



## **Submission by IRDG to DJEI**

**In response to a**

**Consultation Paper  
For Successor to  
Strategy for Science, Technology and  
Innovation**

**March 2015.**

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## **Industry Research & Development Group (IRDG)**

The IRDG is a non-profit, business-led Innovation Network and representative group of member companies and colleges, working together to drive excellence in Innovation within Ireland's industry to create growth, jobs and prosperity.

Established by industry in 1992, the Group is an independent body, serving the needs of members on all matters relating to Research, Development & Innovation.

IRDG corporate membership is relatively evenly divided between Irish-owned and overseas-owned companies, who range in size from start-ups to the largest companies in Ireland.

The Group is largely funded by members' annual subscriptions.

Over the years, the IRDG has developed a wide-ranging network of partner organisations and has had the opportunity to support members through significant commercial projects.

Today, the IRDG represents all sectors of industry including electronics, software & telecommunications (ICT), financial services, food, software, engineering, healthcare & life sciences, plastics and utilities.

In addition, IRDG membership includes most of the third-level colleges and institutes.

*IRDG activity is organized around the 5 pillars of:*

1. Representation
2. Funding & Support
3. Innovation Networking
4. Collaboration
5. Learning

## **Introduction**

This document has been prepared by IRDG to elicit the views of their members regarding the content and focus of the forthcoming Strategy for Science Technology and Innovation 2015—2020. The consultation paper was issued by the Interdepartmental Committee on ST&I in February 2015, received by IRDG on 24<sup>th</sup> February with submission due by 23<sup>rd</sup> March.

## **Methodology**

The consultation paper consists of 8 Pillars of the proposed strategy and a context for consultation section. The methodology followed in compiling this response has been:

- Review of the consultation paper
- Email survey to all IRDG members including a link to consultation paper.
- Consideration of responses of IRDG members to email survey.
- Interviews with key opinion formers within the IRDG membership representing the main segments of members
- Discussions with other contacts in the ST&I ecosystem
- Compilation of a report for review by the Board of IRDG
- Submission of the report by 23<sup>rd</sup> March 2015.

# Recommendations

## The thrust of the new strategy

“Our key differentiators are talent and technology: to genuinely differentiate its offering, Ireland must be recognised as one of the most enterprise-aligned science, technology and innovation systems in the world, renowned for excellence in research, connecting and collaborating with enterprise, delivering sustainable economic impact, and attracting investment and exceptional talent.”

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

- Ireland’s ambition in STI should be as an ‘Innovation Leader’ in areas where our natural and national resources convey a distinct competitive advantage. The areas emerging from the research for this submission are food & agriculture, renewables & cleantech (environment) and health, each of which are underpinned by those resources. The ambition needs to be as a high-tech country as our cost base will never be our competitive edge. In other areas our ambition should be one of ‘fast follower’ as the lead in these areas will be set by (non-Irish) global companies, many of which have a base in Ireland.
- A dynamic and sustainable ecosystem is needed to underpin effective collaboration between the players. Clusters should be incentivised as they offer a vehicle to coordinate our approach to effective exploitation of technology in key sectors e.g. Bioinnovate, and should be assisted through standard T&C’s and IP agreements. Technology Centres and SFI centres have the potential to act as the drivers of clusters, bringing Irish and overseas companies together with colleges to address common research interests.

## Pillar 2 Prioritised Approach to Public Research funding

- Continuation of the Prioritisation approach is recommended. It is critical that public spending on research is focussed on those areas that will yield the greatest economic benefit.
- The Research Prioritisation exercise is acknowledged as a comprehensive endeavour to exploit STI areas of high potential for Ireland. It is however in danger of elongating research activity without timely assessment of commercial, national and talent impacts. If we are to support 14 research areas, we must have an effective filter so that high potential areas come to the fore quickly, and funding redeployed so that capability can be enhanced in areas that show most promise. The strategy of ‘fail cheaply and quickly’ is increasingly being used to good effect in industry, and while it may not be appropriate to apply it literally in the RP context, it could usefully contribute to the thinking around impact assessment.

- In terms of informing the debate on future funding priorities, complementary Horizon Scanning and Scenario Planning processes should be put in place. The latter would determine the likely impact, and preferred responses for Ireland, to major international issues such as climate change, ageing, and financial disruption.
- Simplification of processes and licensing / IP arrangements is needed to achieve greater engagement between SMEs and the public research system.
- Manufacturing and Services have lagged in terms of public research funding and need an increased focus given their fundamental importance to current and future employment and exports.

