



# Ibec submission on the consultation paper for a successor to Strategy for Science, Technology and Innovation

March 2015

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Ibec represents Irish business; home grown, multinational, big and small, spanning every sector of the economy. The organisation and its sector associations, work with government and policy makers nationally and internationally, to shape business conditions and drive economic growth. It also provides a wide range of professional services direct to members.

Ibec's main business sectors are:

Alcohol Beverage Federation of Ireland  
Financial Services Ireland  
Food and Drink Industry Ireland  
ICT Ireland  
Telecommunications and Internet Federation  
Irish Medical Devices Association  
PharmaChemical Ireland  
Retail Ireland  
Small Firms Association  
Industrial Products.

## Background and Context

Ireland has taken significant steps over the past fifteen years in order to become a more knowledge and innovation-intensive economy. According to the 2014 Innovation Union Scoreboard Ireland remains an *innovation follower*, but the Scoreboard recognised the progress that the country has been making in a number of key areas: scientific publications; IP revenues and licensing options; level of the population with tertiary education; employment in knowledge-intensive services; and knowledge-intensive services exports. However, future improvement will largely depend on our ability to maintain favourable innovation framework conditions.

Ireland should strive to join the ranks of European innovation leaders. While Ireland had originally signed up to meeting the ambitious European target for total R&D expenditure to reach 3% of GDP by 2020, we are now committed to a revised R&D investment target of 2.5% GNP (equal to 2.0% of GDP) by 2020. Ireland has a reported annual spend of 1.17% of GDP on R&D for 2011; the EU average being 1.26% and Finland reporting the highest spend at 2.67% of GDP. Our innovation target for 2020 will be achieved by both public and industry direct contributions, and it also assumes that industry's total investment will represent approximately two-thirds of total expenditure. The Forfás Business Expenditure on Research and Development (BERD) survey of 2011/2012 indicated that enterprises across all business sectors spent €1.86 billion on in-house research and development and this was expected to increase by approximately 5.5% by 2012.

Since the launch of the Strategy for Science, Technology and Innovation in 2006, the focus of Government has been on embedding high-value activity in Ireland and improving the chances of successful commercialisation of R&D conducted in Ireland. The National Research Prioritisation Exercise (NPRE) has established a clear business case for investing in fourteen targeted areas and stressed the importance of maintaining public investment, albeit in a more efficient and targeted manner. Action plans have been developed for each area. The national research prioritisation exercise is in essence Ireland's national smart specialisation strategy. In July 2013 Government published a new framework for monitoring the impact of public R&D investment in broad terms and the implementation of the NPRE in the fourteen priority areas. Targets include increasing levels of co-funding by industry to publicly performed R&D, increasing the number of start-ups, broadening the base of research performing enterprise, and greater employment of researchers by the enterprise sector. In addition, the commercialisation of publicly-funded research will be assisted by the roll-out of a new national intellectual property protocol, ensuring that all enterprises, from small businesses to multinationals, get appropriate access to intellectual property arising from such research.

Such activities should be protected and enhanced to ensure that public research continues to benefit from private investment. At the same time, the new strategy should recognise that a strong research base is required to underpin applied/closer to market research activity. Government must safeguard investment in basic research in non-prioritised areas to ensure Ireland can benefit from a strong pipeline of activity and has the activity to exploit new opportunities as they arise.

Investment in intellectual capital is one of the key building blocks for sustainable economic growth. Recent Budget and Action Plan for Jobs policy statements have reaffirmed Government's commitment to invest in research, development and innovation in order to boost Ireland's national productivity and economic competitiveness over the course of the fiscal year. These statements have specifically emphasised output measures. It is vital for a small, open economy that Ireland remains an attractive place to conduct R&D as well as facilitating the emergence of technology-based local firms and encouraging innovative activities in less intensive sectors.

Ireland needs to take full advantage of the opportunities that Horizon 2020, the European Commission's new framework programme for research and innovation (2014-2020) presents. With an overall budget of €79 billion, there will be significant opportunities for Irish-based companies of all sizes to access grants to support R&D across a wide range of sectors, in particular health, ICT, environment, marine and energy. Ibec welcomes the ambitious national target for securing funding of €1.25 billion from this programme. We now need to ensure that the high level of engagement that the programme seeks to encourage by companies, particularly SMEs, is quickly realised and developed over its lifetime. Ireland made excellent progress in increasing participation by SMEs in seventh framework programme (FP7), we currently rank 1st in the EU for SME participation. Government should recognise how this was achieved and replicate it for Horizon 2020. Reducing the complexity and access points to such collaborative programme should encourage a greater interest in participation.

Government's focus on innovation policy has led to the development of a range of national innovation support programmes targeted specifically at industry. These include both direct supports (e.g. grants) and indirect supports (e.g. taxation). There are approximately fourteen state and semi-state agencies offering funding for research activities by companies. However, there has been a lack of clear and consistent information on the wide range of assistance available and a perception that it is difficult to access these supports. This problem is particularly acute for people starting a new business.

The R&D tax credit, according to Forfás, 'forms a central part of Ireland's strategy to stimulate innovation and promote R&D activity in Ireland at the firm level' (Making it Happen, 2010). R&D is an increasingly mobile investment for firms; which face increasingly competitive incentives for their R&D activity from a range of countries. While Ireland's tax incentives for R&D activity have improved considerably over the past decade, the offerings of our main competitors have also been enhanced. Ireland holds about a mid-table ranking in terms its tax incentives for R&D with many jurisdictions offer a significantly preferential regime for smaller firms, according to the B-Index developed by the OECD. Recent developments in competitor countries in the overall corporate tax area and specifically in relation to the tax treatment of intellectual property (IP) and R&D have the potential to undermine Ireland's relative competitiveness ranking.

Ibec look forward to engaging with the Department of Enterprise, Jobs and Innovation and its committees on the development of a future strategy. Given the short time period granted for comment on a significant piece of policy infrastructure, Ibec would appreciate the opportunity to present the details of this submission and recommendations to the steering committee.

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## Ibec Recommendations for a Strategy on Science, Technology and Innovation:

### General Recommendations

1. Ibec welcomes the opportunity to comment on the initial consultation paper to be considered in the development of a new national strategy for science, technology and innovation. We view this as a **first step in a process of engagement with government and key stakeholders** within the Irish research, development and innovation (RDI) ecosystem. Given the significance the challenges that will be set for industry, we look forward to a full and forthright debate around the development, implementation and delivery of the forthcoming strategy.

In addition, the consultation paper refers to a number of current consultancy studies and project reviews that will significantly inform the development of the strategy. Given that they will provide the blueprint for the strategy, the timing to develop the strategy should be more considered. The value of developing an ambitious but fit for purpose strategy which followed due process, will pay dividends. This strategy can only be delivered if the business and research community support and own it. When such studies are complete, it will be necessary for Government to consult with key stakeholders on their findings and their influence on the final the strategy.

