

# Review of supports for exploitation of Intellectual Property from Higher Education Research

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An Roinn Fiontar, Trádála agus Nuálaíochta  
Department of Enterprise, Trade and Innovation





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## Executive summary

### 1 Introduction

Forfás was asked by the Department of Enterprise, Trade and Innovation (DETI) to undertake a review of current supports in place to encourage the exploitation of intellectual property (IP) emanating from publicly-funded research in the higher level sector. The IP Framework (the generation, capture, protection and exploitation of IP) is a vital component of the Strategy for Science, Technology and Innovation, 2006 - 2013, (SSTI) and provides mechanisms for the transfer of knowledge from publicly-funded research into the market place.

The current impetus to turn good research ideas into commercially successful products and services has been given added urgency by the current economic circumstances and the need to ensure that a demonstrable and speedy return on investment through commercialisation is achievable. Concerns have been raised around the suitability and effectiveness of the IP arrangements. To address the concerns this systematic review was commissioned in order to determine a) the validity, b) the extent and c) the cause of these issues. It is intended that the review will provide clarity around the policy objectives and measures to improve the IP arrangements.

### 2 Objectives and Methodology

The objective of this study was to determine whether the current IP arrangements for publicly-funded research in Ireland support the objectives of the SSTI by reviewing the following:

- national and institutional policies that frame the IP arrangements; and
- operational efficacy of the IP arrangements within the funding bodies and research organisations and how they meet the needs of enterprises and entrepreneurs.

The review considered what Ireland seeks to achieve from its national strategy and whether the appropriate policies and levers are in place. It also assessed the impact and suitability of existing policies and practice and benchmarked Ireland against international best practice. This review will be used to build on existing policy to ensure that, where appropriate, a return on investment through commercialisation is achievable thereby maximising the benefit to the Irish economy.

The review's methodology comprised a wide consultation with 78 stakeholders from 42 organisations including central Government, state agencies, multinational companies (MNCs), small and medium enterprises (SMEs), Higher Education Institutes (HEIs) and Technology Transfer Offices (TTOs). Consultations took place between 15th October and 22nd December 2009 and comprised 5 round-tables held in three locations nationally and a series of one-to-one interviews.

The consultations and this report centred around 4 topics, namely:

- ***Suitability of national policies and guidelines:*** the extent to which the national policies are properly defined, understood and are fit for purpose
- ***Suitability of the set of national measures:*** the extent to which the national guidelines, templates and financial stimuli reflect the overarching policies and guidelines and collectively meet stakeholder needs

- **Effectiveness of the measures at national level:** whether policies are appropriately communicated from central Government to the state agencies and the effectiveness of processes for implementing the national measures, as well as whether resourcing, governance and culture within the funding agencies<sup>1</sup> are appropriate
- **Effectiveness of the measures at institutional level:** whether policies are appropriately communicated from the state agencies to the higher education institutes (HEIs), the effectiveness of the HEIs' processes in the stages of generation, capture, protection and, in particular exploitation of IP, as well as resourcing, governance and cultural issues.

In addition to the consultation exercise background research into international best practices in IP commercialisation with which Ireland could be compared was conducted. The countries selected were United Kingdom, United States, Finland and Singapore.

### 3 Overall Findings

In comparison with international standards and whilst mindful that Ireland's system is still relatively new, the national measures are performing well above expectations and are achieving good value for money. Overall the findings show that Ireland's system for commercialising IP from the HEIs is making strong progress. Ireland's national policies and guidelines for managing and commercialising IP arising from publicly funded research are internally consistent, in line with international good practice and provide a good starting point for implementation. They are also consistent with the policies set out in the SSTI and Smart Economy documents. General consensus was that the processes used for implementing the national measures were effective, although, given that many of the measures are recently established and are progressively evolving to more advanced systems this is, in some cases, being perceived as instability.

In addition, the national measures appear to be adequately resourced in terms of value and timescales associated with funding, though there are concerns around how this will change given the economic situation. The TTOs were considered to have adequate resources in terms of headcount but that they need to be up-skilled.

Much of the perceived instability and change in focus is the result of a nascent commercialisation system that has had insufficient time to bed down. The focus of this study has been on identifying root causes to weaknesses in the system and concentrated on identifying recommendations (Table 1) that will improve effectiveness in the short term and also develop more strategic recommendations that will have an impact in the medium to long term. Short-term solutions that could be actioned during the early months of 2010 are highlighted; longer-term directions for 2010 and beyond are also indicated. Linkages between recommendations are also indicated. The main high level findings and recommendations, if addressed, would significantly improve the commercialisation of the IP generated in the HEIs.

