

The logo for the Higher Education Authority (HEA) consists of the letters 'HEA' in a bold, serif font.

Higher Education Authority
An tÚdarás um Ard-Oideachas

The logo for Forfás features the word 'Forfás' in a bold, sans-serif font, followed by a stylized diamond-shaped graphic composed of horizontal lines.

The Higher Education Authority
An tÚdarás um Ard-Oideachas

Marine House, Clanwilliam Court, Dublin 2

**The National Policy and Advisory Board
for Enterprise, Trade, Science,
Technology and Innovation.**

Wilton Park House, Wilton Place, Dublin 2.

Creating Ireland's Innovation Society : The Next Strategic Step

Attracting and Retaining World Class Researchers
Professor Liam Downey

ISBN 0-904 556-81-6

Dublin

Published by the Higher Education Authority

To be purchased from the
Government Publications Sales Office,
Molesworth Street, Dublin 2.

or through any Bookseller

Price €10
July 2003

Foreword

The Irish research environment has changed radically in recent years. The introduction of the Programme for Research in Third Level Institutions (PRTLII) scheme in 1998 provided a new source of research funding to support strategic institutional research programmes and joint research programmes. The creation in 1999 of the Irish Research Council for Humanities and Social Sciences (IRCHSS) provided an important new means to fund individual researchers and research projects in the humanities and social sciences. Subsequent to the setting up of IRCHSS, the Irish Research Council for Science, Engineering and Technology (IRCSET) was established in 2001, to support individual researchers in science, engineering and technology. The establishment of Science Foundation Ireland (SFI) in 2000 to support strategically oriented basic research, in the areas of information and communication technology and biotechnology was a major event in the development of a comprehensive national research capacity. These new sources of funding are complemented by increased research funding from the Health Research Board (HRB).


The Expert Group on Future Skills Needs (EGFSN) in its report published in July 2001, noted the establishment of the new sources of research funding and recommended that national research policy should (a) aim to achieve a substantial increase in the output of doctorates, particularly in science, engineering and technology, and (b) facilitate under graduate students to progress into postgraduate research and also international researchers moving to Ireland.

In response to the recommendations of the Expert Group, an Inter-Organisational Group (Appendix 1) on attracting and retaining researchers was established by the Higher Education Authority (HEA) in February 2002. While recognising the transdisciplinary scope of research, ranging from humanities, jurisprudence, social sciences, economics, natural and medical sciences and engineering, the Inter-Organisational Group considered the particular needs of science, engineering and technology as highlighted by the Expert Group.

With a view to generating the enhanced supply of researchers required to implement Ireland's future research programmes, the Inter-Organisational Group undertook the following actions:

- An examination of the issues involved in the transfer of international researchers into Ireland.
- A survey of final year undergraduate students' perceptions of undertaking postgraduate research and their reasons for such perceptions.

In order to consider the issues arising, Prof. Liam Downey, former Director of Teagasc, was commissioned by the HEA to prepare the following report. The preparation of this report was assisted by the work of the Inter-Organisational Group. While the views expressed in this report are primarily those of Prof. Downey, and do not necessarily reflect the views of



the members of the interorganisational group, or of their organisations, he would like to acknowledge the contribution which was made in the preparation of the report by the members of the group and the work commissioned by it. The HEA and Forfás have decided to publish this report as a major contribution to putting a world class research system in place in Ireland. The HEA and Forfás are most grateful to Prof. Downey for his work and wish to associate themselves with his appreciation of the work of the Inter-Organisational Group.

In the preparation of his report, Prof. Downey drew on his own wide-ranging experiences of the management of major national research organisations, and also took account of the important insights into the issues contained in (a) HEA Report entitled Attracting and Retraining Researchers in Ireland – June 2002 and (b) report of meeting on International Training and Support of Young Investigators in National Sciences held in Strasbourg (2002) under the aegis of the European Science Foundation and the Human Frontline Science Programme.

The recommendations of this report emphasise:

- The essential role of a world class research infrastructure and the need to sustain recent investment in research infrastructure and facilities.
- The urgent need to improve the career structure for professional researchers.
- The need to develop and implement new means to attract overseas researchers to Ireland.
- The critical need to ensure that the quality of research training is sustained and enhanced in order to attract first class candidates to research and protect the quality of future research programmes in Ireland.
- The importance of the creation of a durable human resources strategy to support the institutions in their research programmes and to build a durable national research system.

The recommendations are also set out in Table 1, which identifies the specific actions recommended and the relevant organisations to which these recommendations pertain.

MR. MARTIN CRONIN
Chief Executive
Forfás

DR. DON THORNHILL
Chairman
Higher Education Authority

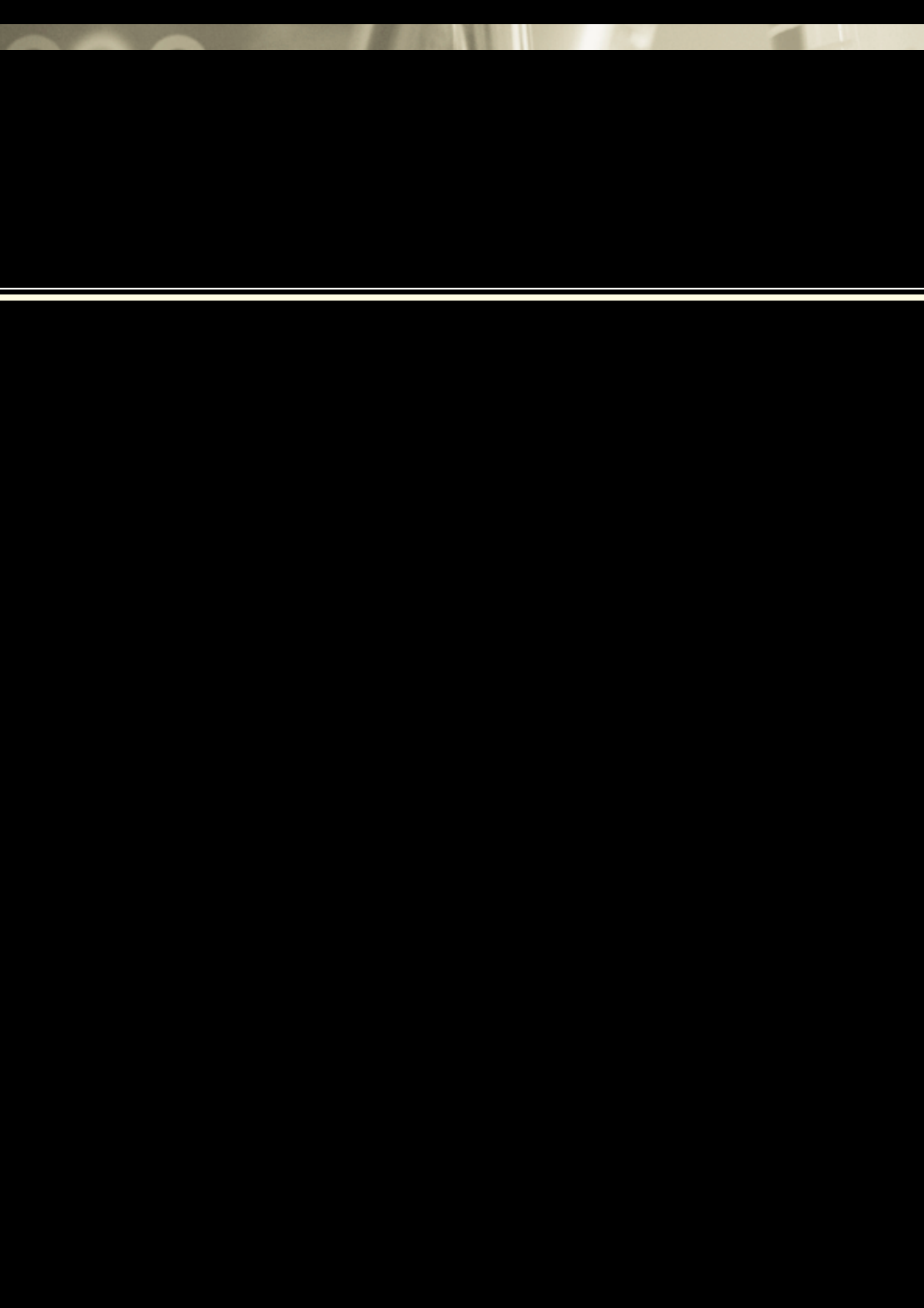
July 2003

Table 1: Recommendations and Follow up Actions arising

Strategic Challenges	Recommendations	Specific Actions	Relevant Actors
To attract and retain researchers	Sustain recent investment in research infrastructure and facilities implemented through PRTLTI and the development of world class research teams through PRTLTI, SFI and other research programmes.	Follow up the long term commitment to investment in the research infrastructure, facilities and programmes needed to carry out Ireland's future research programmes.	Government, relevant government departments and research funding organisations.
	Improved career structure for professional researchers.	Research funding agencies should, in evaluating the funding they distribute to individual institutions, examine how institutions are responding to the need to develop durable and coherent human resources policies to support a durable research capacity.	Universities and Institutes of Technology, supported by funding agencies.