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

- Companies can struggle to understand the funding structures in place for Research & Innovation across the various government bodies from EI, SFI IDA, IRC, Revenue, H2020 etc. Better communication with industry is required to explain the many opportunities and incentives that exist.
- Making the R&D Tax Credit limits on outsourcing to a university or institute of higher education less restrictive would support other State mechanisms designed to foster collaborative industry / academia research.
- Scaling R&D intensity could be enabled by providing industry with easy access to use equipment in colleges. Companies should also be facilitated to conduct research in dedicated premises on university campus which have the equipment in place e.g. Teagasc Food Research Centre, Moorepark.
- Innovation Vouchers are acknowledged as being effective as far as they go, but could usefully be extended (selectively) to €20-50k to step-up the collaboration between the company and the college. This would fill the gap between the current Voucher and a research based Innovation Partnership.
- A range of initiatives should be considered to build Research & Innovation capability within SME's.
  - Establish Mentoring schemes over a 3-5 year period
  - Incentivise the employment of dedicated R&D talent
  - Incentivise exchange between 3<sup>rd</sup> level and SME's
  - Incentivise MNC collaboration with local SME's
  - Ease the administrative burden associated with grants, tax credits etc

#### **Pillar 4 International collaboration and engagement**

- The complexity of application and administrative overhead involved in H2020 is a definite barrier to wider industry participation. The concept of a consultant to partner the company, not just at the proposal stage but throughout the project should be considered. Given Ireland's success in the Framework programmes over many years, there is a good resource base of retired, or otherwise, individuals to fill these roles. This is a support which Enterprise Ireland should consider. The community of practice thus established would provide an expertise resource to improve our participation in, and results from, H2020 participation.
- Strategic cooperation with key groups internationally can ensure complementarity in the research and sharing of expertise. But such cooperation often carries a significant overhead and may be beyond the resources of most indigenous companies. By the same token, MNCs in Ireland could seldom justify this involvement from the Irish plant alone. Sharing the overhead however through collaboration in clusters or through Technology Centres brings such participation within the scope of many more companies.
- The Fast Track to Innovation programme recently launched under H2020 has the potential to bring more first timers into EU framework research. The aim is to:
  - Reduce time from idea to market
  - Stimulate the participation of first time applicants to EU research funding
  - Increase private sector investment in research and innovation

The scheme, which is currently in pilot form, provides funding for bottom-up proposals for close-to-market innovation activities in any area of technology or application.

#### **Pillar 5 Optimising organisational / institutional arrangements to enhance research excellence and deliver jobs**

- Expand the Irish Research Council scheme, and SFI Fellowship scheme, whereby a company puts a research person into a college to train in a technology and in research methodologies. EI/IDA should consider a complementary scheme for training NFQ level 6, 7 and 8 engineers. Through their participation in teams, the individuals concerned contribute to the innovation and absorptive capacity of the enterprise; schemes that promote this transfer of researchers between companies and colleges (both directions) should be continued, strengthened and promoted.
- A Market-focussed Research Centre concept is strongly supported as a wide gap is perceived between the development of the technology

and its commercial exploitation. The centre(s) would be the locus for a range of commercial disciplines—financial, legal, regulatory, and marketing. The commercial potential and exploitation element of a research project should be a stronger part of the application process, with commercial assessment operating alongside the technical assessment.

MNCs have considerable expertise corporately in strategic marketing and product management, and may be prepared to assist in the development of these centres and in helping SMEs build a capability in this area. This may include placing people from companies and from academia into a marketing programme in an MNC. It should be noted that a key gap in capability among Irish-owned companies is in strategic marketing.

### **Pillar 6 World class IP regime and dynamic systems to transfer Knowledge and Technology into jobs**

- Knowledge Transfer Ireland should develop, and make available, a catalogue of IP available from colleges and research institutions. It is acknowledged that KTI has already made a significant contribution to the knowledge transfer system including mapping the research expertise available on the island.
- Intellectual Property protocols need to be harmonised among colleges to avoid the wide variation that now applies. Colleges are often overly keen to lock down their IP rather than having it exploited. An alternative would be to provide free access, for Irish-based companies, to the IP in colleges, with deferred revenue based on results.
- The terms and conditions in circumstances of commercialisation outside Ireland should be less favourable to the industrial partner than those applicable to commercialisation with job creation within Ireland. As an example, the option of IP assignment might not be available unless commercialising with job creation in Ireland.