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<sup>1</sup> In this report the term 'funding agencies' or 'agencies' refers to all those state agencies that fund research in the public sector. They include but are not limited to Science Foundation Ireland (SFI), Enterprise Ireland (EI), Industrial Development Agency Ireland (IDA), Higher Education Authority (HEA) etc.

Table 1: Overview of recommendations

Suitability of National Policies and Guidelines		
Definition of policies & guidelines	<b>R1:</b> Revise the national policies and IP guidelines to recognise the ecosystem nature of innovation and to include a differentiated approach to deal appropriately with IP of various kinds and from different scientific and application domains.	Long Term
	<b>R2:</b> Review the criteria for TTO support for HEIs, in particular taking into account the IoT role as providers of applied and multi-technology solutions to industrial needs.	Long Term
Understanding of Policies & Guidelines	<b>R3:</b> DETI to promote understanding of national policy on IP commercialisation and provide guidance on how to deal with differing national policy objectives in specific situations.	Short Term
Fitness for purpose of Policies & Guidelines	<b>R4:</b> Through bottom-up consultation between the TTOs and the funding agencies, develop a set of national model agreements and principles.	Short Term
	<b>R5:</b> Develop and implement a broad set of performance metrics, using a balanced scorecard approach, which would combine transaction activity (as it currently does) with knowledge transfer activities. The metrics should encourage a sustainable pipeline of quality IP and ensure wider economic wealth.	Short Term
Consistency with EU Policy	<b>R6:</b> Explore, in discussion between TTOs and funding agencies, approaches to IP commercialisation that remain within state aid rules, document these approaches and use them to provide practical advice on this to TTOs and other stakeholders.	Short Term
Suitability of the set of national measures		
Completeness of the set of national measures	<b>R7:</b> In setting out future IP commercialisation schemes, develop and implement schemes which will support the translation of the results of academic research into viable commercial propositions, for example by providing appropriate early-stage funding, ensuring that the business case for a candidate spin out is robust or bringing in experienced entrepreneurs to help make new start-ups operational.	Short Term
Alignment with stakeholder need	<b>R8:</b> Widen the IP Commercialisation schemes to cover broader knowledge transfer (e.g. skills, capabilities and networks) rather than just technology transfer.	Long Term
	<b>R9:</b> Clarify for the benefit of all stakeholders, but especially for industry, what the current objectives of the funding agencies are. Clarify also how SFI, in stressing commercial relevance of research balances this objective against the objective of developing a highly skilled pool of talent, and clarify how this balance is expected to change.	Short Term

Linked Recommendations

Effectiveness of measures at the national level		
Process for implementing national level measures	<b>R10:</b> Develop a systematic mechanism for engaging key industry and HEI stakeholders in government and agency work to develop new IP Commercialisation schemes and/or to modify existing ones.	Short Term
	<b>R11:</b> Emphasise the position that HEIs, through their TTO Director, are clearly empowered to do deals without being required to seek agency approval, provided those deals meet national standards for quality, financial terms, maximum deal size and, where appropriate, geographic destination.	Short Term
Effectiveness of process governance	<b>R12:</b> Whilst ensuring that effective decentralised TTOs are maintained in HEIs, revise and widen the scope and remit of EI's existing central support services for TTOs with, for example, legal services etc.	Short Term
Effectiveness of measures at the institutional level		
Commun'n of measures to institutions	<b>R13:</b> Identify, jointly between Agencies and HEIs/TTOs, and implement ways to enrich existing formal communication and dissemination mechanisms, for example by a regular news publication, 'master class' meetings, action accountability and reporting and a dedicated website. Include wide dissemination of commercialisation success stories amongst all stakeholders, ensuring that processes for capturing feedback are in place.	Short Term
Implementation	<b>R14:</b> To ensure reasonable levels of IP integrity which at least meets international best practice, HEIs, with support from their TTOs, should work together to enhance their systems to develop a consistent approach to achieve this aim.	Short Term
	<b>R15:</b> Agree, jointly between agencies, HEIs and industry, and publish a common position statement setting out what warranties of IP integrity industry can reasonably expect HEIs to give.	Short Term
Process Governance	<b>R16:</b> Each HEI should develop a commercialisation strategy, TTO mandate and performance metrics which takes into account the importance of the role of building and managing relationships and IP portfolios and reduces the levels of effort TTOs spend on 'reactive' activities.	Long Term
Resourcing	<b>R17:</b> Review the arrangements for continued central and financial support for TTOs beyond the term of the current five year Technology Transfer Support Initiative (TTSI) cycle and provide clarity in the near term to the TTO staff because given the relative recent set up of the current TTO structures and Ireland's scale of activity it is unlikely that TTOs will be commercially self-sustaining in the short to medium term.	Short Term

