities' "third mission" (service to society, including the societal and economic impact of research) to bridge the gap between universities and other sectors of employment"¹⁰. A typology of mobility is also relevant as a strategy to promote the

¹⁰ See recommendation made in the Report from the 2014 ERAC mutual learning workshop on Human Resources and Mobility Brussels, March 26, 2014, https://cdn1.euraxess.org/sites/default/files/policy_library/report-intersectoral-mobility.pdf

transfer of innovation and research results achieved by academia in the field of social sciences and the humanities to organisations acting in these fields as well, such as NGOs.

- From a policy maker perspective, the third sector has an important role to play in informing the policy debate in different policy areas across different disciplines and in generating research outputs that contribute towards addressing societal challenges.

3.3. Drivers and obstacles of ISM

The main drivers and obstacles of ISM schemes between academia and the third sector are now examined.

A number of **participation drivers were identified among researchers themselves**. With regard to the **types of graduates participating in ISM schemes**, previous research suggests that it is relatively common for **social science and humanities PhD students and graduates** to engage in intersectoral mobility within an NGO environment, either through temporary mobility to an NGO or a permanent job move from academia to the third sector.

A further driver is that the culture in academia and in NGOs / third sector organisations is relatively similar. Indeed, it was perceived by some stakeholders as being easier to integrate researchers in an NGO environment than an industry one. According to a study by the University of Salford¹¹, *"moves between academia and government and NGOS appeared to be easier than between academia and business, because the difference in culture is not so great"*. This was confirmed in the same study through interviews and survey responses from individual researchers. For instance, an interviewee stated *"I went from the University to [a conservation organisation] and then ... back to [university] ...this shift between these two worlds has been easy because it has always been in the science and technology field"*.

Regarding **drivers for NGOs' participation in ISM**, NGOs often need to strengthen their in-house research capabilities. Some NGOs are research-oriented, whilst others have a strong interest in carrying out applied research (often transdisciplinary) to support their core policy research and organisational activities. Recruiting a highly-skilled researcher on a temporary basis by taking on PhD and / or post-doctoral researchers is one means of achieving this. More generally, NGOs are significant employers of researchers and scientists at different career grades (e.g. R1, R2 and R3). A further driver is that funding and incentives may be made available through ISM schemes, and since many NGOs lack resources, being offered additional human resource support through the placement of a temporary intersectorally-mobile researcher is attractive.

Among NGOs, a barrier to participation is that there are **low levels of awareness about the existence of formal ISM schemes**. This reflects the fact that there are not many formal schemes explicitly targeting the promotion of mobility from academia to NGOs. Where such schemes exist, they are typically very small-scale making them more difficult to publicise. That being said, there are a number of such schemes, as described in Section 1.4. There are also constraints relating to the **financial capacity of these type of organisations**. Commonly, ISM provides funding to support organisations in taking on researchers for a mobility experience, but participant organisations also need to finance part of the costs, which may be more difficult for NGOs and CVOs compared with industry and other types of organisations participating in ISM< such as public sector institutions.

3.4. National support for mobility between academia-industry

In this section, we consider different forms of national support for mobility between academia and the third sector. The analysis begins by examining schemes that specifically target the third sector. These include, in summary:

¹¹ POCARIM policy report : Intersectoral mobility of social science and humanities PhD graduates in Europe, Millard, DM, 2014, the University of Salford.
<http://usir.salford.ac.uk/34893/1/PR09%20Intersectoral%20Policy%20Report%20DM.pdf>

- The '**New Foundations' scheme** being implemented by the Irish Research Council. This is supporting small, discrete collaborative projects between postdoctoral or senior researchers and a community/voluntary organisation (CVO) or NGO.
- The **CAROLINE initiative – 'Collaborative Research Fellowships for a Responsive and Innovative Europe'** - provides a Fellowship for experienced researchers to carry out research either in Ireland or abroad, to gain inter-sectoral and interdisciplinary exposure.

The two Irish schemes identified above are focus for this case study – see Sections 2 and 3 – but are not the only dedicated schemes targeting academia-to-NGO mobility.

There are then a wider series of schemes that promote intersectoral mobility, although this is not the primary focus. Some ISM schemes allow researchers scope to undertake mobility from academia to industry, but are also potentially open to researchers to move to either industry, government or to the third sector without being prescriptive as to the sector in which ISM is undertaken. For example, the **DoRa programme in 2008-2015 in Estonia** supports the training of doctoral students in cooperation with businesses through Activity 3 within a large measure which received funding of €33.5 million in total. Whilst focused on mobility to industry primarily allows for mobility from and to non-academic institutions. Among the participant institutions are: the Estonian Academy of Arts and Tartu Art College. PhDs are possible not only within industry but also cultural organisations from participants from these institutions. Further examples of ISM schemes that are open to NGOs, but also to other types of organisations are now provided. The examples provided demonstrate that third sector organisations (including social enterprises) ought to be able to participate in ISM schemes that also facilitate other types of mobility such as from academia to industry, since there is nothing fundamentally different about such mobility specific to the sector in many cases.

In **Croatia, NEWFELPRO fellowships** are open to a range of host institutions, such as enterprises, universities (public or private) or public institutions (government departments and agencies), but also NGOs. The fellowships are available for researchers with a PhD or at least 4 years of research experience after graduation and can last from 12 to 36 months.

Similarly in **Slovenia**, a scheme to **Strengthen Research Departments in Enterprises (KROP)** aims to strengthen the development and innovation capacities of enterprises through the employment and training of researchers and developers in interdisciplinary R&D groups. The scheme is open to young researchers, including PhD students, but the definition of the enterprises that can take advantage of this scheme is fairly broad. It includes not only enterprises, but also private schools, private universities, private research institutes, private hospitals and clinics and NGOs.

In **Poland, the OPUS scheme** is a funding opportunity for research which is intended to be open to a wide range of applicants. 12 projects financed under this scheme have included cooperation between science and NGOs (foundations) as well as co-operation with businesses.

In the **UK**, the **Knowledge Economy Skills Scholarships (KESS 2)** scheme links companies and organisations with academic expertise to undertake research projects that meet the needs of an active business or its sector. KESS 2 is a collaborative project supported by European Social Funds (ESF) through the Welsh Government involving all universities in Wales, led by Bangor University. A range of companies and organisations can participate in KESS 2, including Micro companies, SMEs, Large Companies, **Third Sector and Social Enterprises**. Applicants need to have an operational presence in the Convergence Area, which covers West Wales and the Valleys.

The **Mobility for Growth programme** in Sweden is operated by VINNOVA, Sweden's Innovation Agency. Among the objectives of the Mobility for Growth programme are promoting intersectoral mobility between the private and public sectors. The programme targets experienced researchers with a doctorate or at least four years' full-time equivalent research experience who are interested in mobility as a career development option. There is no particular focus on the third sector but NGOs are potentially able to participate. The longer-term goal of VINNOVA is to use the scheme as an instrument to support universities in developing their own strategies to better link their activities to the needs of society and industry, including third sector organisations. The programme duration is from 2012 to June 2018 and there is currently an overall budget of EUR 35 million, of which EUR 10 million is co-funding from Marie Skłodowska-Curie Actions.

The **Catalan Industrial Doctorates** from **Spain** is another example. This scheme is a joint doctoral training project between an academic participant (university, research institution, among other HEIs) and industry (which may include companies, public administration bodies or non-profit institutions). The purpose is to help to strengthen and improve the Research & Development system within the Catalan industrial sectors. In setting eligibility criteria and requirements, the programme doesn't distinguish between different types of organisations involved in the mobility. Rather, there are the same conditions for calls and the same level of financial support irrespective as to whether the application is made by an enterprise a public sector organisation or an organisation from the third sector. The Government of Catalonia doesn't have any data on the number of organisations from the third sector that are involved in the Catalan Industrial Doctorates. Once the initial projects funded have been finalised by the end of 2017, monitoring data will be made available and the first programme evaluation will be carried out at the beginning of 2018.

Outside the EU, **the Israel Research Fellowship (IRF)** was established to build a global community of outstanding young leaders and influential opinion makers. It supports exceptional post-graduates and outstanding college graduates from around the world in a year-long Israel-based fellowship, where Fellows are placed in a governmental, non-governmental, think-tank or media setting.

Overall, there are only limited numbers of dedicated schemes to promote intersectoral mobility between academia and the third sector. However, a much wider range of schemes exist to promote mobility from a university or research institute to an NGO, CVO or social enterprise, although such mobility often only accounts for a small percentage of total scheme participants.

3.5. Focus on the CAROLINE (Collaborative Research Fellowships for a Responsive and Innovative Europe) and 'New Foundations' schemes

This case study focuses on two intersectoral mobility schemes in Ireland, which are both targeted at promoting ISM between academia and the third sector, firstly the **New Foundations' scheme**, and secondly CAROLINE – 'Collaborative Research Fellowships for a Responsive and Innovative Europe', which is MSCA co-funded. Both schemes are being implemented by the Irish Research Council (IRC) which is also funded by the IRC. Although both schemes are relatively recent, since they were set up in 2015 and 2016 respectively, they provide examples of ISM schemes explicitly designed to encourage knowledge exchange and engagement between academia and the third sector. Further information about these schemes is now provided.

3.5.1. Scheme objectives, design and set-up phase

Since 2015, in **Ireland**, the **'New Foundations' scheme** supports researchers who intend to pursue research, networking and/or dissemination activities within and across a diversity of disciplines. Under Strand 1, there is a priority on 'Enhancing Civic Society within a national or International context'. This offers support for small, discrete collaborative projects between postdoctoral or senior researchers and a community/voluntary organisation (CVO) or NGO. Under Strand 1b, there is a focus on the engagement of Irish CVOs and NGOs in research projects being developed collaboratively at an international level to address European or global societal challenges. The objectives of this strand are, in summary, to:

- Develop networks between academia and civic society groups in the community and voluntary sector;
- Encourage knowledge exchange between these groups;
- Develop expertise to support the engagement of civic society organisations;
- Develop networks between academia and civic society organisations;
- Develop expertise to support the work of these organisations within the higher education community; and
- Develop capacity and routes for engagement with these organisations on a longer-term basis for participation in EU funded projects.

Regarding eligibility requirements for 'New Foundations', the scheme targets CVOs and/ or NGOs interested in participating in this strand, which must collaborate with an academic partner based in a higher education institution (HEI) or other eligible research-performing organisation. For the civic

society strand, the partner organisation has to be a registered charity. The scheme provides support for research actions, the development of networks and a series of other activities to communicate the outcomes and values of academic research in Ireland and beyond. This theme of disseminating the results of research more widely in society and encouraging inter-disciplinary experience could become more apparent in future, as innovation policy extends its focus beyond product and process innovation to encompass other forms of innovation, including organisational, marketing and social innovation.

The **CAROLINE initiative – ‘Collaborative Research Fellowships for a Responsive and Innovative Europe’** which is also from Ireland provides a Fellowship for experienced researchers¹² to carry out research either in Ireland or abroad, to gain inter-sectoral and interdisciplinary exposure. A key feature of the programme is collaboration between the academic sector, non-governmental organisations and international organisations. Potential partner organisations are not limited to *‘development-orientated’ NGOs or those working in support of developing countries but include a wider range of NGOs.*

Researchers can apply from any discipline, as long as they conduct research relevant to the themes of the **United Nations 2030 Agenda for shared economic prosperity, social development, and environmental protection**. The CAROLINE programme takes into account the ‘3i’ mobility principles of MSCA COFUND, 1) international mobility 2) Intersectoral mobility and 3) Interdisciplinary mobility. The sustainable development goals of the UN 2030 Agenda were seen as being supportive of each of these different types of researcher mobility.

There are two types of fellowships available through CAROLINE:

- **International Fellowships (3-year duration)**, where researchers spend the first two years based at a partner NGO. There is an optional placement(s) within the scheme to NGOs/IOs during both the outward and return phase can be proposed (up to a max. of 6 months in each case), with placement mentor(s).
- **International organisations (IO) outside Ireland**, with a mandatory return year at the host Research Performing Organisation (RPO) in Ireland and Irish Fellowships (2-year duration), where researchers are hosted by an RPO in Ireland for two years, with a mandatory secondment to an NGO or IO partners in Ireland for research and/or training. An optional placement to NGOs/IOs (up to 3 months) can be proposed, with a secondment mentor.

3.5.2. Scheme funding and incentives

In terms of the budget allocated to ISM schemes targeting NGO, this clearly varies depending on the scheme, but often there is modest funding compared with academia-to-industry ISM schemes.

Taking the New Foundations’ scheme as an example, under Strand 1a: Enhancing Civic Society within a national context, awards are made up to a maximum of €20,000. Under Strand 1b: Enhancing Civic Society within an international context, awards are made up to a maximum of €25,000). The scheme is funded by the Irish Research Council.

The CAROLINE programme received funding through the MSCA COFUND action from the EU’s Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie Action. The total cost is EUR 9,204,000 of which the EU contribution is EUR 4,602,000. The funding call was H2020-EU.1.3.4. - Increasing structural impact by co-funding activities.

At the level of individual fellowships, the salary will be determined by the location of the Fellow and the associated country correction co-efficient as specified in H2020 MSCA regulation applicable to the scheme. The salary and allowances rates per year for Fellows are:

- Living €55,800 (adjusted by applicable coefficient)
- Mobility €7,200 (years 1 and 2)
- Family €6,000

¹² ‘Experienced researchers’ are defined as those who are in possession of a doctoral degree or have at least four years of full-time equivalent research experience.

