



Staying the Course

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Advisory Council for Science
Technology and Innovation
An Comhairle Eolaíochta

Introduction

Public investment in research and the attraction of research talent are pre-requisites for a strong innovation economy. Ireland has just put itself on the global research map and become known as a country doing excellent science. We have the opportunity now to hold our nerve and continue to grow a research system with an energetic and well-resourced research community at its heart.

It is critical, if we are to achieve our employment and export goals, that we maintain our commitment to science and technology as a central element of our industrial policy. There is a significant risk that, if we fail to remain committed, we will not only make no further progress but we may also undo and undermine the growth and progress which we have made to date.

The challenge now is to stay the course.

Ireland began to strengthen its science and technology base in the late 1990s. Science Foundation Ireland (SFI)¹, which celebrated its tenth anniversary in 2010, has become the lead agency in supporting and seeking to create critical mass in basic and industry oriented research. Its activities, when combined with the actions of Enterprise Ireland, the Higher Education Authority and IDA Ireland in their core areas of responsibility, enabled us to:

- develop world-class research capabilities in strategic technologies,
- facilitate the undertaking of R&D in this country by multinational companies in order to support the further development of that sector in Ireland
- attract more high technology investment by companies into Ireland, and
- enhance the environment for the creation of new technology-based firms in Ireland.

Despite the difficult economic climate, Ireland continues to support research and innovation as key priorities for economic and employment stability and growth. The Council recognises and applauds this commitment by Government.

This is a time for innovative measures to be taken swiftly, based on good policy advice grounded in evidence. The Council itself, with the support of Forfás, will continue to seek to provide well-founded policy advice to Government on issues of science, technology, engineering and innovation. During 2011 we will focus on:

- sustainability of research centres,
- preparations for the upcoming Eighth EU Framework Programme for Research and Technological

¹ Science Foundation Ireland arose out of a Technology Foresight Exercise under the auspices of ICSTI, the Irish Council for Science, Technology and Innovation, managed by Forfás. <http://www.forfas.ie/publication/search.jsp?ft=/publications/1999/Title,3695,en.php>



Development (2014-2020), and

- prioritising our national research efforts in science, engineering and technology.

By working together we will be able to sustain and grow our science and industry base for socio-economic benefit and the Council will play its part in helping to address the current economic crisis.

The Current Status of Science, Technology and Innovation in Ireland

The Council welcomes the announcement by the Government in September 2010 of spending plans with €2.4 billion of support for science, technology and innovation over the next six years to create new high-quality jobs, in a recognition that short-term measures will not suffice.

In addition to the Smart Economy initiative, Ireland is building on policy measures in science, technology, engineering and innovation which have been put forward in recent times by several Government Departments. The recent Forfás report “Making It Happen: Growing Enterprise for Ireland”² highlights the need for sound and coherent policies to support a strong industrial base in Ireland, one founded on existing established and growing enterprises, including services.

The energy White Paper “Delivering a Sustainable Energy Future for Ireland 2007-2020”³ sets out a clear path for meeting the goals of ensuring safe and secure energy supplies, promoting a sustainable energy future, and supporting competitiveness. The recently launched agri-food strategy “Food Harvest 2020”^{4 5} highlights the importance of investment in research and development as essential to meeting changing consumer demands and realising new growth opportunities. “Sea Change: A Marine Knowledge Research and Innovation Strategy for Ireland 2007-2013”⁶ seeks to achieve a complete transformation of the Irish maritime economy. The “Strategic Plan 2010-2014”⁷ of the Health Research Board aims to build our competence in clinical research, grow our capacity for population health sciences and services and improve healthcare through increased use of evidence based decision-making, better information management and the application of the best research. The Council warmly welcomes progress in the health area following on from its own early work on health research in Ireland⁸.