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

- Driving solutions in the health sector should be a focus in the new STI strategy. This has the potential to link policy development to the addressing of national challenges by mobilising our industrial and academic resources. Developing and delivering the solutions would be an incentive for concerted and collaborative action between the enterprise sector, academia, Government and the health sector. With a €13bn budget and continuous damaging disclosures regarding Patient safety etc., health is in the Gov'ts top three priorities. There are significant savings and improvements to be gained from addressing waste in the health service, improving patient flow, managing patient



records, developing new therapeutics, assistive technologies and so on. Ireland's resources in this area include the quality of our medical personnel, research programmes in our major hospitals, presence of the leading MNCs in medical devices, pharmaceuticals and ICT, an indigenous sector with considerable expertise in life sciences and IT and two complementary Innovation Leader areas allied to health— nutrition and environment.

- The exploitation of the three Innovation Leader areas will drive economic development throughout the country. However connectivity will be a determinant of ultimate effectiveness of the Strategy in rural areas—both in broadband and Smart grid. The challenge of sustaining population, employment and quality of life in rural areas is a problem shared across the developed world, and Ireland has the potential to be a leader in development of solutions.

### **Pillar 8 Research for knowledge and the development of human capital**

- The research for this submission has shown that industry regards the PhD targets as an ambition that suits academia rather than many of the industrial R&D performers. There is too much emphasis within the Irish academic system on higher level degrees. Every college is driving towards more advanced qualifications, whereas many companies would be better served by NFQ levels 6, 7 and 8 graduates rather than levels 9 and 10. Internships are essential for levels 6 and upwards, not only for students but for lecturers as well. The position of vocational training is reported as being undervalued. Technician level graduates or apprentices can be excellent operational people, as shown by the Mittelstand companies in Germany through apprenticeship schemes.
- In regard to the college/industry relationship, academics need to develop relationships earlier with companies, if they are hoping to engage them in research projects or internships. Academics from an industry background are particularly good at forming these relationships. Exchange programmes between industry and academic staff should be expanded, to include opportunities at middle management as well as scientific levels for career path development via such exchange.
- It is recommended that young people be introduced to Innovation at Second level, beginning with a pilot programme in Innovative Thinking in Transition Year. This is already the practice in other countries and if STI is to be the driver of our economy that we expect it to be, the earlier that young people learn the techniques of Innovative thinking the better.

## Pillar 1 Investment in ST&I and key goals/targets

Key areas to be explored include:

- a) What should Ireland's ambition be in STI?
  - b) Ireland is currently an innovation follower and lags other small developed countries in R&D intensity. Should we have more ambitious targets for investment?
  - c) How can that level of ambition be justified? Where would we target increased funding and how could this be justified?
- Ireland's ambition in STI should be as an Innovation Leader in areas where our natural and national resources convey a distinct competitive advantage. The areas emerging from the research for this submission are food & agriculture, renewables & cleantech (environment) and health, each of which are underpinned by those resources. The ambition needs to be as a high-tech country as our cost base will never be our competitive edge. In other areas our ambition should be one of 'fast follower' as the lead in these areas will be set by (non-Irish) global companies. However in our lead areas e.g. health, there is an opportunity to partner with the health sector to pilot technology based solutions. It is felt that there would be considerable goodwill among the FDI companies here, and among indigenous firms as well, to develop and test solutions to many of the problems in the health sector.

Connectivity will drive innovation throughout the country—broadband connectivity and Smart grid networks providing the infrastructure for 'whole of the island' involvement in contributing to the realisation of the ambition.

Innovation and agility will need to be shown by Gov't and Agencies, in the same way that it is expected and stimulated in the companies and colleges supported through our STI incentives. The move to Smart Gov't needs to pick up pace and exploit the potential of Data Management and Analytics to improve its efficiency and the service for the citizen. Open Data offers serious opportunities for innovation and economic expansion.

