Transferable Skills Training for Researchers

SUPPORTING CAREER DEVELOPMENT AND RESEARCH



OECD

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Foreword

This publication is the final report of the OECD Working Party on Research Institutions and Human Resources (RIHR) project on transferable skills training for researchers. Researchers are a key input into science and technology activity and their formation and careers are an important policy issue. The RIHR's project aimed at helping governments, as major actors in researcher training, to consider whether current national approaches provide appropriate support to researchers seeking to improve their transferable skill competencies. With a focus on countries' government- and institution-level policies on formal training in transferable skills for researchers, the project collected evidence on current arrangements and highlighted policy issues, challenges and possible future directions.

The report was prepared by Sarah Box of the Science and Technology Policy Division of the OECD Directorate for Science, Technology and Industry, with oversight from Ester Basri. It draws on responses to a RIHR policy questionnaire and on expert discussions at a project workshop held in Paris in November 2011, and has benefitted from comments from RIHR delegates. The Secretariat would particularly like to thank members of the project Steering Group, comprising representatives from Germany, Italy, Japan, Korea, Luxembourg, Norway, Spain, the United Kingdom and the United States, as well as respondents to the policy questionnaire and participants at the project workshop. The OECD Secretariat would also like to thank delegations for their generous financial assistance for the report and workshop.

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Abbreviations

AFR	*Aides à la Formation – Recherche* (Luxembourg)
CRC	Co-operative Research Centre (Australia)
CTS	Commercialisation Training Scheme (Australia)
DFG	*Deutsche Forschungsgemeinschaft* (German Research Foundation)
ERA	European Research Area
ESF	European Science Foundation
EU	European Union
EUR	Euro currency unit
EUROHORCS	European Heads of Research Councils
FNR	*Fonds National de la Recherche* (Luxembourg)
FP7	European Union Framework Programme 7
HC OP	Human Capital Operational Programme (Poland)
HDR	Higher degree by research
HR	Human resource
ISCED	International Standard Classification of Education
KIRD	Korea Institute of R&DB Human Resources Development
NTNU	Norwegian University of Science and Technology
OCE	Ontario Centres of Excellence
PhD	Doctoral/doctorate
Post-doc	Post-doctoral
R&D	Research and development
RIHR	OECD Working Party on Research Institutions and Human Resources
S&T	Science and technology
UK	United Kingdom

Executive summary

Today's researchers require skills beyond their core competencies

The formation and careers of researchers are important policy issues and training for transferable skills – skills that apply in a broad variety of work situations – is a challenge that attracts increasing policy interest. These skills are receiving more attention, particularly in higher education programmes, and training opportunities are expanding as research careers diversify and researchers' skills needs evolve. Researchers today need skills relating to communication, problem-solving, team-working and networking, and business and management know-how. These give them workplace competencies that are relevant for a broad job market, although the skills they need may vary in different sectors.

Formal transferable skills training is one way to achieve these competencies…

The literature identifies several benefits of formal transferable skills training. PhD candidates, for example, benefit from acquiring transferable skills during their studies. These help them succeed in carrying out their projects and in their later employment. While researchers naturally acquire some of these skills in the course of their studies and at work, others may require more systematic and quality-consistent training. Such training may also be especially valuable to female and international students and can create positive attitudes to ongoing learning. Researchers already in the workplace also benefit from ongoing acquisition of transferable skills in order to update and build on existing competencies or to "fill in gaps" so that they can work more effectively and benefit from a variety of opportunities. Learning by doing on the job is of course an important channel; however, formal skills training can add value, as can learning through work placements and secondments.

...but there are questions about how and whether they develop them successfully

Nevertheless, the literature leaves several important questions unanswered. Some studies have pointed to shortcomings in researchers' competencies in transferable skills, while others have raised issues relating to the provision and relevance of training. Formal approaches to transferable skills training for PhD students are not uniformly welcomed, with some concerns about implications for core research, degree lengths and costs if more training is incorporated into PhD studies. There is also debate over the skills to be taught at different stages and the best way to learn them – interaction with supervisors and peers, formal courses, or workplace-based learning (*e.g.* during an internship). There are also questions about the amount and method of training for transferable skills and the roles of various stakeholders, such as governments and research institutions. For researchers in the workplace, there are also questions about the mix of skills required and learning methods, and there is some evidence of unmet demand for formal "workplace experience" channels. Together, these observations raise the question of the adequacy of current training approaches.

To address this issue, this report presents detailed information on relevant policies and practices in a number of OECD countries

By examining country-specific information on types of training, target audiences and skills, and stakeholder roles, this report begins to analyse transferable skills training for researchers in OECD countries. It focuses on countries' policies and practices at governmental and institutional level as they relate to formal training in transferable skills for researchers, from PhD students through to experienced research managers. It thus provides details on a key input to researchers' transferable skill competencies. It also shows that because researchers' employment differs across sectors and countries, as do their mobility and level of qualifications, the precise challenges countries face differ as well, with consequences for policy approaches. The appropriate role for government in transferable skills training is the central question behind this study.

Most training is driven by individual institutions

In an attempt to shed light on these issues, a policy questionnaire was distributed by country delegates to the OECD's Working Party on Research Institutions and Human Resources. The questionnaire responses indicate that institutions are the main actors in terms of transferable skills training for researchers, with the role of government secondary to that of universities, research institutions and other organisations. Around a third of responding governments have a strategy in this area, compared to almost two-thirds of universities, three-quarters of research institutions and three-fifths of other organisations. Around a third of responding governments also provide programmes for training, compared to practically all responding universities, half of research institutions and all of the other organisations. Summary information separately received from seven countries reinforces this picture; it generally indicates that government is not the key player in transferable skills training for researchers.

Training mostly targets PhD students, post-docs and early-stage researchers, with practical work experience an important complement to training programmes

Many programmes are for researchers at all levels; however, universities had a significant number of programmes specifically for PhD candidates and research institutions often had programmes for research personnel (particularly in leadership roles). At present, PhD students, post-docs and early-stage researchers appear to be the main focus of transferable skills training. Training at the Master's level is much more limited. Few governments, universities, research institutions or other organisations have explicit strategies or programmes for Master's students; those that exist are often part of broader activities for researcher training. However, a third of universities were planning changes to providing this type of training to Master's students. In terms of workplace experience, industrial PhDs, internships and exchanges are the most common approach, and governments noted their importance for building industry knowledge and supporting knowledge transfer. Almost a third of universities plan to expand workplace experience programmes or to make this a more systematic part of their educational approach. Respondents also noted the importance of researcher mobility and collaborative research projects in building valuable skills.

There is little evidence of an overall strategy and the various actors' strategies are general rather than focused on transferable skills

Overall, the questionnaire responses reveal a significant amount of transferable skills training activity, undertaken predominantly by individual institutions, for the most part without any overall national strategy or direction from governments or other entities. Strategies across all groups tend to be broad (not specific to transferable skills) and recently introduced. As well as enhancing the employability of researchers in academia, preparing researchers for a wider labour market, and improving research, the groups identified a number of additional strategic goals, which sometimes overlapped (*e.g.* teaching quality, commercialisation and knowledge transfer, international co-operation, and a quality research environment).

The available information does not allow for comparing transferable skills training across countries…

Unfortunately, it is not possible to compare transferable skills training across countries. Only 13 countries submitted information related to governments' and other institutions' transferable skills training; even for these the questionnaire results give only a sample of activity and numerous gaps remain. Not all relevant institutions were included, and for those that did respond, not all activity is captured. Importantly, some main actors in the transferable skills training arena did not participate. More generally, employers outside of universities and public research institutions were not in the sample of respondents.

…but it does indicate some differences among countries

With this in mind, the information submitted shows some dimensions along which countries appear to differ, although explaining these differences would requires more country-specific contextual information. In some countries, emphasis on transferable skills is relatively new (*e.g.* Luxembourg), while in others organised activity in this area has taken place for some time (*e.g.* United Kingdom). The level of government involvement and direction is relatively high in some countries (*e.g.* Korea) but not in others (*e.g.* Germany). At the institutional level, too, the approach depends on the context; for example, a technical university may be more concerned with academic skills than with transferable skills because its co-operation with industry may be considered to provide sufficient learning opportunities for the latter group of skills.

It is difficult at this point to know whether market or system failures suggest the need for government intervention

While institutions play the primary role in transferable skills training, governments potentially have roles ranging from strategic oversight to funding to delivery. For policy-making purposes, the key question is whether there are market or system failures that government intervention might alleviate. To argue that governments ought to change their current policy stances requires establishing that there is scope for governments to improve on current outcomes. However, while the questionnaire responses indicated a variety of training possibilities for researchers at different stages of their careers, the picture of the supply of training is incomplete and there is little information about demand for training. In addition, provision of training is often "unpriced" for training recipients; as most do not pay explicitly for their training courses there is no signal about the cost or perceived benefits of the training. Moreover, the questionnaire did not include some important players in the transferable skills arena; it is therefore not possible to assess systems as a whole. Finally, as most initiatives are fairly recent and the vast majority of programmes for transferable skills training have not (yet) been evaluated at programme level, it is difficult to comment on their impact, *e.g.* the change in skill levels due to the programmes, the subsequent effects on researchers and their research activities, the wider effects on desired goals, any unintended consequences, changes in behaviour, etc. All these factors make it difficult to identify potential failures that might be addressed by governments.

However, there is some evidence of the need for reconsideration of some policy settings and approaches

While the information gathered for this initial study can only give a partial view of transferable skills training, it is possible to identify some areas which policy makers may wish to review. To date, aside from ongoing improvements to courses and some expansion of programmes by institutions, changes are infrequently envisaged. However, there is some interest in taking a more systematic approach to training and to embedding training more thoroughly in existing education and research structures. Funding conditional on transferable skills training is another possibility, notably for funding for doctoral studies.

Relevant targets include monitoring and evaluation, dialogue between academia and industry, industrial PhDs, and leveraging research collaboration policies to support transferable skills training

Given these constraints, the policy suggestions offered on the basis of an initial and necessarily far from complete study are deliberately limited. They highlight areas in which policy makers may wish to review their policy approaches, having regard to the features of their researcher population and the institutional arrangements in place. They concern issues valued by a spectrum of stakeholders. They aim not to crowd out existing or potential training activity by universities, research institutions and other organisations with an interest in researcher development, but to facilitate their evolution.

First, policy makers could investigate options for boosting the monitoring and evaluation of transferable skills training. The relatively little that is currently known about the outputs and outcomes of transferable skills training hampers robust policy making. A better evidence base is essential if governments and institutions are to make good decisions on training provision.

Second, governments could explore ways to facilitate dialogue between academia and industry on training needs and opportunities. As well as potentially helping to shape training provision, this could reinforce the value of transferable skills and raise awareness within institutions about the training opportunities already on offer.

Third, they could consider ways to encourage provision of industrial PhD options as a complement to formal training courses in universities, as well as opportunities for mobility (both within and between sectors) as a development tool for more experienced researchers. Many stakeholders stress the benefits of a balance of formal and informal learning, and questionnaire responses indicated that workplace experience training is currently relatively less common.

Fourth, governments could consider how their general policies on collaborative research can be leveraged to support transferable skills training opportunities for researchers at all stages of their careers. This could yield benefits for researchers across all sectors and is consistent with the observation that research structures are increasingly collaborative, networked and multidisciplinary.

Chapter 1

Issues in transferable skills training for researchers

Transferable skills can play an important role in supporting researchers' diverse career paths, ultimately promoting better research outputs and helping to underpin innovation and economic growth. These skills have attracted more attention over time, as non-academic employment opportunities grow and research becomes more interdisciplinary and international. The literature suggests formal training for PhD candidates and other researchers as one key channel for transferable skills acquisition as a complement to informal training and workplace experience. It also considers that governments, individuals, universities and other stakeholders share responsibility in designing, funding, organising and providing this training. However, questions remain about the skills required at different career stages, the best methods of acquiring transferable skills, and the exact role of government relative to other stakeholders.

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1.1. Introduction

Researchers' competencies are directly related to the effectiveness of investments in research and development (R&D) for boosting innovative capability and prosperity, not only at firm level but also at regional and national levels. Public expenditures on researcher training and support are therefore significant in many countries; private expenditures can also be considerable. It is important that these investments in researchers' training and careers yield commensurate benefits for their economies and firms.

Researchers work in many fields and their knowledge is highly valued in many employment contexts. Universities and public research institutes as well as business employ many researchers. In fact, 63% of OECD researchers worked in the business sector in 2007. Today, career paths are evolving owing to the greater use of science and technology (S&T) in some industries, the large numbers of PhD graduates relative to the demands of the academic job market, the increasing circulation of workers among research occupations, and policies that encourage intersectoral mobility (Gilbert *et al.*, 2004; *Nature*, 2011; OECD, 2006).

In parallel, the skill needs of researchers are also evolving. The structure of research is increasingly collaborative and multidisciplinary, and the boundaries between research and its application are diminishing (Commonwealth of Australia, 2011). This creates demands for skills in areas such as management, multidisciplinary project administration and intellectual property. In some countries changes in economic activity may pressure researchers to network and to integrate their scientific knowledge with other disciplines and competencies (Hill, 2007). In short, researchers today face new academic pathways and expanded opportunities to work in other sectors, as well as pressures to consider a wider variety of career paths and to use a wider variety of skills in their everyday work.

To meet these challenges, researchers need skills that will allow them to work in and move between different sectors during their working lives and to cope with networked, interdisciplinary modes of work. These are skills that are relevant in a wide variety of sectors and situations and can contribute to better research, with implications for countries' scientific, technological and innovative performance. They are here called transferable skills. Drawing on definitions proposed by the European Science Foundation (ESF) (2009, p. 47),[1] they are defined as:

> "Transferable skills are skills learned in one context (in this case, research) that are useful in another (for example, future employment whether in research, business, etc.). They can serve as a bridge from study to work and from one career to another, as they enable subject- and research-related skills to be applied and developed effectively in different work environments. They include skills such as communication skills and organisational skills."

While researchers acquire such skills in the course of their studies and everyday work, increasing attention is being paid to the formal development of transferable skills, particularly in higher education programmes, and the variety of training opportunities has expanded. There is now a stronger skills orientation in research degrees, with research increasingly viewed as a professional practice requiring common basic standards and certain expertise (Gilbert *et al.*, 2004). It also fits with a heightened emphasis on employability, as governments seek to address concerns about graduates' readiness to work.

There is a need for more comprehensive information about transferable skills training for researchers. Some studies have identified insufficient proficiency in certain transferable skills, such as communication. Others have pointed to a lack of training opportunities for certain groups. Still others have highlighted the relevance of training as a potential area for improvement (Box 1.1). Furthermore, as researchers continue to pursue opportunities across the globe, and education and qualifications become increasingly "tradeable" goods, cross-country analysis of transferable skills training systems is becoming more and more relevant (Scholz, 2011).

This report is based on an exploration of transferable skills training for researchers. The aim of the study was to help governments, as major actors in researcher training, to consider whether current national approaches provide appropriate support to researchers seeking to improve their transferable skills. With a focus on countries' government- and institution-level policies on formal training in transferable skills for researchers, it collected evidence on current training arrangements in order to identify patterns and potential policy issues. The study takes a first step towards analysing researchers' transferable skills by providing new information on formal training for transferable skills. However, information on the skills thereby acquired by researchers and the related outcomes in terms of research outputs, mobility, etc., is limited.

Box 1.1. Taking stock: weaknesses in current training in transferable skills

Various studies have suggested that researchers' transferable skills should be broadened. A study of collaborative PhD programmes by the European University Association (EUA) found that companies were satisfied with the knowledge and research skills of European PhD graduates, but saw room for improvement in communication skills, awareness of intellectual property issues, and understanding of business operations (EUA, 2009, p. 8). Similarly, a small survey of businesses in the United Kingdom found that employers valued doctorate holders' specialist knowledge, analytical thinking and research skills, but found deficiencies in skills related to employability and "commercial *nous*" (CIHE, 2010). An Australian study identified communication, teamwork, and planning and organisational skills as areas for improvement (The Allen Consulting Group, 2010, p. viii). Studies from the United States, cited in a review of graduate education, suggested that employers want more emphasis on broader skills (Wendler *et al.*, 2010, pp. 35-36). Other reports have raised similar issues (OECD, 2011, pp. 105-106).

Some studies have noted potential gaps in training opportunities. The European Science Foundation (ESF) suggested that post-doctoral researchers have not been a key target for such training programmes (2009, p. 22-23). A 2009 survey of research staff in United Kingdom higher education institutions found strong interest in training in areas related to personal or transferable skills, but relatively few researchers had participated in such activities (Vitae, 2009a); while 54% of research staff wished to undertake training in "career management", only 16% had done so. Similar patterns were found for training in the areas of "leadership and management" and "knowledge transfer and outreach activities", perhaps an indication of unmet demand for training. A follow-up survey in 2011 revealed analogous results (Vitae, 2011a, p. 31). In Australia, few research students report having participated in training for university teaching during their course of studies, and many indicated that their degree did not prepare them particularly well for careers outside of academia (Edwards *et al.*, 2011, p. x).

At the same time, researchers are not always interested in transferable skills training. The United Kingdom's Hodge Review (2010, p. 25) suggested that research staff may be less motivated to participate in skills training than PhD students, as their priorities (reinforced by peer pressure) lie elsewhere (*e.g.* developing specialist knowledge, publishing, seeking funding, etc.). Vitae's survey results pointed to a potential lack of demand for some types of training: more than 50% of researchers said training for teamwork was of no interest to them. This prompted Vitae to recommend that higher education institutions "further promote the value of transferable skills (such as team-working) for future employability in order to increase the level of take-up of development activities" (Vitae, 2009a, p. 26). De Grande *et al.* (2011) found that, compared to employers' valuations of such skills, PhD candidates undervalued skills such as teamwork for their career development.

There may also be room for increasing the relevance and quality of training offerings. The Australian government commented that universities have had little incentive to incorporate the needs and potential contributions of employment sectors other than academia in their research training activities (Commonwealth of Australia, 2011, p. XII). It saw a need to ensure that training keeps pace with the changing nature of research and the employment environments in which it occurs (p. 21). The OECD (2006) found scope for bringing PhD training closer to market needs and considered that training which helped young productive researchers to achieve independent researcher status would be beneficial. Vitae (2009a) found relatively high percentages of researchers who had undertaken training in some areas of personal and transferable skills (*e.g.* career management) but had not found it useful. Improving the content and delivery of transferable skills training could make it more attractive to researchers.

The following pages set the scene with a short review of the relevant literature. After defining the scope of the skills concerned and presenting basic data on the researcher population in OECD and selected economies, it expands on the importance of transferable skills for career development and research, the role of training in transferable skill acquisition, and possible roles of governments, individuals and other stakeholders in the training process. The literature review is based on English-language materials, mainly articles in academic journals, publications of the OECD and European-level institutions and reports prepared by or for governments (particularly in the United Kingdom). It is therefore not exhaustive. Moreover, the perspectives of stakeholders such as individual universities and research institutions are not well represented.

Chapter 2 presents cross-country information on patterns in transferable skills training strategies and programmes for researchers. The information is principally based on responses to a policy questionnaire distributed to relevant government officials and selected universities, research institutions and other organisations.[2] Information was received from questionnaire respondents in 17 countries (see Annex A); separate summary information was also provided by delegates of seven countries. Annex B contains more detailed country-level information.

Chapter 3 focuses on the policy implications of the study raised during discussions among OECD delegates and expert practitioners at a workshop in November 2011, which examined the results of the policy questionnaire and debated their policy significance debate. Annex C contains the workshop programme. The chapter concludes with suggested policy directions based on the evidence and expert inputs collected throughout the study.

1.2. Definitions and the scope of the study

The term "transferable skills" can include many competencies, and its precise definition may differ from study to study. Other terms, such as "generic competencies", "transversal competences" or "professional skills" are also used to describe certain transferable skills. This study draws on the ESF definition given above and includes the ESF's list of 17 transferable skills (ESF, 2009, p. 48). These skills are grouped here into six broad categories to form a broad typology of "transferable" skills (Table 1.1).

Table 1.1. Transferable skills

Transferable skill category	Skills included:
Interpersonal skills	* Working with others/teamwork * Mentoring and supervisory skills * Negotiating skills * Networking skills
Organisational skills	* Project and time-management skills * Career planning skills
Research competencies	* Grant application writing skills * Research management and leadership * Knowledge of research methods and technologies beyond the PhD project * Research ethics and integrity
Cognitive abilities	* Creativity and the ability for abstract thought * Problem solving
Communication skills	* Communication/presentation skills, written and oral * Communication/dialogue with non-technical audiences (public engagement) * Teaching skills * Use of science in policy making
Enterprise skills	* Entrepreneurship * Innovation * Commercialisation, patenting and knowledge transfer

Source: ESF (2009), grouped into categories by author.

"Formal training" refers to training that is organised, systematic and, for the purposes of this study, has as its explicit aim to build recipients' transferable skills. It can include courses in universities, workplaces and other organisations designed to help participants learn about, and improve their capabilities in, transferable skills. Such formal training may be provided by academic institutions, specialised training providers or other entities. It does not include acquiring skills as a by-product of everyday activities or usual academic classes (learning which could be classed as "informal" training). However, workplace experience programmes (*e.g.* student work experience or "industrial PhDs"), may perhaps be categorised as "formally organised informal training" and were included.

Finally, the term "researcher", as used in this study, encompasses PhD candidates, post-docs (defined as PhD graduates in their first two years of research work after graduation), other early-stage researchers (defined as non-doctorate holders in their first two years of research work) and research personnel (defined as research staff who have been in the research workforce for more than two years).[3] The study aims at researchers at different career points and recognises that there is not necessarily a linear progression from PhD studies to research jobs. In fact, most researchers do not hold a PhD degree (Auriol, 2010, p. 16). Where noted by countries the report describes examples of formal training in transferable skills for Master's-level students. However, the general term "researcher", as used in this study, does not include this latter group. Box 1.2 gives the OECD task- and job-related definitions of researchers.

Box 1.2. Defining researchers

The *Frascati Manual* provides definitions of R&D personnel, including researchers, for the purposes of gathering statistics. The definitions are used to measure the human resources dedicated specifically to R&D, although these personnel also undertake non-R&D activities such as production, quality control, education and management (OECD, 2002, p. 20). In the *Frascati Manual*, researchers are defined as professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems and also in the management of the projects concerned (p. 93). This definition includes postgraduate students at the PhD level engaged in R&D.

The *Canberra Manual* (OECD, 1995) can be used to identify the occupations encompassed by the Frascati definition of researchers. Here, researchers include physicists, chemists and related professionals, mathematicians, statisticians and related professionals, computing professionals, architects, engineers and related professionals, life science professionals (*e.g.* biologists, pharmacologists and agronomists), health professionals (except nursing), college, university and higher education teaching professionals, business professionals, legal professionals, archivists, librarians and related information professionals, social science and related professionals (*e.g.* economists, sociologists and historians), and research and development department managers. These groups are drawn from ISCO-88[1] groups 21, 22, 23 and 24, plus group 1237.

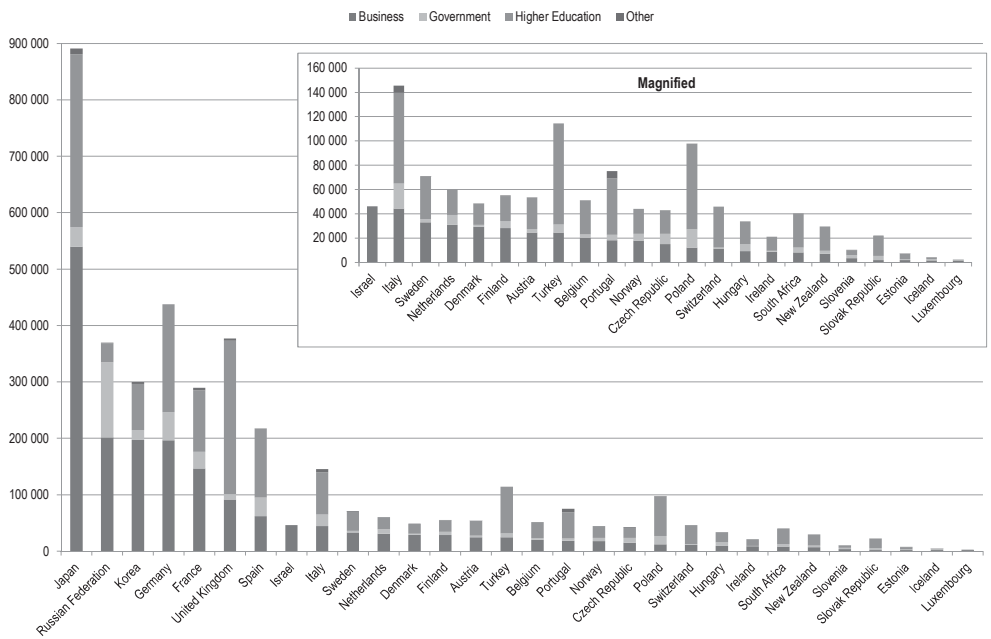
1: ISCO-88 has been updated to ISCO-08. A correspondence table is available at *www.ilo.org/public/english/bureau/stat/isco/isco08/index.htm*.

1.2.1. Characteristics of the researcher population

The researcher population in OECD countries is small but growing, and it is an "employment-significant" group of people who may be affected by government- and institution-level policies on transferable skills training. However, when discussing transferable skills policies, attention must be paid to the potentially different challenges faced by different countries. For instance, the extent to which researchers are employed in different sectors (*e.g.* business *versus* government), and their mobility between sectors, varies across countries. The share of researchers with a PhD degree also differs by country and sector. These factors may influence the kinds of transferable skills needed by researchers and the way in which they are best learned.[4]

Figure 1.1. Researchers by sector of employment (headcount)

2008 or nearest year, available countries



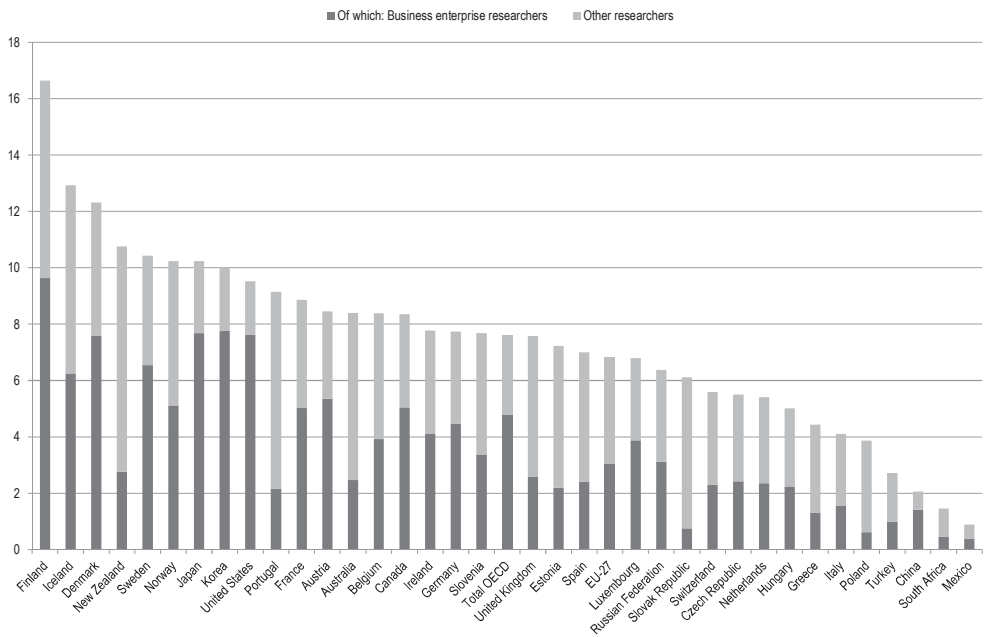
Note: "Other" calculated as a residual. 2007 for Austria, Belgium, Germany, Luxembourg, the Netherlands, New Zealand, South Africa, Sweden and the United Kingdom. 2009 for the Czech Republic, the Russian Federation, the Slovak Republic and Turkey. Headcount data not available for China or the United States.

Source: OECD Main Science and Technology Indicators Database, February 2011.

Figure 1.1 shows that countries' researchers and their sector of employment differ considerably. The number of individuals employed as researchers, working full- or part-time, ranged from less than 3 000 in Luxembourg to over 890 000 in Japan.[5] Headcount data is not available for the People's Republic of China or the United States; however, in full-time-equivalent (FTE) terms, each of these countries had over 1.4 million researchers in 2007.[6] This indicates the number of people currently involved in research (roughly 4 million in all for the countries in Figure 1.1, plus at least 2.8 million in China and the United States) who could potentially be affected by researcher training policies. On the basis of headcounts, Denmark, Japan, Korea and Luxembourg had a relatively high share (over 60%) employed in the business sector. Other countries had relatively high shares of researchers in the higher education sector, over 60% in Estonia, New Zealand, Poland, Portugal, the Slovak Republic, South Africa, Sweden, Turkey and the United Kingdom. The share employed in the government sector was generally small, with only Iceland, Luxembourg, the Russian Federation and the Slovak Republic having more than 20% of researchers in this sector.

