



EURAXIND

Literature review of employers' needs in enhancing intersectoral mobility

September 2016

Work Package 3
Deliverable 3.1



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Introduction

This report summarises findings from a rapid literature review on employers' needs for enhancing intersectoral mobility and building research collaborations, conducted in the context of the project EURAXESS for Industry "EURAXIND". It is based on both academic studies and a variety of grey literature and other sources with relevance for the topic, for example proceedings from working groups or workshops at European level dealing with questions on how to improve intersectoral research collaboration. The intention was to gain grounds in understanding the perspective of non-academic employers in order to inform subsequent actions in the project. This report complements two other literature reviews within the EURAXIND project that focused on institutional practice in promoting the intersectoral mobility of researchers (Deliverable 2.1), and researchers' views and experiences of intersectoral mobility (Deliverable 4.1).

In reviewing the literature and other sources, we were guided by the following questions:

- (1) What high level skills do employers expect from academic researchers when considering them as potential future employees?
- (2) What are specific strategies applied by industrial employers to attract researchers into industry?
- (3) What strategies are used by the business/industrial sector to initiate and implement research collaborations with public research institutions?

Terms used in the report: intersectoral mobility and researchers

Both for the literature review and the report, we follow the definition of intersectoral mobility as provided by the 2014 ERAC mutual learning workshop on Human Resources and Mobility (Vandevelde, March 26, 2014). Here, intersectoral mobility refers to all possible bridges between university, industry and other sectors of employment, including (but not confined to) physical mobility of researchers from one sector (academia) to another. In respect to researchers, we focused on postgraduates from doctoral studies.

As a general remark towards available literature, it seems that there have been only limited direct contributions by representatives from the business sector to these analyses and discussions to date. This is also observed by the EURAXIND literature review focussing on the viewpoint of researchers (see the report "Literature review of researchers' views and experiences of intersectoral mobility", EURAXIND, 2016). Overall, based on these reviews, the "voice of the business sector" seems rather difficult to detect in the literature. However, there are some notable exceptions, particularly in the case of the UK that have provided several studies published roughly within the last decade with interesting insights from this particular perspective. The need for more information on and better understanding of the business sector, and in particular regarding obstacles to intersectoral mobility, is also reflected in the report "Research Careers in Europe. Landscape and Horizons", published in 2009 by the European Science Foundation (Scholz, et al., 2009). Nevertheless, this perspective



persistingly stays missing: For example, the draft report “Intersectoral Mobility of Researchers, their Conditions and their Competences” provided by the Steering Group on Human Resources and Mobility working group (ERA-SGHRM) was compiled predominately without direct involvement of representatives from the business sector (ERA-SGHRM working group, unpublished draft 09/2016). These examples can be seen as a case in point for carrying out a comprehensive survey amongst employers across Europe, to address their needs and expectations with respect to fruitful intersectoral collaboration. Such a survey is one of the next activities carried out in the context of EURAXIND, for which the literature report will serve as input.

What high level skills do industrial employers expect from academic researchers?

Overall, we identified only few studies and conference proceedings that address the expectations and possible attitudes of employers towards academic researchers and their skills. From this, the overall picture emerges that the individual personality and the possession of “transferable skills” such as flexibility, management skills and IP proficiency are of particular importance for non-academic employers. The scientific background of academic researchers, though highly important at least from the perspective of the researcher, seems sometimes to play a less decisive role in the hiring process: This can be illustrated by a conclusion from US reports in the ADOC Career Project, stating that “technical skills are the first reason to recruit a doctoral holder, but personal abilities such as reliability and social skills are highly valued by recruiters and play an important role that doctoral researchers and advisors tend to underestimate.”

A workshop on intersectoral mobility organised by the Science Europe Working Group on Research Careers (2013) concluded that industry seemed to value social and behavioural skills, such as leadership, team work abilities or entrepreneurship and IP. It was also reported that, as in Europe, non-academic employers in the US find that doctorate holders should be more proficient in business related skills, including IP (while their very good technical in-depth knowledge in their field was recognised by employers).