- Research intensity rate (GERD/GNP) is adequate at present at over 2% with a target of 2.5% by 2020. As our GNP is now accelerating, so GERD must increase to keep the rate above 2%. In real terms therefore the investment in R&D will continue to increase. Interestingly GBAORD is reducing while BERD is increasing so a rebalancing of the Government contribution may be needed to keep GERD growing—a situation which may be more palatable as the economic situation improves.

Ireland's rigorous interpretation of State Aids Rules is regarded as an inhibitor on expanding the level of R&D activity in the country. A more

liberal interpretation of the Rules would enable the State to support a wider level of R&D through EI, IDA, SFI and other organisations.

- As GERD increases and funding is redeployed from lower performing, or lower potential, technology areas the extra investment needs to be focussed on accelerating the higher potential opportunities. Ireland has developed an effective incubation model where our entrepreneurial skills increasingly lead to the validation of research projects. Start-ups and scaling of commercial activity resulting from research needs to become an increasing focus of the development agencies as our own capability grows. Israel welcomes FDI but prioritises indigenous industry, especially start-ups.
- A dynamic and sustainable ecosystem is needed to underpin effective collaboration between the players. Clusters should be incentivised as they offer a vehicle to coordinate our approach to effective exploitation of technology in key sectors e.g. Bioinnovate, and should be assisted through standard T&C's and IP agreements. It is noted that the Technology Centres operate on such a collaborative model, bringing Irish and overseas companies together with colleges to address common research interests.

## Pillar 2 Prioritised approach to public research funding

Key areas to be explored include:

- a) How can research prioritisation better serve our national objectives of a strong sustainable economy and a better society?
  - b) How best do we identify emerging areas of opportunity and challenge i.e. Horizon scanning?
- The Research Prioritisation exercise is acknowledged as a comprehensive endeavour to exploit STI areas of high potential for Ireland. It is however in danger of elongating research activity without timely assessment of their commercial, national and talent impacts. The strategy of 'fail cheaply and quickly' has been cited as one that might usefully be employed, and while it may not be appropriate to apply it literally in the RP context, it is being used to good effect in enterprise and should inform the thinking around impact assessment.

There is a perception among IRDG members that we are supporting too many areas under Research Prioritisation and thus spreading resources too thinly. We must have a filter so that high potential areas come to the fore quickly, and funding redeployed so that capability would be enhanced in areas that show most promise. The impact is acknowledged however of the RP exercise, and previous Foresight exercise, in creating a dialog between the players across the STI ecosystem.

- Horizon scanning should be an on-going exercise to identify the areas where funding is being deployed internationally. The output of RPO's should be scanned to determine the gaps and opportunities that are emerging which suggest opportunities for Ireland. The Agencies and Embassies, with their network of international offices, are ideally placed to monitor these developments. (Norway has operated such a Technology Scouting operation for some years). This should be part of the agenda of the Technology centres and SFI centres which should act as technology and business forums, not just in their area of specialisation but in its contribution to the wider economy.

In terms of informing the debate on future funding priorities, the Horizon Scanning process could be complemented by a process of Scenario Planning. This would determine the likely impact, and preferred responses for Ireland, to major international issues such as climate change, ageing, health, financial disruption.

- The response from IRDG members to a specific survey of their views in relation to the success or otherwise of Research Prioritisation supports in particular

- The development of a cross-agency communication strategy to disseminate information to enterprise, improve communication about the public research system and the range of opportunities and supports available.
- The establishment of a concerted, system-wide initiative to engender greater engagement (meaningful, risk-sharing collaborations) between firms (particularly SMEs) and the public research system. The initiative should, based on feedback from firms, actively simplify and streamline processes and remove obstacles e.g. standardise IP, licensing agreements. [This should also address the 'enhancers' that that would support the capacity of the enterprise base to absorb the research emerging from the publicly funded research system].
- Exchange programmes between industry and academic staff, to include opportunities at middle management as well as scientific levels for career path development via such exchange.