Table 1: Recommendations and Follow up Actions arising continued

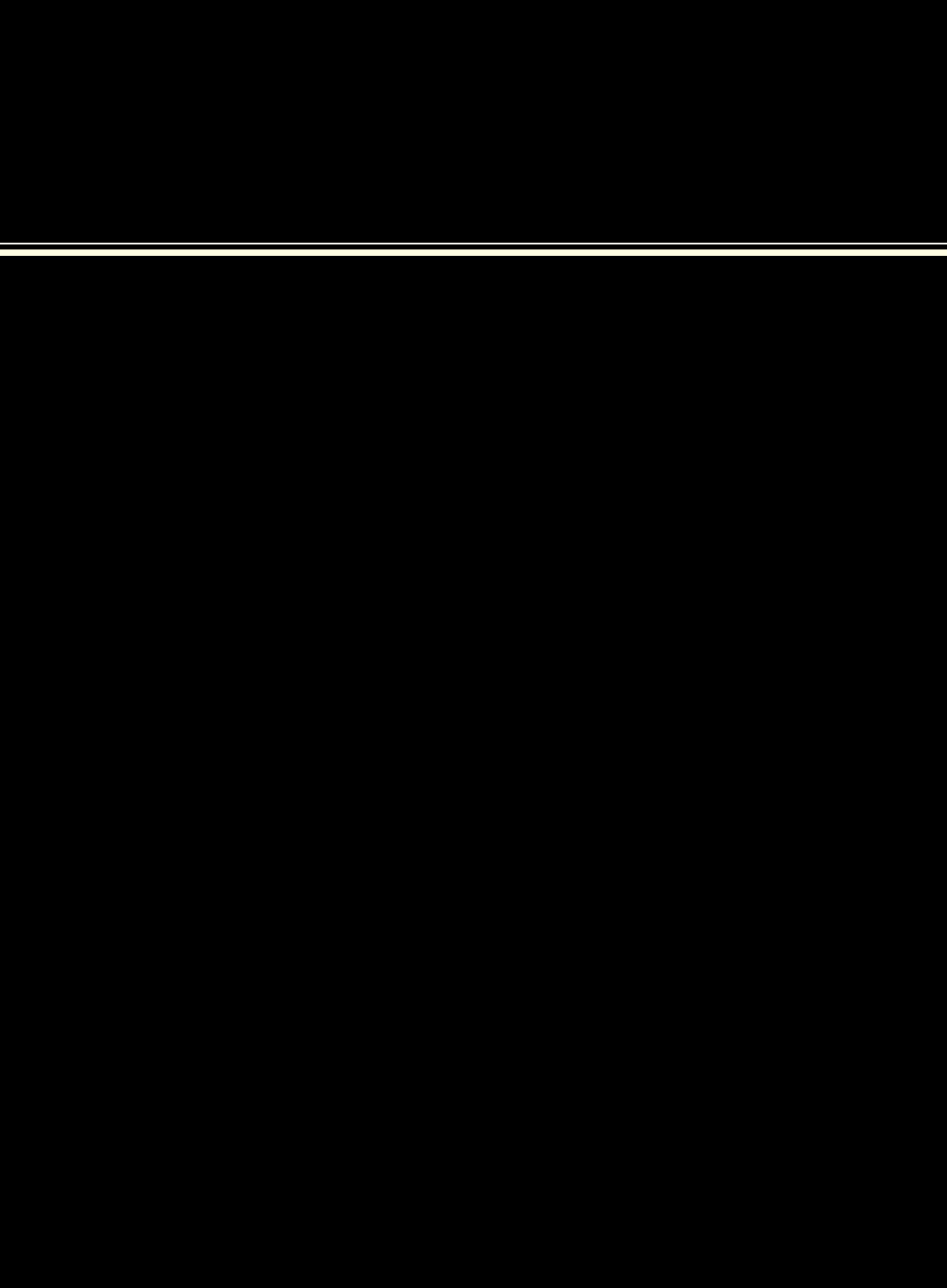
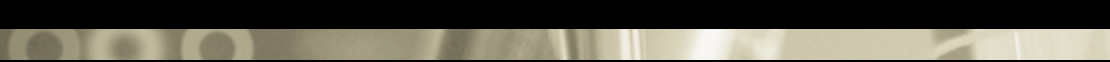
Strategic Challenges	Recommendations	Specific Actions	Research Funding Organisations
To attract and retain researchers.	Improved mechanisms to attract and retain overseas researchers.	<ul style="list-style-type: none"> ● Develop International Research Manpower Programme to attract postgraduates, post-doctorates and principal investigators. ● Build upon the agreement already reached between CHIU and the Department of Enterprise Trade and Employment on work permits for academics/ researchers. ● Review the fees structure for PhD students coming to Ireland from non-EU countries. 	Universities and Institutes of Technology, in consultation with the Department of Enterprise Trade and Employment and the Department of Justice, Equality and Law Reform.
To improve research training	Review postgraduate research training system	<p>Consider the future development of doctoral training with a view to establishing the:</p> <ul style="list-style-type: none"> ● Appropriate length of PhD training programmes. ● Benefits of a defined period of international study. ● Role of course work in PhD training and formation. ● Award of a Master's degree on completion of the appropriate modules of course work. ● Best practice for institutional support for PhD students during their study. 	The HEA in consultation with Universities and Institutes of Technology, HETAC and appropriate stakeholders should consider commissioning a comparative analysis of the systems of PhD formation in the EU and US.