Figure 1.2. Total researchers (FTE) per thousand total employment

2009 or nearest year, available countries



Notes: 2007 for Canada, Greece, Mexico, New Zealand, South Africa, the United States and the OECD aggregate. 2008 for Australia, France, Iceland, Japan, Korea, China and Switzerland. Chinese data do not correspond precisely to the *Frascati Manual* recommendations. 2010 for the United Kingdom.

Source: OECD Main Science and Technology Indicators Database, February 2011.

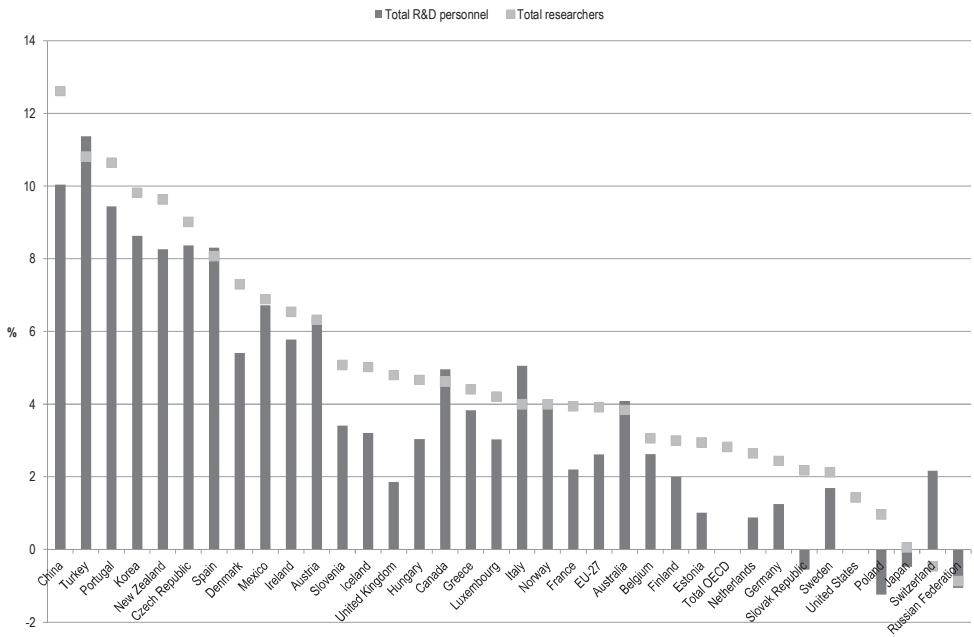
Figure 1.2 presents researcher numbers as full-time-equivalents and compares these to total employment in each country to show the significance of researchers in the economy. While Japan, the Russian Federation, Korea, Germany and France had the biggest absolute numbers of full- and part-time researchers in Figure 1.1 (along with China in FTE), the relatively small countries of Denmark, Finland, Iceland, New Zealand and Sweden had the biggest shares of researchers in total employment. There were more than 16 researchers per 1 000 employees in Finland in 2009, for instance, compared to an OECD average of fewer than eight.

When measured in FTE, the number of countries with a relatively high share of researchers in the business enterprise sector increases – Austria, Canada, China, Denmark, Japan, Korea, Sweden and the United States had more than 60% of researchers employed in the business sector. The different country patterns reflect aspects of their industrial structure, such as the presence of R&D-intensive sectors and the share of higher education in overall employment, as well as the incidence of part-time employment in each sector. Despite differences, however, the data suggest the importance of researchers possessing both research skills and skills that help them to function effectively in a business environment.

Figure 1.3 shows that researchers as a group have been growing strongly in many countries, highlighting the increased relevance of analysing their skills and competencies. While they grew by over 12% a year in China, they also grew by more than 6% a year in Denmark, Korea and New Zealand. For some countries, fast growth represents "catch-up" in terms of numbers of researchers in the workforce. Growth in the total number of researchers is also relatively responsive to business R&D spending (OECD, 2010, p. 44); rapid increases in the intensity of business enterprise R&D expenditures in China, Korea and Turkey over the past decade parallel the growth in researchers. Figure 1.3 shows that growth of researchers was faster than that of R&D personnel (researchers plus related staff) in most countries. This may be partly due to rapid growth in postgraduate student numbers and rebalancing between research and administrative staff.

Figure 1.3. Growth of R&D personnel and researchers (FTE), 1998-2008 (or nearest available period)

Compound annual growth rate (%), available countries



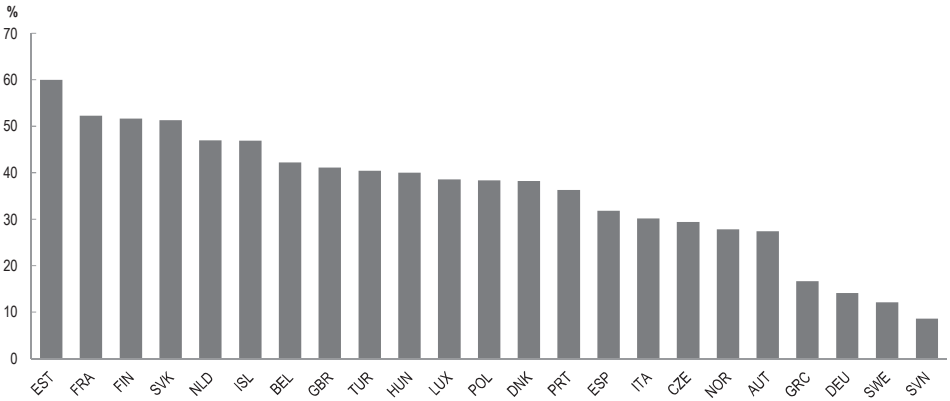
Note: For both series, Canada 1998-2007, Denmark 1999-2008, Greece 1999-2007, Luxembourg 2000-08, Mexico 1998-2007, New Zealand 1999-2007, Norway 1999-2008, Sweden 1999-2008 and Switzerland 2000-08. For the data series on researchers, United States 1999-2007 and OECD aggregate 1999-2007.

Source: OECD Main Science and Technology Indicators Database, February 2011.

Figure 1.4 depicts the intersectoral mobility of human resources in science and technology (HRST) (of which researchers are a part) for selected countries in 2010. While the data should be treated with care, as they pertain to a year in which many countries suffered significant economic upheaval, they show that skilled people have the potential to apply their knowledge in different economic sectors and highlight the relevance of skills that enable people to work effectively in different environments. At the same time, they also show how mobility patterns may be quite different across countries. Between 2009 and 2010 more than half of the HRST in Estonia, Finland and France who changed employers reported a change in their sector of economic activity. In contrast, most HRST mobility in Germany, Slovenia and Sweden occurred within sectors.

Figure 1.4. Intersectoral mobility of HRST, 25-64 year-olds, 2010

As a percentage of HRST changing employer

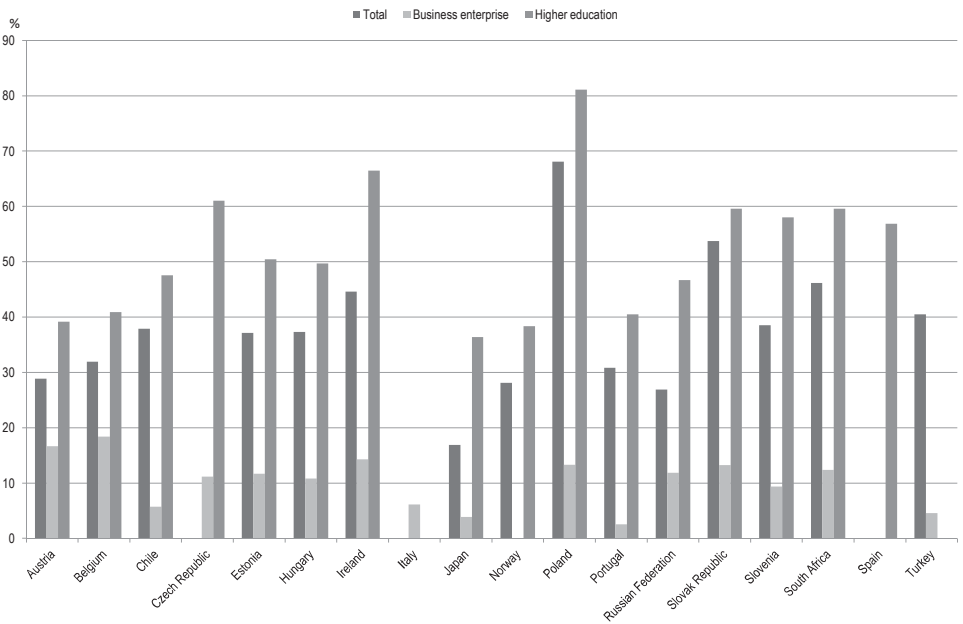


Note: Limited data reliability for the Slovak Republic.

Source: OECD, based on *ad hoc* tabulations of European Labour Force Surveys, Eurostat, May 2011.

Figure 1.5. Percentage of researchers (headcount) with a PhD degree, by sector, 2008 (or nearest available year)

Available countries



Note: 2007 for Austria, Belgium and South Africa.

Source: OECD Research and Development Database, March 2011.

Finally, Figure 1.5 shows the percentage of researchers with PhD qualifications, in total and by sector. It illustrates the point made earlier that many researchers do not hold doctorate degrees. In general, for countries with data, less than half of total researchers have doctorates, with Poland and the Slovak Republic as exceptions. The share of researchers with doctorates is larger in the higher education sector; for the countries shown, the share of business sector researchers with doctorates is often below 40%. This highlights the variety of educational pathways for researchers and suggests that approaches to transferable skills training cannot focus on the PhD level alone.

1.3. Transferable skills for a diversity of careers and better research

Empirical studies suggest that researchers follow a variety of career paths. Data on PhDs, for instance, show that careers in academia are important, but that many other options are also available, both in terms of the sector of employment and the type of work done. An analysis of 12 countries participating in the OECD/UNESCO Institute for Statistics/Eurostat project on Careers of Doctorate Holders (CDH) found that the share of recent PhD graduates[7] employed in higher education ranged from 21% in Austria to over 80% in Poland while the business sector employed more than a third in Austria, Belgium and the United States (Auriol, 2010). Other studies have also found researchers in a range of non-academic positions (Box 1.3).[8]

Researchers also move among sectors during their careers. For example, evidence shows that research students both aspire to and expect to work in different sectors during their careers. In an Australian survey, 63% of research students (those enrolled in PhD and Master's degree courses) wanted to work in academia in the near term, but only 52% considered this a realistic goal, and only 54% wished to work in academia five to seven years after completing their degree in any case (Edwards *et al.*, 2011, p. 22). A United Kingdom study of career pathways of PhD graduates within and between six occupational clusters found "an unexpected degree of mobility between different occupations and employment sectors, usually associated with progression, and a significant proportion creating their own unique paths" (Vitae, 2011b, p. 3). While 23% of the graduating cohort studied started working in higher education research, 40% had moved to a new occupational cluster after three or four years, including higher education teaching/lecturing (11%), research in the non-higher education sector (8%), other common PhD occupations (such as R&D manager) (5%) and other occupations (such as trainee patent attorney) (5%) (p. 8). Participants in the European-level DOC-CAREERS study concluded that career paths of doctorate holders are very diverse both within and outside academia and cannot easily be slotted into a typology (EUA, 2009, p. 71).

Box 1.3. Where are doctorate holders working?

The European-level DOC-CAREERS project found that half of current doctorate holders have research and non-research positions in businesses, governments, service sectors and other education sectors (EUA, 2009, p. 7). The report pointed out that not all PhD candidates can or want to work in academia. Some individuals simply see PhD-level education as the best training in their field and good preparation for a variety of career paths (p. 71). This may vary by field; a United Kingdom study found that the share of PhD graduates employed in research occupations varied from 7% for theology to 71% for microbiology and biochemistry, molecular biology and biophysics (Vitae, 2009b, p. 6).

A survey of United Kingdom PhD graduates provided details on their employment and work characteristics approximately three and a half years after graduating (Vitae, 2010). While half of respondents were working in higher education or in schools, colleges or training providers, they were also employed in sectors such as health and social work (13%), finance, business and information technology (11%), and R&D (9%). Teaching and lecturing was the most common occupation (27% of respondents), followed by scientific research, analysis and development (19%), other professional, associate professional and technical occupations (17%) and commercial, industrial and public sector managers (10%), and 90% reported being very satisfied or fairly satisfied with their career to date.

Studies outside Europe provide similar results. In 2006, only 26% of doctorate holders in Australia were employed as university and vocational education teachers, and only 28% of recent doctorate holders in 2008 were employed in higher education (Commonwealth of Australia, 2011, p. 22). The rest had found employment in a wide range of other public and private sectors. United States data show that most PhDs work in service occupations, generally professional, scientific and technical services, or in government (Wendler *et al.*, 2010, p. 19). The share differs by field; PhD recipients in engineering and physical sciences are much more likely to work outside academia than those in social sciences and humanities (p. 17). International students (those with temporary visas) were more likely to have positions in industry than in academia, compared to United States citizens (p. 25).

Various national and cross-country studies and statements have identified the acquisition of transferable skills as important for researchers' careers. They can enable PhD graduates to acquire work (either in academia or another sector), allow more experienced researchers to explore opportunities for intersectoral mobility, or simply enable researchers to work more effectively in their chosen research environment. Commentary focuses mainly on the implications for doctoral education and on calls for increased inclusion of transferable or "workplace-relevant" skills in PhD programmes (Box 1.4). These skills are seen as a vital way to boost graduates' employment prospects in the broader job market and to help them pursue a variety of professional paths. In a comparative study of seven national research systems, Technopolis commented that "utilisation and employability are new keywords beside scientific quality" in research training (2011, p. 18). Similarly, the Australian

government suggested that changes in the way research is conducted and the variety of sectors in which researchers are employed "demands a contemporary approach to research training which continues to focus first and foremost on the development of the 'scholar' but places increased emphasis on the 'employee' and 'innovator'" (Commonwealth of Australia, 2011, p. 22). In addition, learning opportunities beyond initial training are also crucial. As noted by Wendler *et al.* (2010, p. 43), many individuals have sequential careers and require training and retraining.

Box 1.4. Transferable skills for a diversity of careers

In the early stages of launching the European Research Area, a European Commission Communication noted that research is increasingly conducted in "non-academic" institutions, such as companies, non-profit organisations and independent research centres, and that researchers need to be trained and prepared to enter this wider job market (EC, 2003, p. 14). The document highlighted the need to enhance the employability of researchers by providing wider employment-related skills (*e.g.* research management, communication skills, networking and team-working). Similarly, the ESF (2009, p. 12) noted that research careers are now less path-dependent and more likely to develop into "portfolio careers", and that only a small fraction of PhD candidates take up an academic career. It also concluded that researchers in all sectors require competencies beyond their field and need to acquire transferable skills throughout their careers. Later, the EUA reaffirmed the importance of training in transferable skills, including understanding the ethics of research, and recommended this as a priority for doctoral schools and programmes (2010).

Acknowledging the growing trend towards research careers outside academia, one of the seven key "aspirations" of Australia's Research Workforce Strategy is for research graduates to have the skills to "engage in world-class research and make productive contributions in a wide spectrum of professional roles" (Commonwealth of Australia, 2011). In an analysis of the future of PhDs, the journal *Nature* (2011, pp. 277-278) noted that in Germany and Singapore, doctoral training is seen as preparation for employment in a wider workforce outside academia. In Germany, many PhD students have structured courses in topics such as presentation, report writing and other transferable skills. Fiske (2011) suggested that focused training in areas such as communication and business basics "would go a long way towards strengthening the capabilities of PhD students and improving their career prospects". In the United States, an analysis of graduate education showed that master's programmes increasingly combine theory, practical application and workplace skills (such as critical thinking) to give students more choices in business, government and non-profit organisations (Wendler *et al.*, 2010, p. 18).

Evidence on employment underlines the importance of transferable skills. In response to a United Kingdom survey, 60% of PhD graduates said they used the generic skills developed as research students most of the time in their work (Vitae, 2010, pp. 34-37). This was particularly true for graduates in social sciences, physical sciences and engineering and for those employed in research occupations, whether in higher education or another sector. Vitae noted that this finding was aligned with an increasing focus on developing researchers' personal and professional skills in addition to their specialist skills. Employers have expressed the needs for graduates with business, communication and leadership skills (OECD, 2011, CIHE, 2010).

By helping researchers to pursue fulfilling and diverse careers, transferable skills may also contribute to better research outputs. The Korean Institute of R&D Human Resource Development (KIRD, 2010) suggested that transferable skills can help to maximise research outputs by enabling research personnel to be more effective in their research, as well as adaptable and flexible in an increasingly mobile and global research environment.

An area in which transferable skills may be increasingly important is in collaborative and cross-disciplinary work, including in teams. The capacity of researchers to communicate with others is essential for interdisciplinary work (EUA, 2009, p. 87). Mann and Marshall (2007) noted that the increased emphasis on multidisciplinary project teams at Australia's CSIRO required team leaders able to manage and motivate staff from a range of scientific disciplines who may be working together for the first time. More broadly, they found that the most significant differentiators between the most and the least effective teams were soft skills/interpersonal factors such as trust, goodwill and co-operation, and leadership. They considered that development of leadership and learning about conflict resolution, brainstorming, team learning and creative dialogue would have positive impacts on trust within teams and would contribute to better knowledge flows and performance. In addition, the study identified advocacy, sponsorship and strategic communication with external stakeholders and the public as important new roles for team leaders in order to support the socioeconomic integration of scientific research. Given the emphasis on collaborative, multidisciplinary and globally oriented approaches to research activity, the Australian government is reassessing training programmes and researchers' preparedness for diverse careers (Commonwealth of Australia, 2011, p. 11).

Ultimately, improving researchers' transferable skills may help generate innovation and improve economic outcomes. The European Union put great emphasis on the quality of its human resources in achieving its Innovation Union aspirations. It identified skills such as creativity, entrepreneurship, teamwork, risk-taking and project management as essential "in order to increase the innovation performance of individuals, to improve the competence

of private and public organisations, to facilitate knowledge and technology transfer, and thus to improve the overall competitiveness and the attractiveness of Europe as a region" (EC, 2010, p. 34). Similarly, the OECD (2011) found various "generic" or "soft" skills, as well as managerial and entrepreneurial skills and creativity, frequently mentioned as important for innovation. Highlighting the importance of communication and teamwork, Herrmann and Peine (2011) found that the innovative capacities of scientists stemmed partly from exchanging ideas with colleagues, and that interaction between adequately skilled employees and knowledgeable scientists was an important source of innovation.

National governments have also made the link to enhanced research and innovation outcomes. Policy directions in the United Kingdom have recognised the importance of researcher development for overall R&D capacity and allocated around GBP 20 million a year between 2003 and 2010 for career development and transferable skills training across all research disciplines (Hodge Review, 2010, p. 9). The Impact and Evaluation Group (2010) stated that "researcher development provides a key enabling link from knowledge creation to pathways to impact". It concluded that researcher development not only benefited individual researchers but is crucial for realising the potential of research and maximising outcomes from research funding. It noted opportunities for linking researcher training and economic impact through the analysis of longitudinal data. The Australian government indicated that the combination of highly specialised skills with more generic, high-level cognitive and technical capabilities had enabled researchers "to contribute to some of the most transformative innovations developed in Australia in recent times" (Commonwealth of Australia, 2011, p. 1). It noted that research and its application are often intertwined and researchers are increasingly exposed to commercial product and process development and the intellectual property and financial frameworks in which this occurs (p. 22).

1.4. Acquiring transferable skills – the role of formal training

If transferable skills are a valuable asset for researchers' careers and research, how should they be acquired? Formal training plays a part in preparing researchers for the variety of activities that they undertake in working life. For two broad researcher groups – PhD candidates and researchers in the workplace (*i.e.* post-doctoral graduates, other early stage researchers and research personnel) – this section discusses why formal training is a useful tool.

1.4.1. Training for PhD candidates

Doctoral candidates benefit from acquiring transferable skills during their studies, as these help them complete their PhD projects successfully and gain employment. In a survey of PhD students and post-docs, perceptions of the skills required for a PhD included a number of transferable skills, such as time management, writing skills, oral presentations, research skills (data gathering), teaching, interpersonal skills and computer skills (Pritchard *et al.*, 2010). Interviews with companies have shown that skills and attributes such as "originality and creativity", "team player" and "explain and communicate to non-specialists", are highly valued alongside technical proficiency (EUA, 2009, p. 86). These skills are seen as vital for enabling researchers to play managerial roles, to react quickly and effectively to unforeseen situations and to be flexible. There are also wider benefits from the acquisition of transferable skills at the PhD level. For instance, Gilbert *et al.* (2004) concluded that a key purpose of research degrees is to allow students to contribute to technological, economic, social and cultural pursuits beyond the university, and to the extent that both disciplinary research skills and generic skills of application and exploitation are part of this, both are clearly important.

While some transferable skills may be acquired informally during PhD studies, the massification of postgraduate education has meant that formal training in transferable skills has become more prevalent. In the United Kingdom, the Hodge Review suggested that the increasing number of postgraduate researchers has put pressure on the traditional "apprentice-master" relationships of researcher training, making formal training more important (2010, p. 11). Traditional training may also have delivered training of variable quality; the Hodge Review noted that it depended greatly on the personalities involved and the environment of individual researchers. In a number of countries, such considerations have led to the establishment of graduate and doctoral schools, specific organisational structures that cater for the needs of postgraduate and/or PhD students, including provision of transferable skills training (Box 1.5).

Box 1.5. Graduate schools and transferable skills

The concept of graduate schools emerged in North America in the 1960s (Denicolo *et al.*, 2010, p. 15) and has since expanded to other countries. Graduate schools are usually organised across the whole of a university, while doctoral schools (a similar construct) tend to be organised along thematic lines and may cross disciplines and institutions (LERU, 2010, p. 9). These schools typically provide a range of support for postgraduate students, including opportunities for training in various generic or transferable skills. Doctoral schools were created in France in the early 1990s to develop "soft skills" that facilitate the entry of new PhD graduates on the labour market (Auriol, 2010, p. 6). In the United Kingdom, over 75% of universities now have graduate schools, most of which are strongly involved in generic skills training programmes (Denicolo *et al.,* 2010, pp. 19 and 29). A recent study of Canada, Denmark, Finland, the Netherlands, New Zealand, Sweden and the United Kingdom found that postgraduate education is increasingly delivered in graduate or research schools; this training is often multidisciplinary and includes organised networking activities and skills beyond the academic specialty (Technopolis, 2011, p. 14).

Formal training in transferable skills may be particularly valuable for female and international students. In a study of late-stage PhD students in science, engineering and medical disciplines at Imperial College, London, Walsh *et al.* (2010) found that relatively more female and overseas students considered opportunities for transferable skills training to be very important than male and domestic students. It was suggested that females may perceive academic careers more broadly than men, and thus value transferable skills more highly. It was also suggested that women may have more difficulty accessing networks or mentoring and may therefore obtain additional benefits from training. Walsh *et al.* proposed that the language and cultural adjustment issues experienced by some international students might also lead to greater gains from training opportunities.

Formal training during PhD studies may also lead to positive attitudes towards ongoing learning. The Impact and Evaluation Group (2010) found that transferable skills training and the increase in programmes offered to researchers had "changed the culture" in institutions as researchers and supervisors saw the benefits of transferable skills training. A study by Walsh *et al.* (2010) also reported that participants in a residential training course developed more positive attitudes to skills training.

Box 1.6. Different skills for different career stages?

There appears to be no consensus regarding which transferable skills are most needed at different career stages. The ESF (2009, p. 13) noted knowledge gaps regarding "what kinds of skills are especially beneficial to the career development of researchers at a given stage". In particular, the relative importance of certain skills may vary over time (*e.g.* leadership might become increasingly important in later career stages) (p. 48). Education institutions also question the appropriate mix of skills to deliver to students. Gilbert *et al.* (2004) speculated whether writing, communication and basic research skills ought to be established before entrance to PhD programmes, and whether some work-related skills should be obtained in a post-degree pre-vocational course. Edwards *et al.* (2011, p. 92) found that teaching training is often delivered once a new graduate has been appointed to an academic position. In the United Kingdom, the Concordat to Support the Career Development of Researchers (2008) suggested that employers and funders of researchers consider articulating the skills needed at each stage of the career development framework and encourage researchers to acquire and practice these skills. However, it did not identify specific matches. Surveys of students provide some evidence on required skills, although samples may be small and the results strongly affected by students' assessment requirements. Pritchard *et al.* (2010) found that students in their first and second years found technical skills important (*e.g.* learning to operate equipment), third-year students identified communications skills (particularly thesis writing and communicating with non-academics), and post-docs identified people management skills. Leggett *et al.* (2004) also found that students' perceptions were closely related to the assessment framework and the tasks set for students.

Attempts have been made to set out skill requirements at certain career points. The Joint Skills Statement (JSS) of Research Councils United Kingdom (RCUK), in conjunction with the United Kingdom GRAD programme in 2001, set out the skills that PhD research students funded by Research Councils would be expected to develop during their training.[1] The more recent Researcher Development Statement (RDS) provides an up-dated perspective on the knowledge, behaviours and attributes that researchers need to work effectively. The detailed Researcher Development Framework (RDF) proposes three to five levels/phases of performance for each researcher characteristic – phases one and two generally map to PhD-level requirements, although achievement is personal to the individual researcher.[2]

However, any categorisation of skills by career stage can only be a broad guide; researchers are a diverse group and individual choice and control over training will be crucial. The Hodge Review (2010, p. 15) highlighted that researchers have different specialisations, employment arrangements, personal needs and backgrounds and that this influences the skills they need. Walsh *et al.* (2010) cautioned that training programmes must serve the needs of all research students, and that curriculum changes (*e.g.* to incorporate more enterprise training) should be implemented carefully. Similarly, Craswell (2007) felt that the tendency to view transferable skills training in the context of employ-ability in a knowledge-based society could skew training towards the perceived needs of science students. Craswell also cautioned against notions of best practice that are not sensitive to the local situation, while Campbell (2010) noted that the value accorded to generic skills is affected by differences in social and political contexts, cultures and opportunities. Leggett *et al.* (2004) noted that oral communication may be considered more important for business, and written communication for academia. Moreover, even for quite sophisticated skills training "skills will need to be adapted to accommodate workplace exigencies" (Craswell, 2007). The EUA noted the need to recognise pre-existing skills to avoid unnecessary training that takes time away from research (2009, p. 93).

1. See *www.vitae.ac.uk/CMS/files/upload/RCUK-Joint-Skills-Statement-2001.pdf* (accessed 14 April 2011).

2. For information on the RDS and RDF, see *www.vitae.ac.uk/policy-practice/234301/Researcher-Development-Framework.html*. For details of the RDF, see *www.vitae.ac.uk/CMS/files/upload/Vitae-Researcher-Development-Framework.pdf* (accessed 20 May 2011).

However, it is difficult to identify the appropriate balance between transferable skills training and core research work. Students appear to value transferable skills training opportunities, as evidenced by their voluntary attendance (Walsh *et al.*, 2010) and their positive feedback (Gilbert *et al.*, 2004). Walsh *et al.* also found that supervisors are becoming more positive, as graduate schools and other parties describe the value and impact of training more effectively. For academic careers, in fact, Technopolis (2011, p. 19) advocated more utilitarian skills in the earlier stage of research education and moving acquisition of the scientific specialisation needed for academic work to the post-doc stage. Nevertheless, some academics and students consider skills training a distraction from core research work, and some commentators have voiced concerns about the implications for the length (and cost) of obtaining a degree if more training is included in PhD studies. Edwards *et al.* (2011, p. x) found a lack of time the most notable impediment to research students' involvement in training for teaching, and noted that inserting additional training into Australia's relatively short research degrees might diminish the time students have to complete their core studies. Industry employers also differ in their emphasis on transferable skills; for instance, the EUA found that small- and medium-sized enterprises (SMEs) set higher value on PhD graduates' "soft skills" than large R&D companies for which "the value of hiring a doctorate holder usually lies, in the first instance, in a deep knowledge of a relevant subject and broader competencies that are likely to equip the person to handle subsequent career challenges" (EUA, 2009, p. 8).

The balance between study components will be partly shaped by views on the desired portfolio of students' transferable skills. There is still uncertainty about which skills are most useful at different points of a researchers' career and, indeed, they are likely to differ depending on the sector of employment (*e.g.* academia, business, government) and the type of work (Box 1.6). This indicates that choice of training options should be a key feature of training agendas. For some transferable skills, there are also concerns that formal training in educational establishments is "out of context" or too abstract and that such skills are more effectively acquired in the workplace. For PhD students, this may imply some training through internships or similar work-based opportunities, although such concerns may also be addressed by better integrating skills training in students' courses. "Embedding" transferable skills is an increasingly popular approach,[9] although what this practically involves differs across institutes and programmes. In other instances, different teaching styles may be useful. In both cases, the quality of practitioners is vital to the success of the training.

Transferable skills training needs to complement other learning opportunities. The League of European Research Universities sees the core of doctoral education as research-based training via formal and informal meetings with the supervisor and peer researchers, complemented by more structured training (2010, p. 9). Doctoral students and post-docs also view their research groups and peer networking opportunities as important means of acquiring such skills (Pritchard *et al.*, 2010). More generally, the EUA suggested researchers need to be more aware of the implicit acquisition of skills that takes place during their PhD programme and to be able to convey this to potential employers (2009, p. 93).

