EVALUATION OF ENTERPRISE SUPPORTS FOR RESEARCH DEVELOPMENT AND INNOVATION

Executive Summary

Background

The Department of Jobs, Enterprise and Innovation (DJEI) requested that Forfás undertake a comprehensive evaluation of the suite of enterprise support programmes provided by the enterprise development agencies. This involves the systematic evaluation of circa 70 programmes. A framework was developed by Forfás in 2011 [The Framework[1]] to ensure a consistency of approach that facilitates comparison (where appropriate) and that is cognisant of the common challenges facing enterprise evaluation. The Framework was informed by international best practice regarding the core principles and methodologies required.

The evaluations focus on the appropriateness, efficiency and effectiveness of supports with regard to:

i. Individual programme performance;

ii. Programme performance in relation to other interventions in the system; and

iii. Alignment with national enterprise policy.

An Evaluations Steering Group is overseeing the process, chaired by Forfás, and includes representation from the Department of Jobs, Enterprise and Innovation, the Department of Public Expenditure and Reform, IDA Ireland, Enterprise Ireland, Science Foundation Ireland, and independent evaluations expertise[2].

The programmes have been categorised by thematic area:

- Entrepreneurship and start-up supports;
- Research, Development and Innovation supports; and
- Business development supports that encompasses supports for capacity building (capital and employment) and capability building in the areas of productivity, management and skills, internationalisation and transformational change.

This report sets out the findings and recommendations relating to the evaluation of the **Research, Development and Innovation Supports** (RD&I).

The evaluations were undertaken in an independent and informed manner, ensuring the integrity of the evaluation process. Where evaluations of a programme had been conducted in the past three years by the enterprise development agencies, a review of that evaluation was carried out and in such cases the original time period for the evaluation has been used. Additional analysis was carried out if deemed necessary. External evaluation experts were appointed for a number of the programmes.

Before setting out the findings and recommendations for the programme evaluations, it is important to place these in the context of policy for RD&I. The following sections set out the rationale for government intervention for RD&I informed by international review. This is

[1] *Forfás Framework for the Evaluation of Enterprise Supports*, May 2011

[2] An independent representative stepped down mid 2012 and a replacement was appointed in early 2013.

followed by an overview of Ireland's policy in RD&I during the period over which the individual programmes span.

Rationale for Government Intervention

Research and innovation plays a key role in the productivity and success of firms operating in a fiercely competitive global environment and in the on-going contribution of a competitive, sustainable enterprise base to Ireland's future economic growth. The rationale for government intervention to stimulate increased RD&I activity at firm level is informed by academic literature on the role of the Government in supporting the development of innovation systems and on addressing market failures so as to achieve the development, diffusion and use of economically useful knowledge and innovations.

At a national innovation systems level, there is a need for government to address the coordination failures that can arise between the various players in the innovation system, including Higher Education Institutes (HEIs), research institutes and firms. Imperfect information can limit the level of industry and academic collaboration. Often businesses are unaware of what research is underway in the HEIs and institute researchers are unaware of the commercial applications of their research. In terms of market failure, enterprises are not inclined to invest in what might be deemed economically or socially optimal in innovation. This may be due the risks associated with investment in innovation, the inability to capture the full benefits of such investment due to the positive spillovers to others in the system and difficulties (particularly for SMEs) in raising finance.

Government intervention can lead to benefits for Ireland's economy and society that would not be accounted for in a market-based investment decision. These include, for example, increased employment and exports in the Irish economy, training and skills development, raising the profile of Ireland as a research and inward investment location and improved quality of healthcare and education provision and ICT diffusion in Ireland etc.

Ireland's Research Development and Innovation Policy Context

There has been a significant transformation in Ireland's Research Development and Innovation (RD&I) policy since the late 1990s. Ireland had experienced rapid economic expansion during the 1990s, driven largely by strong growth in export markets and its successful inward investment policies. Ireland's increased wealth, the intensified competition for inward investment and the need to further develop the capabilities of indigenous firms prompted a Technology Foresight exercise in 1998. The Foresight exercise concluded that for Ireland to remain competitive and provide well paid employment, it needed a transformation of the research and innovation performance of the enterprise base and an upgrading of the scientific and research skills, capacity and excellence of the public research system in the country.

At the same time, the EU was focused on generating growth and restructuring the European economy. EU Structural Funds, such as the European Regional Development Fund, provided co-financing opportunities for Member States to additionally target and accelerate the development of the R&D base. The Lisbon Agenda (2000-2010) placed investment in R&D at the heart of its strategy and set a target to increase R&D investment in the EU to 3 per cent of GDP by 2010.

The Irish Government initially responded by committing over €630 million to a Technology Foresight fund for the seven year period of the National Development Plan 2000-2006 to:

- Develop world-class research capabilities in strategic technologies to underpin the future development and competitiveness of Irish owned industry;
- 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 companies to Ireland in the future; and to
- Enhance the environment for the creation of new technology-based firms.

Science Foundation Ireland (SFI) was established to fund the building of research excellence in biotechnology and ICT in Ireland and the Higher Education Authority (HEA) programme for Research in Third Level Institutions (PRTLI) investments were strengthened. *Building Ireland's Knowledge Economy* (2004) recommended a significant step change in enterprise research and innovation performance and absorptive capacity.

The overarching *Strategy for Science, Technology and Innovation (SSTI)* for the period 2006-2013[3] set out specific actions aimed at achieving the target of growing BERD over the period to 2013. The SSTI increased resources for building a world class research system, for enhancing the commercialisation capabilities to translate state funded research into applications, and for driving economic growth through research and innovation in enterprise.

Research and Development Tax Credit Scheme

The R&D Tax Credit Scheme was introduced by government in 2004. As well as addressing market failures, it was intended that such a scheme would improve Ireland's international competitiveness in attracting mobile R&D investment by multinational companies – particularly in the context of similar incentives that are operational in other jurisdictions.

The scheme provides for a 25 per cent corporation tax credit on the incremental increase in expenditure on R&D compared to the year 2003[4]. The scheme also provides a 25 per cent volume credit for eligible capital expenditure. Since its introduction the scheme has been enhanced: for example, Budget 2009 provided for a full discharge of the tax credit over a three year period as an offset against corporation tax or as cash payments in the event of insufficient or no corporation tax. More recently the Finance Act 2012 allowed companies to use a volume based system for the first €100,000 of base year R&D expenditure in calculating their R&D tax credit, and Budget 2013 increased this to €200,000.

An evaluation of the R&D tax credit scheme falls outside of the scope of this programme of evaluations. The availability of the R&D tax credits is taken into consideration by the agencies in their assessment of R&D grant aid intensities and is referred to in the individual programme evaluations where it is pertinent.[5]

[3] The earlier report Building Ireland's Knowledge Economy, Interdepartmental Committee on Science and Technology, published by Forfás, 2004 set out targets for improved business innovation performance

[4] Because it is incremental, the R&D tax credit offers no subsidy to firms that fail to increase their R&D spending

[5] The Department of Finance is undertaking a review of the R&D tax credit in 2013.

Progress to Date: Business Expenditure in R&D

Having come from a low base, Ireland has made significant progress over the past decade. It has attracted and retained top level researchers, has developed research strengths and international reputation in a number of key disciplines of relevance to Ireland's industrial base[6]. There is evidence of increasing collaborations between the HEIs and industry that are delivering economic impact. This enhanced capacity has supported IDA in its mandate to attract R&D activities, to upgrade existing foreign client operations in Ireland and to seed new activity. Enterprise Ireland has supported indigenous company in-firm R&D activity and capability building, together with a range of measures to strengthen applied research capacity in the public research system, so as to enhance indigenous firms' competitiveness and the potential to drive export growth.

At a national level, the following indicators demonstrate the progress being made.

Business Expenditure on R&D (BERD) has increased from €1.2 billion in 2003 to over €1.8 billion in 2011 (constant prices). It has remained relatively constant during the recessionary period (Chart 1).

Chart 1 Business Expenditure on R&D (BERD) in Current/Constant Prices (millions) 2003-2011

Source: Derived from Business Expenditure on R&D, 2009/10 (CSO/Forfás) and Consumer Price Index, Mar 2011, (CSO)

BERD has also increased as a percentage of GNP over that time frame, and is 1.43 per cent of GNP in 2010, having closed the gap when compared with OECD and EU 27 (although an element of this may be due to Ireland's lower growth rate in GDP since 2007). It important to point out that BERD expenditure has held up in Ireland despite the economic recession; this speaks to the success in embedding the practice of R&D investment in companies in Ireland.

Indicators also show that Enterprise R&D intensity continued to increase. The number of firms active in R&D increased by a third from 1,200 in 2005 to just over 1,600 in 2011. The BERD Survey of 1,600 enterprises engaged in R&D in 2011 showed that 27 per cent had spending of €500,000 or more indicating significant scale of R&D spend.

[6] Report of the Research Prioritisation Group, Forfás/DJEI, 2012

- The number of R&D active firms with annual R&D expenditure exceeding €2m increased by 31 per cent from 118 to 154, between 2005 and 2011.
- Within this group, there were 70 firms with annual R&D expenditure over €5m.

Within the Enterprise Agency cohort of client companies there has been significant progress made since 2001 in that in 2011:

- Business R&D as a percentage of sales among agency clients increased from 1.3 per cent in 2001 to 1.6 per cent. In foreign owned manufacturing the increase was from 0.9 per cent in 2001 to 1.6 per cent in 2011, while among Irish-owned manufacturing the increase was from 1.1 per cent of sales to 1.7 per cent of sales.
- 57 per cent of all agency firms were engaged in R&D in 2011 compared with 49 per cent in 2001. Among manufacturing firms the number with any expenditure on in-house R&D increased from 49 per cent in 2001 to 61 per cent in 2011.
- 23 per cent of agency firms spent greater than €250,000 per annum in 2011 compared with 15 per cent in 2001; and
- 32 per cent of agency firms spent greater than €127,000 per annum in 2011 compared with 21 per cent in 2001.

The rationale for investing in research to drive development remains strong. Ireland's National Innovation System (NIS) is still relatively immature. While Ireland has made good progress towards building up its scientific capabililites, the OECD has noted that innovation capacity remains weaker than in other small advanced countries such as Austria, Denmark, Sweden and Switzerland.[7] Indications are that the right steps are being taken to strengthen Ireland's enterprise base and its attractiveness as a location for high value-added investments. The key challenges remain, to:

- Increase scale and depth of R&D activity at the level of the firm;
- Commercialise state funded academic research; and to
- Connect industry with HEI research (and vice versa).

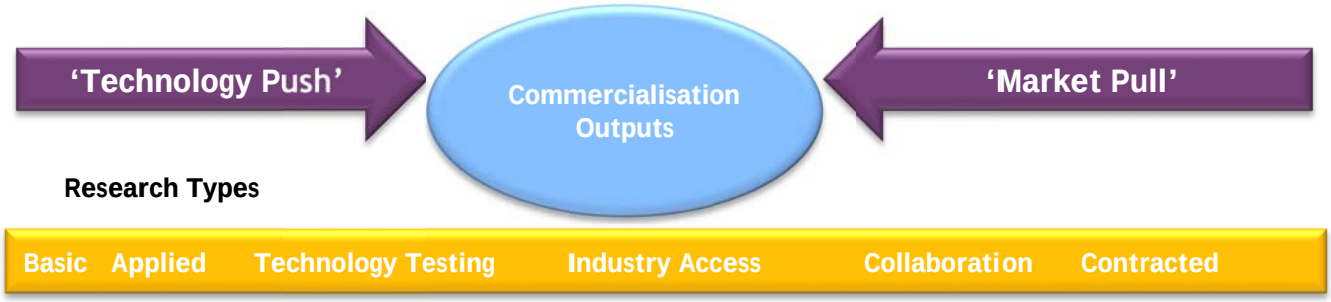
The overall aim is to deliver economic returns and to enhance the potential for growth and job creation through innovation, competitiveness and productivity. It is important in the context of RD&I to emphasise the less immediately quantifiable behavioural changes that are crucial milestones, and that ultimately lead to tangible economic effects.

Scope of Evaluations

There are a number of interventions in place that aim to address innovation system and market failures and externalities and to contribute toward economic development and growth. The chain of events between acquiring new knowledge, ideas or public Intellectual Property (IP) through to the launch of a product or service on the market is complex; involving considerable additional financial and resource investments in research and development, product development, testing and marketing and the process can take many years. This can involve a combination of technology push (what the technologies can do) and market pull (delivering to an identified market need). The interventions evaluated for this report play different roles along this pathway.

[7] OECD (June 2013) Ireland – Economic Review

Figure 1 Scope of Evaluations



The evaluations of RD&I programmes is focused on those that are intended to deliver increases in business innovation performance, in R&D investment and product and process improvements. The individual programmes are aligned with the three pillars of the SSTI (Fig 2). The evaluation covers RD&I programmes delivered by Enterprise Ireland, IDA Ireland and some of those delivered by SFI[8]. The programmes evaluated represent approximately 27 per cent of public expenditure on R&D (or 36 per cent when the HEA Block grant is excluded)[9].

Figure 2: Programmes Evaluated - Aligned with SSTI Pillars

An evaluation of the Technology Centres programme which was launched in 2007 was not undertaken as it was considered too early in the process to deliver a meaningful interim

[8] It is estimated that funding for the SFI CSETs and SRCs amount to circa 40 percent of SFI's total budget (based on review of Annual Report 2011)

[9] The calculations have been based Public Expenditure on R&D for 2011 estimated at €912 million (source: Forfás Science Surveys). This includes programmes delivered by the HEA, Health Research Board, Agriculture/Teagasc etc., as well as those included in these evaluations. The HEA Block Grant represents 27 percent of total public expenditure on R&D in 2011

evaluation[10]. Enterprise Ireland has scheduled an evaluation for 2013, which will utilise the evaluation framework, and Forfás involved in the process.

The evaluations span different periods from 2002 through to 2011 with timelines varying for each individual programme depending on a number of factors.

For R&D programmes in general, a time lag of between 5 to 7 years[11] is needed to realise the full economic impact in terms of increased outputs and/or employment and/or enhanced skills) – with those interventions targeted at areas further from markets (for example, CSETs when compared with innovation vouchers) involving the longer time lag. An interim evaluation can provide initial insights into how a programme is performing, although *full* economic impacts may not be evident. In some instances the period for evaluation was determined by the fact that an evaluation had already been undertaken within the past three years and was reviewed as part of this project. This suite of evaluations therefore involves ex-ante, interim and ex-post evaluations, and this is clearly identified within each programme evaluation. Cost Benefit Analysis (CBA) has been calculated where appropriate as part of the individual evaluations.

The nature of the evaluation informs the extent to which full impact can be determined and the reader is advised to read the individual evaluations which clearly set out the methodologies and basis for the findings before assuming a direct comparison between programmes can be made.

The portfolio approach adopted proved valuable as it allowed the analysis to focus not just on individual programmes, but on the performance of those programmes in the overall context of supports available to companies across the spectrum of the RD&I system.

A brief overview of each of the programmes evaluated is outlined below (Table 1):

Table 1: Brief Overview of RD&I Programmes

Programme Name	Primary Focus
EI RTI Scheme	Assistance to Irish owned firms for investment in R&D as part of a company's strategic development.
IDA R&D Fund	Assistance to foreign owned MNE subsidiaries based in Ireland to establish or expand R&D facilities and fund R&D projects.
R&D Advocates (EI)	Aimed at increasing awareness of, and activity in, RD&I by inactive Irish owned companies through the use of Advocates.
Commercialisation Fund (EI)	Supports academic researchers to bring research with commercial potential to a point of technology transfer to industry (via licensing or spinout).
IPAS (EI)	Advice & financial assistance for patent protection.

[10] Although the programme was launched in 2007 the process involved engagement with industry, definition of needs and calls for proposals and centres were not operational until 2009/2010

[11] Framework for the Evaluation of Enterprise Supports, Forfás, May 2011

Programme Name	Primary Focus
SFI CSETS	Funding of joint academic-industry research centres located within Universities focused on longer term user-oriented basic research.
SFI SRCs	Funding of research clusters to support multi-disciplinary internationally leading investigations with industry engagement.
Innovation Partnerships (EI)	Aimed at harnessing the strengths of the third level sector to work in partnership with companies on specific R&D projects.
Business Partners	Facilitates entrepreneurs to identify research with commercial potential and to connect with research groups, in order to speed up the process of company creation.
Technology Gateways	Funding of manager and up to three researchers. Governed by industry, Gateways provide technology solutions for the close-to-market needs of Irish industry.
Innovation Vouchers	Support small companies to engage with HEI researchers in order explore a business opportunity or solve problems.
Campus Incubation	A capital/infrastructure programme, where EI invested to develop on-campus space for start-up companies, including specialised biotech facilities.

There have been a number of changes to existing programmes during and since the period of evaluation. This points to the continuous and evolving nature of programmes, with modifications instigated by changing economic circumstances, changing client needs or following an internal review of a programme's operational effectiveness. Changes are noted within each of the individual programme evaluations and are synopsised in Appendix 1.

To provide some indication of order of magnitude/scale for the suite of interventions that have been evaluated, the expenditure over the period of the evaluation was 'annualised'[12]. Approximately 58 per cent of funding is directed toward financial supports provided directly to the firm to stimulate increased investment in firm level R&D activities (Figure 2)[13]. These supports are subject to State Aid Guidelines with grant intensities dependent upon the nature of the R&D (how close to market) and the size of the company (with higher grant intensities permissible to SMEs). Actual grants are determined on a case by case basis, taking into account technological, commercial and strategic criteria, as well as the R&D tax credits available.

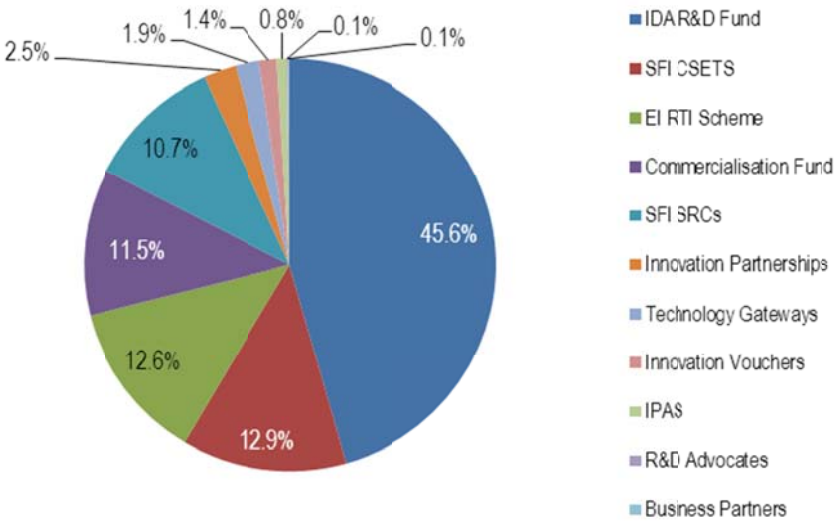
In all other instances, funding is directed at the HEI/Researchers, building expertise that can be availed of by enterprises and/or to stimulate the creation of new commercial activities.

[12] Note that this does not include funding for Technology Centres that have not been evaluated, nor does it include the full RD&I budget assigned to SFI. Because of the nature of the Campus Incubation programme – i.e. capital costs of construction, this programme has also been excluded from this analysis

[13] The IDA R&D Fund (45.6 percent) and the Enterprise Ireland RTI Scheme (12.6 percent) provide funding directly to the firm by way of grant aid toward eligible expenditure on RD&I activities

HEI/Industry collaborations represent 27.4 per cent (involving the 5 programmes evaluated, i.e. technology centres are not included). The balance of 14.4 per cent is targeted toward commercialisation and Intellectual Property (IP) supports.

Chart 2: Programme Expenditure – Indicative Only (Annualised)



Source: Forfás

The next section sets out a brief synopsis of the individual programme evaluations, followed by overarching findings and recommendations. The full individual evaluations clearly set out the methodologies and basis for the findings.

Individual Programmes–Key Findings and Recommendations

The individual programmes are set out as follows:

1. **HEI Commercialisation**
2. **Collaboration Enterprise / HEI**
3. **In-Firm R&D**

1 HEI Commercialisation

1.1 Enterprise Ireland Commercialisation Fund

1.2 Enterprise Ireland Intellectual Property Assistance Scheme (IPAS)

1.3 Enterprise Ireland Business Partners

1.4 Enterprise Ireland Campus Incubation Facilities

1.1 Enterprise Ireland Commercialisation Fund (2003-2009)

The need for a Commercialisation Fund was identified in the RTDI (Research, Technological Development and Innovation) component of Ireland's Operational Plan for Industry (2000 – 2006). It was initiated in 2003 to include two elements - Proof of Concept (POC) and Technology Development. A third element, Commercialisation Plus, was introduced in 2005.

The programme supports researchers in Higher Education Institutions (HEIs) and Research Performing Organisations to develop technology that could lead to either: the generation of spin-out companies; or the licensing of the technologies to companies to bring products/services to market.

It supports projects at all stages of technology development including early stage proof of scientific concepts through technology development to de-risking technologies that are close to market in order to make them ready for investment ideally within a 2-5 year timeframe[14].

This evaluation has been informed by analysis undertaken by Frontline Consultants in 2010, commissioned by Enterprise Ireland.

Over the seven years of the evaluation period (2003-2009) direct costs of the Commercialisation Fund amounted to €144.2 million to support a total of 895 projects across all stages, or an average of €161,000 per project. The project breakdown between 2003 and 2009 was:

- €45.3 million for 543 projects in Proof of Concept (average of €83,403 per project);
- €93.3 million for 302 projects in Technology Development (average of €309,004 per project); and
- €5.5 million for 50 projects in Commercialisation Plus (average of €110,888 per project).

Enterprise Ireland allocated on average 6.3 Full Time Equivalent (FTE) staff to the programme per annum, amounting to €3.438 million indirect costs during the evaluation period. Therefore the total cost (indirect cost and direct cost) of the programme from 2003 – 2009 was €147.6 million.

The primary objective of applying for a Commercialisation Fund grant for the majority (67 per cent) of Principal Investigators (PIs) was to secure research funding to further their main research interest. There was almost an equal spilt in the approach taken by the PIs to commercialisation – that is, they either licensed their IP to firms to bring to market, or they themselves became directly involved in the commercialisation activity by creating a spinout. Changes in behaviours and skills levels were evident. PIs reported that their abilities to develop and maintain relationships with commercial partners and to deliver applied research projects and solve problems in relation to commercialisation were enhanced. Just under half of the PIs reported that their objectives were directly linked to a commercialisation activity, either by developing product/processes or services or to exploit a business opportunity from their research area (either in terms of developing new products/services (49 per cent), or developing a business opportunity (42 per cent)[15].

[14] A 'project' could be funded for any *one* of the stages across the development life cycle through from proof of concept to commercialisation plus

[15] Because the PIs could provide more than one objective, the responses cannot be added across different objectives

Companies that indirectly benefited from Commercialisation Fund by licensing technologies from PIs were predominantly engaged in the following sectors: Industrial Technologies (22 per cent); ICT (48 per cent) and Life Sciences and Food (29 per cent). These companies cited 'technology push' as the main reason why they engaged with the academic institutions, including the application of technologies to existing products, processes and to improve functionality in addition to applying new technology to create new products, processes or services.

During the seven years of the evaluation period, there were a total of 73 patents developed, 35 licenced outputs produced and availed of by companies, and 21 spin-out companies created, across all three stages of the Fund.

From the teams working on the projects, 76 research staff moved into the private sector, to a wide range of companies both large inward investors and spin-outs, such as Beckman Coulter, Abbott, EMC and Nubiq.

The programme resulted in an estimated additional company R&D spend of €14.7 million to further develop the technology licensed from Institutions. Most of this was in-house R&D activities undertaken by the firm. These activities typically involved protecting the IP emerging from the project (or the follow on R&D) predominantly by patents or confidentiality agreements.

Synergies with Other Public R&D Supports

The evaluation found high levels of synergy between the Commercialisation Fund and other programmes that involve activities of applied research and the linking of HEIs and Enterprise, such as SFI's Strategic Research Cluster (SRC) programme and Enterprise Ireland's Innovation Partnerships. It is important to note that each intervention involves a different approach and are therefore not directly comparable.

69 Principal Investigators (PIs) were surveyed as part of the evaluation process and were involved in approximately 25 per cent of all projects across the three stages. Survey responses indicated different levels of additionality for each stage with the PI indicating that the project would not have continued at all without commercialisation support and that they had not applied for alternative funding (Proof of Concept 44 per cent of responses (27); Technology Development 32 per cent of responses; and Commercialisation Plus 62 per cent (13)[16].

Over half of the PIs (57 per cent) overall indicated that they had accessed other forms of Enterprise Ireland complementary supports. The most frequent included: Innovation Partnership programme; Innovation Vouchers; Business Partnering programme; Competence Centres; and Applied Research Enhancement Centre (ARE) – now replaced with the Technology Gateway programme.

Appropriateness, Effectiveness and Efficiency

The Commercialisation Fund was found to be aligned with both past and present Government policy.

[16] Each PI surveyed may have been involved more than one project at different stages of the commercialisation process

A cost to benefit ratio (CBA) was estimated for the companies that had licensed technologies or spun out having received supports from the commercialisation fund[17]. The cost to benefit ratio (based on a calculation of net value add (EVA)) over the evaluation period (2003-2009) results in 0.21 : 1 return to the Irish economy. This does not account for the time lag required to more accurately assess the potential economic return. A more realistic cost benefit ratio estimates a benefit of €2.04 by 2015 for every €1 of grant provided during the period of evaluation (2.04 : 1).

Findings and Recommendations

The Commercialisation Fund has delivered on its stated objectives; however improved performance monitoring would be achieved if the objectives were based on SMART principles (Specific, Measurable, Achievable, Realistic and Time-bound).

The Fund was re-designed in 2010 with the aim of placing more emphasis at an early stage on the potential for commercial application. Under the re-designed Commercialisation Fund, researchers, in partnership with their Technology Transfer Office (or equivalent office), can apply for a Commercial Case Feasibility Grant to investigate, scope and develop a commercial case for their technology or project idea. Early stage industry involvement to improve continuity and likelihood of success is recommended as a result of the evaluation (and is intended). The three stages of support have been amalgamated since the evaluation was completed, and it is important that consideration is given to continued and effective monitoring throughout the commercialisation process from the early Proof of Concept stages, through technology de-risking etc. It is recommended that SMART objectives be explicitly stated, specific to the re-designed programme to facilitate future interim and ex-post evaluations.

1.2 Enterprise Ireland Intellectual Property Assistance Scheme (2005-2009)

The Intellectual Property Assistance Scheme (IPAS) sought to support the protection and exploitation of IP in order to promote economic growth and job creation. It has been in operation since 1998, and traditionally focused on patents rather than on broader forms of IP protection such as trademarks and copyright.

In 2004, the Scheme was split into two strands, each strand having three stages of patenting:

- The HEI Patent Fund, to address the growing emphasis on the commercialisation of research from the higher education sector; and
- The Industry Patent Fund.

This evaluation has been informed by analysis undertaken by the Circa Group Europe Limited, commissioned by Forfás. Over the period under review:

- **HEI Patent Fund**: 647 applications were approved for funding, leading to at least 353 patentable innovations (which is a proxy for those that proceeded to next stages of funding). A total of €6.2 million in expenditure was provided to HEIs. Funding was available for 100 per cent of costs directly involved in patent protection including searches, patent agent advice, filing and maintenance costs.

[17] Based on 41 companies surveyed as part of the evaluation process. The majority of the companies interviewed were micro businesses (67%); almost half have been trading for less than three years

- **Industry Patent Fund:** 71 applications were approved for funding, amounting to a total expenditure of €0.8 million to companies. The 71 funded applications related to 67 separate companies.

Indirect expenditure to support the delivery of the Fund is estimated at €0.8 million. Total cost to the Exchequer over the period of the evaluation is therefore €7.8 million.

The numbers of initial patent applications from the higher education system supported by IPAS grew from 3 in 2005 to 149 in 2008. This is a very significant increase, and entirely consistent with the increase in R&D funding and the growing capacity for commercialisation of research outputs within the HEIs over the period.

Given that the support for patenting is but one link, although an integral and important link within the wider state RD&I system, it is difficult to isolate and quantify the specific effect of the patent funding support in terms of licences issued and companies formed. That said, best estimates indicate the following:

Data from the Enterprise Ireland Technology Exploitation Networks Unit shows that there were a total 68 spinouts from the higher education sector over the review period. With regard to the HEI patent fund, a conservative estimate[18] is that 31 of these spinouts received some degree of support through the fund in terms of financial and/or advisory support.

With regard to the Industry Patent Fund, analysis of the formal applications submitted shows that 80 per cent of the 67 applicants who successfully secured funding were small, early stage companies, or private individuals who were starting a business to commercialise the invention. Thus the Industry Patent Fund played a role in the emergence and development of approximately 54 small, innovative early stage or start-up businesses. These companies demonstrated a survival rate of 97 per cent over the evaluation period.

At the end of 2009 the IPAS programme was discontinued and supports for patenting were repositioned within the Enterprise Ireland portfolio of supports:

- Support for IP management and protection for companies and entrepreneurs has been integrated into Enterprise Ireland sectoral support schemes, primarily the Enterprise Ireland RD&I fund[19].
- Responsibility for patenting technology developed in the HEIs is now with the Technology Transfer Offices with support from Enterprise Ireland under the Technology Transfer Strengthening Initiative. This is line with the strategy for IP management *Putting Public Research to Work for Ireland* published in June, 2012.

Programme Leverage

The Industry Patent Fund grant was generally capped at €20,000 at the second stage filing, with the initial cost being covered by company. However, the full costs of obtaining a patent

[18] Informed by (limited) international comparative data - Association of University Technology Managers, 2009, AUTM U.S. Licensing Activity Survey, 2008 and The Chronicle of Higher Education, 2009 available from www.chronicle.com

[19] Through the RD&I Fund up to 50 percent of costs relating to the preparation, filing and validating of a patent application are eligible for grant support. Costs incurred in renewing the application before the patent/right has been granted as well as translation and other costs of obtaining the granting or validation of the right in other appropriate countries are also eligible. However, patent costs cannot exceed more than 20 percent of the overall project cost

are estimated to be in the region of €90,000 - €130,000 depending on the level of interaction with patent examiners, and the number of countries in which filing is conducted.

Patent Income

The value of licenses achieved from the IP protected through the programme is estimated to be in the order of €9.1 million. This is based on a conservative set of assumptions whereby one third of the 67 companies supported through the Industry Patent Fund and one third of the 69 projects funded through Stage 3 of the patenting process by the HEI Patent Fund secured licensing agreements with average licence fees of €10,000 per annum over 10 years[20].

Synergies with Other Public R&D Supports

Support for patenting activity is an integral and important element of the wider RD&I support system, which works in synergy with other programmes including for example, Feasibility Grants, SFI grants, the EI and IDA Ireland R&D funds, commercialisation etc. The IPAS evaluation demonstrates that without these supports at that time the RD&I support system would have been much less successful.

Appropriateness, Effectiveness and Efficiency

The continuous emergence of a stream of new innovative, high potential companies is an important ingredient of the State's industrial policy. The IPAS was an appropriate intervention to support this policy.

The total direct and indirect costs of the programme were €7.8 million over the evaluation period and the estimated potential income of €9.1 million within 10 years suggests that the IPAS programme was efficient in delivering the desired outputs and outcomes. According to the feedback from survey participants the programme was efficiently managed, in particular from the small team in the IPAS unit in Enterprise Ireland. The Industry Patent Fund has largely outperformed the HEI Patent Fund when compared with their inputs (€0.8 million and €6.2 million respectively) particularly in terms of their contribution to the establishment of spinouts and development of early stage technology intensive start-ups (estimated 54 and 31 respectively).

Findings and Recommendations

In parallel with the significant increase in industry R&D activity nationally over this time from €1.3 billion in 2005 to €1.9 billion in 2009, financial support for industry patent funding increased from 2 successful patent applications in 2005 to 30 in 2009 (averaging at 14 applicants securing funding through the programme per year during the period of evaluation).

In light of the fact that patent supports will now be repositioned within the EI R&D Fund and the Technology Transfer Offices Strengthening Initiative (as outlined in section 3.1.2) it is recommended that mechanisms and metrics be developed to record expenditure on patents, and to track progress of patents through to licensing and spinouts in order to gain a more complete picture of the impact and effectiveness of supporting patent filings.

[20] 270 license agreements were made regarding IP emanating from the higher education sector over this period; many of which were likely linked to the projects that were supported through the HEI Patent Fund. As such, the assumption that a minimum of 23 of the license agreements made related directly to HEI Patent Fund projects is relatively conservative

1.3 Business Partners Pilot Programme (2009-2011)

In 2009 Enterprise Ireland introduced a pilot of the Business Partner programme. The objective of the programme was to facilitate serial entrepreneurs to access research results in third level institutions in order to intensify the commercialisation of public research and form spinout companies. In summary, this is a 'marriage' to bring the academic researcher and entrepreneurial cultures together to help fast track the creation of spin-outs.

The analysis was undertaken by Frontline Consultants, commissioned by Forfás. Based on the 2009 recruitment of entrepreneurs, the programme delivered the following outcomes by 2011:

- 19 Business Partners were accepted onto the programme, and a total of €380,000 was approved as funding to the Business Partners;
- All Business Partners have delivered business plans, 9 of which have been advanced to further commercialisation activities with continued Business Partner engagement;
- 5 'potential' companies have been accepted by Enterprise Ireland as pre High Potential Start-up (HPSU);
- 4 companies have been created and accepted by Enterprise Ireland as HPSU; and
- 9 jobs have been created.

Programme Leverage

External capital commitment totalling €1.205 million has been secured. Enterprise Ireland has further invested varying amounts into 3 business plans totalling €400,000 and have agreed to invest a further €750,000 pending progress being made, and on the company meeting target milestones.

Synergies with Other Public R&D Supports

Enterprise Ireland offers a number of funds to support technology based companies via its HPSU funds. In addition, EI supports companies to access Business Angels and Seed and Venture Capital funds.

Appropriateness, Effectiveness and Efficiency

The Business Partner programme is in line with Government policies to stimulate growth of HPSUs. The programme helps to establish a sustainable commercialisation route for the research outputs from HEIs and is an appropriate mechanism for combining market-led business capabilities with state funded research capabilities.

The outcomes evident after a relatively short time period (being the 9 business plans), range in level of 'success' from a funding commitment for a business plan to becoming a recognised HPSU. The grant of €20,000 awarded to the entrepreneur under the programme acts as a stimulus which can lead to follow-on funding from Enterprise Ireland if the business plan is developed successfully. Dynamic environmental factors, such as access to project finance should be constantly monitored to ensure that this type of support is continuously improved upon.

Findings and Recommendations

The Business Partners programme can be described as a match-making service where the personal relationship between the people involved is as important as the technological

expertise and business acumen brought in. Expectations need to be managed on both sides to ensure the relationship between the business partner and the academic works well.

The biggest barrier to the realisation of business plans has been cited by participants as the lack of finance. Business Partners are expected to have the funding available to them or to source the necessary investment but this does not seem to have happened as well as expected, possibly due to the financial climate. However, it is important to note that the onus of sourcing further finance remains with Business Partners, and Enterprise Ireland should facilitate sourcing of funding to the extent seen as appropriate, avoiding company over-reliance on state supports.

A challenge with HEIs is their perception of the value of the research. Different expectations for equity share in the resultant IP were evident, and varied between 5 per cent and 15 per cent. This is a strategic issue with the HEIs, and has been identified in HEI/Industry collaborative research previously. Efforts continue to be made by relevant stakeholders to manage expectations and increase the understanding of the value of IP depending on its stage of development and the extent of additional resources and time required to bring it to a commercial reality.

The Business Partners programme appears to be a dynamic process. It has already contributed to a welcome change in mind-sets within both 'communities' - bridging the business acumen with research expertise in academia. It helps to accelerate the commercialisation of Ireland's investment in academic research over the past 10-15 years in order to realise economic payback via the creation of HPSUs.

1.4 Campus Incubation Facilities (2005-2007)

The Campus Incubation programme is a capital expenditure programme which started in 1998 and is nearing full completion of construction activity. Campus Incubation Facilities provide critical space for start-ups to link with the host institution's research base. Companies wishing to locate in the campuses need to demonstrate that linkages with Institutions form part of their future business development, or that they have the potential to become a HPSU, i.e. to grow and to export. These start-ups could be either spin-offs arising through research commercialisation or 'spin-ins', i.e. new enterprises coming onto campus that want to forge strategic research collaborations with the college.

Funding of €50 million since 1998 has translated into the development of 22 business incubation Centres[21] on 16 Institutes of Technology (IoTs) or equivalent third level college (i.e. National College of Ireland) campuses and in 4 Universities, as well as for 6 specialist bio-incubation facilities linked to the Universities. By 2009, 240 companies availed of campus incubation facilities and this number is increasing.

The campus offers access to researchers, modern office space and research facilities and business development supports provided by the Centre managers who also sign-post companies to other financial supports available to help companies develop.

[21] Enterprise Ireland assistance (with support from the European Regional Development Fund) for the construction of these centres was provided at 95 percent of eligible expenditure for centres in the Borders Midlands and West (BMW) region and 90 percent in the South and East, up to a maximum of €2.54 million each

One of the cornerstones of the programme is to develop links between companies and their academic hosts, by way of joint R&D projects, access to R&D facilities, student placement and/or networking.

The links *between* tenant companies appear to be very strong, with almost all (91per cent) informally meeting, 31 per cent reporting that other companies influenced their company's business decisions, 26 per cent became business partners/clients, and others had bona fide exchange and sharing of expertise. However, 29 per cent of companies surveyed did not report having any links with their host institutions.

Appropriateness, Effectiveness and Efficiency

The Campus Incubation programme has delivered on a number of its objectives and is in line with recent policy objectives. The availability of campus incubation facilities for companies was identified as a key instrument and element of the innovation eco-system in previous policy reports and in the SSTI (2006-2013) under the third pillar of capturing, protecting and commercialising ideas and know-how.

The gradual growth in turnover and jobs over the period of evaluation and investment by tenant companies in R&D indicates that the programme is delivering results. The efficiency and economic effectiveness of the intervention/infrastructures will be more accurately determined over time (see findings and recommendations below).

Synergies with Other Public R&D Supports

The Campus Incubation programme provides the necessary infrastructure for companies to locate and make the initial links with the higher education sector.

During the evaluation period, the Innovation Vouchers and Innovation Partnership programmes have complemented the Campus Incubation programme, strengthening links between Companies and Host Institutions. Companies were also sign-posted to further support if their business was classified as a HPSU. As a result, measuring and demonstrating impact from individual programmes in cases where several supports are offered to one company in a holistic business development approach is challenging.

Enterprise Ireland has recently redeveloped its New Frontier programme in order to maximise benefits across innovation, research, entrepreneurship and management development and integrate support to companies located in campus where relevant.

Findings and Recommendations

This is a programme largely driven by capital spend on buildings to date. Now that the initial capital investment has delivered the infrastructures, the focus for the campus incubators should now be aimed at: increasing the linkages between tenant companies and the host HEI; increasing the rate of tenancy and company throughput; and decreasing the occupancy time in Campus; and continuing to support the sustainability of the businesses created.

Since the links between tenant companies appears to be the strongest feature of activity in the Campuses to date, this may suggest an appearance of clustering activity or 'follow the leader' syndrome among companies. This is a positive aspect arising from the availability of incubation facilities. However, it is important that the focus remains on increasing the linkages *between* firms and host institutions to deliver on the primary objective of the programme.

Suggested indicators for any future assessment of the performance of the campus incubation programme have been included in the detailed evaluation report.

2 Collaboration between Enterprise & Higher Education Institutes

This section provides brief summaries of the evaluations of the following programmes:

2.1 Centres for Science, Engineering and Technology (CSET)

2.2 Strategic Research Clusters

2.3 Innovation Partnerships

2.4 Innovation Vouchers

2.5 Technology Gateways

2.1 Centres for Science Engineering and Technology (2003-2012)

The Centres for Science Engineering and Technology (CSET) programme is delivered by Science Foundation Ireland (SFI). The programme helps to deliver on SFI's mandate to increase the quantity and improve the quality of Irish research in support of the wider national goals to move Ireland towards a knowledge-based economy.

The CSET programme supports joint academic-industry research centres located within universities. The Centres are focused on longer-term user-oriented research - conducting high quality academic research that is *oriented* to applications and industry needs. The user-oriented goal should not be interpreted as shifting academic research towards applied research and/or to substitute for industrial investment. Rather, the objective is to better align public investments with longer-term industrial needs and in doing so, to improve the linkages and knowledge flow within the innovation system for ultimate economic and societal benefit.

The analysis was undertaken by Technopolis, commissioned by Forfás and conducted in line with the Forfás evaluation framework.

The CSETs funded under the programme align with the national priorities in place when the calls for proposal were made. There are five CSETs focused on themes in ICT, four in biotech and one in nanotechnology.

The total amount awarded under the programme is €316 million of which €225 million has been expended to date (from 2003-2012). The current Centres receive an annual funding from the programme of between €2.8 million and €4.9 million in line with the programme design. Indirect costs have been estimated at €1.69 million over the period.

The CSETs are led by six of Ireland's seven universities and involve a wider consortium of Irish HEIs and public research organisations (PROs) including three of Ireland's 13 Institutes of Technology (IoTs). The governance of the Centres is managed by way of a joint academic-industry model. This ensures that industry plays a strong role in influencing the research strategy and that sufficient opportunities exist to enable industry partners to network with each other as well as with academic partners in order to identify shared needs, collaborate and exchange ideas.

Overall, there was high level of engagement by the CSETs with industry:

- In total 57 organisations have signed up as formal[22] CSET partners, the majority of which (92 per cent) are businesses;
- The majority of formal partners are non-Irish multi-national businesses (56 per cent) with the remainder being predominantly Irish SMEs (30 per cent) and non-Irish SMEs (9 per cent). A small number of Irish multi-national businesses, public bodies and other organisations make up the remainder;
- Just over half (53 per cent) of formal partners are physically located in Ireland;
- There are twice as many non-formal (116) as formal partners (57);
- The majority of non-formal industrial partners are Irish SMEs (54 per cent). These are businesses that have the ability and willingness (the 'absorptive capacity') to engage with academic research; and
- Foreign multinationals make up 25 per cent of the non-formal partners, of which 72 per cent are located in Ireland.

The total number of industrial engagements across a range of activities over the lifetime of the CSET programme is in the order of 450-490.

The cross-disciplinary focus of many of the CSETs was an additional factor that attracted industry participation.

The programme delivered a range of outputs that can be classified as:

- Academic outputs: 2,301 referred publications, 125 PhDs and 32 MSc graduates over the period 2003-2011;
- Industrial engagement: 392 industrial collaborations (across their 173 formal and non-formal partners) over the period 2003-2011. These engagements included:
  - Participation in events (64 per cent);
  - Participation in joint research projects (53 per cent);
  - Membership of management committees (45 per cent); and
  - Making research materials, equipment etc. available to other partners (38 per cent).
- Pre-commercial outputs: 11 patents and 30 licence agreements.

Programme Leverage

The CSETs have achieved a total additional industry contribution of €77 million or 34 per cent of SFI funding spent to date. Additionally, the CSETs have reduced their dependency on Exchequer funding, from 60 per cent in 2003 down to 47 per cent in 2011.

Company R&D

Companies reported a range of benefits including further development of CSET technologies; taking licences of CSET IP; implementing new processes based on CSET IP; and employing CSET researchers. Importantly, industry reported (via interviews) that the knowledge gained via the Centres has accelerated their R&D and innovation efforts. Others reported an

[22] SFI definition of industrial engagements "To be counted under CSET Award, companies must be part of the CSET Award cost-share agreement. To be counted under CSET Associated, a formal agreement must be in place, e.g. formal partner in FP7, EI project, sponsored research project etc."

influence on their research strategies either in the form of a shift in direction or taking a longer–term view of R&D.

Synergies with Other Public R&D Supports

More than half (58 per cent) of companies that engaged with the CSETs on a non-formal basis, accessed support such as Innovation Voucher and Innovation Partnership funding to pursue R&D projects.

Appropriateness, Effectiveness and Efficiency

The programme was found to be appropriate with government policy and continues to be relevant.

The programme was found to be effective, and was assessed against a number of programme impact areas. The programme demonstrated an increase in, and deepening of, academic-industry links; improved research quality; an increase in the relevance of the research conducted in the research groups involved; and an expansion in educational and career opportunities in science and engineering.

While it has not been possible to estimate a quantified economic impact figure, largely due to the timescales involved between research and impact on businesses, the systemic impacts of the programme on the Irish innovation system are considerable. New and lasting connections were reported and new skills, attitudes and behaviours towards research collaboration have been achieved. It is unlikely that other RD&I interventions (from R&D tax credits, increased investment in PIs to one-to-one project collaborations) would yield such systemic effects or behavioural change.

Findings and Recommendations

In terms of support for commercialisation the CSET programme appears to contribute considerably to national objectives above the scale of its inputs[23]. This suggests that the more strategic and longer-term nature of the collaboration (with the potential for developing deeper relationships with a smaller number of key players) leads to more pre-commercial outputs than one-off shorter-term interactions such as contract R&D[24].

The scale of the programme played a key role in attracting high-quality researchers to Ireland, and for stimulating increased industry engagement. Scale was also particularly important for research themes that needed to span disciplinary or institutional boundaries to access relevant expertise and facilities. The CSETs helped to 'sell' the concept of Ireland as a destination for R&D and encouraged major technology-based MNCs to establish R&D facilities in Ireland.

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[23] Technopolis compared the scale of the contribution of the CSET programme to a number of SSTI indicators (defined at national level) with the relative scale of the inputs i.e. the size of the CSET investment compared to all national public investments. Over the years 2008-2010 the CSET programme has represented 20-25 percent of SFI expenditure, 3-4 percent of government expenditure on R&D and 2-4 percent of higher education expenditure on R&D (HERD)

[24] For example, the CSETS produced 50 percent of patents granted and 50 percent of licence agreements that resulted from all SFI interventions in 2010. The absolute values of the indicators are low and this finding would need to be traced over a longer period of time to be considered robust. Interviews with all stakeholders emphasise that the scale of the CSETs (in terms of budget and timescales) was essential to their ability to deliver outputs

The CSET programme is the main instrument in the Irish support portfolio for building the critical mass of research activities in a particular topic area, which is necessary to compete in the global science and technology arena. The CSET programme is the only intervention that fosters medium to long-term strategic collaborations, rather than project-based relationships.

The research themes remain compatible with Ireland's priority areas: ICT, Life Sciences and Energy.

Before the finalisation of this evaluation a decision was made by SFI to replace the CSET programme with the Research Centres 'hub and spoke' programme into which existing Centres or proposed new Centres can bid for funding[25]. The new programme maintains the collaborative and networking features of the CSETs while at the same time places a greater emphasis on delivering nearer-term economic benefits. The emphasis on nearer-term economic benefits needs to be balanced appropriately with the long-term, cross disciplinary, user-oriented research aims set out in the CSET model in the context of an overarching NIS.

In terms of formal partnerships, there should be an increased emphasis on developing collaborations with partners that are physically located in Ireland and/or can be attracted to Ireland as a result of engagement with the CSETs.

2.2 Strategic Research Clusters (2007-2011)

SFI launched the Strategic Research Cluster (SRC) programme in 2007. The programme was designed to fill an identified gap in the provision of funding support for strategic collaborative research between the one-off research projects already supported through the individual PI grant scheme and the large scale collaborative projects supported by the CSET programme.[26]

All SRCs are targeted at biotechnology and ICT, with one exception of financial mathematics.

The SRC programme aims to support researchers to undertake internationally leading investigations across disciplines; to strengthen Ireland's industrial and commercial base; to foster the development of existing and new Irish-based technology companies; to attract and cultivate campus/industry partnerships; and to make a contribution to Ireland and its economy[27].

The analysis was undertaken by Frontline Consultants, commissioned by Forfás and aligned with the Forfás evaluation framework.

A total of €167.6 million of SFI direct funding has been allocated to the SRC programme to date. SFI indirect costs are estimated at €1.1 million, bringing the overall cost of the programme over the period of the evaluation to €168.7 million.

The vast majority of PhD and Post-graduates were attracted to the SRCs because of the field of research being undertaken. The industry engagement in the SRCs was a large factor in a researcher's decision to join the cluster.

In year three, the programme funded 16 leading PIs; 32 visiting researchers; 57 funded investigators; 57 support staff; 73 co-PIs; 125 post-doc; 221 postgrad/PhD, MSc. There was a high level of interaction and collaboration between institutes, as 37 per cent of the funded

[25] Draft findings of the evaluation had been made available to SFI during the process

[26] In 2012, SFI initiated a new Research Centres programme based on a hub and spoke model that replaces the CSET and SRC programmes.

[27] SRC Information Briefing Session, 2008 Competition (SFI)

investigators (including PIs and co-PIs) worked for a different institute to the one leading the cluster; 42 per cent the wider funded team members and 73 per cent of the non-funded collaborators also worked for a different institution.

The programme produced a number of educational outputs and commercial outcomes over its first three years in existence, including:

- **Education Outputs**: 36 PhD Awards, 8 MSc Awards;
- **Published Outputs**: 516 refereed research papers, 80 refereed reviewed papers, 638 conference papers, and 176 other publications;
- **Other outputs**: 475 national presentations, 1,051 international presentations, and 319 hosted conferences;
- **Industry Engagement:** 90 partner companies, 5 on-site participants, 33 co-supervisors, 94 non-partner industry engagement, and 139 new potential partner contacts associated with the centres.
- **Commercialisation Outcomes**: 84 Invention disclosures, 26 patent applications, 1 patent award, 2 licencing agreements; 7 technologies for additional funding approved; and 4 spin-out companies formed.

Programme Leverage

It was estimated that the SRCs attracted further cash investments of €1.29 for every €1 of SFI funding from other industry sources, overseas public sector investment and Irish public and private sector investment. In addition, the programme was able to draw upon a range of in-kind contributions from business, including staff time, equipment, materials and internships.

Company R&D

The survey undertaken for the evaluation also suggests that, as a result of the programme, participating companies will undertake more R&D, with 90 per cent of businesses reporting that they plan to undertake further work to develop outputs of the SRC project. On average, companies plan to spend approximately €500,000 each to further R&D activities related to the work they carried out with the SRCs.

Synergies with Other Public R&D Supports

SRCs are complementary to programmes such as Innovation Vouchers, Innovation Partnerships and the Commercialisation Fund, and a number of PIs were successful in grant applications for these programmes. Over three quarters (78 per cent) of the 40 investigators interviewed recognised that there had been additional money leveraged into the Institutes or specifically their department[28]. There were numerous examples of large European grants cited, predominately from FP7 funding as well as cash contributions or sponsorships from industry partners.

The potential for overlap between SRCs and EI and IDA Ireland's Technology Centres was raised. It is not possible to be definitive as to the existence, or extent, of such overlap as the Technology Centres will not be evaluated until 2013 due to the time lag needed for a meaningful interim evaluation. Recently however, SFI has re-launched its Research Centres hub and spoke programme (replacing CSET and SRC programmes). This presents an

[28] This is not directly related solely to the SRC programme

opportunity to ensure clarity between the rationale, objectives and basis of HEI/industry engagement of this Research Centres programme and of the Technology Centre programme.

Appropriateness, Effectiveness and Efficiency

The SRC programme is appropriate with Irish policy. There has been a demonstrated logical path through which the programme inputs and activities have led to outputs, outcomes and employment impacts, and the programme has recorded encouraging results.

The evidence suggests that there was a good level of partnership outcomes in the form of increasing industry engagement and commercial and technical transfer outcomes. The level of scientific awards generated is also a positive impact of the programme. At early stage of the programme real research clusters are starting to develop which is a highly commendable outcome of the programme.

Findings and Recommendations

The programme has met its objectives and exceeded many of its targets.

SRCs successfully engaged with a wide range of companies including small and large, foreign and Irish owned. One third of companies stated that they would not have been able to develop the research or technology at all without SRC support.

The findings suggest that the programme delivered greater partnership working between academia and industry. For example, 81 per cent of respondents stated that they were more likely to engage with universities or institutes now than they were prior to becoming involved in the programme.

Now that the programme is being replaced by the Research Centres hub and spoke programme, it is recommended that continued efforts are made to address a difficulty found in the evaluation in delivering IP and Consortium Agreements. The recently launched National Framework for IP should go some way to help in establishing this guidance. The new hub and spoke model will allow bilateral IP agreements in addition to a 'softer' multi partner agreement – providing the basis for a framework that will be simpler to operate.

In addition it is recommended that best practice for industry partnerships be strengthened across all Centres including the format of industry project contribution (e.g. in cash or in kind); and that the peer review process be improved upon to ensure all targets and objectives are evenly assessed (including scientific excellence as well as economic return).

2.3 Innovation Partnerships (2004-2006)

The Innovation Partnership programme was launched in 2000 as a successor to the Applied Research Grants programme. It encourages Irish-based companies to work with Irish research institutes, generally on one-off projects, to result in mutually beneficial cooperation and interaction. Companies can access knowledge, expertise and resources based in HEIs to help in developing new and/or improved products, processes, services and to gain commercial advantage.

An evaluation had been completed by 2010, undertaken by Frontline Consultants and commissioned by Enterprise Ireland.

Between 2004 and 2006, Enterprise Ireland provided grants of between 50 per cent and 70 per cent towards the eligible costs of the research projects defined by companies to address specific needs. The projects took place over a 12-24 month period, with a typical duration of

18 months. The grant is paid directly to the research institute, which has an IP rights agreement with the company as part of their engagement.

The objectives of the programme were to: increase collaborative research projects between companies and knowledge providers; increase the level of R&D in the private sector; increase the level of commercialisation activity in the HEIs and use academic knowledge and expertise to gain competitive advantage.

Most companies (94 per cent) conducted some in-house R&D prior to participation in an innovation partnership. The programme reaches a good mix of companies, with:

- 56 per cent participation from SMEs and 44 per cent from large companies;
- a sectoral spread across industrial technologies (40 per cent), life sciences and food (32 per cent) and ICT (28 per cent); and
- Irish owned entities representing 54 per cent and foreign owned 46 per cent.

There were 145 Innovation Partnerships funded between 2004 and 2006. Enterprise Ireland's direct investment was €13.7 million, and company contribution amounted to €8.9 million - bringing total direct investment in partnerships to €22.6 million. Investment per annum grew from €4.2 million in the year 2004 to €11.4 million in the year 2006. Indirect costs incurred by Enterprise Ireland to deliver and manage the programme are estimated to be €4.2 million over the period 2004-2006. The overall total cost (direct and indirect) of the programme for the exchequer therefore amounted to €17.9 million over the period 2004-2006.

The programme has delivered outputs from the partnerships in terms of licences and new or improved products, processes and services to the company and to the market. Almost half of the participating companies had entered or were aiming to enter new, predominantly global, markets; this suggests that the programme is supporting companies with the ambition and ability to trade on a global scale. Some outputs had a degree of transformational effect on companies, causing marketing plans (63 per cent of cases) and corporate strategies (31 per cent) to be updated.

As a result of the programme, a third (34 per cent) of the companies reported or expected an increase in turnover, employment impact (4 per cent) or both (19 per cent). As additional time and investment is required to further develop the technologies, test markets and launch new products and/or services, there is likely to be a time lag before the innovation partnerships realise full economic impact.

Programme Leverage

It is a programme requirement that industry contributes toward the total project cost, in that grant support ranged from 50 to 70 per cent (as indicated above). Additionally, industry made contributions in kind, through staff time, premises and equipment, and institutes through staff time not directly paid for by the funding, as well as premises and equipment.

Company R&D

The main R&D objectives for participating companies were to develop new products (51 per cent), test the technical feasibility of ideas (39 per cent) and obtain external technical assistance (34 per cent).

It is not possible to isolate the increase in R&D as a result of the programme, however the large industry leverage towards project cost (40 per cent), may suggest increasing company R&D spend and activity.

Just under a third (31 per cent) of companies reported that the projects would not have gone ahead at all without the support funding from Enterprise Ireland. A further two thirds (66 per cent) of companies indicated that the projects would have gone ahead but at a smaller scale or to a delayed timeframe.

From a research institution perspective, the partnership programme is an important instrument to commercialise ideas, link with industry and increase R&D capability geared towards industry needs.

Synergies with Other Public R&D Supports

Although somewhat similar to the Commercialisation Fund, the Innovation Partnership programme differs in that it has collaboration between industry and HEIs as a primary objective. The Commercialisation Fund may involve companies licensing HEI researched technologies as part of the process to commercialise state funded HEI research, but it does not require *collaboration* between the parties.

Appropriateness, Effectiveness and Efficiency

Innovation Partnerships programme was aligned with Government policy objectives at the time of its inception, as outlined in the SSTI (2006-2013) and continues to be.

The programme demonstrated an EVA return of €2.13 by 2009 for each €1 of Enterprise Ireland total costs for the programmes (direct and indirect) over the period 2004 to 2006. Given that the EVA was calculated in 2009, (only) 3 years after 2006, it is likely that it underestimates the total economic benefit that can be attributed to the programme.

Findings and Recommendations

The main focus of the Innovation Partnership programme during the period of evaluation was to bring companies and institutes together to drive up the quality and relevance of collaborative research.

Since 2006, the Innovation Partnerships programme has undergone further changes: the funding support now ranges from 25 to 80 per cent of project cost; bonuses for regional location and SMEs no longer apply; only client companies of Irish Government Agencies are eligible; a HPSU cannot own the IP created; and the cost for funding PhD and MSc students is no longer eligible, other than in special cases.

There were issues with some companies in terms of their objectives and commitment to participation, as the programme was not seen by them as being critical to company development in all cases. This may be due to the fact that there was a mix of company profiles, from SMEs to MNEs that took part in the programme, with different impacts depending on size and R&D capability. The clear shift toward a more commercial focus as the programme has evolved should ensure that companies robustly demonstrate technological and economic due diligence on what they expect to achieve through participation prior to entering the programme.

Given the benefits achieved to date, the development of skills and the enhanced mobility from research institutes to the private sector should become objectives of the Innovation Partnership programme.

2.4 Innovation Vouchers (2007-2012)

The Innovation Vouchers programme aims to encourage small companies and public knowledge providers to work together on specific innovation questions, thereby increasing the number of R&D active firms. The objective is to promote and encourage a transfer of knowledge between Ireland's public knowledge providers and small business community, creating greater synergies between the two.

Innovation vouchers can be issued for technical or non-technical innovation including, for example, new business or service development. Under the initiative, vouchers worth €5,000 are allocated on a semi-competitive basis to small businesses whose proposals to work with public knowledge providers on specific innovation questions meet basic criteria. 2,022 innovation Vouchers were completed over the period 2007-2012, involving 1,602 companies and 36 institutes. This represents an expenditure by Enterprise Ireland of €9.907 million, and an additional €2.972 million was issued to HEIs to cover overhead costs. Indirect costs associated with the programme were €0.516 million.

The analysis was undertaken by Frontline Consultants commissioned by Enterprise Ireland. It involved interviews with 17 Institutes and 36 companies, and an e-survey which garnered 283 company responses.

The findings overall were positive. From the perspective of programme management staff and researchers in academic institutes, more than half of respondents (54 per cent) reported that working on projects had led to a strengthening of expertise in core research areas; led to improved networks with businesses (83 per cent); and more companies working with their Institute than previously (67 per cent). There were strong educational benefits with 68 per cent of researchers stating that working with companies on projects enhanced the relevance of teaching through 'live examples'. Commercialisation is seen by researchers as a major benefit. Around half of those in project teams had moved on to work in the private sector, which suggests that the Innovation Vouchers are an important mechanism for knowledge transfer.

From the perspective of participating companies, the findings overall were positive. The programme is reaching a good mix of companies from a range of sectors. The main company motivations for participation are to access academic knowledge and to drive business growth.

Benefits were reported as including: new products to company (24 per cent) and to the market (23 per cent); improved products to the company (20 per cent) and to the market (19 per cent); and new processes to the company (16 per cent) and to the market (12 per cent).

Although 59 per cent of companies stated that their objectives had been wholly or largely achieved, almost a third of companies (31 per cent) indicated that no tangible benefits had been received to date. The most commonly cited barrier to realising benefits was a lack of finance (64 per cent).

The programme has been successful in establishing new relationships between business and academia as 61 per cent of projects occurred where there was no pre-existing relationship. Almost all respondents (94 per cent) would be willing to participate in an innovation voucher project in the future or recommend the programme to other businesses (93 per cent).

Synergies with Other Public R&D Supports

A gap was identified by some stakeholders and companies between an Innovation Voucher (including follow on Vouchers) and the next step up R&D ladder which was widely perceived to be an Innovation Partnership.

In practice, between repeat vouchers and co-funded vouchers, companies can receive up to €15,000[29] in State support at which point they can avail of an Innovation Partnership at around €25,000 (subject to other conditions including being an Enterprise Ireland client). Therefore the gap in State support may not be as great as that perceived by some stakeholders. That said, there does appear to be a lack of awareness of the full €15,000 available under the Innovation Voucher programme, as well as the broader range of supports available through County Enterprise Boards (CEBs), Enterprise Ireland and the Institutes. The first step should be to address these knowledge gaps. Then, if an additional programme *is* deemed appropriate, it is important that it is designed to address a genuine gap and is supported with a robust rationale for continued state involvement.

Appropriateness, Effectiveness and Efficiency

The programme is appropriate and aligned to government policy. It is specifically designed and targeted toward small companies, whether or not they are an existing client of Enterprise Ireland. Innovation Vouchers are in place or have been used in countries across Europe for almost ten years. The overwhelming view of the version operated by Enterprise Ireland is that it is a successful initiative. The Innovation Vouchers are:

- Straightforward and cost effective to manage for Enterprise Ireland;
- Accessible and utilised by a broad range of small businesses;
- Beneficial to companies in many ways, including increasing competitiveness; and
- Beneficial to knowledge providers in building new client partnerships, developing market relevant knowledge for academic staff and raising teaching levels.

In terms of cost efficiency, the overhead costs paid to the HEIs at 30 per cent appear to be relatively high but these are the currently agreed rates to be paid by funding agencies. This adds €1,500 to the cost of each voucher. The Enterprise Ireland indirect costs associated with each voucher works out at an average cost of €203.

To date, it is estimated that the programme has supported an estimated cumulative net additional economic value added (EVA) impact of €31.141 million (PV), equivalent to an impact of €2.95 per €1.00 of Enterprise Ireland investment.[30]

Recommendations

The clarity of objectives is essential to facilitate robust evaluation and determination of a programme's success or otherwise. The identification of metrics and collation of data should be linked directly to the well-defined objectives. It is recommended that Enterprise Ireland review and set out SMART objectives for the Innovation Voucher programme, and related metrics. Consideration should be given to monitoring:

- The number of companies that have not had a relationship with a knowledge provider before;
- Tracking commercialisation outputs; and

[29] Based on the assumption that a company avails of all three vouchers

[30] The Economic Value Added impact is calculated as sales less the cost of all materials and services.

- The number of companies that go on to work on another project, partnership or initiative with a knowledge provider following an Innovation Voucher, and the value of these subsequent investments.

It is recommended that the existing manual process be replaced by an electronic system which would allow for businesses to apply online and increase efficiencies. If an online system was introduced then the need for a 'call' system could also be reviewed to allow for an on-going approval process that would ensure a response within a pre-defined period (e.g. 21 working days).

It was evident that some knowledge providers are more comfortable with the process of delivering and managing Innovation Vouchers than others. It is recommended that good practices be captured as a 'living' (online) document, continuously updated as high quality standards evolve, and disseminated to all knowledge providers to facilitate shared learning.

The current audit process within the HEIs should be reassessed to determine a less burdensome mechanism to manage the verification of expenditure and claim. The existing process has been identified by participants as a barrier to the programme remaining as an 'easy way to do business'.

2.5 Technology Gateways (Ex-Ante 2013)

Enterprise Ireland has initiated a new programme, the Technology Gateway programme and Forfás undertook an ex-ante evaluation of the programme. The programme builds on the existing Applied Research Enhancement (ARE) programme, and as such, analysis of the AREs provided valuable insights into this ex-ante evaluation.

The ARE programme was established as a national programme with the objectives of building a capability within the Institutes of Technology (IoT) to conduct industry relevant applied research and to increase IoT engagement with industry. There are now 13 ARE centres in 9 IoTs in operation and funding for these centres expires over 2012/2013. In total, the ARE programme committed €29 million in direct funding for 17 centres. In 4 cases funding was discontinued due to non-performance. State investment was complemented by industry direct contributions for specific projects, and has enabled IoTs to leverage other non-exchequer funding such as the FP7 EU Framework Programme. This investment resulted in the creation of a local technology capability which has proved attractive to industry based in the regions throughout Ireland. Since 2005, over 350 industrial clients including HPSUs, established Enterprise Ireland clients and foreign owned companies have worked with the ARE Centres.

The new Technology Gateway programme is open to the fourteen IoTs covered by the Institutes of Technology Act 2006. The stated aim is that new Centres will:

- Be small flexible applied research performers and technology solution providers;
- Have an important role in supporting regional companies;
- Provide a technological resource locally;
- Act as a portal to wider expertise;
- Act as an important extended R&D facilities base for companies;
- Work with Enterprise Ireland sponsored incubators where appropriate;
- Each Centre will have staff with an industrial background to ensure high quality interface with industry; and
- A new emphasis will be placed on collaboration between Centres and client companies.

Alignment with National Policy

The Technology Gateway programme is an evolution of the ARE programme which was established by Enterprise Ireland in response to Government policy. The SSTI 2006-2013 stated that "*regional economic development is a key part of Government policy, that regional innovation will have increasing importance and that the IoTs represent an important resource in this context"*. It goes on to state: "*The OECD Review of Higher Education recommends a specific role for Enterprise Ireland in developing a closer relationship between IoTs and regionally based enterprises focusing on applied research*."

The National Development Plan 2007 to 2013 states: "*Enterprise Ireland will also work with the Universities and Institutes of Technology to maximise collaboration between industry and academia to develop clusters of high technology companies in the Regions. The Applied Research Enhancement Initiative, designed to enhance regional research capabilities by supporting projects in Ireland's Institutes of Technology, will continue to be rolled out*."

The industry engagement of the Technology Gateways is an action in the Government Action Plan for Jobs 2012, (action 20 sets a target for the number of collaborative projects undertaken with industry by the Technology Gateways programme).

Recommendations

Bearing in mind that greater detail on objectives, activities and expected outcomes may be available following completion of the application process for Gateway funding, it is recommended that the ex-ante evaluation be updated and revised to reflect the dynamic and consultative nature of the programme design.

- Consider including a counterfactual or control group measure at ex-ante stage, to inform future interim and ex-post evaluations;
- The anticipated outcomes, targets and metrics need to be quantified to the greatest extent possible. Such quantifiable metrics need to be supported with appropriate data and its source and techniques for collection identified at this stage in the process.

The attribution results from the preceding ARE programme may be used as inputs to quantify the metrics. An illustrative example of performance metrics has been outlined in the detailed evaluation for guidance, and an effective system of tracking and monitoring should be put in place by Enterprise Ireland to facilitate future evaluations.

3 Enterprise R&D Supports

The following sections provide brief summary of the following programmes:

3.1 IDA Ireland R&D Fund (2003-2009)

IDA Ireland introduced its R&D Capability Grants Scheme in 2000 (now known as the IDA Ireland RD&I Fund) and it has been in operation for over 11 years. The Scheme provides grant aid to support IDA clients in the establishment of major new R&D facilities or the expansion of existing R&D facilities, and in the undertaking of R&D projects. This evaluation, undertaken

with external consultants Frontline, relates to grants awarded to IDA client companies over the period of 2003-2009.

A company application for R&D support is assessed by IDA Ireland for its commercial and economic benefits and the minimum grant is determined (after consideration of R&D tax credits as part of the overall state support package) to secure the company's investment in the project. An Enterprise Ireland Technical Assessor with expertise in the relevant technological field visits the company to undertake a technical assessment.

The programme has three main objectives, to:

- Increase the R&D capability and capacity of the MNE sector in Ireland;
- Move Irish subsidiaries up the value chain and to increase the embeddedness of these companies in Ireland; and to
- Meet the targets set out in the Strategy for Science, Technology, and Innovation.

IDA Ireland approved investment in the programme was €572 million between 2003 and 2009, which averages at €81.7 million per year. There were 219 grant approvals made to 136 companies during this period.

The total cost of the projects undertaken by companies was €2,113 million. The IDA Ireland grant approvals of €572 million represented 27 per cent of the overall project cost. Over time the IDA Ireland grant intensity reduced from an average of 36 per cent for projects approved in 2004 to an average of 23 per cent for projects approved in 2009, reflecting the introduction of the R&D tax credit.

Company R&D Performance

The responses to the company survey undertaken as part of the evaluation indicate that:

- 90 per cent of company respondents had upgraded their technical capability;
- Over a third of respondents said that without the project, they may not still be in Ireland;
- 76 per cent of companies said that they had maintained a larger staff presence in Ireland than they would have without the project;
- 62 per cent reported it had led to the skills levels employed in Ireland being raised;
- 95 per cent of companies reported that as a result of the IDA Ireland RD&I Fund their company had transformed towards higher value adding operations; and
- 88 per cent of companies felt the company is now more embedded in Ireland as a result of the Fund.

Synergies with Other Public R&D Supports

The programme complements other public programmes aimed at increasing the quantity and quality of BERD undertaken in Ireland. The capabilities developed within the foreign owned companies as a result of undertaking R&D (supported by the IDA Ireland R&D fund) has contributed significantly to their ability to collaborate effectively (including collaboration with Irish owned firms) and to define enterprise needs for the Enterprise Ireland/IDA Ireland Technology Centres programme. A number of foreign owned subsidiaries also engage on collaborative research with the SFI supported CSETS and SRCs, reinforcing the increased embeddedness of these firms with Ireland's growing research and knowledge base.

Appropriateness, Effectiveness and Efficiency

The IDA Ireland R&D Fund was appropriate and aligned with enterprise policy when it was established, and continues to be today. It is also important to consider this instrument in an international context given IDA Ireland's mandate to attract foreign investment in competition with other countries. Many other developed countries also offer incentives similar to IDA Ireland's R&D fund, and without it, Ireland could be at a distinct competitive disadvantage.

The evaluation found that approximately 40 per cent of the grants awarded had been drawn down to date. In some cases projects are still underway although taking longer than anticipated to reach pre-defined milestones, some have altered direction and in others the project has been discontinued. That said, companies cite the importance of the grant approval in gaining R&D mandates when competing with sister plants for investment.

The evaluation was found to be effective in meeting the objectives to embed company operations in Ireland, to move Irish subsidiaries up the value chain (evidenced by the increase in technical capabilities and skills levels reported by the companies) and to increase RD&I investments and capacity, thereby contributing to SSTI policy objectives.

An analysis of cost benefit indicates that a return of €5.0 was achieved in the year 2009 for every €1 of state support (including grants approved by IDA Ireland and indirect costs)[31]. This is a conservative estimate based on the additional value added achieved in 2009 by a sample of 81 projects[32] approved over the period 2003-2008 (i.e. taking the difference in value added in 2009 and the value added in the year of approval)[33]. There were two instances where the plant experienced a substantial fall in value added arising from global/corporate factors external to the R&D fund, and these were excluded from the analysis as they would have significantly skewed the determination of the effectiveness of the programme. This analysis does not take into account the lapsed time period generally required before the full economic impact of an RD&I programme can be determined.

The RD&I fund is aimed at building capability and is not a job creation intervention per se. In the context of international mobile subsidiaries based here, however, the retention of employment can be an indicator of the programme's effectiveness in terms of achieving embeddedness (enhanced capabilities have been discussed above). Over the years to 2003-2011 (which spans the recessionary period), the cohort of plants that availed of the R&D Fund between 2003 and 2009 grew employment by 12.8 per cent (using 2003 as the base year). This compares favourably with those plants that did not avail of the R&D fund whose employment fell by 6.2 per cent over the same period.

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[31] Inputs relate to the approved amounts for the 81 projects of €269 million plus indirect costs of €3.7 million which were apportioned on the basis of the total number of projects approved (81/213 * €9.7m)

[32] A sample of 54 plants was used that were approved funding for 81 projects between 2003 and 2008 and for which complete data was available (ABSEI). Due to data limitations, it was not possible to specify the proportion of increase in value-added directly attributable to the intervention, particularly where the RDI activity involved production/process enhancements. The available data represents a sample of the total RTI funded population. No adjustments have been estimated for potential transfer pricing effects

[33] The additional value added (excluding these two plants) was adjusted for deadweight (63 percent), displacement (5 percent) and a multiplier (1.2) percent to determine attribution

Companies interviewed commented on IDA Ireland's efficiency and the benefits of the related advisory services, including: advising company staff of what was available and simplifying the approval process; the speed of the approval process when the company emphasised that time was an important factor; and the ability to bring influential people along to meet visiting senior company executives. A number of people interviewed had worked in other countries with the same company and offered the opinion that the RD&I Fund was unique in its ability to support compelling cases for investment in R&D for Ireland.

There are a number of initiatives in place to support deepening of research in Ireland's HEIs, commercialisation and collaboration between HEIs and industry. The IDA Ireland RD&I Fund complement the wider innovation system through bringing major players and investment to support a 'market pull' that matches the 'technology push' that the Irish Government has been supporting.

Findings and Recommendations

A number of companies cited that in instances where the nature of the approved project had changed during the R&D process, they were unable to draw down grant support. Although this may be a strictly correct interpretation of the approved project (which had been subject to technical and commercial assessment), it is recommended that the current approach be examined to review the extent to which a degree of flexibility can be accommodated.

3.2 Enterprise Ireland RTI Scheme (2002-2006)

Enterprise Ireland established the Research Technology and Innovation (RTI) competitive grants scheme in 2000. The scheme was a key action under the Government's Operational Programme, which was part of the National Development Plan 2000-2006. It was open to companies in manufacturing and internationally traded services based in Ireland, including both Irish owned and foreign owned companies based here[34]. The RTI fund operated on a competitive basis. The evaluation period spans the years 2002-2006, and this evaluation has been informed by a number of reviews undertaken by Enterprise Ireland for that period, with further analysis undertaken by Forfás[35].

In terms of companies undertaking R&D activity, there was a broad spectrum of companies supported - those who were planning to undertake their first R&D project and those who were significantly developing their existing R&D activities. A project duration of up to 2 years was allowed for approval. The maximum grant amounts range from 30 per cent to 50 per cent of total eligible project costs, depending on the recipient company location and size.

Applications involving expenditure greater than €100,000 were judged on a competitive basis. The projects were assessed by the Research & Technology Innovation Initiative Committee (RTI Committee). Projects below €100,000 were reviewed by a committee within the development agencies on a non-competitive basis, and then recommended to the RTI Committee.

The RTI scheme had the following objectives, to:

- Help firms to develop innovative products, processes and services;

[34] The Enterprise Ireland RTI Competitive Grants Scheme became the Enterprise Ireland R&D Fund in 2008. An IDA client company could submit a claim under the competitive RTI programme for a specific R&D project

[35] CM International, February 2009. Red-C, January, 2008

- Increase the number of companies performing effective R&D in Ireland;
- Increase the scale of the investment in R&D in Ireland;
- Increase the number of companies doing R&D for the first time;
- Ensure Irish based companies, particularly SMEs, protect their futures by helping them reach and exceed European and international norms for R&D investment;
- Increase the quantity and quality of the R&D linkages between companies, and between Third Level Institutions and companies; and to
- Encourage firms to collaborate with other research performers, either in Ireland or internationally through collaborative research programmes such as Eureka and Craft, although only expenditure undertaken in Ireland is eligible for funding.

Between 2002 and 2006 Enterprise Ireland approved €112.5 million for 1,611 projects, which equated to €69,800 on average per project. The total number of companies supported was 565, and in many instances companies were approved funding for more than one R&D project. The average amount of projects approved per year was 317.

Company Performance

An analysis was undertaken of a sample of 208 companies (involved in 682 R&D projects)[36] which includes both Irish and foreign owned companies. Four outlier Irish owned companies experienced a fall in value added of greater than €36 million since 2007 (considerably higher than the remaining sample companies) and they were excluded from the analysis as the scale of fall could not be attributed to participation in fund and therefore would have significantly skewed the determination of the efficiency of the programme.

The analysis shows the change in performance for these companies that can be attributed to the RTI Scheme[37]. The indicators set out the change between the year in which the company was first approved an RTI Scheme grant in the 2002 and 2006 period, and each of the years 2007 and 2010. Setting out the performance pre and post 2007 reflects the fact that the evaluation spans a period of economic turbulence. The key findings indicate:

- The increase in R&D expenditure to 2007 was €14.3 million in 2007 (17.7 per cent) and to 2010 was €14.9 million (18.5 per cent). This shows that although there was a slowdown in the annual growth rate of expenditure on R&D during the recessionary period post 2007, companies continued to invest in R&D. R&D expenditure as a percentage of sales remained steady over the period at 4 per cent;
- The increase in exports to 2007 was €361.2 million (27.9 per cent) and to 2010 was €275.5 million (21.3 per cent). Exports as a percentage of sales increased steadily from 60.27 per cent to 65.35 per cent;
- The increase in value added to 2007 was €166 million (25.2 per cent) and to 2010 was €90.6 million (13.7 per cent); and
- The increase in turnover to 2007 was €592.5 million (27.6 per cent) and to 2010 was €258.2 million (12 per cent).

[36] For which complete data was available - using Forfás ABSEI data for the period 2002-2010

[37] To determine attribution, adjustments were made to account for deadweight, displacement and multiplier effects

The survey undertaken by Red C consultants[38] indicated that companies gained new skills in the areas of strategic planning (91 per cent), application management (87 per cent) and idea generation (85 per cent); introduced new/improved processes (75 per cent) and products (an average of 4 new or improved products); and increased their R&D budget (62 per cent of respondents, with an average increase in budget of 36 per cent) as a result of the RTI scheme.

In terms of employment, the cohort of Irish owned companies that were approved RTI support demonstrated a greater degree of resilience over the recessionary period than the total EI client base. Over the 2002-2012 period the 'RTI cohort' experienced 8 per cent growth in net employment[39] (excluding the three outlier companies from this analysis), compared with a 6.2 per cent decline in employment in the total EI client base. Although the total Enterprise Ireland base is showing employment growth since 2010, the 'RTI cohort' has rebounded at a faster rate and pace since 2010.

In summary, although the recession did have an impact, there was a positive performance demonstrated by companies that availed of the RTI Scheme in the years 2002 -2006 in terms of increased RD&I investment, export intensity and capabilities, as well as a demonstrated ability to rebound in employment terms post 2007.

Synergies with Other Public R&D Supports

The programme complements other public programmes aimed at increasing the quantity and quality of BERD undertaken in Ireland and at capturing and commercialising ideas and knowledge, such as the Innovation Partnerships and the Commercialisation Fund.

Appropriateness, Effectiveness and Efficiency

The RTI Competitive Grants Scheme was an appropriate mechanism to achieve the objectives of growth in BERD as set out in national policy documents during the period of evaluation. The programme is very similar to those in place in most other developed countries to stimulate in-company R&D. Grant aid for in-company R&D has been shown internationally to be an effective way of leveraging private investment in R&D[40].

An analysis of cost benefit indicates that a return of €1.82 was achieved in the year 2010 for every €1 of state support, including direct grant aid approved and indirect costs incurred by Enterprise Ireland[41]. This is a conservative estimate based on the additional value added achieved in 2010 (i.e. taking the difference in value added in 2010 and the value added in the year of approval)[42]. This analysis does not fully account for the lapsed time period generally

[38] Based on a telephone survey of 203 companies undertaken in 2008

[39] Using the year 2002 as a base year the 'RTI cohort' grew at a faster rate than the total EI client base up to 2007. Although employment declined in the immediate post 2007 recessionary period, the level of employment fell to marginally below the 2002 levels, and to a lesser extent than the total EI client base

[40] Government R&D Funding and Company Behaviour, Measuring Behavioural Additionality, OECD 2006 http://carthagene.enim.fr/IMG/pdf/OECD_RD_2006.pdf

[41] Benefits relate to Gross Value Added (GVA) - adjusted to account for deadweight, displacement and multiplier effects to provide an estimate of benefits directly attributable to the intervention.

[42] The CBA methodology follows that used by Frontline Consultants to analyse the IDA R&D fund, with the objective of ensuring a consistent approach across both the EI and IDA schemes that support in-firm R&D. The approach likely underestimates the full economic impact of the programme as the cumulative benefits accruing each year over the period to 2010 are not included (Note that NPV has

required before the full economic impact of an RD&I programme can be determined. It needs also to be recognised that the evaluation period spanned an economic cycle of boom and bust[43].

Findings and Recommendations

A comparator group of companies had not been established ex ante to facilitate comparison of impacts, and Enterprise Ireland cites challenges in doing so given that most firms supported by the agency are eligible or have availed of RD&I supports. However, the importance of establishing a counterfactual is well demonstrated here in that the ability to assess the performance of R&D active companies (supported by the RTI fund) relative to non-R&D active firms over a recessionary period could strengthen the evaluation[44].

It is recommended that a robust counterfactual and/or control group be established ex-ante to support future programme evaluations.

3.3 R&D Advocates (2006-2011)

This programme started as an R&D Awareness programme in 2001 to encourage Irish companies to become more aware of the potential benefits of undertaking R&D and to encourage them to take the first steps to becoming R&D active. Informed by the findings and experiences during the period of evaluation, the programme was subsumed and Advocates integrated into the new Potential Exporters Division since 2011.

The R&D Advocates programme targeted companies that do not undertake R&D or are low to medium R&D performers[45], and companies that are actively engaged with Enterprise Ireland.

The total Enterprise Ireland direct financial support for advocates was €1.25 million. The companies availed of a free half day Advocate visit followed by a three day Advocate support (if required), for which the company contributed one third toward the Advocate fee. Indirect costs to support management and delivery of the programme are estimated at €672,000, bringing the total cost of the programme to €1.92 million for the period 2006-2011.

Over the period of evaluation 1,987 companies were contacted, resulting in 1,218 half-day visits (61.3 per cent) to the firm by an Advocate. Approximately one in six of these companies (15.4 per cent) undertook a follow-on more intensive three day visit to assess the potential for R&D engagement within the context of the firm's business strategy and future development.

The total expenditure by companies that availed of three-day advocate support amounted to €169,200 over the period of evaluation, from 2006-2011. A total of 188 companies spent a fixed amount of €900 for the three days of support.

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not been applied). Furthermore, data limitations have meant that it is not possible to fully distinguish between the recessionary impacts and attribution to the fund. Note, the CBA calculation excludes the four outlier companies.

[43] In this context, it is interesting to note that the CBA for the period to 2007 (i.e. immediately prior to the recession) demonstrates a CBA of €3.34

[44] Analysis was undertaken by Forfás in terms of employment only using the total Enterprise Ireland client base

[45] Companies that spend less than €65,000 on R&D are deemed to be R&D inactive. Low to medium performers are defined as companies spending between €65,000 to €130,000 per year on R&D over the past three years.

As a result, 80 of these companies (42.6 per cent) became active Enterprise Ireland clients and accessed further support.

Other outcomes identified included:

- Identification of projects that would merit research/innovation/intervention (24 per cent);
- Increased employment in research/innovation (20 per cent);
- Established a research/innovation strategy (17 per cent); and
- Established a research/innovation project plan (12 per cent).

Over half (57 per cent) of companies indicated that as a direct result of the support received, research/innovation was now more embedded in the company. For some companies the R&D Advocates programme assisted company strategy and planning in both short and longer term.

Company R&D

A total of 42 companies were contacted to inform the evaluation and were asked about their investment in R&D prior to participating in the R&D Advocate programme. More than 3 in 4 companies (77 per cent, 33) had invested in in-house R&D while around 1 in 4 (24 per cent, 6) had invested in external R&D. This indicates that most companies already had a culture of innovation and improvement before they participated in the R&D Advocates programme. Other impacts included:

- 65 per cent were more likely to invest further in research/innovation; and
- 68 per cent believed that their company had transformed towards higher value added operations.

Synergies with Other Public R&D Supports

The programme has a high level of synergy with other Enterprise Ireland RD&I programme supports. It has led to 39 per cent of companies that participated in the programme to be successful in their application for other Enterprise Ireland funding supports.

Appropriateness, Effectiveness and Efficiency

The R&D Advocates programme is in accordance with Irish Government policies set out in the SSTI 2006-2013, in particular its objectives to increase the quantity and quality of R&D in the business sector.

The main objective of the programme is to promote the benefits of R&D to companies and to increase company R&D activities and performance. The programme is delivering on these objectives, with a high proportion of respondents (87 per cent) declaring that they had their objectives met. Over half (56 per cent) of respondents also reported that as a direct result of the support received, research/innovation was now more embedded in the company.

The programme was efficient and effective in what it set out to achieve. What became apparent was that the scope of the Advocate engagement widened to business development, strategy and advisory services beyond 'just' R&D. This helped to inform the evolution of the use of Advocates, which are now incorporated within the Potential Exporters Division as Enterprise Ireland seeks to broaden its base of active client companies.

Findings and Recommendations

The Advocates programme demonstrated a positive company experience as they gained a range of benefits through participation. The main recommendations are focused on improved advocate-company match and the need for a greater level of follow up by Enterprise Ireland Development Advisors after the Advocate visit to companies.

Overarching Findings

In general, the individual RD&I programmes evaluated are appropriate, efficient and effective. The previous section set out the performance of each of the programmes, and where relevant set out the economic return achieved (CBA). It is important that in the context of RD&I, the broad range of impacts and outcomes (including, for example licenses, patents) are taken into account and that due regard is also given to the qualitative outcomes.

The behavioural changes that have been realised over the past decade *are* important – changes that create an environment conducive to RD&I and capability building will lead ultimately to tangible economic effects. Evidence points to increased academic-industry links, an increase in the industry relevance of the research conducted in research groups, increased mobility of research staff to industry and enhanced in-firm capabilities.

Findings in relation to the behavioural aspect are set out below. The sections following outline a number of areas that warrant attention in order to improve the overall NIS and evaluation culture, building on progress to date.

The Behavioural Aspect

The positive change in behaviour from both industry and HEIs sends the right signals in terms of the increased collaboration in RD&I, and needs to continue and be accelerated with good programme design and management. Irish universities need to be recognised as good innovation partners for businesses, both in terms of conducting relevant research and having sound working practices in research and contractual matters that facilitate collaboration. In parallel, it is important that businesses with less experience of R&D and innovation, particularly SMEs, increase their understanding of the benefits of investing in innovation. These on-going changes will result in greater investment in R&D and in R&D skills, leading in time to tangible economic effects in the form of increased revenue generation and jobs supported in Ireland.

The following changes in behaviour and behavioural additionality has been recorded across the entire suite of programmes:

- **Increased academic-industry links**: Starting from a very low base, long-term strategic relationships have been instigated and deepened across Ireland's academic research base and business sectors. While the academia-industry relationships have improved compared to the position at the start of the programme, the time needed for the building of trust necessary to establish sustainable collaborations is considerable and still requires a structured form of governance.
- **Improved research quality:** The availability of funding budgets and supportive offering of programmes has increased the capacity and capability of research teams in HEIs.

- **Increase in the relevance of the research conducted in the research groups involved:** The CSET and SRC programme requirement for industrial participation, including a role in governance and management, ensured that industrial input was taken seriously by the academics and institutions proposing and running research centres. This has given industry a greater influence on academic research than they would otherwise have had and has increased the relevance of academic research. The challenge is to find the appropriate balance between a research programme that is sufficiently far-sighted while remaining relevant to industry, and to ensure that industrial influence does not tip the balance between 'problem solving' research and state-of-the-art science.
- **Changed behaviours with respect to academic-industry interactions:** In general, academic and industrial partners have had a positive experience of their collaborations. As a result they are better placed to seek out and conduct collaborations in future. In many cases the evidence points to an increased awareness and appreciation of the value of commercialising research on the part of researchers; and an increased awareness by companies of the state supported research expertise available to them.
- **Increased mobility of research staff to industry:** Researchers taking part in collaboration programmes with industry are better prepared for industrial careers and have moved to the private sector. On the other hand, those who decided to stay in academia form the next generation of academics who will have a much better understanding of business needs, cultures and processes.
- **Principal Investigators/Institutional Benefits**: HEIs stakeholders reported: production of conference papers/posters and publication of journal articles; improved competencies; improved teaching; increased number of students attracted to the department; monetary gains to institutions; institutional strategic shift towards commercialisation and industry; follow on activities include applied research projects, additional funding and on-going industry engagement.

A Systems Approach – Alignment with Government Policy and Contributions to National Objectives

The individual programmes within the scope of the evaluation have been found to be appropriate and aligned with Government policy at the time of their implementation. However, this alignment is less clear (or at least not documented) when existing interventions are modified in response to the changing nature of the economy and/or market conditions.

