

IDA Ireland Response to Consultation Paper for Successor to Strategy for Science, Technology and Innovation

IDA Ireland welcomes the opportunity to contribute to the consultation process for the successor to Strategy for Science, Technology and Innovation. The area of research, development and innovation (RD&I) is of paramount strategic importance to IDA as has been outlined in our recently published strategy. IDA advocates a return to growth in Government spend in public research centres and in particular, we would advocate for a higher rate of growth in budget for direct incentives for companies to invest in R&D (e.g. through the IDA RD&I grant program).

IDA's strategy Winning FDI 2015-2019 outlines a plan to support clients in creating 80,000 new jobs and increase employment in the client portfolio to 209,000 by 2019. Support for R&D will be key to achieving these targets.

Direct financial support for RD&I from IDA to our client companies can

- Help to attract new, innovative & R&D-intensive companies with new high value products/services who are considering investment in multiple locations
- Support continuous development/expansion of existing R&D-intensive clients who must continuously compete with sister sites to be the location of choice for development and commercialisation of the most valuable products and services in the company's pipeline
- Support transformation and prevent job losses in existing client companies who are facing severe competitive pressure and potential closure. R&D may support improvements in productivity, develop a strengthened reputation for quality or to develop new products and services. Direct government support for applied RD&I investment in these companies can be a key factor in winning buy-in from company HQ to maintain the Irish operation

All of the above can assist IDA in achieving our targets for new job creation and minimisation of job losses.

5 key priorities for IDA can be summarised below

1. Increase of Government's annual R&D spend (GBAORD) of up to €1.2bn by 2020
 - Target up to 7% CAGR from 2013 GBAORD base of €732M
2. Target of a parallel increase in BERD to reach €3bn by 2020
 - Maintain current ratio BERD:GBAORD of approximately 2:1
3. Increase of IDA RD&I grant budget to €200M by 2020
 - 20% CAGR from 2013 base of \$58.2
4. IDA strongly supports the creation of a funding program for RTOs under SSTI.
 - Pilot RTO in the area of Advanced manufacturing – potential for merger with existing technology Centre ICMRro
5. IDA to receive increased budget for headcount to establish a small RD&I promotion team, composed of highly qualified staff with a background in research and business development.

Priority 1: Increase of Government's annual R&D spend (GBAORD) of up to €1.2bn by 2020

- a. Target up to 7% CAGR from 2013 GBAORD base of €732M
- b. Allow for expansion in basic and applied research in TLIs (through SFI), establishment of RTOs and expansion of direct-to-company supports for R&D (through EI and IDA)

Sustained Government investment in public research performing organisations, such as Universities, IoTs and other research centres is extremely important to IDA and to our client companies. IDA recognises that value of such investments in driving and sustaining FDI for a number of reasons:

- Internationally recognised principle investigators and research centres in Ireland raise the profile of Ireland with research active MNCs
- Positive impact of research active TLI staff and research centres on the quality of third level education for undergraduates
- Output of postgraduates with research training to masters, PhD and postdoctoral levels from leading Irish research centres will address the skills needs of companies investing in high end R&D (e.g. in semiconductor design)
- Output of research publications in high impact journals raises the profile of Ireland as a location for excellent research
- Output of intellectual property (e.g. patents) from Irish research centres creates potential for licensing and collaboration with MNCs
- Availability of cutting-edge research infrastructure and equipment (from bench to pilot/test bed scale) in publically funded research centres creates opportunities for companies to utilise research centres to support early assessment/adoption of new technology
- Collaboration with research centres creates opportunities for companies to attract very significant levels of state (e.g. SFI) or non-exchequer (e.g. H2020) support for collaboration
- Public research centres can serve as a “neutral venue” to support collaborations between multiple parties/consortia – thereby fostering open innovation and B2B collaboration.

Given the potential impact of the above, IDA advocates a return to growth in public spend on R&D. Good progress has been made in the implementation of research prioritisation and the establishment of large academic research centres in Irish Universities. However further investment will be required to ensure that the Irish research landscape stays competitive within the international landscape and that new emerging areas of research that are of potential interest from an economic and societal perspective can be supported (e.g. connected health, memcomputing, immune-oncology, gene therapy). It is also worth noting that some of the specific areas which have been identified for prioritisation, specifically manufacturing research and services innovation, have not seen sufficient progress in recent years. This is of particular concern given the importance of these areas to regional jobs and exports. IDA advocates specific and substantial interventions in these areas with specific instruments such as the RTO model being of particular interest in areas such as manufacturing research. Finally, while IDA would advocate a return to growth in Government spend in public research centres, we would advocate for a higher rate of growth in budget for direct incentives for companies to invest in R&D (e.g. IDA RD&I grant program) – see priority 3 below.

Priority 2: Target of a parallel increase in BERD to reach €3bn by 2020

A desired result of increase in GBAORD would be that it would stimulate an increase in BERD by multinational and indigenous industry. The target should be to maintain current ratio BERD:GBAORD of approximately 2:1. Increasing R&D spend by both indigenous and MNC companies should create opportunities for stronger linkages between companies (B2B collaboration) on co-development of novel products, services and processes.

Ireland's export economy is showing renewed strength with a healthy mix of high value goods and services exports. Part of Ireland's success has been in targeting R&D-intensive sectors where R&D investment results in high value goods and services. Ireland's GDP growth has and will continue to be strongly supported by exports of high margin products and services which have a high level of embedded intellectual property (in terms of patent protection, trade secrets, know-how or brand value). Investment in RD&I is key to ensuring Ireland can continue to show growth in exports of these kind of high value products and services.

Ireland's goods exports are characterised by a large proportion of high-margin goods such as microelectronics, medical devices, bio-pharmaceuticals and food. In these sectors R&D is vital for the generation of Intellectual property (IP) relating to new or improved products or new or improved processes. Ireland has developed and maintained its reputation for excellence in manufacturing and commercialisation of these IP-rich products, providing a strong economic benefit in terms of sustainable regional employment, export growth, spend in the economy and tax returns. While R&D is vital for discovery and development of new products it is important to also remember the importance of process R&D. Support for RD&I in companies undertaking manufacturing can ensure that companies are ready to produce the high value products of the future and can assist in increasing productivity, reducing waste, lowering costs and increasing quality and consistency in manufacturing. The impact that R&D can have in driving productivity, quality and readiness for "what's next" is very significant in the sectors that make up the majority of Ireland's manufacturing exports (microelectronic, lifesciences, engineering and food).