1.4.2. Training for researchers in the workplace

Post-doctoral graduates, other early stage researchers and more experienced researchers all have incentives to acquire additional transferable skills during their working lives. For some, the skills obtained during PhD studies may differ from those required at work. In a survey of recent United Kingdom PhD graduates Vitae (2010) found that 47% had taken their current job to broaden their experience and develop general skills. In addition, many graduates with jobs in non-academic settings had worked alone as students but in teams as professionals; this may suggest a need for new skills. Researchers lacking doctorates may desire skills that complement those acquired at other education levels. Moreover, the ESF (2009, p. 20) noted differences in the training syllabus and skills acquired by PhDs in different faculties.

Like any professional, researchers need to keep updating and building on their existing skills. This is formally recognised in several European policy documents. For example, the European Charter for Researchers considers that researchers should engage in continuing professional development to update and expand their skills and competencies (EC, 2005). Its principles on accountability, good research practice, dissemination and exploitation of results, public engagement and managerial duties also implicitly require good transferable skill levels. Similarly, the United Kingdom's Concordat to Support the Career Development of Researchers (2008) highlights the importance of training for working researchers. It requires signatories to recognise and promote researchers' personal and career development and lifelong learning and calls on them to recognise the need for researchers to develop transferable skills, delivered through embedded training. The Concordat also considers that individual researchers share responsibility for their career development and lifelong learning.

While learning-by-doing in the workplace is an important channel for gaining transferable skills, formal training can also add value. Vitae showed that while researchers gain skills through workplace experience (*e.g.* project management, presenting work at conferences), a significant share of research

staff in higher education institutions express interest in formal training to develop their leadership and management expertise, knowledge transfer and outreach skills, and broader research skills (2009a, p. 36). As noted earlier, some skills are more context-specific than others, and opportunities to undertake formal training in their work environment may be an effective way for researchers to attain these competencies. In addition, explicit opportunities for learning via work placements and secondments may also support transferable skills acquisition. In its 2011 survey of research staff in United Kingdom higher education institutions, Vitae found that 43% of respondents to questions on support and career development wished to undertake a placement in another sector (*e.g.* business, voluntary or government) and 49% wished to undertake a secondment to another institution (Vitae, 2011a, p. 33). However, only 5-7% of respondents had done so, indicating some potential unmet demand in this area.

1.5. Roles and responsibilities in transferable skills training

The literature reviewed generally proposes that training for researchers, including in transferable skills, is a responsibility shared among funders of research, researchers, their employers or managers, research training providers, and professional associations. Ideally, the roles and responsibilities would be divided according to the benefits received and the knowledge possessed by different stakeholders. For example, in the standard analysis of education, training and lifelong learning, individuals fund their training in general skills that are portable across workplaces, while employers help fund training in workplace-specific skills that are of particular value to them (Bassanini *et al.*, 2005). For PhD studies, countries often have a mixed model of finance, with contributions from universities, external research grants, state and private scholarships, companies and individuals (Technopolis, 2011, pp. 15-16). This reflects the diverse benefits that governments, institutions, employers and individuals gain from the pursuit of advanced research studies. Certain stakeholders may also possess competencies or knowledge that make them best placed to design, fund, organise or deliver training activities. Some potential roles and responsibilities of stakeholders in transferable skills training for researchers are set out below.

1.5.1. Government

For transferable skills training, the literature mentions a number of potential roles for governments, ranging from strategic oversight and co-ordination to funding. The Australian government highlighted its role in monitoring the level and quality of skills in the research workforce, assessing where investments could be targeted and providing leadership in addressing

challenges (Commonwealth of Australia, 2011, p. 7). The EUA suggested governments were essential facilitators of workplace training for doctorate holders and should have initiatives to address structural issues that cannot be dealt with at an individual level (2009, p. 9). Its case studies indicated that government involvement led to sustainability and enhanced quality. Scholz (2011) considered that the role of government was to provide quality assurance through a framework of skills programmes and to evaluate outcomes through impact measurement (*e.g.* career tracking). While government may provide funding, researchers' motivation and engagement in training may be greater if they participate in the financing. The Leitch Review (2006) pointed to funding responsibilities for government with respect to basic skills and platform skills for employability. Governments may also play an important co-ordinating role to avoid unnecessary duplication and spur value for money. Governments might add value through support for central repositories of good practice. The ESF (2009, p. 46) suggested funding organisations could support the delivery of transferable skills training through partnerships at national and international level, and through exchange of good practices.

1.5.2. Individuals

Individuals are well placed to recognise their needs and organise their learning. The European Charter for Researchers (EC, 2005) and the United Kingdom's Concordat (2008) consider training a responsibility of researchers, who should engage in continuing professional development to update and expand their skills and competencies. Researchers' responsibilities include developing their ability to transfer and exploit knowledge, to commercialise research, to engage in critical thought, and to identify training needs and opportunities for learning. Respondents to a survey undertaken by the ESF (2009, p. 49) indicated that individual researchers played the most important role in procuring training. Their participation in funding it is also important as they gain from enhancing their competencies. Taking part in financing also increases the motivation to achieve and make the most of learning opportunities.

Nevertheless, individual researchers may have difficulty assessing which transferable skills are most in demand in given sectors or employers. The uncertainty that this creates shows the need for good access to information regarding employers in the different sectors, education and training providers, and researchers.

1.5.3. Other stakeholders

Universities, research institutes, industry employers and organisations such as research funding agencies and dedicated training organisations play a role in transferable skills training. Their potential responsibilities vary from indirect funding support to hands-on delivery of training.

In the United Kingdom, the Warry Report (2006) recommended that the research councils encourage universities to make enterprise training available to researchers in all disciplines in order to increase the impact of funding and support knowledge transfer activities. The Hodge Review considered that all funders of research should contribute financially, either directly or indirectly, to the skills and career development of PhD students and research staff (2010, p. 21). Earlier, the Roberts Review recommended that funding to higher education institutions be conditional on ensuring that postdoctoral researchers had career development plans and access to appropriate training opportunities (2002, p. 13).

Organising appropriate training can be a key responsibility. Respondents to a survey undertaken by the ESF (2009, p. 49) saw research organisations taking the lead role in skills training, particularly for management and delivery. In the United Kingdom's Concordat (2008), employers and funders are asked to recognise researchers' needs for transferable skills, delivered through embedded training, to help researchers stay competitive in internal and external job markets. A study of graduate education in the United States suggested that graduate schools should provide training, mentoring and information for non-academic career options and integrate workplace training needs into their graduate education programmes (Wendler *et al.*, 2010, p. 42). It considered that to be globally competitive, United States universities must develop professional education programmes that encourage creativity and entrepreneurship, personal effectiveness, project management, ethics and other skills that enhance research impact (p. 44). Mann and Marshall (2007) noted that Australia's CSIRO's extensive use of teams as a vehicle for research led it to invest heavily in team training and development.

Co-ordination of stakeholders can be crucial to good training outcomes. The Hodge Review (2010, p. 22) underlined the importance of routine interaction between research organisations and employers (or other stakeholders) when designing skills strategies and programmes, so that training activities are relevant. Otherwise, the focus of training would be unlikely to match the opportunities available to researchers. Along similar lines, Wendler *et al.* (2010, p. 46) called for employers to communicate the skills needed for jobs in the global economy.

1.6. Key points and open questions

The formation and careers of researchers are important policy issues and training for transferable skills is a challenge that attracts increased attention. Research careers are diversifying and researchers' skills needs are evolving. Studies of individual countries suggest that researchers follow a variety of career paths and move between sectors during their careers. To help meet career challenges, researchers need "transferable skills" such as communication skills and problem-solving abilities. The literature identifies transferable skills as important for researchers as they progress, particularly by giving them workplace-relevant competencies that pertain to a broad job market. Communication, team-working and networking, and business and management know-how are often mentioned; however, a wide range of generic skills are generally relevant, with potentially varying emphases across sectors. Transferable skills are receiving more attention, particularly in higher education programmes, and training opportunities are expanding.

However, identification of possible shortcomings in researchers' competencies and training opportunities has led to calls to reconsider current policy settings and approaches. By gathering government- and institution-level information on transferable skills training strategies and programmes this study provides details on a key input to researchers' transferable skill competencies. However, researchers' employment differs across sectors and countries, as does their mobility and level of qualifications. The precise challenges faced by countries therefore differ, with consequences for policy approaches.

The literature identifies several benefits of formal transferable skills training. Doctoral candidates, an important group of researchers, benefit from acquiring transferable skills during their studies. These help them succeed in their projects and in their later employment. While some skills are acquired while preparing the doctorate, formal approaches may provide more systematic and quality-consistent training to an increasing number of postgraduate researchers. They may also provide valuable opportunities to female and international students, and may foster positive attitudes to ongoing learning. Researchers in the workplace also benefit from ongoing acquisition of transferable skills to update and build on existing competencies or to "fill in gaps" so that they can work more effectively and take up different opportunities. Learning-by-doing on the job is an important channel; however, formal skills training can add value, as can learning through work placements and secondments. Surveys suggest researchers seek such opportunities for their career development.

Nevertheless, the literature leaves several important questions unanswered. Formal approaches to transferable skills training for PhD students are not uniformly welcomed, with some concerns about implications for core research, degree lengths and costs if more training is incorporated into PhD studies. There is also debate over the skills to be taught at different stages and the best way to learn them – interaction with supervisors and peers, formal courses, or workplace-based learning (*e.g.* during an internship). For researchers in the workplace, there are also questions about the mix of skills required and learning methods, and there is some evidence of unmet demand for formal "workplace experience" channels. The literature proposes that responsibility for training should be shared in light of the benefits received and the knowledge possessed by different stakeholders. However, governments have a range of potential roles, ranging from strategic oversight to funding to delivery; other stakeholders also play many potential roles. For policy-making purposes, a key question is whether there are market or system failures that government intervention in these areas might alleviate.

The following chapter begins to tackle these questions by presenting a sample of current approaches to transferable skills training by governments and institutions. By examining country-specific information on types of training, target audiences and skills, and stakeholder roles, it provides new insight on a key input to transferable skills training for researchers.

Notes

1 The ESF has since moved from the term "transferable skills" to "professional skills" in its work on research careers, to mark a change in focus from the academic sector (particularly, doctoral candidates and post-docs) to researchers more broadly (Scholz, 2011). This study uses "transferable skills" to encompass researchers in all sectors. Issues related to defining different groups of skills were discussed in previous work on skills for innovation and research (OECD, 2011).

2 The questionnaire was distributed by country delegates to the OECD's Research Institutions and Human Resources (RIHR) Working Party.

3 Definitions of the terms "post-doc" and "early-stage researcher" may differ among countries.

4 Another important influence, not discussed here, is the extent of researcher training abroad.

5 The figures in this section show the data available for OECD member countries and other major economies, where possible.

6 Chinese data do not correspond precisely to the *Frascati Manual* recommendations.

7 The study focused on those who earned their doctoral degrees between 1990 and 2006.

8 As a general caveat, while this study focuses on researchers with research careers, the literature does not always specify whether the population in question is in research or non-research work. Nevertheless, the literature results are indicative of the diverse career opportunities for researchers and, in any case, classification of occupations into "research" and "non-research" is not always clear-cut.

9 For example, in its research workforce strategy, Australia stated its aim to embed the development of transferable skills into university research training programmes to support researchers in a wide range of employment contexts (Commonwealth of Australia, 2011, p. 25). The Hodge Review (2010, p. 15) also favoured the development of generic skills embedded in research degree programmes and as part of normal staff development for research staff.

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Chapter 2

Current approaches to transferable skills training for researchers

Institutions appear to be the main actors in terms of strategies and programmes for formal transferable skills training for researchers. Most training activity is recent and has a variety of goals, with communication and interpersonal skills the most frequent targets. Most programmes have not yet been evaluated and there are few planned changes to current approaches. Workplace-based training appears relatively limited but likely to increase. The data do not allow for robust cross-country comparisons, but countries appear to differ in terms of the level of government involvement and the direction and novelty of their policies.

2.1. Introduction

This chapter presents the results of the OECD policy questionnaire on transferable skills training for researchers. Respondents provided details about government- and institution-level strategies, programmes, and plans for introducing formal transferable skills training for researchers. Information was also gathered on transferable skills training for Master's-level students and workplace-based approaches to training. The information on training was compiled to help inform discussions on future government policy directions by providing new information on this key input to researchers' transferable skills. Given the nature of the exercise, the information gives examples of training activity but does not constitute a statistical sample (Box 2.1). However, for illustrative purposes, occasional reference is made to shares or percentages derived from analysis of questionnaire responses.

Responses came from 17 countries: Australia, Belgium, Canada, Denmark, Estonia, Finland, Germany, Italy, Japan, Korea, Luxembourg, Norway, New Zealand, Poland, Slovenia, Turkey and the United Kingdom. A total of 75 responses were received: 12 from national-level governments (of which one pertained to an individual government ministry), 10 from regional/state-level governments, 36 from universities (at various administrative levels), 12 from research institutions, and 5 from other organisations involved in researcher training activities (see Annex A for the full list). Summary information was provided separately by delegates from Austria, Canada, France, the Netherlands, Turkey, the United Kingdom and the United States, as well as the European Commission.

Box 2.1. Interpreting information from the policy questionnaire

The information gathered from responses to the policy questionnaire on transferable skills training for researchers is best seen as examples of training approaches taken by different organisations in different countries. The sample size and attributes, as well as response rates, differed among countries, so that responses cannot be analysed as a statistically robust sample. In addition, the responses do not necessarily present a full coverage of training activity in the responding organisations. For example, some training activity at faculty level in universities may not be covered in an institution-wide response. Also, for the different training activities (for researchers, for Master's-level students and in the workplace) respondents were asked to describe a maximum of three programmes. This raises selection issues for respondents with more than three programmes in a given area. Finally, respondents interpreted the questions in different ways. Some discussed specific training courses while others discussed programmes under which several courses are offered. Also, some institutions classified similar activities in different ways (*e.g.* delivery of a government-level programme was sometimes described in the "own programme" part of the questionnaire).

The chapter focuses first on formal training for researchers and then looks at other training activities (Master's-level training and workplace experience). More detailed information on government- and institution-level strategies and programmes can be found in Annex B. The final section offers some remarks on overall patterns in transferable skills training for researchers.

2.2. Overview of government responses – training for researchers

National-level government responses were received from Australia, Denmark, Estonia, Finland, Japan, Korea, Luxembourg, Norway, New Zealand, Poland, Slovenia and Turkey.[1] Regional/state-level government responses were received from Flanders (Belgium), and nine German *Länder* – Bavaria, Rhineland Palatinate, Berlin, the Free State of Thuringia, Hamburg, Bremen, Sachsen-Anhalt, Brandenburg and Baden-Wurttemberg. Summary information on Austria, Canada, France, the Netherlands, Turkey, the United Kingdom and the United States is discussed in Box 2.2, and Box 2.4 summarises information provided by the European Commission.

2.2.1. Strategy/agenda

Eight government responses (seven national, one regional) described some sort of overarching strategy or agenda for formal transferable skills training for researchers. The strategies do not generally centre explicitly on transferable skills, but are about broader researcher development. Most often, the goals include enhancing the employability of researchers in academia and improving research work. Three governments mentioned preparing researchers for a wider labour market. Other goals mentioned were improving teaching and supervising skills, improving research management, improving commercialisation skills, and attracting talent.

Of the strategies most directly addressing transferable skills, Estonia has an action plan on entrepreneurship studies. It aims to widen the availability of business education and, notably, will update curricula in the science and engineering fields. Turkey's Ministry of Health (School of Public Health) aims to build the capacity of human resources for health and to support training, research and other activities to support policy making.

Australia, Bavaria (Germany), Korea and Poland described broader strategies relating to science and technology (S&T) workers and researchers. Australia's Research Workforce Strategy envisages a research workforce with the skills to support innovation, educate the next generation and drive productivity improvements across the economy; it defines priority areas requiring action to achieve this vision, including in the research training system. Bavaria's Elite Network gives multi-faceted support to talented

students and young scientists at Bavarian universities. Korea's 2nd National Comprehensive Plan on Nurturing and Supporting National Talents in the field of Science and Technology aims to increase Korea's competitiveness by supporting creative Korean S&T workers. Poland's EU-funded Human Capital Operational Programme (HC OP) includes some objectives that bear on transferable skills for research and development (R&D) staff, in particular research management and commercialisation skills.

Since 2003 Japan's Committee for Human Resources in Science and Technology (of the Council for Science and Technology) has released several recommendations that implicitly and explicitly set directions for enhancing transferable skills training in doctoral and postdoctoral settings. Its Central Education Council also expressed a need for such training in its 2005 and 2011 reports on graduate school education. Denmark's Ministerial Order on PhD Programmes at Universities (a regulatory document) contains some guidance on transferable skills for PhD students, but is not a strategy or agenda as such. Estonia's PhD regulations stipulate proficiency requirements in certain skills and therefore implicitly give some guidance for training.

Five national and nine regional government responses indicated no relevant strategies or agendas. In explaining this, a number of the German *Länder* noted that transferable skills training is the direct responsibility of higher education establishments, with governments playing a role as principal funders of public higher education institutions. Summary information from Austria, Canada, France, the Netherlands, Turkey, the United Kingdom and the United States also suggests that explicit (federal) government transferable skills strategies or agendas are relatively uncommon (Box 2.2); however, general human resource-related strategies may have implications for transferable skills, and other entities provide opportunities for training.

Box 2.2. Various government approaches to transferable skills training for researchers

Responses to the policy questionnaire revealed that for a number of governments, transferable skills training is not a government responsibility but the responsibility of other sectors or entities. To see whether this was true of a wider set of countries, brief summary information was requested about government-level approaches to transferable skills training for researchers. Several responses were received, and additional information about specific programmes is contained in Annex B.

Austria has no specific federal government strategy on transferable skills for researchers. However, some stakeholders offer programmes that provide transferable skills, such as the Austrian Science Fund's structured doctoral programmes (*Doktorats-kollegs*) and Life Science Austria's (LISA) activities to encourage entrepreneurship (*e.g.* seminars on team building, leadership and legal issues). Promotion of collaboration between science and business has also given rise to opportunities for acquiring transferable skills, and a broad spectrum of researchers gain skills and experience while working in temporary institutions that bring universities and other research institutions together with industry partners.

Canada has no specific federal government transferable skills strategy or agenda. However, programmes managed by its research councils and similar entities provide elements of transferable skills training, often through workplace experience. The Research Council of Canada, the Natural Sciences and Engineering Research Council of Canada, and the Networks of Centres of Excellence of Canada all offer programmes that give researchers practical industry experience.

France has no specific government transferable skills strategy. However, the doctoral training framework supports researchers' acquisition of transferable skills, through formal training and workplace experience. In addition, initiatives under the government's "Investments for the Future" programme may offer researchers opportunities to gain transferable skills through actions to bring universities, research institutions and other actors together.

The **Netherlands** noted that its universities are responsible for transferable skills.

Turkey views developing S&T human resources as a pillar of Turkish science, technology and innovation (STI) policy. The government's National Science, Technology and Innovation Strategy 2011-16 has several axes relevant to transferable skills, and the Science and Technology Human Resources Strategy and Action Plan 2011-16 makes "improving research environment, researchers' skills and experience" a strategic objective. This includes efforts to promote research methodology and R&D project management courses, training for soft skills such as leadership, and interdisciplinary work and collaboration. Recent decrees relating to the innovation and entrepreneurship system adopted by the Supreme Council for Science and Technology (SCST) also have implications for transferable skills training for researchers. In addition, the Scientific and Technological Research Council of Turkey (TUBITAK) has a wide range of funding programmes for developing researchers' careers, skills and experience. …/…

Box 2.2. Various government approaches to transferable skills training for researchers *(continued)*

The **United Kingdom** does not have a specific government transferable skills strategy or policy for researchers. Government funding for teaching and research is allocated by funding bodies and research councils with their own governance structures and funding allocation mechanisms. These bodies' strategies can include transferable skills for researchers (*e.g.* Research Councils United Kingdom states that it will ensure its funding develops the right balance of specialist research expertise and wider business and management skills for high-technology employers as well as academia). A number of overarching documents/agreements bear on transferable skills training for researchers, such as the Concordat to Support the Career Development of Researchers, the Researcher Development Framework and Statement, the QAA (Quality Assurance Agency) Code of Practice for assurance of academic quality and standards in postgraduate research degrees, and the Roberts recommendations for postgraduate researchers and research staff. A variety of initiatives exist at the institutional level, ranging from short courses to industrial doctorate centres.

The **United States** has no specific federal government transferable skills strategy or agenda. However, the United States Office of Science and Technology Policy (OSTP) is responsible for providing leadership for interagency efforts to develop and implement sound S&T policies and budgets and to work with other stakeholders (*e.g.* state governments, the private sector) in doing so. Part of this leadership involves workforce development at all levels, including transferable skills for researchers. Programmes developing transferable skills for researchers are managed by individual federal agencies or departments, and policies are programme-specific. Examples include programmes managed by the National Science Foundation (an independent federal agency), the United States Air Force Office of Scientific Research, the United States Department of Energy and the United States National Institutes of Health. These entities provide programmes for researchers and Master's-level students, as well as programmes offering workplace experience via internships, summer schools, etc., to undergraduate and graduate students.

2.2.2. Programmes

Seven national governments and one regional government described formal training programmes for developing researchers' transferable skills. They also described strategies/agendas, although the programmes were not necessarily explicitly linked to the strategies. They detailed 11 training programmes or courses. In addition, Japan noted that its Global COE (centres of excellence) programme includes transferable skills development as part of various activities, Poland mentioned a suite of programmes under the umbrella of its HC OP, and Korea highlighted a programme that delivers a range of training courses via a dedicated training establishment – Korea Institute of R&DB Human Resources Development (KIRD).

With one exception, programmes were not introduced before 2005. Their stated rationales are generally broad – supporting research personnel and research management – although more specific rationales were also noted (*e.g.* Australia's Commercialisation Training Scheme [CTS] attempts to equip researchers with skills to bring ideas to market and Korea's Degree and Research Centre programme tries to bridge universities and research centres). Some programmes are targeted at just one group of researchers (*e.g.* Turkey's three programmes aim only at research personnel), but most target two if not three of the groups of interest (PhD candidates, post-docs, other early stage researchers and research personnel). Communication skills were most often noted as a target of the training programmes, followed by interpersonal skills. Nevertheless, differences among categories were minor and programmes seem generally to provide training in an extensive range of transferable skills.

The length of training varies widely, from a day to 24 months (part-time in the latter case), is most often voluntary, and is provided in various ways (*e.g.* lectures, workshops, residential stays, distance education). Training for PhD students is most often stand-alone; only Korea's Degree and Research Centre programme mentioned training as part of regular courses. The number of researchers participating each year varies widely; for instance, 20-30 personnel take part in the Turkish School of Public Health's personnel development training each year, while 2 500 individuals participate in Estonia's PRIMUS. Training is predominantly provided by universities and funded by the government (although Estonia's programme is funded by the EU, while Turkey's programmes receive some World Bank funding).

2.2.3. Programme evaluation

The vast majority of government programmes for transferable skills training have not (yet) been evaluated, making it difficult to link training to actual output (*i.e.* researchers' skills) and outcomes (*e.g.* research results, mobility, etc.). Australia's CTS was evaluated in late 2010; government support for commercialisation training for higher degree by research (HDR) students was considered appropriate and aligned with the government's strategic priorities; several recommendations were made for future training approaches. In 2010 Japan's Council for Science and Technology undertook a mid-term evaluation of the Young Researchers Training Program for Promoting Innovation[2] and found that activities performed jointly with a company had been important. Feedback from participants in the Bavarian government's soft skills courses, offered under the Elite Network strategy, suggested that communication (including negotiation, intercultural competencies, dealing with difficult situations, etc.) is the topic of most interest to participants, followed by self-development (*e.g.* leadership, self-management) and presentation (*e.g.* presentation skills, argumentation, voice training). Estonia plans to evaluate its PRIMUS programme in 2013.

2.2.4. Allocation of research funding

Government responses indicated that research funding does not usually attach conditions relating to transferable skills training for researchers. However, Denmark remarked that its PhD funding to higher education establishments requires transferable skills training (Ministerial Order), and a forthcoming Flemish scheme will also link doctoral funding to transferable skills training.

2.2.5. Plans for change

Three governments (Flemish, Rhineland Palatinate and Turkey) noted plans to introduce new programmes/activities or to improve human resource plans, while Japan noted that their Committee for Human Resources in Science and Technology is considering enhancing training in transferable skills and career development for postdoctoral researchers. Under its Research Workforce Strategy, the Australian government is consulting universities and other key stakeholders on the establishment of research training standards that would take into account the training of students for broader employability (Box 2.3). It is also considering the implications of including the development of additional generic and innovation skills under key scholarship programmes for research degrees. However, most countries planned no specific changes to their current arrangements for transferable skills training for researchers.

Box 2.3. Influencing skills via quality standards in Australia

In reviewing its Research Training Scheme (RTS), the Australian government launched a consultation process to obtain feedback on what quality in research training means and how it can be measured and encouraged. The RTS is the government's largest source of funding for Australian higher education providers to support research training for domestic students undertaking research doctorate or research Master's degrees. It is paid as a block grant to universities according to a performance index based on student completions, research income and research publications, where these variables are proxies for the quality of training supervision and research.

Among the questions posed, two are particularly relevant to the current study:

- Should government do more to enable research training in multidisciplinary environments? What barriers are there and how might they be overcome?
- Should Australian higher degrees by research include broader skills training? If so, should this be through compulsory coursework or through some other mechanism?

Behind these questions is a sense that requirements for new knowledge are increasingly driven by challenges demanding multidisciplinary solutions, such that researchers need the ability to broaden their own understanding, engage with researchers in other fields, understand a variety of viewpoints and collaborate. There is also a view that students need skills for a wide range of employment contexts and in order to meet the requirements of modern academic careers.

Source: Department of Innovation, Industry, Science and Research (2011).

2.2.6. Wider research career development agenda

A few governments noted that their transferable skills training strategies and programmes were consistent with other human resource-related action plans or higher education strategies.

2.2.7. International co-operation

In response to the question of whether governments co-operate internationally in their research career development activities, a number of government respondents referred to co-operation at the European level. This co-operation centres on several strategy and policy documents and on some joint initiatives; the most commonly mentioned are described in Box 2.4, which also summarises information on the Marie Curie Actions provided by the European Commission. Links at the Nordic level were also mentioned, and several governments noted the importance of researcher mobility internationally.

Box 2.4. Common avenues for co-operation and transferable skills training at the European level

European partnership for researchers: Created in 2008, the partnership proposes joint actions to be implemented by member states to improve the attractiveness of research careers in Europe. Actions are in four areas: open recruitment and portability of grants; social security and supplementary pensions for mobile researchers; attractive employment and working conditions; and improving training, skills and experience. With regard to the last of these, member states are encouraged to develop and support national skills agendas to ensure that researchers are equipped with skills throughout their careers and to ensure better links between academia and industry, *e.g.* industry placements during training (EC, 2008).

Innovation Union: The Europe 2020 Flagship Initiative: Innovation Union, launched in 2010, sets out a strategic approach to economic development *via* innovation in the EU. Key parts of the strategy involve raising skills levels and enabling researchers to work and co-operate across the EU (EC, 2010).

EURAXESS: This joint initiative of the European Commission and member states is a one-stop shop for researchers which provides information on job vacancies, funding opportunities and fellowships in Europe, as well as details of the European Charter and Code of Conduct. It also offers a network of service centres to help internationally mobile researchers and a network for European researchers working outside Europe. The main portal is at *http://ec.europa.eu/euraxess/index.cfm/general/index*.

The **Marie Curie Actions** of the People Programme support transferable skills training in areas such as intercultural skills, project management skills, leadership, communication, information technology (IT) skills, presentation skills, entrepreneurial skills and language skills. …/…

Box 2.4. Common avenues for co-operation and transferable skills training at the European level *(continued)*

Among the eight current Marie Curie Actions, the Marie Curie Initial Training Network (ITN), in particular, addresses the training of PhD candidates and other early-stage researchers. It aims to improve their career perspectives in both academic and non-academic sectors, thereby making research careers more attractive to young people. The ITN has three modes of implementation:

1. ITNs are typically set up as Multi-Partner ITNs, with at least three participants established in at least three member states or associated countries.
2. Introduced in 2012, European Industrial Doctorates (EID) aim to train highly skilled researchers and stimulate entrepreneurship, creativity and innovation in Europe by involving businesses in doctoral training so that skills better match public- and private-sector needs. Each EID is composed of one academic institution and one participant from the private sector.
3. Innovative Doctoral Programmes (IDP), also introduced in 2012, are composed of a sole participant established in a member state or associated country. Participants are typically universities or research institutions offering innovative doctoral programmes with international, interdisciplinary and intersectoral training.

In the next framework programme for research, the proposed Marie Skłodowska-Curie Actions will encourage new, innovative and creative types of training. The actions will become the main EU programme providing structured doctoral education and training. Further information is at *http://ec.europa.eu/research/mariecurieactions/*.