A total of 12 interventions have been evaluated – each of which play a role within the overall NIS. The evaluation has focused on those interventions that aim to increase firm level engagement and investment in RD&I, ultimately leading to economic return. Technology Ireland has an important role to play in the overall coordination of agency programmes. It is important that as new programmes are introduced and/or existing ones modified by any one agency, they are considered in light of complementary interventions and in terms of their specific (intended) role within the context of the NIS. Objectives, target population, and relevant metrics (qualitative and quantitative as appropriate) need to be explicit from the outset. For example, there is now a broad range of programmes aimed at stimulating academic-industry and commercialisation interactions, ranging from the CSETs, to SRCs to Technology Centres, to Innovation Partnerships – all with the ultimate aim of delivering new businesses and/or development of new products, processes and services.

It is important that the distinctions between the academic-led user oriented research agenda of the CSETs and the research agenda determined by industry for the Technology Centres or Gateway Centres (for example) are preserved, underpinned with clarity as to objectives and expectations in terms of outputs (e.g. research citations, patents, licenses) and time to achieve economic outcomes. In some instances the evidence pointed to a 'shifting of goalposts' and a motivation for programmes to move toward delivering economic returns and job creation in a shorter period of time.

At a practical level, consistency in the definitions used to describe the type and level of R&D activity, such as: proof of concept research, collaborative research, basic or pure research, technological de-risking research, experimental or industrial, etc., is essential in order to determine the level of risk associated with a particular intervention and to distinguish between activities of various programmes.

Recommendation

This review is timely given the changed economic circumstance, the extent of programme modifications over the period since 2006 and the developing capabilities within Ireland's Innovation System.

It is recommended that:

- Future Science, Technology and Innovation (STI) policy reasserts the system view of the National Innovation System, taking into account the findings of the individual RD&I evaluations to inform the most appropriate suite of programmes to deliver on objectives – and to clarify the contributing role that each plays within that system.
- Future STI policy should ensure that there is an appropriate balance across the system – building the world class research excellence envisaged while simultaneously stimulating increased R&D activity at the level of the firm.

A clear and consistent definition of research type that is associated with the level of risk or market readiness should be developed (and aligned with EU definitions).

In the interim:

When programmes are redesigned and/or new programmes developed:

- A statement of alignment with current policy should be documented in order to determine their continuing relevance to national policy objectives; and
- New/revised programmes should be presented to Technology Ireland, setting out the rationale and demonstrating their distinguishing characteristics and complementarity with other programmes.

Programme Metrics Linking with RD&I Targets

The large and diverse range of indicators currently being used across the agencies presents challenges in obtaining aggregate data *across* the programmes. Metrics in relation to RD&I *do* exist on an Agency level, such as number of companies with minimum or significant R&D, etc. However, during this evaluation process it has not been possible to link metrics and results coming from individual programme evaluations to the overall targets as set out in the SSTI (2006-2013) or to determine the extent to which each programme contributes to the achievement of the system-level goals and objectives and this should be the subject of further work.

Recommendation

A clear link of quantifiable results of each programme to the overall system metrics should be determined where possible. This can be supported with establishing a clear and specific Programme Logic Model (PLM) for each programme as recommended below.

The on-going work of the Research Prioritisation Action Groups in developing metrics is relevant in this regard.

Programme Design & Embedding an Evaluation Culture

The overall aim of undertaking the suite of evaluations is to embed a culture of evaluations across the agencies, applying a consistent methodology (as set out in the Framework). A number of aspects have come to light which need to be addressed.

Currently there is no formal or consistent process of ex-ante evaluation undertaken. The reviews undertaken by the agencies when instigating a new programme or modifying an existing one predominately focus on operational and management aspects of the programme. This approach has merit. However, the operational approach is distinct from an evaluation approach. The evaluation process needs to be structured and streamlined process with a consistent format of evaluation framework.

There is also a case for continuing to streamline the number of programmes on offer, both for communication purposes and to improve efficiency of delivery.

There were a number of instances where the objectives of a programme were not always clear at the outset and some changed during the consultation process. Objectives stated are not always measurable or specific and vary in level of detail. The causal relationships between objectives, activities, outputs and outcomes were not always clear.

The attribution of benefits and estimation of additionality specific to a programme presents a challenge for evaluations, particularly in instances when a firm avails of number of complementary supports within a period of time. The preferred option to address this challenge is to establish a control group (similar companies that do not avail of any support or inactive R&D companies) in order to measure their performance against those who receive the support. Given that the agencies deal with most (if not all) companies within particular cohorts (e.g. exporting Irish owned firms), this can prove to be problematic, but nevertheless should be given due consideration at the outset.

Recommendations

- Introduce a system of ex-ante evaluation across the enterprise agencies, informed by the programme Logic Model set out in the Forfás Evaluation Framework.
- The purpose of ex-ante evaluation is to carry out analyses that help define objectives, to ensure that these objectives can be met, that the instruments used are cost-effective and that reliable later evaluation will be possible. The ex-ante evaluations should cover all policy issues, such as alignment with national policy, the rationale for government intervention, complementary with other existing supports (where relevant) and its contribution to national targets in RD&I. It is important that the right metrics have been identified that can clearly demonstrate achievement of specified objectives.
- Consider the potential for establishing control groups *(where possible, recognising that this is difficult given the cohort of companies being supported)* in order to assess

impact from programmes. Results from the process of establishing the control group should be documented.

- The design of suitable performance metrics to measure programme inputs, activities/processes, outputs and outcomes should conform to the SMART criteria, which states that optimally specified performance metrics should be:
  - **Specific:** the chosen indicator is well defined and relates clearly to the specific aspect of the programme/support under which performance is being assessed;
  - **Measurable**: the chosen indicator can facilitate the measurement of progress towards achievement of programme/support objectives/goals;
  - **Attainable**: the data supporting the chosen indicator should be attainable or achievable in a cost-effective manner;
  - **Relevant**: the chosen indicator should be relevant to the objectives of the support/programme being evaluated; and
  - **Timely**: measurement on the chosen indicator should be available in a timely manner.
- Due to the 'holistic approach' to company supports, where a company may receive multiple supports for various aspects of development, clear information of receipt of other supports should be gathered as part of an evaluation survey (interim/ex-post). Although it is a challenge to calculate the impact of one support in the context of others being received by a firm, the robustness of a programme evaluation would be strengthened by having complete information to hand.

Programme Design – Industry Interactions with HEIs

As stated above, there has been considerable investment in developing and implementing programmes that stimulate increased interactions between industry and Academic researchers. While the range of interventions is not in itself a bad thing, it has led to a large number of potential contact points for industry. When designing programmes it is important to clarify the objectives and expectations relating to HEIs and their role as an 'instrument' in engaging effectively with companies on RD&I activities. A number of interventions set out a range of objectives, some of direct relevance to the HEI as a 'target' in its own right (e.g. publications, behavioural change) and others relating more to the firm (e.g. increased investment in R&D). A well designed programme that involves interaction between the two parties should be clear in terms of focus, objectives and the responsibility for delivery.

Recommendation

Programmes should be devised with careful selection of, and clarification relating to the target and the 'instruments' of a policy intervention. This will better determine how the intervention will be evaluated in the future and who has the responsibility for delivery on the objectives.

Conclusion

Overall, the individual supports aimed at stimulating RD&I activities are appropriate, in that they are aligned with national policy, and in general are effective and efficient (both in terms of economic return (CBA) and in terms of delivery by the agencies). There is a wide range of

interventions in place currently. Over the period of the evaluations, many programmes have evolved, some have been discontinued and new ones established. The findings of these evaluations will provide strong evidence and information to guide future policy discussion. Future Science, Technology and Innovation policy (post 2013) should ensure that within the National Innovation System, there is an appropriate balance across the system – from building the world class research excellence envisaged while simultaneously stimulating increased R&D activity at the level of the firm.

Programme Evaluations Detailed Reports

The remainder of this report sets out the detailed findings for each of the twelve programmes evaluated. The structure follows the programme Logic Model and sets out the inputs, outputs and outcomes. Each evaluation can be read in its entirety, and because of this, there will (of necessity) be some duplication throughout in terms of policy context and rationale.

Individual Programme Evaluations

1. Enterprise Ireland's Commercialisation Fund (2003-2009)

Programme Logic Model

Objectives[46]

- Transform research output from academic institutions into innovative new products and spin-outs
- Effect a change in the approach to research by academics, to create potentially commercially valuable output
- Realise potential of Higher Education sector in developing new products and processes that have potential for commercialisation

by

- Funding projects at several different stages of commercialisation process (from commercialisation concept to technology de-risking to market & attract investment)

Inputs

- Enterprise Ireland is the sole grant provider to the programme[47]

Outputs

- Number of Proof of Concept projects
- Number of Technology Development projects
- Number of Commercialisation Plus projects

Activities

- Providing financial support at 3 phases of commercialisation to enable Principal Investigators to commercialise research
- Evaluating proposals for commercialisation ventures

Outcomes & Impacts

- Increased number of spin-out/IP from academic research
- Increased exports, jobs created or safeguarded
- Reputational and educational benefits for academics and competitive advantages for companies

[46] Enterprise Ireland

[47] 40 percent of funding is from ERDF which is included in the annual exchequer contribution to Enterprise Ireland.

Evaluation Aim

The aim of the evaluation is to review the appropriateness, efficiency and effectiveness of the Enterprise Ireland Commercialisation Fund in accordance with the Forfás Framework for Evaluation of Enterprise supports, May 2011.

This review is based on the Frontline Evaluation report, issued to Enterprise Ireland in August 2010. The evaluation is an ex-post evaluation, focusing on recipients of the Fund from 2003-2009. However, a time lag of five to seven years[48] before outcomes fully materialise is generally required for a Fund of this nature.

Programme Background, Objectives & Target Population

The Commercialisation Fund was introduced in 2003 to realise the potential of the Higher Education sector in developing innovative products and processes that could be brought to market. The Commercialisation Fund assists projects which are at different stages, ranging from the development of early stage scientific concepts, to ideas that are close to market exploitation but need assistance to enter the market effectively.

When introduced, the Commercialisation Fund was the only major source of applied research funding in Ireland. It offered up to 100 per cent support to institutions to develop technology that was closer to market and could be exploited either by way of the creation of spin outs or by licensing technologies to Irish based companies.

The Commercialisation Fund has evolved over time, with a number of subtle changes in terms of objectives. For the purposes of undertaking an evaluation, Frontline Consultants confirmed the main objectives of the Fund in discussion with Enterprise Ireland, Companies and Principal Investigators. The objectives of the Commercialisation Fund are to:

- Transform research output from academic institutions into innovative new products and spin-outs.
- Effect a change in the approach to research by academics, stimulating researchers to create potentially commercially valuable output.
- Realise potential of Higher Education sector in developing new products and processes that have potential for commercialisation;

by

- Funding projects at several different stages of commercialisation process (from commercialisation concept to de-risk technology for market & attract investment).

The Fund was managed across three stages:

- **Proof of Concept** – aims to support academic researchers to explore innovative scientific concepts with commercial potential. Grants of €50k to €100k may be awarded for up to 12 months;
- **Technology Development** – designed to assist researchers in undertaking substantive applied research projects based on a foundation of confidence that the underlying

[48] Framework for Evaluations, Forfás, 2009. Frontline Consultants consider that the timeline to realisation of full economic outcomes may be us to nine years for the Commercialisation Fund

technologies are sound and there is a market opportunity. Grants of €100k to €400k may be awarded for 18 to 36 months; and

- **Commercialisation Plus** – provides funding for those completed projects that have reached advanced commercialisation discussions with potential industrial partners, but need to address specific market validation issues; does not need to be previously funded through Proof of Concept or Technology Development.

Commercialisation Fund Re-design 2010

In 2010 the Commercialisation Fund was reorganised so that there is greater emphasis from the outset on identifying market application and potential. The Fund continues to support early stage research, technology development and business plan development and technical de-risking R&D, to transition innovations from the HEI to the commercial arena. Under the reoriented Commercialisation Fund, researchers, in partnership with their Technology Transfer Office (or equivalent office), can apply for a Commercial Case Feasibility Grant to investigate, scope and develop a commercial case for their technology or project idea, such as:

- Perform Market analysis and validation;
- Profile the competitor landscape;
- Perform Patent landscaping and develop the IP strategy;
- Investigate potential routes to exploitation to the economic benefit of Ireland;
- Understand relevant regulatory issues or other barriers/hurdles to commercialization; and
- Create a small demonstration or early prototype.

Enterprise Ireland closely monitors progress through a series of stage gates and releases funding on a tranched basis. In 2011, the flexibility of the Commercialisation Fund Programme was improved by introducing a process whereby selected projects can be submitted to the programme outside of the standard published calls.

Target Population

Researchers in Higher Education Institutions (HEIs) and Research Performing Organisations.

Programme Rationale

There has been a significant transformation in Ireland's RD&I policy since the late 1990s. Following a Foresight exercise, and in the context of the EU's Lisbon Agenda (2000-2010), Ireland committed over €630 million to a Technology Foresight fund for a seven year period of the National Development Plan 2000-2006 [See also section on alignment with National Policy below]. The Commercialisation Fund was established in 2003 as a key element in the Research, Technological Development and Innovation (RTDI) for collaboration component of Ireland's operational plan for Industry 2000-2006[49]. Governments internationally play a key role in supporting the development of innovation systems and on addressing market failures in

[49] Technopolis (2004) An Evaluation of the RTDI for Collaboration Programme, Main Report, Forfás

R&D and in science and technologies so as to achieve the development, diffusion and use of economically useful knowledge and innovations. At a national innovation system level, governments can seek to address the coordination failures that can arise between the various players in the innovation system, including HEIs, research institutes and firms.

At this point, Ireland's R&D policy and innovation system was at a relatively early stage of development. The significant increase in R&D investment involved the development of R&D infrastructures in HEIs through the Programme for Research in Third Level Institutes (PRTLI) and capacity building and excellence in science and technology. This evolved initially through the funding of Principal Investigators and through a focus building capabilities in company RD&I activities.

During this time of increased investment and institutional change, it was evident that research institutions' primary focus was primarily on research papers, journal articles and peer review. The Commercialisation Fund was introduced in 2003 to address this issue and to effect a change in the approach to research by academics. The stakeholders[50] consulted as part of the evaluation expressed somewhat differing views as to the rationale for the establishment of the Fund and of its main aims. Generally, however, the rationale was aligned across two areas:

- To use the academic resource base as a means of achieving direct value for Ireland; and
- To build competency and capability in applied research to deliver future economic value.

Evaluation Methodology

The evaluation methodology reflects the Forfás Evaluation Framework[51]. This evaluation has been informed by the evaluation of the Programme undertaken by Frontline Consultants in 2010 which had been commissioned by Enterprise Ireland.

There is a time lag associated with the return one would expect to see from the Fund, as it could take between five to seven years before there is full observable impact in the economy. The Commercialisation Fund provides supports to Principal Investigators (PIs) to commercialise their research outputs. Using evidence from the companies and stakeholders the typical process could take:

- Up to three years to complete a Technology Development project;
- 6 months to 1 year to negotiate the license;
- 1-3 years to complete further R&D and get an end product, process or service; and
- 1-2 years to get the new product, process or service to market[52].

[50] Informed and validated by consultations with strategic stakeholders by Frontline Consultants. Strategic stakeholders largely comprised staff with responsibility for the Fund, staff from the enterprise team within Enterprise Ireland, from Science Foundation Ireland (SFI), IDA Ireland and the Higher Education Authority (HEA)

[51] Framework for Evaluation of Enterprise Supports, Forfás, 2011

[52] Based on this analysis, the extreme case would be nine years to bring to fruition. Forfás Evaluation Framework, informed by international review, estimates a time-lag of up to seven years

The performance of PIs in receipt of the Commercialisation Fund is collected through a survey and inferences on the Programme are drawn from the survey results. In total 69 PIs from across 14 institutions were interviewed as part of the evaluation. Collectively, the PIs interviewed had undertaken 223 (25 per cent) projects supported by the Commercialisation Fund. The 14 institutions surveyed received 95 per cent of total the Programme funding.

The survey also captured 41 of the 91 companies[53] in total that were engaged in the commercialisation process – including spin-outs created as a result of the Fund, as well as companies that licensed research/technologies developed by the PIs. This represents a survey response rate of 45 per cent.

In order to calculate the impact of the Commercialisation Fund, the results are grossed up to be representative of all businesses who have engaged with the Fund (either as a spin out, Licensee Company or some combination of the two) across Ireland[54].

The breakdown of projects carried out by the PIs interviewed is detailed in Table 1 below.

Table 1.1: No of Projects led by Principal Investigators taking part in the Survey

Commercialisation Fund	Number of Projects	Total No. Projects Supported by Fund	Percentage Representation in Fund
Proof of Concept	100	543	18%
Technology Development	95	302	32%
Commercialisation Plus	28	50	56%
Total	**223**	**895**	**25%**

Future Assessment

The assessment of future impact relies on company projections of growth – in terms of employment, turnover and GVA components (profit and employee costs). It is appropriate to adjust the figure for optimism bias as there is a demonstrated systematic tendency for companies to be overly optimistic.

The majority of the companies benefiting from the Commercialisation Fund, fall into three sectors:

- Information and Communication Technology 48 per cent
- Industrial technologies 35 per cent
- Life Sciences and Food 18 per cent

[53] Excluding those who have gone out of business or who operate overseas

[54] A grossing up multiplier of 2.22 to the net impacts is applied, which is calculated by dividing the total population of 91 companies by the 41 companies in the sample

To account for optimism bias a comparison is made between the projected GVA submitted by each of the companies and the closest sectoral match from the top performing European companies[55] in the following sectors:

- General industrials sector, used as a proxy for companies in the industrial technologies sector;
- Software and computer services sector, used as a proxy for companies in the information and communication technology sector; and
- Pharmaceuticals and biotechnology sector, used as a proxy for the life sciences and food sector.

Where the GVA is above the average, the figure was reduced by an appropriate amount to bring it in line with the average. These downward adjustments are applied to turnover and sectoral GVA to develop more realistic estimates of impact. Where the value lies below the average GVA per head for the sector, it is assumed to be within an acceptable level and not adjusted in any way. The optimism bias values for milestone years amounted to:

- 11 per cent in 2010 (this means it is expected that the company will achieve 89 per cent of its projected GVA in that year);
- 18 per cent in 2011 (this means it is expected that the company will achieve 82 per cent of the projected GVA in that year);
- 31 per cent in 2013 (this means it is expected that the company will achieve 69 per cent of the projected GVA in that year);
- 50 per cent in 2015 (this means it is expected that the company will achieve 50 per cent of the projected GVA in that year).

No adjustment has been made for employment projections, even where turnover is assessed as being overly optimistic. Frontline Consultants' assessment of employment projections is that they are actually conservative across the company base (i.e. although companies are predicting substantial output growth they are not increasing employment in line with this).

To adjust for additionality, company level results (gross results) are adjusted for:

- Deadweight – what would have happened anyway, without the Fund;
- Leakage – the extent to which the benefits are retained within Ireland;
- Displacement – the extent to which the benefits are realised at the expense of other Irish based businesses;
- Substitution – the extent to which one company activity is simply substituted for another; and
- Multipliers – the positive downstream effects created through spending on supplies and the wider wages generated from these downstream effects.

The deadweight is estimated by asking the company how different their turnover and employment would have been without the Fund. The average deadweight amounts to:

[55] Data is sourced from the UK Department for Business Innovation and Skills Value Added Calculator, which collects GVA data from the top performing UK and EU Companies

- 62 per cent for turnover (this means that 38 per cent of turnover would not have been generated without the support); and
- 64 per cent for employment (this means that 36 per cent of employment would not have been generated without support)

To put this into context the peak deadweight value for the Scottish Enterprise Commercialisation Programme was 75 per cent for turnover and 77 per cent for employment[56]. This suggests that the Fund is operating within expected benchmarks for deadweight.

Displacement is applied consistently to employment, turnover and GVA based on the location of the companies' direct competitors (and adjusted based on the growth potential of the market they operate in). For the Fund the average displacement amounted to 5 per cent. Using the same assessment, deadweight for the Scottish Enterprise Commercialisation Programme amounted to 4 per cent. This suggests that the displacement level operates within expected benchmarks.

The remaining variables as accounted in the calculation of impact and additionality are as follows:

- Leakage is estimated at 5 per cent (based on the assumption that employment is concentrated in Ireland and that turnover and profits are retained within Ireland);
- Substitution is assumed to be 0 per cent (as no evidence of substitution was found in any of the companies engaged with the Fund); and
- Multiplier value of 1.69 (the average across the companies based on where they source supplies and on the assumption that most of their staff wages are spent within Ireland).

Alignment with National Policy

There has been a rapid change in the infrastructure for delivering high quality research in Ireland over recent years. In the late 1990s, there was a major shift in focus towards a knowledge based economy. The Irish Council for Science, Technology and Innovation (ICSTI) undertook a 'Technology Foresight' exercise in 1998. The subsequent report concluded that Ireland should evolve rapidly to a knowledge society. It determined that the enormous potential of new technologies in areas such as computer science, telecommunications, nanotechnology, biotechnology and medical systems should be exploited. It identified technology as a key driver for knowledge societies and evidenced that Ireland lacked a world class research capability of sufficient scale in a number of strategic areas. It called for a dramatic increase in the level of research investment to address this gap as a matter of urgency. The Technology Foresight Fund was established, that committed €630 million in the National Development Plan 2000-2006.

A number of new programmes were introduced to build the infrastructure and deliver the funding under which world class research activity could be carried out:

- The Programme for Research in Third Level Institutions (PRTLI) and the establishment of the Higher Education Authority (HEA) – which focused on the development of long term strategic plans for research infrastructure and programmes;

[56] Frontline Consultants (2009) Commercialisation Programme Review, Scottish Enterprise

- The establishment of Science Foundation Ireland (SFI) which focused on the development of a foundation for research excellence; and
- The establishment of two new research councils – the Irish Research Council for Science, Engineering and Technology (IRCSET) and the Irish Research Council for Humanities and Social Sciences (IRCHSS) – both focused on the support of postgraduate and postdoctoral research across all disciplines to build a strong base of highly qualified researchers.

The Government's Strategy for Science Technology and Innovation (SSTI), 2006-2013, under the Department of Enterprise Trade and Employment set out a vision that:

"Ireland by 2013 will be internationally renowned for the excellence of its research, and will be at the forefront in generating and using knowledge for economic and social progress within an innovation driven culture."

The three most important pillars of the SSTI from an enterprise perspective were:

1. Building a world class research system
2. Capturing and commercialising Ideas and Knowledge
3. Driving economic growth through research and innovation in enterprise

The Strategy identified that "Serious deficits exist in the Irish system in the areas of awareness, identification, evaluation, capture, protection and commercialisation of ideas… A two pronged approach is being implemented to upgrade our performance in the management and commercialisation of ideas from publicly funded and collaborative research. This will involve strengthening the IP/Commercialisation functions within the Higher Education Institutes and supporting this, where relevant, with a central source of specialist expertise". The Commercialisation Fund therefore has had a strong fit with the objectives of national policy during the period of the evaluation.

Inputs

The total Programme Cost (including direct and indirect costs incurred by Enterprise Ireland) over the period of evaluation is €147.6m.

Over the evaluation period (2003-2009) the Commercialisation Fund committed €144.2m direct funding to 895 projects, or on average of €161,063 per project. The project breakdown between 2003 and 2009 was:

- €45.3m in Proof of Concept (average of €83,403 per project);
- €93.3m in Technology Development (average of €309,004 per project); and
- €5.5m in Commercialisation Plus (average of €110,888 per project).

Full details are included in Table 1.2 and Chart 1.1 below.

Table 1.2: Commercialisation Fund Inputs

Year	Proof of Concept (000's)	Technology Development (000's)	Commercialisation Plus (000's)	Total (000's)
2003	€2,421	€12,134	€0*	€14,555
2004	€4,779	€9,900	€0*	€14,679
2005	€7,715	€15,376	€1,067	€24,158
2006	€7,532	€19,807	€1,669	€29,009
2007	€9,210	€17,482	€784	€27,477
2008	€9,091	€11,545	€1,104	€21,740
2009	€4,539	€7,076	€920	€12,535
Total (per Stage)	€45,288	€93,319	€5,544	€144,152
Average (per year)	€6,470	€13,331	€1,109*	€20,593

* 2003 & 2004 – No payments made

The Commercialisation Plus stage started in late 2005. There has been a high degree of variation in the investment levels over the period 2003-2009 with investment peaking in 2006 at €29.009 million and declining thereafter to €12.535m in 2009. respectively. Enterprise Ireland also advised that the drop in expenditure in 2009 was related to budgetary constraints.

Chart 1.1: Commercialisation Fund Inputs

Indirect Cost

The indirect cost includes cost of front-end Enterprise Ireland staff salaries, i.e. commercial specialists who are involved in managing and delivering the programme. It excludes administrative cost or overheads associated with the Programme.

Enterprise Ireland allocated on average 6.3 Full Time Equivalent (FTE) staff to the Programme per annum. This amounts to an estimated total of €3.437 million during the evaluation period.

The total cost (indirect cost and direct cost) of the programme from 2003 – 2009 was €147.589 million.

Activities & Outputs

Activities

The Fund was operated with three stages of support as described in Section 1 of this report - Proof of Concept (POC), Technology Development and Commercialisation Plus - although it was not necessary for a project to start at POC and work through the other two stages. That is to say, the Fund did not act as a series of stepping stones for every project supported. For example, a project that received Stage 2 support from the Commercialisation Fund (Technology Development) may have resulted in a licence of the technology to a company, and therefore would not have 'advanced' to Commercialisation Plus. In other circumstances, an Innovation Partnership was deemed the most appropriate 'next step' source of funding. Also, the Commercialisation Plus stage was open to projects that may not have received

funding through the earlier stages of the Commercialisation Fund; and the Proof of Concept phase may have delivered findings that indicated that further investment in the project was not warranted.

Although the application process differs across each of the different stages/support of the Fund, the processes for each were found to be thorough, fair and transparent. The key strengths of the application process included:

- Three calls per year – offering a number of application points over a year;
- The ability for rejected projects to be resubmitted – ensuring only the best projects were funded but also that potentially good projects were not left out;
- Strong peer review for Technology Development – ensuring all projects were thoroughly reviewed before funding;
- Use of industrialists/industry experts for Technology Development – adding an external demand perspective to the application process as well as the latest thinking from industry;
- Use of moderators in the assessment process – ensuring consistency and transparency around the assessment of projects;
- Minimum standard for funding – ensuring only projects meeting the criteria were funded but also removing an element of direct competition from the process; and
- Relatively quick turnaround on decision making – providing a responsive system.

Following project approval, processes needed to be managed by Enterprise Ireland to ensure delivery of appropriate project and spend milestones. The delivery process was generally seen to be working well, with commercialisation staff working closely with the projects and with sufficient flexibility in the system to deal with any minor changes to projects as they advanced.

There were some views expressed by stakeholders that the programme was resource intensive, given the number of calls made. At the same time, the process was deemed by them to be effective ('there were very few mistakes') and that the added value was seen to outweigh the time costs associated with the application.

In total 895 projects have been funded under the Commercialisation Fund. The project breakdown between 2003 and 2009 was:

- 543 Proof of Concept projects;
- 302 Technology Development projects; and
- 50 Commercialisation Plus projects.

Table 1.3: Commercialisation Fund Activities

Year	Proof of Concept	Technology Development	Commercialisation Plus	Total
2003	35	46	0	81
2004	66	34	0	100
2005	98	54	12	164
2006	92	66	12	170
2007	104	51	8	163
2008	99	32	8	139
2009	49	19	10	78
Total	543	302	50	895

From the variation in the take up of the different stages in the project above, there is little pattern to the activities funded between 2003 and 2009, although according to Enterprise Ireland, limited budgets had an impact on project activity in 2009 [See also Table 1.3 above].

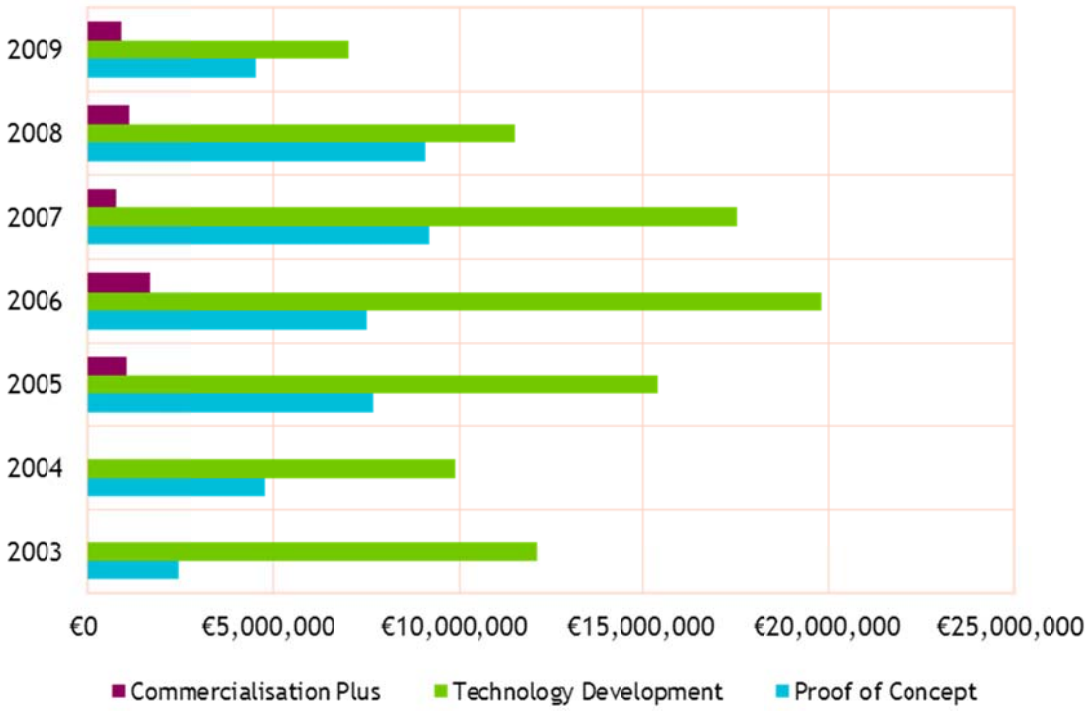
The number of Proof of Concept projects had been increasing steadily with a slight decline in 2008 and a significant drop in projects in 2009 as a result of these budgetary constraints.

The number of Technology Development projects did not follow this trend of steady increase, which indicates that many projects (in total of 241 projects) did not proceed to technology de-risking or development.

The number of projects in the 'Commercialisation Plus' phase (totalling 50 over five years) did not vary greatly between 2005 and 2009.

The trend of the Commercialisation Fund projects is depicted in the chart below.

Chart 1.2: Trend of Commercialisation Activities



*Comm Plus was only introduced in 2005

Outputs

In assessing the outputs of the Commercialisation Fund, a survey was undertaken of a number of PIs involved, as well as companies that either licensed technologies or were spin-outs resulting from the Fund activities. The findings are set out below for each cohort.

Principal Investigators – Outputs

In total 69 PIs were interviewed. Collectively they had undertaken 25 per cent of the projects supported by the fund. Where possible the number of respondents for each of the survey/interview questions has been highlighted in the Tables below. In most instances, the PI could provide more than one response (and were involved in various projects across each of the stages of the Fund).

The final outputs and activities from the Commercialisation Fund are summarised in Table 1.4.

The rate of invention disclosures was highest in Proof of Concept projects, reflecting the early stage nature of these projects. The levels of licensed outputs are highest at the Technology Development stage. The Commercialisation Plus phase delivered 12 spin out companies from a total of 14 research projects completed and signed off by Enterprise Ireland. The level of spin outs from Commercialisation Plus projects resulted in additional monetary gains for almost half of the PIs interviewed. Although very few projects were delivered more quickly than expected, the highest proportion was delivered to plan.

Table 1.4: Final Project Outputs and Activities

Funding Stage	POC	TD	CP
Outputs	**No of responses (% response)**		
Research completed and signed off by Enterprise Ireland	53 (87%)	44 (76%)	14 (50%)
Activities			
Patent developed	31 (51%)	31 (53%)	11 (39%)
Invention disclosure developed	29 (48%)	23 (40%)	8 (29%)
Outputs			
Licensed outputs – Irish company	4 (7%)	15 (31%)	4 (14%)
Licensed outputs – overseas company based in Ireland	1 (2%)	4 (7%)	2 (7%)
Licensed outputs – overseas company, no Irish base	2 (3%)	2 (3%)	1 (4%)
Spinout company developed	3 (5%)	6 (10%)	12 (43%)
Answered question	**61**	**58**	**28**

Principal Investigators - Objectives

66 PIs responded to the survey question relating to objectives for applying for a Commercialisation Fund grant. The PI could respond to more than one objective. The majority (67 per cent) cited that their objective was to secure research funding to further their main research interest; or to secure funding for research assistants and equipment (14 per cent) (Table 1.5).

Just under half of the PIs reported that their objectives were directly linked to a commercialisation activity, either by developing product/processes or services or to exploit a business opportunity from their research area (either in terms of developing new products/services (49 per cent), or developing a business opportunity (42 per cent)[57]. Approximately 20 per cent of respondents were interested in supporting businesses in their main research area and a similar number saw the Fund as a way to keep up to speed with industry developments.

[57] Because the PIs could provide more than one objective, the responses cannot be added across different objectives

Table 1.5: Objectives for Applying for the Commercialisation Fund

Objective	Response (%)	No of Responses
Secure research funding in my main area of interest	67	44
Wanted to develop new products/processes/services from my research	49	32
Wanted to develop a business opportunity from my main area of interest	42	28
Gain applied insights into my main area of interest	27	18
Wanted to support businesses in my main area of interest	20	13
Keep up to speed with industry focus in my main area of interest	18	12
Further the Institution's commercialisation mission	17	11
Secure funding for research assistants and equipment	15	10
Further the Institution's research mission	14	9
Answered question		66

This perhaps points to the challenge in achieving the programme objective of effecting a change in the approach to research by academics. Although there is evidence of a shift in mind-set relating to commercialisation objectives, there is still some way to go, and availability of funding remains of primary concern for research academics. The improvements suggested to the Fund by the PIs (see below) are a positive indication of a desire to focus more on commercialisation objectives.

Principal Investigators - Additionality

PIs were asked to estimate the additionality of the Commercialisation Fund; the results are presented in Table 1.6. 69 PIs were surveyed as part of the evaluation process and were involved in approximately 25 per cent of all projects across the three stages. A PI could respond more than once, i.e. at each stage of the commercialisation process.

From total of 142 responses across the three stages of funding support, survey responses indicated different levels of additionality for each stage. The PIs indicated that the project would not have continued at all without commercialisation support and had not applied for alternative funding in 44 per cent of Proof of Concept projects, 32 per cent of Technology Development projects and 62 per cent of Commercialisation Plus projects[58].

What is also of interest is that the PIs used the feedback process to modify their research proposals and to reapply.

[58] Each PI surveyed may have been involved more than one project at different stages of the commercialisation process

Table 1.6: Additionality of the Support

	POC	TD	CP
Additionality	**No of responses (% response)**		
Would have done the project with a different funder at a later date	10 (16%)	7 (12%)	3 (14%)
Would have had to find a different funder/redeveloped the proposal – so taken longer	12 (20%)	20 (33%)	1 (5%)
Would have used the feedback to redevelop a better project and reapplied	7 (11%)	10 (17%)	2 (10%)
Would have used the feedback to redevelop the project on a larger scale and reapplied	1 (2%)	1 (2%)	0 (0%)
Would have used the feedback to redevelop the project on a smaller scale and reapplied	4 (7%)	3 (5%)	2 (10%)
I would not have continued with the project at all – no other forms of support applied for	27 (44%)	19 (32%)	13 (62%)
Answered question	**61**	**60**	**21**

Note: Does not total 100% due to rounding

Principal Investigators - Engagement with other Enterprise Ireland Supports

Over half of the PIs (57 per cent) indicated that they had accessed other forms of Enterprise Ireland support. The most frequent included:

- Innovation Partnership Programme;
- Advanced Technology Research Programme (ATRP – predecessor of the Commercialisation Fund);
- Innovation Vouchers;
- Business Partnering Programme;
- Competence Centres; and
- Applied Research Enhancement Centre (ARE).

In general PIs access multiple supports to support their research, and had being doing so for a long time; for example, numerous PIs accessed ARTP which was the predecessor of the Commercialisation Fund.

Principal Investigators - Suggested Improvements to the Fund

Overall PIs were very positive about the Fund, highlighting a wide range of benefits. They did however indicate a number of developments that they though could help improve the Fund. These can be summarised as:

- Need the focus of Proof of Concept style projects to be short and sharp with outcomes that align with market need;
- International peer review panel for Technology Development programme to help reduce the local bias that often creeps into assessment;
- Clear route to market from the outset;
- Increased regular communication from Enterprise Ireland during projects, more than just milestones;
- Need for longer project timescales for lifesciences as the commercialisation cycle is much longer; and
- Need for a commercial partner from an early stage of the project to help drive the commercial outputs.

Again, it is interesting to note that the majority of these improvements focus on the commercial return a positive indication of a change in approach by academics to research objectives. This is key if the Commercialisation Fund is to have an improved economic return in the future.

Company - Activities and Outputs

41 of the 91 companies involved in the Fund where surveyed (this includes both spin-outs and companies that licensed technologies from technologies/research developed by the PIs that had received supports from the Commercialisation Fund).

In general, companies were satisfied with their experience of engaging with the Institutions. Just over half suggested they were very satisfied with the whole process. Satisfaction was high across some of the specific areas of engagement with the institution, including approachability and ease of engagement, as well as technical expertise. Negotiating the license had the highest dissatisfaction levels.

Almost all (95 per cent) companies highlighted that all or most of their objectives in engaging with the institution were met.

The main objectives in engaging with the academic institutions varied across the companies surveyed. The main reason centres on 'technology push' objectives, cited by 37 per cent (14) of respondents (Table 1.7), including the application of new technologies to existing products/processes (29 per cent) and increasing functionality (11 per cent). While 'technology push' objectives were the main broad grouping, the single largest objective cited by the companies was the need to develop new products, processes or services (diversification), cited by 13 Companies (34 per cent).

Table 1.7: Company Objectives

	Response Per cent	Response Count
Competitive Advantage	34%	13
Market Pull	23%	12
Technology push	37%	14
Responding to competition	5%	2
Diversification	34%	13
Knowledge Benefits	11%	4
Efficiencies	5%	2

Companies could answer multiple questions

Competitive advantage was also cited by around a third of the companies, this breaks down into:

- 9 Companies (24 per cent) seeking competitive advantage in technology ; and
- 5 Companies (13 per cent) seeking competitive advantage in both technology and business.

These findings suggest a strong focus on the technology, or its development, refinement and enhancement as key company objectives.

Companies - Additionality

All but two companies reported that engagement with the institution had directly impacted upon the current state of their business in some form. Almost two thirds (26) of companies (65 per cent) reported that they would not have been able to develop their technology at all if they had not bought the license or engaged with the institution. This indicates a very high level of absolute additionality (in effect activity that would not have taken place had it not been for the Fund).

Where the activity was not wholly additional, there was evidence of time additionality, where the technology would have been developed later, cited by 7 Companies (18 per cent). There was also evidence of time and scale additionality, i.e. 4 Companies (10 per cent) suggested the project would have been delivered later and to a smaller scale.

This indicates that with the exception of two companies, all impacts and outcomes can be directly attributed to their engagement with the institution to some degree. Full details are included in Table below.

Table 1.8: Additionality of the Commercialisation Fund

Level of additionality	Response Per cent	Response Count
We would have developed the technology anyway	5%	2
We would have developed the technology at a later date	18%	7
We would have developed the technology – but on a smaller scale	3%	1
We would have developed the technology at a later date and on a smaller scale	10%	4
We would not have been able to develop the technology at all	65%	26
Answered question		40

Impacts and Outcomes

There are a number of wider benefits or outcomes from the Commercialisation Fund as detailed below. The evaluation considered attitudinal impacts, medium term outcomes and quantitative impacts of the Commercialisation Fund.

The impacts and outcomes are presented based on feedback from PIs, HEIs, and Companies.

Principal Investigators

There was a wide range of competency-related benefits cited by staff, with the majority of PIs suggesting improvements in internationally recognised commercialisation and knowledge transfer skills as a result of delivering the projects. Across all the core competencies the majority of respondents cited either some impact or a substantial impact on their skills in each area. This suggests that the delivery of the projects is enhancing core commercialisation skills among the PIs who deliver the projects.

A number of core competencies are cited by at least 90 per cent of the PIs in terms of either some or a substantial impact, including increased ability to:

- Manage information and communication linked to commercialisation, cited by 94 per cent (61) of the PIs interviewed as making either some or a substantial impact on their skills; and
- Maintain relationships with commercial partners; deliver applied research projects and solve problems in relation to commercialisation, cited by 92 per cent (60 and 59 respectively) of the PIs as making either some or a substantial impact on their skills.

At the same time, there were a number of areas of activity where no impact was achieved for a number of respondents, including the ability to:

- Develop, manage and maintain relationships with other departments, with 32 per cent (21) of the PIs suggesting no impact;

- Assess next steps for client – and opportunities for other solutions, with around 31 per cent (19) of the PIs suggesting no impact; and
- Manage business opportunities through to successful outcomes, cited by over a quarter of the PIs (28 per cent, 17) as no impact.

This is likely to point to the realities that somewhat different competences are needed to develop/manage a business from those needed to undertake research activities. The fact that a number of PIs opt for the licensing route to market, rather than becoming directly involved in a business/spin-out reinforces this. For a PI, making the 'right' choices for them in terms of a commercialisation route is an important factor.

Table 1.9 sets out the individual benefits obtained by PIs which point to increased exposure for the PI through speaking engagements at international and national events and his/her research and reputation building through awards, for example.

Table 1.9: Individual Benefits from Project Activity (Absolute Responses Only)

Principal Investigator Direct Benefits	POC	TD	CP	Response Count
Invited speaker at national conferences	23	28	6	34
Invited speaker at international conferences	19	27	7	32
Awards / prizes	14	12	2	20
Promotion / improved post	9	14	4	16
Membership of learned committee / professional society	3	7	1	8
Answered question, multiple answers allowed				52

Other outcomes that PIs reported were intangible and were in the form of:

- Reputational benefits – with 87 per cent of PIs suggesting the Institution had improved its reputation;
- Applied research benefits – with 68 per cent of the PIs suggesting the Fund had strengthened expertise in core research areas to the department or Institution;
- Educational benefits – with 70 per cent of PIs suggesting improved teaching through the expertise they developed from the project or the application of theory to the real world; and
- Network benefits – including 70 per cent of PIs who suggested they had developed external networks with other institutions and the 62 per cent of PIs who suggested improved networks with businesses.

Principal Investigators - Follow on Activities

The outcomes presented so far, focus on the relatively immediate effects arising from PI engagement with the Commercialisation Fund. The analysis points to the potential for longer term benefits such as follow on applied research activities or further industry engagement.

Table 1.10: Follow on Activities

Follow-on Activities	POC	TD	CP	Response Count
Follow on basic research projects	27	24	3	34
Follow on applied research projects – closer to market	32	22	10	45
Follow on applied research projects – further from market	7	14	3	17
On-going industry engagement	20	31	11	40
New industry engagement	15	26	9	36
No follow on activities	2	3	2	6
Answered question, multiple responses allowed				65

Higher Education Institutions

Institutional benefits related specifically to those direct and indirect effects arising from the delivery of the Commercialisation Fund projects by the PIs. These include academic benefits, reputation, mobility of staff and evidence of monetary benefits in a proportion of cases.

Academic Benefits: The traditional areas of academic engagement focused on publication, conferences, courses and wider exploration and dissemination, as presented in Table 1.11.

Table 1.11: Academic Benefits from Project Activity

Academic benefits from project activity (absolute responses only)	POC	TD	CP	Response Count
Publication of journal articles	30	37	10	46
Production of conference papers/posters	40	44	14	55
Delivery of lectures/courses in the research area	34	35	9	41
Consultancy work in the research area	4	12	4	19
Events associated with public understanding of science and technology	18	21	5	23

Academic benefits from project activity (absolute responses only)	POC	TD	CP	Response Count
Answered question, multiple answers allowed				61

Reputation: In relation to the perception of the institutions' commercialisation infrastructure and external standing, the following outcomes were reported:

- The institution delivers commercialisation work that is perceived as high quality – 77 per cent (50) of PIs agreed or strongly agreed with the statement;
- The institution is seen to be easy to work with around commercialisation – 70 per cent (46) of PIs agreed or strongly agreed with the statement; and
- The Institution delivers commercialisation activity that is seen as being driven by industry – 62 per cent (40) or PIs agreed of strongly agreed with the statement.

Mobility of staff: PIs suggested that there were wider benefits to the private sector in Ireland, with 63 per cent (42) highlighting a member(s) of the project team had moved into the private sector. From the 67 Principal Investigators questioned 76 staff had moved into the private sector, taking their knowledge expertise and skills with them (what has sometimes been described as 'technology transfer on legs'. This has included staff moving to a wider range of companies both large inward investors and spin outs such as Beckman Coulter, Abbott, EMC and Nubiq.

Monetary Impact: While a wide range of qualitative benefits were cited by PIs, less than half (46 per cent, 31) suggested that there had been a monetary benefit to the institution and similarly (46 per cent, 31) suggested that there had been a monetary benefit to themselves or the department. This is ultimately the expected result as projects take time to produce a commercial return and suggests that the institutions still have the potential to gain more in the future.

Table 1.12: Monetary Benefits to Institutions and Department

	Response Per cent	Response Count
To the institution - Yes	46%	31
To the institution - No	54%	36
To me or the department -Yes	46%	31
To me or the department - No	52%	34
Answered question		67

Companies

Frontline Consultants surveyed 41 companies as part of their evaluation of the programme. This section sets out the main findings.

The companies who have accessed technology licenses are using them, with 87 per cent suggesting they are using them in a meaningful way. In 95 per cent of cases' further R&D was required by the company to apply the licenses acquired to the development of a product.

In total, 79 per cent of companies provided details of the amount they spend on R&D. The companies spent in total approximately €14.7 million on further R&D work. The specific company expenditure ranged from €7,500 to €4 million, with a mean value of €506,810. However, most companies spent less than this, with the median value of €150,000. This still represents a significant wider spend on R&D in order to apply the technology in the development of a product, process or service. A range of R&D and innovation activity was undertaken by firms. As set out in Table 1.13, these included:

- In house R&D or creative work undertaken within the company to increase the stock of knowledge to devise new or improved products, processes and services, cited by 95 per cent (35);
- Acquisition of external knowledge or the purchase or licensing of patents, know how or other types of knowledge from other enterprises or groups, cited by 30 per cent (11);
- Acquisition of machinery, equipment and software or the purchase of advanced machinery, equipment and software to produce new or improved products, processes and services, cited by 24 per cent (9);
- All forms of design or expenditure on design functions for the development or implementation of new products, processes or services, cited by 22 per cent (8);
- Market introduction of innovations or activities associated with the market preparation and introduction of new products, processes or services, cited by 22 per cent (8);
- Acquisition of R&D (external) or creative work purchased externally to the business, but with the purpose of improving the stock of knowledge and devising new and improved products, processes and services, cited by 16 per cent (6); and
- Training associated with innovation, internal or external associated directly with the introduction of innovation, cited by 11 per cent (4).

Table 1.13: Types of R&D Activity

	Response Per cent	Response Count
In house R&D	95%	35
Acquisition of external knowledge	30%	11
Acquisition of machinery, equipment and software	24%	9
All forms of design	22%	8
Market introduction of innovation	22%	8
Acquisition of R&D (External)	16%	6
Training associated with innovation	11%	4

	Response Per cent	Response Count
Answered question		37

The vast majority of innovations are product related - 91 per cent (37[59]) of respondent companies indicated that the technology license enabled them to develop a product, which was either new to the company or new to the market. There was evidence of new services (38 per cent) being developed by 15 companies, and new processes (21 per cent) being developed by 8 companies.

In addition to the technological innovation, there was also strong evidence of other forms of innovation. This largely focused on corporate strategy (90 per cent) and marketing plans (70 per cent), involving the development of new strategies/plans in the majority of cases. These wider innovations are mechanisms which underpin the successful exploitation of new products, processes and services. There was also some evidence of new or improved organisational structures (35 per cent) and management techniques (25 per cent). These were cited as directly resulting from the Fund.

In terms of intellectual property (IP), 82 per cent of the companies surveyed protected the IP emerging from the project or from the follow on R&D. The companies used a range of mechanisms to protect the IP, with formal mechanisms dominating (cited by 91 per cent of the surveyed companies) (Table 1.14).

Table 1.14: Mechanisms of Intellectual Property Protection by Companies[60]

IP Protection	Response Per cent
Formal mechanisms	91%
Confidentiality agreements	46%
Copyrights	12%
Trademarks	12%
Registration of design	9%
Patents	73%
Strategic mechanisms	67%
Secrecy	61%
Lead time advantage on competitors	24%
Complexity of design	36%

[59] Assumed number based on total number of respondents (41)

[60] The data sources did not present absolute numbers to the percentage representation. Multiple choice answers allowed

Quantitative Impacts

The quantitative impacts are relevant only to the company performance. The following sections set out export growth attributable to the Fund, and an analysis of cost benefit based on value added (both actual and anticipated).

Exports are a good indicator of how competitive and/or differentiated a product is, and of the potential geographic reach of the companies that engaged in the Fund. 88 per cent of respondents were looking at either existing or new markets throughout Europe (excluding Ireland and the UK); closely followed by other 'rest of the world' markets (largely the US, but also including China)(85 per cent). The local Irish market and UK market were being targeted by a lower proportion of companies, but this still accounted for around eight out of ten of the companies surveyed. This suggests a broad approach to selling the products wherever there is demand (Table 1.15).

Table 1.15: Geographic Reach of Commercialisation Product

Geographic Market	Response Per cent
Local markets	79%
Local (Irish) – existing markets	47%
Local (Irish) – new markets	62%
UK markets	79%
UK – existing markets	44%
UK – new markets	68%
Other EU markets	88%
Other EU – existing markets	50%
Other EU – new markets	74%
Other rest of world markets	85%
Other rest of World – exiting markets	47%
Other rest of world – new markets	71%

In total the companies surveyed had generated export sales of €137.9 million between 2005 and 2009, with €90.7 million generated in 2009 alone. Although a number of the companies cite local markets as being a target (Table 1.15 above), 64 per cent of respondents suggested that between 90 and 100 per cent of their turnover was accounted for by exports. By contrast, just 14 per cent had generated less than 20 per cent of their sales as exports.

Table 1.16: Proportion of Turnover Accounted for by Exports

	Response Per cent
0-19%	14%
20-39%	4%
40-59%	4%
60-89%	14%
90-100%	64%

Cost Benefit Analysis

Cost Benefit Analysis was developed by adding together the gross profit and the employee costs of the companies in each of the years[61]. The GVA impact accruing over the period 2003-2009, amounts to €34.099 million (NPV €27.698 million). As indicated earlier in the Methodology section of this report, the GVA has been grossed up to be representative of all businesses that have engaged with the Fund. Costs include both direct and indirect costs.

Although the Fund started in 2003, most licenses have only been operational in the last few years. The future GVA impacts represent what the businesses would expect to generate by 2015. The total GVA impact accruing over the period 2003-2015, amounts to €400.168 million (NPV €269.652 million). This highlights that the supported companies are potentially progressing toward market exploitation of the developed technologies. This results in a cost to benefit ratio of 2.04 : 1, which ultimately suggests a return to the Irish economy of €2.04 for every €1 of grant provided by the Fund (Table 1.17) by 2015.

Table 1.17: Current and Potential GVA Impacts of the Commercialisation Fund

Year	Total Costs (000's)	Net Present Costs (000's)	GVA Impacts (000's)	Net Present Benefits (000's)
2003	€15,128	€15,128	€0	€0
2004	€15,252	€14,665	€0	€0
2005	€24,731	€22,865	€0	€0
2006	€29,582	€26,298	€1,313	€1,167
2007	€28,050	€23,977	€3,887	€3,322
2008	€22,313	€18,339	€11,683	€9,602
2009	€13,108	€10,774	€17,217	€13,606

[61] While GVA would generally also account for depreciation and amortisation, these values have been excluded to avoid over-burdening the companies in the survey element of the work (they are also the two smallest parts and can therefore be excluded without significantly undercounting the impacts)

Year	Total Costs (000's)	Net Present Costs (000's)	GVA Impacts (000's)	Net Present Benefits (000's)
2010	€0	€0	€13,541	€10,290
2011	€0	€0	€28,647	€20,932
2012	€0	€0	€28,647	€20,127
2013	€0	€0	€81,595	€55,125
2014	€0	€0	€81,595	€53,004
2015	€0	€0	€132,045	€82,475
Total	€148,162	€132,046	€400,169	€269,652
Benefit to Cost Ratio (2003-2009)[62]				0.21 : 1.0
Estimated Cost to Benefit Ratio (2003-2015)				2.04 : 1.0

Further analysis shows that the greater contribution to impact is made by the ICT sector, which accounted for 48 per cent of the GVA between 2003-2015; and Life sciences and food sector made a disproportionately high impact relative to its percentage of the surveyed companies.

Table 1.18: Impact Split by Sector

Sector	Contribution to impact	Percentage of the surveyed company population
ICT	48%	46%
Life Sciences and food	29%	20%
Industrial technologies	22%	34%

The greater contribution to impact is made by firms that have been trading in Ireland for between 4-7 years, which account for 30 per cent of the total GVA impact between 2003-2015 (Table 1.19). No particular age range made a disproportionate impact on the GVA, though companies trading for 10 years plus in Ireland make a lower contribution to impact than might be expected.

[62] Using the latest data available at time of evaluation undertaken by Frontline Consultants - future estimated GVA has been adjusted as outlined in the methodology to assess attribution and to account for optimum bias.

Table 1.19: Impact by Duration of Trading in Ireland

Sector	Contribution to impact	Percentage of the surveyed company population
1-3 years	23%	27%
4-7 years	30%	34%
8-10 years	10%	5%
10 years plus	8%	15%
Not known	0%	2%

International Comparators

While the evaluation seeks to compare similar programmes in other countries it is not possible to compare outcomes of the Commercialisation Fund with other similar programmes. This is because evaluations of similar programmes are not available in the public domain – the Scottish Enterprise programme is the only one reviewed that provides insights into performance. Details for other similar programmes are useful in that they provide indications of scale and objectives.

Proof of Concept Programme - The Scottish Enterprise

The Scottish Enterprise Proof of Concept programme supports the pre commercialisation of leading edge technologies emerging from Scotland's universities, research institutions and NHS Boards. Key features of the programme include:

- 100 per cent support for eligible costs (excluding overheads);
- Online application with no deadlines – project can come forward at any time; and
- Support focused on ideas with the potential to generate revenue of £5 million within 5 years or £10 million of investment within the same timeframe.

The programme only supports projects coming forward from Scottish Enterprise priority areas, and include:

- Sciences such as chemical sciences, life sciences and energy;
- Resource sectors such as Energy, Forest industries and Marine;
- Food & Drink;
- Defence, and
- Commercial sectors; Digital Markets, Enabling Technologies, Financial services, Aerospace, Construction as well as other emerging technologies.

In total, the programme has supported 227 projects (including current live projects) with the following benefits cited:

- £41 million investment in the HE sector;

- Created 500 knowledge intensive jobs in universities and 300 in private industry in Scotland;
- 42 new companies formed;
- 45 license deals signed; and
- £238 million of wider leverage generated.

Proof of Concept Programme – Invest Northern Ireland

The Invest Northern Ireland Proof of Concept programme supports the pre commercialisation of leading edge technology from Northern Ireland research organisation. Key features of the programme include:

- Capping of investment at £100,000 of eligible costs;
- A technology strand of up to £80,000 with a 12 month durations; and
- A commercialisation strand of up to £20,000 with a 15 month duration (running in parallel with the technology strand).

The programme supports technological development with the aim of future commercialisation under several sectors. These sectors include:

- Sciences in which has the largest concentration of sectors such as life sciences, material science, environmental science food science, chemistry and physics;
- Important Technology sectors including biotechnology, ICT and nanotechnology; and
- Sectors such as construction and engineering are viewed with similar importance.

In total from 2003-2009, 100 projects have been supported. The programme is measured through a series of key performance indicators, covering:

- Establishment of new commercial ventures;
- Achievement of license agreements;
- Leveraging of seed investments;
- Leveraging of additional research council funding;
- Leveraging of additional commercial funding;
- Creation of new, commercially exploitable intellectual property;
- Production of a prototype or working demonstrator of the technology;
- Evidence that the technology is capable of scale up to commercially viable levels; and
- Identification of potential commercial partners.

No evaluation and/or performance outcomes were available.

Australia's Support for Commercialisation

Australia's support for commercialisation is through Commercialisation Australia. This programme is similar to Enterprise Ireland's Commercialisation Fund in that, the Commercialisation Fund is split into different "arms" so that it targets a number of potential commercialisation opportunities such as proof of concept support which is similar in theory to the proof of concept stage in the Commercialisation Fund.

Commercialisation Australia was launched in 2009/10 as part of the Australian Government's 10 year vision "Powering Ideas, an Innovation Agenda for the 21st Century". It involved funding of $196.12 million over the period to 2013, with on-going funding of $82 million per year thereafter. The programme aims to build the capacity of and opportunities for Australia's researchers, entrepreneurs and innovative firms to convert ideas into commercial ventures, creating high skill jobs and increasing their global competitiveness. It provides support under four broad components:

- Skills and knowledge – funding for specialist advice and support for researchers who know they have a good idea, but don't know how to take that forward. Applicants are required to match funding with a 20 per cent contribution and are supported by volunteer business mentors;
- Experienced executives – funding support to engage an experienced chief executive to drive small innovative firms, giving access to expertise, knowhow and key management skills needed to drive a successful business;
- Proof of concept support – funding to assist with testing the commercial viability of the business model or idea for a product, process or service. Grant funding of between €39,519 and €197,597 is available for a project of up to twelve months and requires 50/50 fund matching. The project is supported by volunteer business mentors;
- Early stage commercialisation – repayable grants to undertake activities focused on enabling a new product, process or service to be developed to the stage where it can be taken to market. Repayable loan funding of between€196,286 and €1,570,376 is available for a project lasting up to two years. The loan is repayable as a percentage of sales income from the project and/or company profits, depending on the success of the project.

Finland's Support for Commercialisation

Tekes is the Finnish funding agency for technology and innovation. The organisation mission statement suggests that Tekes boosts the development of Finnish industry and the service sector by technological means and through innovation. This is designed to renew the economy, increase added value and exports, enhance productivity and the quality of working life and created employment and wellbeing. The agency supports a number of priority sectors including:

- Health & Food;
- Service Businesses, Information and Communications and Real Estate & Construction;
- Energy & Environment; and
- Metals.

In 2009 the agency had a budget of €579 million, with €236 million committed to research funding for universities, research institutions and polytechnics.

The TULI programme (from bench to business) is a Finnish operational programme for bridging research and business. The programme promotes commercialisation of research results in universities, universities of applied sciences and research institutions. The key features of the programme include:

- Funding to the value of €50 million over a 6.5 year period (€7.7 million per annum) coming from Tekes, the main innovation agency;
- Open application, with no deadlines or calls open to 45 universities within Finland; and
- Funding up to €55,000 breaking down as:
  - €5,000 for initial evaluation of the idea: or quick screening that evaluates the commercial potential of a case. The stage lasts for between 1-3 months;
  - €20,000 for full evaluation: essentially critical studies in view of commercialisation potential, including preliminary market and competitor analysis (the stage also outlines a commercialisation model for a promising idea). The stage lasts for between 1-6 months;
  - €30,000 for refinement: focused on overcoming crucial bottlenecks from the commercialisation viewpoint. This can include prototype development and testing around functionality and scale up to a final product. The critical networks needed for commercialisation are also developed at this stage. The stage lasts for between 1-2 years.

In total, the programme has supported 22 research programmes, though has only been operational since 2008 and will run until 2014.

From the international comparator programmes above it is apparent that many other countries focus resources on the commercialisation of HEI research – although the approaches differ. Funding levels span a range from €20,000 (Invest NI - Commercialisation Strand) to €1.5 million (Commercialisation Australia - Early Stage Commercialisation); the funding can also take the form of partial funding (i.e. 50-50 or 80-20), fully funded projects, and repayable loans. Ireland's Commercialisation Fund Proof of Concept Stage lasts up to 12 months which compares well with others that span between 6-15 months. The Scottish Enterprise objectives appear to be more focused on outcomes – i.e. on ideas with the potential to generate revenues of £5 million or investment of £10 million within 5 years. The sectoral eligibility of each of the programmes likely reflects the sectoral strengths within each country, although there is a common focus on: biotechnology, ICT, nanotechnology, chemical sciences, life sciences and energy.

Conclusions and Findings

Appropriateness

The Commercialisation Fund is aligned with both past and present Government policy and its approach also reflects international practice in innovation driven economies. The evaluated Commercialisation Fund has three stages of support with each stage contributing to a different phase of development in the commercialisation process. Economic returns from projects were becoming evident from spin-outs and licences generated towards the last three years of the evaluation.

Perhaps of most significance is the behavioural change in evidence. The effect on the institutions and PIs is that they are recognising the value of applied research through the incorporation of commercialisation into their strategic plans, with some citing "innovation as the third pillar" alongside teaching and basic research. Ultimately, institutions have increased their applied research capacities as a direct result of the Fund and its predecessor programmes.

The Commercialisation Fund continues to play a key role within the National Innovation System to drive the commercialisation of state funded academic research. This evaluation identified modifications necessary to improve the Fund, which were implemented in 2010.

Synergies/Overlap

There appears to be some synergies with the Commercialisation Fund and other programmes that involve applied research and collaboration between HEI and Enterprise, such as SFI SRC programme and Innovation Partnerships. They are not directly comparable, however. Over half of the Principal Investigators (57 per cent) indicated that they had accessed other forms of Enterprise Ireland support to fund their research projects, although Enterprise Ireland confirms that the application process and procedures ensure that the same project/activity does not receive 'double funding' through other Programmes delivered by them. As cited earlier, a project that received funding through the Technology Development Stage 2 of the Commercialisation Fund may then access follow-on funding in partnership with a company through the Innovation Partnership Programme. It does, however, point to the range of supports that are available to PIs. The most frequent included:

- Innovation Partnership Programme (involving partnership with firm(s);
- Innovation Vouchers (€5,000 voucher to deliver to research needs identified by a firm);
- Business Partner Programme (note, funding €20,000 goes directly to the Business Partner);
- Competence Centres; and
- Applied Research Enhancement Centre (ARE).

Effectiveness

The programme sets out both tangible and intangible objectives, requiring a change in mind-set and approach by academic researchers to transform state funded research into innovative products (through licensing of technologies to firms and/or through the establishment of spin-outs).

Total expenditure on the Programme over the 2003-2009 period is €147.6 million. This would appear to translate into a high cost per company, either spinning out or accessing a license at €1.6 million per company. It is important to highlight that this analysis is based on results achieved by 2009 (latest data available when Frontline Consultants undertook the evaluation), and is likely to underestimate the future potential given the time lag to realise outputs (see methodology). The average cost per project (across the three stages) is €161,063. A review of commercialisation support in Finland (TULI programme) and close observations of Australia's commercialisation supports suggests that this level of investment is somewhere on the upper end of the scale.

The Fund appears to be achieving its aims in shifting mind-sets in that a number of respondents indicate commercialisation objectives as their reason(s) for applying for support; and PIs have suggested modifications to the Fund that reflect a greater emphasis on a clear route to market and commercial outputs from the outset. At the same time, the evidence shows that 67 per cent of PIs cite securing research funding as a key objective[63].

As previously outlined, a time lag of up to nine years is applicable to the complex process of commercialisation, hence the impacts from this programme are only starting to materialise.

Efficiency

In relation to the efficiency of the intervention, the cost benefit ratio by 2009 appears to be relatively low at 0.21 : 1, which reflects the contention that it takes a longer time period to fully realise economic returns from a support of this nature. Future impact projections estimated by Frontline Consultants indicate a potential Cost to Benefit ratio of 2.04 : 1 by 2015.

Recommendations

The Commercialisation Fund produced both monetary and attitudinal outcomes, the impact of which is likely to be more fully realised in the years to come.

There were a number of amendments made to the Commercialisation Fund programme in 2010 (outlined on page 3) in response to the evaluation undertaken by Frontline Consultants at that time. The changes aim to increase the focus on market applications from the outset, and which should result in a better return on investment. The main issues identified in the earlier evaluation (which have been addressed by Enterprise Ireland) are included here for completeness. Insufficient time had elapsed for an analysis of the potential impact of these changes[64].

Objectives Setting

The achievement of objectives is an important measure of efficiency and effectiveness of a Programme. As mentioned previously, amendments have been made to the Commercialisation Fund in 2010, with increased emphasis on an outcome-driven approach. The new stage-gate approach has addressed a number of issues, to assist in future interim and ex-post evaluations, and steps should be taken to:

- Clearly set out measurable goals and objectives at the outset, and ensure that they are communicated to all potential stakeholders;
- List the appropriate metrics that are required to assess the achievement of objectives, including sources of data/information, reliability of measurement and interpretation; and to

[63] Respondents could respond to more than one objective. Others included 'developing new products (49 percent); to develop a business opportunity (42 percent). See Table 5

[64] And also fell outside of the scope of the Forfás evaluations of all agency programmes, which established that a review would be undertaken of evaluations/reviews completed during the past three years.

- Associate a maturity or time-line to the indicators/criteria of success.

Routes to Market

Identification of routes to market was happening too late in the process according to the research carried out by Frontline Consultants. On-going monitoring and review of routes to market should also be a key part of any performance management framework.

A new Feasibility Funding Stage was introduced in 2011 with the aim to identify route to market and scope the opportunity before the HEI Principal Investigator/Researcher applies for Commercialisation Funding.

Early Stage Industry Involvement

Getting industry involved earlier in the process is crucial. This will help to increase the likelihood of company involvement at the time when the technology is ready to be commercialised, helping to reduce the potential for funding gaps arising before a product/technology is licensed. Projects are now required to include a commercial work plan aimed at engaging relevant industry expertise early in the project with a view to optimising the timeline to commercialisation.

Enforcement of Stage Gates

If a project is not achieving its objectives/outputs, a mechanism needs to be put in place to allow for a 'go/no-go' decision to be acted upon. This should apply to both technology proofing and changes to the market that could result in the technology needing radical changes to make it fit for purpose.

Since 2010, funding for projects is provided on a tranched basis where a project is monitored through a series of stage gates and needs to achieve technical and commercial deliverables agreed with Enterprise Ireland to enable funding for next stage of the project to be provided. This process should considerably enhance funding decisions and ultimately the return on state investment.

Assessment Process for Technology Development

PIs reported issues with the technology development assessment process, in terms of scoring transparency and staffing of assessment panels. The problem was identified in the communication of the assessment and therefore it is suggested that this process becomes more transparent at the outset and the rationale for decisions made is shared with all parties. Since 2010, feedback on the evaluations performed on Commercialisation Fund projects is provided to applicants and their associated technology transfer or equivalent offices.

2. Intellectual Property Assistance Scheme (2005-2009)

Programme Logic Model

IPAS Objectives[65]

- Support firms, entrepreneurs, innovators and researchers to protect their Intellectual Property (IP) with commercial potential, primarily through the provision of financial supports for patenting
- Provide information to firms, entrepreneurs, innovators and researchers on IP protection, management and exploitation.

Inputs

- Enterprise Ireland (EI) contribution – grants, advice and administration

Outputs

- Number of projects awarded funding from
  - Industry
  - Higher education institutes
- Number of patents from
  - Industry
  - Higher education institutes

Activities

- Provision of advice & grants to support IP protection – mainly patents
  - IPAS – HEI Patent Fund: focused on higher education sector
  - IPAS – Industry Patent Fund: focused on enterprise and entrepreneurs

Outcomes & Impacts

- Increased awareness among participants of the importance of IP protection and the necessary steps involved
- Increased numbers of innovative products and services securing appropriate IP protection
- Increased volume of patenting activity relating to research emanating from HEIs
- Increased numbers of spin-outs from the higher education sector to develop and commercialise research outputs
- Increased numbers of innovative and knowledge/technology based indigenous SMEs and start-ups
- Increased revenues for companies and HEIs from IP through licensing

[65] Circa IPAS Evaluation Report (Dec 2011)

Evaluation Aim

The aim of the evaluation is to assess the appropriateness, efficiency and effectiveness of the Enterprise Ireland Intellectual Property Assistance Scheme. This is an ex-post evaluation focusing on the period 2005 to 2009. Circa consultants were commissioned by Forfás to undertake the research and analysis.

Programme Background, Objectives and Target Population

The Enterprise Ireland Intellectual Property Assistance Scheme (IPAS) has been in operation since 1998.

IPAS stemmed from previous programmes run by Enterprise Ireland and its predecessors. These programmes sought to support the protection and exploitation of Intellectual Property (IP), so as to promote economic growth and job creation. They traditionally focused on patents rather than broader forms of IP protection such as trademarks.

IPAS focused on patents in terms of financial support and also provided advice and guidance on other elements of IP development and protection. Initially, IPAS focused on providing supports for companies and entrepreneurs, although researchers in the higher education institutes (HEIs) could also avail of the supports provided. Private inventors, not linked to any company, could get patenting advice under this scheme, but typically did not receive funding support.

The introduction of the academically focused HEI Patent Fund in 2004 was in line with the growing emphasis on the commercialisation of research from the higher education sector. In parallel, personnel and other supports for the commercialisation process were being put in place in the higher education sector, through the establishment and expansion of Technology Transfer Offices (TTOs). These were formalised in 2007 through the Technology Transfer Strengthening Initiative (TTSI).

Albeit the process for securing IP protection is relatively standardised irrespective of where the IP originated, the academic and enterprise communities typically have differing needs and approaches in relation to IP generation and protection. In this context, from 2004 IPAS was run as two sub-programmes tailored to meet the needs of these two distinct target cohorts as outlined below:

1. The **HEI Patent Fund** which involved the provision of advisory and financial support to researchers in Higher Education Institutes (HEIs) who have made discoveries or developed ideas with clear commercial potential to become a patent. The HEI Patent Fund grants normally covered 100 per cent of eligible costs for patenting activities.
2. The **Industry Patent Fund** which involved the provision of advisory and financial supports to indigenous enterprises and entrepreneurs engaged in research, development and innovation activities regarding the protection and commercialisation of inventions. The Industry Patent Fund grants covered a proportion of patent filing costs for applicants that demonstrated that they had the capacity and competence to commercialise the invention.

Although managed and operated by the same unit within Enterprise Ireland, these two elements of the programme were delivered quite differently and were handled separately from an administration point of view. Hence, each fund is discussed separately where appropriate for the purposes of this evaluation.

IPAS divided the process for the patent funding into 3 stages as shown in Table 2.1 below.

Table 2.1: Three Stage Process for Patent Funding

Stage 1	Provisional filing (Industry Patent Fund grants covered a proportion of patent filing costs for applicants that demonstrated that they had the capacity and competence to commercialise the invention);
Stage 2	PCT filing (Through the Patent Cooperation Treaty (PCT) a provisional application in one PCT country will ensure that the priority date of any subsequent full application will be respected by all PCT signatory countries);
Stage 3	This covers the remaining stages until granting of a patent. At the stage of full patent filing the applicant must ensure coverage in different countries, e.g. they can apply for a European Patent, which will allow a common examination whose result is accepted in a defined group of EU and non-EU countries. Under the PCT approximately 100 countries can be designated at the initial filing stage but a full patent must be filed in each country within 30 months of this application. Each country filing involves costs and maintenance fees, so decisions on the countries in which patent coverage is required are important.

Industry Patent Fund grants were generally capped at €20,000 (with some exceptions; the highest grant found in this evaluation is €42,000). However, the full costs of obtaining a patent are in the region of €90,000 - €130,000, depending on the level of interaction with patent examiners, and the number of countries in which filing is conducted.

Table 2.2: IPAS Role in Funding Patent Applications

Timeline	Stage of Patent Process	Industry Patent Fund	HEI Patent Fund	Related Enterprise Ireland Supports
No time limits	Invention development – through RD&I or other means			R&D funding
	Review of invention patentability	Advice; patent and literature searches	Advice on patentability in collaboration with TTOs	Feasibility funding
Stage 1 **1-12 mths**	Provisional Patent Filing	Advice	Full-cost funding (Up to €7,000)	Patent funding through other supports[66]
Stage 2 **Year 2**	Full Patent Filing	Funding for patent submission	Full-cost funding (Up to €20,000)	Patent funding through other supports
Stage 3 **Years 3-7**	Full 'national Filing' in different countries	Funding to a limit of approx. €20,000	Full-cost funding (Typically not more than €50,000)	Patent and commercialisation funding through other supports

[66] Such as through the package of supports for High Potential Start Ups

At the end of 2009 the IPAS programme was discontinued and supports for patenting were repositioned within the Enterprise Ireland portfolio of supports:

- Support for IP management and protection for companies and entrepreneurs has been integrated into Enterprise Ireland sectoral support schemes, primarily the Enterprise Ireland RD&I fund[67].
- Responsibility for patenting technology developed in the HEIs is now with the Technology Transfer Offices with support from Enterprise Ireland under the Technology Transfer Strengthening Initiative.

Objectives

The specific objectives of IPAS were to:

- Support firms, entrepreneurs, innovators and researchers to protect their intellectual property (IP) with commercial potential, primarily through the provision of financial supports for patenting.
- Provide information to firms, entrepreneurs, innovators and researchers on IP protection, management and exploitation. This included advice on patentability of inventions and on sources of external patent expertise, as well as advice on commercialisation supports, so that they can develop commercially successful products and services based on research outputs and market-led business innovations leading to job creation and exports.

Target Population

The target population for the HEI Patent Fund were researchers and innovators. The Industry Patent Fund covered indigenous enterprises and entrepreneurs.

Programme Rationale

Increased productivity and innovation are key drivers of economic growth and development. Within this context, the capacity to generate, capture, protect and exploit IP is an indicator of the innovation capacity of an economy and Intellectual Property Rights (IPR) is a primary mechanism for protecting intellectual assets.

The transfer of knowledge and technology, encompassing IP, from the higher education research system to the market place is recognised as being of crucial importance in the establishment of a strong research environment and a knowledge-based economy.

For companies, entrepreneurs and inventors the use of IPR increasingly goes beyond the basic goal of protecting inventions, forming a key part of their development strategy.

However, there is evidence internationally that SMEs use formal IPR protection methods, such as patents or trademarks, to a disproportionately lesser extent than large enterprises –

[67] Through the RD&I Fund up to 50 percent of costs relating to the preparation, filing and validating of a patent application are eligible for grant support. Costs incurred in renewing the application before the patent/right has been granted as well as translation and other costs of obtaining the granting or validation of the right in other appropriate countries are also eligible. However, patent costs cannot exceed more than 20 percent of the overall project cost

primarily due to factors associated with company size and resources[68]. As such, a number of Governments internationally provide a range of supports to increase the levels of IP knowledge and protection within the SME community and to promote the effective commercialisation of technology and knowledge coming from the HEIs.

Frequently cited reasons for low patent filings by SMEs are a general lack of awareness on how to effectively use IPR, insufficient financial resources, difficulties in enforcing IP rights and the high cost of obtaining IPR. In addition, SMEs often prefer informal protection strategies, such as relying on trade secrecy or the maintenance of lead-time advantage over competitors[69].

Over the past fifteen years, there has been a significant increase in investment in research, development and innovation activities within the higher education sector in Ireland. The HEI Patent Fund as it was delivered through IPAS, and latterly through the TTSI, is focussed on enhancing the capacity of the academic and enterprise community to leverage these investments[70].

According to a recent Forfás review, Ireland's system for commercialising IP from HEIs is making strong progress given that many of the mechanisms were recently introduced[71]. The review reaffirmed the need for IP management and protection as an element of the technology transfer process and that there is role for the state in ensuring this is done effectively[72]. The review also contained recommendations to enhance the effectiveness of Ireland's IP framework, addressing both short-term weaknesses and more strategic and longer term objectives which have informed the development and implementation of IP supports in recent times.

The Forfás review has been acted upon at a national level. In June 2012 the IP Implementation Group published its report entitled "Putting public research to work for Ireland" which sets out a set of policies, procedures and structures to enhance HEI/industry engagement on IP. A key recommendation of the group is the creation of a central Technology Transfer Office (cTTO) which will be housed in Enterprise Ireland. Once established the cTTO will connect companies looking for specific expertise with the most appropriate public research organisation. It will also advise on what IP is already available for commercialisation. Once established, the opportunity will exist for the cTTO to expand its

[68] Radauer, A., Streicher, J. & Ohler, F., 2007, Benchmarking National and Regional Support Services for SMEs in the Field of Intellectual and Industrial Property, PRO INNO Europe paper No. 4; Thumm, N., 2006, The Importance and Use of Patents by Biomedical SMEs. Presentation at the Stockholm Network Conference in Geneva, October 25, 2006; World Intellectual Property Organization, 2003, Intellectual Property (IP) Rights and Innovation in Small and Medium-Sized Enterprises, Second OECD Ministerial Conference for Small and Medium-sized Enterprises

[69] Ibid

[70] Within the higher education sector, technology transfer, linkages with enterprise and IP issues are increasingly handled within the scope of TTOs. As such, many Government supported programmes aim to enhance the effectiveness and efficiency of TTOs as well as the broader IP generation and management process

[71] Review of Supports for Exploitation of Intellectual Property from Higher Education Research, Forfás/ DETI, 2010

[72] Good practice in other countries (the United States, for example) is to expect that the HEIs take reasonable care in ensuring the integrity of their IP as it is created, seeking external professional advice from patent attorneys as necessary. Review of Supports for Exploitation of Intellectual Property from Higher Education Research, Forfás/ DETI, 2010

business-industry outreach role. The cTTO will work closely the Technology Transfer Offices in each of the public research organisations sharing good practice.

Evaluation Methodology

This evaluation was carried out by consultants on behalf of Forfás. The evaluation involved a literature review, stakeholder consultations, impact assessment and participant surveys. The consultations comprised a mixture of one-to-one meetings, focus group discussions, web based surveys and telephone/email contacts. Detailed interviews were held with 12 companies that received IPAS funding. A survey was issued to a sample of 85 companies that were not successful in securing IPAS funding, 24 of which responded. Interviews were carried out with representatives of the Patent Office and workshops were held with 6 Technology Transfer Offices and 6 Patent Attorneys. 19 technology transfer professionals from 12 higher education institutes also took part in a survey to elicit their views on the HEI Patent Fund.

The programme was also reviewed vis-à-vis international best practice.

Alignment with National Policy

This programme is in line with national enterprise policy as it has evolved over the past decade where there has been a strong emphasis on stimulating the emergence of, and supporting the development of, knowledge and/or technology based start-up companies; and on supporting the effective commercialisation of the ideas and know-how being generated in higher education institutes (HEIs)[73].

The longer term strategic importance of supporting investment in research within the higher education sector and maximising the commercial impact of research outputs was again highlighted in the Strategy for Science, Technology and Innovation (SSTI) 2006-2013. The SSTI called for actions to support the effective commercialisation of the ideas and know-how being generated in HEIs, including the provision of IP advisory and funding supports, and to forge new partnerships between these institutes and enterprise.

IP generation, protection and exploitation remain key areas of focus for national enterprise policy. Successive national policy documents including the National Recovery Plan (2011-2014) and the Programme for Government (2011) each emphasise the importance of supporting R&D and commercialisation activities to promote economic growth.

As Ireland faces very challenging economic conditions, the Government's Building the Smart Economy, 2008 discussed the importance of providing "strong supports for start-up companies and entrepreneurs whose companies will provide the employment of the future" as a key element of supporting economic recovery and growth. It also highlighted the importance of supporting the commercialisation of IP arising from state-funded research and development programmes including those in the higher education system.

[73] Key enterprise related policy documents over this time include the Enterprise Strategy Group Report, Ahead of the Curve, 2004; Building Ireland's Knowledge Economy – The Irish Action Plan for Promoting Investment in R&D to 2010, Forfás, 2004; the National Development Plans, 1999 and 2006; the Strategy for Science, Technology and Innovation 2006-2013; and the Government's Action Plan for Jobs 2012

Inputs

Total expenditure through IPAS for the five years under review including indirect costs was €7.8 million. Annual direct expenditures for the IPAS programme fluctuated over the period 2005 to 2009, peaking at €2.509 million in 2008, and tending towards an average figure of €1.4 million per annum for the period under review. Of this approximately €150,000 - €200,000 per annum related to Industry Patent Fund, with the remainder (€1.2 million) related to the HEI Patent Fund.

Over the period 2005 to 2009 there were 647 HEI Patent Fund applications approved for patent funding (353 Stage 1, 225 Stage 2 and 69 Stage 3) with an average expenditure per application of €9,500[74].

Over the period 2005 to 2009 the average number of applications under the Industry Patent Fund was approximately 100 per annum and the average number of projects approved was approximately 14 per annum. Industrial applicants were expected to fund the initial filings from own-source income largely as a demonstration of commitment to the process. As such, the IPAS support was typically for Stage 2 or PCT filings and was typically in the range of €10 - €20,000. The average annual direct spend was €161,800 and the average direct expenditure per project was €11,400.

Table 2.3: Intellectual Property Assistance Scheme Expenditure, 2005-2009

	HEI Patent Fund				Industry Patent Fund	Total
	Stages			Total		
	1	2	3			
	€'000s	€'000s	€'000s	€'000s	€'000s	€'000s
2005	48	60	44	152	25	177
2006	313	560	508	1,381	39	1,420
2007	484	649	582	1,715	108	1,823
2008	834	893	471	2,198	311	2,509
2009	191	456	89	736	326	1,062
	1,870	2,618	1,694	6,182	809	6,991

The large increase in patent funding within the HEIs after 2005 is striking and is closely correlated to the increased investment in RD&I capacity and associated commercialisation activity within the higher education sector since 2000. In addition, the numbers of staff in TTOs in the HEIs increased from 2007 on as a result of the TTSI enabling TTOs to increase the breadth and scale of their activities, including patenting. This increased the rate of

[74] Over the period reviewed, the amounts "approved" for patent costs generally exceeded the amounts actually paid out which typically amounted to amounted to 50-65 percent of the amounts approved

applications to the Fund. From September 2009, no further applications were accepted by the IPAS unit based in Enterprise Ireland and in 2010 the funding for patents was provided directly to the TTOs as part of the TTSI budget.

Indirect Costs

Indirect costs include cost of front-end staff salaries who are involved in managing the programme, in average of two to three FTEs per annum. It excludes overheads and administration cost.

Table 2.4: Total Indirect Costs

	2005	2006	2007	2008	2009	Total
TOTAL COST P.A (€ 000's)	207	218	141	148	148	863

The total cost of the IPAS programme amounts to €7.854 million over the evaluation period.

Outputs & Activities

The IPAS programme was managed by the Intellectual Property Unit (IPU) in Enterprise Ireland which was typically staffed with a team of one to three people annually over the evaluation period. This review found that the programme managers were considered to operate with high levels of professional expertise. There was also some feedback that the administrative processes were slow in some instances.

Companies, researchers and individuals who availed of the supports provided through IPAS were typically referred to the programme through Enterprise Ireland channels, particularly development advisors, a TTO office or a patent attorney.

There were no explicit target metrics for IPAS over the evaluation period. However, analysis of the data generally shows an upward trajectory in the number of projects securing funding through the HEI and Industry Patent Funds.

Over the period under review there were:

- HEI Patent Fund: 647 applications approved for funding, leading to at least 353 patentable innovations (proxy: those which proceeded to stage 2/3 of funding) and amounted to total of €6.2 million in expenditure.
- Industry Patent Fund: 71 applications approved for funding, with expenditure of €809,000. The 71 funded applications relate to 67 separate companies.

Table 2.5: Number of Applications Funded through the HEI Patent Fund and Industry Patent Fund

	HEI Patent Fund				Industry Patent Fund[75]
	Stages			Total	
	1	2	3		
2005	3	9	5	17	2
2006	68	39	15	122	10
2007	97	56	27	180	10
2008	149	71	22	242	19
2009	36	50	0	86	30
Total	353	225	69	647	71

IPAS: Advice on Intellectual Property Management and Protection

It is not possible to quantify the value of the advisory services provided through IPAS. However, stakeholder consultations and applicant interviews carried out as part of this evaluation found that the advisory services provided through this programme were considered to be particularly valuable and the expertise of the team in the IPU in this regard was cited as a key factor in this. In many instances (up to 50 per cent), initial inquiries did not translate into full applications for funding as the ideas may not have been "patentable" or another IP protection model was more appropriate[76]. In addition, applicants to the programme were provided with detailed guides describing the main features of the patent system, commercialisation issues, costs, searches, etc. This constituted a real benefit to several hundred users of the scheme over the evaluation period, particularly those new to the patenting process. This advisory and awareness raising activity was a key aspect of the positive impact of the programme.

HEI Patent Fund Grant Aid

Over the period 2005 – 2009, the HEI Patent Fund provided support for third level colleges and associated teaching hospitals. Advisory supports were available to all researchers in these institutions. Funding was available for 100 per cent of expenditures directly involved in

[75] The amount of applications supported through the industry scheme would have been influenced by the resources available to the IPU at the time. In 2007 resources reduced from 3.5 to 1.5 staff. The increase seen in 08-09 coincided with an increase to 2.5 staff. Also the 30 funded in 2009 refers to a 7 month period as the scheme ended on July 30th 2009. Observed variations may also reflect the growing awareness of the importance of IP and protection during this period

[76] Research on IP support internationally suggests that patent-centric supports such as IPAS can have a high impact on general awareness and patent knowledge in general. Streicher, J., & & Radauer, A., 2007, SMEs and IPR: Financial Support Services in the Absence of a Community Patent, Proceedings of the Institute for Small Business & Entrepreneurship Conference

patent protection including searches, patent agent advice and filing and maintenance costs up to the limits outlined below.

There was a three stage funding process in line with the standard patent process as set out below in Table 2.6. Funding applications could be made for any one or all of these stages.

Table 2.6: Breakdown of HEI Fund Activity and Expenditure

	Description of Activity	% of applications to HEI Fund	% of total HEI Fund Spend 2005-2009
Stage 1	Funding up to €7,000 to meet the costs of preliminary patent protection.	55%	30%
Stage 2	Funding up to €20,000 (additional to any funding already provided for Stage 1) to support patenting costs arising in the continuing prosecution of an initial patent application or extension of patent coverage to other countries.	35%	42%
Stage 3	Funding to provide support for the later stages of the patenting process. The amount to be approved was determined by Enterprise Ireland in each case but was normally not more than €50,000 in addition to any funding already provided. Funding was restricted to costs directly associated with the protection of the invention concerned. It would normally cover 100% of such costs.	11%	27%

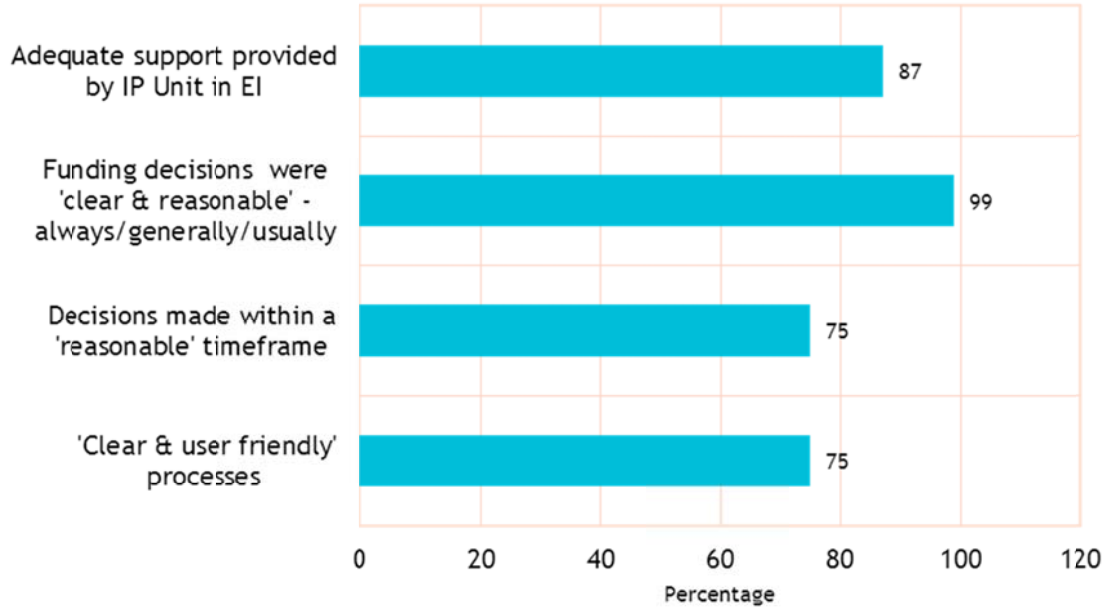
The HEI Patent Fund was targeted at protecting IP that arose from within public funded research in HEIs. To qualify for grant aid under the HEI Patent Fund it was not required that a company was in place to exploit the invention. However, it was necessary to demonstrate that the invention had clear commercial potential. In this case, each HEI's TTO had responsibility to conduct an internal process to evaluate and screen invention declarations from within their institutions. Following evaluation, patent funding was only sought in cases where the TTO had determined that a commercial potential existed[77]. This explains why the success rate for funding applications made to the HEI Patent Fund appears to be high – at or near 100 per cent over the period under review. Stage 1 applications were funded effectively on demand and there was a robust application process undertaken by Enterprise Ireland for Stages 2 and 3.