### Pillar 3 Enterprise-level R&D and Innovation performance

Key areas to be explored include:

- a) A review of the outcomes of SSTI 2006-2013 shows that targets for the public research base were largely achieved or exceeded. Opportunities exist for further progress in regard to enterprise RD&I activity. How can public policy best support and more effectively optimise the impacts of enterprise RD&I investment - what actions could be taken to:
    - Strengthen the number of innovation performers in the multinational sector?
    - Broaden RD&I activity in the indigenous sector and build absorptive capacity?
  - b) Do we need to enhance the suite of enterprise support programmes to further drive innovation in industry and/or is there scope for consolidation of the existing range of support programmes?
  - c) How can we incentivise firms that are R&D active to scale their research efforts?
- The figures indicate that 54% of MNCs are not active in R&D. The challenge for these companies, where the local management may be keen to begin R&D, is to convince their parent company to support research away from the core R&D at HQ. “MNC’s have to prove that they are twice as good as the parent R&D dept. to have any hope of getting R&D to Ireland”. Showcasing R&D successes and benchmarking Ireland’s performance against best in class will help to make that case. Similarly, the engagement of MNC’s with Technology centres and SFI centres will help to advance the companies’ research agenda in Ireland. From a policy point of view, a benefit from a deeper relationship (e.g. R&D) with more MNCs in Ireland is their oversight and access to successful policy instruments across the world, which can provide intelligence on the gating factors to R&D expansion here in Ireland.
  - Companies often don’t see the development work they are doing as research, and hence fail to take advantage of the incentives. This is a particular problem with indigenous companies where a broadening of the eligible activities which can be classified as R&D would provide the funding to stimulate their innovation activity. Continued promotion of R&D tax credits and the proposed KDB will engage the CFOs in most companies, and draw the company more fully into the R&D community. However auditors of R&D tax credit payments can differ in their interpretation of research and scientific uncertainty. This poses an often unacceptable risk to companies of having to refund payments received through the tax credit scheme. The software industry in particular is seeking:
    - Sector specific guidelines in relation to the eligibility of expenditure

- A consistent approach to the interpretation of legislation
  - Clarity for companies in their applications.
- Scaling R&D intensity could be enabled by providing industry with access to use equipment in colleges—maybe under Innovation Vouchers. This is equipment funded by public money. Companies should also be facilitated to conduct research in dedicated premises on university campus which have the equipment in place e.g. Teagasc Food Research centre, Moorepark. Improved capital grants for equipment and buildings would likewise stimulate R&D intensity, as currently R&D tax credits are the only way to subvent these.
  - Innovation Vouchers are acknowledged as being effective as far as they go, but could usefully be extended (selectively) to €20-50k to step-up the collaboration between the company and the college. This would fill the gap between the current Voucher and a research based Innovation Partnership.  
With regard to Innovation Partnerships, agencies sometimes differ on their support for a company under this scheme. It is important that a unified approach should be applied by the Agencies when a company is applying to an R&D scheme.
  - Deeper relationships with academia will help to build absorptive capacity of indigenous companies through access to skilled staff and research partnerships. Likewise participation in clusters by MNCs, SMEs and colleges (e.g. Infosecurity Ireland) has the effect of stimulating knowledge transfer, R&D intensity and ultimately commercial activity.
  - Too much emphasis is being placed on patenting (expensive and lengthy) when what is really needed is to get the product to market with first mover advantage. In the event of a patent breach, how many SME's (or colleges) could afford to defend it against an international company?

## Pillar 4 International collaboration and engagement

Key areas to be explored include:

- a) How can we further increase/strengthen the effectiveness of our international collaboration and engagement across all areas of STI investment in pursuit of economic and societal goals?
  - b) What additional measures can be taken to maximise the engagement of industry as a partner in this regard?
  - c) What additional measures could be taken to enhance Ireland's participation in Horizon 2020 and other EU Programmes – industry, academia, SMEs and MNCs?
  - d) Are there research policy or programme developments taking place at EU level where enhanced engagement by Ireland could provide opportunities for research collaboration and ultimate economic or societal benefit?
- The complexity of application and administration overhead involved in H2020 is a definite barrier to wider industry participation. The concept of a consultant to partner the company, not just at the proposal stage but throughout the project should be considered. Given Ireland's success in the Framework programmes over many years, there is a good resource base of retired, or otherwise, individuals to fill these roles. This may be a support which Enterprise Ireland would consider. The community of practice thus established would provide an expertise resource to improve our participation in, and results from, H2020 participation. It is understood that the Collaborative Centre for Applied Nanotechnology (Cork) provides such a service. Programmes such as ESA and Eureka have a less complex application process and operate on more regular R&D project lines.
  - Multinational companies often find H2020 participation difficult to justify to their parent companies, due to the administration overhead, but also due to the sharing of IP among the consortium. Companies would like to see more case studies where MNC's have gained genuine benefit and would support initiatives that show the value that participation can bring. Appropriate KPIs and RoI indicators are no doubt available and need to be brought to the notice of potential participants.
  - Strategic cooperation with key groups internationally can ensure complementarity in the research and sharing of expertise. But such cooperation often carries a significant overhead and may be beyond the resources of most indigenous companies. By the same token, while participation in EU consortia may be attractive, MNCs in Ireland could seldom justify this involvement from the Irish plant alone. Sharing the overhead however through collaboration in clusters or through Technology Centres brings such participation within the scope of many more companies.