However, correction coefficients are applied depending on the country base and the relative cost of living. All allowances are considered taxable income since all Fellows are employed by an Irish host institution during their secondment.

3.5.3. Scheme management and implementation

The Irish Research Council (IRC) has overall responsibility for the management of both the New Foundations and CAROLINE schemes. These are being implemented by the IRC in partnership with the Wheel and Dóchas. The Wheel is a NGO association and representative body established in 1999 which connects community and voluntary organisations and charities across Ireland. It has evolved to become a resource centre and forum for the community and voluntary sector. Dóchas is the Irish Association of Non-Governmental Development Organisations. Under the partnership the two organisations will work together to promote this strand of New Foundations, enhance engagement between academic researchers and NGOs through the scheme, and contribute to the dissemination of research outcomes for the benefit of practice and policy.

The CAROLINE programme was funded through the first call within the MSCA COFUND which offers fellowships for experienced researchers. There have been two calls to date in 2016 and 2017 which each funded 25 researchers (i.e. 50 in total) with the award starting the year after each call. A further call for the 2018 period was recently closed¹³.

Among the challenges raised by the IRC in relation to scheme management of the CAROLINE programme, 'New Foundations' and indeed other mobility schemes was that the increasing precariousness of academic contracts and the casualization of staff mean that it is increasingly difficult for individual staff members and institutions to commit to schemes that last any considerable time. In fact, the status of staff may even change during the application process. The CAROLINE COFUND scheme is part of a suite of interlinked COFUND research funding schemes are managed by the Irish Research Council, which also include ELEVATE¹⁴, CARA and INSPIRE.

3.5.4. Application and selection process

In terms of eligibility criteria, under CAROLINE, PhD candidates from all disciplines are eligible to apply to take part, with a 50-50 split between applicants from STEM subjects (science, technology, engineering and maths), and those from Arts, Humanities and Social Science (AHSS) subjects. There is also an approximate 50-50% male-female gender balance. Most proposals were interdisciplinary with examples of interesting and innovative topics proposed by applicants, such as physics combined with art and research ethics.

Under the CAROLINE programme, there are three main evaluation criteria for selecting fellows from the proposals made, namely excellence, impact and implementation. Meeting the excellence criterion is important. Sometimes funding available is not used if the candidates are not judged to be sufficiently outstanding. Some of the lessons learned from the first two calls have been fed back into the development of guidance for applicants, which has been provided in the form of PPT slides and through webinars. The IRC has made a number of common sense recommendations to prospective applicants to increase their chances of success in the application process. These are: (1) Ensure that there is a project plan in place for the different elements of the application process, with dates by when things have to be completed and share this with the application 'team' (2) Liaise early and often with the research office of the proposed home host organisation; and (3) start negotiations regarding agreement between their home host organisation and main partner organisation before results are released since it may also take longer than expected.

According to an interviewee working on the CAROLINE scheme, among the lessons learned relating to the application process are that it is important to ensure that the timeline for the application process and scheme implementation more broadly is realistic and allows enough time to allow for the individual steps involved. A further lesson is that it is important to develop an online application system.

¹³ <http://research.ie/funding/caroline2/>

¹⁴ <http://research.ie/what-we-do/career-development-for-researchers/cofund/elevate/>

There were also difficulties – now resolved – since CAROLINE was funded under the first call for MSCA COFUND H2020. A less positive aspect of the COFUND programme was that it was difficult to assess the eligibility of applicants and to make an informed and fair decision before the EC had reviewed their eligibility. For example, applicants were required to have not spent more than 12 months in the previous 3 years in the country to which they were intending to spend their international mobility period. However, if somebody had previously had a job in the country concerned, it was difficult to provide documentary evidence since they often didn't have it available. This rule has however now been abolished since the EC changed the rules for subsequent calls.

3.5.5. Support structures, supervision and mentoring

Researchers have a main host organisation (either a university or a research institution) and are seconded to an NGO. Fellows are allocated a mentor from their Irish host organisation. There is both an academic and a non-academic mentor during the secondment. The academic mentor is affiliated with the eligible home host organisation and the secondment mentor (an eligible NGO or international organisation) is affiliated with the eligible main partner organisation. In general, the academic organisations are responsible for the support and have to report on this.

3.5.6. Training and skills provision

Although the IRC organises training events for Fellows across all programmes (not only CAROLINE and New Foundations) these are usually very short and only last for 1-2 days once per year. They may cover topics such as: the gender dimension of research, using social media to promote research results and other topics relating to acquiring generic research skills.

All IRC programmes require participant researchers in their various programmes to have a career development and training plan and require the researcher to specify how they will achieve goals.

Both Irish schemes offer experience of inter-disciplinary working and applications in real environments to applicants from a wide range of subject disciplines. Furthermore CAROLINE, in particular, offers experience of working in a truly international environment, which is appreciated by participants and also enhances employability prospects considerably.

Turning to experience in respect of wider ISM schemes in which NGOs and other third sector organisations are able to participate, the Catalan Industrial Doctorates includes a mandatory training component, but as explained earlier, the scheme is addressed not only at third sector organisations but also at companies and public administrations.

3.5.7. Scheme outcomes, monitoring and evaluation

There is limited information on outputs, results and outcomes since the two schemes have only been operating for a couple of years. In relation to the CAROLINE scheme, among the expected benefits of the scheme managers for researchers are:

- Opportunity to engage in international collaboration with suitable NGOs or IOs;
- Gaining experience and benefit from intersectoral and international mobility;
- Availing of relevant training and career development opportunities;
- Increasing the chances of researchers of gaining a future senior research position, including in the non-academic sector.

In common with other schemes under the MSCA COFUND, those being awarded the Fellowship from the scheme as CAROLINE Fellows become both Irish Research Council Fellows and MSCA Fellows, which was regarded as prestigious. The New Foundations scheme promotes inter-sectoral and interdisciplinary exposure and participants appreciate the different perspectives that they encounter from people from other disciplines and industrial sectors.

Since both the schemes only recently commenced, no evaluation has yet been conducted on the achievements realised to date. However, positive initial feedback has been received about the benefits which has been provided by previous MSCA co-funded Fellows from the CAROLINE scheme.

Some initial evidence regarding positive outcomes from individual projects was identified by the interviewee. A Fellow is exploring opportunities for a new collaborative research project through partnership between a university and NGOs, which has only come about due to them taking part in CAROLINE. However, the project is at a tentative stage presently.

3.5.8. *Similar models in different countries*

There are examples of other PhD schemes being supported in different EU countries that allow third sector organisations, such as NGOs and civil society organisations to participate, or at least such entities are not excluded from applying to participate in ISM schemes, often mainly academia to industry schemes. Reference should be made to Section 1.4 – national support for mobility between academia and the third sector.

3.6. **Good practices and lessons learned**

The New Foundations' scheme has some good practice traits. For instance, the close involvement of Wheel and Dóchas, two organisations representing the interests of Irish NGOs and CVOs in the scheme has been useful in ensuring that the scheme is being implemented in a way that addresses the needs of NGOs.

The CAROLINE scheme also demonstrates some elements of good practice because it promotes a combination of international, intersectoral and interdisciplinary mobility. It also allows quite a broad spectrum of third sector organisations to participate, such as NGOs, CVOs, international organisations (e.g. Doctors without Borders, Greenpeace, WWF and Amnesty International) and inter-governmental organisations (UNDP, UNESCO, the ILO, WHO). The eligibility of international and inter-governmental organisations has not been identified in other ISM schemes and is seen positively, since such organisations play an important role in holding governments to account and in promoting positive economic, environmental and societal changes. Caroline has a good record so far on the employability of those who participate.

The two schemes have only been operating for a relatively short period, three years in the case of the New Foundations' scheme and the CAROLINE scheme for two years, so it is too premature to identify many lessons pertaining to the schemes themselves. However, interviewees pointed to a key strategic lesson.

Innovative new ISM schemes facilitated through EU co-funding shouldn't be restricted to 5 years' duration. It takes between one and two cycles of the research cycle for researchers and actors in other sectors to get to know the scheme and how it operates. CAROLINE for instance is one of the very first schemes in the EU aiming to strengthen partnership working between higher education institutions and NGOs. It takes considerable time to achieve the necessary momentum required to establish the scheme, establish relationships with other research offices in Ireland, and to enhance the scheme's visibility among potential participant HEIs and NGOs. It also takes time and resources to develop online application systems and IT systems to monitor the involvement of participant researchers (for example through the submission of a bi-annual progress report and the updating of the career development and training plan).

It is therefore imperative to **consider extending the duration of grant agreements beyond 5 years.** It is presently difficult to maintain a co-funded scheme beyond grant agreement duration. Consideration could therefore be given to extending the duration of the initial grant agreement from 5 years to 7 or even 10 years to allow the initial first generation scheme to become better established. Agencies that operate co-funds are used to working within the constraint of a 5 year grant but it is not optimal given that it takes 1-2 years to set up a scheme and to commence its operations and then a longer period to embed it. Here, there may be an inherent tension however between the constraints of EU funding linked to specific programming periods on the one hand, and the need to properly embed ISM schemes to as to ensure sustainability on the other (the most successful schemes take considerable time to prove their real worth (bearing in mind the three-four year PhD cycle it will take time for there to be sufficient numbers of researchers have been awarded a doctorate and even longer for a sufficient critical mass of researchers to have gained such qualifications to allow for evaluation)).

A further lesson was that the **overhead costs relating to operating and participating in ISM schemes can be significant**. Examples cited from the point of view of *scheme managers* were setting up appropriate IT systems for online applications and monitoring of scheme implementation. The costs of operating a scheme extend beyond funding researchers' salaries alone to include a variety of overhead costs, including general administration and putting in place appropriate supervision arrangements and mentoring. In terms of the costs of participation for *NGOs themselves*, because NGOs often have small operations and struggle with their budget, the scheme covers not only the salary costs but also the research overheads. However, this is not the case for the IRC's wider fellowship schemes, but only for the CAROLINE and New Foundation schemes which target NGOs.

In terms of **gender equality**, it was mentioned that under the MSCA COFUND, there is a challenge in terms of how to deal administratively and financially with Fellows going on maternity leave. The EC specifies that the beneficiary institution should provide maternity pay but there is no possibility of using the EC's co-financing contribution and many NGOs are under-resourced. This complicates both scheme administration and financial and management reporting to the EC. It would be better if the EC made provision within the MSCA to use co-funding to cover maternity leave.

3.7. Assessment of replicability / transferability

There is scope for both the New Foundations scheme and CAROLINE programme potentially to be replicated. There do not appear to be any further examples of other countries that have set up ISM schemes explicitly to facilitate academia-to-third sector mobility and there is scope to replicate these schemes in other countries.

Whilst the basic design of these schemes could be replicated elsewhere, in several years' time once the two schemes have acquired sufficient experience, there will be stronger capacity to evaluate their achievements. This could help in identifying particular features of these schemes that could be replicated and adapted elsewhere, as well as any characteristics that would be either inappropriate or difficult to replicate.

3.8. Framework conditions

Among the factors that influenced the ability of the Irish Research Council to get these two schemes off the ground in Ireland was that there were favourable enabling conditions. There are many domestic ISM schemes in Ireland compared with many other countries, and a strong tradition of cooperation between academia and other sectors, which has made it easier to develop and implement the two schemes from academia to the third sector. In the case of the CAROLINE programme, there was already strong awareness about how the Marie-Curie Fellowships operate, and MSCA Co-Fund was therefore quickly identified as a possible funding source by the scheme's managers.

4 CASE STUDY 3 - MOBILITY BETWEEN ACADEMIA AND THE PUBLIC SECTOR (PART 1)

4.1. Introduction and scope

This case study focuses on intersectoral mobility schemes that facilitate mobility between academia and the public sector. In the context of this case study, the scope of such mobility has been defined quite broadly as relating to undertaking intersectoral mobility in any capacity within the public sector. This includes, for instance, working in a research capacity within government in a civil service department, or for a specific public sector institution. A wide variety of institutions may therefore participate in such schemes at different levels of governance (local, regional or national). The types of institutions involved are heterogeneous and may range from locally-based institutions, such as a local authority/ municipality, a public employment office, through to regional and national organisations (e.g. an environmental agency, an education body, a government Ministry or a Central Bank).

4.1.1. Type of mobility in focus

A number of different types of ISM schemes were identified to strengthen mobility from academia to government and public institutions. A distinction can be made between:

- **Dedicated intersectoral mobility schemes** to promote mobility from academia to government and to other types of public institutions, for example through placements or internships.
- **ISM schemes designed to promote mobility from academia to industry**, but which public sector institutions can also participate in (i.e. schemes not explicitly focused on the public sector but which allow them to participate alongside other eligible actors, such as higher education institutions and enterprises).
- **Schemes that involve funding PhDs for public sector employees in order to strengthen the internal research and innovation capacity of their employer** and thereby contribute to the public sector innovation agenda. Such schemes focus not only on strengthening the career of individual researchers, but also on promoting knowledge exchange and shared learning between the academic research community and public sector.

Whereas the first type of scheme commonly involves physical mobility, the latter type of scheme only involves limited mobility, since the PhD student remains employed by their public sector employer.

It should be noted that the scope of this case study does not focus on the role of governments in facilitating, promoting and funding placements for researchers. This is addressed instead in the main report, for instance in the recommendations addressed to national government and policy makers.

