

EURAXIND

Literature review of
institutional practice in
promoting the
intersectoral mobility of
researchers

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Introduction

This report summarises the findings of a rapid literature review on research performing organisations' engagement with industry. It is carried on within European Union's Horizon 2020 funded project EURAXIND (EURAXESS for Industry), which focuses on enabling researchers, academic organisations, and the EURAXESS network more generally, to engage more with business, provide opportunities for collaborations and build strategic partnerships.

The literature review has mainly focused on recent policy documents and selected articles from specialised journals that discuss the approaches and effective practices in outreach activities to industry. These practices included the building of strategic relations, research collaborations, and the recruitment of researchers. This report complements two other literature reviews which are focused employers' needs for enhancing intersectoral mobility (Deliverable 3.1), and researchers' views and experiences of intersectoral mobility (Deliverable 4.1).

Throughout the report, the term "academia" refers to research performing organisations (RPOs) or more specifically higher education institutions (HEIs) and research institutes; while the term industry includes other organisations outside academia.

Specifically, through this literature review, we have addressed the following questions:

- (1) Why should academia engage with industry?
- (2) How does academia currently engage with industry?
- (3) Considering the existing practices, what are the institutional needs with respect to industry engagement?

The information compiled in the report will be used as the basis to enable EURAXESS Service Centres, and RPOs generally, to connect better to industry thereby encouraging more industry employers to engage with the EURAXESS portal. Furthermore, the existing practices and barriers identified will inform the survey of EURAXESS practice and will be key in the design of the EURAXIND Employer Engagement Toolkit.

What are the benefits for academia-industry collaborations?

Research, education and innovation are three central and strongly interdependent drivers of the knowledge-based society. Together they are referred to as the "knowledge triangle", and specifically in the EU, the close collaboration between research, education and innovation is vital for the realisation of European Research Area (ERA) and for maintaining Europe's competitiveness vis-à-vis its main economic competitors (US, Japan and China).

Researchers, entrepreneurs and companies are considered Europe's main strengths, especially in comparison with other regions in the world. Nevertheless, many other regions have economies developing much faster than the European. Thus, although innovation lies at the heart of the Europe 2020 strategy (European Commission, 2010), there strong are indications, however, that Europe might not be using this competitive advantage to the best and is not investing sufficiently, or not adequately, in research and innovation.

Currently, academic institutions are the major employers of researchers in most European countries, while the employment of doctorate holders in the business sector remains relatively low, leaving a great terrain of innovation potential outside academia unexplored.



Looking at the number, we find that although European Research Performing Organisations (RPOs), and more specifically higher education institutions (HEIs) and research institutes currently produce significant amounts of new knowledge, with the exception of a few high performing member states, Europe has a relatively low number of researchers employed in the business sector, compared for example with the US or Japan (Researchers' Report, 2014).

A way forward to bridge this gap would be by bringing academia and other sectors closer together (ERAC, 2014). Universities are organisations that perform a key role within contemporary societies by educating large proportions of the population and generating knowledge. Recently, on the initiative of policy-makers, many universities have been taking action to develop a 'third mission' by fostering links with knowledge users and facilitating technology transfer. A key element for this engagement between academic institutions and private employers is the intersectoral mobility of researchers.

Vandevelde (2014) defines "intersectoral mobility" in the broadest sense of the term and refers to all possible bridges between university, industry and other sectors of employment. However, other sources such as the MORE2 study define "intersectoral mobility" as researchers being physically mobile to sectors outside academia, in the researcher's own country or abroad (IDEA Consult, 2013). This not only relates to private industry but also to the private not-for-profit sector as well as the public and government sectors.

But even in its more limited definition, the key issue is that intersectoral mobility allows researchers to operate as "knowledge brokers" between academia and other sectors of society, and thus, fosters new methods of researcher training and development, which should translate into making them better suited for the challenges of the current labour market, fosters research collaboration, continues to build sufficient critical mass, and intensifies R&D activity in particular areas. In this way, intersectoral mobility is expected to increase the impact of scientific research in society and contribute to researchers' career development, both of which are expected to enrich the European Research Area and to boost economic growth (European Commission, 2006).

Likewise, university-industry cooperation in research is an important vector of innovation and growth, being one of the avenues to foster a dynamic research sector while strengthening the so-called third mission of universities (Allinson et al, 2015). Working closely with higher education and intermediaries, companies can ensure that students develop the transferable skills needed in industry, as well as the right technical competences. European policymakers can further support this through increased support for internships and improving understanding of what constitutes transferable and horizontal skills. University-business cooperation has also a key role to play in horizon scanning through analysis of how emerging trends and developments might potentially affect current policy and practice). There are many areas where horizon scanning is necessary: in skills forecasting, in technological developments and in predicting innovations of the future. Higher education institutions and companies working together can help to reduce forecasting risks and contribute to economic growth by combining their collective knowledge and skills. But for this to work, permanent and stable mechanisms have to be in place to facilitate such institutional dialogue, research and action. Within the following sections we provide an overview of the ways in which academic institutions engage with industry, highlighting what works and identify gaps and needs.