List of acronyms used in the report

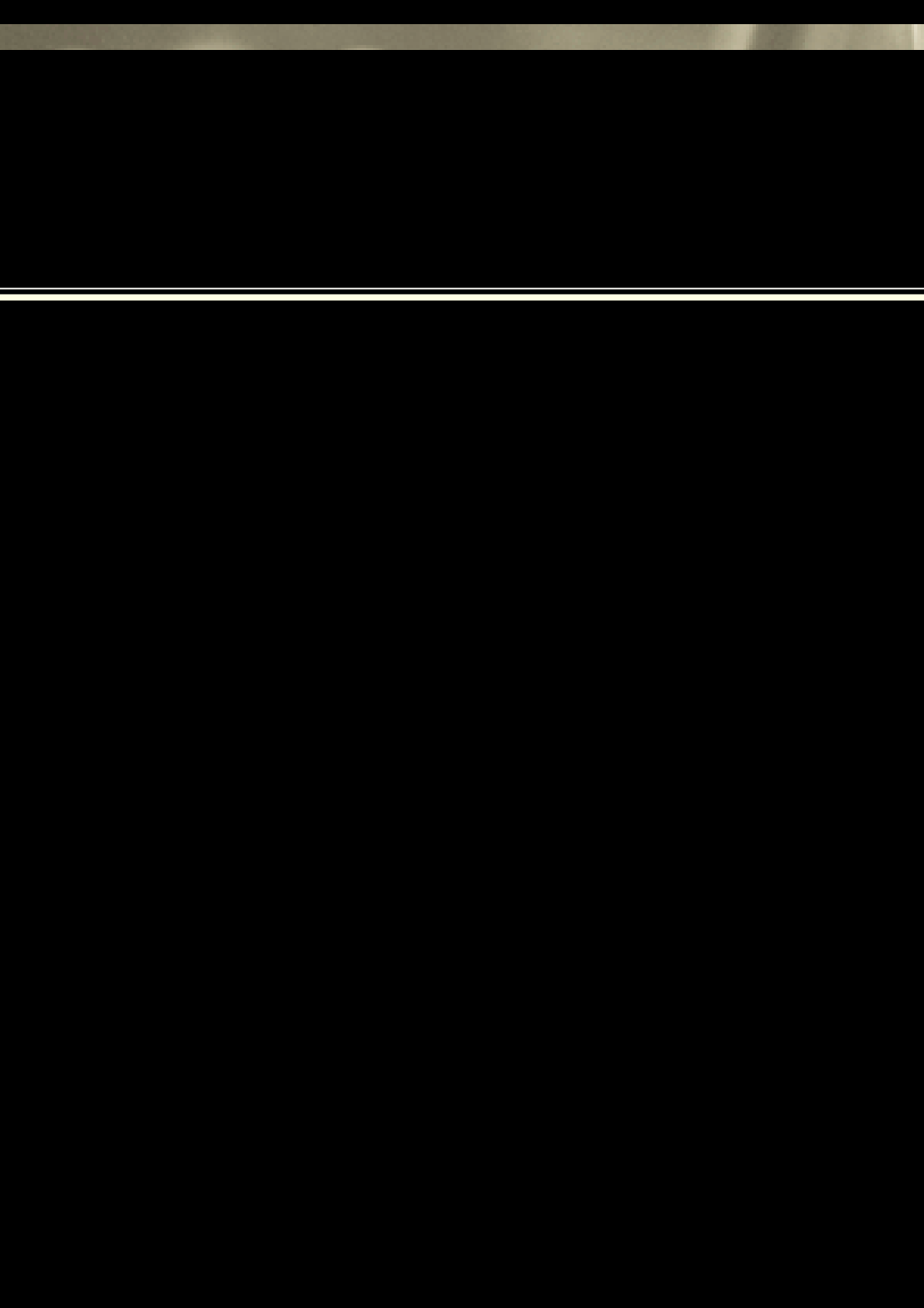
CHIU	Conference of Heads of Irish Universities
DIT	Dublin Institute of Technology
EGFSN	Expert Group on Future Skills Needs
EU	European Union
HEA	Higher Education Authority
HETAC	Higher Education and Training Awards Council
HRB	Health Research Board
ICT	Information and Communication Technologies
IRCHSS	Irish Research Council for Humanities and Social Sciences
IRCSET	Irish Research Council for Science, Engineering and Technology
NDP	National Development Plan
NQAI	National Qualifications Authority of Ireland
OECD	Organisation for Economic Co-operation and Development
PPS	Personal Public Services Number
PRTL1	Programme for Research in Third Level Institutions
SFI	Science Foundation Ireland





contents

FOREWORD	2
EXECUTIVE SUMMARY	11
1. Perspective	15
1.1 Demand	16
1.2 Supply	17
1.3 Impact of New Funding Initiatives	19
2. Generating an Enhanced Supply	21
2.1 Improved Career Structure for Professional Researchers	22
2.2 Postgraduate Research Stipend	23
2.3 Attracting Researchers from other Countries	24
3. Postgraduate Research Training	29
3.1 Review of Training System	31
4. The Next Strategic Step	34
Appendix 1 Membership of the Inter-Organisational Group	40
Appendix 2 Work Permit Scientific Visa System	40
Appendix 3 Factors Influencing the Transfer Rates of Undergraduates into Postgraduate Research	41



executive summary



Executive Summary

1. Perspective

1.1 Demand

1.1.1 As Ireland becomes an economy and society, driven by innovation, an increased demand is likely for postgraduate, postdoctoral and senior researchers. As this transition takes place, there will be greater demand from specific industry sectors, notably information technology, biotechnology and healthcare for doctoral graduates. This increased demand has been signalled by many sources including the Expert Group on Future Skills Needs.

1.1.2 In the publicly funded research domain, the recent investments by Government through the National Development Plan (NDP) has been instrumental in the creation of significantly enhanced research capabilities in third level institutions and in government research bodies, across a wide range of sectors including biotechnology, ICT, marine, food products, agriculture and health. Additional doctoral graduates to carry out research in the public sector will be required as innovation is embedded in every facet of Irish life.

1.2 Supply


1.2.1 A two-fold increase in the output of doctoral graduates would place Ireland among the leading OECD countries in terms of doctoral graduation levels. Such an increase should be sufficient to meet any additional demand that can be anticipated at this juncture.

1.2.2 The new funding sources should ensure that there is a balance between key specialisations being supplied with personnel in response to the identified needs of specific sectors as well as supporting research to ensure proofing of the system against less well-defined future needs.

1.3 Impact of New Funding Initiatives

1.3.1 The greater supply of doctoral graduates, generated by the much increased funding sources now available, will make a sizable contribution to meeting the increased demand.

1.3.2 To ensure that a serious shortfall does not arise, the recommendations outlined in Section 2 and summarised in Table 1 need to be actively pursued.



2. Generating an Enhanced Supply

2.1 *Improved Career Structure for Professional Researchers*

2.1.1 To provide the sustained supply, both from at home and abroad, of high-calibre PhD students, post-doctoral graduates and principal investigators, a human resources policy aligned to the strategic research programmes of universities, institutes of technology and related public services needs to be developed, setting out the career structure of professional researchers, remuneration, pension and other entitlements, as well as the contract conditions. (See 4.1 below.)

2.2 *Postgraduate Research Stipend*

2.2.1 To compete for the best graduates in the prevailing labour market, the annual stipend paid to PhD students needs to be reviewed by the funding agencies and third-level institutions.

2.3 *Attracting Researchers from Other Countries*

2.3.1 An international research marketing programme, designed to attract into Ireland postgraduates, post-doctorals and principal investigators from other countries needs to be developed and marketed.

2.3.3 To facilitate easier access into Ireland by high calibre researchers from abroad, the work undertaken by CHIU and the Department of Enterprise Trade and Employment needs to be continued and expanded to support researchers in moving to Ireland. (Appendix 2).

2.3.4 The practices in place for the payment of fees by PhD students from non-EU countries and the appropriate subvention to be provided by third level institutions and funding agencies needs to be reviewed.

3. Post-Graduate Research Training

3.1 Review of Research Training

3.1.1 To ensure the continued provision of doctoral graduates that match the best international standards, the HEA, with the higher education institutions, the NQAI and HETAC and in consultation with the funding agencies, should undertake a review of postgraduate training.

3.1.2 The proposed review should, among other issues, establish the need for and feasibility of providing PhD programmes of four years maximum duration and incorporating, in so far as appropriate, the following initiatives (1) a study period abroad of up to 12 months duration (2) structured course work leading to a Master's Degree, including modules on research management/administration, technology transfer, entrepreneurship, intellectual property and commercialisation of research.

4. The Next Strategic Step

4.1 To support the development of the research capabilities of the individual higher education institutions, and national capacity across the institutions, the research funding agencies should, in evaluating the funding they distribute to individual institutions, examine how institutions are responding to the need to develop durable and coherent human resources policies to support a durable national research capacity.

section one | Perspective



1.1 Demand


With Ireland's traditional competitive advantages being rapidly eroded, a shift must be made from an economy characterised by foreign investment and importation of technology to a situation where research and innovation become important drivers of sustained international competitiveness. Development of the indigenous research capabilities required to enhance knowledge production, improve the quality and relevance of Irish graduates, and translate new scientific and technological advances into marketable goods and services is a prerequisite to creating new competitive advantages. To prosper in an international knowledge-based economy requires a sustained investment in indigenous research capabilities, in the higher education institutions, research organisations and in various industrial sectors.

In response to the progressive shift to economic competition based on research and innovation, an increase can be expected in the number of researchers required in the immediate years ahead. The main drivers of the increased demand will include the:

- Need to enhance the intellectual capital throughout the economy.
- Sustained international competitiveness in the emerging knowledge-based global society and market.
- Increased staff turnover, in the immediate years ahead, in the public organisations engaged in research, and in the provision of scientific and technical services.