There was a significant rise in the numbers of supported patent applications from approximately 17 in 2005 to more than 200 in 2008 in line with the increase in Government expenditure on R&D, the increase in business expenditure on R&D and the setting up of the TTOs. It is likely that this upward trend continued in 2009 but data for 2009 is truncated because of the changes which moved the funding support scheme into the TTSI.

[77] In these instances a separate evaluation by Enterprise Ireland IP Unit was not deemed necessary

As part of this review, a survey of technology transfer professionals within the HEIs was undertaken to establish views on the HEI Patent Fund as it operated over the period 2005 to 2009. A key finding from the survey is the central role that the HEI Patent Fund played in supporting the patenting activities within the HEIs; 57 per cent of respondents stated that the Fund accounted for over 90 per cent of patenting activities and a further 35 per cent stated that it accounted for over 70 per cent.

Chart 2.1: HEI Patent Fund – Views of Technology Transfer Professionals



Source: Survey of technology transfer professionals - based on 19 responses representing 12 separate HEIs

Some of the other main findings from the survey are provided in Chart 2.1 above. The respondents to the survey also expressed the view that the levels of funding provided under the HEI Patent Fund compare well with similar supports in other EU countries. However, 69 per cent stated that there was no follow-up by Enterprise Ireland staff on the progress of patents and searches for which funding was obtained[78]. As outlined above, the HEI Patent Fund has been integrated into the support provided through the TTSI. It would be beneficial to implement a mechanism for following up on the progress of patents supported so as to gain a more complete picture of the impact of the support.

Industry Patent Fund Grant Aid

Where a company or entrepreneur sought grant support from Enterprise Ireland for an invention/innovation that was the considered to be "patentable," they were invited to formally apply for financial support. The IPU of Enterprise Ireland then conducted an

[78] It should be noted that the purpose of the HEI patent fund was solely to support the filing of patent applications. The follow up from EI on completion of the patenting process was to support the commercialisation and this service was made available to all supported HEIs. Take up, however, relied on the submission of a commercialisation plan from the HEI

appropriate level of evaluation of each individual project. The objective of this was to ensure that a reasonable potential for commercial success existed which would deliver on the objectives of state funding to industry. Over the period 2005 to 2009, approximately 100 inventors per year submitted a formal application.

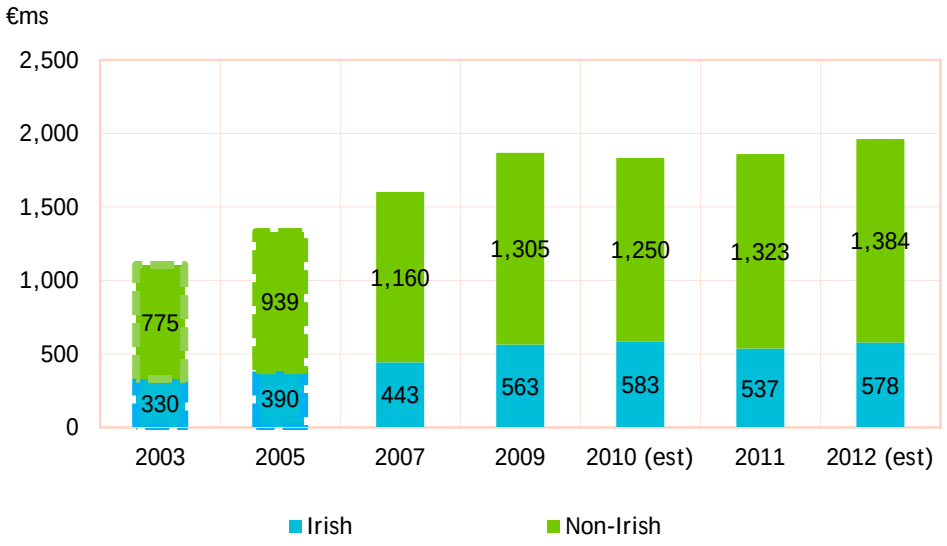
The capacity to commercialise the invention via a company – usually a start-up company already existing or in the course of being formed – was an important condition for support. This requirement aligns with overall national enterprise policy objectives and with Enterprise Ireland's remit to support activities (including commercialisation) that ultimately leads to employment and exports. At the same time, there was a view amongst some of the firms and patent professionals interviewed that this condition could be interpreted in an overly restrictive manner requiring that production had to take place in Ireland, which may have acted as a disincentive to companies in taking up the support. Overseas licencing by Irish companies can be a feature of normal business life, and State Support should be based on a robust assessment of future economic return (which may in fact be via a licencing revenue stream).

Based on applications to the Industry Patent Fund, the level of IP protection activity in the indigenous SME sector is relatively small. A possible explanation for this is that there is a relatively low awareness of the advantages of IP protection through patenting within the indigenous SME sector and/or that the costs and expertise required for successful patenting act as an inhibitor for companies. These are common issues internationally. A number of those consulted during the review indicated that the programme had a relatively low profile amongst the business community and this may also have been a contributory factor in the low take-up of the support.

Private inventors, not linked to any company, could get patenting advice under this scheme, but typically did not receive funding support. A further element of the Industry Patent Fund support was that the applicants typically covered the initial patent filing, at a cost of a few thousand Euros, as a demonstration of their commitment to the overall process.

Certainly, in comparison with the HEI Patent Fund, the number of patent applications funded annually by Industry Patent Fund appears small. In tandem with the significant increase in industrial R&D activity nationally over this time from €1.33 billion in 2005 to €1.86 billion in 2009 (see chart 2.2 below), financial support for industry patent funding increased from 2 successful patent applications in 2005 to 30 in 2009 (averaging at 14 applicants securing funding through the programme per year). However, the increase in industrial R&D was greater among foreign owned companies than among the Irish owned companies that would avail of the Industry Patent Fund. The focus on increasing R&D activities within the higher education sector and on commercialising the outputs of this research is also likely to be a factor in the relatively high numbers of projects funded by the HEI Patent Fund relative to the Industry Patent Fund over this time.

Chart 2.2: Irish and foreign BERD, Current Prices, 2003-2011



Source: CSO databank, Forfás BERD

Unsuccessful applicants were provided detailed feedback explaining the basis for the decision. As part of the evaluation and to contribute to the establishment of a comparator grouping insofar as possible, a survey was issued to a sample of 85 companies that were not successful in securing funding through the Industry Patent Fund. Of these, 24 companies (28 per cent) provided responses.

A key finding from the survey is that of the non-funded applicants, 55 per cent proceeded with the patent using their own resources and a further 11 per cent obtained the funding through other sources. Although these figures are derived from a relatively small sample this could be interpreted as indicating a relatively high level of deadweight associated with the programme. Enterprise Ireland contends that refusals were based on their assessment that these industry applicants did not demonstrate commercial potential, and the fact that these unsuccessful applicants obtained patent protection through other sources does not indicate a failing of the scheme.

Impacts and Outcomes

The IPAS programme contributed in an important way to a number of outcomes during the years 2005 to 2009 including:

a) Increased awareness among participants of the importance of IP protection and the necessary steps involved

As outlined above, a key benefit of the IPAS programme was the advisory and awareness raising supports it provided to firms, entrepreneurs, innovators and researchers regarding IP protection and the patenting process. Although it not possible to determine the impact of this activity in quantitative terms, the companies and stakeholders (patent agents, technology transfer offices and the Patents Office) consulted as part of this evaluation considered that the programme was beneficial for increasing awareness of the value of IP protection and how

this can be managed. The expertise of the team in the IPU was considered to be particularly valuable in this regard.

b) Innovative products and services securing appropriate IP protection

A minimum of 353 (Stage 1) inventions were supported by the HEI Patent Fund and 71 inventions were supported by the Industry Patent Fund to achieve some degree of patent protection (see Table 2.5 above).

Furthermore, as a result of the advisory services provided through IPAS a number of innovative products and services may have gone on to secure appropriate IP protection such as trademarks. However, it is not possible to allocate figures to these outcomes as the IPAS programme focused on patents rather than other forms of IP protection.

c) Increased volume of patenting activity relating to research emanating from HEIs

The numbers of initial patent applications from the higher education system supported by IPAS grew from 3 in 2005 to 149 in 2008. Funding of patents at other stages of the patent process grew at an equivalent rate. This is a very significant increase, and entirely consistent with the increase in R&D funding and the growing capacity for commercialisation of research outputs within the HEIs, over the period. There were also significant increases in other IP related activities within the HEIs over this period with the numbers of licensing agreements, spin-outs and invention disclosures also rising considerably (Table 2.6).

Though the existence of the HEI Patent Fund did not lead directly to patents per se, there is little question that the fund has played a central role in the increased scale of patenting activities that took place within HEIs over the evaluation period. A direct cause and effect linkage between the patent funding programme and the number and value of licences issued is too simplistic.

Most of the patented inventions supported by the Industry Patent Fund and the HEI Patent Fund emerged from publicly funded research. The support for patenting therefore is but one link in a chain of Government supports which includes Feasibility Grants, SFI grants, commercialisation etc. To isolate and quantify the specific effect of the patent funding support (in terms of licences issued and companies formed) would not be realistic. However, it is clear that the patent funding is an integral and important part of the wider State support system and that without it the support system would be much less successful.

The survey carried out with technology transfer professionals within the HEIs found that for 57 per cent of respondents the Fund accounted for over 90 per cent of patent funding and for a further 35 per cent it accounted for over 70 per cent, therefore most of the patented technology coming from the HEIs had relied on the patent fund for support[79].

d) Increased numbers of spin-outs from the higher education sector to develop and commercialise research outputs

Data from the Enterprise Ireland Technology Exploitation Networks Unit shows that there were 68 spin-outs from the higher education sector over the evaluation period. The international experience is that spinouts from HEIs are typically high technology projects based on publicly funded research and that the technology has usually been the subject of one or more patent applications supported by the technology transfer process[80]. On this basis,

[79] Based on 19 responses representing 12 HEIs

[80] Innovate Tech Ventures, LLC , 2011, University Tech Watch Start up Report

it is fair to deduce that a significant number of the 68 spinouts referenced above would not have been formed without the preceding chain of State supports for research, development and commercialisation, including the patent funding support.

Though there is limited international comparative data, research by the Association of University Technology Managers in the US found that there were 596 spinouts from the higher education sector in 2009[81]. According to the Chronicle of Higher Education 555 of these, or 93 per cent, were based on technology developed within the university[82]. Applying this ratio to the spin-outs from the Irish higher education system circa 62 of the 68 spinouts are based to some extent on technology developed within the HEIs.

Data is not available on what numbers of these were based on technology that was patented/protected with support through the HEI Patent Fund. A conservative estimate would be that 50 per cent (31 spinouts) received some degree of support through the fund in terms of financial and/or advisory support.

e) Increased numbers of innovative and knowledge/technology based SMEs and start-ups

Analysis of the formal applications submitted to the Industry Patent Fund shows that 80 per cent of those applicants who successfully secured funding were small, early stage companies, or private individuals who were starting a business to commercialise the invention.

Thus the Industry Patent Fund played a role in the emergence and development of approximately 54 small, innovative early stage or start-up businesses over the evaluation period.

A further 68 companies spun out of the higher education system and as outlined above, it is likely that at least 31 of these were based on IP that was supported through the HEI Patent Fund.

As such, the IPAS Scheme (HEI Patent Fund and Industry Patent Fund) contributed to the development or creation of approximately 85 (54+31) existing SMEs or start-ups, all of which are by definition innovative, between 2005 and 2009.

Furthermore, of the 67 companies that were funded under the Industry Patent Fund scheme between 2005 and 2009; a random sample of 13 companies was selected for detailed interview. Following a search, it was found that one of the companies had failed some 2/3 years ago and the executives were not contactable. The other 12 companies were all contactable, and willingly offered comment on their experiences and their current status.

Based on these detailed interviews the SMEs funded under the Industry Patent Fund were well selected. Eleven of the twelve companies are either currently trading – some quite successfully – or were about to commence trading and four of these companies are creating significant added value by licensing or otherwise exploiting their protected IP. One company is trying to secure sufficient financial backing to start production of the patented product.

In terms of the value of the Industry Patent Fund in helping SMEs commercialise knowledge and technology developed in HEIs, it is worth noting that for five of the companies interviewed, links with R&D in the higher education sector formed the basis for the invention that was patented.

[81] Association of University Technology Managers, 2009, AUTM U.S. Licensing Activity Survey, 2008

[82] The Chronicle of Higher Education, 2009 available from **www.chronicle.com**

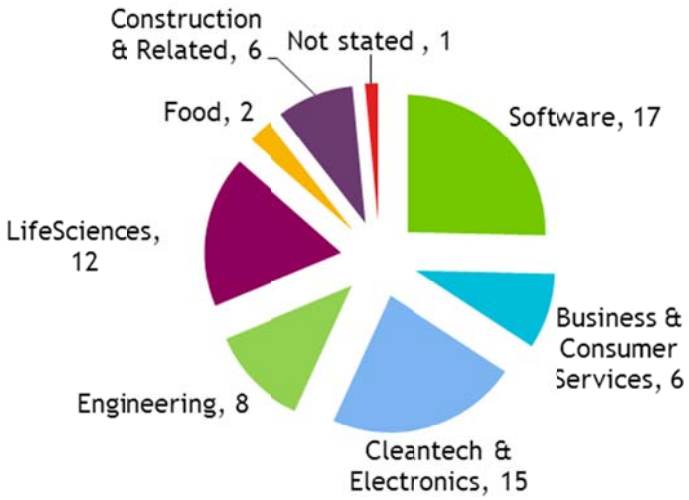
In terms of their experience of dealing with the Industry Patent Fund, eight of the 12 companies stated that they were happy with the advice received from the IPAS staff and five of the companies found that the payment process was overly slow.

As of end 2011, of 67 companies supported by Industry Patent Fund between 2005 and 2009:

- 37 were trading,
- 26 were pre-trading and
- 2 have been acquired.
- 2 remaining companies are no longer trading.

This represents a survival rate of 97 per cent. As outlined above, circa 80 per cent of companies funded were in the start-up/early development stage and as such the broader base of start-ups supported by Enterprise Ireland provides a good basis for comparison in terms of survival rates. Analysis of the population of Enterprise Ireland supported companies that started up in 2007 shows that 75 per cent were still trading or pre-trading in 2011. Company survival is of course down to a range of business factors and it is not possible to attribute this, or a proportion thereof, directly to the Industry Patent Fund. However, it does indicate that those companies which sought to protect and leverage IP appear to have stronger prospects for business survival in the short to medium term than the broader population of start-ups.

Chart 2.3: Sectoral Spread of Companies supported by the Industry Patent Fund, 2005 – 2009



Of the 63 trading/pre-trading companies:

- 19 have grown to meet the criteria for "established" or "scaling" status
- 18 are "HPSUs" and
- 21 are classified as "pre-HPSU."

This represents a small but significant seed bed of innovative companies with growth potential. The remaining two companies are clients of the County Enterprise Boards (CEBs) and IDA Ireland. Chart 2.3 provides an overview of which sectors these companies operate in. Data from the Annual Employment Survey shows that the trading and pre-trading companies together employ in the region of 570 people, circa eight per company.

f) Increased revenues for companies and HEIs from IP through licensing

Some data was acquired during the interviews of commercial companies that had received support the Industry Patent Fund programme, which indicated that a third of the companies supported had secured licensing deals. The value of a license can vary from industry to industry but the feedback from these successful companies indicated a range in the region of €10,000 to €100,000 per license. Most patents would have a twenty year life so the potential is significant relative to the patent costs. There are of course other costs associated with getting an idea ready to be patentable but owning a patent can be a key strategic factor in the development and growth of companies. One company who received support from the Industry Patent Fund stated "that their patent was paramount in negotiating an eight figure sum for their company."

Applying this ratio to the broader set of patents supported through the IPAS programme the value of licenses achieved from the IP protected through the programme would be in order of €9.1 million. This is based on a conservative set of assumptions whereby one third of the 67 companies supported through the Industry Patent Fund and one third of the 69 projects funded through Stage 3 of the patenting process by the HEI Patent Fund secured licensing agreements with average licence fees of €10,000 per annum over 10 years[83]. This would represent a positive return on the programme expenditures which amounted to €7.8 million over the period 2005 to 2009.

The direct benefits from the IPAS programme such as license fees accrued directly to the companies. However there were some public benefits such as job creation and exchequer returns associated with these patents as well as earnings arising to the HEIs.

Table 2.6 below presents an overview of the benefits of the IPAS programme. Many of the patented inventions supported by IPAS, particularly in the HEIs, emerged from publicly funded research. As such, it is not possible to isolate and quantify the specific effect of the patent funding support in absolute monetary terms. However, it is clear that the patent funding is an integral and important part of the wider State support system for RD&I, start-up and commercialisation activities.

[83] 270 licenses agreements were made regarding IP emanating from the higher education sector over this period; many of which were likely linked to the projects that were supported through the HEI Patent Fund. As such, the assumption that a minimum of 23 of the licenses agreements made related directly to HEI Patent Fund projects is relatively conservative (see page 96 for further detail).

Table 2.6: Benefits of IPAS Programme*

Year	Industry Patent Fund Approvals	HEI Patent Fund Approvals[84]	Total no. of funding applications - Approvals	HEI Outputs - RD&I and Commercialisation Activities[85]		
				Licenses Issued[86]	Spin-outs[87]	Invention Disclosures[88]
2005	2	17	19	12	5	135
2006	10	122	132	28	8	193
2007	10	180	190	56	13	271
2008	19	242	261	67	7	407
2009	30	86	116	100	35	457
Total	71	647	718	263	68	1,463

International Comparators

A number of Governments internationally have introduced support programmes to increase the levels of IP protection within the SME and academic sectors. These range from broad awareness raising and training activities to specific financial supports. Due to the lack of equivalence between IP support programmes in different countries and the absence of available international performance indicators, research on IP supports internationally typically focuses on "elements of good practice" in IP service design rather than on comparative performance indicators and outcomes. As a result, it is not possible to make explicit performance comparisons between IPAS and similar programmes internationally[89].

[84] Note: HEI Patent Fund approvals relate to the sum of the total number of approvals at each of the three stages in the patent process. It does not represent the total number of patents involved. From September 2009 no further applications were accepted by the IPAS unit based in Enterprise Ireland and in 2010 the funding for patents was provided directly to the TTOs as part of the TTSI budget.

[85] Source: Enterprise Ireland Technology Exploitation Networks Unit

[86] Data is not available on the proportion of these licenses which received support through the HEI Patent Fund. However, it is likely that a number of these received some degree of support, either advisory and/or financial.

[87] Total number of spinouts during the period of evaluations, not exclusive to IPAS.

[88] Typically the percentage of "disclosures" that convert to initial patent application is in the range 33 per cent to 50 per cent

[89] A review of support programmes across Europe found that the two which most closely align with IPAS are the "SME Patent Action" support provided through SIGNO in Germany and First Patent (1er Brevet) offered by Oséo Innovation (France). Austrian Institute for SME Research and Technopolis, 2007, Benchmarking National and Regional Support Services for SMEs in the Field of Intellectual and Industrial Property

However, based on a review of good practice internationally, the strengths of the IPAS scheme over the evaluation period were deemed to be[90]:

- Strong demonstration of expertise in IP issues by the principal staff involved;
- Clear criteria for financial support and good judgement in choosing companies/projects to be supported; and
- A range of other complementary innovation, commercialisation and development support services within the parent organisation.

The review of IPAS and international comparators also highlighted a number of areas where there would be scope to enhance the delivery and impact of current and future IP support programmes, namely:

- Covering a broader range of IP protection methods such as trademarks, trade secrecy and defensive publishing which can be more appropriate for SMEs than patenting[91];
- Greater promotion of the availability of IP supports to the SME community;
- Increased awareness of broad IPR management strategies as opposed to a narrow focus on patenting; and
- More effective networking between the service providers and the national patent office.

Key Findings

- Given the high failure rates often seen in start-up businesses, data from the patent fund suggests that careful selection of small micro-businesses with inventive ideas, followed by early Government grant support for IP protection represents good public investment and provides a small, but valuable, seed bed of embryonic businesses which have potential to move up the entrepreneurial ladder.
- The data also indicates that those companies which sought to protect and leverage IP appear to have stronger prospects for business survival in the short to medium term than the broader population of start-ups (97 per cent versus 75 per cent).
- The Industry Patent Fund has largely outperformed in comparison with the HEI Patent Fund when compared with the inputs and desired outputs, such as for example, number of spin-outs, based on the assumption that the patent created is the main source of turnover of these new start-ups.
- Stakeholder consultations found that patenting, awareness, promotion and training activities should cover IP management, protection and exploitation in its broadest sense including "know-how", trademarks and other non-patenting approaches which may sometimes be better suited to SMEs and start-ups. In terms of funding supports,

[90] Radauer, A., Streicher, J. & Ohler, F., 2007, Benchmarking National and Regional Support Services for SMEs in the Field of Intellectual and Industrial Property, PRO INNO Europe paper No. 4

[91] Blackburn, R.A., 2003, Intellectual Property and Innovation Management in Small Firms, p 4-15; Moulin, A. & Thue Lie, JH., 2005, Intellectual Property Rights and Nordic SMEs: A Study of IPR Practice in the IT and Biotech Sectors; World Intellectual Property Organization, 2003, Intellectual Property Rights and Innovation in Small and Medium-Sized Enterprises, Second OECD Ministerial Conference for Small and Medium-sized Enterprises, Geneva

there was a consensus that this should only be available where it is linked to a commercially viable project.

- A number of the stakeholders advocated that in addition to dedicated IP expert/s, it would be beneficial if all Enterprise Ireland Development Advisors received training in IP management and protection.
- A number of companies surveyed found the administrative process too bureaucratic and the payment process to be slow.

Conclusions

Appropriateness

HEI Patent Fund: The HEI Patent Fund was successful in delivering on its objectives to support researchers to protect their IP, primarily through patenting and to provide advice on IP protection and management.

This is borne out by the significant rise in numbers of supported patent applications from approximately 17 in 2005 to more than 200 in 2008. Analysis of the data and consultations with technology transfer officers in the HEIs indicate that the programme was effective overall and met the needs of the TTOs in supporting patenting activities. From 2009 the HEI Patent Fund was integrated into the broader TTSI delivered through the HEIs.

The strong growth in the usage of the HEI Patent Fund from 2006 onwards is an encouraging sign that the totality of the State investment and support to increase R&D capacity and commercialisation activity within the higher education sector is materialising.

Industry Patent Fund: The Industry Patent Fund support was appropriate to deliver on its objectives to support companies to protect their IP, primarily through patenting and to provide advice on IP protection and management.

The continuous emergence of a stream of new innovative, high potential companies is an important ingredient of the State's industrial policy. The Industry Patent Fund was an appropriate intervention to support this policy. Over the evaluation period the programme provided supported 67 start-up and early stage SMEs to obtain some degree of patent protection for their inventions. 39 of these companies meet the criteria for HPSU or pre-HPSU status indicating that it is appropriate to classify the companies supported as innovative and high potential. 63 of the 67 companies supported were trading successfully or pre-trading in 2011 and together employed approximately 570 staff.

As outlined above, the IPAS programme and its objectives align with national enterprise policy objectives to support the emergence and development of knowledge and technology based start-ups and early stage companies and to support the commercialisation of research from the higher education sector.

The stakeholder consultations carried out strongly support a role for the State in promoting awareness of and increasing levels of IP protection within the SME and academic communities as part of an overall suite of supports to promote RD&I and commercialisation activities nationally. The review and consultation process also highlighted support for an explicit overarching policy for IP management, protection and exploitation with underpinning supports in terms of awareness raising, training and funding activities, for example, national education and training initiatives linked with the Patent Office and CEBs. In addition, to patenting, awareness, promotion and training activities should cover IP management,

protection and exploitation in its broadest sense including "know-how" trademarks and other non-patenting approaches which may sometimes be better suited to SMEs and start-ups. In terms of funding supports, there was a consensus that this should only be available where it is linked to a commercially viable project.

Synergies and Complementarity

There was a high level of complementarity between IPAS and a number of other agency-delivered programmes particularly those focused on applied R&D, commercialisation activities and on promoting industry-academic collaboration such as Innovation Partnerships.

Within the SME sector specifically, complementary programmes included the RD&I, Applied Research Enhancement, and the HPSU support programmes. Within the higher education sector, and in addition to the programmes listed above, IPAS bridged supports for basic and applied research and those for start-up and commercialisation activities.

Applied RDI support programmes, such as IPAS, have a natural progressive link with the business development role of Enterprise Ireland as they grow and become more established. For example, over time, a start-up enterprise would benefit from supports such as Excel at Export Selling or Leadership4Growth to supports its development and expansion.

A number of the stakeholders consulted as part of this review were of the view that there is even greater scope to integrate IP support and related issues into the available spectrum of support programmes and initiatives at Enterprise Ireland.

Enterprise Ireland has recently appointed an IP Manager, who will continue to play a key role as a focal point for all IP related expertise. At the same time, a number of stakeholders advocated that in addition to dedicated IP expertise, it would be beneficial if all Enterprise Ireland Development Advisors received training in IP management and protection.

Duplication: There was limited duplication between the IPAS programme and other agency provided supports. IPAS was very specific in terms of the focus on patenting and financial supports were strictly limited to qualifying patenting activities. Companies can secure some supports for patenting through the R&D Fund and through HPSU supports; however, any duplication of activities over the evaluation period would have been minimal.

Benefits and Costs: Many of the patented inventions supported by IPAS, particularly in the HEIs, emerged from publicly funded research. As such, it is not possible to isolate and quantify the specific effect of the patent funding support in absolute monetary terms. However, it is clear that the patent funding is an integral and important part of the wider State support system for RD&I, start-up and commercialisation activities.

Efficiency

Efficiency covers the extent to which the inputs have led to the desired output and outcomes. Analysis of programme data and findings from the stakeholder consultations show that the IPAS led to:

- A total of 718 inventions (see table 6) obtained some element of patent protection;
- The Industry Patent Fund played a role in the emergence of approximately 54 small, innovative early stage or start-up businesses over the evaluation period. A further 68 companies spun out of the higher education system and it is likely that at least 31 of these were based on IP that was supported through the HEI Patent Fund. Therefore, approximately 85 (54 plus 31) start-up companies formed either as spin-outs from HEIs or as part of the business development process to commercialise an invention supported through the Industry Patent Fund;
- €9.1 million in income from licensing activities based on the patented inventions over the next ten years based on a set of conservative assumptions outlined above.

The total direct and indirect costs of the programme were €7.8 million over the evaluation period and the estimated potential income of €9.1 million suggests that the IPAS programme was efficient in delivering the desired outputs and outcomes.

Effectiveness

Overall, the IPAS scheme appears to have contributed to a significant number of outcomes during the years 2005 to 2009:

- A minimum of 424 (353 from HEI Patent Fund and 71 from Industry Patent Fund) inventions secured some element of patent protection;
- Circa 85 start-up companies were formed and received support to protect and leverage IP as part of their business development; and
- It is estimated that a minimum of €9.1 million will be earned in licensing income over the next ten years alone.

Furthermore, 270 license agreements were issued from the higher education sector over the years 2005 to 2009. Data is not available on the proportion of these licenses that received support through the HEI Patent Fund. However, it is likely that a number of these received some degree of support, either advisory and/or financial. It would be beneficial to track this link in a systematic way so as to provide a fuller picture of the impact of the Patent Fund as it now operates, under the auspices of the TTSI.

As outlined above, the Industry Patent Fund facilitated the early growth of a small cohort of high quality companies, but its take-up was moderately low within the context of the overall SME population. The high selectivity can be seen as special feature of IPAS compared to similar services, but is also an explanation for the low user take-up, especially among SMEs. For the most part, this can be explained by the fact that financial support services are often tied to funding limitations – which has been the case for both IPAS schemes. Analysis of the data on proposals funded through IPAS shows that, in broad terms, the volume of proposals funded through both the HEI Patent Fund and the Industry Patent Fund increased year and year over the review programme. However, there were no explicit target metrics for IPAS in terms of numbers of proposals funded over this period.

Specific targets and metrics should be developed coupled with the introduction of a mechanism for following up on the progress of patents and IP supported so as to gain a more complete picture of the impact and effectiveness of IP supports delivered by Enterprise Ireland[92].

Substitution: Of the 67 companies supported through Industry Patent Fund scheme, it seems likely that a number of them would have emerged and/or grown in the absence of the scheme. However, it is also likely that the scheme helped their formation and early growth through financial support and advice offered.

Deadweight: A high proportion, approximately 66 per cent, of the unsuccessful applicants surveyed went on to patent their inventions from their own resources or from other sources. This indicates a high level of deadweight. Caution is required therefore in trying to link the emergence of the new IPAS companies unequivocally to the grant support received for IP protection. At the same time it is important to reflect Enterprise Ireland's contention that refusals were based on their assessment that these industry applicants did not demonstrate commercial potential, and the fact that these unsuccessful applicants obtained patent protection through other sources does not indicate a failing of the scheme.
Displacement: Any displacement effect of IPAS is small. It supported the development of innovative high technology based ideas and clear criteria were in place to ensure participants were appropriate to deliver on these aims.
Behavioural Additionality: Participants benefit from an increased awareness of the value of IP protection and management as part of the business development process. In addition, they gain a greater knowledge and understanding of supports for enterprise development and commercialisation of research and the steps involved.

Recommendations

Broaden IP Support Services

- Within the planned re-introduction of some IP services by Enterprise Ireland, consideration should be given to implementation of a wider range of IP support services for client companies. Patent-funding is only one element of the potential for the use of IP within Irish companies and the wider economy. Other non-patenting approaches, such as trademarks and copyright, may sometimes be better suited to SMEs. Enterprise Ireland should develop a policy to broaden and intensify the promotion to its client base of appropriate forms of IP protection, and of the strategic value of IPR as a business function [see end note below].

Raise Awareness/Understanding of Development Advisors of IP

- Since 2009 Enterprise Ireland has re-positioned the IP grant support for industrial companies so that it is now integrated into a wider portfolio of supports. However, most Enterprise Ireland DAs have only a limited knowledge of IP protection issues. In particular Development Advisors (DAs) and Technologists associated with "technology" sectors (including DAs who work with HPSU companies) should receive training in this important field. Training should include, for example, developing an understanding of the issues facing companies that have developed their own IP or know how, and also

[92] It should be noted that the TTOs do report on licences, spinouts and disclosures, however, these are not explicitly linked to preceding supports such as patent funding.

the opportunities and pitfalls for companies trying to access new technology via licencing from HE research.

Review Preferred Outcomes Approach

- Enterprise Ireland should review its "preferred outcomes" policy with respect to outcomes emerging from grant supported companies in the area of IP protection. Although it may be most desirable that the outcomes would be Irish based companies exporting goods and services, State support for patent protection should be based on a robust assessment of future economic return (which may in fact be via a licencing revenue stream).

End Notes

In 2009 the IPAS Scheme was closed. However, Enterprise Ireland has maintained a continuity of support to HEIs and industry to enable them to protect their innovations, through a number of alternative financial and strategic support instruments.

Responsibility for patenting technology developed in the HEIs is now with the TTOs with support from Enterprise Ireland under the TTSI. The TTO personnel provide the professional capability within each HEI to identify the research outputs with commercial potential that should be protected. Therefore, the TTO has the responsibility to employ the appropriate IP protection instruments, including patents, as they are required. There is no ring-fenced budget for patenting services within the TTSI budget.

TTOs are required to report on outputs such as licences, spinouts and disclosures. However, their reporting does not link outputs directly to a particular activity or budget allocation such as patenting.

Further Recommendation:

- It is further recommended that mechanisms and metrics be developed to record expenditure on patents, and to track progress of patents through to licensing and spinouts in order to gain a more complete picture of the impact and effectiveness of supporting patent filings.

The patent funding supports provided to companies under the Industry Patent Fund have been integrated into Enterprise Ireland's R&D Fund and other relevant initiatives (such as the Innovative HPSU programme). Enterprise Ireland continues to provide advisory support on IP issues through a range of non-financial programmes. EI has recently created the post of Intellectual Property Manager to create a focal point for the delivery of this varied type of support. Therefore, IP support from Enterprise Ireland is intended to be broader than purely patenting and is supported as part of a wider business development context.

3. Pilot Business Partners Programme 2009

Programme Logic Model

Objectives[93]

- Accelerate commercial exploitation of publicly funded research
- Provide another population of investment-ready HPSUs to Enterprise Ireland portfolio in short time period
- Create businesses that will support commercialisation activity
- Support serial entrepreneurship in Ireland
- Facilitate experienced entrepreneurial investors to access and extract research assets

Inputs

- Enterprise Ireland grant funds
- Business partner contribution
- Leveraged private sector funding
- HEI contribution in kind

Outputs

- New products/processes
- IP registrations
- Follow on to other Enterprise Ireland Programmes (i.e. HPSU)
- Business start-ups

Activities

- HEI/Entrepreneur link-up
- Technology scanning and transfer
- Networking
- Commercialisation

Outcomes & Impacts

- Creation of new businesses including HPSUs
- The potential for creation of jobs, sales and value added

[93] Based on research and analysis undertaken by Frontline Consultants

Evaluation Aim

The aim of the evaluation is to assess the appropriateness, efficiency and effectiveness of the Business Partner Programme. This is an interim evaluation of the Pilot Programme initiated in 2009, covering the period of impact from 2009-2011, and is based on Frontline Consultants evaluation report commissioned by Forfás and delivered in April 2012.

Programme Background, Objectives and Target Population

Enterprise Ireland introduced a pilot of the Business Partner Programme in 2009. The objective of the Programme was to facilitate serial entrepreneurs to access research results in third level institutions in order to intensify the commercialisation of public research and form spinout companies.

A media advertising campaign was used to market and search for Business Partners. Two hundred applications were received. The original aim was to secure twenty business partners, and following a formal screening process, nineteen were engaged on the Programme.

The Programme provided a flat grant of €20,000 to the Business Partner as a contribution toward the initial costs that would accrue. Enterprise Ireland also provided the support of a commercialisation specialist and facilitated a monthly forum with relevant parties.

The Business Partners were given access to details of university research. It was then up to the Business Partner to find out more about the research area(s) of interest to them, seek commercial avenues and negotiate a deal with the relevant university. Having identified commercial potential, the Business Partner would agree the specific project with Enterprise Ireland in advance of receiving financial support. The Business Partner would then proceed to the creation of a business plan that could be taken forward. The time frame for activity was anticipated to be in the region of six months.

The fact that it was a new and evolving initiative at the time of the evaluation was taken into account by Frontline Consultants. The objectives that have been used as the basis for the evaluation (to determine the effectiveness and efficiency of the Programme) were agreed through discussion with the Enterprise Ireland staff that are involved in the Business Partner Programme.

The overarching objectives in terms of return on delivery were to[94]:

- Accelerate the rate of research commercialisation;
- Facilitate experienced entrepreneurial investors to access and extract research assets; and
- Bring investment-ready High Potential Start-ups (HPSUs) into the Enterprise Ireland portfolio in a short timeframe.

In addition, the aim was that the formation of new businesses through this partnership approach would support:

- Commercialisation activity; and
- Serial entrepreneurship in Ireland.

[94] Enterprise Ireland paper dated 9/2/2010 to the Business Committee

Target Population

The Business Partner Programme aims to connect two key stakeholder groups in order to generate value from applied research – these being:

1. Universities with a high stock of applied research; and
2. Highly competent business people with some or all of the following characteristics:

- A strong commercial track record & excellent business credentials;
- Ability to identify commercial opportunity;
- Ability to articulate strategy, motivate, lead and inspire others;
- Capacity and time to invest in the creation of a new company;
- Vision to transform new technologies into solid businesses; and
- Established links and relevant industry contacts and a potential network in one of the technology sectors that Enterprise Ireland fund.

Programme Rationale

Developed economies recognise that it is vital to turn knowledge into innovation to gain competitive advantage. In reality this process is difficult because the skills required for developing research and the skills and acumen required to commercialise are quite different. In establishing the rationale for the Programme it is important to consider the following factors:

- The Global Entrepreneurship Monitor 2011 on Ireland showed that new businesses are highly innovative: 50 per cent of early stage entrepreneurs introduce products /services that are completely new to some or all of their customer base; and 28 per cent of early stage entrepreneurs reported that they are using new technologies (less than five years old) [95].
- Irish Universities and Institutes of Technology (IoTs) are important assets to the Irish economy. Ireland's investments in developing the R&D infrastructures over the past decade in particular have resulted in considerable knowledge and expertise being built up in the Higher Education Institutes (HEIs). This knowledge is a significant source of innovative and commercial potential for the Irish economy.

In effect, Ireland has:

- Willing buyers: entrepreneurs want to take up opportunities to be more successful, particularly if they are to drive out of the current recession; and
- Willing sellers: universities and Institutes of Technology want to maximise their income (and reputation) through developing their research in applied ways.

Bringing researchers and entrepreneurs together can create significant value through the commercialisation of research – and both parties benefit. Entrepreneurs can avail of new opportunities to adapt new knowledge and technology and HEIs can maximise their incomes through licencing.

[95] Fitzsimons, P. and O'Gorman, C. Entrepreneurship in Ireland in 2011. Global Entrepreneurship Monitor: The Irish Annual Report for Ireland

Although one might anticipate that engagement between researchers and entrepreneurs together would happen as a matter of course given the mutual potential benefits it is, in fact, a difficult and complex process. In many instances, there may be a lack of knowledge on the part of potential entrepreneurs of what research is being undertaken within HEIs, and a lack of awareness of commercial applications and/or industry needs on the part of researchers.

Enterprise Ireland's Business Partners Programme was introduced to support entrepreneurs in their reach into the research community to identify and exploit commercial opportunities.

Methodology

It should be emphasised that this Programme had only been recently introduced and was a pilot Programme when the evaluation was undertaken. Findings are based on information gleaned from the nine business plans that have been developed and that involve on-going commercialisation activities with the Business Partners. Great care has been taken to preserve confidentiality as these business plans remain 'live' and some are in the midst of negotiating funding deals. This evaluation therefore interprets the **potential** of the Programme to deliver an economic impact as opposed to having already created any.

The data collected was collected through:

- Five face to face interviews with the Heads of the HEI Technology Transfer Offices in five Universities that undertook the largest share of business partner projects;
- 13 interviews with the Business Partners; and
- Internet and telephone search for international comparators.

Enterprise Ireland staff were interviewed at the beginning of the project and on-going discussions were held throughout the project to clarify issues as they arose.

Alignment with National Policy

Reporting to the Department of Jobs, Enterprise and Innovation, Enterprise Ireland is responsible for supporting commercialisation, for stimulating the creation of high potential start-ups and for developing Irish owned companies to deliver economic growth through exports, value add and employment. Enterprise Ireland's approach to innovation is guided by the Government's *Strategy for Science, Technology and Innovation, 2006-2013.* Under the heading of Capturing, Protecting and Commercialising Ideas and Knowhow are the following objectives:

- Ensure that HEIs encompass IP management and commercialisation as a central part of their mission, equal to teaching and research;
- Strengthen institutional competence at TTO level and among researchers;
- Establish a competitive fund administered by Enterprise Ireland to assist strengthening of IP management function; and
- Establish a new function in Enterprise Ireland providing centralised support to HEIs, thereby maximising the commercialisation of IP.

The Business Partners Programme aims to contribute directly to Enterprise Ireland's targets set out in its strategy *Transforming Irish Industry, Enterprise Ireland Strategy 2008-2010*; in

particular the target to support 200 new HPSUs, with 50 per cent of these coming from regions outside Dublin.

The Business Partners Programme is also relevant to the following objectives of the EI Strategy (and therefore national policy) to:

- Address the full range of start-up needs including finance, management support, R&D and market development; and
- Work with the city and county enterprise boards, business innovation centres, and third-level institutions to actively promote the establishment of HPSUs throughout Ireland.

The Business Partner Programme is directly aligned with national enterprise policy. The Programme fosters entrepreneurship and supports commercialisation by combining successful business people with research that has potential to be brought to market. Already a proportion of clients from the Business Partners Programme have gone onto become recognised pre-HPSU or HPSU.

Inputs

The up-front cost of the Programme is relatively low with a total of €380,000 being input by Enterprise Ireland as grant funding for 2009 for 19 business partner participants.

The time, skills and investment made by the Business Partners to cover due diligence and market testing is in addition to the grant provided.

Indirect costs

Indirect costs are calculated based on full time equivalents (FTEs), multiplied by the maximum range of the salary for their appropriate level. There were approximately 1.5 FTEs in 2009. Indirect costs include only the cost of front-end staff salaries who are involved in managing the Programme. It excludes back office cost, overhead and administration cost.

The total cost of the FTEs in 2009 was €102,251, which brings the total cost of the Programme to €482,251.

Outputs and Activities

As this is an interim evaluation of the Business Partner Programme it is more applicable to look at the early outputs rather than outcomes, mainly because one would expect a time lag of at least 5 years before any discernible outcomes are visible.

The following summary of outputs (by the end of 2011) has been documented:

- 19 Business Partners were accepted onto the Programme, the original target being 20;
- €380,000 was approved as direct funding to the Business Partners;
- All Business Partners have delivered business plans (19), of which 9 business plans have been advanced to further commercialisation activities, with continuous Business Partner engagement;
- External capital commitment totalling €1,205,000 has been secured;

- Enterprise Ireland has invested varying amounts into 3 business plans totalling €400,000;
- Enterprise Ireland has agreed to invest a further €750,000 pending progress being made against targeted milestones;
- 5 'potential' companies have been accepted by Enterprise Ireland as 'pre HPSU';
- 4 companies have been created and accepted by Enterprise Ireland as HPSU; and
- 9 jobs have been created.

Since the creation of HPSUs is a key objective of this Programme, it is worth mentioning the definition used by Enterprise Ireland. A HPSU is a company which is:

- Based on an innovative technology or service offering;
- Likely to achieve significant growth in three to four years (sales of €1 million per annum and employment of 10 or more);
- Export oriented; and
- Led by an experienced team, with a mixture of technical and commercial competencies.

Despite the challenging economic conditions private sector funding sources have committed funding of €1,205,000, as outlined above. These figures cannot be assessed any further as the business plans remain a work in progress and are commercially sensitive.

Table 3.1: Breakdown of Partners and Expenditure for Business Partners Programme

	Business Partners	Grant per Partner	Total
Direct Costs	19	€20,000	€380,000
Indirect Costs	-	€5,382	€102,251
Total EI Costs	-	€25,382	€482,251

As a direct result of the Programme, business experts have engaged with several applied research experts, which signals the start of a new informal network between these two stakeholders which could lead to non-supported collaborations in the future.

Business Partner Feedback

In total 13 Business Partners were interviewed and they spoke freely about their view of the Programme, their experience and ways that they thought could improve the Programme.

There was a genuine interest in the concept of the Programme and a number of the Business Partners recognised the potential that university research could have. The relationship with Enterprise Ireland was highly valued.

The Business Partners were critical of the initial process citing too much bureaucracy. The Business Partners also thought that the recruitment process could be more selective,

identifying less entrepreneurs and providing more support. The majority of Business Partners were positive about the support they received from the Technology Transfer Offices (TTOs) and thought that the TTOs were a crucial part of making the process work.

The issue of a clash of cultures between the business community and academia was highlighted. A number of Business Partners highlighted difficulties in negotiating financial arrangements with the Universities. Business partners outlined issues with IP management, IP ownership and negotiating IP values with Universities. There were a number of positive comments about the academic staff involved with the Business Partners, but the most prevalent view was that the Principal Investigators (PIs) were not always readily prepared for taking the product to market.

Many of the Business Partners felt that the initial €20,000 helped to formalise the relationship between the partners and the Universities and with Enterprise Ireland. The Business Partners contended that their skills, time, personal investment and engagement well exceeded the initial investment. The aim of the Programme, however, was to stimulate or incentivise the engagement, and was not intended to fully cover the Business Partners total inputs.

Some Business Partners stated that sourcing start-up finance was seen as the major barrier, and some business plans are currently stalled as they cannot access/attract project finance. However, the view from Enterprise Ireland is that there are adequate early stage finance sources available, and strong investment opportunities, such as venture capital, do exist.

University Feedback

The Technology Transfer Offices (TTOs) in Universities that had worked with a high number of Business Partners were approached to give feedback on their experience to date with the Programme and to give a view on how it might be shaped for the future. In total, five Universities gave feedback. Overall, the Universities felt that the Business Partners Programme is a good idea and that it should continue.

The view of the Universities was that they had come across some excellent people, but not all of them were ideally suited to the Business Partners Programme due to lack of sectoral experience. However, it is interesting to note that the most successful cases had no sectoral experience before becoming involved in the Programme, but managed to deliver successful business ventures.

Universities thought that Business Partners do not always understand the culture of working with academics. The issue about who should manage expectations from each cohort is still open for resolution. In practice, Business Partners sought mediation through Enterprise Ireland and Principal Investigators (PIs) sought Technology Transfer Office (TTO) mediation. It is recommended that TTOs should better manage PIs expectations as very often the PIs overvalue their input and seek unrealistic equity shares.

The view of the Universities was that when recruiting Business Partners, the focus should be more around their track record in turning early stage technologies into viable investment opportunities, and less about how much they are willing to invest.

International Comparators

Commercialisation projects are commonplace across the world, but Programmes that focus on fusing commercial skills with university research in the way that Business Partners does are less common, certainly on a Programme level. The examples provided below are illustrative of other approaches and due to their scale, investment vehicles, research income, maturing, surrounding ecosystem, are not to be considered a direct comparison of the Business Partner Programme.

Ben Franklin Tech Enterprise Solutions[96]

Ben Franklin Technology Partners of South-eastern Pennsylvania is a nationwide model for technology innovation and a catalyst for Stimulating Entrepreneurial Potential (SEP). For over 28 years, they have invested in innovative enterprises and created commercialisation pathways and partnerships with research institutes that generate wealth through science and technology. They offer entrepreneurs and established businesses the capital, knowledge and networks to compete in the global marketplace. They have invested more than $155 million to grow more than 1,750 regional enterprises across all areas of technology.

Impact 2001-2010:

In this 10 year period, Tech Enterprise Solutions:

- Committed $55 million to over 450 early stage companies;
- Client companies created or retained over 3000 high-tech jobs; and
- Clients raised more than $1 billion in follow-on investment.

Approach

Ben Franklin TechEnterprise Solutions lets participants choose the right mix of supports and services needed to succeed. Their supports span the continuum from assessment to commercialisation to capital, and are designed to address the different requirements of early stage companies as well as mature enterprises.

- Their focus and expertise is technology companies only;
- Their experience spans all areas of technology: Information Technology, Life Sciences, Alternative and Clean Tech and other Physical Sciences; and
- They have a connection to experts from more than 20 regional colleges, Universities and research institutions, with the ability to access a network of private technology and Business Partners to provide access to real-world problem solvers.

Oxford University: Isis Innovation and Oxford Innovation

Since 1997, Isis Innovation has been responsible for creating spin-out companies based on academic research generated within and owned by the University of Oxford. It has spun-out a new company every two months on average. Over £266 million in external investment has

[96] http://www.sep.benfranklin.org/about/

been raised by Isis spin-out companies since 2000, and five are currently listed on London's AIM market. The creation of these new spin-out companies also channels millions of pounds back into University research, benefits local economic development and has created many new jobs in the region.

The Oxford area has an active group of Business Angels involved. Early stage finance has proved to be a barrier in Ireland for Business Partners. Oxford Innovation is a good example of how a Business Angel Network has contributed to the growth of a regional economy through its involvement in a technology business start-up[97].

Oxford Innovation is a company which provides services to entrepreneurs, innovators and organisations that encourage innovative start-ups and spin-outs. The company manages 14 innovation centres through which business incubation facilities are offered. Oxford Innovation has successfully initiated four different Business Angel Networks, of which OION (the Oxford Investment Opportunity Network) is probably the most well-known. The four networks unite more than 400 active informal investors who have invested more than £25 million in 91 firms since 2000. In 2006, for example, more than 120 business presentations have been given to informal investors. A technology finance panel assesses the market potential of new technologies. The networks are:

- The Oxford Investment Opportunity Network;
- The Silverstone Investment Network;
- The Thames Valley Investment Network; and
- Oxford Early Investments.

In September 2006, Oxford Innovation also launched IQ Capital, which is a 335 million co-investment enterprise capital fund, focusing on seed and early stage companies in high technology sectors, but also on fast growing companies in more traditional sectors.

Where regions and incubation programmes struggle with a gap in financing early stage companies, Oxford Innovation has managed to successfully bridge that gap.

The absence of finance and/or inability to tap into early stage funding was highlighted as a market failure by a number of Business Partners.

IPSO Ventures and Loughborough University

IPSO Ventures through its management, corporate finance expertise, and access to capital has created a portfolio of companies to commercialise the IP and technology generated by Universities and other research institutions. This example is how they work with Loughborough University and their ExcellENT approach.

IPSO's focus is on technology commercialisation using a demand-led, as opposed to technology push, approach. The ExcellENT approach at Loughborough University uses this same focus to develop enterprise and innovation understanding within the university setting. ExcellENT complements the work of the Loughborough Enterprise Office technology transfer professionals and others working on the enterprise agenda within the university by bringing an independent, commercially focused, external view to the research activities of academics (IPSO). ExcellENT is not intended to divert or change the research activities of any researcher or department, but is expected to give them an ability to identify research

[97] www.oxin.co.uk

outputs that might have commercial potential and feed those ideas into the Loughborough Enterprise Office.

The IPSO Entrepreneur associates bring knowledge of demand to the university, exploiting their commercial knowledge, experience and success in order to assess internal IP and technology developments specifically from the perspective of industry demand.

The entrepreneurs have each achieved commercial success; taking technology from early stages through to exit and each therefore have sector specific market knowledge. Under the ExcelIENT framework the entrepreneur associates will meet with researchers and others within the university and will be supported by an IPSO commercialisation manager. Each entrepreneur will remain 'on the team' for between two and three months, making five or six visits to the university over that period, meeting in groups and potentially on a one-to-one basis in order to identify which specific elements of technology or IP under development could have relevance within the entrepreneur's own sector. Each entrepreneur will give the university a different perspective on its IP and research activities.

IPSO assists entrepreneurs to work out which departments are most relevant to their experience and then arrange for them to go in to those departments. They meet the professors and other researchers, assisted by an IPSO contact. The IPSO assistant will generate the documentation and work with the entrepreneur to clarify their assessment of the different technologies that they discuss. IPSO will then ensure that the work integrates appropriately with the technology transfer team as they emphasise that they are enhancing, not replacing existing technology transfer initiatives.

(No figures are available to show how well this is working to date.)

Conclusions

Appropriateness

The Business Partner Programme is in line with Government policies to stimulate growth of HPSUs. The entrepreneurs and academics were in broad agreement about the need for such a Programme and were satisfied that it was starting to make a difference. The Business Partner Programme helps to establish a sustainable commercialisation route for the research outputs from HEIs and is an appropriate mechanism for combining business and research capability, aptitude and expertise.

In terms of a fit with other publicly funded Programmes, the emergence of this Programme makes a great deal of sense. The Irish Government has invested significantly in R&D, particularly over the past decade. The investment in the Campus Incubation project and supports under the HPSU Programme are an appropriate fit with Business Partners and provide vehicles of complementary support.

The Programme is considered appropriate and aligned with national policy.

Effectiveness

The Programme is delivering to its objectives to stimulate the creation of HPSUs and to commercialise State funded Research – with positive early stage indications. The grant of €20,000 awarded to the entrepreneur under the Programme acts as an effective stimulus. Outputs are being generated in terms of business plans that lead onto to HPSU or pre-HPSU

status being awarded to companies. Over 47 per cent (9/19) of Business Partners supported had either become a HPSU or pre-HPSU companies.

Partnerships between entrepreneurs and researchers have been established, and the Programme is innovative in its approach, although with some cultural and operational aspects that can be improved upon.

Efficiency

This is a relatively low cost Programme, with total input costs amounting to €482,251 (of which direct grants amounted to €380,000). The 9 outcomes obtained to date have been delivered in a relatively short time period, and range in level of success from a funding commitment for a business plan to becoming a recognised HPSU. These new start-ups have also leveraged funding of €1.25m from the private sector as well as further funding from Enterprise Ireland totalling €750k (based on meeting specified targets).

Although the Programme has already produced some results in terms of company and job creation, albeit on a small scale, the real value and potential impact in terms of economic return will emerge over time as the business plans are realised. The exact level of efficiency is difficult to estimate because the Programme is at such an early stage but dynamic environmental factors should be constantly monitored to ensure that this type of support is continuously improved upon.

Recommendations

The Business Partner Programme objective was to establish a sustainable commercialisation route for publicly funded research. In summary, this Programme is a starting point to bring the academic and entrepreneurial cultures together as an asset to the Irish economy.

Since the pilot, the Business Partner Programme has introduced clearly defined objectives and metrics in 2010, which measures:

- Number of Business Partners to be recruited;
- Number of business plans to be written;
- Number of companies created;
- Number of HPSUs created;
- Impact.

Attitudinal Changes

The Business Partners Programme was often described as a match making service where the personal relationship between the people involved was as important as the technological expertise and business acumen brought in.

Trust had to be earned on both sides. The academics had to be upfront regarding the stage of their research and what they expected from its commercialisation. Similarly, the Business Partner had to be upfront regarding the possibilities they saw for the technology as a product, the potential size of the market, any difficulties in market penetration and what they wanted from the project. Where this was clear, trust was established.

Expectations need to be managed on both sides to ensure the relationship between the Business Partner and academics works well.

Lack of Finance

The biggest barrier to the development of business plans has been cited as the lack of follow on finance. The intention was that Business Partners themselves would source investment or access investment but this does not seem to have happened as well as expected, possibly due to the financial climate.

Enterprise Ireland provides supports to risk based technology companies through equity via HPSU packages. As cases develop, Enterprise Ireland has a process of handover from the commercialisation team to the HPSU team – with both parties usually involved in presenting the case to the Enterprise Ireland investment committee. Enterprise Ireland also seeks to connect HPSUs with the Business Angels Network and Venture Capital Funds, both of which provide sources of finance for the Business Partners.

However, it is important to note that the onus of sourcing further finance remains with Business Partners, and Enterprise Ireland should facilitate sourcing of funding to the extent seen as appropriate, avoiding over-reliance of supports.

Universities

Business Partners have expressed frustrations with the fact that Universities operate with different expectations of equity share - which varied between 5 per cent and 15 per cent. This is a strategic issue with the HEIs, and has been identified as an issue in HEI/Industry collaborative research before now. Efforts continue to be made by relevant stakeholders to manage expectations and to increase the understanding of the value of IP depending on its stage of development and the extent of additional resources and time required to bring it to a commercial reality. It is recommended that the TTOs play a stronger role in support of the Business Partner Programme in this regard.

Recruiting Business Partners

Recruitment is the critical success area for Enterprise Ireland as they are effectively 'approving' Business Partners and referring them to Universities. The view of the HEIs is that the focus should be much more around their track record in turning early stage technologies into viable investment opportunities than on how much they are willing to invest. Yet, at the same time, the analysis indicates that a lack of finance has acted as a barrier to progress for a number of the business plans.

Overall the interview responses indicated that some Business Partners, TTOs and Enterprise Ireland that the original recruitment process attracted some excellent people – but it also allowed a few through that were not in line with what was required of a Business Partner. Recruitment for the pilot was undertaken at the one time, but this has now changed to a rolling Programme.

A completely new recruitment process is now in place with a focus on business finance. As this is the major barrier to the pilot projects being advanced, this seems entirely appropriate. Continued efforts are needed to strengthen the 'matching' process, to bring the most appropriate business/commercial expertise to exploit the research.

Business Partners Expectations

The on-going management of Business Partner expectations is as important in terms of equity share and management positions as it is with the HEIs as identified earlier. Enterprise Ireland has a role to play in monitoring relationships closely and intervening early where necessary.

The long term focus should be on changing attitudes and mind-sets to the potential of commercialisation of research and if progress continues to be made, then a sustainable commercial route will emerge as envisaged.

4. Campus Incubation Programme (2005-2007)

Programme Logic Model

Objectives

- Foster entrepreneurship and campus company activity
- Provide an essential transitional space between the research and business worlds
- Support balanced Regional development
- Help realise the commercial potential of Ireland's research community

Inputs

- Enterprise Ireland committed €50 million in capital supports to 22 Centres
- Financial assistance for Institutes of Technology for initial management costs

Outputs

- No of Companies per Centre
- No of Employees per Centre
- Links with Tenant Companies 'clustering effect'

Activities

- High Quality facilities which include modern office space
- Business development advice
- Financial advice
- Advice in the form of mentoring

Outcomes & Impacts

- Increased Company RD&I spend and activity
- Increasing exports, turnover and employment
- Increasing links with Host Institutions

Evaluation Aim

The aim of the evaluation is to assess the appropriateness, efficiency and effectiveness of the Enterprise Ireland's Campus Incubation Programme. The evaluation is based on the Frontline evaluation report commissioned by Enterprise Ireland and submitted in March 2009.

Programme Background Objectives and Target Population

The Campus Incubation Programme started in 1998. The programme was a capital investment in facilities to provide a transitional space between the research and business worlds, in which the commercial potential of the scientific research undertaken in Ireland's third level institutions could be maximised. This involved creating an environment conducive to the free and flexible flow of ideas out of the research system into the business world, where they can be developed into marketable technologies, products and services; as well as for new enterprises coming onto college campuses and leveraging the expertise that resides there. This venture aimed to promote campus entrepreneurship and to explore new ways of realising the value of the high quality research carried out in Irish Universities and Institutes of Technology (IoTs).

The campus incubators (the Centres) offer benefits to both the host institutions and the companies that they support. Tenant companies benefit from the research environment, being able to tap into mentors and the facilities of the host institution. The institutions benefit from having a focal point for entrepreneurial activity on campus and a path to the commercialisation of research performed in their college.

Eligibility for companies to locate in the Incubation Centres is based broadly around two categories:

1. The firm's potential to become a High-Potential Start-Up (HPSU), i.e. to grow and to export; and
2. The firm's plans to develop a strategic relationship with the host institution.

The aim of the state in providing funds to pre start-up businesses and potential entrepreneurs is to gather expertise and develop new technological products and processes with potential to grow jobs in Ireland and to potentially sell these products to domestic and non-domestic markets. The Centres are an integral part of Enterprise Ireland's strategy and suite of initiatives to transform Irish industry. One of the corner stones of the programme is to develop links between companies and their academic hosts.

Target Population

- 14 Institutes of Technology; and
- The University sector.

Centres are now operational on fourteen IoTs (or equivalent third level college), and are providing space and support for knowledge-intensive companies with export potential. In the university sector, Enterprise Ireland has supported five business incubation Centres, which are now operational (UCD, DCU, NUI Galway, UCC and University of Limerick). Funding for a further university incubation centre has recently been approved. The agency has also invested in bio-incubation facilities at all Universities.

Programme Rationale

The Campus Incubation Programme provides entrepreneurs with a supportive environment that assists them in bringing their idea to market, aimed at helping to reduce the risk aversion to failure. The Campus incubators provide occupants with access to resources including business development advice, financial advice, marketing advice in the form of mentoring, as well as proximity to research and development teams and facilities that otherwise would not be publicly available. The programme is designed to allow researchers or entrepreneurs with potential to become a HPSU or to develop a strategic relationship with the institution to engage with relevant experts who can potentially help them develop and commercialise these ideas.

Methodology

Enterprise Ireland engaged Frontline Consultants to undertake an evaluation of the programme which covered the following key stages:

- Incubation client company interviews and online survey;
- Host institution interviews;
- Enterprise Ireland regional directors and additional strategic stakeholder interviews; and
- International best practice review.

The final stage included synthesis and analysis of all findings, finalisation of the competency framework and development of a report to inform the future direction of the Campus Incubation Programme.

This evaluation has been informed by the Frontline report. All findings and conclusions regarding the programme included in this evaluation, with few exceptions as indicated, are based on the 2009 evaluation. A workshop was facilitated by Forfás with Enterprise Ireland in order to update findings/recommendations as necessary.

Alignment with National Policy

In the late 1990s, Ireland's national policy objectives evolved from one focused on primarily attracting investment into low cost manufacturing industry to attracting and growing knowledge intensive sectors and activities. The strategy Building Ireland's Smart Economy – A Framework for Sustainable Economic Renewal (2008) clearly stated and named this programme as instrumental in commercialisation:

"We will focus on the promotion of commercialisation of opportunities arising from research undertaken including through the Commercialisation Fund, the Incubator Space Scheme, and the Technology Transfer Strengthening Initiative" (P14)

The campus support to companies has been identified in the Strategy for Science, Technology and Innovation (2006-2013) under the third pillar of capturing, protecting and commercialising ideas and know-how.

The Campus Incubation Programme aligns with Enterprise Ireland's commitment to assist entrepreneurs to develop commercial opportunities from scientific research. Enterprise Ireland's 2008-2010 strategy states that "the development of innovative products and services

by start-up companies with a high potential to grow, underpinned by the effective and imaginative use of technology, will be the lifeblood of the Irish economy".

The Campus Incubation Programme as a policy intervention aligns with the relevant policies at the time of inception and with current policies.

Inputs

Between 1999 & 2007, 240 companies availed of facilities constructed as a result of the Campus Incubation Programme (there were 275 companies involved by 2011). Capital investment and funding of €50 million since 1998 has translated into support for 22 business incubation Centres on 16 Institutes of Technology, or equivalent third level college (i.e. National College of Ireland) campuses, in four Universities as well as for 6 specialist bio-incubation facilities linked to the Universities[98].

Table 4.1: Costs associated with Campus Incubation Programme

Year	1999-2004	2005	2006	2007	Total
Costs (€, 000s)	39,444	5,904	1,314	4,074	50,737

Indirect costs

Indirect costs include the costs for providing related advisory services - back office salary cost, overheads or administration costs are not included. The Campus Incubation Programme had the commitment of 4.5 full time equivalents (FTE) over the period of evaluation, averaging at 1.5 per annum. The table below details the cost per year.

Table 4.2: Related Advisory Service Cost

Year	1999-2004	2005	2006	2007	Total
Cost(€, 000's)	648[99]	103	109	111	972

This cost brings the total expenditure on the program to €51.709 million.

[98] Enterprise Ireland assistance (with support from the European Regional Development Fund) for the construction of these centres was provided at 95 percent of eligible expenditure for centres in the Borders Midlands and West (BMW) region and 90 percent in the South and East, up to a maximum of €2.54 million each.

[99] An Average of 107,962 was taken from 2005-2007 and applied to 1998-2004.

Outputs & Activities

The funding translated into support for 22 business incubation Centres. In addition to capital investment, Enterprise Ireland provided small financial assistance to support the management costs of the Centres in the IoTs as they commenced their operations.

Under the Campus Incubation Programme, companies benefit from:

- Modern office/bio incubation facilities;
- Campus location with access to the countries' leading researchers and academics; and
- Business development support through access to an incubation centre manager, and sign-posting to additional start-up supports.

As of 2011, there were 275 companies engaging with the Centres, employing 1,611 people. Table 4.3 below gives the breakdown of companies per knowledge institution. A net increase of 35 companies since 2007 shows the number of companies is gradually increasing. UCD has the most concentrated incubator with 29 companies.

Table 4.3: Breakdown of No of Companies & Employees Associated with the Centres, 2010

Centres	Companies	FTE employees[100]
Cork Institute of Technology (Rubicon)	24	133
IADT	18	69
NCI	17	92
Sligo	22	47
Tallaght Institute of Technology	7	41
Tralee Institute of Technology	13	33
Waterford Institute of Technology	17	57.5
Galway Mayo Institute of Technology (Mervue)	11	37
Dundalk Institute of Technology	16	45
Limerick Institute of Technology	10	46.5
Letterkenny Institute of Technology	11	27
Carlow Institute of Technology	11	25
Athlone Institute of Technology	7	24
Castlebar Institute of Technology	7	12
Blanchardstown Institute of Technology	7	15
University College Dublin	29	213

[100] Full time equivalent

Centres	Companies	FTE employees[100]
National University of Ireland, Galway	21	60
Dublin City University	16	73
Trinity College Dublin	5	59
University College Cork	6	51
Total	275	1160

Source: Enterprise Ireland

Company Outcomes

Through the programme, Enterprise Ireland, in partnership with the third level sector, has provided the incentive to stimulate the creation and growth of knowledge-intensive companies. However, the success of the programme relies on wider factors, particularly:

- the motivation and commitment of incubation client companies to maximise the benefits to be gained from their tenancy; and
- the extent to which the host institution and the incubation centre manager collaborate with incubation client companies to influence their development.

Interviews/surveys were conducted with 149 of the total 240 companies located in the Centres as at 2007 which gives a response rate of 62 per cent. The companies provided feedback on the following broad areas:

1. Motivation for entering the incubation centre;
2. The extent to which general incubation facilities met with company needs;
3. The extent to which companies availed of business development services (both internally and those provided by wider economic development agencies);
4. Strength of relationship with host institution (current and planned); and the
5. Nature and influence of relationships with tenant companies.

Motivation for Entering the Incubation Centre

In terms of attracting people and businesses, 51 per cent of respondents reported 'access to general incubator support', as a primary reason for companies coming to the Centres. The following sets out the findings based on the 91 per cent of that responded to the survey question, the following feedback was received by companies[101]:

- 'Access to general incubator support'(51 per cent)
- 'Practicality' (39 per cent)
- 'Access to wider business support (35 per cent),
- 'Association with the institution (28 per cent) and

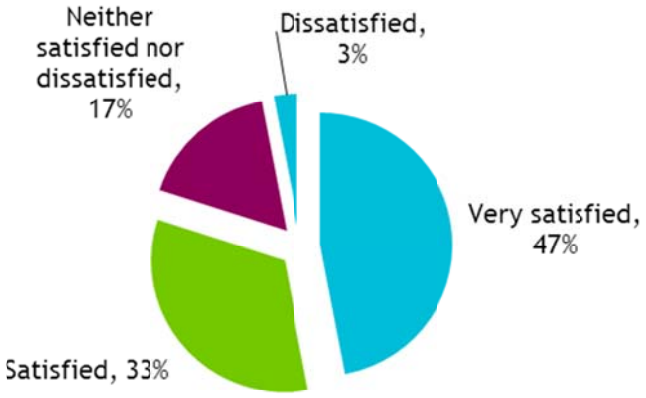
[101] Respondents could select more than one response option

- 'Access to R&D expertise' (28 per cent).

Company Satisfaction with Support

Levels of satisfaction were high overall, with 89 per cent of respondents 'satisfied' or 'very satisfied' with the level of facilities provided. Companies indicated that the quality of business accommodation and in many cases, prestigious addresses, made them "instantly credible" with prospective clients.

Chart 4.1: Level of Company Satisfaction with Support



Business Development Availed by Companies

The types of business development support availed by the clients varied from informal discussions with other companies to regular meetings with the incubator manager (Chart 4.2).

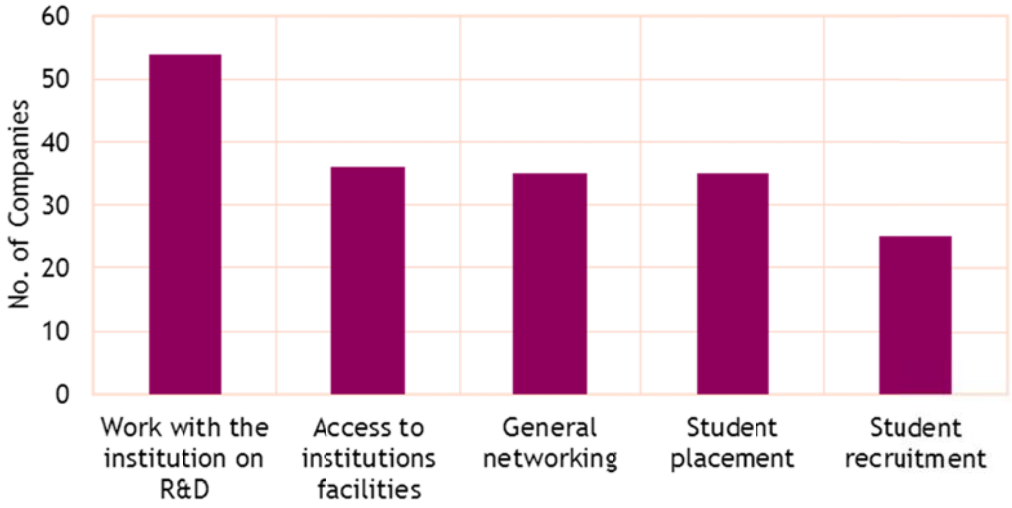
Chart 4.2: Engagement with Business Development Support Provided by the Centres

The response rate to this question was 84 per cent. 61 per cent of respondents reported having regular meetings with the incubation centre manager, 57 per cent of respondents were currently participating on business development training programmes (for example, Enterprise Platform Programmes). Interestingly, 45 per cent of companies viewed the discussions they had with other tenants as having an important influence on their development. 38 per cent of respondents reported that they were working with a business mentor, allocated through their Enterprise Ireland development adviser.

Links with Host Institution

It was essential to the evaluation to understand how companies were engaging with host institutions and the chart below illustrates the nature of engagements that were most frequently cited. The response rate was 79 per cent to this question.

Chart 4.3: Links with Host Institution



In total 36 per cent of companies reported that they had worked with their host institution on R&D (a higher proportion of companies in universities reported having R&D links with their host – 48 per cent). There is potential to significantly increase this number and to encourage both companies and host institutions to consider the potential of joint R&D projects, outlined in the recommendations at the end of this report. It also needs to be recognised that the evaluation is carried out at an early in the programme and that a time lag of 5 to 7 years needs to be considered for the economic benefits to fully materialise. However, it is worth mentioning that the Innovation Vouchers support programme is offered by Enterprise Ireland as a key instrument for increasing research linkages, and is complementary to the Incubation Centre Programme.

Where R&D links exist, these were viewed positively, with 54 per cent of companies with links in this area citing R&D as the single most important engagement with the host institution.

While these findings are positive it is concerning that 29 per cent of companies surveyed did not report having any links with their host institutions. Where links did not exist, companies were asked to identify what barriers were inhibiting engagement and what would have to be addressed/ changed to encourage development of links.

The following points give an overview of the most common issues identified:

- Too early in the stages of company development;
- Culture clash - perception that commercial and academic environments do not combine very well;
- Lack of responsiveness from host institutions; and
- Lack of interest from companies.

Links with Tenant Companies

Companies were asked to outline how they interacted with other companies in their centre. The response rate was 72 per cent. Informal networking emerged as the popular form of

interaction (cited by 90 per cent of respondents), with 31 per cent reporting that other companies were 'informal sounding boards/mentors' for them. Finally, commercial relationships had also been established, with 26 per cent of companies reporting that other companies were 'clients/business partners'. In some cases this formed part of a 'barter system' where, for example, a web developer would help another company with their website in exchange for financial advice.

Impacts

This section considers the impact of the Campus Incubation Programme on the two main stakeholders involved – companies and knowledge institutions. The impacts are assessed against the stated objectives of the programme. The findings at this stage of the programme's existence inform the first two aspects in particular.

- Foster entrepreneurship and campus company activity;
- Provide an essential transitional space between the research and business worlds;
- Support balanced regional development;
- Help realise the commercial potential of Ireland's research community.

The campus incubation centres are regionally spread, with 10 of the 17 incubators located in regions (and of these 3 are sited in regional cities); and six located in the BMW region. It is too early in the programme to provide insights into economic returns. It is also worth noting that post-incubation, 91 per cent of all respondents reported that they plan to remain in the local area.

Companies

There are a number of very good examples of entrepreneurship being fostered in institutions – simply because a facility existed on the grounds of the campus. To say that a 'building' is responsible for this is inaccurate, however, but its 'value' is reinforced by the fact that the tenants have access to advisory services, training[102], mentoring, peer supports as well as financial start-up and R&D supports. The incubator model gives business ideas the opportunity to be taken further forward than might have been the case in pre-incubator days.

Two main criteria were used to assess the tangible benefits that had been leveraged by companies:

- Access to capital; and
- Investment in R&D.

Access to Capital

Just under half (49 per cent) of the sample sourced additional capital. The most frequent cited sources of additional capital were:

- Venture Capital/Business Angels (28 per cent);
- Other Enterprise Ireland Finance (28 per cent);
- Bank overdraft or loan (21 per cent);

[102] Including, for example, participation on the Enterprise Platform Programme

- Profits/cash-flow (8 per cent); and
- Other sources (12 per cent)

A high percentage of companies (58 per cent) who had accessed further capital reported that their location in the incubation centre made this process either 'a lot' or 'a little easier'.

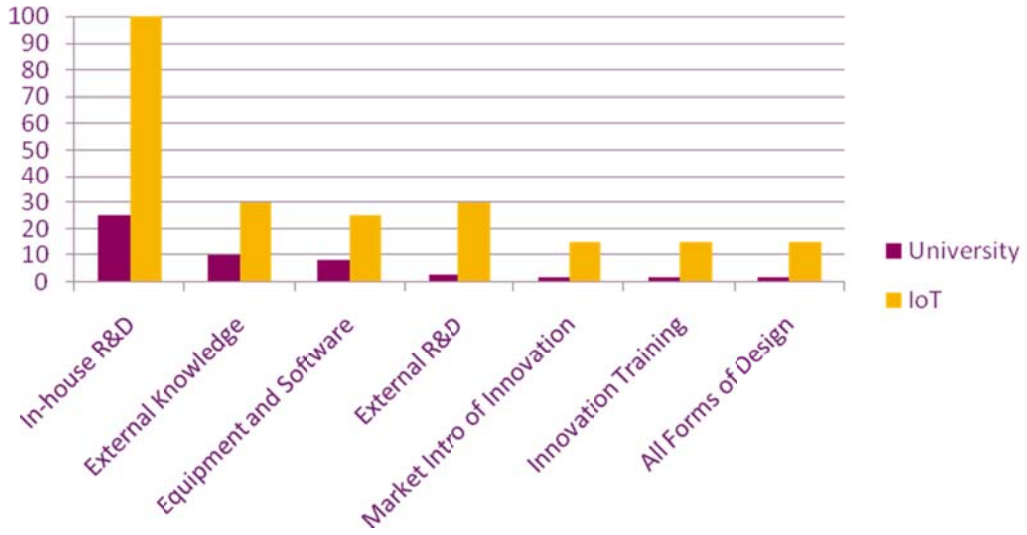
Investment in R&D

The level of R&D undertaken by firms is a key indicator for this programme. 110 companies out of the 149 respondents (74 per cent) were undertaking some form of R&D. In the period 2005-2007 the companies in Campus Incubation Centres were increasingly investing in R&D activities.

Frontline Consultant's report indicates that in the period 2005-2007, incubation client companies invested €51.5 million of public and private funds in R&D[103]. This R&D activity ranged from discrete external R&D projects (e.g. Innovation Vouchers and Innovation Partnerships) to internal time invested in undertaking R&D activities relating to the development of new and/or improved products, services and processes.

The most common type of R&D activity was "in house" while several other forms of R&D activity were conducted in a low proportion of the businesses in the sample (Chart 4.4).

Chart 4.4: Type of R&D Investment by Client Companies



Business Impact

Incubation client companies reported the following immediate benefits:

- 30 per cent of companies reported an increase in company value;
- 27 per cent of companies reported new domestic sales;
- 17 per cent of companies reported new export sales; and
- 13 per cent of companies reported an increase in the volume of exports.

These results indicate that a sizable proportion of participating companies are experiencing business benefits within a short timeframe. A number of respondents commented that these benefits and the shorter timelines to achieve them were positively influenced by their being located within the Centres.

The following long term benefits were identified:

- 40 per cent of companies reported an improved ability to attract highly skilled staff;
- 38 per cent of companies reported improved technological skills; and
- 23 per cent of companies reported improved higher level skill.

This evaluation sought to establish if being located in the campus incubation centre had any impact on improving and/or developing business capabilities. 73 per cent of companies reported improvements in this area. In many cases this was linked directly with participation on Enterprise Platform Programmes. The findings from this question are presented in the Table 4.

Table 4.4: Has the support you received in the incubation centre improved your business abilities in any of the following areas?

Improved business abilities?	% response
Development of a business strategy that positions the company for growth	56
Understanding of your market and the use of this knowledge in business planning	44
Developing a culture of innovation	42
Knowledge in business planning	32
Understanding the needs of your customers	29
Development of a global perspective in relation to trading or knowledge	28
Leadership	28
Development and use of information and communication technology	27
Development of a strong financial position from which to act	26
Encouragement of initiative at all levels	23
Developing mutually beneficial relationships with customers and suppliers	21
Training and development of staff	21
Management of change	19

Knowledge Institutions

The impacts that have materialised to the host institutions are primarily evidenced in attitudinal change with benefits arising from more staff becoming entrepreneurial, changes in institutional strategies and changes in the institute's profile geared towards commercialisation. The signs are evident in Higher Education Institutions' reputations as hubs of entrepreneurial activity, attractiveness to spin-ins and proactive engagement in business development support for businesses.

There is evidence that the majority of institutions are benefiting from the Campus Incubation Programme although this is being demonstrated in different ways and at different levels across the country. Major changes may not have occurred yet (at the time of the Frontline evaluation) but the signs are that progress is being made to change attitudes that set the foundations for more benefits to emerge over coming years.

Wider Institutional Strategies

The development of incubators as a strategy has been primarily developed through a top-down approach, driven by national research and enterprise policy aims. It is embraced at senior levels within the Universities and Institutes of Technology and there is evidence in most institutions that 'incubation' is now embedded in their strategies. Being strategically committed, however, can take time to filter into operational support. For example, at a very practical level, details of the campus incubation centre (or its existence) were not easy to find during a desk based review of the websites of institutions. Feedback from companies (at the time of the Frontline Consultants evaluation) also indicated that this strategic drive was not always backed up with hands-on support at a (HEI) departmental level. On the other hand, there are some instances emerging where university/IoT staff are being given sabbaticals to support campus companies.

Links between HEIs and Businesses

There was great disparity between Centres regarding strong working links being formed between the host institution and the businesses. Although there does not appear to be one specific reason for this, it often seemed to happen best where good relationships at a personal level existed. In some of the more positive cases the ability to have access to academics, lab space and equipment was viewed as a huge advantage by businesses. From the consultation and e-survey results with incubation companies:

- 71 per cent of companies reported having links into the host institution;
- 36 per cent reported undertaking R&D with host institutions (generally through innovation vouchers and innovation partnerships): and
- 39 per cent reported that they were actively involved in arranging student placements.
- One way of achieving the objective to help realise commercialisation of HEI research is through stronger linkages between firms and HEIs on R&D activities.

Given that an objective of the Programme is to help realise commercialisation of HEI research, the relatively low proportion that reported undertaking R&D with host institutions indicates that further effort is required in this regard.

Where R&D was occurring, businesses reported it to be of a very high standard. There was some dissatisfaction from businesses with the relationship that existed because of the 'non-commercial timescales' that academics worked to. Many businesses are actively supporting student placements and they see graduate recruitment as a major benefit of being based in a

Centre. The innovation vouchers and partnerships are also viewed as a particular success by businesses and the Centres, aimed at stimulating (generally smaller scale) collaborative R&D activities. The findings indicate that the suite of Enterprise Ireland products and services to support business development stimulate an increased level of commitment from the host institutions.

Reputation as a Hub of Entrepreneurial Activity

A number of Centres are achieving strong brand recognition for entrepreneurial activity, notably the UCD Nova Centre, Arclabs in Waterford IoT and the Rubicon Centre in Cork IoT. The motivation and commitment of the Centre manager appears crucial to the overall reputation and success of the Centres. It is also the case that the starting point in terms of entrepreneurial/enterprise engagement was very different across the HEIs. Those that have achieved a good reputation for the Incubation Centres had already demonstrated the culture and mind-set required to 'embed' incubators and associated innovative businesses within their campus activities.

The Universities have demonstrated higher levels of engagement for R&D activities relative to the IoTs, and again, this may result from the fact that researchers within the Universities were already more geared toward exploiting their research (through setting up their own business and/or licensing arrangements).

What this finding demonstrates is the future potential that can be realised over time – driven by the strategic commitment by the HEI and relevant departments; and by the motivation of the Centre manager.

One of strengths of the programme is the number of spin-ins that have been supported by many of the Centres. Many spin-ins are as a result of highly skilled people that have come from multinationals that are relocating. The Enterprise Ireland New Frontiers Programme[104] is anticipated to provide one of the main future sources of spin-ins.

The combination of the availability of Centre facilities together with the range of Enterprise Ireland supports for businesses operates as an attractive overall package for new firms (both spin-outs and spin-ins).

Quantitative Impacts on Companies

This programme primarily involved capital expenditure in constructing the incubation centres as a crucial part of the overall innovation eco-system. The Incubator Programme is also complemented by a range of direct supports (financial and 'soft' supports) provided to occupant firms directly and/or to the HEIs to stimulate increased collaborative engagement in RD&I.

Given the timing and the nature of the intervention, it is too early to fully assess its economic impact in relation to turnover, value added and exports. Feedback from companies provides some confidence that an economic return will result from being located in the Campus environment. As indicated above, for example, companies themselves cite the incubator location as being of added benefit (bringing credibility/reputation/on-site advisory supports etc., to bear) in accessing funding and generating sales.

[104] The New Frontier Programme was a successor to the Enterprise Platform Programme

However, in reality it would also be challenging to attribute (current or future) impacts directly to the existence of the building itself, given the range of complementary State supports that will be accessed by the small start-up firms - to engage in R&D, to develop leadership and strategic competences, to develop the business - and the time-lag involved in bringing new products and services to market[105]. Much of the impact to date is evidenced in behavioural change within the HEIs and in knowledge/resource sharing between firms and 'clustering' stimulated by the on campus incubator environment.

In terms of employment created within the campus incubators, total employment was 1,611 by 2010 (See Table 4.3 above). For the incubators located at Universities, the available data allows employment to be segregated into two types of incubators – Business Incubators and Bio Incubators (Table 4.5). Business incubators account for two-thirds of employment in these incubators. Only Trinity College and University College Cork have a larger portion of total employees employed in the bio incubators. Trinity College only provides bio incubation facilities.

Table 4.5: Breakdown of Employment in University Campus Incubation Facilities

Centre	UCD	NUIG	DCU	TCD	UCC	Total
Total Employees	213	60	73	59	51	456
Business Incubator	166	46	55	0	19	286
Bio Incubator	47	14	18	59	32	170

Source: Enterprise Ireland

International Perspective

Business incubation is now a widely accepted approach adopted by established economies and emerging economies to promote regional and/or industry cluster development. Since their inception, business incubators have continually developed new services and processes in response to the needs of their stakeholders/founders, clients and changes in the global economy. While the comparison with similar international programmes is useful, most countries do not provide output information on their respective programmes as the information is very sensitive. Considering the absence of output metrics, this section focuses on the type and objectives of the incubation programmes in operation which is informative for the future development of the programme in Ireland.

United Kingdom - Oxford Innovation

Oxford Innovation is a company which provides services to entrepreneurs, innovators and organisations that encourage innovative start-ups and spin-outs. The company manages 14 innovation Centres through which business incubation facilities are offered. Oxford Innovation has successfully initiated four different Business Angel Networks, of which the Oxford Investment Opportunity Network (OION) is probably the most well-known. The four networks

[105] R&D impacts typically take between 5-7 years to fully accrue - Forfás Evaluation Framework

unite more than 400 active informal investors who have invested more than €25 million in 91 firms since 2000. In 2006, for example, more than 120 business presentations have been given to informal investors. A technology finance panel assesses the market potential of new technologies. The networks are:

- The Oxford Investment Opportunity Network;
- The Silverstone Investment Network;
- The Thames Valley Investment Network; and
- Oxford Early Investments.

In September 2006, Oxford Innovation also launched IQ Capital, which is a €35 million co-investment enterprise capital fund, focusing on seed and early stage companies in high technology sectors, but also on fast growing companies in more traditional sectors. Where regions and incubation programs struggle with a gap in financing early stage companies, Oxford Innovation has managed to successfully bridge that gap.

In Ireland's context, the absence of business angel networks was highlighted as a market failure by a number of companies in the West of Ireland. Inability to tap into this early stage funding was considered to be a barrier to growth for high-tech start-ups.

Since 2009, Enterprise Ireland funds the activities of the Halo Business Angel Network, administered through the four regional Business Innovation Centres. In addition, Enterprise Ireland holds a database of potential Business Angels. The availability of this type of seed funding has a direct impact on start-ups.

The Investment Services Division of Enterprise Ireland works with client companies to identify suitable third party funding for start-up companies.

Finland - Virtual Incubators

Virtual incubation refers to the use of ICT to get added value – wider support, connections to other businesses and research for innovation and economies of scale. The services the incubator can provide to tenants are not confined to the physical entity in which tenant firms are located. Otaniemi Science Park in Finland has pioneered the concept of the 'virtual incubator', which involves an intranet with access to a shared database and other quality business support services delivered on a virtual basis. www.vIZET.de is a virtual house of innovations. vIZET offers entrepreneurial services for start-up and growth of virtual enterprises, software tools supporting the management of virtual enterprises, an electronic market for the matching of virtual collaborators, and a commented list of global links providing best-practice models, platforms and expert networks.

ZET provides a home for virtual enterprises. Due to its virtual status there is significant potential to build a large community. The acceptance of the virtual community depends on the added value of being part of vIZET. The main benefits are the support structure, providing:

- Non-institutional "open" roof for all virtual enterprises;
- Services which will enhance the functionality of virtual enterprises; and
- Fast and reliable access and connectivity via a 155 MB/s port.

In Ireland, the Innovation in Business Centre, GMIT (Castlebar) has recently introduced virtual incubation as an innovative way of increasing the centre's reach in the rural area. Virtual incubation enables early-stage entrepreneurs to understand the potential for their business concept while maintaining their anonymity in rural communities, where they may not wish their current employer to be aware of their plans. It is a model worth monitoring, and replicating in regional locations where this alternative and progressive approach could be effective. This approach could miss out on the benefits of the on-site knowledge sharing aspects of a physical incubator location.

Sweden – Chalmers Innovation

It is a fact that excellent scientists are in most cases not necessarily also excellent entrepreneurs. The incubator model can play a role in matching the scientist with an entrepreneur and form a team around a business plan in which both the scientific knowledge and the entrepreneurial knowledge is united. This trend is growing internationally and in order to meet this requirement, incubators need to further extend their network and intermediary functions to enable them to scout for entrepreneurs who are willing to be part of the management team of a new science based start-up company.

A good example of this matching process can be seen in Chalmers Innovation, Gothenburg, Sweden (www.chalmersinnovation.com). The focus of Chalmers Innovation during the pre-incubation process is to validate business ideas through pushing ideas towards the marketplace, assist in building an effective business model and a valid business plan. Chalmers assess 120 business ideas per year. When a new project enters the pre-incubation process, Chalmers Innovation always matches the scientist with an entrepreneur to be combined into the (future) Management Team of the (pre)start-up company. The incubator indicates that finding high quality entrepreneurs for the new projects is their biggest challenge at this point in time.

Enterprise Ireland's Business Partner pilot programme is similar, although is not specifically 'attached' to the incubator programme.

Israel - Technion Incubator in Haifa

It is widely accepted that establishing formal working relationships with university departments can strengthen the pre-incubation process. A good example of such formal cooperation is the Technion Incubator in Haifa, where the incubator manager is also a member of the Patent Application Board of Technion Technical University. This provides the incubator with a 'first right of refusal' in the process of scouting new projects.

Part of the Enterprise Ireland supported incubation process is to encourage and attract potential high growth start-ups with a technology focus – hence the link to Universities and Institutes of Technology.

Conclusions

The Campus Incubation Programme is now in its final stages in terms of providing physical build and operational start up at every location. Each centre is now at a different phase of development ranging from those HEIs with a long background of working with incubation to those that are only just starting. Incubation is a difficult area and the fact that it needs a

high capital injection followed by a period of 'slow burn' can often mean that projects are criticised or even stopped before they have had a chance to deliver results.

To date, this project has moved steadily forward and the results it is already delivering should rise steadily as companies mature and the process develops further.

