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docent
doctors in enterprise

**Transferable skills and employability
for doctoral graduates:
survey of the current landscape
(Final report)
June 2010**

This report has been produced as part of the DOCENT Project.

DOCENT - DOCTors in ENTerprise is a 24 month project financed by the European Commission Lifelong Learning Programme – ERASMUS/ Multilateral projects/ Cooperation between Universities and Business.

The project aims to contribute to enhancing the employability of technical and scientific doctoral candidates through the development and testing of:

- a model for the provision of careers services specific to doctoral candidates and graduates capable of innovation and effective knowledge transfer, whether as an employee or as an entrepreneur. It will include guidelines for integration/coordination between University functions
- training modules to be offered within this careers services framework to support the professional development of doctoral candidates and graduates, in particular opening up opportunities beyond academia, and underpinning the development of transferable skills

Partners in the DOCENT project:

Promoter

- ASTER – Associazione Scienza e Tecnologica Emilia-Romagna, Italy

Partners

- Confindustria Emilia-Romagna, Italy
- Università Degi-Studi di Modena e Reggio Emilia, Italy
- COEPA – Confederacion Empresarial de la Provincia de Alicante, Spain
- Fundeun – Fundacion Empresa Universidad de Alicante, Spain
- CRAC – the career development organisation, UK
- University of Malta

Associate partner

- Fondazione CRUI, Italy

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SUMMARY

Authors: Jane Sugars and Ellen Pearce (CRAC)

Work on this project takes place in the context of numerous European and national policy drivers to support the transition of doctoral graduates into private sector careers. Whilst much interesting work is being done in this area, the agenda is a new one for some member states. There remains a long distance to travel before all barriers to movement between employment sectors are removed and stakeholders from all EU countries can learn from the best responses to this challenge. Related national initiatives 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.

A change to the long-established and widespread culture of doctoral degrees as training for academic research (only) is needed. Stereotyped views that are no longer valid are also current amongst some private sector employers. Clear and well-targeted information can help to reverse these views as well as to open a new world of possibilities to those researchers whose work experience is limited to public sector institutions. The amount of career development support available at university level varies but many institutions are re-orientating their support to tailor it to doctoral graduates' needs. Many are also working to foster a culture of entrepreneurialism.

Doctoral graduates develop many of the skills highly prized by employers in the course of learning to do research. There is scope to include more transferable skills training in doctoral education programmes but a good starting approach can be to recognise and develop the ability to articulate existing skills. Doctoral candidates and graduates need support to establish personal career goals and strategy; an individual support approach is desirable. An ability to 'talk the language of employers' is central to removing employment barriers and much can be achieved through making and taking opportunities to gain experience in the private sector.

More and better data on careers for doctorate holders is needed to ensure that effort is targeted in appropriate directions. While the situation is highly heterogeneous, we know that in some European countries a majority move into work outside the academic sector soon after graduating with a doctoral degree.



1. BACKGROUND

Authors: Jane Sugars and Ellen Pearce (CRAC)

Knowledge is a powerful driver of productivity and growth but in the past Europe has failed to convert excellent science into wealth¹. Ten years ago Europe set itself the ambitious goal to become the most dynamic and competitive knowledge economy in the world² and in order to achieve this established an R+D spending target of around 3% GDP by 2013. With the emergence of the Asian economies, if we are to thrive globally we need to equip ourselves for exploitation as well as for innovation.

An analysis of key data for EU-27³ called for a more efficient and effective European Research Area (ERA), noting no progress towards the R+D spending target from 2000 to 2006. In terms of forward steps, it highlighted 'constant progress in training new researchers' as particularly positive. In 2005, greater numbers of doctoral degrees were awarded in EU-27 compared to the U.S. and Japan, although Germany and the UK accounted for about 40 % of these. Numbers have grown twice as fast in the EU as in the US and Japan, and most markedly in the Nordic countries. However, the EU has a lower share of researchers in the labour market compared to the US and Japan. This difference is mainly due to a far lower intensity of researchers in the business sector in the EU, with only Finland, Iceland, Sweden, Luxembourg, Denmark and Norway being comparable to the US and Japan. At the same time, the EU's world share in patent applications declined by 14% between 2000 and 2005 in favour of Asian economies and the EU is behind the US in exploiting knowledge produced in other world regions, based on patents owned by domestic companies. Furthermore, the EU was found not to be specialised in the most dynamic research disciplines and to contribute less than the US to high-impact publications.

Doctoral graduates have the potential to be key actors in the creation of innovation and knowledge-based economic growth, being most likely to contribute to the advancement and diffusion of knowledge and technologies. Doctoral studies are amongst the most advanced and specialised forms of education available, enhancing capacity to carry out high quality research and also providing high quality graduates who can contribute in a variety of roles throughout the economy.

In 2005 the European Commission adopted the European Charter for Researchers and a Code of Conduct for the Recruitment of Researchers⁴ setting out the roles and responsibilities of researchers and their employers and funders and ways to make recruitment fairer and more transparent. This action reflects the importance being given across Europe to making this the most advanced knowledge society in the world. The emphasis is on ensuring that there is a good supply of researchers to the labour market outside the academic world.

The modern doctorate is seen as an excellent training for those who go into roles beyond research and education, in the public, charitable and private sectors, where deep rigorous analysis is

¹ The first 'European Report on Science and Technology Indicators', European Commission, 1994.

² Lisbon, March 2000. Brussels, 11.9.2002, COM(2002) 499 final, Communication from the Commission. More research for Europe. Towards 3% of GDP

³ http://ec.europa.eu/research/era/pdf/key-figures-report2008-2009_en.pdf

⁴ European Commission, Directorate-General for Research Information and Communication Unit, 2005, *The European Charter for Researchers: The Code of Conduct for the Recruitment of Researchers*, Brussels: European Commission.



required⁵. Available data tell us that the majority of doctoral graduates leave academia, many never having intended to follow an academic career. We must leave behind an outdated mindset that sees a move to the private sector as a failure to earn a place in academia and foster individuals with appropriate skills and broad employment horizons. With better preparation for employment in academic or non-academic settings, or for self-employment, doctoral education can be seen as an important tool to boost the global competitiveness of Europe.

A modern career can encompass a number of distinct areas, types of role, employment sectors and so on. It contrasts with a more traditional concept of career as progression up an ordered hierarchy within a single organisation or profession. Now is the time to focus on the role of research institutions in producing doctoral graduates ready to meet the challenges common to our whole society.

'The business of research and innovation in the knowledge economy is ... international, interdisciplinary and increasingly intersectoral and this must be reflected in the organisation of doctoral education'⁶

⁵ League of European Research Universities, 2010. *Doctoral Degrees beyond 2010: Training talented researchers for society*

⁶ http://www.leru.org/files/publications/LERU_Doctoral_degrees_beyond_2010.pdf



2. The DOCENT Project

The project aims to contribute to enhancing the employability of technical and scientific doctoral candidates through the development and testing of:

- a model for the provision of careers services specific to doctoral candidates and graduates capable of innovation and effective knowledge transfer, whether as an employee or as an entrepreneur. It will include guidelines for integration/coordination between University functions
- training modules to be offered within this careers services framework to support the professional development of doctoral candidates and graduates, in particular opening up opportunities beyond academia, and underpinning the development of transferable skills

A handbook for stakeholders, containing guidelines for the adoption of training modules into doctoral programmes and the implementation of a career services model to support non-academic career paths for doctoral graduates

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- University of Malta

Associate partner

- Fondazione CRUI, Italy



3. METHODS

Authors: Jane Sugars and Ellen Pearce (CRAC)

Representatives of the seven project partners met in November 2009 and agreed to structure the collection of information for this report into four main sections:

- High-level skills needs of employers
- Institutional support for doctoral candidates,
- National and European support for doctoral candidates and
- Careers and employability skills for doctoral candidates and graduates

These sections will provide the four main chapters of the final report.

Four project partners were actively involved in gathering information for this part of the project by means of semi-structured interviews and a review of relevant literature. 'Key players' were identified by the wider project team and 40 30-minute interviews were conducted either by telephone or face-to-face, shared between the 4 active partners. Questions were relevant to one or more of the four sections identified and were structured around an agreed framework (see appendix). Partners also reviewed literature relevant to the project aims from a list compiled by the wider project team.

In reviewing the material collected, partners aimed to identify the current picture, areas of strength or good practice and gaps in knowledge, experience or provision. Recommendations from the literature were noted where they have relevance to this project and interviewees were asked for their recommendations as a starting point for the next stages of the project.

An interim report was used as the basis for discussions at the second project meeting in April 2010. The project partners and invited experts reviewed and added to the background material and recommendations collected and partners discussed and agreed next steps towards meeting the aims of the project.

Invited experts to the 2nd DOCENT meeting were:

- Pierre Goldberg, Deputy Director, ABG
- Clare Jones, Nottingham University Careers Advisor, AGCAS
- Tim Vorley, Cambridge University. Tim was involved in the development of the ReMAT programme



4. NATIONAL AND EUROPEAN SUPPORT

Authors: Maria Grazia D'Angelo and Sofia Miceli (ASTER)

4.1 INTRODUCTION

This chapter contains an overview of the main funding programmes ongoing across European countries which are designed to facilitate, whether directly or indirectly, assimilation of doctoral graduates into the commercial sector. We make specific references to programmes that support the strengthening of transferable skills as well as knowledge of the business world and we examine services available to doctoral candidates and graduates which support career development and decisions. Measures may be promoted by public bodies, such as Ministries, or public institutions operating at EU or national level. Whilst initiatives might have similar objectives or approach, they may diverge in funding sources. We do not include initiatives from universities or academic networks as these are described in a separate chapter of this report. Whilst this chapter is not exhaustive it collects information resulting from the intense debate in Europe on this issue during recent years. We highlight experience gained from collaborative ventures between the various actors (universities, companies, business associations, local government bodies, agencies for innovation, etc.) undertaken at national, regional or local level⁷.

4.2 POLICIES AND PROGRAMMES TO SUPPORT TRAINING AND CAREER DEVELOPMENT OF PHDS: CURRENT PICTURE

"Ensuring appropriate funding: the development of quality doctoral programmes and the successful completion by doctoral candidates requires appropriate and sustainable funding"⁸ is the tenth of the "Salzburg principles" established in February 2005, during the Bologna Seminar entitled "Doctoral Programs for the European Knowledge Society". Doctoral education is considered key for a scientific or technical research career in either academia or industry. Moreover, decisions for a research career are often taken during the doctoral phase and thus funding to provide appropriate support at this stage is essential. Issues related to appropriate financial resources were again emphasized in the Bologna Seminar held in Nice (2006) on "Doctoral programmes: Matching Ambition with Responsibilities and Resources". Finding the necessary resources to sustainably support career development was considered a priority: "There is an urgent need for greater consultation and coordination at the national level between government ministries, research councils and other funding agencies (including European Institutions) on doctoral programme financing and career development"⁹.

Universities, together with public authorities in Europe, share responsibility for promoting attractive research careers and career perspectives for doctoral candidates and graduates. This should be managed in collaboration with non-academic partners in order to clarify career paths inside and outside academia, and between academia and other employment sectors. Governments also have

⁷The concept is well expressed in the last report EUA, of Lidia Borrell-Damian, "Collaborative Doctoral Education" (2009) in which, about the successful experiences in the field of collaborations between universities and businesses says : "there are not <one size fits all solutions> a successful approach tend to incorporate local or regional cultural specificities as captured in the phrase<the way we do things here>".

⁸ *Doctoral Programmes in Europe's Universities: achievements and challenges report prepared for European Universities and ministers of higher education*, EUA, 2007. http://www.eua.be/fileadmin/user_upload/files/Publications/DOC-CAREERS.pdf

⁹ Bologna Seminar on Doctoral Programmes (Nice, 7-9 December 2006), *Final Conclusions - Preparing Recommendations for the London Communiqué, Matching ambition with responsibilities and resources*, (<http://www.afsp.msh-paris.fr/observatoire/dossiers/doctorat/conclusionsnice2006.pdf>)



a role to play in the career futures of doctoral graduates: collective effort is needed if Europe wants to achieve its objectives¹⁰.

The "European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers "(2005)¹¹, reiterate and emphasize the importance of ensuring appropriate career opportunities for doctoral graduates, both in academia and in other areas and the importance of sustainability and continuity of career development.

Several European initiatives promote the mobility of researchers in general but also mobility between academia and other sectors. These include the European Commission Communication on "Better Careers and More Mobility: a European Partnership for Researchers "(2008)¹² and increased funds offered as part of the 7th Framework Programme, known as the Marie Curie Actions¹³. This has given rise to the Intra-European Fellowships for Career Development¹⁴ aimed at 'helping experienced researchers to try something new for a while' including work in other sectors and the Industry-Academia Partnerships and Pathways (IAPP)¹⁵, helping commercial and non-commercial research organisations to work together, developing solid partnerships to promote sustainable and focused exchange of knowledge and the mobility of staff between the public and private sectors. These funds are aimed at supporting the career development and the advanced training of experienced researchers at different stages of their careers. The acquisition of new and transferable competencies is one objective of these schemes; funding provided may include practical training in new scientific techniques or tools and in skills such as proposal writing, patent applications, project management, staff management, etc.

There is wide variation in approach between European countries with some only beginning to develop awareness of and interest in related areas. Established initiatives from mature contexts may still offer useful ideas for evolving contexts.

Examples of funding made available at a national or European level have been grouped into 4 main approaches:

Championing the professional and career development of researchers: involving stakeholders such as universities, commercial employers and policy-makers in ongoing dialogue

Transfer of research results and collaborations: cross-sectoral transfer of results from public-funded research to industry; support to create spin-off companies; jointly funded doctoral projects with an industrial focus

Development of transferable skills: support for training and opportunities to address a mismatch between the skills of doctoral graduates and those required, e.g. by employers, including career management skills

Incentives to employ specialist research staff: subsidies to businesses, especially to SMEs, to reduce the risk of hiring staff for R&D projects

¹⁰ *Doctoral Programmes in Europe BFUG Report*, EUA 2007

¹¹ http://ec.europa.eu/eracareers/pdf/am509774CEE_EN_E4.pdf

¹² Communication from the Commission to the Council and the European Parliament, *Better careers and more mobility: a European partnership for researchers*, COM(2008)317 final

¹³ http://ec.europa.eu/research/fp7/understanding/marie-curieinbrief/research-development_en.html

¹⁴ http://ec.europa.eu/research/fp7/understanding/marie-curieinbrief/research-development_en.html

¹⁵ http://ec.europa.eu/research/fp7/understanding/marie-curieinbrief/research-business_en.html



4.2.1 Championing the professional and career development of researchers:

Vitae, a national programme funded by the UK Research Councils, champions the personal, professional and career development of doctoral researchers and research staff in higher education institutions and research institutes¹⁶. Vitae works with all stakeholders to:

- establish strategic partnerships, championing the needs and demonstrating the impact of researchers
- embed professional and career development in the research environment
- provide career-related resources, advice, information and fora for individual researchers, including doctoral candidates and doctoral graduates
- be an interface between researchers, the higher education sector and employers, facilitating a network of employers who employ (or intend to employ) researchers; provide information to employers regarding the value of researchers; explore the needs and experiences of non-HE employers.

4.2.2 Transfer of research results and collaborations:

IWT¹⁷, the Belgian government agency for Innovation by Science and Technology, aims to help Flemish companies by stimulating innovation. Specific grants for doctoral candidates and post-doctoral fellows made available through the Baekeland programme. Fellowships offered in cooperation with an industrial promoter include:

- creation of a spin-off
- transfer of research from academia to industry
- valorisation within the research institute.