In response to the future knowledge-based economy, an increased demand for doctoral graduates is expected from specific industry sectors, such as information technology, electronics, pharmaceutical/biotechnology and the human and social sciences. Greater need for doctoral graduates might also be expected from the agri-food, construction and other indigenous industries as innovation policy becomes more widely embedded, and other associated policy changes and incentives are put in place. Developments in the public sector and in particular in the higher education institutions, will stimulate innovation more broadly and encourage industries to establish R&D facilities in Ireland.

In the short term, the main demand for the increased number of doctoral graduates is most likely to arise in the higher education institutions, public research bodies, as well as the veterinary and other state scientific and technical services. This demand is expected to rise rapidly over the next few years and then, as retirement posts are filled, drop back to a more "steady state". National aspirations to engage in more high-value and knowledge intensive industry, together with the significant research programmes being undertaken in Ireland, both in higher education and industry means, that the level of demand for such graduates is likely to be higher than before. The investment in training of post-doctoral graduates,



through the new State funding mechanisms, will be a key supplier of post-doctoral graduates for both public and private sector research.

Following from stated national strategic priorities, a significant proportion of the increased national demand for doctoral graduates will be in the sciences, especially in biotechnology. Indeed, given that biotechnology is the lynchpin of most future advances in the biological sciences, it is possible to envisage a qualification in biotechnology, either at undergraduate or postgraduate level, becoming a prerequisite for future research appointments or advanced level education and training, in such areas as agriculture, food, marine, veterinary medicine and pharmaceuticals.

Greater emphasis is being given by the universities and the institutes of technology to recruiting engineering graduates with doctoral degrees. With the exception of the information technology and pharmaceutical sectors, an increased demand for doctoral graduates from industry is not likely to be as strong as from the academic sector in the immediate short-term, but it is anticipated that this demand will increase in the future.

1.2 Supply

In 2000, six hundred and seventy graduates qualified for higher degrees in Science and Engineering (science, mathematics, computing, engineering manufacturing, construction, agriculture and veterinary) with close on 60% (355) being awarded PhD degrees.

In relative terms, Ireland's current output of science and engineering graduates and doctoral graduates conforms fairly well with the norm in other comparable countries. In a number of EU countries (Netherlands, Germany, Sweden and Spain), the US and Japan, science and engineering graduate output (as expressed per thousand of the labour force, aged 25-34) ranges from some 6 to 11 with higher rates in Ireland (13.4), UK (13.53), Finland (13.6) and France (14.3). The relative doctoral graduate output, as a proportion of total science and engineering graduates, ranges from approximately 4 to 6 in a number of EU countries (Spain, Ireland, UK, France and the Netherlands) and the US up to higher relative rates in Finland (7.1), Germany (10.8) and Sweden (13). The corresponding rate for Japan (2.3) is half that of Ireland (4.6).

If the recent output of doctoral graduates in Ireland (upwards of 300-400) was doubled over the coming years, this would place Ireland between Finland (7.1) and Germany (10.8) on the international league table, and well above the norm for a number of EU countries (Sweden, UK, France, Netherlands, Finland), the US and Japan.

It would be difficult to argue, on the basis of the information currently available, that this would not be sufficient to meet any anticipated need that can be quantified at this juncture. Provided the quality of the output can be ensured (see Sections 3 and 4), it may not be overly ambitious to contemplate a doubling in the annual output of doctoral science and engineering graduates in Ireland over a five to ten-year period. However, some of those currently engaged in the Irish research system feel that this output may be somewhat excessive, given the relatively low investment by industry in research and development.


Against this, there are clear indications that educational, research and industrial policy will be dependent on increasing output of doctoral graduates into the future. Nationally, industrial policy is focused on the need to promote and support knowledge-intensive industry and to promote “fourth level” for post graduate education. At EU level, the Lisbon programme has established a target level of EU expenditure in R&D at 3% of GDP by 2010 - most recent figures indicate that Ireland stands at less than half that level (1.39%)¹. In this context, there is a clear focus and drive to enhance the doctoral level output to meet a variety of national needs.

In relation to the expected needs of different industry sectors, such as biotechnology or information technology, an indication of the potential supply of doctoral graduates in the different disciplines can be gleaned from the number of grant applications submitted in 2003 to the Irish Research Council for Science, Engineering and Technology (IRCSET) in respect of post graduate research scholarships. Of the applications received in 2002, roughly similar proportions were to undertake research in computer science (19%), chemistry (18%), engineering (18%) and molecular biology (16%), with relatively smaller proportions in physics (10%), macro/micro biology (7%).

The number of applications received for grants in engineering was substantially higher than might have been expected. Together with those relating to computer science, they account for close on 40% of the total applications received. The receipt of over 40% of the applications in molecular biology, chemistry and macro-micro biology may be seen as a response to the increased demand for doctoral graduates envisaged from the pharmaceutical / biotechnology and environmental sectors.

In relation to the Government of Ireland Scholarships Programme, operated by the Irish Research Council for Humanities and Social Sciences (IRCHSS), the number of applications has exceeded the number of scholarships available by at least a factor of two in each year the scheme has been in operation, and in some years has considerably exceeded that ratio.

1. Towards a European Research Area Key Figures 2001 European Commission DG Research



For example, in the academic year 2003/04, the number of applications exceeded the scholarships awarded by almost a factor of 4.

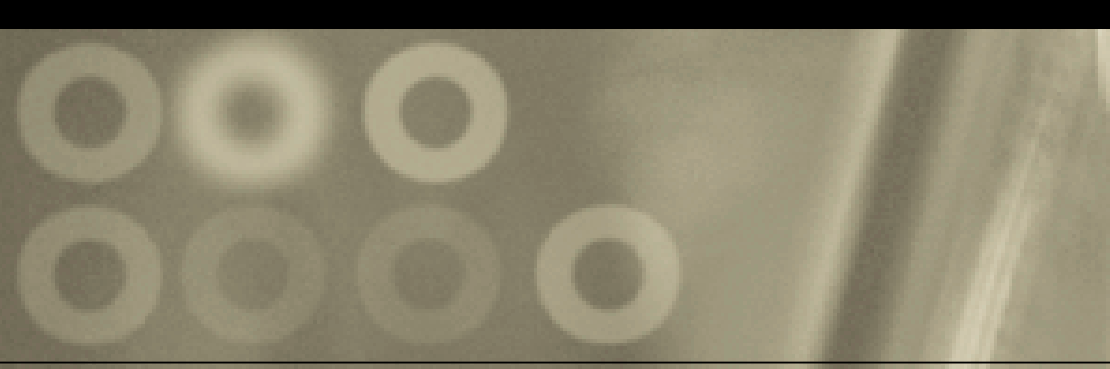
These deductions appear to herald an increased supply from 2004/5 onwards of doctoral graduates in biotechnology and information technology, the two industry sectors where greatest demand is most likely to be experienced. Clearly, however, these conclusions are predicated on the assumption of a continued supply of high quality graduates. In this regard the magnitude of the decline (of some one third from 1998 to 2010) in the cohort of school leavers underlines the importance of implementing the recommendations set out in this report.

1.3 Impact of New Funding Initiatives

Substantially increased funding for research in is being provided to the universities and the institutes of technology by new funding sources including:

- Higher Education Authority
- Irish Research Council for Science, Engineering and Technology
- Irish Research Council for Humanities and Social Sciences
- Science Foundation Ireland

These new funding sources should generate upwards of 250-300 additional doctoral graduates per annum over the coming years. This would make a sizeable contribution to meeting any overall increase in the total number of doctoral graduates that can be anticipated at this juncture. The disciplinary breakdown of the increased number of doctoral graduates needs to take account of identified national strategic research priorities, as well as other key research areas required to support economic and social development. Current strategic priorities have already been identified and are being provided for through the PRTL programme (supporting institutional research programmes) and SFI, (supporting the national Government priorities of ICT and biotechnology). However, in order to ensure that other areas of strategic importance are not overlooked, it is important that there is an ongoing process to identify and support wider national research needs. This would require a more top-down approach, involving the preferential allocation of funds to research areas of growing strategic importance.



Recommendation

To build a balanced research capability, a national oversight function for research should identify emerging specialisation needs in areas of strategic importance.