2. This process provides a great opportunity for Government to develop a lasting strategy that sets out an ambitious long-term vision for science, technology and innovation policy. This **strategy should be the comprehensive, overarching framework** from which all complementary policy and initiatives to support RDI activity in Ireland should be linked in order to foster a strong innovation system and develop the knowledge-based economy and society.
3. Ibec recommends **the establishment of an independent advisory committee** on a permanent basis to review, evaluate and inform the strategy as it evolves. This committee should comprise key representatives of the main stakeholders involved in its delivery, i.e. key government departments implementing RDI policy, higher education institutes (HEIs), research performing organisations (RPOs), business representative organisations and specific state agencies.
4. The overall efficiency of conducting research in Ireland, including **the level of administration and cost of developing and undertaking research programmes needs to be reviewed**. A greater level of efficiency and a reduction in complexity to participate in the research programmes needs to be achieved to ensure that business of all sizes can capitalise on research outputs. By reducing the administrative burden and cost for the state, for the research community and for business, a greater value (cost effectiveness) will be realised from RDI investment, simply because more money and time will be allocated to performing research.
5. The next strategy for science, innovation and technology must further emphasise the **connection between research and skill development** at all levels. A strong research base, rooted in excellent science, gives educators the authority, assurance and confidence **to educate and train the next generation** of business leaders, scientists, technologists and engineers.
6. To build the innovative capacity of SME's, including their ability to increase knowledge and competence in bring science closer to the market place. Specific **SME incentives and supports** will need to be incorporated to the strategy. While the current innovation voucher system provide some entry level access to the system, more could be done to incentives R&D activity amongst SME's including financial, tax credit and information supports.

## Specific Pillar Recommendations

Pillar Theme	Recommendation
<b>Pillar 1: Investment in STI and key goals /targets</b>	<ol style="list-style-type: none"> <li>1. Develop a long-term science, technology and innovation strategy that encompasses a horizon scanning system to define opportunities as they develop.</li> <li>2. Undertake an international benchmarking exercise.</li> <li>3. Identify appropriate policy options to encourage Ireland to become an innovation leader.</li> <li>4. Focus on how Ireland can build scale to become a world class research hub attracting increased indigenous and FDI investment.</li> </ol>
<b>Pillar 2: Prioritised approach to Public Research funding</b>	<ol style="list-style-type: none"> <li>1. Ensure the review impact assessment of the NRPE sets out clear directions for its improvement and increased effectiveness under phase two.</li> <li>2. Safeguard a sustainable research base with a balanced portfolio of activity across the research continuum.</li> <li>3. Implement the support measures to enhance activity in Innovation in Services and Process.</li> </ol>
<b>Pillar 3: Enterprise-level R&amp;D and Innovation Performance</b>	<ol style="list-style-type: none"> <li>1. Enhance state support for BERD and collaborative activity with HEIs and RPOs.</li> <li>2. Continually monitor Ireland’s competitors with regard to innovation policy and tax incentives to ensure we capture a significant proportion of investment attached to innovation.</li> <li>3. Develop specific financial and information resource supports for SMEs to encourage their innovation activity.</li> </ol>
<b>Pillar 4: International collaboration and engagement</b>	<ol style="list-style-type: none"> <li>1. The strategy should be aligned with key pillars of Horizon 2020</li> <li>2. Ireland needs to be more strategic in how it engages with Horizon 2020 programmes.</li> <li>3. Greater information and financial resources should be made available to encourage business, particularly SME, participation. It must be recognised that Horizon 2020 is not a panacea and applicable to all sectors of the economy.</li> <li>4. Ireland should target other EU funding programmes and aim to increase the internationalisation of research programmes currently underway.</li> </ol>
<b>Pillar 5: Optimising organisational/institutional arrangements to enhance research excellence and deliver jobs</b>	<ol style="list-style-type: none"> <li>1. Establish an independent advisory committee comprising representatives of all stakeholders in the innovation system to inform the development of policy and its implementation.</li> <li>2. Ensure that the research structures are reviewed for continuous improvement and fit for purpose.</li> <li>3. Review the administration burdens and cost of collaborating in research programmes.</li> </ol>

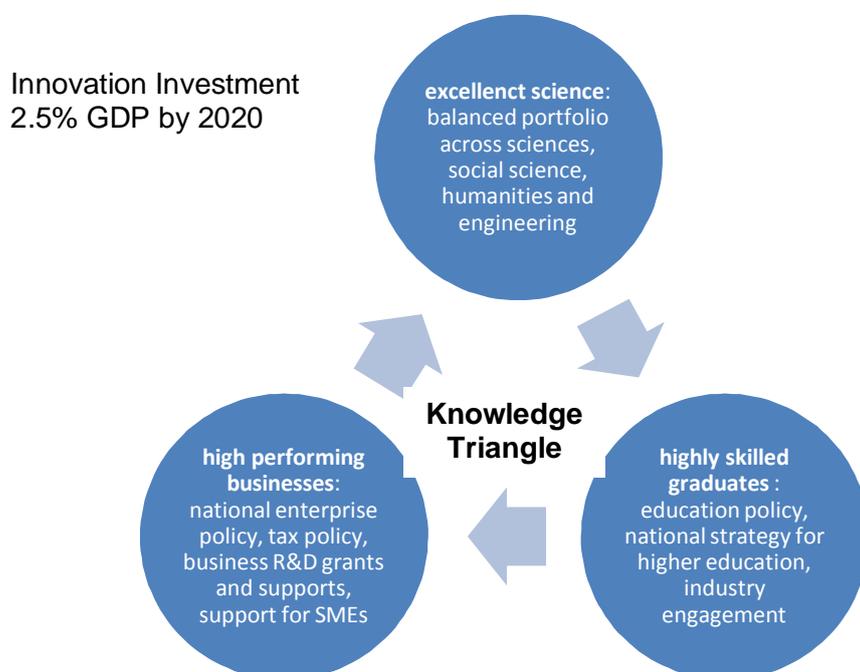
<p><b>Pillar 6: World class IP regime and dynamic systems to transfer knowledge and technology into jobs</b></p>	<ol style="list-style-type: none"> <li>1. Increase the awareness of KTI and its activities, amongst business and research communities, particularly SMEs.</li> <li>2. Develop materials and case study examples that promote collaboration, communication and understanding of roles and responsibilities across the innovation system. This should encourage greater engagement is all stakeholders are working towards a common objective.</li> <li>3. Ensure that all Government policy, regardless of its core origin, should support knowledge creation and transfer in Ireland.</li> </ol>
<p><b>Pillar 7: Government-wide goals on innovation in key sectors for job creation and societal benefit</b></p>	<ol style="list-style-type: none"> <li>1. In line with a strategy for better government and governance, public policy should be underpinned by scientific evidence.</li> <li>2. Identify areas where national and international policies and regulations may impact on sector growth and develop strategic partnerships to address these challenges in an innovative manner.</li> </ol>
<p><b>Pillar 8: research for knowledge and the development of human capital</b></p>	<ol style="list-style-type: none"> <li>1. Human capital development and research are explicitly linked and the strategy should foster their increased connectivity.</li> <li>2. Incorporate learning activities and projects centered on entrepreneurship, critical thinking and innovation at primary and secondary level.</li> <li>3. Ensure that education reform progresses to support Ireland’s ambitions as a knowledge and innovative economy, including Junior Cert reform, embedding entrepreneurial thinking into the teaching and learning programmes and an increased focus on STEM subjects.</li> <li>4. Expand and develop industry and academic training and education programmes.</li> </ol>

## Pillar 1: Investment in STI and key goals / targets

Ibec supports the Government's policy of developing a competitive knowledge-based economy through continued investment in STI.