How do academia and industry engage?

The issue of academia-industry collaboration has been a priority in the EU science policy for some time. In line with this, the EC published in 2005, the document “Mobility of Researchers between Academia and Industry: 12 Practical Recommendations” (European Commission, 2005) that was addressed to research organisations, universities, and private companies engaged in research, as well as to public authorities. The document was based on a thorough analysis of the perceived insufficient cooperation between public sector organisation and private companies in the field of research and presented coherent and powerful set of recommendations for improving intersectoral mobility of researchers between academia and industry, as a means of enhancing a culture of longer-term, structured interaction and cooperation between both sectors in terms of knowledge transfer and development of cross-sector skills and competence. The recommendations can be summarised into the following key concepts:

1. Joint researcher training programmes
2. Developing key employment skills for all researchers
3. Joint doctoral supervision
4. Intersectoral mobility: internship, consultancy
5. Appreciation of mobility staff through evaluation criteria
6. Recruit more staff on permanent positions with intersectoral experience
7. Remove administrative barriers, esp. in recruitment
8. Align academia-industry interests through framework conditions: co-location, grants, technology transfer offices
9. Appreciation of institutional collaboration activities through evaluation criteria/incentives
10. Informal networks between SMEs- - academia
11. Funding to professionalise academic staff
12. Raise awareness and provide legal instruments : social security, pensions, EU programmes.

Some years later, these concepts were further reviewed, and developed into an updated set of recommendations aimed at fostering intersectoral mobility (European Commission, 2011):

- Many countries need to train more researchers at R1 and R2¹ level in order to meet their R&D targets, and in order to support intersectoral mobility. More graduates can be attracted into doctoral research by treating them as professionals, by providing them with adequate scholarships, and by presenting them with interesting career opportunities.
- R1 and R2 researchers are the target group most easily reached when promoting intersectoral mobility.
- Employers, who already have doctorate holders amongst their staff, tend to judge their added value more favourably than those who do not. Highlighting good experiences in this area and developing a joint vocabulary between academia and other sectors of society related to “research-based skills” may contribute to changing the perception of the value of research experience.

¹ R1 – R4 as defined in the European Framework for Research Careers, European Commission 2011 http://ec.europa.eu/euraxess/pdf/research_policies/Towards_a_European_Framework_for_Research_Careers_final.pdf



- Employers in other sectors of the labour market and academics need to learn to speak the same language and appreciate each other's focus and strengths. This is a process in which taking small steps can be very effective.
- By maintaining a limited set of research performance criteria when hiring R3 and R4 stage researchers, universities miss out on great opportunities to take on board researchers with experience in other sectors of employment. Better recognition of activities related to the universities' "third mission" (service to society, including the societal and economic impact of research) will help to bridge the gap between university and other sectors of employment.
- The principles of innovative doctoral training continue to deserve attention (European Commission, 2011). These principles, developed by the ERA Steering Group for Human Resources and Mobility for the European Commission, can play a significant role in focusing the attention on intersectoral mobility. Due to this, Member States must be prepared to invest time and funding in the implementation of these principles.
- During the doctoral training programme, doctoral researchers need more exposure to other sectors of the labour market. This can be achieved through e.g. joint supervision, collaboration with the public/private sector, or internships. This generates benefits for the doctoral researchers (employability skills) as well for the employer/organisation (appreciation of research experience) as for the academic environment (networking, collaboration).
- The impact of broader research training on intersectoral mobility and on a more intensive circulation of knowledge are not easy to measure as the outcomes are long-term. Adequate monitoring systems need to be developed.
- In most countries, legal and administrative measures are in place to facilitate the intersectoral mobility of researchers. Governments should consult regularly with the research community whether any such barriers may need to be addressed further.
- Governments should be able to trigger large impacts with small-scale initiatives, such as establishing partnerships with SME clusters, focusing on niche areas of strengths, and adopting European Structural Funds and European Social Funds in order to support intersectoral mobility.
- Internships for researchers, i.e. a limited period of time spent in other sectors in order to gain sector-specific experience and share research experience, are inexpensive, bottom-up initiatives that potentially have long-lasting effects on researchers' employability, employers' perception and long-term collaborative initiatives. Governments can play a role in facilitating, promoting and funding such internships.
- Government initiatives to support co-location of university and industry, or to develop competency clusters fostering collaboration between university and other sectors on a particular topic, provide a more integrated approach to advancing knowledge exchange.
- Intersectoral mobility provides a highly relevant focus to recognise weak elements in a country's knowledge transfer system and identify appropriate measures for improvement.
- As many countries experience similar concerns in supporting intersectoral mobility, further opportunities to exchange experiences and good practices will help to accelerate the introduction of effective measures towards better knowledge exchange
- Not all good practices would operate as effective enablers in every country. In countries with limited R&D budgets and limited R&D performance levels – modest and moderate innovators– activities addressing the intersectoral mobility of



researchers tend to be project-based rather than structural, to be reliant on external funding rather than national funding, and to focus on one particular layer of the knowledge transfer pyramid rather than encompass multiple layers in an integrated approach.