The general findings (at the time of the Frontline evaluation) are:

- Despite varying levels of 'maturity' of the programme, the early indications are that the programme is succeeding; reflected in areas such as employment creation and benefits directly attributable to location within the Incubation Centre;
- Good 'incubation practice' is in evidence and is comparable to or better than other European strategies;
- The role of the Centre Manager is critical to success;
- The overall programme is delivering results, whether the incubator is based in a University or an Institute Of Technology, based in a city or in a more rural location; and
- At a relatively early stage of a long term, strategic programme, the results are positive.

Appropriateness

The Campus Incubation Programme is in line with recent policy objectives. One of the Government's main aims in RD&I policy is to bridge the gap between academics and businesses, so that academic knowledge can be converted into outputs that generate monetary value in the form of jobs, exports and sales. The campus support to companies has been identified in the Strategy for Science, Technology and Innovation (2006-2013) under the third pillar of capturing, protecting and commercialising ideas and know-how.

The Campus Incubation Programme bridges the gap by providing client companies with high quality premises and mentoring on a range of important topics such as finance, business development and marketing. The range of supports helps to address to some degree, the risk aversion to failure that companies participating in RD&I activities normally contend with.

Efficiency

In the years 1999 – 2007, the exchequer support to the programme amounted to €50.7 million predominantly in capital cost towards building and establishing the incubation facilities. Over this period, 240[106] companies had received support from the Centres. As highlighted above, State investment in an incubation centre model is a long term strategy. Over time, the capital cost (averaging €2.9 million per centre) should be offset by the returns generated by occupying companies. Greater returns can be realised with increased occupancy rates and effective throughput of early stage innovative companies as they outgrow the incubator and scale in Ireland. The incubator model should assist in strengthening a company at its formative stage, enhancing business manager capabilities and generating a supportive peer network as well as stimulating engagement in collaborative RD&I all of which serve to provide a strong platform for growth.

International metrics for comparison are unavailable so measures of efficiency are difficult to put in context.

[106] Companies that were operating in the facilitates from 1999-2007

Synergies

The Campus Incubation Programme facilitates private companies to engage with knowledge institutions to generate economic benefits from knowledge that was generated in the Institutions. The programme provides the necessary infrastructure for companies to locate and make the initial links.

Enterprise Ireland launched its New Frontier Programme which aims to maximise benefits across innovation, research, entrepreneurship and management development and integrate support to companies located in campus where relevant.

The Innovation Vouchers and Innovation Partnership Programmes have complemented the Campus Incubation Programme, in order to strengthen links between Companies and Host Institutions. Companies were also directed to further support if their business was classified as a High Potential Start-Up (HPSU).

Effectiveness

Effectiveness covers the extent to which the inputs have led to the desired outputs and outcomes.

The companies are R&D active, indicating a spend of €51 million over the 2005-2007 period. 74 per cent of companies consulted engaged in R&D activities, but only 36 per cent are engaged in joint R&D projects with the host institution. Where R&D links did exist these were viewed positively, with 54 per cent of companies with R&D links citing it as the single most important engagement with the host institution. At the same time, when asked whether the support they had received from the incubation centre had made their investment in R&D any easier, 41 per cent (43 of the 104 respondents that answered the question) of companies surveyed indicated that it made no difference, 34 per cent said it made R&D a little easier, and the balance of 25 per cent said it made a big difference.

The evidence doesn't provide insights into the proportion of spin-outs (e.g. researcher community establishing spin-outs) relative to spin-ins.

It is important to note that there are other beneficial linkages with the host institution including student placements and use of specialised equipment.

Acknowledging that the programme is at a relatively early stage overall, these indicators point to room for improvement in terms of achieving the objectives relating to realising the commercial potential of Ireland's research community and of providing that transitional space between the research and business worlds.

Recommendations

Attitudinal and Cultural Aspects

As the incubation centres were being established, cultural issues also needed to be addressed in terms of host institution commitment and company expectations of academia and the incubation process in general.

The findings show that 29 per cent of companies surveyed did not report having links with their host institutions, and highlighted issues in relation:

- A culture clash - perception that commercial and academic environments do not combine very well;

- A lack of responsiveness from institutions; and
- A lack of awareness of institution activities by companies.

In other instances, companies cited the fact that the company itself was at too early a stage of development.

Having progressed this far in establishing the Centres, the future focus of the programme should now be aimed at:

- Increasing the number of companies and their throughput and decreasing the tenancy time in Campus, pressing for sustainability of the businesses created;
- Continuing to promote interventions to stimulate increased R&D activity, and in particular joint projects that enhance relationships and knowledge transfer between the two 'communities' (researchers and business); and
- Creating awareness of positive success stories and sharing best practice.

Clear Targets Built into the Programme

The funding to the centres is now complete. Indicators for any future assessment of the performance of the campus incubation programme against original objectives may include:

- Number of HPSUs joined Campus;
- Number of HPSUs created in Campus;
- Number of other start-ups in Campus;
- Number of R&D linkages;
- Number of other linkages with the Host Institutions;
- Number of companies that have left the centre and remain the region;
- Increasing Company throughput; and
- Reducing incubation time.

Integrate Complementary Programmes with the Centres

Enterprise Ireland is seeking to ensure a joined up approach to business supports to suit companies at a range of business development stages, primarily through the New Frontiers programme. While this approach is of course most optimal from a client perspective and should be pursued, it raises challenges from an evaluation perspective in that it may be increasingly challenging to measure programme impacts if a company is receiving support through multiple channels. In this context, the establishment of control groups should be considered to facilitate future interim and ex-post evaluations.

Drive up Links to Host Organisations

Improving links between companies and host institutions should be tackled as it is fundamentally important. Suggested initiatives in order to achieve this are outlined below:

- Presentations and tours by (relevant) departments on what they can offer in terms of staff expertise and equipment;

- Linkage or matching service between tenant company and academic, driven by centre managers;
- Commitment sought from tenants when entering the centres to seek expert help from the host institution;
- Commitment sought from host institutions to push strategic intent to a more practical and operational level.

Tracking of Companies

Improving the tracking of incubation clients would be of benefit in general and to Enterprise Ireland in particular. At present the key beneficiary in tracking clients is Enterprise Ireland, as the real economic impacts will come when companies leave and mature – particularly if they are classified as HPSUs. For this reason, Enterprise Ireland should work with incubation centre managers and colleges to build a robust tracking mechanism that is not onerous to operate.

Building Linkages

Informal networking emerged as the most popular form of interaction (cited by 90 per cent of respondents), and companies viewed the discussions they had with other tenants as having an important influence on their development. Commercial relationships had also been established, with 26 per cent of companies reporting that other companies were 'clients/business partners'.

Since the links between tenant companies appears to be the strongest feature of activity in the Campuses to date, this may suggest an appearance of clustering activity among companies. This is a positive aspect arising from the availability of incubation facilities however, it is important that the focus remains on increasing the linkages between the firm and host institutions to deliver on the primary objective of the programme.

More Visible Presence of Enterprise Ireland for Business Development

Enterprise Ireland personnel across the regions are regularly involved in the centres:

- By representation on Centre advisory boards, and
- Sub-committees on tenant selection.

However, respondents recommended for Enterprise Ireland to have a more visible presence regarding business development for companies in the centres.

The Role of Centre Managers

The value of the centre manager (position rather than individual) was not always demonstrated as being appreciated by Host Institutions. Centre Managers should be encouraged to manage the incubation process as opposed to providing administration for space. There is scope to support the development of the centre managers.

The centre manager network should be developed further to allow good practice and new ideas to be shared. This is continuing and evolving holistically to reflect Enterprise Ireland's holistic development of its entrepreneurship supports linked to the colleges.

5. Centres for Science, Engineering & Technology Programme (2003-mid 2012)

Programme Logic Model

Objectives

- To improve linkages between scientists and engineers through developing partnerships across academia and industry to address crucial research questions;
- To foster the development of new and existing Irish-based technology companies;
- To attract industry that could make an important contribution to Ireland and its economy; and
- To expand educational and career opportunities in Ireland in science and engineering.

Inputs

- SFI Funding
- University funding/ support (e.g. provision facilities and support functions)
- Industry funding (cash and in-kind)

Activities

- Joint academic-industry management and governance
- Development and implementation of a joint academic-industry research strategy
- Research (at HEIs and in industry)
- Education (Masters, PhDs)
- Networking (industry-academic & inter-HEI, interdisciplinary) – events, workshops, etc.
- HEI-industry staff exchanges
- Tech transfer/ IP protection and commercialisation activities
- Commissioning new research facilities and equipment
- Public outreach activities

Outputs

- Publications
- Events/networking
- Linkages – new industry academic relationships, new inter HEI relationships
- Education – PhDs, MSc awarded
- Pre-commercial outputs – invention disclosures, patents, licences, new products or processes, spinouts
- Leveraged funding from variety of sources
- Outreach with media and schools

Outcomes & Impacts

- Direct business outcomes (participating companies or from new businesses created)
  - New products / processes/ services on market
  - Income from new products / processes/ services
  - New jobs/ jobs safeguarded as result of income from new products/ services
  - Increased proportion of income from innovative products/ processes/ services
  - Increased FDI from participating foreign affiliates (ideally with a research focus)
- Direct outcomes (HEIs)
  - Income from IP
  - Increased income from business sector
  - Increased income from international sources
  - Additional new relationships with businesses
- Wider Business Outcomes – participating companies
  - Increase BERD in participating companies
  - Employment of researchers by businesses (e.g. PhDs)
  - Increased engagement with HEIs
- Wider HEI Outcomes – participating HEIs
  - Increased engagement with industry
  - Increased capacity/capabilities for technology transfer, IP management and other commercialisation activities
  - Long-term changes to research organisational structures & strategies (internal to HEI and inter-HEI)

At national level (SSTI metrics):

- HEIs:
  - Improved Ireland's international position in terms of publications and citations
  - Increased number of PhDs and MSc in technical subjects
  - Increased share of HERD from international sources
- Industry
  - Increased BERD (no. of businesses doing R&D and volume of R&D) in indigenous and foreign companies
  - Increased innovation (in terms of % sales from innovative products/ processes) in indigenous and foreign companies
  - Increased FDI – particularly FDI that results in R&D in Ireland or makes use of Irish R&D capacity
- Higher level of objectives (National Development Plan):
  - Growth & Jobs, particularly in high value-added sectors

Evaluation Aim

The aim of the evaluation is to assess the appropriateness, efficiency and effectiveness of the SFI's Centres for Science Engineering and Technology (CSETs) programme. In particular the programme is evaluated in terms of:

- Programme performance;
- Programme fit in terms of complementarities and/or overlap with other interventions in the enterprise support system; and
- Programme performance in relation to the enterprise policy context that applied during the time period under review.

Furthermore, in the constantly evolving policy context, the extent to which the programme aligns with current and future policy challenges were also examined, and conclusions drawn on the adequacy and balance of resources allocated to the programme. The programme was instigated when Ireland was still in a period of economic growth and therefore there is a need to assess the rationale for the programme in terms of the context at the time it was instigated and in the current economic climate.

The scope of the evaluation is the nine centres currently funded under the programme plus REMEDI (formerly funded under the programme) and covers the period from 2003 when the programme was conceived until mid-year 2012. While many centres are nearing the end of their maximum 10 year funding some are only a few years old and therefore the study is, strictly speaking, an interim evaluation.

Programme Background, Objectives & Target Population

The CSET programme is a key component of Science foundation Ireland's (SFI) support for academic research representing 20-25 per cent of its total annual investment in Irish higher education institutes (HEIs). As such it supports SFI's role to increase the quantity and improve the quality of Irish research in support of wider national goals, articulated in the national Strategy for Science, Technology and innovation and the National Development Plan, to move Ireland towards a knowledge-based economy.

The CSETs programme has been in operation since 2003 and aims to:

- Help link scientists and engineers in partnerships across academia and industry to address crucial research questions;
- Foster the development of new and existing Irish-based technology companies;
- Attract industry that could make an important contribution to Ireland and its economy; and
- Expand educational and career opportunities in Ireland in science and engineering.

The CSET programme supports what are commonly called 'competence centres', that is, joint academic-industry research centres located within universities focused on longer-term user-oriented research. The aim is to conduct high quality academic research oriented to applications and industry needs.

The goal is not to shift academic research towards applied research and substitute for industrial investment but to better align public investments with longer-term industrial needs *and,* in doing so, improve the linkages and knowledge flow within the innovation system.

Target Population

The target population is scientists, engineers and industry.

Programme Rationale

The rationale and objectives for the CSET programme fall within the wider objectives of Irish government support for continued growth in the economy, with a particular focus on moving Ireland towards a knowledge-based economy and stimulating more businesses to operate in high-tech and high value-added areas. Within this wider policy framework the CSET programme has a particular focus on increasing the quality and quantity of academic-industry collaboration in pursuit of innovation. The CSET'S objective is also defined in terms of the following more detailed objectives:

- Create centres formed by clusters of internationally competitive researchers from the third-level sector and industry, particularly Irish-based industry;
- Support excellence in research and education as measured by international merit review;
- Exploit opportunities in science, engineering, and technology where the complexity of the research agenda requires the advantages of scope, scale, dynamism, synergy, duration, equipment and facilities that a centre can provide;
- Promote organisational connections and linkages within and among campuses, industry, other research bodies, private-sector research laboratories and international collaborators;
- Support frontier investigations across disciplines that underpin biotechnology, information and communications technology, or both, and that are essential to the development and competitiveness of Ireland's industrial base;
- Engage the intellectual talent within Ireland in conducting advanced research and education activities; and
- Foster science and engineering in service to society, especially in research areas that promise to create new technologies.

Evaluation Methodology

The evaluation follows the approach specified in the Forfás document 'Framework for the Evaluation of Enterprise Supports (2011)'.

The methodology consisted of:

- Desk research to: develop the PLM; refine the evaluation questions; identify relevant indicators; collate and analyse existing programme monitoring data against the required indicators.
- A programme of interviews with a range of stakeholders to collect quantitative and qualitative data on the programmes from a range of perspectives. Interviewees included:
  - CSET managers;
  - HEI senior management;

- Policy makers and enterprise development agencies – from DJEI, EI, IDA etc.;
- Industrial participants; and
- Unsuccessful bidders to the CSET programme.

- A survey of industrial participants in order to:
  - Collect primary data on outcomes, fill any gaps in terms of the indicators for inputs, activities and outputs;
  - Collect estimates as to the additionality of the CSETs as judged by the industrial participants;
  - Collect industry's views on the need for / rationale of the programme at its instigation and in the current economic context; and
  - Collect industry's views on the efficiency of the programme.

Alignment with National Policy

During the 1990s and early to mid-2000s, the Irish economy experienced considerable growth due to its relatively low wages, high skills and its European location, making it a favourable destination for foreign direct investment (FDI). The challenge in place (as perceived in the National Development Plan 2000-2006) when the CSET programme was conceived, was to support the continuation of this growth and to ensure a fair distribution of the outputs of economic success. However, the 1996 White Paper on Science, Technology and Innovation and the Foresight study of 1999 had already identified that Ireland's growth would not continue as a result of wage increases compared to global competitors and a general increase in global competition. Therefore, Ireland needed to move towards a higher skilled, knowledge based economy. The subsequent National Development Plan 2007-2013 was focused on similar objectives to the previous plan but with a more explicit focus on the desire to move Irish-based businesses, both indigenous and multinational companies, towards higher value-added economic activities. This entailed a greater focus on innovation and the need for a strong underpinning science and research base and innovation. Furthermore the total budget for the NDP increased significantly from €41 billion for the period 2000-2006 to €184 billion for the period 2007-2013.

However, in the late 1990s, Ireland had a very limited academic and industrial research base. Public and private sector investment in research and development was low by international standards due to a low 'cultural commitment' to enterprise and innovation, to science and technology and to its application.[107] A particular challenge for Ireland was to address the dual nature of the manufacturing sector where the high-tech, high value-added industries were dominated by foreign ownership and low-tech, low productivity industries were largely Irish owned.

The CSET programme, within the funding portfolio of the recently established (1999) SFI, formed part of public support for the move towards a knowledge-based economy. Considerable policy emphasis was placed on:

(i) Improving the underpinning public research base (in terms of both human and physical capital);

[107] Tierney Report of the Science, Technology and Innovation Advisory Council, 1995

(ii) Facilitating an increased investment in R&D and innovation activities by indigenous and foreign businesses; and

(iii) Improving the linkages between the research base and industry.

The SFI calls for proposals for CSETs indicate that the objectives for the CSETs remain unchanged and, as already described, the rationale and objectives of the current NDP has changed little during the period when the CSETs were selected for funding. The Strategy for Science, Technology and Innovation (SSTI) and SFI strategies are dated 2006 and 2004 respectively and so appeared after the CSET programme commenced.

However, the Irish economy has contracted considerably since 2008 and while no new National Development Plan has been published, economic policy has shifted to budget cuts and deficit reduction measures. This has not, as yet, impacted on the funding levels of CSET programme directly but it significantly changes the economic context from those under which the original programme rationale and objectives were defined. The role of the programme within the changed context is considered by the evaluation.

Inputs

SFI CSET Programme Funding

SFI has held three calls for CSET supported research centres, selecting and funding a total of eleven CSETs from 31 full proposals. At the present time there are nine CSETs in existence since the termination of NCHP and the move of REMEDI to the SRC programme. Seven centres have been through an end-of-award progress review (at five years) and been awarded 2nd round funding. Three centres (CLARITY, CNGL and SBI) are still in their first round of support from the CSET programme (see Table 5.1).

The centres funded under the programme align with the national priorities in place when the calls for proposals were made i.e. ICT, biotech (later referred to more broadly as life sciences) and nanotechnology. There are five centres focused on themes in ICT, four in biotech and one in nanotechnology. Funding is distributed fairly between ICT (45 per cent) and bioscience (41 per cent) with the remaining funding (14 per cent) directed to nanotechnology (see Table 5.2).

The programme allocated a total of €316m to the ten centres and expended €225m to date (from 2003-2012). The CSET documentation states that centres will be funded in the range of €1m-5m over a period up to five years. The current centres receive an average annual funding from the programme in the range €2.8m and €4.9m annually in line with the programme design (Table 5.3).

Table 5.1: The Ten Centres Covered by the Evaluation

	CSET	Acronym	Theme	Lead	Year commenced
1	Alimentary Pharmabiotic Centre	APC	Bioscience	UCC	**2003** (in Round 2 funding period)
2	Biomedical Diagnostic Institute	BDI	Bioscience	DCU	**2005** (in Round 2 funding)
3	CLARITY	CLARITY	ICT	UCD	**2008**
4	Next Generation Localisation	CNGL	ICT	DCU	**2007**
5	Centre for Research on Adaptive Nanostructure & Nanodevices	CRANN	Underpinning technology	TCD	**2003** (in Round 2 funding period)
6	Telecommunications Research Centre	CTVR	ICT	TCD	**2004** (in Round 2 funding period)
7	Digital Enterprise Research Institute	DERI	ICT	NUIG	**2003** (in Round 2 funding period)
8	Irish Software Engineering Research Centre	LERO	ICT	UL	**2005** (in Round 2 funding period)
9	Systems Biology Ireland	SBI	Bioscience	UCD	**2009**
10	Regenerative Medicine Institute	REMEDI	Bioscience	NUIG	**2003** (in Round 2 funding period)

Source: SFI MIS

Table 5.2: CSET Funding Awarded by Theme, 2003-2011

	CSET programme funding	% CSET programme funding
ICT	€143,448,781	45%
Bioscience	€129,656,828	41%
Nanotech	€42,833,956	14%
TOTAL	€315,939,565	100%

Source: SFI MIS

Table 5.3: SFI CSET Programme Funding Awarded per Centre

Acronym	SFI CSET programme funding	Average annual funding
APC	€43,813,314	€ 4,381,331
BDI	€38,471,362	€ 4,808,920
CLARITY	€16,438,011	€ 3,287,602
CNGL	€21,386,748	€ 3,564,458
CRANN	€42,833,956	€ 4,283,396
CTVR	€44,220,556	€ 4,913,395
DERI	€32,157,934	€ 3,215,793
LERO	€29,245,532	€ 3,655,692
SBI	€18,942,529	€ 4,735,632
REMEDI	€28,429,623	€ 2,842,962
TOTAL	€ 315,939,565	€ 39,689,182

Source: SFI MIS

Table 5.4 shows the total CSET Programme expenditure by year from 2003 to 2011.

Table 5.4: SFI Funding Payments to Date – Breakdown by Calendar Year

Year	Payments
2003	€13,620,380
2004	€10,141,950
2005	€16,943,359
2006	€22,135,296
2007	€15,841,338
2008	€31,197,433
2009	€29,533,896
2010	€36,891,079

Year	Payments
2011	€32,089,773
2011-mid 2012	€16,771,611
Total	€225,166,115

Source: SFI

Table 5.5: Indirect Costs by Calendar Year[108]

Year	Indirect costs
2004	€190,169
2005	€93,797
2006	€118,787
2007	€240,401
2008	€357,104
2009	€205,259
2010	€242,932
2011	€249,862
Total	€1,698,311

Source: SFI

Industry Funding

In line with the programme design, centres have achieved a total additional contribution of €77 million to date from industry. This represents 34 per cent of SFI expended funding to date and 24 per cent of awarded funding. Industry funding tends to be weighted towards the later years of a centre's funding period and therefore there is every indication that the programme will meet its target of a minimum of 25 per cent industry support above SFI funding level. The majority of industrial funding (90 per cent) is in-kind, typically in the form of staff time on research projects, loans or donations of equipment or data sets. This means that the data on industry contribution should be considered an estimate, as valuing in-kind contributions is

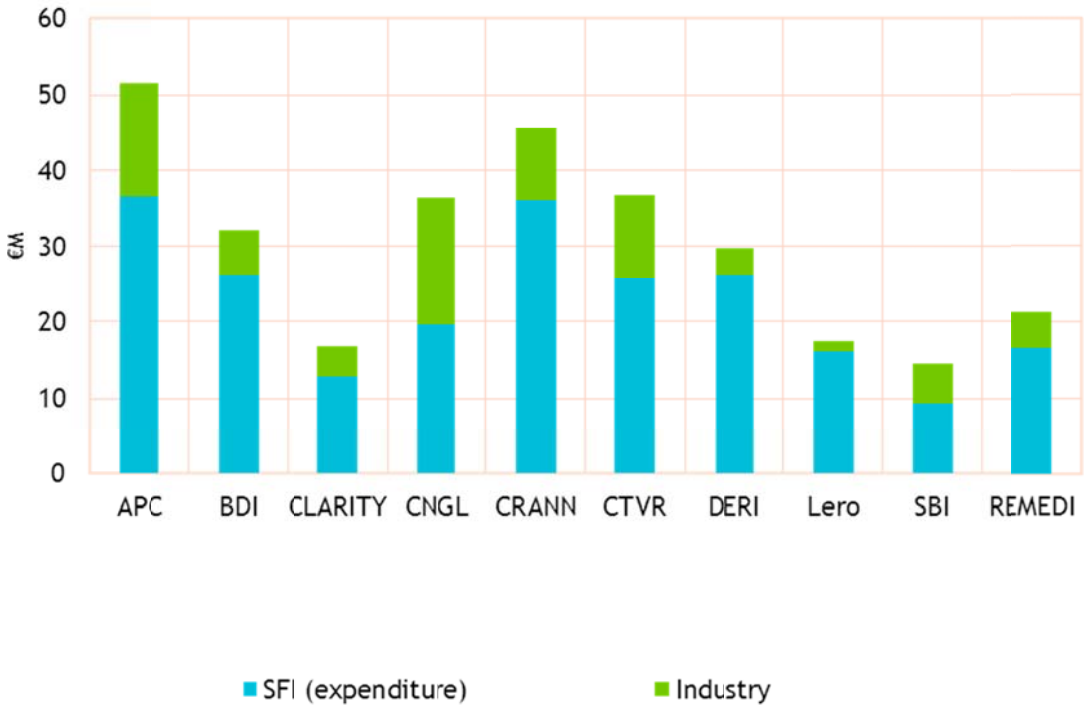
[108] Indirect cost is calculated multiplying salary costs of each SFI staff member by the time associated with the programme plus a review cost. A general overhead figure was attributed of 2.85 percent of the total salary cost plus review cost.

inherently problematic. The majority of industrial partners (71 per cent) reported that their participation was funded from their company's general R&D budget.

To date the level of industry funding varies centre to centre (Chart 5.5) not only in absolute terms, but also in terms of the extent to which individual centres have been able to achieve industrial funding over the 25 per cent target. (These proportions will change as the centres come to the end of their respective funding periods). However, there are some issues as to the consistency in the data collected by SFI largely linked to the difficulties in defining a consistent approach to quantifying in-kind benefits. SFI have been working to resolve this as examples arise as part of their on-going efforts to improve data quality.

The differences in industrial funding do not align with the number of industrial partners, the thematic /sector focus, the age and experience of the centres or with the lead host institution. This suggests that the variability is down to the individual centres themselves and may be due to the degree of alignment of the research theme with industrial need (the scale and intensity of relevance) and/or the skills and experience of the centre management team in industrial collaboration.

Chart 5.5: SFI Expenditure and Industry Contribution (up to mid-2012)



Age of centre (Since est.)	APC Year 10	BDI Year 8	CLTY Year 5	CNGL Year 6	CRANN Year 10	CTVR Year 9	DERI Year 10	Lero Year 8	SBI Year 4	REMEDI Year 10

Source: SFI MIS

Outputs & Activities

The CSETs are led by six of Ireland's seven universities and all but one (DERI) involve a wider consortium of Irish higher education institutes and public research organisations (PROs) including three of Ireland's 13 Institutes of Technology (Table 5.6). Several universities lead and/or are partners in several CSETs.

Table 5.6: CSET Lead and Consortium Partners (HEIs and PROs)

CSET	Host HEI	Partner HEIs
APC	University College Cork (UCC)	Cork Institute of Technology National University of Ireland, Galway Teasgasc
BDI	Dublin City University (DCU)	National University of Ireland, Galway Royal College of Surgeons in Ireland Tyndall National Institute (at UCC) Trinity College Dublin
CLARITY	University College Dublin (UCD)	Dublin City University Tyndall National Institute
CNGL	Dublin City University (DCU)	Trinity College Dublin University College Dublin University of Limerick
CRANN	Trinity College Dublin (TCD)	University College Cork
CTVR	Trinity College Dublin (TCD)	National University of Ireland, Maynooth Dublin Institute of Technology Dublin City University Tyndall National Institute University of Limerick
DERI	National University Ireland, Galway (NUIG)	-
LERO	University of Limerick (LU)	Dublin City University University College Dublin Trinity College Dublin National University of Ireland, Galway

CSET	Host HEI	Partner HEIs
		Dundalk Institute of Technology
SBI	University College Dublin (UCD)	National University of Ireland, Galway
REMEDI	National University of Ireland, Galway	National University of Ireland, Maynooth University College Cork

Source: SFI MIS & Individual CSETs

Industry Partners

As required by the programme design all CSETs have a number of formal industrial partners, that is, partners who contribute to the 25 per cent cost-share required by SFI and who will have signed a collaboration agreement with the CSET.

- In total 57 organisations have signed up as formal CSET partners, the majority (92 per cent) are businesses;
- The number of partners per centre ranges from two to ten with a mean (and median) of six;
- The majority of formal partners are non-Irish multi-national businesses (56 per cent) with the remainder being predominantly Irish SMEs (30 per cent) and non-Irish SMEs (9 per cent) plus a small number of Irish multi-national businesses, public bodies and other organisations making up the remainder (Table 5.7);
- Just over half (53 per cent) of formal partners are physically located in Ireland (Table 5.8); and
- Similarly half of the partners that are non-Irish MNCs are located in Ireland.

Centres are also expected to widen their industrial reach and engage with additional businesses over and above their formal partners.

- There are twice as many non-formal (n=116) as formal partners (n=57). The majority (94 per cent) are businesses;
- The number of non-formal partners per centre ranges from zero to 50 with a mean of 15 and a median of 10;
- The majority of non-formal industrial partners are Irish SMEs (54 per cent) with non-Irish multinationals making up just 25 per cent (Table 5.7); and
- The majority of the non-formal partners (72 per cent) are located in Ireland, i.e. significantly more than is the case for the formal partners (Table 5.8).

Furthermore ICT focused centres have a slightly higher proportion of SME partners than biotech based centres (54 per cent compared to 47 per cent) who have as slightly greater proportion of partners from multinational corporations (47 per cent compared to 39 per cent).

The number of non-formal partners is approximately double that of the formal partners. This data was provided by the centres themselves. Centre managers invited to provide data on

their CSET partners in terms of those that contributed to the cost-share (i.e. the formal partners) and "other businesses with which the centre has interacted as part of its CSET activities" (i.e. the non-formal partners). It was considered possible that there has been some positive bias – that centres might have provided a larger number of company names as non-formal partners than was truly warranted. On closer inspection this was unlikely to have been the case for the following reasons. Centres were able to provide contact names and details for all company names they provided and, for more than half (58 per cent), they provided details of the form of the interaction. These included licences, partners in Innovation Voucher and Partnership projects and users of CSET outputs. Furthermore there was a 26 per cent response rate to the survey from non-formal partners, just slightly lower than the response rate for formal partners (34 per cent). Further data shows that the total number of industrial engagements over the lifetime of the CSET programmes to be of the order 450-490, meaning an average of nearly 3 collaborations per partner which seems entirely plausible[109]. This would suggest that the number of non-formal partners has not been over-exaggerated.

It is interesting to note that half of all (formal and non-formal) partners that are non-Irish (owned) companies are located outside of Ireland. The interviews tell us that this group is made up of: MNCs with a manufacturing or service presence but no R&D function in Ireland; MNCs with no current presence in Ireland; plus a small group of overseas SMEs from the UK, Sweden, Portugal, The Netherlands and the USA.

Table 5.7 CSET Industrial Partners by Type of Business

Type of business	No. of formal industry partners	%	No. of non-formal industry partners	%	Total no. of partners	%
Non-Irish Multi-national company (MNC)	32	56%	31	27%	63	36%
Irish SME	17	30%	63	54%	80	46%
Non-Irish SME	5	9%	8	7%	13	8%
Irish Multi-national company (MNC)	1	2%	9	8%	10	6%
Public bodies	1	2%	4	3%	5	3%
Other /unknown	1	2%	1	1%	2	1%
TOTAL	57	100%	116	100%	173	100%

Source: CSETs

[109] SFI definition of industrial engagements "To be counted under CSET Award, companies must be part of the CSET Award cost-share agreement. To be counted under CSET Associated, a formal agreement must be in place, e.g. formal partner in FP7, EI project, sponsored research project etc."

Table 5.8: CSET Industrial Partners by Location

Location	No. of formal industry partners	%	No. of *non-formal* industry partners	%	Total no. of partners	%
Ireland	29	51%	84	72%	113	65%
European Union (exc. IE)	10	18%	14	12%	24	14%
USA	6	11%	8	7%	14	8%
Other/unknown	12	21%	10	9%	22	13%
TOTAL	57	100%	116	100%	173	100%

Source: CSETs

Research Teams Established

CSET programme funding of the order of €3m-5m a year per centre has enabled the establishment of centres of considerable scale. SFI data shows that in 2011, the total headcount of people associated with the ten centres was 1,341 (Chart 5.2 top). This data includes lead principal investigators (PIs), other funded investigators, post-doctoral researchers, research assistants, PhD students, MSc students (research), managers, administrators and any other relevant staff. However this figure includes all people associated with the centres, not all of whom are supported directly by CSET programme funding. The number more directly linked to CSET programme funding is estimated to be nearer 580 (Chart 5.2 overleaf).

The funding supports a range of research staff including PIs, post-doctoral researchers and PhD students, plus centre managers, commercialisation/business development staff and technicians. Without the CSET programme, individual researchers and small research teams might be supported by other public funding streams, but the centre managers, commercialisation/business development staff and technicians are not readily funded from other public sources.

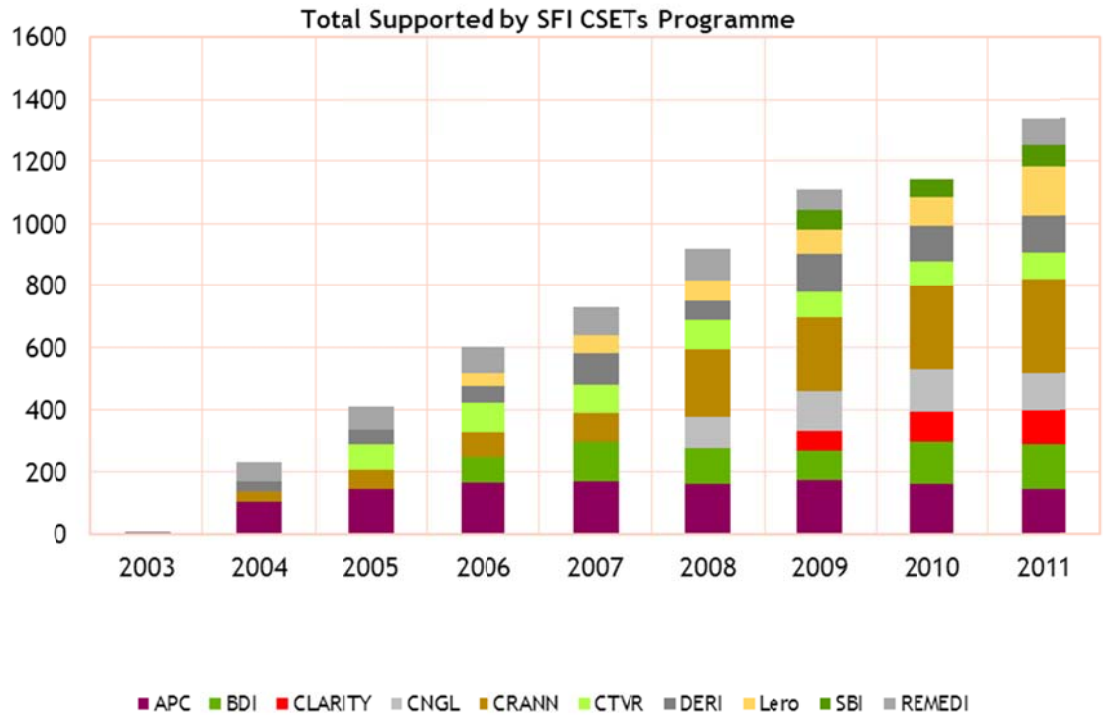
The exact nature of the management team varies centre to centre but, as required by SFI, the management team comprises: a scientific leader (who is typically the Scientific Director and/or Centre Director), an operational or general manger (who is in some cases is the 'CEO' of the centre) and a person or people dedicated to industrial liaison, commercialisation, IP management and business development. Typically the research leaders work as centre and/or project managers as well as active researchers. Centres also employ administration support staff and a number of centres also have staff dedicated to managing the interface between academic partners and/or outreach activities. This group of people is funded from a number of sources – some (all or in part) via CSET programme funds and others from the universities themselves. SFI data on research composition further illustrates the difference between the CSETs and academically focused centres. The SFI Census Report in 2009 shows that a much

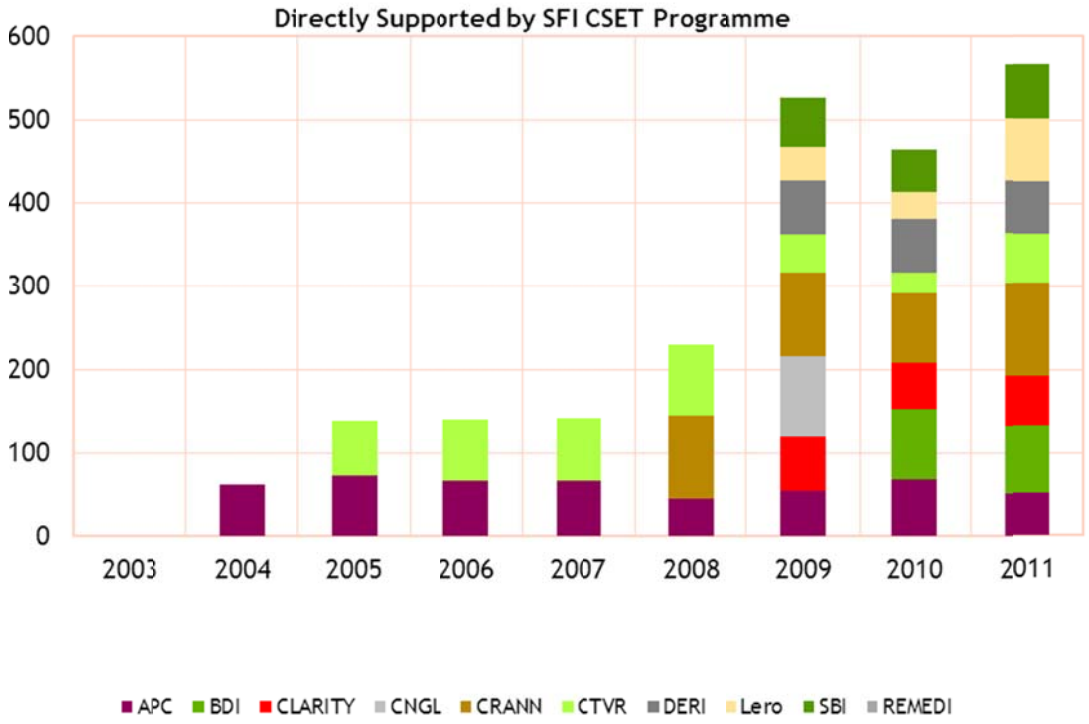
greater proportion of CSET awards are directed to non-research centre staff (i.e. the categories of 'administrators' and 'others').

The management and administration staff are essential to creating a cohesive research centre as opposed to a group of loosely connected researchers and number between 6 and 14 per centre, representing around 10 per cent of the centres *direct* headcount or around 6 per cent of the total (direct and associated) headcount.

The key research leaders such as centre directors and deputy directors are typically leaders in their field, and as a result the CSETs are led by either high quality Irish researchers or foreign researchers that have been attracted to Ireland through the programme. Many of the industrial interviewees noted the excellence of centre staff.

Chart 5.2: Headcount (Total and Directly Supported by SFI CSET Programme)





Source: SFI MIS

Centre Activities

Conducting industry-relevant research and creating industry-relevant research outputs requires activities to:

- Develop appropriate research strategies taking on board the interests and needs of both the academic and industrial partners;
- Implementing appropriate and effective governance and management processes;
- Communications and relationship management;
- Conducting research (sometimes jointly);
- Staff exchanges;
- Training post-graduates researchers;
- Communication and dissemination of research outputs;
- Intellectual property protection and management; and
- Stimulating and enabling commercialisation activities.

The monitoring data available on centres activities is largely descriptive and captured more indirectly via the programme outputs. Funding breakdowns per centre are only able to illuminate that the majority of expenditure in each centre is focused on staff (varying between 70-80 per cent of total spend depending on centre) with most of the remainder allocated to equipment, materials and travel and, in some cases, a small amount on

education and outreach, but do not identify the budget for research staff versus operations or commercialisation staff.

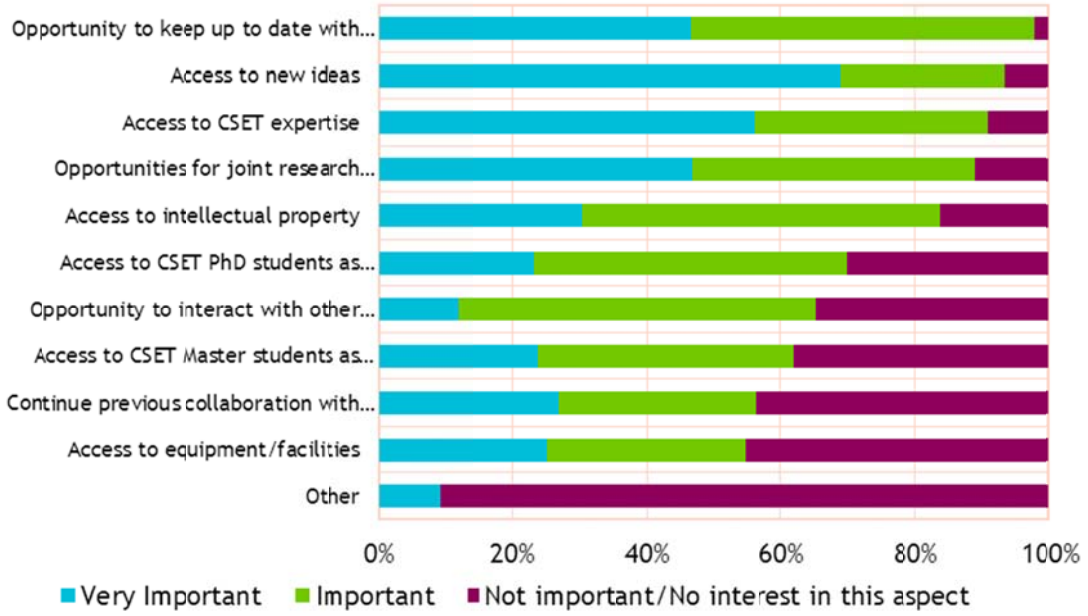
Motivation for Industry Engagement

The most common reasons reported by firms for participation with CSETs relate to staying abreast of scientific and technical developments in the research base (Chart 5.3) in areas aligned with companies' interests. More than 90 per cent of participants report that accessing new ideas, accessing CSET expertise and keeping up to date with scientific and technical developments as very important or important, with nearly 70 per cent reporting that accessing new ideas is very important. As a result nearly 90 per cent report the opportunities for joint research as a motivation. The outputs of the research are also important with 83 per cent reporting that accessing intellectual property (IP) as a motivation. The opportunity to access skilled employees is also reported by around two-thirds of respondents (70 per cent interested in PhDs and 56 per cent in Masters graduates).

There were few differences between various partner and company types, except that formal partners were more motivated than non-formal partners by opportunities to interact with other partner companies. This would suggest that formal partners are much more aware that they are involved in a wider consortium while non-formal partners may perhaps see their interaction with the CSET as a one-to-one interaction between themselves and the academic partner.

The industrial interviews highlighted that the cross-disciplinary focus of many centres was an additional key factor for participation.

Chart 5.3: Motivation for Industrial Participation



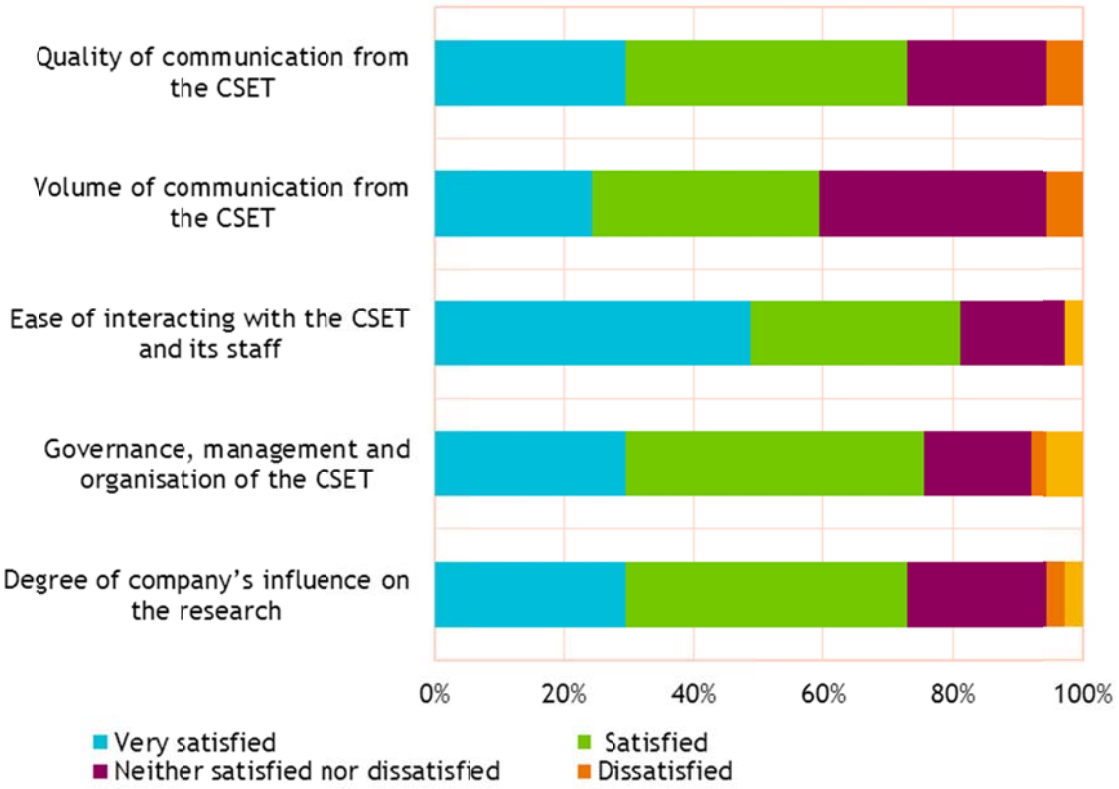
Source: Technopolis CSET industrial participant survey

Satisfaction with the Experience of Engaging with Centres

Satisfaction with the process of collaborating with centres is generally high (Chart 5.4). Around three-quarters of respondents are satisfied or very satisfied with their experience with the CSETs in terms of the ease of interacting, the quality of communication, the governance and management and the degree of influence on the research. The only area with a slightly lower level of satisfaction is the volume of communication from the CSETs. The interviews suggest that, at least in some circumstances, the level of communication is not enough, for example during IP negotiation phases.

In general there was little difference in the responses from formal and non-formal partners except in two areas - the non-formal partners expressed less satisfaction with the ease of interacting with, and the governance and management of the CSET. This no doubt reflects the different role and intensity of interaction of the two types of partner. Similarly SMEs and Irish businesses (which are more likely to be SMEs) report less satisfaction with the ease of interacting with the CSETs.

Chart 5.4: Satisfaction with CSET Collaboration



Source: Technopolis CSET industrial participant survey

Management and Governance

In recent years the centre governance model has been defined in a high level of detail by SFI. While the intention is to ensure that there are sufficient checks and balances between different partners and interests, it is felt by many stakeholders to be overly bureaucratic and

not as effective as it could be. A particular concern is the separation of the scientific and industrial committees that works against the very ethos of an academic-industry collaborative centre.

Managing large and often complex centres, in what was a new organisational form for most universities, has been a steep learning curve for the individual academics and universities involved. While managers with industrial experience have been recruited in operational and commercial roles, there are still improvements to be made to management and organisational processes. However while some industrial partners would like to see formal project management introduced there is also a balance to be struck between industrial approaches to project management and academic needs for curiosity, publication and training students.

Establishing an IP agreement among the centres' formal partners was a significant challenge for all involved due, in the main, to a lack of experience within Irish universities and, in some cases among industrial partners as well. The inexperience within university administration not only resulted in inefficient IP negotiations but also a tendency by academics to over-value very early-stage IP.

Outputs

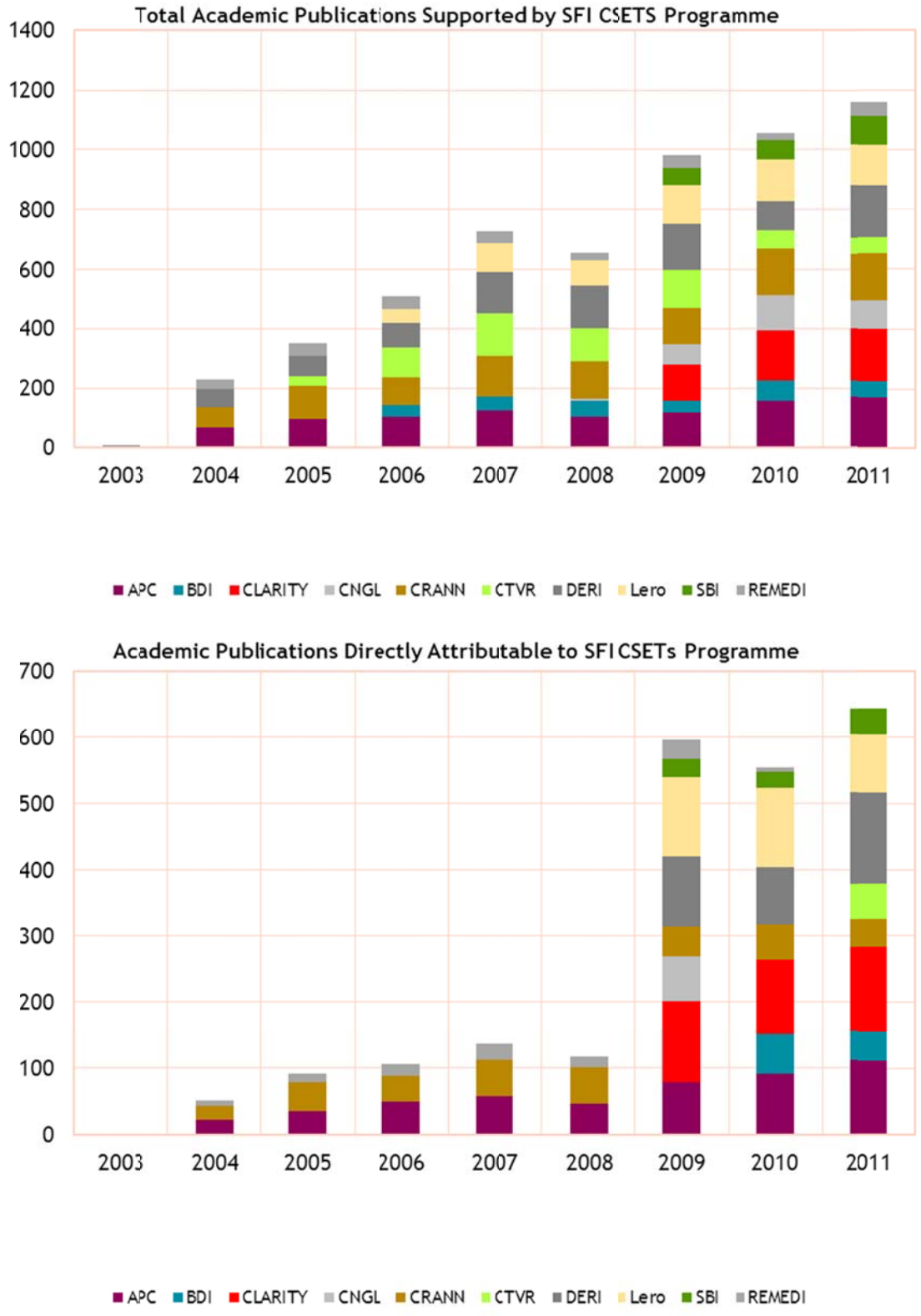
Centres are expected to provide both academic and industry relevant outputs and are required to report to SFI against a range of outputs that include:

- Academic outputs;
- Industrial engagement ;
- Pre-commercial outputs; and
- Funding diversification - from both the public and private sectors.

Publications

Academic publications from 2003 to 2011 total 1,162 with those directly attributable to the centres representing around 55 per cent of the total (around 640 publications) (Chart 5.5).

Chart 5.5: Publications

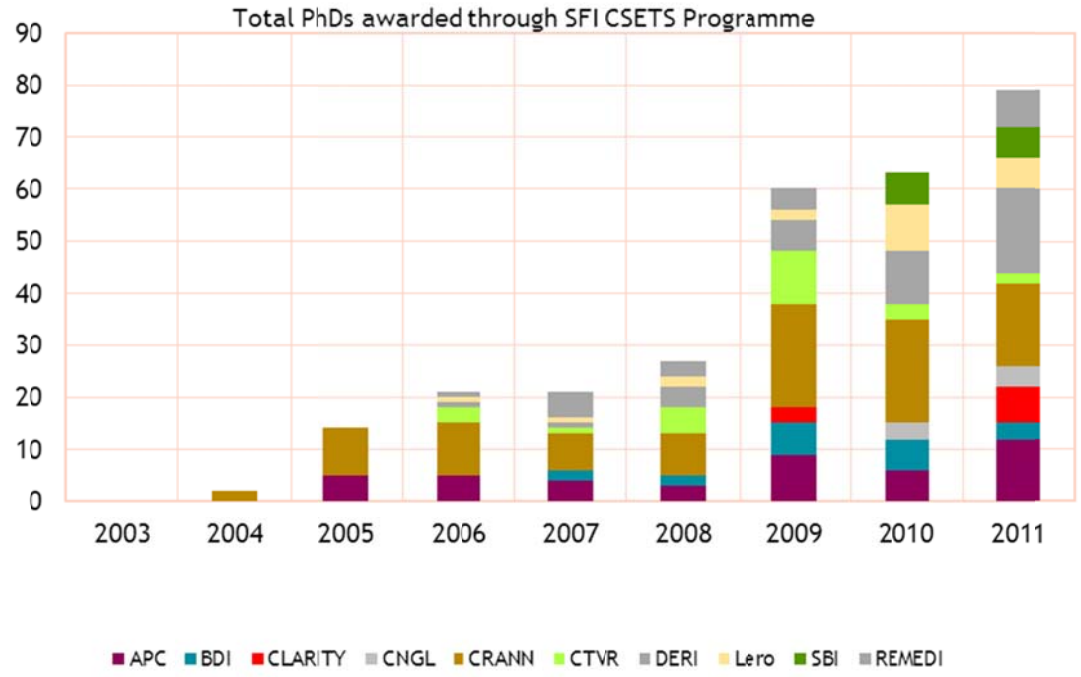


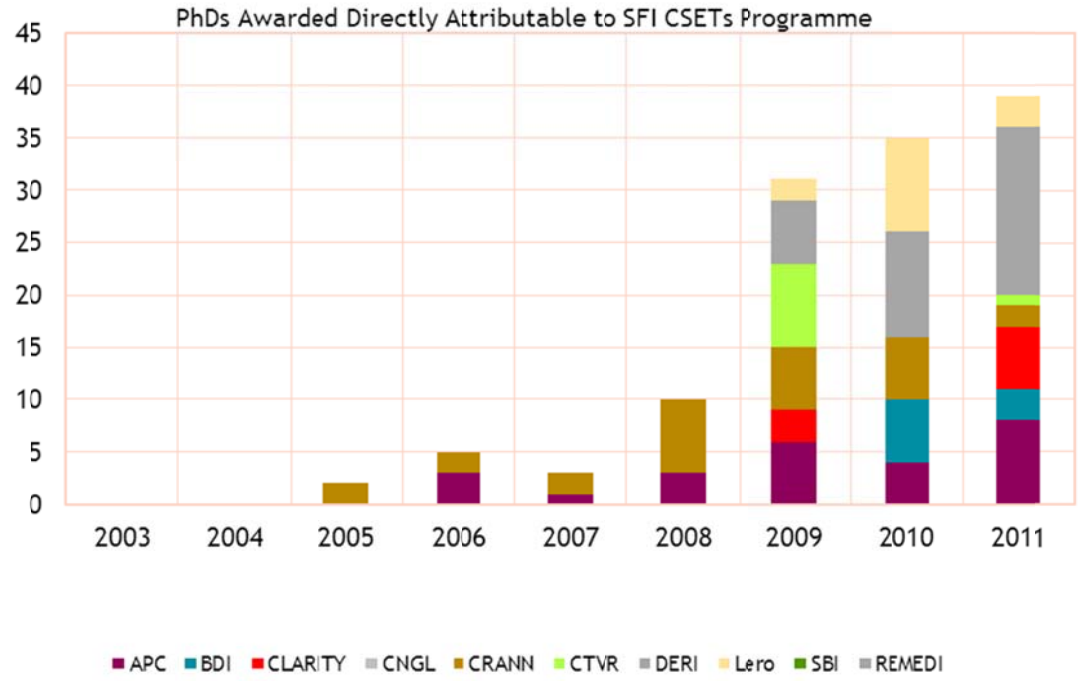
Source: SFI

PhDs Awarded

PhD degrees awarded from 2003 to 2011 total 287 with those directly attributable to the centres representing 44 per cent of the total (around 125 PhDs) (Chart 5.6).

Chart 5.6: PhDs Awarded





Source: SFI

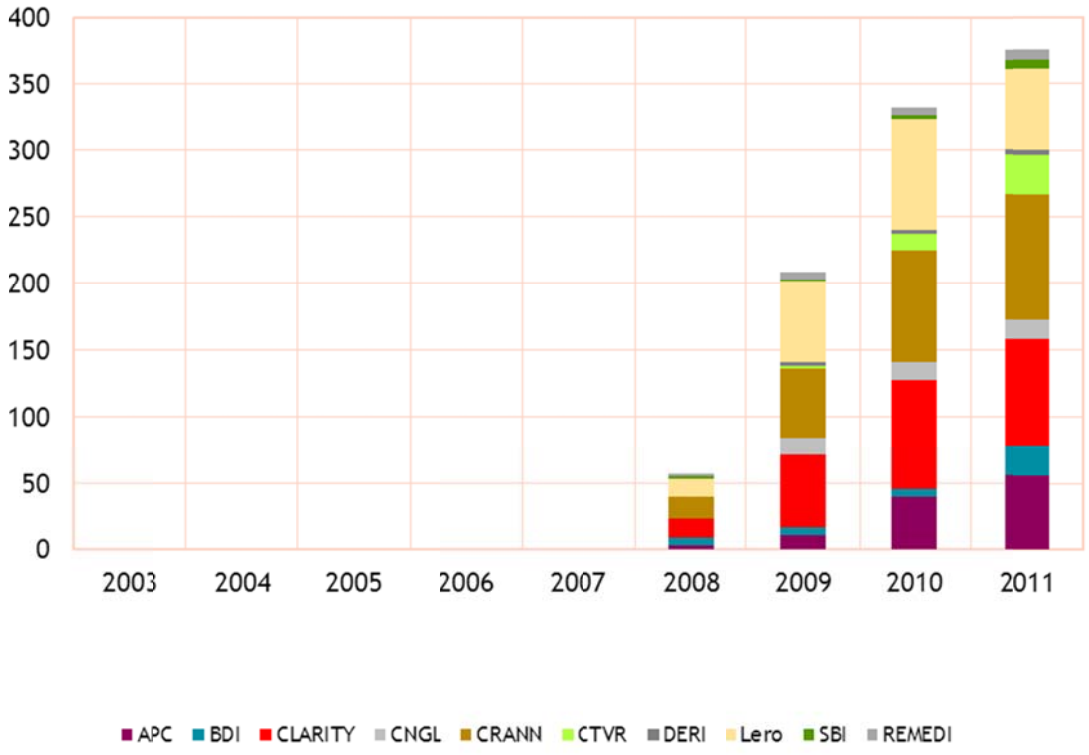
MSc Degrees Awarded

A number of centres have developed MSc courses and a total of 159 MSc degrees have been awarded with around 20 per cent reported as being directly attributable to the CSET programme. BDI and REMEDI have been particularly active in MSc provision accounting for account for 73 per cent of the total number of MSc degrees awarded.

Academic Collaborations

The number of collaborations with other academic groups has only been recorded since 2008 and only in terms of the total number (i.e. no *direct* figures are available). In 2011 there were 376 collaborations (Chart 5.7). The number appears to have been growing at a fairly rapid rate but this might be due in part to a greater focus on this indicator and subsequent concerted attempt to record the necessary data.

Chart 5.7: Academic Collaborations



Source: SFI

Type of Industrial Engagement

The survey provides data on the centres' activities from the perspective of industrial participants.

Participants were asked to indicate in which years between 2003 and 2011 they had engaged with a centre. Most participants (60 per cent) engaged with the centres over a period of

years, the average being 2.9 years. As might be expected, formal partners were involved more for a longer period of time, an average of 3.7 years as opposed to 2.3 for the non-formal partners. In fact, 50 per cent of non-formal partners appeared to have had 'one-off' engagements in that their interaction took place within one calendar year.

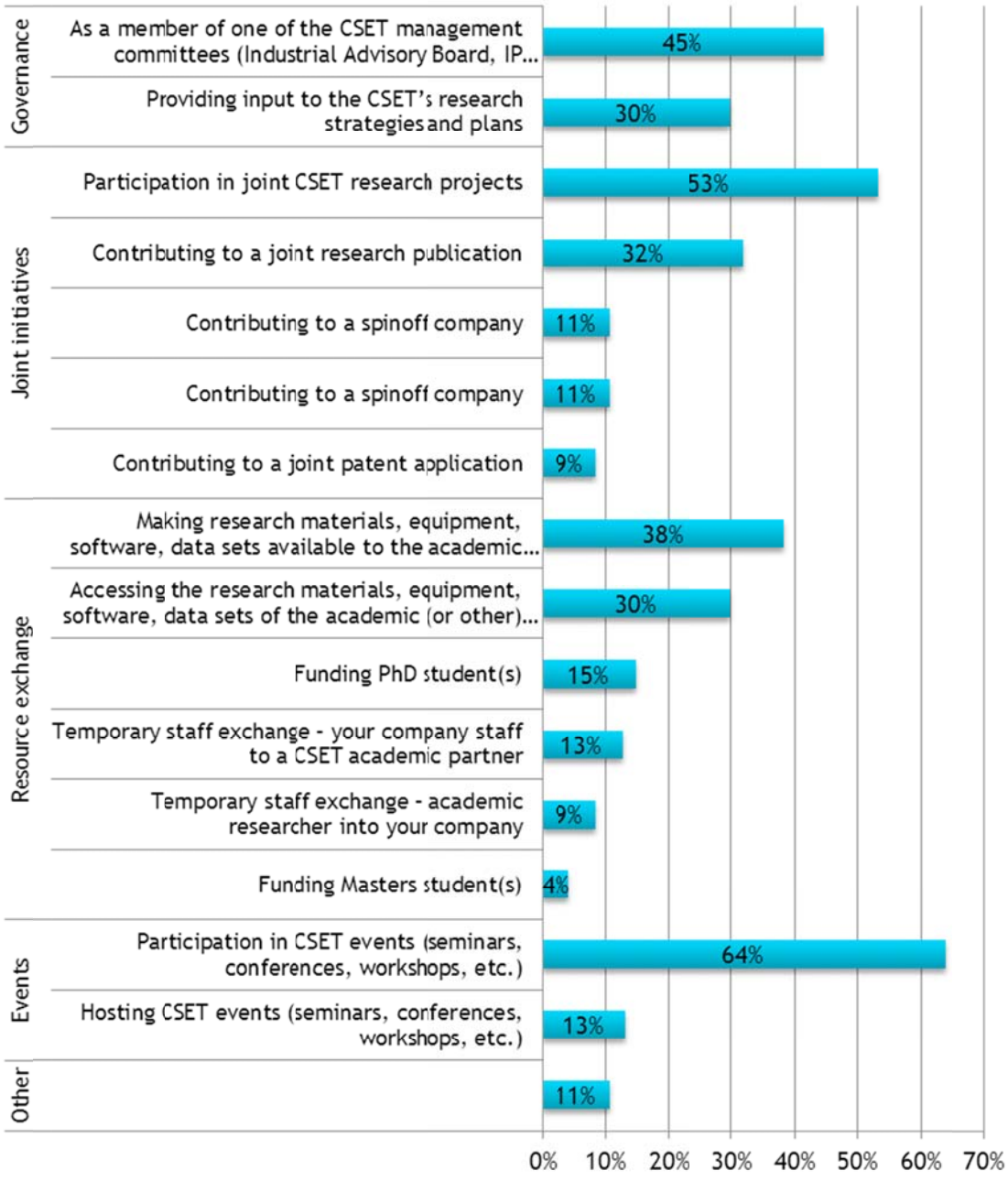
The range of engagement is broad (Chart 5.8). The most common being participation in events (reported by 64 per cent of all respondents), followed by participation in joint research projects (53 per cent), membership of management committees (45 per cent) and making research materials, equipment etc. available to other partners (38 per cent). Generally there is a lower level of involvement in staff exchanges and funding of researchers (PhDs) and therefore the engagement in joint projects must either involve work conducted at industrial sites and/or a more directional or observational input.

Involvement in activities closer to centre 'outputs' - joint publications, patents, spin-offs - is generally much lower.

There are a number of differences in the patterns of engagement between formal and non-formal partners and between MNCs and SMEs:

- Formal partners tend to interact more than non-formal partners with the CSETs in all categories and, as might be expected, are much more heavily involved in governance activities.
- A higher proportion of large companies have participated in joint initiatives, in comparison with SMEs. For example, 64 per cent of all MNCs have participated in joint CSET research projects, in comparison with 44 per cent of all the SMEs.
- SMEs also engage to a lesser extent in staff-related resource exchanges i.e. staff exchanges and funding PhDs.
- By contrast, a higher proportion of SMEs engage in CSET events and in the exchange of research materials, equipment, etc. (accessing and making it available), in comparison with MNCs.
- A higher proportion of total Non-Irish companies have participated in joint CSET research projects (65 per cent), in comparison with the proportion of the total Irish companies (38 per cent). Or, to put it differently: of all the companies that participated in joint CSET research projects, 68 per cent of them were Non-Irish companies, and the remaining 32 per cent were Irish companies.

Chart 5.8: Industrial Partner Activities



Source: Technopolis CSET Industrial Participant Survey

There are also differences in the patterns of engagement between partners in biotech versus ICT-focused centres. ICT centres are more engaged in exchanges of materials, equipment and data sets, funding students (both PhD and Masters) and contributing to research papers and spin-outs, while partners in biotech centres are more likely to place staff within centres.

Patents, Licences and Spin-Outs

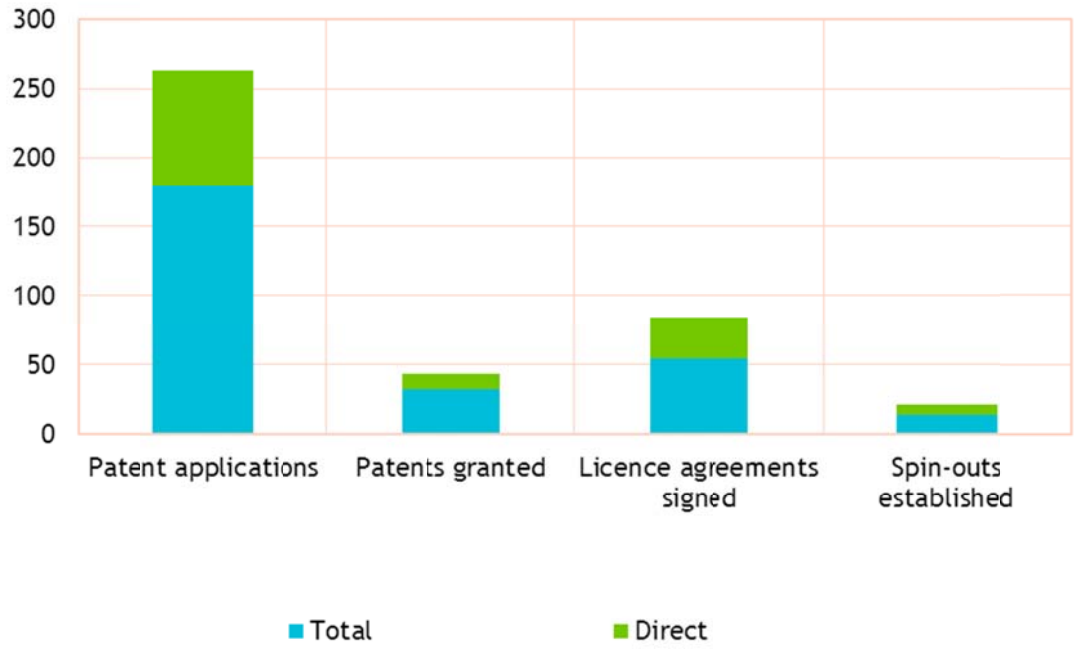
SFI records data on the number of patents applied for and granted as well as the number of licences to exploit and spin-out companies established. These outputs tend to occur later in the lifetime of the centres as the research comes to fruition and the potential, if any, of the outputs starts to become apparent. Not all research outputs will have commercial potential nor will all outputs be protectable as formal IP.

Chart 5.9 shows the numbers of patents applied for and granted, licence agreements signed and spin-outs established. The total number of patents granted to date, attributable to the CSET programme, is 11. However the number may be slightly higher as the disaggregation of output data (i.e. total and direct) did not start across all centres until 2008/2009. The total number of patents granted to the centres (attributable to all funding sources) is 32.

These 11 patents have generated 30 licence agreements attributable to the CSET programme while the total number of 32 patents (i.e. attributable to all funding sources) has resulted in 54 licences. Assuming that the CSET- attributable patents and licences are directly connected, this might suggest that the CSET generated patents are more likely to result in licences with 2.9 licences per patents versus 1.7 licences per patent. This may be due to the close link between the centres' research activities and their industrial partners, in particular the fact that formal partners are members of centre IP Committees and so have first sight, and often first refusal, on patents created. However the numbers of patents and licences involved are very small and therefore this can only be taken as a very tentative finding. The counterpoint to these close links is the patent 'lock-in' by the formal partners that might act to hinder commercialisation by other companies who either do not have early sight of, or access to, the patents. The extent of this lock-in depends on the detailed IP agreements between the academic and formal partners. Some centres in their second round of funding have modified their IP agreements to ensure that the time taken for formal partners to review and evaluate IP is limited (typically to a year) to enable the IP to be made more widely available in the event that no formal partner wishes to invest in commercialisation.

It is also important to note that the recording of formal IP as outputs of centres was added a few years into the programme and there remains concern among some academic partners (centre directors and HEI leaders) as to their appropriateness for centres focused on long-term basic use-oriented research. The issue is not that such outputs should not be monitored but that the expectations of the extent of these outputs compared to other more nearer market public support for RTDI might be over-stated.

Chart 5.9: Patents, Licences and Spin-Outs, 2003-2011 (*Total* and *Direct)*



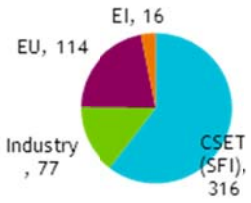
Source: SFI

Diversified Funding

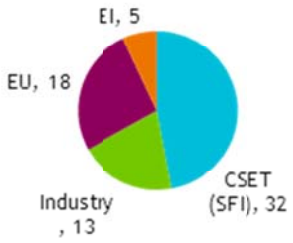
The majority of centres report that initially they were wholly, or nearly, wholly dependent on CSET programme funding. This funding enabled the centres to be established, recruit staff and students and develop skills and activities in industrial liaison, outreach and developing proposals for funding. While no data is available that accurately depicts the funding distribution when each centre was established, the data for the lifetime of the centres can be compared to the data for the most recent full year (Chart 5.10). This illustrates that the proportion of CSET programme funding is less in 2011 than for the lifetime of the centres and so suggests that dependency on this funding source is decreasing with time. Correspondingly, funding from all other sources is greater in 2011 than for the lifetime of the centres. Chart 5.11 provides the lifetime data for the individual centres.

Chart 5.10: Funding Sources of the 10 CSETs (Lifetime)

Lifetime:

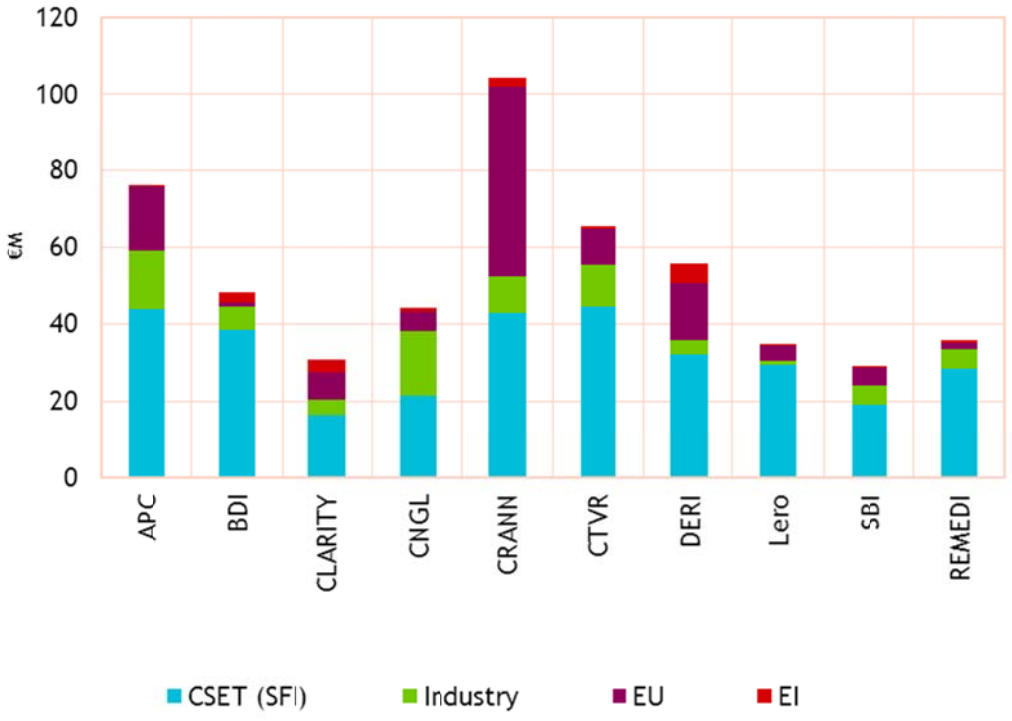


2011:



Source: SFI

Chart 5.11: Funding Sources by CSET (Lifetime)



Source: SFI

Industry Views on Outputs

A reasonably common comment from industry interviewees with respect to research activities and outputs was that the research was too academic and should have a greater focus on applied research. However several also appeared to view this issue as less related to the issue of basic versus applied research and more related to the need for a professional approach to project management. They felt that a more goal-orientated approach would keep the focus on outputs, specifically those of most interest to industry. This suggests that the issue may not be about basic versus applied research but that 'user-oriented basic research' needs to retain its focus on the user throughout the research process and not just in the research definition stage. This would entail regular reviews that allow for a change of direction and the ability and willingness to stop projects.

Impacts & Outcomes

Centres have significantly increased the extent of interactions between academics and industry and, in doing so, stimulated attitude and behavioural change within both industry and academia.

Attitude and Behavioural Change - Industry

The survey of industrial participants provides very strong evidence for an improvement in the attitudes towards working with universities in Ireland (Chart 5.12).

- 90 per cent of respondents agree (and around half 'strongly agree') that the CSETs have created new opportunities for industry to interact with academics in Ireland and enabled companies to deepen their relationships with Irish universities;
- Consequently 90-95 per cent agree (and 35-45 per cent 'strongly agree') that the CSETs have increased the attractiveness of Irish universities as research partners, improved the reputation of the research base in Ireland and increased the attractiveness of Ireland as location for industrial R&D;
- A slightly lower, but still considerable, proportion of around two-thirds agree that the CSETs have improved opportunities for trained researchers and the mobility between academia and the industry;
- The difference in responses between the types of partner and company was minimal; and
- As a result, industry reports a significant increase in the existence of academic-industry linkages. Ten years ago the majority reported (59 per cent) that linkages between their industry and academia in Ireland were non-existent or weak and only 12 per cent reported strong links, whereas now 79 per cent report linkages as strong or very strong (Chart 5.13).

Industry interviewees report a greater awareness and more positive view of the resources in universities that can be brought to bear on industrial R&D, product/processes development and 'innovation thinking'. The flow of formal and particularly informal knowledge and the insights they have brought is, in the main, highly valued.

As might be expected from the findings above, the most commonly reported future behavioural change is an increase in collaborations with Irish universities (reported by 84% of

respondents) (Chart 5.14). Related changes in terms of increased expenditure on R&D and subsequent changes in terms of increased income from innovative products/processes/services, increased employment of researchers and increased employment (in general) are reported by 40-50 per cent of respondents. This suggests that the link between increased interaction and subsequent effects is either not perceived by respondents and/or, perhaps, that respondents understand that the link is not certain.

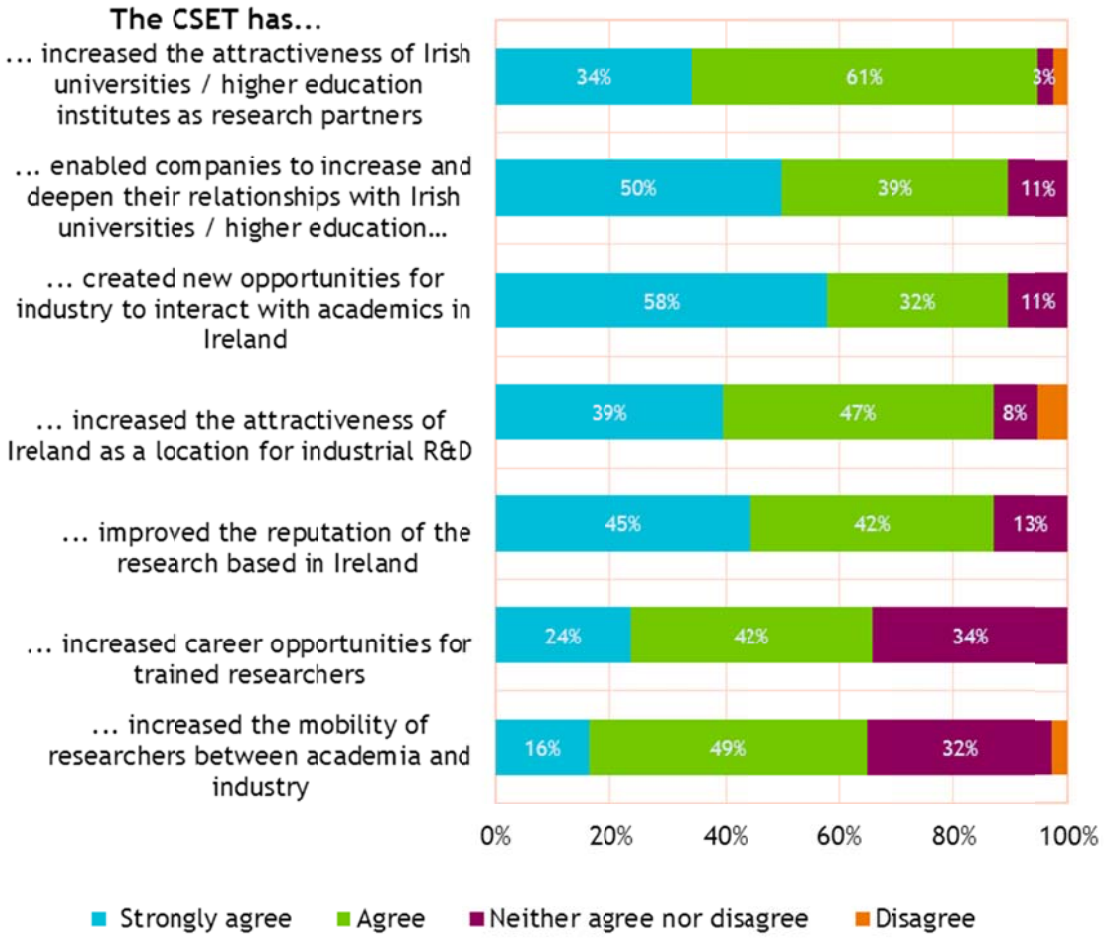
Interestingly there is a greater positive view of the effects on behaviour from the non-formal partners and Irish companies. This might suggest that those partners with the least prior experience of working with universities (assuming the number of the formal partners are more likely to have such experience, particularly the foreign MNCs) had the most to gain from the CSET experience in that they were starting from a lower base of experience and expertise in research collaboration and had more to learn.

One of the most significant effects reported is the influence of CSET participation on company research strategies, reported by around a half of interviewees. The new knowledge and insights gained have led to effects such as:

- Shift to a more longer-term view on R&D;
- Better positioning of R&D within the company; and
- Being better prepared in terms of the direction of technological developments and establishing new strategic partnerships with academics or other businesses.

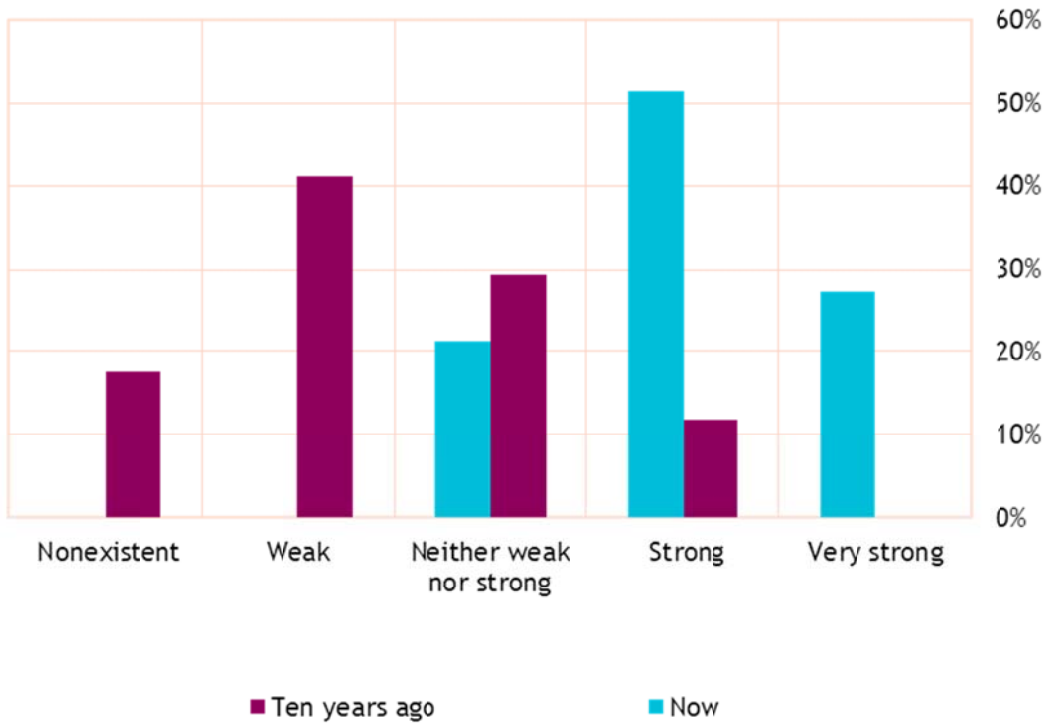
These are very positive findings, providing evidence that, among those who have been enabled to experience academic-industry interactions in Ireland, there is a move towards the development of an innovation culture in which academic-industry collaboration is a key feature.

Chart 5.12: Attitude Change



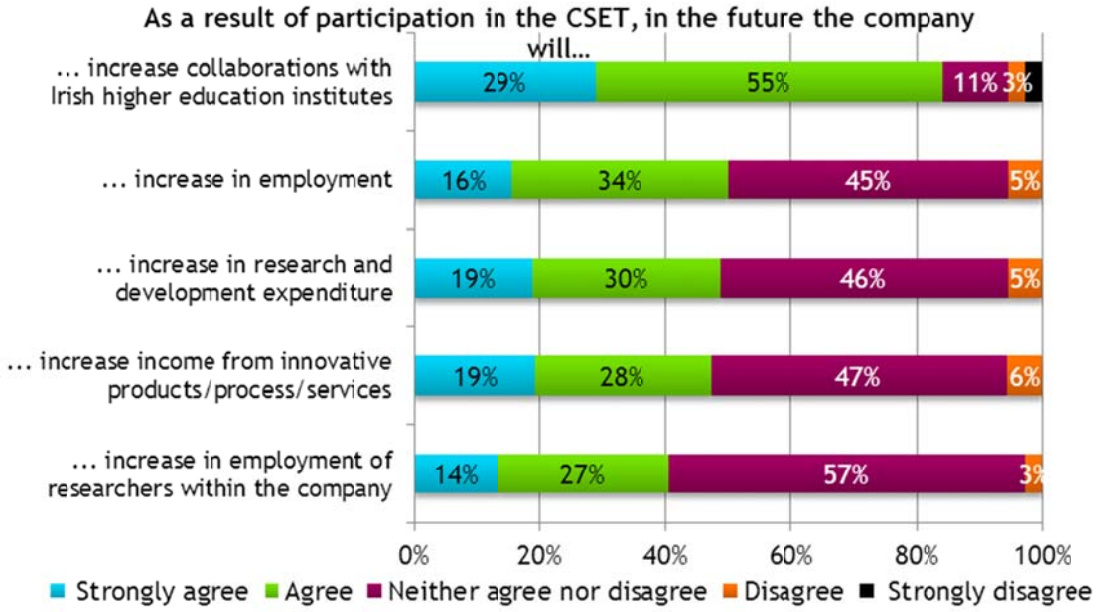
Source: Technopolis CSET industrial participant survey

Chart 5.13: Change in Linkages Between Academia and Industry



Source: Technopolis CSET industrial participant survey

Chart 5.14: Behavioural Change (Future)



Source: Technopolis CSET industrial participant survey

Reputational Effects, Attitude and Behavioural Change - Universities

The interviews with stakeholders from academia reported a number of effects on the CSETs on university research and wider society.

Reputation

- The critical mass and scale of the centres allowed them to attract new researchers, including foreign researchers with a strong scientific reputation. The visibility of the centres also increased the visibility of the hosting university faculties who were seen as the employers of the CSET-researchers and PIs. Thus the CSETs helped raise the international profile of the partner universities.
- The increased scientific output of the CSET researchers helps to raise Ireland's profile in terms of scientific outputs and thus contribute to an improvement in the international reputation of Irish science. This indirectly had a number of other effects reported by CSET-directors: increasingly the centres were asked to join European consortia and, when they did, they were more able to act as instigators and coordinators of large EU projects, and they were increasingly invited to international conferences and events.
- The partnership with industry has offered a challenging environment for the training of researchers, who are enabled to conduct traineeships at firms. Interviewees report an increase in the demand for courses in the domains covered by the CSETs.

Behaviour

Together, working with industry, focusing on international excellence and managing large centres have led to a number of effects within the universities:

- An improvement in the internal quality assurance systems in the research groups
- The CSET centres – albeit to varying degrees – positively influenced the management of the universities who were required to put more emphasis and focus on various research management tasks such as business development, technology transfer, IP, and recruitment and researcher career policies. So in broad terms the CSET was one of the initiatives that contributed to progressing the modernisation agenda of Irish HEIs. However the process is not over yet and the centres report slow progress in modernisation as a potential bottleneck to centre development – in particular in areas as such as, for example, slow and inflexible recruitment processes, lack of support for centre operations and negotiating IP agreements with partners.
- Most CSET-directors – in particular the more distributed CSET centres - reported that the programme had led to much better relationships between universities, research institutes and between separate research groups. Many distributed centres have regular and structured meetings with the academic partners, leading to a greater willingness to cooperate beyond the institutional borders.
- Most of the CSETs have outreach programmes to engage pupils and the broader public into science. As with working with industry, these activities help to instil an understanding of the need to engage in outreach among researchers, particularly younger researchers and enable them to develop relevant skills.

In summary the effects of the CSET programme on research in Ireland has gone beyond the directly participating research groups. It is difficult to isolate the specific effects of the CSET programme from other developments that were supported in the HEI and research centre community. However, given the scale of the CSET initiative, it would be fair to suggest that CSET has been a significant contributor to the modernisation of the HEI sector as well as the increased profile of Irish science on the international map.

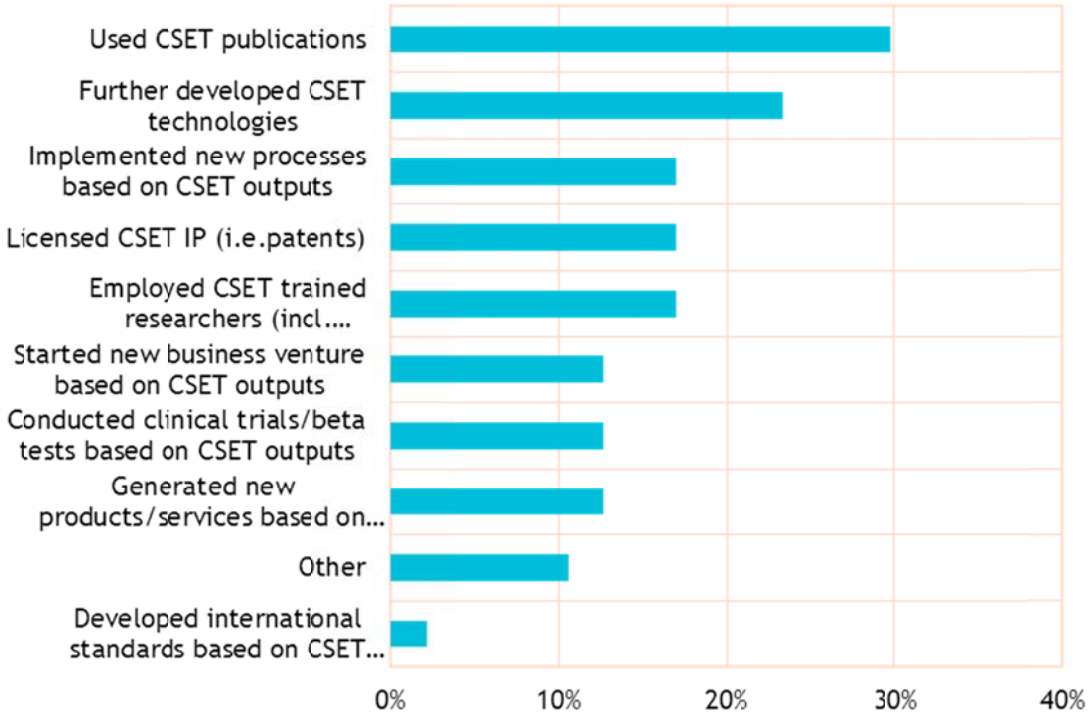
Economic Impacts: New Products/ Services/ Processes

As previously described, the economic effects of greater collaboration between academics and industry take time to come to fruition and involve a number of intermediate steps. Firstly the outputs of the research undertaken need to be utilised by the industrial partners, typically requiring further evaluation as to their relevance to business needs, followed by technical, product and, possibly, market development before the possibility of revenue generation and employment growth. Chart 5.15 shows that in terms of the first step, 72 per cent of respondents report making use of CSET outputs:

- 30 per cent of respondents report making use of CSET publications;
- 23 per cent report further development of CSET technologies;
- 17 per cent report taking licences of CSET IP, implementing new processes based on CSET IP and employing CSET researchers;
- 13 per cent report starting a new business venture, conducting a clinical trial or generating new products or services based on CSET IP; and
- 46 per cent report the use of CSET outputs in two or more of the categories above and 19 per cent in three or more the categories.