The Fixo programme¹⁸, (*Formazione & Innovazione per l'Occupazione- Training & Innovation for Employment*), promoted and supported by the Italian Ministry of Labour, Health and Social Policy, is relevant though not specific to doctoral graduates. It promotes the industrial use of research ideas by supporting academic spin-offs in strategic areas for Italy's economic and social development.

Important opportunities are offered within member countries through access to the European Social Fund (ESF). The fund focuses on European Community priorities such as strengthening economic and social cohesion by improving employment and job opportunities. For example, the Mykolas Romeris University in Lithuania uses these funds as the first stage in a process to create a system where industry participates actively in doctoral education and "Dote Ricerca Applicata" is designed to support specific research projects developed in partnership between universities and enterprises in the Lombardia Region of Italy. The Italian Region of Puglia is exploiting the ESF to fund scholarships for the implementation of applied research projects and/or technology transfer proposed jointly by a researcher, a research body and a company and providing a tangible economic and industrial impact whilst delivering innovative products and/or processes¹⁹.

A major recent change to doctoral training in France has been the spread and strengthening of linkages between the academic and productive research sectors. Doctoral graduates, especially mechanical engineers and computer scientists, are increasingly attracted to careers in the private sector. Since the early 1980s the French Ministry of Research and Technology has developed the CIFRE programme²⁰. This is an incentive scheme linking a company and a public research group in order to finance a doctoral candidate working in an applied area likely to be profitable for the

¹⁶ Some of the many activities of the Program Vitae can be found in the report's examples of good practice.

¹⁷ <http://www.iwt.be>

¹⁸ <http://www.progettofixo.it/>

¹⁹ <http://formazione.regione.puglia.it/index.php>

²⁰ ANRT, association nationale de la recherche technique, <http://www.anrt.asso.fr/>



company as well as to produce doctoral graduates better adapted to the needs of employers. Doctoral candidates work on a three-year contract within a business or industrial setting in cooperation with an external academic research team and are paid by the company partner. The candidate commits to split his/her productive time between the company and the academic institute or laboratory. Aims of the programme are that research is increasingly linked to business needs and that a large proportion of these highly qualified human resources will go on to work in the private sector.

In Denmark, “The Industrial PhD Programme” was established in 1989 by the Danish Agency for Science, Technology and Innovation. The Programme strengthens research and development in Danish business communities by giving scientists an insight into commercial aspects of research and development and helping them to develop personal networks to promote sharing of knowledge between companies and universities. An Industrial PhD is a three-year research project and training programme with an industrial focus conducted jointly by a private company, a doctoral candidate and a university. The candidate is employed and paid by the company and enrolled at the university, dividing time equally between the company and the university²¹. The company and the university each receive a subsidy through the Programme.

In the UK, a national programme of Collaborative Doctoral Awards (CASE awards)²² has run since 1994. This grant scheme intends to encourage and develop collaboration and partnerships between Higher Education Institutions (HEIs) and non-academic organisations and businesses. Awards should provide opportunities for doctoral candidates to gain first hand experience of work outside an academic environment with some candidates having support from both academic and non-academic supervisors. Awards enhance employment-related skills gained during the course of a doctoral programme, encourage and establish links that can have long-term benefits for both collaborating partners and provide access to resources, materials, knowledge and expertise that may not otherwise have been available. The overall aim is to provide social, cultural and economic benefits to wider society.

In Malta, the national Research, Technology, Design and Innovation programme funds research projects which must include Academia-industry links and doctoral candidates are recruited as part of this initiative.

4.2.3 Development of transferable skills:

In 2001, the UK Government commissioned a review of the supply of people with science, technology, engineering and mathematics skills. The resulting “Roberts’ Review” identified a number of problems in the supply of high level skills including a mismatch between the skills of doctoral graduates and those required by employers, for example transferable skills including practical application of technical knowledge. Following the report and the UK government’s response²³, specific funding to support career development and the development of transferable skills was made available to research institutions on a per-head basis for doctoral candidates and post-doctoral research staff funded by the UK Research Councils²⁴. Funding was designed to build

²¹ <http://en.fi.dk/acts/guidelines-for-the-industrial-phd-fellowship-programme>

²² With one per cent of the world’s population the UK achieved 12 per cent of the world’s scientific citations in 2007/08 (Cfr. Department for Business Innovation & Skills, *Higher Ambitions*, 2009)

²³ http://webarchive.nationalarchives.gov.uk/+http://www.hm-treasury.gov.uk/budget/budget_06/assoc_docs/bud_bud06_adscience.cfm

²⁴ <http://www.rcuk.ac.uk/cmsweb/downloads/rcuk/researchcareers/faqs.pdf>



capacity in the short-term and over the longer-term will be incorporated into normal research funding streams.

The Academy of Finland²⁵ is the main funding agency for basic research in Finland. It works towards:

- more efficient career planning and mentoring of doctoral candidates
- an increase in the number of doctoral graduates working outside academia
- providing the skills required for a professional career in research
- providing qualifications for other positions of expertise.

In France, following intense debate around the professional future of doctoral graduates, an association specializing in professional development and careers counselling for researchers was established, namely the Association Bernard Gregory (ABG). In line with national policies, the ABG have developed an exemplary programme of training and services to develop and place doctoral candidates²⁶.

In Italy, an interesting pilot project, aimed at enhancing knowledge of the entrepreneurial environment, is currently running with doctoral candidates in Italian Universities.²⁷ In the UK, specific funds have been made available to universities in receipt of research council research grants and who wish to develop activities to promote entrepreneurship, with £2.4M paid to 51 organisations in 2008²⁸.

The Emilia Romagna Region in Italy is supporting a programme called "SPINNER"²⁹. It aims to promote the development of a new knowledge-based society by supporting the upgrading of qualifications, knowledge and competences of people operating in R&D, technology transfer and innovation. The programme provides individuals or groups with fellowships, assistance for developing business ideas or writing project proposals, tutoring and technical assistance for implementation of the projects, together with highly specialized consulting services and financial aid to achieve specific activities. The Programme, running since 2001, is funded by the European Global Grant – an innovative financial tool aiming at managing public intervention policies through the support of a selected intermediary, in this case a consortium acting on behalf of the Emilia-Romagna Regional Government. Partners in the consortium are [ASTER Emilia-Romagna Science and Technology Association](#) (Bologna, Italy), [Fondazione Alma Mater](#) (University of Bologna, Italy) and Invitalia – the National Agency for Inward Investment Promotion and Enterprise Development.

4.2.4 Incentives to employ specialist research staff:

The Spanish Ministry of Science and Education (MEC) promotes the incorporation of doctoral graduates and technologists into companies by funding the Torres Quevedo programme³⁰. The programme aims to relieve companies - especially SMEs - of the considerable cost of employing specialist staff during the first years of their business activity or when starting a new R+D+I project, largely reducing the risk of this kind of activity. Grants available are direct subsidies and may amount up to 75% of the total recruitment cost, depending on the project and the kind of beneficiary. This programme also provides the "Sistema Puente" (Bridge System), an online tool for enhancing inter-sectoral mobility by promoting contact between researchers and employers.

²⁵ <http://www.aka.fi>

²⁶ The training activities of ABG are described among the examples of training paths outlined in the following pages.

²⁷ The project is very interesting from the point of view of the implementation process of an action aimed at PhDs in a changing environment which is that Italian and for this reason it will describe among the good practice.

²⁸ <http://www.rcuk.ac.uk/cmsweb/downloads/rcuk/researchcareers/08repsument.pdf>

²⁹ www.spinner.it, www.form-azione.it.

³⁰ Cotec, *Valor de los doctores en las empresas*, Madrid 2006



Researchers are encouraged to post details of their areas of expertise to a database open to potential employers.

The issue of careers beyond the academic environment for doctoral graduates has been addressed only recently in Italy. In a recent joint statement³¹, the relevant government ministries identified six related areas of action focussed on career-related training including the need to 'open' doctorates to the industrial sector. The concept of "high level apprenticeship"³² is suggested to support SMEs to invest in high quality personnel.

4.3 GOOD PRACTICE IN DOCTORAL TRAINING AND CAREER SUPPORT SERVICES: SOME EXAMPLES

Given below are examples of experiences considered to represent good practice in national and European-level support for cross-sectoral employability of doctoral graduates.

Criteria used to define "good practice" were:

- Relevance to the aims of this survey
- Innovation: is it innovative in at least one aspect?
- Reproducibility and transferability to different settings
- Sustainability
- Mainstreaming

4.3.1 ReMaT Project³³

WHO

Partners in this EU-funded project were the Brussels Office of the Helmholtz Association of German Research Centers, the Oxford Science Enterprise Center, Saïd Business School, University of Oxford and TuTech Innovation GmbH (Hamburg University)

WHAT

REMAT (Research Management Training for Early-Career Researchers) is an intensive programme of research management training aimed at early career researchers including doctoral candidates. It is now being offered to research institutions on an 'at-cost' basis.

Acknowledging that such knowledge may not only be developed through participation in a research project, it gives a basic introduction to the ideas of scientific entrepreneurship, research funding and project management. The idea of European networking is embedded in the concept and participation from different countries is encouraged at each workshop.

HOW

Content was developed through focus groups involving researchers at different stages of their career, senior industrial research managers, business executives and academics from doctoral schools. The model was tested in several locations in Europe, inviting participants and external observers to provide feedback.

³¹ http://www.governo.it/GovernoInforma/Dossier/piano_occupabilita/Piano_occupabilita.pdf

³²In Italy the "apprenticeship contract" is a contract of employment with training function. Among the various types of contract of apprenticeship, a law of 2003 (D. Lgs. 276/2003) provides the possibility to achieve a qualification at secondary level, equivalent to university degrees and of higher education (including doctoral). This type of contract is particularly advantageous for employers because it allows employers to employ young people until 29 years, taking advantage of special benefit and tax relief.

³³ www.remat-project.eu



The ReMaT course is normally delivered as a 2-day intensive course of 5 modules but 'train-the-trainer' workshops are also available to support research institutions to offer similar training based on the ReMaT model.

4.3.2 Association Bernard Gregory³⁴

WHO

The ABG, established in 1980, promotes the value of training through research to non-academic employers to aid the entry of new doctoral graduates into business.

WHAT

Working with partner organisations it publishes magazines and newsletters, offers training for doctoral candidates and job matching through an online database.

Training and support available from ABG includes

- Avanthese (before thesis): an 18-hour course providing guidance to those considering a doctoral course. It examines personal aspirations and helps a potential candidate to understand the nature of research training.
- Self-evaluation tool: an annual assessment survey for doctoral candidates directing them to reflect on the skills they are developing through their doctorate.
- Doctoriales: one week courses for mid-term doctoral candidates introducing them to the business world and encouraging them to reflect on their future career
- Nouveau Chapitre de la these (new chapter of the thesis): with the help of a mentor, candidates are encouraged to consider their skills, career prospects and destinations and present them as an additional chapter to their thesis.
- Post Doctoriales: 3-day residential seminars for recent doctoral graduates to explore, with HR managers and consultants, alternatives to academic research. Graduates are supported to understand the job market and to build a professional network.

HOW

The cycle of training activities aim to support doctoral candidates from the point of choice to the completion of doctoral studies. Training is led by ABG-trained staff, often from the business world, and requires that candidates take a pro-active approach. The programme of support includes working in groups as well as individual counselling.

4.3.3 ASTER³⁵

WHO

ASTER, the consortium among Emilia Romagna Region (Italy), universities, national research organisations CNR and ENEA, working at local level, and Regional Union of Chambers of Commerce of Emilia-Romagna and regional business associations, aims to support, coordinate and consolidate the regional Research and Technology Transfer Network, creating two-way dialogue and partnerships between research and industry.

³⁴ <http://www.abg.asso.fr/>

³⁵ <http://www.aster.it>



ASTER aims to address:

- Competitiveness of the Emilia Romagna Region by increasing collaborations between academic research and business
- the need for researchers to strengthen their professional identity as new industrial career opportunities arise

WHAT

Since 2005, ASTER coordinates the High Technology Network. In the Network, there are 57 organizations dedicated to industrial research, innovation and technology transfer located in different areas of Emilia-Romagna and it employs 313 researchers.

M-ASTER³⁶ is a range of training opportunities, aiming to develop transferable skills and business awareness, for scientific and technical doctoral candidates and graduates. The programme, developed in conjunction with representatives from the business community, has been running since late 2006.

HOW

The following schemes form part of the M-ASTER programme:

- M-ASTER DOC: an intensive week-long summer school aimed at increasing business and TT awareness. Team-working activities, conversations with entrepreneurs and industrial researchers and visits to companies are included
- M-ASTER LAB: This is a one year course (approx 1.5 days/month) and includes:
 - 6 events addressing key themes of innovation and TT introduced by experts in the field with follow-up in-depth sessions related to these themes
 - Half-day in-depth sessions focussed on topics such as intellectual property and companies' innovation needs
 - 2 month projects proposed and completed by working groups with the support of tutors. Groups were matched with an appropriate local company and group members spent time working in the partner company
- M-ASTER Match: 3 days during which a psychologist and scientific communicator prepare groups of researchers to present their research results to companies at the local event "R2B-Research to Business" that takes place in Bologna each year.
- M-ASTER 2 days: Intensive 2 consecutive 12-hour-days course including meetings with representatives from innovative companies or research centres

4.3.4 Dottorati³⁷ - a project of the Italian Agency for the Diffusion of Innovation Technology

WHO

Active since 2009, the national Agency is directed by the Ministry of Public Administration and Innovation. Its mission is to enhance the competitive capacity of SMEs and industrial clusters through the dissemination of new technologies and their industrial applications. It also promotes integration between research and industry through the identification, enhancement and dissemination of new knowledge, patents and industrial products at national and international level.

³⁶ M-Aster is not a masters degree. The 'M' focuses on 3 features of the courses: Modular, Matching (amongst doctoral candidates) and Meeting (doctoral candidates from different fields of study).

³⁷ In Italian language the word "Dottorati" means "Doctoral courses"



WHAT

The Agency strives to consolidate university-industry relationships and prioritises interventions to accelerate the inclusion of doctoral graduates into business and to strengthen researchers' managerial skills. A working group was established in 2009 composed of two experts from the agency, 5 professors with a specific background in innovation, a representative of Aster and a representative of the Conference of Rectors of Italian Universities (CRUI). The group intends to operate alongside existing initiatives and has designed four pilot projects aimed at integrating elements of enterprise culture into doctoral training. The projects will be piloted with doctoral researchers from different Italian regions during 2010-11. The main roles of the Agency will be in monitoring and implementation. The aim is to ensure that this 'cultural integration' becomes standard practice in Italy.

HOW

The scheme will be piloted with 2nd year doctoral candidates and will:

- a) Encompass two elements - teaching and project work;
- b) Cover issues relating to business culture as well as transferable skills;
- c) Feature a wide range of training tools, including workshops, company visits and an internship;
- d) Encourage economic exploitation of the candidates' research results by creating a business plan;
- e) Encourage participants to undertake projects outside the academic context;
- f) Encourage partnerships between candidates from different regions.

The recommended duration for pilot projects is approximately four weeks plus preparatory work. The proposed timing (during the 2nd year of the doctoral programme) is intended to encourage timely reflection on future career options.