Effectiveness of measures at the institutional level Continued		
Culture	<p><b>R18:</b> While the time taken to do a deal is typical by international comparison there is an opportunity for Ireland to be quicker than everyone else. This can be achieved by setting up a standard list of elements of the deal process and record the time taken for each element of the negotiation process. Based on this analysis, agree realistic targets for TTOs for the maximum time allowed for each element over which they have control.</p>	Short Term

#### 4 Suitability of national policies and guidelines

##### Definition of national policies and guidelines

This section considered the national policies and guidelines that provide the context and direction for IP commercialisation.

It was found that the principles that underpin the national policies and guidelines are in line with international good practice. These principles include the need to maximise the economic and social benefits of public investment in research; the preference for HEI ownership of IP arising from most forms of collaborative research; and the view that joint ownership is discouraged but can be used when unavoidable.

However, the national policies are founded on a linear model of innovation which means that a concept moves step by step from research through development, into production and finally to market. Modern best practice recognises that this is an overly simple model that does not adequately describe the complex processes involved in innovation. A far richer view of innovation is to see it as a web of highly iterative processes involving multiple actors in an innovation network or eco-system. Therefore, policies, measures and metrics based on the linear model are likely to have limited effectiveness.

In addition to using the linear model of innovation the policies don't distinguish between the different types of IP which can give rise to the industry concerns that HEIs overvalue the IP. IP is generated at different levels of maturity - that generated from basic research is not the same as IP which underpins a HEI spin-out. The gap between having IP and a commercial product is substantial. A further distinction needs to be taken into account with regard to the scientific domain from which the IP arises and the implications this has for time-to-market.

##### Recommendation 1:

Revise the national policies and IP guidelines to recognise the ecosystem nature of innovation and to include a differentiated approach to deal appropriately with IP of various kinds and from different scientific and application domains.

The report also considers the role of the Institutes of Technology (IoTs) and while not pre-empting what may emerge from the National Strategy for Higher Education recommends the following:

**Recommendation 2:**

Review the criteria for TTO support for HEIs, in particular taking into account the IoT role as providers of applied and multi-technology solutions to industrial needs.

**Communication of national policies and guidelines**

The findings show that an understanding of the ambitions and directions set out in the national policies was sometimes poor and communicating the need to pursue multiple national priorities needed to be improved. The SSTI and the *Smart Economy* document together set the basic framework for the roles and activities for several state agencies, e.g. Enterprise Ireland (EI), IDA Ireland (IDA) & Science Foundation Ireland (SFI). With each agency having different mandates they each implement the national policy in line with their own particular mandate. As a result the policies and actions of the different agencies can appear in conflict with each other and this has caused considerable confusion amongst stakeholders. These parallel priorities are inevitable.

However, it's the apparent patchy awareness of the content of the various national policies and guidelines that suggests that a necessary first step is for central government and the agencies to communicate and explain more effectively the underlying thinking in the national policies, including the need to deal with multiple ambitions. A second step would be to provide guidance on how to reconcile the differing national ambitions in specific cases.

**Recommendation 3:**

The DETI to promote understanding of national policy on IP commercialisation and provide guidance on how to deal with differing national policy objectives in specific situations.

**Fitness for purpose of national policies and guidelines**

The national policy documents are broad as they set out the framework for stimulating IP management and commercialisation and the guidelines, i.e. the codes of practice and the funding agency guidelines, show how individual commercialisation arrangements should be structured. However, the general consensus was that the guidelines are not sufficiently prescriptive. This gives rise to a lack of consistency from one deal to the next and no clear expectations for the starting point in negotiating a deal. There is a need for more prescriptive guidelines and templates to be developed and applied consistently by all the agencies.

**Recommendation 4:**

Through bottom-up consultation between the TTOs and the funding agencies, develop a set of national model agreements and principles that set out the preferred terms applying to IP and allow the TTOs flexibility in negotiating the financial and other terms of an agreement on a case-by-case basis, within clearly understood boundaries. These should be common to, and consistently used by, all agencies; recognise the different needs of different types of company (such as SMEs vs. MNCs); and create an appropriate playing field for each type.

