

RETHINKING INNOVATION POLICY IN IRELAND: A CRITICAL CRITIQUE (2010)

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Abstract

Prior to the current economic recession, the Irish government has been championing an innovation agenda. However, national and European reports and metrics paint a mixed picture about Ireland's engagement in and outputs derived from innovation activities. Therefore, a critique of Irish innovation policy is timely and relevant given the renewed emphasis and restricted budgetary support afforded to create new enterprises, markets, export opportunities and employment growth. In short, where innovation policy traditionally focused on funding future opportunities and capacities, micro and macroeconomic forces now requires innovation policy to be responsive to current enterprise difficulties. Through incorporating innovation policy priorities, funding streams and key policy stakeholders we find that there is an imbalance in Irish innovation policy with a legacy of prioritising and funding 'hard' science and technology based innovations while ignoring 'softer' aspects of innovation i.e. service products, business models and customer/delivery interfaces at a similar level which can be implemented at all enterprise levels, incur less costs and operationalised in a more timely manner. This policy disparity has serious consequences for our progressive innovation ambitions around entrepreneurship, scaling indigenous enterprises, creating and sustaining SME's. The paper identifies that there is a paramount need to rethink innovation policy in order to reap the rewards of our previous and on-going investments towards achieving our national innovation goals and ambitions. To conclude we provide a roadmap for rethinking this policy around widening innovation concepts, improving SMEs capacity to innovative and addressing the academic-industry applied research and collaboration gaps.

INTRODUCTION

Innovation is critically important to the enterprise sector in Ireland from a productivity, sustainability, efficiency, employability, export and growth perspective. Mindful of this, innovation has and continues to be championed as a significant objective at government and national policy level. Realising Ireland's strategic vision of '*Building the Ideas Economy: Creating the Innovation Island*' (DETE, 2008a, Building Ireland's Smart Economy – A Framework for Sustainable Economic Renewal) the government has allocated €20 billion to enterprise development, science and innovation (NDP 2007-2013). According to Cordis-Erawatch (2010a) "...in order for Ireland to compete for internationally mobile investment and to protect indigenous enterprises, Ireland needs to move up the value-added chain through increased investment in research and development". The Irish Government's

response is encapsulated in the Strategy for Science, Technology and Innovation (SSTI) 2006-2013 which has set the following objective:

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

However, this objective has proven difficult to achieve, exacerbated by the prevailing domestic and global recession and the resulting socio-economic impacts. Accordingly, this paper illuminates Ireland's recent innovation performance and in doing critiques the factors which have influenced innovation policy (innovation governance framework, innovation strategy development, funding priorities and output metrics). While Ireland has made significant improvements over the last decade or so in accelerating its research and development activity from a previously relatively low base, gaps have emerged in national innovation practice and performance. This is in large part due to the science and technology dominant orientation of existing innovation policy and the current socio-economic impacts experienced at the firm-level. Therefore, for the sustainability of innovation policy in the current and prospective Irish economy, options for rethinking innovation policy are offered which centre on service innovation, accelerating SMEs capacity to innovate and finally, addressing the paucity of industry-academia collaborative innovation partnerships.

OVERVIEW OF IRELAND'S INNOVATION POSITION

As reflected in Ireland's position within the 'Innovation Followers' scoreboard categorisation, the national aggregate innovation performance is below that of 'Innovation Leaders' but above the EU average (European Commission, 2010, European Innovation Scoreboard 2009). However, nationally all enterprise sectors have experienced declines in innovation engagement levels, and the following discussion illustrates that these declines are more pronounced in the SME sector. At both Irish and European levels it is recognised that

small and medium sized enterprises report lower levels of engagement in innovation activity when compared to their large sized counterparts. European research output signals that innovative enterprises employ on average three times the amount of staff as non-innovating enterprises (European Commission, 2008, Innobarometer Analytical Report 2007). In the Irish context this finding is also echoed whereby three quarters of large sized enterprises cite engagement in innovation whereas less than half of small sized enterprises report such activity (CSO, 2007, Small Business in Ireland). This finding is also mirrored in the CSO/Forfás (2009a) Community Innovation Survey (CIS) findings where it was identified that 40% of small firms engage in innovation, whereas 61% of medium sized enterprises and 75% of large sized enterprises engaged in innovation activities. The national rate of process innovation for all firms reduced from 42.7% in 2002-2004 (Forfás, 2006a), to 30.3% in 2004-2006 (CSO/Forfás, 2008) and, in turn, increased to 35% between 2006-2008 (CSO/Forfás, 2009a). In relation to organisational innovation, in 2002-2004 one out of every two firms surveyed (50.5%) carried out an organisational innovation, this figure reduced to 42% between 2004-2006 and less than a third (32.3%) of enterprises reported organisational innovation activity between 2006-2008 (CIS, 2006a:2008:2009a findings).

Across the three rounds of the CIS, large firms were recorded as the highest innovation spenders followed by their medium and small sized counterparts. Emphasising this point, of the total €5,279.9 billion spent on innovation activities between 2006 and 2008, the small enterprise sector accounted for €483.5 million, whereas this figure rose to under €2billion for medium sized enterprises and under €3billion for large enterprises (CSO/Forfás, 2009a). Specifically, Ireland's innovation levels at the enterprise level appear to be significant; however, there is a disparity between the levels of innovation inputs compared to the outcomes received from these investments:

“Ireland’s innovation performance at the level of the firm is very healthy. However, turnover derived from “new to market products” and “new to firm products” is relatively low. From an enterprise perspective, it is desirable that efficiency inputs are transformed into outputs in terms of actual results... [Ireland’s} innovation conversion rate from inputs to outputs is not as efficient as it could be” (DETE, 2008b:41, Innovation in Ireland Policy Statement).

In this vein, between 2006 and 2008, CIS findings indicate that 4.9% of turnover from new to firm products and 6.1% from new to market products were recorded by all enterprises in Ireland. Alarming over the same period, 89% of all firms identified that their turnover levels did not change (CSO/Forfás, 2009a). Ireland’s lacklustre performance, in recent years in capitalising on innovation activity is further captured at European level (Eurostat, 2007, Community Innovation Statistics Fourth Community Innovation Survey CIS4 and European Innovation Scoreboard EIS 2006) whereby it was highlighted that Ireland ranked 15th in sales of new to market products and 24th in sales of new to firm products.

Despite national consensus on the importance of firms forging collaborative relationships with external parties for innovation activities, it has been acknowledged that Irish enterprises are weak in terms of innovation development (Forfás, 2004, Sales Marketing and Innovative Capabilities of Irish Exporting SMEs). A Forfás (2005a:41) study on the absorptive capacity of Irish SMEs reports that *“...the majority of companies would benefit from some external help in sustaining both internal product and process innovations”*. Mindful of the importance of external collaboration beyond the enterprise level in the pursuit of innovation activities, the same report identifies that key to SME innovation performance is the ability to recognise the value of external information and knowledge and in turn, assimilate and apply this towards commercial ends. Despite the acceptance of the role of external knowledge to innovation development, the aforementioned Community Innovation Survey findings, Jordan and O’Leary’s (2007) innovation study signals that the majority of SMEs in particular form