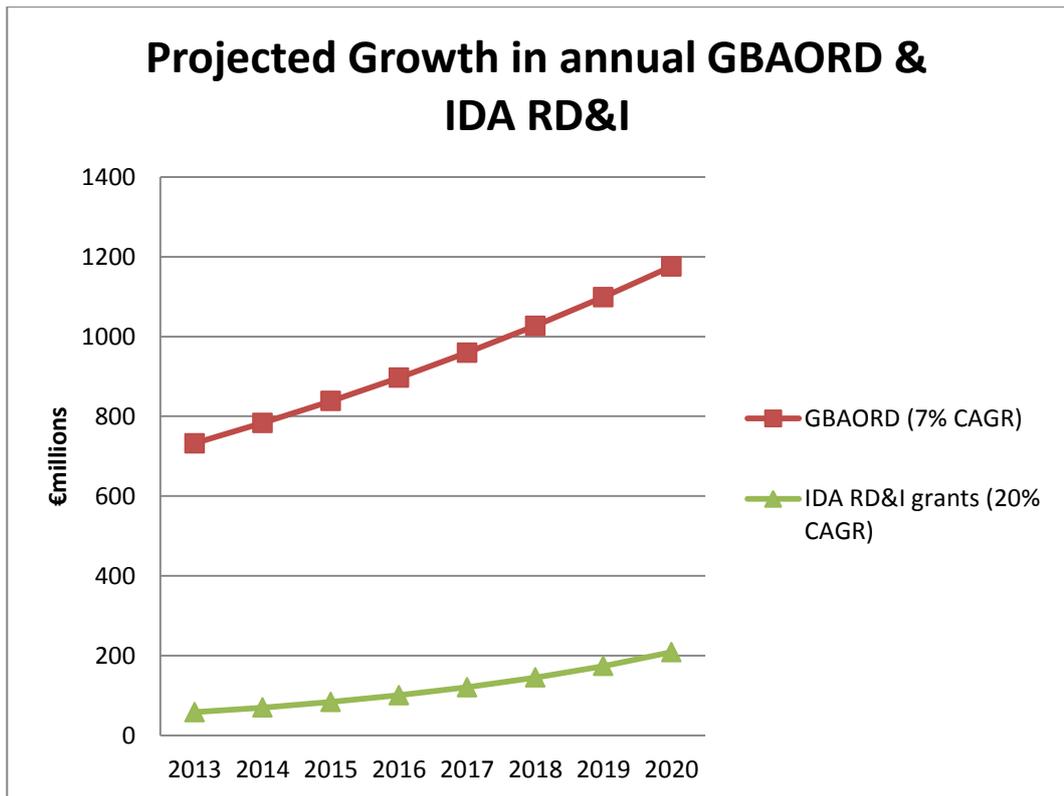
The services sector in Ireland and globally is being transformed by technology and investment in R&D. Industries such as advertising, retail, hospitality and banking are being transformed by the application of technology by research-intensive companies such as Google, Amazon, AirBnB and PayPal to name but a few. RD&I in a global business services context involves the development and testing of new technology which can transform a service offering. Such R&D driven innovation can result in entirely new service offerings or a transformation of existing services at lower cost, greater personalisation and higher quality.

Priority 3: Increase of IDA RD&I grant budget to €200M by 2020

- a. Target approximately 20% CAGR from 2013 base of \$58.2

Year	2013	2014	2015	2016	2017	2018	2019	2020
IDA RD&I grant budget	58	70	84	101	121	145	174	209
(20% CAGR)								

- b. Aggressive growth in IDA budget will be utilised to directly target the winning of high value, high ambition R&D projects from the world’s leading MNCs. These projects will in turn be expected to drive long term job and export growth. IDA RD&I grant program has been shown to have economic value add of €25:1 over a 10 year horizon
- c. IDA RD&I grant should grow at a faster rate than overall spend due to the high return on investment from IDA RD&I program
- d. IDA RD&I spend to increase from current low level of 8% of GBAORD to 16% by 2020
- e. Increased budget will allow IDA to support increased number of 1st time R&D investments by clients (IDA strategy targets at least 120 new R&D performers by 2019)
- f. Increased budget will allow IDA to provide higher R&D grant levels (“Grant bursts”) to incentivise more ambitious R&D investments by clients (develop higher value products/services)
- g. Grant bursts will be targeted at winning investment in new emerging technology areas which have been identified through consultation with industryq as having high potential for economic and societal benefit (e.g. connected health, intelligence, robotics, internet of things, Memcomputing, immuno-oncology, regenerative medicine, additive manufacturing)
- h. Increased budget will allow IDA to incentivise MNCs to undertake collaboration with other companies (B2B collaboration) supporting development of linkages with indigenous companies and convergence across sectors
- i. IDA strategy targets a cumulative €3bn in new RD&I investment projects from MNCs, including in-house and collaborative RD&I projects with European companies and universities by 2019
- j. Increased budget will allow IDA to co-invest with EI in creation and sustainable development of Research and technology Organisations (RTOs) in areas of strategic importance to our client companies (e.g. in Advanced Manufacturing, Internet of Things etc)



In the last ten years, RD&I supports have become the key element of IDA’s financial supports to companies, with the majority of IDA’s grant approvals and payments now being for RD&I grants. IDA’s Client Development Process drives IDA project executives and senior management to engage with key executives in client companies in Ireland and at HQ and analyse the future business and technological roadmap of our key clients, their competitors and their sectors. This analysis very often identifies areas where a targeted R&D incentive (RD&I grant) may support a short, medium or long-term job creation or retention agenda with a client. Larger incentives (higher percentage grant) can be utilised to help win more ambitious R&D investments where the technical risk is high but the potential for long term economic impact may be great (and where international competition for the investment may be intense). In dialogue with key opinion leaders in world leading companies, IDA has identified a number of areas such as connected health, artificial intelligence Memcomputing, immune-oncology and others which have real industry momentum but where Irish subsidiaries of MNCs currently do not have any mandate. There is a strategic imperative for IDA to focus resources on supporting our clients to engage in some of these longer terms investments, even if not all will pay off.

It is worth noting the Government’s R&D Tax credit provides a strong incentive for companies to invest in R&D in Ireland and the credit has become increasingly attractive in the years since it was introduced. The R&D tax credit is now internationally competitive with similar R&D tax credits and write offs available to MNCs elsewhere. As such the Irish R&D tax credit helps ensure Ireland is on a par, competitively, with other locations for R&D. However the R&D tax credit is a somewhat “passive” incentive – a company applies for the credit retrospectively if they have taken the initiative to invest in R&D. The credit is also available at the same level to companies to invest in low

ambition, incremental R&D (e.g. process improvement) or high ambition, high risk R&D (development of breakthrough new products)

In contrast the IDA RD&I grant is proactively offered by IDA to a client to win a specific R&D projects and higher levels of grant funding can be offered to win more attractive/ambitious projects. This combination of “passive” (tax credit) and “active” (grant) incentives provides a powerful and compelling message to international companies that Ireland wants to compete aggressively for high-value R&D investments. The offer of R&D grant support by IDA to our clients to help to de-risk investment in R&D is very much in keeping with IDA’s ambition to be seen as a “partner” to our clients.

However, while Ireland’s R&D tax credit has become more attractive in recent years, (most recently with the removal of the base year), IDA’s RD&I grant program has become less competitive over the years. The overall budget for IDA grants decreased significantly following the financial crisis at a time when the number of companies investing in R&D and the scale of R&D investments were increasing. This has resulted in a decrease in the average level of grant support on a per project basis from 33% in 2006 to 15% in 2013. This gradual decrease in the level of IDA funding creates competitive challenges for IDA in comparison to agencies such as EDB in Singapore who typically compete for similar profile investments. The decrease also sends out a negative message to international companies about Ireland’s commitment to support more ambitious R&D. As funding levels drop below 15% and approach single digits they are arguably reaching a level where they can have only a marginal influence on company decision making with respect to R&D, given the compliance, inspection, audit and legal obligations associated with grant application and draw down. Finally it could be argued that while this level of grant funding may be sufficient to win investments in relatively low ambition, incremental R&D (e.g. process improvement) it may not be sufficient to win the more attractive and ambitious R&D projects that can create more substantial economic value over a longer term.

IDA also sees significant potential for promoting business to business collaboration, between indigenous and MNC companies and between MNCs in the same of different sectors. The availability of significant and direct RD&I incentives can be a key enabler of this objective as it provides an element of “de-risking” for companies to consider collaboration with other companies

Priority 4: IDA strongly supports the creation of a funding program for RTOs under SSTI.