A more detailed picture on the expectations of non-academic employers towards researchers has been assembled by several authors for the UK. In particular, a report published by the Rugby Team (Rugby Team 2007) draws on more than 50 studies to extract information on “Employers’ views of researchers’ skills”, mostly focusing on the UK. While the authors emphasise that the underlying studies cannot be directly compared and thus only qualitative descriptions lacking statistical validity could be obtained, the resulting list of employers’ views that are needed (and that employers believe Doctoral graduates and research staff have and do not have) comprises recurring issues. According to this review, the “gap” most commonly cited concerns the difficulty in “gaining commercial awareness and in making the transition from one working culture to another”. Another frequently mentioned topic was lack of flexibility and adaptability; followed by a lack of interpersonal skills, team-working skills and



customer orientation. Further topics that were brought up by employers include the perception that doctoral graduates and research staff may seem overqualified and overspecialised, leading to a narrowness of interest and lack of self management. One of the underlying studies concluded that while doctoral graduates and research staff possess specific aptitudes, these do not suffice to make them attractive to industry (Rugby Team, 2007).

A further important topic in this context is the perceived “*communication gap*” between *academic researchers and their potential future employers* in the business sector, reported by the EMPRESS study on “Employers’ Perceptions of Recruiting Research Staff and Students”, conducted in 2005 by Clair Souter from the Careers Centre of the University of Leeds for the UK. According to this study researchers do not seem to articulate their personal skills well and also appear to be unable to talk to employers in “their” language (Souter, 2005; Rubio & Hooley, 2010; Rugby Team, 2007). That said, the Rugby review also quotes positive views on academic researchers shared by employers, e.g. “a general assumption that completion of a doctorate indicated possession of initiative, intellectual ability and the capacity to work autonomously.” doctoral candidates who already had industrial experience were considered to be highly commercially aware and to have shown great capacity to learn. Other positive attributes mentioned include “maturity and enthusiasm, technical proficiency, specialist knowledge and problem solving skills”.

A recent report on the Exchange of Early Career Researchers between Universities and Businesses in the UK issued by the National Centre for Universities and Business NCUB/ UK (Fernandez & Sileryte, 2015) echoes and expands on the main topics discussed above. According to this report, businesses view academic researchers as adept at conducting research, but they also think that they need additional investment in commercial work skills, which can be developed when they work in industry. It is also taken into account that academic rewards are designed for academic achievements only with a focus on publications, which deters intersectoral mobility by putting “investment in non-academic roles and activities at odds with the academic career”. While the number of interviews was very low – altogether nine interviews were conducted with business representatives –the report observes that businesses were particularly critical of this situation, stating that “academic rewards based on publications are narrow, and do not reflect the breadth of delivery outputs that a research career entails in or out of academia”. There is also a perception that academic researchers expect the non-academic sector to reflect their own research interests, which makes them appear as inflexible and lacking business acumen to employers. Moreover, businesses seeking new expert talent reportedly find the academic information systems complex and geared to academic careers, which is why they may frequently stick to whom they already know when searching for new employees. The report also emphasises that information gaps about careers available outside academia and the expertise within academia hamper a better allocation of research talent through (intersectoral) mobility.

With particular interest on employers’ expectations towards graduates from social sciences, Purcell and Elias identified three categories of employers: (1) small specialist



research agencies and consultancies where the employer sought ‘all round’ research skills, project management skills and excellent interactive skills, (2) employers looking for particular technical and specialist analytical skills and knowledge, mostly to fill vocational roles such as clinical psychologist or a psychometrics expert in the human resource management department and (3) large organisations, generally global or with a global remit, who required highly-specialist expertise in economics or development (Purcell, et al., 2005). These differences in expectations among companies towards graduates can also be illustrated by the outcomes from the 2009 project report of DOC-CAREERS, (Borrell-Damian, 2009): even though there is a general agreement on the relevance of transferable skills, different employers place different values to certain skills: here, SMEs would place higher value to doctorate holders who have also the soft skills to complement their research capabilities at the moment of recruitment; whereas for larger R&D companies the most valued skill is first of all a deep knowledge of the subject as well as broader competencies in order to handle career challenges. Apart from skills directly linked to research, the report also mentions the following skills seen to make a doctorate holder more employable outside the academic world: communication, negotiation, management. What also should be kept in mind is that potential employers might be less aware of skills acquired during doctoral studies, for example adaptability, capacity to deal with complex problems or to engage in both multidisciplinary and international work (Borrell-Damian, 2009). In the context of the follow-up project DOC-CAREERS, companies indicated the need for highly specialised workforce with interdisciplinary expertise, which increasingly has influenced the recruitment of doctoral candidates in the industry/business sector (Borrell-Damian, et al., 2015).