4.3.5 VITAE Programmes and on line databases

WHO

Vitae is a national organisation funded by the UK Research Councils to champion the personal, professional and career development of doctoral researchers and research staff. It comprises a national team based in Cambridge, eight regional hubs located in UK universities and a large network both of researchers and of staff who support their professional development. Vitae is supported by a range of sector based bodies and advised by a range of expert advisory groups drawn from across the sector.

WHAT

Vitae Programmes: training and development courses tailored to researchers, based on an experiential learning model, freely available to the Higher Education sector for use as part of institutional or regional programmes. Courses have been piloted in partnership with institutions and are supported by guidance and access to a network of experienced trainers.

A series of searchable online databases³⁸:

- Database of practice: over 600 examples of practice relating to skills and career development for researchers, the majority submitted by UK universities

³⁸ www.vitae.ac.uk/practice



- Database of resources: a range of resources designed for training providers including icebreakers, presentations, videos, evaluation tools etc. Resources are all freely available and users can upload more
- Database of trainers and developers: access to experienced individuals working in the field of researcher development
- Database of career stories: written and filmed stories from hundreds of people with a doctorate or research background. Users can upload their own stories

Inter-linkages can be made, e.g. to indicate a trainer who has experience in delivering a particular resource.

HOW

A large part of Vitae's work is to encourage and facilitate the sharing of examples of practice related to researcher development across UK institutions. This supports sustainability by minimising overlap of effort. Sharing happens within the network, at national and regional events and also through a series of freely-accessible online databases. Vitae hosts and administers the databases, has developed some of the content and encourages network members to update and use them.

4.4 OPPORTUNITIES

The main gap emerging from our survey is the lack of homogeneity of experience between European nations in the support available to doctoral candidates and graduates to engage in careers outside the academic context. In some countries provision is very advanced but in others the issue has only recently been recognised as important. This heterogeneity of context has to be taken into account during the implementation of new actions resulting from this project.

Some 'key players' interviewed highlighted difficulties for beneficiaries in accessing funds available to support collaborative doctorates suggesting a gap in information and support. Partners in this project should pay attention to similar issues when making recommendations for career guidance services for doctoral candidates and graduates.

Several surveys mapping the landscape of training and employment outcomes of doctoral graduates already provide rich data (in particular those undertaken by LERU³⁹ and EUA⁴⁰). However, there has been no in-depth study of transferable skills training and career guidance services for doctoral candidates and graduates across Europe and sharing models for universities, companies and other players is an area of opportunity.

4.5 RECOMMENDATIONS AND SUGGESTIONS

Two levels of recommendations are presented:

4.5.1 Recommendations addressed to public bodies

1. The European Commission, report "Mobility of Researchers between Academia and Industry - 12 practical recommendations"⁴¹, recommends that public authorities:

³⁹ www.leru.org

⁴⁰ www.eua.be

⁴¹ EC, DG Research, *Mobility of Researchers between Academia and Industry - 12 practical recommendations*, http://ec.europa.eu/euraxess/pdf/mobility_of_researchers_light.pdf



- remove administrative barriers to the mobility between academia and industry,
 - set the framework conditions for academia-industry partnerships by favouring co-location and collaboration through jointly funded research grants and fellowships
 - provide funding for training to further professionalise academic staff at all levels to become on a par with industry
 - actively support the implementation of EU existing and future initiatives, schemes and instruments that remove obstacles to inter-sectoral mobility by raising awareness of their importance, e.g. social security rules, complementary pension schemes etc., where necessary changing national legislation to overcome obstacles
2. LERU (League of European Research Universities), in its report on "Doctoral Studies in Europe: excellence in research training"⁴², recommends that the European Commission and other actors promote and support dialogue, interaction and exchange of researchers between universities and business
 3. EUA in its report "Collaborative Doctoral Education"⁴³ underlines that "*The committed support of governments is essential, as facilitators of university-industry collaboration and, specifically, in doctoral education, and should include initiatives to address structural issues that are outside the capacity of the individual research actors*". It also states that "*...collaborative programmes require for their sustainability...the continued support from governments and funding bodies. Government funding support and its necessary accountability requirements provide organizational structure and help to enhance quality*".

4.5.2 Recommendations related to operational practice

The following recommendations are mostly taken from interviews with key players:

- promote self-awareness for existing skills and attributes
- support doctoral candidates/graduates in articulating their skills and attributes to non-academic audiences using a language all can understand
- support doctoral candidates/graduates and their supervisors to be informed of all the opportunities open to them
- empower doctoral candidates/graduates to take development opportunities
- Support the creation of opportunities for secondments, or work experience in the commercial sector
- increase networking opportunities and awareness of the hidden job market
- promote greater awareness of the value of doctoral graduates to the growth of business and industry through innovation.

⁴² LERU, *Doctoral Studies in Europe: excellence in research training*, www.leru.org/file.php?type=download&id=1020

⁴³ Borrell-Damian, Lidia, *Collaborative Doctoral Education*, EUA, 2009.

http://www.eua.be/fileadmin/user_upload/files/Publications/DOC-CAREERS.pdf



5. INSTITUTIONAL SUPPORT FOR DOCTORAL CANDIDATES

Author: Suzanne Gatt (University of Malta)

5.1 INTRODUCTION

This part of the report focuses on the different forms of institutional support which exist within Universities for doctoral candidates and for doctoral graduates employed as staff. At European level, in 2005, the Commission adopted the European Charter for Researchers and a Code of Conduct for the Recruitment of Researchers⁴⁴ setting out the roles and responsibilities of researchers, their employers and funders and ways to make recruitment fairer and more transparent. This action reflects the importance being given by the European Commission to make Europe the most advanced knowledge society in the world. The emphasis is on ensuring that there is a good supply of researchers to the labour market outside the academic world.

The need for researchers in the economy has also impacted Universities as they realise that more and more of their graduates will not remain in academia but will move to industry. Universities need to ensure that doctoral graduates are not only trained to develop the skills needed for work in academia, but also those skills which are needed to work, research and generate knowledge as part of the innovation and development process within industry from a European and International perspective.

5.2 CURRENT PRACTICE

Reforms in Higher Education across Europe have influenced the provision of training for doctoral candidates. Culturally, a doctorate is considered as preparation to follow an academic career path and consequently publications are considered the most important accomplishments. However, with a need for more doctoral graduates in industry, skills requirements for researchers have to change accordingly. A report about doctoral programmes, their achievements and the challenges faced⁴⁵, was prepared by the European University Association for Ministers of Higher Education. This document identifies two types of current organisational models for providing doctoral studies:

- **Graduate Schools:** which provide administrative and transferable skills development support, organise admissions, courses, and seminars and take responsibility for quality assurance;
- **Doctoral/Research Schools:** which are organisational structures that include only doctoral candidates and may be organised round a particular discipline, research theme or cross-disciplinary research areas and/or may be focused on creating a research group/network and is project driven. These models are not mutually exclusive and often have shared characteristics.

The report highlighted how countries or institutions may adopt both models within their systems and/or structures. It identified the main advantages and added value which doctoral/graduate/research schools provide and which they identified to include:

⁴⁴ European Commission, Directorate-General for Research Information and Communication Unit, 2005, *The European Charter for Researchers: The Code of Conduct for the Recruitment of Researchers*, Brussels: European Commission.

⁴⁵ Universities U.K., 2009, *Promoting the UK doctorate: opportunities and challenge*, London: Universities UK



- A definite mission or vision shared by all partners and which facilitates the process of turning doctoral candidates into excellent researchers;
- Provision of a stimulating research environment and promotion of cooperation across disciplines, fostering interdisciplinarity;
- Provision of a clear administrative structure for doctoral programmes, candidates and supervisors, and offering a clear profile and status for doctoral candidates;
- Ensuring critical mass of research tutors and support to overcome the isolation of young researchers;
- Enabling junior and senior researchers to join and work together;
- Support and facilities for the task of supervising candidates and the role of supervisors;
- A good organisation with respect to the admission process with transparent rules and regulations;
- Provision of teaching and transferable skills training across the various disciplines;
- Provision of enhanced career development opportunities, including advice on funding opportunities (scholarships, projects);
- Guarantee of quality assurance and monitoring;
- Provision of a framework allowing the development of codes of practice, procedures and mechanisms within the university structure and acting as an independent arbitrator or ombudsman where necessary;
- Opportunities for mobility, international collaboration and inter-institutional cooperation.

The amount of career development support offered to doctoral candidates in Universities is not uniform and varies across countries as well as across institutions. Infrastructure across Europe varies. The most advanced country is the United Kingdom where most Higher Education institutions have a careers service. Germany and Belgium are also ahead in terms of supporting the transition to non-academic careers. There is, however, no overall strategic plan and above all there are no services devoted to doctoral candidates.

In the UK the Research Councils' Career Development and Transferable Skills Training Fund (known as the Roberts' Fund) – is specifically for the training of doctoral candidates and early career research staff. Roberts funding is to be dedicated to transferable skills training, applicable to a range of environments including the business environment. Payments are made to institutions in receipt of research council grant funding to support researchers on a 'per head' basis; in 2007/08, payments totaling £22M were made to 170 organisations. The aim of the fund is to promote the embedding of transferable skills development into doctoral programmes over the longer term. From 2007, an additional sum has been distributed to support training and/or course development in the area of entrepreneurship with the aim of increasing awareness and encouraging innovative approaches to the exploitation of research – £2.4M was paid to 51 organisations in 2008²⁸.

A concordat⁴⁶ with the aim of setting out a vision of working practices, roles and responsibilities that UK Research Councils and Universities believe will further the attractiveness and sustainability of research careers in the UK was published in 2008. The Concordat establishes seven principles:

1. Recognition of the importance of recruiting, selecting and retaining researchers with the highest potential to achieve excellence in research (recruitment and selection);

⁴⁶ Research Councils UK Executive Group, 2009, Research Council Implementation Plan 2009 for the Concordat for the Career Management of Researchers



2. Researchers are recognized and valued by their employing organization as an essential part of their organisation's human resources and a key component of their overall strategy to develop and deliver world-class research (recognition and value)
3. Researchers are equipped and supported to be adaptable and flexible in an increasingly diverse, mobile, global research environment (support and career development);
4. The importance of researchers' personal and career development, and lifelong learning, is clearly recognized and promoted at all stages of their career (support and career development);
5. Individual researchers share the responsibility for and need to pro-actively engage in their own personal and career and lifelong development (Researchers Responsibilities)
6. Diversity and equality must be promoted in all aspects of the recruitment and career management of researchers (Diversity and Equality);
7. The sector and all stakeholders will undertake regular and collective review.

Some university academics have a limited view of the skills that researchers in industry need, and so there is a need for more input from other stakeholders. Doctoral graduates need to develop transferable skills such as commercial awareness, social and language skills, career management, internationalization and global citizenship, strategic overview, environmental approach etc.

Currently there is general acknowledgement that doctoral graduates need to be supported in their career management. There is also an overall understanding that support for and promotion of effective career management through training and career services should be an essential part of doctoral candidates' education programmes. Although different countries and institutions within the same countries provide different levels and types of support, there is agreement that support needs to increase and that there should be more support available to doctoral graduates for their transition to the labour market.

5.3 EXAMPLES OF GOOD PRACTICE

Several examples of good practice in support for doctoral candidates have been identified through interviews as well as the literature reviewed. These include various forms of training programmes, support and career services as well as opportunities for work placements during doctoral studies.

5.3.1 Some examples influence the direct or individual support available:

- ***Holistic approach to Research:*** Ruhr University in Germany supports a holistic approach to doctoral studies and promotes interdisciplinary research. The research-related training is intended to provide in-depth disciplinary and interdisciplinary competence for and beyond an individual research project. This part of the training programme relies on strong collaborations with faculties and their own initiatives (International Graduate School Biology, Graduate School for Chemistry and Biochemistry) and research programmes like Collaborative Research Centres (SFBs), Research Units (FGs), Marie-Curie Activities (EU-MC), Research Training Groups (GRGs), Graduate Schools (GSs) of the Ruhr-University Bochum. Furthermore the involvement of the International Max-Planck Research Schools in Dortmund (IMPRS-CB) and in Düsseldorf (IMPRS-SurMat) offer research related training in cooperation with the Research School. Doctoral candidates engage in activities such as: discussions about recent scientific knowledge; discussions about special research methods; active participation in scientific communication; and section day - organised by the doctoral fellows - supporting networking activities within

DOCENT Doctors in Enterprise



the section as well as across sections by giving candidates the opportunity to present their research results to all fellows of the Research School;

- **Mentoring:** Imperial College London, UK have a mentoring scheme which was introduced to give researchers the opportunity to talk with someone who has similar experiences but is further ahead in their career. The idea is to get help and guidance from others who have recently been in similar situations and can thus provide vital information on how best to invest in one's career;
- **Ensuring Quality assurance in doctoral supervision:** There have been developments in the type and quality of supervision for doctoral candidates. In the UK there has been the development of a transparent system for skills development based on the Quality Assurance Agency Code of Practice for research degree programmes⁴⁷.

5.3.2 Various forms of career support actions aimed specifically at doctoral candidates or early stage researchers have also been identified, including:

- **Enterprise and Entrepreneurship Training for Researchers:** Through support funds made available by the UK Engineering and Physical Sciences Research Council (EPSRC) to develop entrepreneurship skills with doctoral candidates and graduates, UK Universities have improved the level of support available to doctoral candidates and graduates who wish to develop their own business ideas. Areas addressed include intellectual and property rights and patents, recognizing opportunities, networking, how to start a business or a spin-out company, creativity, case studies of successful entrepreneurs, entrepreneurial strategy, marketing opportunities, finance, business planning and marketing. The type of support provided varies, ranging from websites and podcasts to business games, seminars, workshops, special events, residential courses, mentoring schemes and placements;
- **Recognition of transferable skills:** Liverpool John Moores University, UK, has developed a collaborative 'World of Work' programme with employers which supports a pro-active approach to preparing for work and identifies 8 transferable skills that all their graduates should have: analyzing and problem solving, team working and interpersonal skills, verbal communication, personal planning and organizing, initiative, numerical reasoning, information literacy and IT skills. The programme⁴⁸ includes a skill gap analysis, workshops and group sessions, filmed interviews with employers, placement opportunities, conventional careers guidance and employer-endorsed certification;

5.3.3 Other examples of good practices include:

- **Dialogue with industry:** The University of Southampton, UK has a good level of interaction with employers and schools. It runs two programmes finding placements for doctoral candidates. One programme uses EPSRC entrepreneurship 'Roberts' funding to support an internships programme. Two persons are employed to run an employer engagement project. Their role is to facilitate dialogue between industry and the University, in order to check that the University is doing the right thing in terms of skills development. This was considered necessary as there is such a great difference between how educational institutions and industry think and operate;
- **Widening knowledge and experience amongst senior university staff:** One way of keeping university professors in touch with industry is to encourage them to take on

⁴⁷ <http://www.qaa.ac.uk/academicinfrastructure/codeofpractice/section1/default.asp>

⁴⁸ <http://www.ljmu.ac.uk/WoW>



consultancy work such that they can build a network within the labour market as well as understand better the skills needed within industry. There are various models which have been identified. In Norway, professors can spend 20% of their time in industry. In the Netherlands there are 'Extraordinary Professors' who work outside University, usually in industry, allowing the University to bring in specialized expertise that otherwise would not be available;

- **Setting up of technology transfer offices:** This model is found both in Spain as well as in Malta, even if in the latter it is still in its early stages. The concept of such offices is to provide that stepping-stone which would allow doctoral graduates and Professors to obtain support to exploit their research in business. It is often difficult for individuals to go into business alone. These offices aim to work in partnerships with researchers in the process of setting up spin-off companies which would be to the financial benefit of both the University and the researchers. In Malta the University has entered into talks with government and there will be a special trust-fund for start-ups. This fund will help doctoral graduates, in partnership with the university, to start up R & D companies and through which doctoral graduates can start their own business;