In reviewing the status of science, engineering and research in Ireland, the Council is aware that the measurement base relies heavily on the metrics of publishing. It is pleasing to note that the published output of the research base in Ireland has grown rapidly, more than doubling between 1998 and 2007 with associated very positive increases in citation impact rates⁹. It is not realistic to expect that every research output will be of value to the market place and commercial outputs of research can take a long time to come to fruition. It is, however, realistic to now put in place appropriate indicators which will enable us to extend our measurement of research outputs beyond those of bibliometrics, given that some research is beginning to cross the bridge to commercialisation. The Council values the efforts being made at national and EU levels to establish a measurement base of non-bibliometric indicators to complement bibliometric ones. One such is the indicator on the share of fast-growing innovative companies, currently being developed at EU level¹⁰. It is important that measurement and evaluation be supported in the research

² <http://www.forfas.ie/publications/2010/title,6807,en.php>

³ <http://www.dcenr.gov.ie/Energy/Energy+Planning+Division/Energy+White+Paper.htm>

⁴ <http://www.agriculture.gov.ie/media/migration/agri-foodindustry/foodharvest2020/2020FoodHarvestEng240810.pdf>

⁵ <http://www.agriculture.gov.ie/research/>

⁶ <http://www.marine.ie/home/SeaChange.htm>

⁷ http://www.hrb.ie/uploads/tx_hrbpublications/HRB_Strategy_2010-2014_01.pdf

⁸ “Towards Better Health: Achieving a Step Change in Health Research in Ireland” (2006) Advisory Science Council

⁹ <http://www.sciencecouncil.ie/publication/ascSearch.jsp?ft=/publications/2006/title,3254,en.php>

⁹ http://www.forfas.ie/media/forfas091209_bibliometric_study.pdf

¹⁰ http://ec.europa.eu/research/innovation-union/index_en.cfm

sector, including policy, and take place in a realistic timeframe with appropriate indicators which will provide strong foundations for evidence-based decision making.

It is essential that our research institutions can demonstrate the outputs and value for the money which they are receiving from the public purse to further substantiate the view that such investment should continue in the long term, as the Council believes that it should.

Irish research institutions must also be able both to compete in the international arena and to collaborate equally on international terms. Irish researchers are active participants in the Seventh EU Framework Programme for Research and Technological Development (2007-2013) drawing down approximately 1.5% of available funding, ahead of the national target of 1.25%. Work is now underway on establishing Irish priorities for international scientific co-operation, in the upcoming Eighth Framework Programme for Research and Technological Development (2014-2020). This is taking place in parallel with the National Research Prioritisation exercise. This exercise is led by a Government-appointed Steering Group supported by the Department of Enterprise, Trade and Innovation (DETI) and Forfás, in which the Council is participating actively. This priority setting needs to be completed with due rigour and swiftly as it will shape the future of research in Ireland for the next five years.

The co-location of SFI and PRTL under the auspices of the Department of Enterprise, Trade and Innovation should enable synergies in infrastructure and the funding of research projects and people, particularly as approximately three-quarters of SFI supported research is carried out within PRTL facilities. It is crucial that infrastructure be maintained and well managed in our research institutions and this should be one benefit of this new combination of research supports. It is also worth noting that universities need to retain core funding for large scale research teams such as Centres for Science, Engineering and Technology (CSETs), Competence Centres and Strategic Research Clusters (SRCs).

In order to convert ideas and knowledge into socio-economic benefits for Ireland, the outputs from our publicly funded research need to be well-managed and utilised. The Council and its predecessor the Irish Council for Science, Technology and Innovation (ICSTI) have been working in this area since 2001^{11 12}. Building on that work, the support mechanisms for public-private interactions now include the Intellectual Property Framework¹³, which covers the generation, capture, protection and exploitation of intellectual property so that it can reach the market place efficiently, and is a vital component of the Strategy for Science, Technology and Innovation¹⁴.

Recent work by the Council culminated in its recommendations for “Maximising the Environment for Company Research and Development”¹⁵, advising that the best such environment can be created (1) by exploiting intellectual property arising from publicly funded research, with the greatest ease and speed, for local benefit where possible and (2) through the facilitation of dual academic-enterprise career

¹¹ <http://www.sciencecouncil.ie/publication/ascSearch.jsp?ft=/publications/2001/title,3795,en.php>

¹² <http://www.sciencecouncil.ie/publication/ascSearch.jsp?ft=/publications/2004/title,3792,en.php>

¹³ “National Code of Practice - for managing and commercializing intellectual property from public-private collaborative research”, 2005