4.1.2. Rationale for setting up schemes

The rationale for ISM schemes that promote mobility between academia and government varies according to the stakeholder group concerned. The research identified the following rationale for such schemes:

- For researchers, the opportunity to work in government for a temporary placement or internship is seen as being highly attractive in terms of the opportunity to carry out applied policy research. It is also viewed as being a stepping stone towards a career in the civil service or public sector more widely.
- For government and other public sector institutions, there is an ongoing need for highly qualified researchers to carry out research to support policy evaluation and formulation and to strengthen the research capacity of the civil service and public sector. This applies, for instance, to the Public Sector PhD scheme in Norway.

- For higher education institutions, it is regarded as being prestigious to be able to send researchers to work in government, or for other public sector institutions such as the UK's Parliamentary Research Service and the Bank of Italy.
- There is strong interest among national governments and national / regional research and innovation agencies in strengthening organisational capacity to develop and implement news innovation within the public sector. The types of innovation being generated may include organisational innovation and the development of innovative solutions to societal challenges (process-driven innovation).

With regard to the last bullet, the growing interest in public sector innovation was confirmed both in interviews with stakeholders involved in ISM schemes that target the public sector, and in relevant literature. The desk research identified many examples of evaluation, studies and reports that focus on innovation in the public sector, such as the OECD's *Innovating the Public Sector: from Ideas to Impact*¹⁵, and also in EU-level literature, such as a report on "Powering European Public Sector Innovation"¹⁶. Moreover, the British Council is expected to launch a new strategy for public sector innovation in January 2018 in which the importance of fostering closer collaboration and interaction between academia, the public sector and the third sector as a pre-requisite to strengthening innovation capacity is emphasised. ISM has a major role to play in fostering such innovation.

There is evidence that growing policy interest in public sector innovation is being backed up by funding support, at least in a limited number of countries. Examples are the Norwegian Public Sector PhD scheme (the focus of this case study) and also in Norway, the FORKOMMUNE scheme, which commenced in 2017. FORKOMMUNE is an R&I program that aims to increase innovation in the municipality sector through funding to develop new and relevant knowledge to address challenges at local level. Creating better links and interaction between the municipality sector, research institutions and knowledge providers is another important goal. Elsewhere, a new fund for public sector innovation was launched by the Scottish Funding Council¹⁷. Calls to address public sector challenges will be held twice a year on the Scottish Enterprise website. Funding programmes and other types of initiatives will be used to promote innovation within the public sector. Although there is not a specific focus on ISM, this and other funding initiatives show that there is strong interest in the role of research in strengthening innovation capacity.

4.1.3. Drivers and obstacles of ISM

The main drivers and obstacles of ISM schemes between academia and government are now examined.

A number of **participation drivers were identified**. As noted in the previous sub-section, there is a lot of interest among researchers in undertaking secondments, placements and internships in government, as it is seen as being prestigious to undertake an intersectoral mobility experience. However, this may not be the case for all types of public institutions. Organisations such as local authorities and public employment offices may, for example, find it more difficult to attract highly-skilled researchers since there is less of a tradition of supporting PhD research within such organisations (and less evidence of post-doctoral researchers being explicitly targeted in recruitment processes).

From the perspective of government Ministries and agencies and wider public sector organisations, a driver of emerging interest in intersectoral mobility (since dedicated schemes remain quite rare, as will be demonstrated later in the case study) is the need to strengthen their in-house capacity to undertake research and innovation and to utilise applied research results to improve the efficiency and effectiveness of public service provision. Public sector organisations need to embrace innovation in order to make organisational process improvements and to respond to

¹⁵ OECD's *Innovating the Public Sector: from Ideas to Impact*, 12-13 November 2014 OECD Conference Centre, Paris. <http://www.oecd.org/innovating-the-public-sector/Background-report.pdf>

¹⁶ *Powering European Public Sector Innovation: Towards a New Architecture* Report of the Expert Group on Public Sector Innovation, 2013

¹⁷ <http://www.sfc.ac.uk/news/2017/news-64418.aspx>

pressing problems faced by particular types of public institutions, for instance those linked to the societal challenges agenda¹⁸.

Public sector institutions have different means of addressing their research needs. First, they may decide to recruit research talents for a temporary mobility period to help focus on a particular research project. This is seen as an effective mechanism to identify potential bright future recruits that could be recruited on a permanent basis (examples are the two ISM schemes at the Bank of Italy to recruit economists at both the PhD and Masters' levels). An alternative approach is to strengthen the qualifications base of their existing staff, by encouraging them to consider applying to do a PhD whilst remaining employed and focusing on a specific research challenge faced by their employer (see the description of the Public sector Ph.D. scheme in Norway in Sections 2 and 3, which is the scheme examined in detail in this case study).

With regard to **barriers to ISM** for public sector institutions, among the obstacles are that there is low awareness among public institutions about the potential role of intersectoral mobility in addressing the research needs of national governments and of public sector institutions across different sectors. This is a reflection of the general absence of formal ISM schemes targeted at the public sector in most countries. Public institutions may already have dedicated internship programmes but these may not be classified as formal ISM schemes, since they are often targeted at those that have completed their studies (often at Masters' level), rather than targeting their current staff who may be willing to consider doing a PhD in order to develop their research skills whilst solving problems faced by their own organisation.

4.1.4. *National support for mobility between academia and government*

In this section, examples of intersectoral mobility schemes between academia and government are provided. A short overview of key schemes identified is first provided. A select number of more detailed examples as to how these schemes operate is then outlined.

- The Bank of Italy offers two types of scholarship schemes for economists, one targeted at those having already gained a PhD or equivalent the '**Research Fellowships for Economists**' and the second targeted at Masters' graduates.
- The **Policy Secondment Programme** in the UK is managed by the Royal Society and recently began providing government departments with highly-qualified researchers who undertake a specific research project during a placement as a researcher within a team of civil servants.
- The UK's Parliamentary POST (Parliamentary Office of Science and Technology) operates two schemes, firstly the **POST Fellowships Scheme** (open to PhD students) and secondly the **Parliamentary Academic Fellowship Scheme** (for experienced researchers and academics).
- The **Public sector Ph.D. scheme (OFFPHD)** in Norway and thematic pilot follow-ups, as well as a new pilot R&I programme for the municipality sector launched in 2017.
- The **Industrial Postdoc Programme** in Denmark has a variant on the main programme, with a specific sub-programme, the Industrial Postdoc Researcher in the Public Sector.
- In **Canada**, although now discontinued, an interesting scheme is the '**Visiting Fellowships in Canadian Government Laboratories Program**'.

Further details about these schemes are now provided. For those with a PhD level qualification, the **Bank of Italy's** Directorate General for Economics, Statistics and Research in Rome runs a scholarship scheme, the '**Research Fellowships for Economists**'. The fellowships are for twelve months, renewable for another twelve, and provide fellows with a monthly stipend of €4,000 before tax. During the fellowship, participants are expected to carry out the research project proposed in their application, and have autonomy to organize their research activities, and can use all the facilities available at the Bank (databases, library, computing resources), in a stimulating

¹⁸ The societal challenges agenda focuses on a number of themes, such as: health, demographic change and wellbeing; Secure, clean and efficient energy; Smart, green and integrated transport; Climate action, environment, resource efficiency and raw materials; Europe in a changing world - inclusive, innovative and reflective societies.

environment. When the project is concluded, fellows may be invited to take part in a competition for a permanent position with the Bank at the entry level of the managerial career stream.

Economists working at the DG ESR are expected to carry out both economic research and policy analysis conveyed through internal notes, contributions to policy debate, and the Bank's publications. They may also participate in high-level academic workshops and interact with policymakers. Researchers may be asked to get involved in other research projects, and to contribute to policy analysis in their fields of expertise, with the advice of a tutor.

For those with a Masters' level qualification, the Bank of Italy offers three different scholarships¹⁹ for graduates wishing to undertake further study in the following fields: political economy and economic policy, mathematical, statistical and econometric methods, applied to the analysis of institutions, markets and financial instruments and associated regulations, and the relationship between the legal framework and economic growth and the impact of regulation on economic activity.

In the UK, the Royal Society recently launched the **Policy Secondment Programme²⁰ (PSP)** which is a new scheme for University Research Fellows and Dorothy Hodgkin Fellows to undertake a secondment within a Science Policy Environment. The PSP was set up as a pilot scheme with three researchers commencing in November 2017. The pilot involves an early-stage researcher taking a secondment of either 3 months (full-time), or 6 months (part-time) within a science policy environment in government. The scheme has been broadly modelled on a well-known scheme to promote academic mobility to government operated by the NIH in the US. The objective is to recruit university research associates, typically early-stage researchers and to provide them with a secondment opportunity to work as a policy associate in government. In order to raise awareness about the new scheme and to train those that will participate, the Royal Society ran a 2 day primer about policy-making processes. The course was made available to interested early-stage researchers not yet participating in a mobility period. There was strong interest with 27 researchers signing up to the event.

In terms of the expected benefits for researchers of the PSP scheme, there were identified as being:

- Receive first-hand experience of how scientific research and other evidence inform the policy making process;
- Develop networks with policy organisations and officials in areas allied to your research interest;
- Network with thought leaders in research, industry and policy-making; and
- Develop your understanding of potential routes to achieving research impact.

Also in the UK, two further examples of ISM schemes from academia to government were identified. The **POST (Parliamentary Office of Science and Technology) scheme²¹** enables PhD students to spend three months working at POST. Most fellows will research, write and publish a research paper during their time at POST, but some fellows have instead been placed with a parliamentary Select Committee or Library. PhD students can be sponsored to spend (usually) three months working at POST. Some fellowships are also open to post-doctoral researchers in academia and industry. This scheme is run in collaboration with Research Councils, learned societies and charities.

A second scheme implemented by POST is the **Parliamentary Academic Fellowship Scheme**, which is open to academics holding PhDs. The scheme is open to senior political and social scientists currently researching or wishing to study the work of the British Parliament. This scheme provides access to the Parliamentary Estate for up to 2 years. The scheme is open to academics working in different subject areas and at all career levels. Academics can apply to work on a

¹⁹ The scholarships schemes are the Bonaldo Stringher, Giorgio Mortara and Donato Menichella schemes respectively.

²⁰ <https://royalsociety.org/grants-schemes-awards/policy-secondment-programme/>

²¹ <http://www.parliament.uk/postfellowships>

project proposed by a department in Parliament or, may submit a proposed research project idea. Fellowships are between one and twelve months in duration. Applicants can apply to work on a specific research project issued by an office in Parliament, or may propose a project of their own choosing. This scheme is open to academics employed at a UK higher education institution that hold either an ESRC or EPSRC IAA account.

In addition to the above-mentioned formal schemes, POST run a number of competitive schemes for Masters' students to join POST for one month. These opportunities are advertised through Masters' university course co-ordinators. Interestingly, the intersectoral mobility schemes are the only means via which it is possible to undertake a placement as a researcher since "*no undergraduate, Masters or PhD students are taken on outside of the competitive schemes*".

Regarding funding, there are a number of sponsors of the POST fellowships, mainly the UK research councils (e.g. the BBSRC, the Arts and Humanities Research Council, the Engineering and Physical Sciences Research Council, as well as public and private research foundations (e.g. Nuffield Foundation, Wellcome Trust Humanities and Social Science Programme).

The **Industrial Postdoc Programme in Denmark** has a variant on the main programme, with a specific sub-programme, the **Industrial Postdoc Researcher in the Public Sector**. A drawback however is the lack of funding, since Innovation Fund Denmark funds the core Industrial Postdoc scheme targeted at enterprises, but does not have budget for the Industrial Postdoc Researcher in the Public Sector. Since the scheme got underway, public sector organisations have had to pay all the project expenses themselves. However, in October 2017, a decision was made for the annual funding call to make DKK 10 million available to finance both the core Industrial Postdoc and Industrial PhD projects in the public sector.

In **Canada**, although now discontinued, an interesting scheme was the '**Visiting Fellowships in Canadian Government Laboratories Program**' ("VF program"), which was implemented by the Natural Sciences and Engineering Research Council of Canada. The VF program sought to attract early stage researchers who are either scientists or engineers with the opportunity to work with research groups or leaders in Canadian government laboratories and research institutions. The eligible disciplines were engineering, life sciences and physical sciences. Fellowships were awarded for one year with the possibility of renewal for a second and third year, at the discretion of the government department concerned. Eligible participants must have received a doctoral degree in the natural sciences or engineering from a recognized university within the past five years. Fellowships were awarded for 1-3 years to postdoc scholars who will research in Canadian labs. The stipend was \$43,724 per year plus travel expenses. The selection committee rated the applications according to a number of criteria such as: evidence of academic excellence; number of scholarships and awards held; duration of previous studies; research ability or potential, judgment, originality, and curiosity; initiative and autonomy; communication skills, interpersonal and leadership abilities and the potential benefits to the government department concerned. Although successful according to an email respondent from Canada involved in the scheme, it was discontinued since all ISM schemes in Canada have been merged into the Accelerate programme operated by Mitacs²².

In addition to schemes that are expressly designed to facilitate academia-to-government mobility and vice versa, there were also examples of ISM schemes that are not explicitly focused on government or the public sector, but where researchers may choose to undertake a mobility experience in the public sector among alternative destinations. For example, in **Croatia**, NEWFELPRO is a mobility fellowship scheme for researchers funded by the Ministry of Science and Education. It supports mobility to many types of host institutions, including intersectoral mobility. Host institutions can be public institutions (government agencies, universities, institutes), as well enterprises, private universities and research institutions, NGOs and others.