5.4 OPPORTUNITIES

The concept of a supply of doctoral graduates to work in industry is quite recent within Universities, where, in the past, the majority tended to remain within academia. As policies change and new challenges and opportunities emerge, gaps in the type of preparation and provision need to be identified. Identifying gaps is an important exercise as it serves to provide direction with respect to action that needs to be taken and at what level. The interviews carried out for this project as well as the literature review have provided some insight into the various gaps which exist when it comes to the training of doctoral candidates and graduates in preparation for work in industry. Opportunities presented by some gaps identified include:

- **Harmonisation of support from Universities:** The current situation across Europe is that there is variance in the type and quality of career management support provided to doctoral graduates in preparation for the labour market. This reflects a lack of coherent strategy at both National and European levels. So far, every institution provides different services depending on the importance it attributes to different skills, its budget as well as the number of personnel which it can dedicate to such services. The outcome is lack of harmonisation of development support resulting in different levels of preparation of doctoral graduates within the same country and more so across Europe. Increases in sharing of practice and strategy between institutions could benefit doctoral candidates and enrich the pool of those with high level skills available to European industry;
- **Achieving greater clarity on employment possibilities:** doctoral candidates will not all realise that, by a long way, there are not enough jobs within academia to accommodate all doctoral graduates produced. A majority of graduates will need to plan for careers outside academia and should be encouraged to invest in training, at an early stage, which will help them to work in industry;
- **A greater emphasis on career management:** A survey on career prospects for researchers in Europe highlighted that the majority of scientists had not received support on career development but that they would have liked to have had more training in transferable skills which could allow them to adapt to any environment. Opinions vary on whether it is the job of industry or of universities to provide training and development opportunities of this type;



- **Networking within academia and between academia and industry:** doctoral candidates are often reported to experience isolation both within the department in which they are carrying out research as well as within academic society in general. Socialisation is a very important element of research as peer review is one of the important aspects of research, whether working in academia as well as in industry. Research is becoming more interdisciplinary and there is need for doctoral candidates to be exposed to different disciplines in order to familiarise themselves with other areas of knowledge. The same argument can be put forward with respect to networking with employers: only exposure to different employment sectors will lead to an understanding of the needs of industry and of the many opportunities available to doctoral graduates;
- **Increased mobility of doctoral candidates:** As research projects become larger and interdisciplinary, they are also becoming more trans-national and trans-sector. This means that researchers need to learn to work within international and multi-sector teams. It thus becomes important for doctoral candidates to have opportunities for working in different environments as part of their research studies. There could be more opportunities for doctoral candidates to experience mobility through placements in industry rather than in other research institutes;
- **Quality assurance in supervision:** One of the factors identified which still needs to be addressed and improved is that of ensuring quality assurance in the type, level and frequency of supervision provided to doctoral candidates. Some have started working to develop quality assurance measures to ensure good supervision, either at national or at university level, but this is not present everywhere resulting in a non-uniform level of doctoral supervision;
- **Better support for part-time doctoral candidates:** Universities are not always aware of the difficulties which doctoral candidates, particularly part-time candidates, may experience in coping with the demands of work and studies as well as home and family. Additional support may be needed including better levels of supervision and tailored career management support;
- **Improved dialogue between Universities and employers:** If universities are to prepare doctoral candidates for work in industry in order to help meet the demand for high level skills to in society dialogue between academia and industry must be opened or built on.

5.5 RECOMMENDATIONS

The interviews and literature review undertaken for this project have provided ample ideas with respect to possible actions which can be taken in order to build on the transferable skills of doctoral candidates and to facilitate their transition to work in industry.

- **Universities need to develop better understanding of the needs of industry.** One way to achieve this is through research grants in areas of importance to industry and which promote synergies between Universities and industry. The more Universities work closely with industry, the more they can understand how industries think and operate and how they view research and the high level skills they need to achieve their goals;
- **Promote better University-industry collaboration** by encouraging professors and established researchers to take up consultancy assignments in industry. This will both provide Universities with insight into what industry requires as well as create channels and networks which may be of value to doctoral graduates looking for employment opportunities;



- ***Provide more work placement opportunities for doctoral candidates:*** Spending some of their time within industry will give doctoral candidates insight into how industry works and what to expect when working outside academia. Work placements could also be in a different country to provide an international experience;
- ***Universities need to offer comprehensive career management services to doctoral candidates:*** There is need to develop programmes which provide more effective career management services to doctoral candidates, starting from the point where an individual is choosing the topic for research. Support services (such as advice, guidebooks) can help them in deciding on the best opportunities, initiatives and career investments to make. Access to training workshops in transferable skills and opportunities for interdisciplinary networking are vital. Career management services should be targeted specifically to doctoral candidates and graduates rather than including them in undergraduate provision. Doctoral candidates and graduates should be encouraged to reflect on their own career development needs;
- ***Increased financial support for research-related activity:*** Participation in conferences, peer review exercises and collaborative meetings are examples of research-related activity that could constitute an important means of developing employability skills. Doctoral candidates could get much more out of such experiences if they were adequately funded and supported, for example by being linked to training and with support for candidates to reflect on their learning;
- ***Promote an entrepreneurial attitude:*** There is an agreed need that Universities should have specific programmes, particularly in entrepreneurship, for doctoral candidates as well as support for start-up companies;
- ***All Universities can be encouraged to publish standards for doctoral programmes:*** Candidates registered on doctoral programmes have expressed the desire to have more clear information about their studies. They need Universities to set standards about what students can expect in terms of the quality of their programme and as well as the support available to develop employability skills alongside research skills. Universities should also invest in more transparent and effective systems for gathering and responding to feedback from doctoral candidates to help evaluate the quality and suitability of the support they are offering;
- ***Improve the quality of supervision:*** mainly through having two rather than just one supervisor and by including supervisors with experience in different employment sectors in order to widen perspectives and increase inter-sectoral mobility;
- ***Make greater efforts to integrate doctoral candidates in the Faculty.*** Universities need to make efforts to prevent doctoral candidates from feeling a sense of isolation, especially within the Faculty within which they are doing their research. This may involve including them in Faculty activities and staff discussions, as well as organising events where doctoral candidates come together to discuss their work.

It is evident that there are yet many improvements which could be made by Universities in terms of support structures for the career management of doctoral candidates, particularly in respect of preparation for newly trained researchers to take up employment in industry. This transition requires a different form of preparation to that for employment in academia and this new challenge needs to be addressed at the earliest opportunity.



6 HIGH-LEVEL SKILLS NEEDS OF EMPLOYERS

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In the business environment high level skills are key to maintaining the competitive advantage of companies. Doctoral graduates are, in many ways, well-placed to meet the high-level skills needs of private employers. This study sets out to analyse, from the perspective of businesses, the current situation and processes around employment of doctoral candidates in the private sector.

The viewpoint taken is based both on relevant reports and reviews selected by each partner participating in the project and on individual interviews with key players. Much of the "Current Picture", including Quantitative data, has been drawn from the desk research. Qualitative information (mainly described in "Opportunities" and "Recommendations") is largely derived from interviews. The selection of key players to represent the interests and concerns of companies who hire doctoral graduates was an important aspect of this study.

6.1 CURRENT PICTURE

The contribution that doctoral graduates can make to a knowledge-based economy and to meeting the needs of a wide employment market has been recognised in policy-level discussions related to the development of a single 'European Research Area'⁴⁹. To ensure the successful exploitation of the high level skills of doctoral graduates, strong relationships between businesses and universities are vital; although major progress has been made in this area⁵⁰ there is still much more to be done⁵¹.

The situation is a highly heterogeneous one; clear differences across Europe, make it difficult to draw general conclusions. We can see variation in employment patterns of doctoral graduates as well as in the specific contributions that companies might be looking to doctoral graduates to make. Company size, strategy and R+D spending, approaches to recruitment and career structures, national or regional policies and the emphasis universities put on preparation for work outside the academic sector are several factors likely to contribute to the complexity of the overall picture. In addition, debates about the purpose of the doctorate are ongoing in Europe with opinions remaining divided in some countries.

There are thus a range of environments with variation within as well as between countries. These encompass areas where a doctorate is widely considered an appropriate training for a career in the commercial sector as well as for academic roles. This environment is more prevalent in some subject areas, especially engineering⁵². and in Germany where a high proportion of company directors have doctorates (based on views from several interviewees). In other areas a high percentage of doctoral graduates work in private companies but a doctorate is still widely considered, in both business and academic circles, as associated with an academic career. This environment is more typical of knowledge-economies including the UK, France, the Netherlands

⁴⁹ http://ec.europa.eu/research/era/index_en.htm

⁵⁰ Research careers in Europe - Landscape and Horizons. Beate Scholz, Eero Vuorio, Susanne Matuschek, Iain Cameron for the European Science Foundation forum on research careers.

⁵¹ Mobility of Researchers between Academia and Industry 12 practical recommendations. European Commission - Directorate-General for Research

⁵² Employers' views of researchers' skills. The Rugby Team



and Skandanavian countries. In other areas a doctorate may be more widely viewed as the precursor to an academic career only and here we would expect that relatively few doctoral graduates work in the private sector. This environment is more prevalent in predominantly industrial and/or service sector economies (including those with a high reliance on tourism) and including parts of Spain, Portugal, Greece and Italy.

6.1.1 Where are doctoral graduates employed?

Limited data are available to describe the employment patterns of European doctoral graduates but there is useful data from a few countries which is described in more detail in chapter 7.

- Spain: in 2006, only 27% doctoral graduates worked for private companies, the majority working in universities and Public Authorities. A career in public research institutes is still a strongly preferred option for Spanish doctoral graduates⁵³. The highest numbers of doctoral graduates are concentrated in the areas of natural, medical and social sciences⁵⁴
- Italy: just 12% of doctoral graduates asked as part of the STELLA survey were employed in the private sector, while most (40%) work for a public university⁵⁵
- France: 46% French doctoral graduates/researchers work in private companies⁵⁶
- UK: half of all 2007 UK-domiciled doctoral graduates (and more for some subjects including biomedical and physical sciences/engineering) were working outside the higher education sector within 1 year post-graduation⁵⁷.

6.1.2 What do doctoral graduates bring to the private sector?

From an individual perspective, reasons to undertake a doctoral degree are various. While some wish to follow an academic career, many undertake doctoral studies because of interest in the subject area and to develop their expertise. Their main motivation might be career advancement and a desire to 'stand out from the crowd'. For others it may be a way to change direction professionally or to improve skills in order to be more employable in difficult economic conditions. A preference for a career based entirely or partially in the private sector could have a similar range of motivations, from the desire to see a personal contribution translated into action or products, through financial considerations and the desire for relative stability.

Reasons for companies to hire doctoral graduates vary depending on the role in question. They may include in-depth expertise in a specialised area but other high level skills they have developed and their 'first class brains' might be as important or more important to the employer. Doctoral graduates may be hired for problem solving ability and analytical skills, the capacity to communicate with and work with other specialists – inside or outside the company – and their international links. The report from the DOC-CAREERS project⁵⁸ highlights an expectation that they be aware of potential commercial outputs from research and have an ability to integrate into the culture and values of a company. Such attributes may be valued especially by SMEs who may be seeking employees with the ability to contribute across functions and at all levels. Entrepreneurial

⁵³ Guía de las Empresas que ofrecen Empleo 2009.

⁵⁴ <http://www.ine.es> INE. Encuesta sobre Recursos Humanos en Ciencia y Tecnología. Año 2006.

Guía de las Empresas que ofrecen Empleo 2009. (Pag.31).

Estudio situación Laboral de los Doctores. Datos generales.

⁵⁵ The doctor of research: a driver of innovation for companies? STELLA Inter-university initiative (Statistics on the theme of degrees and work archived online)

⁵⁶ <http://www.ine.es>. INE. Estadística de I+D. Datos Europeos. Recursos humanos

⁵⁷ www.vitae.ac.uk/wdrd

⁵⁸ Collaborative doctoral education. University-industry partnerships for enhancing knowledge Exchange. EUA publications 2009



spirit, being a self-leader, ability for long-term planning and original thinking are valued as is international experience and interdisciplinarity. Exploitation of the skills and competencies of doctoral graduates is not limited to R+D activities: monitoring technological developments worldwide, technology transfer to affiliates or sub-contracting companies and training technicians and engineers for implementing new processes are some areas where their contribution might be sought. Employers place great value on whether doctoral graduates have work experience in a private company, especially in the same sector and even in the same company. As well as developing commercial awareness and business skills this is likely to enhance experience in managing people and in leadership.

Potential employers of doctoral graduates may not be fully aware of the range and level of skills that doctoral graduates could bring to their companies. Of a group of 104 employers surveyed in the UK⁵⁹, whilst around a third are already targeting doctoral graduates in their recruitment, nearly half are not actively targeting them but express an interest in doing so and many of the 1/5 of employers who said they do not wish to recruit doctoral graduates do not have any experience of working with this group. 73% of the companies who replied would welcome more applications from doctoral graduates.

Companies consulted for the DOC-CAREERS project ranked prized skills and attributes offered by doctoral graduates as follows (most valued first): technical proficiency, work in-depth at the frontiers of knowledge, work across disciplinary/functional boundaries, originality and creativity, being a team player, ability to explain and communicate to non-specialists, ability to integrate ideas and resources from a wide pool of sources, customer orientation, entrepreneurial mindset, social skills and experiences and leadership potential. It should be noted that these are 'average' ratings and the focus of different companies is likely to vary.

UK employers were asked to rank doctoral graduates' skills to paint a picture of their expectations from this group⁵⁹. Skills were typically ranked in the following order: data analysis, problem solving, drive and motivation, project managing, interpersonal skills, leadership and commercial awareness. Unsurprisingly, skills closely related to the process of research are high on the list of expectations. It is interesting to note that the greater an organisation's experience of doctoral graduates, the higher the anticipated level of competence across all skills.

Aside from expectations, companies may also have specific concerns about hiring doctoral graduates, whether these are based on experience or on general perceptions. Companies may take a cautious approach to hiring doctoral graduates as they may consider their focus to be on research and publication in journals etc. If there is a perception that the doctoral graduate's professional objective may be focused on obtaining an academic position, a company might question their long-term commitment to the company's business objectives⁶⁰. Some candidates themselves believe that companies either do not value their doctorate or can even see their qualification as a disadvantage. One Spanish study addressed this question and found that 39% consider their doctorate as a disadvantage when seeking employment with private companies, 36% feel that companies are indifferent to a doctorate and that it is valued by just 25%⁶¹. In Catalonia, 35% of doctoral graduates who look for work in companies hide the fact that they are doctoral graduates. When asked about their professional expectations, half indicated that they have encountered obstacles when searching for work in companies, such as: being over-qualified, being too expensive, lacking work experience in the private sector, being relatively old for a first

⁵⁹ Recruiting researchers survey of employer practice 2009; www.vitae.ac.uk/employers

⁶⁰http://stella.cilea.it/opencms/export/sites/default/pdf_stella/Executive_DR_STELLA_2009_tabelle_v11.pdf

⁶¹ Estudio Situación Laboral de los Doctores. Fundación Madrid+d para el conocimiento. 2007



job, being thought likely to leave to pursue academic opportunities or having a low value placed on their doctoral studies⁶².