The findings show that while metrics are an important indicator of the performance of the TTOs the metrics used sometimes distort behaviour and there appeared to be an overemphasis on quantity over quality. A more successful set of metrics would be to use a balanced scorecard approach, combining measures of current transaction activity with others that assess the economic and social benefits of the knowledge transferred and the quality of the relationships developed by the TTO with both the academic and industrial communities.

The linear model of innovation and the associated metrics assumes that more deals to commercialise results must lead to more successful companies and products. In reality however, success is more likely to follow if research results are carefully selected for commercialisation on the basis of their market potential. This requires continuous dialogue between researchers and industry. It is important that the policies and measures also drive quality and sustainability which can be constrained when metrics focus on deal flow.

**Recommendation 5:**

Develop and implement a broad set of performance metrics, using a balanced scorecard approach, which would combine transaction activity (as it currently does) with knowledge transfer activities. The metrics should encourage a sustainable pipeline of quality IP and ensure wider economic wealth.

In addition to the national policies the EU State Aid rules with regard to IP are poorly understood. More guidance and information is required in this area.

**Recommendation 6:**

Explore, in discussion between TTOs and funding agencies, approaches to IP commercialisation that remain within state aid rules, document these approaches and use them to provide practical advice on this to TTOs and other stakeholders.

**5 Suitability of the set of national measures**

This section considered the set of measures that are in place to support and encourage the commercialisation of IP arising from HEI research.

It was generally agreed that there is an opportunity to provide more support for the development of academic results into commercial propositions that would be considered commercially attractive in the private sector. Crossing the "valley of death", i.e. translating

the results of academic research into a commercial proposition, is often difficult for apparently two reasons, namely:

1. Lack of early stage funding
2. Lack of appropriate leadership skills needed to translate the results of academic research into a commercial proposition

This issue has already been recognised and schemes, such as EI's Business Partners Programme, have been established.

#### **Recommendation 7:**

In setting out future IP commercialisation schemes, develop and implement schemes which will support the translation of the results of academic research into viable commercial propositions, for example by providing appropriate early-stage funding, ensuring that the business case for a candidate spin out is robust or bringing in experienced entrepreneurs to help make new start-ups operational.

Another important finding was that the present emphasis on technology transfer risks disguising the importance of the larger need for knowledge transfer, which was an important need expressed by some MNCs. Industry - the ultimate customer of technology transfer is focused on the quality of skills base and is more important to them than the IP portfolio available. Therefore it would be worth considering widening the scope of the measures to cover knowledge transfer in addition to technology transfer.

#### **Recommendation 8:**

Widen the IP Commercialisation schemes to cover broader knowledge transfer (e.g. skills, capabilities and networks) rather than just technology transfer.

#### **Recommendation 9:**

Clarify for the benefit of all stakeholders, but especially for industry, what the current objectives of the funding agencies are. Clarify also how SFI, in stressing commercial relevance of research balances this objective against the objective of developing a highly skilled pool of talent, and clarify how this balance is expected to change.

## **6 Effectiveness of measures at national level**

This section considered to what extent the various measures (Table 3, page 32) related to IP commercialisation are effectively managed at national level, in particular by the funding agencies. Again the issue of communication was highlighted.



### Processes for implementing national measures

In general it was found that the processes for implementing the national measures were effective but were still evolving. However, stakeholders from both industry and the HEIs felt that they could be better consulted when revising existing measures and developing new ones.

#### Recommendation 10:

Develop a systematic mechanism for engaging key industry and HEI stakeholders in government and agency work to develop new IP Commercialisation schemes and/or to modify existing ones.

In addition there was a perception that an agency may interfere with a TTO which caused difficulty when finalising deals. While these comments were relatively infrequent it raised an issue of TTO governance and motivation. While it is appropriate for funding agencies to set and monitor financial and quality standards it would be preferable to allow TTOs to act autonomously to those standards. This would place responsibility for deals with the HEIs, where it appropriately belongs, speed up decision making and motivate TTO staff by signalling trust in their ability.

#### Recommendation 11:

Emphasise the position that HEIs, through their TTO Director, are clearly empowered to do deals without being required to seek agency approval, provided those deals meet national standards for quality, financial terms, maximum deal size and, where appropriate, geographic destination.