A survey on UK employers expectations towards researchers skills, conducted by Vitae (Rubio & Hooley, 2010), shows a tendency among employers to anticipate that doctoral graduates are stronger in technical areas related to their research, whereas they may have to develop soft skills. Employers came from the following fields: engineering, IT and information, pharmaceutical, banking and finance, science, retail, public sector, non-profit. In relation to transferable skills the study reveals that employers would expect doctoral graduates to be particularly strong in data analysis, problem solving and project management. However, the authors also stress that there is no particularly good predictor of employer attitude to researchers. Another interesting aspect of this survey is a finding which seems to mirror the above mentioned “communication gap” identified in earlier studies: employers are expecting doctoral graduates to be prepared during the interview to answer questions about their skills and their career aspirations and to show an understanding of the particular business they are applying for. This can be well illustrated by the following figure: when asked if they actually employ a candidate for positions where a doctorate is either essential or desirable, only 37% of the respondents answered “yes” – whereas 63% “no”. This means that doctoral graduates should invest into appropriate research and preparation for the interview. Furthermore, doctoral graduates should be able to prove that they can expand their skills and transfer knowledge to new contexts.



Vitae identified the knowledge, behaviours and attributes of researchers most valued by employers in the Vitae Researcher Development Framework employability lens (Vitae, 2012). This was based on a meta-analysis of published research into the skills that are most frequently desired by employers, and consultations with professional organisations and employers who have an interest in researchers' employability.

Based on a review of 35 articles¹, the following ten main skills could be identified as most recurring to be demanded by employers in the business sector:

- communication skills
- organisational skills
- problem-solving
- flexibility
- leadership skills
- confidence
- entrepreneurial skills
- teamwork
- project management.

These skill-sets, along with their variations, were prevalent throughout all articles. It should be noted that other skill sets were identified, yet none were prevalent enough to be included in this list. Interestingly, there has been significant overlap between these findings and a survey on desirable skills for companies in the business sector, conducted by the already mentioned ERA-SGHRM working group in September 2016. The skills found to be prevalently required in the survey, were: scientific presentation, time and self-management, interpersonal skills, networking, career planning, intellectual property, and entrepreneurship. Two skills were identified both in the survey and the literature review: entrepreneurship and communication (interpersonal skills). As such both of these skills should receive further study and extra attention.

In addition to desirable skills of doctoral holders from an employers perspective, we would also like to add here some evidence on companies' expectations towards HE graduates from other levels, as it underlines how complex and manifold expectations towards skills for employment look in practice: In 2015, the German Association of Chambers and Commerce published the report "Competent and close to practice: Expectations of Companies towards HE graduates", which summarises companies expectations towards bachelor compared with master graduates, based on a survey amongst over 2000 enterprises in Germany. An interesting finding is that larger companies are by tendency more satisfied with the competences of bachelor graduates than are small enterprises. One explanation for this finding is that small enterprises, differently from larger companies, often do not have the capacity for additional/continuous training of their employees according to their own needs, whereas larger companies usually compensate "training gaps" or the needs for specific skills not secured by study programmes more easily (Deutscher Industrie- und Handelskammertag e. V., 2015). This illustrates that when looking into skills needs

¹ The full list of articles is provided at the end of the document.



from the employers, one encounters a wide field of expectations, anchored in national, regional, educational and sectoral particularities.

What do industrial employers do to attract researchers?