6.1.3 Effect of company size

Large companies with separate R+D functions are more likely than SMEs to target doctoral graduates as employees. Human Resources policies in most small and medium-sized companies are not focussed on recruiting highly specialised workers as they require personnel with general knowledge⁶³ and, often, without major work and salary expectations. The profile of an SME employee must typically be more versatile and multidisciplinary and a specialisation can therefore have less value than transferable skills such as project management, languages, team management and leadership. A person with a first degree may be seen as less costly, less specialised and easy to train as they develop experience within the company. Larger companies may be in a position to divide activities and make use of specialist skills but general attributes such as originality and creativity remain important whilst many specific skills can be learned later⁶⁴. In very small and start-up companies the business model may be based on costs and not on research, innovation and training. In countries where a majority of private companies are smaller, we might expect that the proportion of doctoral graduates employed in them might be lower.

6.1.4 Company strategy

Companies with long-term vision and a policy to innovate are those most likely to hire doctoral graduates⁶⁵. In order to innovate companies must invest: a study conducted in Spain in 2008 among companies found that the factors which impeded innovation or which influenced the decision not to innovate included cost – costs were too high or there was a lack of funds or financing⁶⁶. Across European countries the higher the percentage of GDP invested in R&D, the higher the number of doctoral graduates who tend to be hired by companies. R+D spending is typically lower in industry-based than in knowledge-based economies. R&D spending in Spain in 2007 was 1.27% of GDP, whereas, for example, in Germany and France it was 2.53% and 2.08% respectively⁶⁷.

Although companies are increasingly investing in innovation and the number of researchers in business is growing, some countries still lag behind in this area⁶⁸.

Smaller companies are typically able to devote fewer resources to research and innovation. In 2008, 42% of Spanish companies with 250 or more employees were innovative (using a broad definition of 'innovation') and 28% had an R+D function, whilst of companies with fewer than 250 employees just 17% carried out innovative activities and 6% performed R+D⁶⁹. This suggests that smaller companies typically employ lower proportions of doctoral graduates but some likely exceptions to this are smaller technology-based and research-service companies who need the skills of doctoral graduates to support their day-to-day business. Tertiary sector companies

⁶² Estudio Situación Laboral de los Doctores. Fundación Madrid+d para el conocimiento. 2007

⁶³ MCFA survey: Training Needs of Researchers on Complementary Skills. Marie Curie Fellowship Association. Recruiting PhD UK Grad programme.

⁶⁴ Collaborative doctoral education: University-Industry Partnerships for Enhancing Knowledge Exchange (DOC-CAREERS project). Lidia Borrell-Damian for EUA

⁶⁵ Valor de los doctores en las empresas. Cotec, Fundación por la innovación tecnológica

⁶⁶ <http://www.ine.es>. INE. Estadística de I+D. Datos Europeos. Encuesta sobre innovación en las empresas 2008

⁶⁷ <http://www.ine.es>. INE. Estadística de I+D. Datos Europeos. Gastos

⁶⁸ Value of PhDs in companies. Fundación Cotec

⁶⁹ <http://www.ine.es> INE. Encuesta sobre innovación en las empresas 2008.



(services, tourism etc) are less likely to invest in R+D and so we would expect the proportion of doctoral graduates employed to be lower in those companies.

In the case of 'spin-off' companies originating in a university or research institute the R+D function may be retained in or sub-contracted to the academic 'home' and whilst doctoral graduates are not directly employed, academic staff are able to gain valuable experience working on a commercial project.

6.1.5 Approaches to recruitment

Companies who are actively targeting doctoral graduates in their recruitment often have specific criteria for hiring doctoral graduates and /or a specific organisation for recruiting them and managing their careers (e.g. scientific recruitment division in HR department). Employers who simply encourage researchers to apply on the same basis as other graduate recruits are not usually as successful in recruiting doctoral graduates⁵⁹. Large companies are most likely to use in-depth selection processes directed by specialised human and technical resources⁷⁰ whereas reliance on selection from a contact network is more prevalent amongst smaller companies.

In contrast to the situation in some universities, a candidate qualified to doctoral level may not be paid a premium based on their qualifications alone. Whilst an elevated salary may be used to attract candidates where a doctoral graduate is required⁷¹, salaries are more likely to be based on the perceived value of an employee to the company than to be on a special 'scale'.

There is a general move towards the use of New Technologies for recruiting personnel to companies, e.g. to obtain CVs which match the profile of a vacancy. An example of an innovative portal is www.alicante.tumeves.com.

6.1.6 Career structures for doctoral graduates

Career management of doctoral graduates varies according to the management policy and culture of each company. Some larger companies have multi-track routes, either hiring doctoral graduates as researchers to follow a specific career pattern as scientific and technical specialists or as generalists on a management track. Other large companies and most smaller companies will take a less structured approach, recruiting to a specific position but with potential to shift towards management positions, inside or outside R+D activities.

6.1.7 National or regional policies

National and sometimes regional policies may significantly affect the numbers of doctoral graduates hired by the private sector. For example, 'credit impot recherche' (research tax credit) in France⁷² is designed to stimulate R+D and the Torres Quevedo programme in Spain⁷³ specifically aims to stimulate the flow of doctoral graduates into private companies by offering temporary salary subsidies to the company.

⁷⁰ Employers' views of researchers' skills. The Rugby Team

⁷¹ Recruiting researchers: survey of employer practice 2009. Vitae- realising the potential of researchers.

⁷² <http://www.industrie.gouv.fr/enjeux/innovation/cir.html>

⁷³ Programa Torres Quevedo. Mec (Ministry of Education and Science, Spain)

<http://investigacion.universia.es/programas-nacionales/torres-quevedo/index.htm>.
www.madrimasd.org/empleo/documentos



6.1.8 Preparation for work outside the academic sector

A doctoral degree has traditionally been considered to lead to an academic career. Whilst this is still the prevailing viewpoint in some European countries, others have begun re-orienting themselves to consider the benefits that a doctoral education can offer to wider society. This entails helping individual doctoral candidates and graduates to prepare for a non-academic or varied career path. As the provider of doctoral education, much of the responsibility for this rests with the University or research institute and their funders. Companies who employ doctoral graduates are increasingly involved in joint doctoral projects with universities. Such schemes foster relationships and understanding and offer opportunities to individuals to gain valuable experience working outside the academic environment⁵⁸.

It is worth noting that several employers interviewed for this project emphasised that they look to doctoral graduates to provide core research-related skills such as analytical and problem-solving ability. They also look for potential to develop other competencies and attributes related to the role or career path, such as leadership or interpersonal skills. Companies expect to develop the transferable skills of staff members further. An ability to recognise and articulate ones own skills and potential is therefore an important area of focus in preparing doctoral candidates and graduates to work outside the academic sector. Different working cultures can also be an obstacle⁷⁴ and so a basic understanding of this is also key.

Candidates for private sector jobs requiring high level skills may also need to be flexible in terms of geographical mobility⁷⁵. During the period 1996-2006, over a quarter of Spanish doctoral graduates went to live abroad although reasons for doing so varied⁷⁶.

64% of doctoral graduates questioned as part of a Spanish study believe that their doctoral studies prepared them for work in the private sector. This is promising, however there is still some way to go⁷⁷.

6.2 EXAMPLES OF GOOD PRACTICE

The following are examples of activities that contribute to our understanding of how high level skills needs of employers from the private sector can be met. Examples were included if they were judged to be:

- Pioneering -, i.e. activities perceived to be new or different, or
- Excellent - i.e. activities perceived to make particularly efficient use of resources to obtain good results

6.2.1 Producing doctoral graduates better adapted to the needs of private companies

The CIFRE Programme in France, through the Ministry of Investigation and Technology, connects universities and companies to train doctoral candidates so that they are better adapted to company needs. Three year grants are made to companies who then recruit doctoral candidates

⁷⁴ Research careers in Europe - Landscape and Horizons. Beate Scholz, Eero Vuorio, Susanne Matuschek, Iain Cameron for the European Science Foundation forum on research careers.

⁷⁵ Collaborative doctoral education: University-Industry Partnerships for Enhancing Knowledge Exchange (DOC-CAREERS project). Lidia Borrell-Damian for EUA

⁷⁶ <http://www.ine.es> INE. Encuesta sobre Recursos Humanos en Ciencia y Tecnología. Año 2006.

⁷⁷ Estudio Situación Laboral de los Doctores. Fundación Madrid+d para el conocimiento. 2007



from universities or research institutes. 80% of past participants in the scheme currently work in private companies and just 12% in the public sector⁷⁸.

6.2.2 Generating high level skills from within

Many companies support interested employees to undertake doctoral training, often on a part-time basis, alongside their work. Examples are Bosch, Germany⁷⁹ and the Technological Toy Institute in Spain.

6.2.3 Supporting spin-off companies

There are numerous examples of European companies created by doctoral graduates from within universities or research institutes. One example from is GalChimia (REF www.galchimia.com), which has become a leader in the field of Synthetic Organic Chemistry in Spain. It provides the Chemical and Pharmaceutical industries with customised Synthesis services, Research under Contract and Process Development by providing a team of expert professionals.

6.2.4 Supporting mobility

Through the EURAXESS EU-funded web portal aimed at supporting geographical mobility of researchers⁸¹, European doctoral graduates have access to a wide range of useful information including links to opportunities for jobs, for research funding, for international collaboration and for trans-national mobility. EURAXESS provides targeted information about research policies, and for researchers planning to relocate, offers assistance on matters such as work permits, schooling, health care and languages both through the website and through local offices. An online networking tool is provided for researchers working away from their own country. Whilst opportunities and information highlighted are currently targeted at the academic researcher, the service represents a model which could be used to support mobility between employment sectors.

6.2.5 Promoting the supply of high level skills to industry

AstraZeneca (AZ) is an international pharmaceutical company which has strong links with the academic sector on different levels. Examples from the UK include AZ-led collaborations with universities, joint doctoral studentships, individual research fellowships offered with other organisations and engagement in KT networks. Engagement with academic partners is important to the company who value both technical research skills and leadership attributes in recruits. AZ are interested in influencing policy related to the supply of skills to the industry and support the European level 'Innovative Medicines Initiative'⁸² which aims to attract bio-medical R&D investment to Europe, to anchor R&D jobs in Europe and reverse the brain drain and to strengthen the competitive position of smaller companies in the pharma sector. The company interfaces with the policy field at different levels, both local and national: e.g. working with UK Research Councils

⁷⁸ Value of PhDs in companies. Fundación Cotec

⁷⁹ Mobility of Researchers between Academia and Industry 12 practical recommendations. European Commission. Directorate-General for Research

⁸⁰ EURAXESS jobs portal. http://ec.europa.eu/euraxess/index_en.cfm

⁸¹ EURAXESS jobs portal. http://ec.europa.eu/euraxess/index_en.cfm

⁸² http://imi.europa.eu/index_en.html



where the focus is on postgraduate training, strong links to UK sector skills councils⁸³ and local RDAs (regional development agencies). AZ sits on the UK STEM high level strategy group and contributed to the UK government science and innovation investment framework and next steps⁸⁴.

6.2.6 Developing career management skills

Investment in developing the career management skills of doctoral candidates and graduates will aid the mobility of highly skilled individuals to private companies. A substantial amount of support is offered to UK researchers by the academic sector and by Vitae⁸⁵ who work with research institutions to support and promote the professional development of all researchers. Vitae has developed, tested and shared many activities which support active career management and widen employment perspectives such as GRADschools, Broadening Horizons and Careers in Focus events³⁸.

6.2.7 Linking companies and doctoral graduates

As well as specific incentives for companies to invest in research which are used in some countries, there are some specific actions which aim to establish links between companies and doctoral graduates. These are targeted in particular at small and medium-sized companies:

- In Italy, associations (ADI) are working on projects to create specialised national databases which allow companies and doctoral graduates to form direct links
- In Spain, the Bridge System is a mobility tool which the Ministry of Science and Innovation (MICINN) offers on its website⁸⁶. It promotes contact between those with vacancies and researchers whilst maintaining the fullest confidentiality possible. The site also allows access to the websites of other agencies which place researchers in contact with possible hirers.

6.3 OPPORTUNITIES

We can identify several areas which present opportunities for action to support a flow of doctoral graduates into private industry.

6.3.1 Policy is ahead of practice

Policy at European and often at national level aims to bring wide benefits to society by promoting a flow of those high level skills offered by doctoral graduates into private companies. However, implementation of those practical actions that will support this still lag behind in many areas. Academia produces increasing numbers of doctoral graduates³ in order to support this need for high level skills – far more than it can employ - but the perception that a doctorate will lead to an academic career remains, to a greater or lesser degree, amongst the academics and doctoral candidates of many European countries.

⁸³ <http://www.sscalliance.org/>

⁸⁴ http://webarchive.nationalarchives.gov.uk/+http://www.hm-treasury.gov.uk/budget/budget_06/assoc_docs/bud_bud06_adscience.cfm

⁸⁵ www.vitae.ac.uk

⁸⁶ Mec (Ministry of Education and Science in Spain)



6.3.2 Levels of understanding between the academic and commercial worlds

Awareness of the added value that doctoral graduates can bring to private industry is likely to remain low whilst employers have limited experience of employing doctoral graduates and this is likely to persist while investment in R&D remains low in some sectors and countries⁸⁷. Employers may not look beyond the specialist technical skills that doctoral graduates can offer and might even perceive a mismatch between their needs and the technical skills that the academic sector delivers. From the other perspective, 'business orientation' can be lacking, or perceived as lacking, amongst doctoral graduates as well as the ability to speak to employers 'in their own language'. A lack of work experience outside academia can mean that other highly valued skills are relatively underdeveloped, e.g. people management or leadership⁸⁸. Due to a lack of prior experience, doctoral graduates involved in developing spin-off companies have often found themselves on a steep learning curve when it comes to managing the financial and commercial aspects of a company.

6.3.3 Awareness of skills and the ability to develop them

Based on experience from countries which have focused on the career development of doctoral candidates and graduates we can say that promoting greater awareness of existing skills and how to continue developing them is an appropriate approach. Well-focused experience, time to reflect on what has been learned and developing the ability to articulate and evidence attributes are also important.

6.3.4 Entrepreneurial education

Creativity is an attribute closely aligned with the research process and is likely to be highly prized by employers. Companies also need entrepreneurs in order to turn ideas into innovations. An entrepreneurial approach can be learned by channelling creative thought into meeting commercial aims.

6.3.5 Drawing value from working together

Based on responses from several interviewees, some collaboration agreements between companies and universities were felt to be weak in that they did not always support the synergies that they aimed to create. There is an opportunity for all parties to learn from the most successful examples across Europe, in particular as regards outcomes likely to support flow of doctoral graduates into the private sector.

Heavy use of subsidies to stimulate flow of doctoral graduates into the private sector may generate negative as well as positive effects such as over-reliance on temporary funding leading to a reduced drive to innovate. They may, however, provide a way in for doctoral graduates to be able to demonstrate the commercial value of their high level skills.

6.3.6 Reaching doctoral graduates

Employers may not know how to reach doctoral graduates⁸⁹. Companies' increasing use of recruitment agencies also opens up the question of whether agencies are familiar with what this group can offer and how they can be reached. Some universities provide job-matching services for

⁸⁷ Evaluating the impacts of developing researcher skills. The Rugby Team

⁸⁸ MCFA survey: Training Needs of Researchers on Complementary Skills. Marie Curie Fellowship Association

⁸⁹ Evaluating the impacts of developing researcher skills. The Rugby Team



graduates although these are unlikely to be specific to doctoral graduates; help with professional orientation and work experience opportunities is more widely available. There is an opportunity for a more active mediation role.