2.3. Overview of institutional responses – training for researchers

Among the responses received from institutions regarding their transferable skills training activities 36 were from universities in Belgium (Flanders), Denmark, Estonia, Germany, Japan, New Zealand, Norway, Poland and the United Kingdom. Most described approaches at the university level (respondents were often from graduate/doctoral schools), but one described the approach of a group of universities; and six responses were from faculties or departments. There were 12 responses from research institutions in Finland, Germany, Italy, New Zealand and Norway, and five were from other organisations involved in researcher training activities in Canada, Korea, Luxembourg, Poland and the United Kingdom.

2.3.1. Role in government programmes[3]

Few universities indicated a specific role in delivering government programmes for transferable skills training for researchers. In Estonia, Tallinn University and the University of Tartu have some responsibility for training under the PRIMUS programme, which is mainly financed by the

European Social Fund. Japan's three responding universities carry out training under programmes designed by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) and the Japan Science and Technology Agency (JST) (*e.g.* the Young Researchers Training Program for Promoting Innovation at the Tokyo Institute of Technology). Scotland's University of Strathclyde is a partner university, host and manager of events for the Scottish Crucible leadership and development programme. Three universities and one department indicated responsibilities for PhD and other general university studies and/or meeting standards under the Bologna process.

Three research institutions indicated that they deliver government programmes for transferable skills training for researchers. In each case, this includes doctoral training and hosting students; one also included sabbaticals (inward and outward) in this category. Scion (New Zealand) noted positive synergy between itself and universities in hosting work placements, as Scion's research projects are well aligned with specific postgraduate studies. The Finnish Meteorological Institute also noted training on air quality measurement in this category, but this does not appear to be closely related to transferable skills.

The five other organisations involved in transferable skills training each indicated a role in delivering government programmes. The Ontario Centres of Excellence (OCE) delivers the Industry-Academic Collaborative Program on behalf of the Ontario Ministry of Research and Innovation and acts as the programme development and delivery agent for training programmes. Korea's KIRD is a training and educational institution belonging to, directed and funded by the Korean government's Ministry of Education, Science and Technology. It is based on the government's second "National Comprehensive Long-term Plan on Nurturing and Supporting National Talent". KIRD is the sole institution providing transferable skills training programmes for researchers in the public sector and in government-funded institutions, and for Master's and PhD-level students and professors in universities that participate in national R&D programmes in science and technology. Luxembourg's Fonds National de la Recherche (FNR) has two funding instruments that relate to training and plays a role in programme management and impact evaluation. Poland's Foundation for Polish Science helps deliver the EU-funded SKILLS programme on behalf of the Ministry of Science and Higher Education and the Ministry of Regional Development. The United Kingdom's Vitae is itself an initiative of Research Councils United Kingdom and indirectly of the Department for Business, Innovation and Skills, and plays an important role in strategy development, delivery and evaluation.

2.3.2. Strategy/agenda

Among responding universities 23 indicated an overarching strategy or agenda for transferable skills training for researchers. More than half had broader plans related to university and human resource development, and in nine cases, their strategies related directly to doctoral or graduate schools. One university indicated that their strategy was under development, and five universities had no strategy. The departmental/faculty responses did not indicate strategies. When dates of introduction of strategies were noted, they were mainly 2008 or later. Universities offered various rationales for their strategies. Most frequently these involved preparing people for a wide range of careers and ensuring that their skills were useful, followed by a desire to provide a good research environment. Several universities mentioned professionalising training and making it more systematic. In answer to the multi-choice question about goals for the strategy/agenda, most ticked enhancing employability of researchers in academia, preparing researchers for a wider labour market and improving research work. In the additional responses, improving the quality of teaching and supporting internationalisation were commonly mentioned.

Nine research institutions mentioned strategies or agendas for transferable skills training for researchers. For some, this meant a broad approach to researcher development (*e.g.* the Helmholtz Association's Talent Management strategy), while others had a more targeted approach (*e.g.* Plant and Food Research New Zealand's Leadership Development agenda). Many of the strategies are very new (one is being introduced in 2012). The rationales included maintaining the expertise and commitment of staff, improving the qualifications of researchers for varied careers, stimulating internal communication and creativity, supporting organisational success by developing effective leaders, retaining and attracting talent, and improving the quality of work. In answer to the multi-choice question about goals for the strategy/agenda, they frequently ticked improving research. The many additional responses included supporting commercialisation and international co-operation, raising competitiveness and organisational performance, and improving external relationships.

Three of the five other organisations have a strategy or agenda for transferable skills training. The OCE has an OCE Talent Strategy (introduced in 2005), KIRD has its Long-term Development Strategy for 2020 (introduced in 2008), and Vitae pointed to certain recommendations regarding PhDs and post-docs in a 2002 report, "SET for Success – the supply of people with science, technology, engineering and mathematics skills". Luxembourg's FNR is currently developing its strategy. Two organisations mentioned that their rationale for introducing their strategies was to meet government requirements, whereas the OCE is trying to address knowledge gaps identified by

industry and Vitae aims to augment the supply of highly skilled researchers for research and the United Kingdom economy. Strategies' goals include enhancing employability of researchers in academia, preparing researchers for a wider labour market and improving research work, but a number of additional responses named encouraging knowledge transfer and commerce, building an entrepreneurial culture, improving the environment for research for local and foreign researchers, increasing public understanding of research and contributing to policy making.

2.3.3. Programmes

University responses

All of the universities and five of the six university departments responding to the questionnaire offer formal transferable skills training programmes for researchers. More than 70 examples were provided.[4] Some described specific courses (*e.g.* a Job Seeking Workshop at the Norwegian University of Life Sciences), while others described broader programmes with a variety of training opportunities (*e.g.* the Doctoral Training Programme at Ghent University). Like strategies, most have been introduced since the mid-2000s, although there are some longer-standing examples, such as the Scientific Continuing Education Programme at Technische Universität Berlin (since 1996) and the Pedagogical Development Programme at the Norwegian University of Science and Technology (NTNU) (since 1994).

The rationales for the university programmes range from broad to very specific. The most frequent theme is preparing students and researchers for a range of careers by building a variety of skills, followed by improving teaching and supervisory skills. Other rationales include supporting young researchers, restructuring training to uphold quality standards, meeting student demand for courses, improving management and research leadership skills, and improving writing and publishing skills. The overwhelming majority of programmes are voluntary. However, some graduate schools require participation, and some pedagogical training programmes are compulsory for those without formal qualifications. About 40% of the programmes target PhD candidates. The rest address various combinations: all researchers, solely research personnel, or PhD candidates and post-docs. For programmes for research personnel, few respondents indicated a focus on particular career levels; however, some noted staff new to teaching and supervision, or new to leadership roles. A quarter of the programmes address all types of transferable skills and the rest target various combinations. In the latter group, communication skills were most frequently mentioned, followed by interpersonal skills. Enterprise skills were least frequently mentioned.

The length of university programmes varies widely. Around a quarter of those described run for several days (essentially, a short training course); they cover teaching and supervision skills, writing and publishing, project management and intellectual property rights (IPRs). A fifth of programmes offer modules over several months to a year; they tend to focus on mentoring, coaching and leadership, and pedagogy. The next most frequent type of programme involved training through the degree programme (usually, a doctorate) with a variety of short courses. Other options were programmes of several hours or several weeks, and certificate programmes of one to three years, with lectures and seminars, workshops, group work, practical experience, individual coaching and exchanges. In doctoral/graduate school programmes, up to 100 different training options may be offered each year, and individual courses may be offered up to ten times a year. Most programmes appear to be stand-alone, in that the training is conducted in a dedicated course.[5] The number of people attending programmes each year ranges widely, with the largest numbers associated with doctoral school programmes. Programmes are most often delivered by university staff, sometimes from dedicated career development centres, but external specialists are also involved. Programmes are most often funded by universities themselves, with government- or EU-level funding and industry funding mentioned for a small number. Participants' fees were mentioned only for three programmes.

Research institution responses

Six of the responding research institutions provide programmes for transferable skills training for researchers. A total of 13 examples were given, all introduced since 2005. Many of the programmes are aimed at management and leadership, but language training, academic writing and transferable skills for PhD students were also mentioned. The programmes are a mix of short courses (*e.g.* a one-day workshop on teams) to programmes over several months or several years (*e.g.* the Helmholtz Management Academy offers training over a year and a half). Compared to university programmes, these programmes generally take place fewer times a year and have fewer participants. However, this is likely consistent with these organisations' workforce size and the type of training provided. Around half of the programmes are aimed at all researchers in the organisations (from PhD candidates to experienced research personnel), but half have particular target groups, notably research personnel and people in positions of leadership. One programme was also available to administrative staff. Interpersonal and communication skills are the most common topics, followed by organisational skills. External consultants and specialists frequently deliver programmes in addition to own staff, and funding is overwhelmingly internal. Participation is compulsory in only a few cases (for some management/leadership training).

"Other organisation" responses

These organisations all have programmes for transferable skills training for researchers. Eleven examples were discussed, of which ten were introduced since 2006, but one dates to 1968 (the GRADschool programme in the United Kingdom). The content of eight of the programmes is relatively specific (*e.g.* the FNR's workshop on communication with the media); the other three are broader programmes comprising a number of training opportunities (*e.g.* the OCE Value-Added Personnel programme). The rationales for the programmes are in line with the overall strategies; some additional specific rationales included improving the success rate of applicants to Luxembourg- and EU-level funding calls, strengthening R&D staff potential in science administration and management, and raising researchers' awareness of their skills and how best to present them. Communication skills and research competencies were most frequently mentioned as topics, followed by organisational skills.

The length of training (which is generally voluntary) ranges from a half-day to two weeks, and is delivered in various ways, such as workshops, group discussions and lectures. Vitae highlighted the use of "experiential learning" and noted that several programmes are residential. Some of the programmes have large numbers of participants: KIRD's R&D competency programme has around 1 000 participants a year, and Vitae's GRADschool programme accommodates up to 2 000 researchers a year. Just under half of the programmes are open to all researchers (PhD candidates to experienced research personnel). Training programmes of the Foundation for Polish Science are open to PhD candidates, post-docs and other early-stage researchers who have been laureates and scholars of other Foundation programmes. KIRD and Vitae deliver some or all of their training programmes themselves; other organisations use specialised agencies and external experts. KIRD was the only organisation to mention a tranche of funding from training participants.

2.3.4. Programme evaluation

Many university training programmes for researchers are evaluated by participants at the end of training, but few have been evaluated for their impact. This makes it difficult to link training inputs to actual outputs and outcomes. Some respondents noted that evaluations had been positive, and that changes had occurred as a result of feedback, but provided little information. NTNU mentioned that its Equal Opportunities Mentor Programme has enhanced cross-disciplinary understanding and interaction, owing to the way mentors are matched to partners, and the University of Oslo stated its Research Leadership Programme has been adopted by other

universities and is now also taught in English. The University of Strathclyde's Researcher Development Programme is evaluated annually based on the Rugby Team Impact Framework (Box 2.5).

Research institutions indicated that their researcher training programmes were evaluated by participants and evolved according to feedback.

"Other" organisations indicated evaluation by participants in training programmes. Vitae also mentioned an external evaluation of its "How to be an effective researcher" programme in 2010, which was positive but pointed to possible changes, and a follow-up study of the impact on participants of its 2009 "Leadership in Action" programme, which was also positive.

Box 2.5. Rugby Team Impact Framework

The Rugby Team (now the Impact and Evaluation Group) was established in 2005 in the United Kingdom. Its purpose is to "propose a meaningful and workable way of evaluating the effectiveness of skills development in early career researchers". A particular challenge is to understand what has occurred as a result of (rather than coincidentally with) recent training initiatives.

The Rugby Team Impact Framework attempts to evaluate impacts of investment in researcher training and development at several levels:

- Impact level 0: Foundations –inputs and throughputs (*e.g.* number of training opportunities offered and number of researchers participating).
- Impact level 1: Reaction – participants' reaction to training (*e.g.* their view of the training experience).
- Impact level 2: Learning – the extent to which participants change attitudes, improve knowledge or increase skills as a result of the training.
- Impact level 3: Behaviour – changes in behaviour that have occurred owing to participation in training.
- Impact level 4: Outcomes – an attempt to measure the final results of training (*e.g.* has the quality of research improved?).

Source: Rugby Team (2008).

2.3.5. Allocation of research funding

Few universities mentioned conditions attached to funding which required recipients to ensure provision of transferable skills training. Some German universities highlighted PhD programme rules or conditions of funding from the *Deutsche Forschungsgemeinschaft* (DFG – German Research Foundation), and a Belgian university noted that requests for funding needed to be in line with its doctoral school strategy. Only one research institution indicated funding conditions related to requirements of doctoral programmes. None of the other organisations involved in

transferable skills training activities noted funding conditions. However, the OCE mentioned that this had been considered and discarded, while the FNR noted that in future transferable skills training may be made a part of FNR funding to Luxembourg institutions.

2.3.6. Plans for change

Among universities, more than half indicated no changes to the current approach to transferable skills training for researchers or did not answer the question. Five noted that improvements would be made to training arrangements, and a further five wished to make training more systematic (and perhaps compulsory). In Norway, the adoption in 2012 of the Norwegian national qualifications framework (based on the Bologna Framework[6]) may require revisions to universities' training approaches, as it will influence both course content and pedagogy.

Responding research institutions had few plans for change. Two had plans for expansion and improvement, and one noted the challenge of financing training (although management remains convinced that training will help cope with a changing market). One highlighted the introduction of a Human Resource (HR) Action Plan in 2012 to accompany its HR Strategic Roadmap.

Other organisations involved in training described various changes. The OCE mentioned a recent streamlining of its activities to focus on entrepreneurship but foresaw no further changes. KIRD plans to develop longer courses, and the Foundation for Polish Science wishes to use its own funds to continue the programmes of the SKILLS package. At a more comprehensive level, Luxembourg's FNR plans to analyse training needs at the national level, identify gaps and construct an agenda. Vitae would like to achieve a cultural shift, with a holistic approach to professional development of researchers and integration of training into PhD programmes and the normal business of doing research.

2.3.7. Wider research career agenda

Most universities did not answer the question about the relation between their formal transferable skills training for researchers and their wider research career development agenda (if one existed). Six indicated their activities were in line with university-wide strategies or complemented other educational opportunities for students. Some considered that the training helped prepare researchers for non-academic careers.

Half of the research institutions responded to the question on career development agendas. Several noted that transferable skills are crucial for career advancement and that training complements other learning opportunities such as mentoring. The Istituto Superiore Mario Boella in Italy noted that its researchers are encouraged to investigate ways to help the institute evolve and improve its researchers' careers; its HR Action Plan will play a role.

Among other organisations, the OCE noted that its transferable skills training complemented its core activity of industry-academia collaboration, and the Foundation for Polish Science pointed to complementarities between training and programmes in the EU Innovative Economy Operational Programme for Poland. Vitae's training fits with its vision of the United Kingdom as a leader in the career development of researchers.

2.3.8. International co-operation

Almost half of responding universities either did not cover international co-operation in their research career development activities or did not respond to the question. Several universities mentioned European-level links, and two New Zealand universities noted programme links with Australia. NTNU has an internationalisation strategy which emphasises collaboration and mobility; some universities in Estonia and Poland also mentioned mobility.

More than half of the research institutions mentioned international co-operation related to researcher development. Hosting researchers and exchange of staff were mentioned by several, and the role of international projects in providing career development activities was also noted.

The three Europe-based other organisations indicated co-operation at the European level (*e.g.* the ESF or involvement of foreign institutes in training. Vitae also interacted with the United States. KIRD wishes to develop strong global networks and co-operation with other countries in transferable skills and career development activities.

2.4. Overview of responses – other training activity

The questionnaire also sought information from governments and institutions on transferable skills training for Master's-level students and on the development of researchers' transferable skills through workplace experience. While these were not the focus of the project, some countries indicated in the project design phase that, for them, this was where most transferable skills policy operated.

2.4.1. Training for Master's-level students

Government responses

Four government respondents had a strategy for transferable skills training for Master's-level students. In Bavaria, Estonia and Poland, the strategies were those described above for researchers (the Elite Network, the Entrepreneurship Studies Action Plan, and the HC OP, respectively). Additionally, Norway described its strategy for entrepreneurship skills aimed at students from compulsory school to higher education, targeting skills related to communication, innovation and ethics. At the programme level, Bavaria mentioned its Max Weber programme for building interpersonal, organisational and communication skills and improving cognitive abilities, and its soft skills seminars under the Elite Graduate programme. Together, these voluntary programmes train around 600 students a year. Poland noted that its HC OP funds projects that provide training to Master's students; similarly, Australia's Commercialisation Training Scheme is open to Master's degree students, and Korea's Degree and Research Centre programme also supports these students. Looking ahead, the Flemish government is considering funding in this area; no other governments foresaw changes.

University responses

More than half of university responses had no strategy for formal transferable skills training for Master's students.[7] A few noted that their strategy was part of a wider university strategy, and one Japanese university noted that Master's-level training was usually organised along with PhD-level training. Two New Zealand universities implemented strategies at faculty level and drew on Graduate Profiles.

Consistent with this pattern, more than half of university responses had no specific programmes for Master's-level training. Twelve institutions (in Estonia, Germany, Japan, New Zealand, Norway and Poland) had programmes, and twenty-five examples were discussed. Some were short training courses (*e.g.* a two-day Entrepreneurship Camp at the Norwegian University of Life Sciences), but a number appeared to be degree/certificate programmes (*e.g.* Communication Management at Tallinn University, the Master of Bioscience Enterprise at the University of Auckland, and the European Business Competence Licence at the Wroclaw University of Economics). Philipps-Universität in Marburg, Germany, described a group of 60 Master's programmes. Four programmes targeted all transferable skills although two did not have a strong focus on enterprise skills. The other programmes targeted a mix of skills, most often including communication and interpersonal skills. Research competencies and

enterprise skills were the least frequently mentioned, although the NTNU's Entrepreneurship Venture Cup only targeted enterprise skills.

Around a third of university responses indicated changes for Master's-level training in transferable skills. The Heinrich-Heine-Universität in Düsseldorf plans to combine existing programmes under a central organisation, and the University of Strathclyde's approach may evolve with a reorganisation of the infrastructure of its researcher development programme. Several Norwegian universities noted that the forthcoming national qualifications framework might lead to a change in approach, and the University of Auckland highlighted plans to develop a skills programme similar to that for its PhD candidates.

Research institution responses

Nine of the twelve responding research institutions have no strategy for Master's-level training in transferable skills. Two Norwegian institutions host Master's students and another encourages its Master's-qualified staff to upskill. One Finnish institution provides some training in Master's programmes. No institution envisaged any changes. However, the two that host Master's students commented that this can be an important start for a research career, and that Master's students often advance as candidates for PhD work on projects in the institution. Nofima (Norway) noted that Master's students were an important source of recruitment.

"Other organisation" responses

The strategies of OCE and KIRD related to transferable skills training for researchers also included Master's-level students. The OCE Value-Added Personnel Program offers training to around 50 students a year, on interpersonal, cognitive, communication and enterprise skills. Student evaluations have been positive. KIRD offers lectures and practice in writing academic papers in English, research experimental planning methods and research data analysis to up to 300 students a year in each programme. The programmes target research competencies, and participants fund 30% of the costs. KIRD may introduce e-learning courses. The Foundation for Polish Science is considering funding some Master's-level training.

2.4.2. Workplace experience programmes

Government responses

Three government respondents indicated an overarching strategy for the development of researchers' transferable skills through workplace experience: Estonia (the Operational Programme for Human Resource Development, funded by the European Social Fund), Slovenia (Research and Innovation Strategy), and the Free State of Thuringia (Germany) (Research Strategy). The goal of each is to prepare researchers for a wider labour market. Estonia and the Free State of Thuringia also aim to enhance employability of researchers in academia and improve research (as well as commercialisation and international co-operation in the case of Thuringia).

Seven governments (Australia, Belgium (Flanders), Denmark, Estonia, Norway, Slovenia and the Free State of Thuringia) described ten programmes that provide for workplace experience for researchers; some of Korea's other training programmes also include workplace experience. All but two programmes have been introduced since 2006. Some common aims are to produce researchers with knowledge of industry and to support knowledge transfer and interaction between the academic and industry sectors. Programmes typically provide training over two to four years but sometimes less, depending on the research project. Numbers of participants vary; the largest numbers are in Australia's Cooperative Research Centre (CRC) programme; in 2009-10 universities awarded over 300 higher degrees to students studying under the programme. Five of the programmes aim specifically at PhD candidates and could be regarded as "industrial PhDs". Australia's CRC programme essentially provides an industrial PhD-type experience (as well as training for other researcher levels) as part of a broader goal to support collaboration on research driven by end users, and Slovenia's "Programme for Strengthening R&D Personnel in Companies" provides for industrial PhDs, engagement of new or guest researchers, and establishment of new topic-oriented research groups. Enterprise and interpersonal skills are key targets. Four programmes split the funding responsibility between government and industry, while the others are funded solely by governments (with European-level contributions in two instances).

Denmark's industrial PhD programme has been evaluated and suggests positive effects for both researchers and companies. For example, wages for industrial PhDs are 7-10% higher than those of regular PhDs, and companies that host industrial PhD students have more patenting activity and higher growth of gross profits. An evaluation of the Australian CRC programme suggested the need for more analysis of researcher training in the centres and noted some concerns about student satisfaction with the experience and the skills learned. The Free State of Thuringia planned to evaluate its Agenda Proexcellence at the end of 2011.

Workplace-based approaches to transferable skills acquisition were also a notable feature in the separate government-level information provided (Box 2.2). France indicated that the vast majority of PhD graduates involved in the CIFRE programme (essentially, an industrial PhD scheme) find employment within six months of graduation. The ease with which researchers change companies may indicate their high employability and the extent to which their experience is appreciated.[8]

University responses

The vast majority of university responses indicated no strategy to support the development of researchers' transferable skills through workplace experience.[9] Nevertheless, it is part of some universities' wider strategy: the Midterm Plan of Japan's Nagoya University, the Strategic Plan of New Zealand's Auckland University of Technology and the NTNU's strategy (in a section on innovation and creativity). At Belgium's Universiteit Hasselt workplace training is part of its doctoral school approach, while at Germany's Heinrich-Heine-Universität Düsseldorf and New Zealand's University of Canterbury it is a faculty/college-level choice. Some of the rationales mentioned included understanding firms and preparing students for career choices, helping students transition to the real world, upholding a commitment to be a knowledge partner to the public and private sectors, and meeting PhD regulations.

Eight universities mentioned a total of 13 programmes or examples; three involved participation in the government's industrial PhD schemes and one referred to the internships included in Master's-level education programmes. Six examples of internships were given; the Tokyo Institute of Technology's Value Creating Internship gives three months or more of full-time experience in firms. The Auckland University of Technology has positions for graduate assistants (to give students employment and career development) and short-term post-doctoral fellows (to help establish research careers and identify future staff).

However, while the level of formal training related to workplace experience is low, there may be other opportunities for developing relevant skills. NTNU noted that, in terms of numbers, many more researchers are engaged in research activity with external partners (essentially, getting experience and building skills) than in formal training programmes for transferable skills. It also mentioned the option for researchers to take a part-time (20%) position outside the university in addition to their university post (Box 2.6). At NTNU this is quite common among research staff in engineering who may have external engagements in industry, research institutes or university start-ups.

Box 2.6. Adjunct professors in Norway

In Norway, academic and research staff in higher education institutions and research institutes can take a part-time (20%) position with another employer in addition to their main full-time post. Similarly, higher education institutions and research institutes are permitted to employ external staff in part-time (20%) positions. These positions are used by institutions to strengthen co-operation in research and teaching and promote knowledge transfer. The main occupation of these "adjunct professors" and "adjunct associate professors" may be outside academia (*e.g.* in hospitals or industry) or in another higher education institution or research institute, in Norway or abroad. For individuals, this scheme may contribute to the development of transferable skills, especially when the engagement is cross-sector.

There is little information available about evaluations of workplace experience programmes. An evaluation of Nagoya University's research internship programme found that students, supervisors and business appreciated this activity; it enhanced students' ability to solve problems and helped them learn about leadership. Some ten universities (from six countries) noted possible changes, with several considering the introduction of a programme. One university intends to expand structured PhD and Master's programmes and to include workplace experience on a more regular basis, another is planning a university-wide approach and a third is developing an internship programme. One Norwegian university is working on an internal qualification framework based on the forthcoming national version; it will spur course revisions and address transferable skills training, including that gained via workplace experience.

Research institution responses

Three research institutions have a strategy or agenda related to transferable skills acquisition through workplace experience, and a further four have implicit support for the activity. The Finnish Meteorological Institute encourages mobility (arguing that this brings fresh views and new networks), as does Norway's Centre for Rural Research. Norway's Northern Research Institute Narvik wants researchers to be familiar with industry and have relevant experience; this is seen as an important part of their career development. The Helmholtz Association and the Finnish Institute of Occupational Health host PhD students, thereby providing valuable workplace experience, while Norway's Nofima hosts industrial PhD students and supports "foreign exchanges" (financing researchers to visit research institutions abroad). New Zealand's Scion seeks to strengthen technology foresight, translation and commercialisation capabilities and has a sabbatical programme that both sends out and hosts researchers. This is seen as a mechanism to strengthen engagement, improve research design and accelerate uptake of technology.

Nofima indicated it would welcome additional industrial PhD students if financing is available. The Finnish Institute of Occupational Health is working on a national co-operative structure for research and education in work-related rehabilitation.

"Other organisation" responses

KIRD indicated that its long-term development strategy encompassed training through workplace experience, while Vitae is developing a plan in this regard. At programme level, the OCE offers two programmes – one facilitating one-year industry internships for post-docs, other early stage researchers and post-secondary graduate students, the other linking young entrepreneurs (either PhD candidates, post-docs or other early stage researchers) with industry. These programmes aim to support Ontario's competitiveness by helping firms access skilled people and fast-track new ventures and industry-academic collaboration. The OCE hopes to expand funding for their programmes and will attempt to align with industry hiring timelines. KIRD offers three one- or two-day training courses with strong workplace relevance: R&D project management; intellectual property management; and research commercialisation. The latter two courses target enterprise skills and require part-funding by participants. KIRD wishes to develop additional courses.

Luxembourg's FNR's *Aides à la Formation – Recherche* (AFR) is a funding scheme for PhD and post-docs involving public-private partnerships. It seeks to promote knowledge transfer between sectors, motivate the private sector to participate in PhD training and develop a research culture in Luxembourg. The funding requires recipients (PhD candidates and post-docs) to spend a minimum of 10% of their research time in the company over their period of study. FNR also oversees state aid for temporary secondment of highly qualified people, which supports experience of up to three years (the hosting organisation and the government share salary costs).

2.5. Overall patterns

The questionnaire responses suggest that institutions are the main actors in terms of strategies and programmes for transferable skills training for researchers, with the role of government secondary to that of universities, research institutions and other organisations. Around a third of responding governments have a strategy, compared to almost two-thirds of universities, three-quarters of research institutions and three-fifths of other organisations. Around a third of responding governments provide programmes for training, compared to practically all responding universities, half of research

institutions and all of the other organisations. The summary information separately received from RIHR delegates from seven countries reinforces this picture; most indicate that government is not the key player in transferable skills training for researchers.

Most initiatives are fairly recent and often little evaluation has been carried out, beyond end-of-course evaluations by participants, making it difficult to draw links between training inputs and training outputs and outcomes. Strategies across all groups tend to be broad (not specific to transferable skills) and recently introduced. As well as enhancing the employability of researchers in academia, preparing researchers for a wider labour market, and improving research, the groups identified a number of additional strategic goals, which sometimes overlapped (*e.g.* teaching quality, commercialisation and knowledge transfer, international co-operation, and a quality research environment). Communication and interpersonal skills are frequent targets of the predominantly voluntary training. Many programmes were for all researchers; however, universities had a significant number of programmes specifically for PhD candidates and research institutions often had programmes for research personnel (particularly in leadership roles). The vast majority of programmes for transferable skills training have not (yet) been evaluated at programme level. This makes it difficult to comment on their impact, *e.g.* the change in skill levels due to the programmes, the subsequent effects on researchers and their research activities, the wider effects on desired goals, any unintended consequences, changes in behaviour, etc.

Changes are infrequently envisaged, aside from ongoing improvements to courses and some expansion of programmes. However, a few respondents indicated they wished to take a more systematic approach to training and to embed training more thoroughly in existing education and research structures; one respondent hoped for a "culture change" with respect to transferable skills training. Research institutions and other organisations were the most engaged in international co-operation for training. All groups noted the importance of researcher mobility and the role of international and collaborative research projects in building valuable skills. Funding conditional on transferable skills training was infrequently mentioned; when it was, it was often related to funding for doctoral studies.

Activity at the Master's level is much more limited. Few governments, universities, research institutions or other organisations have explicit strategies or programmes; those that exist are often part of broader activities for researcher training. Nevertheless, some respondents noted the importance of Master's students as an inflow to the researcher population and a third of universities were planning changes, including addressing the system and infrastructure for providing this type of training to Master's students.