¹⁴ “Strategy for Science, Technology and Innovation”, www.deti.ie

¹⁵ <http://www.forfas.ie>

structures. We must optimise the transfer of knowledge and people across the public and private sector in order to capitalise on the investments we are making. The overall objective is to create an exemplary research, innovation and commercialisation ecosystem, to translate knowledge creation into economic return. In particular, more effort must be made to assist SMEs who are predominantly indigenous companies, to use the outputs of research, including the recruitment of staff, in a timely manner. This issue is also being examined at European Union levels. We need to sustain the increase in the proportion of research being done that is market-relevant and market-led to support economic and employment growth, including the establishment of new businesses.¹⁶

Sector specific barriers identified in the report in five of the leading industry sectors that invest in R&D - food, medical devices, software, services and pharmaceuticals - highlighted the need to:

- increase the involvement of industry in developing postgraduate programmes;
- increase the engagement of industry in research through measures to support exchanges with academia and to provide appropriate training for industry researchers and innovators;
- make R&D more cost effective, for example through tax measures;
- reduce the complexity of State supports to industry¹⁷; and
- establish industry-relevant research centres which address the full research and development value chain.

The Council looks forward to seeing further action on those recommendations in 2011 and thereafter in support of a strong industrial base in Ireland, founded on existing established and growing enterprises, including services.

The Council welcomes progress already on some of the issues which it raised in its 2009 end of year statement¹⁸ including measures to improve the effectiveness of science and technology spending through the prioritisation of supports for innovation in enterprises and for the links between industry and academia. 2010 has seen the establishment of industry-led competence centres¹⁹ which the Council anticipates will make a strong contribution to sustainable employment in the future. Research and innovation alone are not sufficient for developing the ideas economy: commercially relevant ideas need to be brought to market.

The Council continues to advocate the use of procurement in the public sector as a tool to promote innovation and support industry wherever appropriate for national goals within State Aid rules, a theme which is now under debate at European Union levels. It also remains certain that R&D tax credits are a useful mechanism to embed research in companies in Ireland and to enhance their competitiveness and

¹⁶ <http://www.forfas.ie/publication/search.jsp?ft=/publications/2010/title,6985,en.php>

¹⁷ DAFF and EI are working together to develop a National Food Research Strategy which will set out a research plan, in line with growth targets stated in Food Harvest 2020, to ensure that the industry is fully aware of all available State supports.

¹⁸ Sustaining Investment in R&D, ASC, December 2009 (<http://www.forfas.ie>)

¹⁹ Competence centres were advocated by the ASC in its statement of 2007, "Promoting Enterprise-Higher Education Relationships" and established as industry-led centres jointly managed by IDA Ireland and Enterprise Ireland



encourages all efforts to implement them in a manner which can best support Irish enterprises, namely by allowing them to be offset against employment costs as well as capital and consumable investments.

In releasing its views at the end of a tough year in Ireland, the Council is conscious of the hard decisions which need to be made to sustain socio-economic goals here. The Strategy for Science Technology and Innovation²⁰ emphasises the importance of impacts of our research in terms of knowledge transfer (within and external to the academic system) and commercialisation. Ireland must also build on the strategic prioritisation of translational research, supporting critical mass with good facilities, strategic alliances and structured graduate programmes. In sustaining investment in research and development, the next logical step is to focus our activities. The concentration of research investment is important, if not more important, than the absolute amount of funding. We believe that prioritising research is the right agenda for Ireland now. Some activities need to grow but ceasing to engage in others which cannot be sustained in the current economic climate will enable resources to be targeted on growth areas.

The Council takes this opportunity to give its views on what could be done now to support the research community and the R&D-based enterprise sector.

²⁰ <http://www.deti.ie/science/technology/sciencestrategy.htm>

Practical Steps for Maximising the Return from Investment in Science, Technology, Engineering and Innovation

Based on the body of work it has undertaken in recent years the Council recommends a number of immediate priority actions.

The Council strongly encourages the investigation of measures to co-ordinate research and to link academic and industrial research. Close interaction between strategically-focused research departments, industry representatives and commercialisation experts can enable strong and mutually beneficial projects to emerge. These can be fostered by personnel having the appropriate skills and experience and an understanding of and ability to communicate research and/or industry opportunities and challenges. Exchange of personnel between industry and academic institutions throughout their career is often a key factor in the success of such interactions. Out of these exchanges can flow excellent research, relevant skills and expertise, and valuable commercial knowledge, leading to jobs and export growth for Ireland. Strong relationships between the technical and scientific leaders of research centres and industrial directors, operating at the same levels within their organisations, can lead to durable research collaborations and bring significant benefits in research and commercial environments. Co-location of research and innovation activities within research institutions can facilitate interactions throughout the research space and not along a linear path from basic to applied (and possibly pre-competitive) research alone. In saying this, the Council is well aware that not every research project will produce an economically useful output at the end of three years, or even ten years²¹ but its view is that commercial output should be sought where possible as one outcome of public investments, in addition to furthering research knowledge, education and skills.