- The Fast Track to Innovation programme recently launched under H2020 has the potential to bring more first timers into EU framework research. The aim is to:
  - Reduce time from idea to market
  - Stimulate the participation of first time applicants to EU research funding
  - Increase private sector investment in research and innovation

The scheme, which is currently in pilot form, provides funding for bottom-up proposals for close-to-market innovation activities in any area of technology or application.

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

Key areas to be explored include:

- a) What could we do to further enhance our landscape and institutional arrangements to maximise the impact of research excellence and deliver jobs?
  - b) Is there a need for a complementary market focused research centre structure in Ireland and how should that be organised?
  - c) How can Ireland optimise its strategic advantages of location, scale and environmental quality as a fundamental component of its research infrastructure?
  - d) How can we further increase/strengthen the effectiveness of our national collaboration and engagement across all areas of STI investment in pursuit of economic and societal goals?
- Expand the Irish Research Council scheme whereby a company puts a research person into a college to train in a technology and in research methodologies. The IP issue is clear from the start, it belongs to the company. SFI Fellowship scheme is similarly effective but less easy to operate. EI/IDA could usefully look at a complementary scheme for training NFQ level 6, 7 and 8 engineers. Through their participation in teams, the individuals concerned contribute to the innovation and absorptive capacity of the enterprise; schemes that promote this transfer of researchers between companies and colleges (both directions) should be continued, strengthened and promoted.
  - The concept of an Innovation Think Tank should be considered to address the exploitation of major opportunities e.g. arising from Horizon Scanning and Scenario Planning.
  - A Market-focussed Research Centre concept is strongly supported as a wide gap is perceived between the development of the technology and its commercial exploitation. The centre(s) would be the locus for a range of commercial disciplines—financial, legal, regulatory, and marketing. The commercial potential and exploitation should be a stronger part of a research application, with market reports quoted and a commercial assessor operating along with the technical assessor.

MNCs have considerable expertise corporately in strategic marketing and product management, and may be prepared to assist in the development of these centres and in helping SMEs build a capability in this area. This may include placing people from companies and from academia into a marketing programme in an MNC. It should be noted that a key gap in capability among Irish companies is in strategic marketing.

- National collaboration and engagement in STI can be strengthened through expert and relentless communication of the societal benefits, technical achievements and channels of participation. In particular, notwithstanding the achievements of the MNCs, the advances made by indigenous companies need to be highlighted so that we are seen to be doing it for ourselves through our home grown companies.

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

Key areas to be explored include:

- a) The establishment of Knowledge Transfer Ireland has seen an important evolution in our knowledge transfer system but what more can we do to enhance further the transfer of knowledge into jobs?
  - b) In terms of Intellectual Property policy, are there specific interventions or supports of a legislative or non-legislative nature that would improve the business environment and act as an incentive to create and sustain an innovative culture?
- It is acknowledged that KTI has already made a significant contribution to the knowledge transfer system. The map of research expertise from KTI is excellent, but for the next stage industry would like to see a cataloguing of IP available from the colleges and institutions. The IoTs started this in 2010 but it seems to have been discontinued.
  - Although EI and KTI have made some progress in harmonising IP protocols among colleges, there is still a wide variation in how individual colleges deal with IP. Colleges are too keen to lock it down, rather than get it exploited. Some work is apparently underway between EI, the colleges and the Law Society to get a reasonable balance on the IP ownership issue.  
Furthermore Technology Transfer Offices in colleges are reported as frequently having little understanding of what it takes to get a product to market e.g. product registration, toxin studies. However, in a given city, collaboration among TTO's, and between TTO's and Incubation Centres, would result in a sharing of skills and best practice.
  - TTOs should employ risk adjusted NPV based valuation methodologies in all licencing. The Central TTO should define a standard methodology and templates for use by all TTOs. The Central TTO should have the necessary commercial expertise to provide support to TTOs in formulating valuation strategies.
  - The terms and conditions in circumstances of commercialisation outside Ireland should be less favourable to the industrial partner than those applicable to commercialisation with job creation within Ireland. As an example, the option of IP assignment might not be available unless commercialising with job creation in Ireland.
  - The option of colleges taking equity in a spin-out or start-up company may be preferable to royalties for licenced IP. In the view of potential investors, royalties are considered to be ongoing liabilities which devalue a business over time.