### Process governance and resourcing of national measures

In comparison with international standards and whilst mindful that Ireland's system is still relatively new, the national measures are performing well and are achieving good value for money. The national measures appear to be adequately resourced in terms of value and timescales associated with funding, although there are concerns around how this will change given the current economic situation.

The concept of a centralised TTO for the whole of Ireland came up frequently throughout the consultations. Opinions varied as to whether a centralised or decentralised model of TTOs is best for Ireland but on balance, a decentralised model was favoured, but supported by centralised IP management skills and strong linkages between TTOs. Throughout all the discussions the need was recognised to have TTO presence on the ground in order to build up relationships between the academic community and industry and for HEIs to take responsibility and ownership of the function. In view of the current perceived instability within the system and the focus on achieving overall efficiencies, the report concludes that building on and enhancing structures already in place would be more effective in addressing the main challenges to commercialising publicly-funded IP.

**Recommendation 12:**

Whilst ensuring that effective decentralised TTOs are maintained in HEIs, revise and widen the scope and remit of EI's existing central support services for TTOs with, for example, legal services etc.

**7 Effectiveness of measures at institutional level**

This section considered the effectiveness of the IP arrangements at the level of the HEIs and centred round the understanding and communication, performance, governance and resources.

**Communication from state bodies to institutions**

Whilst mechanisms are in place for communication between the funding agencies and HEIs, these are not always fully effective. The TTOs understand the majority of the measures available to them, but are less aware of the national policy which drives the measures. Awareness of both is limited in industry.

**Recommendation 13:**

Identify, jointly between agencies and HEIs/TTOs, and implement ways to enrich existing formal communication and dissemination mechanisms, for example by a regular news publication, 'master class' meetings, action accountability and reporting and a dedicated website. Include wide dissemination of commercialisation success stories amongst all stakeholders, ensuring that processes for capturing feedback are in place.

**Implementation of processes**

It is evident that Ireland's IP performance in terms of quantity of patenting activity, licence deals and spin-outs is outstanding when the metrics published by EI are compared to international benchmarks. This is despite the fact that many institutional level measures are relatively new. In terms of the operation of the TTOs, opinions diverge considerably as to who is responsible for assuring the integrity of IP and the extent to which the TTOs are required to be responsible for issuing warranties and liabilities. This issue was identified as one of the major sources of difficulty and delay in negotiating agreements in Ireland.

**Recommendation 14:**

To ensure reasonable levels of IP integrity which at least meets international best practice, HEIs, with support from their TTOs, should work together to enhance their systems to develop a consistent approach to achieve this aim.

**Recommendation 15:**

Agree, jointly between agencies, HEIs and industry, and publish a common position statement setting out what warranties of IP integrity industry can reasonably expect HEIs to give.

TTOs find it difficult to spend enough time building network relationships, given the pressures to spend time on defensive/reactive activities. Nevertheless, there is broadly a consensus view that the TTOs have adequate resources in terms of headcount but that they need to be upskilled (it is notable for example that compared to benchmarks Irish TTOs typically have no in-house dedicated legal staff). Findings similar to those under the Suitability of National Policies and Guidelines with regard to metrics were also identified.

**Recommendation 16:**

Each HEI should develop a commercialisation strategy, TTO mandate and performance metrics which takes into account the importance of the role of building and managing relationships and IP portfolios and reduces the levels of effort TTOs spend on 'reactive' activities.

There is an unrealistic expectation that TTOs can be profitable and that commercialisation deals can bring in funds to support research budgets. Allied to this was the finding that institutional support for TTOs was patchy which arises as a result of the "Third Mission" not being considered a legitimate activity for HEIs. Overall, given the above and Ireland's small scale it suggests the need for continued financial support for the TTOs for several years.

**Recommendation 17:**

Review the arrangements for continued central and financial support for TTOs beyond the term of the current five year Technology Transfer Support Initiative (TTSI) cycle and provide clarity in the near term to the TTO staff because given the relative recent set up of the current TTO structures and Ireland's scale of activity it is unlikely that TTOs will be commercially self-sustaining in the short to medium term.

There were many complaints, from a wide variety of stakeholders, about what is seen as the excessive length of time it can take to complete the negotiations to do a deal. These concerns were found to be only partly justified and could be dealt with by documenting how much time is taken on each of the various steps.

**Recommendation 18:**

While the time taken to do a deal is typical by international comparison there is an opportunity for Ireland to be quicker than everyone else. This can be achieved by setting up a standard list of elements of the deal process and record the time taken for each element of the negotiation process. Based on this analysis, agree realistic targets for TTOs for the maximum time allowed for each element over which they have control.