The Council also views very positively the provision of networking and communication mechanisms which enable industry, particularly SMEs, to be informed about and consider engaging with the research and funding systems. From recent discussions, industry and its representative bodies would welcome measures to aid in communication and information exchange with academic research, based on parity of esteem. This should not be just information provision at the academic level (as in the Expertise Ireland database) but also at the level of data provision to help industry in knowing who to contact for specific research assistance, such as that provided in the software sector by the Irish Software Innovation Network (ISIN). To make these linkages and circulate the relevant information, the connectivity needs to be provided through knowledgeable individuals, who are independent and industry-focussed and with sufficient time and experience to ensure a robust process, who can help to link industry to research and to benefit from existing funding options at national and international levels and can ensure follow-up on contacts and projects. While there are many good initiatives in place, such as the Innovation Vouchers and Innovation Partnerships operated by the DETI agencies, and similar measures operated through DAFF^{22 23} and other ministries, many companies are too stretched for resources to identify these for themselves.

²¹ Recent pilot evidence from the UK on impact assessment is showing that 'impacts' are rarely fully realised in less than 15 years (ARMA conference, Manchester, 2010).

²² Department of Agriculture, Food and Fisheries

²³ DAFF recently launched a new Initiative entitled FIRM+ aimed at speeding up research with commercial potential.

<http://www.agriculture.gov.ie/media/migration/research/callforresearchproposals2010/PlusG.pdf>. DAFF, under the remit of its Industry-led Food



A neutral facilitating body, such as the Enterprise Innovation Networks²⁴, operating with funding from the enterprise development agencies but outside of them, can operate well in this space as a knowledge transfer partnership. IBEC has been supportive of this activity within its membership and it and other industry associations are well-placed to provide the networks necessary to connect enterprise with funding and research possibilities if the connection is resourced in a similar manner to the innovation networks of the ISA²⁵, CITA²⁶ and IIRG²⁷. It may be possible to benefit from economies of scale if innovation network resources for individual industry sectors are sufficient in number and connected by complementary needs and issues. Good examples of this exist in Scotland (Interface) and, under the British Council, in Africa. *It is the view of the Council that full exploration and consideration of the knowledge transfer partnerships model by government departments and agencies should be a priority for 2011. The Council believes that successful innovation networks should receive continued funding.*

Excellence in engineering is fundamental in driving new knowledge, derived from high quality scientific research, out into the marketplace - especially in the key areas such as ICT and Energy. SFI currently funds engineering-related research under the heading of “Applied Science”, not overtly recognising engineering as an intrinsically-valuable discipline. Recognition of engineering is important. This will have the effect of both attracting such individuals to Ireland, and encouraging young people to go into engineering as a career choice. Consideration should be given to explicitly including the discipline of engineering and the funding of excellent research in the field within the remit of SFI. Included within that remit would be its outreach activities into schools, to raise consciousness of the value of engineering as a discipline within the school education system. *It is the view of the Council that the issue of the recognition of engineering as a discipline in its own right should be pursued and that excellent and creative engineers should be valued for what they deliver to society.*

The Council has been a strong advocate of the underpinning importance of high quality mathematics education in supporting the national innovation effort. The recent decisions of higher education institutions to enhance the reward for performance in higher level Leaving Certificate mathematics for the purpose of third level entry are very welcome. However, this alone cannot address the challenge of enhancing mathematical understanding and performance more generally. Reform of mathematics teaching and learning at second level offers a real opportunity for more fundamental improvement. *The Council strongly supports the major reform that is now underway through Project Maths. This should be progressed quickly, as planned, and needs to be supported by the necessary investment.*

The Council endorses the view that the single most important element in improving mathematics learning is the quality of mathematics teachers. In a climate of scarce resources, it is essential that the necessary investment in supporting the professional development of mathematics teachers is now given priority. It

Research Advisory Committee, has made significant progress in developing a National Food Research Strategy which involves ongoing communication with the food industry to ensure that the research needs of the industry are incorporated into the FIRM.