- Where royalties apply, these should be capped at a value agreed in advance to be a fair return on the investment of the RPO in developing the IP. Future revenue streams are influenced by many factors including IP; e.g. company investment in infrastructure for manufacture, sales, distribution, marketing, clinical research etc. It is unusual in commercial licencing that the return through royalties would not be capped by some mechanism after an agreed return on investment has been achieved. As an example the CCAN network employ such a strategy.
- In terms of the Knowledge Dev Box, IP agreements with colleges are difficult to conclude to the satisfaction of all parties. An alternative would be to provide free access, for Irish-based companies, to their IP with deferred revenue based on results arising from exploitation in Ireland. This is the model reportedly in use in QUB.

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

Key areas to be explored include:

- a) What steps need to be taken to further the translation of investments in STI into the achievement of stated public policy goals? How can the Strategy enable research programmes to optimally support policy development and actions to address key national challenges in areas such as environment, health, etc.?
  - b) What are the synergies between Government's goals in building a better society and the goal of creating jobs and economic growth?
  - c) How can we address national challenges and also provide economic opportunities through development of new products, processes, systems?
  - d) How can we address local and national challenges that are also regional and global challenges - how can Ireland through its research turn national challenges into global opportunities in areas such as sustainable land use, urban and rural development, and vulnerabilities to global trends and changes?
  - e) How can Ireland harness the opportunities presented by the major developments on observation systems, including the analysis and use of Earth Observation data by a wide array of sectors and users?
- The effective implementation of Pillar 7 requires coordinated action by all the players in the STI ecosystem. Indeed it will be a measure of the effectiveness of coordinated action that will see innovative approaches to the solution of national issues such as rural development.
  - The research for this submission has identified three areas where Ireland can be an Innovation Leader—food & agriculture, cleantech & renewables and health. These are based on our natural and national resources. Taking health as an example there are significant savings and improvements to be gained from addressing waste in the health service, improving patient flow, managing patient records, developing new therapeutics, assistive technologies and so on. With a €13bn budget and continuous damaging disclosures regarding Patient safety etc., health is in the Gov'ts top three priorities. Our resources in this area include the quality of our medical skill base, research programmes in our major hospitals, presence of the leading MNCs in medical devices, pharmaceuticals and ICT, an indigenous sector with considerable expertise in life sciences and IT and two complementary Innovation Leader areas allied to health—nutrition and environment. The challenge is to mobilise these resources to produce a shared understanding of the problems and possible solutions. Developing and delivering the solutions would be an incentive for concerted action between the enterprise sector, colleges and health sector.
  - Addressing rural decline is, and will remain, a Gov't priority. The challenge of sustaining population, employment and quality of life in rural areas is a problem shared across the developed world, and Ireland has the potential

to be a leader in development of solutions. The three Innovation Leader areas identified in this submission—food & agriculture, cleantech & renewables and health—are ideally suited to application in rural areas. In addition, the small scale of Ireland makes it ideal for trialling solutions and pilot programmes.

In the case of health, priority actions might include:

- Linking the national research priorities with clusters of companies that can deliver them
  - The role of Public Procurement and the SBIR scheme
  - eHealth strategy
  - Clinical trials and medical devices
  - Technologies relating to independent living
  - Security of people and communities
- The delivery of solutions through these Innovation Leader areas can provide economic opportunities through development of new products, processes, systems. However connectivity will be a determinant of ultimate effectiveness of the Strategy in rural areas—both in broadband and Smart grid. Tackling the big issues such as health or environment will require the right infrastructure to be in place so that all the resources of the state (and outside the state) can be brought to bear on the problem. Note that the addressing of national priorities may deliver benefit in another country e.g. Photovoltaic research in Germany, in line with a national priority, led to manufacture of the devices in China for the German market.
  - Where gov't has opportunities or challenges they want to address e.g. environment, it is suggested that some of the dividend that commercial semi-states pay to government be invested in researching innovative applications within the organisation instead.