Continued work is required to optimise the balance between fundamental and applied research in the public research ecosystem and consideration must be given to the mode of execution of these two distinct research activities. An attempt has been made (through changing SFIs research mandate to include applied research) to drive the Irish University research community to strive for excellence and impact in both fundamental and applied research. Combined with the responsibility for delivering higher education, such a broad suite of activities is a challenging mandate for the TLIs to deliver on. Consideration should be given to whether a new instrument such as an RTO could form part of the solution to this issue. An RTO could be good venue to specifically support applied research, where the researchers employed by the RTO could focus on delivering to that mandate. They in turn could collaborate, where appropriate, with their peers in University research centres who could place a somewhat greater focus on excellence fundamental research. RTOs should have the scale and scope to support market-oriented, applied, industry led research. RTOs will complement the academic research centres currently funded by SFI. RTOs will be funded at a higher level than current technology centres and will have significant capital budget for facilities and equipment. NIBRT would have many of the characteristics of an RTO and lessons learned from NIBRT would be factored into new RTOs

- Pilot RTO would likely be in the area of Advanced manufacturing – potential for merger with existing technology Centre ICMRro
- Tyndall institute could be funded to upgrade capital infrastructure and move to RTO status in the area of microelectronics
- NIBRT could be deemed eligible for RTO status without need for additional core funding beyond that already committed. Given NIBRT's focus on manufacturing, NIBRT could be aligned closely with or become a subsidiary of the ICMR RTO

Priority 5: IDA RD&I promotional team

Under the winning abroad program, IDA received government support and budget to recruit 35 new staff to assist in marketing Ireland as a location for FDI. The majority of these new recruits have now been on-boarded and are already showing results in terms of new site visits and project approvals. However the Winning abroad initiative was established with a heavy emphasis on winning job-intensive FDI projects and with less emphasis on promoting R&D. As a result, the staff recruited to these roles have, in general, profiles aligned to business development and relationship-based marketing, with few having any R&D background.

In order to maximise the potential impact of state investment in R&D on the FDI agenda, and bearing in mind the highly technical and specialised nature of R&D engagements, IDA requests increased budget for headcount (4-6FTEs) to establish a small RD&I promotion team, composed of highly qualified staff with a background in research and business development. This team will address key elements of IDAs new strategy (Winning FDI 2015-2019)

- a. The IDA Strategy emphasises the importance of IDA continuously improving how we partner with existing and prospective clients (see diagram below). The strategy also focuses on the imperative of increasing focus on winning R&D based investments to support long term growth of jobs and exports from the MNC base.
 - This team will help IDA to drive high value R&D intensive investment by engaging and partnering with key contacts (such as Chief Scientific Officers) with a high degree of credibility.
 - They will use these relationships to identify the technological drivers for new FDI opportunities and deliver projects in these areas
 - Aggressive targets for this team will include supporting at least 120 MNC companies to invest in R&D for the first time, drive cumulative investment of €3bn in R&D by IDA clients over the course of the strategy and and drive strong growth BERD investment form MNCs to support a target of €3bn annual BERD by 2020
- b. The IDA strategy also focuses on the importance of consistent and effective partnership between IDA and our sister organisations (such as SFI, HEA, EI, Government Departments and TLIs)
 - This team will be well positioned to bring the detailed insights into MNC technological roadmaps to the wider public research ecosystem, again with a high degree of technical credibility
 - This team will collaborate with sister agencies to help develop the Irish research value proposition (e.g. via joint work on research prioritisation, evaluation and development of SFI Centres, Technology centre oversight, development of potential RTO program, H2020 promotion)
 - Collaborate effectively with sister agencies market the Irish research ecosystem so that it has an significant positive influence on companies' decisions to locate strategic investments in Ireland

How IDA Ireland **Partners** with Leading Multinational Companies



IDA Responses to Consultation Paper Questions

Pillar 1: Investment in STI and key goals/targets

Question 1: What should Ireland's Ambition be in STI?

Expenditure ambitions:

Subject to continued positive growth in economy/exchequer finances, Government should look to increase investment in R&D (GBAORD) in the coming years, with a target of growing from the 2013 level of €732.6M to approximately **€1.2Bn by 2020** (7% CAGR).

We propose a particular focus on growing the IDA RD&I budget in a more aggressive way in the coming years. Given the importance of IDA client companies to the overall expenditure in R&D and the impact that these investments have in regional employment, exports and tax receipts, we would propose that the **IDA R&D budget should be significantly higher than 8% of the overall GBAORD**. In 2006 the average grant rate awarded by IDA for R&D projects was 33% and by 2013 this had fallen to 15% as more IDA client companies started to invest in R&D and IDA's grant budget was stretched over a larger cohort of companies. While the development of the R&D tax credit was in-part off-set this decrease in IDA grant rate, this decrease in IDA grant rate limits our ability to proactively encourage our companies to invest for the first time in R&D or for companies already investing in R&D to take on more ambitious R&D activity.

The case for increasing investment in IDA RD&I grant program is supported by an independent study on all R&D grant programs commissioned by Forfás which showed that the **IDA RD&I program had, by far, the highest economic value add (at €25:€1)**¹ of any of the state's R&D funding programs. As such this should be an instrument that the state should expand to maximise return on investment.

The Government's commitment and enhancement of the R&D tax credit is also welcome and will have an important role to play in driving increased BERD. Development of the knowledge development box also has the potential to have an important role in incentivising companies to invest in R&D in Ireland.

Output targets:

IDA's strategy has targeted at **least 120 companies to start investing in R&D for the first time by 2019**. An increase in IDA's RD&I budget will be imperative to assist in achieving and exceeding this target. In addition we will continue to promote further R&D investment by companies who have established R&D functions. This will result in an increase in overall business expenditure in R&D. This can be tracked quantitatively through increase in R&D spend at the firm level. As outlined in

¹ Forfás evaluation of Enterprise Business Development Supports: IDA R&D Fund (2003-2009). Based on an estimate by a sample of companies on the potential net impact on future sales and Economic Value Add (sales minus cost of material and services) arising from projects funded through the R&D fund. They estimate growth in both of 4.4 % per annum., which would translate to a return over the 5 year time frame 2009-2013 of €1: €25.5.

the report, Ireland has achieved strong growth in BERD in the last decade and achieved a ratio of approximately 2:1 with BERD reaching €1.9Bn in 2012, of which 70% came from MNC firms. Given that this is regarded as an optimal ratio, we would advocate a target for BERD growth that correlates with the Government's planned growth in GBAORD. Hence should GBAORD increase at a CAGR of 7% to €1.2Bn by 2020, this would equate to **a target of approximately €3bn for BERD by 2020**. This ambitious target for increase in BERD will have to come **from both the multinational and indigenous** sector and we would propose that a significant focus for the next STI should be on IDA and EI promoting **R&D collaboration between firms (B2B collaboration)**. This can drive strategic engagement between MNCs and indigenous within and across sectors and drive the development of a vibrant innovation culture. Research active, innovative indigenous companies are and will become an increasingly important attractor for new FDI. **Higher levels of R&D grants could be made available** by IDA and EI to their client companies who are co-investing in B2B collaborative projects and proposed investments in industry-led RTOs and the existing technology centres can serve as "hubs" to stimulate B2B engagement and collaboration.

Beyond the simple quantitative measure of BERD it is important to consider the qualitative improvements in business R&D activity which will be expected. IDA's will continue to utilise its Client development process and active engagement with clients in Ireland and at HQ to promote continuous development of their R&D agenda. We will push Irish sites to get involved in increasingly **early stages of the R&D "value chain"** (e.g. moving from process improvement into process development and further into early stage product development/design and fundamental research). IDA's new strategy also proposes the use of **"grant bursts" of higher level of R&D grant funding** available to stimulate client companies to invest in technology areas which have been identified as being strategic for the development of the sector (e.g. additive manufacturing, internet of things). This will result in the Irish site becoming more strategically important to the parent company and also provide potential for the site to become the commercialisation site for the firm's latest, highest value products or services. This in turn will provide a strong economic return as it translates into growth in high value exports, investment in new facilities and equipment and the creation and retention of high value jobs.