Apart from developing recommendations to be implemented in order to increase the engagement of institutions and industry in general, and intersectoral mobility in particular, several studies measuring the level of collaboration are worth mentioning to have a better view of institutional engagement with industry.

Based on budgetary data from the 6th EU R&D Framework Programme (FP6), in 2009 the EC's Joint Research Centre Institute for Prospective Technological Studies (JRC-IPTS), analysed the main patterns derived from budget allocation to university-industry cooperation (UIC) projects versus other forms of collaboration (e.g. academic-only networks, intra-firms networks, etc). The main findings show that for the EU average, a university-industry collaboration contract involves funding four times bigger than other forms of collaboration. The results also show that countries getting the majority of FP6 UIC projects and value are usually Western, Northern and, to a minor extent, Southern member states, while Eastern and most Southern countries tend to rank low in both the number and value of projects. When correlating the average value of FP6 UIC projects with gross domestic product (GDP), this pattern appeared to be even clearer. Considering that the FP allocates funds on the basis of the quality of the proposal, these findings could be attributed to the self-reinforcing nature of UIC, and open perspectives of possible ways of better involving the new member states in an increasingly important knowledge-oriented future for Europe. Nevertheless, this report still acknowledges that further analysis would be needed to suggest a causal relationship between geographical differences in UIC and per capita GDP. This could shed light on the variables that lay behind differences in GDP: a history of engagement with R&D (and perhaps the private and collaborative parts in particular), the number of years a country has been a member of the EU, the spatial concentration of industrial activity, institutional barriers to collaboration, the number of universities in each Member State, the size of the public sector research workforce, etc.

The previously mentioned MORE2 Study estimated that in the EU around one in four researchers (23%) were mobile to a sector outside of academia during their doctoral studies. This was made up of 4% of researchers who were active in private industry, 9% in the private not-for-profit sector and 10% in the public or government sector. When looking into their motivation to take up employment in the private sector, the most important factors encouraging researchers to become mobile (>60%): career progression (70%), gaining first-hand experience in industry (69%), increasing employability (67%), availability of research funding (61%) and bringing research to the market (61%). On the other hand, the least important motives for moving to the private sector (<40%) job security (38%), personal/family reasons (33%) and social security and pension systems (30%); aspects which are also not considered to be important motives for international mobility.

The Researchers' Report (European Commission 2014) looked further into this issue by analysing the public-private co-publications between different sectors and comparing the results between 2003 and 2008. The number of public-private co-publications between different sectors per million population increased in the EU-27 from 31.7 to 36.2 (14%). The increase in the United States was from 67.1 to 70.2 (4.6%). In Japan, the number of public-private co-publications between different sectors per million population increased from 55.4



in 2003 to 56.3 in 2008 (approximately 1.6%). China reported a substantial increase in scientific public-private co-publications between two or more sectors per million population (200%) from 0.4 in 2003 to 1.2 in 2008. This report also states how many countries acknowledge the problem and are promoting partnerships between universities, research institutions and private companies, and measures to improve the skills of doctoral researchers in areas such as technology transfer and intellectual property. Other measures include the implementation of joint projects, exploitation programmes, research traineeships in companies, inter-sectoral mobility programmes, industrial Doctoral programmes, and the possibility to combine teaching and private sector research.

Reinforcing the importance of joint activities between academia and industry, the project “Promoting Collaborative Doctoral Education for Enhanced Career Opportunities” (DOC-CAREERS II) looked at how universities work with their business and other non-university partners in establishing and taking forward research projects in the framework of doctoral education. It aimed at reflecting on good practices in university-business relations, with particular emphasis on regional dimensions, as well as exploring the employment prospects of doctorate holders and how collaborative schemes can enhance their career prospects.

The key report of the project (Borrell-Damian, 2015) points to the existence of a variety of collaborative models, shaped by the characteristics of the research project, the profile of the university and the company, and the regional context. The potential importance of collaborative doctoral education for regional development is highlighted. It demonstrates that the establishment of university-business partnerships is based upon proximity among the different partners (e.g. geographical proximity, shared language), a common understanding of the regional context, and the presence of appropriate policies and legal frameworks which are all important elements in developing and sustaining successful partnerships.