It should of course be noted that absolute numbers are small, 13 per cent and 17 per cent equate to 6 and 8 respondents respectively. However the data provide evidence that CSET outputs are currently use in businesses innovation activities, be that in the evaluation of possible new ideas, further development of specific technologies, or in the generation of specific products/services/ processes.

Chart 5.15: Use of CSET Outputs



Source: Technopolis CSET industrial participant survey (n=47)

In terms of financial benefits achieved to date directly related to CSET outputs, the evidence is somewhat limited. Just four respondents were able to report revenue generated due to new products/services generated as a result of participation and three were able to report financial savings due to implementing new processes. Current annual revenues per product/service vary from €20k-200k with future annual revenues are estimated to be between €200k and €20m in 5-10 years. Savings are reported to be in the region of €100k-500k. Attribution of these benefits to the programme was in the 0-25 per cent range. The number of data points is insufficient to develop a gross economic impact for the programme as whole, however, they do serve to illustrate that financial effects do occur and that the scale of the benefits varies enormously.

This low number of tangible benefits (to date) and the range in the scale of benefits is to be expected. Investments in R&D and innovation activities are highly uncertain and at each stage in the product development process, there is the possibility that the activity will be deemed unsuccessful and investment stopped. This uncertainty and risk results in a highly skewed distribution of economic impact, where a large proportion of the benefits are the result of a very small number of RDI projects. Therefore we would expect to see a tail off in the numbers of participants reporting economic benefits achieved due to both factors: the time required to generate economic impact and skewed distribution of impact.

However, further innovation and financial impacts are expected. 21 per cent of participants have generated (or are in the process of generating) new products or services or have implemented new processes as a result of their participation in a CSET and 51 per cent expect

to do so in future. These are divided almost equally between those that expect new products/ services and those that expect to implement new processes (and a few that expect both). This finding is reinforced by the interviews, with a large proportion of industry interviewees (at least a third) specifically reporting that they have, or expect to have, products in development as result of the knowledge or IP gained through participation. Furthermore, many interviewees report that the knowledge acquired has enabled them to accelerate the process of product/process development and so shorten the development cycle to reach an outcome more quickly.

Overall Benefits of Participation

Overall, participants view participation in CSETs as worthwhile. The majority of participants (86 per cent) view the benefits of participation as equal to or greater than, the costs of participation. In addition the majority of participants with previous experience of academic-industry collaboration rate their experience with the CSETs as better or the same as previous collaborations in terms of the ease and success of collaboration, the number and quality of outputs and administrative processes. There is slightly less satisfaction with the intensity of collaboration and the degree of influence on research programmes and projects. This suggests that the centres, based in universities with often limited previous experience of collaboration, have been able to develop and implement effective processes for academic-industry engagement; however there is room for improvement in relationship management and the extent to which industry can really influence the direction of the research conducted.

Impacts

In terms of impacts, the CSETs are expected to contribute to the objectives of the SSTI and thereby contribute to the development of a knowledge–based economy in Ireland. The SSTI objectives and indicators metrics are focused in four areas: (i) increasing the capacity and capabilities of the research base; (ii) providing support for commercialisation within the research base; (iii) improved levels of RDI activity in enterprises and (iv) increased internationalisation of the research base[110].

The CSET programme has the potential to contribute to all four areas. To understand the contribution that the CSET Programme has made to date we compare the scale of the contribution of CSET programme to a number of SSTI indicators (defined at national level) with the relative scale of the inputs i.e. the size of the CSET investment compared to all national public investments.

In terms of inputs, in the last three years (2008-2010) the CSET programme has represented

- **20-25** per cent of SFI expenditure;
- **3-4** per cent of government expenditure on R&D (GBAORD); and
- **2-4** per cent of higher education expenditure on R&D (HERD).

(with the higher figures being for 2010)

This assessment leads to two important findings:

[110] Strategy for Science, Technology and Innovation, 2007-2013

- In terms of the CSET programme's contribution to the research base, it would appear to be contributing to the scale of the research activity (in terms of numbers of researchers and numbers of PhDs) in direct proportion to its inputs. This is to be expected as the cost of supporting researchers will be approximately the same across all public research funding programmes. However, the outputs in terms of publications is a little lower than the input proportions might be expected to generate. This may be a reflection of the fact that centres fund a number of non-research staff that are essential to centre operations, industrial relations and commercialisation and who therefore do not contribute to publication outputs.
- In terms of support for commercialisation the CSET programme appears to contribute considerably above the scale of its inputs. While centres would appear to engage in a lower absolute number of industrial collaborations, they lead to a relatively greater number of IP related outputs. This suggests that the more strategic and longer-term nature of the collaboration (with the potential for developing deeper relationships with a smaller number of key players) leads to more pre-commercial outputs than one-off shorter-term interactions such as contract R&D. Of course, the absolute values of the indicators are low and this finding would need to be traced over a longer period of time to be considered robust. To date, the evidence is somewhat limited as to whether these commercial outputs lead to significant economic effects for individual partners and for Ireland more generally.

The interviews with all stakeholders, particularly among policy-makers and university staff, emphasise that the scale of the centres (in terms of budget and timescales) was essential to their ability to deliver outputs for a number of different reasons.

- Typical principal investigator led research teams are made up of 5-10 people. This results in numerous small groups conducting a wide range of research but does not allow for the development of research centres with the critical mass to deliver significant research outputs and enhance reputations (individual, institutional and national). Scale was particularly important for research themes that needed to span disciplinary or institutional boundaries to access relevant expertise and facilities. Here the long-term nature, as well as budget, enhanced the incentive for inter-university collaborations.
- Furthermore, scale enhances the visibility of the research conducted. A large research centre is identifiable in its own right and demonstrates institutional and national commitment to specific research fields. IDA report that the centres provided a focus for discussions with MNCs they were hoping would establish an R&D presence in Ireland, enabling IDA to highlight research skills and demonstrate long-term commitment to resourcing relevant research fields. IDA can identify a number of specific examples where the presence of a CSET has contributed to the attraction of major technology-based MNCs to establish R&D facilities in Ireland.
- For researchers, the scale offered the potential to design and conduct larger and longer-term research projects than typical research support schemes permit as well as allowing long-term cross-disciplinary academic expertise and resources. This was a highly attractive offer that enabled Ireland to retain or attract young and mid-term career 'rising academic stars' to Ireland to pursue their research careers.

These different benefits of the scale of the centres are mutually reinforcing and the majority of interviewees take the view that the CSETs have a played an important role in developing Ireland's research reputation.

It is important to note that centres with a focus on long-term user-oriented basic research contribute to innovation and the commercialisation of universities' knowledge outputs in other less direct ways than the exploitation of centre-generated IP. Influencing the research strategies of businesses and increasing the diffusion of knowledge creates new opportunities for innovation and the resulting longer-term financial impacts. This is an important point, as there is a tendency among policy-makers to focus on the more readily measureable outputs such as IP and its exploitation. This can lead to an over-emphasis on commercial deal-making leading to what are essentially private goods at the expense of the public-good role of the universities and their role in disseminating research outputs more widely.

The continuing rationale for the CSET Programme

Section 3 and 5 discussed the rationale and appropriateness of the rationale for setting up the CSET programme in the early 2000s. A question this evaluation also addressed is the appropriateness of rationale in the current context – whether or not it still stands, is no longer relevant or needs adaptation.

The strongest arguments put forward to support the on-going validity of rationale for the CSET are the following:

- The CSET programme is the main instrument in the Irish support portfolio that ensures the critical mass of research activities in a particular topic area, which is necessary to perform in the global science and technology arena. The fact that the programme funds much of the 'organisational glue' that makes the difference between a collection of individual researchers and a cohesive research centre adds value to the portfolio of other support programmes that are either R&D project based or geared to individual researchers. It has taken centres years to build up reputation and expertise, and it can deteriorate very quickly - within a year - if there is uncertainty about their future.
- The CSET programme is the only intervention that fosters medium to long-term strategic collaborations, rather than project-based relationships. The latter tends to resemble contract research focused on nearer-term problem-solving, while medium to long term collaborations have a better chance of opening new innovation trajectories for the participating companies.
- The research themes remain compatible with Ireland's priority areas: ICT, Life Sciences and Energy.
- While the academia-industry relationships have improved compared to the position at the start of the programme, the time needed for the trust-building necessary to establish sustainable collaborations is considerable and still requires a structured form of governance. Most CSET centres are not sufficiently established to continue operating as a centre without the SFI funding nor are the host universities able as yet to support the centres directly themselves.

There have also been some arguments put forward that ask for a rethinking of the rationale for the CSET programme in its original form:

- Since the programme was instigated, other centre programmes and academia-industry collaboration and business development initiatives have been put in place, making the number of potential contact points for industry too numerous. This has led to two distinct problems. Firstly, a wide range of centres and academics are approaching the same companies for collaboration and, secondly, the shift in emphasis to demonstrating direct socio-economic impacts has led to a situation where all interventions are being measured against the same set of metrics.

Shifts in the Rationale of the Current Research Centres Call

The call for centres under the new SFI Research Centres programme was issued in the Spring of 2012 and proposals for the centres have been submitted and are currently in the process of appraisal and selection. It is obvious that since 2003 the programme and its rationale have evolved as the landscape has changed. The 2003 CSET programme call, for instance, was focused on establishing centres and developing the linkages between academics and industry. While the general philosophy of the current Research Centre call has remained similar to the original CSET programme, some important differences can be noted. In particular the objectives and expectations of the 2012 Research Centre Call not only contain the CSET objectives but, in addition, include a much stronger emphasis on delivering significant economic and societal impact, including:

- Attracting Foreign Direct Investment;
- Spin outs of high-technology start-ups;
- Technology transfer through licenses to both MNCs and SMEs based in Ireland;
- Increasing the level of industrial and commercial investment in R&D in Ireland;
- Delivering tangible societal benefits; and
- Plus, a greater requirement for industrial cash contributions.

While a greater emphasis on socio-economic impacts is understandable given the role of the CSETs as centres for excellent research on an international scale, pushing them too much in the direction of short term direct socio-economic outputs will likely harm the medium to long term strategic approach, the opportunities to create new markets with more disruptive technologies and the systemic effects. As international benchmark studies show it often takes more than 10 years before research and technology institutes manage to stabilise their scientific reputation, before significant socio-economic effects can be achieved. In addition many socio-economic benefits are not readily measurable, for example the spill-over effects of well-trained scientists and technologists as they enter the Irish labour markets.

The 2012 SFI Research Centres approach has a hub and spoke model that allows for a more flexible involvement of partners outside the core technology platforms situated at the heart of the centres. While the increased flexibility has positive aspects, not least in potentially simplifying IP agreements, SFI should be vigilant that this does not undermine the long term strategic element, as exists in the current CSET model, that is essential to address industry relevant issues beyond 'problem-solving' applied technology agendas. In addition, the hub and spoke model could also reinforce that industry cooperation becomes an exclusively bilateral affair, thus hampering opportunities for indigenous Irish companies to collaborate with international companies through the Research Centres. Therefore, it is important that the governance model ensures that industry plays a strong role in influencing the research strategy of centres and that sufficient opportunities exist to enable industry partners to

network with each other as well as with academic partners in order to identify shared needs, collaborate and share ideas.

Conclusions

Appropriateness

The rationale for the CSET programme in 2002 rested within a wider objective to move Ireland towards a knowledge-based economy to ensure continued economic growth and jobs for its citizens. The objective of the programme is to contribute to the development of a pro-innovation culture and the enhancement of Ireland's capacity and capabilities for research in both the academic and business sectors with a particularly focus on increasing the quality and quantity of academic industrial collaboration in pursuit of innovation.

The evidence strongly supports the appropriateness of the programme rationale and objectives. There was widespread agreement among all stakeholders that at the time the programme was the conceived interactions between academia and industry, and between different academic groups and institutions, were extremely limited. Furthermore, if Ireland was to compete internationally as a knowledge-based economy, it would need to: improve the quantity and quality of its research base; increase the linkages between public and private sector research in order to improve the flow of knowledge, ideas and IP between academia to industry and; ensure that academic research was sufficiently aligned to support industry's future needs.

The CSETs are viewed as complementary to other public investments being made at the time. In particular, they complemented the SFI Principal Investigator grants that funded individual researchers and small research teams to create an underpinning cadre of researchers and the Programme for Research in Third Level Institutions (PRTLI) that funded physical research infrastructure. No other programme was targeted at long-term user-oriented basic research. Together these investments, including CSET programme, have contributed to a step change in the quality and quantity of the Irish academic research base. A significant contributing factor being SFI's introduction of peer review across all its programmes and, in the particular case of the CSET programme, international peer review.

The CSET programme objectives align in their intent with international practice in defining the role of competence centres. As currently presented they are a combination of a description of what the centres are intended to do (create academic-industry centres of scale, conduct excellent research, etc.) and what they will achieve (support excellence in research, foster science and engineering in service to society) and would benefit from a clearer statement in terms of the outputs, outcomes and impacts they of what they are intended to produce. This would help to develop appropriate indicators of success.

As an entirely new programme the process of defining and implementing metrics evolved as the programme was implemented and as the SFI staff gained skills and experience in programme management. To date monitoring processes have focused on individual centres and the considerable volume of data collected has not been aggregated to assess the progress at programme level.

All of the centres established by the programme are aligned with the Irish priority areas in ICT and biotech and furthermore in themes of relevance to Ireland's indigenous SMEs, foreign owned multinationals and to MNCs being courted by IDA, as evidenced by the ability of

centres to achieve industrial contribution targets from a range of partners, plus the subsequent the establishment of new MNC R&D centres in Ireland aligned with CSET themes.

Effectiveness

The effectiveness has been assessed against a number of key programme impact areas:

- **Increased academic-industry links**. The CSET programme has led to a step-change in the number and depth of relationships between academics and business in Ireland. Starting from a very low base, long-term strategic relationships in the priority areas of biotechnology and ICT have been instigated and deepened across Ireland's academic research base and business sectors. This due to the selection of industrially relevant research themes and the scale of the funding available per centre and hence the volume of research undertaken – that has served to attract both industry and high quality academic researchers to the centres. The majority of these linkages would not have been established without the programme as there virtually no pre-existing culture of academic-industry collaboration Ireland or other enterprise mechanisms to facilitate them. As a result the programme has made a significant contribution to the networking function of the national innovation system that aids the flow of scientific and technical knowledge in the economy. The centres have played an important role bringing both multi-national corporations and Irish SMEs together in innovation networks.
- **Improved research quality.** The quality of the centres' research was assured by a rigorous peer review process during the selection process and on-going regular external reviews. The implementation of peer review throughout SFI programmes, not just the CSET programme, has been critical to 'raising the game' of Irish research and contributed, along with the budget increases, to Ireland's rise in the international research rankings. The programme has contributed to the quality increase through its ability to provide stable support to existing high quality researchers and attract additional high quality researchers and research leaders to Ireland through offering relatively long-term positions with large and stable research budgets.
- **Increase in the relevance of the research conducted in the research groups involved.** The programme requirement for industrial participation in centres and a role in centre governance and management ensured that industrial input was taken seriously by the academics and institutions proposing and running centres. This has given industry a greater influence on academic research than they would have otherwise had and increased the relevance of academic research conducted in centres as compared to research conducted outside of centres. Without these strong drivers from SFI it is doubtful if the extent of industrial relevance would have been reached. The extent to which centres' research programmes have been influenced by industrial needs is somewhat in the eye of the beholder. Most academics feel that there has been a strong influence and most welcome that influence in their research, while many industry partners would like more influence. From an industry perspective there is always a desire for more applied research but the rationale of publicly funded research is to support the more basic research that is more difficult to appropriate, that industry will not conduct itself. The challenge for centres is to find the appropriate balance between a research programme that is sufficiently far-sighted while remaining relevant to industry and to ensure that industry influence does not tip the balance towards 'problem solving' research rather than science that is internationally state-of-the-art.

- **Changed behaviours with respect to academic-industry interactions.** In general, academic and industrial partners have had a positive experience of their collaborations, with the benefits of participation outweighing or equalling the costs. As a result they are better placed to seek out and conduct collaborations in future. Furthermore the centres are training a cadre of researchers with collaboration experience and for whom working with industry will not be an alien concept. These researchers are better prepared for industrial careers but will also form the next generation of academics and who will have a much better understanding of business needs, cultures and processes. The majority of industrial participants have valued the opportunity to experience academic-industry collaboration and report that are now more likely to engage in such collaborations in Ireland in future. Furthermore CSET partnerships with multi-national corporations have contributed to the increased reputation of Ireland as a place for high quality research, research collaboration and a location for industrial research. The generally positive industry experience of CSETs has led a small number of businesses to increase their R&D investments (both within and external to Ireland) or establish/increase their R&D presence Ireland. However, as yet, the impact on national levels of business R&D expenditure, innovation outputs and employment would appear to be minimal.
- **Direct economic effects.** A large proportion (70 per cent) of industrial participants have made use of, or plan to make use of, centre research outputs and a very small number have achieved some financial impact due to products /services introduced to the market or savings from processes implemented. Most impacts from these products/services/processes are expected to accrue in the future. The impact evidence suggest that CSETs may be more effective in terms of their generation of tangible pre-commercial outputs (patents etc.) than other forms of research support and therefore future economic impacts can be expected. There is also evidence that CSET collaborations have influenced companies' R&D strategies and accelerated product/process development processes of participants and so can be expected to contribute to additional future innovations and impacts. However the impact of these effects will be difficult to capture due to the time lag and the challenge of attribution of the CSET input among the various inputs to future innovation generated impacts.
- **Additionality.** As is typical of such programmes the additionality is highest for the impacts that are more readily tied to the CSET activities and outputs – in particular in terms of positive changes in attitudes and behaviours. Without the CSET programme support academics and industry, both based in Ireland and overseas, would not have had the opportunity to experience academic-industry collaborations. Some businesses had prior experience of academic-industry collaborations but rarely in Ireland. Furthermore the programme challenged the university support structures to instigate change to facilitate centre governance, management and operations. This process is by no means complete but the programme has played a considerable role in instigating institutional change.
- The chain of events between acquiring new knowledge, ideas, or even university IP, to the launch of a product on the market is complex, involving considerable additional financial and resource investments in R&D, product development, testing, marketing, etc. and the process can take many years, therefore the additionality of programme investments to directly economic impacts decreases with every increase in subsequent investments and timescales. Therefore the additionality with respect to direct economic impacts will be lower than for behavioural change. For those businesses with

some tangible outcome to date, the additionality is estimated to be below 25 per cent, and future direct economic impacts are likely to be at a similar level.

- **Diversified funding.** The evidence shows that during their lifetime the centres as a group have decreased their reliance on core CSET programme funding by 13 percentage points (from 60 per cent to 47 per cent), while funding from other public sources and the private sector has increased. It should be noted that the longer-term research focus of competence centres and their corresponding focus on the market failures of under-investment by the private sector in basic research, means that centres will never become self-sustaining from private sector income. Funding diversification must then entail success in attracting and winning other forms of public support and/or investment from the universities themselves.
- **Expansion in educational and career opportunities in science and engineering.** The long-term funding commitment made by the programmes is particularly amenable to supporting several cycles of PhD students. Furthermore industrial collaboration is increasingly attractive to students for the additional experience and career opportunities they provide. There is some evidence that a number of PhD students and post-doctoral researchers have been recruited by industrial partners or moved into other industrial employment. However the main purpose of PhD training is still seen by more senior academics to be a career in academic research and it will take time to adjust long-held cultures. Nevertheless the very process of undertaking a PhD within a CSET exposes students and their supervisors to industry in a way not possible in most other research training programmes

Efficiency

While it has not been possible to estimate a quantified economic impact figure largely due to the timescales involved between research and impact on businesses, the systemic impacts of the programme on the Irish innovation system are considerable. New and lasting connections have been made and new skills, attitudes and behaviours towards research collaboration have been achieved. It is unlikely that other RDTI interventions (from R&D tax credits, increased investment in PIs to one-to-one project collaborations) would yield such systemic effects or behavioural change. The scale of the investment in research via the programme had the effect of almost forcing academic institutions to pro-actively seek out academic and industrial partners. If no-one had been willing to participate and experiment with a new structural approach to research in Ireland then the programme would not have led to the establishment and continued existence of centres and the delivery of the outputs, outcomes and impacts reported here. The programme has started a process of change in research structures and is contributing to the development of a well-connected innovation system in Ireland and these systemic effects could not easily be achieved by other means. Although these effects cannot be readily quantified they are a vital component of a knowledge-based economy and a pro-innovation culture and therefore the programme outcomes and impacts are likely to exceed the investments.

Summary

The CSET programme has played a significant role in what has been a fairly rapid improvement in the Irish research base. Along with other SFI programmes and the PRTLI investments it has made significant contribution to the quantity and quality of the research conducted in the academic sector. The scale and long-term nature of the CSET investment has attracted and retained high quality researcher leaders in Ireland and given them the opportunity to develop centres of scale and critical mass and conduct high quality research in a stable funding environment. In addition, the key feature of the centres is the collaborations between academia and industry that ensure that long-term basic academic research is oriented to industry needs and that industry is brought closer to the academic base. This serves to enhance the Irish innovation system in terms of both improving the quality and relevance of the underpinning research base and increasing the connections in the system. It is this contribution to enhancing the wider innovation system that is, arguably, the most important feature of the programme. Links between academics and industry (and even links between HEIs) were extremely limited in Ireland prior to the programme and where they existed they tended to focus on short-term problem-solving and not long-term strategic research collaborations. Therefore it was entirely appropriate to instigate a programme of public support and, in taking the competence centre approach; SFI was following international good practice. Other existing RDTI support in Ireland could not have filled this role and there are no obvious alternatives in use internationally.

Developing and improving the national innovation system is a work in progress in Ireland, as in other countries, and the CSET programme has made a significant contribution not only to improving its institutions but to developing new innovation networks and so increasing opportunities for new knowledge, ideas and technologies to flow within the system. Knowledge flows and is exchanged via people and therefore the role of the centres in bringing together academics with researchers and innovation leaders in multi-national corporations and Irish SMEs to design strategic long-term research programmes but also simply to meet, network and exchange ideas is extremely important. The evaluation has demonstrated that establishing centres as focal points for research strategy and networking is bearing fruit and attitudes and behaviours towards academic-industry collaboration are improving. In addition the scale of the centres and their ability to support inter-disciplinary research has helped to increase the international visibility of Irish research, and there are specific examples of CSET centres playing a key role in attracting R&D based foreign direct investment.

The Changing Policy Context

The broader context of the Irish knowledge economy has changed considerably since the start of the CSET programme. The financial and economic crisis and the related austerity measures that followed have put pressure on the available public financial support. The Irish government is looking for a greater leverage of non-exchequer funds from its publicly funded programmes. Most interviewees indicated that this has brought a change in the political expectations of science and technology policies. In particular it has led to a stronger pressure to demonstrate the socio-economic benefits of public investments in science and technology. Specifically in case of the CSET centres, those closely involved report that this resulted in 'the goal-posts shifting' during the programme and much more emphasis has been placed on evidence of direct socio-economic impacts which, while understandable to some extent, it has reduced emphasis on the systemic effects.

The effects of the CSET-programme have been considerable. However, there remains a need to provide policy interventions to support longer-term industrially oriented basic research in academic-industry collaborations. The strongest arguments for this are:

- The CSET programme is the main instrument in the Irish support portfolio that ensures the critical mass of research activities in a particular topic area, which is necessary to perform in the global science and technology arena. In particular the programme funds much of the 'organisational glue' that makes the difference between a collection of individual researchers and a cohesive research centre adds value to the portfolio of other support programmes that are either R&D project based or geared to individual researchers.
- The CSET programme is the only intervention that fosters medium to long-term strategic collaborations, rather than project-based relationships. The latter tend to resemble contract research focused on nearer-term problem-solving, while medium to long term collaborations have a better chance of opening new innovation trajectories for the participating companies.
- While the academia-industry relationships have improved compared to position at the start of the programme, the time needed for the trust-building necessary to establish sustainable collaborations is considerable and still requires a structured form of governance. Most CSET centres are not sufficiently established to continue operating as a centre without the SFI funding nor are the host universities able as yet to support the centres directly themselves.

In addition in the years since the CSET programme was created there has much has been growth in the funding for various forms of academic-industry interactions. While this not in itself a bad thing as an innovation system can support many routes to interaction and knowledge flow, it has led to some confusion in the marketplace due to the large number of potential contact points for industry chasing the same group of companies. There is a need to clarify the policy and support offerings.

Recommendations

Continued Support for Competence Centres

There is strong evidence for continued support for competence centres within the Irish innovation system; the development of a functional innovation system is a work in progress. However a decision has already been made to replace the CSET programme with the Research Centres programme into which existing centres or proposed new centres can bid for funding. The new programme would seem to maintain the collaborative and networking features of the CSETs while at the same time placing a greater emphasis on delivering nearer-term economic benefits. The recommended design of the new centres is intended to avoid some of the difficulties with making IP agreements and make it easier to bring in new partners on a project by project basis and reduce the effect of a 'closed shop' at the core. However if the aim is to continue with the competence centre model focused on long-term use-oriented basic research, and this is not clear at the present time, then a number of key features of the competence centre model would need to be maintained.

- Strong industry involvement in governance of the 'core' centre to ensure industry relevance. It is also recommended that the separation between scientific and industry governance committees is removed. Bringing academia and industry together not only

to ensures industry input to research strategies but also helps to maintain the balance between the longer time horizons of academia and the shorter time horizons of industry. The latter point is important as competence centres should maintain their focus on longer-term more basic research and not shift towards applied research.

- The Research Centre programme has a much longer set of objectives than the CSET programme; nevertheless most of them appear in the CSET programme logic model. It would be helpful for those proposing centres, centre directors and SFI if a programme logic model was developed. This would then group the objectives into different levels according to where they fit in the logic model, i.e. whether they are centre outputs, outcomes or impacts. This then helps to define which objectives are wholly the responsibility of centres and their host institutions and which are objectives to which they provide an important contribution. For example, centres are wholly responsible for 'achieving maintaining and enhancing research excellence and leadership' whereas they can only contribute to 'attracting large foreign direct investment'. There are many reasons why an MNC makes a decision to invest in R&D in Ireland (fiscal incentives, access to new markets etc.) and a while a centre can be an influencing factor it is highly unlikely to be the sole reason. A well-defined logic model is also essential to the development of appropriate metrics.
- We would recommend an additional objective to reflect the networking role of the centres in the innovation system would be appropriate.

Improvements in Programme and Centre Operations

- There is room for improvement in the skills for managing IP and negotiating IP agreements and licences within universities. There will always be tensions between academic and business cultures where IP is concerned but the focus of IP skills development should be how to diffuse IP to those best able to generate economic and societal benefits and not to maximise IP revenue to universities. In some sectors and for some technologies patenting is essential for commercialisation and diffusion via application to society, but patenting is not a way for most universities to boost their revenue streams.[111] While this may be a somewhat controversial point for universities in the current economic and policy climate, a diffusion focused approach to IP serves to maintain the public good role of universities and moreover, may make IP negotiations simpler.
- The monitoring requirements for centres are fairly heavy with a series of quarterly, annual and mid and end of term reviews. It is recommended that for centres with several years' experience that monitoring requirements are reduced. Quarterly reporting should focus on the most basic requirements to enable the transfer of granted funds and annual reporting on outputs and outcomes where appropriate. There is currently duplication between annual reports and the SFI census. The system should be streamlined such that data is collected by the census plus a streamlined process for the collection of data unique to the programme. Centre planning could move to a two or three stage process with annual exception reporting i.e. reporting key changes or successes. Future evaluations and impact assessments would be aided by a more

[111] The evidence from countries with a long history of technology transfer is that a very small number of patents account for the majority of the return and therefore most universities make very little from patents and licensing.

concerted approach by centres to follow up with industry to identify and report 'success stories'.

- SFI is strenghtening its data collection and more resources could be allocated to the aggregation of data at programme level to monitor programme progress and achievements.
- The networking role of centres and a focus on knowledge diffusion could be aided by centres taking a more proactive role in communications – networking events, workshops, annual centre events), newsletters etc. to disseminate information and bring partners together. This would also help to raise the profile of centres.
- As yet there is no CSET in the national priority area in energy although there is a Strategic Research Cluster in the area in University College Dublin. The future programme may need to proactively ensure that such centres emerge from the bottom-up process of centre development. Furthermore SFI may want to implement a process to balance the portfolio of centres across areas of academic excellence, industrial requirements and Irish national advantage.

6. Strategic Research Clusters Programme (2007-2012)

Programme Logic Model

Objectives

- Create clusters of internationally-competitive researchers from academia and industry, particularly Irish-based industry
- Support internationally leading investigations across disciplines that are essential to developing and strengthening Ireland's industrial and commercial base
- Create awareness among academic-based researchers of industrial road maps and research goals
- Support excellence in research and education as measured by international merit review
- Exploit opportunities in science and engineering where the complexity of the research agenda requires the advantages of synergy, scale and shared resources
- Facilitate the development of new research partnerships and strengthening of existing partnerships between academic and industrial researchers

Inputs

- SFI Grant funding
- Privately levered cash
- Business in kind contributions of time, equipment, materials and internships

Outputs

- Educational (MSc & PhD awards)
- Published outputs
- Other (national & international presentations and hosted conferences)

Activities

- Number of lead Private Investigators(PIs)
- Number of visited researchers
- Number of Support Staff
- Number of co-PIs
- Number of Post Doc Researchers
- Number of postgrad PhD/Masters

Outcomes & Impacts

- Scientific Awards
- Industry Engagement
- Commercialisation outcomes (patent, invention disclosures, etc.)

Evaluation Aim

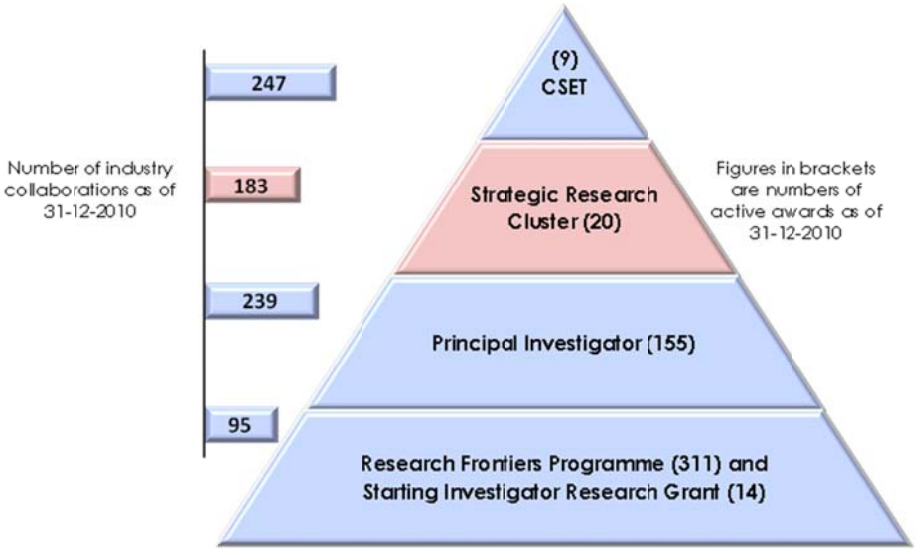
The aim of the evaluation is to assess the appropriateness, efficiency and effectiveness of Science Foundation Ireland's Strategic Research Network Programme. This is an interim evaluation focusing on the period 2007-2012. Frontline Consultants were commissioned by Forfás to undertaken the research and analysis for the evaluation.

Programme Background, Objectives & Target Population

Science Foundation Ireland (SFI) launched the Strategic Research Cluster (SRC) Programme in 2007. The project was designed to fill an identified gap in the provision of funding support for strategic collaborative research between the 'one off' research projects already supported through the individual Principal Investigators (PIs) grant scheme and the large scale collaborative projects supported by the CSET (Centres for Science, Engineering and Technology) programme, and to do so in a way that would:

- Help researchers to address crucial research questions;
- Foster the development of existing and new Irish-based technology companies;
- Provide time and resources to attract and cultivate campus/industry partnerships; and
- Make an important contribution to Ireland and its economy[112].

Figure 6.1: Strategic Research Clusters in the Institutional Research Funding Landscape



The SRC programme objectives have shifted over the duration of the programme. The original objectives of the programme are listed below:

[112] SRC Information Briefing Session, 2008 Competition (Dr Paul Dodd, SFI)

- To create clusters of internationally-competitive researchers from academia and industry, particularly Irish-based industry;
- To support internationally leading investigations across disciplines that are essential to developing and strengthening Ireland's industrial and commercial base;
- To create awareness among academic-based researchers of industrial road maps and research goals;
- To support excellence in research and education as measured by international merit review;
- To exploit opportunities in science and engineering where the complexity of the research agenda requires the advantages of synergy, scale and shared resources that clusters of research partners can provide; and
- To facilitate the development of new research partnerships and strengthening of existing partnerships between academic and industrial researchers.

The wording of some of these objectives has changed over the duration of the programme and an extra objective has been added as detailed below:

- For some objectives, the wording has been 'sharpened' to give greater focus to precisely what impacts the programme is trying to support, and how these can be benchmarked (such as changing the phrase 'frontier research' to 'internationally leading investigations' in point two); and
- A further objective to 'build interdisciplinary links between researchers' has been added.

SRC Governance and Management Structure

While no SRCs were identical in size and structure, SFI required that all SRCs put in place clear Governance and Scientific Advisory functions. As outlined in SFI *Specific Grant Policies - Management and Governance Requirements* guidance, SFI allows for the configuration of the Governance and Scientific Advisory functions to fall under two options:

- Option 1: Establishment of a single committee that serves both Governance and Scientific Advisory functions; or
- Option 2: Establishment of a Governance Committee and a separate Scientific Advisory Board.

For Option 1, the Governance and Scientific Advisory Committee must consist of 6-10 members, including the SRC Director. At least half of the members must be external individuals, and at least 2 must be leading international researchers. Their role includes:

- Provision of oversight of the activities and progress of the SRC;
- Provision of independent, impartial scientific advice on an on-going basis and feedback;
- Assisting in the delivery of 6-monthly progress updates to SFI; and
- Advising the SRC management on policy, strategy and overall objectives.

For Option 2, the Governance Committee must consist of 6-8 members, including the SRC Director. At least half of the members must be external individuals. Their role includes:

- Provision of oversight of the activities and progress of the SRC;

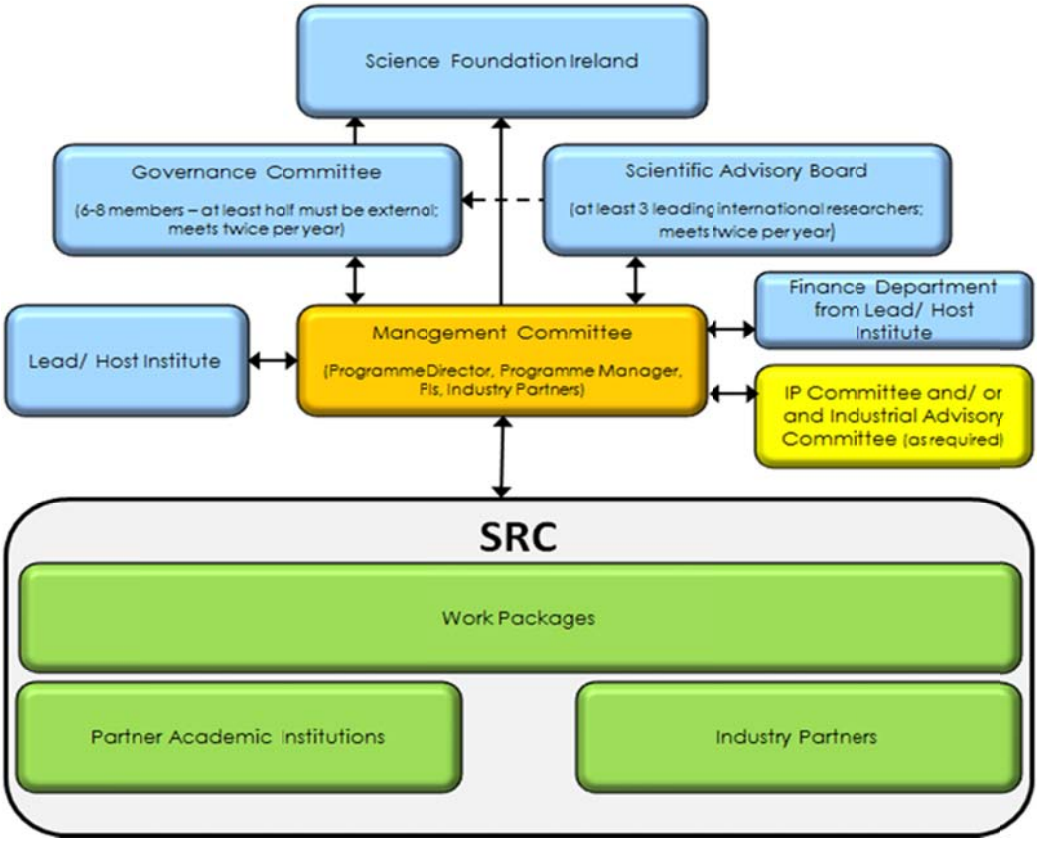
- Assisting in the delivery of 6-monthly progress updates to SFI; and
- Advising the SRC management on policy, strategy and overall objectives.

The Scientific Advisory Board must be composed of at least three leading international researchers and their role includes:

- Provision of independent, impartial scientific advice on an on-going basis and feedback; and
- Assisting in the delivery of 6-monthly progress updates to SFI.

The Management Committee must consist of the SRC Director and co-PIs and may also include the programme/ project manager and industry partner representatives in an advisory capacity. Their role was to support the SRC Director in the day-to-day operations of the Cluster and to help ensure alignment between research requirements and operational plans. Other Committees such as the Intellectual Property (IP) Committee and/ or an Industrial Advisory Committee were set up as required, dependent upon the practices of the SRC. An illustration of an SRC Governance and Management structure based on the Option 2 is presented below.

Figure 6.2: Example SRC Governance and Management Structure



The target population for the programme was any Irish research institute with an interest in and the ability to carry out internationally competitive collaborative research.

Programme Rationale

The consultants were unable to identify any written articulation of the rationale for intervention dating from the start of the programme. However, a market failure rationale was developed through interviews with key project stakeholders as well as an identified gap within Ireland's emerging National Innovation System. These discussions indicated that a rationale for intervention is two-fold, namely:

- **Supporting collaborative academic research in general:** based around the market failure principal of imperfect information; and
- **Supporting the SRC programme in particular:** based on an identified 'gap in the landscape' between the individual PI awards and the CSETs.

The term 'market failure' describes any challenges in the private sector free market that could prevent the desired outcome from occurring without the support from a public sector intervention. In the case of this programme, the market failure case for publically funded support for collaborative academic research can be justified based on imperfect information. This is based on the assumption that markets are only able to operate efficiently in cases where both buyers and sellers have full information about the quality, costs and availability of the product. There were a number of areas where imperfect information may have limited the level of academic and industry collaboration in Ireland including:

- Businesses were unaware of the industry relevant research that is taking place in Irish universities;
- Institute researchers were unaware of commercial applications of their research; and
- Institute researchers were unaware of the potential synergies that could result from collaborations with researchers in other Irish universities.

These provide a rationale for public interventions to encourage greater levels of collaborations between Irish researchers and industry.

SFI's decision to support the SRC programme in particular can be justified based on the identified gap in the collaborative research landscape between the large scale CSET grants and the small scale PI grants.

Evaluation Methodology

While SFI developed a number of performance metrics for use in measuring the performance of each individual SRC, they were not defined in any 'logic chain' structure. The structure provided in the following performance metrics section is the consultant's interpretation of the logical sequence through which the programme outcomes could be achieved.

In addition, the performance metrics used for this programme were based on a standard list of SFI metrics, and had not been designed to specifically align with the programme objectives.

While this constitutes a feasible model for delivering the support, SFI's decision to develop the programme without a pre-defined logic chain is not best practice.

The evaluation is based on research carried out between April and June 2012, including:

- Visits to each SRC, where the following stakeholders were consulted with:

  - Programme director;
  - Programme manager;
  - Sample of PIs;
  - Sample of research students;
  - Research Vice Principal/Dean (or similar role);
  - Technology Transfer Office;
  - Business engagement or business development team (where applicable).
- Interviews with key strategic stakeholders;
- Survey of participating partner businesses;
- Telephone interviews with a small sample of scientific advisory board members;
- Discussions with the programme directors of the closed SRCs;
- Desk review of the SRC annual reports, performance review reports, balanced scorecard reports and performance metrics data; and
- An international comparators review.

It should be noted that, while the SRCs stated in their reports to SFI that the impacts identified were *attributable* to the SRC programme, it cannot be stated for certain that they were *solely attributable*, as many of the research projects were financed through multiple funding streams. In other words, these outputs and outcomes are likely to include a proportion of the outputs and outcomes which would have occurred anyway under the counterfactual, 'without programme' scenario. For example:

- In the case of awards won it may be difficult to differentiate between awards which solely recognise work undertaken within the clusters programme, and awards which recognise work across an academic's full career;
- Some of the publications may relate to papers published during the lifetime of the cluster, but may draw on research funded through other grant streams; and
- Some of the spin-out companies may operate in fields related to the cluster, but may have spun out anyway, even if the SRC programme never took place.

During the course of the evaluation consultations were held with investigators and researchers across 17 SRCs. Consultation with investigators was conducted either face to face or by telephone. The researchers participated in the evaluation by e-survey and a limited number of focus groups. In total, consultations were held with:

- 58 investigators out of a total of 185 (31 per cent):
  - 28 per cent of whom are principal investigators (PIs);
  - 46 per cent co-PIs; and
  - 26 per cent funded investigators (FIs).
- 110 researchers out of a total of 371 (30 per cent):
  - 77 per cent of whom are PhD students; and
  - 23 per cent are post-doctoral research assistants (PDRAs).

Alignment with National Policy

In order for any programme to be viewed as appropriate it is essential that the programme contributes to the achievement of targeted government policy(s).

The Strategy for Science, Technology and Innovation (SSTI) launched by Government in mid-2006 mapped a path that would further transform Ireland in the period to 2013. The three most important pillars of the SSTI from an enterprise perspective were:

▪ Building a world class research system	Significantly increase the number of research teams led by internationally competitive Principal Investigators; upgrade existing research infrastructure and develop new facilities; develop sustainable career paths for researchers; enhance the mobility of researchers; double the number of PhD graduates in science, engineering and technology to nearly one thousand per annum by 2013. Establish a number of graduate schools to provide high-quality training of researchers, and equip them with generic and transferable professional skills that are relevant to a modern knowledge-based enterprise economy.
▪ Capturing and commercialising Ideas and Knowledge	Increase outputs of economically relevant knowledge, know-how and patents from third-level institutions; strengthen the Intellectual Property/ Commercialisation functions within Higher Education Institutes and provide them with expertise to translate research into applications.
▪ Driving economic growth through research and innovation in enterprise	Transform the quality and quantity of research undertaken by enterprise – both directly and in cooperation with third-level institutions; grow business expenditure on R&D from €1bn in 2003 to €2.5bn by 2013; develop a number of industry-led research-driven Competence Centres with research facilities in third-level institutes.

The SRC programme aligns with national policy as set out in the SSTI as outlined above. The SRC aims to create clusters of internationally competitive researchers from academia and industry, particularly Irish based industry and sets targets for the number of industry collaborative partners engaged in each cluster. The SRCs have offered R&D support to both multinational businesses and indigenous businesses (newly established and existing). The SRC also requires investigators from different HEIs to work together within the clusters. Evidence from fieldwork undertaken suggests that this enhanced collaboration experience has increased their capabilities to attract funds from the EU research framework programmes.

Inputs

A total of €128.9 million of SFI direct funding has been allocated to the SRC programme to date to support their research, with the host universities receiving a further 30 per cent of this sum (€38.7 million) to cover the administration costs of the programme. The total direct funding provided was therefore €167.6 million[113].

[113] This figure excludes funding for REMEDI, a former CSET which has since been reclassified as an SRC.

The largest awards (€9m and over) went towards the Reproductive Biology Research Centre and the Immunology Research Centre. The two smallest grants went to the discontinued centres of BioNanoInteract and EEDSP. No programme funding was made directly to the companies involved. SRC grants were awarded for an initial period of 3 years, and will be extended for a further 2 years if they are deemed to be successful in their year three progress review.

Indirect costs

SFI provided Forfás with figures of indirect costs from 2008-2011, these totalled €1.104 million and include costs relating to SFI personnel involved in managing the programme. The table below provides an annual breakdown of the indirect cost[114].

Table 6.1: Indirect Cost Strategic Research Centre

	2007	2008	2009	2010	2011	Total
Indirect Cost (€)	196,692	292,176	114,020	323,893	177,066	1,103,846

The total cost of the programme to the exchequer was therefore €167.8 million over the period 2007-2011.

Other Inputs

This expenditure also leveraged further cash investments from other industry sources, overseas public sector investment and Irish public sector investment. For example, based on evidence provided by 16 of the SRCs, it is estimated that for every €1.00 of SFI investment, the SRCs attracted a further:

- €0.15 of private sector funding;
- €0.52 of funding from non-Irish public bodies; and
- €0.62 of funding from Irish public bodies.

This equates to a leverage ratio of €1.00: €1.29 from an SFI perspective for total leverage (against a target of €2.03) and of €1.00: €0.52 (against a target of €0.54) for leverage from other non-Irish public sector sources.

While it is difficult to quantify how much of this additional funding can be fully attributed to the SRC, all respondents agreed that being part of a cluster of researchers has attracted more funding than otherwise would have occurred and in some instances has created the critical mass that is allowing them to lead in large European funding programmes such as FP7 grants. One reason for this is that, having been involved in the SRC programme; researchers can now evidence their ability and capacity to deliver large collaborative research programmes which includes industry.

[114] Indirect cost is calculated multiplying salary costs of each SFI staff member by the time associated with the programme plus a review cost. A general overhead figure was attributed of 2.85 percent of the total salary cost plus review cost.

Aside from leveraged grant funding, SRCs have been successful – some more than others – in leveraging industry contributions, whether 'in kind' contributions such as the donation of equipment and supplies used in research programmes or staff time, or through 'in cash' such as contract research income. Operational and other institutional stakeholders' feedback was broadly in line with the analysis of annual reports in asserting that industry support had been primarily 'in kind', although there was some mention of success in gathering cash contributions from industry partners.

Outputs and Activities

A total of 21 clusters were funded over the period of evaluation. In 2007, when the SRC programme was initiated, ten clusters were established of which two are now inactive. Geographically, Dublin has the highest number of clusters with 8. The overall level of employment in these centres is 725; REMEDI which started in 2010 has 56 employees, the largest employment of all the clusters.

Table 6.2: Basic Details of SRCs

	Name of SRC	Host Institute	Year started	Investigators and Team Members	Budget
1	Advanced Biomimetics for Solar Energy Conversion	University College Dublin	2007	54 (20 + 34)	5,812m
2	BioNanoInteract[115]	University College Dublin	2007	Not active	3,657m
3	Efficient Embedded Digital Signal Processing for Mobile Digital Health (EEDSP)[116]	University College Dublin	2007	Not active	2,394m
4	FORME - Functional Oxides and Related Materials for Electronics	Tyndall National Institute of Technology	2007	38 (16 + 27)	5,771m
5	Information and Communication Technology for Sustainable and Optimised Building Operation (ITOBO)	University College Cork	2007	38 (7 + 31)	7,935m

[115] Didn't pass the 3 year evaluation so funding was stopped

[116] Ibid

	Name of SRC	Host Institute	Year started	Investigators and Team Members	Budget
6	Irish Drug Delivery Research Network (IDDN)	University College Dublin	2007	35 (5 + 30)	6,234m
7	Network of Excellence for Functional Biomaterials (NFB)	NUI Galway	2007	35 (10 + 25)	5,613m
8	Photonics – Integration "From Atoms to Systems" (PiFAS)	Tyndall National Institute of Technology	2007	36 (15 + 26)	6,970m
9	Reproductive Biology Research Cluster	University College Dublin	2007	45 (9+ 36)	9,365m
10	Solid State Pharmaceuticals Cluster	University of Limerick	2007	48 (12 + 36)	8,607m
11	Immunology Research Centre (IRC)	Trinity College Dublin	2008	28 (10 + 18)	9,032m
12	Strategic Research in Advanced Geotechnologies (StratAG)	NUI Maynooth	2008	41 (12 + 29)	8,838m
13	Alimentary Glycoscience Research Cluster (AGRC)	NUI Galway	2009	34 (8 + 26)	6,560m
14	Clique	University College Dublin	2009	32 (6 + 26)	4,560m
15	Federated, Autonomic Management of End-to-end Communication Services (FAME)	Waterford Institute	2009	39 (7 + 32)	7,444m
16	Financial Mathematics Computation Cluster, FMC^2	University College Dublin	2009	25 (6 + 19)	5,360m
17	Irish Separation Science Cluster	Dublin City University	2009	27 (8 + 19)	6,155m
18	Molecular Therapeutics for Cancer Ireland (MTCI)	Dublin City University	2009	37 (11+26)	7,223m

	Name of SRC	Host Institute	Year started	Investigators and Team Members	Budget
19	Precision	Dublin City University	2009	32 (6 + 26)	5,384m
20	Regenerative Medicine Institute (REMEDI)	NUI Galway	2010	56 (13 + 43)	9,693m
21	Sustainable Electrical Energy Systems (SEES)	University College Dublin	2010	45 (13 + 22)	5,943m

From Table 6.2 (above) the average budget of the SRCS is approx. €6,597m and the average employment is 38 FTEs per centre. The programme funds have been used to support research staff across a range of grades. In the first three years of the programme, the programme funded 25 lead PIs in year 1, 24 in year 2 and 16 in year 3[117]. In year three, the programme also funded 32 visiting researchers, 57 funded investigators, 57 SRC funded support staff, 73 co-principal investigators, 125 post-doctoral researchers, and 221 PhD or Masters Researchers. The total headcount of the programme was equal to 491 in year 1, 569 in year 2 and 581 in year 3.

Table 6.3: Research Staff Funded by Programme[118]

	Year 1	Year 2	Year 3
Lead Principal Investigator	25	24	16
Visiting Researcher	14	19	32
Funded Investigator	43	53	57
SRC-funded Support Staff	50	47	57
Co-principal Investigator	86	80	73
Post-doctoral Researchers	99	130	125
PhD/ Masters Student	174	216	221
Total	491	569	581
Targets	424	567	607

[117] Only includes those SRCs that had reached year three of the programme by the time of reporting

[118] These figures represent the total number of staff in post in each year, rather than new appointments

The above researchers collectively delivered a range of research outputs, including:

- **Educational outputs:** including 8 MSc awards and 36 PhD awards (given that PhDs typically take three years to complete, it is likely that those outcomes claimed by the SRCs in year 2 may not be wholly attributable to the clusters);
- **Published outputs:** including 516 refereed research papers, 80 refereed review papers, 638 conference papers and 176 other publications; and
- **Other outputs:** including 475 national presentations, 1,051 international presentations, and 319 hosted conferences.

Based on this assessment, the SRCs exceeded their targets against each output indicator over the first three years of the programme; these figures are broken down in table 6.5 below.

Table 6.5: Outputs

Outputs achieved	Year 1 Outputs	Year 2 Outputs	Year 3 Outputs	Cumulative Outputs	Cumulative Targets
	Educational Outputs				
MSc Awards	3	2	3	8	No Target
PhD Awards	0	22	14	36	No Target
	Published Outputs				
Refereed Research Papers	87	179	250	516	487
Refereed Review Papers	18	32	30	80	94
Conference Proceedings	87	247	349	683	683
Other Publications	40	71	65	176	No Target
	Other Outputs				
National Presentations	76	174	225	475	264
International Presentations	75	380	496	1,051	655
Conferences	85	121	113	319	111

Impacts & Outcomes

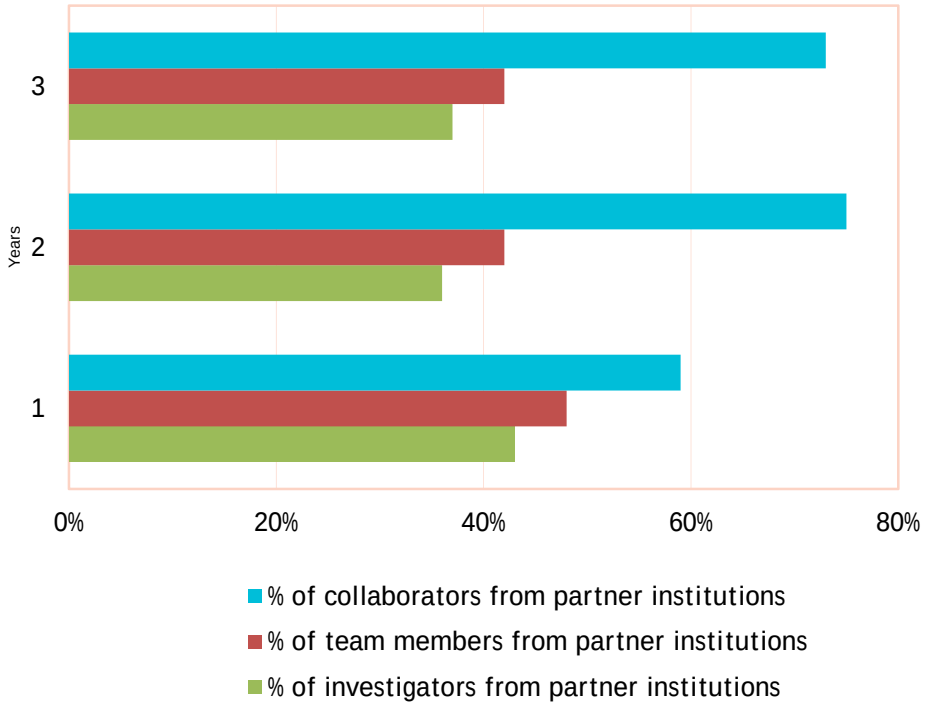
This section measures the impacts and outcomes of the programme. The results are presented in relation to Partnerships, Investigators/Researchers and the Institution.

Partnerships

The process of delivering the above outputs led to a number of outcomes, including improved partnership working between academic institutions. For example, in year 3 of the programme:

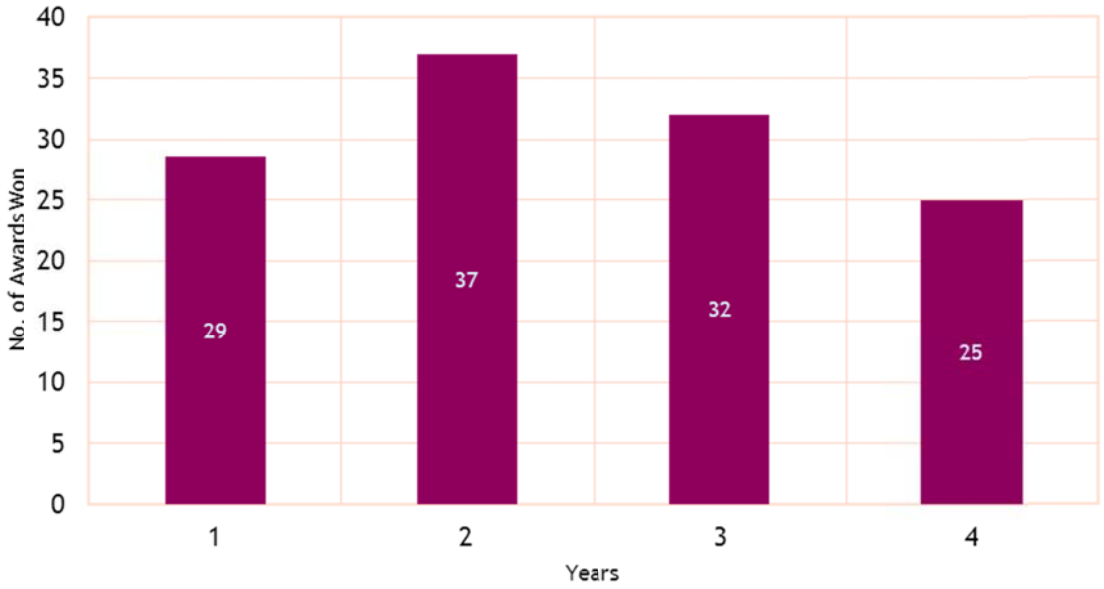
- 40 per cent of the funded investigators (including PIs and co-PIs) worked for a different institute to the one leading the cluster; and
- 43 per cent of the wider funded team members also worked for a different institution, as did 74 per cent of the non-funded collaborators.

Chart 6.1: Partnership Outcomes



A second example of a positive outcome for research participants was where academics received awards in recognition of the quality of their publications. As of September 2012, SRC members received 119 scientific awards, including 29 in year one, 38 in year two, 31 in year 3 and 22 in year four (Chart 6.2).

Chart 6.2: Scientific Awards Received



In terms of industry engagement, there were 72 active industry partner companies working with an SRC by year three of the programme, as well as 8 on-site industry participants, and 27 business partners co-supervising team members. There were also 94 non-partner industry engagements, and the number of new potential industry partner companies contacted had reached 139[119].

Table 6.6: Industry Engagement Outcomes

Outcomes	Year 1 outcome	Year 2 outcome	Year 3 outcome
Active Industry Partner Companies	74	70	72
On-site Industry Participants (FTE)	6	9	8
Co-supervision of Team Members	14	16	27
Non-partner Industry Engagement	54	73	94
New Potential Industry Partner Companies Contacted	64	111	139

[119] These are businesses who have engaged with the SRC on the programme, but are not active industry partner companies.

In addition to the above, the programme has generated a range of commercialisation and technology transfer outcomes. By year three the programme generated 84 invention disclosures, 26 patents applications, 1 patent awarded, and 2 licencing agreements. 7 technologies had been approved for additional funding and 4 spin out companies have been formed.

Table 6.7: Commercialisation and Technology Transfer Outcomes

Outcomes	Year 1 outcomes	Year 2 outcomes	Year 3 outcomes	Cumulative outcomes	Cumulative targets
Invention Disclosures	7	35	42	84	98
Patent Applications	3	10	13	26	47
Patents Awarded	0	1	0	1	8
Licencing Agreements	1	1	0	2	17
Technologies Supported for Additional Funding	0	2	5	7	25
Spin Out Companies Produced	0	3	1	4	5

Under the conditions of the programme, researchers were only required to engage with industry after year three, although a number did so at an earlier stage of their existence. Consultations highlighted a degree of 'shifting of goalposts' during the programme, in that the expectations regarding the timing of industry engagement changed. In this context, although collectively the SRCs did not meet targets for commercialisation outcomes over years 1 to 3, this may not in fact, reflect a failure of the programme to achieve its objectives.

Additionality for Company R&D

The programme has stimulated R&D activities that are additional to those that would have occurred in the absence of the programme. For example, one third of companies surveyed stated that they would not have been able to develop the research or technology at all without SRC support, while 29 per cent reported that they would have developed the research/technology at a later date and on a smaller scale.

The survey also suggests that, as a result of the programme, participating companies will undertake more R&D in the future than would have been the case without the programme. For example, 90 per cent of businesses reported that they plan to undertake further work to develop outputs of the SRC project. On average, businesses plan to spend approximately €500,000 each of further research and development activities related to the work they carried out with the SRCs.

This additional research will normally come in the form of in-house R&D (mentioned by 92 per cent of businesses planning to undertake further work), though 12 per cent of businesses plan to also acquire external R&D support.

Finally, findings suggest that the programme may have encouraged greater collaboration between academia and industry. For example, 81 per cent of respondents stated that they were more likely to engage with universities or institutes now than they were prior to becoming involved in the programme.

Investigators and Researchers

This section considers the range of benefits obtained by Investigators (PIs and Funded Investigators) and researchers (PhD/PGRAs) involved in the SRCs. It looks firstly at the reasons for Investigators' participation in the SRCs; research projects delivery and outcomes; and investigator benefits. The findings relating to PHDs and PGRAs are then set out. Broader outcomes were identified relevant to the institute including educational benefits and reputational benefits.

Investigators

Participation in SRCs

Investigators included their research projects in the SRC for various reasons, and respondents gave multiple answers to the question. The main reason cited was to secure research funding in their main area of interest. The importance of the applied research features strongly with slightly over half highlighting this as a key reason for participating in the cluster, while 48 per cent stated that they viewed the SRC as having a key role in keeping up to speed with industry.

The furthering of their institutional research mission featured slightly more strongly, at 45 per cent than furthering the institute's commercialisation agenda at 40 per cent. A third of investigators were participating to develop new product/ process/services, and a quarter to develop a business opportunity linked to their area of research. Table 7 gives a detailed breakdown of the results.

Table 6.8: Investigator Reasons for Participating in the SRC

	Response Per cent	Response Count
Secure research funding in my main area of interest	79%	46
Gain applied insights into my main area of interest	52%	30
Keep up to speed with industry focus in the main area of interest	48%	28
Further the institute's research mission	45%	26
Learn from industry to enhance my research/teaching abilities	43%	25

	Response Per cent	Response Count
Secure funding for research assistants and equipment	41%	24
Further the institute's commercialisation mission	40%	23
Develop new products/processes/service from research	33%	19
Support businesses in my main area of interest	31%	18
Secure funding for specialist equipment	26%	15
Develop a business opportunity from my main area of interest	26%	15
Other	38%	22

Number surveyed=58, Respondents gave multiple answers to this question

Overall the findings suggest that investigators are attuned to the overarching objectives of the SRC programme, but that the applied and commercialisation objectives of the programme lag somewhat behind fundamental research objectives. This finding aligns with the feedback provided by programme directors and managers.

When asked about support from the centres, Investigators were very positive about on-going support they receive from management of the SRCs with over three quarters viewing it as either very good (51 per cent, 24) or good (28 per cent, 13). The involvement of investigators in the planning of research projects and the setting of targets and milestones varied across SRCs. Most investigators were fully involved, many from application stage. Others have more limited involvement with directors setting the targets, and others stated they have no involvement at all. There was no real correlation between type of investigator (i.e. PI, co-PI or funded investigator) and level of involvement as may have been expected.

Research Projects – Delivery and Outcomes

The majority of respondents' research projects (74 per cent, 40) are being delivered according to the timescales and milestones contained in original plans. Some had a slower start than anticipated for various reasons, such as difficulties recruiting or retaining staff, but have since made up time. Within research projects, some aspects have gone quicker than expected while there were delays with other parts. Indeed, in a third of cases, respondents stated that all research activities planned have been completed, and half felt that most research activities have been undertaken. Given that all SRCs are still progressing, it is highly likely that these projects will be completed on time.

A high proportion of respondents (39 per cent, 21) felt there were no barriers to projects making anticipated progress. Where barriers were cited, the most frequent were around recruitment and retention of staff, particularly in light of recruitment freezes and salary cuts in the university sector. The economic situation in Ireland was perceived as acting as a barrier to attracting people from other countries.

When discussing experience of applied research benefits, there were fairly mixed views. Some respondents felt that they were already fairly focused on applied research, while some viewed it as too soon in the SRC process to be seeing applied benefits. The majority (77 per cent, 37) cite the outcome of being in the SRC as strengthening expertise in core research area, while around two-thirds indicated that there has been technology advancement (65 per cent, 31) and knowledge flows (67 per cent, 32). Around half cite further research stimulus as well as more interest in applied research.

Table 6.9: Applied Research Outcomes

	Response Per cent	Response Count
Strengthening of expertise in core research area	77%	37
Knowledge flows	67%	32
Technology advancement	65%	31
Research stimulus	56%	27
More interest in applied research	46%	22
No applied research benefits	6%	3

Number surveyed=48, Respondents gave multiple answers to this question.

Investigator Benefits

Investigators were asked about the range of benefits and outcomes that had come about as a result of the SRC programme. Over three quarters (78 per cent, 40) of the investigators interviewed recognised that they had seen additional money leveraged into the institute or specifically to their department. Investigators had also participated (and some were successful) in developing applications for additional grants, such as Enterprise Ireland funds ranging from Innovation Vouchers, Commercialisation Fund and Innovation Partnerships. There were numerous examples of large European grants cited, predominately from FP7 funding as well as cash contributions or sponsorships from industry partners.

Investigators have had an overwhelmingly positive experience of the SRC programme, with 90 per cent having either a very good (62 per cent, 33) or good (28 per cent, 15) experience. Positives mentioned included:

- Collaborative aspect, particularly the chance to be involved in inter-disciplinary working;
- Interaction with industry;
- Opportunity to increase headcount/scale of research effort and offer opportunities to post graduate researchers; and
- 'Agility' of the SRCs in comparison to CSETs and large European programmes – this increased pace and makes industry collaboration easier.

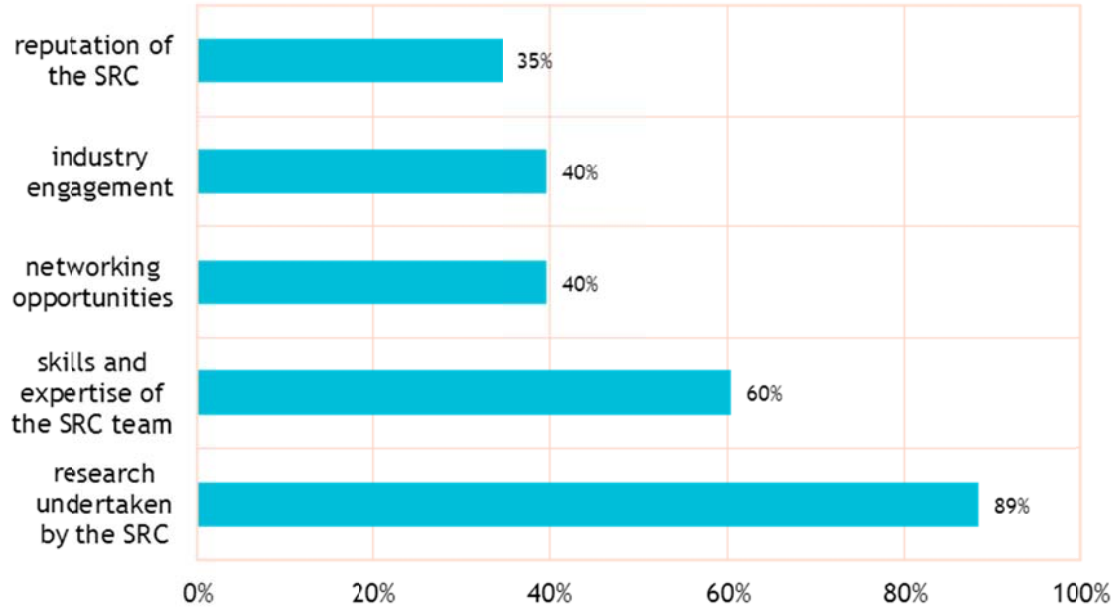
Those with a less than positive experience cited bureaucracy, poor communication and inflexibility as the reasons for this, but they were very much in the minority.

Researchers

Objectives for Participation

The vast majority of PhD and PGRAs were attracted to the SRCs because of the field of research being undertaken (89 per cent, 69). The skills and expertise of the SRC team also featured highly (60 per cent, 47). It is clear that that industry engagement angle of the SRCs is important, as 40 per cent (31) of respondents cited this as being a factor in their decision to join the cluster.

Chart 6.3: PhD and PGRA Reasons for Joining the SRC



Number surveyed=78, Respondents gave multiple answers

Researcher Benefits and Outcomes

The PhD and PGRA respondents identified benefits of the SRCs, and these align well with those benefits recognised by the investigators. The majority (75 per cent, 61) of researchers appreciate that the cluster has internationally competitive researchers, and can see that there are strong inter-disciplinary links among researchers (61 per cent, 49).

Around half of respondents felt there were benefits from the cluster in relation to:

- Developing research partnerships (54 per cent, 44);
- Networking opportunities (54 per cent, 44);
- Promoting excellence in research as measured by international merit review (51 per cent, 41);
- Research agenda (48 per cent, 39); and

- Industry engagement (47 per cent, 38).

There was less recognition that the SRC can support awareness of industrial roadmaps (40 per cent, 32), and only a third (33 per cent, 27) felt it can support internationally leading investigations which support the development of Irish industry.

Table 6.10: Benefits to Researchers of Working with the SRC

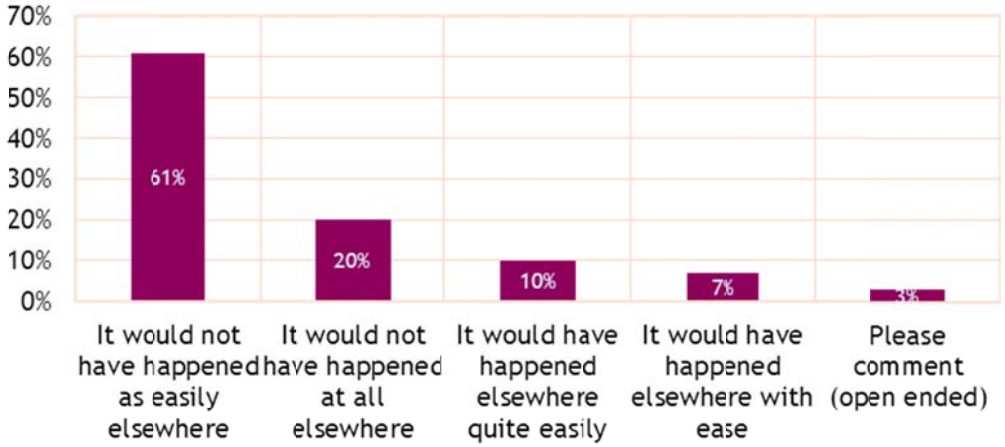
	Response Per cent	Response Count
SRC has internationally competitive researchers from academia and industry	75%	61
Interdisciplinary links among researchers	61%	49
Research partnerships	54%	44
Networking	54%	44
Promotes excellence in research as measured by international merit review	51%	41
Research agenda of the SRC	48%	39
Industry engagement	47%	38
Awareness of industrial roadmaps and research goals	40%	32
Supports internationally leading researchers that are essential to the development and competitiveness of Ireland's industrial and commercial base	33%	27

Number surveyed=81

Researcher Additionality

Researchers viewed the SRCs as instrumental to the above benefits being realised such that 20 per cent (16) state they would not have happened at all, and a further 61 per cent (49) highlighting they would not have come about as easily elsewhere. Figure 7 presents the overall additionality results.

Chart 6.4: Researcher Additionality



Number surveyed=81

Researchers were asked what they thought would have happened, if they had not come to the SRC. While some would still have followed a research pathway and completed a similar role elsewhere others would be working with industry and some would have left Ireland.

Researcher – Potential Improvements Identified

Researchers suggested a wide range of improvements to the programme, from increased links with industry, to more involvement of the Science Advisory Board, to better equipment budgets. One area that was consistently highlighted was the interaction with other institutes. While researchers were involved in this they believed there was scope for further multidisciplinary and inter institute developments citing this as key to the role of the SRC. Some specific examples are presented below followed by a selection of quotes:

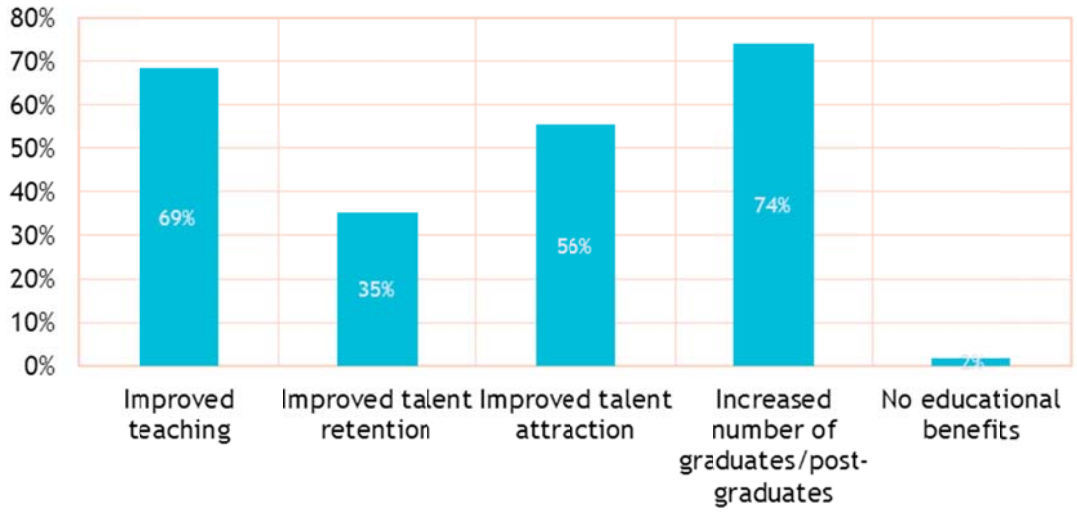
- Arrangement of more international conferences in Ireland particularly in multi-disciplinary sciences;
- More interaction between researchers based in different institutes;
- More significant involvement of the scientific advisory board;
- More inter-institute collaborations and placements for PhD students to strengthen links and develop contacts further;
- Encourage true collaboration of academics and industry working together;
- Industry collaboration should be seen as an opportunity, not a requirement;
- More training opportunities;
- An increased budget for equipment;
- Further opportunities to liaise with industrial partners; and
- Better support from PIs.

Institution Benefits and Outcomes

Educational Outcomes

The key educational benefits were perceived by investigators to be the increased number of PhDs and PGRAs employed as a result of the SRC funding – 74 per cent (40) of respondents mentioned this. A large proportion (69 per cent, 37) also mentioned improved teaching as an educational benefit. An example of this would be increased access to facilities, courses and expertise being offered by different universities across a single cluster. Improved talent attraction, and the knock on benefits of this for post graduates and taught courses was also highlighted (56 per cent, 30).

Chart 6.5: Generation of Educational Benefits for the Institute



Number surveyed= 54, Respondents gave multiple answers to this question

Network Outcomes

The key network benefit highlighted by 80 per cent of respondents was improved networks with other research institutes – both within Ireland and internationally. 41 per cent of respondents had seen a member of their research team leave to join industry. This included industry partner companies in many cases, although some did move overseas. Moving from an institute research position to take up a company position is generally viewed positively – it is evidence of enhanced career prospects being offered by the cluster.

Table 6.11: Network Outcomes at the Institute

	Response Per cent	Response Count
Improved external networks - with other institutes/research organisations	80%	41
Improved internal networks - within the institute	59%	30
Companies engaging with the institute (non-monetary value)	57%	29
Improved external networks - with businesses	57%	29
Companies engaging with the institute (monetary value)	45%	23
Improved external networks - other business support agencies/providers	37%	19
Greater engagement with VCs and angel investors	6%	3

Number surveyed= 51, Respondents gave multiple answers to this question

Reputational Benefits

The vast majority of investigators feel that both the institute (87 per cent) and the investigators themselves (94 per cent) have benefited from improved reputation as a result of SRC involvement. Almost three quarters (74 per cent) are of the opinion that the institute has seen increased demand for engagement from industry as a result of enhanced reputation and almost two thirds (65 per cent) stated impact on the individual or team. Around 60 per cent of investigators cited improved demand for engagement with other institutes in the same discipline and around 40 per cent highlighted examples in other disciplines. These indicators are positive signs of real collaborative benefits that are occurring as a result of the SRC.

Table 6.12: Reputational Benefits

	For institute	For individual/ team
Improved approachability	57%	60%
Improved demand for engagement - industry	74%	65%
Improved demand for engagement - within same institute, different disciplines	42%	37%
Improved demand for engagement - other institutes, same discipline	64%	60%
Improved demand for engagement - other institutes,	43%	39%

	For institute	For individual/ team
other disciplines		
Improved reputation	87%	94%
Improved employability of staff	-	64%
No reputational benefits	4%	0%

Number surveyed= 52, 53

These findings resonate with the views of the strategic interviewees discussed in the previous section and support the evidence analysed from reports and reviews that the SRC is having an impact on stimulating collaboration.

International Comparators

While the development of the CSETs was modelled on an American research centres approach, there was no similar model identified for the SRCs and as such it has been difficult to find international comparators of similar size and structure. This section gives an overview of publicly funded collaborative research delivery models outside of Ireland and illustrates how Ireland's SRC approach compares.

Sweden

The majority of public R&D funding in Sweden comes from two agencies – the Swedish Research Council and INNOVA, their innovation agency. While the former focuses on individual grants, INNOVA is more focused on collaborative industry-led research as well as the development of collaborative research centres.

While the first centre programme in 1990 focused on one specific research area, it was followed in 1995 by a Competence Centre programme. This programme focused on industry-relevant long term research programmes (i.e. 10 years over two five year funding periods – similar to CSETs), where industry participated and provided part funding to support a change in culture of HEI research through encouraging:

- Greater interaction with industry; and
- More collaboration, teamwork and inter-disciplinary approaches.

Their main aim is to lead to more rapid uptake of technology from research institutes. The Competence Centres have since been succeeded by three programmes:

- VINN Excellence Centres – continuation of the Competence Centre approach;
- Berzelii Centres – focus on areas with higher scientific and technological risk; and
- Industry Excellence Centres – pilot programme requiring high levels of industry input from the outset.

The Berzelii Centres are the most similar to the SRCs, with lower levels of industry output at the outset and increase over time. Although these models started in 1990, Sweden has a

well-established approach for applied research institutes with 23 centres which date back to the 1940s. Despite these having maturity behind them, they still rely on monies from INNOVA for their core funding. Sweden has a portfolio of over 120 research centres employing 5,200 people and covering the continuum from pure basic research to applied R&D.

Finland

Dedicated public support for HEI started in Finland in 1939 with the establishment of the Academy of Finland. It took until 1983 before the innovation agency Tekes was established. Since 1995, research centres have been supported through a Centres of Excellence programme, which aims to support international quality research and train top-class researchers with the ultimate goal of raising the quality of Finnish research. Some are part funded by Tekes, others by industry. The Centres of Excellence programme is responsive in nature, evolving around HEI priorities whereas Tekes funds through grants, predominantly in collaboration with industry, and thematic funding areas. Approximately 50 per cent of Tekes funding is thematic.

The most recent addition is collaboration between Tekes and the Academy in the development of Centres of Science, Technology and Innovation (SHOKs). These are legally constructed public-private partnerships that operate across five thematic areas. It is expected that more of these centres will be added once the initial five have been thoroughly piloted.

Finland also has a group of long standing research institutes, some dating back to the late 19th Century. Excluding the SHOKs, Finland has over 60 research centres employing over 9,000 people. This number is high predominantly due to the state funded research institutes. The SHOKs are viewed as the most closely aligned to SRCs, however these are to date untested.

Catalunya

R&D levels in Spain were very low prior to late 70s as most research was linked to government departments. During the mid-80s, a dedicated science, technology and innovation policy was established leading to increased budgets and growth in research in HEIs. In the early nineties the government established the Catalan Research Centres (CERCAs). There are currently 39 CERCAs which are focused on predominantly basic research. Recent regional strategies have tried to shift this towards more demand-based research; however, the majority of the budget is still basic in nature.

To support the focus on applied research, the government created the TECHNIO network. This is focused on technology transfer from existing research centres and has a main aim to make it easier for industry to access new technologies and develop collaborative research ventures.

There are approximately over 160 research centres in Catalunya, employing over 11,000 people. While this figure may seem high compared to Sweden and Finland, the figures are inflated by the large number of HEI-based members of the TECHNIO network and there are a number of very large health research centres. Based on this landscape, there are no centres that are similar to the SRCs.

In Conclusion

All three comparator research centre landscapes, like Ireland, have evolved from the bottom up, aligned with science and technology policy development. In addition, all have responded to research community and industry demand. While the actual composition of the research centre portfolio is different, they are all looking to establish critical mass in key research fields and improve linkages and collaborations between institutes and industry. While research centres are the favoured approach for the former, in the case of the latter, Sweden and Ireland have opted for long term academic-industry collaborative models, mainly led by HEIs, and Finland has adopted for a more thematic approach. The Catalan Government is recently focusing on industry-facing academic groups.

There appears to be no published information in the public domain on the three international comparators to provide an indication of costs or quantitative impacts. Therefore, it was not possible to estimate how the outputs and impacts from the SRCs compare in the international context.

Findings

There are a number of positive outputs and outcomes emerging from state investment in SRCs which are set out below. A number of areas have been identified where improvements can be made in the future.

Research Clusters and Critical Mass

Real research clusters have started to develop with all stakeholders citing that the SRCs have been important in building critical mass – this is not just at a research level but also with the links to industry. These clusters also appear to be developed around genuine collaboration, rather than just co-location. This is evident in the number of funding awards that Irish institutions now receive from the EU, often based on applications developed collaboratively between SRC partners.

Current SRCs are strengthening research in key areas which are well aligned with the new research prioritisation exercise. They have also already leveraged extra resources in these areas and a number of SRCs have partnered with other SRCs/research centres in the current SFI Research Centres Programme call. From interviews, it is understood that a number of SRC bids have been successful in getting through to the next stage of this call which is a testament to their ability to grow to a centre of scale.

Strategic Importance

SRCs (and research centres in general) are majorly important for Irish institutes on a number of levels:

- Attractors to industry – they are viewed as doorways into the institute;
- Attractors to leading scientist in key research disciplines;
- Attractors to students who want to study or start their research careers in globally recognised research centres;
- Part of the brand development of the institute; and

- An important mechanism to link into and help exploit other programmes such as PLRTI infrastructure monies.

The institutes highlighted the key role the SRCs played in building their 'research credibility'.

Skills Development

There have been examples of extensive skills development across all participants, these include:

- Capacity and capability development of SRC directors and managers;
- Development of research competences for PIs/co-PIs/FIs; and
- PhD students and post docs have developed more skills aligned with the requirements of industry.

SRC Programme Management

All monitoring of outputs happened at an individual SRC level with limited programme level assessment. This has led to the programme being managed more operationally rather than strategically. In addition, there was a need for a performance management framework which aligned metrics to objectives.

This lack of an overall strategic approach minimises the ability to review lessons learned and establish best practice at a programme level.

While this programme evaluation does go some way to help this, it is somewhat after the fact and as such is insufficient to capture all the lessons. In addition, with no actual baseline assessment it is difficult to assess what has happened as a direct result of SRCs as opposed to what would have happened anyway.

Evaluations and Peer Review

Peer review is the evaluation mechanism of choice for SFI. This is done through formal interim reporting stage prior to awarding the years 4 and 5 grants as well as through the SABs which are required to have an international science perspective where possible, to inform the direction of the research.

While this is good from a scientific output perspective, it does not take fully into account the wider industry linked benefits and impacts that have occurred. Each SRC does however have industry members which help ensure that industry considerations remain a priority.

Time spent on IP and Consortium Agreement

The level of time spent on the development of the IP and consortium agreements was continually cited as excessive. IP negotiations and agreements between HEIs and Industry partners has been identified as an issue over the past number of years and is not particular to

SRCs. Steps are being taken to address the situation including for example the recent publication by the Department of Jobs, Enterprise and Innovation of IP protocol guidelines[120].

Emphasis on Socio-Economic Impacts

SRCs have successfully engaged with a wide variety of different businesses, large and small and multi-national and indigenous. However, the nature of product commercialisation means that the programme has only been able to advance the technologies to a partial extent, and significant further work will need to be undertaken by companies in-house before most of the technological advances can be turned into a market ready proposition.

A view was expressed during consultations that there appears to be an increased emphasis on delivering socio-economic impacts – particularly in the current environment of constrained resources. While a greater emphasis on socio-economic impacts is understandable given the role of the SRCs as clusters of internationally-competitive researchers from academia and industry, pushing them too much in the direction of short term direct socio-economic outputs will likely harm the medium to long term strategic approach, the opportunities to create new markets with more disruptive technologies and the systemic effects.

As international benchmark studies show, it often takes more than 10 years before research and technology institutes manage to stabilise their scientific reputation, before significant socio-economic effects can be achieved. In addition many socio-economic benefits are not readily measurable, for example the spill-over effects of well-trained scientists and technologists as they enter the Irish labour markets.

Conclusions

Appropriateness

The Strategic Research Centre programme is appropriate in the context of enterprise and science policy in Ireland. It provides an essential space for researchers in the institutional research funding landscape.

As the international comparators section shows a similar approach has been used in other countries to improve support for collaborative research.

The SRC programme should be better managed from a strategic point of view. Each SRC developed their own targets based on their own experience. In addition there was no formal alignment of these targets with the objectives of the SRC Programme. This may be as a result of SFI having the same metrics framework for their entire programme portfolio as opposed to having a specific set aligned to individual programme objectives. While a 'one size fits all solution' for metrics assessments may seem good regarding consistency across programmes it does not demonstrate where the focus of a project or programme should be.

120 http://www.djei.ie/publications/science/2012/Intellectual_Property_Protocol_Putting_Public_Research_to_Work_for_Ireland.pdf

Effectiveness

Notwithstanding the concerns around defining best practice for the SRCs, it appears that the programme is working well. This is evidenced by good progress against targets as demonstrated in the outputs and the impact section of this evaluation. In addition only two SRCs did not progress towards years 4 and 5 following the international peer review. The peer review reports during year three also emphasised the international standing created by the majority of SRCs.

There has been a demonstrated logical path through which the programme inputs and activities have led to outputs, outcomes and employment impacts, and the programme has recorded encouraging results along each stage of this journey.

The evidence suggests that there were good partnership outcomes in the form of increasing industry engagement and technology transfer.

The number of scientific awards generated is also a positive impact of the programme.

Even at this early stage of the programme, real research clusters are starting to develop.

Efficiency

In terms of process efficiency, as noted above, the vast majority of respondents felt positive that their SRC management team had given them either good or very good levels of support. This is evidence of efficiency in the management of the programme.

Similarly, with the vast majority of research components delivered according to original timescales, it is clear that overall there has been efficiency in the delivery of the programme. However, there were delays in some projects, and issues were not just those of a technical nature. There were inefficiencies in the resourcing of some projects, including recruitment, where a number of projects failed to increase capacity sufficiently quickly.

The majority (78 per cent) of investigators recognised that the SRC funding had allowed investigators to lever in additional research monies and industry contributions, supporting assertions of the stakeholders that the programme was cost efficient. The success of the SRCs in leveraging additional research funding and contributions from industry – whether 'in cash' or 'in kind' – was recognised as having a positive impact on the overall cost efficiency of the programme allowing SRCs to achieve more with their budgets.

A final consideration under cost efficiency is sustainability. While all stakeholders stated that the SRCs have facilitated the development of a critical mass of research expertise and activity, losing this was of great concern to the majority of them. It was clear from the interviews that clusters were not viewed as being self-sustaining entities in their five year life span, with most believing that, like CSETs, they would at least require another funding round.

In summary, the programme has been efficient. However, due to the lack of a suitable comparator for the cost of the programme it is not possible to be definitive about cost efficiency.

Duplication/Synergies

Stakeholders across all groups overwhelmingly agreed that the SRCs complement and add value to other public sector programmes, such as the Innovation Partnerships Programme or the Commercialisation Fund, rather than overlap.

It was consistently reported that the SRC structure has acted as an enabler to access other grants. For example, the majority of SRCs have accessed EU FP7 funds and some are, or will be leading these large programmes of collaborative research. The experience gained delivering SRC programme-level research and the credibility of the SRCs were recognised as being instrumental in the success of winning wider research grants, by a large number of interviewees across all stakeholder groups. The corollary of this for some was that the end of SRC funding could potentially jeopardise their chances of future success in similar bids.