Based on the data presented in the report we would expect to see the continuation of the trend whereby **R&D performers in the IDA portfolio will outperform non-performers in terms of exports and employment**.

Continued investment and a return to growth in investment in research in the third level system in Ireland is strongly supported by IDA as it has an important role in production of human capital and increasing Ireland's reputation internationally as a location for research and innovation. IDA works closely with SFI, the HEA, the Universities and IOTs in promoting linkages with our client companies, many of whom have established research collaborations and partnerships with these organisations. However following independent review of many of these academic research funding programs in the Forfas study, some questions remain regarding the overall return on investment in funding programs such as the SFI CSETs, SRCs and Centres. While there is strong demand from the academic research community to drive significant increases in available funding, **IDA would suggest that priority should**

be given to more rapid growth of research funding streams that will have a direct impact on enterprise investment in R&D.

Question 2: Ireland is currently an innovation follower and lags other small developed countries in R&D intensity. Should we have more ambitious targets for investment?

It is acceptable to be an innovation follower as long as Ireland remains fast and agile in response to new trends. It is probably unrealistic to expect that Ireland can rapidly attain the status as an innovation leader and for Irish Universities to compete with established powerhouses such as MIT, Oxbridge, Stanford & Berkley. Nonetheless significantly increased investment in STI will be required to simply maintain Ireland's status as an innovation follower. Attempting to attain an innovation leadership position via large scale investment in fundamental research creates the risk that Ireland pursues STI investment in new, unproven technology areas which may not provide a return on investment, while underinvesting in more applied research that could allow exploitation of more established technologies.

Countries like South Korea have emerged from their own financial crisis and IMF bail-out by adopting a "fast follower" approach in science and technology as evidenced by the success of South Korean Chaebols such as Samsung and Hyundai.

Question 3: How can that level of ambition be justified? Where would we target increased funding and how could this be justified?

The level of ambition outlined above is very much in line with the evidence of economic impact derived from recent years of investment by IDA in supporting the R&D agenda in our client companies.

Pillar 2: Prioritised Approach to Public research Funding

Question 4: how can research prioritisation better serve our national objectives of a strong sustainable economy and a better society?

Research prioritisation has achieved good progress in supporting development of state funding for a number of important research areas at a time when there was severe pressure on Government expenditure. A good example is the area of Therapeutics (priority area G) where cross agency support (IDA, EI, SFI, HEA) for research initiatives in pharma and biopharma manufacturing process research (e.g. expansion of SSPC Centre, further funding of NIBRT, creation of the PMTC) supported an area that is vitally important for exports and regional jobs in Ireland. This investment came during a time of threat (patent cliff) and opportunity (growth in biopharmaceuticals) and allowed Ireland to build on strengths and address weakness in state support for R&D.

Research prioritization could better serve our national objectives if greater focus could be placed on a small number of key priority areas (such as advanced manufacturing and service innovation) which have strong relevance to industry where, according to the recent review, little progress has been made to date. In these areas it would be beneficial to pilot new funding models, vehicles and approaches to drive more progress than has been seen to date with the potential to have a significant economic and societal impact. Lessons learned from these new approaches could be applied in the other priority areas.

Research prioritisation should also continue to consider more directly the balance between GBAORD spend on fundamental and applied research. Significant consideration should be given to whether it is realistic to expect single research centres, located in Universities, to be able to carry both a fundamental and applied research mandate. An alternative model would be to utilise SFI Centre funding to support academic led centres that are predominantly focused on fundamental research but have a some applied research activity and have a second distinct funding program/instrument (e.g. the RTO) which supports centres that are predominantly focused on applied research but can bridge back into the SFI centres. While EI/IDA technology centres currently serve some of that latter function, their lack of scale relative to SFI centres indicates the overall lack of substantial funding for applied research centres of scale.

The approach taken in research prioritisation could be applied to a deeper level in the Irish TLI ecosystem by applying some of the same approaches to the allocation of the HEA Block grant. An incremental increase in the block grant in the coming years could be applied to ensure close alignment with the SFI centres model of building a small number of centres of true scale and capacity and ensuring there is strong industry validation for new investments.

It could be argued that perhaps too much emphasis is placed within Government policy and strategy on driving innovation through industry-academic linkages and the new SSTI should place greater emphasis on driving Business to business collaboration (B2B). This can drive greater and more strategic linkages between MNCs and innovative indigenous companies, supporting the global sourcing agenda. This can also promote intercompany collaboration across sectors to drive opportunities in convergence (e.g. factory 4.0, connected health & next generation services)

As evidenced by the recent independent review of research prioritisation, an example of where **research prioritisation is clearly not working is in manufacturing research.** Irish TLIs did not prioritise this area in the period of the original SSTI and hence the TLIs and the funders (in particular SFI) have struggled to respond to this as a priority area in recent years as evidenced by the recent failures in the call for a Centre proposal and research Professorships in manufacturing research.

Given the importance of this area to the Irish economy and society (manufacturing jobs show strong regional dispersal) a new approach to investing in this area could be piloted in this priority area. IDA's new strategy has an ambition to work with sister agencies EI and SFI to secure the funds for the creation of a well-resourced and internationally recognised **Research Technology Organisation in advanced manufacturing.** We believe that this will create a step-change in how research prioritization impacts manufacturing research in multiple sectors by supporting applied research at TRL4-9 in an industry-relevant context. Such an investment will help attract the best manufacturing

research talent to Ireland and serve as a hub for B2B collaboration in manufacturing research. This organisation will be able to operate independently of the Irish TLI system, whereby career development could be tied more closely to industry engagement rather than publication track record. That said, such an organisation would still collaborate closely with academia where appropriate. With separate and ring-fenced funding for this type of RTO centre, it could be seen by the TLIs as complementary rather than a competitive threat.

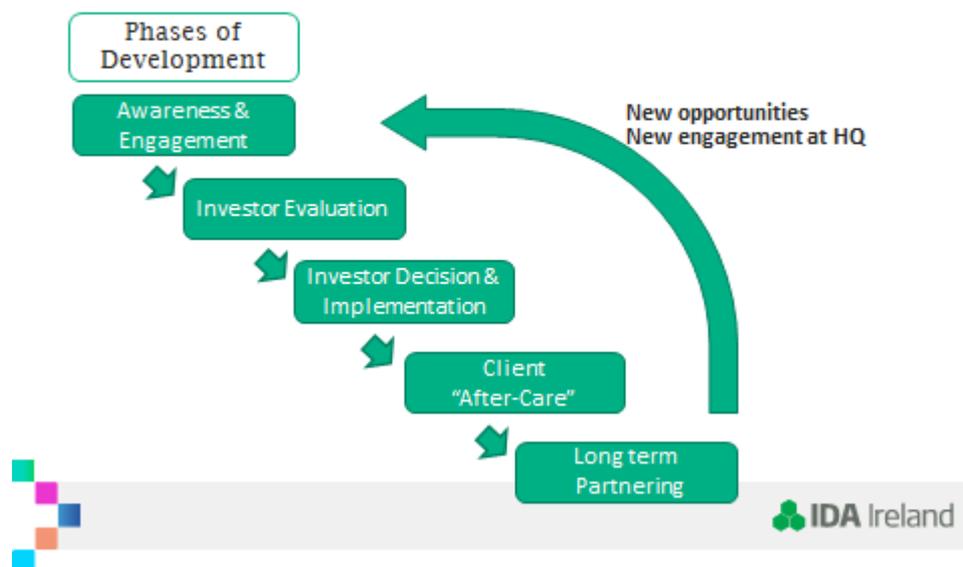
As a pilot, this approach would serve a number of very important roles in improving research prioritisation: it would demonstrate Government commitment to priority areas where less progress has been made, it would test new approaches to supporting market focused applied research and it would serve as a pilot for testing the “RTO hypothesis” which has been identified by two studies as a major gap in Ireland’s research ecosystem.