Examples were also identified of schemes that **facilitate mobility from the public sector to academia**, and also those that encourage employees of public sector institutions to strengthen their qualifications and research skills by studying for a PhD whilst continuing to work in the public sector. **The Public sector Ph.D. scheme (OFFPHD) in Norway** set up by the Norwegian

²² <https://www.mitacs.ca/en/programs/accelerate/fellowship>

Research Council allows different types of public sector institutions to apply for funding from the Norwegian Research Council for an employee wishing to undertake doctoral degrees focused on a research topic relevant to their institution. Further details are provided in Section 2, since this scheme is the focus of the case study.

Also in **Norway**, the Norwegian Research Council has recently (2017) started a new R&I for the municipality sector. This programme seeks to strengthen the **interaction between academia and the municipality sector, industry and the third sector** in order to generate ideas and outcomes generated through a bottom-up approach. The scheme is at an early stage in its development, with adjustments still being made to scheme design. So far the scheme will not promote the embedding of innovation within the public sector through the prioritisation of research topics in calls for research projects, but will seek to address specific problems being faced by the public sector.

A third scheme in Norway is the **Program in Innovation Management and Innovation Strategy**, known as the "PIMS program" at NTNU²³ focuses on innovation processes in and between existing organizations. All types of organisations participate, from small firms to large multinationals, from local government to large public organizations and public bodies and agencies.

4.2. Case study 3 – Focus on the Public sector PhD scheme (OFFPHD) in Norway

4.2.1. Scheme management and implementation

This case study focuses on the **Public sector PhD scheme (OFFPHD) in Norway**²⁴, which was launched in 2014, with calls for applications to the scheme in 2014, 2016 and 2017 (there was no funding available in 2015). The scheme was selected because it is one of the few examples of a dedicated scheme targeting researchers working in the public sector that are considering undertaking doctoral level research, and because it seeks to strengthen the public sector's research and innovation capacity through a full-length PhD rather than through researchers from academia spending only a limited mobility period working in a public sector environment as part of their course.

4.2.2. Scheme objectives, design and set-up phase

The purpose of the scheme is not to stimulate physical mobility between public sector and academia, (although this may happen), but rather to strengthen and improve the transfer of knowledge and competence between sectors and to increase this interaction.

There is a particular emphasis in the scheme on strengthening the public sector's capacity to generate and to embed innovation. The scheme's objectives are to strengthen the research capacity of public sector institutions over the longer-term, through relevant competence-building and by undertaking research activities in the public sector body. Further aims are to promote greater collaboration between academia and the public sector by increasing the recruitment of highly-qualified researchers by the public sector.

The OFFPHD scheme is complementary to the Norwegian Research Council's responsibility of boosting research and innovation activities in the public sector and supporting research projects. Interestingly, scheme managers did not consider OFFPHD to be a formal intersectoral mobility scheme, reflecting the fact that stakeholders are unfamiliar with the term. However, this is partly since interaction than mobility in describing the programs purpose. The scheme meets the criteria for being an ISM scheme.

There is an expectation among the public sector that the Research Council should work to increase knowledge-intensity in the public sector in various ways, including by facilitating the recruitment of

²³ <http://www.ntnu.edu/innovation/norsi-pims>

²⁴ <https://www.forskningsradet.no/no/Utlysning/OFFPHD/1253995410398/p1173268235938?visAktive=true>

doctoral candidates. The Public Sector Ph.D. scheme is therefore designed to support long-term research that has the same level of scientific merit as the general doctoral degree education, but through the undertaking of applied research rather than introducing a new type of doctoral degree. The doctoral research projects undertaken through the scheme are expected to generate knowledge relevant for, and which can be applied by, public sector organisations and users of their research outputs and / or services.

Projects are also expected to develop and improve the public sector's capacity to strengthen innovation capacity and to create new and improved solutions. The doctoral research projects also seek to develop new knowledge in areas where there is a substantial need for knowledge and innovation, and to support the institution's R&D and innovation strategy. The improved use of knowledge generated nationally and internationally within the public sector will be promoted through greater collaboration between the public sector and academia.

Regarding **scheme design**, the doctoral degree awarded is of the same academic equivalence as a traditional doctoral degree, but the PhD scheme has some unique features. A key difference is that the public sector institution and the academic institution make a formal agreement on collaboration, which includes the broad topic, resources involved, division of costs and benefits that applies to take part in the public sector PhD scheme.

If the application to RCN is successful, the employee is then able to embark on a PhD research project to undertake a doctoral thesis project and must qualify to the institution's doctorate programme according to the regular criteria. The project must be relevant for the needs of the public sector institution that employs them. The doctoral thesis must be relevant to the public sector organisation's long-term competence needs and their respective areas of responsibility

With regard to how the scheme operates, it is required that the employee (the candidate) spend all of their time working on their PhD for the 3 year period assigned to the project; a minimum of one year during the project period is required to be spent at the work place, and 1 year at the research institution. There is a possibility to apply for a 4 year endurance of the project. In that case 20% of their time can be spent in their regular job.

In terms of the duration of the PhD, the doctorate is completed over either three years (in which case it is fully funded for the Research Council's financing contribution part of up to 50% (see details in Section 2.2. on scheme funding below) or over four years (in which case the Research Council's yearly financing contribution is reduced accordingly, but prolonged).

In terms of **eligibility criteria**, the scheme accepts applications from public sector institutions from national government, regional government and from local authorities, public bodies or associations who carry out tasks on behalf of the public. All public sector organisations may apply on behalf of their employees²⁵, with one exception. Organisations approved by the Research Council as a research institution cannot however apply for public sector PhD projects. Any given public institution cannot normally receive support for more than two new candidates per year (since there has been strong demand to participate, and only limited budget available).

4.2.3. Scheme funding and incentives

The Norwegian Research Council funds the Public sector PhD scheme, but PhD projects also require co-funding from the public sector institution benefiting from support. Since the inception of the OFFPHD Public sector PhD scheme in 2014, the scheme has so far granted NOK 147.8 million (€14.77 million) to 92 projects.

The scheme partially covers the costs directly related to the implementation of doctoral projects. This includes: 1) salary and staff costs for a candidate 2) salary and personnel costs for internal supervisors 3) what may be paid to the degree institution and 4) other operating expenses such as laboratory attempts, buying relevant literature, conference trips, etc. Equipment cannot however be included in the budget. The Research Council can provide funding support up to 50% of the

²⁵ Information provided on Research Council Norway's homepage: https://www.forskningsradet.no/prognett-offphd/Home_page/1253996824464.

current fellowship rate at the application date, with a calculated growth rate of 3% per annum. However, the support cannot exceed 50% of the total approved project costs. Support is not provided as a research grant, but is rather based on actual project costs. Funding support is provided for the project directly to the public sector institution rather than granted to the candidate personally. Costs incurred for the provision of mentoring support and guidance and for the period spent at the PhD-providing institution can be classified as R&D services, as long as the degree-giving institution is Norwegian. Costs for receiving support and guidance abroad are recorded under other operating costs.

In 2017, the scheme has increased its general funding by tapping into alternative sources of funding within the Research Council available to promote innovation in different sectors. As a pilot attempt three Research and innovation programs with relevance to the public sector has contributed some of their resources to fund PhD research projects according to the criteria set in the Public Sector PhD scheme. The three programmes are:

- **Good and effective health, care and welfare services (HEALTHVEL).** The programme will finance up to three public sector PhD projects relevant to the programme plan. It is a requirement that the projects should be rooted in the municipal health and care services or in labour and welfare services.
- **Research and innovation in the education sector (FINNUT).** The programme will finance up to five public sector PhD projects relevant to the FINNUT programme plan. It is a requirement that the projects should be anchored in the municipal or county municipal education services.
- **ICT and digital innovation (ICT).** The programme will finance up to three public sector PhD projects that are relevant to the ICT PLUS programme.

With the additional funding the scheme has been able to stay open for additional projects to apply. Looking ahead, consideration may be given to expanding the pilot scheme to cover all thematic areas with higher funding to support these types of doctorates.

4.2.4. Scheme management and implementation

The Norwegian Research Council has overall responsibility for scheme management. The two main actors involved in taking part in the scheme are higher education institutions and public sector institutions. With regard to monitoring and reporting requirements, public institutions entering into a contract with the Research Council are required to attend a set-up meeting to review the overall framework for the research project to be carried out by the PhD researcher and to agree the monitoring and reporting obligations during the project.

The public sector beneficiary institution must designate a person in charge of the PhD project as far as formalities, progress and reporting are concerned. The aim for this is to ensure proper anchoring in the institution and to allow candidates to focus their efforts on conducting the doctoral research project itself.

Interviews and necessary follow up may also take place with the doctoral student and with their research supervisors before the doctoral research starts. Once a year, in October, the institution must report if there are any deviations from the original planned research project. An interim progress report has to be produced around the mid-term period of the research and a final report has to be provided at the end of the project one month after the dissertation has been handed in.

4.2.5. Application and selection process

In terms of the requirements at application stage, the public sector institution must be both the applicant and recipient of research funding, the employer of the PhD candidate, and they must prepare the research project in joint cooperation with the degree-giving institution. They must also outline in their application the relevance of the doctorate to the public sector institution's long-term needs in terms of skills and competence development, and provide an explanation as to how the PhD is related to the public institution's research and development work.

4.2.6. *Support structures, supervision and mentoring*

Among the requirements for participant institutions are that they must have sufficient capacity to provide mentoring support to PhD students during their doctoral programme. They must also have a supervisor from the degree-giving institution and the public institution where the candidate is employed. Funded PhD researchers must have a minimum of two academic supervisors, one in the PhD institution and one in the public sector institution. The supervisor in the public sector institution must be from the doctoral level, or an additional academic supervisor can be chosen. In case of the latter, a non-academic supervisor from the beneficiary organisation must be appointed to ensure relevance and professional support during the project period.

The academic institutions participating in the scheme must enter into a binding cooperation agreement with the public sector organisation and sign a written cooperation agreement on the completion of doctoral thesis work. The OFFPHD scheme requires PhD students to spend at least one year in the public sector. The research is developed in close collaboration between the public sector, degree-giving institutions and candidates.

4.2.7. *Training and skills provision*

There is no formalised on-site training during the PhD but all PhD candidates are invited to attend an annual conference, which focuses on specific issues relating to their doctoral research and general issues such as research ethics, any general common challenges that they may face in carrying out the research).

4.2.8. *Scheme outcomes, monitoring and evaluation*

An overview of the number of research projects supported through PhD grant awards is provided below:

- 2014 – 25 grants
- 2015 – 0 (no resources)
- 2016 – 29 grants
- 2017 – 38 grants
- Total 2014-2017 - 92 grants

Among the types of institutions that have participated to date are: local authorities, state institutions (government offices working on tackling unemployment, and social security and pension-related matters), organisations in the educational sector, such as state institutions dealing with special needs pupils. A national environmental agency also has some ongoing research projects, and some museums in the cultural sector have participated in the scheme.

Compared with other ISM schemes run by the Research Council designed to strengthen cooperation between academia and industry, the size of the scheme is quite modest in terms of both the overall budget allocation and the number of PhD researchers. However, this was intentional since the Council wanted to operate the scheme as a pilot for a few years before subjecting it to a full evaluation.

There has not as yet been an evaluation of the OFFPHD scheme. However, there is planned to be a thorough evaluation of the scheme's effectiveness in 2019. Since no research projects have yet been completed (these last a minimum of three years), it was considered too early to evaluate the scheme before then. However, a portfolio assessment of the projects funded through the scheme has been carried out by the Research Council. The research topics being funded were found to be central to the work of the institutions and sectors (e.g. education, the environment) concerned. A further finding from the portfolio review is that the funded projects cover quite a broad range of different types of public institutions and different sectors.

Public sector innovation has become an increasing priority for the Research Council in order to strengthen innovation capacity and to develop an improved knowledge base as to how to solve strategic challenges and problems faced by different types of public sector institutions across different sectors. An interviewee commented that "There is a need to make the transition from

carrying out research into what should be done to address problems to a more practical applied research approach which focuses on how to actually implement innovation”.

4.2.9. *Similar models in different countries*

The interviewee from the Norwegian Research Council commented that they have sought to identify examples of similar schemes both during the design phase and during implementation (looking ahead to the future evaluation). However, it has been difficult to identify examples of other ISM schemes with similar objectives (promoting a stronger emphasis on research-driven innovation) within the public sector.

The only scheme with similar characteristics, which provided initial inspiration for the development of the OFFPHD scheme is the Industrial Postdoc Researcher in the Public Sector in Denmark. However, a perceived weakness of this scheme is that it is rather subsidiary to the core Industrial Postdoc Researcher scheme which is targeted at enterprises across different industry sectors. Therefore, the specific objectives of the public sector researcher scheme have been somewhat lost.

4.3. **Good practices and lessons learned**

Among the characteristics of the scheme that demonstrate good practice are:

- Scheme design - the scheme is structured in a way that the public sector institution is required to apply directly rather than the prospective PhD student making an application to the academic institution directly. The rationale is that this requires both the future PhD researcher and the institution they work for to think carefully during the application process about how they will address problems and challenges specific to the public institution concerned.
- The requirement in the eligibility criteria for the public institution and their academic institutional partner on the research project to develop a joint research plan which is regularly monitored is helping to create sustainable partnerships between academic research communities and public institutions focused on strategic challenges.
- The requirement for applicants to demonstrate how the research project will contribute to strengthening research capacity within the public institution should over the medium-longer term help to develop the public sector’s capacity to deliver innovation.