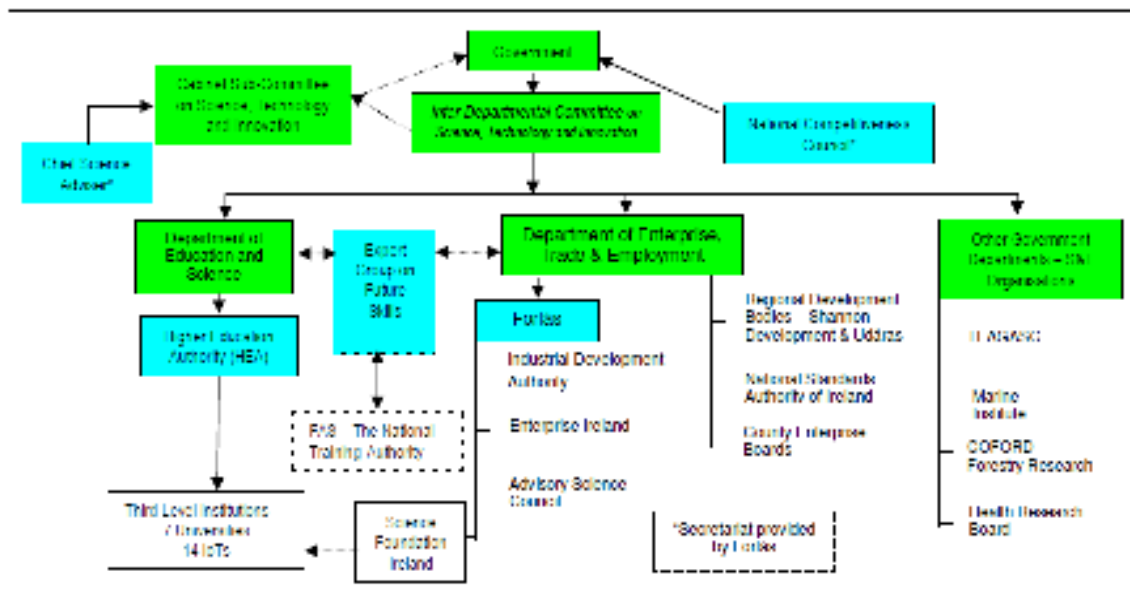
partnerships within the enterprise group itself or by collaborating with their immediate suppliers and customers at a more significant rate in comparison to external knowledge and R&D providers.

Based on the foregoing, Ireland to date has experienced mixed results in terms of innovation performance. To gain a greater appreciation of the factors which have led to this level of performance the following section delineates innovation policy orientation and strategy. Within this approach three criteria have been utilised namely, innovation governance framework, the development of innovation strategy and funding prioritisation/ output metrics.

1) Irish Innovation Governance Framework

Ireland’s innovation governance system comprises of a range of government, advisory and implementation bodies according to the European Commission (2009) Innovation Policy Progress Report Ireland, which, in turn, is illustrated in Figure 1.

Figure 1 Ireland’s Innovation Policy System



Source: European Commission (2009) Innovation Policy Progress Report Ireland, InnoPolicy Trendchart.

At the apex of this system, the government's approach to innovation policy is to group science, technology and innovation (STI) under the umbrella of various committees:

- **The Cabinet Subcommittee on Science, Technology and Innovation**, represents the strategic coordination and policy making committee for innovation which allocates the necessary responsibility and resources for innovation policy making (DETE);
- **The Inter-Departmental Committee**, chaired by the Director General of the Office of Science, Technology and Innovation, is a policy making and implementation committee comprising of the 8 government department and agencies responsible for coordinating STI policies. The IDC consists of representatives from the following government departments Department of Enterprise, Trade and Innovation, Department of the Taoiseach, Department of Health and Children, Department of Education and Skills, Department of Agriculture and Food, Department of the Environment, Heritage and Local Government, Department of Finance and Department of Communications, Marine and Natural Resources (CordisErawatch, 2010b);
- **The Department of Enterprise, Trade and Employment¹** mission is: *“To drive Ireland’s competitiveness and productivity by creating the conditions where enterprise, entrepreneurship and innovation can flourish and quality employment opportunities are grown and maintained* (DETE);
- **The Office of Science, Technology and Innovation (OSTI)**: is charged with the development, promotion and coordination of national STI policy at a national and international level. In addition the OSTI allocates basic research funding to Science Foundation Ireland and the Irish Research Councils for Science and Technology and Humanities and Social Sciences (DETE);
- **The Department of Education and Science² (DES)**: allocates funding to the Third Level sector and two research councils - IRCSET and IRCHSS (<http://www.education.ie/>).

¹ The Department of Enterprise, Trade and Employment is now the Department of Enterprise, Trade and Innovation.

² The Department of Education and Science is now the Department of Education and Skills.

A number of advisory bodies also contribute to the aforementioned government departments and agencies in terms of innovation policy development and implementation. Again, reflecting the science and technology orientation of Ireland's innovation policy framework the chief scientific advisor and the advisory science council alongside Forfás and The national competitiveness council encompass the advisory elements of the national innovation governance framework:

- Reporting to the Cabinet Committee on Science, Technology and Innovation, via the Interdepartmental Committee (IDC) on STI, **The Office of the Chief Scientific Adviser** (<http://www.c-s.ie/>) provides high-level advice on *scientific* issues across the spectrum of disciplines, provides scientific input into the development and review of the SSTI 2006-2013 and the advisory science council;
- Providing the principal interface between stakeholders and policymakers in the STI arena, **The Advisory Science Council** (ASC) provides policy advice to the Irish Government on “...*medium and long term science, technology and innovation (STI) issues and contributes towards the development and implementation of a coherent and effective national strategy for STI*” (<http://www.sciencecouncil.ie/aboutus/>);
- **Forfás** is Ireland's national policy advisory body for enterprise and *science* providing independent and rigorous research, advice and support in the areas of enterprise and science policy (<http://www.forfas.ie/aboutus/>);
- **The National Competitiveness Council**, aligned with Forfás, reports to the Taoiseach on key competitiveness issues facing the Irish economy and offers recommendations on policy frameworks and actions required to enhance Ireland's competitive position at both domestic and international levels (<http://www.competitiveness.ie/aboutus/>).

Regarding the execution of innovation related policies, there are three major categorisations of implementation bodies – scientific (Science Foundation Ireland), third-level (The Higher Education Authority) and enterprise (Enterprise Ireland, Industrial Development Authority, InterTradeIreland and local enterprise boards, chambers and skillnets):

Science Foundation Ireland (SFI) (<http://www.sfi.ie>), as the national agency for investment in scientific and engineering research invests in academic researchers and research teams (predominantly University sector) in pursuit of generating new scientific

knowledge, technologies and competitive enterprises in the three broad areas of Biotechnology; Information & Communications Technology (ICT) and Sustainable Energy & Energy Efficient Technologies (Energy). SFI currently funds 10 Centres for Science, Engineering & Technology (CSETs) up to €25m over 5 years with a 25% cost share from industry and 19 Strategic Research Clusters Programme (SRCs) up to €7.5m over 5 years and the 25% industry cost-share is only required after month 36. A sum of €8.2 billion has been allocated for scientific research under the NDP and SSTI of which SFI has responsibility to invest €1.4 billion. SFI also promotes and funds science education training initiatives at primary, second and third level.

The Higher Education Authority (<http://www.heai.ie/>) is the statutory planning and policy development body for higher education and research in Ireland, possessing advisory and funding authority for the entire range of higher education institutions. While heavily focused on academic and education policy development and programme implementation, the HEA is also geared towards enhancing the “...*research capabilities, capacity and infrastructure of Ireland’s higher education institutions*”. Through a wide portfolio of programmes intersecting humanities, social sciences, enterprise, science and technology, funding programmes such as The Programme for Research in Third-Level Institutions (PRTLTI) and the Technological Sector Research (TSR) have facilitated in the development of academia-industry collaboration at both capacity and infrastructural levels. Moreover, the HEA also incorporates two research councils - Humanities and Social Sciences Research Council and Engineering and Science Research Council which fund multi sectoral and disciplinary research and researchers.