Question 5: How best do we identify emerging areas of opportunity and challenge i.e. horizon scanning?

IDA has access to some of the world’s most innovative companies who in turn are scanning the world for emerging areas of opportunity and challenge. In IDA’s day-to-day engagement with companies we are often focused on solving near-term problems for our clients – e.g. supporting investment in R&D to improve productivity on an existing manufacturing process. However we have the relationships and access with clients to go much deeper into their long term technology and research roadmap. In turn we can provide access and insights from our clients to our sister agencies and departments.

We employ a systematic process of client analysis and engagement (called the client development process or CDP) to assess our clients, their competitors and sectors and horizon scan on the technological roadmap ahead that will impact their business. In many cases the most important viewpoints on long term technological threats/opportunities may not come from the client contacts in Ireland or the “usual contacts” at HQ, but from new contacts in the companies (e.g. Chief technology Officer, Chief Scientific Officer) with whom we need to develop an engagement with over time. It is important that IDA staff seeking to engage with the leading technical experts in industry have a strong background in R&D themselves and can maximise the value of these engagements for IDA and the client.

This activity has been depicted in the IDA Strategy on “how IDA Partners with Leading MNCs”



Horizon scanning is driven by IDA leveraging our long term partnership with clients and fostering new engagements at the HQ, identifying new opportunities and then pitching these concepts back to the company with a compelling value proposition on “Why Ireland” for this new opportunity. A challenge for IDA is in breaking away from an over reliance on our “usual contacts” and “usual discussions” with clients and dedicating resources to new areas which may be longer term opportunities with less certain outcomes.

A way to address this would be to **establish a small IDA RD&I promotion team dedicated to the research agenda**. This would require additional headcount for IDA to form a small team (4-6) of skilled staff with a background in research (PhD level with background in international academia and industry) and would engage in more long-term strategic dialogue with client companies on their research roadmaps and the opportunities that may exist for them in Ireland or in the EU for research collaboration (links with SFI and H2020). This team would also be tasked with engaging proactively and consistently with the wider Irish community (agencies, departments and TLIs) to convey these insights from industry and work collaboratively to shape Irish research and educations/skills policy. This strategic influencing role of the IDA research team would also help to ensure that when a company was starting to evaluate Ireland as a location for investment in a new opportunity, that the research ecosystem was suitably prepared to offer a compelling case for investment.

Pillar 6: Enterprise-level R&D and innovation Performance

Question 6: 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?**

The single most important policy instrument that can drive MNC investment in R&D is through engagement with IDA on the potential for **grant support for an R&D initiative in the Irish site**. Once a company has started investing in in-house R&D at their Irish site, there is a much greater chance they might consider increasingly ambitious R&D activity and engagement in collaboration with academia or other companies. For MNCs who have not yet invested in R&D in their Irish site, it is unlikely that they will engage in any meaningful collaboration with Irish academia. Or if they do, this will be driven from HQ and have little or no impact on their Irish operation.

Converting non-performers to R&D performers will involve sustained engagement by IDA at the Irish site and at HQ. For companies resistant to the concept of giving an R&D mandate to their Irish site an important tool that IDA can use would be the offer of a very attractive financial incentive to support them in undertaking R&D in Ireland. IDA's current average R&D grant rate of 15% is probably too low to convert a company who are resistant to the concept of R&D in Ireland. While the Irish 25% R&D tax credit is attractive it must be remembered that many MNCs can access similar or more attractive R&D tax credits or tax write offs for R&D conducted in a high corporation tax jurisdictions. Hence the potential for IDA to return to offering higher R&D grants, similar to the situation in 2005 when average R&D grants were 33% would have a significant impact in encouraging more companies to undertake R&D in Ireland. As discussed above, the potential for IDA to offer "grant bursts", higher level of funding for first time R&D would require a significant increase in the IDA grant budget to implement successfully.

In addition IDA Marketing/Comms Budget could be increased to allow for targeted co-marketing with R&D centres in Ireland and overseas. IDAs limited marketing budgets mean we often deprioritise marketing opportunities relating to research centres/research conferences and can't fund institutions to travel to meet us in market for opportunities.

Question 6 part 2

- **broaden RD&I activity in the indigenous sector and build absorptive capacity?**

A focus on supporting business to business collaboration between MNCs and indigenous companies could be beneficial to both sets of companies. While the global sourcing initiative is aimed at driving MNC procurement of existing products and services from indigenous companies, a more strategic initiative would incentivise "co-development" of new products and services. **IDA could offer "grant bursts" to MNCs who undertake R&D projects in close collaboration with an indigenous company**, while EI could provide R&D grant support to the indigenous company to support their efforts in this type of arrangement.

Question 7: 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?

IDA supports to enterprise are very straightforward, the RD&I program is utilised to support R&D projects by the company and these are subject to independent assessment of the technical risk and uncertainty and assessment of the business case by the IDA board. Because the IDA board meets monthly, companies benefit from the flexibility and fast turnaround of this process. However the level of funding available under this program has dropped dramatically in recent years as IDA's capital budget has decreased and the number of companies looking for support to engage in R&D has increased. This program has shown a very strong return on investment with an estimated economic value add of 25:1 based on independent assessment commissioned by Forfás. **A key way to enhance this program would be to increase the IDA budget in the coming years allowing IDA to provide greater incentives to try to drive the types of behaviours by enterprises that are seen as desirable. These would include higher levels of R&D funding for a first R&D project by a company, a step up in the level of ambition of the R&D undertaken by an Irish site, support for investment in strategic technology areas (e.g. additive manufacturing or internet of things), support for R&D in regional locations and support for B2B collaboration.**

A large number of funding programs exist for industry academic collaboration, in particular innovation partnerships from EI and SFI Centres, Spokes and partnerships programs. In addition a number of programs exist from SFI and HEA for industry fellowships. While these programs are welcome, there are somewhat confusing with each program having its own terms and conditions, closing dates etc. This area could well benefit from significant consolidation to improve state return on investment, eliminate duplication and improve clarity of messaging to clients. IDA clients have very successfully utilised the innovation partnership program down through the years and this program has many positive features. It is a rolling program with no closing date and the committee meets monthly to decide on whether proposals will be funded. The level of funding (up to 65%) is very attractive and in recent years this program has been used to fund larger R&D projects (up to €1M) and projects involving more than one company collaborating with each other and an academic partner. There are few restrictions on what academics can apply for funding, and this allows the innovation partnership to fund collaboration with academics who might have a more applied research mind-set and industry track record, even if their academic track record is less strong. It is worth considering whether the innovation partnership program and the spokes program could be merged and whether some of the industry fellowship programs could be merged and simplified.

Question 8: How can we incentivise firms that are R&D active to scale their research efforts?

IDA can incentivise companies to scale their research efforts through two approaches. The establishment of an **dedicated research team in IDA would support IDA project execs in undertaking deeper analysis of a clients' and sectoral technical roadmaps.** This team could work with the IDA exec in Ireland and overseas to engage in a proactive and highly credible way with the key scientific decision makers in companies (Chief scientific officer, chief technical offer) to promote

the idea of broadening and increasing the ambition of their research activity in Ireland. This team could assist the companies in identifying collaborative opportunities with Irish research groups and opportunities to pursue H2020 funding programs.