## 1. Introduction

As is the case in many countries, Ireland is encouraging its publicly funded research organisations to pay more attention to the effective commercialisation of intellectual property (IP) arising from research while, at the same time, encouraging the private sector to make better use of these public sector research and knowledge resources.

Concerns have been raised by a wide range of stakeholders over the suitability and effectiveness of the Irish Government's arrangements to stimulate IP commercialisation. The need for a review of these arrangements was highlighted in the Department of the Taoiseach's 2008 *Smart Economy* policy document<sup>2</sup>. Forfás was requested by the Department of Enterprise, Trade and Innovation (DETI), to undertake an independent review of the suitability and effectiveness of existing policies and measures to stimulate IP commercialisation.

### 1.1 Objectives and scope

The objective of this study was to determine where and how improvements may be made to the current national IP arrangements for publicly funded research in Ireland, in order to support the objectives of Chapter 3 of DETI's Strategy for Science, Technology and Innovation 2006-2013 (SSTI)<sup>3</sup>. These SSTI objectives comprise the following:

- Measures for IP management and commercialisation within Ireland's higher education institutes (HEIs)
- Innovation support for HEIs and enterprises from Enterprise Ireland (EI)
- Fostering of collaboration between HEIs and industry

To do this, the report considers the following elements of the national arrangements:

- Appropriateness of national policies: the extent to which the national policies and related guidelines are properly defined, understood and are fit for purpose;
- Suitability of the set of national measures: the extent to which the various support measures, templates and financial stimuli reflect the policies and guidelines, collectively meet stakeholder needs and are sufficient;
- Effectiveness of the measures at national level: the extent to which central Government effectively communicates policies to the relevant state funding agencies, these agencies effectively implement the national measures and there is appropriate resourcing, governance and culture within these agencies; and
- Effectiveness of the measures at institutional level: the extent to which the agencies appropriately communicate policies, guidelines and measures to the HEIs, the effectiveness of the HEIs' processes for generation, capture, protection and, in particular, exploitation of IP, as well as resourcing, governance and cultural issues.

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<sup>2</sup> Department of the Taoiseach, 2008. Building Ireland's Smart Economy A Framework for Sustainable Economic Renewal

<sup>3</sup> Department of Enterprise, Trade and Innovation, 2006. Strategy for Science, Technology and Innovation 2006 - 2013

The study focuses mainly on experience and developments over the past three years since the SSTI was published, and on arrangements pertaining to Ireland's HEIs, which primarily comprise the universities and the Institutes of Technology (IoTs).

Given that a wide range of different concerns had been raised from a number of different stakeholder groups, this study sets out to identify whether these concerns are valid, what their extent is and what is causing them. It also draws comparisons between the situation in Ireland and in other countries, in terms of comparable benchmarks (Singapore and Finland) and those considered to be operating to best practices (the United Kingdom and the United States). It also considers whether the arrangements in Ireland are broadly aligned with European-level policies, guidelines and initiatives.

The outcome of the study is a number of short-term recommendations, that could be actioned during the early months of 2010, and longer-term recommendations, for 2010 and beyond, to improve the IP arrangements to encourage better IP exploitation from publicly funded research.

## 1.2 Methodology

The evidence in this study was gathered through consultation with 78 stakeholders from 42 organisations between 15<sup>th</sup> October and 22<sup>nd</sup> December 2009. The consultation exercise was supported by a literature review of relevant policy documents, guidelines, templates, and other publicly available material, referenced as footnotes throughout this report.

The stakeholders consulted included senior representatives from central Government, the funding agencies, multinational companies (MNCs), small and medium enterprises (SMEs) and the HEIs, from the perspectives of researchers and the technology transfer offices (TTOs). All comments made by the consultees have been treated as non-attributable and their sources are anonymous.

The consultations were guided by a structured "issues analysis" framework, which unbundled the main questions into mutually exclusive, comprehensively exhaustive issues and which was used as the basis for interview guides and a roundtable plan. The framework is provided in Annex IV of this document and was agreed at the outset of this study. Consultations took place through:

- Semi-structured face-to-face or telephone interviews
- Five half-day roundtable discussions, held in Cork, Galway and Dublin, involving between 6 and 15 participants from industry and the HEIs

The outputs were analysed and interpreted, the extent and validity of the stakeholders' concerns were assessed, areas of consensus or divergence of opinion were identified as were the root causes. In addition, a background research into international best practices in IP commercialisation with which the situation in Ireland could be compared was conducted, by examining arrangements in the United Kingdom, the United States, Finland and Singapore. Reference is made to this evidence throughout this report, and benchmarking data is provided in Appendices A - E.