The strategy should set out an ambitious, long-term vision for public investment in science, technology and innovation activity in Ireland. Government must embed innovation across national policies that support private and public R&D activity. This requires an integrated approach across the policy spectrum from building capacity in basic and applied science, delivering highly skilled and knowledgeable graduates, to support significant enterprise investment and job creation.

**Strategy for Science, Technology and Innovation should aim to deliver:**



As the consultation paper clearly demonstrates, the increased public R&D funding has already begun to stimulate increased business research expenditure and has been a significant factor in activating high value research based projects, including significant foreign direct investment (FDI) projects. This highlights the complementary nature of public and private investment, where one can act as a catalyst for the other.

The key priorities to underpin such investment should be:

- Knowledge creation
- Knowledge transfer
- Human capital

Success is derived from having a strong research capacity, a diverse industry base (including favourable environment for enterprise creation) and necessary supporting infrastructure.

Investment in knowledge development is a key factor in driving sustainable economic growth. The aim is to drive innovation at the business level, build human capital and maximise the return on R&D investment for economic and social progress.

As a priority, Ireland must continue to invest in research, development and innovation in order to boost its national productivity and economic competitiveness. It is also vital for a small, open economy to remain an attractive place to conduct research, development and innovation.

While the consultation paper provides a good starting point for discussion on the development of the strategy, it should not be viewed as a critical assessment of the research and development activity in Ireland. As noted, the 2014 Innovation Union Scoreboard classifies Ireland as an *innovation follower*. This consultation process should seek to understand why this is the case; and develop and recommend policy options that will see Ireland join the ranks of the European innovation leaders. The consultation process should undertake an exercise to benchmark Ireland's activity against international best practice. By reviewing the activity of the best international innovators, by country and by institute, Government will have a greater understanding of how this can be potentially realised.

### Recommendations for Pillar 1:

1. Develop a long-term science, technology and innovation strategy that encompasses a horizon scanning system to define opportunities as they develop.
2. Undertake an international benchmarking exercise.
3. Identify appropriate policy options to encourage Ireland to become an innovation leader.
4. Focus on how Ireland can build scale to become a world class research hub attracting increased indigenous and FDI investment.

## Pillar 2: Prioritised Approach to Public Research Funding

Following the launch of Strategy for Science, Technology and Innovation (SSTI) 2006-2013, the national focus is to activate high-value R&D and improve opportunities for its successful commercialisation.

The Research Prioritisation Exercise set out the rationale for continued public investment in science, technology and innovation and identifies measures to improve the efficiency and effectiveness of the Irish innovation landscape. Government has set targets to maximise the impact of public investment in R&D and metrics to measure it's the success. This exercise has established a clear business case for investing in 14 targeted research themes and the stressed the importance of maintaining public investment, but in a more efficient and targeted manner.

*Research Prioritisation: A Framework for Monitoring Public Investment in Science, Technology and Innovation* contains targets, including specific challenges for business:

- Increase the share of publicly performed R&D financed by enterprise to €180m from 2013 to 2017 – an average of €36m per annum, from a baseline of €31.2 m in 2010;
- 50% increase in number of spin-outs from publicly-funded research;
- Increase the number of spin-out companies greater than 3 years old from 44 to 69 by 2017;
- Increase the number of firms engaged in R&D projects of significant scale by 115 firms by 2017, i.e. from 1070 companies in 2011 to 1185 companies in 2017;
- Increase by 10% the turnover due to new-to-firm or new-to-market product innovations from 9.3% to 10.3% by 2017;
- Increase by 65% the proportion of invention disclosures, patents, licences and spin-outs recorded by Enterprise Ireland that are linked to SFI and industry collaborative research;
- A further 1,100 researchers to be employed in the enterprise sector in addition to the circa 10,600 currently employed.

As we currently await the report of the International Panel for the Independent Assessment of Progress on Implementing Research Prioritisation, it is difficult to comment on specific issues related to the National Research Prioritisation Exercise (NRPE). Nonetheless, Ibec have some general comments to make.

The aim of the original exercise was to identify areas that can accelerate, deliver and create economic benefits. As highlighted in the paper, publicly funded research can generate real economic growth, underpinned by knowledge creation and transfer and supported by industry investment. The recent announcements relating to research and technology centres show that this is happening. In addition, there has been an increase in the number of industry partners and their contribution value both in-kind and in-cash, again demonstrating the complementary nature of public and private investment.

It is essential that the NRPE remains flexible to incorporate emerging market trends, future needs and Government policy supporting sector specific growth. Research programmes and the system needs to have the resources available to revise programmes according to new trends. Programmes must also remain flexible to the changing regulatory environment and market drivers. Equally, Government policy and the regulatory environment must enable technology and innovation commercialisation.

The Independent Assessment of the implementation of the NRPE will identify gaps and lags in its progress. With specific regard to one of the priority areas, Innovation in Services and Process, Ibec encourages Government to implement the recommendations of the recent report on the public funded RD&I supports for this area. Ireland is considered a leader in business services, given its significance to the economy and its ability to reinforce the need to take a broader view of innovation. This cross-cutting theme will support innovative activity in all industrial sectors.

The current NRPE will expire in 2017. Its extension beyond 2017 has yet to be planned and the key areas need to be identified. Ibec recommends that this phase of the NRPE be commenced as soon as possible.

The impact of the NRPE on the public research system will be positive. It will help build the competency and capability of the research community in key priority areas, which contribute to the development of world-class, reputable research centres capable of competing for external, non-exchequer funding in the future. The NPPE is the platform for investing in areas where Ireland has clear strengths. Nevertheless we must continue to monitor the impact of public R&D investment ensuring that research is effectively commercialised and that scientific talent transfers to industry.

However, we need to be mindful that we do not restrict innovation investment solely to the current 14 identified areas with sufficient Irish or inward investment. There is a risk that this strategy could be too constraining and narrow, and that potential innovation opportunities will be missed, especially those that may emerge from a small base. This will also help mitigate any risks of attempting to correctly identify longer-term market trends.

Equally, a long-term STI strategy solely focussed on research prioritisation may erode basic research capacity in non-prioritised areas. This may threaten current and future industry needs as well as potentially weaken national prospects of successfully winning competitive international research grants across the available funding spectrum. Rebuilding capacity in particular areas takes considerable time and investment and the necessary skills may not be available to address evolving further identified research priorities.

Ibec recommend safeguarding a sustainable research base with a balanced portfolio of activity across the research continuum. There is a need and a value in supporting research activity at all levels across the innovation system.

To avoid protracted debate centred on basic versus applied activity, Ibec recommend that Government promote communication and understanding of research activity and needs across the research and business communities. This communication will facilitate mutual learning on the “boundaries” that exist and the roles and responsibilities of each actor can be clarified.