Enterprise Ireland (EI) (<http://www.enterprise-ireland.com/>) is the government agency responsible for the development and promotion of the indigenous business sector. EI supports are directed at developing, facilitating and promoting export sales, investing in research and innovation, competing through productivity, business development, internationalisation and driving regional enterprise. Equally, EI assist both firms and researchers in third level institutions to engage and collaborate in an effort to yield mutually beneficial commercialisation benefits. Within this remit, EI provide R&D and innovation supports, infrastructure, tools and developments for companies, researchers and research performing organisations, in addition to coordinating the Seventh EU Framework Programme (FP7). Findings from the Irish Government (2008) First Report on the SSTI illustrates that Enterprise Ireland has and continues to strengthen the research and technological base of the enterprise sector in order to drive productivity, competitiveness, exports and jobs. This same report highlights that in 2008 EI assisted 794 companies to perform R&D and between 2000 and 2006 supported 430 High Potential Start-Up (HPSU) companies which yielded sales in the region of €638 million, exports of €344 million and generated employment of 5,500 with 1,300 employed in R&D specifically. Moreover, in 2007 and 2008 EI supported a further 140 new high potential start up companies.

Enterprise Ireland has also established 20 incubation centres on IOT campuses, four at university level, in addition to six bio-incubation facilities aligned to the universities. Enterprise Ireland also focuses on research commercialisation and collaboration at both firm and HEI level. Reflective of this, Enterprise Ireland has established ten technology transfer offices across the university and IOT sectors and their focus of interest is centred on intellectual property activity. In 2007 there were 270 invention disclosures from all HEIs and research institutes, in addition to the creation of 13 spin-out companies from the Universities

and IoTs in 2007. 7 further spin outs were created in 2008 and the first half of 2009 resulted in a further 14 (DETE, 2009, STI - Delivering the Smart Economy). In a similar vein, 227 priority patent filing applications were made in 2008, representing a 57% increase over the previous year. To promote collaboration between SMEs and academic, the innovation voucher scheme introduced by EI has partnered small companies (428 alone in 2007 and increases each year to date) with knowledge providers to facilitate knowledge transfer between academic and enterprise communities (Irish Government 2008, First Report on the SSTI).

Industrial Development Authority (IDA) (<http://www.idaireland.com/>) represents Ireland's inward investment promotion agency exclusively focused on the attraction and development of foreign investment in Ireland. The IDA is orientated towards attracting and securing investment in key sectors such as high end manufacturing, life sciences, ICT, engineering, global services and emerging areas include clean technology, convergence and service innovation. Reflecting the quality of the IDA's track record and further reinforcing the national science and technology orientation of innovation policy, Ireland is home to 13 of the top 15 worldwide pharmaceutical companies, 15 of the world's top 25 medical technology companies and 8 of the top 10 ICT companies. Furthermore, in 2009 49% (€500million) of IDA investments were in RD&I which equates to a 10% increase on 2008 levels.

InterTradeIreland (<http://www.intertradeireland.com/>) is the only organisation that has been designated responsibility from both governments to accelerate north/south economic cooperation for the dual betterment of Ireland and Northern Ireland. Through leveraging collective resources of both economies, *InterTradeIreland* assists in accelerating macro-

regional trade and business growth through creating a more harmonious business operating environment. InterTradeIreland conduct and provide economic and policy research, network companies for profitability, competitive and learning gains, financially supports viable business initiatives/projects aligned with InterTradeIreland goals and objectives and finally, provides practical and support programmes around innovative business development opportunities, new product and process opportunities and attracting equity investment. To date InterTradeIreland assisted more 1300 companies through their various programmes, sales and marketing activities programmes have resulted in €37.5million in sales activities since 2003, 272 jobs have been created as a result of the Acumen programme, €52.5m has been generated from technology transfer initiatives, 15 R&D partnerships have been established, participants have leveraged in the region of €65m in new equity finance and over 130 participants have obtained post-graduate qualifications.

Local and National Enterprise Support Agencies Providing Assistance to SME's.

There are a variety of local and national agencies and supports, charged with assisting in business development, training and employee up-skilling which has relevance to innovation activities at the enterprise level. There are 35 *County and City Enterprise Boards* (CEBs) located nationally to support and develop indigenous enterprise in terms of commercial activity and to promote micro-enterprises employing 10 or fewer employees (<http://www.enterpriseboards.ie/>). CEBs provide both financial supports in terms of capital grants, employment grants and feasibility grants and non-financial assistance. The non-financial support on offer is wide and varied including context and business specific training programmes, work-shops, seminars, mentoring services and networking services.

Chambers Ireland (<http://www.chambers.ie>) is the country's largest business organisation, with 60 member chambers representing over 13,000 SME's nationally. Each

individual chamber, consisting of local business representatives, through networking and training and development initiatives promote the social and economic development of their community.

Skillnets, as an enterprise-led support body charged with skills development and facilitation of learning at enterprise level, has improved the range scope and quality of employee training in 50,000 Irish enterprises, in over 300 networks since 1999 (<http://www.skillnets.ie/>). Irelands Innovation Policy Statement (DETE, 2008b) identifies that since 1999 Skillnets has facilitated over 43,000 Irish enterprises, in over 300 networks to enhance the degree and quality of training enabling over 200,000 to benefit from up skilling.

2) Development of Ireland's Innovation Strategy

Ireland's current innovation strategy is anchored, funded and implemented via the aforementioned Strategy for Science, Technology and Innovation (SSTI) 2006-2013. The vision of the strategy espouses world class research and people, capturing, protecting and commercialising ideas and knowhow, R&D for enterprise, innovation and growth, a supportive science society and life-long learning, promoting research in the public sector and all-island and international science, technology and innovation. At a more quantifiable level, DETE's (2008c) Innovation in Ireland report identifies key aims around academic research, industrial research, commercialisation and cross border and international research which are illustrated in more detail in Table 1.

In terms of illuminating the science and technology orientation of Ireland's innovation policy and strategy, policy makers and national advisory bodies have traditionally pursued innovation from a scientific and technological perspective as reflected in the 1996 White

Paper on Science and Technology and the Technology Foresight Ireland Reports of the late 1990's.

Table 1 Main aims of the Strategy for Science, Technology & Innovation

Academic research	<p>Significantly increase the number of research teams led by internationally competitive Principal Investigators;</p> <p>Upgrade existing research infrastructure and develop new facilities;</p> <p>Develop sustainable career paths for researchers;</p> <p>Enhance the mobility of researchers;</p> <p>Double the number of PhD graduates in science, engineering and technology to nearly one thousand per annum by 2013.</p>
Graduate schools	<p>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;</p> <p>Accommodate industrial placements to facilitate development of enterprise expertise.</p>
Commercialisation	<p>Increase outputs of economically relevant knowledge, know-how and patents from third-level institutions;</p> <p>Strengthen the Intellectual Property/ Commercialisation functions within Higher Education Institutes and provide them with expertise to translate research into applications.</p>
Industrial research	<p>Transform the quality and quantity of research undertaken by enterprise – both directly and in cooperation with third-level institutions;</p> <p>Grow business annual expenditure on R&D from €1 billion in 2003 to €2.5 billion by 2013;</p> <p>Develop a number of industry-led research-driven Competence Centres with research facilities in third-level institutes.</p>
Sectoral research	<p>Enhance the contribution of research to economic and social development across all relevant areas of public policy;</p> <p>Provide a competitive fund to encourage excellent research in areas of social, economic or environmental need, such as sustainable agriculture, treatment of specific medical conditions, and energy security.</p>
Public awareness	<p>Increase public awareness and appreciation of the role of science in society, with a particular focus on schoolchildren and those that influence them;</p> <p>Increase the number of schoolchildren taking science subjects.</p>
Cross-border and international cooperation	<p>Increase international cooperation in science and technology and participation in transnational research activity;</p> <p>Encourage Irish researchers to collaborate internationally and to avail of EU Framework Programme funding. Leverage complementary strengths in institutions and enterprises in Ireland and Northern Ireland through increased cross-border cooperation.</p>

Source: Department of Enterprise, Trade and Employment (2008) Innovation in Ireland, p. 4

In terms of the last decade, Table 2 below highlights that science and technology has remained at the forefront of innovation policy, reports and reviews. Indeed, the prevailing sustainability and knowledge economy agenda, increased funding and research activity in the third-level sector and the establishment of SFI culminating in the SSTI itself illustrates this agenda.