Training through workplace experience also appeared more limited, but the activity looks set to increase in the future. So far, research institutions appear to offer (relatively) the most opportunities for this type of training. Industrial PhDs, internships and exchanges are the most common approach, and governments noted their importance for building industry knowledge and supporting knowledge transfer. Almost a third of universities plan to expand workplace experience programmes or to make this a more systematic part of their educational approach. The information received separately from Austria, Canada, France, the United Kingdom and the United States included several examples of policies for acquiring transferable skills through workplace experience. Taken together, workplace experience seems to be regarded as an important tool for building transferable skills as well as deepening research capabilities, supporting organisational goals and contributing to industrial goals. The limited evaluation material available also points to positive outcomes from such activities.

Unfortunately, it is not possible to compare transferable skills training by country. Only 13 countries submitted information related to both governments' and other institutions' transferable skills training; even for these the questionnaire results give only a sample of activity and numerous gaps remain. Various reasons were discussed in Box 2.1. Essentially, not all relevant institutions were included, and for those that did respond, not all activity is captured. Importantly, some main actors in the transferable skills training arena may not have participated; in Norway, for instance, the Research Council of Norway and the Norwegian Association of Higher Education Institutions are involved in different types of training, but were not targeted in the study. More generally, employers outside of universities and public research institutions were not in the sample of respondents.[10]

With the caveat on country comparisons in mind, the information submitted shows some dimensions along which countries appear to differ; however, explaining these differences requires more country-specific contextual information. In some countries, emphasis on transferable skills is relatively new (*e.g.* Luxembourg), while in others organised activity in this area has taken place for some time (*e.g.* United Kingdom). The level of government involvement and direction is relatively high in some countries (*e.g.* Korea) but not in others (*e.g.* Germany). Understanding why this is so requires interpretation of questionnaire responses in the context of individual countries' particular institutional arrangements, industrial structures, etc. For instance, Luxembourg has a relatively young research environment – its university was established in 2003 and doctoral schools are only now being set up. At the institutional level, too, the approach depends on the context; for example, a technical university may be more

concerned with academic skills than with transferable skills because its co-operation with industry may be considered to provide sufficient learning opportunities for the latter group of skills.

Overall, then, the questionnaire responses reveal a significant amount of transferable skills training activity, undertaken predominantly by individual institutions, for the most part without any overall national strategy or direction from governments or other entities. Chapter 3 explores the potential policy implications of these insights, drawing on discussions among delegates and experts at a project workshop.

Notes

1 The Turkish response specifically concerns the Ministry of Health (School of Public Health).

2 This programme was renamed "Promotion of Internship Program for Postdoctoral Fellows" in 2011.

3 This section draws on answers to the question "Does your organisation have a role in delivering any national, state or regional government programmes for formal transferable skills training for researchers?" The aim was to identify programmes for which the initiative and design came from government while the organisation's role was implementation. However, some responses referred to programmes that appeared to be the choice of the organisation rather than the result of specific government policies (*e.g.* sabbatical opportunities for research institution staff) or the result of particular obligations (*e.g.* hosting PhD students in research institutions). Also, respondents' judgement of whether a programme was governmental appeared to differ. Some universities included doctoral training as a government programme, while others with such training identified it as an organisational strategy or programme. The summary here follows the categorisation given by respondents and also notes where programmes could also be considered in other categories (*e.g.* sabbaticals as workplace experience).

4 The collective response for the Russell Group universities did not provide as many programme details as direct responses to the questionnaire. Thus, calculations of shares or percentages of university programmes in this sub-section's discussion are based solely on questionnaire responses (*i.e.* 65 examples).

5 This draws on responses to the question "Where the programme is for doctoral candidates, how is it structured?" The question aimed to understand whether transferable skills training was embedded in regular courses (*e.g.* communication skills training for political science PhD students through student presentations of work during their weekly tutorials) or delivered in a dedicated course (*e.g.* communication skills training in a two-day workshop). However, some responses appeared to contradict other information given about the programmes. The results for this question are mentioned here but are tentative.

6 *www.ond.vlaanderen.be/hogeronderwijs/bologna/qf/documents/Bologna_ Framework_and_Certification_revised_29_02_08.pdf*.

7 Master's-level strategies and programmes were not specified in the Russell Group university response.

8 See *www.anrt.asso.fr/fr/pdf/plaquette_cifre_complete_avril2009_GB.pdf*.

9 Workplace experience was not discussed explicitly in the Russell Group university response.

10 The questionnaire was distributed by RIHR delegates.

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Chapter 3

Transferable skills for researchers: Policy challenges and directions

The appropriate role for governments in transferable skills training is the central question addressed by this study. While much training activity appears to be initiated spontaneously by institutions, possible areas of action for governments include boosting monitoring and evaluation, encouraging greater dialogue between academia and industry, supporting modes of workplace-based training and leveraging policies on collaborative research. These suggestions take into account the constraints on the information gathered for the study and address issues identified as relevant by numerous stakeholders.

This concluding chapter presents ideas on policy challenges and future policy directions for transferable skills training for researchers. It begins by setting out the views on policy expressed by delegates to the OECD Working Party on Research Institutions and Human Resources (RIHR) and experts who attended the Workshop on Transferable Skills Training for Researchers: Supporting Career Development and Research (Annex C presents the workshop programme). It then draws together the main points emerging from the study to highlight key policy issues and potential avenues for policy makers to consider.

3.1. Workshop discussions – views on the future of transferable skills training for researchers

Participants at the workshop were invited to reflect on the policy implications of issues raised by presentations of current government- and organisation-level transferable skills training for researchers and by contributions of experts. In particular, participants were encouraged to consider the following questions:

- Are current arrangements for transferable skills training for researchers meeting the goals/requirements that countries have set?
- If additional action is needed, who should take responsibility? Do governments need to act further, or is it the responsibility of universities, employers, research groups and individuals to take steps to address training needs?
- If governments should act, how should they proceed? Should it be through funding, directives, regulations, etc.?
- How might governments, higher education institutions, and research funding and performing institutions interact for the provision of transferable skills?

During the workshop's wide-ranging discussions participants identified some key policy choices and a number of related policy issues. A fundamental policy question was whether government-level action on transferable skills training is needed; this led to issues regarding specific government roles, funding regimes and programme focus. Participants noted the influence of other policy settings, particularly those related to collaborative research, on transferable skill training opportunities for researchers. It was agreed that impact and evaluation was a particularly important area requiring further efforts by governments. There was strong emphasis on PhD-level training; however, participants also recognised the significance of lifelong learning for researchers. The following sections expand on participants' views on the role of government and the balance between formal training in transferable skills and other training methods.

3.1.1. Is government action required?

The responses to the questionnaire on government- and organisation-level transferable training activities suggested a spectrum of views in terms of the level and intensity of government direction and/or organisation. As described in Chapter 2, governments in some countries have taken a relatively "hands-on" approach, for example by setting up dedicated

institutions for researcher training. Others have given mandates (with more or less precise directions on training activities) to agencies and public bodies that operate at arm's-length from the government. Still others leave decisions on transferable skills training to universities, to be addressed as part of their overall education and training missions. This variety of approaches raised the question: how much government direction is desirable?

Box 3.1. Examples of transferable skills training in PhD training in Australia

The Australian Technology Network of Universities (ATN) has launched an Industry Doctoral Training Centre in Mathematics and Statistics (IDTC-M) to give PhD students with broad capabilities not generally acquired in Australian PhD studies. The Centre, which operates as a network of the five ATN universities, offers a four-year PhD degree that links students to industry. In the IDTC-M programme research problems tackled by the students originate in industry, students spend a significant amount of time working at the site of the industry partner, and students at the participating universities are brought together during the year to discuss their projects and learn transferable skills such as communication and project management. Seed funding for the IDTC was provided by the Australian Department of Innovation, Industry, Science and Research. Industry partners make a financial contribution of up to AUD 40 000 a year per student to cover tuition and other expenses. The IDTC-M will act as a pilot for similar centres in other discipline areas. Mathematics was chosen because of the rise in demand for doctorates in the field and its application in a wide range of fields. See: *www.atn.edu.au/IDTC/index.htm*.

The University of Queensland Career Advantage PhD programme is a new training initiative starting in 2012. Its goal is to offer a more multifaceted research training experience. Students choose one of three career pathways approximately 12 months into their PhD research project; each of these provides workshops and other training opportunities aimed at professional development and transferable skills. The three career pathways are: Higher Education Practice and Leadership; Research Innovation, Translation and Commercialisation; and Global Collaborations. The programme is being introduced in response to identified needs of research students and to differentiate the university from its domestic and international competitors. See: *www.uq.edu.au/grad-school/career-advantage-phd*/.

Workshop participants observed that much activity already takes place at the level of individual universities and research institutions. In Australia, several universities have taken the initiative to provide courses and programmes that build transferable skills, in response to pressures from industry to address skills gaps and in recognition that they must prepare students for a wide range of careers (Box 3.1). These activities are mostly funded by existing university budgets; little new government funding has been made available. Research institutes have their own incentives to train staff and to contribute to training students. The Helmholtz Association in Germany, for example, felt that transferable skills training plays a role in

fostering a "Helmholtz identity" and creating a strong network. The Helmholtz Association offers a variety of training opportunities and has been active in this area for some time; the German government takes a "hands-off" approach to the issue. In the United States, there is no government mandate as such for transferable skills training, but the National Science Foundation (an independent federal agency that funds research in basic science and engineering) has training activities that encompass transferable skills.

Workshop participants argued nonetheless that governments have a role to play in transferable skills training, although precise rationales were not discussed and participants acknowledged that more robust evidence of impact was needed to make convincing arguments. It is difficult to identify which government approach might work best; lessons from past experience can be useful, but evaluations and impact studies are, so far, relatively rare. More monitoring and evaluation of policies was widely supported, with participants agreeing that more evidence is needed to understand the impact of transferable skills training. This would support the development of evidence-based policy over what some participants referred to as "pressure-based policy". There were some calls for funding more research in this area, although participants noted that funding opportunities for this type of research are already available in some countries and not taken up. One area of particular interest was monitoring the employment outcomes of PhD graduates and their career development.

There was some discussion of the appropriate approach to monitoring and evaluation of training activities. A key initial question was "What are the criteria for success?" Some participants pointed out that employment outcomes are already better for PhDs than for other graduates, so what should the goal be? Some participants suggested that the purpose of transferable skills was to facilitate employment and mobility. This would suggest a focus on these aspects in any monitoring work. It might also be useful to look closely at training recipients who have not been successful or who are unsatisfied with their careers, to see if there are any lessons for programme design or policy approaches.

3.1.2. What are the possible government roles?

Workshop participants debated a variety of possible government roles in transferable skills training for researchers. The bulk of the discussion was on training related to PhD candidates and other students. In this respect also, supporting more monitoring and evaluation was identified as an important role for government. There was no discussion of hands-on provision of courses by governments.

Workshop participants felt that, at the least, governments could usefully provide "messages" on training. Individual country circumstances would determine how directive these messages would be, the form they would take and how they might change over time. The role of government in spurring action on transferable skills training should not be underestimated, even if strong signals are sent only intermittently. Some participants highlighted the importance of a long-term approach, given that it takes many years to change mindsets and attitudes towards training. For some countries, training "messages" can also come from the supra-national level. For instance, some countries may be influenced by the European Charter for Researchers, the Bologna Process on higher education (which includes issues of curriculum reform, qualifications frameworks and quality assurance), and various European funding instruments that incorporate principles related to transferable skills.

However, there was less agreement about the way "messages" could be delivered, how directive they should be, and when "message sending" should evolve into programme design and/or delivery. Participants mentioned several instruments that governments might use to shape provision of transferable skills training to researchers. At the most "hands-off" end of the scale, it was suggested governments can facilitate dialogue between industry and academia to ensure that industry's skill needs are well understood and can be taken into account in the design of formal training courses. Governments may also set national research priorities that implicitly support transferable skills training (*e.g.* by prioritising intersectoral and multidisciplinary research).

In a more active approach, governments can set frameworks that support the acquisition of transferable skills. One way to do this is through the mandates of government agencies, their governing legislation, charters, etc. Similarly, as described in Chapter 2, individual governments can set directions for transferable skills training through university regulations on PhD training or through wider education qualification frameworks (such as the forthcoming Norwegian National Qualifications Framework, which is based on the European Qualifications Framework). These actions can be more or less directive, depending on the level of detail contained in the mandates/ frameworks and the degree of autonomy enjoyed by the organisation (Box 3.2). Participants noted that detailed and strict regulation of transferable skills training at universities would be incompatible with the trend towards institutional autonomy.

Box 3.2. Supporting transferable skills acquisition – mandates for government agencies

The Natural Environment Research Council (NERC) is one of seven United Kingdom research councils. It is a "non-departmental government body", meaning that it operates at arm's-length from government ministers.[1] Under its Charter and the Management Statement agreed with the government,[2] the Council's mission is to deliver independent research, surveys, training and knowledge transfer in its scientific area. In doing so, it determines and implements strategies and plans that will meet the government's policy objectives. The NERC's role in supporting skills and training is often evoked in its governing documents, although transferable skills themselves are not explicitly mentioned. The NERC is also a member of Research Councils United Kingdom (RCUK), which supports postgraduate training and researcher development.[3]

Luxembourg's National Research Fund (FNR) is a public body with scientific, financial and administrative autonomy. Its strategic objectives include the support of researchers in improving scientific quality and excellence and the development of human resources in both volume and quality. In its 2011-13 performance contract with the Luxembourg government, the FNR also committed specifically to "contribute to the development of a coordinated approach to provide adequate training of (young) researchers with all the actors involved and in line with the European Charter and the Code of Conduct for the recruitment of researchers".[4] To meet these goals, FNR has set itself a number of priority actions, including development of a common framework for quality standards for PhD training in Luxembourg (which will encompass recommendations for provision of transferable skills training).

1. *www.rcuk.ac.uk/about/Aboutrcs/Pages/default.aspx*.

2. *www.nerc.ac.uk/about/work/boards/documents/mgt_statement05.pdf*.

3. *www.rcuk.ac.uk/researchcareers/Pages/home.aspx*.

4. *www.fnr.lu/en/About-Us/Mission*.

Awareness-raising may be another possible role for governments. Concerns were voiced that organisations may not be fully cognisant of policies and programmes that now support transferable skills training. For example, it was mentioned that the policy questionnaire had motivated some universities to consider taking stock of their transferable skills training programmes so as to understand better the variety of training options already available. A mixture of university-, department- and faculty-level programmes may exist concurrently and there is not necessarily a central "node" with information on all options. Also, in their responses, some universities did not mention government-sponsored industrial PhD schemes or national qualifications frameworks, although governments considered these important policy tools for transferable skills training. While this could have been due to the way in which institutions interpreted the questionnaire, it could also be due to a lack of awareness, different use of these arrangements or lack of interest, all

of which imply the need for dialogue on the perceived benefits, costs and relevance of these policy tools.

Co-ordination was considered a more "hands-on" role for governments. Governments could play a co-ordinating role in situations that may offer economies of scale by developing or providing courses at national level. Governments could also co-ordinate sharing of best/good practice in training. Such co-ordination exercises might also have valuable awareness-raising effects. Co-ordination and awareness may help improve the organisation and uptake of existing transferable skills training opportunities.

There was some discussion of whether accreditation should be used to encourage transferable skills training, but participants disagreed on the merits of this. A country's education institutions and educational programmes may be formally "accredited" by a recognised authority as having adequate standards and methods. The accreditation process may be linked to qualifications frameworks as well as other standards and requirements for organisations. Some participants viewed accreditation as a potential tool for driving the inclusion of transferable skills in educational programmes, with some noting that where accreditation systems already exist, they may also be used to support government goals. Participants also pointed to benefits such as supporting cultural change and increasing consistency among programmes and disciplines. However, others considered accreditation too heavy-handed and resource-intensive. They felt that it could become a "tick-box" exercise rather than a genuine process for raising standards and shaping programmes, and that recognition of transferable skills training achievements does not necessarily require accreditation. Although no consensus was reached, it was noted that good outcomes may be achieved both with and without accreditation.

A good deal of discussion centred on funding issues, notably the questions of who should pay and how public funding could be structured to provide incentives for transferable skills training. Some participants identified financing of transferable skills training as a key role for governments (the "Roberts money" in the United Kingdom was cited as a relevant example). However, some questioned whether government funding should be raised, given already substantial funding for education and research and the direct benefits likely to accrue to training recipients and employers as a result of training. Societal/political attitudes towards the role of government in education funding, and the "fiscal space" for expanding expenditure are likely to be important factors. On funding structures, it was suggested that public funding for universities or research could be made conditional on the provision of transferable skills training or on transferable skills training "outcome" indicators (such as employer feedback). In this way, funding could function as a lever to improve training standards. However, while some countries are taking their university funding formulas in this direction, others judge it too complicated to

add transferable skills to performance-based funding schemes, noting that institutions may already have many objectives. Participants also raised the issue of how research funding entities and research delivery entities interact and what "powers" funders currently have over training activities in funded organisations. Here, some participants suggested that the role of research funders is to provide a framework rather than an explicit direction for training activities.

3.1.3. What is the right balance between formal and informal learning?

While governments may wish to support transferable skills training for researchers, it is not clear which type of training is best. As discussed in Chapter 1, transferable skills can be acquired in a variety of ways, including formal training courses, learning-by-doing during studies, and learning-by-doing at work, whether during internships, other forms of work placement, or during one's career. The question for policy makers is the appropriate mix of training to support.

Workshop participants stressed that important skills are gained during study and that informal training makes a strong contribution to researchers' competencies. They also considered that including more coursework or professional skills training would have implications for the length and cost of degrees. At the university level, where transferable skills training programmes are offered, a mix of formal courses and work experience might be the best approach. Industrial PhDs were discussed. The Irish Research Council for Science, Engineering and Technology (IRCSET) stated that it too managed an "Enterprise Partnership Scheme" that offered co-funded postgraduate scholarships and postdoctoral fellowships with companies. The positive evaluation of Denmark's scheme was mentioned. Concerns that such schemes might create a "two-tier" doctoral training regime were downplayed; several participants noted that equivalent standards must be met for award of the PhD degree and that industrial PhD recipients also work in academia. For researchers further into their careers, a mix of formal and informal learning opportunities seems best; participants suggested the need to embed transferable skills training in everyday activities so as to support lifelong learning.

A point that emerged from the questionnaire results, and which was further commented on by workshop participants, was the importance of research collaboration between industry and academia in providing transferable skills to researchers. The Norwegian University of Science and Technology, for instance, highlighted its range of tools to support study programmes, research and innovation through joint activities and agreements, including strategic partnerships with major industry corporations and collaborative networks. It also described its web-based jobs database

(*www.ideportalen.no*) which offers students industry-generated semester-long projects and master's projects and which involves co-operation with regional industrial parks, industry associations and chambers of commerce to mobilise industry partners.

Some participants advocated a stronger role for government in encouraging intersectoral collaboration, a by-product of which is informal training opportunities for researchers in both sectors. Some participants noted that training can be a subordinate role of temporary research institutes involving co-operation between academia and industry, and that it would be interesting to assess its impact compared to formal training programmes. At the least, the training opportunities provided by collaborative research suggest that governments can leverage other policies and activities to support transferable skills training, and that supporting direct policies and programmes is not the only tool.

For the content of training, participants stressed the need for consultation with industry and other stakeholders on the skills to be included in formal training. Given the prevalence of teamwork in research, participants suggested that training should support team performance and that not all people need to be highly competent in all transferable skills if they work in a team environment.

3.2. What this study suggests about transferable skills training policy

The question of whether current approaches to transferable skills training for researchers are adequate is the underlying policy issue addressed by this study. The literature reviewed for this study suggested that transferable skills training for researchers of all levels can help them navigate increasingly diverse careers and evolving research environments and work methods. However, there are questions about the suitability of current training approaches; some studies find shortcomings in researchers' proficiency in certain skills, gaps in training opportunities for some groups, and potential deficiencies in the relevance of training. For this reason, the policy questionnaire sought to gather information on training activities currently taking place in a variety of OECD countries as a first step to analysing the issues.

To begin to answer the policy question, it is interesting to compare the training activities described in the questionnaire responses with the ideas presented in the literature reviewed in Chapter 1, to see if consistencies or discrepancies exist between "theory" and "reality". In addition, while the potential merits of formal training in transferable skills seem clear, the literature review raised several important questions about the appropriate settings for this training.

One proposition contained in the literature was that formal transferable skills training can be valuable for researchers at all stages of their careers. The questionnaire responses showed that training is indeed taking place at all levels. Given that the sample of respondents contained many universities, it is unsurprising that PhD candidates were often a focus of transferable skills training activity. Nevertheless, the responses from universities and research institutions showed that experienced researchers also have training opportunities. However, whether these are sufficient (*i.e.* whether there is an adequate supply of training for researchers) remains an open question, as the questionnaire responses give an incomplete picture and do not discuss researchers' demand for such training.

The literature also suggested that the mix of transferable skills relevant at different career stages and in different sectors may vary. The questionnaire responses tentatively confirmed this from a supply perspective. While communication and interpersonal skills were the skills most frequently mentioned overall, universities focused more on preparing researchers for teaching and supervisory roles while research institutions were more often concerned with management and leadership.

An important topic discussed in several studies was the appropriate amount and method of delivery of transferable skills training in PhD programmes. The questionnaire results showed that there are currently many formal training options for PhD candidates, although relatively few responses indicated plans to change the offerings. This might suggest that governments and institutions generally consider the current amount of formal training sufficient, given the constraints on time and funding in degree programmes. It may also be due to the currently sparse evidence on training outputs and outcomes. Workplace experience programmes are relatively less common; however, it appears that more options will be developed. This may reflect increased demand or governments and institutions may see merit in providing a greater variety of skill development options for PhD candidates. A number of respondents from governments, universities, research institutions and elsewhere highlighted the role of researcher mobility and collaborative research in building vital transferable skills. This is clearly relevant for the choices of training methods in all institutions, for PhD students but also for researchers at every level.

The central question in this study is whether and how stakeholder roles in training should change. The literature suggested many possible roles for governments, including strategic oversight, quality assurance, funding and co-ordination. However, the questionnaire results revealed that most governments have no explicit strategy on transferable skills; the strategies that do exist are usually related to researchers' development more generally. Responsibility for transferable skills training tends to reside with other entities, although

governments retain a funding role and wield some influence over quality (*e.g.* via PhD regulations). Government involvement in the co-ordination of training at national level is rare. This policy stance suggests that most governments currently consider other entities better positioned to make practical decisions on training for researchers with a limited amount of government guidance.

The literature suggested several roles for other stakeholders, including funding and provision of training opportunities. It also noted the importance of co-ordination with employers to help ensure that training is relevant. The questionnaire responses confirmed that universities and research institutions are actively funding, designing and providing training to researchers; in fact, many go further, devising strategies and agendas that explicitly or implicitly address transferable skills training. Universities' greatest interaction with employers appears to be through workplace experience programmes. The roles of arm's-length research funders were not well covered in questionnaire responses, with the exception of Luxembourg's FNR, which takes an active role in strategy, funding and training provision. The questionnaire responses showed that other organisations also play an important role in transferable skills training for researchers. Like KIRD (Korea) and Vitae (United Kingdom), which are national-level bodies dedicated to researcher training issues, the Ontario Centres of Excellence (Canada), a non-profit organisation involved in commercialisation and technology transfer, also takes a strong interest in human resource development. This indicates that the landscape for transferable skills training is diverse; the full scope of training activity may be wider than governments realise and should be considered when formulating policy.

3.2.1. Future policy directions

Overall, this study has produced evidence of a variety of transferable skills training opportunities for researchers in a number of OECD countries. This training is currently dominated by institution-level approaches; with some notable exceptions, governments offer minimal strategic direction. Governments typically play a role in funding but leave responsibility for most decisions on transferable skills training to other entities.

To argue that governments ought to change their current policy stances requires establishing that there is scope for governments to improve on current outcomes. Usually, this would be justified by the existence of a market or system failure, which in this case would mean sub-optimal outcomes. However, while a variety of training possibilities appear to be available to researchers at different stages of their careers, the picture of the supply of training is incomplete and information about demand for training is not included. In addition, provision of training is often "unpriced" for training recipients; as most do not pay explicitly for their training courses there is no signal about the cost or

perceived benefits of the training. Finally, the questionnaire did not include some important players in the transferable skills arena; it is therefore not possible to assess systems as a whole. These factors make it difficult to identify potential failures that might be addressed by governments. In any case, countries' assessment will differ, given different policy settings and institutional contexts.

Given these constraints, the policy suggestions made here are deliberately limited and focus on issues valued by a spectrum of stakeholders. They aim not to crowd out existing or potential training activity by universities, research institutions and other organisations with an interest in researcher development. They highlight areas in which policy makers may wish to review their policy approaches, having regard to the features of their researcher population and the institutional arrangements in place. The suggested actions are:

- Governments could investigate options for boosting the monitoring and evaluation of transferable skills training. Currently, relatively little is known in most countries about the outputs and outcomes of transferable skills training, and this hampers robust policy making. A better evidence base is essential if governments and institutions are to make good decisions on training provision.
- Governments could explore ways to facilitate dialogue between academia and industry on training needs and opportunities. As well as potentially helping to shape training provision, this could also reinforce the value of transferable skills and raise awareness within institutions about the training opportunities already on offer.
- Governments could consider how to encourage provision of industrial PhD-type options as a complement to formal training courses in universities, as well as opportunities for mobility (both within and between sectors) as a development tool for more experienced researchers. Many stakeholders stressed the benefits of a balance of formal and informal learning, and questionnaire responses indicated that workplace experience training is currently relatively less common.
- Governments could consider how their general policies on collaborative research can be leveraged to support transferable skills training opportunities for researchers at all stages of their careers. This could yield benefits for researchers across all sectors and is consistent with the observation that research structures are increasingly collaborative, networked and multidisciplinary.

Annex A

Respondents to the questionnaire

National governments

Department of Innovation, Industry, Science and Research	Australia
Danish Agency for Science and Technology	Denmark
Ministry of Education and Research	Estonia
Ministry of Education and Culture	Finland
Ministry of Education, Culture, Sports, Science and Technology	Japan
Ministry of Education, Science and Technology	Korea
Ministry of Higher Education and Research	Luxembourg
Ministry of Education and Research	Norway
Ministry of Science and Innovation	New Zealand
Ministry of Science and Higher Education	Poland
Ministry of Higher Education, Science and Technology	Slovenia

National government ministries

Ministry of Health: Turkish School of Public Health	Turkey

Regional/state-level governments

Flemish Department of Economy, Science and Innovation	Belgium
Bavarian State Ministry of Sciences, Research and the Arts	Germany
Ministerium fur Bildung, Wissenschaft, Weiterbildung und Kultur, Rhineland-Palatinate	Germany
Senatsverwaltung fur Bildung, Wissenschaft und Forschung, Berlin	Germany
Thuringian Ministry of Education, Science and Culture, Free State of Thuringia	Germany
Behorde fur Wissenschaft und Forschung, Hamburg	Germany
Bremen	Germany
Sachsen-Anhalt	Germany
Brandenburg	Germany
Baden-Wurttemberg	Germany

Universities

Universiteit Hasselt	Belgium
Ghent University	Belgium
Universiteit Antwerpen	Belgium
Aarhus University	Denmark
Tallinn University	Estonia
University of Tartu	Estonia
Freie Universitat Berlin	Germany
Leibniz Universitat Hannover	Germany
University of Magdeburg	Germany
Friedrich Schiller University, Jena	Germany
Technische Universitat Berlin	Germany
University of Bamberg	Germany
Heinrich Heine University Dusseldorf	Germany
Technische Universitat Munchen (TUM)	Germany
Philipps Universitat, Marburg	Germany
Carl von Ossietzky University, Oldenburg	Germany
Tokyo Institute of Technology	Japan
University of Tsukuba	Japan
Nagoya University	Japan
Norwegian University of Science and Technology (NTNU)	Norway
University of Stavanger	Norway
University of Oslo	Norway
Norwegian University of Life Sciences, Research Department (Main Administration)	Norway
University of Otago	New Zealand
Auckland University of Technology	New Zealand
University of Auckland	New Zealand
University of Canterbury	New Zealand
Russell Group universities	United Kingdom
University of Strathclyde	United Kingdom
University of Stirling, Scotland	United Kingdom

University departments/faculties

Estonian Business School (Department of Law and Public Administration)	Estonia
Faculty of Natural Sciences, University of Bergen	Norway
Faculty of Social Sciences, University of Bergen	Norway
Faculty of Psychology, University of Bergen	Norway
Norwegian University of Life Sciences - Dept of Mathematical Sciences and Technology	Norway
Wroclaw University of Economics (Faculty of Management, Computer Science and Finance)	Poland

Research institutions

Finnish Institute of Occupational Health	Finland
Finnish Meteorological Institute	Finland
Helmholtz Association	Germany
Istituto Superiore Mario Boella	Italy
Northern Research Institute Narvik	Norway
Peace Research Institute Oslo	Norway
Centre for Rural Research	Norway
SNF - Institute for research in economics and business administration	Norway
Nofima	Norway
Scion Research	New Zealand
Landcare Research	New Zealand
Plant and Food Research NZ	New Zealand

Other organisations

Ontario Centres of Excellence Inc.	Canada
Korea Institute of R&DB Human Resources Development (KIRD)	Korea
Fonds National de la Recherche (FNR)	Luxembourg
Foundation for Polish Science	Poland
Vitae	United Kingdom

Annex B

Approaches to transferable skills training for researchers: Country notes

Australia[1]

Australian government response (Department of Innovation, Industry, Science and Research)

Transferable skills training for researchers

The Australian government does not have a specific strategy or agenda for transferable skills training for researchers. However, its Research Workforce Strategy, introduced in 2011, recognises the importance of generic skills training for Higher Degree by Research (HDR) students, particularly for allowing them to operate in diverse workplaces. With respect to programmes, at a national level, the Commercialisation Training Scheme (CTS) aims to equip researchers with skills to bring research-based ideas to market. Introduced in 2007, the programme offers 6 (24) months of full-time (part-time) training (additional to the regular course load) via lectures and practical learning, and caters for around 250 HDR students each year. The course is funded by the Department of Innovation, Industry, Science and Research and successful completion results in a graduate certificate qualification. The programme was evaluated in 2010; it found that government support of commercialisation training was appropriate, and recommended some possible approaches for future training initiatives.