6.4 RECOMMENDATIONS

From the studies reviewed and the interviews conducted we can make recommendations for further work on this project and more broadly to support the incorporation of doctoral graduates into private industry as a valuable source of innovative thinking.

6.4.1 General recommendations:

- Industry and the academic sector can work together to ensure a good supply of appropriate high level skills to the private sector
- There is much benefit to be drawn from industry-university collaborations and we should learn from the successes of the best schemes and examples
- Doctoral education must include opportunities to gain wider experience, particularly of work in the private sector
- Doctoral education should advance interdisciplinary approaches as well as supporting the development of those transferable skills and competencies which will help graduates to succeed outside as well as inside academia.

6.4.2 Recommendations specific to this project, i.e. to feed into development of training modules and a model for university careers services:

- 'Work orientation' courses aimed at widening the employment perspective and support to develop a professional strategy should be developed for use as part of doctoral degrees. Individual support should be available
- A candidate for a private sector post requiring high level skills should be able to evidence some experience in or understanding of the following transferable skills and competencies: leadership, teamwork and decision-making, negotiating, personal skills (empathy, communications, etc), communication, command of foreign languages. As well as these, doctoral graduates should gain experience in practical skills such as in handling budgets. Engaging companies' active participation in the development and delivery of training is recommended⁹⁰
- Activities should be offered to support the development of creativity into an entrepreneurial approach
- Universities should offer practical support to doctoral candidates and graduates who wish to have a career outside academia. This could include tailored advice, based on a strong network of university and private sector contacts, both for companies seeking high level skills and for doctoral graduates. A designated contact or candidate mentors could be the conduit for such a service
- Universities should take an informing and promoting role, targeting information about the potential value of employing doctoral graduates to employers, employment agencies, trade

⁹⁰ Evaluating the impacts of developing researcher skills. The Rugby team



associations etc. and sharing good practice from companies which have hired doctoral graduates to those who have not yet considered hiring them⁹¹

- The Eures Network⁹², currently aimed at promoting geographical mobility, could also be used to promote inter-sectoral mobility or used as a model
- Opportunities to gain direct experience of the private sector can be achieved through measures such as placements and internships⁹³, private sector mentors as is more common in France and Germany⁹⁴, via academics with industrial experience such as the Extraordinary Professors engaged by Universities in the Netherlands to broaden the perspective of the institution⁹⁵ or via events and activities which bring doctoral candidates into contact with private sector representatives such as alumni
- Universities should foster close links with companies, business and professional associations, science parks and biocentres in order to have a clear and up-to-date picture of the high level skills and attributes that are needed by the private sector
- Universities should consider approaches and mechanisms to facilitate direct links between companies and doctoral graduates, for example by building networks

⁹¹ Research careers in Europe - Landscape and Horizons. Beate Scholz, Eero Vuorio, Susanne Matuschek, Iain Cameron for the European Science Foundation forum on research careers. Researchers' skills and competencies. Vitae

⁹² Red Eures <http://ec.europa.eu/eures/home.jsp?lang=es>

⁹³ Recruiting researchers: survey of employer practice 2009. Vitae- realising the potential of researchers.

⁹⁴ Mobility of Researchers between Academia and Industry 12 practical recommendations. European Commission - Directorate-General for Research

⁹⁵ Mobility of Researchers between Academia and Industry 12 practical recommendations. European Commission - Directorate-General for Research



7 CAREERS AND EMPLOYABILITY SKILLS FOR DOCTORAL CANDIDATES AND GRADUATES

Authors: Jane Sugars and Ellen Pearce (CRAC)

'Career' refers to an individual's work and life roles over their lifespan. It can encompass a number of distinct areas, types of role, employment sectors and so on. Society as well as individuals can benefit from such an open career model as it fosters a broad outlook and supports a cooperative approach. This view contrasts with a more traditional concept of career as progression up an ordered hierarchy within a single organisation or profession. While we can identify themes and trends in career paths for researchers, individual careers and career decisions are usually based on a complex set of motivations.

Participants at a recent European Universities Association Council for Doctoral Education (EUA-CDE) conference were of the view that researchers and research need to be an underpinning element to building a European knowledge economy. However, there is still debate around the doctorate and how it should be promoted as an appropriate basis for a career in any sector as, historically, it has primarily been seen as training for an academic career. Despite some common perceptions we know that a majority of doctoral graduates in some European countries leave academia, many never having intended to follow an academic career. A recent proliferation of professional doctorates and part-time researchers undertaking doctoral degrees mid-career as part of their continuing professional development (CPD) gives weight to the view that doctoral studies add value far beyond the academic sector.

In this chapter we examine

- The current policy context
- Concepts of career and theory on career management
- What we already know about career paths and destinations for doctoral graduates, including both research and non-research careers in academia, the public and private sectors.

We also look at different sector viewpoints on

- The purpose of doctoral education
- Career paths for doctoral graduates
- Support for doctoral candidates to establish successful careers in the private sector.

We highlight some examples of good practice, consider what is yet to achieve and draw out recommendations from the data collected.

7.1 THE CURRENT PICTURE

7.1.1 Policy context

For the past decade the drive in Europe has been to unify systems of HE qualifications to form the so-called European Higher Education Area (EHEA) and to adopt common principles for undertaking research, to form a European Research Area (ERA). Numerous agreements and projects have arisen from these drivers, several of which have relevance to careers for doctoral graduates. These include:



- The Dublin Descriptors⁹⁶. Drawn up in 2004 by a cross-Europe 'Joint Quality initiative Group' they provide a framework for doctoral-level qualifications, seeing doctoral education as relevant to society as a whole. A doctoral graduate 'can be expected to promote... technological, social or cultural advancement in a knowledge based society'
- The 'Salzburg Principles'⁹⁷. Resulting from a 2005 EUA meeting on the EHEA they recognise that doctoral training must increasingly meet the needs of an employment market wider than academia
- The European Charter for researchers⁹⁸. A set of general principles adopted by the European Commission in 2005 which specify the roles, responsibilities and entitlements of researchers as well as of funders and/or employers of researchers. It calls for new instruments for the career development of researchers to be implemented across Europe
- In 2008 the European Council called for the creation of a 'fifth freedom'⁹⁹ to remove barriers to the free movement of knowledge in the EU. It envisions better career structures and 'the optimal use of intellectual property created in public research organisations so as to increase knowledge transfer to industry'.

Policy is also made at national, regional and often at institutional level. The UK in particular has produced many national policy initiatives relevant to this area (see chapter 4).

7.1.2 The concept of career

Modern concepts of career are influenced by changes in work and recruitment patterns, many of which have taken place rapidly over the last few years affecting all sectors. Globalisation, competition and financial constraints have meant restructuring and more fixed-term contracts leading employers to demand flexible and adaptable employees with transferable skills.

These trends are likely to have an impact on careers for doctoral graduates. Intersectoral mobility and the ability to translate skills, knowledge and experience into new settings and contexts will be important. A modern career is unlikely to be within a single organisation or occupation and is likely to embrace paid and un-paid work, part-time and full-time work and self-employment. The balance of responsibility for career management has shifted from employer to individual. To maintain employability, any individual in the workforce needs to be able to adapt to changes by continuously learning, developing and transferring skills¹⁰⁰.

7.1.3 Career management

Many policy documents highlight the active role of researchers in managing their own careers¹⁰¹. The term 'career management' suggests taking control, but modern careers theory also places emphasis on the role of serendipity and luck and of creating and being open to opportunities. Effective career management requires that an individual understands themselves and what they want from life and has a knowledge of possible careers including types of work and working environments, recruitment methods, career structures and the available development opportunities. An understanding of the wider economic, political, social, and technological climate is also important.

Typically, a career management process will follow this cycle:

⁹⁶ <http://vitae.ac.uk/cms/files/Dublin-descriptors-for-doctorate-Mar-2004.pdf>

⁹⁷ http://www.eua.be/eua/jsp/en/upload/Salzburg_Report_final.1129817011146.pdf

⁹⁸ http://ec.europa.eu/eracareers/pdf/am509774CEE_EN_E4.pdf

⁹⁹ <http://vitae.ac.uk/policy-practice/3394/Fifth-freedom.html>

¹⁰⁰ <http://www.vitae.ac.uk/researchers/1332/What-is-a-career.html>

¹⁰¹ Eg UK Concordat



- self awareness review to consider career priorities, values, current skills, commitments and constraints
- exploration of the range of options and possibilities for a future career
- planning steps towards a career goal
- actions to fulfill the plan
- review of learning¹⁰².

Universities (e.g. the UK model) provide dedicated career advisors to support doctoral candidates and/or graduates considering their options. The kind of process outlined above may be undertaken with an advisor or coach or tackled as part of a course. In some countries, for example in France, a similar process typically forms a formal part of doctoral education and may be led by academic staff.

7.1.4 What data do we have and who collects it?

This is an emerging area of focus and there is widespread acknowledgement of the need to increase our understanding of career pathways for doctorate holders by collecting more data¹⁰³. A collaborative project run by OECD, Eurostat and the UNNESCO Institute for Statistics explores career mapping for doctorate holders globally and recommends the collection of internationally comparable indicators, giving a model and guidelines¹⁰⁴. The Europe-wide DOC-CAREERS project⁶ found few examples of institutional mechanisms for career tracking but saw this as an emerging and important area of activity. Diverse motivations for and approaches to collecting data were reported by respondents.

There are some examples of data ranging from European to university level:

- Following on from the Careers of Doctorate holders (CDH) project, the first large scale data collection was carried out in 2007 and has recently been analysed¹⁰⁵. 25 countries including several from the EU participated
- Eurodoc has surveyed European doctoral candidates and recent graduates to collect data on topics including career paths¹⁰⁶
- The UK national agency HESA (the Higher Education Statistics Agency) conducts an annual Destinations of Leavers (DLHE) survey. Data collected includes employment destinations of recent UK-domiciled graduates each January (0-12 months post-graduation) and has been analysed by Vitae as part of the What Do Researchers Do? Series (WDRD)
- Reports on relevant national or other initiatives can provide useful data. For example, COTEC (Spain) have published a report¹⁰⁷ analysing the impact of recent initiatives in Spain to integrate doctoral graduates into commercial companies
- The STELLA survey of Italian doctoral graduates¹⁰⁸ is an inter-university initiative. The 2009 study analyses employment destinations of Italian PhDs who graduated in 2005, 2006 and 2007
- A 2008 survey by the Italian AlmaLaurea inter-university consortium¹⁰⁹ on occupational destinations of doctoral graduates from the University of Bologna makes comparisons with 1st degree graduates from the same university

¹⁰² <http://www.vitae.ac.uk/researchers/1333/Managing-your-career.html>

¹⁰³ Collaborative doctoral education: University-Industry Partnerships for Enhancing Knowledge Exchange, European Universities Association (2009)

¹⁰⁴ Mapping careers and mobility of doctorate holders: draft guidelines, model questionnaire and indicators. OECD, Eurostat, UNESCO Institute for statistics, (2007)

¹⁰⁵ <http://www.oecd.org/dataoecd/46/43/44893058.pdf>

¹⁰⁶ The situation of doctoral candidates within Europe. Eurodoc (2010)

¹⁰⁷ Valor de los doctores en las empresas, Cotec, Fundacion por la innovacion tecnologica (2006)

¹⁰⁸ The doctor of research: a driver of innovation for companies? STELLA inter-University initiative (2009)



- Collections of qualitative data include the Vitae career stories portal¹¹⁰ with links to 200 individual profiles illustrating the range of career options for doctoral graduates

Locating and engaging doctoral graduates is seen as one of the biggest challenges in terms of collecting data. Strategic challenges at university level include agreeing objectives and gaining commitment from the institution.

7.1.5 What do doctoral graduates do?

Relatively little is known about the careers of doctoral graduates within industry, business or enterprise beyond early destinations data for some European countries.

- Just 12% Italian doctoral graduates asked as part of the STELLA survey¹⁰ worked in the private sector, with most (40%) working for a public university
- Half of all new UK-domiciled (2007) doctoral graduates go on to work outside the higher education sector within 1 year post-graduation. This figure is even higher for graduates in biomedical sciences and physical sciences and engineering⁵
- Numbers of UK doctorate holders employed within 1 year of graduation in a particular sector or occupation are highly variable between subject areas⁵
- A strongly preferred option for doctoral graduates within Spain is a career in public research institutes
- UK Research Councils have funded a study to map the career paths of researchers at 3.5 years after gaining their doctorate¹¹¹. Data will be published later in 2010 as part of the WDRD series.

WDRD 2009⁵⁷ identifies employment destinations of UK domiciled doctoral graduates within 1 year post-graduation. UK-domiciled graduates make up 54% of all UK doctoral graduates.

- Half worked outside the education sector (includes university research, teaching and academic-related roles)
- 'Researcher' was the most popular role: 23% overall entered research roles in academia with 12% working in research roles elsewhere. Numbers were higher for graduates in biological sciences (36%; 28%) and physical sciences and engineering
- 25% physical sciences/engineering graduates (1/3 of the cohort) go into manufacturing and 20% go into business/finance/IT. These numbers are considerably higher than those for the whole cohort
- Doctoral graduates are less likely to go into teaching/lecturing compared to the whole population

In 2007, data was collected from 25 countries using methods and guidelines developed by the CDH project to facilitate collection of comparable data sets. European and non-European countries participated. A majority of doctorate holders were found to work as researchers with higher education as their main employment sector, although the average includes data from the US and other non-EU countries where the situation varies from that found in Europe. Interestingly, it showed that, for participating countries, no more than 10-15% of researchers in the business-enterprise sector held a doctoral degree. At least 15% to 30% of European citizens with a doctoral degree

had stayed or lived abroad in the past ten years, generally in another European country. The study noted large intra-European flows, notably towards France, Germany and the United Kingdom.

¹⁰⁹ Doctors of Research. AlmaLaurea (2009)

¹¹⁰ www.vitae.ac.uk/careerstories

¹¹¹ <http://www.rcuk.ac.uk/rescareer/rcdu/impact.htm>



Mobility between research and non-research positions or between different sectors of the economy is stated as a future area for focus.

7.1.6 The doctorate as a preparation for future career

Candidates undertake a doctorate for a wide range of reasons but it is often a proactive career choice. Common reasons include: a desire to develop expertise or to specialize; career advancement; a change of direction; the desire to 'stand out from the pack'; to qualify for a particular profession, including an academic career; interest in the subject; as a response to economic conditions⁵⁹.

Whilst a doctorate is a prerequisite to an academic career in most disciplines across European HE Institutions, many more doctorates are gained than there are places available on the academic career ladder. The modern doctorate constitutes excellent training for non-academic roles outside research or education but where deep and rigorous analysis is required⁴. The traditional output from a doctoral degree is an original contribution to research in the field of study but, increasingly, candidates with wide-ranging professional and transferable skills to add to those specific to their area of research are a desired output.

While a few institutions have a mission focused on producing future research leaders, e.g. the European Molecular Biology Laboratory (EMBL), many aim to prepare doctoral candidates for a range of careers. This might not be immediately apparent to all candidates since academic viewpoints can differ from those of the institution's central functions. There is a view of the doctorate as a high level qualification that trains people to think deeply and rigorously and to translate knowledge into novel opportunities for society but this is not yet held by all employers¹¹².