As to why collaborate, enhancing their competitive advantage and fostering innovation were the main incentives for both universities and companies in strengthening their cooperative relations. Specifically, for universities, this was related to furthering their relative position in the higher education landscape, as their mission and core activities in teaching and research were increasingly related to innovation. Indeed, research and innovation activities were perceived by universities as essential pillars of their development, allowing them to better tackle societal challenges and to contribute to regional and national development. Interacting with industry partners, namely via the establishment of collaborative doctoral schemes, was therefore considered as an important strategic activity for universities, as it pushed forward the development of interdisciplinary training, provided innovative solutions for complex problems responding to industry needs and supplied a highly skilled workforce for companies. Advancing research, namely through cooperation with the business sector, also gave universities more visibility, nationally and internationally, and allowed them access to a wider pool of funding sources, e.g. industry partners, international competitive funding. Cooperation with the business sector also supported universities in strengthening the perceived value of research, namely to companies and other external partners.

What are the main barriers to academia-industry collaboration?

Although the last Researchers’ Report (European Commission 2014) compiles how the EU, Member States and/or institutions have introduced a range of measures, programmes, strategies and legislative acts to address the barriers and train researchers to meet their



national R&D targets, including the improvement of academia-industry collaboration, there are still barriers to overcome.

The Sixth University-Business Forum provided an opportunity for representatives from higher education institutions, companies, government, youth associations and other organisations to come together to discuss how partnerships can stimulate new jobs and growth (Allinson et al, 2015). One of the highlights of the event was that, despite advances, there remain many barriers to university-business collaboration, often caused by competing priorities.

The lack of mutual understanding between the worlds of higher education and business was discussed in the forum, and several options to improve this situation were proposed:

- better involving alumni, intermediary organisations and better engagement of students as active partners in all parts of the collaborative process are key to better collaboration.
- urgent changes need to be made to the academic community's incentive and reward structures if university-business collaboration is to be accorded the same value as teaching and research.
- measuring the different types of activities undertaken by HEIs is crucial, but assessing the outputs of university-business collaboration is really difficult.
- case studies showcasing good practice in how such measurements are made and making examples readily available would be highly beneficial.

In regards to institutions suggestions for improving their engagement with business, included:

- Examples of successful cooperation activities and models should be made available to those HEIs, companies and other potential partners who are less convinced of the potential positive outcomes.
- Making university's activities more visible and accessible to companies and other stakeholders is important if they are to engage in cooperation activities. There are many mechanisms for this including online databases, dedicated offices and marketing material.
- Changing the incentive and reward structures to promote university-business cooperation related activities for example through recognition in career progression, prizes and awards, or reduced teaching / research commitments.
- Supporting HEI staff to take risks. With the right kind of support in place HEI staff can be encouraged to take more risks, engage in innovative projects which then enhance their academic portfolio.
- Attaching funding to university-business cooperation, either in the form of base funding or as competitive funding. This would further encourage academic staff to pursue collaborative projects and programmes with industry.
- Support the entrepreneurial and innovative potential of HEIs. HEIs are being judged by the ways in which they respond to the social and economic needs of society. This means that HEIs are having to change the way they work and their organisational models in order to adapt to the different demands of education, research, knowledge production, entrepreneurship and innovation.



The career perspectives for “linked scientists” in industry are not so straightforward. Kitigawa (2011) explains that, although there are a number of perceived “barriers” between university and academia and that in general it is assumed that these barriers “hinder effective knowledge exchange”, there is no evidence on “how the perceived barriers shape subsequent collaborations” or how individuals may overcome such barriers. Furthermore, we do not know how these perceived barriers affect individual career strategies and decision making processes.

Finally, the SGHRM Working Group 2016 on intersectoral mobility has focused its work on summarising the most important barriers to intersectoral mobility under the following five categories: (i) Rules & Regulations, (ii) Funding & Support, (iii) Training & Development, (iv) Cooperation & Entrepreneurship, and (v) Awareness & Recognition. Although there are limitations to this approach due to the fact that individual barriers are in most cases interrelated and that the environment for intersectoral mobility differs among countries, this approach allowed a consultation of member states (through SGHRM members) which identified Awareness & Recognition is the area that is considered most important in the respect to barriers hindering intersectoral mobility. To overcome these barriers, there is a need for cooperation and interaction among researchers from different sectors, to learn about the opportunities, and to recognise competences of researchers from other sectors. This is a question of a deliberate and systematic development of culture and traditions.

Key findings

The institutional engagement with industry has been a key priority for the European Union for some time.

Although many analyses have been carried on by different stakeholders and the barriers are generally well understood, there is still need for practical actions in fostering the engagement of research institutions with industry.

Related national initiatives could include cross-sector collaborative programmes, targeted funding to develop individuals, overarching services and networks that help or advise researchers or those who support them, financial incentives for companies to employ doctoral graduates and innovative or exemplary projects and programmes (DOCENT, 2010).



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