## **Recommendations for Pillar 2:**

1. Ensure the review impact assessment of the NRPE sets out clear directions for its improvement and increased effectiveness under phase two.
2. Safeguarding a sustainable research base with a balanced portfolio of activity across the research continuum.
3. Implement the support measures to enhance activity in Innovation in Services and Process

### **Pillar 3: Enterprise-level R&D and Innovation Performance**

Pillar 3 is a critical pillar of the strategy that recognises the significant role that industry will play in achieving the investment target by 2020. It will also highlight the many challenges that industry face in supporting and achieving such a target. The strategy therefore must reflect the unique needs of business and, consequently, provide supports relative to their size (small, medium, large), origin (indigenous, multinational, foreign direct investment) and sector.

The Department of Enterprise, Jobs and Innovation have commenced a study into optimising policy intervention to strengthen the impacts of enterprise RD&I in Ireland. Ibec eagerly await the outcome of this study and final report, as it will significantly inform the strategy on the most appropriate policy options to support Ireland's innovation ecosystem.

In the absence of such a central report, it will be difficult to comment on specific options at this stage. Nonetheless, we believe that public financial supports, in the form of tax / fiscal schemes or direct grants, narrow the gap between the private and social rates of return by lowering the cost and risk of innovation and ensure that the level of innovation performed moves closer to the desired optimum.

As stated, investment in research, development and innovation is a key factor in driving sustainable economic and social growth. This strategy provides an opportunity to accurately define the term "innovation", to identify its relevance to Ireland for society, business and research communities and the economy, and to promote policy options to foster a first-class innovation system in Ireland. The successor to the Strategy for Science, Technology and Innovation, should be the overarching policy framework that provides a consistent and coherent direction, to which all related and complementary RDI policy is aligned.

#### **Specific Support for SMEs**

Small to medium-sized enterprises (SMEs) face a specific set of challenges with regard to research, development and innovation. The 2012 analysis of the Forfás BERD survey indicates that medium and large enterprises (greater than 50 employees) account for almost two-thirds of all business investment in R&D in 2011. This indicates that start-ups, micro and small sized enterprise are not engaged in this activity. Some companies may lack the management capability and capacity to engage. While other companies are locked out of the innovation system due to limited availability of resources, finance, time and an inability to identify access points. Given the importance and unique nature of SMEs to the Irish economy, they merit special consideration within the strategy.

In 2014, Ibec launched a campaign to map out the key priorities for business in the next phase of economic recovery and growth, entitled An Ireland that Works. A central pillar of this campaign is to impress upon Government and policy makers the immediate necessity to improve the innovation and technology supports for SMEs. Many SMEs, even those who undertake a degree of research and development activity, are not engaging with the funding and credit schemes due to their complexity and arduous administrative requirements. Improvements may include a streamlining and simplification of the process to acquire financial assistance to support R&D activity. In addition, consideration needs to be given on how to support SMEs to access collaborative research programmes and their outputs. In some cases, the cost to access collaborative projects may be prohibitive for SMEs but the potential benefit they may gain would be significant. Government policy needs to encourage and support SME participation. Ibec recommend that a separate piece of research is commissioned to understand and quantify the barriers that exist for SME participation and the innovation challenges they face. The outcome of this research will help identify specific policy recommendation tailored to the needs of SMEs.

## Building Ireland's Innovation System

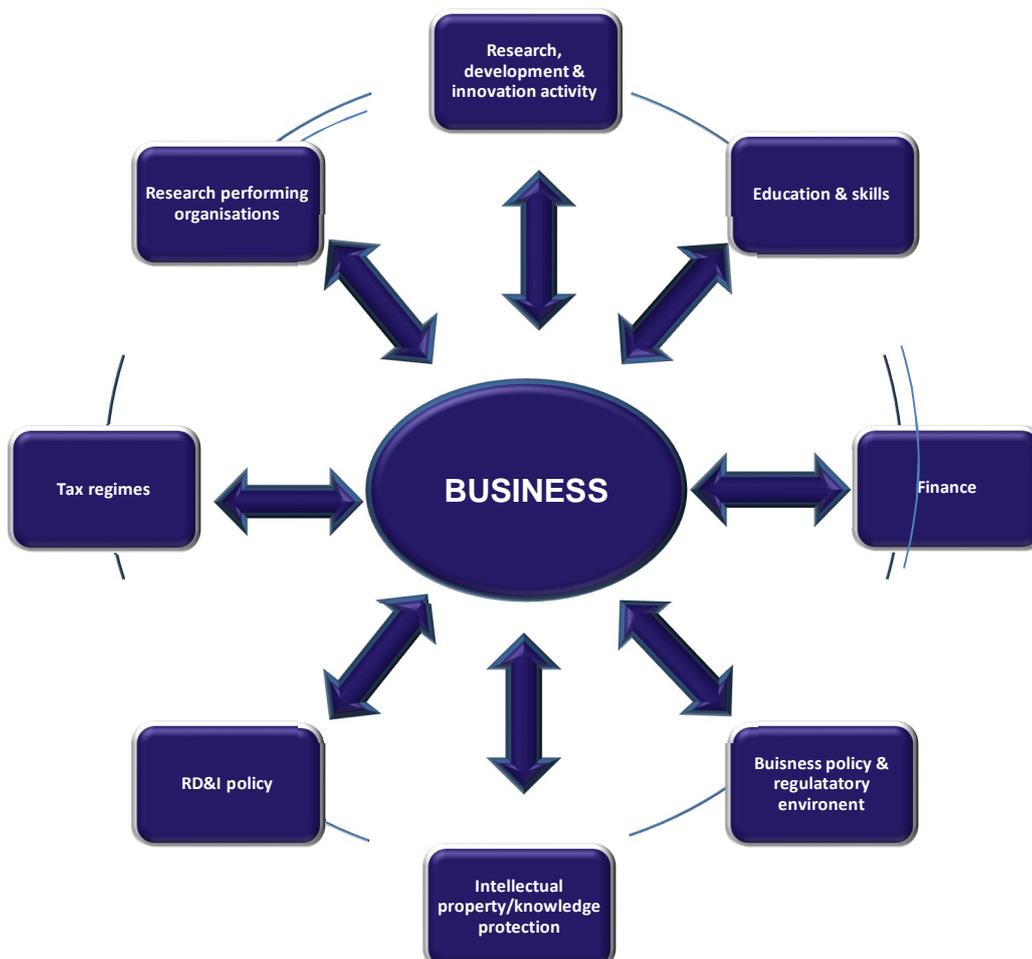
The World Bank (2006) states that the 'The Innovation Systems (IS) concept embraces not only the science suppliers but the totality and interaction of actors involved in innovation. It extends beyond the creation of knowledge to encompass the factors affecting demand for and use of knowledge in novel and useful ways.'

According to the Innovation Union Competitiveness Report (June 2011), "Ireland is relatively well diversified and its trend towards a more knowledge and innovation-intensive economy is a realistic prospect".

While the focus of Ireland's national policy has changed, so too has our understanding of R&D activity. It has evolved beyond the confines of the laboratory bench and the traditional "white coat" approach into a wider, far-reaching cross-functional activity that applies to all business in the economy. R&D activity also encompasses a significant proportion of process innovation to enhance Ireland's reputation in manufacturing excellence. Much of this activity will not be patented and protected under a formal process with the result that the innovation remains in-house. Nonetheless, it demonstrates that the translational phase is equally creative as the discovery phase and that the channel to commercialisation is not linear. Such innovation needs to be recognised by Government policy.