Only a few studies could be identified that investigate the recruitment strategies of industrial employers. The already mentioned study “Employers’ views of researchers’ skills” published by the Rugby Team emphasises a requirement to distinguish between companies who incidentally have doctoral graduates as members of staff and companies who specifically recruit doctoral graduates as members of staff, as not all companies who count staff members with research postgraduate qualifications amongst their ranks have actively sought doctoral graduates. Furthermore, the studies analysed by the Rugby Team advocate the classification of industrial employers according to their size, discipline specificity and recruitment intentions. For instance, as one study mentioned in the Rugby report states, there are employers who have so far “not considered targeting PhD graduates as a cohort” (Rugby Team, 2007).

According to the EMPRESS study on “Employers’ Perceptions of Recruiting Research Staff and Students” 2005 for the UK, “the majority of employers not recruiting PhD students or Post Docs are unable to list their skills. Even those who did try to list the skills a PhD student should have developed were unable to do this comprehensively.” Another group is formed by employers who have recently started to employ or are considering employing newly qualified doctoral graduates (Jackson 2006, cf Rugby Team, 2007). Morris and Cushlow (2000, cf. Rugby Team 2007) furthermore define the category of “chance employers”, meaning companies who do have at least one postgraduate member of staff, but did not intentionally seek a postgraduate researcher. These employers were reportedly often unwilling or unable to recognise the additional skills gained from a postgraduate qualification. By contrast, the group of “large” graduate employers according to Morris and Cushlow are “large companies who recruit a large number of graduates and postgraduates each year, typically onto a graduate development scheme. Postgraduates are nearly always given the same roles as graduates.” Another distinct group identified are “intentional employers” who intentionally or regularly employ postgraduates. According to Morris and Cushlow, these employers frequently were small, technical SMEs interested in the specialist skills and knowledge of postgraduate researchers, whereas Purcell and Elias do not emphasise the size of these companies but find that the “large” graduate employers are in the majority (Purcell, et al., 2005).

As already stated, there seems to be only little evidence in literature on the strategies that employers apply in actively targeting researchers. As we learn from the already cited employer survey in UK, only a small number of employers are *actively* recruiting doctoral researchers. The following strategies are mentioned when actively recruiting doctoral graduates:

- (1) explicitly mentioning the “doctorate” as a qualification in job advertisements;



- (2) to design the recruitment process in a way which explicitly addresses researchers – thus also recognising the specific sort of knowledge a doctoral graduate brings: i.e. conducting specific assessment centers; including the presentation of the thesis in the interview and thus, using services of specialised recruitment agencies;
- (3) building wider links with universities, which go beyond the recruitment strategies, but also serving to identify potential doctoral graduate recruits;
- (4) using enhanced / premium salaries to attract/retain doctoral graduates.

In building wider links with universities and public research organisations (3), the following mechanisms for collaboration are mentioned: funding studentships for doctoral study; funding research projects, providing placements or internships, involvement in knowledge transfer partnerships; specific doctoral candidates career events and marketing of the companies` career opportunities; seminars for doctoral graduates (Rubio & Hooley, 2010).

One finding from the Empress study is that “the longer someone stays in research in HE, with little or no evidence of industrial collaboration, the more employers worry that they will be unable to make the transition“ (Souter, 2005). This statement deserves particular mention in the context of possible measures to increase intersectoral mobility: i.e. the high relevance of providing early possibilities for researchers to experience non-academic environments e.g. in the course of intersectoral doctoral projects or internships. The Science Europe Workshop on intersectoral mobility (Science Europe, 2013) informs us that short-time placements of three to six months in a non-academic environment, as well as joint doctorates with industry, are more and more common.

A concrete example for companies looking for researchers interested in a career in the industry is the job portal www.academics.de. Academics is a well established web resource highly relevant for those HE graduates seeking a job in German speaking countries (Germany, Austria, Switzerland). Apart from job advertisements which can be linked to a personalised newsletter, a whole range of career information in several sectors is provided, covering not only the classical academic career path, but also careers for graduates in the non-academic sector, including a research career in industry. In addition to advertising of open positions, employers can include their short profiles as attractive employers, thus advertising themselves.² For instance, the Head of Personnel Marketing at Audi AG emphasises the “active role“ the company plays on the labour market in spite of the financial crisis, and the perspectives offered for engineers by the R&D department, with increased starting salaries for doctoral graduates. Two routes for an “industrial PhD degree“ are outlined: Either for doctoral candidates who are staff members of the company, or via projects carried out within a “scientific cooperation“. According to the CEO of the HR consultancy Alma mater, which specialises on academics, companies are particularly interested in doctoral graduates in the fields of chemistry, biotechnology and physics. An application-oriented doctoral thesis will be valued higher (also in terms of salary) by companies than a