Table 2 A Decade of Innovation Policy Documentation

Year	Document	Source
2000	National Development Plan 2000-2006	Government
2003	Industrial Development (SCIENCE FOUNDATION IRELAND) Act 2003	Government
2004	Building Irelands Knowledge Economy – The Irish Action Plan for Promoting Investment in R&D	DETE
2004	Sustainable Development in Ireland: The Role of Science and Technology	ICSTI
2004	Science and Technology in Ireland	Forfás
2004	Ahead of the Curve	Enterprise Strategy Group
2004	Innovate Market Sell: A Review of the Sales, Marketing and Innovation Capabilities of Irish Exporting SMEs	Forfás
2006	Strategy for Science, Technology and Innovation 2006-2013	Irish Government
2006	Services Innovation in Ireland – Options for Policy	Forfás
2007	National Development Plan 2007-2013	Government
2007	Tomorrow’s Skills: Towards a National Skills Strategy	Expert Group on Future Skills Needs
2008	Catching the Wave: A Services Strategy for Ireland	Forfás & SSG
2008	Innovation in Ireland	DETE
2008	Innovation in Ireland Policy Statement	DETE
2008	Ireland’s International Engagement in Science, Technology and Innovation	Advisory Science Council & Forfás
2008	The Report of the High Level Group on Manufacturing	Forfás DETE
2008	Building Ireland’s Smart Economy – A Framework for Sustainable Economic Renewal	Government
2008	First Report on Strategy for Science, Technology and Innovation	Government
2009	Science, Technology and Innovation – Delivering the Smart Economy	DETE
2010	Innovation Ireland – Report of the Innovation Taskforce	Innovation Taskforce

Equally, the concept of innovation as a business and entrepreneurial concept gained momentum as Ireland developed a strong reputation for entrepreneurship with Ireland ranking 2nd in the EU and 5th among OECD countries for entrepreneurial activity in 2008 (Global Entrepreneurship Monitor, 2008). Within this emerging focus it was strategically recognised that Ireland’s workforce and enterprise landscape (particularly SMEs) needed continuous development and up-skilling. Interestingly, service innovation emerged as a new departure in innovation thinking and practice driven from international success stories and gained prominence at a domestic level as the manufacturing sector began to lose competitiveness. Nonetheless, concrete policy is lacking in service innovation. Regarding the last 24 months, Ireland’s innovation agenda as a means of sustainable economic recovery has manifested in policy, framework and report articulations. This reactive and immediately

demanding approach is in stark contrast to Ireland's previously proactive and future orientated innovation policy. Indeed, the recent report of the Innovation Taskforce is vociferous in its recommendation for innovation to be placed at the heart of each and every Irish enterprise.

3) Innovation Funding Prioritisation and Output Metrics

Under the current national development plan 2007-2013 - "Transforming Ireland – A Better Life for All", over a seven year period in the region of €184 billion of investment has been earmarked for "*...our economic and social infrastructure, the enterprise, science and agriculture sectors, the education, training and skills base of our people, environmental services and in the social fabric of our society that, within a strong and vibrant economy geared to meet the challenges of the future, will deliver a better quality of life for all*"(NDP 2007-2013:16). Within this, five priorities have been identified and these include economic infrastructure (€54.7b), human capital (€25.8b), social infrastructure (€33.6b), social inclusion (€49.7b) with enterprise, science and innovation amounting to the least proportion at €20 billion. In terms of the enterprise, science and innovation allocation, enterprise development is allocated to receive in the region of half the support afforded to science technology and innovation over the lifespan of the NDP.

Regarding innovation metrics from a R&D perspective, in the period between 1998 and 2008 alone, total Research and Development (GERD) spending almost trebled (Forfás, 2009a, Research and Development Statistics in Ireland at a Glance). Turning to business expenditure on research and development, an estimated €1.6 billion was recorded in 2008, almost double of the figure recorded in 2001 (CSO/Forfás, 2009b, Business Expenditure on Research and Development 2007/2008), while higher education research and development spending has

almost quadrupled in current terms over 10 years and is now at the EU and OECD average levels. In terms of Research, Development & Innovation (RDI) output in recent years, Table 3 illustrates that R&D activity in the business and third-level sectors have significantly increased in terms of volume and impact. At a scientific and technological level SFI and PRTL I programmes have facilitated many scientific outputs in the form of patents, disclosures and licenses. Likewise, the third-level sector has also recorded significant achievements intersecting science, technology and business domains in terms of spin-outs and enterprise incubations. Moreover, enterprise support agencies in the form of IDA and EI have contributed significant investments yielding results in high tech and knowledge intensive enterprise creation, employment and exports.

Table 3 Outputs from Innovation

Metric	Description
Research and development in the business sector	R&D personnel rose to 13,861 in headcount terms in 2007. 164 significant R&D performers in 2007 compared to 118 in 2005.
PhD researchers	The number of PhD-qualified researchers has increased from 420 in 2001 to 1191 in 2007 (an increase of 183%).
Scientific agency driven innovation support	Science Foundation Ireland supported 322 PI teams in 2008. Furthermore, SFI researchers generated 135 invention disclosures, 95 patents were pending (up from 82 in 2007), secured 13 patents (up from 11 in 2007) and generated 22 licenses (up from 8 in 2007).
Invention disclosures/patents/licenses/ spin-outs	The total number of invention disclosures in 2007 was 270 from all HEIs and research institutes. This increased by 51% in 2008 to reach 407. 145 priority patent filing applications were made in 2007 by all HEIs and research institutes. This increased by 57% to reach 227 in 2008. In 2007, 56 Licences, Options or Assignments for intellectual property (IP) were concluded between HEIs/research institutes and companies and in 2008 this number increased to 67.
Third-level sector	2007 saw the creation of 13 spin-out companies from the Universities and IoTs. The number of spin-out companies created in 2008 was 7 but interim figures for 2009 showed a substantial increase with 14 created in the first 6 months. Enterprise Ireland's campus incubation programme, More than €50 million has been invested under the campus incubation programme over the last decade with 20 centres operational and home to over 230 companies employing over 1,000 people.
Enterprise agency driven innovation support	In 2008 Enterprise Ireland (EI) supported 838 companies to engage with RD&I. Between 2000 to 2007; EI supported 430 High Performance Start-Ups yielding sales of €638 million, exports of €344 million and generated employment for 5,500 people. Over 40% of IDA investments (€420 million) in 2008 were in RD&I.

Source: Adapted from DETE, 2008b, Innovation in Ireland Policy Statement; DETE (2009) STI – Delivering the Smart Economy; <http://www.enterprise-ireland.com>; <http://www.idaireland.com>.

Aligned with the overarching Strategy for Science, Technology and Innovation 2007-2013, the above snapshot of innovation outputs indicates a strong focus on prioritisation and funding scientific and technological aspects of innovation (DETE, 2008b, Innovation in Ireland Policy Statement). Questioning this strategy about advancing the numbers of PhDs and Postdoctorate researchers Jordan (2009a) queries their business impact as academic researchers tend to stay in academia moving from one funded project to another: *“That so few of these [postdoctoral scientific] researchers made the switch to related industry may be a symptom of a large cohort of doctoral or post-doctoral researchers pursuing research in areas of basic science that have no obvious interest to industry in the short-term”*. Furthermore, while the science and technology push may have been feasible prior to the economic recession where enterprise and employment were thriving, the renewed emphasis on innovation for economic recovery requires innovation to be repositioned:

“While it may seem positive for governments to support basic research and science, business leaders should be wary that enterprise policies suffer from an over-emphasis on the role of science and technology...Innovation policies must be designed to support the activities of businesses, facilitating the easy establishment of new businesses or the introduction of new products/services or processes to the market” (Jordan, 2009b).