Training for Master's-level students

There is no specific strategy or programmes for Master's-level students; however, the CTS described above is open to Master's by research students.

Workplace experience

The government described two programmes that support the development of transferable skills via workplace experience. The first, Researchers in Business, was introduced in 2009 and supports the placement of researchers

from universities or public research bodies into firms that wish to develop a new idea with commercial potential. Over 100 doctoral candidates or post-docs have participated since the beginning of the scheme; placements are for 2-12 months and funding for up to 50% of salary costs (up to AUD 50 000) are paid by the government. The second example is the Cooperative Research Centres (CRC) programme, introduced in 1991. This programme aims to support end-user driven research collaboration, but also includes significant education and training activity, since each centre must offer an education programme that trains PhDs (many go beyond this to train students in all levels of postgraduate degrees, and some also target lower levels). The length of experience offered depends on the research project. In 2009-10, 305 higher degrees were awarded by universities to students studying through a CRC, including 218 PhDs. Funding comes from government, industry and research participants, and industry participants may sponsor additional student placements within their organisations. The CRC programme has been evaluated; the issue of research training via CRCs was assessed as requiring more analysis (see O'Kane Review (link below), 2008, p. 65-66).

Wider research career development agenda

The Australian government recognises that university research training programmes must include "soft" and generic skills development to support students in diverse employment contexts. It also considers that it has a role in facilitating research workforce mobility by providing funding and incentives to overcome financial barriers to intersectoral mobility.

International co-operation

With collaborative and multidisciplinary research environments becoming the norm, the Australian government supports the international movement of researchers, and research collaboration and exchange via numerous programmes.

Links:

- Research Workforce Strategy: *www.innovation.gov.au/Research/ResearchWorkforceIssues/Documents/ResearchSkillsforanInnovativeFuture.pdf*
- Commercialisation Training Scheme: *www.innovation.gov.au/Research/ResearchBlockGrants/Pages/CommercialisationTrainingScheme.aspx*

- Researchers in Business: *www.enterpriseconnect.gov.au/services/pages/researchersinbusinessgrant.aspx*
- Cooperative Research Centres: *www.crc.gov.au*
- O'Kane Review (2008) – Collaborating to a Purpose: *https://www.crc.gov.au/HTMLDocuments/Documents/PDF/CRCReviewReport.pdf*

Austria

Austrian federal government information (Federal Ministry of Economy, Family and Youth; Federal Ministry for Science and Research)[2]

The Austrian federal government's strategy for research, technology and innovation, presented in March 2011, identifies the need for adequate human resources, along with their mobility and career development, as a key challenge, and the development of human resources is targeted by higher education programmes. However, there are no specific federal government strategies directly aimed at building transferable skills in researchers, and the curricula of higher education programmes seldom feature specific criteria related to transferable skills.

Various stakeholders offer programmes that provide transferable skills, such as:

- Structured doctoral programmes ("Doktoratskollegs"): the Austrian Science Fund offers a programme to fund structured doctoral programmes at research institutions that are entitled to award a doctoral degree. The programmes are formed as a result of a joint initiative by several scientists or scholars whose research is of an internationally leading standard and are based on clearly defined research programmes. The programmes provide for a stay abroad and offer transferable skills training.
- The "fForte Coaching" programme: this programme offered by the Federal Ministry for Science and Research (BMWF) is a two-semester course aimed at helping women put together successful grant proposals. It also provides information on various sources of funding as well as personal development, *inter alia*, in order to increase the proportion of women in a range of research funding programmes.

- Research competences – grant application writing skills: funding organisations such as the Austrian Science Fund and the Austrian Research Promotion Agency provide/offer seminars on proposal writing to enhance the writing skills of PhDs and postdocs. The Austrian Agency for International Co-operation in Education and Research also provides guidelines, recommendations and seminars for the elaboration of grant proposals.

- The LISA (Life Science Austria) programme: this programme run by Austria Wirtschaftsservice on behalf of the Federal Ministry of Economy, Family and Youth, promotes the creation of start-ups in the area of life sciences and the commercial application of research results. Specific qualification activities within this programme are aimed at researchers and students as potential entrepreneurs in the life science sector. Examples include business seminars on issues such as team building, leadership and legal issues, and training modules on business in life science courses at the University of Vienna and University of Applied Sciences of Vienna. There is also an international business plan competition – "Best of Biotech" – that is designed to encourage entrepreneurial potential in life science research and exploit research results commercially.

- The publicly-funded organisation "dialog<>gentechnik" holds an annual competition for scientists/students to write press releases as part of their remit in science communication.

There are also several industry-oriented initiatives that enhance transferable skills in researchers. For instance, the programme "Building Research Capacity in Industry", introduced in 2011, is designed to provide targeted funding to support companies in the systematic development and qualification of their research and innovation staff. It encompasses short-duration seminars for employees of Austrian companies through to tertiary level courses provided in conjunction with companies in industry-driven topics. A goal of the programme is a stronger anchoring of business-relevant teaching and research at universities and universities of applied sciences as well as sectoral mobility. In another example, the promotion of collaboration between science and business has given rise to a broad spectrum of temporary institutions that sit alongside universities and firms in Austria. Depending on the particular objectives and parameters of the underlying programmes, these institutions can run for up to 10 years and offer a broad spectrum of researchers the opportunity to acquire a wide range of transferable skills and relevant experience with participating industry partners. Examples of such temporary institutions include Competence Centres for Excellent Technologies (COMET), Christian Doppler Laboratories,

Josef Ressel Centres, Laura Bassi Centres of Expertise and Research Studios Austria (RSA).

Belgium[3]

Flemish government response (Department of Economy, Science and Innovation)

Transferable skills training for researchers

The Flemish government (on behalf of the Flemish community and region of Belgium) currently has no overarching strategy or agenda regarding formal transferable skills training for researchers, and no formal training programmes for developing researchers' transferable skills. However, the government is developing a funding programme for transferable skills training for researchers, which is scheduled for introduction before the end of 2011. Funding of EUR 4 million per year will be provided to universities to support young researchers in doctoral programmes; these programmes include transferable training activities. In addition to explicit government funding, Flemish institutions are also encouraged to respect and implement the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers.

Training for Master's-level students

There are currently no strategies or programmes for Master's-level students. Some funding is foreseen for "innovation internships", although this has still to be developed.

Workplace experience

The Flemish government's Baekeland programme supports the development of researchers' transferable skills through workplace experience. This voluntary "on demand" programme, introduced in 2008, aims to improve research and enable doctoral graduates to work in both the academic and non-academic labour markets. It targets interpersonal skills, research competencies and enterprise skills. The workplace experience accounts for 50% of the candidate's time over four years and is funded 50:50 by the Flemish government and industry. Co-operation between candidates, the supervising academic institution and the enterprise is a key element, as is a commitment to the continuing high standards of doctoral research. Research may be carried out both in the university lab and the company. An agreement on IPRs is made before the start of each project.

Wider research career development agenda

The funding and programmes delivered by the Flemish government are consistent with the directions for researchers' career development set out in the Flemish action plan (Vlaanderen in actie) and a 2010 Action Plan for Researchers.

International co-operation

The Flemish government co-operates internationally on research career development in the framework of the European partnership for researchers and the Innovation Union. It noted an important activity here is the EURAXESS network.

Institutional responses

Three universities from Belgium responded to the questionnaire. For each, doctoral schools were described as the strategy/programme for developing researchers' transferable skills. These schools were introduced in the last five years, and have a common aim of preparing graduates for academic and non-academic careers as well as supporting research. No strategies or programmes for Master's-level students were described. The doctoral school programme described by Universiteit Hasselt includes some workplace experience, and some doctoral students at Ghent University participate in the Flemish government's Baekeland programme.

Universities	Institutions: Key features
Ghent University	Strategy: Doctoral Schools Visietekst Programmes for researchers: Doctoral Training Programme Workplace experience: Student participation in the government's Baekeland programme
Universiteit Antwerpen	Strategy: Antwerp Doctoral School Programmes for researchers: Doctoral Study Programme
Universiteit Hasselt	Strategy: Doctoral Schools at UHasselt Programmes for researchers: Doctoral School of Medicine and Life Sciences Workplace experience: Via doctoral school training

Links:

- Flemish action plan (Vlaanderen in actie): *http://vlaandereninactie.be/?lang=en*
- Action plan for researchers: *www.ewi-vlaanderen.be/sites/default/files/documents/Daar%20zit%20beweging%20in_Een%20Vlaams%20actieplan%20voor%20onderzoekers_web.pdf*
- European Charter and Code for Researchers: *http://ec.europa.eu/euraxess/index.cfm/rights/brochure*
- Ghent University Doctoral School: *www.ugent.be/doctoralschools*
- Universiteit Antwerpen Doctoral School: *www.ua.ac.be/ads*
- Universiteit Hasselt Doctoral School of Medicine and Life Sciences: *www.uhasselt.be/ds-medicine*

Canada

Canadian federal government information (Industry Canada)[4]

There are no specific federal government strategies, policies or programmes directly aimed at building transferable skills in researchers. However, some programmes offered by the Canadian government's research councils and related entities contain elements of such training. For example:

- The National Research Council of Canada manages an Industrial Research Assistance programme (NRC-IRAP) which provides innovative small- and medium-sized enterprises with financial assistance to hire post-secondary science, engineering, technology, business and liberal arts graduates. Graduates work on innovative projects within the enterprise environment and may participate in research, development and commercialisation of technologies. This programme contributes to the Youth Employment Strategy of the Canadian government, part of which is aimed at helping graduates develop advanced work skills.
- The Natural Sciences and Engineering Research Council of Canada (NSERC) provides several programmes that give workplace experience to researchers. The Industrial R&D Fellowships programme (IRDF) provides financial assistance for recent doctoral graduates who wish to engage in research and development in the private or non-for-profit sectors. The Industrial Postgraduate Scholarships (IPS) programme provides financial support to science

and engineering graduates to allow them to gain research experience in industry while undertaking advanced studies, and aims to encourage scholars to consider research careers in industry. The Collaborative Research and Training Experience (CREATE) programme provides experienced researchers with funding to offer a defined research training programme to students and postdoctoral fellows, which provides experience relevant to both academic and non-academic careers.

- The Networks of Centres of Excellence of Canada (financed by investments from Industry Canada, NSERC, the Canadian Institutes of Health Research, and the Social Sciences and Humanities Research Council) offers Industrial Research and Development Internships (IRDI). This programme supports collaborative projects involving graduate students and postdoctoral fellows, their supervising professors and industrial partners.

Institutional response[5]

The Ontario Centres of Excellence (OCE), an independent not-for-profit organisation that is involved in commercialisation, talent and technology transfer activities, responded to the questionnaire. The OCE operates a Talent Strategy, under which several programmes are delivered for researchers and masters-level students and for workplace experience. The Strategy aims to "develop the next generation of innovators who will enable Ontario companies to succeed in the knowledge-based global economy".

Other organisation	Institutions: Key features
Ontario Centres of Excellence	Strategy: Ontario Centres of Excellence (OCE) Talent Strategy Programmes for researchers: OCE Value-Added Personnel Program (also for Master's-level students) Workplace experience: OCE First Jobs Program; Experiential Learning Program

Links:

- National Research Council of Canada Industrial Research Assistance programme (NRC-IRAP): *www.nrc-cnrc.gc.ca/eng/services/irap/youth-initiatives.html*
- Youth Employment Strategy: *www.youth.gc.ca/eng/common/yes.shtml*
- Natural Sciences and Engineering Research Council of Canada (NSERC):
  - Industrial R&D Fellowships programme (IRDF): *www.nserc-crsng.gc.ca/Students-Etudiants/PD-NP/Industrial-Industrielle_eng.asp*
  - Industrial Postgraduate Scholarships (IPS): *www.nserc-crsng.gc.ca/Students-Etudiants/PG-CS/IPS-BESII_eng.asp*
  - Collaborative Research and Training Experience (CREATE) programme: *www.nserc-crsng.gc.ca/professors-professeurs/grants-subs/create-foncer_eng.asp*
- Networks of Centres of Excellence of Canada – Industrial Research and Development Internships (IRDI): *www.nce-rce.gc.ca/NCESecretariatPrograms-ProgrammesSecretariatRCE/IRDI-SRDI/Index_eng.asp*
- OCE Value-Added Personnel Program: *www.oce-ontario.org/Pages/Talent_VAP.aspx*
- OCE First Job Program: *www.oce-ontario.org/Pages/Talent_FJ.aspx*
- OCE Experiential Learning Program: *www.oce-ontario.org/Pages/ELP.aspx*

Denmark[6]

Danish government response (Danish Agency for Science and Technology)

Transferable skills training for researchers

While not an overarching strategy or agenda for transferable skills training, the Ministerial Order on PhD Programmes at Universities (a regulatory document related to the Danish University Act) contains some guidance on transferable-type skills for PhD students. In particular, Section 3 requires PhD students to gain experience of teaching and knowledge dissemination and universities must offer students a course and guidance on teaching (broadly defined to imply "communication"). The Ministerial Order aims to enhance the employability of researchers in academia and enhance teaching.

As part of the Industrial PhD programme (see below), the Danish government funds a 6-day business course aimed at interpersonal skills, communication skills and enterprise skills. The compulsory (for Industrial PhD students) residential course aims to strengthen students' insights into the creation of knowledge, leadership and business economic aspects of their research. The course is provided by the Technical University of Denmark (DTU), on a contract from the Danish Agency for Science, Technology and Innovation.

Training for Master's-level students

There are currently no strategies or programmes for Master's-level students.

Workplace experience

The Danish government's Industrial PhD programme was introduced in 2002 and allows students to complete a 3-year PhD while employed at a private company. It has three broad aims: to educate researchers at a PhD level with knowledge of industrial aspects of research and innovation; to create growth in the Danish business community through the promotion of co-operation on research and innovation between universities and Danish companies; and to facilitate knowledge transfer and networking between Danish companies and researchers at universities in Denmark and abroad. The programme helps prepare researchers for a wider labour market and improves research work. Approximately 116 students participate each year and funding is provided by the Danish Agency for Science, Technology and Innovation.

The programme has had positive effects. Industrial PhDs' wages are approximately 7-10% higher than those of regular PhDs and comparable university graduates. They are also more likely to be in the top levels of their organisations' hierarchies and in positions requiring high-level specialist knowledge. Companies that host Industrial PhDs experience increased patent activity, are characterised by high growth in gross profit, and experience more positive developments in gross profit and employment growth than control firms. Users of the programme also claim very high satisfaction.

Institutional response

Aarhus University described its LEADER programme, introduced in 2011 and funded by the European Union, which provides doctoral students with a mix of transferable skills in a standalone course. The university has international co-operation in transferable skills training through its participation in the Coimbra Network (a network of European multidisciplinary universities). No strategies or programmes for Master's-level students or for workplace experience were described, although the university is investigating possible options for the latter.

University	Institutions: Key features
Aarhus University	Programmes for researchers: LEADER programme

Links:

- Industrial PhD programme:
  http://en.fi.dk/research/industrial-phd-programme
- Business course (Industrial PhD):
  http://en.fi.dk/research/industrial-phd-programme/what-is-an-industrial-phd/the-business-course
- Evaluation of Industrial PhD programme:
  www.fi.dk/filer/publikationer/2011/analysis_of_industrial_phd/index.htm

Estonia[7]

Estonian government response (Ministry of Education and Research)

Transferable skills training for researchers

At the strategy level, the Estonian government supports entrepreneurship training with its "Entrepreneurship studies for non-economic fields: Action Plan for 2010-2013". The plan is overseen by the Ministry of Economic Affairs and Communications and the Ministry of Education and Research. It addresses the content and quality of entrepreneurship education and the wider availability of business education and its integration into professional training. Planned activities include defining learning outcomes, updating curricula (with the priority in science and engineering fields), creating study materials, providing opportunities for teaching personnel to refresh competencies, and launching schemes to facilitate academic-industry mobility. There will also be further development of the Tallinn University of Technology-University of Tartu "technology management" programme, with funding for students to prototype business ideas. The action plan aims to enhance the employability of researchers in academia and the wider labour market, improve research and support better teaching and supervisory skills. Funding is from European Structural Funds.

While not an overarching strategy or agenda for transferable skills training, Estonia's qualifications framework sets some requirements for proficiency in transferable-type skills. In particular, the learning outcomes for doctoral students (described in the Standard of Higher Education, Regulation No. 178, 18 December 2008) demand that PhD recipients can, for example, act independently in complex environments requiring leadership and team work skills, innovative thinking and strategic decision-making, analyse social norms and relationships, present orally or in written form the problems and conclusions of their research to specialist and non-specialist audiences, and hand down knowledge via teaching or instruction.

At the programme level, the Estonian government introduced PRIMUS in 2008, with the aim of supporting improved professional competencies for academic staff (professors, lecturers, doctoral students, researchers). The stand-alone training courses provided under the programme are based on a university teacher competence model and are offered to research staff of partner universities (currently 19 Estonian higher education institutions). Courses include activities to improve teaching and supervisory skills and support strategic management capacity building, and target the full range of transferable skills. Participation is voluntary, although some partner institutions plan to make certain courses mandatory for their staff. In 2010, over

200 different training courses were offered (*e.g.* 17% on communication, 7% on supervision-mentoring), using a variety of delivery methods (*e.g.* lectures, workshops, e-learning) and involving more than 2500 individuals. Courses are provided mainly by training centres run by the University of Tartu and the University of Tallinn, and are supported financially by the European Union Social Fund. Evaluation of the programme is planned for 2013.

Training for Master's-level students

The Estonian government's "Entrepreneurship studies for non-economic fields: Action Plan for 2010-2013" applies also to Master's students.

Workplace experience

Estonia's Operational Programme for Human Resource Development for 2007-2015 (outlining activities and financing funded by the European Social Fund) provides the overarching strategy for transferable skills development via workplace experience. In 2008, the government introduced the Doctoral Study and Internationalisation Programme "DoRa": Training doctoral students in co-operation with business. This programme aims to link research with practical problem solving, and particularly targets enterprise skills, as well as interpersonal, organisational and communication skills. DoRa is targeted to students of Estonian universities in accredited PhD programmes in Estonia's priority R&D areas (as specified in the national RD&I strategy), namely information and communication technology, materials technology, environmental technology, biotechnology, power engineering and health. The programme is funded by the European Structural Fund (EUR 2.6 million for 2008-2015); in addition, participating businesses must be willing to conclude an employment contract and pay at least the minimum wage to students. Training is for four years (the standard period of doctoral study) and 50 students are expected to complete the DoRa programme in the 2008-2015 period. DoRa helps to strengthen co-operation between university academic staff and enterprises.

Wider research career development agenda

The aims of the Primus programme fit within the aims of the Estonian Higher Education Strategy 2006-2015, the National Strategic Reference Framework 2007-2013 (and the Operational Programme for Human Resource Development created from it), and the development plan "Tark ja tegus rahvas" (Wise and active people) 2008-2011.

International co-operation

The Estonian Science Foundation is participating in a European Science Foundation Member Organisation Forum study of a pan-European professional development framework for researchers.

Institutional responses

Three Estonian universities responded to the questionnaire. Two described explicit roles in implementing government programmes, through acting as trainers under PRIMUS, managing doctoral schools and implementing PhD regulations. The University of Tartu noted its Strategic Plan makes reference to transferable skills for students and employees, and all three institutions noted programmes at the university-level (for the Estonian Business School, this involved delivery of training for PRIMUS). Baltic- and European-level co-operation was noted by two institutions. Looking ahead, the Estonian Rectors Conference is working on a new Quality Agreement with Estonian public universities, which will address the mandatory components of doctoral study, including transferable skills, and may trigger change. Tallinn University offers Master's programmes related to transferable skills, while the University of Tartu and Tallinn University noted their participation in DoRa (which involves workplace experience).

Universities	Institutions: Key features
Estonian Business School	Programmes for researchers: partner in government's PRIMUS programme
Tallinn University	Programmes for researchers: Educational Sciences PhD programme; Learning and teaching in multi-cultural study groups (programme under PRIMUS) Master's-level training: Meet government regulations; offer Master's programmes in Organisational Behaviour and Communication Management Tallinn University also participate in government's DoRa programme, although this was mentioned in terms of internationalisation activities, not workplace experience activities.
University of Tartu	Strategy: University of Tartu Strategic Plan 2009-2015 Programmes for researchers: Blocks on general elective subjects and the practice of teaching in the PhD curriculum. The University is involved in delivering the PRIMUS programme. Workplace experience: Participate in government's DoRa programme

Links:

- Entrepreneurship studies for non-economic fields: Action Plan for 2010-2013 (in Estonian): *www.koda.ee/public/MKM_raport.pdf*
- Operational Programme for Human Resource Development for 2007-2015 (in Estonian): *www.hm.ee/index.php?popup=download&id=8838*
- PRIMUS (in Estonian): *http://primus.archimedes.ee/node/5*
- University of Tartu Strategic Plan: *www.ut.ee/544423*

Finland[8]

Finnish government response (Ministry of Education and Culture)

Transferable skills training for researchers

The Finnish government currently has no overarching strategy or agenda regarding formal transferable skills training for researchers, and no formal training programmes for developing researchers' transferable skills. The Ministry has no role in explicitly defining educational content, but in future some guidance for universities may be provided via the steering and funding links between the Ministry of Education and Culture and universities. In particular, an Academy of Finland working group has suggested increasing the structure of doctoral education and giving students similar/equal rights and responsibilities. This would include providing a pan-discipline curriculum of transferable skills at the university level, instead of the traditional doctoral programme-based provision. The majority of Finnish universities have restructured their doctoral training programmes in line with the Academy's suggestions, although they are not yet implemented within the official steering and funding process.

Training for Master's-level students

There are no government strategies or programmes for formal transferable skills training for Master's-level students.

Workplace experience

There are no government strategies or programmes that support the development of researchers' transferable skills through workplace experience. The Academy of Finland has had funding instruments that would support this type of activity, but the aim has been collaboration across sectoral borders rather than learning transferable skills.

Wider research career development agenda

The development of the doctoral education system fits with the strategic emphasis on research careers contained in the current university funding model and with the "four stage researcher career" framework applied by Finnish universities.

Institutional responses

Two Finnish research institutions responded to the questionnaire. Each has some sort of agenda for staff development, and the Finnish Meteorological Institute (FMI) offers several courses to staff to improve various transferable skills. The Institute of Occupational Health (FIOH) lectures in Master's degree programmes, and hosts PhD students. FMI provides opportunities for staff to gain experience in other organisations and abroad.

Research institutions	Institutions: Key features
Finnish Institute of Occupational Health	Strategy: A forum for qualitative and mix-method researchers Master's-level training: Provide lectures in degree programmes Workplace experience: Hosting PhD students
Finnish Meteorological Institute	Strategy: An agenda to develop staff skills, commitment and work satisfaction Programmes for researchers: Project management; Manager training; Language courses Workplace experience: The institute encourages mobility for skill acquisition

France

French government information (Ministère de l'Enseignement supérieur et de la Recherche)[9]

There is no specific French government strategy or agenda directly aimed at building transferable skills in researchers. However, doctoral studies in France aim to support the acquisition of transferable skills, via several paths:

- The new frame for doctoral studies is consistent with the statement made in Bergen (Norway) in 2005 by the ministers of higher education of the 45 countries involved in the Bologna Process, which recommended that doctoral study programmes guarantee interdisciplinary training and the development of transferable skills. Doctoral schools offer students preparation for employment and "doctoriales" (seminars) seek to promote meetings between doctoral

students and economic actors. Specific training organised by doctoral schools (*e.g.* in communication, foreign languages, project management) complement these seminars. Evaluation criteria for doctoral schools include factors related to transferable skills.

- The CIFRE process (conventions industrielles de formation par la recherche) enables doctoral students to study towards their PhD while carrying out research work within both the academic laboratory and a company. This process was initiated in 1981 and is run by the Association Nationale de la Recherche et de la Technologie (ANRT). Students are recruited on either a permanent or a 3-year contract and receive an annual salary. The ANRT (on behalf of the State) provides companies with an annual subsidy, and expenses related to hiring a CIFRE doctoral student are eligible for the Crédit d'Impôt Recherche (CIR – Research Tax Credit). Students receive joint supervision and gain both field experience and academic skills.

In addition, the "Investments for the Future" programme may provide opportunities for researchers to build transferable skills. This programme aims to build larger scientific and technological centres with excellent researchers and scientific institutions. The integration of institutions (universities, colleges, research organisations) in the framework of a common scientific strategy aims to increase international visibility, synergies and impact, as well as improve working conditions for researchers.

Links:

- Doctoral studies (in French):
  www.recherche.gouv.fr/cid20185/le-doctorat.html
- Evaluation of doctoral schools:
  www.aeres-evaluation.com/index.php/Evaluation/Evaluation-of-programmes-and-degrees/Doctoral-school-evaluation-criteria
- CIFRE:
  www.anrt.asso.fr/fr/pdf/plaquette_cifre_complete_avril2009_GB.pdf
- Investments for the Future (in french):
  http://investissement-avenir.gouvernement.fr/content/action-et-projets

Germany[10]

Regional government responses[11]

Transferable skills training for researchers

For most German regions (Länder), training is the direct responsibility of universities, with governments contributing to its financing through their role as principal funder of public higher education institutions. Funding for skills training is also available via the Exzellenzinitiative (Excellence Initiative) and through supra-regional funding organisations such as the Deutsche Forschungsgemeinschaft (DFG – German Research Foundation).

Nevertheless, the Bavarian government has a strategy/agenda and programmes that address transferable skills training for researchers. The strategy – the Elite Network of Bavaria – was introduced in 2002/03 and gives financial assistance and wider support to talented students and young scientists at Bavarian universities. It aims to enhance employability of researchers in academia and improve research work, and to increase Bavaria's competitiveness in attracting talent. Soft skills courses, funded by the Bavarian government, are offered to all members of the Network (doctoral candidates, post-docs and other early stage researchers) –these courses take the form of 2-4 day workshops and target the full range of transferable skills. Over 350 researchers participate each year. In addition, some doctorate programmes of the Network incorporate voluntary 1-7 day courses in soft skills, with approximately 130 candidates participating each year. As well as the Network activities, the government also launched the Bavarian Elite Academy in 1998. This programme is targeted at excellent students (at the undergraduate-, Master's- and doctoral-level) who may choose to become researchers, and around 30 students participate each year. It aims at developing leadership skills through a series of three compulsory 4-week training sessions (during term breaks), using workshops, seminars, projects, internships and excursions. The full range of transferable skills is targeted by the programme.

Looking ahead, the government of Rhineland Palatinate has declared its intent to design and improve human resource development plans, including the issue of transferable skills, for post-docs and early stage researchers. The aim is to improve the status and career opportunities of early stage researchers. Development of these plans and an overarching agenda for all levels of academic careers will take into account the programmes and institutions already in place.

Training for Master's-level students

As well as the Elite Academy, Bavaria's Elite Network is also open to Master's-level students. As such, students may choose to participate in the Max-Weber programme of 2-4 day workshops that target interpersonal, organisational, cognitive and communication skills. These are funded by the government and around 270 students participate each year. Students may also attend the soft skills seminars offered within the Elite Graduate programmes. These target the full range of transferable skills, with training via seminars, workshops and excursions over a period of 1-5 days. They are attended by around 325 students per year.

Workplace experience

The Free State of Thuringia's Research Strategy, introduced in 2008, aims to enhance the region as a centre for research. Within this, there are goals for enhancing the employability of researchers in academic and wider labour markets, improving research, and spurring commercialisation and international co-operation. The strategy takes the view that practical experience is preferable to formal teaching programmes. Two programmes linked to the strategy provide workplace experience for researchers and target the full range of transferable skills. The programme "Funding of management, implementation and publication of R&D activities" offers experience of 2-3 years and has 100-150 participating researchers each year. The "Agenda Proexcellence" aimed to help Thuringian institutions compete in the Excellence Initiative II, and offered experience from 2008-2011 for 100-200 researchers each year.