The potential for overlap between SRCs and EI and IDA's Technology Centres was raised by one interviewee, given the focus on supporting industry/academic partnerships in the research. However, the stated mandates indicate a different emphasis. Technology Centres have a specific mandate to pursue an industry-led research agenda for foreign and indigenous companies in Ireland, while the SRCs are more focussed on creating clusters of internationally competitive researchers from academia and industry and they are more focussed on academic-led research. An evaluation of the Technology Centres will be undertaken in 2013 and will provide greater insights into any potential duplication.

Recommendations

Recommendation 1: Need for a Robust Appraisal Process

In recent months, SFI initiated a new Research Centres programme based on a hub and spoke model that replaces the CSET and SRC programmes. It is suggested that prior to the start of the new Research Centres Call a robust ex ante appraisal be conducted aligned with the best practice which would ensure clarity of objectives for the programme, identification of specific metrics, data collection methods etc.

Recommendation 2: Need for a Performance Monitoring Process

While SFI undertook on-going monitoring of each individual SRC, no programme level monitoring was undertaken during the course of the programme. It is recommend that, for future interventions, a robust monitoring framework should be developed prior to the start of the programme, providing details of:

- **Report milestones:** regular milestones for monitoring reports;
- **Report contents:** early reports should focus primarily on performance against activity and output metrics, while later reports should focus more on outcome and impact metrics;
- **Data gathering responsibilities:** to provide clarity on who has responsibility for gathering, verifying and archiving data;
- **Procedures for monitoring programme changes**: to record and explain any alterations to programme objectives or targets; and
- **Consistency across targets**: a set of guidelines to help with monitoring and establishing monitoring and review points to support the development of measurable programme targets.

Recommendation 3: Improving the Industry/Academia Agreements and IP Agreements

The IP and Consortium Agreements (CA) were highlighted as problematic from the outset of the SRC programme. There is a need for better SFI guidance on IP and CA. This would have helped in managing some of the issues that arose between SRCs and their industry partners. The recently launched national framework for IP should go some way to help in establishing this guidance. In addition the new 'hub and spoke' model in the current research centres call will allow bilateral IP agreements in addition to a 'softer' multi partner approach.

Recommendation 4: Establishing the Right Industry Contribution Model

SRCs did not require industry involvement at the outset, with the industry contribution being necessary during year 4 onwards. In reality the majority did have (some) industry involvement from the outset. Contribution from industry in the SRC model could either be 'in kind' or 'in cash' with both contributing to industry leverage targets. The new Research Centres model recognises the importance of industry contribution and as a result SFI deemed it a requirement at the proposal stage with industry partners demonstrating their planned 'in cash' contribution at this time.

There is general agreement that it is important to have industry involvement from the outset as this has the potential to have increased commercial benefits and economic return to Ireland. However, stakeholder concerns were raised about the 'in cash' contribution model. In the current recession cash is a premium, and while it is important to demonstrate leverage and returns to Ireland, it may be the case that this model could exclude companies, particularly smaller indigenous companies, who may benefit immensely from the new technology.

An alternative model would be one that includes 'in cash' and 'in kind' but more of the latter at the outset. The result of this approach should encourage more companies to get involved and could result in wider benefits to Ireland in the medium to long term.

Recommendation 5: Establishing the Best Industry Partnerships

While the level of applied research activity is often related to the research area in which the SRC operates in combination with the level of industry activity and availability, some SRCs require a greater degree of industry related advisory inputs. Providing such industry advice where necessary would ensure that the most appropriate industry partner is sought so that both parties benefit fully from the engagement.

Recommendation 6: Improving the Peer Review Process

In the current model the peer review process focuses more on the academic outputs rather than the commercial outputs. While the Strategic Advisory Board has industry representatives they had limited involvement in assessing the outputs. It is recommended that any future assessment panel has a mix of academic and industry representation to ensure all targets and objectives are evenly assessed.

7. Innovation Partnerships (2004-2006)

Programme Logic Model

Objectives[121]

- Increase collaborative research projects between companies and knowledge providers
- Increase the level of R&D in the private sector
- Increase the level of commercialisation activity in the Higher Education Institutes
- Use academic knowledge and expertise to gain competitive advantage

Inputs

- Enterprise Ireland contribution – through grants to each of the 19 institutes
- Private sector funds amounting to approximately 40 per cent of overall funding
- HEI funding of Principal Investigator and provision of location for research

Outputs

- Number of Innovation Partnerships
- Percentage of sample engaging in "follow on" activities
- Number of product, service and process outputs
- Increased competencies for academics (reputational, educational, etc.) and companies (competitive advantage)

Activities

- Technical and commercial revaluation of proposals
- Promoting and marketing
- Feedback to Applicants

Outcomes & Impacts

- Increased collaborative research between private sector and knowledge institutions
- Increased turnover
- Increased employment
- Increased R&D activity in Companies

[121] Frontline Evaluation of the Innovation Partnership Programme, May 2010

Evaluation Aim

The aim of the evaluation is to review the appropriateness, efficiency and effectiveness of the Enterprise Ireland Innovation Partnerships. An evaluation was conducted in 2010 by Frontline Consultants on behalf of Enterprise Ireland. The report was delivered to Enterprise Ireland in May 2010 and informs the analysis set out below.

Programme Background, Objectives & Target Population

The Innovation Partnership Programme was launched in 2000 and encourages Irish-based companies to work with Irish research institutes resulting in mutually beneficial cooperation and interaction. To qualify for funding, the research project must outline how the company will benefit in terms of its growth, the evolution of strategic R&D within the company and the creation of new knowledge that can be used by the company to generate commercial advantage. The grant is paid directly to the research institute, and it should have an intellectual property rights agreement with the company as part of their engagement.

Between 2004 and 2006, Enterprise Ireland provided grants of between 50 per cent and 70 per cent towards the eligible costs of the research projects, which took place over a 12-24 month period, with typical duration of 18 months. All manufacturing, processing and internationally traded service companies, with an operating base in the Republic of Ireland, collaborating with Irish third-level institutes were eligible to participate.

The objectives of the Programme during the evaluation period were:

- Increase collaborative research projects between companies and knowledge providers;
- Increase the level of R&D in the private sector;
- Increase the level of commercialisation activity in Higher Education Institutes; and
- Use academic knowledge and expertise to gain competitive advantage.

Target Population

Irish based companies.

Evolution since 2004-2006

The Programme is evolving and there have been some modifications since the period of evaluations. There is now a clearer direction towards supporting commercial outputs that will fast track economic development – changes to the programme include the following:

- The level of grant intensity has changed since the period being evaluated. During 2004-2006, grant levels ranging from 50 per cent to a maximum of 70 per cent of eligible expenditure were provided. Bonuses were provided for regional locations and engagement with SMEs (these no longer apply). Today six different grant levels apply, ranging from 40 per cent to 80 per cent depending on the size of the company and the type of research being undertaken. Company size is categorised as small, medium and large and type of research is categorised as Industrial Collaborative Research and Experimental Collaborative Development. With regard to eligibility, in 2004-06 any business could be involved, but this is now restricted to clients of Irish Government Agencies such as Enterprise Ireland and IDA Ireland;

- There were no limitations to High Potential Start Ups in 2004-06 but they now cannot own the Intellectual Property created;
- In 2004-06 requests to fund PhD and MSc training was eligible as part of a proposal, whilst now only experienced personnel can be included, other than in special cases; and
- There is now an indicative maximum grant available per project of €300k.

A real strength of the Innovation Partnership programme has been its evolutionary nature. The majority of stakeholders interviewed, with the benefit of hindsight, believe the Programme has changed positively to meet economic circumstances.

Programme Rationale

The primary objective for the Innovation Partnership Programme is to support leading edge, collaborative research between companies and research Institutes.

An evaluation of the UK based Teaching Company Scheme, the precursor to the Knowledge Transfer Partnerships programme (a description of which is contained in International Comparators section below), suggested that the primary rationale for this type of intervention is based on:

- Firms, especially SMEs, have difficulty exploiting technological developments that are outside their established capacities; and
- Insufficient use being made by industry of the wealth of expertise and technology available from the UK's knowledge base[122].

The implication is that there is a market failure, or more appropriately a market imperfection around access to information on the potential costs and benefits for businesses in engaging with the academic and research base to improve or develop new products, processes and/or services. Information deficiencies are about more than a simple lack of understanding of the process, costs or benefits. They actually reflect:

- Demand for information - businesses want to improve their business performance;
- Information is not readily available – where businesses do work successfully with the research base they do not publicise their experiences, while wider academic studies in the area are patchy and inconclusive;
- People do not always have the knowledge or capacity to make the best choice – developing new product, process or service innovations is a highly complex, time consuming and complicated process, with skills requirements often beyond a number of business managers current expertise (and therefore high cost and high risk); and
- A mismatch between perceived costs and benefits – for businesses the assumption is that working with academia is expensive and with a lack of clarity on the return this loads the cost element while not adequately reflecting the full potential benefits.

The rationale for the Innovation Partnership Programme is therefore set against the market failure of information deficiencies.

By undertaking an Innovation Partnership companies can develop their businesses, and can:

[122] SQW Limited (2002) Evaluation of TCS, DTI Evaluation Report Series Number 7

- Access technologies developed in the Irish third-level sector;
- Follow a cost-effective approach to innovative product and process development;
- Access an R&D capability that not present in-house; and
- Access high quality researchers, capital equipment and know-how.

Alignment with National Policy

The Innovation Partnership Programme was launched in 2000 as a successor to the Applied Research Grants Programme. At the time it was one of the three core elements of the RTDI (Research, Technological Development and Innovation) Collaboration Programme. This was part of Ireland's Operational Plan for Industry 2000-2006, which represented a strategic shift in the importance of R&D in Irish policy and Government ambitions. This new commitment was highlighted by high levels of funding allocated at a national level.

This evaluation focuses on impact achieved over the 2004-2006, and it is important to take note of how the policy environment evolved during this time. In July 2004, at a time when Ireland had experienced a decade of sustained growth, the Government launched the Enterprise Strategy Group Report, *Ahead of the Curve.* The report identified that Irish firms needed to move beyond excellence in production and to 'build technological and applied research and development capability to support the development of high value products and services'[123].

In parallel to this enterprise strategy report, '*Building Ireland's Knowledge Economy – The Irish Action Plan for Promoting Investment in R&D to 2010'* was launched in July 2004. This called for business investment in R&D to increase to €2.5 billion in 2010, or 1.7 per cent of GNP. To help achieve this, the report called for a significant increase in budgets to enable businesses to adopt a systematic and continuous approach to R&D.

Enterprise Ireland had an important role to play in implementing these strategies, with ambitious targets set by the Agency over the 2005-2007 period; 'doubling to 1,050, the number of firms engaged in meaningful R&D (in excess of €100,000 per annum) by 2010' and 'increasing threefold, to over 100, the number of indigenous enterprises performing significant R&D' (in excess of €2 million)[124]. The Innovation Partnership Programme was viewed as being highly relevant in encouraging R&D collaboration between companies and the wider research community.

The longer term strategic importance of business investment in R&D in Ireland was again highlighted in the *Strategy for Science, Technology and Innovation 2006-2013,* which called for continued support for Higher Education Institute/industry collaborative research, with the Innovation Partnership Programme cited as an enabler for building links between companies and research groups to allow industry to access expertise and facilities available.

In more recent times, as Ireland faces very challenging economic conditions, the Government's *Building the Smart Economy* (2008) aspires to make Ireland 'an innovation and commercialisation hub for Europe' with a focus on generating economic return from knowledge creation. The aims and objectives of the Innovation Partnership Programme remain valid and relevant to achieving Ireland's plan for economic recovery.

[123] Ahead of the Curve, Enterprise Strategy Group, 2004

[124] Transforming Irish Industry, 2005-2007, Enterprise Ireland

Evaluation Methodology

The review of the Programme was conducted in 2010 and focused on firms participating in the Innovation Partnerships programme from 2004 to 2006. The review focused on:

- Ensuring that the objectives of the Innovation Partnership Programme are being met;
- Answering whether the Programme is proving to be effective; and
- Demonstrating whether the Programme represents value for money.

The following stakeholders provided feedback on the Programme, regarding the outcomes, outputs and impacts:

- Strategic Stakeholders, Enterprise Ireland, Higher Education Authority, Irish Development Agency, Technology Transfer Offices and Vice Principals of Research in Institutes;
- Principal Investigators (PIs); and
- Companies (feedback that enabled quantifiable outcomes and impact).

Frontline Consultants chose the timeframe from 2004 to 2015 for assessment of participating companies. The evaluation assesses the outcomes of the participating companies over the period to 2009 and forecast to the period 2015. This is estimated by the consultants as sufficient time for impact to be realised (since it can take several years for innovation partnership activities to translate into product or process improvements and increased turnover).

Between 2004 and 2006, 145 Innovation Partnership projects were undertaken involving 109 companies and 19 institutions. The survey sample included 54 of the 109 companies (50 per cent) and 71 of the 145 partnerships (49 per cent) undertaken. Given that this evaluation takes place 4-6 years after the innovation partnerships began, the survey response rate of 49 per cent is satisfactory.

The programme achieved a good sectoral spread, with 40 per cent of companies from industrial technologies sector, 32 per cent from life sciences & food and 28 per cent from information and communication technology sectors. Irish owned companies represented just short of half at 49 per cent of the total surveyed; foreign owned subsidiaries represented 21 per cent of companies surveyed.

The evaluation also contains input from interviews, with 31 PIs who were involved in 37 of the 145 Innovation Partnerships over the evaluation time period.

Through guided discussion, Frontline Consultants garnered good data from company interviewees where they identified that their partnership had resulted in a quantitative impact. It is important, however, to bear in mind challenges when considering programme impact, in that in some instances the:

- Interviewee could not quantify impact – either because they did not know (for example, they had a technical not financial or sales role in the company) or because they thought it was impossible to identify impact specifically resulting from the partnership; and the
- Interviewee made best guesses, but underlined that these, particularly concerning future impacts, were surrounded by high uncertainty.

There is a tendency for companies to overestimate the future returns from R&D-related projects. A rule of thumb developed by venture capitalists, for example, is that it can take

companies twice as long to generate half as much as they expect - an optimism bias rate of 75 per cent[125].

Frontline Consultants' impact modelling (Cost Benefit Analysis CBA) incorporated caution through the introduction of such an 'optimism bias' assumption in projecting forward turnover impact. They assumed that turnover would stay constant at the 2010 levels given by the company until 2014 (unless interviewees told interviewer otherwise). For the final year of impact in 2015, Frontline Consultants reduced the difference between the 2015 and 2010 figures given by the company projection by 75 per cent, before adding to the 2010 figure.

Impacts and Value Added Methodology

Frontline Consultants built an impact model using the data received from companies, running from 2004 to 2015, giving enough time for impact to be experienced.

Gross profit and staff costs were requested of the companies in each of the years to enable the estimation of EVA[126] through the addition of these variables. While depreciation and amortisation also form part of the EVA estimation process, these values were excluded to avoid over-burdening the companies in the survey element of the work (they are also the smallest parts and can therefore be excluded without significantly undercounting impacts).

Turnover was requested of the companies on an annual basis from the year of their Innovation Partnership to a projection for 2010. A projection was also requested for five years' time in 2015.

The estimates for the survey are grossed up to be representative of the full population of 145 by applying a grossing up ratio of 2.04 (145/71). Implicit in this assumption is that the same level of impact would be expected across those companies not interviewed as those interviewed. Impact estimates are collated on an annual basis and then fed into a cost benefit calculator which assesses the ratio of costs to benefits, all discounted back to the base year of 2004. This is done both for impact to date (2004-09) and for the total period (2004-15).

The results are discounted in line with Ireland Department of Finance guidance at a rate of 4 per cent per annum. For the Innovation Partnerships Programme the base year was 2004, representing year zero of the programme, or the year of first investment. The period of impact assessment runs from 2004 to 2015. This allows a time horizon for the full impact of the Innovation Partnerships to be experienced, given that, even in 2010, several were still anticipating future impact which has yet to accrue.

Gross to Net Adjustments (Additionality)

To adjust for additionality, company level results (gross results) were adjusted for:

- Deadweight – what would have happened anyway;
- Leakage – the extent to which the benefits are likely to be retained within Ireland;

[125] Alan Brazewell Economic Consultancy and GEN Consulting (2007) Evaluation of the High Growth Start Up Unit, Scottish Enterprise

[126] Frontline Consultants use the term Euro Value Added interchangeably with Gross Value Added. GVA has been 'netted' to determine additionality

- Displacement – the extent to which the benefits may come at the expense of other Irish based businesses;
- Substitution – the extent to which one activity is simply substituted for another by the company to take advantage of the support; and
- Multipliers – the positive effects created through spending on supplies and wages and the downstream effects of these.

The adjustments made to most of these factors are based on data supplied by the individual companies and therefore vary on a company by company basis. Deadweight was estimated by asking the companies how different their turnover and employment would have been or may be in the future without the Innovation Partnerships Programme. Across the companies, average deadweight was stated as:

- 93 per cent for turnover (7 per cent would not have been generated without the partnership); and
- 95 per cent for employment (5 per cent would not have been generated without the partnership).

To put this into some context, the average deadweight for a similar project designed to link university expertise to businesses amounted to:

- 91 per cent for turnover; and
- 94 per cent for employment[127].

Displacement is applied consistently to employment, turnover and EVA, based on the location of direct competitors to the companies supported (and adjusted based on the growth potential of the market they operate in). For the Innovation Partnerships Programme, the average displacement across companies was 19 per cent.

There is less scope to benchmark the remaining variables as they are frequently not accounted for in the evaluation literature. Their average values in this impact model are:

- Leakage is estimated at 5 per cent (based on the assumption that employment is concentrated in Ireland and that turnover and profits are retained within Ireland);
- Substitution is assumed to be 0 per cent (as no evidence of substitution was found in any of the Innovation Partnership companies); and
- Multiplier value of 2.24 (the average across the companies based on where they source supplies and the assumption that most staff wages are spent within Ireland).

Frontline Consultants' assessment is that leakage and substitution are low and non-existent. These suggest benefits are not being lost to Ireland, and that companies are not taking public sector resources to do activity they would have done themselves anyway. The multiplier value is relatively high; representing the use of Irish based suppliers by companies and the assumption that their staff wages are largely spent within Ireland.

[127] Frontline Consultants (2008) Evaluation of Knowledge Transfer Partnerships and Collaborative Innovation Programmes, One North East

Inputs

Between 2004 and 2006, 145 Innovation Partnerships were part funded by Enterprise Ireland. Total investment was €22.6 million (Table 7.1). The costs incurred by Enterprise Ireland amounted to €13.688 million (61 per cent) paid to the HEIs and the balance of €8.911 million (39 per cent) was contributed by companies. Direct investment grew steadily from €4.173 million in the year 2004 to €11.387 million in the year 2006. Indirect costs incurred by Enterprise Ireland to deliver the programme are estimated at €4.194 million for the period 2004-2006. Total overall costs to the exchequer (direct and indirect) for the programme amounted to €17.882 million over the period 2004-2006.

Table 7.1: Total Investment in Innovation Partnerships, 2004-2006[128]

	2004		2005		2006		2004-06	
Enterprise Ireland Contribution	**€ (000's)**	**%**	**€ (000's)**	**%**	**€ (000's)**	**%**	**€ (000's)**	**%**
Direct Costs	2,487	48%	4,236	50%	6,966	53%	13,688	51%
Company Contribution	1,687	33%	2,804	33%	4,421	34%	8,912	33%
Sub Total	4,174	81%	7,040	83%	11,387	87%	22,600	84%
Indirect Costs	953	19%	1,472	17%	1,770	13%	4,195	16%
Total	5,127	100%	8,511	100%	13,156	100%	26,795	100%

Two thirds of partnerships and Enterprise Ireland grant awards occurred in six institutes (Table 7.2).

Table 7.2: Investment in Innovation Partnerships by Institute, 2004-2006

Institute	Number of Innovation Partnerships	%	Total grant awarded € 000's	%
University of Limerick	22	15	2,356	17
National University of Ireland - Cork	17	12	1,443	11
National University of Ireland - Galway	16	11	1,364	10

[128] Rate depended on the size of company: 20 percent matching from small company, medium size 25 percent up to 35 percent from MNC.

Institute	Number of Innovation Partnerships	%	Total grant awarded € 000's	%
National University of Ireland - Dublin	15	10	2,030	15
Athlone Institute of Technology	15	10	1,369	10
Trinity College Dublin	11	8	1,432	10
Dublin Institute of Technology	8	6	659	5
Waterford Institute of Technology	6	4	671	5
Dundalk Institute of Technology	6	4	413	3
Dublin City University	5	3	345	3
Galway-Mayo Institute of Technology	4	3	192	1
Cork Institute of Technology	4	3	212	2
National University of Ireland - Maynooth	4	3	274	2
Tralee Institute of Technology	3	2	213	2
Tyndall National Institute	3	2	206	2
Sligo Institute of Technology	2	1	210	2
Teagasc	2	1	179	1
Limerick Institute of Technology	1	1	87	1
Tallaght Institute of Technology	1	1	33	0
Total	**145**	**100**	13,688	**100**

Source: Enterprise Ireland

Outcomes and Activities

The feedback from each of the stakeholder groups is set out below, including Enterprise Ireland/External Stakeholders, Institutes/Technology Transfer Offices, Principal Investigators, and Companies. This analysis provides a broad understanding of the Programme from different perspectives. A greater emphasis is placed on the responses from PIs and Companies as the main participants (and therefore beneficiaries) of the Programme.

Enterprise Ireland and External Stakeholders

The following summary was informed by the stakeholders, from strategic and operational point of view.

Enterprise Ireland's role is primarily as the funder and promoter of the Innovation Partnership Programme. Key activities undertaken by Enterprise Ireland include:

- Promotion and marketing of the Programme to institutes, companies and partners;
- Technical and commercial revaluation of proposals;
- Provision of feedback to applicants; and
- Review of interim and final reports.

The main programme activity occurs within the Innovation Partnerships and is focused on the research project. The bulk of the research and project management activity is typically conducted by the institute, with company input on research and project management varying widely across partnerships from intensive (including the embedding of academics within companies) to a more 'hands off' approach to the project.

The main users of the Innovation programme tend to come from:

- University spin-outs/ins;
- Inward investors; and
- High tech, high potential start up (HPSU) companies.

The drivers for these types of companies being involved, tends to be because:

- University spinouts/ins have a knowledge of the innovation partnership programme through previous/current links to an institution;
- Inward investors are encouraged to use the programme to support the anchoring and ownership of technology – the adage of production being more mobile than intellectual property applying; and
- HPSU businesses are strongly supported by Enterprise Ireland and for a forward thinking, high tech company, the programme has many strong advantages.

In the initial stages of the Innovation Partnership Programme, it was decided that the best way to get a strong uptake, was to invite the Institutes of Technology (IoTs) and Universities to generate demand through their already established contacts. There was little disagreement that this was the best way to get the programme up and running. There is some dispute now whether this has run its course and a more demand-led process should now be considered and introduced.

Promotion of Programme

'Collaborating for Future Success' was the tag line in the brochure that was used in the 2004-2006 period that is being evaluated. The 2012 branding and collateral has re-emphasised this.

There are differences in opinion over the target market for the Innovation Partnership Programme. Some see the Institutes as the target market because they drive the Programme, whilst others promote their own 'clients' – the early adopters – as continuing to be the target market.

The criterion needs to be set to ensure that Institutes and businesses are clear what the objectives and priorities of the Programme are.

Stakeholder feedback also indicated that the Programme is less likely to be promoted by Enterprise Ireland Development Advisors (DAs) than others – whereas the DAs that were

consulted came out very positively about promoting the Programme to companies and supporting the application process.

Externally to Enterprise Ireland, stakeholders were positive about the Programme.

Institutes and Technology Transfer Offices

In terms of promoting the Innovation Partnership Programme, some Institutes market directly to industry through their Technology Transfer Offices (TTOs), whilst others predominantly leave this in the domain of Principal Researchers and the links that they have established with partner businesses.

The benefits that are being realised by Institutes have been reported as follows:

- The reputation of Institutes and relationships with industrial community has improved as a result of Innovation Partnerships;
- Innovation Partnerships have seen the Institute become more involved in basic research as well – some of the Innovation Partnership projects are a stepping stone to large basic research projects funded by SFI – so are very important from that perspective;
- Innovation Partnerships have helped develop internal strategic thinking about R&D;
- Working relationships have been developed with foreign multinationals that would not otherwise have come about;
- Institute believes that Innovation Partnerships can be a significant benefit to SMEs – they access skills and learn about R&D process – transfer of knowledge and capability; and
- There is a positive benefit for students in getting exposure to industry through working on Innovation Partnership teams.

Principal Investigators

Interviews were completed with 31 PIs involved in 37 of the 145 Innovation Partnerships – a response rate of over a quarter (26 per cent). A margin of error is estimated at +/- 14 per cent. In statistical terminology, where the option response to a question across the surveyed 37 PIs is 50 per cent, the 'real' answer across the population of 145 would lie between 36 per cent and 64 per cent.

Almost half of PIs were approached directly by companies that had interest in participating in the Programme. In other cases PIs pro-actively sought companies by identifying companies with complementary technology areas (32 per cent) or where they had previous experience in working with a particular company (32 per cent).

Table 7.3: Reason for applying for Innovation Partnership project

Why did you decide to apply for an Innovation Partnership project(s)?		
Answer Options	**Response Per cent**	**Response Count**
Wanted to develop new products/processes/services from research	37.8%	14
Wanted to support businesses in my main area of interest	56.8%	21
Wanted to develop a business opportunity from my main area of	16.2%	6
Business approached me with a research idea which fit with an	64.9%	24
Enterprise Ireland approached me with a proposition for an	13.5%	5
IDA approached me with a proposition for an Innovation	0.0%	0
To secure research funding in my main area of interest	67.6%	25
To gain applied insights into my main area of interest	43.2%	16
To keep up to speed with industry focus in my main area of	24.3%	9
To learn from industry to enhance my research and teaching	27.0%	10
To secure funding for research assistants and equipment	56.8%	21
To secure funding for specialist equipment	13.5%	5
To further the institute's research mission	27.0%	10
To further the institute's commercialisation mission	18.9%	7
Other (please specify)	10.8%	4
Answered question		37/37

Research Project and Commercialisation

The respondents stated that 70.3 per cent of Projects were delivered to the timescale set out in the plan, 18.9 per cent took longer than planned. The research was comprised of:

- Industrial research (78.4 per cent), and
- Experimental development (21.6 per cent).

In terms of commercialisation, 12 respondents (33.3 per cent) indicated that the industrial partners commercialised the research outputs. A surprising 16.7 per cent did not know and 50 per cent (18) stated that the research outputs had not been commercialised. (The section below sets out the responses from the companies surveyed).

In terms of barriers to commercialisation a significant one third of the respondents considered that the research needed more work to be commercialised and 19.4 per cent indicated a lack of continued interest from the industrial partner.

Table 7.4: Barriers to Commercialisation

What were the main barriers to the commercialisation of the project outputs?	Response %	Response count
No barriers	12.9%	4
Programme outputs could not be commercialised	16.1%	5
Programme outputs needed more work to be commercialised	35.5%	11
Lack of contact with industry	3.2%	1
Lack of support from Enterprise Ireland for commercialisation	3.2%	1
Lack of support from technology transfer/ industrial liaison office for commercialisation	0.0%	0
Lack of institute finance to commercialise the research	0.0%	0
Lack of external finance to commercialise the research	9.7%	3
Industry partner no longer interested in Programme outputs	19.4%	6
Expected market for product did not materialise	3.2%	1
Lack of own time due to commitment to other research projects	6.5%	2
Bureaucracy associated with the on-going management of the Programme	3.2%	1
Lack of own time due to other teaching commitments	3.2%	1
Lack of own time due to commitment writing other research applications	3.2%	1

What were the main barriers to the commercialisation of the project outputs?	Response %	Response count
Lack of own time due to commitment delivering other research projects	0.0%	0
Other (please specify)	19.4%	
Answered question	31/37	

The following outputs were cited by the PIs, with 28 respondents indicating that a new product/process had been developed, 5 licenses were secured and 3 spinouts created.

Table 7.5: Final Outputs

What were the final outputs from the Innovation Partnership project(s)?[129]	Response Per cent	Response Count
Research completed and signed off by Enterprise Ireland	97.3%	36
Research reached pre-commercial phase of market readiness	27.0%	10
New product developed	24.3%	9
New process developed	51.4%	19
Patent secured	18.9%	7
Invention disclosure	10.8%	4
Licensed research outputs to an Irish company	10.8%	4
Licensed research outputs to a foreign company based in	2.7%	1
Spin out company created	8.1%	3
Other (please specify)	6	
Answered question	37/37	

The vast majority of PIs rated their overall experience of innovation partnerships very positively. The positive experience that the majority of PIs enjoyed seemed to focus around the ease of use of the Innovation Partnership Programme, the opportunity to focus on applied research in their chosen fields, and the chance to build a relationship with an industrial partner.

[129] Multiple choice answers are allowed

Company Feedback

All 109 companies who participated in the Innovation Partnership Programme over 2004-2006 were invited to participate in this evaluation. Interviews were completed with 54 company representatives of the 109 companies that participated in the Programme, and they were involved in almost half of the innovation partnerships (71 of the 145 partnerships). Given that this evaluation takes place 4-6 years after the innovation partnerships began, the survey response rate of 49 per cent is deemed to be a good response rate.

Table 7.6: Innovation Partnerships by Institute 2004-2006, Population and Survey

Participating Higher Education Institutes	Count	Per cent	Population
National University of Ireland - Cork (UCC)	12	17%	12%
University of Limerick	11	16%	15%
National University of Ireland - Dublin (UCD)	9	13%	10%
National University of Ireland - Galway (UCG)	8	11%	11%
Athlone Institute of Technology	7	10%	10%
Dublin City University	5	7%	3%
Trinity College Dublin	5	7%	8%
Dundalk Institute of Technology	3	4%	4%
Dublin Institute of Technology	3	4%	6%
National University of Ireland - Maynooth	2	3%	3%
Teagasc - Moorepark	2	3%	1%
Cork Institute of Technology	1	1%	3%
Galway-Mayo Institute of Technology	1	1%	3%
Limerick Institute of Technology	1	1%	1%
Sligo Institute of Technology	1	1%	1%
Tralee Institute of Technology	1	1%	2%
Tyndall National Institute	1	1%	2%
Letterkenny Institute of Technology	0	0%	0%
Tallaght Institute of Technology	0	0%	1%

Participating Higher Education Institutes	Count	Per cent	Population
Waterford Institute of Technology	0	0%	4%
	71	100%	100%

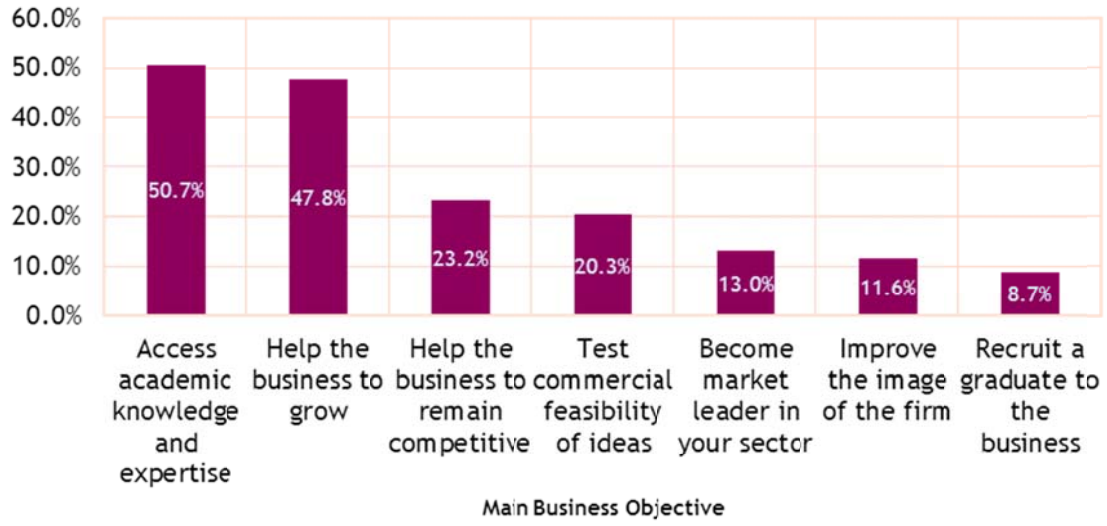
The Programme reached a good mix of companies in terms of:

- Size – all sizes from start up to multinational (56 per cent SME, 44 per cent non-SME)
- Sector – industrial technologies (40 per cent), life sciences and food (32 per cent) and ICT (28 per cent)
- Ownership – Irish (54 per cent) and non-Irish (46 per cent)
- Headquartered in Ireland (49 per cent) and subsidiary (51 per cent)

The Innovation Partnership Programme is supporting companies that already have a history of investing in innovation and R&D activity and has played a role in deepening existing links between academia and business in many cases. The programme supported ideas that originated in the companies (78 per cent), although it is also common for an idea to originate at a partner institute (33 per cent) – or a combination of both, with idea development emerging through collaboration between company and Institute.

Companies typically put forward more than one business objective for each Partnership. The most frequently cited business objective was 'accessing academic knowledge and expertise' (51 per cent of cases). 'Help the business to grow' was the next most important objective (48 per cent).

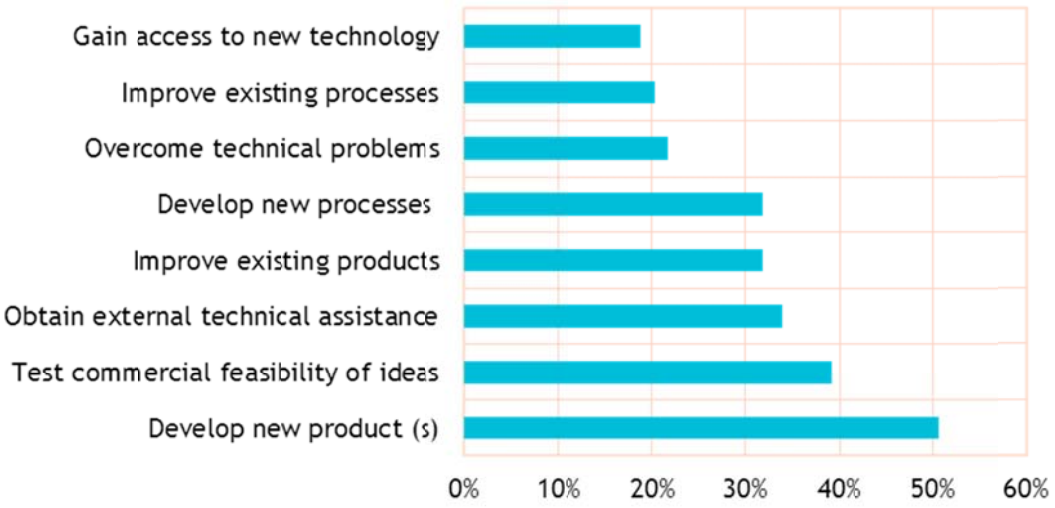
Chart 7.1: Company Objectives for Participation



Answered Question: 69 Skipped Question: 2

To develop new products (51 per cent) and test the technical feasibility of ideas (39 per cent) were the two most frequently cited technological objectives among many given by respondents.

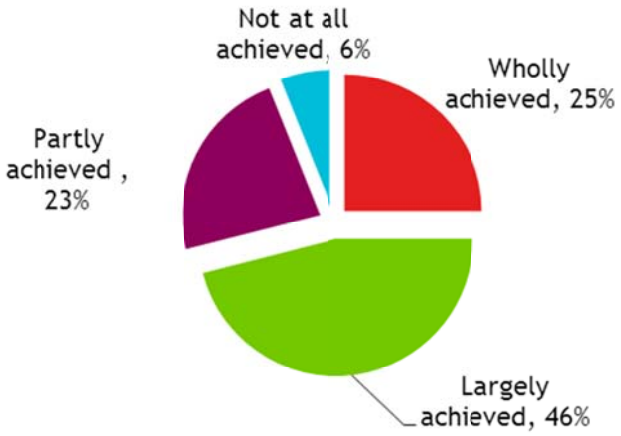
Chart 7.2: Technological Aims of Participating Companies



Answered question: 69

In 25 per cent of projects, companies felt their objectives had been wholly achieved, and in a further 46 per cent of cases, objectives were largely achieved. In 23 per cent of projects objectives were only partly achieved and in 6 per cent they were not achieved at all.

Chart 7.3: Achievement of Objectives



In just over half of projects (53 per cent) there had been some barriers in realising the potential benefits from the Innovation Partnership Projects, while in just under half (47 per cent) there had not been any.

The most commonly cited barrier was that the firm had other priorities (20 per cent of cases) and a lack of finance (17 per cent). 'Other' reasons were advanced in many cases, the most popular of these including:

- Delays in reaching agreement on IP ownership with academic partners;
- A long product development cycle; and
- The project not resulting in a marketable product.

Table 7.7: Barriers to Realising Innovation Partnership Project

Question 22: If you have experienced any barriers, do they include any of the following? (tick		
Answer Options	**Response Per cent**	**Response Count**
Firm has other priorities	20	8
Lack of finance	17	7
Change in the market	10	4
Competitors have developed similar products,	10	4
Lack of skills amongst staff to implement or deliver	10	4
Inadequate sales prospects	5	2
Other (please specify)	68	28
	Answered question	41/71

Outputs

According to the companies interviewed, the following outputs were delivered from 65 per cent of the 71 partnerships, including:

- New products to company (35 per cent) and to the market (21 per cent);
- Improved products to the company (21 per cent) and to the market (11 per cent); and
- New processes to the company (37 per cent) and to the market (9 per cent).

The majority of projects led to an output targeted at private sector markets, either existing (72 per cent) or new (52 per cent). The public sector was also important, but to a lesser extent with 25 per cent of outputs targeted at existing public sector markets and 17 per cent at new public sector markets. Outputs aimed at consumer markets were much less common at 9 per cent in each of existing and new markets.

Engagement in the Programme had a degree of transformational effect on companies:

- In almost two thirds of Partnerships (63 per cent) the key outputs from the projects had led companies to update their marketing plan;
- In 31 per cent, companies had introduced an updated corporate strategy;
- In 19 per cent, companies had introduced a new marketing plan; and
- 19 per cent new organisational structure put into place following the Innovation Partnership.

Companies expressed satisfaction with the Programme in terms of:

- Access to technical expertise and research facilities;
- Excellent framework for interacting with a third level institute;
- 'De-risking' innovation;
- Improving R&D capacity and enabling strategic R&D activity;
- Contributing to a highly skilled workforce;
- Genuine commercial focus; and its
- Demonstration of Irish R&D capability, for example, to potential inward investors.

Companies expressed some dissatisfaction in terms of:

- Difficulties in negotiating intellectual property, which is common on system level[130];
- Bureaucracy associated with working with an institute;
- Inflexibility on measures of project success which don't reflect the uncertainty inherent in research projects;
- More engagement from Enterprise Ireland could have helped maintain commercial focus and momentum; and
- Conflicting interests of partners – commercial returns vs research income and publications.

Additionality of Engagement

In just under a third (31 per cent) of companies reported that the projects would not have gone ahead at all without the support funding from Enterprise Ireland. In a further two thirds (66 per cent), companies indicated that the projects would have gone ahead but at a smaller scale or to a delayed timeframe. However, from a research institution perspective, the Partnership Programme is important instrument to commercialise ideas, link with industry and increase R&D capability geared towards industry needs.

Only 3 per cent of projects would have gone ahead unchanged, without any changes to timeline or to scope without the Enterprise Ireland support.

[130] The DJEI report 'Putting Public Research to Work for Ireland', 2012, and associated changes such as the Central Technology Transfer Office will help to improve this situation.

Table 7.8: Additionality of Support

Question16: If you did not receive assistance for the Innovation Partnership would the project have?		
Answer Options	**Response Per cent**	**Response Count**
Gone ahead anyway	3	2
Gone ahead – but would have been delayed slightly	10	7
Gone ahead – but would have been delayed significantly	15	10
Gone ahead – but would have been slightly smaller in scope	22	15
Gone ahead – but would have been much smaller in scope	18	12
Would not have gone ahead at all	31	21
Answered question		67/71

Impacts & Outcomes

This section considers the impacts and outcomes from the perspective of the PIs and from the perspective of the company. The objectives, and therefore the benefits accruing to each party are different, with the networking/wider research outputs being of greater interest to the Institute and new product introduction being of greater benefit to the firm. Both parties should benefit from the collaborative approach taken in the project if the objectives of the programme are to be realised – increased commercial awareness and applied research for the Institutes, and access to R&D and a stimulus for increased engagement in R&D for the company.

Principal Investigators

As a result of the Innovation Partnerships, PIs reported wider benefits and outcomes as a result of their participation, which are summarised below:

- Reputational Benefits: improved reputation, approachability, improved employability of staff and improved demand for engagement;
- Research Benefits: strengthening expertise in core research area, knowledge flows, technology advancement and research stimulus;
- Educational Benefits: improved teaching, talent attraction and retention, increase in applied researcher competencies; and
- Transfer of research to industry, with 61.1 per cent responded that members of research team moved on to work in the private sector in Ireland.

In many cases follow-on activities continued in terms of R&D activities and collaboration, which are set out in Table 7.9; as well as increased networks (Table 7.10). Wider benefits were realised in terms of journal articles (77.3 per cent), conference papers and posters (81.8 per cent), and delivery of lectures in the research area (59.1 per cent) (22 respondents) (Table 10).

Table 7.9: Follow-on Activities

Have you been able to develop any follow-on activities since the completion of the Innovation Partnership project(s)?	Response Per cent	Response Count
Follow on basic research projects	29.7%	11
Follow on applied research projects – closer to market	37.8%	14
Follow on applied research projects – further from market	40.5%	15
On-going industry engagement	70.3%	26
New industry engagement	37.8%	14
No follow on activities	8.1%	3
Please provide examples of follow-on activities		30
Answered question		37/37

Table 7.10: Network benefits

Has your engagement with the Innovation Partnership programme generated any networks benefits at the institute?	Response Per cent	Response Count
Greater engagement with VCs and angel investors	3.2%	1
Companies engaging with the institute (monetary value)	38.7%	12
Companies engaging with the institute (non-monetary value)	48.4%	15
Improved internal networks – within the institute	22.6%	7
Improved external networks – with other institutes/research	41.9%	13
Improved external networks – other business support	48.4%	15

Has your engagement with the Innovation Partnership programme generated any networks benefits at the institute?	Response Per cent	Response Count
Improved external networks - with businesses	35.5%	11
Answered question		31/37

Table 7.11: Wider Research Outputs

Have you done any of the following as a result of the research project?	Response Per cent	Response Count
Publication of journal articles	77.3%	17
Production of conference papers/posters	81.8%	18
Delivery of lectures/courses in the research area	59.1%	13
Consultancy work in the research area	4.5%	1
Events associated with public understanding of science and technology	9.1%	2
Answered question		22/37

Cost Benefit Analysis

The estimate of impact considers the ultimate effect of a programme on the economy. This is assessed as the net increase in EVA accruing as a direct result of the programme. The net EVA impact estimated to have accrued in companies across the 145 innovation partnerships over the period 2004-09 is €41.2 million (NPV €34.1 million)[131]. This is equivalent to a return of €2.13 for every €1 of the €17.9 million total costs (NPV €16 million) incurred by Enterprise Ireland between 2004 and 2006. It is fair to assume that further benefits will be realised over the period to 2015 and attributable to this intervention (based on a 9 year timeline from 2006), and estimates are set out in the Table 11.

This CBA exceeds the findings of the knowledge transfer programme referred to below which indicated a return of €1.82 for every €1 invested over a six year period.

[131] Frontline Consultants calculations as outlined in Methodology including adjustments for optimum bias

Table 7.12: EVA Impacts of the Innovation Partnerships Programme

Year	Total Costs €'000	Net Present Costs €'000	EVA Impacts €'000	EVA NPV €'000
2004	3,440	2,487	-	-
2005	5,708	5,488	-	-
2006	8,736	8,077	-	-
2007			-	-
2008			6,112	5,224
2009 Project			35,096	28,845
2010 Project			30,347	23,983
2011 Project			30,691	23,322
2012 Project			31,094	22,720
2013 Project			31,024	21,797
2014 Project			30,117	20,347
2015 Project			41,686	27,079
Total 2004-09	17,883	16,051	41,207	34,069
Total 2004-15	17,883	16,051	236,166	173,319
Benefit to Cost Ratio (2004-09)				1: 2.13
Benefit to Cost Ratio (2004-15) Projected				1:10.80

International Comparators

It is difficult to identify identical programmes for comparison. This section considers three Programmes that can be considered near equivalents to the Innovation Partnership Programme in Ireland. The three programmes are:

- The Knowledge Transfer Partnership in the UK;
- The Linkage Projects in Australia; and
- The TULI Programme in Finland.

Although broader than the Innovation Partnership Programmes, the greatest focus is given to the Knowledge Transfer Programme from the UK as it contains many elements that emerged as having 'desirable' aspects to many of those interviewed in the course of his evaluation. We also note that the Innovation Task Force report of March this year recommends the introduction of "a scheme similar to the "Knowledge Transfer Partnership Programme" in the UK by placing recent graduates in companies to facilitate the transfer of high technology skills and expertise".

The UK - Knowledge Transfer Programme (KTP)

Over the past thirty-five years Knowledge Transfer Partnerships (KTP) has given British firms new opportunities to break into new technologies, new markets, new processes and production methodologies. Funded under the Science and Technology Act 1965, the Teaching Company Scheme (TCS) was established in 1975 by the Science and Engineering Research Council, based upon the teaching hospital idea - 'learning by doing'. Originally aimed at engineering projects, KTPs today covers a wide business spectrum to meet the social, technological and economic priorities of the UK.

The growth of TCS/Knowledge Transfer Partnerships from a handful of partnerships in 1976 to over 1,000 today highlights the value that firms place on participation through their commitment and financial investment. The growth in partnership numbers has been met in part through increased public sector contributions, all aimed towards strengthening the competitiveness, wealth creation, social and economic performance of the UK.

There are three principle players within a partnership:

- **Company partner** - this is usually a company (including not-for-profit) but in some cases it can be a health or education organisation or Local Authority. KTP supports a broad cross-section of UK firms, regardless of size;
- **Knowledge-base partner** - this is a higher education institution (e.g. university), college or research organisation (public or privately funded); and
- **KTP Associates** – Each partnership employs one or more high calibre Associates (recently qualified people), transferring the knowledge that the company is seeking into the business via a strategic project.

The key objectives of the KTP programme can be summarised as follows:

- Facilitating the transfer of knowledge and the spread of technical and business skills, through innovation projects undertaken by high calibre, recently qualified, people under the joint supervision of personnel from business and the knowledge base;
- Providing company-based training for graduates in order to enhance their business and specialist skills within the context of the project;
- Stimulating and enhancing business relevant education and research undertaken by the knowledge base; and
- Increasing the extent of interactions by businesses with the knowledge base and their awareness of the contribution that the knowledge base can make to business development and growth.

The broad outcomes delivered by the KTP programme can be summarised as follows:

- There are over 1,000 Partnerships running at any one time and over 1,100 Associate projects;
- For every £1 million of government spend the average benefits to the company amounted to a £4.25 million annual increase in profit before tax, £3.25 million investment in plant and machinery with 112 new jobs created and 214 company staff trained as a direct result of the project;
- For the knowledge base partner (higher education institution mainly), on average, each KTP Associate project produces 3.6 new research projects and 2 research papers; and

- 60 per cent of associates are offered and accept a post in their host company on completion of their KTP project. 41 per cent register for a higher degree and 67 present of these were awarded a higher degree.

Table 12 is taken from the Knowledge Transfer Partnership annual report for 2006/07, produced by the Technology Strategy Board. It demonstrates the effects on companies from £1 million of public expenditure on Knowledge Transfer Partnerships (estimated from all final reports graded since March 2005).

Table 7.13: KTP Outputs – National (UK)

	2003/04	2004/05	2005/06	2006/07
Number of jobs created	65	77	112	43
Number of company staff trained	259	263	214	190
One off increase in profit before tax (000's)	£700	£725	£1,130	£790
Increase in annual profit before tax after completion (000's)	£3,050	£3,300	£4,240	£2,970
Investment in plant & machinery (000's)	£2,050	£1,540	£3,250	£2,520

Australia – Linkage Projects

Linkage Projects supports R&D projects which are collaborative between higher education researchers and other parts of the national innovation system, which are undertaken to acquire new knowledge, and which involve risk or innovation.

Proposals for funding under *Linkage Projects* must involve a Partner Organisation from outside the higher education sector. The Partner Organisation must make a significant contribution in cash and/or in kind, to the project that is equal to, or greater than, the Australian Research Council (ARC) funding.

Under the *Linkage Projects* scheme, the ARC provides opportunities for postgraduate and postdoctoral researchers to engage in industry-oriented research training and enables postdoctoral researchers to pursue internationally competitive research opportunities in collaboration with industry, *Linkage Projects* awards and Fellowships offered by the ARC are:

- Australian Postgraduate Awards (Industry), available for postgraduate research students;
- Australian Postdoctoral Fellowships (Industry), available for researchers with fewer than three years' postdoctoral experience at the closing date for applications; and
- Linkage Industry Fellowships, which enable the temporary transfer of a researcher to a Partner Organisation or another higher education organization participating on a project, or vice versa.

The objectives of Linkage Projects are to:

- Encourage and develop long-term strategic research alliances between higher education institutes and other organisations, including with industry and other end-

users, in order to apply advanced knowledge to problems and/or to provide opportunities to obtain national economic, social or cultural benefits;

- Enhance the scale and focus of research in National Research Priorities;
- Foster opportunities for postdoctoral researchers to pursue internationally competitive research in collaboration with organisations outside the higher education sector, targeting those who have demonstrated a clear commitment to high-quality research;
- Provide outcome-oriented research training to prepare high-calibre postgraduate research students; and
- Produce a national pool of world-class researchers to meet the needs of the broader Australian innovation system.

Proposals for funding under the Linkage Projects scheme are processed twice a year[132].

Finland – TULI Programme

TULI is a programme for bridging research and business. The programme promotes commercialisation of research results in universities, universities of applied sciences (polytechnics) and research institutes. TULI provides business expertise and funding for researchers, research groups and students. The goals of the TULI Programme are:

- Support commercialisation of publicly funded research results;
- Develop and increase commercialisation services in universities, polytechnics and research institutes;
- Promote cooperation between research organisations and companies; and
- Create successful and viable businesses through start-ups, spin-offs and technology transfer.

The TULI programme budget is approximately €50 million for 2008-2014. TULI projects are run by universities, universities of applied sciences (polytechnics) and research institutes. TULI funding is available for researchers, research groups and students through 45 organisations. TULI funding is an opportunity for researchers to acquire access to business expertise that will hone the commercialisation of their research. Funding can be used for purchasing e.g. surveys in order to uncover the business potential of a single research result. A single case can be granted up to €55,000 of TULI funding, through from initial evaluation (€5,000) to the final refinement stage (€30,000).

- The initial evaluation phase is a quick screening that evaluates the preliminary commercialisation potential of a case.
- The evaluation phase performs critical studies in view of commercialisation potential, including preliminary market and competitor analysis. This stage also outlines a commercialisation model for a promising idea.
- The refinement phase overcomes critical bottlenecks from the commercialisation viewpoint. At this point a prototype can be developed and its functionality may be tested to guarantee the optimal development of the final product. Also the critical networks needed for the commercialisation will be outlined.

[132] http://www.arc.gov.au/ncgp/lp/lp_fundingrules.htm

Key points for consideration relating to Ireland

Whilst each example has merit, the KTP appears to be particularly relevant as it covers many of the areas that the interviews brought out in the course of this evaluation. The KTP has been continually developed to keep track with economic, business and technology trends, thus keeping it fresh over a thirty five year period. The key learning points are:

- KTP focuses on win-win-win for researcher, business and Institute;
- Researcher views KTP as a career step into business having gained experience at the research/commercial interface;
- Every KTP must be focussed on a strategic business priority for the company; and
- Each KTP sets business objectives at the outset and is measured and evaluated against commercial and economic achievement.

Findings and Recommendations

All respondents who commented indicated that there was a continued need for Innovation Partnerships. Some PIs suggested that the programme should continue because it incentivises companies to engage with knowledge institutions; provides a valuable source of funding for applied research; and supports academics towards commercial thinking.

Strategic Stakeholders suggested that the criteria need to be re-established and that Institutes and businesses made aware of any changes in objectives and priorities of the Programme.

Partnership came out as a key strength of the Innovation Partnership Programme, particularly at an operational level between institutes, companies and Enterprise Ireland.

During the evaluation period, the Innovation Partnership Programme was more focused to bring companies and institutes together to drive up the quality and relevance of collaborative research. Since then, the Innovation Partnership Programme has evolved with an increased focus on economic need and delivery on commercialisation objectives.

The experience gained by PIs and researchers undertaking applied research to meet commercial goals should be recognised as a real benefit which can be built upon. The recognition of skills-building and transfer of skills (research mobility) should be explicitly stated as an objective of the Innovation Partnership Programme.

Companies were positive about the Innovation Partnership Programme and the majority of those that participated commented on a range of benefits that have accrued. However, an issue that was raised that some companies had entered the programme without being fully committed; i.e. the programme was not seen as critical to company development but as an inexpensive way of 'trying something'. The Innovation Partnership Programme is now mature enough to be able to ensure that companies entering it are fully committed and undertaking research for the right strategic reasons. The more commercial focus that the programme is now demanding should ensure that both technological and economic due diligence are covered robustly with companies demonstrating what they expect to achieve through participation prior to entering the Programme.

Consideration should be given to revising objectives to reflect that the Programme has changed to a more commercially focussed vehicle, and ensure this change in objectives is communicated effectively.

Conclusions

Appropriateness

Innovation Partnerships were aligned with Government policy objectives at the time of its inception. Interventions of this kind are common across innovation driven economies such as the UK, Australia and Finland. The programme aims to stimulate both R&D activity in the private sector and commercialisation activity in Higher Education Institutions.

From the surveys it is clear that a high proportion of companies and academics that participated in the programme are conducting follow on activities; however it is less clear what the outcome of these follow on activities might be. This is partly due to the time lag associated with the evaluation period and the challenges in collecting data specific to the follow on activities over time.

Synergies/Duplication

Innovation Vouchers which target early stage R&D performers or firms who are not yet R&D active may be used as a stepping stone to Innovation Partnerships. Other interventions such as the Technology Gateways use Innovation Vouchers and Innovation Partnerships as funding mechanisms to link industry and HEIs. The Commercialisation Fund (primarily focused on commercialising State Funded HEI research) can involve licensing technologies to companies (as distinct from spin-outs) although does not have R&D project collaboration with industry as an objective.

Effectiveness

The outputs of the programme are the 145 innovation partnerships. The programme provides financial support to research institutions who engage in collaborative research projects with companies. Enterprise Ireland contributes between 50 to 70 per cent of funding which amounted to €13.69m and Industry partners contributed an additional €8.9m as is required under the programme. The total Input costs for the programme over the period were €22.6 million with a ratio of 61:39 HEI/Industry; therefore for every €1 of public funds, €0.40 is leveraged from the private sector. There is also significant leverage from companies through staff time, premises and equipment, and from institutes through staff time not directly paid for by the funding, premises and equipment.

Efficiency

Efficiency covers the extent to which the outputs have led to the desired outcomes. The principal quantitative outcomes are the 'bottom line' impacts on companies, which were communicated by interviewees. The key programme impact is of EVA to the Irish economy. Our analysis suggests that each €1 of Enterprise Ireland total costs over the period 2004-06, a total of €2.13 of EVA by 2009.

These levels of return suggest good programme efficiency, and commercial gain may be interpreted as being a useful indicator in meeting the objective of using academic knowledge and expertise to gain competitive advantage.

8. Innovation Vouchers Programme (2007-2012)

Programme Logic Model

Objectives

- To drive an on-going innovation cultural shift within small enterprise by promoting and encouraging a transfer of knowledge between Ireland's public knowledge providers and the small business community and creating greater synergies between the two.

Inputs

- Enterprise Ireland funding
- Enterprise Ireland staff time

Activities

- Number of Innovation Vouchers completed

Outputs

- New and improved products and processes and services

Outcomes & Impacts

- Increased numbers of companies engaged in R&D
- Increased Business Expenditure on R&D
- Increase in commercially focussed research undertaken in HEIs
- Enhanced industry-academic relationships and collaboration
- Increased productivity, sales, value added and employment for companies

Evaluation Aim

The aim of the evaluation is to assess the Innovation Partnership Programme in terms of its appropriateness, effectiveness and its efficiency. The Programme does not operate in isolation and this evaluation considers the Programme in terms of its individual performance, in relation to other interventions and its fit with Irish enterprise policy.

Programme Background, Objectives & Target Population

A pilot project for an Innovative Voucher Initiative was introduced by Enterprise Ireland in April 2007. The initiative is designed to encourage small companies and public knowledge providers to work together on specific innovation questions and projects related to the company's needs. It is intended that the nature of the projects will transfer knowledge that is new to the company. For the purposes of this initiative, a knowledge transfer project is defined as one that transfers knowledge of a scientific, technological or innovative nature that is new to the small enterprise. The company may use the new knowledge to innovate a product, production process or service.

All small enterprises are eligible to apply for an Innovation Voucher. Under the initiative, vouchers worth €5,000 are allocated on a semi-competitive basis to small businesses whose proposals to work with public knowledge providers on specific innovation questions meet basic criteria. To be successful in an application for an Innovation Voucher, the company's defined issue or project must require an innovative solution; provide additional value for the company and result in on-going benefits.

2,022 Innovation Vouchers were completed over the period of 2007-2012, involving 1,602 companies and 36 institutes. This represents a direct investment by Enterprise Ireland of €9,866,691.

Innovation Vouchers encompass innovation in its broadest definition, including:

- New business model development;
- New service delivery and customer interface;
- New service development;
- Tailored training in innovation management; or
- Innovation / technology audit.

Eligible activity would include:

- Efficiency audits, process change;
- Supply chain management and logistics; and
- Product and service testing and economic impact assessment

The company applies directly to Enterprise Ireland for an Innovation Voucher. When and if approved, the company then takes the voucher to a knowledge provider (predominantly a university or Institute of Technology). Vouchers are exchanged for knowledge transfer projects from the knowledge provider, who at the end of the project applies to Enterprise Ireland for payment. No cash payment is made to the company.

Objectives

The overarching objective of the Innovation Voucher initiative is to drive an on-going innovation cultural shift within small enterprise by promoting and encouraging a transfer of knowledge between Ireland's public knowledge providers and the small business community and creating greater synergies between the two[133].

For the purpose of this evaluation the following were the key objectives prepared by Frontline Consultants in consultation with Enterprise Ireland to enable the measurement of the success of the programme:

- To encourage the creation of relationships between academia and business;
- To develop lasting relationships that grow;
- To support company growth based on innovation;
- To stimulate research providers to access and support a new (to many of them) important client base; and
- To deliver economic development through job creation, job retention and contribution to EVA.

It was also intended that the programme design ensured that it was simple to access and straightforward to deliver.

Companies are now asked on the application form to indicate the main 'added value' that a solution to the knowledge question they pose will bring to their company from the following options:

- Improvement in product quality;
- Reduction in company costs;
- Enhanced capability to carry out innovative projects;
- Stronger links with the Third Level Research Community;
- Productivity gains;
- Creation of an 'innovation culture' in the company; and
- Other.

Target Population

Small companies[134] based in Ireland - not confined to Enterprise Ireland's existing company base. A small enterprise is defined as an enterprise that has fewer than 50 employees and has either an annual turnover and/or an annual Balance Sheet total not exceeding €10 million.

[133] As set out in the paper noted by Enterprise Ireland's Industrial Research and Commercialisation Committee (IRCC)

[134] The Programme was limited to registered companies and does not include partnerships or sole traders

Programme Rationale

The majority of small businesses are unlikely to have the scale or the resources necessary to engage in in-house research to the extent that would be considered socially optimal. The Innovation Vouchers Programme aims to address this market failure. The programme is designed to encourage small companies and public knowledge providers to work together on specific innovation questions and projects related to the company's needs, thereby increasing the numbers of innovative and R&D performing companies in Ireland.

Methodology

The evaluation methodology reflects the Forfás Evaluation Framework[135]. This evaluation has been informed by research and analysis undertaken by Frontline Consultants in 2012 which had been commissioned by Enterprise Ireland.

The evaluation involved:

- Interviewing researchers involved in delivering Innovation Voucher projects to understand the issues surrounding the technical delivery of the Programme;
- Interviewing senior staff within 'knowledge provider' institutes to ascertain their views on strategic relevance to their university or Institute of Technology (IoT) of the Programme and any operational issues that exist;
- Interviewing companies who had undertaken Innovation Voucher projects to uncover the benefits that were accruing to the company and potentially the wider economy, also to understand whether attitudinal change was taking place regarding academic/business partnership working;
- Undertaking an electronic survey of all companies who had undertaken Innovation Voucher projects; and
- Undertaking desk and internet research supported by telephone and face to face interviews regarding other areas that had delivered an Innovation Voucher approach to ascertain how the Irish version compares (including Invest Northern Ireland).

Numerically the evaluation was delivered by:

- Visiting 17 Institutes;
- Interviewing 12 staff responsible for Innovation Vouchers in Institutes;
- Interviewing 25 researchers;
- Holding seven mini workshops with Institute staff;
- Interviewing 36 companies;
- Gaining a further 283 company responses from the e-survey; and
- Desk research and face to face interviews with two organisations involved in the delivery of Innovation Voucher approaches elsewhere.

[135] Framework for Evaluation of Enterprise Supports, Forfás, 2011

Alignment with National Policy

The report of the Forum on Small Business published in 2006 pointed out that the majority of small businesses are unlikely to have the scale or the resources needed to engage in in-house research. However, it noted that the stimulation of innovation (much of which is non-technological) is important to the continued health and growth of small business. In that regard, the Forum recommended two specific initiatives: an Innovation Vouchers scheme, and a Knowledge Acquisition grants scheme.

The Strategy for Science, Technology and Innovation (SSTI) 2007-2013 stated that The Forum's thinking on the issue of knowledge acquisition grants is consistent with the proposals contained in this strategy for developing linkages between business and knowledge providers but brings a specific small business orientation to that issue. The Innovation Vouchers proposal has valuable awareness raising potential, in line with the overall thrust of this strategy to increasing the numbers of innovative and R&D performing companies. The resulting schemes should be designed to be administratively simple, effective and have minimum deadweight.

Therefore, the programme is appropriate and aligned with Government policy during the time period of evaluation.

Inputs

As at July 2012, 2,048 Innovation Vouchers were completed over the period of 2007-2012 involving 1,602 companies and 36 institutes. This represents a direct expenditure by Enterprise Ireland of €9.907 million (Table 8.1).

Enterprise Ireland also contributed €2.972 million to cover overhead costs incurred by the Institutes. Indirect costs incurred by Enterprise Ireland are estimated at €0.516 million based on 1.5 FTEs[136] required to deliver and manage the Programme. The total cost of the programme, therefore over the period 2007 to July 2012 was €13.394 million.

Table 8.1: Vouchers Approved and Paid

Year	Number of vouchers issued	Cumulative value of vouchers
2007	4	€18,264
2008	206	€1,014,935
2009	526	€2,406,334
2010	524	€2,591,145
2011	518	€2,573,568
2012 (to 16 July)	270	€1,303,061

[136] Full Time Equivalents

Year	Number of vouchers issued	Cumulative value of vouchers
Total	2048	€9,907,307

It is not possible to match exactly the year of approval to the year of payment as there can be significant overlap; however the table above demonstrates the flow of approvals and payments since the launch of the Programme in 2007.

Outputs & Activities

Knowledge Provider Feedback

Interviews were carried out during visits to universities and IoTs. 17 Institutes were visited, with interviews taking place with 12 members of staff who were either the Technology Transfer Officer, Head of Research or senior staff tasked with managing the delivery of the Innovation Voucher Programme on behalf of their Institute. In addition to this, 30 researchers were interviewed to promote an understanding of how the relationship with companies was developing and whether the Programme was achieving some of its wider objectives. A pro-forma was used for these interviews and the composite findings of these interviews are presented later in this section.

The opportunity arose on a number of occasions (7) to hold impromptu, mini workshops because staff were brought together at the same time to meet the evaluators. These sessions were particularly beneficial as many of the issues sparked lively debate and allowed a free flow of ideas to emerge.

Overall, Programme management staff and researchers were very positive about the Innovation Voucher Programme, with a number of individual and organisational benefits achieved as a result of participation. The application process is seen as being simple and straightforward and is appreciated by the institutes. However, the system of having a number of call periods when applications could be made is not popular and it is thought that some potentially good applicants can be deterred by having to wait. There was a common view that the application process should be e-based in line with most modern procedures.

Researchers were asked how they thought awareness of Innovation Vouchers was generated. In the majority of cases, companies approached them directly with their idea. In some Institutes it came through strongly that the Technology Transfer Officer drove the process and managed all related marketing of the Programme.

Table 8.2: Generating Awareness of the Innovation Voucher Programme

Answer Options	Response %	Response Count
Companies tend to approach us directly if they have interest in participating in an Innovation Voucher project	71%	20
Technology Transfer Office/Industrial Liaison Office manages all marketing relating to the Innovation Voucher Programme	68%	19
Where I have worked with a company on a previous research project, I will suggest considering an Innovation Voucher if I see an opportunity	43%	12
Proactively identify and approach companies with expertise in complementary technology areas	39%	11

Number surveyed=28

There was a broad range of motivations among knowledge providers for wanting to work on projects. Staff with responsibility for the Programme felt that it was strategically important to be involved. A minority saw Innovation Vouchers as an important income stream in their own right.

The main reason cited by researchers for getting involved was a desire to support and work with businesses in their main area of interest (75 per cent), with the desire to maintain an industry focus cited by 50 per cent of the respondents. In 68 per cent of cases, the researcher was approached directly by business. The top funding related reason was to secure funding for research assistants although a common frustration pervaded in terms of the inability to keep the research assistant for any length of time unless another project was in the pipeline.

Table 8.3: Why Researchers Work with Companies on an Innovation Voucher project(s)

Answer Options	Response %	Response Count
Wanted to support businesses in my main area of interest	75%	21
Business approached me with a research idea	68%	19
To keep up to speed with industry focus in my main area of interest	50%	14
To learn from industry to enhance my research and teaching abilities	43%	12
To secure funding for research assistants and equipment	43%	12
To gain applied insights into my main area of interest	39%	11

Answer Options	Response %	Response Count
Wanted to develop new products/processes/services from research	32%	9
Enterprise Ireland approached me with a proposition for project	32%	9
To further the institute's research mission	21%	6
To secure research funding in my main area of interest	18%	5
To further the institute's commercialisation mission	18%	5
To secure funding for specialist equipment	18%	5
Wanted to develop a business opportunity from my main area of interest	7%	2

Number surveyed=28

Around half (55 per cent) of the projects were delivered on time. Where it took longer, there was normally a good reason, such as the project had to change in emphasis (based on initial findings) to give greatest impact for the company. Another frequently quoted reason was the researcher had become absorbed by the project and was going the extra mile for the project.

Researcher/Institute Benefits

The institutes themselves believe that one of the benefits of Innovation Vouchers is the opportunity to expose new academics to companies and research projects. Despite this, the biggest problem - because of the short term nature of projects - is finding researchers with the time to do them. Researchers believe that commercialisation of work is a major benefit, and according to them almost three quarters of projects had commercial outputs[137].

Institutes indicated that there was a strong network and reputational benefit to being involved in the Programme, and that it had stimulated improved demand for engagement. The evidence points to improved networks with businesses (83 per cent) and more companies working with their Institute than previously (67 per cent) (Table 8.4).

[137] Refer to the results from the company survey in the following section which provides greater insights into product/process developments arising from their engagement with Innovation Vouchers

Table 8.4: Networking Benefits through Engagement

Answer Options	Response %	Response Count
Improved external networks - with businesses	83%	20
More companies engaging with the institute	67%	16
Improved internal networks - within the institute	33%	8
Improved external networks - with other institutes/research organisations	21%	5

Number surveyed=24

It was reported that projects had led to a strengthening of expertise in core research areas (54 per cent of respondents).

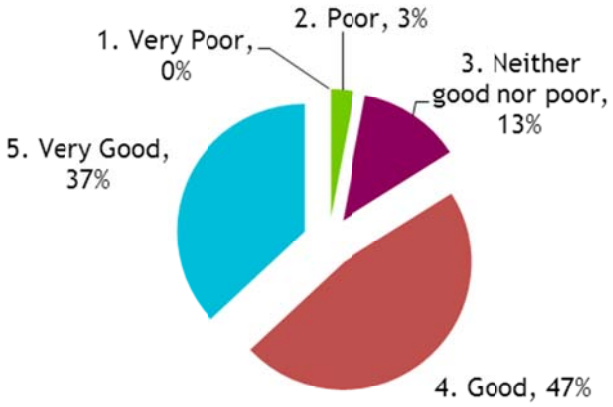
There were also perceived educational benefits, with a particularly large number of researchers (68 per cent) saying that working with companies on projects was adding relevance through using 'live examples' to make points when teaching.

Few barriers were identified. The higher proportion, a fifth of researchers quoted (internal) bureaucracy as a barrier. Companies' unrealistic expectations of what could be delivered were also cited. Other barriers included the system of having a number of 'call' periods for applications – stating that potentially good applications can be discouraged.

A popular view cited by the researchers is that Innovation Vouchers present an excellent first rung on the ladder for businesses, but the second rung was too far away (often an Innovation Partnership).

Only 3 per cent of researchers found working on a project to be a poor experience. The vast majority found it to be a good or very good experience and made many positive comments.

Chart 8.1: How Researchers Rated the Innovation Voucher Programme



Number surveyed=30

Around half of those in project teams had moved on to work in the private sector. This suggests that this type of project helped clear the way for people to dip in and out of both academia and business, which is an important mechanism for knowledge transfer.

Company Feedback

Interviews were completed with 319 businesses, who had collectively received 469 Innovation Vouchers. This sample accounts for 20 per cent of the total population of beneficiaries, and 23 per cent of all vouchers issued. This sample allowed results to be reported at a +/- 4.87 per cent confidence interval, and the impacts of the voucher programme at a 3.97 per cent confidence interval.

Overall companies were very positive about the Innovation Voucher Programme, which resulted in deepening existing links between academia and business.

The Programme is reaching a good mix of companies from a variety of industries – with a particularly strong participation rate from some of Enterprise Ireland's key sectors including, for example, engineering, consumer services and life sciences.

Just over half (51 per cent) of companies heard about the Programme through Enterprise Ireland and the majority (77 per cent) took up to six months to start their project which was thought to be 'about right' by most. Areas that took the greatest amount of time/difficulty were developing the idea (40 per cent), and agreeing the project with academic partner (27 per cent). From consultations with stakeholders and companies it is evident that there was often a misalignment between companies and institutes in terms of expectations of the voucher – leading to delays.

In the majority of cases, the Programme is supporting ideas that originated in the companies (mentioned in 63 per cent of cases), although it is also common for an idea to originate at a partner institute (18 per cent) – or a combination of both with idea development through

collaboration between company and institute. The Programme is serving companies whose main motivations for participation are accessing academic knowledge (52 per cent) and driving business growth (50 per cent).

The Programme has delivered benefits for 69 per cent of companies. Table 8.5 sets out the findings (which allowed for multiple responses), including:

- New products to company (24 per cent) and to the market (23 per cent);
- Improved products to the company (20 per cent) and to the market (19 per cent); and
- New processes to the company (16 per cent) and to the market (12 per cent).

In 31 per cent of cases, companies cited no commercial benefits had been achieved to date.

Table 8.5: Company Benefits

Answer Options	Response Per cent	Response Count
Products new to the company	24%	68
Improved products to the company	23%	65
Products new to the market	20%	59
Improved products to the market	19%	55
Processes new to the company	16%	47
Improved processes to the company	12%	36
Improved processes to the market	10%	30
Services new to the company	10%	30
Improved services to the market	10%	28
Improved services to the company	8%	22
Services new to the market	7%	20
Processes new to the market	5%	15
No benefits received to date	31%	89

Number surveyed=288

The majority of projects led to outputs targeted at the private sector markets, either existing (49 per cent) or new (37 per cent).

Overall, 59 per cent of companies felt their objectives had been wholly or largely achieved.

A high proportion of companies indicated that they would be willing to participate in an Innovation Voucher project in the future (94 per cent). The majority (93 per cent) would recommend the Programme to other businesses. For most (82 per cent), the involvement in the Programme has increased their desire to work with research partners in the future. It is also interesting to note that 130 companies of those surveyed indicated that they continued to engage in innovation activities - supported through another voucher project (99), Innovation Partnership project (17), Commercialisation Fund (7) or another Enterprise Ireland programme or project with a research provider (13). These findings point to the value placed on the Programme overall, and the achievement of its objective to improve links between small businesses and academia.

The most commonly cited barrier to realising commercial benefits was a lack of finance (64 per cent) – an issue that has been cited by small businesses since the onset of the recession[138] . What is also informative is the issue pertaining to access to skills and expertise (whether internally or externally sourced). Table 8.6 sets out the range of responses from 128 respondents – the survey allowed for multiple responses.

Table 8.6: Barriers Experienced

Answer Options	Response Per cent	Response Count
Lack of finance	64%	82
Lack of skills amongst staff to implement or deliver	25%	32
Lack of access to external expertise	23%	29
Competitors have developed similar products, processes, services	16%	20
Firm has other priorities	16%	20
Inadequate sales prospects	13%	17
Change in the market	12%	15

Number surveyed=128

While many companies participating in the Programme were likely predisposed to undertaking RD&I in the first instance, in 27 per cent of Innovation Voucher projects, companies reported that the projects would not have gone ahead at all without the funding from Enterprise Ireland. In a further 51 per cent of cases the projects would have gone ahead but at a much smaller scale or to a significantly delayed timeframe.

[138] The Advisory Group for Small Business cited access to finance as the 'single biggest issue for the Irish small business community'. Source: The Voice of Small Business, The Advisory Group for Small Business, November 2011

This underlines a high additionality of the project activity across the Programme – it would not have happened to anything like the scale or timescale without the Enterprise Ireland funding.

Table 8.7: Innovation Voucher Additionality

Answer Options	Response Per cent	Response Count
Gone ahead anyway	11%	33
Gone ahead - but would have been delayed slightly	7%	20
Gone ahead - but would have been delayed significantly	32%	96
Gone ahead - but would have been slightly smaller in scope	5%	14
Gone ahead - but would have been much smaller in scope	19%	56
Would not have gone ahead at all	27%	79

Number surveyed=298

The Programme has been successful in establishing new relationships between business and academia; 61 per cent of projects occurred where there had been no pre-existing relationship.

Most companies were satisfied or very satisfied with their partner institutes when asked about the following aspects:

- Overall role (72 per cent)
- Setting up the project (67 per cent)
- Supporting the project (68 per cent)
- Following up the partnership after completion (57 per cent)

What companies valued most was:

- Access to external expertise;
- The opportunity to build links with academia;
- The simplicity of the programme; and
- The chance to develop new ideas/test feasibility.

Unsurprisingly, suggestions to improve the Innovation Voucher Programme were closely linked to what companies did not like about the scheme, including difficulties experienced with knowledge provider partners and relatively little scope for continued support. The most frequently suggested improvements were to:

- Increase the value of the vouchers;
- Improve the contribution made by the knowledge provider; and to
- Introduce frequent calls for application.

Impacts & Outcomes

This section presents estimates of the economic impacts by Frontline Consultants of the Innovation Voucher programme between 2007 and 2011, based on an analysis of the 323 responses to the business survey.

Methodological approach

Gross impact (G) Every business in the sample was asked to report the levels of turnover and employment experienced by their company in each year between 2007 and 2011[139].

Deadweight (Dw) – *assumptions applied to 2007 to 2011 figures.* The term deadweight refers to "An impact arising from an intervention that would still have occurred in the absence of the intervention"[140]. In this case, the term describes any increase in turnover or employment that would have still happened in the business, even if the company had not received a voucher.

Deadweight was estimated by asking each business how different they thought their turnover and employment levels would be had they not received a voucher. The following principles were then applied to the businesses response:

- In cases where the business was able to provide a precise percentage figure, the inverse of this percentage was used as deadweight assumption. For example, if the business reported that 80 per cent of the impacts would still have occurred, 20 per cent deadweight was assumed;
- In cases where the business was able to provide a banded percentage figure, the inverse of the midpoint was used as the deadweight assumption. For example, if the business reported that between 70 per cent and 80 per cent of the impacts would still have occurred, 25 per cent deadweight was assumed; and
- In cases where the business could not provide a percentage figure, but could provide a verbal description of how different sales would have been, the following proxies were applied;
- In cases where the business was unable to provide an answer to this question, the average percentage deadweight figure of all those businesses who did provide an answer was applied; and

[139] Frontline Consultants also developed an estimate of future potential economic return, acknowledging that the full economic benefits may be realised over a longer time period. Their analysis indicates an economic return of €11.26 over the period to 2017. Although adjustments were made to account for optimum bias, It is suggested that a degree of caution be exercised in solely attributing this potential future benefit to the Innovation Voucher Programme, while recognising that the CBA to date may underestimated the true economic return of the Programme

[140] This definition, and all other definitions used in this chapter, are those used by the UK Treasury, and are sourced from: http://www.hm-treasury.gov.uk/d/green_book_complete.pdf

- A 100 per cent deadweight figure was applied to any turnover or employment experienced by the business prior to receiving their first voucher (Table 8.8).

Table 8.8: Deadweight

Response	Deadweight assumed
A lot lower	20%
Moderately lower	80%
About the same/no different	100%

Displacement (Dp) Displacement describes "the degree to which an increase in productive capacity promoted by government policy is offset by reductions in productive capacity elsewhere." In this case, displacement would occur in circumstances where the recipient of the support uses the support received to increase its share of the domestic Irish market, at the expense of local competitors.

As a general principle, it was assumed that the risk of displacement would be highest for businesses who exclusively serve the Irish market, compete exclusively with other Irish businesses, and who are experiencing a declining demand for their product. By contrast, it was assumed that the risk of displacement would be lowest for businesses that exclusively sell to overseas markets, only compete against businesses based overseas, and operate in an expanding market.

Following this logic, the following displacement proxies were applied to the information businesses provided on these three indicators, and used the mean average of these three proxies as the estimate for overall displacement in the business (Table 8.9).

Table 8.9: Displacement

Question	Response	Proxy
Which markets are/will the products developed through this voucher be targeted towards?	Domestic only	100%
	Domestic and export	50%
	Export only	0%
Which of the following statements best describes the location of your competitors?	All of my competitors are based in Ireland	100%
	The majority of my competitors are based in Ireland	75%
	Around half of my competitors are based in Ireland	50%
	The minority of my competitors are based in Ireland	25%

Question	Response	Proxy
	None of my competitors are based in Ireland	0%
How would you describe the market for your main products or services over the last three years?	Declining strongly	100%
	Declining	75%
	Static	50%
	Growing	25%
	Growing strongly	0%

Leakage (L) Leakage describes "any benefits that accrue to beneficiaries located outside of the target area". It was assumed that no leakage adjustment would be necessary for this project given that all of the beneficiaries were Irish businesses.

Substitution (S) Substitution describes "the situation in which a firm substitutes one activity for a similar activity to take advantage of government assistance". As this is the only type of innovation voucher available to businesses in Ireland, it was assumed that there was zero substitution.

Multiplier effect (M) The multiplier effect accounts for the 'knock-on' benefits that occur elsewhere in the Irish economy as a result of the growth experienced by the direct beneficiaries. It includes two kinds of impacts:

- indirect multipliers – benefits which occur as a result of additional business purchases made by the direct beneficiaries, such as raw materials and professional services
- induced multipliers – benefits which occur as a result of additional personal expenditure by staff members at direct beneficiaries

Multipliers on a company by company basis were inputted, using the applicable multiplier for each industry as reported in the Central Statistical Offices most recent Input-Output tables.

Net impact (N) In line with industry best practice, Frontline calculated the net impact of the project based on the calculation: N = G - OB - Dw – Dp – L – S x M

Discounting Both costs and financial benefits were discounted at a rate of 4 per cent per annum, using 2007 as a base year, to account for the fact that projects offering an immediate return and delayed outgoings are preferable to those offering a delayed return and immediate outgoings. In line with good practice, discounting factors to the employment impacts were not applied.

Grossing Up Frontline Consultants 'grossed up' the aggregate impacts from all of the businesses in the sample to derive an estimate for the full population of beneficiaries based on the formula: *Total number of vouchers issues to date across all businesses ÷ Total number of vouchers issued to date to businesses in the sample.* This produced a different grossing factor for each of the years from 2007 to 2012.

EVA impact For each of the sampled businesses, the estimates of net turnover impact were converted to net EVA impact by applying a value added ratio to each business, based on the

ratio reported in the CSO National Accounts for their industry – this averages at 35.6 per cent as included in Table 8.10. These figures were then aggregated and grossed-up using the method above to produce an estimated EVA impact for the full population of beneficiary businesses.

Results

Turnover and EVA Impacts

Table 8.10 shows the turnover and EVA impacts associated with the Innovation Vouchers Programme to date[141]. The figures show that, since the start of the programme in 2007, the 1,602 businesses that have used Innovation Vouchers have collectively generated an estimated €784.698 million of turnover, €87.424 million of which would not have occurred had the vouchers not been available. This has contributed an estimated €31.141 million to Irish EVA (in prevent value, using 2007 as a base year).

Table 8.10: Turnover and EVA Impacts (discounted)

	Impacts experienced to date (2007-2011) [Present Value]	
	Adjustment	Value (€ million)
Gross Turnover Impact	-	784.698
Less Deadweight	90%	707.426
Less Displacement	34%	26.244
Plus Multipliers	1.71	36.396
Equals Net Turnover Impact	-	87.424
Times Value Added Ratio	35.6%	-
Equals Net EVA	-	31.141

Employment Impact

The employment impacts associated with the Innovation Vouchers to date show that, by 2011, the Innovation Voucher recipients collectively employed 2,169 full time equivalent workers. Applying the methodology outlined above, 806 people would not have been in employment had it not been for the Innovation Vouchers programme.

Cost Benefit Analysis

During the period leading up to the start of the survey by Frontline in July 2012, Enterprise Ireland had issued €9.907 million worth of vouchers to businesses, paid out a further €2.972 million in overhead payments, and incurred costs of €0.516 on indirect costs. The total cost

[141] That is, between the start of the programme in 2007 and 2011, the last full year for which turnover figures are available

incurred in delivering the project was €13.394. This is equivalent to €11.885 million in present value terms.

A cost benefit analysis estimates a return on investment of €2.95 to date[142]. In other words, every €1.00 of investment made by EI has contributed to a €2.95 increase in Irish EVA so far.

International Comparisons

There are a large number of innovation schemes being used across Europe, with the Senter Novem one in Holland being the inspiration for them all. Schemes vary in terms of amounts of grant given and whether or not the company must part fund the project. Many have the option for different tiers of support. The scheme in Ireland seems to fall well within the 'core' in terms of voucher size. The €5,000 voucher is somewhat smaller than many schemes, although the option of having the part funded vouchers for €10,000 brings in the added flexibility of other schemes.

Schemes also vary in terms of criteria. Firstly, with respect to size and type of company supported. Ireland appears to be more restrictive than some schemes in that the scheme will only fund registered companies, and not partnerships or sole traders as is the case in Wales for example. In Greece, vouchers can only be used to fund small companies in the manufacturing sector. In Denmark start-ups cannot avail of vouchers.

In some schemes, the criteria around innovation are much stricter than in Ireland. For example, in Austria, vouchers are only available to companies that have not received innovation support before, in Denmark they are for companies that do not regularly engage in innovation activity. In Northern Ireland, there are ex-ante appraisals around the extent to which projects contain an element of innovation.

There is some variety around the types of organisations vouchers are redeemable at. In Ireland, it is HEIs. In Austria, business to business services can be purchased. In Germany, the services of foreign knowledge providers can be purchased.

In conclusion, the Ireland innovation voucher scheme can be said to be fairly 'middle of the road'; it is not overly strict in terms of acceptance criteria, and it is not overly generous in terms of the value and number of vouchers that companies can receive.

Conclusions & Findings

Appropriateness

The Programme is appropriate and aligned to government policy – designed specifically to target small business and to stimulate innovation through engagement with external knowledge providers in the HEIs. It is wide reaching in terms of its target population and appropriate in terms of its use of a broad definition of innovation.

Innovation Vouchers are in place or have been used in countries across Europe for almost ten years. They are universally popular and the overwhelming view of the version operated by

[142] This figure refers to the impacts reported by businesses up to 2011, and therefore have excluded any grants paid out and indirect costs incurred in the first half of 2012 from the denominator. Therefore, total cost (NPV) is €10.545 million and the net EVA is €31.141 which gives a return of €2.95 for every euro invested.

Enterprise Ireland is that it is a successful initiative and valued by companies and stakeholders.

Effectiveness

The outputs of the programme are the 2,048 Innovation Vouchers completed over the period of 2007-2012 involving 1,602 companies and 36 institutes. The Vouchers have delivered a range of outputs and benefits for all participants, including companies and researchers.

As of the end of 2011, it is estimated that the programme has:

- helped small businesses to achieve an estimated €87.424 million of cumulative net additional sales (PV), equivalent to sales of €8.29 per €1.00 of EI investment;
- supported an estimated cumulative net additional EVA impact of €31.141 million (PV), equivalent to an impact of €2.95 per €1.00 of EI investment; and
- supported 806 net full time equivalent jobs

The Innovation Vouchers, as delivered by Enterprise Ireland through knowledge providers, are:

- Accessible and utilised by a broad range of small businesses; and delivering tangible results; and
- Highly beneficial to Knowledge Providers through building new client partnerships, developing market relevant knowledge for academic staff and providing 'live examples' to enhance teaching.

A recognised benefit for companies is in the ease of access to the Programme and its delivery. This simple approach should be maintained.

Efficiency

The Programme has broadly delivered to the stated objectives and has increased the number of relationships between small businesses and knowledge providers (researchers in HEIs). The indications are that this has stimulated further engagement by firms in innovation activities and in a majority of cases, a stated willingness to participate again in an Innovation Voucher project. Researchers also cite a strengthening of expertise in core research areas and educational benefits resulting from their engagement in the Programme.

It is difficult to assess the extent to which the engagement by firms in innovation activities will be sustained over the longer term. Although indications are positive in terms of a willingness by companies to continue to engage, the barriers to further engagement such as access to funding and skills/expertise need to be better understood in the context of the small scale of these companies.

The programme supported an estimated cumulative net additional EVA impact of €31.141 million (PV) to date, equivalent to an impact of €2.95 per €1.00 of EI investment

Synergies/Overlap

There was a great deal of discussion from stakeholders and companies around the gap between an Innovation Voucher (including follow on Vouchers) and the next step up the value chain, widely perceived to be an Innovation Partnership.

In practice, between repeat vouchers and co-funded vouchers, companies can receive up to €15,000[143] in state support at which point they can avail of an Innovation Partnership at around €25,000 (subject to other conditions including being an Enterprise Ireland client). This is not quite the chasm highlighted by some. However, clearly a gap of some sort exists. This appears to be more of a knowledge gap – perhaps a lack of awareness of the full €15,000 available, or of other supports that County Enterprise Boards and consultancy support that Knowledge Providers themselves can provide.

That said, there is a still a gap for some companies unable to fund further development themselves, particularly those that are not and are unlikely to become EI clients. However, before trying to create an alternative or change towards a more 'flexible' Voucher Programme, two factors should be taken into account. The first is that some form of flexible Voucher Programme would remove the simplicity that is a critical factor in the Programme's popularity, and the second is that another Programme could be construed as fuelling a 'hand-out culture' at a time of public funding austerity.

The first step should be to try to address gaps in knowledge. Only then, if the issue persists, the need for an additional Programme should be robustly researched in the context of other sources of funding, the target audience, and rationale for continued state intervention. Enterprise Ireland has taken these finding on board and a new fastracked Innovation Partnership (and accompanying communications drive) is currently being developed to address this gap in support.

Recommendations

Clarity of Programme objectives is essential to facilitate robust evaluation and determination of a Programme's success or otherwise. The identification of metrics and collation of data should be linked directly to the well-defined objectives. Enterprise Ireland should review and set out SMART objectives for the Innovation Voucher Programme, and related metrics. Consideration should be given to monitoring:

- The number of companies that have not had a relationship with a knowledge provider before;
- Tracking commercialisation outputs; and
- The number of companies that go on to work on another project, partnership or initiative with a knowledge provider following an Innovation Voucher, and the value of these subsequent investments.