²⁴ Three enterprise innovation networks are funded through Enterprise Ireland to stimulate R&D linkages between companies and research organisations in the software, construction and industrial areas.

²⁵ Irish Software Association <http://www.software.ie>

²⁶ Construction Information Technology Alliance <http://www.cita.ie>

²⁷ Irish Industry Research Group <http://www.irdg.ie/>

is also essential that all students in second level schools are taught mathematics by teachers who hold a qualification and competence in the subject. Postgraduate programmes for existing teachers need to be provided on a scale and level commensurate with this objective and the Council welcomes current initiatives on this front. *The elements of the Teaching Council Acts relating to continuing professional development of teachers should be commenced and the Teaching Council should introduce a requirement as soon as possible that engagement in continuing professional development is a prerequisite for maintaining professional registration.*

National funding for infrastructure and for research and development projects is essential to enable us to remain at the global research table and to leverage our own national funding. As a lynchpin of such research, infrastructure must be maintained and well-managed in order to retain its usefulness.

Equipment and expertise, hard and soft infrastructure, should continue to be accessed on a national and collaborative basis but must be maintained through core infrastructure-specific funding in order for good research to be possible. Facilities and personnel funded through ‘soft money’ are continually under threat. We currently save time and money and capitalise on our own expertise by having the best equipment available to our researchers on their own doorstep and we must safeguard that. Without a sustained system for infrastructure construction, management and replacement of infrastructure buildings and equipment, including proper maintenance and technical expertise and appropriate access mechanisms, we will lose the opportunity to leverage from the investment made in infrastructure to date, having to go back to using facilities abroad. The continued support for key national infrastructures is also necessary for Ireland to be competitive in future EU programmes. *It is the view of the Council that full consideration must be given to our infrastructure needs and how they can best be maintained. The Council supports the planned review of existing infrastructure to be undertaken by Forfás and the Higher Education Authority.*

The current economic crisis has highlighted the nature of the workforce which is required now in Ireland. The focus at PhD and Master’s levels is increasingly on industry relevant world class qualifications. In order that the people emerging from our academic institutions are well-placed to find rewarding employment and to contribute fully to the economy, it is the view of the Council that the majority of higher level degrees should incorporate practical workplace exposure. For some Masters and PhD students this may mean placement in industry while for others it may mean the incorporation of elements to encourage entrepreneurial abilities to be identified and fostered²⁸. Having invested resources in their education and training, *it is the Council’s view that measures to embed employability in all emerging graduates should be accelerated.*

Ireland has benefited greatly from, and contributed to, international relations and the internationalisation of research. As recommended by the Council in its report on International STI Engagement, regular reviews should be conducted in relation to Ireland’s participation in international research programmes and in particular, the EU Framework Programmes. At the mid-term of the Seventh EU Framework Programme for Research and Technological Development and as we begin our preparatory discussions for

²⁸ See also the report of the Council on “The Role of PhDs in the Smart Economy” (2009) http://www.sciencecouncil.ie/media/asc091215_role_of_phds.pdf



the Eighth Framework Programme, such a review is timely. In the coming months, Forfás and the Council will be engaged in leading a national consultation process on the Irish priorities for the EU Framework Programme for Research and Technological Development FP8 (2014-2020) and *the Council will be inviting the informed input of stakeholders from all areas of the research and innovation system in order to produce the most relevant advice on FP8 to the European research system.*

Measures to encourage industry participation with academia, such as but not only those mentioned above, can help to strengthen our indigenous research base but also make Ireland more attractive in terms of education, investment and employment. We need to enable our high-quality graduates to use their skills and to link to the national priorities in science, engineering, technology and innovation. *It is the view of the Council that measures outside of the direct research system to enable research excellence by facilitating mobility of Irish researchers and mobility of top class research into Ireland and other collaborative opportunities are essential, for example those in transfer of pension and social welfare entitlements, as a means to sustain our economy through science and technology.*

Appendix Members of the Advisory Council for Science, Technology and Innovation

Council Members

Dr. Tom McCarthy, (Chairman ACSTI), Chief Executive, Irish Management Institute

Dr. Sean Baker, Independent Consultant

Bernadette Butler, Managing Director, Good 4U Food and Drink Co. Ltd.

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