The development of human resource plans in Rhineland Palatinate will consider the role of workplace experience in career development.

Wider research career development agenda

Bavaria's Elite Network aims to build connections between various scientific and academic centres and across boundaries of individual academic fields. The soft skill courses that are open to all members are seen as fostering this network. Further, by enabling Master's-level students to participate in training programmes, the government aims to give students a chance to have early contact with researchers.

International co-operation

Bavarian universities are linked with each other and with international institutions to create the best possible environment for research and to attract talent.

Institutional responses

One research institution (the Helmholtz Association) replied to the questionnaire. It has a strategy and programmes for transferable skills training for its researchers, which are part of its wider strategy that spans preschool to experienced personnel. Helmholtz noted ongoing change related to continuous improvement of programmes, and pointed to international linkages in its training activities. No specific Master's-level or workplace experience programmes were noted; however, the Helmholtz Association hosts PhD students, offering transferable skills workshops throughout their PhD programme.

Ten universities also submitted replies to the questionnaire. All but one has a strategy or agenda on transferable skills training for researchers, and all offer training programmes. For eight of the universities, graduate academies or schools play an important role in training. These offer co-ordinated programmes to students, usually with the aim of improving employment prospects, research and teaching (supporting international co-operation was also mentioned by some respondents). Three universities described programmes for Master's-level students. One university noted a long-standing practice of supporting workplace experience (via industry PhDs or part-time PhDs).

Through their programmes for researchers, the universities offer a diverse range of transferable skills training opportunities, targeting various combinations of skills and using a variety of approaches. This variety was noted by the government of Rhineland Palatinate, which observed that its universities and polytechnics take different approaches to transferable skills training, with some integrating learning into the curriculum of respective disciplines, and others offering separate courses covering various topics in different formats.

Over half of the universities noted some conditions on funding that required transferable skills training; usually this was related to doctoral programme rules or to conditions of funding from the Deutsche Forschungsgemeinschaft (DFG – German Research Foundation). Six pointed to future changes in their training – either via continuous improvement, or via expansion (*e.g.* more courses and widening the scope). One university noted plans to establish a university-wide graduate academy, while another suggested making the courses obligatory. Half of the universities noted international linkages related to their training activities.

Research institution	Institutions: Key features
Helmholtz Association	Strategy: Talent Management Programmes for researchers: Transferable Skills courses for PhD students; Effective Leadership course; Helmholtz Management Academy Workplace experience: Helmholtz hosts PhD students
Universities	Institutions: Key features
Carl von Ossietzky University Oldenburg	Strategy: Establishment of graduate academy with two graduate schools Programmes for researchers: "olwin" (Human Resources Development for Oldenburg young academics and early stage researchers); CoachWIN (planned for 2012)
Freie Universität Berlin	Strategy: International Network University strategy Programmes for researchers: Dahlem Research School
Friedrich Schiller University Jena	Strategy: Conceptual frame of the Graduate Academy at Friedrich Schiller University Programmes for researchers: Study programme at the graduate academy
Heinrich-Heine-Universität Düsseldorf	Strategy: Part of the university's development plan Programmes for researchers: iGRAD (Interdisciplinary Graduate and Research Academy) and affiliated PhD programmes; Medical Research School; Professional Teaching Competence for university-level teaching Master's-level training: Also part of university development plan; offer Studium Universale and KUBUS (Barriere und Berufsorientierung und Studium) programmes Workplace experience: Part of doctoral regulations and a longstanding practice in faculties
Leibniz Universität Hannover	Programmes for researchers: Promotion Plus
Philipps-Universität Marburg	Strategy: Marburg University Research Academy (MARA) Programmes for researchers: Certificate "Entwicklung und Management von Forschungsprojekten" (Design of and Application for Research Projects); Certificate "Kompetente Hochschullehre" (teaching in the context of institutions for higher education); Softskill programmes of the Graduate Centres and Career Development Program Master's-level training: Strategy to deliver instrumental, systemic and communicative competences; offer approximately 60 Master's programmes that comply with the German National Qualifications Framework
Technische Universität Berlin	Strategy: Continuing Education Program for the Scientific Staff of TU Berlin Programmes for researchers: Grouped under three main topics in the Scientific Continuing Education Program (improving teaching in higher education, research management, working and management techniques)
Technische Universität München	Strategy: Qualification programme for doctoral candidates as part of the German Excellenz Initiative Programmes for researchers: Qualification programme at the TUM Graduate School; programmes from TUM-wide institutions (*e.g.* language centre)
University of Bamberg	Strategy: Scientific Career Service Programmes for researchers: TRAc Doctoral Academy; Fortbildungszentrum Hochschullehre FBZHL (Further Education Centre – Teaching at universities); Sprachenzentrum (university language centre) Master's-level training: Studium Generale; Sprachenzentrum (university language centre)
University of Magdeburg	Strategy: Graduate School Programmes for researchers: Graduate School course programme

Links:

- Elite Network of Bavaria:
  https://www.elitenetzwerk.bayern.de/22.0.html?&L=2
- Bavarian Elite Academy:
  www.eliteakademie.de/index_content.html#home
- Freie Universität Berlin – Dahlem Research School:
  www.fu-berlin.de/en/sites/promovieren/drs/index.html
- Friedrich Schiller University Jena – Graduate Academy:
  www.jga.uni-jena.de/index.php?id=95&L=1
- Heinrich-Heine- Universität Düsseldorf:
  - Faculty of Mathematics and Natural Sciences' Interdisciplinary Graduate and Research Academy (iGRAD):
    www.uni-duesseldorf.de/iGRAD/
  - Medical Research School (in German):
    www.medrsd.uni-duesseldorf.de/MedRSD
  - Studium Universale (in German):
    www.hhu.de/home/Zentrale_Einrichtungen/StudiumUniversale/schluesselkompetenzen
  - KUBUS (in German):
    www.phil-fak.uni-duesseldorf.de/kubus/das-kubus-programm/master-kubus/
- Philipps-Universität Marburg – Marburg University Research Academy (MARA) (in German): *www.uni-marburg.de/mara*
- Technische Universität Berlin – Centre for Scientific Continuing Education and Co-operation (ZEWK) (in German):
  www.zewk.tu-berlin.de/v-menue/wissenschaftliche_weiterbildung/
- Technische Universität München (TUM) Graduate School courses:
  http://portal.mytum.de/gs/kurse/index_html/document_view?
- University of Bamberg – Trimberg Research Academy:
  www.uni-bamberg.de/en/trac/
- Helmholtz Association – Talent Management:
  www.helmholtz.de/en/working_at_helmholtz/

Italy[12]

Institutional response

The Istituto Superiore Mario Boella described its forthcoming Strategic Plan for HR, which will target "soft skills" for researchers, with the goal of stimulating internal communication and creativity on important strategic topics. Activities for skill development will aim to support the evolution of the institute as well as researchers' careers and roles.

Research institution	Institutions: Key features
Istituto Superiore Mario Boella	Strategy: HR Strategic Roadmap Programmes for researchers: A new HR Action Plan to start 2012

Japan[13]

Japanese government response (Ministry of Education, Culture, Sports, Science and Technology)

Transferable skills training for researchers

Japan does not have an explicit strategy or agenda on transferable skills training for researchers. However, its Committee for Human Resources in Science and Technology (of the Council for Science and Technology) has released several recommendations since 2003 that implicitly and explicitly set a direction for enhancing transferable skills training in doctoral and postdoctoral training.[14] The Central Education Council has expressed a need to introduce something similar to transferable skills training in its 2005 report "Graduate School Education in the New Era" and its 2011 report "Graduate School Education in a Globalizing Society". The Ministry of Education, Culture, Sports, Science and Technology (MEXT) has developed and operated many programmes in line with such reports.

The Promotion of Internship Program for Postdoctoral Fellows was introduced in 2008 to help develop wider career paths for postdoctoral researchers and doctoral candidates, and provides systematic career development activities as well as workplace experience. It is provided through universities, and choices on the length of training and method of delivery are a university responsibility. The programme targets all transferable skills and is voluntary. A mid-term evaluation of the programme suggested activities performed jointly with a company have been important. In addition, Japan's Global COE (Centres of Excellence) programme includes training for transferable skills as part of various activities of the programme. The

programme provides funding support for establishing education and research centres with a goal of excellence and international competitiveness. It aims to enhance the education and research functions of graduate schools and to foster young researchers. The training for transferable skills is provided through universities and decisions on training length and methods are taken by these institutions.

Training for Master's-level students

No strategies or programmes for Master's-level students were described.

Workplace experience

No specific strategies or programmes for workplace experience were described. However, the Promotion of Internship Program for Postdoctoral Fellows includes opportunities for workplace experience.

Institutional responses

Three Japanese universities responded to the questionnaire. Each plays a role in delivering national government programmes that contribute to transferable skills training for researchers (such as the Global Center of Excellence Program of the Ministry of Education, Culture, Sports, Science and Technology – MEXT) and each described university-level programmes for researcher training. Some programmes have quite specific goals, such as giving students "global negotiation" skills, while others are broadly aimed at diversifying the skills of researchers and assisting their careers. Master's- and PhD-level training activities are often combined in Japan, and Nagoya University noted its Preparing Future Faculty programme is open to both groups. All the universities described internship programmes that offered workplace experience to develop the skills of doctoral candidates (as well as Master's students and post-doctoral researchers in some cases). Looking ahead, Tsukuba and Nagoya Universities are planning for transferable skills training for researchers to become more systematic.

Universities	Institutions: Key features
Nagoya University	Strategy: Mid-term Plan for FY2011-2015 Programmes for researchers: Preparing Future Faculty programme; Center for the Studies of Higher Education (CSHE) skill-up seminar series for postgraduates Master's-level training: See above – handled together with doctoral training Workplace experience: Strategy part of Mid-term Plan; offer Research Internship Programme for graduate students in engineering
Tokyo Institute of Technology	Programmes for researchers: Innovation Skill-up Program at the Productive Leader Incubation Platform Workplace experience: the Value Creating Internship programme
University of Tsukuba	Strategy: Mid-term Plan for FY2010-2015 Programmes for researchers: the Graduate General Education system; the Post-Doc Career Development program provided by the Office of Gender Equality; the Global Negotiation Program (a postgraduate certificate programme) Workplace experience: International Internship (part of the Graduate General Education system)

Links:

- Mid-term evaluation of the Promotion of Internship Program for Postdoctoral Fellows (formerly the Young Researchers Training Program for Promoting Innovation) (in Japanese): *www8.cao.go.jp/cstp/tyoutyou/20100805hyoka/siryo-1.pdf*
- Young Researchers Training Program for Promoting Innovation: *www.jst.go.jp/shincho/en/program/ino_wakate.html*
- Global COE (Centers of Excellence) Program: *www.jsps.go.jp/english/e-globalcoe/index.html*
- University of Tsukuba:
  - Graduate General Education: *www.tsukuba.ac.jp/english/education/g-courses/kyoutsuukamoku.php*
  - Global Negotiation Program: *http://gnp.hass.tsukuba.ac.jp/index.html*
- Nagoya University – Center for the Studies of Higher Education: *www.cshe.nagoya-u.ac.jp/index_en.html*

Korea

Korean government response (Ministry of Education, Science and Technology) [15]

Transferable skills training for researchers

The Korean government's 2nd National Comprehensive Plan on Nurturing and Supporting National Talents in the field of Science and Technology 2011-2015 was introduced in May 2011 with an overarching goal of increasing Korea's competitiveness by supporting creative Korean S&T talent. With respect to transferable skills, it aims to enhance employability of researchers in academia, prepare researchers for a wider labour market and improve research work.

Two training programmes are targeted at developing researchers' transferable skills. The first, the Degree and Research Centre Support Program (DRC), was introduced in 2008 with a rationale of bridging universities and government-funded research institutions and enabling staff exchange between the two sectors. Doctoral candidates can undertake six months of coursework (designed for specific research areas and incorporating transferable skills training) and two months of site work (for practical training), with the government funding the training provided by participating universities and institutes. The programme targets interpersonal, organisational and communication skills, as well as research competencies and cognitive abilities, and around 150 researchers participate each year. The second programme funded by the government, Education and Training for Fostering Experts in R&D Service Work, was introduced in 2010. It aims to improve the management of R&D activities in institutes, universities and industry, through basic and tailored training via stand-alone courses, for other early stage researchers and research personnel. The training is provided by the Korea Institute of R&DB Human Resources Development (KIRD) and is discussed further below from that institute's perspective.

Training for Master's-level students

The DRC (described above) is also open to Master's-level students.

Workplace experience

There are no specific government strategies or programmes that support the development of researchers' transferable skills through workplace experience, although the Degree and Research Centre Support Program allows for site work.

Institutional response

The Korea Institute of R&DB Human Resources Development (KIRD) is a training and educational institute funded by the Korean government. In its questionnaire response, it described examples of transferable skills training programmes for researchers and Master's-level students, under its Long-Term Development Strategy for 2020. Research competencies are a key target of many of these courses; organisational and communication skills also feature as frequent targets. KIRD also offers courses aimed at improving research and commercialisation, such as intellectual property management and R&D project management. Notably, participants contribute to the cost of KIRD's courses in a number of cases. In the future, KIRD plans to develop longer courses, and wishes to establish strong global networking and co-operation with other countries on transferable skills training and career development. Its vision is to become a global centre of excellence by 2020. Further information is presented in Box B.1.

Other organisation	Institutions: Key features
KIRD	Strategy: KIRD Long-Term Development Strategy for 2020
	Programmes for researchers: Basic competency; Leadership competency; R&D competency
	Master's-level training: English academic paper writing; Research experimental planning methods; Research data analysis
	Workplace experience: KIRD offers work-relevant courses on R&D project management, intellectual property management, and research performance commercialisation

Links:

- KIRD: *www.kird.re.kr/home/role/roadmap-en.jsp*

Box B.1. The Korea Institute of R&DB Human Resources and Development (KIRD)

KIRD, founded in 2007, provides a variety of transferable skills training programmes for researchers and staff in the public sector and government-funded institutions, and for masters and doctoral-level students and professors in universities that participate in national R&D programmes in science and technology (S&T).

KIRD's vision is to pursue global excellence in human resources management and development in S&T. KIRD directs its efforts towards the provision of systematic continuing education and training for the management of the entire R&D phase. Its training is in accordance with career development programmes and the improvement of national R&D capabilities so researchers can cope with the rapidly changing S&T environment.

Based on the three key missions of education and training, policy research and consulting, the core roles and responsibility of KIRD are:

- The development and provision of education and training programmes to R&D personnel.
- The execution of R&D personnel training and project co-ordination for co-operation between institutions.
- The establishment and operation of R&D training systems and programmes.
- Providing advice and consultations, and studies of policy strategy and research about R&D human resources development and management.
- Providing advice for planning and pursuing training projects regarding overall R&D promotion.

Ultimately, the key missions of KIRD are to enhance the productivity and efficiency of national R&D investment.

As of 2012, KIRD provides training programmes for four types of customers as well as 100 on-line courses and e-learning in the field of R&D capabilities:

- For government supported research institutes and key public research institutes in the areas of S&T, KIRD services 19 capability reinforcement training programmes for heads of institutions, high-ranked executives, appointed managers and senior level researchers and administrators, existing junior-level researchers and administrators, and newly recruited researchers and administrators.
- For professors, masters and doctorate holders, KIRD provides "capability reinforcement training programmes" for professors and project managers in charge of research at universities participating in national R&D projects, research agreement and research budget management courses, and masters and doctorate-holders courses at universities participating in national R&D projects.
- For special training programmes responding to government policy requests related to industry, academic research institutes, and government, KIRD provides six courses such as the "R&D specialized human resources cultivation course", national R&D management specialist courses, administrator courses for developing a safe environment in research labs, large scale national R&D project leader courses for understanding all phases of R&D, and district S&T innovation courses.
- For researchers working in mid-sized enterprises with national R&D projects, KIRD provides customer-friendly tailored courses and a variety of courses centered on R&D planning and performance expansion for commercialisation.

KIRD also provides three "categorized capabilities" training programmes for researchers and administrators:

- For R&D capability training, KIRD provides 18 training courses such as "reinforcement of specialised knowledge for the entire R&D phase", and "planning strategies for R&D policies, management and the assessment of executing and expanding performance on the basic principle of a 'plan-do-see' R&D cycle".
- For common R&D capability training, KIRD provides seven training courses such as planning for retirement, creative thinking and science communication.
- For essential capability training in accordance with the law on establishing a safe environment for research labs and regulations on the management of national R&D projects, KIRD provides four training courses, namely project funding management, research notes and ethics, research safety and research security.

Source: Information provided by KIRD.

Luxembourg[16]

Luxembourg government response (Ministry of Higher Education and Research)

Transferable skills training for researchers

The Luxembourg government currently has no overarching strategy or agenda regarding formal transferable skills training for researchers, and no formal training programmes for developing researchers' transferable skills. Training for researchers is within the remit of the Fonds National de la Recherche (FNR – National Research Fund).

Training for Master's-level students

There are no government strategies or programmes for formal transferable skills training for Master's-level students.

Workplace experience

There are no government strategies or programmes that support the development of researchers' transferable skills through workplace experience.

International co-operation

The Ministry of Higher Education and Research is an active member of the ERA Steering Group for Human Resources and Mobility and of different fora of the OECD dealing with research career development activities.

Institutional response

A questionnaire response was received from Luxembourg's Fonds National de la Recherche (FNR – National Research Fund), a public body that develops and implements various funding instruments to support researchers, develop the research environment and promote a scientific culture. The FNR is currently developing a joint strategy for the development of researchers' skills, together with partners from Luxembourg's public research sector. This aims at a co-ordinated approach that provides adequate training of young researchers, in line with the European Charter and Code of Conduct for recruitment of researchers. As well as delivering government funding that supports training activities, FNR also offers training programmes for researchers and supports schemes for workplace experience. Looking ahead, the FNR is working with institutions to make transferable skills training opportunities a core component for doctoral and postdoctoral researchers receiving FNR research funding, and beneficiaries of AFR

(Aides à la Formation – Recherche) grants will be required to agree a training plan with their supervisors. At a national level, it is planned to conduct an analysis of training needs, identify gaps, and set up a common training agenda for all researchers from Luxembourg's public research institutions, with additional FNR courses organised if necessary.

Other organisation	Institutions: Key features
Fonds National de la Recherche	Strategy: under development Programmes for researchers: Project Management course for PhD and post-docs; Grant Proposal Writing seminars (for the FNR CORE programme and FP7 Marie Curie individual fellowships); Communication with the media Workplace experience: AFR funding scheme for PhD and Postdocs – Public Private Partnerships; State aid for temporary secondment of highly qualified people

Links:

- Fonds National de la Recherche: *www.fnr.lu/*

New Zealand[17]

New Zealand government response (Ministry of Science and Innovation)

Transferable skills training for researchers

The New Zealand government currently has no overarching strategy or agenda regarding formal transferable skills training for researchers, and no formal training programmes for developing researchers' transferable skills.

Training for Master's-level students

There are no government strategies or programmes for formal transferable skills training for Master's-level students.

Workplace experience

There are no government strategies or programmes that support the development of researchers' transferable skills through workplace experience.

Institutional responses

Three research institutions in New Zealand responded to the questionnaire. Two have strategies and programmes for transferable skills training for their research personnel, which are focused on leadership and collaboration. One of these institutions also noted it delivers national government programmes (post-doctoral scholarships and postgraduate study, in conjunction with universities) and offers opportunities for workplace experience, both within the research institution (for guest researchers) and in other organisations (for their own staff). The third institution is currently reviewing its approach to career development and will consider transferable skills as part of this.

Four universities also provided information on their approach to transferable skills training for researchers. Three have a strategy/agenda for transferable skills, either explicit or implicitly embedded in other strategic documents, and one is currently developing a strategy. Each university offers training programmes for researchers, aimed at doctoral students (*e.g.* the University of Auckland's Doctoral Skills Programme) as well as academic staff (*e.g.* the Auckland University of Technology's Leadership and Management Enhancement Programme). Two universities have strategies for Master's-level training, related to Graduate Profiles (documenting expected attributes of graduates), and three have training programmes. Three universities offer workplace experience opportunities; these relate both to students gaining experience in industry settings as well as to students or recent graduates gaining academic career-related experience in the university. Two of the universities signalled international links, including via the provision of a course developed by the Australian Group of Eight universities.

Research institutions	Institutions: Key features
Landcare Research New Zealand Ltd	Currently reviewing approach to career development
New Zealand Institute for Plant & Food Research	Strategy: Leadership Development Programmes for researchers: Leadership Programme
Scion	Strategy: People, Performance and Culture Plan 2011-2016 Programmes for researchers: Radical Collaboration; Belbin teams Workplace experience: a sabbatical programme (inward and outward); funding and work placement for post-doctoral scholarships
Universities	
Auckland University of Technology	Strategy: the AUT Strategic Plan Programmes for researchers: the Academic Practice series; AUT Leadership and Management Enhancement Programme (LMEP) Master's-level training: KEYS to Academic Success courses; courses at Te Tari Āwhina – Learning Development Centre Workplace experience: consistent with the Strategic Plan, offers positions for Graduate Assistants, short-term Postdoctoral Fellowships, and various work placement/co-operative education schemes in study programmes
University of Auckland	Strategy: The Doctoral Skills Programme, deriving from Graduate Profiles. Programmes for researchers: Doctoral Academic Career module; courses under the Doctoral Skills Programme; the Future Research Leaders programme Master's-level training: Faculty-level approaches, consistent with Graduate Profiles. Offer Master's programmes that incorporate industry contact/internships, such as the Postgraduate Diploma of Bioscience Enterprise and Master of Bioscience Enterprise, the Master of Engineering Studies (Medical Devices and Technologies) and the Master of International Business.
University of Canterbury	Strategy: A graduate profile for PhD candidates is currently under development. Programmes for researchers: Transferable Research Skills (introduction 2012); Career Planning for the Early Career Academic Master's-level training: Approaches derive from Graduate Profiles developed for each college. Programmes include a Graduate Certificate in Science and Entrepreneurship, a Research Methods paper, and the University of Canterbury Entrepreneurship Challenge. Workplace experience: Approaches are college-dependent. Programmes include Engineering Practical Work Experience; opportunities within the National ICT Innovation Institute; and an Arts Internship programme.
University of Otago	Strategy: Implicit approach contained in university documents (*e.g.* Strategic Direction to 2012, the Teaching and Learning Plan) Programmes for researchers: Professional Development programme; Preparing for Academic Careers; The Research Journey

Links:

- University of Auckland:
  - Graduate profiles:
    www.auckland.ac.nz/uoa/home/about/teaching-learning/principles
  - Doctoral Skills Programme:
    www.auckland.ac.nz/uoa/home/for/current-students/cs-current-pg/cs-dsp
  - BioScience Enterprise qualifications:
    www.biotech.co.nz/enterprise-training/
  - Master of Engineering Studies – Medical Devices and Technologies:
    www.engineering.auckland.ac.nz/webdav/site/engineering/shared/for/future-postgraduates/study-options/documents/mengst-med-dev-tech.pdf
  - Master of International Business:
    www.business.auckland.ac.nz/uoa/home/for/future-postgraduates/study-options-7/postgraduate-programmes-1/mintbus-quick-facts
- University of Canterbury Entrepreneurship Challenge:
  www.entre.canterbury.ac.nz/
- University of Otago – Higher Education Development Centre:
  http://hedc.otago.ac.nz/hedc/home.html

Norway[18]

Norwegian government response (Ministry of Education and Research)

Transferable skills training for researchers

The Norwegian government currently has no overarching strategy or agenda regarding formal transferable skills training for researchers, and no formal training programmes for developing researchers' transferable skills. The Ministry of Education and Research suggested the generally good labour market outcomes for doctorate holders in Norway partly explain the (so far) limited focus by government on this type of training. However, transferable skills may be one of the issues considered in the process leading up to the new White Paper on research.

Training for Master's-level students

The Norwegian government introduced a strategy for entrepreneurship skills (Entrepreneurship in Education and Training: 2009-2014) for students from compulsory school level through to higher education. This followed an earlier scheme (See the Opportunities and Make them Work!) launched in 2004. These educational programmes form part of an effort to make Norway a leader in entrepreneurship and target skills related to communication, innovation and ethics. An important initiative is closer contact between education and employment.

Workplace experience

The Norwegian government introduced an Industrial PhD scheme in 2008, designed to equip researchers with industry-relevant knowledge as well as enhance interaction between companies and research institutions and increase research activity in industry. The scheme targets several transferable skill groups – interpersonal skills, organisational skills, cognitive skills and enterprise skills. During the three-year programme, candidates are employed in companies, although are obliged to spend one year in total in an academic institution, and financing is equally shared between the government and the host company. As at August 2011, 87 candidates were enrolled in the scheme.

International co-operation

At the Nordic level, Norway takes part in NordForsk – an organisation promoting Nordic research collaboration and which offers a Nordic industrial PhD (the PPP – Private Public Partnership) as well as several

research training courses for PhD students and young post-doctoral researchers. At the European level, Norway participates in numerous forums/programmes related to researchers and skills, including the ERA Steering Group for Human Resources and Mobility, EURAXESS, the ESF, EU FP7 Marie Curie Actions and EUROHORCs.

Institutional responses

Five research institutes responded to the questionnaire. One indicated no activity in transferable skills, as it collaborates with another organisation that provides any required training. Another had no specific strategies or programmes, but noted its expectation that researchers are familiar with business (commenting that collaboration with industry helps build transferable skills). The remaining three institutes have their own strategies; in two cases, these were accompanied by training programmes for staff. Two institutes also noted that they deliver government programmes for transferable skills, namely doctoral training and internships, and that they host Master's-level students. (The Ministry of Education and Research noted there is work in progress to further develop the role of independent research institutes in Norwegian doctoral education.) With respect to workplace experience, one institute is involved in the Industrial PhD programme, and another encourages visits to other (especially foreign) research institutes and universities.

Five universities participated in the questionnaire, giving four university-level responses and four department/faculty-level responses. One university indicated it delivers national programmes for training via financing of PhD fellowships and implementing the requirements of the Bologna Process. Three of the four universities have strategies for transferable skills training for researchers, as part of their overall university-level strategies, and all have programmes for researchers. Three of the four departments/faculties also provide training programmes. More than half of the programmes were aimed specifically at doctoral candidates; communication skills and research competences were the most frequent targets. Most programmes are voluntary, although several courses related to pedagogy, ethics and research design were compulsory. The universities suggested that training may become more systematic in the future, and several mentioned the introduction of the Norwegian national qualifications framework[19] in 2012 as a likely driver of change. Two universities described international links related to researcher career development (in particular, European-level connections).

Master's-level training is encompassed within the general strategies of two universities, and three universities have transferable skills programmes for these students; changes were indicated, with more systematic and a

greater variety of training likely to be available. One university mentioned that good training for Master's students could help encourage research careers. Only the Norwegian University for Science and Technology has a strategy for training via workplace experience, included within its general strategy, and offers an Industrial PhD programme. None of the departments/faculties described Master's training or workplace experience schemes.

In addition to the information provided by universities, the Ministry of Education and Research mentioned that an established practice in Norwegian higher education is that of "adjunct professors" and "adjunct associate professors", where persons whose main occupation is outside of the academic institution (*e.g.* they are employed in industry, research institutes or hospitals or in another academic institution) may take up an additional part-time academic position (usually around 20% FTE). These positions are used to connect universities and university colleges with specialist competencies and aim to strengthen teaching, research co-operation and knowledge transfer. At the individual level, such professorships can contribute to developing transferable skills, especially when the professorship is cross-sector. The total number of shared professorships in the higher education sector is around 1 100, compared to 3 100 full professors. The practice is sanctioned by the University Act and operative responsibility lies with academic institutions. This practice was mentioned in the questionnaire response from the Norwegian University of Science and Technology.

Research institutions	Institutions: Key features
Centre for Rural Research	Strategy: Development of Scientific Skills Master's-level training: Hosts Master's students Workplace experience: Encourages visits to other institutes and universities, and hosts PhD candidates
Nofima	Strategy: PhD programme Programmes for researchers: Leadership programme; Project Managers programme Master's-level training: Hosts Master's students Workplace experience: Participates in Industrial PhD programme; finances researchers to visit foreign research institutions; hosts PhD students
Northern Research Institute Narvik	Workplace experience: Expect researchers to be familiar with business and have industry experience.
Peace Research Institute Oslo	Strategy: HR Guidelines Programmes for researchers: Academic writing; Media training
SNF – Institute for research in economics and business administration	No need for own activities as SNF collaborates with the Norwegian School of Economics on training.