Innovation as a Means of Sustainable Economic/Enterprise Recovery

While the Irish government has championed an innovation agenda for well over a decade to position Ireland as a knowledge economy, the innovation push, for recovery as opposed to capacity building purposes, has become more pronounced with the advent of the prevailing global and national recession. Reflective of this, Jordan (2009b) notes that *“The promise of an innovative, competitive economy is being held out as the panacea for economic ills:*

“Ireland is at a cross-roads in terms of its economic development. The current recession has only accentuated the need for innovation and productivity growth” (Forfás 2009b:3, Skills in Creativity, Design and Innovation);

“The Government’s Smart Economy Framework sets out a clear vision for sustainable economic renewal. Our goal is to develop a critical mass of companies – both Irish and international – at the forefront of innovation, creating the products and services of tomorrow, and providing well paid jobs for this and future generations” (Forfás & National Competitiveness Council, 2009:4, Annual Competitiveness Report 2008, Benchmarking Ireland's Performance Volume 1).

Within the Irish business landscape each enterprise, large, small, indigenous and multinational have been exposed to the current international financial crises and downturn in domestic and global trade. Economic metrics³ clearly show that Ireland has become less competitive on the global map, national income has declined rapidly, income levels have fallen and unemployment has risen sharply. In short, Forfás/NCC (2009b) Driving Export Growth: Statement on Sectoral Competitiveness report and the Government’s (2008) Smart Economy Framework signal that Ireland needs to mobilise its existing resources, infrastructure and strengths to improve its cost competitiveness, expand export opportunities, sustain employment levels, foster innovation at all levels of economic activity and enhance training and development and education opportunities:

*“Ireland offers great potential to enterprise for innovation and wealth creation. The recent significant public investment in basic research and in building excellence in the public research system means companies large and small can use the knowledge, expertise and facilities of public research organisations to help build their technological capability and create the technologies that will underpin future products and services”*⁴;

*“...relatively few small businesses in Ireland have either the technical expertise or the financial resources to develop, absorb or exploit new scientific or technological knowledge”*⁵;

*“...IoTs can develop into an effective technology resources, focused on collaboration with local industry on the basis of applied research and technology development directed at the challenges facing the company”*⁶;

“One of the most important assets in Ireland’s innovation system- and vital in a small economy with limited resources – is the quality of the public research infrastructure

³ Forfás/NCC (2009a) Annual Competitiveness Report 2009 Volume 1: Benchmarking Ireland’s Performance and Forfás/NCC (2010) Annual Competitiveness Report 2009 Volume 2.

⁴ Forfás (2005b:1) National Code of Practice for Managing and Commercialising Intellectual Property from Public-Private Collaborative Research.

⁵ Small Business Forum (2006:45) Small Business is Big Business.

⁶ The Strategy for Science, Technology and Innovation 2006-2013 (2006:45).

and its links to industry. Strengthening links between our research infrastructure and industry and transferring knowledge to the marketplace remain key goals of our innovation strategy”⁷.

Addressing our national economic recovery ambitions requires a shift in prior innovation thinking which predominantly focuses on new science and technology towards utilising our existing resources, expertise and infrastructure to address current enterprise conditions. This is captured in a Forfás report on innovation “... [there is] a need to go further, to tackle a disconnect that exists between science, engineering and technology (SET) disciplines on the one hand, and business on the other” (Forfás, 2009b:13, Skills in Creativity, Design and Innovation). Indeed this line of thinking has resurfaced in the recent Report of the Innovation Taskforce (2010:2) Innovation Ireland - which focuses on placing:

“...innovation at the heart of enterprise policy. Our future economic success depends on increasing levels of innovation across all aspects of Irish enterprise – from large Irish-owned multinationals to foreign multinationals located here to established Small and Medium Enterprises (SMEs) in services and manufacturing, as well as start-ups and existing companies with high growth potential”.

However, this is not a novel approach as DETE’s (2008b) Innovation in Ireland Policy Statement recognises that stimulating innovation is not the sole province of scientists and technologists with a pivotal role to be played by entrepreneurial stakeholders and support agencies as entrepreneurial behaviour and innovation are inextricably linked. Further stressing the enterprise requirements of emerging innovation policy, the DETE (2008c: foreword) Innovation in Ireland report notes that to advance and sustain innovation in the sector, businesses need to focus on consumer driven innovative products and services and to do so need “...new business models, new organisational structures and skills for innovation”.

⁷ DETE (2008:7) Innovation in Ireland.

RETHINKING INNOVATION POLICY

As previously alluded to, Ireland's innovation policy is myopically orientated towards science and technology and this is reflected in policy content, drivers funding support and output metrics. While significant advancements have been made in the scientific and technology domains with industry, employment and infrastructure gains in the pharma and biotech industries from pursuing this strategy, there is more to the Irish enterprise landscape than science and technology i.e. manufacturing and service industries and firms across all sectors and sizes. Indeed, there is more to innovation than scientific and tangible output metrics. Going forward, Irish innovation policy needs to be responsive to all sectors of Irish industry and achieve balance between science and technology and particularly, the industrial and service sectors. In reality, the previous strategy of heavily investing for the future (3rd and 4th level graduates, physical and collaborative infrastructures) is not inclusive to the current environment which demands immediate deliverables in terms of firstly, sustaining and up-scaling the entire range of existing enterprises and employment and secondly, fostering multi-sectoral entrepreneurship.

In short, and as articulated in the recent report of the Irish Innovation Taskforce (2010), innovation needs to take centre stage within enterprises, be seen as an accessible, deliverable and implementable business concept and as a means for sustainable enterprise and entrepreneurial development. To achieve this, policy makers, policy implementing bodies and enterprise stakeholders themselves need to rethink innovation policy. There are a multitude of action points available for rethinking innovation policy and three overarching pillars intersect innovation governance, policy design, policy advisers, implementation stakeholders and innovation infrastructure (people, physical and relational). Given the international recognition of the impact and benefit of service innovation, the underperformance on Irish SMEs and the

fertile opportunities surrounding industry- academia partnerships we recommend the following as the three major action points for Ireland's innovation policy sustainability:

1) Expanding the Concept of Innovation beyond Scientific and Technological Domains

As previously highlighted, policy makers, academics and service providers alike have historically incorporated traditional manufacturing paradigms of new product development into the service setting and so current models and thinking on innovation reflect more manufacturing innovation than services innovation⁸. This is in part a result of the complicated nature of services. Services are intangible, they cannot be seen, handled, or smelled. Moreover, services are highly perishable in that unsold service is time lost that can never be regained, so they tend to be consumed at the point of production and are typically customised for each client or situation. As services are difficult to conceptualise, developing a concrete vision of the service in a customer's mind requires a high degree of interaction between provider and buyer and so the critical focus in services is on people interacting with people and serving the customer rather than transforming physical goods (Forfás, 2006b, Services Innovation in Ireland- Options for Innovation Policy). Based on the foregoing, the traditional manufacturing paradigm is too narrow which emphasises the need for a new understanding of innovations within services. Drawing on the Forfás 2006b definition, we conceptualise service innovation intersecting both product producing and service producing enterprises by involving:

“A new or considerably changed service concept, client interaction channel, service delivery system or technological concept that individually, but most likely in combination leads to one or more (re)new(ed) service functions that are new to the firm and do change the service/good offered on the market and do require structurally new technological, human or organisational capabilities of the service organisation”⁹.