²https://www.academics.de/wissenschaft/forschen_fuer_die_wirtschaft_-_chancenboom_fuer_nachwuchswissenschaftler_in_den_unternehmen_36400.html



strictly “academic“ doctoral project. The Audi Logistics Laboratory, which is jointly run by the University of Dortmund, a Fraunhofer Institute and Audi is presented as successful example for intersectoral collaboration. Academics.de outlines the strategy of another large industry actor, Siemens AG, which looks for specialists and interdisciplinary experts with knowledge in raw materials, software development or sensor technology and initiates around 500 research cooperations per year, with institutes, universities and industrial partners. This includes contact with “top researchers interested in an industrial career“.

What strategies are used by industrial employers for research collaboration with public research institutions?

With respect to (potential) strategies used by the industrial sector for research collaboration with the public sector, Vandeveldt points out that intersectoral mobility and academic / non-academic partnerships may not always be as straightforward in every sector of the labour market (Vandeveldt, March 26, 2014). Moreover, as also mentioned in the literature review “Researchers' views and experiences of intersectoral mobility“ (EURAXIND, 2016), Thune observes in his literature review that most studies on intersectoral collaborations cover cases where university–industry collaborations have been established over a long time, e.g. in engineering or natural sciences, which means that collaborating partners have developed a detailed understanding of each other over time. Such institutionalised forms of university–industry collaboration, for example, within collaborative research centres, may however not reflect the reality of much of the informal type of university–industry relations. Therefore, Thune concludes that future analyses should address a broader spectrum of collaborative arrangements and also that more longitudinal research on this topic is required. From the existing literature, however, Thune finds evidence that collaborations are viewed in more positive light where the businesses themselves carry out research, as opposed to companies with little experience in R&D activities (Thune, 2009). The variety of formats of research collaborations between universities and industry that can take place is nicely illustrated in a study conducted by Scharfetter et al for Austria. These include: employment of graduates by companies; conferences and events with company and university participation; creation of new companies by university staff; joint publications; informal meetings, talks and communication; joint supervision of doctoral and master research projects; training of company staff; mobility of researchers between universities and firms; sabbatical periods for university staff in companies; collaborative research and joint research programmes; lectures at universities held by company staff; contract research and consulting; use of university facilities by companies; licensing patents by companies; purchase of prototypes developed at universities; reading of publications, etc. Drawing on data from the 1990s, study also finds that the intensity of knowledge interactions does not follow a simple sectoral pattern – in the sense that interactions between high-tech industries and firm orientated technical sciences are intense, whereas interactions in humanities and low-tech industries are low. It is also said that universities and industry use various channels to transfer knowledge, depending on the intensity of personal relations and the type of knowledge.



There are also differences between sectors, for example, while technical sciences and R&D intensive manufacturing industries tend to use more intense direct research cooperation, service industries and the social/economic sciences rest more on personal mobility or training (Schartinger, et al., 2002).



Key findings

There is so far only limited involvement of industry in discussions on how all actors can best profit from intersectoral mobility.

A case can be made for a comprehensive survey to identify requirements of the non-academic/business sector at European level, also as a means to support a stronger involvement of industry in the “European HR policy” discourse

While a scarcity of literature is observed in particular in terms of cross-national comparisons, the sources identified paint a quite similar picture of opportunities and challenges for intersectoral mobility and emphasise the importance of transferable competencies for researchers

Internships, intersectoral doctoral programmes, such as the Marie Skłodowska Curie Actions are examples of schemes that support early exposure of researchers to the non-academic sector and thus foster the development of transferable competencies and intersectoral mobility