While the increased funding will make an important contribution to reducing the gap between the current supply and the anticipated demand for doctoral graduates, in order to ensure that a serious shortfall does not arise, the initiatives outlined in Section 2 need to be actively pursued.

section two | Generating an Enhanced Supply




2.1 Improved Career Structure for Professional Researchers

Lack of a proper career structure for professional researchers constitutes a major disincentive for postgraduates in Ireland to continue to PhD degree level. As outlined below it is also a serious obstacle to attracting greater numbers of doctoral graduates from other countries, especially those with well-supported research systems.

The professional education and training of researchers usually involves a series of stages over twelve years, comprising two four-year periods at undergraduate and postgraduate levels, followed by a four-year apprenticeship as a post-doctoral research graduate in order to become a fully qualified researcher. The majority of students who undergo long periods of education and training, for instance in medicine, law or business, can be fairly sure of obtaining relatively secure and well paid jobs within reasonable time periods. The converse is true of those who pursue careers as professional researchers. Following some twelve years of education and training, many researchers are faced with very uncertain career prospects, involving one or more term contracts and too few opportunities of securing permanent appointments. Many, especially in some areas of the sciences, become “*perpetual post-docs*” without any real prospects of securing a full-time research appointment. Apart altogether from the mortgage and other financial difficulties encountered in such circumstances, serious ethical issues arise in relation to the “*hit or miss career pathway*” currently open to young research scientists and engineers. These issues were strongly underlined at a meeting on *International Training and Support of Young Investigators in the Natural Sciences*, (2001 in Strasbourg), held in France under the aegis of the *European Science Foundation and the Human Frontline Science Programme* and attended by Directors and Senior Officials from various international and national organisations in Europe, the US and Canada. The published report of the meeting states that “... it is common for students to spend more than 10 productive, achievement-filled years as graduate and postgraduate fellows without any real prospect of obtaining a full-time academic research position.” It goes on to stress that... “This is causing a crisis at the entry-point of the traditional scientific pipeline”.

Further to this, a recent statement by the Royal Academy of Engineering confirms that Engineering Departments in UK universities are experiencing “great difficulty in recruiting high-calibre UK domiciled doctoral research graduates” and goes on to highlight “the relatively unattractive career opportunities”. In a similar vein, the Royal Society of Chemistry recently stressed the crucial importance of “competitive salaries; good opportunities for career progression; and a conducive working environment” in recruiting high-quality scientists and engineers.



Ireland's research capacity is becoming increasingly dependent on PhD students, doctoral appointments and term contracts. To build durable national research capabilities/centres, a proper career structure for professional researchers is urgently required, involving in particular the creation of permanent research posts in higher education institutions and taking into account the recently agreed guideline salary scale for researchers in universities. The availability of such posts would also go a considerable way to meeting the requirements of the EU Directive on Fixed-Term Work and also the Wellcome Trust for eventual tenure to be provided to researchers.

Recommendation

To provide the sustained supply, both from at home and abroad, of high-calibre PhD students, post-doctoral graduates, principal investigators and other senior researchers, a human resources policy aligned to the research strategies of the universities, institutes of technology needs to be developed as a matter of urgency, setting out the career structure of professional researchers, remuneration, pensions and other entitlements, as well as the contract conditions.

2.2 Postgraduate Research Stipend

While the level of the stipend is clearly a consideration for those contemplating a research career, security of funding for up to four years is vitally important in getting high quality postgraduates to pursue PhDs in Ireland. From a very low base of typically €2,500 - €3,800 in the early 1990's, the actual payment which research students receive per annum has been substantially increased in recent years through the new funding sources. In the case of science and technology, IRCSET, under the Embark initiative currently pays a rate of €19,100 for post graduate scholarships. Of this, €12,700 is the student stipend and €6,400 is allocated to fees, international travel, consumables, and a bench fee. At least in those areas covered by the new funding sources, this long-standing problem is now being addressed.

Having regard to the fact that half of recent graduates with primary degrees secure salaries in excess of €21,500 to €24,000, consideration needs to be given to ensuring that postgraduate stipends are competitive with prevailing labour market conditions – otherwise continued difficulties will be encountered in securing the necessary calibre postgraduates especially in areas such as veterinary medicine.

Recommendation

A review by all funding agencies and third level institutions of the stipend paid to PhD students needs to be carried out, taking account of prevailing economic circumstances.

2.3 Attracting Researchers from other Countries


The €2.5 billion allocated for research under the NDP 2000-2006 is a vital element in building state of the art laboratories and upgrading existing infrastructure. However to capitalise on these developments Ireland must both retain its best researchers and attract the best from abroad. Researchers operate in a global market and Ireland must compete with countries such as the US and UK. Even where state of the art facilities and competitive salaries are provided, legal and administrative obstacles can hinder the attraction of researchers to Ireland.

Such impediments have been identified in the joint HEA and Forfás report entitled *Benchmarking Mechanism and Strategies to Attract Researchers to Ireland* (2001). The report points out that there is currently insufficient information provided centrally for incoming researchers. Accordingly, it goes on to recommend the creation of a clearing house that would provide information on all aspects of researcher mobility: visa, work permits, social welfare, language courses, housing etc.

The European Commission has emphasised the need for more abundant and mobile human resources in research. This is seen as one of the major instruments to enhance the transfer of knowledge and to boost the European Union's attractiveness for research talent from all over the world.

In response to this, the Lisbon European Council (22/23 March 2000) invited the Commission, in close collaboration with the Member States, to take the necessary steps to remove the obstacles to mobility by 2002. This objective was further emphasised by the Council Resolution of 15 June 2000.

In order to respond to the Lisbon mandate, a High Level Group of national experts was set up in the Summer of 2000 to help the Commission identify and assess the various types of obstacles and to propose solutions for their removal. Based on the conclusions of the High Level Group, the Commission adopted (20 June 2001) a Communication entitled "A Mobility Strategy for the European Research Area" which proposed a series of concrete measures to improve the overall environment for researchers in Europe. One of these measures proposed setting up a European network of mobility



centres, designed to provide researchers and their families with information and assistance in matters pertaining to their professional and daily lives.

In implementing this initiative, the Commission set up (October 2001) an informal group of experts with the objective of helping the Commission to define the structure and the missions of the new network. The group of experts also provided valuable help in identifying the organisations which provide the above-mentioned services in the Member States and candidate countries.

In the document entitled *“Towards a European Network of Mobility Centres”* the European Commission pointed out that there are *“generally no one-stop information offices available”* and that, as a consequence, *“communication and co-ordination among public organisations is poorly organised and administrators are not aware of all of the information available”*.

While there is no single information office in Ireland good co-ordination exists between public organisations on some mobility issues. For example, FÁS provides a wide range of information collected from different Government departments on job opportunities in Ireland and related mobility issues (visa, work permit, accommodation, etc.). The OASIS website provided by the Government, facilitates easy access to information on mobility. For researchers moving to Ireland their first point of contact is usually a third level education institution, research organisation or company. The universities have a long history of hosting foreign researchers and have staff in the personnel offices familiar with mobility issues. This is not always the case with the institutes of technology, companies and other research organisations.

It has been agreed with the Department of Enterprise and Employment (as the government department responsible for labour market regulation) that the Conference of Heads of Irish Universities (CHIU) will act as the Mobility Centre for Ireland by acting as a hub in the provision of all information relating to researcher mobility to and from Ireland.

From a number of viewpoints, Ireland’s research system would be significantly enhanced by an accelerated intake of higher calibre researchers from other countries. At a very basic level, international researchers, coming from a variety of diverse backgrounds, can have a positive and innovative impact upon the research system, bringing new ideas and experiences, and enhancing creativity. Integration of a substantial number of well-qualified PhD students and post-doctoral researchers into the system would also ensure that the anticipated increase in the demand for researchers is met, both in terms of numbers and emerging specialisations. Even more importantly, a sizeable number of world-class principal investigators is an urgent requirement. By raising the international standing of Irish research teams/centres, they would bring about a more rapid

influx of high-calibre PhD students and post-doctoral researchers from other countries. Added to this, their expertise and knowledge would provide the integrating force required to build new research capabilities with the necessary critical mass. To attract a substantial number of researchers from other countries, whether at doctoral, post-doctoral or principal investigator level, a number of common preconditions must be met.


