

Consultation on the Successor to Strategy for Science, Technology and Innovation

DRAFT Response from Cork Institute of Technology

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Introduction

CIT strongly welcomes the successor to the Strategy for Science Technology and Innovation 2006-2013. The previous strategy was key to the development of science-based research and innovation (R&I) activities and the development of human R&I capital in Ireland. Several of the initiatives initiated or continued throughout the period of the last SSTI were key enablers in transforming the scale and impact of R&I in CIT. The new strategy should ideally afford similar opportunities for growth over its lifetime, and the even closer alignment with enterprises in the R&I arena, across the landscape of higher education in Ireland.

An internationally recognised competitive R&I ecosystem necessitates coherent and joined-up thinking, with the appropriate amount of investment and the systemic structures that facilitate broad participation.

Ireland's ambition in STI

Ireland needs to invest wisely with the finite resources that are available to us, a statement which is true for any country, but which differs in detail between countries. We need to be mindful that the current economic situation will not last forever and our ability as a country to support economic and societal advances in 10 years' time will depend on decisions we make today. Our thinking needs to have both short-term tactical objectives and long-term strategic goals. There is a danger that the current SSTI draft strategy focuses on the former, perhaps driven by the understandable need to improve employment rates.

In framing the new SSTI strategy we need to ensure that we are positioning ourselves to respond to new models of innovation. We need to broaden the real and meaningful engagement of society and all its actors in innovation. Having macro financial targets is important, but there is a danger that these targets are being met by a small number of dominant industries and educational institutions, rather than on a more balanced and regionally broad basis. The number of large companies in Ireland is limited as is their ability to commercialise all of the state funded research outputs locally. . The broader the reach of innovation, the less exposed we are to shifts in investment or changes to global economic or geopolitical situations. Almost by definition, innovation generates returns which have not been wholly foreseen.

As an open economy Ireland needs to consider models of open innovation. Open innovation increasingly depends on the free flow of people and ideas across international boundaries. And people are at the heart of innovation.¹ As a result, the traditional metrics for measuring impact are changing to include concerns about the social inclusiveness of citizens in education at all levels and in the R&I process, the need for better gender balance, the recognition that excellence has many different meanings, the role of Arts, Humanities and Social Science (AHSS), the increasing importance of lifelong learning, etc.

¹ "Innovation has nothing to do with how many R & D dollars you have. When Apple came up with the Mac, IBM was spending at least 100 times more on R & D. It's not about money. It's about the people you have, how you're led, and how much you get it." Steve Jobs

In scoping Ireland's STI ambition we should recognise that in addition to the traditional R&I track record there are disruptive models of innovation that necessitate consideration. We should recognise that unleashing the nation's full intellectual capital will bring rewards for the whole of society and that investing in "excellence" means different things depending on the context.

Some key questions to ask about the draft:

- Are all potential actors being engaged and facilitated/supported? Are we too focused on a few high-profile "wins"?
- Are we using the best model(s) for converting investment into impact, how do we measure that impact and what timescale(s) are involved?
 - Do we need areas that are funded for immediate impact and others which will position Ireland to be strong in the future (e.g., through becoming knowledge leaders via some form of basic research and by providing excellent human capital, for example)?
- Are we setting the entry bar correctly when it comes to drawing down national funding? Is there an overreliance on the standard metrics? Do we recognise, sufficiently, the difficulties faced by smaller enterprises in raising their levels of innovation?
 - Is there too much focus on bibliographical performance and not enough on entrepreneurial performance, where "entrepreneurial" does not equate solely to commercialisation?
 - Is there sufficient weight being given to creativity?
- Are we sufficiently engaging with the Arts, Humanities and Social Sciences? Do we have adequate funding programmes which specifically recognise the key role they play as disciplines in their own right, and as part of multidisciplinary programmes of R&I? Or do our funding programmes focus too strongly on a narrow interpretation of the National Research Priority areas and what they need to succeed?
- Are the funding programmes which support the development of intellectual capital sufficiently broad? Do they recognise the need to develop such capital, and support its diffusion into society?
- Is the citizen's participation in R&I sufficiently represented – does the new strategy support, for example, SFI's own strategic objective to make Irish citizens the most scientifically-literate?