In terms of lessons learned, one lesson is that there was considerable untapped demand for this type of scheme. According to the scheme manager, many of the topics research that have been supported through the scheme that have been identified as being important to public sector institutions in Norway “flew under the radar previously”.

4.4. **Assessment of replicability / transferability**

Since there is growing interest in the role of high quality researchers in addressing the strategic problems faced by different types of public sector institutions, this scheme could be replicated in other EU countries.

4.5. **Framework conditions**

Over the longer term, it was emphasised that schemes such as OFFPHD have an important role to play in promoting cultural changes in mind-set: Within the **public sector**, there is a need to recognise the importance of research and innovation in addressing organisational and societal challenges as well as those relating to public service delivery. Research also has an important role to play in addressing strategic policy issues. Academic treatment and knowledge can be applied to public sector problems.

Within **academic research communities**, it is also crucial to promote attitudinal changes since too little attention has been given previously either in Norway or in many other EU countries, among HEIs to the strategic role that applied research and knowledge transfer can play in improving the capacity of the public sector to use research as a change agent and to deliver innovation.

5 CASE STUDY 4 - MOBILITY BY RESEARCHER TARGET GROUP, TOOLS AND INCENTIVES (FOCUS ON R3 AND R4) - PART 1.

5.1. Introduction - type of mobility in focus

This case study is related to the special characteristics of ISM schemes aimed at researchers with substantial professional experience. Experienced researchers (R3/R4) at a mature stage of their research and scientific career are a targets of some ISM schemes, but this group is targeted less often than schemes for researchers in the early stages of their professional career.

Experienced researchers can be defined as researchers with at least 4 years post-doctoral experience (R3). The term also relates to professors and leading researchers (R4), leading in a research area or field e.g. the team leader of a research group or head of an industry R&D laboratory. Researchers at this stage in their career are expected to have an international reputation based on research excellence in their field, to demonstrate critical judgment in the identification and execution of research activities and make a substantial contribution (breakthroughs) to their research field or span multiple areas.

ISM schemes related to the experienced researchers target group contribute significantly to the intersectoral transfer of specialized knowledge given their substantial research experience. A limited number of ISM schemes target the mobility of experienced researchers from industry to academia, and schemes supporting mobility and knowledge transfer from academia to industry have also been identified. It is notable that ISM schemes involving mobility from industry to academia are more common in countries which are innovation leaders on the European Innovation Scoreboard, such as several Scandinavian countries and the UK.

In the course of their academic career, many experienced researchers have previously made the transition to work in non-academic sectors. Subsequently, at R3 and R4 level, this kind of scheme provides an opportunity to return to academia and to bring their business skills to educational programmes, or innovation skills to R&D focused labs. This can be done through part-time appointments, endowed chairs, or full-time employment.

Experienced researchers who are employed through ISM schemes at an academic institution are more likely to consider cooperation with the industrial sector to be an important means of broadening their research experience. They are more likely to have an applied orientation in their work and to have the objective of creating a spin-off or applying for a patent. There is evidence of the growing emergence of collaborative research projects between academia, publicly-funded research and industry, often focused on the development of technologies and innovations with high Technology Readiness Levels (TRL) (e.g. TRL 6, 7 or 8) which involve 'close to the market' demonstration projects and the development of prototypes, etc. Arguably, experienced researchers are especially well placed to take advantage of such projects being research leaders in their respective fields and sometimes having strong credibility in both academia and industry.

5.1.1. Rationale for setting up schemes

Experienced researchers are a group which contribute to the knowledge flow within the economy. There are a number of reasons why ISM schemes targeting this group are being set up:

- There is a growing interest in industry and academia in undertaking **joint collaborative research** to foster the development of sustainable relationships between researchers and enterprises. This helps to promote mobility of experienced researchers who are well placed to ensure the formation of sustainable cooperation arrangements between academia and industry. Moreover this target group is well-placed to develop and implement research projects that lead to products being brought to the market;
- Research results are often developed into **innovation outcomes outside the academic environment** (e.g. by TTOs and through university spin-offs, through technology incubators associated with universities and research institutes and through ISM). Experienced researchers are arguably in a stronger position to set up spin-offs than younger, early-stage researchers (given their extensive research experience it may be easier to raise funding). However, some ISM schemes also allow R1 and R2 researchers to set up spin-offs (e.g. ETH Zurich);

- From a national policy perspective, schemes to promote ISM of experienced researchers can **strengthen the 'knowledge triangle'** i.e. the interaction between higher education, research and industry through increased collaboration between universities and industry. The involvement of experienced researchers in ISM schemes may bring benefits related to their significant knowledge in their field of research specialisation, but also in relation to research process organisation and management.
- ISM schemes that target experienced researchers moving from academia to industry expect to bring innovation to the market. They may also: (i) solve a particular problem in industry, (ii) meet specific policy objectives of the government, or (iii) conduct a research project that is "close to the market".

5.1.2. Drivers and obstacles of ISM

The main **drivers** of ISM focused on experienced researchers are as follows:

- **Interest in pursuing a specific research project that would be difficult to pursue within an academic environment.** Some research projects pursue commercial objectives, and involve transferring knowledge and new innovations to the marketplace. Whilst in principle it is possible to conduct such projects whilst remaining within a research environment, it can be difficult to do so (for instance because the university encourages spin-off creation, and for licensing and IPR reasons, it may be more appropriate to support such research projects through mechanisms that allow research to take place through the use of flexible mechanisms and structures at arms-length from the university itself). Some researchers are looking for innovative structures to enable them to bridge the gap between industry and research.

The main **obstacles** of ISM focused on experienced researchers include:

- Compared with earlier stage researchers, the experienced researchers (R3 and R4) group's **individual careers are better-established and more settled, underpinned by a permanent employment contract and academic and teaching commitments.** This may increase the perception of personal or professional risk related to a change of current position. One risk is related to difficulties of going back into academia after time spent working in industry. The researchers' perception is that if a mobility experience involves leaving academia for more than 12 months, it may be very difficult to return to academia unless intersectoral mobility experiences are explicitly recognised within career appraisal systems.
- Issues related to the **lack of formal recognition and accreditation** of time spent in industry were identified through the research. Whilst in some EU countries academic institutions recognise the importance of their researchers participating in ISM, in other countries there is a lack of an appropriate framework in place, and there are difficulties in getting time spent in industry formally recognised in career appraisal systems. This affects experienced researchers, not only early-stage researchers.
- However, this is not seen as a problem for the most prestigious schemes. Industrial scientists securing places on the IF scheme run by the Royal Society viewed their successful application for the scheme as a **recognition of their scientific credibility.** It has been used as a stepping stone for some industrial scientists to transition into academic roles (and vice versa), which would have been much more difficult without the fellowship.
- **Funding uncertainties and financial considerations for researchers** – although funding to facilitate ISM is available for leading researchers in some countries, there is evidence of funding discontinuity of some national schemes. This may dissuade some prospective participants. Examples have been identified in the country level analysis of a reluctance among some researchers to participate in ISM unless there is greater funding certainty.
- **Low prestige related to work for industry** – this can be observed in some countries from the perspective of experienced researchers employed in academic institutions. Stress on basic research work and scientific publications may cause the period of work in industry to be perceived as a lack of opportunity to publish.

5.1.3. National support for mobility of experienced researchers

Whereas the second part of this case study focuses on the **Royal Society's Industrial Fellowship Grants Scheme**, in this section, a number of national schemes are provided as further examples of intersectoral mobility schemes that focus on experienced researchers:

- Strategisk Mobilitet (strategic mobility) is the scheme run by the Swedish Foundation for Strategic Research (Sweden);
- "Entrepreneur in residence" scheme run by the Royal Society (UK);
- Dual Professor concept (Norway);
- Industrial Liaison Scheme at Ghent University (Belgium);
- SoMoPro international researchers' mobility programme supported by MSCA-COFUND programme (Czech Republic); and
- The President of Ireland Future Research Leaders programme (Ireland).
- In addition, many companies have set up their own schemes either to support their staff to work in universities or to second experienced academics into companies. An example from the pharmaceuticals area is run by Astra Zeneca²⁶, but there are others that exist.

A finding in previous studies such as MORE2²⁷ was that the **number of mobility schemes for experienced researchers is more limited** than for early-stage researchers. This may reflect the fact that the obstacles to taking part in mobility described above become more pronounced as an individual's career progresses. Intersectoral mobility experiences may also be encouraged at the early career stage because of an increasing expectation that the majority of PhDs and post-doctoral researchers won't go into academic careers.

Schemes targeted at experienced researchers are nevertheless regarded as highly prestigious since they contribute to enhancing the professional development of experienced and lead researchers and help to spread their reputation in a particular discipline (e.g. the Future Research Leaders programme in Ireland and the Industrial Fellowships scheme in the UK). At a more mature stage of career development, a considerable number of researchers have already made the transition to the non-academic sectors, so many ISM schemes provide an opportunity to return to academia and bring business skills to educational programmes, or innovation skills to R&D-focused labs. However, for researchers employed in academia, ISM schemes allow the possibility of undertaking collaborative research close to the commercialisation stage.

Examples of the specific characteristics of ISM schemes targeted at experienced researchers are now provided. In particular, the analysis focuses on a number of the features that are typical for experienced researchers in ISM schemes. The following features of ISM schemes will be presented:

1. Schemes that provide a flexible combination of work in industry and academia;
2. Schemes that make a contribution to enhancing the reputation of researchers and organisations participating in ISM;
3. The small size of many schemes in terms of their funding and the number of participants; and
4. Researchers' mobility from academia-to-industry and from industry-academia, as well as bi-directional schemes.

Bi-directional researcher mobility (university-industry and industry-university) is a feature of ISM schemes for experienced researchers, such as the IF scheme, examined in detail in the next section and the Strategisk Mobilitet scheme in Sweden. Scheme managers for the latter scheme have found that it is much easier to obtain applications from large enterprises than from SMEs. For example, one of the largest corporations in Sweden submits around 5 applications every year (approx. 20% of the total number) since this is perceived this as being part of its internal researcher mobility strategy.

However, not all schemes are bi-directional. ISM schemes targeted at **experienced researchers** have sometime been **adapted to address distinct needs**, for instance, ensuring that such schemes allow sufficient flexibility to combine ongoing academic responsibilities with undertaking a mobility experience in industry.

A flexible combination of work in industry and academia allows the possibility of sharing the researcher's time between two sectors. This means that researchers do not leave their work

²⁶ <https://careers.astrazeneca.com/students/programmes/post-doctoral-programmes>

²⁷ MORE2 Study on Mobility Patterns and Career Paths of Researchers, 2013 - <https://euraxess.ec.europa.eu/content/more2-study-mobility-patterns-and-career-paths-researchers-2013>

permanently and they don't have to commit to just one sector. This may lower the perception of personal or professional risk related to a change of current (established) position and allows temporary work in different research conditions and different projects.

An example of combining industry and academic work is the case of the **Dual Professor concept** in Norway. This consists of part-time positions in academia. By combining two different jobs, these academics continuously bring innovation skills into academia, maintain access to new knowledge, and act as intermediaries for academia-industry relations. Denmark has similar schemes which allow professors to teach part-time in a university or work for research institutes.

Another example of a flexible ISM scheme is the new **"Entrepreneur in Residence" scheme** in the UK being launched by the Royal Society, which is offering up to £40,000 over 2 years for experienced industry scientists and entrepreneurs to spend 20% of their time in a UK university. This aims to increase knowledge and awareness in UK Universities about cutting-edge industrial science, research and innovation.

In the case of the **Swedish scheme Strategisk Mobilitet**, the assumption is that the exchange period should be equivalent to four to twelve months working full time in another sector (academia or industry) than the one in which the person is currently active. It is necessary that the person doing the sabbatical returns to the original institution, thus the knowledge exchange goes both ways. However, the exchange may be divided into different periods. The grant holder may also work part-time during his/her stay, but not more than for a period of two years. The limitation²⁸ is that visiting researchers with part-time appointments of 25% or less (e.g. one day a week) will be accorded lower priority than those who devote more time to the exchange (e.g. half-time for a period of one year or full-time for six months).

Funding support for mobile researchers which covers the researcher's salary during the mobility period is a common feature of ISM schemes targeting experienced researchers. In the **Strategisk Mobilitet scheme in Sweden** mentioned earlier, funding may be provided for the researcher's salary during the mobility period and additionally limited funding is possible for travel expenses, the costs of maintaining a dual residence during the mobility period, etc. The maximum possible single grant amounts to €150,000 (SEK 1.5 million), which includes overheads, of which no more than €10,000 (SEK 100,000) is for other costs. Overheads are applicable when the host organization is a Swedish higher education institution, which provides an additional incentive for university participation in the scheme. A similar solution in terms of salary and mobility costs are also used in SoMoPro scheme.

National ISM schemes have also helped to strengthen the reputation of experienced researchers and of the organisations taking part in such schemes. From a researcher perspective, taking part in a mobility experience is a means of strengthening networks and enhancing the professional career development process. Gaining further professional prestige was identified as one of the most important factors behind the decision to apply for a Fellowship grant²⁹ for the **Royal Society's Industrial Fellowship Grants Scheme**. The President of Ireland's **Future Research Leaders' programme** similarly tries to communicate high prestige, by associating the scheme with the country's Head of State. This encourages participation and helps to change the perception that moving from academia to industry (and vice versa) is a step back in a researcher's career. On the other hand, the reputational issue can be recognised by the academic institution which participate in the scheme, as source of additional value related to promotion and visibility³⁰.