⁸ Forfás (2006) Services Innovation in Ireland – Options for Innovation Policy; DETE (2008) Innovation in Ireland Policy Statement and Forfás (2008) Catching the Wave – A Services Strategy for Ireland.

⁹ Forfás (2006:17) Services Innovation in Ireland – Options for Innovation Policy.

What is particularly noteworthy in terms of service innovation vis-à-vis pure product innovation is:

- Its application to both manufacturing and service enterprises;
- The emphasis on the incremental rather than radical innovation;
- Focus on implementation, delivery and organisational capabilities;
- Less technical R&D intensive and therefore less risky and costly;
- The Significance of Non-Technological alongside technological innovation;
- The prominent role of customers as end-users.

Although differences exist in terms of designing and implementing innovation, the dichotomy between physical goods and intangible services is not always discrete i.e. a restaurant may produce a tangible good in the form of food but it also provides a service in the form of ambience and setting and clearing the table. It is argued that services utilise manufactured goods and equally, manufacturing firms consume business services (Expert Group on Innovation in Services, 2006, Fostering Innovation in Services Report of the Expert Group on Innovation in Services). Typologies of service innovation can be grouped into categorisations concerning activities oriented towards the design and development of new service product offerings, business models and customer/delivery interface innovations. Accelerating engagement in service innovation is not a novel approach as Forfás (Services Innovation in Ireland – Options for Innovation Policy and Catching the Wave – A Services Strategy for Ireland), DETE (Innovation in Ireland Policy Statement, Innovation in Ireland, Building Ireland's Smart Economy A Framework for Sustainable Economic Renewal, Science, Technology and Innovation: Delivering the Smart Economy) and Innovation Taskforce (Innovation Ireland Report of the Innovation Taskforce) have articulated the benefits of service innovation yet this is an area which still lacks concrete policy direction.

In short, Jordan (2009b) identifies that in order for innovation policy to be responsive to today's enterprise conditions alternatives to scientists and technologists need to be considered

to create tangible and meaningful business-level innovation impacts: “*Successful innovation requires contributions from managers, salespeople and customers just as much, if not more than, researchers and scientists*”.

2) Support SME Capacity to Engage in Innovation

For SMEs, engaging in innovation presents many in-company capability and capacity challenges in terms of firstly, identifying and secondly, absorbing external knowledge and technology in pursuit of service innovation¹⁰. Indeed, Irish micro enterprises have articulated that support measures in terms of innovation are not well identifiable or readily accessible to them due to the traditional prioritisation on product innovation metrics and supports (Forfás and Services Strategy Group, 2008, *Catching the Wave – A Services Strategy for Ireland*). Moreover, it has been noted those SMEs who do not conduct formal R&D “...often fall outside the remit of current research and innovation investment and support programmes” (Innovation Taskforce, 2010:53, Innovation Ireland Report of the Innovation Taskforce).

At both Irish and European levels it is recognised that small and medium sized enterprises report lower levels of engagement in innovation activity when compared to their large sized counterparts. European research output signals that innovative enterprises employ on average three times the amount of staff as non-innovating enterprises (European Commission, 2008, Innobarometer Analytical Report 2007). In an Irish context this finding is also echoed whereby three quarters of large sized enterprises cite engagement in innovation whereas less than half of small sized enterprises report such activity¹¹. An overwhelming majority (97%)

¹⁰ Forfás (2006) Services Innovation in Ireland – Options for Innovation Policy and DETE (2008) Innovation in Ireland Policy Statement.

¹¹ CSO (2007) Small Business in Ireland and Forfás (2009) Community Innovation Survey 2006-2008-First Findings.

of enterprises within Ireland employ less than 50 people¹² which signals that Irish micro enterprises are at an immediate disadvantage in terms of the staffing resources required for regular and sustained engagement in innovative activities. Indeed, it is generally acknowledged that due to staffing limits, innovation in most instances is at best a part-time activity for many SMEs (CSO, 2008, Small Business in Ireland). As particular evidence of this, the number of research personnel in small enterprises in 2007 was 3,864 while the number of research personnel in medium/large enterprises was over double this figure at 9,997 (CSO/Forfás, 2009b) Business Expenditure on Research and Development 2007/2008 Preliminary Findings).

Related to lower staff numbers as highlighted above, in the SME sector the range and depth of management and innovation capabilities is often more limited in this sector and this is particularly emphasised in small owner-manager and family businesses contexts (Small Business Forum, 2006, Small Business is Big Business). In terms of the Irish workforce and the previous reliance on unskilled labour, it has been identified that in the region of 500,000 people need up-skilling by 2020 if Ireland is to meet the needs of the emerging innovation-based economy (Forfás, 2007, Tomorrow's Skills – Toward a National Skills Strategy). As Ireland is pursuing such a transition, characterised by continuous innovation requires traditional management skills to adapt and evolve (Fás, Enterprise Ireland and Expert Group on Future Skill Needs, 2005, SME Management Development in Ireland) as the unstable commercial operating environment is not conducive to a management focus on creativity and innovation vis-à-vis cost and day-to-day productivity concerns. Moreover, for many SMEs, training and development in the area of innovation is lacking: “...*many professional and*

¹² DKM (2006) The Economic Impact of Small Business in Ireland and Small Business Forum (2006) Small Business is Big Business.

sporadic innovators have little or no education or training in the topic” (Forfás, 2009b:92, Skills in Creativity, Design and Innovation).

Small firms are also constrained by the degree of investment and expenditure they can contribute to innovation activities (CSO/Forfás, 2009b, Business Expenditure on Research and Development 2007/2008 Preliminary Findings) and a lack of funds to invest in innovation activities can be detrimental to the SME sector in developing and accelerating their business ideas and activities:

“Failure to obtain growth capital may result in small business managers resorting to a steady state or low growth strategy, and may also result in business owners exiting a company before it has realised its growth potential”¹³.

Due to their limited resources in terms of headcount, management capabilities, funding and expenditure levels and time to devote to innovation activities, many SMEs experience difficulties in accessing, utilising and exploiting innovation tools, supports and expertise. Taking the South East region alone, only 12% of firms reported dedicated in-house R&D facilities (Jordan and O’Leary, 2007). The Small Business Forum Report (2006) captures these difficulties by signalling that relatively few small businesses in Ireland possess sufficient reservoirs of technical expertise or financial resources to independently develop and exploit innovation opportunities.

As such, SMEs have reported unsatisfactory idea generating and idea screening tools and processes “...which, if not addressed, will remain a significant barrier to SMEs becoming more innovative and competitive” (Small Business Forum, 2006:35). Accordingly, policy prioritisation, funding supports and information and guidance on research, development and innovation need to be more user-friendly and accessible to micro-firms. In addition,

¹³ Small Business Forum (2006:35) Small Business is Big Business.

enterprise support agencies need to play a significant role in catering for the demands and operating contexts of the SME sector. A particular shining light in this domain in recent years has which proves the value of structured support interventions has been the success of Enterprise Ireland's Innovation Voucher programme which has partnered SMEs with knowledge providers to increase innovation engagement and innovation skills at the firm level.

3) Industry-Academic Collaboration: Addressing the Applied Research Gap

While research infrastructure and links with industry have been signalled as important and fertile assets in Ireland's innovation system¹⁴, higher education institutes (HEIs) remain an underutilised source for innovation partnerships. This is specifically reflected in previous Irish policy findings with less than 4% of industrial firms and 6% of services firms citing the HEI sector as important sources and supports for innovation (Jordan and O'Leary, 2008 and Forfás, 2005a, Making Technological Knowledge Work - A Study of the Absorptive Capacity of Irish SMEs). Indeed, the number of small enterprises collaborating with higher and further education institutes is not adequate given the population of small firms in Ireland and as such, the level of innovation transfer activity is insufficient and warrants addressing (South Western Regional Authority, 2008). Moreover, it has been identified that many indigenous SMEs suffer from absorptive capacity deficiencies in comparison to larger sized and R&D savvy enterprises in terms of accessing and capturing applied science and technology expertise and the associated corps of expertise in higher and further education institutes¹⁵.