Voucher Processing

Enterprise Ireland currently process approximately 800 voucher applications annually mostly though four 'calls' for applications. The process is largely a manual one for application entry, recording, evaluation, approval and reporting. It is recommended that the existing manual process be replaced by an electronic system which would allow online application by businesses and electronic processing within Enterprise Ireland – thereby increasing efficiencies both for the company and for Enterprise Ireland. If an online system was introduced then the need for the 'call' system could also be reviewed to allow for an on-going approval process that would ensure a response within a pre-defined period (e.g. 21 working

[143] Based on the assumption that a company avails of all three vouchers

days). This would allow applications from companies when the need for a project arose, whilst still giving Enterprise Ireland time to manage the approval process.

Good Practice and Quality Improvement

Some knowledge providers are more comfortable with Innovation Vouchers than others. The following factors tended to be in place with the providers that felt they were delivering successfully:

- A genuine commitment to Innovation Vouchers and clarity of vision for the next steps in relationships;
- The TTO (or voucher manager) is immersed in the process;
- Finance departments have been willing and able to adapt;
- There are 'research centres' that are committed to Innovation Voucher delivery;
- Good case studies exist and some really good marketing drives are taking place; and
- The institution is already actively involved in 'service delivery' for companies.

It is recommended that these good practices be captured as a 'living' online document, continuously updated as high quality standards evolve, and disseminated to all knowledge providers to facilitate shared learning.

It is not envisaged that Enterprise Ireland become involved in how individual HEIs manage the financial aspects of the programme, although it is acknowledged that in some instances, knowledge providers found the process overly onerous. That said, exchange of best practice amongst knowledge providers may be useful here.

Audit

The current audit process within the HEIs should be reassessed to determine a less burdensome mechanism to manage the verification of expenditure and claim. The existing process presents a barrier to the programme remaining as an 'easy way to do business'.

9. Ex-Ante Evaluation of Technology Gateways Programme 2012

Programme Logic Model

Objectives

- Harness the applied research expertise in the Institute of Technology (IoT) sector for the benefit of Irish industry;
- Provide a source of technological and applied research expertise which is relevant to local- and nationally- based industry on an open-access basis;
- Increase the level of collaboration between industry and the IoT sector; and
- Contribute to greater innovation activities in Irish industry.

Inputs

- The Total cost of the Programme is estimated at €22,800,000;
- Direct Costs: €17,000,000; Indirect cost: €5,100,000; Overhead cost: €700,000
- Company Contribution.

Centre Activities:

- Applied research between discovery and industrial exploitation;
- Technical and commercialisation services; and
- Very specialised training.

Programme Activities[144].

- Establishing a Technology Gateway Network;
- Industry engagement with Enterprise Ireland; and
- Industry engagement with Gateways.

Outputs

- Industry-led Gateway Board;
- Industry & Enterprise Ireland Open Days;
- No. of Gateways in operation;
- Network in operation (Steering Body, Business Plan); and
- Increased industry engagement.

Outcomes & Impacts

Programme Level:

- Increase in value of industry projects / EI gross funding;
- Increase in value of direct industry funding / EI gross funding;
- Increase in total non-state Gateways income / EI gross funding; and
- Increase in no's of referrals and collaborative projects.

Gateway Level:

- No. of industry project completed;
- No. of industry clients engaged with;
- Value of industry projects;
- Value of industry contribution to projects; and
- Measure of licences to industry from Gateway industry projects.

Impacts

- Increased level of R&D activity in industry participants; and
- Increased business performance of industry participants (turnover, value added measures, profitability, employment).

Evaluation Aim

This is a review of ex-ante evaluation as compiled by Enterprise Ireland. The scope of the review is informed by the following papers:

- Enterprise Ireland Executive Board Paper: 'The Future of the Applied Research Enhancement Programme', 1 November 2011.
- Enterprise Ireland Paper for Meeting No. 76 of the Industrial Research and Commercialisation Committee, 26th April 2012.
- Enterprise Ireland Executive Board Paper: 'Technology Gateways Programme', 1st May 2012.
- Enterprise Ireland Executive Board Paper: ''Technology Gateways Programme', 15st May 2012.
- Enterprise Ireland Technology Gateway Programme Guidelines 2012, 16th July 2012.
- Technology Gateways Programme 2012 Application Process, Stage 1: Industry Needs Assessment Form, 28th May 2012.
- Technology Gateways Programme 2012 Application Process, Stage 2 Application Form, 16th July 2012.

The findings of this review are based on the Forfás evaluation framework developed for the purpose of evaluating enterprise support programmes. The Framework provides a common basis for the evaluation of all enterprise supports and interventions. As part of the Framework, a Research, Development and Innovation template has been developed for evaluation of supports and it has been used to inform the ex-ante findings and recommendations to be brought forward for planned future Programme evaluations. This is included in the Appendix 5 to this report.

Programme Background, Objectives & Target Population

Background

The Applied Research Enhancement (ARE) programme was established as a national programme with the key objectives of building within the Institutes of Technology (IoTs) a capability to conduct industry relevant applied research, and of increasing IoT engagement with industry. The Enterprise Ireland Applied Research Enhancement Programme has supported the Institutes of Technology (IoTs) to develop an applied research capability that is of relevance to industry, particularly in their local region. Since 2005 Enterprise Ireland has invested in the order of €1.25 million to €2 million in each centre for a 3 to 5 year period. This investment has resulted in the creation of a local technology capability which has proved attractive to industry.

Since 2005 over 350 industrial clients including HPSUs, established Enterprise Ireland clients and MNCs have worked with the ARE Centres.

There are 13 ARE centres in 9 IoTs in operation and funding for these centres expires over 2012/2013. In total, the programme has committed €29 million in funding 17 centres. Funding in 4 of these centres ceased due to non-performance. The current 13 centres have a funding commitment of €23 million to 2012/2013.

Enterprise Ireland has initiated a new programme, the Technology Gateway Programme that builds on the successes of the applied research enhancement centre platform. It aims to have a greater propensity to meet the needs of local industry. An important aspect of the Technology Gateway Programme will be its branding and promotion as a national network of research and technology capability that is delivered regionally at each of its constituent Gateways. The creation of a Technology Gateway Network will facilitate access to each Gateway's expertise through a national portal as well as through the regional hubs. A strong, common identity will ensure that the programme is clearly visible as an Enterprise Ireland initiative, and, over time, it will help enhance the programme's reputation as a professional technology research network.

The role of Enterprise Ireland's sectoral teams will be very important to the successful development of the new Centres. Currently staff from the sectors play an important role on the steering committees of some existing ARE Centres and in the evaluation of Centre proposals and progress reviews. This role will be developed and integrated into the on-going work of the Centres in areas such as the Centres' governance, client engagement with the Centres and contributions towards the formulation of on-going research agendas that will be of relevance to Enterprise Ireland clients.

The Programme will encourage each Gateway to form working relationships with other relevant State supported Centres with the intention of opening up the wider resource to industry and, in particular, to create a pathway for smaller companies to gain experience in working with external partners. This pathway could start with simple enquiries or Innovation Vouchers with a Technology Gateway and in time move to research collaborations with Technology Centres or even Centres on the scale of the CSETs. One important lesson learned through the management of the Technology Centres is that it takes time for companies need to develop their own capability and confidence to collaborate.

The Network will be a mechanism which facilitates the Gateways to pool their skills, expertise and equipment while also allowing them to share leads and contacts. The way in which a Gateway engages with a company will be common across the network and companies that approach any individual Gateway should expect to get a professional service which either directly addresses their needs or alternatively delivers access to an appropriate service provider across the network.

The Programme was approved by its Executive Committee and funding/budget agreed by DEJI.

Other features of the new Centres include the following. Centres will:

- Be small, flexible, applied research performers and technology solution providers;
- Have an important role in supporting regional companies;
- Provide a technological resource locally;
- Act as a portal to wider expertise;
- Act as an important extended R&D facilities base for companies;
- Work with Enterprise Ireland sponsored incubators where appropriate; ,
- Each Centre will have staff with an industrial background to ensure high quality interface with industry; and

- A new emphasis will be placed on collaboration both between Centres and client companies.

Objectives[145]

The Programme has the following primary objectives, to:

- Provide relevant technology solutions to industry in specific domains; and to
- Undertake collaborative R&D with companies to improve their use of new and established technologies.

The objectives of the Technology Gateway Centre in relation to Industry engagement are to[146]:

- Increase the number of industry projects per year to 250;
- Increased interaction level with established Enterprise Ireland clients; and

Deepen the interaction with Enterprise Ireland clients, e.g. from interaction to longer term engagement, repeat projects and projects of more strategic impact**. The mission of the Technology Gateway Centre is to[147]:**

- Utilise its technological expertise to generate solutions for the close-to-market needs of Irish industry, as identified by a clearly defined industry client base;
- Form partnerships with industry to work on challenging problems and facilitate technology transfer to companies;
- Provide an open access point to industry for the provision of applied research and technical expertise;
- Serve as a portal for companies to wider expertise on a national level through a Network of Technology Gateways;
- Engage its industry support base strongly in its on-going strategic development to ensure the continued relevance of the Gateway to evolving industry requirements; and
- Contribute to greater R&D and innovation activities in indigenous and foreign-owned industry in Ireland.

Target population

The Programme is open to the fourteen Institutes of Technology covered by the Institutes of Technology Act 2006:

- Existing ARE centres, whose funding expires in Dec 2012, to apply at Stage 1, i.e. first open call for the Programme
- New applicants, to apply at Stage 2, i.e. second open call for the Programme.

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[145] Enterprise Ireland Executive Board Paper: 'The Future of the Applied Research Enhancement Programme', 1 November 2011

[146] Enterprise Ireland Executive Board Paper: ''Technology Gateways Programme', 15st May 2012

[138] Enterprise Ireland Technology Gateway Programme Guidelines 2012, 16th July 2012

Programme Rationale

The Applied Research Enhancement Centres have proven to be very successful in engaging with local industry - however there is an opportunity to increase these engagements and to shift from predominantly small term projects to longer term, more significant relationships, with greater propensity to meet the needs of local industry. The National Network will also lead to more effective use of state resources, increase coordination between Centres and minimise the potential for duplication.

Enterprise Ireland

A defining feature of the new programme will be the level to which industry is integrated in to the operations of each Gateway. Not only will industry be the Gateway's clients and main stakeholders, they will also take a pivotal role for governing and charting their development.

Evaluation Methodology

There are three important aspects in relation to selecting methodology:

- Structuring, i.e. choosing the right structure for evaluation and/or monitoring;
- Selecting the appropriate approach: evaluation or monitoring process; and
- Identifying the data requirements and tools necessary to collect and analyse these data.

A recommended approach for structuring evaluation is to consider using the Programme Logic Model in order to test the causal relationship between inputs and activities, and between outputs and outcomes.

The most important aspect in relation to evaluation during the ex-ante period is to select the appropriate monitoring and evaluation processes and methodologies.

The difference between monitoring and evaluation process is that monitoring involves tracking the performance of stakeholders. This typically includes documenting activity and reporting the participant's perceived value of the scheme – usually recipient's views are obtained through surveys or interviews. A key drawback of the monitoring approach is that the beneficiaries of the support are likely to report a positive bias for the support programme because they benefit directly from its continuation. However, this can be overcome by devising an appropriate counterfactual or control group against which comparison will be made[148].

An economic impact review will be conducted in 2013.

Attribution

The data already collected from the ARE programme may serve as a potential starting point for selecting appropriate metrics to measure activities, outputs and outcomes and, in addition, to select sources of such data for analysis.

[148] It is appropriate for Enterprise Ireland to consider establishing a control group or counterfactual at this ex-ante stage. Consider whether the participants not successful in application for Tech. Gateways would be appropriate.

In this section, we have included some data that supports the success of the ARE programme as a point of reference.

The ARE programme followed a number of phases of development, from a piloting period over 2006-2008, to establishing a full programme and building IoT applied research capacity over 2008-2010, followed by the recent period of increasing engagement with industry. This is evidenced by the following:

- The current 13 ARE centres employ approximately 50 direct-funded industry research staff, and leverage an additional 100 IoT staff on projects conducted for industry by the centres.
- The 13 centres have completed €6million worth of industry funded projects, and have successfully bid for other R&D funds – e.g. FP7, PRTLI, Enterprise Ireland Commercialisation fund.
- The Centres conducted 150 industry projects in 2011, in comparison with 36 in 2008. 180 projects are projected for 2012.
- Over 350 industrial clients have engaged with the centres to date.
- 79 projects were funded 100 per cent by industry in 2011, compared with 2 in 2008.

Alignment with National Policy

The Technology Gateway programme is an evolution of the ARE programme which was established by Enterprise Ireland in response to Government policy. The "Strategy for Science, Technology and Innovation 2006-2013" published in 2006, states that regional economic development is a key part of Government policy, that regional innovation will have increasing importance, and that the IoTs represent an important resource in this context. It goes on to state: "The OECD Review of Higher Education recommends a specific role for Enterprise Ireland in developing a closer relationship between IoTs and regionally based enterprises focusing on applied research."

The National Development Plan 2007 to 2013 states:

"Enterprise Ireland will also work with the Universities and Institutes of Technology to maximise collaboration between industry and academia to develop clusters of high technology companies in the Regions. The Applied Research Enhancement Initiative, designed to enhance regional research capabilities by supporting projects in Ireland's Institutes of Technology, will continue to be rolled out."

The Technology Gateway programme (and its predecessor, ARE programme) have been key elements of Enterprise Ireland's corporate strategy (e.g. Transforming Irish Industry 2008-2010: p 19 and p 22).

The industry engagement of the Technology Gateways is an action in the Government Action Plan for Jobs 2012, (action 20 sets a target for the number of collaborative projects undertaken with industry by the Technology Gateways Programme).

Inputs

The Total cost of the Programme is estimated at €22.8 million, broken down as follows:

Direct Costs

Estimated total direct cost for the funded centres is €17 million (assuming max 14 centres each funded at approximately €1.2 million)

Indirect costs

Enterprise Ireland's programme management costs (including network development, admin, technical evaluation, branding and promotion) are estimated at €700,000.

Overheads (at 30 per cent) are payable to the Centres by Enterprise Ireland - estimated at €5.1 million.

Outputs & Activities

The following activities are specified for Centre and Programme Activities.

Centre Activities:

- Applied research between discovery and industrial exploitation;
- Technical and commercialisation services; and
- Very specialised training.

Programme Activities

- Establishing a Technology Gateway Network;
- Industry engagement with Enterprise Ireland; and
- Industry engagement with Gateways,

The Network will be established after the individual centres are operational. It will be branded and promoted on a regional, national and international basis in order to generate as much industry awareness as possible. The Network will be a mechanism which facilitates Centres to pool their skills, expertise and equipment while also allowing the Centres to share leads and contacts. The way in which a Centre engages with a company will be common across the network and companies that approach any Centre should expect to get a professional service which either directly addresses their needs or alternatively delivers access to an appropriate service provider across the Network.

The composition of the Network would be as follows:

- Centre managers and IoT representatives;
- Industry Representatives;
- Representatives from Enterprise Ireland and IDA Ireland; and a
- Technology Centre representative.

While the new programme will charge Gateways with the task of achieving wider and more long-term engagement with the Enterprise Ireland client-base, it is equally important that Enterprise Ireland sectoral Development Advisors have greater awareness of the programme and thus can facilitate greater involvement amongst their client portfolios.

The Enterprise Ireland proposed Network will contribute to a greater awareness and ease of access. Additional measures could include for example hosting a series of industry case-study presentations in Enterprise Ireland, and a schedule of industry open-days with individual Gateways, in order to show-case their technologies and industry case-studies both to Enterprise Ireland companies and Enterprise Ireland staff.

A defining feature of the new programme will be the level to which industry is integrated into the operations of each Gateway, each of whom will have a defined industry support group and will be funded to deliver on a technology work programme endorsed by that industry group.

New Gateways must be governed by a Board which has a majority of industry membership to ensure the balance of influence is towards economic impact. The Board will be chaired by an industry person from a sector not directly involved with the work of the Gateway. Each Gateway (and its work programme) will be founded on a defined and supportive cluster of companies, which will continue to inform their views and their understanding of industry need.

Call Process

The application process for the Technology Gateways Programme comprises two calls.

The first call is restricted to existing recipients of ARE funding, and groups with both an industry track record and proposition that are equally robust as those put forward by existing ARE Centres. A second call for applicants for the Technology Gateway programme was launched in September 2012 and open to applicants across the IoT sector.

Each call process will comprise two stages:

Stage 1: Industry needs assessment; and

Stage 2: Detailed application.

The Industry needs assessment is an outline application (on a defined application template) from potential centres, which will allow Enterprise Ireland to confirm whether:

- there is a defined industry cluster around the proposed new centre;
- the industry cluster has been consulted and that it helped inform and support the applied research strategy of the centre;
- the applied research themes proposed have relevance for the targeted industrial sector on a regional and national level; and
- the proposal team has the track record (in terms of industrial collaboration and technical competency) to successfully deliver upon the proposed research themes.

The Stage 2 evaluation process will focus in particular on criteria such as:

- Evidence of a well-defined research strategy, with demonstrable support from and potential benefits to, a cohesive industry group both regionally and nationally.
- Track record and competencies of the applicant to successfully deliver on the proposed research strategy and proposed work programme, and to assist industry to commercialise research outputs.
- The additionality of the proposed centre within the current landscape of applied research and technology for the proposed industry group within Ireland, and its

capacity to form collaborative links with a wider IoT network of applied research centres and with University based research groups.

- The quality of governance and management of the proposed centre, including a strong industry led steering committee, a process of engagement with wider industry, clearly defined roles for the Centre Manager and supporting Researchers, and standardised procedures and best practice in management of IP.
- The capacity of the host IoT to provide on-going management and administrative supports to the proposed centre and a commitment to the proposed centre as an integral part of its applied research strategy.

Enterprise Ireland will host information workshops and individual meetings for IoTs, in order to clearly communicate Enterprise Ireland's expectations for the revised programme.

A Selection Process Flow Chart is included in the Enterprise Ireland Technology Gateway Programme Guidelines 2012, 16th July 2012.

Outputs

The outputs are the technical and immediate results the Programme is expected to produce.

Some of the expected outputs are outlined below and need to be captured in the performance metrics.

- Industry-led Gateway Board;
- Industry & Enterprise Ireland Open Days;
- Number of Gateways operational (e.g. fully staffed, delivering on work programme etc.);
- Network Structure in place and in operation (Steering Body and Network Business Plan); and
- Increased industry engagement as per metrics

Outcomes & Impact

Performance Metrics

The following metrics have been proposed for the Programme:

It is recognised that each centre will have different technology research areas and different client bases, each with their own unique set of requirements. Enterprise Ireland has set out the following 'core' Performance Metrics on which basis an agreed level of funding support will be made available to approved applicants.

- Number of industry projects;
- Number of industry clients;
- Value of industry projects;
- Contribution from industry; and
- Value of industry projects/total EI funding.

Performance Monitoring[149]

On-going funding from Enterprise Ireland will be dependent on satisfactory programme performance against the metrics (number of collaborative projects successfully completed etc.). It will be the responsibility of the IoT to ensure that they deliver on the programme objectives and metrics and hence secure continued Enterprise Ireland support. Payments will be made on the basis of clear deliverables and via a milestone based payment system that will be aligned to each Centre's work plan.

International Comparators[150]

The following information provided some reference to other International Programmes:

The current 13 centres have received under the ARE programme a core programme funding amount of €23 million to 2012/2013. These centres have generated to date annual funding income from the following sources:

- €8 million research funding income from competitive schemes such as Innovation vouchers, Innovation partnerships;
- €5 million (in cash) from industrial project contracts;
- €10 million from other non-exchequer sources such as FP7.

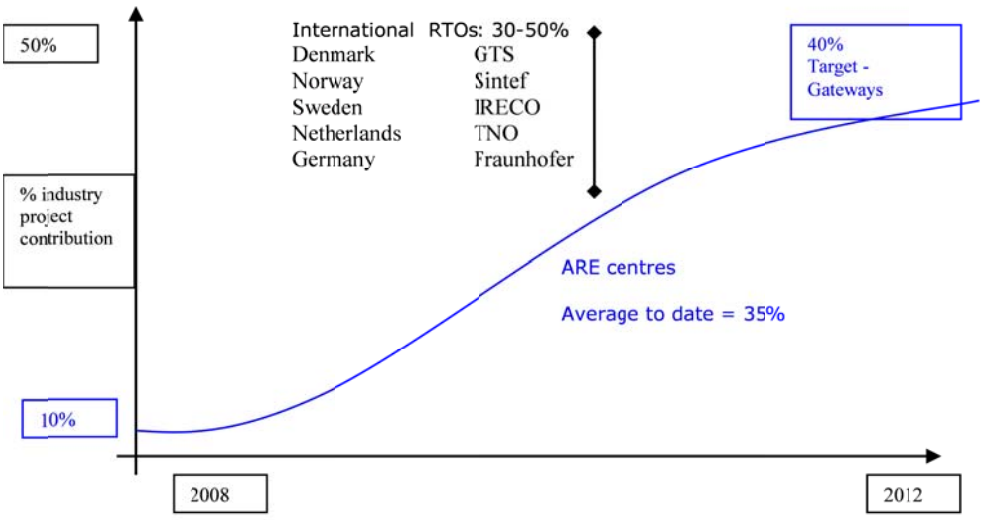
Excluding core programme funding, annual industry contributions to projects in 2011-2012 account for almost 40 per cent of applied research project income.

This compares well with international norms for research centres.

[149] Enterprise Ireland Board Paper: 'Technology Gateways Programme', 1st May 2012

[150] Consider expanding on the International comparator with Programmes of similar objectives. This may be used as a benchmarking exercise to evaluate Programme efficiency in a wider context.

Chart 9.1 Industry Contributions to Projects



Further international benchmark would consider how programmes work, how they are funded, what impacts they have produced, what challenges they have faced, and what lessons could be learned from them to help reshape future support activity.

Findings and Conclusions

The documentation provided to inform a formal ex-ante evaluation predominately focuses on the operational and management aspect of the Programme, from Enterprise Ireland's perspective. Although this approach has merit, the operational approach is distinct from an evaluation approach. A robust ex-ante evaluation (as set out in this review) will inform interim and ex-post evaluations of the programme and future decision making.

The evaluation process needs to be structured and streamlined process with a consistent format of evaluation framework. It is recommended that the ex-ante evaluation is compiled and structured in one report in order to set the framework for interim evaluation.

Appropriateness

The evaluation should consider wider policy objectives and alignment with National Policy. The following questions may be addressed as starting point:

- To what extent the Programme fits with the emerging needs of the assisted enterprises?
- To what extent does the Programme under evaluation operate in line with national policy objectives?

The synergies/complementarities and identified gaps with other agency-delivered programmes have been outlined below:

Table 9.1: Programme Comparators[151]

	Gateway (Enterprise Ireland)	Technology Centre (Enterprise Ireland, IDA)	CSETs; Research Centres (SFI)
Comparative Funding Scale	€1 million	€5 million	€10-25 million
Type of Research	Applied 'technology solutions'	Pre-competitive, applied research agenda of member group	Basic
Impact Time Frame	Short-term	Medium term	Medium-longer term
Typical Project Duration	1 – 6 months	1-2 years	2-5 years
Initiation/ Operation	IoT and Enterprise Ireland initiated Industry endorsed and governed	Initiated and governed by industrial group Fulfilled by research consortium	Competitive call
Client Base	70% SMEs incl start-ups, 30% large Cos & MNCs	Currently 70% MNC, 30% SME	Large Cos & MNCs
Access	Open access	Initially to members	-

Effectiveness

The ex-ante evaluation should consider how impact will be measured. The preferred method in industry practice is to create control group or counterfactual. An alternative approach is to use additionality calculations to measure additionality on input, output and behaviour.

Efficiency

Consider measuring efficiency, using cost efficiency analysis and identify data needs at ex-ante stage. The efficiency may aim to address the following questions as a starting point:

Efficiency (against alternatives):

- Is the Technology Gateways Programme funding well spent on resources and activities that contribute to the key objectives?
- Do other Irish interventions achieve similar effects as Technology Gateways Programme with a similar or smaller financial investment?

[151] As presented in Enterprise Ireland Board Paper: ''Technology Gateways Programme', 15st May 2012

Efficiency (for participants)

- Are participants satisfied with the management and implementation of the programmes?

Recommendations

Bearing in mind that greater detail on objectives, activities and expected outcomes may be available following review of the application process, it is recommended that the ex-ante evaluation be updated and revised to reflect the dynamic and consultative nature of the Programme design.

1. Identify the chain of causal links between inputs and activities, outcomes and outputs through which the intervention is expected to achieve impact.
    - For example, greater consideration needs to be given on the activities of the Gateways, in order to demonstrate their link to meeting the objectives. A clear outline of the activities will ensure consistency and comprehensive evaluation and design of the expected outputs and outcomes of the Programme. Such a link needs to be clearly tracked during Programme design, monitoring and evaluation stage.
2. Optimism bias: Consider how optimism bias would be overcome if a survey of beneficiaries for future monitoring of progress on performance is applied.
3. In relation to the sample Performance Metrics, it is recommended that:
    - The Performance Metrics more accurately reflect the objectives, expected outputs and expected outcomes of the programme.
    - Consideration should be given to how the overall performance of the Programme, versus the performance of the individual Gateways, will be measured.
4. The following expectations outlined from successful implementation of the proposed Programme network need to be incorporated in the metrics for evaluation[152]:
    - Collaborative projects with other Gateways for the benefit of industry, in addition to the suggested number of referrals, as above.
    - Increased visibility nationally, internationally and with IDA, IBEC etc.
5. Consider rating objectives to primary, secondary and tertiary, to relate to 'tiers' of the support Programme is aiming to capture and impact on.

For example:

- Primary, being the Programme objectives for the direct beneficiaries, in this case the Technology Gateways in IoTs;
- Secondary, being the objectives for the indirect beneficiaries, and in this case, Industry;
- Tertiary, being Programme objectives for the wider RD&I Policy System.

Following such exercise, outputs and outcomes and wider benefits, can be streamlined with:

[152] Enterprise Ireland Board Paper: 'Technology Gateways Programme', 1st May 2012

- Metrics/indicators of Immediate (first order) effects; for example outputs and outcomes from Gateways;
- Metrics/indicators of Intermediate (second order) effects; for example, economic outcomes/additionality on company performance;
- Metrics/indicators of Final (third order) effects; for example, economic performance of specific sectors/clusters on the overall economy.

6. The metrics need to be quantified to the greatest extent possible.

Such quantifiable metrics need to be supported with appropriate data and its source and techniques for collection identified at this stage in the process.

The attribution results from the preceding ARE Programme contained in the documentation provided maybe used as input to quantify the metrics. Recognising that update of the performance metrics to its fullest extent would be possible only after consultation and application stage, it is recommended to develop a tracking system and employ a cost effective approach to data collection. The development of database can be done on modular basis and tailored to requirements. Such results will inform performance on both Programme level, but also on a system level.

An Illustrative example of Performance Metrics based on recommendations is outlined in the Appendix 4 below.

10. IDA R&D Fund (2003-2009)

Programme Logic Model

Objectives

- To increase the R&D capability and capacity of the MNE sector in Ireland
- To move subsidiaries based in Ireland up the value chain and to increase the embeddedness of these companies in Ireland
- To meet the targets set out in the Strategy for Science, Technology, and Innovation:
  - No. of foreign affiliates with a minimum scale R&D activity to (in excess of €100,00) 520 by 2013
  - No. of foreign affiliates performing significant levels of R&D (in excess of €2 million) to reach 150 by 2013
  - Business expenditure on R&D in foreign-owned companies to grow to €1.675bn by 2013

Inputs

- IDA grant investment
- Indirect costs of the programme

Activities

- Approval of grant level
- Advice and assessment of projects

Outputs

- Number and value of projects approved
- Amount of R&D grant investment
- Amount of private MNC R&D investment supported in Ireland
- Number and value of the projects completed

Outcomes & Impacts

- Increase level of MNE investment in R&D in Ireland
- Maintain presence of, and embed, MNEs in Ireland
- Upgrade of technical capability of MNEs in Ireland and transform companies towards higher value added operations
- Increase EVA contributed by MNEs in Ireland

Evaluation Aim

The aim of the evaluation is to assess the IDA R&D Fund in terms of its appropriateness, effectiveness and its efficiency. The Fund is not acting in isolation and this evaluation considers the Fund in terms of its individual performance, in relation to other interventions and its fit with Irish enterprise policy.

Programme Background, Objectives & Target Population

The 1990s was a period of rapid economic expansion in Ireland, driven largely by phenomenal growth in exports of manufactured goods and internationally traded services (including software). Crucially, many of Ireland's internationally trading industries are foreign owned and Ireland has benefited from its inward investment policy that has been in place since the early 1970s.

Because of this strong growth Ireland had become one of the highest income countries in the OECD, as measured by GDP per head. The basis for Ireland's attractiveness for FDI was shifting from one of low cost / high labour availability when at the same time its low corporate tax rate policy was being adopted by competitors in Eastern Europe and elsewhere. Addressing this shift in national competitiveness became a key policy issue in Ireland in the late 1990s.

Against that background the Irish Council for Science, Technology and Innovation (ICSTI) undertook a 'Technology Foresight' exercise in 1998. The subsequent report concluded that Ireland should evolve rapidly to a knowledge society. Without a strong research capability to support the technology-based industries (which now accounted for more than two thirds of manufacturing output in Ireland) it would be challenging to sustain the momentum built up by the inward investment policy. Ireland would gradually lose its comparative attractiveness for manufacturing industry and the basis of its export led growth in the 1990s. The Government responded by establishing a Technology Foresight Fund of over €630 million for the seven year period of the National Development Plan 2000-2006.

Within this context IDA Ireland introduced its R&D Capability Grants Scheme in 2000 (now known as the IDA R&D Fund). The programme operated under the EU State Aid R&D Guidelines, 2000-2006,[153] and has been in operation for over 11 years.

The evaluation of this Programme relates to the period 2003-2009. It is delivered by the IDA and provides grant aid to support clients in the establishment of major new R&D facilities or in the expansion of existing ones, and in the development of R&D projects.

IDA Project Executives introduce the RD&I grant scheme if a relevant project has been put forward by the company. If required, IDA staff will support client companies to develop a company application form and then a more detailed proposal document. This covers a range of issues including:

- Objectives and fit with company strategy;
- Description;
- Cost; and
- Milestones.

[153] And subsequently EU State Aid Research, Development and Innovation, 2007-2013

An Enterprise Ireland Technical Assessor with expertise in the relevant technological field visits the company to undertake a technical assessment. The proposal is also assessed by IDA for its commercial, strategic and economic benefits. The IDA Project Executive determines the minimum grant that will be required to secure the company's investment in the project (after consideration of R&D tax credits that will also be part of the package).

The programme has three main objectives. These are:

- To increase the R&D capability and capacity of the MNE sector in Ireland;
- To move Irish subsidiaries up the value chain and to increase the embeddedness of these companies in Ireland; and
- To meet the targets set out in the Strategy for Science, Technology, and Innovation.

The Strategy for Science Technology and Innovation 2006-2013 (SSTI) was developed and introduced during the evaluation period. It sets aspirations and a framework for the development of the knowledge economy in Ireland that the R&D Fund is supporting. The key targets are to increase:

- No. of foreign affiliates with a minimum scale R&D activity to (in excess of €100,00) 520 by 2013;
- No. of foreign affiliates performing significant levels of R&D (in excess of €2 million) to reach 150 by 2013;
- Business expenditure on R&D (BERD) in foreign-owned companies to grow to €1.675bn by 2013.

Target Population

The Fund's target population is IDA clients who are the affiliates of international multinational enterprises (MNEs) already located in Ireland. The main industries which these clients are from are in Table 10.1 below.

Table 10.1: IDA Supported Companies by Sector and Share of Employment

Sector	Employment as a percentage of total employment in IDA client companies
Pharmaceuticals	14%
Computer, Electronic & Optical Equipment	11%
Medical/Dental Instruments & Supplies	16%
Metals & Engineering	7%
Miscellaneous Industry	4%
Internationally Traded Services (Including Financial Services and Software)	47%

Programme Rationale

The programme provides grant aid to support clients in the establishment of major new R&D facilities or in the expansion of existing ones, and in the development of R&D projects.

The programme was introduced during a period when Ireland was repositioning its enterprise strategy – with the aim of becoming a knowledge economy. It was recognised that potential existed for Ireland to attract more R&D investment from abroad. Such investments would build the future competitiveness of Ireland and facilitate Ireland's transition to a knowledge based economy. However, considerable efforts would be required to convert this potential into real R&D investments since Ireland was predominantly known for its strengths in areas other than R&D.

The rationale for the programme, then, was to successfully challenge the efforts of other countries in attracting R&D and to increase the number of R&D investments from abroad. This would help to embed FDI subsidiaries in Ireland and to enhance their technical capabilities, leading to a greater proportion of their employees being engaged in high value jobs.

The programme would help to market the Ireland as a location for R&D and develop Ireland as a cluster for R&D in key sectors.

The core objectives of the Programme (outlined above) remain valid today and the R&D Fund continues to be an important contributor to the objectives of the Strategy for Science, Technology and Innovation 2007-2013.

Methodology

This is an interim evaluation of IDA R&D Fund from 2003 to 2009; the evaluation was completed by Frontline Consultants on behalf of Forfás in April 2012. The time frame chosen reflects time lags associated with research and development projects – a 5 to 7 year timeframe[154] is considered necessary for a programme of this type to deliver on its stated objectives. The years following the time period are looked at in a predictive manner. The impacts section below show the potential attributable economic value added (EVA) impacts and provides commentary on turnover and employment.

The core element of the evaluation is to understand the benefits that companies have received through participation with the Fund and in turn how these have impacted on the wider Irish economy.

Once company information was gathered, the details given were matched against the Annual Business Survey of Economic Impact (ABSEI) provided by Forfás. Care was taken to ensure that information provided in good faith remains confidential.

Feedback from the companies was gained through a targeted series of face to face interviews. This was complemented by a short e-survey that went to all other 136 companies that had been involved in with the fund between 2003 and 2009.

In effect, the companies receiving the 30 largest Fund approvals plus a further 20 companies selected at random were put forward by the evaluators. The companies were contacted by e-mail to set up interviews and this was followed up where necessary with a reminder and

[154] Framework for the Evaluation of Enterprise Supports, Forfás, May 2011

telephone call. From this, 23 companies were interviewed face to face, following a pro forma. Most of the interviews were with the larger companies.

The rationale for the focus on the largest companies was to ensure the fieldwork captured the largest and most heavily engaged companies, in order to cover off as high a percentage of the actual grant payments as possible. Companies interviewed accounted for approximately two-thirds of the grant money allocated and drawn down. The split between manufacturing and services firms amongst companies interviewed was approximately two-thirds manufacturing to one-third services and this accurately reflects the breakdown of grants.

The interviews were split into three sections to cover:

- Background and delivery of the R&D Fund;
- Company objectives for R&D Fund supported projects; and
- Information on which economic impact could be calculated.

Based on the qualitative responses from the face to face interviews, an abbreviated e-survey was prepared and sent to all remaining companies, the survey was aimed at gauging their opinion on the attribution levels that the Fund has had on company performance in Ireland. A further 41 responses were received through this route. This resulted in 64 out of 136 companies that received grant support over the period, being contacted by the end of the survey processes.

Alignment with Policy

The Irish Council for Science, Technology and Innovation (ICSTI) undertook a 'Technology Foresight' exercise in 1998. The subsequent report concluded that Ireland should evolve rapidly to a knowledge society. It identified technology as a key driver for knowledge societies and determined that the potential of new technologies in areas such as computer science, telecommunications, nanotechnology, biotechnology and medical systems should be exploited. At that time Ireland lacked world class research capability of sufficient scale in a number of strategic areas. Technology Foresight called for a dramatic increase in the level of research investment to address this gap as a matter of urgency.

This was reinforced by the Economic and Social Research Institute (an independent policy agency) in its report *Investment Priorities 2000-2006* – which stated that 'the promotion of investment in R&D is seen to be at the heart of national development strategies. The case for support for R&D is extremely strong since it can offer significant potential returns on investment'. At the time, levels of public investment in R&D were low by international standards and the report recommended a substantial increase in public expenditure on R&D.

The Government responded by establishing a Technology Foresight Fund of over €630 million for the seven year period of the National Development Plan 2000-2006. This led to the establishment of Science Foundation Ireland (SFI) and a number of other programmes to develop Ireland's public research base. In tandem, a number of new initiatives were developed to increase the quantity and quality of company R&D.

In 2004, the Enterprise Strategy Group as formed by the Minister for Enterprise, Trade and Employment issued a report *Ahead of the Curve, Ireland's Place in the Global Economy*, which identified that Ireland had significant enterprise expertise in manufacturing/operations and limited expertise in R&D and sales and marketing. The recommendations set out in the report sought to build new competencies in the development and introduction of new

products, processes and services and in international sales and marketing, thereby re-balancing Ireland's enterprise expertise.

Furthermore, the report specifically recommended that public funding for applied research and in-firm R&D should be progressively increased to match that invested by the State in basic research and that this should include support for in-firm capability development, commercialisation, cluster-led academic research and innovation partnerships.

In 2004, Forfás published its report to the Interdepartmental Committee on Science and Technology entitled *Building Ireland's knowledge Economy*. The report set out specific targets for the performance of business, higher education and public sector R&D which were to result in gross expenditure on R&D in Ireland increasing to 2.5 per cent of GNP by 2010.

Since then, *The Strategy for Science, Technology and Innovation* (SSTI) launched by Government in mid-2006 mapped a path that would further transform Ireland in the period to 2013. The SSTI aimed to bring Ireland in line with competitor countries that create a significant proportion of their GDP from the creation and utilisation of knowledge – countries like Singapore, Australia, Germany, Denmark, Austria, and France. This transformation would require investment in R&D to reach a level of 2.5 per cent of GNP, two-thirds of which would be invested by business in R&D activities.

The 2006-2013 SSTI objectives for Research and Development for Enterprise, Innovation and Growth, are to:

- Strengthen manufacturing in Ireland into the long term;
- Increase absorptive capacity by strengthening technology skills in firms new to R&D;
- Rationalise and simplify enterprise R&D grant structures to make them more accessible to firms; and
- Grow Business Expenditure on R&D (BERD).

The IDA R&D Fund continues to be aligned with and play a key role in delivering upon national policy.

Inputs

Direct Costs of Programme

IDA investment in the programme through grants awarded to companies was €572m between 2003 and 2009, or €81.7m on average per year, between 2003 and 2009. Over time the IDA grant rate reduced from 36 per cent in 2004 to 23 per cent in 2009, reflecting the introduction of the R&D tax credit.

Proportion of Programme Direct Costs Paid to Companies

Between 2003 and 2009 there were 219 grant approvals made to 136 companies. The projects supported totalled €2,113,406,063, toward which IDA grants of €572,392,038 were approved, averaging at a grant rate of 27 per cent.

Table 10.2: Summary of Inputs

Number of companies	136
Number of projects	219
R&D Fund approvals	€572,392,038
Company investment	€1,541,014,025
Total value of projects	€2,113,406,063
IDA Ireland average contribution as percentage	27%
Actual grant paid to companies to date	€228,234,375

Companies are not restricted to one single application. 100 companies had a single project whilst 36 companies had multiple projects. 44 per cent of approvals were a one-off for companies in the period 2003-2009.

Companies draw down against approved amounts over the period of the project, based on amounts actually spent and subject to validation by the agency Grants Department. Some of the common reasons the draw-down rate include the fact that the project may be still on-going and claims have yet to be made or there may be a claim pending. In other instances the project may have been delayed, or cancelled. In some cases the project may have changed from what was outlined in the original application and approved.

Indirect Costs

The provision of R&D grants to companies involves considerable interaction with the relevant project executive throughout the process. Client facing project executives provide complementary advisory services and manage the client relationship (both locally and overseas) to garner additional responsibilities for the Irish operation. The indirect costs attributed to these activities involved in delivering the programme have been calculated as follows:

- Staff Costs (client facing): based on the proportion R&D project approvals against all project approvals in each year[155], multiplied by the average cost of client facing staff for each year (number of staff multiplied by the median wage for each year).

Total Indirect cost of RD&I programme 2003 – 2009 is estimated at €9,672,217. The average indirect cost per annum over the duration of the evaluation period was €1,381,745.

[155] IDA Annual Report (2003 – 2009) http://www.idaireland.com/news-media/publications/annual-reports/ - other projects relate to grants provided to support other activities such as capacity building, greenfield investments, expansions etc.

Table 10.3: Indirect Cost of RD&I Programme (2003 – 2009)

Year	R&D projects approved as a % of total approvals	Total Cost of all client facing staff	Client Facing Staff costs attributed to R&D project approvals (column B x C)
2003	38%	2,621,568	996,196
2004	34%	2,979,696	1,013,097
2005	41%	2,841,696	1,165,095
2006	43%	3,224,999	1,386,750
2007	39%	3,259,935	1,271,375
2008	43%	4,064,005	1,747,522
2009	49%	4,269,760	2,092,182
2003-2009			9,672,217

The indirect costs of the programme have risen year on year - this can be explained by the fact that number of R&D project applications increased from 39 in 2003 to 62 in 2009 and the fact that it is premised on added value services provided by staff that complements the financial grant.

When indirect costs are included the total commitment from the exchequer for the period of 2003-2009 is €582,064,255.

Outputs & Activities

Business Objectives

Around half of the 23 companies interviewed face-to-face had not undertaken R&D before in Ireland. Where companies had undertaken R&D it was mostly done in-house and on a small scale, with reliance on 'next generation direction' from R&D undertaken predominantly near the parent company headquarters.

Companies were asked their business (some deemed these strategic) objectives for applying for the Fund and undertaking an R&D project. Most companies selected more than one with the key objectives being, to:

- Help the company to grow in Ireland;
- Transform the capability of the company in Ireland; and
- Embed R&D in the company in Ireland

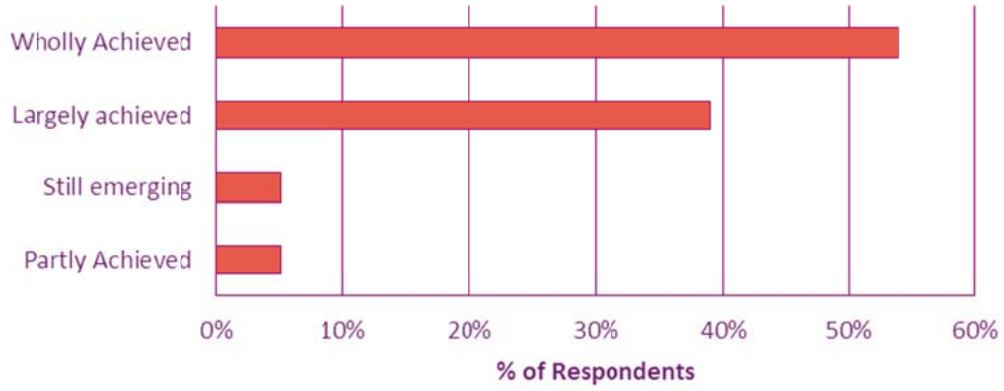
Table 104 below shows the findings. These are encouraging as they demonstrate not only business objectives, but a commitment to growth through higher value added activity in Ireland which are main objectives of the programme.

Table 10.4: Business Objectives

	% of respondents	No. of respondents
Help the company to grow in Ireland	22%	13
Transform the capability of the company in Ireland	23%	14
Embed R&D in the company in Ireland	20%	12
Become market leader in sector	17%	10
Help the company to remain competitive	15%	9
Test commercial feasibility of ideas	10%	6
Improve the image/ profile of the company	8%	5

93 per cent of respondents indicated that their objectives were either largely or wholly achieved (Chart 10.1).

Chart 10.1: Achievement of Objectives



The other 10 per cent felt that their objectives were either partly met or that the benefits were still emerging. This is a strong indicator that the Fund is supporting not only business objectives, but that it can also be considered instrumental in supporting the wider economic impact that business benefits will bring.

Technological Objectives

Companies were asked what their objectives were in terms of the technical side of what they were undertaking research into and/or trying to develop. New products came out as the most prevalent objective, and this related to products for both internal and external customers. As a range of sectors were involved, the terminology of a product and a service varied. In other words not all products were physical goods that would end up on the shelves for sale,

but might be a product that supported internal and/or external customers in other aspects of their business. The size and scale of a number of the projects meant that almost all the technological objectives were selected.

Table 10.5: Technological Objectives

	% of respondents	No. of respondents
Test technical feasibility of idea(s)	41%	9
Overcome technical problem(s)	32%	7
Improve existing product(s)	50%	11
Improve existing process(es)	41%	9
Improve existing service(s)	18%	4
Develop new product(s)	86%	19
Develop new process(es)	63%	14
Develop new service(s)	14%	3

As with the business objectives, there are high levels of success in achieving technological objectives. Particularly positive results are the achievement of existing product development and to a lesser extent the new product development figures (Table 10.6). The fact that the end column has no responses indicates a level of success has been gained in all projects.

Table 10.6: Achievement of Objectives

	Fully	In part	Not at all
Test technical feasibility of idea(s)	75% (6)	25% (2)	-
Overcome technical problem(s)	50% (3)	50% (3)	-
Improve existing product(s)	89% (8)	11%(1)	-
Improve existing process(es)	67% (4)	33% (2)	-
Improve existing service(s)	33% (1)	67% (2)	-
Develop new product(s)	72% (13)	28% (5)	-
Develop new process(es)	58% (7)	42% (5)	-
Develop new service(s)	33% (1)	67% (2)	-

Performance

One of the questions asked was how delivering the R&D project has supported the performance of the company in Ireland. The highest figure of 90 per cent (noted in Table 10.7) relates to upgrading the technical capability and this should not be discounted purely as an expected result of an R&D project. The comments behind the answer show that without this upgrade the companies in Ireland might not be in a position to support the strategy of their parent company.

Table 10.7: Impact on Performance

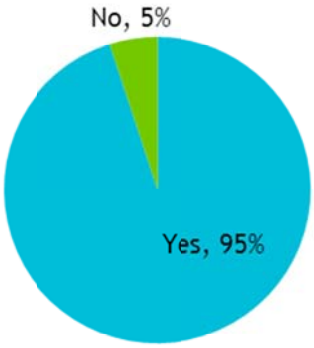
	% of respondents	No. of respondents
Upgraded the technical capability in Ireland	90%	57
Maintained a presence in Ireland	35%	22
Maintained a larger staff presence than without the project	76%	48
Supported a larger turnover than without the project	30%	19
Raised the skills levels required in Ireland	62%	39
Transformed company operations in Ireland to higher value ones	51%	32

Over a third of respondents said that without the project, they may not still be in Ireland. This goes hand in hand with the 51 per cent companies who said that company operations had been transformed. During interviews, the companies were asked if this was perhaps an over-reaction, but they talked through the situation and confirmed that Ireland was no longer seen as a production base, but had managed to re-invent itself as location for activities that were further up the value chain. In many cases this had resulted in a loss of production related jobs, but had also seen an increase in higher skilled jobs.

Given the importance of job creation in the current climate it is particularly encouraging that 76 per cent of companies said that they had maintained a larger staff presence in Ireland than they would have done without the project, especially when allied to the 62 per cent that said it had led to the skills levels employed in Ireland being raised. This signals that Ireland's strategy of creating a knowledge economy is paying dividends in this cohort of companies.

To reinforce the above comments on higher value jobs, companies were asked whether as a result of the research project(s) supported by the IDA R&D Fund, they believe the company in Ireland has transformed towards higher value adding operation. Perhaps unsurprisingly, given the previously noted success of the projects, 95 per cent of companies indicated that this was the case.

Chart 10.2: Higher Value Added Operation



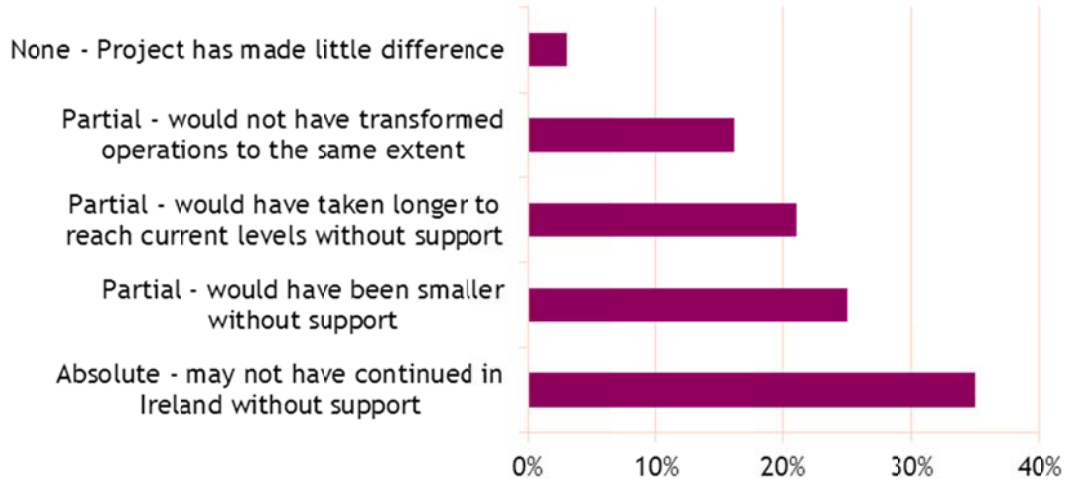
Attribution to R&D Fund

Attribution

This particular question is critical to the evaluation of the Fund. The aim is to assess the level of attribution that the Fund has had on the overall project and on what the company would have achieved in the absence of R&D support.

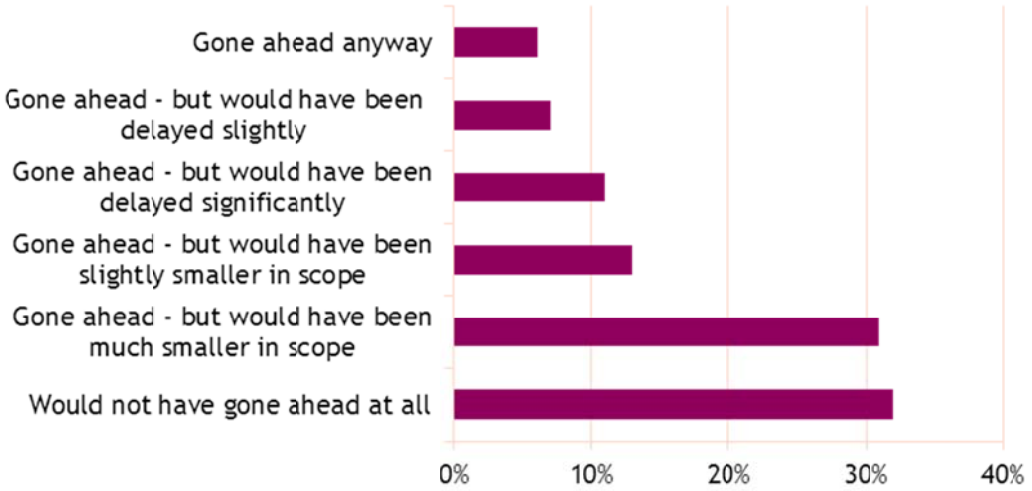
Around a third said that the effect of the Fund was absolute and that the operations may not have continued to be based in Ireland without it. This high level of absolute attribution is uncommon and again was challenged at interview. In economic development terms this is highly significant as partial attribution around the project is expected in helping projects to happen sooner and be undertaken to a higher quality etc. All of these things happened and were commented on by companies, but it is the level of absolute attribution which stands out (Chart 10.3).

Chart 10.3: Attribution to Fund



The method that was used to establish a counterfactual was to ask the companies what they would have done if they did not receive assistance from the R&D Fund. Over a third of the projects would not have gone ahead at all without the Fund which again is significant – particularly when set against the results in the attribution. These are estimates but the sample size provides confidence that they are generally reliable indicators. The message is that without the Fund, progress and competitiveness in a number of Ireland's major employing and exporting companies would be affected.

Chart 10.4: Project without the Fund



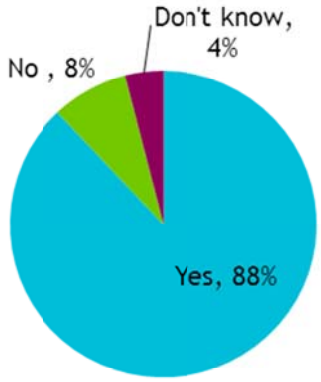
Embedded in Ireland

Over many years Ireland has followed a highly successful strategy of attracting FDI. Many of the companies that were attracted initially employed a large number of low and semi-skilled staff. Over the period of the implementation and evaluation of the Fund Ireland has been

advancing its enterprise policy to develop a knowledge based economy, that is more reliant on higher level skills to support higher value added products and processes. This is very much a demand led strategy aligned with the needs of the enterprise in general, and of the companies that took part in this evaluation.

The companies were asked if they considered that the company is now more embedded in Ireland as a result of the R&D project supported by the IDA R&D Fund. The response was very positive; 88 per cent of cases answered yes as shown in Chart 10.5.

Chart 10.5: Embedded in Ireland



The follow on question was whether the company is now more or less likely to invest further in R&D in Ireland and the answer was an unequivocal yes as shown in Table 10.8 below.

Table 10.8: Further R&D investment

	% of respondents	No. of respondents
More	100%	22
Same	-	-
Less	-	-

Capability

It is difficult to measure accurately what is meant by an increase in skill levels. In an attempt to gain some measure of perspective, companies were asked if they employed a higher proportion of staff in Ireland at degree level qualifications or above, compared to before the

project(s). The figures were high at 91 per cent and were reinforced by positive comments from the companies in the interviews.

Table 10.9: Qualifications

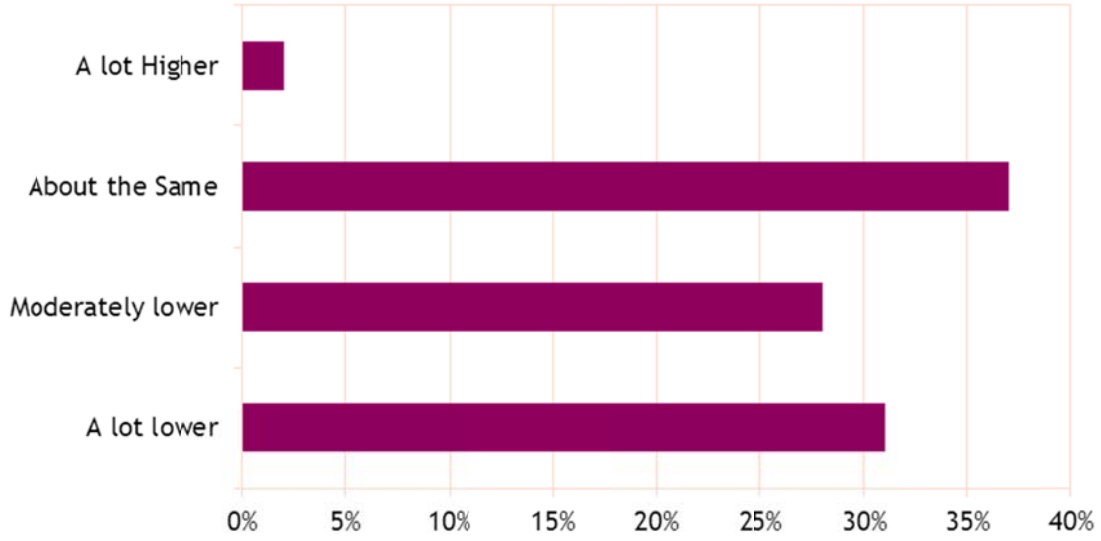
	% of respondents	No. of respondents
More	91%	20
Same	9%	2
Less	-	-

This demonstrates that the nature of the employment has been enhanced in these companies, leading to the potential for increased value added to meet the objective of helping companies to 'move up the value chain'. A reasonable assumption might be made that this will also be positively reflected in the wider economy with suppliers to these companies following suit.

Effect on Turnover

To assess whether any bottom line impact was being generated, companies were asked how different they thought their turnover/revenue level would have been if they had not undertaken the R&D project.

Chart 10.6: Turnover/Revenue (had the project not gone ahead)



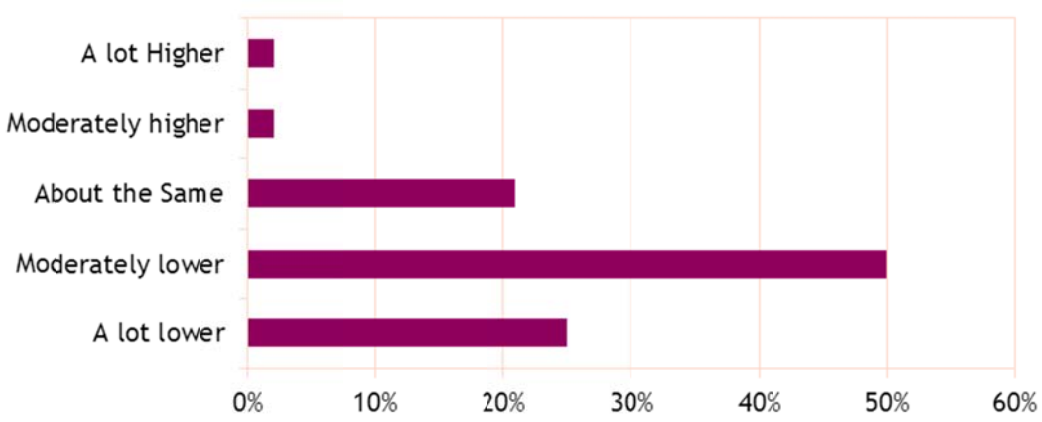
As shown in Chart 10.6, around 60 per cent of the companies considered that turnover would have been moderately or a lot lower if they had not undertaken the projects. Respondents indicated that the R&D projects had kept companies competitive by modernising their approach and offering something that was in line with the parent company requirements.

In the instances where a company suggested that turnover might be higher, the reasons given were that the previous high volume production generated a greater turnover than the research facility/activity that now existed. There was also an acceptance that without the research activity now in place, there might not be production of any kind taking place.

Effect on Employment

In a similar vein, companies were then asked how different they thought their employment would have been had they not engaged with the IDA R&D project. Over 70 per cent thought that employment would have been lower without their project. In a similar way to the turnover question, two companies contended that employment may have been higher if they had tried to 'tough it out' in a high volume market, but both accepted that this may have represented a short sighted strategy (Chart 10.7).

Chart 10.7: Effect on Employment (had the project not gone ahead)

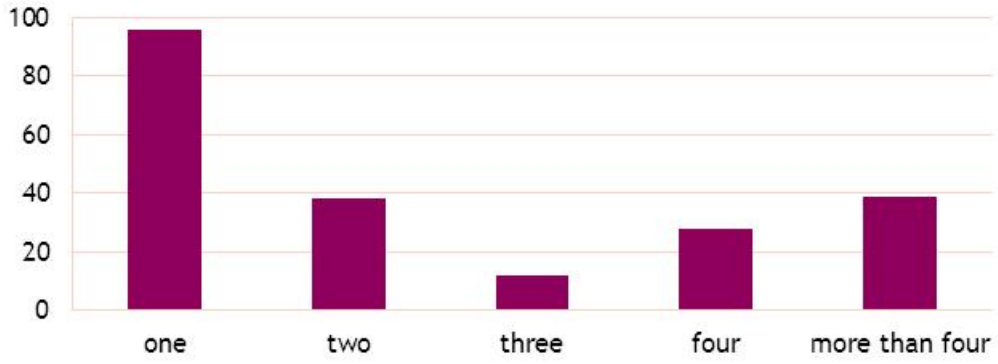


Grants per company

Companies are not restricted to one single application, 96 companies had a single project whilst 35 companies had multiple projects. The implication of this is that 44 per cent of approvals were a one-off for companies in the period from 2003 -2009. The table below shows:

- 96 projects were the only ones delivered by a specific company;
- 38 projects were delivered by 19 companies (2 per company);
- 12 projects were delivered by 4 companies (3 per company);
- 28 projects were delivered by 7 companies (4 per company); and
- 39 projects were delivered by 5 companies (various, more than 4 per company).

Table 10.8: Number of Projects Involved



Companies that have had more than one project explained that the R&D process for them has been incremental. Companies did not see an R&D project as being a 'one-off', they saw it as part of a continuous developmental process to maintain competitiveness in the global markets that they operated in.

Grant Level

The level of Grant has to be justified on the basis of:

- Commercial importance of the RD&I project within the parent company's overall R&D strategy, the commercial importance and economic benefits of the investment to the Irish operation and the technical merit of the proposed research;
- Total State financial support for the RD&I project including an estimate of the financial benefit of the 25 per cent RD&I tax credit to the company;
- Market Failure Effect as defined by the EU that exists which creates the need for State Aid intervention; and
- Demonstration of the Incentive Effect as defined by the EU to justify the proposed grant.

Impacts & Outcomes

Economic Impact Assessment

This section shows the economic impacts of the intervention in terms of net increase in sales and Economic Value Added (EVA).

The analysis of impact is based on a sample of 54 plants that were approved funding for 81 projects between 2003 and 2008 for which complete data was available.

The analysis is based on the additional sales and value added achieved in 2009 since the year of grant approval (i.e. taking the difference in sales/value added in 2009 and the year in which the grant was approved). There were two instances where the plant experienced a substantial fall in sales/value added arising from global/corporate factors external to the R&D fund, and which would have significantly skewed the determination of the efficiency of the programme.

The additional gross sales/value added figures were adjusted to account for deadweight, displacement and the multiplier effect in order to arrive at a net figure that is attributable to the R&D fund as set out below.

Impact on Sales (2009)

Gross impact

Data was obtained from the Annual Business Survey of Economic Impact (ABSEI) to measure the total value of annual sales for each company both in the year in which they first received the grant, and the last full year for which complete data was available (2009).

In the majority of cases, the gross impact of the programme was measured as the difference between these two figures. In the case of the three businesses which reported that they definitely would not now be trading in Ireland without the grant, gross impact was measured as the total value of sales in 2009.

Based on this analysis, the gross sales impact of the programme was calculated as €6.639 billion.

Deadweight

A deadweight adjustment was applied to account for the proportion of gross turnover which would still have been generated in Ireland even if the IDA grants were not available. All survey respondents were asked "How different do you think your turnover/revenue level would have been if you had not undertaken the R&D project(s)?"

From the results deadweight was broken down as follows:

- 5 per cent deadweight to the 28 per cent of businesses who said that turnover would have been "a lot lower";
- 50 per cent deadweight to the 31 per cent of businesses who said that turnover would have been "moderately lower"; and
- 100 per cent deadweight to the 41 per cent of businesses who said that turnover would have been "about the same".

This produced an average deadweight assumption of 63 per cent, which was applied to all but three of the businesses. The three exceptions were the three businesses who said they would not have continued trading in Ireland at all without the support, where it was assumed 0 per cent deadweight.

Based on the above assumptions, €3.225 billion was deducted as deadweight.

Displacement and Leakage

Displacement describes the proportion of benefits received by participating businesses that occur at the expense of losses elsewhere in the Irish economy. As the majority of the businesses who participated in this programme were multinational subsidiaries, who compete with businesses and with affiliates on a global scale, and not just in Ireland, the scope for displacement is low. However, a 5 per cent displacement adjustment was applied to the deadweight totals for each company for caution, which equates to a deduction of €0.171 billion.

Leakage describes the percentage of benefits that go towards businesses based outside of Ireland. As all beneficiaries of this programme are Ireland based, no leakage was assumed.

Multiplier effect

The multiplier effect accounts for the 'knock-on' benefits that occur elsewhere in the Irish economy as a result of the growth experienced by the direct beneficiaries. It includes two kinds of impacts:

- Indirect multipliers – benefits which occur as a result of additional business purchases made by the direct beneficiaries, such as raw materials and professional services; and
- Induced multipliers – benefits which occur as a result of additional personal expenditure by staff members at direct beneficiaries.

A multiplier of 1.20 for all businesses in the sample was applied, based on the mean average multiplier across the knowledge intensive manufacturing sector, as reported in the Central Statistical Offices most recent Input-Output tables[156]. This was equivalent to an additional €0.655 billion.

Net impact of Sales

Based on the above assumptions, it is estimated that the project has led to a net sales impact of €3.899 billion. This is shown below:

Table 10.9: Gross to Net Sales Impact

	Gross impact	**€6.639 billion**
Less*	Deadweight	€3.225 billion
Less**	Displacement	€0.171 billion
Less	Leakage	€0
Plus***	Multiplier	€0.655 billion
Equals	Net Sales Impact	€3.899 billion

*Total relates to sum results for 81 companies, including 3 companies with 0 per cent deadweight factor applied.

** Displacement is applied to the increase in gross sales minus deadweight loss for each company.

*** Multiplier is applied to the increase in gross sales minus deadweight loss minus displacement factor for each company.

[156] Includes sectors 24 (chemicals), 29-31 (machinery and equipment, including electronics and ICT), 32 (communications), 33 (medical, precision and optical equipment)

Impact on EVA (2009)

Gross EVA impact

For this calculation, the same approach was followed to measure net EVA impact[157]. Likewise an exception was made for the three businesses who reported that they would have left Ireland had they not received a grant, attributing the full 2009 EVA contribution in these three cases.

Based on this analysis, the gross EVA impact of the programme was calculated as €2.963 billion and the net EVA as €1.366 billion. This is shown below:

Table 10.11: Impact on EVA

	Gross impact	**€2.963 billion**
Less*	Deadweight	€1.767 billion
Less**	Displacement	€0.059 billion
Less	Leakage	€0
Plus***	Multiplier	€0.230 billion
Equals	Net EVA impact	€1.366 billion

*Total relates to sum results for 81 companies, including 3 companies with 0 per cent deadweight factor applied.

** Displacement is applied to the increase in gross sales minus deadweight loss for each company.

*** Multiplier is applied to the increase in gross sales minus deadweight loss minus displacement factor for each company.

The total inputs for the 81 projects amounted to €269 million of approved grants, plus an additional €3.689 million estimated for indirect costs. Indirect costs were apportioned on the basis of the total number of projects (81 sample projects divided by 213 total number of projects multiplied by the total indirect costs of €9.7 million)

The analysis of cost benefit indicates that a return of €5.0 was achieved in the year 2009 for every €1 of grant approved by IDA. This analysis does not take into account the lapsed time period generally required before the full economic impact of an RD&I programme can be determined.

Estimated Future Impacts

Given the timeframe required to recoup the full economic benefits of R&D projects (5-7 years) Frontline Consultants also requested views from the companies regarding the potential net impact on future sales and EVA arising from the projects funded through the R&D fund. Based on the responses of the sample of 23 companies, a potential annual average growth in both sales *and* EVA of 4.4 per cent is estimated by those companies. Frontline estimates that

[157] The Economic Value Added impact is calculated as sales less the cost of all materials and services.

this would translate to a CBA over the 5 year time frame 2009-2013 to be in the region of €1: €25.5[158].

Cost Benefit Analysis

The analysis shows that for every €1 IDA has committed through the grant (including indirect costs) over the period 2003 to 2009 €5.07 has been returned to the Irish economy by the end of 2009.

Table 10.12: Summary of predicted values[159]

Cost To Benefit Ratio	2009-2013	2009 year
EVA per €1.00 grants (incl. indirect costs), 2013 (PV)	€25.47	€5.07

Employment

The IDA R&D Fund is aimed at building capability and is not a job creation intervention per se. In the context of international mobile subsidiaries based here, however, the retention of employment can be an indicator of the Programme's effectiveness in terms of achieving embeddedness (enhanced capabilities have been discussed above).

Annual Employment Survey data was used for all of the 139 plants that availed of the IDA R&D Fund during the period 2003 to 2009. The difference between total employment in 2011 (the latest data available) and in the year in which the grant was approved was calculated.

The headline results demonstrate a net decrease in employment of 787 from the date of grant approval to 2011. This needs to be put into context, given the recessionary period post 2007. Further analysis indicates that two plants that were approved R&D grants in 2005 moved manufacturing abroad based on external decisions made at corporate headquarters. This resulted in a significant drop in employment, (close to 2,700 attributable to the two plants aforementioned). The impact of the downsizing skews the results of the performance of the R&D fund. In general, firms that were approved R&D grant aid since 2007 have demonstrated an increase in overall employment.

Comparative performance - employment

A more informative approach is to consider the employment performance of the R&D 'active' firms over a period of time compared with those firms that did not receive R&D grant approvals. Using 2003 as a base year:

- For the cohort of plants that availed of the R&D Fund between 2003 and 2009 total employment grew by 12.8 from 2003 to 2011.

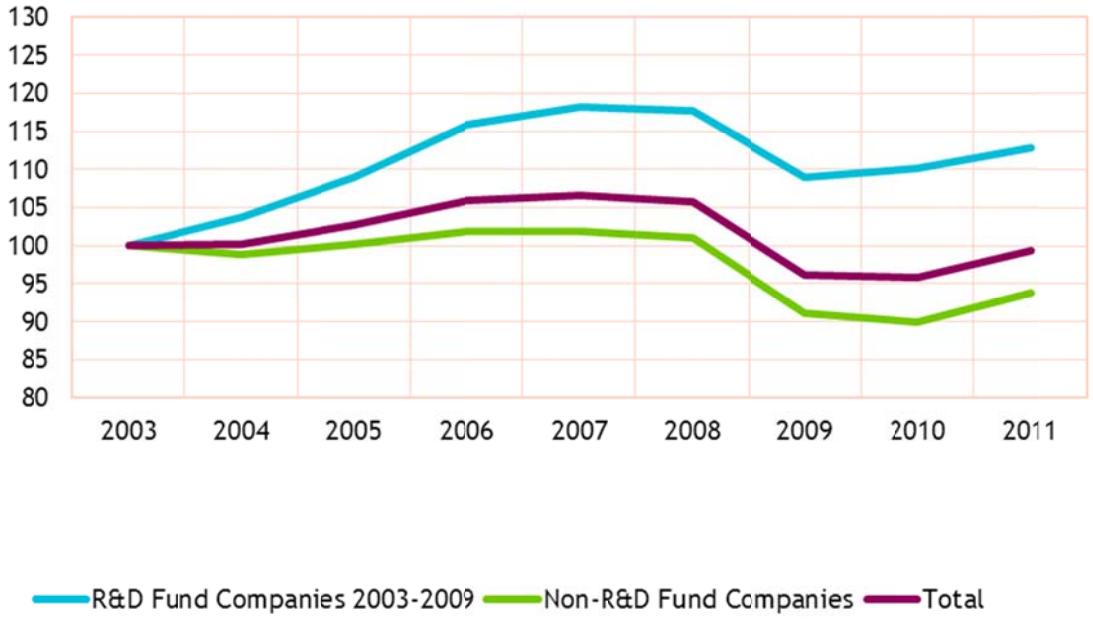
[158] Frontline Consultants adjusted for optimum bias by extending the company forecasts from 3 to 5 years

[159] The economic impact figures are particularly strong. This should be expected as the money was invested in blue chip companies that were also putting in substantial levels of funding.

- For those plants that did not avail of the R&D Fund between 2003-2009 employment fell by 6.2 per cent from 2003 to 2011.
- For the total population of IDA client plants employment fell by 0.7 per cent from 2003 to 2011.

Therefore, employment grew faster in companies that availed of the R&D Fund than companies that did not. Furthermore, although impacted by the recession, the R&D active firms was above average in terms of employment growth over the period 2003-2011 and employment remained significantly above the 2003 base.

Chart 10.9 Employment Growth in IDA Client Companies 2003-2011



Conclusion

The above figures constitute high sales and EVA return on investment and have demonstrated that the objectives of sustaining and embedding subsidiary companies in Ireland have been achieved. It can therefore be reasoned that this project offers a worthwhile economic return to the Irish Exchequer.

International Overview

Looking internationally, it is apparent that countries' R&D schemes differ. Many, if not most countries provide fiscal incentives through tax credits or allowances and grant aid. In Belgium, France, Korea and Spain, additional fiscal incentives are provided through reductions in R&D workers' wage taxes and social security contributions. In some countries, the reported cost to the exchequer of tax incentives differs from the real cost. For instance, Austria has both an R&D tax credit and R&D allowances but only reports the cost of the R&D tax credit. Belgium's tax incentives cover R&D expenditures but also include a deduction for patent income.

These differences make transnational comparison difficult. The OECD is currently working to compare countries' R&D schemes and methodologies and to assess factors that affect the overall cost (inclusion of sub-national R&D tax credits, differences in firm eligibility, etc.). When possible and to improve international comparability, figures are adjusted to meet the internationally accepted definition of R&D.

As a comparator of progress, the following table shows BERD as a percentage of GDP. What should be noted is that Ireland has made the greatest progress of the countries listed between 2001 and 2010. How much can be laid at the door of the IDA fund is unclear, but it should be accepted as a contributory factor (Table 10.13).

Table 10.13: Business Expenditure on R&D as a Percentage of GDP

	2001r	2002r	2003r	2004r	2005r	2006r	2007r	2008r	2009r	2010	2001-2010 % change
Ireland	0.76	0.75	0.78	0.8	0.81	0.82	0.84	0.94	1.16	1.22	0.61
Scotland	0.63	0.59	0.49	0.45	0.5	0.43	0.48	0.49	0.55	0.52	-0.17
UK	1.19	1.14	1.08	1.07	1.08	1.05	1.1	1.12	1.1	1.09	-0.08
Norway	0.95	0.95	0.98	0.86	0.81	0.79	0.84	0.84	0.92	0.87	-0.08
Finland	2.36	2.35	2.42	2.42	2.46	2.48	2.51	2.75	2.8	2.69	0.14
Denmark	1.64	1.73	1.78	1.69	1.68	1.66	1.8	1.99	2.08	2.08	0.27
Sweden	3.2	…	2.83	2.63	2.59	2.75	2.47	2.74	2.54	2.35	-0.27
Canada	1.29	1.17	1.16	1.17	1.14	1.14	1.09	0.98	0.99	0.91	-0.29
EU27	1.12	1.11	1.1	1.09	1.09	1.11	1.12	1.15	1.17	1.16	0.04
OECD	1.55	1.5	1.49	1.48	1.51	1.55	1.58	1.63	1.62	…	…

Source: OECD MSTI 2011/1

Summary

Supporting R&D is backed strongly by most governments in recognition of the need to develop or maintain a competitive edge for their economy. According to Frontline Consultant's analysis, Ireland's strategy appears to have been most successful in the following ways:

- In matching or exceeding wider benefits (such as taxation for R&D) vis-à-vis other countries;
- In investing significantly in research in the academic base ahead of some other countries to provide a platform for collaboration;

- The IDA R&D Fund (2003-2009) was predominantly focussed on larger, multinational companies[160] that were able to develop projects of scale quickly with substantial investment;
- The ease of use of the IDA R&D Fund and the way in which it is used effectively as part of a package to promote the undertaking of R&D in Ireland to overseas HQs;
- Ireland appears to have supported more projects of scale than many other countries – many of which appear to have been won through a competitive process; and
- Despite difficult economic conditions, Ireland remains committed to R&D – a commitment that helps to retain confidence and credibility.

Conclusions and Findings

The core conclusion is that the IDA R&D Fund works for the benefit of the Irish economy with the following results in Ireland. It has supported:

- Significant sales and EVA growth;
- An increase in higher skills and higher added value jobs;
- FDI companies to be more embedded in Ireland; and
- FDI companies to transform their capability in Ireland.

The Fund has delivered value for money and the benefits are tangible.

Appropriateness

For several years the Irish Government has delivered an economic strategy that strongly supports FDI and over the past decade has significantly increased its investment in research in science and technology to drive the knowledge economy. The IDA R&D Fund was appropriate and aligned with enterprise policy when it was established, and continues to be today. It is also important to consider this instrument in an international context given IDA's mandate to attract foreign investment in competition with other countries. Many other developed countries offer incentives similar to IDA's R&D Fund, and without it, Ireland could be at a distinct competitive disadvantage.

There are a number of initiatives in place to support deepening of research in Ireland's Higher Education Institutes, commercialisation and collaboration between HEIs and industry. The R&D Fund complements the wider innovation system through bringing major players and investment to support a 'technology pull' that matches the 'technology push' that the Irish government has been supporting.

[160] Although this may be more a factor of the enterprise development agency structures. IDA's mandate is focused solely on the attraction of foreign investment (greenfield and expansion) across a range of activities – this is somewhat different than enterprise development agencies in other countries that have the dual role of attracting FDI and supporting entrepreneurship and indigenous firms

Effectiveness

RD&I grants are common among innovative countries, the IDA's RD&I grant differs somewhat from most countries in that the support it is mainly aimed at larger, multinational companies operating in the host country[161]. This strategy has led to several positive outcomes; projects being developed quickly, large amounts of private funding leveraged and a high number of large projects compared to other countries. The companies also responded positively to questions about attribution, embeddedness & follow-on research, capability and performance.

The grant has increased the value of the products the company is producing and the quality of individual being.

Duplication/Synergies

The programme shares some characteristics with the Enterprise Ireland R&D fund but the target audience is totally different, and they are addressing the same need but for different segments of the enterprise mix. IDA utilises the expertise of the Enterprise Ireland technical assessors as part of the application process which is a positive demonstration of the effective use of resources.

The capabilities developed within the foreign owned companies as a result of undertaking R&D (supported by the IDA R&D Fund) has contributed significantly to their ability to collaborate effectively[162] and to define enterprise needs for the Competence Centre programme. A number of foreign owned subsidiaries also engage on collaborative research with the SFI supported Centres for Science, Engineering and Technology (CSETs) and Strategic Research Clusters (SRCs) reinforcing the increased embeddedness of these firms with Ireland's growing research and knowledge base.[163]

Efficiency

In the years 2003-2009, the overall level of grant support approved to client companies totalled €582,064,255. This accounted for 27 per cent of the total funding needed to complete all supported projects. The balance of the funding for projects is sourced from company funds and private sector funders. The grant intensity has also reduced over the period, from 36 per cent in 2004 to 23 per cent in 2009, reflecting the introduction of the R&D tax credit. Over 60 per cent of companies said that the intervention had an impact on turnover and employment over the period of the grant.

Companies interviewed commented on IDA's efficiency and the benefits of the related advisory services, including advising company staff of what was available and simplifying the approval process; the speed of the approval process when the company emphasised that time was an important factor; and the ability to bring influential people along to meet visiting senior company executives. A number of companies interviewed had worked in other countries with the same company and offered the opinion that the R&D Fund was unique in its ability to support compelling cases for investment in R&D for Ireland.

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[161] Note: a range of supports are available through Enterprise Ireland for Irish owned export oriented companies and SMEs

[162] Including collaboration with Irish owned firms

[163] Refer also to individual evaluations for each of these programmes CSETs and SRCs

For every €1 IDA commits through the grant (including indirect costs) €5.07 was returned to the economy by the end of 2009. This is likely to underestimate the potential return as it does not take into account the lapsed time period generally required before the full economic impact of an RD&I programme can be determined. Analysis undertaken by Frontline anticipates that a CBA over the 5 year time frame 2009-2013 is likely to be in the region of €1: €25.5.

Recommendations

Maintain the Fund

Whilst the Fund has been successful, many of the products and processes it has supported have a shelf life, and future investment by foreign owned companies may again require support from the R&D Fund – particularly in the context of intensified competition from affiliates. The recommendation is therefore that the Fund continues to be used to support IDA client companies.

Funding/ Flexibility in claims for changed items

The evaluation found that approximately 40 per cent of the grants awarded had been drawn down at the time the evaluation was being undertaken. In some cases projects are still underway although taking longer than anticipated to meet pre-defined milestones, some have altered direction and in other cases the project has been discontinued. A number of companies interviewed cited that in instances where the nature of the approved project has changed during the R&D process, they were unable to draw down grant support. Although this may be a strictly correct interpretation of the approved project (which had been subject to technical and commercial assessment), it is recommended that the current approach be examined to review the extent to which a degree of flexibility can be accommodated.

11. EI RTI Scheme Programme (2002–2006)

Programme Logic Model

Objectives

- Help firms to develop innovative products, processes and services;
- Increase the number of companies performing effective R&D in Ireland;
- Increase the scale of the investment in R&D in Ireland;
- Increase the number of companies doing R&D for the first time;
- Ensure Irish based companies, particularly SMEs, protect their futures by helping them reach and exceed European and international norms for R&D investment;
- Increase the quantity and quality of the R&D linkages between companies, and between Third Level Institutions and companies and
- Encourage firms to collaborate with other research performers, either in Ireland or internationally through collaborative research programmes such as Eureka and Craft, although only expenditure undertaken in Ireland will be eligible for funding.

Inputs

- Enterprise Ireland grants to companies.

Activities

- No. of projects approved;
- Linkages with 3rd level institutions;
- No. of staff doing R&D activities.

Outputs

- New products/processes/services;
- Company increase in R&D spend;
- Skills developed or improved;
- Improved productivity;
- Improved R&D management capability; and
- Companies doing first-time R&D

Outcomes & Impacts

- R&D impacts (increased R&D spend and R&D related employment);
- Development of new products, processes and services;
- Increased exports;
- Increased employment; and
- Gross Value Added (GVA).

Evaluation Aim

The aim of the evaluation is to assess the appropriateness, efficiency and effectiveness of the Enterprise Ireland Research Technology and Innovation (RTI) Competitive Grants Scheme. This review is based on:

- Two previous evaluation reports provided by Enterprise Ireland[164]; and
- Forfás analysis of a sample of recipient (n=208) of the RTI Scheme during the period 2002 to 2006 and the performance of these companies to 2010.

Programme Background, Objectives & Target Population

Enterprise Ireland established the RTI Competitive Grants Scheme in 2000[165] which had been approved by the Office of Science & Technology (OST) at the then Department of Enterprise, Trade and Employment (now Department of Jobs, Enterprise and Innovation - DJEI). The Scheme was a key action under the Government Operational Programme, which was part of the National Development Plan 2000-2006.

The RTI Competitive Grant Scheme was managed by Enterprise Ireland on behalf of the Department of Jobs, Enterprise and Innovation in conjunction with IDA Ireland, Shannon Development and Údarás na Gaeltachta.

This Scheme was open to all Irish based companies (including IDA Ireland clients) in manufacturing and internationally traded services. The programme was designed to cater to companies on the different parts of the spectrum, ranging from those planning to undertake their first R&D project to companies that were significantly developing their existing R&D activities or functions.

Objectives

The RTI Scheme had the following objectives, to:

- Help firms to develop innovative products, processes and services;
- Increase the number of companies performing effective R&D in Ireland;
- Increase the scale of the investment in R&D in Ireland;
- Increase the number of companies doing R&D for the first time;
- Ensure Irish based companies, particularly SMEs, protect their futures by helping them reach and exceed European and international norms for R&D investment;
- Increase the quantity and quality of the R&D linkages between companies, and between Third Level Institutions and companies; and to
- Encourage firms to collaborate with other research performers, either in Ireland or internationally through collaborative research programmes such as Eureka and Craft, although only expenditure undertaken in Ireland will be eligible for funding.

[164] CM International, February 2009. Red-C, January, 2008

[165] The Enterprise Ireland RTI Competitive Grants Scheme became the Enterprise Ireland R&D Fund in 2008. See Appendix 3

Funding limits

The Enterprise Ireland RTI Scheme operates under EU State Aid Guidelines. Maximum grant rates range from 30 per cent to 50 per cent of total eligible project costs[166] depending on recipient company, location and size. Internal limits were determined to provide guidelines on levels of funding permissible for each project. Funding included a grant and a repayable element with a maximum overall funding support for an application capped at €650,000. (Table 1)

Table 11.1: Funding Support Rates

Region	Max. Funding Incentive	Max. grant Amount	Max Grant level (%)
Dublin and Mid East	€650,000	€390,000	SME 40% Large Co. 30%
South East, South West and Mid-West	€650,000	€425,000	SME 40% Large Co. 30%
Border, Midland & West	€650,000	€450,000	SME 45% Large Co. 35%

Grants were aimed at supporting product and process development undertaken substantially within companies. It was intended that through this intervention a sustainable culture of R&D would be embedded in companies by increasing their in-house R&D activity. The Scheme supported projects that:

- Are central to the company strategic development plans;
- Assist companies in meeting market requirements for higher value added products;
- Constitute a higher level of technological innovation in products/processes; and
- Have well defined plans to commercialise the results of R&D within a relatively short timeframe.

Approval Process

Project duration of up to 2 years was allowed for approval. As part of the application process applicants provided information as to the potential economic benefit to Ireland that would derive from a successful project.

Applications involving expenditure of greater than €100,000 were judged on a competitive basis. The projects were assessed by the Research, Technology and Innovation (RTI) committee. This committee included members from the higher education sector and the OST. Proposals were assessed based on the following information:

[166] Grants were available for expenditure incurred exclusively for and essential to the project for salaries & wages; travel & subsistence; materials; external consultancy fees; capital items; and technology acquisition in certain circumstances

- Standard application form submitted by a company;
- Commercial assessments prepared by Development Agency Advisor; and
- Technical assessments prepared by a Technology Specialist.

Projects below €100,000 were initially reviewed by a committee within the development agencies, and after consideration on a non-competitive basis, were recommended to the RTI Committee for approval.

Target Population

Irish based companies in manufacturing and internationally traded services.

Programme Rationale

At the time the RTI Competitive Grants Scheme was established, most SMEs in Ireland did not conduct R&D and many large multi-national companies did most of their R&D abroad. The rationale for this programme was to take a new direction and increase the quantity and quality of R&D undertaken by businesses in Ireland through the provision of R&D grant supports to companies.

A number of market failures are identifiable that justify State intervention to provide R&D programmes and funding for the enterprise sector. The private sector tends to under invest in R&D relative to what would be considered socially optimal. Private companies cannot fully appropriate the returns from R&D due to knowledge spillovers and the high risk associated with R&D projects. In addition enterprises often lack the required information and face difficulties in raising finance for R&D investment. These market failures lead most Governments in developed countries to invest in schemes which will stimulate private investment in R&D.

Support for in-company R&D is a vital pillar within a 'systems of innovation' policy approach. Innovation and technology development are the result of a complex set of relationships among actors in the system, including enterprises, universities and government research institutes. In order to optimise the efficiency of this system it is vital that effective linkages are developed between its different components, to facilitate the transfer of scientific knowledge. The Government has a key role to play in this area. Policies which seek to improve networking among the actors and institutions in the system and which aim at enhancing the innovative capacity of firms, particularly their ability to identify and absorb technologies, are most valuable in this context.

Evaluation Methodology

Two previous reviews of the RTI Scheme were undertaken in 2008 and 2009, commissioned by Enterprise Ireland, which informed this evaluation. These are:

- Survey of RTI Scheme clients carried out by Red C in 2008, which surveyed 203 companies that availed of the RTI Scheme between 2000 and 2006.
- A more in-depth evaluation of the RTI Scheme was carried out by CM International in 2009, which assessed the RTI Scheme over the 2000 to 2004 period, evaluating a cohort of 50 companies.

In addition, Forfás undertook further analysis to assess the impact of the RTI Scheme, based on data received from Enterprise Ireland and on the Annual Business and Economic Impact (ABSEI). Analysis was based on a large sample of companies (n=208) that were recipients of the RTI Scheme between 2002 and 2006 and engaged in a total of 682 projects. Forfás assessed the impact of the RTI Scheme on company performance. The evaluation of the programme's impact focuses on the change in turnover, exports, employment, value added and R&D performance from the time the company first received the grant in the 2002 – 2006 period and each of the years 2007 and 2010. This facilitates an assessment of the impact of the recession on this cohort of companies (pre and post 2007).

Table 11.2: Summary Statistics of RTI sample (n=212)[167] 2002

Employees	#	%	Turnover	#	%	Year Established	#	%
10 or less	36	17%	**less than 500k**	11	5%	**Pre-1960**	13	6%
11-50.	94	44%	**500 - 999k**	14	7%	**1961 - 1980**	50	24%
51-250.	74	35%	**1m-1.9m**	28	13%	**1981- 1990**	60	28%
251-1000.	6	3%	**2m-4.9m**	63	30%	**1991-2000**	85	40%
1001+	2	1%	**5m-9.9m**	38	18%	**2001 +**	4	2%
			10m or more	58	27%			

Alignment with National Policy

The Irish Council for Science, Technology and Innovation (ICSTI) undertook a 'Technology Foresight' exercise in 1998. The subsequent report concluded that Ireland should evolve rapidly to a knowledge society. It identified technology as a key driver for knowledge societies and determined that the potential of new technologies in areas such as computer science, telecommunications, nanotechnology, biotechnology and medical systems should be exploited. At that time Ireland lacked world class research capability of sufficient scale in a number of strategic areas. Technology Foresight called for a dramatic increase in the level of research investment to address this gap as a matter of urgency.

This was reinforced by the Economic and Social Research Institute (an independent policy agency) in its report *Investment Priorities 2000-2006* – which stated that 'the promotion of investment in R&D is seen to be at the heart of national development strategies. The case for support for R&D is extremely strong since it can offer significant potential returns on investment'. At the time, levels of public investment in R&D were low by international standards and the report recommended a substantial increase in public expenditure on R&D.