Several examples of schemes were identified that **mainly or exclusively involve mobility from industry to academia**. Examples are the **Dual Professor concept in Norway**, which consists of part-time positions in academia and the **Industrial Liaison Scheme at Ghent University (Belgium)**. Under this scheme, various research teams and departments having a particular expertise join forces to hire a business developer with industry experience to lead the consortium

²⁸ See more on http://stratresearch.se/app/uploads/sm14_en.pdf

²⁹ <https://royalsociety.org/grants-schemes-awards/grants/industry-fellowship/gavin-andrews/>

³⁰ <https://royalsociety.org/grants-schemes-awards/grants/industry-fellowship/gavin-andrews/>

or to scout for development potential. Quite often, these developers are PhD graduates from the same university who have acquired a number of years' work experience in industry, and are recruited back into academia at R3 or R4 level. As a business developer, they rarely engage in research themselves but are the intermediary for business contacts, the trainer for entrepreneurship, or the R&D manager facilitating patent application.

Although most schemes aimed at experienced researchers identified were national schemes, a limited number of schemes were identified that support **both international and intersectoral mobility** from industry to academia. Examples are the **SoMoPro scheme in Czech Republic** supported by the MSCA-COFUND programme, which allows international industry researchers to be recruited to work at Czech research institutions. The scheme covers the costs of the salary at the university and also covers the costs of relocation. The President of Ireland Future Research Leaders' programme attracts outstanding academic or industry researchers from outside of Ireland to Irish universities, and expects relationship-building with industry to follow from the award. Such schemes involve an international not only an intersectoral dimension in order to bring in specific expertise that might not be available in the country concerned, for example, due to the country being small, or due to there being a lack of experience of more commercial approaches to research.

5.1.4. Case study 4 – Focus on the Royal Society Industrial Fellowship ("IF") Scheme.

The second part of this case study focuses on the **Royal Society Industrial Fellowship ("IF") Scheme** in the UK³¹, but makes reference to other relevant ISM schemes as and when appropriate. The rationale for selecting this scheme is firstly that it involves bi-directional mobility and targets experienced academic and industrial researchers. Secondly, the scheme has been in operation for more than 20 years, which means that there is a sufficient critical mass of graduates to make it evaluable. Case studies have also been produced to showcase researchers' career progression and interactive videos have been used in order to disseminate information about outcomes³². Thirdly, it provides an interesting example of an ISM scheme that has succeeded in attracting private sector funding through corporate sponsorship.

5.1.5. Scheme design and set-up phase

The IF scheme aims to enhance knowledge transfer in science and technology between industry and academia. The IF scheme is targeted at academic scientists who want to work on a collaborative project with industry and for scientists working in industry seeking to work on collaborative research projects with an academia. The IF scheme provides grants to fellows with a permanent post in either a UK university, a not-for-profit research organisation or in UK industry, and for persons who are at a stage in their career when they would benefit from establishing new, or strengthening existing personal and corporate links between the two sectors. Most, but not all IFs have PhDs, but it is not a pre-requisite qualification for the programme since equivalent level of experience is also accepted.

Since the scheme is targeted at experienced researchers/ lead researchers and is highly selective, the research being undertaken is often **cutting-edge and contributes to scientific thinking in emerging disciplines**. For instance, an industry recipient was recently awarded an Industry Fellowship to work on "Fundamental studies of boiling in nuclear reactors" with Imperial College London. A further fellowship awardee from industry won a fellowship to carry out research into "Optimised electrical machines through additive layer manufacturing". A third example from industry was an environmental research from industry doing a PhD in "Next Generation Auralisation for Architectural and Environmental Acoustic Design".

Regarding **eligibility requirements**, applicants must have a PhD or be of equivalent standing in their profession. They must also hold a permanent post in a university, not-for-profit research organisation or work in industry in the UK or be at a stage in their career when they would benefit from establishing or strengthening personal or corporate links between academia and industry as a

³¹ <https://royalsociety.org/grants-schemes-awards/grants/industry-fellowship/>

³² Idem.

foundation for long-term collaboration and development. Applications that involve small companies are particularly encouraged.

In relation to the **application process**, applications have to be submitted through the Society's grant management system Flexi-Grant. Applications are initially assessed by Industry Fellowship panel members and a shortlist is drawn up. Shortlisted applications are then sent for independent review and are finally considered at a panel meeting, together with their nominated and independent references. Regarding the timing between the application being submitted and a decision made following the selection procedure, typically, applicants are notified of the outcome of their application 4 months after the closing date.

There are two rounds per year and 5-6 fellows are selected in each round. At any one time, there are approximately 35-40 industry fellows in post which means that approximately 200 fellows have taken part in the scheme over 15 years. Since there are only a small number of places available, the scheme attracts significantly more applicants than there are places available. The more competitive the IF scheme has become, only those applications of the highest quality (from the pool of those received) are funded. The Royal Society would ideally like to increase the number of IF fellows if more funding were available.

In terms of the **direction of mobility**, on average, since the scheme's inception, approximately 70% of the participants in the IF scheme move from academia to industry, whilst 30% move from industry to academia, although this depends on the number and quality of applications in a given year, since there are no fixed shares relating to the direction of mobility.

5.1.6. Scheme funding and incentives

The scheme is funded by the Royal Society, with some financial support from Rolls-Royce, although disaggregated data on the respective funding shares is not available.

The IF scheme provides a basic salary for the researcher and a contribution towards research costs. Only the research fellow's basic salary will be paid during the secondment and the employing institution continues to pay national insurance and pension contributions. The scheme fosters collaborative research projects between academic institutes and industrial partners. Research expenses may be claimed up to the value of £2,000 (€2,200) per year.

5.1.7. Scheme management and implementation

The scheme is managed by the Royal Society. Fellows can be hosted by an academic institution or in industry, and should be partnered with an industrial or academic partner accordingly. The forms of combination of the work at home and hosting institutions may differ, but the application must state the mutual benefit of the fellowship to both organisations and the collaborative elements of the project. Fellows may work either 50% part time (for the period 4 years) or full time (2 years) e.g. on the secondment.

The relatively small number of participants in each application round makes the scheme easier to manage, for example by facilitating the organisation of training and workshops for Fellows. This makes it easier to establish contacts between new and former Fellows, which creates professional networking opportunities. The scheme size is broadly comparable with other schemes, such as the Swedish scheme Strategisk Mobilitet, which operates nationwide where the number of Fellows funded is also limited. The Swedish schemes tends to receive about 40 applications per year and funding is provided to around 15 applicants.

5.1.8. Support structures

Supervisory support structures are less relevant for experienced researchers and lead researchers compared with their more junior counterparts. However, it was nevertheless seen as important that the Royal Society puts in place an overall framework to support Fellows taking part in the IF programme. It organises a number of events for instance for both former Fellows and new Fellows in order to promote the sharing of experiences and to provide networking opportunities. In addition, the Royal Society organises supplementary training sessions.

5.1.9. Training and skills provision

Fellowship holders join the wider community of funded scientists from across all mobility schemes. They then gain access to a range of training courses to foster their professional development, such as: a media-training course, courses examining the relationship between science and industry: Science and the Economy and Scientific Entrepreneurship, and a training course on Innovation and entrepreneurship. Fellows are also able to gain access to the Royal Society library.

5.1.10. Scheme outcomes, monitoring and evaluation

The scheme overall is evaluated based upon the impacts it has achieved as a whole – follow-on funding, long-term collaborations, IP, publications and the more qualitative impacts on people's careers. Since the scheme has been operating for more than 15 years, it has been subject to an external evaluation undertaken by a third party research consultancy and commissioned by the Royal Society. The evaluation report has not however been made public, but the findings are fed through the Society's reporting structure and any accepted recommendations are then implemented.

A benchmarking analysis was also undertaken by the Royal Society to compare the performance of early-stage fellowship schemes with later-stage fellowship schemes such as the IF programme found that the IF has been successful in promoting commercialisation, with proportionately more successful academic-industry collaborations, patents registered, and new products brought to market compared with academics of a similar calibre that had not taken part in the scheme. Although Fellows who participated in the IF scheme were found to be publishing slightly fewer academic publications, this has not prevented them from continuing to develop and maintain their academic career but with evidence that some Fellows have also achieved success in commercialising research.

The Royal Society attested to some of the benefits of the scheme. It commented that "IFs have either been employed by, or hosted at over 40 universities and about 100 companies since 2003, and the applicants are more distributed across the UK HE sector compared to purely academic funding schemes (in terms of both university mission group and location).

A number of benefits of being an Industrial Fellow were identified by senior academic and industrial researchers having participated in the scheme. The main benefits identified were as follows:

- **Networking opportunities** – IF Fellows are invited to attend Royal Society events which allow them to network with other Fellows and leading researchers in academia and industry.
- **A strengthened reputation for research and scientific excellence** – partly through the research itself and through networking, examples were identified where Fellows have been able to engage in research projects with industrial partners, and to forge strong links with academic groups in particular fields as a direct result of being an IF Fellow.
- **Enhanced professional development** – participating in the IF Fellowship Scheme was seen as highly prestigious for experienced researchers. The training received was identified as having contributed to strengthening professional development.
- **The strengthening of academic-industry collaboration and ensuring that there is a sustainable legacy.** Examples of outcomes from participation in the IF scheme are:
 - The development of **stronger networks of researchers** from both sectors to address key industrial problems.
 - The submission of a number of **joint research grant applications** were submitted by IF Fellows both from academia and industry for new projects taking place outside the IF scheme as a follow up. This is also in keeping with a shift in UK R&D&I funding approaches, with some government research funding being explicitly earmarked for industry-academic collaboration.
 - The development of **joint research publications** as a result of collaboration which would otherwise have been difficult in an industrial research environment.
- **Improvements in academic teaching** - gaining hands-on experience in an industrial research setting has led to improvements in teaching once back in academic, for example, through a greater focus on research-led teaching approaches.
- **The opportunity to carry out research in new and innovative areas, and to foster the commercialisation of new products, services and technologies over the medium term.**

As a result of the visibility of research projects taking place within the context of an excellence scheme, this has enabled some researchers to attract further collaborators to develop and commercialise future products.

- **Obtaining further research funding** – some IF holders have subsequently obtained further grants directly as a result of earlier research carried out during the IF.

The benefits should also be examined from the point of view of **funding organisations**. For the Royal Society itself, the IF scheme has become well known and is seen as highly prestigious. It has also served as a testing ground in that experiences gained from the design and set-up of the ISM scheme and from its implementation over 20 years have been used to inform the development of further new pilot ISM schemes, notably the Entrepreneur in Residence Scheme, mentioned earlier in this case study).

The close involvement of a major funder, Rolls Royce, has been an effective mechanism to strengthen collaboration between participant universities and industry. Indeed, several academics have carried out their mobility period at Rolls Royce and the company has also allowed some of its senior industry researchers to carry out research in an academic setting.

5.2. Lessons learned and key challenges

Among the **lessons learned and challenges** of taking part in the scheme from the perspective of experienced academic researchers was that of "balancing academic responsibilities and research" since at this stage in career development, there are major expectations on academic researchers to continue publishing academic publications.

A further lesson was that combining work at two different organisations (for example, an academic institution and a company) can create practical challenges, such as geographic considerations. These need to be taken into account, since many industry fellows work for host organisations that are not local to their current employer or where they live, which has implications in terms of travel time and costs, time away from home/family etc.

In terms of the challenges identified, participation in ISM schemes may sometimes be perceived as a factor disrupting the current professional development of experienced researchers with an established individual career. This may be considered a challenge for this kind of scheme and recruitment of relevant candidates seems to be one of the key issues. The problem arises from elements such as the application procedure, including the evaluation of applications which is important in ensuring a good quality of applicants. The following activities facilitating the identification of suitable candidates can be identified 1) effective communication of the benefits, 2) communication with possible organisational partners and 3) Fellowship networking.

Effective communication of the benefits of participation.

It is crucial to increase potential applicants' awareness of the different personal benefits arising from cooperation with industry/academia. Since the target group is very much aware of possible obstacles (especially related to lowering the publication activity of university researchers), it is important to broaden understanding of possible benefits among target group. As an example we may indicate the Royal Society which disseminates information on the outcomes of participation in the ISM scheme, such as promoting professionalization and the development of researcher careers including citing cases of the successful career flexibility of particular researchers. The Royal Society's ISM scheme outcomes promotion takes the form of short online descriptions of career development with a chart showing the researchers' work for different sectors and video case studies of former grant fellows. Two case studies have been produced showcasing researchers' career progression. These are:

- Changing expectations – this project looks at research culture more broadly, with a series of case studies of researchers whose careers have spanned research and other sectors - <https://royalsociety.org/topics-policy/projects/research-culture/changing-expectations/>

- Pushing the revolving door – looks at ten individuals who have moved between academia and industry - <https://royalsociety.org/topics-policy/industry-innovation/case-studies/pushing-the-revolving-door/>

Not all these case studies are of individuals who have been on the industry fellowship. The focus is instead on highlighting ISM more broadly to reflect on research culture and careers and the benefits in terms of collaboration and innovation. A series of case studies specifically about IFs will be published in March 2018.

One of the interesting findings from the case studies and information provided about the impact of the fellowship grants on the Royal Society website is that whilst there are some common benefits for all Fellows of participating, the precise nature of the perceived benefits is specific to each Fellow, depending on their specific area of expertise.

Communication with possible organisational partners.