¹⁴ Department of Enterprise, Trade and Employment (2008) *Innovation in Ireland* and Strategy for Science, Technology and Innovation 2006-2013.

¹⁵ South Western Regional Authority (2008) Linkages for Innovation between the Higher Education Institutes and Indigenous Firms in the South West Region and Forfás and Advisory Council for Science, Technology and Innovation (2007) Promoting Enterprise-Higher Education Relationships.

Reflecting the low levels of engagement and collaboration between enterprise and academic communities, the level of technology transfer by the institutes has been “...by and large, limited” (HEA and Forfás, 2007:185, The Role of the Institutes of Technology in Enterprise Development Profiles and Emerging Findings). Accordingly, it is acknowledged at national policy level that in order to increase the levels of innovation activity among SME’s that there “...is a major need for government R&D programmes which support the integration of university and industry research” (Forfás and HEA, 2007:59, Research Infrastructure in Ireland – Building for Tomorrow). Nonetheless, the emerging consensus is that HEI’s have and continue to experience difficulties in developing “...appropriate structures to engage with enterprises and to contribute to economic development” (Forfás, 2009c:19, National Strategy for Higher Education). Mindful of this, innovation centres have proliferated our HEI campuses over the last decade, however, a review of their service offerings indicate an incubation focus as opposed to firm-level innovation collaboration. In addition, research capability gaps have surfaced due to both sectors dichotomised sectoral and cultural traditions¹⁶. Stressing the importance of promoting non-scientific and enterprise-based input into innovation policy, Jordan and O’Leary (2008:1) paper exploring the efficacy of Irish innovation policy signals that “...innovation is a business rather than a technological phenomenon and argues for a changed role for HEIs to one of responding to innovative businesses”.

CONCLUSION

While Ireland has made significant advances in the last decade or so in developing its innovation ecosystem, the synthesised critique of innovation governance structure, policy

¹⁶ Forfás (2010b) Regional Competiveness Agendas: Overview, Findings and Actions; SSTI 2006-2013; Forfás (2009c) National Strategy for Higher Education; South Western Regional Authority (2008) Linkages for Innovation between the Higher Education Institutes and Indigenous Firms in the South West Region; Forfás and ACSTI (2007) Promoting Enterprise-Higher Education Relationships and Forfás and HEA (2007) Research Infrastructure in Ireland.

documentation, performance and output signals the dominant science and technology focus of existing policy. Indeed, while Ireland has amassed core expertise and proficiency in niche scientific and technological domains, the haemorrhaging of jobs and enterprise closures across all sectors of industry at low and high skilled levels has resulted in widespread entrepreneurial concerns which cannot be solely counterbalanced by our scientific and technological strengths. Somewhat juxtaposed with our traditional focus on funding and facilitating future scientific and technological innovation opportunities, the current recession has positioned innovation as a sustainable means of economic and entrepreneurship recovery and rejuvenation given the volume of manufacturing enterprises which have either closed or migrated to lower cost economies.

Therefore, in critiquing innovation policy it was found that there is significant scope for 'rethinking' innovation to include non-scientific and less technologically driven service innovation concepts, accelerating SMEs innovation capacity levels and industry-academic innovation collaborations to respond to our current and pressing enterprise demands. The challenge for Ireland's innovation policy makers is immediate, requiring attitudinal and cultural shifts from the status quo of established science and technology traditions to remain relevant to the swiftly changing needs of all firms large and small, indigenous and multinational operating in Ireland. In this respect, we do not purport to lessen the magnitude of existing supports available for innovation in general, but the prevailing economic environment provides a timely and relevant rethinking opportunity to explore the practicality and sustainability of our national innovation policy. It is hoped that this paper stimulates further and sustained multi-stakeholder engagement and discourse on the topic of Irish innovation policy.

Bibliography

- ASC and Forfás (2008) *Ireland's International Engagement in Science, Technology and Innovation*. Ireland: Advisory Science Council and Forfás.
- Chambers (2010) *Chambers Ireland Introduction*. Available at: <http://www.chambers.ie/index.php?id=2> (Accessed: 18 May 2010).
- Cordis-Erawatch (2010a) *The Relative Importance of Research Policy, Ireland Profile*. Available at: <http://cordis.europa.eu/erawatch/index.cfm?fuseaction=ri.content&topicID=612&parentID=12&countryCode=IE> (Accessed: 02 May 2010).
- CordisErawatch (2010b) Inter Departmental Committee on Science, Technology and Innovation. Available at: <http://cordis.europa.eu/erawatch/index.cfm?fuseaction=org.document&uuid=96289DBA-DAD1-4DC4-64D55754F0D4D508> (Accessed 18 May 2010).
- County and City Enterprise Boards (2010) Available at: <http://www.enterpriseboards.ie/index.aspx> (Accessed: 22 February 2010).
- CSO (2008) *Small Business in Ireland*. Ireland: Central Statistics Office.
- CSO (2007) *Small Business in Ireland*. Ireland: Central Statistics Office.
- CSO/ Forfás (2009a) *Community Innovation Survey 2006-2008-First Findings*. Ireland: Central Statistics Office and Forfás.
- CSO/Forfás (2009b) *Business Expenditure on Research and Development 2007/2008 Preliminary Findings*. Ireland: Central Statistics Office and Forfás.
- CSO/Forfás (2008) *Community Innovation Survey 2004-2006-First Findings*. Ireland: Central Statistics Office and Forfás.
- DETE (2010) *About Us*. Available at: <http://www.deti.ie> (Accessed 29 May 2010).
- DETE (2009) *Science, Technology and Innovation: Delivering the Smart Economy*. Ireland: Department of Enterprise, Trade and Employment.
- DETE (2008a) *Building Ireland's Smart Economy A Framework for Sustainable Economic Renewal*. Ireland: Department of Enterprise, Trade and Employment.
- DETE (2008b) *Innovation in Ireland Policy Statement*. Ireland: Department of Enterprise, Trade and Employment.
- DETE (2008c) *Innovation in Ireland*. Ireland: Department of Enterprise, Trade and Employment.
- DETE (2004) *Building Ireland's Knowledge Economy – The Irish Action Plan for Promoting Investment in R&D to 2010*. Ireland: Department of Enterprise, Trade and Employment.
- DKM (2006) *The Economic Impact of Small Business in Ireland*. Ireland: DKM Economic Consultants Ltd.