[167] Three companies were significantly impacted by the downturn post 2007 and have been excluded from the impact analysis as they would have skewed the determination of the efficiency of the RTI Scheme (See Section 8)

The Government responded by establishing a Technology Foresight Fund of over €630 million for the seven year period of the National Development Plan 2000-2006. This led to the establishment of Science Foundation Ireland (SFI) and a number of other programmes to develop Ireland's public research base. In tandem, a number of new initiatives were developed to increase the quantity and quality of company R&D.

The RTI Competitive Grants Scheme was a key action under the *Government's Operational Programme for the Productive Sector*, which was part of the *National Development Plan 2000-2006*.

In 2004, the Enterprise Strategy Group as formed by the Minister for Enterprise, Trade and Employment issued a report *Ahead of the Curve, Ireland's Place in the Global Economy*, which identified that Ireland had significant enterprise expertise in manufacturing/operations and limited expertise in R&D and sales and marketing. The recommendations set out in the report sought to build new competencies in the development and introduction of new products, processes and services and in international sales and marketing, thereby re-balancing Ireland's enterprise expertise.

Furthermore, the report specifically recommended that public funding for applied research and in-firm R&D should be progressively increased to match that invested by the State in basic research and that this should include support for in-firm capability development, commercialisation, cluster-led academic research and innovation partnerships.

In 2004, Forfás published its report to the Interdepartmental Committee on Science and Technology entitled *Building Ireland's knowledge Economy*. The report set out specific targets for the performance of business, higher education and public sector R&D which were to result in gross expenditure on R&D in Ireland increasing to 2.5 per cent of GNP by 2010.

The Enterprise Ireland RTI Programme was clearly aligned with national R&D policies as set out above up to 2006 (the period of this evaluation spans 2002-2006).

Since then, *The Strategy for Science, Technology and Innovation* (SSTI) launched by Government in mid-2006 mapped a path that would further transform Ireland in the period to 2013. The SSTI aimed to bring Ireland in line with competitor countries that create a significant proportion of their GDP from the creation and utilisation of knowledge – countries like Singapore, Australia, Germany, Denmark, Austria, and France. This transformation would require investment in R&D to reach a level of 2.5 per cent of GNP, two-thirds of which would be invested by business in R&D activities.

The 2006-2013 SSTI objectives for Research and Development for Enterprise, Innovation and Growth, are to:

- Strengthen manufacturing in Ireland into the long term;
- Increase absorptive capacity by strengthening technology skills in firms new to R&D;
- Rationalise and simplify enterprise R&D grant structures to make them more accessible to firms; and
- Grow Business Expenditure on R&D (BERD).

The Enterprise Ireland RTI Competitive Grants Scheme became known as the Enterprise Ireland R&D Fund in 2008, and continues to be aligned with and play a key role in delivering upon national policy.

Inputs

Enterprise Ireland has spent a total of €113.9 million in the RTI Scheme over the period 2002 to 2006, which includes both direct grants approved and indirect costs. Indirect costs of €1.4 million relate to the cost of 'front-end' staff involved in promoting and delivering on the programme, through engagement with client companies. Inputs equate to an average annual programme total cost of €22.8 million.

Approximately 130 full proposals are approved each year, which contain a variety of smaller projects within them. The average number of projects approved per year is 322.

Table 11.3: Inputs

Approvals	2002	2003	2004	2005	2006	Total
Number of projects	395	349	296	263	308	1611
Amount offered €000's	€26,882	€22,445	€19,724	€19,564	€23,877	€112,494
Amount Paid €000's	€21,161,	€17,349	€14,316	€14,948	€18,136	€85,910
% of offer drawn down	79%	77%	73%	76%	76%	76%
Indirect costs €000's	€243	€250	€285	€302	€320	€1,402
Total Costs €000's	€27,125	€22,696	€20,009	€19,867	€24,198	€113,897

The difference between approved funds and drawn down funds differs each year, ranging from 73 per cent to 79 per cent of the approved funding for a particular project. The average value of grant payable for each project is €69,829 over the period of evaluation. As indicated, companies were often approved funding for more than one project at the same time.

The amount of grants offered to the sample of 208 companies (682 projects) used for impact analysis is €49.2 million, and the related indirect costs are 0.593 million.

Outputs & Activities

A total of 1,611 projects received approval over the period 2002-2006 (see table 5 above for annual approvals), involving a total of 565 companies. As noted above, a company may have been approved for more than one project over the period 2002-2006. The number of companies approved each year has been set out in Table 6 below.

Table 11.4: Number of Companies Approved Funding per Year

2002	2003	2004	2005	2006
177	141	107	98	123

Impacts

The following section draws from the previous reviews commissioned by Enterprise Ireland, and the data analysis undertaken by Forfás to provide a comprehensive overview of the impacts of the RTI Scheme, from both a qualitative and quantitative perspective.

The reviews commissioned by Enterprise Ireland commissioned were:

- A survey of 203 RTI Scheme clients that availed of the RTI Scheme between 2000 and 2006, carried out by Red C in 2008; and
- An evaluation of the RTI Scheme was carried out by CM International in 2009. It looked at the RTI fund over the 2000 to 2004 period, evaluating a cohort of 50 companies and 126 projects. The 50 companies were chosen to broadly reflect the sectoral and location profile of the database of 600 companies that participated in the RTI Scheme during the 2000 to 2004 period. Of particular relevance to this evaluation is the deadweight analysis, which has been used to determine attribution in Forfás impact analysis.

Company Performance – Survey Responses

Although relating to a different time period for RTI approvals (2000-2006) than this evaluation, the key findings from the Red C telephone survey of 203 companies provide useful insights. The findings indicated an increase in capabilities, skills levels and financial resources committed to RD&I within firms as a result of their engagement with the RTI Scheme. Specifically:

Capability and human resources

- Over 7 in 10 companies employed new staff as a result of RTI funding with the majority (89 per cent) still employing these after the completion of the project;
- 54 per cent of new employees had a diploma, while 33 per cent had a masters and 7 per cent had a doctorate degree;
- 61 per cent of redeployed workers were still employed in the R&D area post RTI funding; and
- New skills were gained primarily in the areas of strategic planning (91 per cent), application management (87 per cent), idea generation (85 per cent) and process management (82 per cent).

Increased financial resources dedicated to R&D

- 62 per cent of companies who received RTI funding cite an increased R&D budget as a result of the RTI funding with this increase averaging 36 per cent; and
- Although not a specific objective of the Scheme, the RTI funding was more likely to fund an improved R&D facility with just 1 in 5 companies obtaining a new R&D facility.

Commercial outcomes

- Overall, 7 in 10 companies achieved their commercialisation objectives;
- 3 in 4 businesses achieved at least 1 or more new/improved processes as a result of the RTI funding; and
- On average, 4 products were either introduced or improved as a result of RTI funding. Those respondents that introduced or improved zero or 1 new product were also those least more likely to have met their commercialisation objectives.

Productivity

- 33 per cent of companies said their productivity improved a lot since the completion of the RTI funded project and 49 per cent said it improved a little.

Other findings arising from the survey related to increases in sales and future expectations. These are not reflected in this evaluation, as they are superceded by the Forfás impact analysis set out below.

Impact Analysis – Forfás Analysis

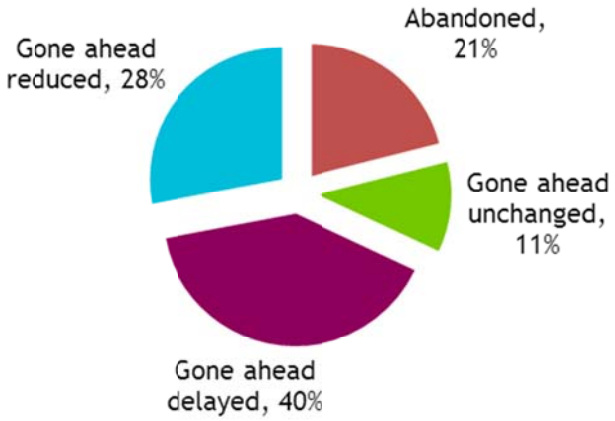
An analysis was undertaken of a sample of 208 companies (involved in 682 R&D projects)[168] which includes both Irish and foreign owned companies for which complete date was available, using Forfás ABSEI data for the period 2002-2010. Three outlier Irish owned companies experienced a fall in value added of greater than €36 million since 2007 (significantly higher than the remaining sample companies) and they were excluded from the analysis as they would have skewed the determination of the efficiency of the programme.

The analysis shows the change in performance for these companies that can be attributed to the RTI Scheme. To determine attribution, adjustments were made to account for deadweight, displacement and multiplier effects.

Deadweight was calculated as follows based on responses to CM International survey of 50 companies that undertook 126 projects, and applied a total deadweight of 35 per cent. The CM International evaluation examined the deadweight associated with RTI funded projects. The findings suggest that zero deadweight was evident in 26 of the projects examined (21 per cent) – that is these companies would have abandoned their projects in the absence of RTI funding. In the majority of cases, however, partial deadweight was identified. In this respect the results suggest that some 51 projects would have gone ahead on a delayed basis (40 per cent), or reduced scale (28 per cent). 100 per cent deadweight was found in only 11 per cent of projects (Chart 11.1).

[168] Complete data was available for 212 companies in total and four outlier companies were excluded from the analysis

Chart 11.1: Deadweight of RTI Projects



Displacement of 10 per cent was applied[169]. A multiplier of 1.47 was used, based on the mean average multiplier across all sectors, as reported in the Central Statistical Offices most recent Input-Output tables.

The indicators set out the change between the year in which the company was first approved an RTI Scheme grant in the 2002 and 2006 period, and each of the years 2007 and 2010. Setting out the performance pre and post 2007 reflects the fact that the evaluation spans a period of economic turbulence.

The key findings indicate:

- The increase in R&D expenditure to 2007 was €14.3 million in 2007 (17.7 per cent) and to 2010 was €14.9 million (18.5 per cent). This shows that although there was a slowdown in the annual growth rate of expenditure on R&D during the recessionary period post 2007, companies continued to invest in R&D. R&D expenditure as a percentage of sales remained steady over the period at 4 per cent;
- The increase in exports to 2007 was €361.2 million (27.9 per cent) and to 2010 was €275.5 million (21.3 per cent). Exports as a percentage of sales increased steadily from 60.27 per cent to 65.35 per cent;
- The increase in value added to 2007 was €166 million (25.2 per cent) and to 2010 was €90.6 million (13.7 per cent); and
- The increase in turnover to 2007 was €592.5 million (27.6 per cent) and to 2010 was €258.2 million (12 per cent).

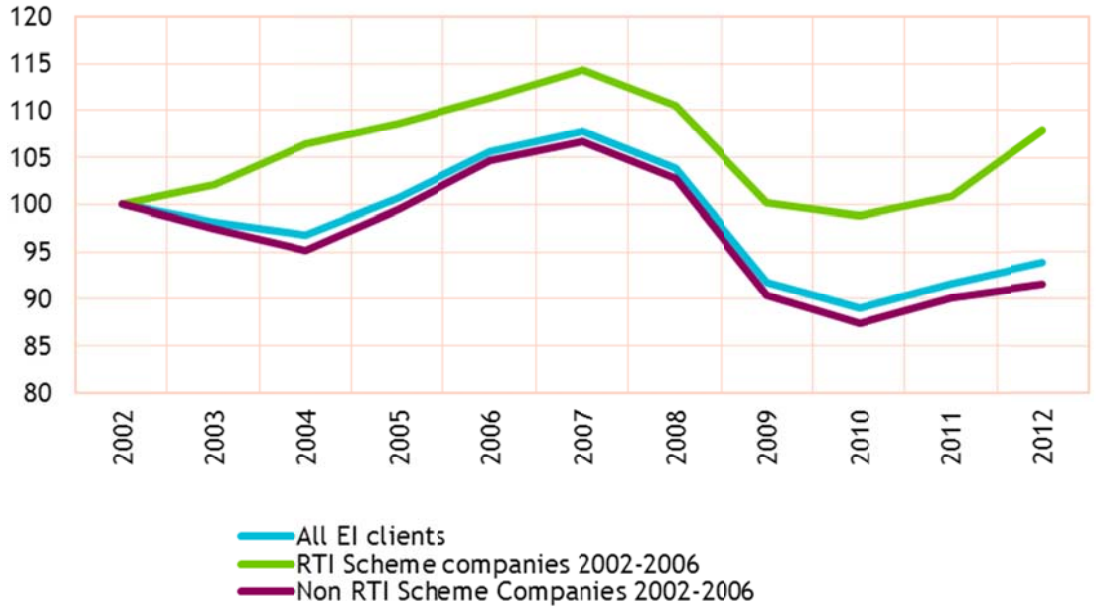
[169] Displacement was estimated at 30 percent in the UK for a similar Scheme (GDR Scheme). In the Irish context, given the very small population of R&D active companies, displacement was likely to be much lower. A displacement rate of 5 percent has been applied in the evaluation of the IDA R&D Fund that supports foreign owned subsidiaries based here

In order to assess the impact on employment, data was obtained from the Annual Employment Survey for the total population of Enterprise Ireland companies that received funding under the RTI Scheme (n=509). Non-Enterprise Ireland companies that received the grant were excluded so as to allow comparison with the total EI client base. The three outlier companies were again excluded from the analysis. This left a sample of 506 companies.

For the 'RTI cohort', the change in employment from the time of grant approval to 2007 was an increase of 478 and to 2012 was a decline of 729. The base employment in 2002 for this cohort was 24,580. This view is somewhat simplistic, however, as it does not provide a full understanding of how investment in RD&I activity can influence a firm's overall performance.

Using the year 2002 as a base year, it is evident that the 'RTI cohort' grew at a faster rate than the total Enterprise Ireland client base up to 2007. All companies were badly impacted in the immediate period post 2007 when the confluence of international and national factors resulted in a severe economic downturn. The 'RTI cohort', however, dipped only slightly below employment levels of 2002. Although an increase in employment is now evident across the board since 2010, employment in the RTI cohort rebounded at a faster rate and pace than the total Enterprise Ireland base (Chart 11.2).

Chart 11.2 Employment Growth in EI Companies 2002-2012



In summary, although the recession did have an impact, there was a positive performance demonstrated by companies that availed of the RTI Scheme in the years 2002-2006 in terms of increased R&D investment, export intensity and capabilities, as well as a demonstrated ability to rebound in employment terms post 2007.

Cost Benefit Analysis

The CBA in 2010 is estimated at €1.82. It is estimated that for every €1 expended by Enterprise Ireland during the evaluation period, an EVA return of €1.82 was realised in

2010[170]. Cost benefit has been calculated for the sample of 208 companies for which data is available, based on total inputs (including direct and indirect costs) and the change in value added over the period from when a company first received a grant approval to 2010. As outlined previously adjustments have been made to account for deadweight, displacement and the multiplier effect.

International Comparisons

Most developed countries provide some form of financial support for in-company R&D. Three such programmes that have been recently evaluated are:

- The Smart Scheme and Grants for Research and Development (GDR) Scheme - United Kingdom[171] (Each £1 million of Smart and GRD support in present value led to increased annual GVA of between £1.4m and £2.1m)
- The Tmura R&D Fund – Israel[172] (results show a minimal multiplier of 1.5 to 2 between the government investment and the total future industry GDP increment); and
- KMU-innovativ (Innovation in SMEs) - Germany.

Smart Scheme and Grants for Research and Development (GDR) Scheme UK – 1998 to 2008

The GRD Scheme was introduced in 2003 as a replacement for the former Smart Scheme[173]. Between 2001 and the Smart Scheme's closure in March 2003, over 2,500 grants were awarded, worth just under £110 million. Since its introduction in April 2003 to 2008, GRD has helped almost 1,700 SMEs to research and develop technologically innovative products and processes through over £130 million of grant funding.

An evaluation carried out in 2009 concluded that the schemes "have been positive and effective in relation to both their intermediate and their longer-term objectives"[174]. Specifically the following findings were highlighted:

- A small but significant proportion of supported firms reported increases in their productivity and profitability as a result of their projects;
- Strong evidence of increased and improved technology use and adaptation;
- Supported firms were more able to raise extra external financial support and showed greater commitment to innovation and R&D;
- The schemes addressed and helped to remove a significant funding gap for R&D / innovation projects by SMEs resulting from the risky nature of such investments and the reluctance of investors;
- Through the Scheme firms improved their attitude towards R&D and innovation;

[170] The impact of both the boom period and the recession is evident, in that if we apply the same methodology to the period 2007 the return stands at €3.34

[171] http://www.berr.gov.uk/files/file52026.pdf

[172] http://www.tamas.gov.il/NR/rdonlyres/04D3E45C-A94D-408D-8813-5C65869162C4/0/RDGovSupportEnglish2011821.pdf

[173] Despite the name change the Scheme remains the same

[174] http://www.berr.gov.uk/files/file52026.pdf

- Some evidence that investors are more encouraged to put money into R&D; and
- Strong evidence that the large majority of both Research/Feasibility projects and Development/Exceptional projects achieved their technical and technology objectives to develop prototypes and products.

The £239 million in grants during the evaluation period had led to the creation of between 6,000 and 9,000 net additional jobs (without and with multiplier effects respectively) and between £400 million and £600 million net additional Gross Value Added (GVA) (without and with multiplier effects) or over £2.5 billion cumulatively. Supported businesses also experienced a range of other business performance effects, and it was found that the schemes were associated with positive spill-over effects (e.g. through linkages) and multiplier effects.

The cost effectiveness ratios indicate that the cost per £1 increase in net GVA was £0.60 and £0.40 (without and with multiplier effects). Each £1 million of Smart and GRD support (in present value) led to increased annual GVA of between £1.4 million and £2.1 million, cumulative GVA of £9.0m and to between 21 and 32 FTE jobs. The ranges reflect the multiplier effects. These effects were net additional, i.e. they allow for deadweight and displacement, and the higher figures allow for multiplier effects.

On the basis of this evidence, it was concluded that the schemes represent good value for money.

R&D Fund – Israel – 1996-2003

For many years, the Israeli government has allocated significant resources to the support and promotion of R&D activities by the private sector. The R&D Fund is the main vehicle used by the Office of the Chief Scientist in the Ministry of Industry, Trade and Labour to support innovation in Israeli companies. Support for the R& D fund is based on:

- An outright grant based either on the merits of the project or its relative importance to Israeli industry; and
- A grant which companies have to repay in the form of royalties if the project succeeds.

The maximum grant allowable in this programme is 50 per cent toward eligible expenditure. Royalties from successful projects form a significant part of the R&D Fund budget. The R&D Fund is a general framework. It approves general requests for support from all companies - start-ups, SMEs, and larger established firms. Its decision-making body is the R&D Committee.

The programme was assessed in a study commissioned from an economic consultancy in 2008. The main findings of the study were:

- A highly positive rate of 1.28, meaning that a government investment of NIS 1 million stimulates firms to invest another NIS1.28 million (for computer services, software and R&D branches, it leverages NIS 1.81 million);
- The economic effects of government investment in R&D (GDP increment) on average are between 5 and 6 times the amount of money invested by the government, depending on the size of firm and its specialisation.
- Higher returns are attained in the medium-low, medium-high and low-technology branches. Even within the high-technology branches where the vast majority of R&D

expenditures in manufacturing are concentrated, a multiplier of 4.7 to government funds is attained.

KMU-innovativ (Innovation in SMEs) – Germany – 2007 to 2010

"KMU-innovativ" aims to encourage and strengthen research activities in SMEs as part of the German High-Tech Strategy.

While SMEs are flexible and fast in developing new technologies for new markets, they often face specific obstacles when it comes to getting access to high-technology funding programmes. KMU-innovativ thus seeks to reduce compliance costs of SMEs and increase the propensity of SMEs to apply for funding within the thematic R&D programmes. The basic feature of the programme is to simplify application procedures and to offer SMEs some kind of priority access to funding (including better opportunities for funding R&D projects that do not involve other partners, which is often a requirement in thematic R&D programmes). By establishing an SME help desk and by shortening the time needed for processing proposals, compliance costs for SMEs has been reduced. Both single company projects and cooperative projects are eligible for funding.

An evaluation of the grant Scheme **"Innovation in SMEs"** found that the Scheme has effectively addressed the needs of SMEs and triggered additional private investments in R&D. The analysis mainly covers the first three years of the programme (September 2007 - October 2010). Since 2007 until May 2012 almost 4,500 applications have been submitted and about 700 innovation projects involving 1,200 SMEs have been funded with a total budget of about €480 million. The evaluation found that the participating beneficiaries, as a result of receiving a grant, expanded their own R&D investments: for each Euro they received from the initiative, they spent an extra amount of €1.50 out of their own resources. Key success factors for the favourable reception of the initiative by enterprises are the simple administrative procedures for submitting an application, and the openness with regard to innovation themes that can be funded. The evaluation was conducted by ZEW (Centre for European Economic Research), a leading German economic research institute, on behalf of the Federal Ministry of Education and Research.

The findings confirm the results of an earlier study by the German Expert Commission on Research and Innovation (EFI) which also found that grants for R&D activities can be a major incentive and, thus, have a significant impact on investment decisions in companies.

The German Government has continuously increased the budget for SME-specific innovation funding in recent years. In total, the government has spent about €1.2 billion for supporting innovation activities of SMEs in 2011. The Ministry of Education and Research claims that more than half of its innovation funding goes directly to SMEs.

Conclusions & Findings

Synergies with Other Programmes

The programme complements other public programmes aimed at increasing the quantity and quality of BERD undertaken in Ireland and at capturing and commercialising ideas and knowledge, such as the Innovation Partnerships and the Commercialisation Fund.

Appropriateness, Effectiveness and Efficiency

The RTI Competitive Grants Scheme was an appropriate mechanism to achieve the objectives set out in section 2 and was aligned with national policy. The Scheme contributes toward achieving the targets for growth in BERD as set out in national policy documents during the period of evaluation. The programme is very similar to programmes that are in place in most other developed countries to stimulate in-company R&D. Grant aid for in-company R&D has been shown internationally to be an effective way of leveraging private investment in R&D and addressing market failures[175].

The Scheme was effective in achieving the objectives set out, and stimulated increased in-firm R&D activities within SMEs. The evidence points to the development of new products and processes, increased resources (both people and finance) dedicated to R&D, increased export intensity and enhanced skills and capabilities in the supported firms. The results show that the RTI Scheme performed positively although the recession has clearly had an impact on the performance of companies that had availed of the RTI Scheme in the years 2002-2006.

The lack of a comparator group, however, means that it was not possible to determine the performance of the supported cohort of companies relative to other similar companies across a number of metrics. An exception to this was the analysis undertaken for employment. The cohort of Irish owned firms that were approved RTI support demonstrated a greater degree of resilience over the recessionary period than the total Enterprise Ireland client base. Over the 2002-2012 period, the 'RTI cohort' experienced 8 per cent growth in net employment compared with a 6.2 per cent decline in employment in the total Enterprise Ireland client base. Although employment is on the increase for the total client base since 2010, employment in the 'RTI cohort' has rebounded at a faster rate and pace.

An analysis of cost benefit indicates that a return of €1.82 was achieved in the year 2010 for every €1 of state support (including direct and indirect costs). This is a conservative estimate, and does not fully account for the lapsed time period generally required before the full economic impact of an RD&I programme can be determined.

Recommendations

Improve Objective Setting

The objectives that were set out for the programme were very wide-reaching. They included aims to increase linkages between companies and between Third Level Institutes and firms, and for firms to engage in collaborative research programmes (both in Ireland and internationally). While many of the objectives *were* met (in terms of product/process development, scale of investment etc.) the evaluations undertaken to date do not provide evidence of delivery against these collaboration/linkage objectives as a result of the RTI Scheme. Nevertheless, it can be contended that this Scheme has helped to increase the absorptive capacity of the recipient firms, which is an important building block for collaboration. Other complementary programmes such as the Innovation Partnerships, Innovation Vouchers, SRCs and CSETs have collaboration as a primary objective.

The RTI Competitive Grant Scheme has been replaced by the EI R&D Fund[176]. It is recommended that the objectives of the Fund be reviewed to ensure that they are

[175] Government R&D Funding and Company Behaviour, Measuring Behavioural Additionality, OECD 2006 http://carthagene.enim.fr/IMG/pdf/OECD_RD_2006.pdf

[176] A review of the EI R&D Fund was not undertaken as part of this evaluation

sufficiently focused, and that the range of metrics is identified and data collected to facilitate evaluation (e.g. if linkages is a key objective of the programme, effective evaluation could help to assess whether or not this was the most appropriate instrument to deliver).

Develop a Counterfactual

A comparator group of companies had not been established ex ante to facilitate comparison of impacts, and Enterprise Ireland cites challenges in doing so, given that most firms supported by them are eligible and/or have availed of RD&I supports. However, the importance of establishing a counterfactual is well demonstrated here in that the ability to assess the performance of R&D active companies (supported by the RTI fund) relative to those not in receipt of RTI supports would strengthen the evaluation.

It is recommended that a robust counterfactual and/or control group be established ex-ante to support future programme evaluations.

12. Research and Development Advocates Programme – 2006-2011

Programme Logic Model

Objectives

- Encourage companies to become more aware of the value of RD&I as a business process
- Reach out to companies who are currently not engaging actively with Enterprise Ireland
- Direct eligible companies to relevant supports and to conduct more RD&I

Inputs

- Enterprise Ireland Advocate Programme Fund for payment of R&D Advocates
- Company contribution of €900 for three day intervention

Activities

- Enterprise Ireland Letter of Introduction to companies
- Free Half Day Company visits by R&D Advocates
- Three Days subsidised technical consultancy
- Awareness raising for access to R&D funding support

Outputs

- Awareness of Enterprise Ireland Client re R&D and funding supports for R&D
- Strategic consultancy support
- Improved understanding of innovation processes
- Increased understanding of the requirements of companies by Enterprise Ireland; and increased understanding by companies of supports from Enterprise Ireland
- Identified opportunities for improved company productivity[177]

Outcomes & Impacts

- Increased access to Enterprise Ireland and Other RD&I funding support
- Capability building in RD&I processes
- Business expansions strategy development signposted
- Potential for revenue generation from new product or improved practices
- Expected increase in turnover and contribution to EVA

[177] Signposting companies to relevant supports such as Productivity Improvement Fund 2006-2008, Growth Fund 2008-2010, and Job Expansion Fund 2009-Present

Evaluation Aim

The aim of the evaluation is to assess the appropriateness, efficiency and effectiveness of the Enterprise Ireland R&D Advocates programme. This is an ex-post evaluation focusing in the period 2006-2011. This evaluation is based on Frontline Consultants (Frontline) evaluation commissioned by Forfás and delivered in March 2012.

Programme Background, Objectives & Target Population

Background

The Programme was originally initiated as an R&D Awareness Programme in 2001 to encourage Irish owned companies to become more aware of the value of R&D and new product development as a business process and to encourage them to conduct more R&D. The companies were approached via organised seminars.

By 2005, attendance at events was diminishing and, in an attempt to reinvigorate the support, Enterprise Ireland launched the R&D Advocates Pilot. The pilot was launched to test a new approach to capturing the attention of companies which had the potential to innovate but were not forthcoming in seeking support for their development plans; or lacked the knowledge that such help was available.

The R&D Advocates Pilot involved a direct and proactive approach:

- A letter of introduction was sent to the company by Enterprise Ireland;
- An Advocate telephoned and subsequently visited the company; and
- Three days subsidised technical consultancy was available to eligible companies.

Following on from the success of the pilot, the Enterprise Ireland Business Committee agreed to fund a two year R&D Advocates Programme to target companies in every region over the period 2006 to 2008. From 2009-2011 the R&D Advocates Programme had its emphasis on Innovation (design) steps required as a pre-cursor to R&D. The evaluation spans this 2006-2011 period.

The Advocate Programme was delivered through a panel of external consultants/technical specialists, supported by the Enterprise Ireland Advocates Team.

A company list was created by reviewing the Enterprise Ireland existing client database, focusing on 'inactive' clients, and undertaking a number of checks on eligibility. Advocates were appointed for each company selected and charged with initially making contact by phone as a precursor to an Advocate visit to the company[178].

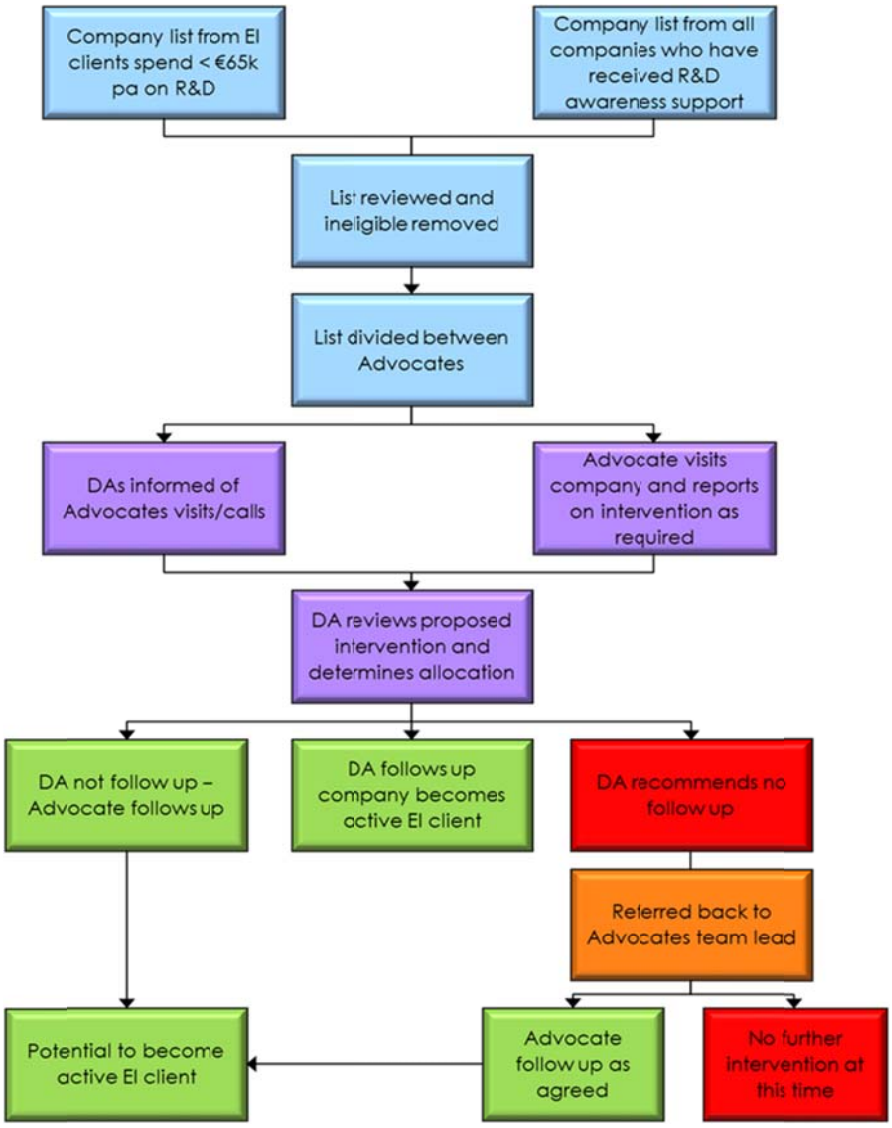
The programme takes the form of a free half day's support followed by three days of part-funded support if pursued by the company and signed off by the relevant Enterprise Ireland Development Advisor (DA).

The purpose of the Advocate's visit was to raise awareness and instil an understanding of RD&I processes and, where appropriate, to guide the company through the process of developing and defining an R&D Programme. The Advocates could also assist companies in preparing an application for other forms of Enterprise Ireland support.

[178] Letters were sent by the Enterprise Ireland Advocates Team so that the follow up direct contact made by an Advocate was recognised as being at the behest of Enterprise Ireland

Figure 1 shows detailed flow chart of how the process works.

Figure 1:R&D Advocates Processes



Objectives

The R&D Advocates Programme objectives are to:

- Encourage companies to become more aware of the value of RD&I as a business process;
- Reach out to companies who are currently not engaging actively with Enterprise Ireland; and to
- Direct eligible companies[179] to relevant supports to conduct more RD&I.

[179] Those falling within the remit of Enterprise Ireland – exporting companies or those with the potential to do so

The initiative contributes to the key objectives of the Enterprise Ireland RD&I strategy of increasing the number of companies in Ireland spending over €100k a year on R&D.

Target Population

The R&D Advocates Programme target population was companies that:

- Do not undertake R&D, defined as spending less than €65,000 per year on R&D; and
- Are low to medium R&D performers - defined as spending between €65,000 to €130,000 per year on R&D over the past three years.

According to Enterprise Ireland, the pilot programme conducted in 2005 affirmed the assumption that 10 per cent of companies contacted would respond positively by engaging in some level of innovation, leading to an increase over time in the take-up of R&D supports.

Evolution of the Programme

During the period covered in this evaluation, slight modifications were made to the programme for 2009-2011 based on the lessons learnt over 2006-2008. It was recognised that in order for a company to develop an innovation agenda, it needed to be contextualised within the strategic business needs of the company. Therefore, although the Programme still had an emphasis on R&D, the advisory services provided by the Advocates broadened to encompass business planning and growth through exports.

In 2012 the use of Advocates as a mechanism for stimulating 'inactive' companies, including those not previously engaged with Enterprise Ireland, was transferred into the recently launched Potential Exporters Division (PED).

Programme Rationale

The original aim for the pilot programme in 2005 was to increase the awareness among indigenous companies both of the value of R&D and of the State supports available for company R&D, thereby increasing the level of R&D investment by Irish-owned companies[180].

The publication of the Strategy for Science, Technology and Innovation (SSTI) 2006-2013 stated that "In light of the fact that significant numbers of indigenous and foreign owned firms do minimal or no R&D, there is a clear requirement to raise awareness of the need for, and benefits of, technological innovation and research, and to encourage existing firms to do more.". This programme plays a contributing role toward increasing RD&I activity and expenditures by firms.

Evaluation Methodology

The Programme was aimed at increasing awareness of the value of RD&I in companies and stimulating companies to engage more actively with Enterprise Ireland. The data gathering to inform evaluation took the form of:

1. Stakeholder interviews including Development Advisors and Advocates;

[180] Market failure of information asymmetry applies

2. Company Interviews and e-surveys; and
3. International comparator review, which is a desktop research and a review of evaluation reports of similar Programmes – this included a sample evaluation by Frontline allowing for 'insider perspective' to be drawn out.

Stakeholder Interviews

A total of 17 stakeholder interviews were achieved, comprising of six Development Advisors, six Advocates, four member of Enterprise Ireland and one member of the County Enterprise Board. The majority of these interviews were conducted face-to-face.

The stakeholder interviews explored:

- Range and outcomes of support offered;
- Fit with other forms of Enterprise Ireland support;
- What works well; and
- Lessons learned and areas for improvement.

Company Interviews

Consultation was undertaken with companies who participated in the R&D Advocates Programme to understand the range of benefits and impacts gained, in addition to areas for future and continued improvement.

- Profile and business objectives for participation;
- Perception of the application process;
- Range and outcomes of support received;
- Impact; and
- Recommendations and areas for improvement.

All companies who had participated in the R&D Advocates Programme were invited to share their views and experiences.

The Advocates team provided details relating to 166 companies[181], from the initial 188 that had received three day support. From this sample, a further 10 companies were no longer trading, reducing the population to 156. Consultations were completed with 45 companies, giving a response rate of 29 per cent.

Alignment with National Policy

A key element of the SSTI 2006-2013 was to address the need for a transformational change in both the quantity and quality of research undertaken by the business sector in Ireland. The SSTI set targets to grow Business Expenditure on R&D to €2.5 billion by 2013 and committed to putting in place measures to support companies to engage in R&D such as promoting higher

[181] 188 companies had received three-day support since the programme was established. However, a number were no longer in existence and were removed from the sample by the Advocates team, resulting in a sample population of 166

education–industry linkages and assisting firms with licencing technology. The SSTI committed to working with companies to strengthen the RTDI base of the enterprise sector and to bring about a transformational change in company attitudes to R&D.

The Enterprise Ireland R&D Advocates Programme was aligned with national policy as set out in the SSTI 2006-2013.

Inputs

Direct Costs

The advocate fee was €900 per day. For the three day visits the company paid €300 per day towards the Advocate fee and Enterprise Ireland paid the remainder. In addition Enterprise Ireland paid the Advocates €50 per phone contact subject to a certain amount of information from the company being obtained, plus Advocates travel costs. In exceptional circumstances an extra day would be added to the three day visit.

The total Enterprise Ireland direct financial investment awarded to companies for participation in the Advocate Programme was €1,252,000 for both half day and three day engagements.

This was allocated across two periods of the evaluation period:

- 2006 – 2008: €552,000; and
- 2009 – 2011: €700,000

The total expenditure incurred by companies that availed of three days of advocate support amounted to €169,200 over the period of evaluation, from 2006-2011. A total of 188 companies spent a fixed amount of €300 per day for the three days of support. The cost for companies was split across two periods as follows:

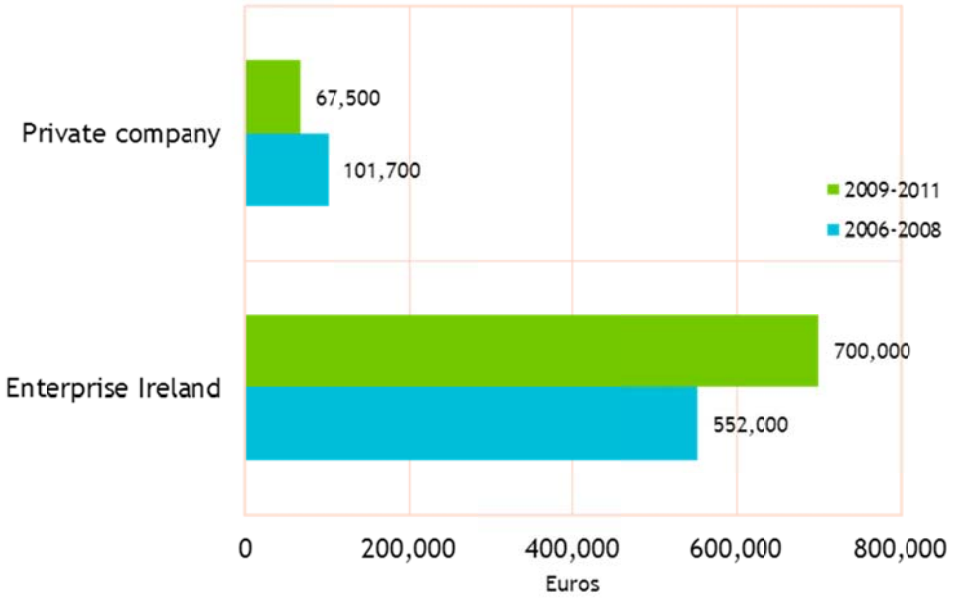
- 2006 – 2008: €101,700 paid by 113 Companies; and
- 2009 – 2011: €67,500 paid by 75 Companies.

Indirect Costs

The indirect cost includes cost of front-end Enterprise Ireland staff salaries who are involved in managing the programme, and is directly attributed as transaction management cost to the programme. It excludes general overheads. Enterprise Ireland allocated 1.5 Full Time Equivalent (FTE) staff to the Programme per annum. This amounts to total €672,318 during the evaluation period 2006-2011.

The total R&D Advocate Programme Cost to Enterprise Ireland during the period of evaluation is € 1,924,318.

Chart 12.1: Inputs by both private and public institutions over 2 periods



Outputs & Activities

The majority of Advocates have met with multiple companies, with some visiting as many as 200 during their involvement in the R&D Advocates Programme. The purpose of the R&D Advocates programme was to engage with inactive clients, i.e. those that are on the periphery of Enterprise Ireland support, deemed as having less than €65k spend on R&D or not having recently accessed Enterprise Ireland support.

The R&D Advocates Programme was described during stakeholder consultation as being extremely well-managed and a relatively low cost intervention. It worked well at introducing and raising awareness of Enterprise Ireland's support on offer. The sectoral and industry experience of the Advocates in addition to the complementary role they add to Development Advisors were two other key areas identified as working very well. Advocates generally have manufacturing and engineering backgrounds[182] and have been working with Enterprise Ireland for several years, ranging from 4 to 10 years.

The Programme delivered a mix of activities and outputs for companies. They included:

- Signposting to further funding support for R&D;
- Re-engaged companies in R&D activity;
- Improved understanding of innovation processes;
- Improved perception of Enterprise Ireland; and
- Improved relationship with Development Advisors.

Over the full period of evaluation 1,987 companies were contacted, resulting in 1,218 half-day visits (61.3 per cent). Approximately one in six of these companies (15.4 per cent)

[182] Development Advisors within Enterprise Ireland come from a wide range of business and technology backgrounds across a range of sectors including life-sciences, food, construction, engineering, etc.

undertook the three day visits. Of these, 80 companies (42.6 per cent) became active Enterprise Ireland clients and accessed further support.

Table 12.1 below presents a summary of the activities and outputs across the pilot and the two support rounds.

Table 12.1: Conversion Rates

	Number of companies							
	Contacted		Half day visits		Three day visits		Further support uptake	
	Actual	Target	Actual	Target	Actual	Target	Actual	Target
06-08	959	1,300	545	NA	113	NA	48%	NA
09-11	1,028	1,040	673	520	75	120	35%	50%
Total	1,987	2,340	1218	520	188	120	NA	NA

The above table presents good conversion rates from the 06-08 sample with almost half of the three day supported companies going on to access further Enterprise Ireland support.

The 09-11 targets were subsequently established, resulting in:

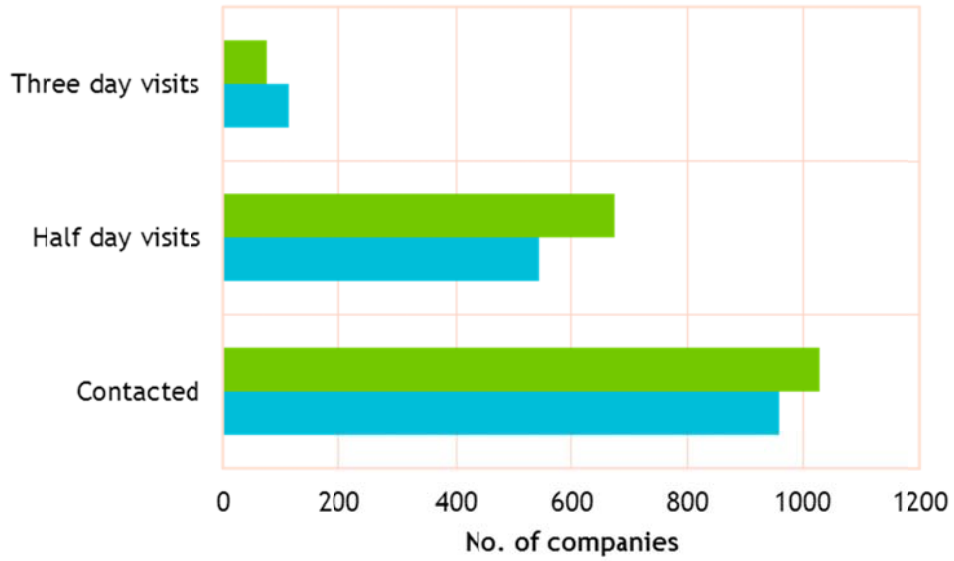
- Almost achieving contact target;
- Overachieving the number of companies going on to avail of the free half day of support;
- Underachievement of those accessing the three day of support; and
- Underachievement of those accessing further Enterprise Ireland support.

The underachievement of the targets for both the three day support and accessing further Enterprise Ireland support, while having substantially overachieved in the free visits was viewed by Enterprise Ireland staff and Advocates as a direct result of the recession.

The companies responded as being unable to fully commit to 'paid for' three days consultancy. Furthermore a matched funding commitment by companies is often required in order to access further Enterprise Ireland support.

The take up of Enterprise Ireland support is outlined in (Chart 12.1).

Chart 12.2: Two Period Comparison of take-up



The companies consulted spanned a broad spectrum of sectors and activities and scale.

Almost half (44 per cent) of the companies that were consulted came from the manufacturing sector. Other sectors included business or IT service providers (18 per cent) and engineering (15 per cent). The remainder of companies were from agriculture, printing and waste management.

Of the 45 companies consulted 42 companies provided turnover (based on last financial year) and employment data:

- Companies turned over between €80,000 and €57m per annum (17 per cent turned over €5m or above);
- Companies employed between 1 and 72 FTEs[183]; and
- Most companies also employed part time employees; no company employed more than 10 part time employees in this capacity.

This data points to the broad range in scale of participating companies.

The main business objectives for participating companies in the R&D Advocates Programme included are presented in Table 12.2 below. Companies could provide responses across the range of options provided.

[183] Full Time Equivalents

Table 12.2: Business Objectives

Meeting Company Objectives	% of respondents	No. of respondents
Help the company to grow	82%	36
To access Enterprise Ireland innovation/research grant funding	59%	26
Help the company to remain competitive	39%	17
Help embed innovation in the company	21%	9
Increase the company's awareness of innovation/NPD	21%	9
To access Enterprise Ireland productivity improvement funding	21%	9
To access wider Enterprise Ireland/non-Enterprise Ireland grant funding	11%	5
Transform the innovation capability of the company	14%	6

Almost two thirds (64 per cent) of companies largely or partly achieved their business objectives through participation in the Advocates Programme.

However, more than 1 in 10 (13 per cent) stated that their objectives were not met at all suggesting that there was some room for improvement. Some reasons cited included mismatch of the Advocate and business, lack of follow-on support that fitted with the business needs and access to the right personnel and contacts (e.g. contacts in overseas markets).

Previous R&D Investment

Companies were asked about their investment in R&D prior to participating in the Advocate Programme. More than 3 in 4 companies (77 per cent, 33) had undertaken some in-house R&D while around 1 in 4 (24 per cent, 6) had invested in external R&D. This high level of in-house R&D was not surprising given that the eligibility criteria allowed for some R&D as long as it was under certain thresholds. This indicates that most companies already had a culture of innovation and improvement before participating in the R&D Advocates Programme, helping evidence the reason for widening the scope of the Programme beyond R&D, to support businesses in general.

The companies (23 per cent) that had not previously invested in R&D support all differed considerably; therefore no specific pattern was evident.

Outcomes

The main aim of this intervention is to garner increased engagement by firms in RD&I activities. The most insightful outcomes, therefore, relate to progress made in this regard, given that the target population was previously deemed 'inactive'. A range of other positive outcomes relate behavioural aspects and strategic planning for the company, including increased awareness and understanding of the benefits of RD&I; the definition of a RD&I

strategy/approach specific to the firm; and identification of business development opportunities.

In 'successful' cases this has led to companies obtaining supports from other Enterprise Ireland programmes (as relevant, and based on approved proposals) with the aim of enhancing product/process development, productivity etc., to deliver improved company performance. Although a number of the company survey questions relate to output performance, it is most unlikely that growth in turnover and/or employment is directly or *solely attribute* to the Advocates programme.

Table 12.3 presents the range of supports accessed by companies through the Advocate.

Table 12.3: Types of Support from Advocate

	% of respondents	No. of respondents
Helped apply for funding	67%	28
Helped the company in application for innovation support – Enterprise Ireland products/programme	67%	28
Assisted in identifying opportunities for the company to develop	43%	18
Signposted to other forms of support	36%	15
Improved our understanding of innovation processes/our approach to these	33%	14
Helped define innovation/ strategy/approach for the company	26%	11
Assistance to improve productivity	21%	9
Signposting to Training in Innovation Management	7%	3
Helped the company in application for innovation/ NPD support – Non-Enterprise Ireland products/Programmes	5%	2

Note: Multiple answers, no. 42 companies.

Table 4 below, details the responses of companies when they were asked to state what outcomes they considered were directly attributable to the support.

For these companies, the R&D Advocates Programme helped to embed a culture of R&D and innovation and led to the delivery of 'hard' outcomes. The responses (and the following Table 12.4) demonstrate that there has been an improvement in company performance. As discussed in the introduction to this section, however, it is unlikely that increases in turnover or employment can be solely attributed to this programme. It can, however, be inferred that the companies consider that the Advocate programme was the main catalyst.

Table 12.4: Outcome of Support/Impact on Business Performance

	% of respondents	No. of respondents
Was signposted to wider Enterprise Ireland support – was successful in getting funding	39%	16
Greater understanding of innovation in the business	34%	14
Developed a product/process/service	27%	11
Increased sales/turnover	27%	11
Improved productivity – e.g. linked through the other Enterprise Ireland support	24%	10

Note: Multiple answers, no. 41 companies

Other outcomes identified included:

- Identified the right projects that would merit research/innovation/intervention (24 per cent);
- Increased employment in research/innovation (20 per cent);
- Established a research/innovation strategy (17 per cent); and
- Established a research/innovation project plan (12 per cent).

Companies were asked in what ways the support had improved the performance of their company. The most frequently cited improvements (39 respondents) were:

- Helped identify developments which could benefit the business;
- Received further Enterprise Ireland/Non Enterprise Ireland grant support which enabled businesses to develop products/processes/services; and
- Upgraded the research/innovation/technical capability.

Table 12.5: Business Performance

	% of respondents	No. of respondents
Helped identify developments which could benefit the business	51%	20
Upgraded the research/innovation/technical capability	36%	14
Received further Enterprise Ireland/Non Enterprise Ireland grant support enabled us to develop products / processes/services	36%	14
Transformed company operations to higher value ones	28%	11

	% of respondents	No. of respondents
Helped increase our exporting	26%	10
Other	21%	8
Increased staff numbers than without the project	21%	8
Supported a larger turnover than without the project	18%	7
Signposted to other forms of support	18%	7

Note: Companies could respond to more than one category. Base 39 companies.

While five companies stated that the support did not have a positive impact on the company, all others cited that there had been a positive impact.

Over half (57 per cent) of companies indicated that as a direct result of the support received, research/innovation was now more embedded in the company. This shows that for some companies, the R&D Advocates Programme had a lasting legacy, assisting companies in both the short and longer term.

Other impacts included:

- 65 per cent were more likely to invest further in research/ innovation;
- 68 per cent believed that their company had transformed towards higher value adding operations;
- 58 per cent predicted that turnover would be moderately or a lot lower if they had not participated;
- 43 per cent indicated that employment would be lower without participation;
- 57 per cent reported that impacts were likely to last up to three years while 26 per cent indicated four to six years; and
- 58 per cent reported that the impact would increase over time while 31 per cent indicated that it would stay the same.

Findings and Conclusions

Appropriateness

The R&D Advocates Programme aligns with Irish Government policies set out in the SSTI 2006-2013. In particular it targets previously 'inactive' companies with the aim of contributing to an increase in the quantity and quality of R&D in the business sector.

The programme and its objectives have developed and evolved from 2005-2011 based on changing government policies and fluctuations in the demand for the programme from Enterprise Ireland's client (and potential client) companies.

The rationale for an intervention of this type remains valid. The programme has a high level of synergy with other Enterprise Ireland RD&I Programme supports, as it has led to 39 per

cent of companies that participated in the programme to be successful in their application for other Enterprise Ireland funding supports.

Effectiveness

The main objective of the programme is to promote the benefits of R&D to companies and increasing R&D activities and performance. It was clear from the results that the Programme delivers on these objectives for the clients. A high proportion (87 per cent) declared that they had their objectives (increasing R&D activities and performance) for the Programme met. Over half (56 per cent) of client companies also reported through the client surveys, that as a direct result of the support received, research/innovation was now more embedded in the company.

However, there were no set targets at the outset for the number of companies increasing R&D and no data from this Programme was available on the company R&D spend of over €100K per annum, which was an objective of the programme.

Efficiency

The cost of the Programme was relatively low with approximately €1.2m being input by Enterprise Ireland over the evaluation period 2006-2011. For this, 1,218 businesses availed on the free half day diagnostic and 188 went on to access the three day support.

Enterprise Ireland was advised of the findings of the evaluation at an early stage, which allowed them to make amendments as necessary when the Advocates approach was integrated into the Potential Exporters Division earlier in 2012.

Enterprise Ireland Advocate Programme supports companies across regions and resulted in positive attitudinal changes with the potential to lead to increased activity by a broader range of companies:

- It serves to raise awareness and initiate innovation;
- Companies have become more informed in terms of identification of opportunities and of the innovation processes. Enterprise Ireland's experience is that companies are generally more confident in terms of decision making, demonstrating the ability to abandon non-viable projects at the appropriate time;
- More companies have defined innovation strategies and have accessed Enterprise Ireland funding support; and
- Targeted companies have shifted from an 'inactive' status to an 'active' status.

On the whole, companies view the Advocates Programme as positive and gained a range of benefits through participation. In addition, companies indicated that outcomes could be directly attributed to the Advocates Programme and without their support; the range of outcomes would have been reduced.

Recommendations

The Advocates Programme has evolved over the years since its inception, and the early stage finding of this evaluation served to inform its operation in the context of the Potential Exporters Division (PED). The following sets out the main learnings:

- Advocate-company match – For some companies, the Advocates Programme did not adequately match their requirements, and this more likely pertains to the earlier phases of the programme. Enterprise Ireland acknowledges the importance of matching the most suitable Advocate with the correct company at the outset. Over recent years a greater panel of Advocates has been developed. Based on the findings of this report, the Advocate panel is now segmented into 7 specialist lots in terms of expertise (functional and /or sectoral).
- Company target lists – The initial phases of the programme involved Enterprise Ireland Development Advisors working from a listing of inactive client companies (i.e. known at some stage to Enterprise Ireland). Consideration needs to be taken as to how best to improve conversion rates while at the same time, broadening the programme to companies not already engaging with Enterprise Ireland[184].
- Advocate fee – the fee of €900 paid as supplement by the companies for three day training was viewed as high by them, especially in the current economic climate and suggestions were that this be reduced. The fees currently charged by the Advocates have been reduced significantly: typically within a range of 45 per cent – 55 per cent from 2011 levels.
- Follow-on support – The findings of this evaluation indicated a need for a greater level of follow up by the Development Advisors following on from the Advocate Support.
- Development Advisors ownership – Development Advisors need to take ownership of Programme outputs to ensure that the company realises maximum benefit from the support.
- DA-Advocate relationship – the need for more interaction between the Development Advisors and Advocate was highlighted by Frontline as a result of its consultations. The Development Advisor needs to be up to date on the capabilities and skills sets of Advocates and in turn, the Advocate must better understand the needs of Development Advisors – this would be a win-win all-round.

The revised processes within the PED including follow on client engagement and segmenting of the Advocate Panel should serve to address these last three requirements.

End Notes

The Potential Exporters Division – Recent Developments

Arising from experience, it became evident that the targeted companies benefited from (and required) a broader range of advisory services – to include business development, strategic planning (and the role/value of RD&I investments in this context), productivity etc. The use of Advocates as an approach that enables Enterprise Ireland to engage proactively and efficiently with a greater number of inactive and potential client companies has been integrated into the Potential Exporters Division. As part of their *Get Export Ready* programme, which is aimed specifically at pre-export and early stage exporting companies, the following services are provided:

- Workshops, seminars and training across the country;

[184] The Potential Exporters Division has embarked on a broad promotional campaign aimed at this cohort

- Mentoring (long term individual support) and Advocate support (short intervention at a company level);
- Access to market information;
- New website with 'how to' guides, links to relevant information, self-assessment tools and templates;
- New helpdesk;
- Access to advice from successful exporting companies; and
- Access to a range of Enterprise Ireland financial supports.

The Advocates operated within an innovation ecosystem which provides a wide range of financial and soft supports to companies. Each of the individual programmes either have been or will be evaluated as part of the overall evaluation process being undertaken by Forfás over 2012 and 2013.

Appendix 1: Evolution of Programmes

Since the evaluation, some of the programmes outlined below have evolved; therefore a brief summary of changes are presented below.

1. Intellectual Property Assistance Scheme (IPAS)

The IPAS has been terminated in 2009. Responsibility for patenting technology developed in the HEIs is now with the Technology Transfer Offices (TTOs) with support from Enterprise Ireland under the Technology Transfer Strengthening Initiative.

The patent funding supports provided to companies under the Industry Patent Fund have been integrated into Enterprise Ireland's R&D Fund and other relevant initiatives (such as the Innovative HPSU programme).

2. R&D Advocates

The R&D Advocates scheme was subsumed in Potential Exporters Division in Enterprise Ireland this year, and Advocates are offered to companies based on company needs assessment.

3. Technology Gateways

The Technology Gateways as predecessor of the Applied Research Enhancement programme is due to start funding in 2013.

4. SFI CSET and SRC

Both programmes have been amalgamated into one Research Centres programme – hub and spoke model that allows for a more flexible involvement of partners outside the core technology platforms situated at the heart of the centres. In particular the objectives and expectations of the 2012 Research Centre Call not only contain the CSET objectives but in addition include a much stronger emphasis on delivering significant economic and societal impact including:

- Attracting Foreign Direct Investment;
- Spin outs of high-technology start-ups;
- Technology transfer through licenses to both MNCs and SMEs based in Ireland;
- Increasing the level of industrial and commercial investment in R&D in Ireland;
- Delivering tangible societal benefits;
- Greater requirement for industrial cash contributions.

5. EI RTI Scheme

The Industry Research and Development Initiative (1994-1999) was predecessor of the RTI Scheme. Following the Midterm Review of the Operational programme in 1997, the Scheme was broadened, expanded and redesigned as the Research, Technology and Innovation (RTI) Scheme. The RTI Scheme was a key action under the Government's Operational programme for the Productive Sector, which was part of the National Development Plan 2000-2006. The RTI Scheme was co-funded by the European Regional Development Fund (ERDF). The RTI Scheme was open to Enterprise Ireland, IDA Ireland, Udarás and Shannon Development clients. In 2008 the RTI Scheme was revised and became the R&D Fund. IDA Ireland initiated its own R&D Committee in 2008 which approved R&D projects for IDA Ireland clients. The approach to the R&D Fund was guided by the Government's Strategy for Science, Technology

and Innovation, 2006-2013, under the co-ordination of the Department of Enterprise, Trade and Employment.

6. Commercialisation Fund

The Fund has been re-designed in 2010 and the three stages of support amalgamated. The revised Fund is recommended to place more emphasis on commercialisation, i.e. closer to market projects (as intended in SSTI 2006-2013).

In 2011, the flexibility of the Commercialisation Fund programme was improved by introducing a process where selected projects can be submitted to the programme outside of the standard published calls.

7. Innovation Vouchers

The Innovation Vouchers scheme review, as undertaken by Enterprise Ireland, is in process of preparation and is not ready for inclusion into this document at present. Modelled on the Dutch Voucher scheme in 2007, Innovation Vouchers are designed to enable small businesses in Ireland & Northern Ireland to access knowledge and expertise to develop innovative solutions to business issues.
The programme provides a voucher of up to €5000/£4000 to enable eligible businesses to engage with one of the 41 universities, colleges and other publicly funded research organisations throughout the Republic of Ireland and Northern Ireland. Vouchers can be pooled by up to ten companies to create a larger fund to a maximum of €50,000 (10 vouchers x €5,000) to address an issue of common concern. This has been suspended in Q1 2012 pending the outcome of the evaluation of the scheme. The Enterprise Ireland scheme is restricted to small limited companies. The Objectives of the programme are:

- Build links between Ireland's public knowledge providers (i.e. higher education institutes, public research bodies) and small businesses
- Create a cultural shift in the small business community's approach to innovation.

Appendix 2: List of Abbreviations

CSET	Centres for Science, Engineering and Technology
EI	Enterprise Ireland
EVA	Euro Value Added
DEJI	Department of Jobs, Enterprise and Innovation
GDP	Gross Domestic Product
GNP	Gross National Product
HEA	Higher Education Authority
HEI	Higher Education Institutes
HPSU	High Potential Start Up
ICT	Information Communication Technology
ICSTI	Irish Council for Science, Technology and Innovation
IDA	IDA Ireland
IPAS	Intellectual Property Assistance Scheme
PI	Principle Investigator
PRTLI	programme for Research and Third Level Institutions
MNC	Multi National Company
OECD	Organisation for Economic Cooperation and Development
RPO	Research Performing Organisations
R&D	Research and Development
RD&I	Research, Development and Innovation
SFI	Science Foundation Ireland
SMART	(Specific, Measurable, Achievable, Realistic and Time bound)
SME	Small and Medium Enterprise
SRC	Strategic Research Cluster
SSTI	Strategy for Science, Technology and Innovation
TTO	Technology Transfer Office

Appendix 3: Development of Enterprise Ireland R&D Fund

Development of R&D Fund since 2008

In 2008 the RTI Scheme was replaced by two separate R&D Funds operated by Enterprise Ireland and IDA Ireland respectively. The general objectives of the R&D Fund remained the same as the RTI Scheme, with the exception of the objective below, now captured by other Programmes that focuses on linkages between Higher Education Institutions and Enterprise, such as Innovation Partnerships, Innovation vouchers, etc.

As was the case with the RTI Scheme, the Enterprise Ireland R&D Fund is still operated as a Small Project Fund (for projects with costs no greater than €150,000) and the Standard Fund (which applies a grant maximum of, currently, €650,000). Larger projects following much the same process are dealt with by the Investment Committee of Enterprise Ireland[185].

Small Project Fund (SPF) aims to target beneficiaries that have modest R&D ambitions or firms that are relatively new to R&D activities. Eligibility under this Scheme is limited to projects costing up to €150,000. The SPF provides funds for R&D projects to support companies that want to achieve some or all of the following criteria:

- Establish or increase R&D activity leading to an on-going R&D commitment in driving company development;
- Demonstrating a connection between R&D and the overall business objectives;
- Developing culture of innovative thinking throughout the company which aims to harness the skills of all staff towards defined business goals;
- Establishing or increasing the R&D capability of a company; and
- Establishing or developing quality R&D management systems and procedures.

The R&D Fund (RDF) supports projects which have the potential to develop novel products, processes and services with a clear competitive advantage in their target market. This will enable companies to increase employment through substantially increased sales. Companies are only eligible for funding of up to €650,000. The fund will supply grants to companies to help them achieve some or all of the following:

- A demonstrable connection between R&D and the overall business objectives;
- A culture of innovative thinking throughout the company which aims to harness the creativity of all the staff towards defined business goals;
- A significant on-going/established R&D budget;
- An established R&D team with high level skills;
- High quality facilities for R&D; and
- Good quality R&D management systems and procedures.

The level of funding which companies are eligible for depends on the size of the companies and whether or not companies are collaborating. Enterprise Ireland can only fund up to 50 per

[185] A lower limit of €450,000 was applied to the R&D Fund for a period of financial uncertainty.

cent of the total project cost due to Irish legislation. For RDF the maximum funding by size of company is detailed below:

Table 1: Maximum grant rates for large projects

R&D Fund - Large Projects	Small companies	Medium companies	Large companies
Maximum funding for projects that are innovative and technically challenging involving significant risk (and depending on geographic location)	45%	35%	25%
A collaboration bonus of up to 15 per cent is available for innovative projects where there is collaboration between two companies, but the total maximum funding cannot exceed 50 per cent of the total project cost.			

Conditions for Standard and Small Project funds

For the Standard Fund companies have to be Enterprise Ireland or Údarás na Gaeltachta clients who are manufacturing or internationally traded services companies that can show adequate trading income to implement the proposed project. For the Small Fund, City and County Enterprise Board clients who meet the same criteria are additionally eligible. Funds are delivered through grants[186].

[186] Enterprise Board Clients are only eligible for SPF support.

Appendix 4: An Illustrative example of performance metrics based on recommendations – Technology Gateways

Objectives	Inputs	Activities	Outputs	Outcomes	Impacts
▪ First level: Programme objectives for the direct beneficiaries, in this case the Objectives of Technology Gateways in IoTs;	EI Funding	Centre Activities: ▪ Applied research between discovery and industrial exploitation ▪ Technical and commercialisation services ▪ Very specialised training	▪ Training Delivered ▪ Seminars ▪ Open Days	▪ Income from IP ▪ Increased income from business sector	▪ Increased share of HERD from international sources
▪ Second level: the objectives for the indirect beneficiaries, and in this case, **Industry Objectives ;**	Industry Funding	▪ Industry engagement with Enterprise Ireland ▪ Industry engagement with Gateways	▪ Collaborative projects ▪ Licences/Patents	▪ New products / processes/ services on market ▪ Income from new products / processes/services ▪ New jobs/ jobs safeguarded as result of income from new products/ services ▪ Increased proportion of income from innovative products/ processes/ services	▪ Increased BERD (no. of businesses doing R&D and volume of R&D)
▪ Third level: Programme objectives for the wider RD&I Policy System	Other Programme/	Programme Activities[187]. ▪ Establishing a Technology		▪ Increased engagement with Industry ▪ Long-term changes to research	

	Agency Funding	Gateway Network		organisational structures and strategies per Thematic	
METRICS	**Inputs**	**Activities**	**Outputs**	**Outcomes**	**Impacts**
TECHNOLOGY GATEWAY METRICS	EI Funding	▪ Technology Themes ▪ Researchers engaged ▪ Industry Consultations/Research strategy in place	▪ No. of training courses ▪ No. of seminars ▪ No. of open days ▪ No. Joint publications, etc.	▪ Income from IP ▪ Value of new income from business ▪ Number of new relationships with business ▪ Examples of increased quantity and quality of support for technology transfer, IP management and other commercialisation activities ▪ organisational structures and strategies	▪ Percentage of HERD from international sources
INDUSTRY METRICS	Industry Funding Cash, in-Kind, equipment, etc.	▪ Bilateral Consultations/Research pipeline ▪ Budget breakdown by activities (research, outreach, commercialisation, etc.) ▪ No. of industry researchers ▪ Industry Steering Committee presentation, etc.	▪ Number of staff trained ▪ Number of invention disclosures ▪ Number of patents applications ▪ Number of patents approved ▪ Number of licence deals signed ▪ Number of products /processes/services in development ▪ Number of new	▪ Number of new products / processes/services on market as result of participation ▪ Income from new products / processes/services on market – and per cent of total revenue ▪ Employment of number researchers by participating companies	▪ Increased no. of companies doing R&D ▪ Increased BERD from international sources

			businesses created ▪ Value of further R&D funding achieved		
PROGRAMME METRICS	Other Programme/ Agency Funding (FP7, Inn. Vouchers, etc.)	▪ Number of new Gateways established/available	▪ Number of publications ▪ Number of conference presentations ▪ Number of publications ▪ Number of other types of published outputs	▪ BERD of participating companies (before &after participation) ▪ Additional Investment of FDI of participating Co.'s ▪ Examples of new interactions with IoTs in Ireland	▪ Sector-specific growth and jobs ▪ Sector-specific Indicators
DATA SOURCES	Enterprise Ireland	▪ Enterprise Ireland ▪ Gateway Application	▪ Enterprise Ireland & Against Target ▪ Gateway Application ▪ Preceding ARE Centres	▪ Enterprise Ireland & Against Target ▪ Counterfactual ▪ Survey & Annual/Monthly reporting	▪ SSTI ▪ DEJI ▪ Against available National targets

Appendix 5: Framework for the Evaluation of Enterprise Support Programmes

Thematic Area: Research, Development & Innovation

Step 1: Define evaluation objectives and describe the programme (using a logic model approach)

Step 2: Identify appropriate methodology for analysis

Step 3: Identify data requirements

Step 4: Evaluate the programme (Not Applicable)

Step 5: Report and review the evaluation

Sub-Headings and Questions	Complete Response to Questions	Guidance on Issues
Step 1: Specify the Programme Logic Model (PLM) **This first step will provide details on the programme to be evaluated and will inform many subsequent aspects of the evaluation. It will record the characteristics of each element of the programme, from objectives through to outcomes**		
Define the Evaluation Objectives	As per section 1 of Report	Defining the evaluation objectives relates to the questions that the evaluation is trying to answer. These questions typically relate to programme appropriateness, effectiveness and efficiency. At this stage, the type of evaluation to be undertaken should be defined - this should outline whether the evaluation is ex-ante, ex-post, mid-term or other. Evaluations of RDI programmes/supports are often completed on an ex-ante basis so as to enable consideration of difficult-to-quantify potential benefits in the future (spillover, diffusion/dissemination impacts)

Sub-Headings and Questions	Complete Response to Questions	Guidance on Issues
1.1. Programme Objectives		
Outline background details on the programme being evaluated	As per section 2 of Report	Background details may include the following: ▪ Name and details of programme/measure under review (specify title and details) ▪ Name of implementation agency (specify agency: Forfás /Enterprise Ireland/IDA/SFI/CEBs) ▪ Number of years in which the programme has been in operation (specify months and years in operation) ▪ Brief description of programme/measure
What are the programme objectives and target population?	As per section 2 of Report	Programme some illustrative examples of potential objectives might include: ▪ Competitive advantage/driving company development (business and technology) ▪ Develop new products and processes (innovation) ▪ Develop new services and generate knowledge ▪ Develop breakthrough technology ▪ Increasing the R&D capability and capacity ▪ Creating a culture of innovation ▪ Building corroborations between Irish enterprise and Irish universities/IoTs ▪ Meet the targets set out in the Strategy for Science, Technology and Innovation
What is the time period being evaluated?	Ex-ante	
What is the programme rationale – is it addressing a specific market failure?	The rationale relates to capturing the public good and internalising the positive	The market failure that would arise in the absence of this support should be considered. Some illustrative examples of market failure may include:

Sub-Headings and Questions	Complete Response to Questions	Guidance on Issues
	externality, being the public funded research, by offering the necessary link to companies. Rationale predominantly relates to the change in direction, in order to further increase performance of preceding programme. Launch a revised Applied Research Enhancement Programme, due to expire in Dec. 2012, with enhanced industry governance and networking elements, to leverage against FP7.	▪ Failure rates: To what extent is there risk aversion resulting from high failure rates in RDI? ▪ Imperfect Information: To what extent has imperfect information (for both enterprises and investors) concerning the difficulty in assessing the likely success costs and benefits of an RDI venture led to market failure? ▪ Free Rider/Positive Externalities: To what extent has there been market failure as a result of enterprises foregoing RDI because they will still benefit from RDI without having to invest in it? ▪ Public good ▪ Potential externalities Strategy for Science, Technology and Innovation Seventh EU Framework Programme (FP7) High quality research collaborations with European counterparts Specific questions in this area may include the following: ▪ Consideration of whether there are alternative ways of including private sector involvement to achieve the objectives of RDI supports should be examined and identified ▪ The evaluation should consider whether the objectives of the Research, Development and Innovation programme are time-limited and related to specific market conditions ▪ If there are changes in overall market or economic conditions the issue of whether the objectives should be revised or changes made or the initiative be closed should be examined ▪ Outline government policies and relevant policy documents
What national policies are the programme objectives aligned to?	No information provided. However, it is stated that it is aligned to Enterprise Ireland	In considering the specific objectives of the Research, Development and Innovation

Sub-Headings and Questions	Complete Response to Questions	Guidance on Issues
	mission	
By what metrics will programme success be measured? Please give details	Needs further detail.	The metrics used to assess programme performance should be specified by reference to the Programme Logic Model (PLM), to include metrics relating to programme inputs, activities/processes, outputs and outcomes
Have targets been set for these metrics?	No. Recommended.	Specify quantitative or qualitative targets set for the metrics to be utilised
Has an evaluation of the programme been undertaken previously? If yes, please provide detail	Evaluation of impacts on preceding Programme. Some findings summaries in documentation and informed further decision making.	Was it an ex-ante, mid-term or ex-post evaluation? What were the findings/conclusions?
1.2. Inputs Describe and quantify the financial, human and other resources employed in the delivery of the programme/support, measured by appropriate expenditure/resource input indicators		
What is the direct cost of the programme?	Provided.	This refers to the direct financial cost (€) of the intervention on an annual basis. Examples include: ▪ Agency annual expenditure on R&D funds ▪ Agency annual expenditure on R&D stimulation and feasibility funds ▪ Typically inputs are financial but can also be advisory
What are the indirect costs of the programme?	Provided.	This will include allocated administration costs, including agency head office costs and programme administration costs (€) on an annual basis

Sub-Headings and Questions	Complete Response to Questions	Guidance on Issues
What proportion of programme funding is paid directly to companies?	n/a	Issues related to public and private sector support should also be considered ▪ To what extent have the supports (financial grant, advisory and mentoring) been provided by the agency? ▪ To what extent have supports (financial grant, advisory and mentoring) been provided by enterprises themselves? ▪ What is the ratio of public to private leverage? Has there been additional venture capital or investor funding as a result of the programme?
Does the participating company make a financial contribution to the programme costs? If so, what proportion of programme costs are met by participating companies?	Expected ration for company contribution on projects is 40%, based on previous Programme performance of approx. 35%.	
1.3. Activity/Process Describe the processes and tasks supported by the implementation agency in delivering the programme/support		
Describe how programme is delivered	Provided.	Include details on whether support is soft or financial and whether external parties are used for delivery
List activity measures for programme	Provided.	Process: Idea → development application → decision on progress → delivery of RDI → preparation for market → sell product Illustrative examples of possible activities and process-related questions may include: ▪ How many RDI projects have been funded in total? ▪ To what extent does the measure lead to more R&D activities at enterprises (first-order effect)? ▪ To what extent have there been collaborations (including research collaborations) in RDI across and within academia and industry? ▪ What type of RDI has been funded (product/process innovation, new product, new features added to a product, improvement in process)?
1.4. Outputs Describe and quantify the immediate outputs (technical results) produced by the programme/support		

Sub-Headings and Questions	Complete Response to Questions	Guidance on Issues
Outline output indicators for the programme	Further improvement Recommended.	What are the immediate outputs of the programme? Illustrative examples of possible Output Indicators for RDI programmes may include: ▪ Enterprise: Annual no. of client firms supported through RDI programmes by type of support (e.g. capital, feasibility, R&D facility) ▪ Intellectual Property generation: patents registered ▪ Access to knowledge/infrastructure ▪ Research Institutes: Number of publications ▪ Number of graduates
1.5. Outcomes Describe the more immediate benefits (direct affects) and the ultimate outcomes (wider affects) for supported companies arising from the programme/support provided/accessed		
Outline outcome indicators for the programme	Further improvement recommended	Subject to data availability, the envisaged Outcomes from RDI programmers/supports under evaluation should ideally be assessed by reference to quantified outcome metrics. Outcome metrics/indicators should be broken down into the following categories: ▪ Metrics/indicators of Immediate (first order) effects, ▪ Metrics/indicators of Intermediate (second order) effects and ▪ Metrics/indicators of Final (third order) effects. Describe the more immediate benefits (direct effects) or assistance received through the programme/support by the assisted companies. To what extent has the programme affected the following areas of RDI:

Sub-Headings and Questions	Complete Response to Questions	Guidance on Issues
		▪ Level (value and quantity) of R&D capital expenditure? ▪ Level (value and quantity) of R&D infrastructure and capital? ▪ Number and type of R&D jobs created and number and type of other jobs created? ▪ Number and type of R&D jobs safeguarded/sustained and number and type of other jobs safeguarded/sustained? ▪ Number of posts with enhanced R&D skills ▪ Additional increases in industry performance ▪ Impact on the strategic level (synergy, catalyst and strategic influence) ▪ Information exchange and collaboration among participants ▪ Changes in RDI Expenditure ▪ Commercialisation on patents – earnings arising ▪ What new products and processes have occurred as a result of RDI ▪ Number of 1) new products developed; 2) new processes developed ▪ Innovation intensity (innovation expenditures as % of total sales) ▪ Number of new international markets developed Describe the ultimate outcomes (wider affects) for assisted companies arising from the programme/support provided/accessed: ▪ Changes in other firms IT and service capability ▪ Raised services quality in economy ▪ Improved national economic performance ▪ Increased competitiveness at the industry and economy-wide level ▪ Increased overall exports ▪ Wider social benefits ▪ Reputational benefits ▪ Wider Innovation (new marketing developments resulting from programme)

Sub-Headings and Questions	Complete Response to Questions	Guidance on Issues
		▪ Spillovers
Step 2: Identify Appropriate Methodology for Analysis *Having identified the objectives and metrics of interest using the Programme Logic Model, the evaluator can now proceed to select a set of appropriate analytical techniques that can relate inputs and activities to outputs and outcomes to identify whether programme objectives have been met*		
Identify appropriate analytical methodology *Relating input and activity to impacts by completing the following:*		Qualitative and Quantitative analysis can be employed here. Survey and/or econometric techniques may be required depending on the specific nature of the programme/intervention – i.e. where some form of behavioural change is the primary focus of an intervention a qualitative approach to its measurement, such as a survey or case study, may be required.
2.1 Can we test for a causal relationship between inputs and activities and between outputs and outcomes?	No.	Identify the chain of causal links through which we would expect the intervention to achieve impact.
2.2 Identify the counterfactual: Is there a control group or some other reference that can be used to establish a counterfactual? (What are we measuring against and comparing to?)	No counterfactual/control group.	The counterfactual is the consideration of what would have (hypothetically) happened in the absence of the programme support – what would have been the activities, outputs and impacts if the enterprises had not received any support at all. The difference between the counterfactual and the true outputs/outcomes is the true impact (or additionality) arising from the support. A counterfactual is always an estimate by its nature. It can be estimated based on the general population of enterprises (extracted from secondary source data such as the enterprise data from CSO, Eurostat, World Bank or OECD), other similar or related enterprises (for example, enterprises which were approved for the programme but chose not to participate) or using econometric methods. The counterfactual estimation should also take account of selection bias (discussed in the Report) Illustrative examples of useful counterfactual indicators/ causality considerations

Sub-Headings and Questions	Complete Response to Questions	Guidance on Issues
		include: ▪ What has been the direct impact on the knowledge base of enterprises? Has this lead to more RDI activity? ▪ What has been the impact on the commercial prospects for these enterprises? Has it changed the company size, technology and classification? ▪ What have been the impacts on the broader socio-economic environment? Has there been a difference between supported and unsupported firms? ▪ What have been the additional enterprise performance benefits (net RDI jobs/GDP/GVA/turnover/profits/reduced costs) and the indirect enterprise performance benefits
2.3 Identify means to overcome selection bias. Is our comparison fair?	Recommendation	To overcome selection bias, programme participants should only be compared to non-participants from whom they do not systematically differ (i.e., programme participants should have the same characteristics as non-participants to whom they are being compared) – unless this difference can be taken into account (controlled for)
2.4 Identify the appropriate evaluation methodology, having regard to elements 2.1-2.3 above	Select appropriate techniques for analysis, based on data expected to be available.	Illustrative examples of techniques for analysis may include: ▪ Econometric regression analysis ▪ Participant/beneficiary survey research ▪ Case study ▪ Control (comparison group) approach – can be looked at on firm or industry-wide basis – assess performance measures (output and value added) in supported and unsupported firms ▪ Experimental and quasi experimental approaches ▪ Time series analysis (the level of RDI expenditures before the start of the support with the outcomes after the completion of the support). ▪ Univariate analysis (compare the mean R&D expenditures of the treatment group with the mean R&D expenditures of the control group) ▪ Bivariate analysis (compare the extent of programme aid received with the level of

Sub-Headings and Questions	Complete Response to Questions	Guidance on Issues
		R&D of the recipient enterprise) ▪ Delphi surveys/Benchmarking/Expert panels/SWOT analysis
Step 3: Identify Data Requirements **The PLM will have identified the metrics of interest for each aspect of the programme under review (i.e. inputs, activity, outputs, and outcomes). Data on each of these metrics should be collected with reference to SMART protocols – where data is unavailable, the evaluation methodologies may have to be adapted or the evaluation may not be able to proceed**		
3.1 Identify sources of appropriate data	Recommended.	Techniques to support data collection include: ▪ Beneficiary surveys (e.g. Agency Annual Business Survey, other agency client surveys and tailored primary research for purposes of evaluation) ▪ Desk research (e.g. using national statistical datasets, agency and other data) ▪ Stakeholder consultations (e.g. interviews with sample of agency client beneficiaries) ▪ Case studies (e.g. focussed case studies on sample of client firms) ▪ Expert panels (e.g. focus group session involving experts and sample of client firms supported through RDI programmes)
3.2 If desired data is not currently collected, investigate the possibility of implementing the appropriate data capture and management systems to enable future evaluations	Add modular features to existing agency data base.	Importance of employing cost-effective approach to data capture – there may be scope to add modular features to existing agency data capture processes to facilitate evaluation, rather than expend significant resources on developing new systems.
Step 4: Evaluate **This step utilises the outputs from the tasks completed under Steps 1-3. Once the PLM, analytical tools and data are in place, the programme can be evaluated. The evaluation will broadly seek to identify programme appropriateness, effectiveness and efficiency**		
4.1 Assess the appropriateness of the programme	n/a	Assessment of appropriateness should be informed by the PLM. Relevant issues requiring consideration within this context include:

Sub-Headings and Questions	Complete Response to Questions	Guidance on Issues
		▪ Does the intervention fit with the emerging needs of the assisted enterprises? Are there gaps in relation to the specific needs of enterprises in this area? (Inputs: Steps 1.2 and 1.5) ▪ To what extent does the RDI programme under evaluation operate in line with national policy objectives (short/long term)? (Input: Step 1.1) ▪ What is the on-going rationale for the intervention in relation to evolving national policy? o The evaluation should consider wider policy objectives and indicate which other enterprise support programmes are most clearly linked with the objectives of this RDI programme/measure o List names of related programmes & implementation agencies (Input: Step 1.1) ▪ What is the extent of synergies/complementarities between the programme and other agency-delivered programmes? (Input: Step 1.1) o Research, Development and Innovation can often involve driving company development and can therefore relate to both Business Development and Start-Up enterprises in addition to enterprises focused towards Productivity. ▪ Is there any actual or potential overlap/duplication between this programme and other agency-delivered programmes (for example, could there be overlap with programmes run by other agencies? Provide detailed qualitative account of potential overlap and duplication. (Input: Step 1.1)
4.2 Assess the effectiveness of the programme. Has the intervention the desired (or any) impact?	N/a	Apply appropriate methodology (econometric analysis, survey etc) as identified in step 2. This should seek to isolate additionality by measuring programme impact against a robust counterfactual or control group. ▪ Additionality is the net additional benefit of an enterprise support. The difference between what would have happened anyway (reference case) and the impact of the intervention. An estimate of additionality involves the estimation of a number of its components in the first instance, which are as follows: ▪ Deadweight - An estimate is also required of whether there are any deadweight factors which apply. What proportion of outputs and outcomes identified under the RDI programme would have occurred anyway, regardless of the support

Sub-Headings and Questions	Complete Response to Questions	Guidance on Issues
		▪ Displacement - The evaluation needs to answer whether it is likely that the measure would have resulted in displacement of activity from other firms. To what extent have the RDI-related outputs and outcomes of competing (non-supported) enterprises been reduced as a result of the support? ▪ Leakage - To what extent does the support ultimately benefit those outside of the target population of the enterprise support intervention? ▪ Substitution – Are there substitution effects? For example, do firms replace existing workers with jobless workers to take advantage of the support? ▪ Multiplier - What are the economy-wide effects resulting from indirect and induced impacts throughout the economy? ▪ Are there other unintended consequences for the targeted (or non-targeted) outputs and outcomes? Additionality can also be usefully broken down as follows: ▪ Input additionality – Additional RDI-related investments that the recipient companies make that that they would not have made if the programme had not existed ▪ Output additionality – additional RDI (jobs, innovation, new products, patents, market share, profitability) that would not have been achieved if the programme had not existed ▪ Behavioural additionality – To what extent has the support scheme induced the recipients to adjust their RDI processes/behaviour (production process, image, location of facilities, innovation process)? Other considerations which may be of note include the following: ▪ Are these relationships causal? ▪ What is the role of decision making of companies about RDI? ▪ What other effects does the programme have on the RDI process? ▪ What is the contribution of the programme to innovation objectives? ▪ To what extent is the target population reached? ▪ How efficiently is the scheme executed?

Sub-Headings and Questions	Complete Response to Questions	Guidance on Issues
		▪ What possible amendments are necessary to improve the scheme?
4.3 Can Cost Benefit Ratio of this impact be established?	n/a	What is the Cost Benefit Ratio of achieving this impact? Financial cost, displacement, deadweight vs. additionality of outputs, outcomes The possibility of undertaking this analysis will be determined by how thoroughly Step 4.2 has been completed
4.4 Assess the efficiency of the programme	recommended	Utilise a cost efficiency analysis – can the programme be more efficiently delivered? Take into account the headline costs per participant for example.
Step 5: Report and Review the Evaluation		
5.1 Report conclusions of evaluation and formulate recommendations	The following steps could be applied as follows: ▪ Integrate findings from analysis phase ▪ Apply appropriate judgment techniques to judge analysis against evaluation criteria ▪ Address the policy questions and answer the evaluation questions ▪ Draw detailed conclusions from the evaluation viz. Programme performance and effectiveness ▪ Formulate recommendations from the evaluation, including recommendations for future operation and design of the enterprise support under evaluation Key conclusions/findings could be made on the following areas: ▪ Continuing validity or otherwise of rationale of programme ▪ Extent of integration/coherence of programme with other initiatives ▪ Costs of programme ▪ Extent to which the targets set for the programme are still valid ▪ Whether the targets should be revised or refined ▪ Whether the targets have been met	

Sub-Headings and Questions	Complete Response to Questions	Guidance on Issues
	▪ What possible amendments are necessary to improve the scheme? Draw conclusions on overall of impact/effectiveness/efficiency Recommendations: ▪ Recommendations should be made on whether the RDI programme under evaluation should continue and whether changes in the level of resources allocated are appropriate ▪ If the RDI programme or measure is to continue, recommendations for the future operation and design of the enterprise support measure which would enhance cost effectiveness should be identified	
5.2 How complete/robust is the evaluation? Submit for peer review?	▪ Decide on appropriate approach to quality review internal versus external or peer review approach ▪ Assess whether policy needs are met: extent to which evaluation adequately addresses policy and placing needs ▪ Does the evaluation itself consider competition and complementarity between this and other interventions? ▪ Does the evaluation provide information on beneficiaries progression to other scheme as a result of increased awareness ▪ Does the evaluation provide information on progression as a result of the intervention increasing the beneficiaries' capacity to participate in other schemes or programmes? ▪ Does the evaluation provide information on whether participation in the intervention has displaced/prevented participation in other intervention? ▪ Does the evaluation provide information on whether the intervention complements or displaces the deliverers' performance in other interventions? ▪ Assess defensibility of evaluation design ▪ Access data reliability and soundness of analysis ▪ Assess credibility of findings and clarity of report	

Appendix 6 Forfás Board Members

Eoin O'Driscoll (Chairman) Chairman, Southwestern
Martin Shanahan Chief Executive, Forfás
Mark Ferguson Director General, Science Foundation Ireland
John Murphy Secretary General, Department of Jobs, Enterprise and Innovation
Barry O'Leary Chief Executive, IDA Ireland
Frank Ryan Chief Executive Officer, Enterprise Ireland
Michael O'Leary Secretary to the Board, Forfás

Appendix 7: Recent Forfás Publications

Annual Employment Survey Forfás	April 2014
Costs of Doing Business in Ireland 2014 NCC	April 2014
Annual Business Survey of Economic Impact Forfás	March 2014
Regional Labour Markets Bulletin 2013 EGFSN	March 2014
Action Plan for Jobs 2014 Forfás, DJEI	February 2014
Consumer Costs and Inflation Forfás	February 2014
State Investment in Research and Development 2012 – 2013 Forfás	December 2013
Survey of Research and Development in the Higher Education Sector 2010/2011 Forfás	December 2013
NCC Submission to the Action Plan for Jobs 2013 NCC	November 2013
Addressing Future Demand for High-Level ICT Skills Forfás, EGFSN	November 2013
Business Expenditure on Research & Development (BERD) 2011/2012 Forfás, CSO	August 2013
State Investment in Research & Development 2011 – 2012 Forfás	August 2013
Social Enterprise in Ireland: Sectoral Opportunities and Policy Issues Forfás	July 2013

Ireland's Construction Sector: Outlook and Strategic Plan to 2015 Forfás	July 2013
Forfás Annual Report 2012 Forfás	July 2013
Research Prioritisation: Framework for Monitoring Public Investment in Science, Technology and Innovation and 14 Action Plans Forfás	July 2013
Monitoring Ireland's Skills Supply – Trends in Education and Training Outputs 2013 EGFSN	July 2013
National Skills Bulletin 2013 EGFSN	July 2013
Annual Business Survey of Economic Impact 2011 Forfás	July 2013
Global Entrepreneurship Monitor (GEM) 2012 Global Entrepreneurship Monitor	July 2013
Annual Employment Survey 2012 Forfás	July 2013
Ireland's Competitiveness Performance 2013 Forfás	May 2013
Making it in Ireland: Manufacturing 2020 Forfás	April 2013
Future Skills Requirements of the Manufacturing Sector to 2020 EGFSN	April 2013
Sectoral Regulation Forfás	April 2013
EGFSN Statement of Activity EGFSN	March 2013
Costs of Doing Business in Ireland 2012 Forfás	March 2013

The publications of Forfás and the advisory groups to which it provides research support are available at www.forfas.ie

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