With business at its core, Ireland's innovation framework encompasses grants, education and skills public policy, tax regimes, finance and intellectual property and knowledge protection services (see Figure 2).

**Figure 2: Core components of the Ireland's innovation framework**



The majority of innovation stems from research outputs and from the knowledge and skills of experienced and trained researchers supported by appropriate infrastructure. For business, innovation can be considered extremely risky and costly, and the innovative firms may have difficulty netting the full value of successful innovation, often to the benefit of others, including competitors. This is often referred to as the “spill-over phenomenon”. Public funding for private enterprise R&D activity has a complementary but critical role in supporting innovation, ensuring that incentives will benefit the economy as a whole.

As the business expenditure in research and development activity has increased, so has the level of business engagement with universities and research performing organisations (RPOs). This reflects a growing understanding of the potential benefits such collaborations can bring for both the business and the university environment. Business also engages on an individual level with universities on specific business research consultancy projects. Research consultancy is an important element of the knowledge transfer system to deliver social or economic benefit. Ibec recommend that R&D tax credit system is reviewed to increase the credit available for business R&D projects undertaken in consultation with university to ensure business can work with the critical expert rather than having to make a value decision.

Ireland has made progress over the past decade but continued improvement will largely depend on the ability to maintain favourable conditions.

Innovation can be assessed by an overall review of a range of indicators that broadly assess the level of public and private investment, the outputs of this investment (publications, patents, etc.) and the overall performance of the firm. It is recognised that Ireland’s investment in R&D is increasing at both public and private level. Ireland has a low level of patent applications and is ranked 12<sup>th</sup> in Europe in this regard, according to Eurostat. This demonstrates that Ireland focuses less on developing *new/novel* products. However, the true acid test of successful innovation and knowledge development can be demonstrated by overall business performance. Forfás analysis of the ABSEI (Annual Business) survey in 2013 demonstrates that over the last decade research active companies consistently increased sales and exports, and retained jobs during a difficult economic period. Exports from non-R&D performing companies decreased from €48bn to €26bn during the same period.

In addition, grant supports from the enterprise agencies have been introduced or refined to include new types of research and innovative activities, including measures to assess scientific, technological and innovative merits and subsequent impact. This change in innovation activity has led to the development of a range of innovation supports that national and regional agencies target specifically at industry. This has enabled companies to select an investment strategy that best suits their long-term business plans.

A Strategy for Science, Technology and Innovation must be cognisant of national enterprise policy development. There is a critical need to ensure that all policy is developed with a common understanding and recognition of R&D activity. The Department of Finance tax offering to support R&D activity must reflect the actual innovation activity and evolving national innovation policy environment.

It is essential that the national research prioritisation exercise remains flexible to incorporate emerging Government policy supporting sector specific growth and that programmes are revised accordingly. Programmes must remain flexible to the changing regulatory environment and market drivers. Equally, the regulatory environment must enable technology and innovation commercialisation. This includes supports to enable market

validation process be undertaken in Ireland, for example, clinical trials for medical devices and pharmaceuticals and sensory analysis for food product development.

### **Competitiveness as a location for R&D**

Ireland has a unique concentration of the world's most innovative companies in addition to world-class global and home grown leadership skills. If supported effectively, these companies and their people will collaborate to produce technologies and knowledge that will drive societal and economic change for Ireland. It should also be recognised that R&D is an increasingly mobile investment for firms, which face increasingly competitive incentives for their R&D activity from a range of countries.

Small to medium sized enterprises (SMEs) may experience greater challenges than larger companies to dedicate and develop internal resources needed to engage successfully with universities and to capitalise on their research outputs. These enterprises will require additional state support to build the absorptive capacity and to participate in any research collaboration.

An environment that supports the implementation of these recommendations can only benefit industry further and ensure that Ireland is well positioned to capitalise on the opportunities created by innovative activity.

Government must continue to monitor Ireland's R&D competitors in terms of tax incentives offered in order to underpin Ireland's attractiveness for mobile investment and make improvements to the R&D tax credit scheme when necessary.

Government must do more to support entrepreneurship, particularly serial entrepreneurs. We need to make it easier to set-up a business and we need to ensure the tax system encourages investment and rewards success. The regulatory environment needs to better support start-ups, tax and business supports need to be updated to keep Ireland competitive and the education systems needs to better foster entrepreneurial skills. It is vital that the government's upcoming National Entrepreneurship Policy Statement leads to meaningful and lasting change.

### **Recommendations for Pillar 3:**

1. Enhance state support for BERD and collaborative activity with HEIs and RPOs
2. Continually monitoring Ireland's competitors with regard to innovation policy and tax incentives to ensure we capture a significant proportion of investment attached to innovation.
3. Develop specific financial and information resource supports for SMEs to encourage their innovation activity.

## **Pillar 4 : International Collaboration and Engagement**

### **International Collaboration**

All researchers are encouraged to collaborate internationally and to avail of international funding sources. The EU R&D funding programmes (due to their eligibility requirements) are inherently collaborative. Programmes such as Horizon 2020 should be viewed as strategic drivers for achieving greater international research collaborations. This strategy should include an integrated approach to improving Ireland's international collaboration performance and support our strengths in key areas.

Programmes such as Horizon 2020 could be leveraged to Ireland's advantage in terms of attracting potential partners in non-EU countries. Ireland should position itself to be a research gateway to the European Research Area and associated funding programmes. US partners could be encouraged to participate in relevant EU-funded programmes through Irish-led projects. This would complement Ireland's desire to be an attractive location for mobile R&D investment by industry. It would also build on current bilateral arrangements in place such as the US-Ireland R&D Partnership.

The EU has an active programme of forming bilateral partnerships with third countries in R&D. Government should explore the potential for positioning Ireland in existing arrangements and being involved in discussions on future agreements. Many of the EU agreements have separate budget lines for R&D projects.

### **Recruiting high-calibre researchers to Ireland**

In order to meet the ambitious strategy of sustainable economic growth through research, development and innovation, the underpinning skills have to be either developed locally or attracted into the country. Ireland needs a combination of both to satisfy its current and future requirements. According to the Advisory Science Council's *The Role of PhDs in the Smart Economy*, 40% of PhD students in Ireland are international. The quantity and quality of experts entering Ireland can also be an important indicator for measuring the success of Irish innovation policy.

The Organisation for Economic Co-operation and Development (OECD) draws the important link between the mobility of science and technology talent and successful innovation. It is not confined to meeting the demand for skilled workers but its positive impact on knowledge-creation and transfer. Inflows of talent, according to the OECD, benefits receiving countries in a number of ways related to innovation and R&D, based on improved knowledge flows and collaboration with different countries.

Ireland must also continue to leverage the talent, expertise and network of its diaspora. They can bring tangible benefits to the successful delivery of Ireland's innovation policy. According to the OECD, a country's diaspora can act as a conduit for continual knowledge-flows and R&D. This should include leveraging existing higher education contacts, the global links of Ireland's firm base and connecting with networks of Irish affiliated researchers abroad.

### **Take advantage of EU funding opportunities**

Ireland must view Europe's success in research, development and innovation as intrinsically linked to its own. We must adopt a comprehensive strategy to position Ireland in areas of national strength and expertise to shape the direction of the EU's RD&I policy. This would better enable us to take advantage of the associated funding opportunities.