In knowledge economies, doctorates are more commonly recognised as having relevance to industry and business. In Germany, it is common for doctoral graduates to have a career outside academia and many company directors and managers have doctorates (based on several interview responses). Differences exist between disciplines, for example, 34% UK-domiciled mechanical engineers were employed in the manufacturing sector within a year of graduating (average between 2003 and 2007, compared to 14% for all doctoral graduates). Just 30% of this group were employed in HE research staff roles¹¹³. In some countries, increasing numbers of doctorates are undertaken by mid-career individuals as part of CPD.

Conversely, in countries with largely industrial economies, such as Italy, the clear-cut view of a doctorate as pre-academic training is typically more widespread. Employers might see a doctoral graduate as coming from a 'different world', as 'speaking a different language' and as having too narrow a focus and might not appreciate a potential contribution to industry or business. Such views are not confined to industrial economies but can be found amongst employers and academics across Europe. In addition, academics perceive that companies are still more likely to recognise the benefits of employing doctoral graduates in research roles than in other roles requiring high level analytical skills. Several private sector employers identified practical research skills as more valuable than skills which might be classed as 'transferable'. At one extreme, holding a doctorate can even be viewed as a disadvantage when seeking employment outside academia (views from the UK and Spain).

¹¹² Doctoral degrees beyond 2010: Training talented researchers for Society. League of European Research universities (2010)

¹¹³ What Do Researchers Do? Vitae (2009)



7.1.7 Career paths for doctoral graduates

Given that a career path is unique to each individual, the relatively small numbers of doctoral graduates (compared to first degree graduates and the overall workforce) and the complexity and difficulty of undertaking large scale studies, there is relatively little robust information on the longer term career paths of doctorate holders. There do not seem to be many examples of explicit career path descriptions for doctoral graduates in use at institutional level.

Some larger companies employing doctoral graduates have clear multi-pathway career trajectories e.g. distinguishing research and general management paths. The many doctoral graduates who work in small or medium-sized enterprises are likely to follow more individualised career paths.

One of the challenges for doctoral graduates is to understand progression criteria within their own context, as well as those within other countries or systems. Individuals need to recognise that progression is not automatic, and 'standard' routes mapped out may not always fit with the range of factors that affect their career decisions.

7.1.8 Enhancing employability

In line with European policy, stakeholders in doctoral education are beginning the re-orientation of support to focus on ensuring that doctoral candidates and graduates are able to transfer their skills, knowledge and experiences into diverse work environments and to recognise and articulate the full value of their doctoral education.

Some countries make use of a widely recognised framework of skills and attributes as a basis for employability reflection and training. Universities in Ireland and the UK use nationally agreed frameworks of skills to devise and assess support programmes for doctoral candidates^{114, 115}. These provide guidelines to higher education institutions and include research and generic transferable skills including skills related to career management. A 2009 report from the European Science Foundation (ESF) member organisation forum on research careers recommends that 'the ESF and its member organisations... adopt the joint skills statement' (JSS)¹¹⁶, a tool currently in use in UK universities. The JSS will soon be superseded (summer 2010) by the 'Researcher Development Framework' (RDF) which has been developed by a sector working group¹¹⁷. It describes the knowledge, skills, behaviours and personal qualities of researchers and encourages them to aspire to excellence. The intention is to develop the framework as a tool for individual researchers as well as for universities and support staff. Other organisations have developed lists of key skills for local use.

An increasing amount of work is being done to develop doctoral candidates' awareness of the transferable skills that a doctoral education can bring. Employers want to see evidence of a practical as well as a theoretical approach and self-awareness, potential and experience of the private sector are particularly valued. Employer views are needed to anticipate future development needs. A 2009 Vitae survey of over 100 UK and international employers found that a majority of respondents (73%) would welcome more applications from doctoral graduates.¹¹⁸ Many individual institutions are working closely with companies on collaborative research projects that have the added benefit of increased understanding between the different employment sectors.

¹¹⁴ http://www.4thlevelireland.ie/publications/Graduate_Skills_Statement.pdf

¹¹⁵ www.vitae.ac.uk/jss

¹¹⁶ http://www.esf.org/fileadmin/links/CEO/ResearchCareers_60p%20A4_13Jan.pdf

¹¹⁷ www.vitae.ac.uk/rdf

¹¹⁸ www.vitae.ac.uk/employers



7.1.9 How careers support and guidance is given

Key questions are: how should employability support be provided within an institution and by whom? What is the role of the supervisor? What other specialist staff are required?

The growth of graduate schools across Europe is evidenced by the European Universities Association Council for Doctoral Education, set up in 2008 to enable the 130 members to share practice in supporting career development for doctoral candidates. In many instances, the graduate schools are providing new structures for transferable skills training, for example those funded via the German Excellence Initiative¹¹⁹ which ‘...are based on the principle of training outstanding doctoral students within an excellent research environment’. 50% of such graduate schools have been found to have ‘active collaborations with companies’¹²⁰. At the University of Utrecht a model is used, for arts and humanities research degrees, which aims to integrate supervision and coaching on the levels of content, project management and emotional development¹²¹.

All UK universities offer a careers advisory service to support their students. Typically a range of activities will be available to doctoral candidates (and often to doctoral graduates employed by the university) including courses and workshops, work experience, web-based careers information and events offering links with employers.

Initiatives like the ‘Roberts agenda’¹²² have meant that ‘careers advisors are taking on specialist roles [which] marks a subtle reconfiguration of the way university careers services are operating. This recognises that doctoral candidates and graduates have distinct career needs’¹²³. An Association of Graduate Careers Advisory Services (AGCAS)¹²⁴ works across the UK and has two taskforces specifically to share practice and develop resources to help careers advisors who are working with doctoral candidates and research staff. The association also produces written resources for researchers.

7.2 STRENGTHS AND EXAMPLES OF GOOD PRACTICE

Examples of practice are chosen for their relevance to the aims of this project and to illustrate the range of activity across Europe in this area.

7.2.1 The UK Concordat: putting policy into practice

The ERA⁴⁹ and the European Charter and Code⁴ require that researcher careers are made a focus. In the UK, a Concordat to support the career development of researchers¹²⁵ sets out a vision of working practices, roles and responsibilities to further the attractiveness and sustainability of research careers in the UK by establishing 7 principles. The 2008 Concordat replaces an earlier agreement (1996) and closely aligns with the Charter and Code. It is being widely adopted by UK institutions. A ‘Research Concordat Strategy Group’ and funding for a national implementation co-ordinator position has been made available to promote and aid implementation as well as to assess its extent and impact. Practice-sharing amongst institutions, facilitated through the Vitae

¹¹⁹ http://www.dfg.de/en/research_funding/programmes/excellence_initiative/index.html

¹²⁰ http://www.esf.org/fileadmin/links/CEO/ResearchCareers_60p%20A4_13Jan.pdf

¹²¹ <http://www.vitae.ac.uk/policy-practice/916-86363/Workshops/119901/Vitae-researcher-development-conference-2009-realising-the-potential-of-researchers-.html#pageInfo>

¹²² www.vitae.ac.uk/roberts

¹²³ www.vitae.ac.uk/employers

¹²⁴ <http://www.agcas.org.uk/>

¹²⁵ <http://www.researchconcordat.ac.uk/>



network, complements the role of the group. Vitae has supported implementation of the Concordat's principles in other ways, for example by producing a series of briefings for the various stakeholder groups.

7.2.2 Supporting the collection of internationally comparable data

The Careers of Doctorate Holders (CDH) project was launched in 2004 by the OECD in co-ordination with the UNESCO Institute for Statistics and Eurostat. Its aim is to better understand the labour market, career paths and mobility of a population, which is seen as being key to the production and diffusion of knowledge and innovation. A methodology has been devised and since improved, with the help of an expert group of statisticians from many countries. Methodological guidelines, a core model questionnaire, instruction manual and output indicators are provided for use by countries newly introducing such surveys and to help to improve and align survey methodologies for countries already collecting related data. Survey types to consider include graduate surveys, cohort surveys and cross-sectional retrospective surveys.

Seven countries – Argentina, Australia, Canada, Germany, Portugal, Switzerland and the United States – participated in a data collection pilot in 2005. An analysis from a larger-scale data collection (2007) involving 25 countries has recently been published¹⁰⁵ and represents a rich source of internationally comparable data related to the careers of doctoral graduates.

7.2.3 Career path tool for researchers

Newcastle University, UK, is piloting the 'career pathways scheme'¹²⁶ with research staff in the Faculty of Medical Sciences. If successful it is expected that the programme will be rolled out across all Faculties. The review tool provided by the scheme recognises 4 career routes: 3 academic and 1 'alternative'. Researchers at the 4/5 year post-doctoral point are invited to undertake a Career Pathway Review (CPR) with their manager and a trained advisor, and progress reviews are thereafter linked to the Personal Development Review which should be carried out at least annually and for which there is a specific form for research staff. The CPR includes a discussion of future career aspirations and is designed to

- Allow researchers to focus, from an early stage, on their career path
- Help prevent career drift
- Help identify and encourage suitable candidates to apply for Fellowships at an early stage
- Recognise the contributions of researchers to research teams or groups
- Allow access to careers advice and suitable development activities
- Offer 2 year Faculty Fellowships
- Identify alternative funding sources for Team Scientists

7.2.4 Guidance for effective cross-sector research collaborations

'Responsible Partnering'¹²⁷ is a voluntary code of conduct for innovative companies and public research institutions to enable them to collaborate more effectively to carry out research and at the same time contribute to the achievement of their respective missions in a sustainable way. All forms of collaboration between Science and Industry are useful but collaborative research is the most difficult form of knowledge transfer and also the one with the largest potential for innovation.

The Responsible Partnering guidelines have been developed by experienced practitioners of collaborative research from four European associations representing the needs of Industry (EIRMA), Research & Technology Organisations (EARTO), Universities (EUA) and Knowledge

¹²⁶ http://researchstaff.ncl.ac.uk/rss/careers/index_html?pid=14

¹²⁷ <http://www.responsible-partnering.org/>



Transfer Organisations (ProTon Europe). It is based on an analysis of the main problems preventing effective collaboration and also on collaboration success stories.

Responsible Partnering is both a change of mindset and a practical set of tools. It is also consistent with the new paradigm of Open Innovation.

7.2.5 Raising awareness with employers: Vitae

A range of information resources tailored to the needs of employers and potential employers of researchers have been produced³⁸. These include clear explanations of academic terms and trends in language all can understand and small pieces of research likely to be of interest to private sector employers. The aim is to highlight the value that doctoral graduates can bring to companies, address misconceptions or stereotypes and tackle specific issues such as effective recruitment. Vitae offers employers a chance to join a network to stay updated on matters related to researcher careers and employability including relevant information from other sources.

Recent publications include an analysis of a 2009 survey of employer practice 'Recruiting researchers', an 'at a glance' guide to researchers' skills and competencies and a briefing on 'targeting the postgraduate and researcher market' produced jointly with the Association of Graduate Careers Advisory Services and the Association of Graduate Recruiters.

7.3 OPPORTUNITIES

Much work is already going on in this field but we can identify some areas where further work will support progress; most of the points set out here have been identified through interviews with key players and fall into 3 areas:

7.3.1 Data collection:

Whilst some useful data is available, there are still gaps in the type and extent of data collection and analysis. Collecting data is challenging so is often not done or not done effectively. Also,

- There is a lack of internationally comparable data on the supply, demand and mobility of researchers
- Knowledge of the extent of inter-sectoral mobility is lacking
- Knowledge of non-academic career paths for doctoral graduates is lacking
- Where data is being collected and analysed improvements could often be made, e.g. to collect longitudinal rather than 'snapshot' data or to improve data breakdown e.g. to reveal more about the career aspirations and destinations of different types of doctoral graduates

7.3.2 Attitudes and culture:

There is an opportunity to target better information to academics and employers, many of whom do not consider doctoral graduates' skills as able to meet the needs of the private sector. Amongst academics, a career in industry can still be viewed as a 2nd class choice and those who take up non-academic roles can be seen as failures or a loss to the system rather than as using their skills to benefit society. This view is not universally held and varies between institutions as well as from country to country. Employers do not universally recognise a modern doctorate as more than training for an academic career. In some cases they may expect that doctoral graduates seeking to join their company are not doing so as a first choice and will leave if a preferred academic appointment becomes available.



There is also a lack of knowledge amongst supervisors on their doctoral candidates' career aspirations and the possibilities open to them, due insufficient information and training.

Amongst doctoral candidates themselves the need for career planning can be under-recognised; careers advisors often state that they seek advice only in times of crisis. There is scope for improvements in candidates' awareness of the range of career options and in support to take a pro-active approach to career planning.

7.3.3 Working together:

Industry-academic collaborations could benefit much more from each other than they do now, through sharing practice from the most successful partnerships. Dialogue between universities and private companies should also be developed to better understand skills gaps and how to address them.

7.4 RECOMMENDATIONS

Recommendations are derived both from interviews and from the literature reviewed. Many touch on the need to think flexibly about careers for doctoral graduates and to consider careers spanning both the academic and business sectors with two-way movement possible.

7.4.1 Support for doctoral candidates and graduates from the academic sector

- The need for coherent and evidence-based policy around continuing professional development plus the financial means to support it should be addressed
- Potential career paths for doctoral graduates, which are flexible and endorse inter-sectoral mobility, should be made clear/explicit. Researchers should be actively informed on the range of career opportunities
- Programmes to promote the transferability of researchers between sectors should be created and supported
- A framework of skills appropriate to researchers should be agreed and implemented - to give orientation to doctoral candidates and graduates whether they follow an academic or non-academic career path (or a mix)
- There is a need for more and better data collection and analysis. This will help universities to be in a position to ensure that doctoral programmes support employability of candidates, to inform candidates of employment options and to assess how well doctoral education fits graduates for the labour market. The sector as a whole needs to answer questions related to brain drain/gain and how well the skills of the highest educated are used by society
 - Possible survey types include graduate surveys, cohort surveys and cross-sectional retrospective surveys
 - to be measured: demographic, employment, mobility (between countries, between sectors), career and salary characteristics
 - Models and guidelines already developed can be used
- The effects of university practices on inter-sectoral mobility should be considered (e.g. the possibility of return to academia after working elsewhere). Selection for academic posts should be based on academic quality and allow for 'gaps', including those created by time outside academia (e.g. in an individual's publication record). Private sector HR should be included in discussions

7.4.2 Widening perspectives and raising awareness of doctoral candidates/graduates

It's often about mindset, potential and awareness rather than just about well-developed skills



- Foster positive views, for example choosing a non-academic career should be marketed as a valid first choice for doctoral graduates
- Offer direct support to candidates and graduates to formulate their own professional strategy
 - Initiate conversations with doctoral candidates around their career goals, skills etc
 - Offer seminars and training
 - Create tools to help individuals to consider their own skills, how to develop them and how they can be used. The forthcoming UK 'Researcher Development Framework' would be a useful starting point

7.4.3 Offer full information to enable doctoral candidates/graduates to make the best choices

- Clear career paths in academia and industry. Encourage employers to do more to define profiles for employees
- Information days on employability issues and relation to transferable skills
- Setting out the requirements for a research career (e.g. online)
- Presentation of role models, for example Vitae career case studies

7.4.4 Create/promote opportunities for doctoral candidates to gain concrete experience as part of or alongside their doctoral degree

This enables a candidate to acquire skills they cannot get any other way (e.g. from standard training). This can be on a variety of levels and might include

- structured internship programmes
- fully collaborative degrees
- tools to promote the individual's engagement in activities, such as granting an extended leave of absence etc
- Opportunities for 'the 2 worlds' to meet with events such as job fairs and career days specific to doctoral candidates/graduates

7.4.5 Building awareness and knowledge amongst academic and commercial employers

- Make explicit - to employers - the implicit acquisition of a range of skills during doctoral training
- Foster positive views with both academics and employers, e.g. a doctorate is appropriate training for both an academic and a non-academic career; choosing a non-academic career does not equal a failure to get an academic position
- Foster closer ties and discussions between universities and industry – including discussion on inter-sectoral mobility - at the appropriate levels

7.4.6 Training and aspects of effective training models

- Experience is the best training. Promote collaborative partnerships (uni-industry), including those between countries, to give the widest possible perspective to candidates
- Transferable training should be seen as integral to research degree programmes
- Include training in entrepreneurship – a self-employment perspective. Consider schemes to help doctoral graduates set up companies
- Use university business schools (e.g. masters level courses) to supplement training for doctoral candidates



- Use models that test skills in real-world scenarios. This could include videos, on-line and face-to-face situations. Use scenarios to make training interactive
- Bear in mind individual learning styles. Get people to work in small groups and talk/think. Use successful elements from existing models e.g. 'the funnel' from the Vitae 'Broadening Horizons' model¹²⁸
- Consider the particular development needs of women researchers. Female doctoral graduates are much more likely to be affected by existing barriers and obstacles to successful careers. Failing to address this means failing to effectively exploit the potential of a large proportion of this highly skilled group

7.4.7 Also

- Don't re-invent things that are already working well. Make better use of existing models by encouraging the sharing of practice

¹²⁸ <http://vitae.ac.uk/policy-practice/40705-74531/Broadening-horizons-programme.html>



8 SUMMARY OF RECOMMENDATIONS

The following is a synthesis of recommendations relevant to this project, based both on those made directly by project interviewees or taken from the literature. Recommendations are set out in more detail in chapters 4-7. In implementation of actions resulting from this project we must bear in mind the significant differences existing in different national contexts and between current levels of provision.