Universities	Institutions: Key features
Norwegian University of Life Sciences – Research Department	Strategy: Strategy 2010-2013 for the Norwegian University of Life Sciences (ref: PhD education) Programmes for researchers: Job seeking workshop; Intellectual Property Rights and Innovation; How to write a competitive proposal to the EU framework programmes Master's-level training: An Entrepreneurship camp and programme on Mentoring for Young Start-up Companies in the region. Currently developing a university qualifications framework (based on the national framework) that will include transferable skills. Workplace experience: The qualifications framework under development will have implications for workplace experience.
Norwegian University of Life Sciences – Department of Mathematical Sciences and Technology	No activity at the departmental level
Norwegian University of Science and Technology (NTNU)	Strategy: NTNU Strategy 2011-2021 – "Knowledge for a better world" Programmes for researchers: Academic Leadership programme; Equal Opportunities Mentor programme; Pedagogical Development programme Master's-level training: Part of the NTNU Strategy. Programmes include Experts in Teamwork, a Researcher Programme for medical students, and the Entrepreneurship Venture Cup. Workplace experience: As well as hosting research fellow positions, NTNU participates in the Industrial PhD programme.
University of Bergen, Faculty of Natural Sciences	Programmes for researchers: Theory of Science and Ethics; Knowledge Transmission; Publishing Issues and Information Use for PhD candidates
University of Bergen, Faculty of Psychology	Programmes for researchers: Scientific and Scholarly Writing; Design and Conduct of Research
University of Bergen, Faculty of Social Sciences	Programmes for researchers: Philosophy of Social Science and Research Ethics; Academic Writing and Publication
University of Oslo	Strategy: Strategy 2020; Action Plan for Academic Staff 2010-2012 Programmes for researchers: Research Leadership programme; Innovation and Intellectual Property Rights; Project Management and the Project Method Master's-level training: Part of the university strategy. Activities include Media Students in the Workplace, Project Work – Leadership and Organisation, Human Rights in Practice
University of Stavanger	Programmes for researchers: UNIPED (university pedagogy); English Presentation Techniques course; Writing for Scholars

Links:

- Industrial PhD programme:
  www.forskningsradet.no/servlet/Satellite?c=Page&cid=1253952592752&p=1253952592752&pagename=naeringsphd%2FHovedsidemal
- Private Public Partnership (PPP):
  www.nordforsk.org/en/funding/finansieringsformer/private-public-partnership-ppp-phd
- Norwegian University of Life Sciences – Strategy 2010-2013:
  www.umb.no/statisk/om-umb/strategi_umb_2010-13.pdf
- Norwegian University of Science and Technology:
  - Pedagogical Development (in Norwegian):
    www.ntnu.no/plu/uniped/pedup
  - Experts in Teamwork programme: *www.ntnu.edu/eit/main-page*
  - Researcher programme for medical students (in Norwegian):
    www.ntnu.no/dmf/forskerlinjen/forskerlinjestudiet
- University of Bergen – Faculty of Natural Sciences – course on Theory of Science and Ethics:
  www.uib.no/course/MNF490#introduction
- University of Oslo:
  - Strategy 2020 and Action plan for staff:
    www.uio.no/english/about/strategy/ and
    www.uio.no/english/for-employees/support/human-resources/personnel-policy/uio-workingconditions-academicstaff/actionplan-researchers.html
  - Research Leadership Programme:
    www.uio.no/english/for-employees/competence/leadership-development/leadership-support/development-programme/research-leaders/index.html

Poland[20]

Polish government response (Ministry of Science and Higher Education)

Transferable skills training for researchers

While there is no strategy explicitly aimed at formal transferable skills training in Poland, the EU-funded Human Capital Operational Programme (2007-2013) includes some objectives that bear on transferable-type skills. In particular, under Priority IV (Tertiary Education and Science), Measure 4.2 calls for "Development of R&D system staff qualifications and improving the awareness of the role of science in economic growth". Related projects aim to improve staff competences in managing large scientific projects and commercialising their results. Marketing skills and promotion of industrial and intellectual property protection are also targeted. Funding under the Programme has been used to create postgraduate studies to raise research management skills (*e.g.* "R&D management in research institutions" at the John Paul II Catholic University of Lublin, and "Professional head of research and development projects – postgraduate studies for researchers" at the University of Agriculture in Krakow). A new initiative is the "Government Strategy of Innovation and Efficiency of the Economy for 2012-2020", or "Dynamic Poland". Action 2.1.3, Training of Young Researchers, includes enhancing the quality of research management and covers upgrading the skills of managers and administrators engaged in research projects. In another example, a recently announced programme (the "Top 500 Innovators – Science – Management – Commercialisation") will allow 500 Polish researchers to take internships in top universities abroad for training in research, research management and research commercialisation.

Workplace experience

There are no explicit government strategies or programmes that support the development of researchers' transferable skills through workplace experience, although the fore-mentioned Human Capital Operational Programme includes some objectives that bear on such activities.

Wider research career development agenda

There are numerous programmes aimed at supporting career development in a wide sense. These include programmes for doctoral candidates, young researchers, researchers returning from abroad or from career breaks, and foreign researchers.

International co-operation

The Polish government supports career development via the international mobility of researchers (*e.g.* the Mobility Plus programme).

Institutional responses

In university responses, the Wroclaw University of Economics (Faculty of Management, Computer Science and Finance) noted it offers a pedagogical programme to prepare young researchers for teaching, and plans ongoing development of training. Certificate-level courses that target particular skills (*e.g.* business competences) are offered to Master's students. No workplace experience activities are currently offered, but this may change in future.

The Foundation for Polish Science (FNP) also responded to the questionnaire. It delivers the part-EU-funded SKILLS programme on behalf of the Polish government. Training activities under this programme aim to strengthen R&D staff potential in science administration, research management and communication. The whole programme runs for five years and courses are aimed at laureates and scholars of the Foundation's scholarship programmes (especially research team leaders and PhDs). In future, the Foundation may continue the training activities using its own funds. International co-operation is part of the SKILLS programme delivery, with foreign partners contributing to training.

University	Institutions: Key features
Wroclaw University of Economics – Faculty of Management, Computer Science and Finance	Programmes for researchers: Pedagogical Programme Master's-level training: In addition to formal diplomas, the university offers certificates in certain skills *e.g.* the European Business Competency Licence.
Other organisation	
Foundation for Polish Science	Programmes for researchers: Delivery of the SKILLS programme for the Polish government Workplace experience: Internships are included in some SKILLS programme activities.

Links:

- Dynamic Poland (in Polish): *http://bip.mg.gov.pl/files/upload/15929/2.%20PL_MG_MG_KRM_SIEG_20120403_w%200.16.pdf*
- Human Capital Operational Programme: *www.nauka.gov.pl/financing/european-funds/human-capital/*

- Top 500 Innovators – Science – Management – Commercialisation (in Polish): *www.nauka.gov.pl/ministerstwo/aktualnosci/aktualnosci/artykul/top-500-innovators-science-management-commercialization/*
- Mobility Plus programme: *www.nauka.gov.pl/ministry/international-cooperation/mobility-plus/*
- Foundation for Polish Science – SKILLS programme (in Polish): *www.fnp.org.pl/programy/aktualne_programy_fnp/program_skills*

Slovenia[21]

Slovenian government response (Ministry of Higher Education, Science and Technology)

Transferable skills training for researchers

The Slovenian government has no overarching strategy or agenda regarding formal transferable skills training for researchers and no formal training programmes. Doctoral study programmes are guided by the Higher Education Act, which specifies the general abilities students should acquire through the programmes.

Training for Master's-level students

There are no government strategies or programmes for formal transferable skills training for Master's-level students. The scope of Master's programmes is set by the Higher Education Act.

Workplace experience

One goal of Slovenia's Research and Innovation Strategy 2011-2020 is to prepare researchers for a wider labour market. A programme introduced in 2007 and aimed at doctoral students – Young researchers in companies (or "Young Researchers for Economy") – aims to promote the transfer of research between academia and business and targets students' research competencies and enterprise skills. The voluntary programme has around 70 participants per year and is funded by the government. The training runs for the time of the doctoral studies. In addition, in 2010 a new scheme involving workplace experience – "Programme for Strengthening R&D Personnel in Companies" – was introduced. The scheme is a joint effort by the Ministry of Higher Education, Science and Technology and the Ministry of Economy and aims at strengthening research units in companies and their potential for innovation. It provides for training of young researchers in

companies and thus supports development of transferable skills via workplace experience. As well as the engagement of industrial PhDs, the scheme covers engagement of new or guest researchers and the establishment of new topic-oriented research groups. Placement of researchers from universities into firms may occur where there is a wish to develop a new idea with commercial potential. Funding comes from the national government and EU Structural Funds.

International co-operation

The Ministry of Higher Education, Science and Technology co-operates, on behalf of the Slovenian government, with the European Commission on issues related to FP7 and participates in various working groups and bodies. Slovenia participates in the European Partnership for Researchers process, via its membership of the EC Steering Group on Human Resources and Mobility. The Ministry also implements various bilateral and multilateral programmes of co-operation relevant to researcher career development.

Turkey

Turkish government information (TÜBİTAK)[22]

Developing science and technology human resources is one of the main pillars of Turkish science, technology and innovation (STI) policy and is one of the horizontal axes of the National Science Technology and Innovation Strategy 2011-2016. A Science and Technology Human Resources Strategy and Action Plan 2011-2016 is in place, which includes a strategic objective of "improving research environment, researchers' skills and experience". This objective speaks directly to the aim of transferable skills training for researchers, with related strategies and actions including the following:

- Designing mechanisms for improving researchers' skills
- Designing and promoting research methodologies and R&D project management courses and training for graduate students
- Providing courses and training for improving soft skills such as leadership, science communication and language skills
- Promoting interdisciplinary work and collaboration

As well as the development of STI human resources, the National Science, Technology and Innovation Strategy has two further axes that relate to transferable skills – "Stimulate the Transformation of Research

Results into Products and Services", which includes designing and implementing patent training programmes for researchers, and "Diffusion of a Multi-actor and Multi-discipline R&D Co-operation Culture". In addition, the main theme of the Supreme Council for Science and Technology (SCST) meeting on 27 December 2011 was the National Innovation and Entrepreneurship System and steps to be taken to foster this system. Two of the eight decrees adopted at the meeting (promotion of an entrepreneurship culture, and developing policy tools to trigger innovation and entrepreneurship in universities) comprise transferable skills training for researchers.

The Scientific and Technological Research Council of Turkey (TUBITAK) has a wide range of funding programmes for researchers to develop their careers, skills and experience. These programmes range from national and international PhD and post-doc scholarships to short-term research scholarships in international universities and research centres.

Response from the Turkish Ministry of Health – Turkish School of Public Health[23]

At the Ministry level, a policy questionnaire response was received from the Turkish Ministry of Health (Turkish School of Public Health).

Transferable skills training for researchers

The Ministry of Health (School of Public Health) has an agenda to build the capacity of human resources for health and to undertake training, research and other tasks to develop the Ministry's general health policies. This agenda was introduced in 2003 with a rationale to support, motivate and train human resources in health, undertake health research, and produce knowledge to improve health care services. Its goals include improving research work (including the academic quality), and supporting management processes.

Several programmes are offered to Turkish School of Public Health research personnel that target transferable skills. The "Basic Managerial Skills" programme was introduced in 2007 and aims to support management and research personnel. Training is provided by universities via distance education, for a period of two months, and around 22 school research personnel participate each year. The programme addresses interpersonal, organisational and communication skills, as well as research competencies and cognitive abilities. The "Personnel Development Training" programme was introduced in 2005 and provides 3-7 days per year of compulsory lectures and activities to School research personnel. Interpersonal, organisational, communication and enterprise skills are targeted, as well as cognitive abilities. Around 20-30 personnel participate each year, with training

provided by universities and private firms. The "Research Methods in Health Care Training" programme was introduced in 2010 to support skills in research planning, literature review, data collection and analysis and research reporting. Compulsory lectures are provided by universities in three five-day modules, and target research competencies and communication skills. Around 30 School research personnel participate per year. The programmes are all jointly funded by the World Bank and the Turkish government.

Looking ahead, there are plans to build a database about development skills.

Training for Master's-level students

The Ministry of Health has no strategies or programmes for formal transferable skills training for Master's-level students.

Workplace experience

The Ministry of Health has no strategies or programmes that support the development of researchers' transferable skills through workplace experience.

International co-operation

The Ministry of Health has a budget and programme to train personnel abroad.

Links

- National Science, Technology and Innovation Strategy 2011-2016: *www.tubitak.gov.tr/sid/2415/pid/2400/index.htm*
- Science and Technology Human Resources Strategy and Action Plan 2011-2016: *www.tubitak.gov.tr/sid/2416/pid/2400/index.htm*
- SCST meeting held on 27 December 2011: *www.tubitak.gov.tr/sid/2400/pid/2400/cid/26210/index.htm*

United Kingdom

United Kingdom government information (Department of Business, Innovation and Skills)[24]

The United Kingdom government itself does not have a specific strategy or programmes aimed at transferable skills for researchers. In the United Kingdom, government funding for teaching and research is allocated by funding bodies and research councils[25] who have their own governance structures and funding allocation mechanisms. These bodies' strategies can include transferable skills for researchers – for instance, the RCUK (Research Councils UK) states that it will ensure its funding develops the right balance of specialist research expertise and wider business and management skills for high-technology employers as well as academia. It also has a statement of expectations for research organisations that receive funding, including that organisations will act to maintain availability of a broad range of career planning, training and development opportunities for Research Council funded researchers and to fully embed researcher development into normal processes in the research and training environment.

There are a number of overarching documents/agreements that bear on transferable skills training for researchers in the United Kingdom. Together with other stakeholders in the higher education sector, the funding bodies and research councils have signed a "Concordat to Support the Career Development of Researchers". This document sets standards for career management and conditions of employment for researchers employed by higher education institutions or funded through grants and analogous schemes. The sector has also endorsed the Researcher Development Statement (RDS), which is a strategic statement setting out the knowledge, behaviours and attributes of effective and highly skilled researchers appropriate for a wide range of careers. The RDS is derived from the Researcher Development Framework (RDF), which is an operational framework identifying the characteristics of excellent researchers through a set of 63 "descriptors" related to knowledge, intellectual abilities, techniques and professional standards to do research, as well as personal qualities, knowledge and skills to work with others and ensure the wider impact of research.[26] The RDS supports higher education institutions in their implementation of the Concordat, the QAA (Quality Assurance Agency) Code of Practice for assurance of academic quality and standards in postgraduate research degrees, and the "Roberts recommendations" for postgraduate researchers and research staff (see Box B.2). The RDS/RDF also help researchers themselves consider their competencies and opportunities for development.

Box B.2. The Roberts Report

The emphasis on personal and professional development for postgraduates was boosted by a review of the sector by Sir Gareth Roberts, which led to increased investments in science and research by government. The recommendations of the so-called "Roberts Report" included a ring-fenced budget of GBP 100 million a year in the Comprehensive Spending Review in 2002. Part of this funding was dedicated to ensuring that Research Council-funded PhD students and postdoctoral researchers had access to significantly improved training opportunities to develop further the transferable skills important to employers. The funding, managed by RCUK, delivered around GBP 20 million a year between 2003 and 2010 for development and transferable skills training. Evaluations and progress reports on the uses and impacts of these investments were positive. Some further information can be found in the links noted below.

The Concordat has led to different initiatives at the institutional level. A summary of progress can be found in the annual report on the implementation of the Concordat (see links below). The work of Vitae (see institutional responses below) is significant in this respect. In addition, doctoral training centres such as those funded by the Engineering and Physical Sciences Research Council deliver transferable skills as well as technical competencies to students. In 2009 the EPSRC funded 45 new centres for doctoral training, which bring together diverse areas of expertise to provide multidisciplinary training for engineers and scientists. Students at doctoral training centres undertake a four-year PhD course or equivalent, with an original research project, a programme of coursework to develop technical interdisciplinary skills, and other activities to develop breadth of knowledge plus transferable skills (*e.g.* public engagement). Engineering doctorate and industrial doctorate centres offer an alternative approach, with 75% of students' time being spent working directly with a company.

Institutional responses[27]

Two universities individually responded to the questionnaire. One is involved in delivering a government training initiative for early career researchers, by acting as a host and manager of "Scottish Crucible" events. Both have an agenda for researcher development and offer programmes in transferable skills to all levels of researchers. A number of the programmes commenced with financing from "Roberts funding" – a funding stream for transferable skills training in the United Kingdom, which ceased in its existing form in 2011. Both universities expected future changes, with one looking at reorganising its infrastructure for development activities. Neither provided information about Master's-level training or workplace experience; however, Strathclyde's Researcher Development Programme offers opportu-

nities for internships and an internship programme is under consideration, while workplace experience is also under discussion at Stirling.

In addition, the Russell Group provided information about support for staff development in Russell Group universities.[28] Russell Group universities provide a range of training opportunities, including:

- Diplomas/certificates in teaching (*e.g.* the University of Liverpool's Postgraduate Diploma in Learning and Teaching in Higher Education);
- Development for staff with teaching responsibilities (*e.g.* the University of Bristol's Teaching and Learning in Higher Education course);
- Training programmes for postgraduate and post-doctoral research staff (*e.g.* the University of Leeds' Graduate Training and Support Centre offers courses in leadership and management, knowledge transfer, personal development, *etc*);
- Training for postgraduate and post-doctoral staff with teaching responsibilities (*e.g.* the University of Birmingham's training module in teaching skills for research staff); and
- Courses on academic practice (*e.g.* the University of Oxford's Developing Academic Practice course).

A questionnaire response was also received from Vitae. This organisation supports the personal, professional and career development of doctoral researchers and research staff in higher education institutions and research institutes in the United Kingdom. It acts as a facilitator (for example, managing events, bringing together stakeholders, providing opportunities to share best practice), information provider and developer of resources for use by trainers. It is funded by Research Councils UK. Vitae described three programmes; two aimed at doctoral candidates and one for all researchers. Experiential learning is a key component of the programmes, and they target the full range of transferable skills. While no specific workplace experience programmes are in operation, Vitae is currently developing an employer engagement strategy. Looking ahead, Vitae aims to support a "cultural shift", such that training in transferable skills becomes a comprehensive part of doctoral programmes and research activity. The organisation engages extensively on a European level (*e.g.* it is working with the European Science Foundation to evaluate the feasibility of using the Researcher Development Framework more widely in Europe), and also has interaction with the United States.

Universities	Institutions: Key features
Russell Group universities	Programmes for researchers: Many examples, as outlined above.
University of Stirling	Strategy: To implement the Concordat to Support the Career Development of Researchers and Vitae's Researcher Development Framework Programmes for researchers: The Graduate School Seminar Programme; Researcher Development Programme; Effective Research Supervision
University of Strathclyde	Strategy: Researcher Development Strategy and Operational Plan 2011-2015 Programmes for researchers: Researcher Development Programme
Other organisation	
Vitae	Strategy: SET for Success – The supply of people with science, technology, engineering and mathematics skills 2002 Programmes for researchers: GRADschools programme; How to be an effective researcher; Leadership in Action

Links:

- Research Concordat: *www.researchconcordat.ac.uk*
- 1st annual report on implementation of the Concordat: *www.researchconcordat.ac.uk/documents/FundersForumDecember09.pdf*
- Roberts Report:
  - *www.rcuk.ac.uk/ResearchCareers/researcherdevelopment/Pages/ImplementingRobert.aspx*
  - *www.1994group.ac.uk/documents/public/Research_Policy/090115_RobertsFundReport.pdf*
- University of Strathclyde – Researcher Development Programme: *www.strath.ac.uk/rdp/*
- Vitae: *www.vitae.ac.uk/policy-practice/167/Home.html*
  - GRADschools programme: *www.vitae.ac.uk/gradschools*
  - Vitae "How to be an effective researcher": *www.vitae.ac.uk/effectiveresearcher*
  - Vitae "Leadership in Action" course: *www.vitae.ac.uk/researchers/104253/Leadership-in-Action.html*

United States

United States federal government information (National Science Foundation)[29]

There are no specific government-level strategies or programmes directly aimed at building transferable skills in researchers in the United States. Programmes to develop transferable skills for researchers are managed by individual federal agencies or departments, and policies are programme-specific. However, the United States Office of Science and Technology Policy (OSTP) has responsibility for providing leadership for interagency efforts to develop and implement sound science and technology policies and budgets, and to work with the private sector, state and local governments, the science and higher education communities, and other nations toward this end. This OSTP leadership involves workforce development at all levels, including transferable skills for researchers.

Some examples of departments/agencies and the programmes they manage are:

- National Science Foundation (NSF): The NSF has a broad mandate in supporting the science and engineering fields. It has general requirements that proposals for funding to support postdoctoral researchers must include a description of mentoring activities, and each institution that applies for financial assistance must describe its plans for training and oversight in the responsible and ethical conduct of research. In specific activities, NSF's Integrative Graduate Education and Research Traineeship (IGERT) programme has been developed to educate United States PhD scientists and engineers with interdisciplinary backgrounds, deep discipline-specific knowledge and technical, professional and personal skills. Its Science Master's programme prepares graduate students for careers in business, industry, non-profit organisations and government agencies by providing a foundation in science, technology, engineering and mathematics disciplines plus research experiences, internship experiences and career skills.
- Air Force Office of Scientific Research (AFOSR): The United States Air Force sponsors programmes in support of its mission; as such, the AFOSR sponsors research assistantship programmes, faculty programmes and graduate school programmes. These are intended to support graduate education, to encourage development of research excellence in critical technological areas where research facilities and qualified researchers are lacking, to train personnel to conduct high quality research and to stimulate mutual research interests between the Air Force and higher education institutions.

- United States Department of Energy (DOE): The DOE also sponsors programmes to support its mission. For instance, it sponsors a graduate fellowship programme to support students to pursue graduate training in basic research in areas of physics, biology, chemistry, mathematics, engineering, computational sciences, and environmental sciences relevant to the DOE mission and to develop talent in the United States. Another example is the DOE Minority Educational Institution Partnership Programme, which offers undergraduate and graduate students summer internship positions with the DOE and its national laboratories.

- The United States National Institutes of Health (NIH) sponsor health-related programmes. For example, the NIH offers summer programmes where researchers can work with leading scientists in the biomedical research area. It also sponsors the NIH Graduate Partnerships Programme, which gives graduate students the opportunity to conduct all or part of their dissertation research at the NIH. Students come to the NIH either as part of formal institutional partnerships or via individual agreements negotiated between their university mentor and an investigator at the NIH. Another example is the NIH Ruth L. Kirschstein National Research Service Award – Institutional Research Training Grants, which support predoctoral and postdoctoral research training to help boost the workforce available to assume leadership roles related to the United States' biomedical, behavioural and clinical research agenda.

Notes

1 Information from the policy questionnaire.

2 Information supplied by RIHR delegate.

3 Information from policy questionnaires.

4 Information supplied by RIHR delegate.

5 Information from policy questionnaire.

6 Information from policy questionnaires.

7 Information from policy questionnaires.

8 Information from policy questionnaires.

9 Information supplied by RIHR delegate.

10 Information from policy questionnaires.

11 From: Bavarian State Ministry of Sciences, Research and the Arts; Thuringian Ministry of Education, Science and Culture; Ministerium für Bildung, Wissenschaft, Weiterbildung und Kultur (Rhineland Palatinate); Senatsverwaltung für Bildung, Wissenschaft und Forschung Berlin; Behörde für Wissenschaft und Forschung (Hamburg); Senatorin für Bildung, Wissenschaft und Gesundheit (Bremen); Ministerium für Wissenschaft und Wirtschaft des Landes Sachsen-Anhalt; Ministerium für Wissenschaft, Forschung und Kultur des Landes Brandenburg; and Ministerium für Wissenschaft, Forschung und Kunst Baden-Württemberg.

12 Information from policy questionnaire.

13 Information from policy questionnaires.

14 Updated information from RIHR delegate: In December 2011, the Committee issued a recommendation that young postdoctoral fellows employed with public research funding from the Ministry of Education, Culture, Sports, Science and Technology (MEXT) must receive certain support from their employers, including action plans to support their careers (including, for example, lectures conducted in co-operation with companies, internships, exchange meetings with companies, *etc*). The Committee also suggested that public research institutions should provide doctoral researchers who do not qualify for this policy with access to similar career development activities.

15 Information from policy questionnaires.

16 Information from policy questionnaire.

17 Information from policy questionnaires.

18 Information from policy questionnaires.

19 This framework is a Norwegian adaptation of the European Qualifications Framework that is being put into practice across Europe. See *http://ec.europa.eu/education/lifelong-learning-policy/doc44_en.htm* (accessed 19 January 2012).

20 Information from policy questionnaires.

21 Information from policy questionnaire and RIHR delegate.

22 Information supplied by RIHR delegate.

23 Information from policy questionnaire.

24 Information supplied by RIHR delegate.

25 Funding bodies include, for example, the Royal Society, the Arts Council, and NESTA. There are seven research councils under the umbrella of Research Councils UK (RCUK): Arts and Humanities Research Council (AHRC); Biotechnology and Biological Sciences Research Council (BBSRC); Economic and Social Research Council (ESRC); Engineering and Physical Sciences Research Council (EPSRC); Medical Research Council (MRC); Natural Environment Research Council (NERC); and Science and Technology Facilities Council (STFC).

26 The RDF is being trialled in Europe and the United States for its applicability across research systems.

27 Information from policy questionnaires.

28 The Russell Group represents 20 universities in the United Kingdom: University of Birmingham; University of Bristol; University of Cambridge; Cardiff University; University of Edinburgh; University of Glasgow; Imperial College London; King's College London; University of Leeds; University of Liverpool; London School of Economics & Political Science; University of Manchester; Newcastle University; University of Nottingham; University of Oxford; Queen's University Belfast; University of Sheffield; University of Southampton; University College London; University of Warwick.

29 Information supplied by RIHR delegate.

Annex C

Workshop agenda

OECD RIHR Workshop on Transferable Skills Training for Researchers: Supporting career development and research

Monday, 28 November 2011

Background

Researchers are a key input into science and technology activity and their formation and careers are an important policy issue. Governments are keen to ensure that approaches to researcher training and careers are yielding net benefits for their economies. The OECD's Working Party on Research Institutions and Human Resources (RIHR) is undertaking a project aimed at helping governments, as major actors in researcher training, to consider whether current national approaches provide appropriate support to researchers seeking to improve their transferable skill competencies. With a focus on countries' government- and institute-level policies on formal training in transferable skills for researchers, it will collect evidence on current arrangements, attempt to identify good practices in transferable skills training, and highlight possible future directions to support researcher career development and improve research.

This workshop brings together subject experts and members of the RIHR Working Party to discuss the results of a RIHR policy questionnaire on current training arrangements for transferable skills and to "brainstorm" future policy directions.

Agenda

Session 1: Welcome and introduction

Chair: **Ms. Jana Weidemann** (Ministry of Education and Research, Norway)

a) **Ms. Yuko Harayama**: Deputy Director, OECD Directorate for Science, Technology and Industry

b) **Ms. Sarah Box**: Science and Technology Policy Division, OECD

Presentation of the background note for the workshop.

Session 2: Current arrangements for transferable skills training

Chair: **Mr. Thomas Hesse** (Alexander von Humboldt Foundation, Germany)

This session will describe the results of the recent RIHR policy questionnaire on transferable skills training arrangements. Expert practitioners from participating countries will highlight current examples.

a) **Ms. Sarah Box**: Science and Technology Policy Division, OECD

Approaches to transferable skills training for researchers: Summary of responses to the questionnaire

b) **Mr. Marc Schiltz**: Secretary General, *Fonds National de la Recherche* (National Research Fund), Luxembourg

c) **Mr. In-Seo Park**: Director, Education and Training Division, Korean Institute of R&DB Human Resource Development (KIRD), Korea

d) **Ms. Nina Löchte**: Promotion of young and early stage researchers / International networking, Helmholtz Association of German Research Centres, Germany

e) **Mr. Johan Hustad**: Pro-rector, Innovation and External Relations, Norwegian University of Science and Technology (NTNU), Norway

Session 3: Insights from recent research

Chair: **Ms. Carmen Huber** (National Science Foundation, United States)

a) **Ms. Karen Vandevelde** and **Ms. Aukje te Kaat**: ECOOM, University of Gent, Belgium

Doctorate holders: Competent and employable?

b) **Ms. Janet Metcalfe**: Chair and Head, Vitae, United Kingdom

Identifying impacts of research training on doctoral graduates

Session 4: Policy brainstorm – "where to" for governments' transferable skills training policies?

Chair-rapporteur: **Ms. Beate Scholz** (Scholz – consulting training coaching)

Led by the roundtable of invited experts, this session will allow participants to identify possible future government policy directions. Key questions include:

Are current training strategies and approaches having the desired effects?

What should be governments' responsibilities in transferable skills training? Where (and by what mechanisms) is additional action required?

a) **Ms. Barbara Olds**: Deputy Assistant Director, Directorate for Education and Human Resources, National Science Foundation, United States

b) **Mr. Derek O'Brien**: Programme Leader, Enterprise Partnership Scheme, Irish Research Council for Science, Engineering and Technology, Ireland

c) **Ms. Janica Ylikarjula**: BIAC and Senior Adviser, Research and Innovation Policy, Confederation of Finnish Industries, Finland

d) **Ms. Janet Metcalfe**: Chair and Head, Vitae, United Kingdom

Session 5: Summary and next steps

Chair: **Ms. Jana Weidemann** (Ministry of Education and Research, Norway)

The OECD Secretariat summarised the key points of the workshop and outlined next steps.

Ms. Sarah Box: Science and Technology Policy Division, OECD

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Transferable Skills Training for Researchers

SUPPORTING CAREER DEVELOPMENT AND RESEARCH

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Transferable skills for a diversity of careers and better research
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