Other countries recognise the importance that European RD&I activities support their efforts to boost national competitiveness and productivity. This is not simply of aligning themselves to existing policy and funding streams. They look to influence and shape programmes and initiatives to reflect core national strengths. Finland, for example, has long recognised this objective in its national RD&I strategy. Ireland's revised national strategy for science, technology and innovation must include a firm commitment to do likewise.

Ireland needs to show greater ambition in influencing European RD&I policy. For example, we should lose sight of the fact that agreement on the Horizon 2020 programme was reached during the Irish Presidency of the EU. There is still time for Ireland to take full advantage of the opportunities it presents. This would go beyond the traditional calls which we have already considerable success in accessing. We should look to the European Institute of Technology with a view to establishing a Knowledge and Innovation Community (KIC) in Ireland in the future. Government should support this ambition.

### **European Research Framework Programmes**

On 11 December 2013, the European Commission launched the first calls for proposals under its new framework programme for research and innovation funding (2014-2020). With an overall budget of €79 billion, there will be significant opportunities for higher education institutions and Irish-based companies of all sizes to access grants to support R&D across a wide range of sectors, in particular health, ICT, environment, marine and energy.

For the first time, the Commission will set out funding priorities in two year blocks. The idea is to provide businesses and researchers with more certainty in terms of EU research policy. In keeping with EU2020 targets, there's an objective to have more SMEs involved and a dedicated SME Instrument has been created. Horizon 2020 has the following three pillars:

1. Excellent Science including funding for the European Research Centre, Marie Curie Actions, vital infrastructures and future and emerging technologies.
2. Industrial Leadership is the truly innovative element of the programme as it contains specific supports for SMEs and for enabling industrial technologies such as nanotechnologies, biotechnologies and ICT.
3. Societal challenges will ensure that research is directed at areas of most concern to citizens and business such as health, climate, food, security, transport and energy.

Horizon 2020 is the largest EU R&D funding programme yet, with a 30% increase on the previous initiative. However, there is concern over the current budget for the coming year as €2.7 billion is expected to form part of the new European investment programme (i.e. Juncker plan). Nevertheless Ireland needs to take full advantage of the opportunities that the H2020 programme presents. Ibec welcomed the ambitious national target for securing funding of €1.25 billion from this programme. We now need to ensure that the high level of engagement that the programme seeks to encourage by companies, particularly SMEs is quickly realised and developed over its lifetime.

Early indicators are pointing to a strong performance by Ireland's research base in the initial H2020 calls. The national H2020 strategy outlines the approach Ireland should adopt over the programme's lifetime. It focuses on the areas of Irish strength in the previous framework programmes as well identifying new opportunities for Irish researchers. It is on the latter area that Ireland can and should do more. Besides the general framework programme, H2020 comprises the old competitiveness and innovation programme and the European Institute for Innovation and Technology. These are two areas that Ireland have not focused on in the past.

In the seventh framework programme (FP7), Ireland ranked 1st in the EU for SME participation in the SME call. This was just one area within the larger programme. More must

be done to take advantage of the new broad SME pillar. For example, it has a mechanism to provide access to risk finance (debt & equity facility). Also, SMEs stand to benefit even further from approval of a complementary EU programme to boost the competitiveness of small and medium-sized enterprises (COSME), with a budget allocation of €2.3 billion.

We need to strategically examine all areas of H2020 in terms of potential involvement of Ireland's research base. This needs to be carried out on a call-by-call basis. H2020 does not just fund basic research and there are calls that could help commercialise research here. The area of public procurement features as part of H2020: pre-commercial procurement (PCP) and public procurement of innovative solutions (PPI). SFI-funded research centres could look to prototyping some of their research in a public setting under these calls. It could complement the initial pilot small business innovation research scheme being run by Enterprise Ireland.

It is not enough to identify H2020 to target. We need to be proactive and pragmatic in positioning for future calls. For example, the outputs of the future national research prioritisation/smart specialisation exercise should form the basis of the national lobbying exercise in shaping the design and themes of calls for proposals and the successor framework programme. We also must ensure adequate Irish representation on the committees in shaping the design and themes of calls for proposals. Many of the committees have an open call for experts and areas of under-Irish representation should be identified and addressed.

Irish HEIs will be expected to deliver the greatest return from H2020 participation. National funding criteria contain H2020 success as part of evaluation metrics. However, success from traditional calls will not be enough for Ireland to meet its overall target. We need to ensure that ongoing industry-academic collaboration in national programmes can be leveraged to achieve greater success at European-level. Industry and academia must work closely in order to take advantage of the opportunities available under the *Industrial Leadership* pillar and across the entire H2020 programme.

### **North South Cooperation**

Cross-border collaboration can also bring real benefits to the whole island of Ireland. For example, cross-border linkages in energy research would result in better co-ordination of work and will better address areas where the island of Ireland would have a distinct advantage (e.g. renewable energy). To date, collaboration has largely been confined on a case-by-case basis, driven by enterprise agencies such as Enterprise Ireland and InterTrade Ireland because cross-border collaboration was previously outside the direct legal remit of Science Foundation Ireland. European RD&I funding programmes can serve as a strategic driver for achieving greater north/south research collaboration. Successful EU funding applications must have at least three legal entities must participate, each of which is established in a Member State or associated country, and no two of which are established in the same Member State or associated country. Thus, through increases collaboration, applications from organisations from both sides of the border can be considered as being from two Member States. This could significantly increase Ireland's success-rate in securing EU research funding.

### **Targeting international R&D funding**

Actively targeting and securing international sources of funding may require a targeted programme of up-skilling individuals to identify, track and secure internationally available funds. A longer-term, strategic approach will be needed that will allow Irish entities to successfully pursue potential funding opportunities. This should not focus solely on H2020. It should take into account potential funding under the INTERREG programme and other

potential European funding streams. A programme should be developed for each research area. For example, marine and energy research may be in a position to access specialised funding streams to support large-scale research.

Government-funded research and technology centres should be supported in developing specific funding roadmaps for their respective areas. This would improve their ability to secure non-exchequer sources of finance and potentially attract new partners and researchers to the centres. A specific EU funding strategy would also contribute to the overall goal of establishing a set of world-leading, large-scale research centres that will provide major economic impact for Ireland.

### **EU Cohesion Policy 2014-2020**

Negotiations have already been concluded on securing cohesion policy funding for the period 2014-2020. Ireland will receive €1.2 billion of which approximately 80% will be allocated to the two main structural fund pillars, the European Regional Development Fund (ERDF) and the European Social Fund (ESF). The remainder will be used to support programmes such as the Ireland/Wales INTERREG Programme, the Northern Ireland PEACE Programme and the Ireland/Northern Ireland/West of Scotland INTERREG Programme.

The Partnership Agreement Ireland 2014-2020 (November 2014) sets out the identified priorities to be funded under the current structural funds programme. These were aligned to EU2020 goals and the national reform programme. R&D, ICT, SMEs and industry competitiveness, as well as energy and resource efficiency feature within those two overall strategies. Government mechanisms to influence the design of areas to be funded under the various operational programmes (e.g. regional, sectoral etc) are well-established.