Evidence based policy

The draft SSTI strategy correctly argues the need for evidence-based policy. Interestingly, however, the evidence presented does not strongly consider the "return on investment" but rather concentrates on statements about Ireland's position against various benchmarks. This shows that Ireland is performing well in many instances, but the data does not question whether our current approach, or likely future approaches, are getting the best return on investment. In this regard, consider the two figures below. Figure 1 shows that CIT's performance against investment in generating top-quality journal publications compares favourably with UCC and DIT (which are chosen as examples of traditional universities and nascent technological universities). Figure 2 shows that, when normalised relative to the R&I expenditure, CIT significantly outperforms the aggregate data for the traditional seven universities in terms of KT outputs. This may well be due to CIT's integrated R&I Innovation

Ecosystem. The implication is that we need to be very mindful of not only outputs, but the ratio between those and inputs.

Institution	Publications per author	Publications in top 10% most cited journals worldwide	Publications in top 10% journals by SNIP	Publications with international co-authors
CIT	2.3	15.6%	23.2%	45.6%
DIT	2.0	14.1%	23.5%	40.6%
UCC	1.9	18.6%	23.3%	46.2%

Figure 1- Publication quality for CIT is comparable with other HEI's.

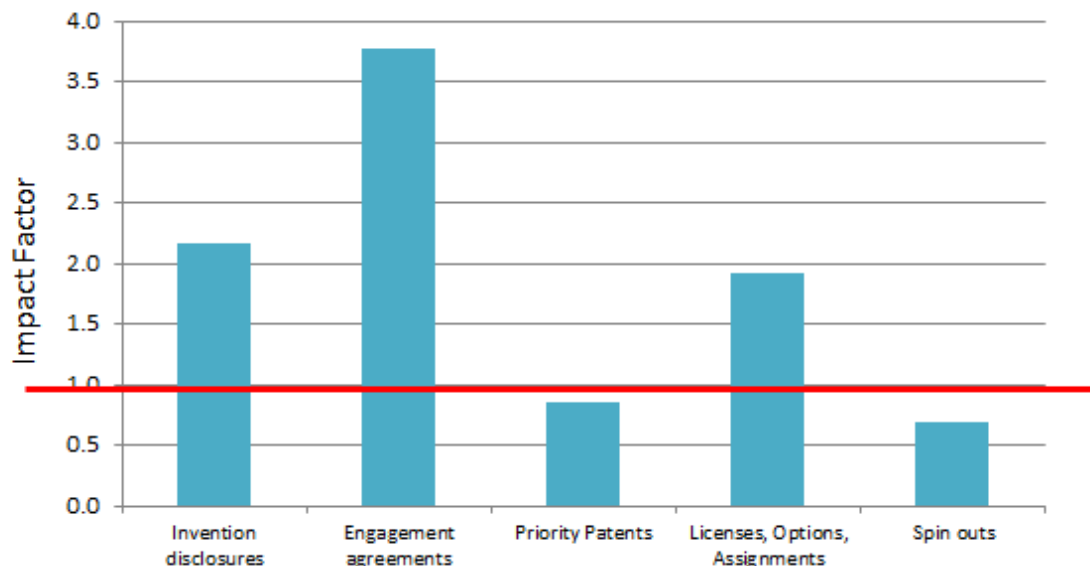


Figure 2 - The red line indicates the expected IP outputs if CIT's research income was equal to the average for an Irish university. Source (university data): Knowledge Transfer Ireland, Annual Knowledge Transfer Survey 2013; the data for CIT is from HEA returns

Facilitating greater participation of SME's

During the period of SSTI 2006-2013 the economic downturn introduced a greater need to have rapid returns on investment (both economic and societal) catalysing the National Research Prioritisation Exercise (NRPE) and initiatives such as R&D Tax Credits. The results of this approach have generated some significant wins, both in terms of bibliographical and citation performance in certain disciplines, and in terms of the number of companies involved in RDI. However, while the macro data is encouraging a look into the detail reveals the continuing lack of significant participation by small enterprises. The enterprise R&I landscape continues to be dominated by multinationals who have the resources to dedicate personnel to medium-to-long term R&I programmes, something which is increasingly difficult as the scale of the company decreases. In Europe, the national target