The most frequently made recommendations were around the following areas:

- The value of direct experience, especially through work in private sector companies
- Availability of information related to non-academic careers
- Setting career goals and having a 'professional strategy'
- The doctorate as an appropriate background for careers in industry/business/enterprise
- Sharing practice

8.1 THE VALUE OF EXPERIENCE

This was raised by several of the private sector representatives interviewed and also by many university-based professionals. A practical rather than a theoretical approach is required by employers.

- opportunities for doctoral candidates to gain experience of work outside academia (e.g. through collaborative doctorates or company internships) are the best way for individuals to gain insight into careers in industry or business, to clarify their own career goals and to develop the types of transferable skills most prized by employers
- we should consider the mechanisms that will facilitate uptake of such opportunities, e.g. provision for extended leave of absence, encouragement and support for spin-off businesses from research projects or other business start-ups, more international mobility initiatives, mentoring schemes
- Valuable experience with relevance to work beyond academic research can be gained within as well as outside a university, e.g. experience on policy committees, involvement in event organisation, interdisciplinary networking
- Academic opportunities such as conference attendance can be exploited as development opportunities for doctoral candidates/graduates e.g. by raising awareness of development needs and opportunities with pre-conference training (e.g. on networking) and/or reflecting on learning points post-conference
- Employers and those with non-academic careers should be involved in training and development, e.g. by attending networking events
- Realistic simulated situations (e.g. experiential training) are more effective in developing skills than is theoretical training
- Doctoral candidates and their supervisors should understand the importance of familiarity with business language in order to effectively communicate of the value of a doctorate
- Career paths should allow for 2-way movement between academia and industry and we should acknowledge what currently stops this happening (e.g. lack of publishing opportunities for industrial researchers). Experience gained in other sectors should be understood and valued
- Government support is required to effect changes and sustain initiatives - including policy and funding.

8.2 INFORMATION

Doctoral candidates should have easy access to information related to appropriate career paths in all employment sectors.



- Candidates and their supervisors should know where to find information on non-academic careers and on the opportunities available
- Doctoral candidates and graduates should know what skills are expected by employers and how to access 'hidden' jobs. This should be backed up with 1st-hand insight from those who know
- Shared experience, e.g. in the form of case studies, can enlighten and inspire
- Clear descriptions of appropriate career paths should be created by institutions. Employers should be encouraged to publicise career paths for doctoral graduates joining their company
- Web-based information is often the most easily accessible.

8.3 CAREER GOALS AND PROFESSIONAL STRATEGY

Individuals need support to consider their career goals and to develop an individual strategy. This includes the ability to assess their own skills and develop them as appropriate.

- Opportunities should be provided for individuals to consider their own career path, set career goals and plan their own training and development needs, i.e. their 'professional strategy'
- Development should be researcher-led but individuals should be empowered to take opportunities
- There is no 'one size fits all'. An individual approach is needed, e.g. the individual career interview model where this forms an integral part of the degree programme (EMBL, France)
- Careers advisory services could be offered regionally wherever it may not be cost-effective for single institutions to make provision specific to doctoral candidates
- Inclusivity is an important consideration, e.g. part-time candidates could be included by using video and online services etc.
- Doctoral candidates should be supported to consider the skills they have developed as part of their research training and to understand their importance and relevance to careers beyond academia; they should not simply be offered training in complementary skills. There is also a need to develop the skill to articulate one's own skills!
- 'teaser' training can give a broad idea of whether a particular career or development area is of interest to an individual and likely to fit their strengths (e.g. finance)

8.4 A DOCTORATE IS NOT JUST FOR AN ACADEMIC CAREER

There is a need to widen recognition of the doctorate as an appropriate background for a non-academic career.

- We need to foster a widespread view of a move into industry/business/enterprise as a positive choice rather than a failure to secure an academic position. Closer ties between academia and industry will help here
- We should build up companies' awareness of the 'added value' that a doctorate can bring
- A transformation in the attitudes of influential academic staff can be supported by increasing awareness of non-academic career possibilities and destinations
- Consideration should be given to working with companies in developing skills and career-related support for doctoral candidates
- Direct links with companies on recruitment should be considered, e.g. a database of individual doctoral graduates by knowledge area. Supply of qualified personnel to companies (mediated by universities) should be better managed with universities distinguishing between graduate and doctoral level candidates.



8.5 SHARING PRACTICE

- Don't re-invent things that are already well-developed, share ideas and build on current practices
- Establish mechanisms for practice-sharing in areas such as skills development and university-industry links, e.g. Vitae Hubs model (UK); a network to link trainers/developers in companies with those in universities
- The requirement to share practice should be enshrined in national and institutional policy
- Areas where existing good practice could be extended or replicated across Europe include:
 - Data collection and analysis to: inform development of university support, inform stakeholders about trends and options and answer related questions from wider society
 - The embedding of transferable skills training within doctoral degree programmes
 - Careers advisory services specific to doctoral candidates and graduates
 - Close links between universities and employers, including collaborative degree programmes
 - Skills descriptors or frameworks that can provide orientation to researchers and those who support them
 - Schemes to promote entrepreneurship to develop entrepreneurship skills and to support business start-ups



9 NEXT STEPS

Using the findings of this report as a basis the DOCENT partners discussed next steps and actions to meet the project aims.

We agreed to develop short 'teaser' training modules, designed to widen awareness of the types of skills that public sector employers are looking for and to help doctoral candidates to reflect on ways to develop their own skills further.

The following learning modules with 3/4 units each were agreed:

CAREER MANAGEMENT:

- PROFESSIONAL STRATEGY
- RECOGNICE PROMOTE SKILLS
- CAREER MANAGEMENT

WORKING OUTSIDE ACADEMIA:

- COMMERCIAL AWARENESS
- BUSINESS CULTURE
- KNOWLEDGE OF THE LABOUR MARKET

WORKING WITH OTHERS:

- LEADERSHIP
- COMMUNICATION
- NETWORKING/MULTICULTURAL/WORKCULTURE

MANAGEMENT:

- PROJECT MANAGEMENT
- INTELLECTUAL PROPERTY MANAGEMENT(IPR)
- FINANCE, FUNDING AND RESOURCES

EDUCATION TO ENTREPRENEURSHIP

- CREATIVITY
- ENTREPRENEURSHIP
- RESILIENCE AND RISK-TAKING
- BUSINESS PLAN



APPENDIX

Structure for interviews

The following structure was used to conduct 30 minute semi-structured interviews with 'key players' identified by the partnership.

General information about interviewee

Including

- Name, title, organisation
- professional role and affiliations
- areas of expertise and responsibility

High level skills needs of non-HE employers

Forming a picture of the current landscape

- Existing structure
 - o What do you know about recruitment structures in different types of companies?
 - o Are there networks or forums interested in high level and research skills and/or recruiting PhDs?
 - o Do you know of industry/academic links or joint programmes?
- Sources of relevant data
 - o What skills do employers value most in doctoral graduates?
 - o Do you use or know of lists of technical and generic transferable skills?
 - o Good sources of data on recruitment policies?
- Policy
 - o Do you recruit PhDs? Why? What do you know of company policies e.g. for recruiting PhDs or for meeting demand for high level and research skills?
 - o Do you know of any relevant national or regional policies that might impact PhD recruitment, e.g. to support smaller companies wishing to develop a research and development function?
 - o Forecasts of demand for types of skills: has this come under discussion/what would be your forecast?
- culture
 - o Is there a prevailing attitude to recruiting PhDs, e.g. as opposed to in-house development of higher level skills and/or research skills?

Strengths: We would like to know what's already working well, e.g. where skills found in PhDs are valued by employers; where strong industry-academic links are in place.

- Which companies/industries actively recruit doctoral graduates?
- Where PhDs are actively recruited, how does it work, what makes it work well?
- What would you say are the primary benefits to a company of employing PhDs?
- Can you identify areas of strength/innovation such as projects, programmes, schemes, networks or organisations related to high level skills needs of employers; policies and procedures
- Any key players? (can be individuals, organisations, networks etc)

Identifying gaps:

- What might make the transition from academic research to non-academic employment easier?
- Is there anything missing in terms of knowledge/information around PhD skills or recruitment of PhDs?
- Are there gaps in the skills of PhDs that need to be addressed? (in order that they can move more easily to industry)



- Is there anything that could be working better than it does? Any other issues?

Recommendations:

- The DOCENT project will be developing transferable skills training modules for PhD graduates considering a career outside academia plus a model for University career guidance support focussed on non-academic careers: do you have any recommendations for how these might look?

Support for PhD students from their University/Institution (could also include support for staff researchers)

Forming a picture of the current landscape:

- existing structure
 - o What services are available in terms of careers guidance, advice and development specific to PhD candidates/graduates?
 - o Is there a well-developed infrastructure to support professional and skills development for PhDs e.g. graduate schools, mentors, training departments?
 - o Do you know of any schemes to aid transition to non-academic careers for PhDs? E.g. University-industry links, mentoring etc.
- sources of relevant data
 - o Are you aware of useful sources of data on support specific to skills and career development for PhDs?
- Policy
 - o Are there institutional policies in place on professional/skills development for PhDs and how are these followed in practice?
 - o Do institutions aim to supply researchers with skills to match employer needs?
 - o Is specific guidance/support available to PhDs considering a career outside academia?
- culture
 - o What are the assumptions about what a doctorate is for and how people should be prepared for their careers
 - o Where is responsibility considered to sit for training and support for PhDs preparing for a non-academic career?

Strengths: What is working well?

- Can you identify areas of good or innovative practice in
 - o training or guidance specific to PhDs considering a career outside academia?
 - o policies and procedures, e.g. Human Resources policies to support career development for PhDs
 - o Links between academia and industry
- Are there any key players we should be in touch with?

Identifying gaps:

- Is there anything missing in terms of the knowledge/information needed to move forward in this area?
- Are there gaps in support specific to PhDs that need to be addressed? (in order that they can make a successful transition to non-academic careers?)
- Is there anything that could be working better than it does? Any other issues?

Recommendations:

- The DOCENT project will be developing transferable skills training modules for PhD graduates considering a career outside academia plus a model for University career guidance support focussed on non-academic careers: do you have any recommendations for how these might look?

Regional, national and European support for PhD students (could also include support for staff researchers)

Forming a picture of the current landscape:

DOCENT Doctors in Enterprise



- existing structure
 - o What funding is available to support careers and skills development for PhDs, e.g. training, career guidance and business-link services
 - o Which organisations and networks offer (direct or indirect) support for PhDs' professional and career development?
 - o Do you know of any regional/national/ European schemes to aid transition to non-academic careers for PhDs?
- sources of relevant data
 - o Are you aware of useful sources of data on support specific to skills and career development for PhDs?
- Policy - relevant to careers for researchers and professional development for PhDs
 - o Are there regional or national policies in place on professional and skills development for PhDs, in particular any related to careers for researchers outside academia?
 - o Which aspects of European policy relate specifically to supply of researchers to industry or non-academic career paths for PhDs?
 - o What is in place to monitor how policy is followed in practice?
 - o Are there policies related to the supply of researchers with skills to match employer needs?
- culture
 - o What are the assumptions about what a doctorate is for and how people should be prepared for their careers
 - o Where is responsibility considered to sit for training and support for PhDs preparing for a non-academic career?
 - o Is there a willingness to collaborate in offering support for PhDs?

Strengths: What is working well?

- Can you identify areas of good or innovative practice in
 - o training or guidance specific to PhDs considering a career outside academia?
 - o Support for training or guidance specific to PhDs considering a career outside academia at regional, national or European level, e.g. schemes/ projects/ funding
 - o policies and procedures to support career development for PhDs e.g. relevant areas of degree quality requirements
 - o Links between academia and industry
- Are there any key players we should be in touch with?

Identifying gaps:

- Is there anything missing in terms of the knowledge/information needed to move forward in this area?
- Are there gaps in support specific to PhDs that need to be addressed? (in order that they can make a successful transition to non-academic careers?)
- Is there anything that could be working better than it does? Any other issues?

Recommendations:

- The DOCENT project will be developing transferable skills training modules for PhD graduates considering a career outside academia plus a model for University career guidance support focussed on non-academic careers: do you have any recommendations for how these might look?

PhD students'/researchers' employability skills and careers

Forming a picture of the current landscape:

- existing structure
 - o Are you aware of career path descriptors in use that include non-academic career paths for researchers?



- Who collects data relevant to non-academic career paths for researchers and related skills development? E.g. institutions, national organisations or statistics agencies
- sources of relevant data
 - What data (either qualitative or quantitative) are you aware of that relates to career destinations for researchers, especially transition to non-academic careers?
 - What evidence is there for the types and level of skills attained by PhDs?
 - What evidence is there for the impact of PhD-level skills (on careers, in employment, on society etc)
 - Do you know of other relevant sources of data?
- Policy
 - Do you know of policies related to the supply of researchers with skills to match employer needs?
- Culture
 - What are the assumptions about what a doctorate is for and how people should be prepared for their careers

Strengths: What is working well?

- Can you identify areas of good or innovative practice in
 - Training, guidance or direct support aimed at PhDs considering a career outside academia, including schemes or projects to support transition of researchers to non-academic careers
 - Support structures or frameworks such as CPD or career-path frameworks
 - Industry-academia links
- Are there any key players we should be in touch with?

Identifying gaps:

- Is there anything missing in terms of the knowledge/information needed to move forward in this area?
- Are there gaps in support specific to PhDs that need to be addressed? (in order that they can make a successful transition to non-academic careers?)
- Is there anything that could be working better than it does? Any other issues?

Recommendations:

- The DOCENT project will be developing transferable skills training modules for PhD graduates considering a career outside academia plus a model for University career guidance support focussed on non-academic careers: do you have any recommendations for how these might look?