A ‘communication triangle’ approach involving senior academics/supervisors, external employers and researchers, as outlined in the EMPRESS study, should be considered to sustainably support intersectoral mobility



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Articles used for identifying skills required by employers

1. Resolving complex research data management issues in biomedical laboratories: Qualitative study of an industry-academia collaboration. By Myneni, S.a, Patel, V.L.b c, Bova, G.S.d , Wang, J.e Ackerman, C.F.f, Berlinicke, C.A.g, Chen, S.H.e, Lindvall, M.f , Zack, D.J.d g h
2. Research Careers in Europe by PPMI Group, CARSA and INOVA+
3. Collaborative Doctoral education in Europe: Research Partnerships and employability for Researchers by Borrell-Damian, L., Morais, R., and Smith, J.H.
4. Intersectoral mobility of researchers in Russia: trends and policy measures by Dezhina, I.
5. The Exchange of Early Career Researchers between Universities and Businesses in the UK by Fernandez, R.
6. Bringing Research Careers into Focus: an MRC Review of Next Destinations by IFF Research
7. Science in the modern society of knowledge: role, status and social functions by Ivancheva, L.
8. Careers in Research Online Survey (CROS) 2015: UK aggregate report by Mellors-Bourne, R., and Metcalfe, J.
9. Careers of Doctorate holders in the Netherlands, 2014 by Bart Maas Marjolein Korvorst Francis van der Mooren Ralph Meijers



10. University-Business Collaborative Research Goals, Outcomes and New Assessment Tools. The EUIMA Collaborative Research Project Report by Borrell-Damian, L., Morais, R., and Smith, J.H.
11. DG Research & Innovation: Researchers' Report 2014 by Deloitte
12. Researchers' Report 2014 by DG Research and Innovation
13. Collaborative Doctoral Programmes: Employer Engagement, Knowledge Mediation and Skills for Innovation by Kitagawa, F.
14. Technological model of collaboration between the educational institution - real business by Kolev, N.
15. HEIs-Regions Engagement Using Knowledge Management Strategy by Perry, Milly
16. Intersectoral Mobility: Report from the 2014 ERAC mutual learning workshop on Human Resources and Mobility by Vandeveld, K.
17. The Core Competencies of PhD's by The Core Competencies of PhD's
18. Careers of Doctorate Holders: Analysis of Labour Market and Mobility Indicators Auriol, L., Misu, M. and Freeman, R.A.
19. New Concepts of Researcher Mobility – a comprehensive approach including combined/part-time positions by Borchgrevink, H.M. and Scholz, B.
20. Analysis of the relevant context and the main challenges that the innovation policies of Bulgaria face by Karova, Z.
21. Personal and professional competencies of current Croatian doctoral students by Millard, D.
22. Workshop on Inter-sectoral Mobility by Science Europe Working Group Research Careers
23. Developing Research Careers In and Beyond Europe: Enabling – Observing – Guiding and Going Global by Scholz, B. et al
24. Career development perspective of UK researcher-business interactions by Vitae
25. E*CARE Report Summary by E*CARE project
26. What do researchers do? Career paths of doctoral graduates by Hodges, V., Metcalfe, J., & Pollard, E.
27. Industrial Doctorates - Employer Engagement in Research and Skills Formation by Kitagawa, F.
28. Mobility versus job stability: Assessing tenure and productivity outcomes by Cruz-Castro, L. and Sanz-Menendez, L.
29. What do researchers do? Doctoral graduate destinations and impact three years on 2010 by Hunt, W., Jagger, N., Metcalfe, J., and Pollard, E.



30. recruiting researchers: survey of employer practice 2009 by Vitae
31. Collaborative Doctoral Education. University-Industry Partnerships for enhancing knowledge exchange by Borrell-Damian, L.
32. University-industry cooperation in the Research Framework Programme by Joaquín M. Azagra-Caro, Gérard Carat, Dimitrios Pontikakis
33. University–industry relations in Norway by Gulbrandsen, M., & Nerdrum, L.
34. Training a new breed of researchers, inside and outside universities by Gemme, B., & Gringas, Y.
35. Vitae Researcher Development Framework Employability Lens, 2012, by Vitae.