of €1.25 billion to be won under H2020 means little to small enterprises given that success rates are around 20% for even well-resourced companies (meaning a lack of success of the order of 80%). Third level institutions can play an important role in raising the success rate across a wider enterprise base, and programmes like the EI Technology Gateways could be extended to include supports for H2020 participation, alongside their remit to support access to national funding schemes (notably through EI Vouchers and Innovation Partnerships). In the recent Frontline report the Gateways were found to have a net turnover impact to date of €215m (NPV €166m). This is a return of €5.85 for every €1 invested in the Programme. The Gateway Programme should be expanded as a critical piece of innovation infrastructure regionally. Gateways provide more accessibility, on an ongoing basis, to innovation supports for SME's which are not in a position to commit to the programmatic approach of the large SFI Research Centres and the larger Technology Centres funded by Enterprise Ireland.

There is a limit to the R&I absorptive capacity of enterprises and in many instances smaller companies would benefit from R&I programmes to Master's, rather than PhD, level. This may be sector specific, but there is likely to be significant merit in the new SSTI formally recognising the relevance of R&I to Master's level and the need for funding programmes to support same. These programmes should be available across the full breadth of the HEI sector, and not restricted to a specific sector. Driving innovation into companies can be a mix of passive (e.g., graduates diffuse into the enterprise base) and targeted (e.g., graduate programs that specifically require the involvement of industry, although the considerable overhead associated with IP protection needs to be simplified where possible). The suite of programmes that support R&I in enterprise needs to clearly address the associated needs.

In relation to Pillar 6 and the national IP regime, the establishment of KTI has been a very positive development. In order to achieve the range of objectives set out for it in the IP Protocol of June 2012, KTI needs to be better resourced and funded. In addition KTI needs to focus efforts on meeting the innovation needs of enterprise as opposed to just promoting the large centres funded by SFI and EI. Industry innovation needs can be met through a variety of modes of interaction with the HEIs and the KTI efforts need to reflect this.

CIT would welcome the continuation of the Technology Transfer Strengthening Initiative (TTSI) which has a significant impact on CIT's knowledge transfer activity and the overall framework in CIT for commercialisation of research. Patent funding has become an issue nationally and this aspect should be addressed as part of the new SSTI.

In terms of pillars 5 and 6, there needs to be more collaboration among the research funding agencies in terms of interpretation and implementation of national IP rules for publically funded research. This should be centralised through KTI as the national centre of expertise in this space.

Investment in People

People are at the heart of the R&I system. The new SSTI needs to ensure that supporting mechanisms will be enhanced or, where they do not exist, developed to address, for example:

- **Graduate formation across all discipline areas**
Currently the Irish Research Council (IRC) performs this role. SFI also plays a role here, but almost exclusively as part of applications for project grants, where the main focus is on the research and not graduate formation. In the case of EI there is no support for graduate formation and this appears to be a missed opportunity.
- **Researcher Career Frameworks (RCF)**
In CIT we have established an RCF for contract researchers that includes, as part of its remit, connecting the R&I activities more closely back into the undergraduate educational structures and courses. What we lack is the capacity to drive the process

in the other direction amongst academic staff (i.e., more strongly involve the academic staff in R&I activities) due to contractual pressures. There is a need to provide greater flexibility to facilitate greater engagement between staff and R&I activities, to ensure continued undergraduate education of the highest order. Staff engaged with R&I activities that involve industry have an understanding of the latest issues and opportunities that can contribute to the knowledge base of their students. In addition, the changing research funding landscape has excluded a cohort of teaching staff with an interest in research, but who may not meet the SFI criteria. In terms of the relationship between teaching and research this can only be a negative and the old 80:20 rule applies. 80% of funding is now in the hands of 20% of staff.

- **Structured Graduate Formation**
The draft SSTI recognises the importance of preparing graduates for careers outside of academia (and indeed within). Structured PhDs and Structured Masters are a vital mechanism to ensure graduates have the requisite skillsets for their future careers and for the needs of Irish enterprise and education.