The revised national strategy for science, technology and innovation should contain a strategy on how to position Ireland for the next round of EU structural funds beyond 2020. This must include a clear statement on how Ireland can influence the RD&I focus of the successor to the EU2020 strategy.

### **Recommendations for Pillar 4:**

1. Ireland needs to be more strategic in how it engages with Horizon 2020 programmes
2. The strategy should be aligned with key pillars of Horizon 2020.
3. Greater information and financial resources should be made available to encourage business, particularly SME, participation. It must be recognised that Horizon 2020 is not a panacea and applicable to all sectors of the economy.
4. Develop a strategy plan to increase the level of North South Collaboration to increase Ireland's success rate in securing EU and international research funding and knowledge development.
5. Ireland should target other EU funding programme and aim to increase the internationalisation of research programmes currently underway.

## **Pillar 5: Organisation / Institutional arrangements to enhance research excellence and deliver jobs**

Ibec welcomes the recent developments in the organisation and institutional arrangements to deliver better RD&I outcomes. Significant capital investment has been made in scaling research capacity across the research performing organisations (RPO's), including the development of critical mass and expertise in key areas. It is important that the infrastructure put in place is fully utilised by academia and industry. Such investment will lead to increased collaboration between academic centres and industry.

Positive developments include the broadening of scope of Science Foundation Ireland's (SFI) remit to fund the full continuum of research. This was necessary to reflect the changing economic and societal challenges. In addition, the development of SFI Research Centres and the Technology Centres under the Enterprise Ireland research programme, has brought industry closer to concept of R&D collaboration with universities and RPOs. It has also challenged some industry sectors to develop a detailed description of research needs, and build the business case for why this knowledge deficit needs to be addressed and funded.

The consultation process to develop a new STI strategy is an opportunity to address and review the administration and structural frameworks associated with collaborative research activity and the development of such centres.

The time and resources required of industry to support the development of a centre, prior to launch, is significant. This iterative process may take two to three years depending on the research theme and potential research consortium. However, this process could be significantly expedited if minimum terms covering the consortium and grant agreements, IP terms and legal frameworks became standard issue and available at the beginning of the process for consideration and development.

The overhead costs associated with conducting research in Ireland must be assessed to determine if they represent best value for money and whether financial resources could be reallocated to the research programme.

In addition, given the number of research and technology centres that are now operational, Ireland needs to determine if cross-centre efficiencies and alliances can be developed and develop appropriate mechanism to facilitate this. This will minimise the duplication of effort and limit the potential competition for limited external resources i.e. finance, company contributions, access to postgraduate students.

The consultation paper refers to a study on Applied Research Capacity is currently underway. Again, Ibec awaits the outcome of this study, given that it will assess the feasibility of enhancing the market-focussed element of the research centre landscape. We believe this will be a critical component of any high functioning centre to assist with horizon-scanning, foresight planning and emerging trends that could radically redirect the research programme. This market focus activity should also monitor the regulatory framework which may impact commercialisation opportunities. Ibec support the continued dialogue between SFI and Enterprise Ireland on the optimum arrangements for institutional organisation, however we encourage that other stakeholders are involved and contribute to the process.

In addition, Ibec recommends the establishment of an independent Advisory Committee on a permanent basis, to oversee the implementation of the strategy and its ability to achieve key milestones and goals. Membership of the committee should comprise representatives from all stakeholders in the innovation system, including Government, research and business community representatives and agencies. It also ensures that the Government system is open and collaborative and benefits from mutual learning and experience. This committee

can also be activated when required to discuss international and national policy developments which may impact on Ireland's innovation system.

#### **Recommendations for Pillar 5:**

1. Establish an independent advisory committee comprising representatives of all stakeholders in the innovation system to inform the development of policy and its implementation.
2. Ensure that the research structures are reviewed for continuous improvement and fit for purpose.
3. Review the administration burdens and cost of collaborating in research programmes.

## **Pillar 6: World class IP regime and dynamic systems to transfer knowledge and technology into jobs**

Investment in intellectual capital is one of the key building blocks for sustainable economic growth. Research, development and innovation activity is a key driver of intellectual capital. Business requires a more user-friendly system for industry to identify, commercialise and exploit state-funded intellectual property (IP). True innovation occurs at the point of application and relies as heavily on human capital as an input as IP commercialisation.

Ireland has taken a number of steps in recent years to improve the environment for the development, exploitation, and development of IP, including measures to make it easier to commercialise and ultimately create jobs from ideas developed through publically-funded research. The research prioritisation exercise stated that technology transfer should be “fast, predictable and consistent”.

The establishment of Knowledge Transfer Ireland (KTI) in 2012 as the central technology transfer office, to act as a one-stop shop for business seeking to use IP deriving from public-funded research was a welcome development. KTI will have a major role in assisting the research commercialisation agenda, ensuring all enterprises, from small businesses to multinational, get appropriate and timely access to IP.

Ibec particularly welcomes the online tool operated by KTI to help companies easily locate expertise in Irish academic institutes. This central tool will help companies find the relevant first point of contact within HEIs and RPO's, which can help identify, access and engage with relevant world-class research and expertise available.

The development of the National IP Protocol should support the KTI mission by providing clarity and certainty to companies and by putting in place an effective IP rights framework. The Protocol states that “enterprise should be able to negotiate access arrangements quickly on terms that provide fair value to all parties, and in way that are predictable from one negotiation to the next”

To support the recent review of the National IP Protocol, Ibec consulted with its members and sector organisation to find low level of awareness of the Protocol amongst the business community. As the landscape for research collaboration between industry and the research base has evolved, we do not have any real sense of awareness or how deeply embedded the Protocol has become, even amongst RPO's.

Awareness amongst the SME sector of the Protocol is very limited, and the secondary aim of increasing and helping small firms to interact more with HEIs has not been achieved. SME's are likely to be deterred from collaboration by the costs and time required for negotiation.

Ibec recommend that KTI to engage with stakeholders to consider the case for introduction of Easy Access IP into the Irish system for certain early-stage IP, which could prove particularly beneficial to early-stage companies.

In addition, KTI should develop a set of collaboration guidelines specifically for start-up business. Barriers to negotiation that are cited as important remain the valuation of IP, organisational administration and the lack of skills of the negotiations on both sides.

In order to promote the impact of research collaboration and technology transfer, KTI should develop and communicate recent and relevant case studies where positive outcomes have been achieved. This will demonstrate to the unfamiliar that the technology transfer process is working.

The sustainability of an innovative system in Ireland will largely depend on the ability to maintain favourable framework conditions. An environment that supports such conditions can only benefit industry further and ensure that Ireland is well positioned to capitalise on the opportunities created by innovative activity.

There is a critical need to ensure that all policy is developed with a common understanding and recognition of R&D activity on the ground. There may be a misconception that all activity will lead to the development of patents or formally protected IP. R&D activity also encompasses a significant proportion of process innovation to enhance Ireland's reputation in manufacturing excellence and business services. Much of this activity will not be patented and protected under a formal process so as the innovation remains in-house. This demonstrates that the translational phase is as equally creative as the discovery phase and the channel to commercialisation is not linear.

We need to ensure that the Irish innovation system supports the creation of knowledge and the appropriate mechanism for its protection, if required, including intellectual property, copy right and trade secrets.