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

Key areas to be explored include:

- a) What more can we do to best harness the potential of our knowledge base for sustainable economic and social well-being?
  - b) What additional steps can government take to ensure the development of human capital across the population to ensure the success of the new Strategy?
  - c) How can we ensure that the requisite links between research and scholarship are maintained across all RPOs?
  - d) In order to achieve a sustainable research capacity, are the outputs of our research system at doctoral and postdoctoral level the right ones in terms of volume, quality and relevant discipline?
  - e) How can the new Strategy support and strengthen the reforms taking place under the Higher Education Strategy and align with the new National Skills Strategy and develop capacity to enable Ireland to deal with new and emerging challenges across the full breadth of government strategies?
  - f) How can we better leverage our research talent into the economy? How can those individuals active in research (and those seeking to be), both in the public and private sectors, be best supported to perform and progress including through optimum researchers' careers, recognition and mobility mechanisms.
  - g) How can gender equality in publicly funded research activity be further enhanced?
  - h) How can the Action Plan for Jobs 2015 objective to increase the number of researchers in enterprise be fulfilled?
  - i) Should research and innovation performers be supported to engage citizens more actively in the innovation process to achieve optimal outreach to the public?
- The STI strategy 2009-2013 made significant strides in increasing the number of PhD's coming through the system. The research for this submission has shown that industry regards the PhD targets as an ambition that suits academia rather than many of the industrial R&D performers. There is too much emphasis within the Irish academic system on higher level degrees. Every college is driving towards more advanced qualifications, whereas many companies would be better served by NFQ levels 6, 7 and 8 graduates rather than levels 9 and 10. Internships are essential for levels 6 and upwards, not only for students but for lecturers as well.

The position of vocational training is reported as being undervalued. Technician level grads or apprentices can be excellent operational people, as shown by the Mittelstand companies in Germany through their apprenticeship schemes.

It is acknowledged that students (and their families) will aspire to higher level qualifications but there is an opportunity for the new STI strategy to promote the worth of, and demand for, qualifications at every level.



- Expand the Irish Research Council scheme whereby a company puts a research person into a college to train. The IP issue is clear from the start, it belongs to the company. SFI Fellowship scheme is similarly effective but less easy to operate. EI/IDA could usefully look at a complementary scheme for training NFQ level 6, 7 and 8 engineers. The individuals concerned contribute to the innovation and absorptive capacity of the enterprise; schemes that promote this transfer of researchers between companies and colleges (both directions) should be continued, strengthened and promoted.

In regard to the college/industry relationship, academics need to develop relationships earlier with companies, if they are hoping to engage them in research projects or internships. Academics from an industry background are particularly good at forming these relationships.

The mechanism through which companies can input into course curriculums, should be strengthened. Colleges should note the courses that companies are running for their staff and aim to address these gaps for graduates.

- There is no stability for researchers and post-docs whose contracts are only for the length of the project. We are losing researchers from academia to positions abroad, as it is reported that there are no full time researcher positions in Irish academia. The individual must have a teaching position first.
- A key element is the internationalisation of our research teams (which we are already seeing to a certain extent). The benefits of bringing in foreign researchers are threefold: firstly it helps solve the serious skills problem, secondly it brings in new and diverse perspectives which boosts the innovation capability and thirdly it brings in knowledge of technologies and markets that we may not have in Ireland.

The Key Worker scheme within IDA 'industry supports package' has good potential for attracting high level staff but is reported as being underutilised.

- The engagement of the public in the world of STI and its outcomes is an essential part of the process. The Science Gallery, European City of Science 2012 and Young Scientists have been highly effective in this regard. But the exposure to innovation is a wider issue and needs to be addressed in a structured way. It is recommended that young people be introduced to Innovation in second-level, beginning with a pilot at Transition Year. This is already the practice in other countries and if STI is to be the driver of our economy that we expect it to be, the earlier that young people learn the techniques of Innovative thinking the better.