Secondly the **ability to provide “grant bursts” or higher levels of funding for R&D to incentivise companies to undertake a step change in their R&D activity in Ireland would be a key tool.** Under EU state aid laws, if a company is moving from lower risk, lower ambition “experimental development (e.g. process improvement) into higher risk, higher ambition “industrial research” (e.g. product development, technology platform development) then IDA R&D incentives can increase from a max of 25% to a max of 50%. If companies include a substantial amount of collaboration (e.g. B2B collaboration) then grants of up to 65% are allowable. **This level of funding would have a big impact in incentivising companies to increase the scale and ambition of their research efforts in Ireland.** However this level of funding would only be possible if IDA’s grant budget was increased significantly. It is also worth noting that if a company is encouraged to increase the ambition of its in-house R&D activity in Ireland, then that company is also more likely to be interested in undertaking longer term collaborative R&D projects with academia in Ireland and Europe, thereby opening up the possibility of greater company participation in SFI centres and H2020 programs.

Pillar 4: International Collaboration & Engagement

Question 9: 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?

If a company is encouraged to increase the ambition of its in-house R&D activity in Ireland (through increased funding from IDA under the RD&I grant program), then that company is also more likely to be interested in undertaking longer-term collaborative R&D projects with academia in Ireland and Europe. This will open up the possibility of greater company participation in SFI centres and H2020 programs.

Question 10: What additional measures can be taken to maximise the engagement of industry as a partner in this regard?

While it would be positive to see more MNCs using their Irish R&D group as a hub for international collaboration this area naturally sits lower on the priority list for IDA project execs compared to the imperative of working with the company grow the level of jobs and economic activity by MNCs in Ireland. The establishment of an **dedicated research team in IDA would support IDA’s activity in this regard by providing the bandwidth and expertise to pursue this more long term objective.**

This team could assist the companies in identifying collaborative opportunities with Irish research groups and opportunities to pursue H2020 funding programs.

Question 11: What additional measures could be taken to enhance Ireland's participation in Horizon 2020 and other EU Programmes – industry, academia, SMEs and MNCs?

IDA will work with clients who have the interest and potential to engage with H2020 to support them in any way possible to pursue this agenda. In this regard, **the assistance of EI and SFI is invaluable given their expertise in the complex area of H2020.** The establishment of an **dedicated research team would support IDA's activity in this regard by providing the bandwidth and expertise to pursue this more long term objective.** This team could work closely with colleagues in EI and SFI to assist the companies in identifying collaborative opportunities with Irish research groups and opportunities to pursue H2020 funding programs. The group could also ensure that our colleagues in SFI and EI have a good sense of the precise areas of interest of our MNC clients which will assist in the influencing agenda in Brussels around future calls for research that may resonate with the Irish MNC base.

Question 12: 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?

It is important that Ireland places increased focus on the industrial leadership strand of H2020 to ensure that Ireland has a voice in influencing the research agenda in this strand for the benefit of MNC and indigenous industry. Ireland has an interesting industry base, retaining a higher proportion of manufacturing compared to other EU economies. Furthermore, this manufacturing base is characterised as being quite high tech, with strong representation of bio-pharmaceuticals, medical devices, microelectronics and food in our goods exports. Hence research on advanced manufacturing, under the strand of industrial leadership, should be of strong relevance to Irish industry. **It is important that the views of Ireland's manufacturing base is represented in Brussels to ensure that there is equal representation vis-à-vis other manufacturing sectors such as automotive and aerospace which are more important to other member states.** The interest at EU level in funding high TRL research in key enabling technologies such as biotechnology, nanotechnology, advanced materials and advanced manufacturing is to be welcomed as these are areas where significant research infrastructure (pilot lines etc.) is required to support the "readiness" of new technology for adoption in industry. Ireland's investment in NIBRT is a good example of investing in pilot scale research infrastructure to support a KET and NIBRT is currently pursuing ESFRI status as a key piece of infrastructure within Europe. If Ireland was to invest in an RTO in advanced manufacturing, this should create strong opportunities for collaboration with similar centres in Europe such as the UK catapult centre in manufacturing and the Fraunhofer centres and support Irish based MNCs and indigenous companies who have an interest in manufacturing to engage in Europe.

Internet of things is a huge focus area in Horizon 2020, having started with significant efforts under FP7. Ireland has many natural strengths in this area including both our academic research and our openness in public policy to new models and providing test-beds. An organised approach around test beds such as the TSSG / Teagasc, IBM / Marine Institute and Intel / Dublin City Council projects could leverage more funding in this highly prioritised area.

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

Question 13: What could we do to further enhance our landscape and institutional arrangements to maximise the impact of research excellence and deliver jobs?

Implementation of SSTI policy has tended towards a channelling of the majority of GBAORD funds through the existing TLIs. In parallel, the Irish Universities and IoTs have attempted to position themselves as being able to bridge from both fundamental, curiosity-based research through to market-led applied research. SFI funding is directed to TLIs and is likewise spanning from fundamental to applied research. The EI/IDA technology centre program was originally designed as a program to create industry-led research centres of scale, to focus on applied research. Due to budget cuts, most of these “industry led” centres were hosted in Irish universities. They are dependent on University support and facilities to operate and in many cases struggle to differentiate themselves from traditional academic-led centres.

This approach of channelling the majority of GBAORD spend through TLIs has obvious benefits in terms of leveraging existing infrastructure and capability in the TLIs. However, it also has significant risks in terms of these institutions being challenged to deliver on multiple different agendas (education, fundamental research, applied research industry engagement).

This stretching of the University and IoT mandates across the broad reach from fundamental to applied research is extremely ambitious and one could argue has not been a success. Irishscientists.org have published an open letter to government signed by many Irish academics expressing their dissatisfaction at the overemphasis on applied research. In 2013 the Times Higher Education Survey ranked Irish Universities lowest out of over 30 countries in terms of engagement with industry and winning funds from industry. Two independent studies have also identified that a significant gap exists in the Irish research landscape in the areas of market focused research centre. Hence IDA would strongly advocate the creation of well-funded Research and technology Organisations (RTOs) which are market focused with strong industry engagement and focused on applied, high TRL research. These RTOs would be independent of the Irish Universities and IoTs but retain strong collaborative links with them.

Question 14: Is there a need for a complementary market focused research centre structure in Ireland and how should that be organised?

IDA wholeheartedly supports the concept of a complementary market focused research centre and feels that the RTO, as developed under recent Forfás commissioned studies, would fit this gap very well. **We firmly believed that this model should be piloted in the research priority area of Advanced manufacturing.** IDA has previously invested in a quasi-RTO centre in NIBRT and while this centre struggled for several years with its funding and operational model (due in part to it being the only centre of its kind), it has become a hugely valuable asset to IDA in winning over €3bn of new biopharma manufacturing investments since it opened in 2011. NIBRT currently brings over 50% of its funding for research in cash from industry, far exceeding the 33% target typical for RTO-like centres. In addition NIBRT provides invaluable training for over 3,000 graduates annually in a facility that closely mimics an industrial context.

IDA believes that an RTO centre could be funded by IDA and EI, subject to an increase in respective capital budgets. The board of the organisation would be derived from industry with some independent representatives from academia and agencies. The RTO would have a scientific advisory board derived from technical experts (industry and academic) in the field to assist in identification of priority research areas and guide in recruitment and development of the research team.

The RTO should have a budget to build a new facility, on “neutral grounds” independent of any one University but close to a cluster of relevant companies. The RTO should also have a budget to invest in state of the art research equipment, up to pilot scale to support high TRL research activity. The RTO would have a core funding stream for 10 years subject to rigorous KPIs (on research performance, links with industry etc.) with regular reviews of performance. This core funding would cover the operational cost of the facility and the salaries of a small management team of CEO, CSO/CTO, business development execs and admin functions. Core funding would also cover the salaries of a cohort of principle investigators (Professorial level, lecturer level and PIYRA/SIRG levels) who would be hired by the RTO, or possibly through joint appointments with Universities where the universities may partially cover the PI’s salary. The RTO would have research centre status with SFI, EI and the EU and so could compete for competitive grants. PI’s would apply to SFI/EU for competitive funding to grow their research team. PIs would also engage with industry to win collaborative R&D projects (potentially through innovation partnerships). The centre would also develop additional revenue streams from services such as contract research, training, equipment showcasing/demonstration etc. Surplus generated from these services activities would be reinvested in core research. In total the centre would migrate to a funding model of 1:1:1 in respect to core funding: competitive funding: industry funding in line with international best practice.