Among the first things looked at by researchers from other countries who are contemplating opportunities in Ireland are the:

- Actual strength of the Irish research teams/centres relative to other countries with well-developed research systems, and in particular the international standing and critical mass of the research teams.
- Financial and other resources provided, including the quality of facilities, equipment and funding opportunities.

Ireland has some research teams that meet these essential criteria and with the support of the new funding sources already referred to others are rapidly progressing towards that position. However, even where these requirements are satisfied the incentives outlined below are needed in order to attract high quality researchers from abroad in any significant number.

Immigration Controls: The visa, and more especially the work permit system, has been a major obstacle to attracting researchers into Ireland. There is now an agreement in place between CHIU and the Department of Enterprise Trade and Employment that simplifies the work permit procedures for research/academic university staff. This will reduce significantly the amount of time required to obtain a work permit. Other important issues that need to be addressed in the proposed Scientific Visa System are outlined in Appendix 2.

Universities in the USA, Europe and elsewhere are taking productive initiatives to attract researchers from Eastern European countries that are producing graduates in excess of their own needs, including researchers with high levels of capability in rapidly developing areas of science and technology. One specific initiative that Ireland should take in this regard is to earmark a proportion of the new research funding for an International Research Marketing Programme designed to attract into Ireland high quality PhD students, post-doctoral researchers and principal investigators from abroad. SFI have already begun such a process in relation to researchers in the specific areas of biotechnology and ICT. It is also necessary to have regard to research specialisations outside those two particular areas. Such a programme would not necessarily require a high proportion of overall research funding – some 1% of research allocations could make a significant contribution in attracting overseas researchers.



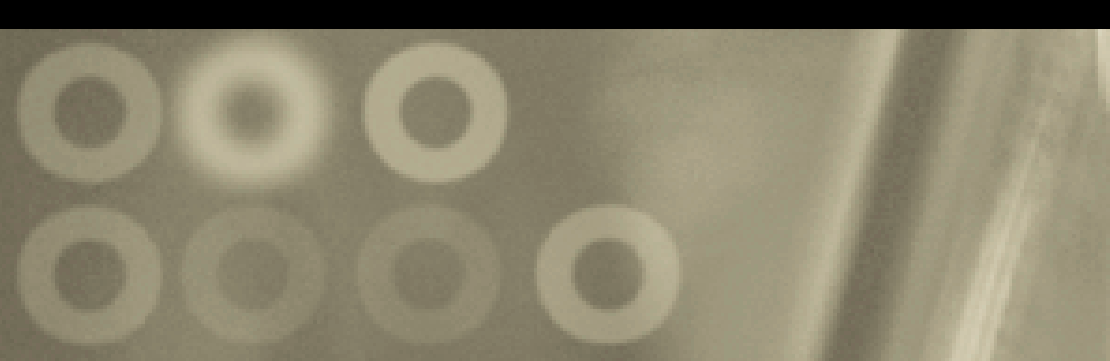
The innovative application of immigration controls, together with the targeting of research funds, would be instrumental in attracting into Ireland high-calibre researchers from Eastern European countries. However, in order to ensure an inflow of high calibre researchers it is essential to improve the career structure for young researchers. Uncertain career prospects will militate against attracting doctoral candidates and graduates from countries with well developed research systems – even if term contracts have relatively high remuneration levels.

PhD Student Fees: The fees imposed on research students from non-EU Countries being educated in Ireland is an impediment to attracting high quality PhD students into Ireland. In response, some institutions are already charging reduced fees to non-EU students. This practice should be reviewed and, in general, given the growing constraints under which universities are operating, the possibility of the research funding agencies part-funding the PhD fees of high calibre postgraduates from non-EU countries should be examined.

Accommodation: An important incentive in attracting and retaining high quality researchers, especially principal investigators, is the availability of residential accommodation. Further details on some innovative approaches taken in the UK to assist visiting researchers in acquiring temporary and permanent accommodation are given in the HEA report entitled *Attracting and Retaining Researchers in Ireland*.

Induction Training Programme: To ensure that overseas researchers are fully integrated into research teams/centres and contribute to the development of the Irish research system, an induction training programme should be provided, to familiarise them with the culture and objectives of the research teams/centres, the necessary understanding of the Irish and EU research systems, including the preparation of grant proposals as well as the wide range of socio-economic issues which they will be required to deal with, such as taxation, health services, social welfare, pension entitlements, etc. As further detailed in the aforementioned HEA report, the induction training programme should be modelled along the lines of those provided by the more advanced companies based in Ireland.

Permanent Posts: In relation to principal investigators in particular, an issue of central importance is the prospect of securing a permanent post towards the end of their contract as project/programme leaders. This important requirement is dealt with in Section 4.



Recommendations

Building upon the agreement already reached between CHIU and the Department of Enterprise, Trade and Employment, further work needs to be carried out to facilitate researchers in locating in Ireland. (see Appendix 2).

An International Research Marketing Programme designed to attract into Ireland postgraduates, postdoctorals and principal investigators from other countries needs to be developed and marketed.

There is some diversity of approach in regard to the payment of tuition fees by PhD students from non-EU countries. Some institutions provide subventions. This practice should be reviewed and the possibility of research funding agencies part-funding the fees that PhD students from non-EU countries are required to pay, should be examined.

section three | Postgraduate Research Training



The concern with supplying the numbers to meet expected needs must, of course, be matched with an equal, if not greater, pre-occupation with the quality of the doctoral graduates. The goal must be *To Produce Better, Not Just More*.

The survey outlined in Appendix 3 on the factors influencing the transfer rates of undergraduates into postgraduate research, points out that in addition to the need for improved levels of financial support, there is a need for wider access to information on postgraduate research opportunities and application procedures, better selection of research topics combined with more effective supervision and less uncertainty about the length of time taken to complete postgraduate degrees especially PhD projects.

While there is no documented evidence of a deterioration in quality, increasingly questions are being raised about the continued provision of doctoral graduates that match the best international standards. The concerns expressed range from the:

- Projected sharp decline in the cohort of school leavers, and thus potential research students
- Progressive reductions in entry-point requirements to under-graduate courses in some areas
- Proficiency of new entrants in the basic science and mathematics subjects
- Capacity of some university departments and institutes of technology to cope with increasing numbers of PhD students, especially from the viewpoint of proper supervision
- Intellectual development of postgraduate students
- Improvements required in doctoral training

Clearly these are issues of fundamental importance in determining the future supply of high quality doctoral researchers. In particular they highlight the critical need to achieve the optimum balance between quantity and quality. When taken together with the perceived weaknesses in postgraduate training outlined in Appendix 3 and the concerns raised by a number of people currently engaged at various levels in the Irish research system, they underline the importance of the HEA, with its statutory function for the development of third-level education, being centrally involved with other stakeholders in all funding and other initiatives that affect postgraduate research and training.

Steps being taken within the higher education sector to address the issues referred to above include the development of quality assurance procedures by the universities, and also by the institutes of technology and the Dublin Institute of Technology in conjunction with HETAC and the NQAI. Procedures for a systematic review of the quality of research



postgraduate training and outcomes, provide a means to identify issues of concern, and to consider means for improvement.

Institutions are increasingly proactive in terms of reviewing and, where appropriate changing the structures to support students undertaking research. For example, recent university strategic plans have given considerable focus to improving the quality of research, and inter alia, include the objective to provide a more structured approach to PhD programmes, involving greater attention to principles, methodology and ethics of research, and to develop a more systematic approach for the supervision of postgraduate research.

3.1 Review of Research Training System

Arising from the concerns outlined above, it is now timely to undertake a review of structures for postgraduate research training in Ireland. This review should be undertaken by the HEA with third level educational institutions and in consultation with the NQAI and HETAC. In addition to the concerns listed above, and taking into account the Bologna process underway in Europe to bring greater convergence into higher education awards, the review should consider the need for a revamped system of doctoral training, possibly a system of four years maximum duration, with the first year devoted to courses with modules on research methodology, as well as technology transfer and entrepreneurship. Perhaps a hybrid of the present thesis-driven system and the more course-based systems common in the USA and elsewhere might be a way forward? The awarding of a Masters Degree on the successful completion of the prescribed courses would have merit both from the viewpoint of providing an incentive to attend the courses and also as a formal qualification for those who decide to opt out of research, to pursue other careers for instance in the business sector, teaching or administration.