### 1.3 Structure of this document

The remainder of this document sets out the findings in accordance with the structure of the “issues analysis”, and where relevant, highlights recommendations to be taken forward by Government, the funding agencies and the HEIs to improve the existing IP commercialisation arrangements. The report contains the following sections:

- Section 2: Suitability of national policies and guidelines
- Section 3: Suitability of the set of national measures
- Section 4: Effectiveness of the measures at national level
- Section 5: Effectiveness of the measures at institutional level

The document is accompanied by the following annexes:

- Annex I: Summary of national measures
- Annex II: List of consultees
- Annex III: Consultative Group
- Annex IV: Issues analysis structure
- Annex V: Glossary

Benchmarking data for the four countries considered in terms of international best practice, and in terms of provisions at the European level are presented as follows:

- Appendix A: Provisions at the European level
- Appendix B: Benchmarking data - United Kingdom
- Appendix C: Benchmarking data - United States
- Appendix D: Benchmarking data - Finland
- Appendix E: Benchmarking data - Singapore

## 2 Suitability of national policies and guidelines

In this section, the national policies and guidelines that provide context and direction for IP commercialisation are considered. The implementation of these policies and guidelines, at national and institutional levels are discussed in Sections 3, 4 and 5.

The policies and guidelines considered in this study are contained in the following documents:

### Policies:

- Chapter 3 of the *Strategy for Science, Technology and Innovation 2006-2013*: Department of Enterprise, Trade and Innovation, 2006 (the “SSTI”)
- *Building Ireland’s Smart Economy: A Framework for Sustainable Economic Renewal*: Department of the Taoiseach, 2008 (“*Smart Economy*”)

### Guidelines

- National Code of Practice for Managing and Commercialising IP from Public Funded Research: Forfás and the Irish Council for Science, Technology and Innovation, 2004
- National Code of Practice for Managing and Commercialising IP from Public-Private Collaborative Research: Forfás, and the Advisory Council for Science, Technology and Innovation, 2005
- Funding Agency Requirements and Guidelines for Managing Research Generated Intellectual Property: Commercialisation steering group, 2006
- Requirements regarding the ownership and exploitation of foreground IP generated under the Innovation Partnership Programme: Enterprise Ireland

### 2.1 Definition of policies and guidelines

Ireland’s overarching strategy is to maximise national economic wealth, as set out in the *Smart Economy* policy document. The *Smart Economy* set several high-level ambitions in terms of encouraging innovation, making Ireland an attractive home for innovative multinational corporations (MNCs), stimulating an R&D (research and development)-intensive indigenous enterprise sector, and generating a stock of highly skilled workers. Given Ireland’s relatively small scale, these ambitions are framed under the auspices of an exemplary research, innovation and commercialisation ecosystem, or “super cluster”, involving both HEIs and companies (both large and small).

The *Smart Economy* specified the following measures:

- A €500 million venture fund, “Innovation Fund - Ireland” aimed at attracting major overseas venture capital firms to enter Ireland. (yet to be implemented);
- More favourable tax treatment of the carried interest of venture capital. (implemented in Finance (No. 2) Act, 2008 via the introduction of a more favourable tax regime on the carried interest of venture capital at a rate of 15% for partnerships and 12.5% for companies to underpin the Innovation Fund - Ireland); and
- Revised arrangements for the taxation of intellectual property, to allow tax write-off for IP, in line with other EU jurisdictions. (implemented in the Finance Act, 2009).

It also created some important starting principles:

- The impetus for continued funding of research and innovation and its commercialisation will be maintained in the long term;
- A commitment that Ireland will continue to offer a lower corporation tax burden for businesses to attract MNCs to Ireland (12.5% compared to an average of 26.30% in other European Union countries);
- Recognition that wealth will be gained through creation of highly skilled jobs; and
- The reflection that the rapid deterioration of public finances is one of the greatest issues which will need to be overcome in the short to medium term.