Investment in the R&I Ecosystem

To remain competitive in the R&I arena requires ongoing investment in people and infrastructure. Since the introduction of the National Research Priority Areas investment has become more focused and there is good evidence to suggest that value-for-money has improved in these areas. Nevertheless, there are some associated key areas which should be considered:

- **Infrastructural investments – hard infrastructure**
The equipment and other facilities which underpin R&I activities, especially in science and engineering, need constant maintenance and upgrading, yet the number of routes whereby institutions might find funding is very small and in the case of CIT the overall reduction in the Institute's budget removes any realistic chance to address any shortfalls from within own-resources. This is, however, a system-wide problem. Many of the successfully operating R&I facilities (e.g., Nimbus and CREATE in CIT which combined employ over 150 researchers and research students) are not funded within schemes such as the SFI Research Centres Schemes and are therefore not eligible for potential ongoing maintenance/upgrade from within those schemes, whence alternative infrastructural investment schemes (or funding models for institutions) need to be considered if the considerable expertise and impact is not to be lost.
- **Infrastructural investments – soft infrastructure**
The need for access to journals and other knowledge sources remains critical to all R&I activities. While various open access policies are being developed, the reality is that institutions need access to schemes such as IReL to remain competitive. Currently there is a disparity in the funding mechanisms for access to journals which significantly disadvantages institutions outside of the university sector and this needs to be recognised in the draft SSTI document.
- **Reduction in strategic R&I investments in institutions**
The Programme for Research in Third Level Institutions (PRTLTI) had a hugely positive impact on the CIT R&I ecosystem, largely because it provided a degree of multiannual funding alongside the infrastructural funding. Importantly the programme also afforded institutions to argue for funding on the basis of a developmental trajectory and an institutional commitment to prioritised R&I themes. The result of receiving funding from PRTLTI can hardly be overestimated for CIT and it has facilitated increases in the number of contract researchers from a handful to over 100,

the number of PhD's from 10 to 130, a five-fold increase in journal publications, a ten-fold increase in the number of engagements with companies, etc.

- **Reduction in HERD**
This is a cause for concern and while government budgets are finite there is only so much rationalisation and prioritisation that can take place and still have an effective national R&I ecosystem. An additional cause for concern is the damage that is done when R&I areas are underfunded for a consistent period of time and are therefore no longer in a position to contribute when required. In particular, the increasing opportunities to solve problems and to bring products/processes to market afforded by multidisciplinary research may be lost if the number of supported disciplines continues to fall. While the NRPE areas are well defined, the wider base of expertise that is required to support them will deteriorate from a potential lack of funding mechanisms. Explicit references in the draft SSTI of the need to fund supporting mechanisms, including but not confined to those in AHSS, would be very constructive.

Engaging the citizen

While the need to engage the citizen in R&I activities - increasingly labelled as Responsible Research and Innovation (RRI) - there appears to be a lack of coherence in programmes which would support this. While it is generally known that engaging citizens in RRI requires investment in personnel and infrastructure, the level of investment is at less than 0.1% of the R&I budget quoted in Table 1 (page 7) of the draft SSTI document. And while there are references to “excellence” in R&I there is no plan, as yet, to support excellent facilities which would have the scale and impact to leave a lasting impression on the public. A recent report by John H. Falk Research involving 10,000 individuals from 17 science and discovery centres (not to be confused with museums) across 13 countries concludes that: *There is significant evidence that Science & Discovery Centres provide memorable learning experiences which can have a lasting impact on attitudes and behaviour. For both youth and adults, visiting a science centre significantly correlated with increased: Science and technology knowledge and understanding; Science and technology interest and curiosity; Engagement with and interest in science as a school subject (youth); Engagement with science and technology-related activities out-of-school; and Personal identity and confidence in science and technology.*² Ireland has few of the types of centre listed in the report, although we are well served with excellent museums, and this is largely due to an almost complete absence of national funding to establish and maintain such centres. CIT operates a science and discovery centre at Blackrock Castle Observatory with over 100,000 visitors annually, and has all the requisite expertise to engage with the public in RRI, yet there is no funding mechanism of scale which recognises its impact, nor provides the additional resources to facilitate growth. The draft SSTI should recognise the need to redress Ireland's paucity of Science and Discovery centres.

² *International Science Centre Impact Study Final Report* (Feb 2014). The International Science Centre Impact Study, a consortium of 17 science centres in 13 countries under the direction of John H. Falk Research and involving Technopolis, was designed to empirically determine whether experiences at science centres correlated with a range of critical public science and technology literacy outcomes.