This includes activities related to establishing and maintaining communication with external organisations which may be the sources of ISM scheme applicants. Their understanding of the benefits may be diminished by the stance of certain organisations that do not envisage employees' participation in ISM activity. One of the solutions in such cases is to put a strong emphasis on the prestige and promotional opportunities related to employees' participation in the scheme. This can be easily recognizable from the organisation point of view.

Fellowship networking.

The Royal Society's Industrial Fellowship Grants Scheme provides an opportunity for recently recruited fellows to contact more experienced fellows through Royal Society events and courses. This supports personal knowledge transfer of experience gained in the course of an ISM project. It is a part of the process of participation in the project, but also creates additional professional networking opportunities.

One of the former Fellows, a senior university lecturer and researcher who took part in a mobility period in the pharmaceutical industry pointed to a number of different ways in which cooperation has been sustainable beyond taking part in the Industrial Fellowship Programme. The Fellow commented in relation to the relationship with the company where he spent his Fellowship as follows: *"We are still in contact and have secured additional funding for PhD students that were involved in the work as part of the fellowship and have made ongoing inputs to their research projects. Where possible, I continue to involve colleagues at the company in aspects of work relating to the fellowship."*³³

A number of good practices were identified by ISM scheme managers:

- **The importance of being flexible in setting eligibility criteria** – for instance in respect of subject disciplines - was emphasised as a critical success factor in many industry-academia schemes. The IF scheme covers a broad range of disciplines across the life and physical sciences, including engineering, but excluding clinical medicine. A broad range of industry sectors have been supported, covering for example the automotive sector, additive manufacturing (3D printing), research into new materials, the energy sector (oil and gas) through to the creative arts.
- **The need to ensure that collaborative relationships are sustainable** - the period of collaboration between academia and industry (irrespective of the direction of mobility) should be long and intensive enough to establish strong links with the hosting institution and staff and to maintain professional and collaborative links when the fellowship ends. Professional networking should continue beyond the immediate mobility experience through the Fellowship.
- **The flexible approach adopted to adapting scheme design and the implementing arrangements** to overcome difficulties encountered in attracting small businesses (SMEs) to take part. The Royal Society found that there were difficulties for in persuading SMEs to take part in the scheme as full industrial partners, since it meant making a major commitment to

³³ <https://royalsociety.org/grants-schemes-awards/grants/industry-fellowship/gavin-andrews/>

supporting a researcher during a scheme of 2-4 years. Accordingly, new pilot schemes of shorter duration are being designed to run in parallel with the main Industrial Fellowship scheme so as to ensure the necessary flexibility that SMEs need to be able to actively participate in future.

5.3. Assessment of replicability / transferability

The IF scheme has strong replicability potential in other countries. Among the characteristics that could be replicated are:

- **Bidirectional mobility** – making the scheme eligible for both academic and industrial researchers is an effective means of attracting both sectors to participate.
- **The importance of assessing applications on the basis of research merit to promote scientific excellence.** It is also important to recall that each application is evaluated on the strength of the research proposal and its potential impact.
- **The emphasis on growing the scheme's reputation over time and selectivity leading to strong competition for places.** The more selective and prestigious schemes are, the more likely they are to attract high-profile, talented post-doctoral lead researchers and academics, as well as industrial researchers. A high level of selectivity can lead to a virtuous circle whereby the scheme becomes better known and has enhanced visibility over time as it becomes well-established, which then encourages more applications from top-performing researchers.
- **Flexibility in scheme design** – when replicating the scheme in other countries, due attention will need to be paid to the importance of incorporating flexibility into the development of an ISM scheme for more experienced researchers. This applies at two levels, in relation to:
 - **The lead researchers themselves**, who commonly have an established reputation in their field, and who may continue to have professional responsibilities during the period of mobility (i.e. back in academia in the case of academic researchers and at their employer in the case of industrial researchers undertaking mobility in an academic setting).
 - **Ensuring that SMEs are able to participate** – schemes will need to be adapted if they are to be successful.

5.4. Framework conditions

Critical enabling conditions that underpin the success of the IF scheme are:

- A culture of strong cooperation and research collaboration between industry and academia – there is a more longstanding tradition of such collaboration in the UK than in quite a lot of EU countries.
- A willingness among private sector organisations engaged with by the Royal Society to help with funding.

6 CASE STUDY 5 - PREPARATION FOR MOBILITY

6.1. The Case of VITAE in the UK: Introduction and scope

6.1.1. Type of mobility

In terms of numbers, the most significant group of intersectorally mobile researchers are the PhD graduates leaving academia in order to establish a career in R&D intensive industries, in education, in the private non-profit sector, as an entrepreneur, or in a range of other sectors. The case study developed around this group of (not yet) intersectorally mobile researchers is a particular one in the sense that no actual mobility is involved. The schemes looked into in more detail here are those that *prepare* PhD graduates for a future intersectoral mobility experience and *enable* the transition to non-academic sectors. The main scheme under review in this section is Vitae, the organisation for researcher development in the UK, complemented by a number of similar schemes in Europe preparing researchers for ISM-careers.

6.2. Drivers and obstacles of ISM

When drawing up the Lisbon agenda in 2001, the European Commission identified a need to increase the number of researchers in Europe in order to meet the demands of the knowledge economy. In subsequent large-scale monitoring initiatives such as the Innovation Union Scoreboard, increasing the number of doctoral graduates has remained a priority for European Member States. Their universities, funding agencies and governments have met this challenge by increasing the number of bursaries, scholarships and positions for PhD-level research. The EU-average number of new doctoral graduates, for example, increased by 26.7% in the period 2010-2016.³⁴

However, it is not only the increase in the number of researchers that has been a priority. The way researchers are being trained and prepared for their career after completing the PhD degree has been equally remarkable. Due to their rising numbers, these graduates' futures were to be less in academia and more in other sectors of the labour market. The European University Association was the most widespread European organisation to articulate these changes at an early stage. When drawing up the Salzburg Principles on Doctoral Education in 2005, the EUA's members identified this change in their very first principle: "The core component of doctoral training is the advancement of knowledge through original research. At the same time it is recognised that *doctoral training must increasingly meet the needs of an employment market that is wider than academia.*" Logically, the second of the Salzburg Principles stated that doctoral programmes should thus be designed "to meet new challenges and include appropriate professional career development opportunities".³⁵ While intersectoral mobility is not yet a core feature of doctoral programmes, preparation for intersectorally-mobile careers has gradually become a significant component.

The drivers for such career preparation were clear from a knowledge economy point of view. The main obstacle to introducing these principles was the traditional apprenticeship model, the way in which most researchers were being trained in universities. Many academics were reluctant to change this model, out of a fear that a preparation for non-academic careers may dilute the quality standards of PhD-research. Introducing transferable skills training, entrepreneurship training and career development would do little more than distract researchers from what really mattered – the research itself. Since the Lisbon agenda of 2001, much has changed. The Principles for Innovative Doctoral Training, for example, published as a European Commission Communication, identified the "exposure to industry and other relevant employment sectors",

³⁴ https://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards_en "New doctoral graduates per 1000 in the population aged 25-34".

³⁵ http://www.eua.be/eua/jsp/en/upload/Salzburg_Report_final.1129817011146.pdf

including placements and intersectoral work experience as standard practice in the new PhD.³⁶ This clearly went a step further than skills training and ISM-preparation. Nevertheless, the prominence given to transferable skills training in the Bratislava Declaration of Young Researchers of 2016³⁷, and to the lack of mobility between the public and private sectors, highlights the fact that in many EU-countries, early-stage researchers still face the obstacle of traditional training methods unfit for a 21st century research career.

6.3. Rationale for setting up schemes

Vitae has been a membership organisation in the UK since 2015. It is managed by the organisation CRAC, Careers Research and Advisory Centre, established in 1964 as an independent registered charity. Having experience in supporting the transition of doctoral researchers to industry, CRAC ran the UK Research Councils Graduate Schools Programme' from 1968 until 2002 to encourage more doctoral graduates to be more to intersectorally mobile. The "SET for Success" report, better known as the Roberts' Review³⁸, made a strong recommendation for skills training in all PhD training and resulted in an 8-year funding programme for UK universities (2003-2011). In parallel, the UK GRAD Programme, funded by the UK Research Councils, was managed by CRAC from 2003-2007. UK GRAD began to work with research institutions to build sector-wide capacity to deliver high quality development training and opportunities for postgraduate researchers. In 2008, Vitae was established to succeed UK GRAD and its remit extended to include postgraduate researchers. It was jointly funded by the UK Research Councils and the UK Higher Education Funding Bodies. Since 2015, they have been a self-sustaining international membership organisation with over 183 member organisations – most of whom are based in the UK.³⁹

6.4. VITAE: Scheme management and implementation

6.4.1. Scheme design and set-up phase

Vitae covers a broad range of activities: they provide skills training directly to researchers; offer training to trainers and supervisors; carry out in-depth studies of researchers' careers; organise events, conferences and networking activities; and influence the development and implementation of policy. At the core of its researcher development activities is the Vitae **Researcher Development Framework** (RDF), which describes the knowledge, behaviour and attributes of successful researchers. The RDF, and associated online RDF Planner, covers researchers at all stages of their career (R1-R4) and enables researchers to assess their strengths and development needs, and articulate their competencies to potential employers. Most of Vitae's training courses, development tools, mentoring programmes and business exchange activities take the RDF as a starting point to prepare researchers for a broad range of careers and to make well-informed career choices. The schemes focused on in this case study are the training and development initiatives coordinated by Vitae, but the information on funding and management refers to Vitae as a whole. Vitae's focus is on strengthening the employability of researchers both at PhD and postdoctoral levels, on skills training, on collaboration across sectors, and on an increased understanding between labour sector demands and university missions, make Vitae's activities instrumental in preparing researchers for intersectorally mobile careers. Being interviewed, Vitae's Head Dr Janet Metcalfe stated that Vitae works very hard at changing the perception amongst researchers that a career outside academia is at best a plan B.

6.4.2. Scheme funding

Vitae's Organisational membership is based on the number of doctoral and postdoctoral researchers based at the institution. All researchers and staff within these institutions

³⁶https://euraxess.ec.europa.eu/sites/default/files/policy_library/principles_for_innovative_doctoral_training.pdf

³⁷ <http://www.eu2016.sk/data/documents/bratislava-declaration-of-young-researchers-final.pdf>

³⁸ http://webarchive.nationalarchives.gov.uk/http://www.hm-treasury.gov.uk/d/robertsreview_introch1.pdf

³⁹ <https://www.vitae.ac.uk/about-us/our-history>

automatically acquire Vitae membership and can access membership resources. Other organisations with a commitment to the development of researchers, but not employing researchers themselves, are eligible for Affiliate membership. Membership provides access to Vitae's resources, news, policy intelligence, and events. Subscription to Vitae's RDF Planner (described earlier) comes at an additional cost (reduced rate for members), as do some events and conferences. Consultancy services and training services are provided at cost. Through its combination of membership fees, training services, consultancy services and event sponsorship, Vitae is a self-funded not-for-profit organisation.

6.4.3. Scheme management and implementation

Vitae's activities relevant for this case study are their events, training courses and workshops, and its resource library. Most of their events are aimed at those with responsibility for supporting the professional and career development of researchers. Their programme of events is based on input from its members. Although managed by Vitae, member organisations play a key, role in particular in sharing good practices and highlighting recent developments.

Vitae also provides training courses and workshops, specifically designed for researchers, and train the trainer programmes to build sustainable capacity for member organisations. The training provided can take many forms:

- workshops for organisations and their researchers, using an interactive and experiential approach, with optional virtual support
- established programmes for researchers at all stages of their career (R1-R4)
- tailored training programmes to suit particular needs or specific topics, such as "Becoming an enterprising researcher", "A mentoring approach to research supervision", "Building your research profile"
- Train-the-trainer methods which enable an institution to build in-house capabilities and drive innovation in the training of researchers.

Finally, all members acquire access to Vitae's impressive resources library, consisting of a database of good practices, career information brochures based on survey results, stakeholder consultations and in-depth study, and training and development materials for in-house capacity development.

Much of Vitae's material has been developed in partnership with members and other stakeholder organisations. Its membership approach invites continuous development of resources, bottom-up participation, and new ideas for collaboration. From 2004 to 2014 Vitae's UK Regional Hubs provided local support to staff involved in the development of researchers. These hubs no longer exist but Vitae continues to make use of the regional working groups and local relationships established at the time.

6.5. VITAE: Scheme outcomes, monitoring and evaluation

6.5.1. Good practices and lessons learned

Vitae invests a substantial share of its budget on monitoring and evaluation. Some of these reports measure the immediate outcome of Vitae's own activities, but the majority assess the broader outcomes of a changing culture of researcher development.

The Careers in Research Online Survey (CROS) gathers the anonymous views of research staff (postdoctoral researchers) in UK higher education institutions about their experiences, career aspirations and career development opportunities. The Principal Investigators and Research Leaders Survey (PIRLS) gathers anonymous views and experiences from principal investigators in relation to their role as managers and leaders of researchers and research groups. The publication series "What do researchers do?" explores the destinations and career paths of doctoral graduates and how they contribute to society, culture and economy. These reports provide discipline-specific data and infographics, highlighting career destinations, research roles, and occupations. In addition, a large number of case studies, reports and other sources of information about institutional practice in researcher development are provided to Vitae's members, ranging from strategic to practical level.