Recommendations

The HEA, with the third level educational institutions and with the NQAI, and HETAC, and in consultation with funding agencies should undertake a review of postgraduate training of scientists and engineers, with a view to developing a revamped system of doctoral training, possibly of four years maximum duration, with the first year devoted to course-work and leading to the award of a Master Degree.


Innovative training programmes need to be developed and implemented to facilitate the transition of research graduates to becoming independent researchers, rather than members of collaborative teams.

Study Period Abroad

An important feature of Ireland's research system is the substantial number of staff in the universities and research institutes who have undertaken PhD degrees and have postdoctoral experience in the US, UK and elsewhere and who brought with them emerging techniques/methodologies, when they took up research appointments in Ireland. This important mechanism for the importation of technology could be severely curtailed if the Irish research system produces the bulk of its own doctoral graduate requirements. To ensure that the system takes account of developing practice and trends in other countries, a structured study period abroad of up to twelve months duration and appropriately funded should, in general, be encouraged as an inherent component of PhD training programmes. This should be undertaken in a university or research organisation with a proven track record of scientific achievement, where the postgraduate student would have the opportunity to become conversant with the most up-to-date research techniques and be exposed to a research environment beyond that of the home laboratory/department.

Recommendation

A structured study period abroad of up to twelve months duration, and appropriately funded should be made available to PhD students and where necessary, post-doctoral students involving the provision of Post-Doctoral Fellowships.



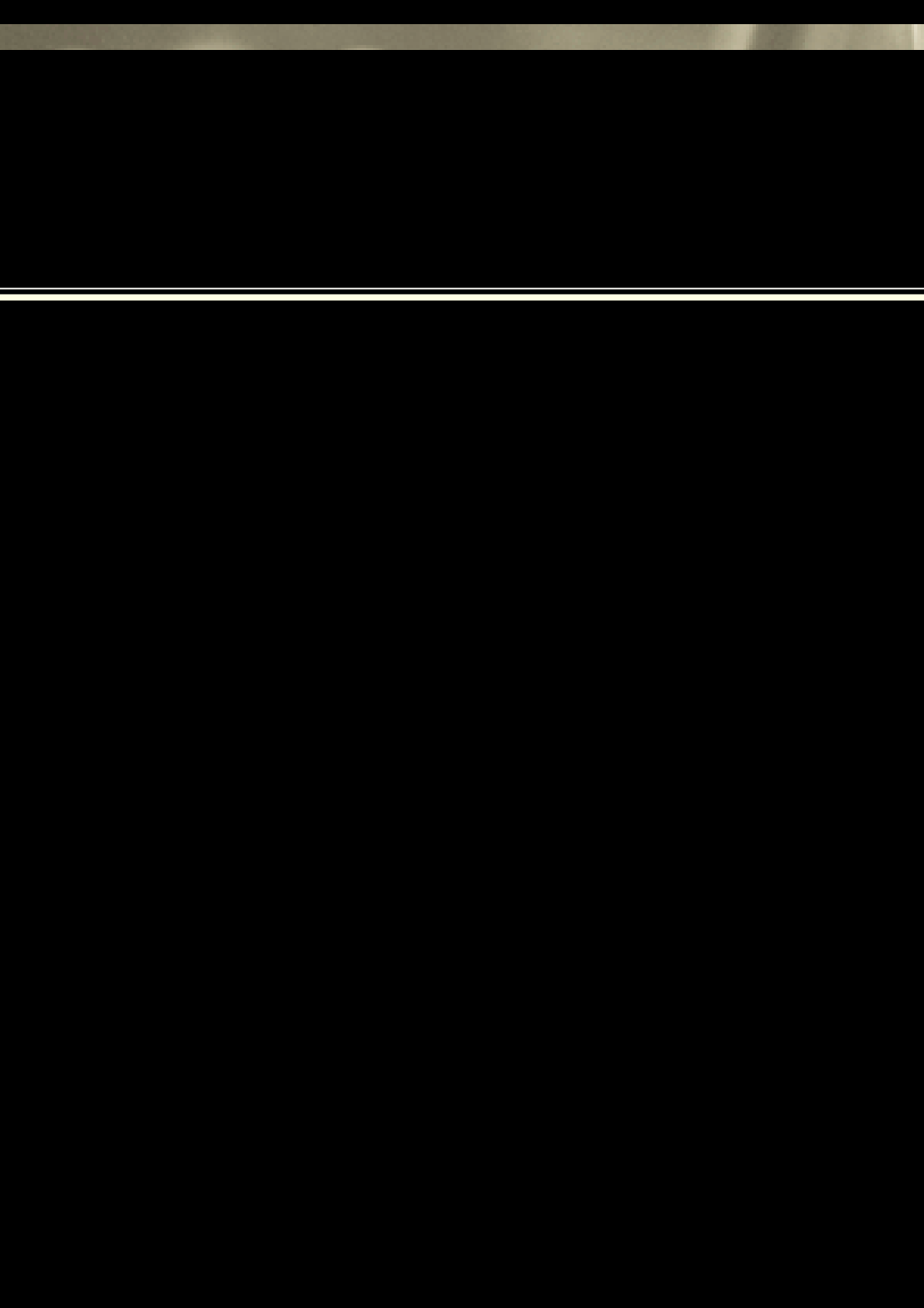
Wider Career Horizons

Many doctoral graduates progress to becoming leaders of research teams and a number make the transition to research managers, requiring skills in planning, financial management, human resource development and negotiations comparable to those needed in senior management positions in the private sector. Others leave research shortly after acquiring the PhD degree to avail of career opportunities arising in industry, business and public administration. To provide the foundation for the broadening range of professional opportunities becoming available to well qualified science and engineering graduates, doctoral training programmes should include courses on research management/administration, technology transfer and entrepreneurship, as well as exposure to the processes involved in making “mind-shift” required in the transition from research performance to research management.

The importance of having a wide exposure to various disciplines and career opportunities was strongly endorsed at the aforementioned meeting on International Training and Support of Young Investigators in the Natural Sciences. The report on the meeting states that... “research training requires a broader didactic base and experiences [for student graduates and more particularly doctoral fellows who too frequently] are treated as highly-skilled and hard-working assistants rather than scientific minds in training”. In stressing the widely recognised need for “innovative programmes to facilitate the transition to independence for their most promising investigators” the report of the conference concludes that “student-centred training environments for doctorates, as well as research students, are urgently needed for the health of the scientific enterprise”. Such innovative PhD training programmes are required in Ireland if the projected increase in doctoral output is to enhance the intellectual capital of the various economic sectors to the levels necessary to sustain international competitiveness in the emerging knowledge-based society.


Recommendation

To facilitate the transition from research performance to research management, doctoral training programmes should include courses on research management/administration, technology transfer and entrepreneurship.



section four | The Next Strategic Step





Ireland is at the transition stage in building the indigenous research capabilities required to create competitive advantages and support broader national development. Considerable investment has already been made in building up the physical infrastructure necessary to carry out world-class research programmes. The next strategic step towards the establishment of sustainable and durable national research capabilities is to put in place and support the appropriate human resources to undertake national research programmes. This report seeks to support institutions and research funding agencies and indeed Government in addressing this strategic step.

The challenge for the higher education institutions and for the research funding agencies is to put in place improved structured career opportunities to attract and support undergraduates, PhDs and post-doctorals, from both Ireland and abroad, to become research active personnel within the Irish higher education system. By research active is meant that these personnel who, as members of the academic institution, would make a substantial contribution to research programmes, whilst also being involved in teaching and other activities within the institution.

The availability of such opportunities is central to addressing the growing concerns which led to the commissioning of this report. These concerns include -

- How to attract and retain world class researchers from other countries, especially principal investigators in the absence of the prospect of permanent appointments being available after the end of their contracts (see paragraph 2.3).
- The need to retain high quality researchers trained in Ireland and build up the national research system (see paragraph 2.1).
- The need to develop a proper career structure for professional researchers (see paragraph 2.1) and meet the requirements of the EU directive on fixed term contracts and those of the Wellcome Trust in relation to eventual tenure being provided to researchers.

The development of structured career opportunities for research active personnel that addresses these key requirements is the next strategic step in building the indigenous capabilities essential for Ireland to make the transition to “an innovation society” with sustainability and durable research teams and centres in the higher education institutions.