- Enterprise Ireland (2010) *About Us*. Available at: <http://www.enterprise-ireland.com/AboutUs/> (Accessed: 28 May 2010).
- Enterprise Strategy Group (2004) *Ahead of the Curve Irelands Place in the Global Economy*. Ireland: Forfás.
- European Commission (2010) *European Innovation Scoreboard 2009*. Europe: Pro Inno Europe Paper No. 15.
- European Commission (2009) *Innovation Policy Progress Report Ireland, InnoPolicy Trendchart*. Available at: <http://www.proinno-europe.eu/page/innovation-and-innovation-policy-ireland> (Accessed: 25 March 2010).
- European Commission (2008) *Innobarometer Analytical Report 2007*, Eurobarometer. Available at: http://ec.europa.eu/public_opinion/flash/fl_215_en.pdf (Accessed: 10 April 2010).
- Eurostat (2007) *Community Innovation Statistics Fourth Community Innovation Survey (CIS 4) and European Innovation Scoreboard (EIS) 2006*. Europe: Eurostat.
- Expert Group on Innovation in Services (2006) *Fostering Innovation in Services Report of the Expert Group on Innovation in Services*. Available at: http://www.genecat.cat/diue/doc/doc_33636404_1.pdf (Accessed: 09 April 2010).
- Fás, Enterprise Ireland and Expert Group on Future Skill Needs (2005) *SME Management Development in Ireland*. Ireland: Fás, Enterprise Ireland and Expert Group on Future Skill Needs.
- Forfás (2010a) *About Us*. Available at: <http://www.forfas.ie/aboutus/> (Accessed: 10 June 2010).
- Forfás (2010b) *Regional Competiveness Agendas: Overview, Findings and Actions*. Ireland: Forfás.
- Forfás (2009a) *Research and Development Statistics in Ireland, at a Glance*. Ireland: Forfás.
- Forfás (2009b) *Skills in Creativity, Design and Innovation*, Forfás. Ireland: Forfás.
- Forfás (2009c) *National Strategy for Higher Education*. Ireland: Forfás.
- Forfás (2007) *Tomorrow's Skills – Toward a National Skills Strategy*. Ireland: Forfás.
- Forfás (2006a) *Innovation Survey - The Fourth Community Innovation Survey-First Findings*. Ireland: Forfás.
- Forfás (2006b) *Services Innovation in Ireland – Options for Innovation Policy*. Ireland: Forfás.
- Forfás (2005a) *Making Technological Knowledge Work A Study of the Absorptive Capacity of Irish SMEs*. Ireland: Forfás.
- Forfás (2005b) *National Code of Practice for Managing and Commercialising Intellectual Property from Public-Private Collaborative Research*. Ireland: Forfás.
- Forfás (2004) *Sales, Marketing and Innovative Capabilities of Irish Exporting SMEs*. Ireland: Forfás.
- Forfás and ACSTI (2007) *Promoting Enterprise-Higher Education Relationships*. Ireland: Forfás and Advisory Council for Science, Technology and Innovation.

- Forfás and DETE (2008) *Report of the High Level Group on Manufacturing*. Ireland: Forfás and Department of Enterprise, Trade and Employment.
- Forfás and DETE (2004) *Science and Technology in Ireland*. Ireland: Forfás and Department of Enterprise, Trade and Employment.
- Forfás and HEA (2007) *Research Infrastructure in Ireland – Building for Tomorrow*. Ireland: Forfás and Higher Education Authority.
- Forfás/NCC (2010) *Annual Competitiveness Report 2009 Volume 2: Irelands Competitiveness Challenge – Creating a Better Future*. Ireland: Forfás and National Competitiveness Council.
- Forfás/NCC (2009a) *Annual Competitiveness Report 2009 Volume1: Benchmarking Ireland's Performance*. Ireland: Forfás and National Competitiveness Council.
- Forfás/NCC (2009b) *Driving Export Growth: Statement on Sectoral Competitiveness*. Ireland: Forfás and National Competitiveness Council.
- Forfás and Services Strategy Group (2008) *Catching the Wave – A Services Strategy for Ireland*. Ireland: Forfás and Services Strategy Group.
- Global Entrepreneurship Monitor (2008) Available at: <http://www.gemconsortium.com> (Accessed: 02 June 2010).
- Government (2008) *First Report on the Strategy for Science, Technology and Innovation*. Ireland: Department of Enterprise, Trade and Employment. Available at: <http://www.deti.ie/publications/science/2008/firstreportonSSTL.pdf> (Accessed: 29 March 2010)
- Government (2007) *National Development Plan 2007-2013 Transforming Ireland – A Better Quality of Life for All*. Available at: <http://www.ndp.ie> (Accessed: 13 March 2010).
- Government (2006) *Strategy for Science, Technology and Innovation 2006-2013*. Available at: <http://www.deti.ie/publications/science/2006/sciencestrategy.pdf> (Accessed: 19 March 2010).
- Government (2000) *National Development Plan 2000-2006*. Source: Ireland.
- Higher Education Authority (2010) Available at: <http://www.heai.ie/> (Accessed 15 May 2010).
- HEA & Forfás (2007) *The Role of the Institutes of Technology in Enterprise Development Profiles and Emerging Findings*. Ireland: Higher Education Authority and Forfás.
- ICSTI (2004) *ICSTI Statement - Sustainable Development in Ireland: The Role of Science and Technology*. Ireland: Irish Council for Science, Technology and Innovation.
- Innovation Taskforce (2010) *Innovation Ireland Report of the Innovation Taskforce*. Available at: http://www.taoiseach.gov.ie/eng/Innovation_Taskforce/Report_of_the_Innovation_Taskforce.pdf (Accessed: 10 March 2010).
- InterTradeIreland (2010) *About Us*. Available at: <http://www.intertradeireland.com/index.cfm/area/information/page/whatwedo%20> (Accessed: 14 May 2010).
- Jordan (2009a) *Beware Unintended Consequences of Innovation Policies*, *IrishTimes* 6th July. Available at: <http://www.irishtimes.com/newspaper/finance/2009/0706/1224250103510.html> (Accessed: 07 July 2010).

- Jordan (2009b) Re-Imagining Innovation: Hold the Scientists and Bring on the Practitioners, *Ivey Business Journal Online*. Available at: http://www.iveybusinessjournal.com/article.asp?intArticle_ID=840 (Accessed: 22 March 2010).
- Jordan, D. and O'Leary, E. (2007) Benchmarking Study on Innovation in the South East Region, Drive for Growth Project. Available at: <http://www.driveproject.eu/contentfiles/survey/DRIVESouthEast.pdf> (Accessed: 22 March 2010).
- National Competitiveness Council (2010) *About Us*. Available at: <http://www.competitiveness.ie/aboutus/> (Accessed: 14 May 2010).
- Science Foundation Ireland (2010) *About*. Available at: <http://www.sfi.ie> (Accessed: 14 May 2010)
- Skillnets (2010) *About Skillnets*. Available at: <http://www.skillnets.com/about-skillnets> (Accessed: 13 May 2010).
- Small Business Forum (2006) *Small Business is Big Business Report of the Small business Forum*. Ireland: Small Business Forum.
- SWRA (2008) *Linkages for Innovation between the Higher Education Institutes and Indigenous Firms in the South West Region*, Drive for Growth Project. Ireland: South Western Regional Authority.
- Technology Foresight Reports (1999) [*Reports included: Materials and Manufacturing, Natural Resources, Information Technology, Chemicals and Pharmaceuticals Construction and Infrastructure, Transport and Logistics, Energy and Health and Life Sciences*]. Available at: <http://search.forfas.ie/query.html?style=forfas&col=forfas&qt=technology+foresight+report> (Accessed: 02 June 2010).
- The Advisory Science Council (2010) *About Us*. Available at: <http://www.sciencecouncil.ie/aboutus/> (Accessed: 14 May 2010).
- The Cabinet Subcommittee on Science, Technology and Innovation (2010) Available at: <http://www.deti.ie/science/technology/sticoordination.htm> (Accessed: 13 May 2010).
- The Department of Education and Science* [*now Skills*] (2010) Available at: <http://www.education.ie> (Accessed: 29 May 2010).
- The Industrial Development Authority (2010) Available at: <http://www.idaireland.com/> (Accessed 15 May 2010).
- The Office of Science, Technology and Innovation (2010) Available at: <http://www.deti.ie/science/technology/> (Accessed 15 May 2010).
- The Office of the Chief Scientific Adviser (2010) Available at: <http://www.c-s.ie/> (Accessed 15 May 2010).
- White Paper on Science and Technology (1996) Available at: <http://www.deti.ie/publications/science/1996/whitepaper.pdf> (Accessed 20 May 2010).