Question 15: How can Ireland optimise its strategic advantages of location, scale and environmental quality as a fundamental component of its research infrastructure?

Ireland can establish itself as an optimal location for Business to business collaboration, between MNCs from US, Europe and Asia and between MNCs and indigenous Irish companies. Financial incentives through IDA and EI for company investment in collaborative R&D can support this. Creation of RTOs and further growth in academic research centres can also serve as hubs for B2B collaboration

Question 16: 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?

IDA can contribute more to national collaboration and engagement and can ensure that our client companies also have a greater input in this regard. However as discussed, the establishment of a dedicated RD&I promotion team in IDA would be transformative in creating the bandwidth within IDA to pursue these longer term strategic goals

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

Question 17: 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?

KTI currently can play a role in supporting the process of agreeing the terms and closing deals in licensing and collaboration between industry and academia. However at present KTI does not have the resources of expertise to support to IDA in marketing the capability of the Irish research base to our client companies. Without the ability to market and raise awareness of what is happening in the Irish TLI system, the number of “deals to be closed” will likely remain modest. IDA still has to rely on our own knowledge of relevant research activity in the TLIs and/or support from the TLIs themselves and from funders such as SFI and EI. If IDA had a small RD&I promotion team, these people could liaise more effectively with KTI and the funders and research performers to better market existing capability in research in the TLIs and identify opportunity for linkages with industry.

A common criticism that IDA hears from clients is that, despite having what is a central information sharing platform (KTI does not transact IP nor get operationally involved), the experience of engaging with Knowledge Transfer at each institution has been frustrating. There are two reasons for this – different approaches and terms at each institution (despite a common framework they are

different legal entities) and lack of expertise due to volumes transacted at each institution. An operational, centrally-managed KT office for Ireland which has executive decision making capability would greatly simplify the process and complement KTI's effort. This should lead to more IP being leveraged by the Irish State and more academic-industry collaboration.

Also, Irish knowledge and IP should be sold much more actively by a professional, targeted team. A PPP approach could be explored for this which is driven by commercial reward.

Question 18 : 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?

The proposed KDB is intended to apply to certain qualifying income streams coming from patents or patent equivalents where the value added R&D expenditures/activity was carried on in the same company. However the definition of qualifying assets is currently expected to exclude marketing IP such as trademarks etc. and even items such as non-registered industrial designs, process know-how and trade secrets.

Ensuring that the KDB can apply to a broad base of intellectual property assets will provide a strong incentive to create and sustain an innovative culture

Our current taxation burden for entrepreneurs puts them at a significant disadvantage versus the UK and other jurisdictions. This may have a negative impact on the potential for the growth of innovative SMEs in Ireland which could be targets for B2B collaboration with MNCs

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

Question 19: 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.

This document lists a large number of strategies for development of Ireland's research activity and government policy in areas such as health, ageing, food, marine, environmental protection, energy. What is striking is the large number of strategies & policy initiatives, many or all of which overlap with areas of focus for IDA in terms of attracting or retaining FDI. In addition, IDA would advocate that a number of additional strategic areas should be added to this list, including future skills needs or manufacturing competitiveness.

While IDA is very active in supporting companies to invest in commercial and R&D activity, there is potential for further cross agency collaboration on the prioritization, development and implementation of these strategies. This is reflective of the fact that in recent years IDA's strong

focus on meeting stretch targets for job creation has left less resources and time for engaging on these longer range strategic initiatives. If IDA had a small, RD&I promotion team of experts, these people could liaise more effectively with colleagues in sister agencies to provide the voice of MNC industry in informing the process of strategy or policy development and in supporting implementation of these strategies and policies through driving of linkages with our client base.

Question 21: What are the synergies between Government’s goals in building a better society and the goal of creating jobs and economic growth?

In an industrial context “process R&D” can drive increased productivity in manufacturing and services provision while maintaining the highest quality standards and thereby increasing profitability and improving job sustainability. “Product R&D” leads to the development of new and improved products that provide a benefit to the end user and supports higher profit margins and job sustainability. Fundamental R&D can indirectly support both of the above by developing new technology that can be applied in the above. All R&D creates new knowledge and supports the development of human capital in the firm, leading to spill-over effects throughout society.

However R&D is fundamentally risky and state support for investment by companies (e.g. IDA RD&I grants to companies) is a key way to mitigate risk for companies and ensure that firms do not underinvest in R&D.

Question 22: How can we address national challenges and also provide economic opportunities through development of new products, processes, systems?

Ireland can become a test bed for companies to trial new technologies, products, processes. In the healthcare sector there is an extremely well established route to testing new products – the clinical trial. While various strategies for healthcare have been listed in the document, very little mention is made of how Ireland could position itself as a true centre of excellence for clinical research. Without this focus on fostering clinical trial activity in the Irish healthcare system, many of the laudable aspirations of initiatives such as the health innovation hub, e-health and smart ageing will be difficult to achieve.

For example, a company which wants to test a new drug for chronic lung disease might be interested to do an innovative trial in Ireland using the latest patient monitoring technology to monitor patient response to therapy. By providing a supremely supportive clinical trial ecosystem to assist the company in doing this work, Ireland will get access to new drug treatments and new patient monitoring technology which could have a major impact on how healthcare is delivered and costs of chronic diseases are managed in the future. Tech companies with novel patient monitoring technology will be attracted to Ireland to work with pharma or medtech companies and B2B linkages

can grow from this. The support that companies require to undertake clinical trials has less to do with University infrastructure and impressive clinical research facilities/equipment and more to do with effective networks of clinicians and their patients supported by research nurses, extremely strong project management and a robust but open and speedy ethical and regulatory framework.

The efficacy of this kind of clinical trial network approach to test-bedding can be seen in the area of cancer where the Irish Cooperative Oncology Research Group has been very effective in working at the interface of patients, oncologists and industry: getting the latest drugs and diagnostics to Irish cancer patients, working very well with industry and playing a significant role in increasing cancer survival rates in Ireland in the past 15 years.

It is important to consider how any “test bed” initiative can be structured. Academic research centres often tend to focus on the more creative end of the research spectrum, exploring new concepts and developing new technology. Academic research often tend to develop technology to a point after which there is usually a role for industry to take on the further routine development work required to make a commercial product or service. **Academic researchers may have less interest in the more routine activity of testing technology from other sources (e.g. testing of a pipeline product from industry), where the output of the research may not be a high impact publication but rather may be data to support a regulatory submission or a product performance manual.** This type of test bedding needs a large emphasis on project management and robust systems to ensure that large datasets can be obtained from systematic research activity. It is worth noting that the concept of the RTO is highly compatible with this type of test bedding work. In the area of advanced manufacturing, an RTO may serve as a very effective test bed to undertake routine research on new manufacturing technology (e.g. additive manufacturing) to ensure that it is ready for deployment in a highly regulated manufacturing environment (e.g. for use in medical device manufacturing).

Question 23: 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?