The Department of Finance's proposal to establish a "Knowledge Development Box (KDB)" to incentivise the development of formal intellectual assets is currently under consultation. While the exact format of the KDB is yet to be determined, Ibec cautions that eligibility criteria may discourage cross functional collaboration. It is important that the KDB policy acknowledges the shift in the funding landscape between industry and academia and the investment by business ( in-cash and in-kind) by business in research and technology centres.

### **Recommendations for Pillar 6:**

1. Improve the roll out of KTI and its activities to increase its awareness amongst business and research communities.
2. Develop materials and case study examples that promote collaboration, communication and understanding of roles and responsibilities across the innovation system. This should encourage greater engagement as all stakeholders are working towards a common objective.
3. Ensure that all Government policy, regardless of its core origin, should support knowledge creation and transfer in Ireland.

## **Pillar 7: Government-wide goals on innovation in key sectors for job creation and societal benefit**

Ibec welcomes the inclusion of this Pillar for consideration in the strategy's development. Public policy decisions that impact on society and the economy should be underpinned by strong scientific evidence. This leads to better governance and regulatory structures. This pillar will also ensure that there is a greater degree of alignment between sector specific growth strategies, regulatory challenges and the Irish innovation system. A timely example of this national, specific policy, supported by aligned research, is the Ireland's potential to increase milk production and exports following the abolition of the EU production quota system in April 2015, while striving to meet the climate change targets for agriculture by 2020. By managing these potentially conflicting policies, Irish dairy companies and producers have embarked on significant environmental and sustainability programme to monitor and improve carbon efficiencies. All of these programmes are supportive by Government and public research.

The disruptive reform measures, outline in the 2014 and 2015 Action Plan for Jobs polices have the potential to coordinated innovation and regulatory activity in specific areas including Energy Efficiency, Health Innovation, Big Data. These reform measures are high impact with ambitious targets are supported by industry and should be managed to ensure their potential is realised. They will require significant innovation input to deliver the knowledge and to act as a job creation stimulus.

### **Recommendation for Pillar 7:**

1. In line with a strategy for better government and governance, public policy should be underpinned by scientific evidence.
2. Identify areas where national and international policies and regulations may impact on sector growth and develop strategic partnerships to address these challenges in an innovative manner.

## Pillar 8: Research for knowledge and developing human capital

The critical output from Ireland's research activity is not just development opportunities, technology or knowledge, it is highly trained and educated people. Business operates in a connected, technology-driven, interdependent, fast changing and extremely complex international environment. The availability of skilled labour is essential to both the creation of Irish companies and attracting new industry to locate here. The competitiveness of Irish businesses and their future growth is dependent on their ability to absorb, understand and exploit high value research. People and their talent is the primary determining factor of this potential.

As such, business and higher education institutes have a shared objective in developing adaptable, well-rounded, creative, cultured and ethically-minded citizens who have an appetite for continuous learning.

Ireland needs the best education and research systems in the world in order to meet its aspirations to be an innovative and productive economy. Success will depend on Ireland's collective ability to bring what we teach and how we teach it into the 21<sup>st</sup> century. A strong research base, rooted in excellent science, gives educators the authority, assurance and confidence to educate and train the next generation of business leaders, scientists, technologists and engineers. Research-led education will also support capability and capacity building in strategic areas.

The core skills of investigation, problem solving, critical thinking, design, innovation, communications and creativity are important skills required by industry and it is key that these are developed at second level. Individuals, who can combine discipline-specific technical knowledge with an ability to think creatively, will be increasingly in demand in the future. The strategy should also focus on the education continuum in Ireland to ensure that provides an appropriate pipeline for Ireland's innovation system.

According to the European Commission, most studies have also found positive impacts of inquiry instruction on student content, learning and retention. Overall, results indicated that 'having students actively think about and participate in the investigative process increases their science conceptual learning.'

In order to increase motivation and interest in science, it is essential that the new curriculum emphasises connections with students' personal experiences, potential careers and their awareness of the latest scientific developments through the media. Industry has an important role to play in this regard. The more abstract issues relating to scientific method, the 'nature of science' or the production of scientific knowledge cannot be ignored at this more advanced level. However most advanced education systems are making efforts to integrate context-based issues and hands-on activities into science curricula.

### *Primary and secondary level*

- Curricula and assessment mechanisms should promote critical thinking, entrepreneurship and innovation. Junior Certificate reform is a good opportunity to formally embed such skills into the education system as demonstrated by NCCA draft science specification for Junior Certification. Ibec will continue in its efforts to ensure Junior Cert reform progresses.
- There is a strong case for that teacher professional development should be frequent, continuing and progressive during a teacher's career and not limited to introduction of new syllabi.
- Positioning the economy towards knowledge-intensive high-technology sectors

requires a supply of people with science, technology, engineering and mathematics (STEM) skills of the highest calibre. Initiative, such as Smart Futures, should be encourage to promote STEM career opportunities to primary and secondary level students.

- To ensure that Ireland keeps pace with the overwhelming digital revolution and to truly support every child's development potential, an urgent strategic ICT in the classroom initiative is required to support our schools and teachers in fulfilling their key social and economic responsibility.

#### *Third and fourth level*

- Institutes of technology and universities should encourage broader programmes of instruction, both in sciences and in the Arts, Humanities and Social Sciences (AHSS). These should encourage reflection on the nature of the disciplines studied and their relationship with other disciplines.
- Institutes of technology and universities should develop strategic programmes that explicitly remove barriers to interdisciplinary teaching and research.
- AHSS departments should encourage the full exploitation of technological potential in teaching and learning.
- The development of generic skills for PhDs should be at the core of Fourth Level Ireland and other research training programmes.
- HEIs should ensure that strategic engagement with industry identifies the skills deficits and opportunity to address this.

Central to achieving this must be the development of even closer relations between HEIs and industry. While most employers will acknowledge a positive view in term of graduate quality, opinion on collaborations between business and education providers are considered inadequate. It is believed that collaboration could be improved by greater two-way communication between business and higher education, identify a shared objective or common ground and for industry to develop greater partnerships with individual institutions. To support this endeavour Ibec recommend the expansion of the Irish Research Council's Enterprise Partnership Scheme, Employment based Postgraduate Programme and the ELEVATE Postdoctoral Programme.

Innovation is a far-reaching concept that impacts on all elements of a business. It arises from the combination of creativity, research and entrepreneurship. Business and entrepreneurship help devise new products, processes, innovations and develop new markets. The successful linking of the creative and entrepreneurial strands can lead to strong economic growth potential.

Knowledge transfer and the business's absorptive capacity should be a priority. This will allow Ireland to develop real competitive strength in research and development while also creating a dynamic enterprise culture that begins to drive value creation in the economy. This is a far broader concept than being able to convert public investment into commercial products and services. It underpins the elements such as industry-academic collaboration, private sector investment and ultimately job creation for skilled graduates.

The next strategy for science, innovation and technology must further emphasise the connection between research and skill development at all levels.

### **Recommendations for Pillar 8:**

1. Ensure that education and innovation are linked throughout the strategy
2. Incorporate learning activities and projects centred on entrepreneurship, critical thinking and innovation at primary and secondary level.
3. Ensure that education reform progresses.
4. Expand and develop industry and academic training and education programmes.

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