Particularly useful in mapping the outcomes of researcher development activities was the establishment of the Vitae Impact and Evaluation Group (IEG), a sector-wide working group focussing on the evaluation of the professional development of researchers and researcher careers. It developed the Impact Framework, designed to foster, support and guide existing and new ways of effectively evaluating researcher training and development across the sector.⁴⁰ "Impact" of researcher development is described (and evaluated) at 4 levels:

- Level 0: Foundations: development of infrastructure (programmes, capacity)
- Level 1: Reaction: participant reaction to activity
- Level 2: Learning: attitude-changing, increased skill level
- Level 3: Behaviour: promoting behavioural changes, e.g. self-reflection, skill-awareness
- Level 4: Outcomes: external impact, e.g. better research, improved qualifications

Through regular internal evaluation and monitoring, Vitae fosters a high degree of self-reflexivity, continuous improvement and stakeholder engagement. Its evaluation and impact framework is well-developed.

VITAE's surveys CROS and PIRLS map the various outcomes of researcher development activities. Based on data of the past 10 years, modest progress has been observed in terms of the availability of training programmes, reasonable progress in terms of research culture and an interest in personal development; marked increases in the proportion of researchers undertaking training/CPD on certain themes relating to research and academic practice; however, only slight increases in those undertaking training/CPD in communications, collaboration and team working and, critically, career management – elements which can be crucial in preparing for ISM. Modest progress is observed in the form of higher proportions of research staff who undertake developmental activities, including external interactions, research management and preparation for academic practice.⁴¹

6.5.2. Assessment of replicability / transferability

The framework conditions under which Vitae has developed and currently operates are replicable to other institutions and to other countries. This illustrates the potential of Vitae as a feasible model to introduce on a Europe-wide scale.

However, while Vitae already provides services and membership internationally, both within the EU and beyond, the framework conditions across Europe may not be entirely comparable to those of the UK. Without financial support to establish such a scheme across Europe, and without a national policy context encouraging researcher development as well as a culture of supply-and-demand of/for broadly trained researchers, it is unlikely that many institutions across Europe will be prepared to self-fund training initiatives on such a large scale. With European funding for skills training as leverage, an international network of experts devoted to researcher training and development, modelled on the Vitae example, would seem to be feasible.

Vitae is currently co-ordinating a EURAXESS-funded project 'EURAXIND'⁴² with six partner countries to identify employers' and researchers' needs to support ISM; encourage researchers to consider ISM and provide the EURAXESS network with resources to researchers and engagement with employers.

6.5.3. Framework conditions

The skills mismatch between PhD candidates' potential on the one hand and the needs of industry on the other, was identified as a key problem in Higher Education in the Roberts' Review. This government report gave rise to a substantial ring-fenced budget for skills development for a period of 8 years, provided by the UK government. This helped to create a new culture of holistic PhD

⁴⁰ <https://www2.le.ac.uk/departments/gradschool/about/external/publications/quick-guide.pdf>

⁴¹ <https://www.vitae.ac.uk/vitae-publications/reports/vitae-5-steps-forward-web.pdf>

⁴² https://www.vitae.ac.uk/researcher-careers/euraxess-uk-career-development-centre/euraxind/copy_of_euraxind-increasing-industry-engagment-with-the-euraxess-network

training, improved standards of researcher development and a tighter quality assurance system in third-level education. The policy conditions in the UK have clearly been a strong trigger for the funding, the establishment and the subsequent spread of Vitae.

The pilot funding in response to this policy context created the ideal framework conditions for an organisation such as Vitae to survive on a self-funded basis:

- a **holistic culture of PhD training** across UK Higher Education Institutions, convincing many stakeholders of the benefits of this new approach and removing much of the reluctance against time spent on skills development;
- a **national/regional network** of academic and non-academic institutions sharing a concern for adequate training and demonstrating a willingness to cooperate;
- a **demand on the side of early-career researchers** to be provided with training and development opportunities;
- an **expectation on the side of employers** to be able to hire graduates with high employability skills;
- **expertise and experience** developed over many years to provide training facilities of the highest standard;
- a substantial number of higher education institutions **prepared to invest** in researcher development out of their own funds;
- an ambitious, well-organised and well-managed **business plan**; and
- a **close link with policy makers** in the national government (Department for Business, Energy & Industrial Strategy), in funding agencies (Research Councils UK) and internationally (Vitae is the UK's Euraxess Career Development Centre and is highly prominent in European Commission Advisory Groups and Working Groups). Vitae manages the UK process for the HR Excellence in Research Award.

6.6. Similar models in different countries

6.6.1. The case of ABG in France

The Vitae model is unique in its design, structural organisation and range of activities, but similar schemes exist in other countries that cover some of Vitae's activities, or combine Vitae's training and development components with other activities.

The **French Association Bernard Gregory (ABG)** is a non-profit organisation dedicated to bridge the academic and private sectors.⁴³ It was established in 1980 to support the professional development of doctorate holders, increase the innovation capacity of business enterprises and to provide better outcomes for the competencies acquired through research, originally based on the CRAC training model. It was named after the renowned French Scientist Bernard Gregory who had set up a task force on career opportunities for scientists with research training, shortly before he died. Its board of trustees consists of delegates from companies, institutes of higher education, research institutes and associations. Any individual or organisation can become a member of ABG.

ABG focuses on raising awareness (to both PhDs and Industry) of the complementarity between the two worlds and the opportunities to collaborate. Similar to the RDF in the UK, French researchers can make use of a **skills framework, MyDocPro**, to map their individual progress, to identify areas of development in terms of their employability, and learn to speak the same language as (future) employers in other sectors.⁴⁴ The skills framework website presents a wide range of success stories and role models.

ABG receives funding for its activities from the French Fond National de Recherche (FNR) as well as from individual universities, but mainly on an ad hoc basis. Despite the fact that stakeholders and participants are engaged in sharing experiences on skills development, ISM appears not to be at the top of the priority list for partners and funders. Private companies and industry partners are

⁴³ <https://www.abg.asso.fr/en/>

⁴⁴ <http://www.mydocpro.org/fr>

keen to participate in activities, in particular in sectors with a crucial demand for talent. For them, engaging in activities with ABG's activities may be a shortcut to hiring high-potentials.

More so than Vitae, ABG's focus has been very much on intersectoral mobility, and in particular on bridging language barriers between the corporate world and academia. It promotes the idea that PhD-holders are professionals who have acquired all the competencies and people skills needed to meet the needs of the corporate world. As such, the organisation facilitates communication between PhD-holders seeking new career opportunities, and recruitment officers.

Just like Vitae, ABG provides information to researchers, provides workshops, group trainings and individual trainings, and develops tools around skills assessment and skills transferability. Any differences lie in the fact that it focuses more explicitly on the preparation for non-academic careers and includes in its range of activities various networking events. These are designed to bring researchers into direct contact with industry, and to facilitate intersectoral mobility experiences to early-career researchers. Its website includes a matchmaking platform for PhD researchers seeking industry placements, private companies keen to hire research graduates, and academic institutions looking for PhD candidates. Over the past 30 years its activities have developed from a national to an international focus.

Due to a more limited policy context and more limited funds than Vitae, its main drivers tend to be bottom-up rather than top-down: researchers are keen to receive practical information on career possibilities and paths; are worried over the lack of academic career opportunities; are excited about more practical outcomes for their research in industry, better job security, higher pay and better contracts, as well as a more challenging and fast-paced environment than academia.

The key obstacles for ABG's activities are the lack of familiarity amongst many researchers of these drivers and therefore the lack of interest in finding out more about other sectors. Sustainable funding is an additional limitation to its activities, as a result of which ABG's activities mainly targeted those who are already converted to its ideas. ABG's internal monitoring activities are based around internal surveys and immediate feedback from participants.

In terms of replicability at European level, there is some overlap between ABG's matchmaking platform and the Euraxess website: they both provide job offers and career information to (early-stage) researchers. There is also an overlap between ABG's training capacity and Vitae's training provision, with those of ABG targeting intersectoral mobility more directly than those organised by Vitae.

6.6.2. *The case of "OJO" in Flanders*

OJO is the abbreviation for "**Omkadering voor Jonge Onderzoekers**" (Support for young researchers), the 4M€ per year funding programme of the Flemish government specifically designed to support activities which enhance the training and employability of researchers.⁴⁵ The funding decision followed the bottom-up initiative of setting up Doctoral Schools at the Flemish universities, a process which had already started a number of years before.

The OJO funding scheme was launched in 2011; its annual budget is divided amongst the five Flemish universities on the basis of an allocation key. Capacity-based indicators (number of researchers) and output indicators (number of PhD degrees awarded) more or less define each institution's funding share.

Each institution manages its own budget and can use it to cover field-specific training activities, transferable skills programmes, entrepreneurship initiatives, career fairs and similar events, as well as the operational costs of running one or more doctoral schools – whether organised internally or outsourced to external experts. At least 25% of this budget must be spent in collaboration with the other universities. This way the OJO funding programme respects the university's autonomy in running their own doctoral schools, but its conditions for spending set clear priorities. A specific link is made with the **European Charter for Researchers** and the **Code of Conduct for the Recruitment of Researchers** and the **Innovative Doctoral Training**

⁴⁵<https://data-onderwijs.vlaanderen.be/edulex/inhoudstafel.aspx?docid=14545>

Principles. Possible activities which can be funded with this budget are: skills training and development (including research integrity, gender equality and interdisciplinarity), career development and employability (including entrepreneurship and intersectoral collaboration but not explicitly intersectoral mobility), and the international dimension of a researcher's career.

The Flemish universities have set up an interuniversity working group under the auspices of the VLIR, the Flemish Rector's conference, to exchange good practices, share experiences and organise joint activities. Each university monitors its own activities in an annual report submitted to the government. An external evaluation is taking place in 2018.

The OJO training and development scheme is simple and hands-on in its set-up. Its management cost is limited as the scheme is closely embedded within the institution's already present (and possibly different) management structures. As its implementation was strongly driven by bottom-up interests, the OJO scheme managed to 'gently steer' the universities towards focusing on more holistic research career development facilities for doctoral and postdoctoral researchers, by providing an additional layer of funding.

The OJO scheme's lean management approach, its flexible implementation and its link with the national/regional rector's conference make it particularly replicable on a European scale. Framework conditions such as a focus on the Charter and Code and the Innovative Doctoral Training Principles could be guaranteed through co-funding requirements. An already-present bottom-up drive amongst participating institutions to provide quality training for doctoral and postdoctoral researchers remains an important framework condition. The intense level of inter-institutional collaboration in Flanders may be hard to realise across a wider geographical space. Nevertheless, a small but strong international collaborative component could be an asset to a pan-European scheme.

6.6.3. *The case of MSCA's focus on training and development throughout Europe*

The funding requirements for participation in MSCA schemes – either as an Individual Training Network (ITN), as a host organisation for an Individual Fellowship or as a partner organisation in Cofund – emphasise training and development provisions for early-stage researchers, a career development plan for researchers alongside facilities for international and intersectoral mobility. Organisations that participated in any of these roles in MSCA projects and that did not already provide training and development for researchers, thus developed in-house capacity, experienced the benefits of training and development, and moved towards a research environment in which intersectoral mobility is considered a valuable career move. Such involvement in MSCA also changed the minds of some who were initially apprehensive about the benefits of taking time out from pure research to invest in training and development.

Several examples collected during this study that focused on the preparation for participation in an ISM experience and the enabling of ISM were MSCA-funded. For example:

- The **Irish Research Council's CAROLINE MSCA COFUND** emphasises collaboration between academic and non-academic sectors, but the Council itself hosts research and career training programmes for its postdoctoral researchers so they can develop their communication skills, improve stakeholder engagement and enhance their research impact.⁴⁶
- The **Czech SoMoPro scheme**, supported under MSCA COFUND, requires host organisations to provide participant researchers with adequate training and career development opportunities.⁴⁷
- Vinnova, Sweden's innovation agency, developed its "**Mobility for Growth**" programme through MSCA COFUND. Its focus is on creating an enriching collaborative research environment in order to maximise postdoctoral researchers' potential. The programme intends to advance training and skills demand by enhanced human resource management, promoting equal opportunities and supporting international and intersectoral mobility as a merit.⁴⁸

⁴⁶ <http://research.ie/funding/caroline2/information-for-applicants/>

⁴⁷ <http://www.icmm.cz/en/somopro.html>

⁴⁸ <https://www.vinnova.se/en/m/mobility-for-growth/>

- The **MSCA-cofunded Brain Circulation scheme** invites researchers to Turkey through competitive grants from TÜBİTAK, Turkey's Scientific and Technological Research Council. According to the evaluation framework, 20% of their application is assessed on the basis of "Training and career development aspects", illustrating the centrality of training and development in a 21st century research career.⁴⁹

In this way, MSCA has contributed to mainstreaming employability, skills training and career development initiatives in researchers' host organisations, which in its turn has paved the path towards more intersectoral mobility later on during a researcher's career. Not only beneficiaries with already well-established training facilities benefited from this; in particular institutions with a low level of training facilities were able to invest in long-term capacity building by establishing sustainable development programmes.

⁴⁹ <http://www.cocirc.tubitak.gov.tr/node/5.html>

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This report contains the five case studies developed through the study. The purpose of the case studies is to present examples of different forms of intersectoral mobility between academia, industry and the third sector and to shed light on the characteristics of different types of mobility taking place at international, national, regional, bilateral and sectoral levels. In addition, good practices have been identified and an assessment undertaken as to how far particular schemes are replicable and transferable.

Studies and reports