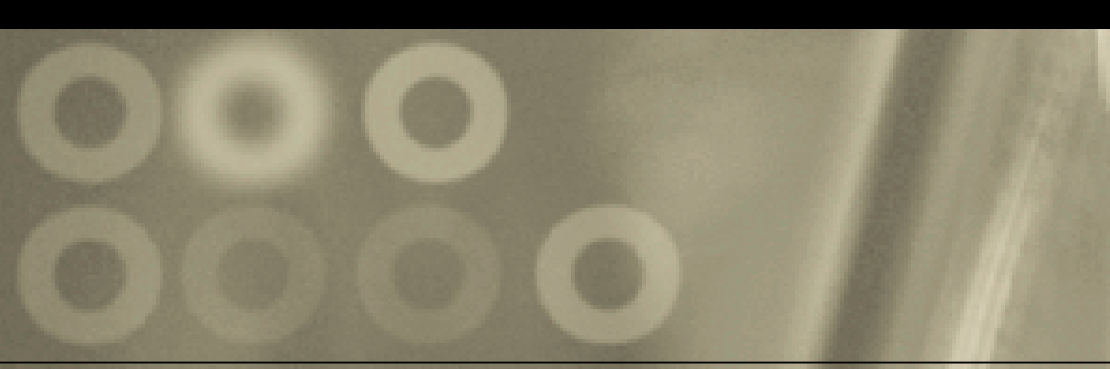
While many of those engaged in the Irish research system recognise that such a strategic step will have to be taken, a number of important issues arise in relation to the concept. In particular:

- The essential link between teaching and research needs to be maintained.
- An appropriate balance needs to be maintained between contract posts and the opportunities for permanent and tenured positions, including the contract conditions that should be attached to such posts.
- The different requirements of individual universities and institutes of technology need to be taken into account.
- These additional career opportunities must be aligned with the strategic research direction of the individual third level institutions.

Clearly these are issues of importance to the higher education institutions, in the shaping of their research strategies and in the development and maintenance of their human resource policies. Institutions have a responsibility to undertake a strategic approach to the management and development of their human resources, both from the viewpoint of their own institutional research programmes, but also in the context of the over-arching aim of building durable national research capabilities and centres.

The funding agencies, including the HEA, SFI, HRB, EI and research councils, must also take account of the vital importance of developing sustainable national research capacity. A critical element of such capacity building is the development of an effective human resource strategy. Therefore in evaluating the impact of the funding they allocate to higher education institutions, funding agencies must assess how well the institutions are gearing themselves to achieve this goal. The review of university strategic plans being undertaken by the HEA provides an opportunity for such a stocktaking exercise. Other agencies will have different opportunities to engage with the institutions they are funding to undertake similar evaluation and provide appropriate support.

Finally, underpinning this process is the long-term national commitment to continued investment in research. Security of funding is an essential element in the development of a strategic approach to building durable research capabilities/centres.



Recommendation

In order to support the development of the research capabilities/centres of the individual higher education institutions, and national capacity across the institutions, the research funding agencies should, in evaluating the funding they allocate to individual institutions, examine how institutions are responding to the need to develop durable and coherent human resources policies to support a durable research capacity.

appendices



Appendix 1

Membership of the Inter-Organisational Group

Dr. Don Thornhill (Higher Education Authority) Chairman of the Group
Dr. Marc Caball (Irish Research Council for Humanities and Social Sciences)
Dr. Anne Cody (Health Research Board)
Mr. Fergal Costello (Higher Education Authority)
Mr. Michael Fitzgibbon (Forfás)
Professor Robert Forster (Conference of Heads of Irish Universities)
Mr. Martin Hynes (Irish Research Council for Science Engineering and Technology)
Mr. Bob Kavanagh (Dublin Institute of Technology)
Mr. Martin Lyes (Enterprise Ireland)
Dr. Eucharia Meehan (Higher Education Authority)
Dr. Patricia Mulcahy (Council of Directors of Institutes of Technology)
Dr. Conor O'Carroll (Conference of Heads of Irish Universities)


Appendix 2

Work Permit Scientific Visa System⁽¹⁾

In designing an incentive package to attract researchers from other countries into Ireland, a fast-track visa and permit system should be an inherent component of such a package. The work already completed by CHIU with the Department of Enterprise Trade and Employment to develop a simplified procedure for research/academic staff to obtain a work permit is an important initiative in this regard. Other areas requiring attention include the following:

- **Accompanying Dependants:** The acquisition of visas and work permits constitutes a serious difficulty, for the spouses/partners and children of visiting researchers. Greater flexibility in this area would be helpful in attracting researchers from abroad.

(1) For further details see the HEA Document entitled Attracting and Retaining Researchers in Ireland (June 2002).

- 
- **Citizenship:** Application for citizenship through residence qualifications, is difficult and time-consuming and should be fast tracked for visiting researchers.
 - **Administrative Requirements:** A number of other issues such as securing a PPS number, obtaining tax credits and avoiding emergency taxation, as well as problems arising from temporary addresses should, in so far as possible, be considered in developing a proposed Scientific Visa System for researchers.

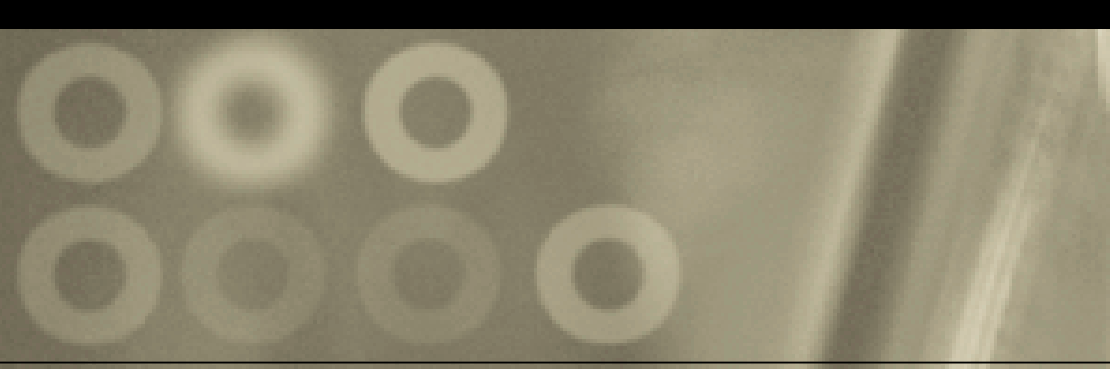
Appendix 3

Factors Influencing the Transfer Rates of Undergraduates into Postgraduate Research

While the number of first degree graduates in Science and Engineering as a proportion of the relevant age cohort is among the highest in the world, the transfer rate from undergraduate study to postgraduate research is lower in Ireland than in other countries. In order to explore empirically the reasons for this a small-scale focus group study was jointly commissioned by HEA and Forfás. Six focus groups were convened, each with 6-8 participants, representing final year science and engineering students in universities and institutes of technology as well as first and second year PhD students. The aim of the study was to identify factors influencing the transfer rate of undergraduates into postgraduate research.

The survey findings highlight a lack of information available to undergraduates with regard to career paths and postgraduates opportunities. The survey also identified a broad lack of awareness of postgraduate research options, including application procedures, timing and funding, and a need for improved information dissemination and career guidance.

The survey indicated that postgraduate research topics are generally selected on an ad hoc basis and that the introduction of a formal application procedure for specific PhD research projects could yield beneficial results, especially if combined with deadlines set well before the examination season. The degree of ambiguity involved in selecting a particular topic would also be reduced and a better match between student and their enthusiasm for a particular research topic could be obtained. The uncertainty surrounding the length of time the degree could take to complete is also an inhibiting factor.



The survey findings also illustrated the need for providing interpersonal and academic support to postgraduates. Those surveyed suggested that it would be constructive to implement a mentor system and guidelines/regulations for supervisors to ensure that all postgraduates receive adequate and quality supervision. There is currently no system in place which monitors the supervisor's role and students stated that the quality of supervision varied widely.

The survey identified a range of practical suggestions that the higher education institutions could take to facilitate potential postgraduate students. Improved levels of financial support were a common request from all the groups.