Ireland could offer incentives to companies to solve societal problems. For example the imminent rollout of smart metering for electricity is one example of where this would be useful both in societal and research terms. In this example we could offer preferential grant aid for development of new and innovative solutions in this space (grant bursts) or offer test-bed facilities for companies to trial their infrastructure in a “live” environment. Rewarding innovation at all levels of the value chain for these activities could lead to win/win outcomes for Ireland’s societal needs and companies’ need to develop and test solutions to real world problems. Ireland could create a brand for test beds – something like “small enough to trial, large enough to prove”. This will be increasingly important as the pace of innovation accelerates. It is important to recognise that a significant element of research in the area of test bedding is quite applied and routine in nature, requiring diligent project management and collection of robust statistically significant data as opposed to requiring very

creative approaches and new insights. As such it is important to consider whether such research is best conducted by University academic research centres or whether a different model is required.

Question 24: 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?

Pillar 8: Research for knowledge and developing human capital

Question 25: What more can we do to best harness the potential of our knowledge base for sustainable economic and social well-being?

IDA would strongly agree that human capital is most important output from research base. We would content that perhaps not enough emphasis has been placed on the importance of engineering in research funding. Science has tended to slightly dominate the focus of many of the flagship SFI and PRTLTI investments down the years. Although CSETs referred to centres for Science Engineering and technology, the engineering component was sometimes underrepresented.

IDA invested in the creation of a quasi-RTO in the form of NIBRT. This centre is now working extremely well in providing a real world training environment to over 3,300 people per annum with extremely high employment rates (>70% in the biopharma industry) for graduates. This centre complements undergraduate education in science and engineering and the springboard program for unemployed postgraduates. It also supports companies wishing to support their existing staff in upskilling for next generation technology. The co-location of research and training/education in a state-of-the-art facility that mimics the industrial context is a unique attribute that RTOs like NIBRT can offer in harnessing our knowledge base. Key decision makers in companies like Alexion, Regeneron and BMS have cited NIBRT and its output of trained people as a major determinant in their decisions to invest over \$3Bn in new biotech facilities since 2012.

Question 26: What additional steps can government take to ensure the development of human capital across the population to ensure the success of the new Strategy?

Greater focus on engineering research and supporting engineering graduates pursue some level of postgraduate research would be welcome given the high demand for engineering expertise in industry.

Greater focus on research in support of manufacturing would be welcome given the importance of the manufacturing base to our exports and regional job creation/retention. As discussed the

investment in an RTO for Advanced manufacturing would likely be the single most impactful investment in this regard.

Postgraduate education to masters level is sometimes sufficient for the purposes of research in a manufacturing or services innovation context and an over emphasis on PhD and postdoctoral research can make the public research system somewhat inflexible in response to changes in industry research interests.

For the individuals pursuing these qualifications there is a risk of “over-specialisation” in areas that are no longer of interest to industry, closing off career paths beyond a career in an academic institution. In the biomedical space, Ireland has a very high concentration of bio-pharma and medical device companies and Universities have responded to this by producing a large number of PhD students in areas such as basic biomedical research. While these skills are relevant to some elements of these industry – such as drug discovery and business development , these are not areas that Irish based companies are currently active in. In fact it could be argued that there is a global oversupply of graduates in these areas as evidenced by recent high profile downsizing of HQ drug discovery activities by companies such as Pfizer and Merck. In contrast the industry in Ireland is challenged by a undersupply of masters and doctoral graduates in areas such as process engineering and bioprocess science. While recent scale up of investments by SFI in SSPC and IDA in NIBRT will help to address these gaps, further investment is likely to be required to meet industry needs.

In areas such as Microelectronics, Electronic Engineering and Computer Science additional high calibre candidates at Ph.D level are in high demand and industry could benefit from an increased supply.

Question 27: How can we ensure that the requisite links between research and scholarship are maintained across all RPOs?

Programs are available to fund these linkages but in many cases the researchers in TLIs are not conducting research in areas of relevance to industry or are conducting research at low TRLs, which is of less use to industry. Establishment of RTOs and further development of centres like Tyndall and NIBRT can assist in bridging between the existing TLIs and the Irish industry base. They can provide a location for postgraduate researchers to work on market focused research in a context that is more relevant to industry.

Question 28: 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?

Some significant misalignment between PhD and postdoctoral research focus and industry requirements is evident in, for example, the life sciences. While the majority of industry roles are in

areas such as process engineering, process development, the majority of PhD and postdoctoral researchers have been in areas of basic biomedical research, areas which have been traditionally funded by SFI and EU but where there are relatively few jobs available in Ireland. While IDA would not advocate for closing off of research in basic biomedical research (as this would impact on our strengths in for example Immunology research) it would advocate for increased research in areas such as process engineering. RTOS such as NIBRT, working with centres such as SSPC and PMTC, can drive this.

There is significant potential to explore expansion of education/research to masters level. This would provide the option for students to combine masters to offer unique combinations of skillsets that might be of greater interest to industry. For example a Masters in science (basic biomedical research) combined with a Masters in business could be combined to create prepare students for jobs in the growing area of healthcare economics, an area which large MNC companies may consider as a shared service function that could be operated from Ireland for the wider EMEA market.

Question 29: 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?

Question 30: 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.

The RTO model of market led research centres may provide greater clarity to research leaders and their teams in terms of potential career pathways. The current situation has resulted in TLIs trying to serve two agendas (industry relevance and academic excellence) making it difficult for them to provide clear and consistent guidance to staff on the optimal course for career advancement. RTOs would offer a career pathway which is clearly for those researchers who are interested in working with industry and undertaking applied research to address industry issues. Career advancement would be based on clear metrics around industry engagement. This would allow traditional TLIs to focus more clearly on academic excellence and teaching while ensuring that any outputs from their research which might have commercial value are given support for further development (perhaps through RTOs, start-ups or partnership/out-licensing)

Practical measures which could be pursued might include setting limits on research posts in an academic setting in terms of the tenure which can be held, i.e. forcing interchange between

academia and industry. It could also be mandated that certain courses must have content taught by private sector researchers.

IDA could, for strategic areas supported by grant bursts, mandate that the company must include a budget for collaboration with academic institutions (e.g. funding of postdocs or masters students, funding part of the salary of a new principle investigator etc) and provide curriculum and teaching support for these areas. This would need alignment from the third level system and a process for implementation.

Question 31: How can gender equality in publicly funded research activity be further enhanced?

Perhaps a greater focus on funding for Masters level research qualifications could be of particular benefit to women who may be returning to the workforce following, for example, maternity leave. This would provide opportunities to “top up” previous qualifications and develop the multidisciplinary research capability which could be a valuable commodity in emerging areas of convergence in industry.

Given the need (mentioned above) to place more emphasis on research in engineering, it would also be important to explore ways to encourage more women to take on engineering at undergraduate level.

Question 32: How can the Action Plan for Jobs 2015 objective to increase the number of researchers in enterprise be fulfilled?

There are currently 11,500 employed in R&D positions in IDA client companies and IDA R&D grants are predominantly directed toward support for the salary costs of researchers in industry. **Hence and increase in IDA grant budget will allow for greater incentives to increase researcher headcount.**

It is vital that Irish TLIs and funders take greater cognisance of the types of researchers that industry are looking to hire and ensure that research funding programs are aligned to this so that masters, PhD graduates and postdocs have been undertaking research that is relevant to that which is happening in industry. **The establishment of RTOs as a venue for research activity may increase the “employability” of graduates from masters and PhD programs given the market focused, industry led nature of RTO research.**

Question 33: Should research and innovation performers be supported to engage citizens more actively in the innovation process to achieve optimal outreach to the public?

Yes. Showing how R&D can support job retention and creation would be one compelling way to engage citizens. Providing clear examples and case studies of where industry have used R&D to drive productivity, maintain quality, develop new products or services and thereby create or retain jobs would be compelling to the public. Establishment of a dedicated research department in IDA would greatly assist in supporting our clients companies to drive this outreach to the public