A more detailed roadmap and targeted investment programme is provided by the SSTI, established under Ireland's National Development Plan two years prior to the publication of the *Smart Economy*. SSTI seeks to make Ireland internationally renowned for the quality of its science base and an attractive place to do research. SSTI is considered the first coordinated effort to encourage the HEIs to refocus on the "third mission" of commercialisation in addition to their traditional roles of teaching and research. Here, top-level provisions are found for stimulating IP management and commercialisation from the HEIs to industry through a two-pronged approach involving strengthening the IP and commercialisation functions within the HEIs through a series of financial measures and supporting this, where relevant, with a central source of specialist expertise. Section 3 of this report summarises and discusses these measures.

### IP guidelines

Ireland's national level guidelines for managing IP from HEIs include two national Codes of Practice: one for managing IP from publicly funded research (published in 2004) and another for managing and commercialising IP from public-private collaborative research (published in 2005). Both documents are intended only as guidelines and are left open to interpretation by the TTOs and industry to allow them to negotiate commercially favourable deals on a case-by-case basis.

Given this level of flexibility, the two Codes of Practice were supplemented by the funding agency guidelines in 2006. These provide further guidance and basic rules on how IP arising from publicly funded research should be managed. The rules are as follows:

- The HEI must retain ownership of its inventions, with the exception of joint ownership, which must be negotiated with the funding agency beforehand;
- Requirement for each HEI to publish an IP policy, make it available to researchers and ensure that the researchers assign IP to the HEI;
- Requirement for researchers to report useful discoveries to the HEI and subsequently the funding body within a given timeframe to obtain adequate protection, notwithstanding the researcher's right to publish after a given confidentiality period;
- A duty for the HEI to exploit discoveries to the best benefit of public monies;
- Restrictions on the HEI assigning or selling IP without permission of the funding body;
- An agreement that commercialisation income will be shared with the inventor by the HEI; and
- A requirement for the HEI to provide a statement of assurance that conflicts of interest have been managed transparently.



To allow for a degree of national standardisation, guidelines are supported by standard template agreements produced by the Irish Research Council for Science, Engineering and Technology (IRCSET) for postgraduate studentships<sup>4</sup>, the Environmental Protection Agency (EPA)<sup>5</sup> and Forfás<sup>6</sup> as well as some template disclosure forms, disclosure evaluation forms and checklists in the 2004 National Code of Practice. The TTOs consulted agree that these are well written, and draw on them, adapting them to suit their own purposes (indeed, this behaviour is encouraged by the Codes of Practice).

F1 Ireland's national policies and guidelines for managing and commercialising IP arising from publicly funded research are internally self-consistent, in line with international good practice and provide a good starting point for implementation.

Taking the policies and guidelines as they stand, the review of the documents indicates a consistent and thoughtful approach. From some of the consultations at senior government levels, a similar quality of appreciation of high-level purpose and direction was noted.

The principles that run through the policies and guidelines closely follow international practice, especially that emerging at European Union level, described in the two most recent and important documents, the *Commission Recommendation of April 2008*<sup>7</sup> and the latest (October 2009) version of the *Responsible Partnering Guidelines*<sup>8</sup> (see Appendix A). These common principles include, for example, the need to maximise the economic and social benefits of public investment in research and the preference for HEI ownership of IP arising from most forms of collaborative research.

In time, these EU initiatives are likely to create a more level playing field across Europe, in which Ireland must at least be able to compete on equal terms. Ireland must therefore monitor these developments and consider how to respond, including ways to meet the policy goal of being 'an attractive place to do research'. As a minimum, Ireland must ensure its policies and guidelines are in line with emerging EU-wide practice, which at present they are.

Given the above, priority should not be given to fundamental changes to the ambitions and directions set out in the policies and guidelines. The immediate emphasis should be on communicating and elaborating how the existing policies and guidelines should be implemented. These issues are dealt with later in this Section.

In the longer term, however, there are opportunities to develop the policies and guidelines further to deal with the three issues described in Findings 2, 3 and 4.

<sup>4</sup> Intellectual Property agreement relating to IRCSET / Enterprise partnership scheme postgraduate scholarship

<sup>5</sup> Circa Group, 2007. Guide to Commercialisation of Environmental R&D Outputs: A Manual for Researchers in Receipt of Environmental Research and Development Funding (2005-ET-DS-25-M3) [www.epa.ie/EnvironmentalResearch/ReportsOutputs](http://www.epa.ie/EnvironmentalResearch/ReportsOutputs), accessed November 2009

<sup>6</sup> Forfás, 2007. Template Collaboration Agreement Based on the National Code of Practice for Managing and Commercialising Intellectual Property from Public-Private Collaborative Research.

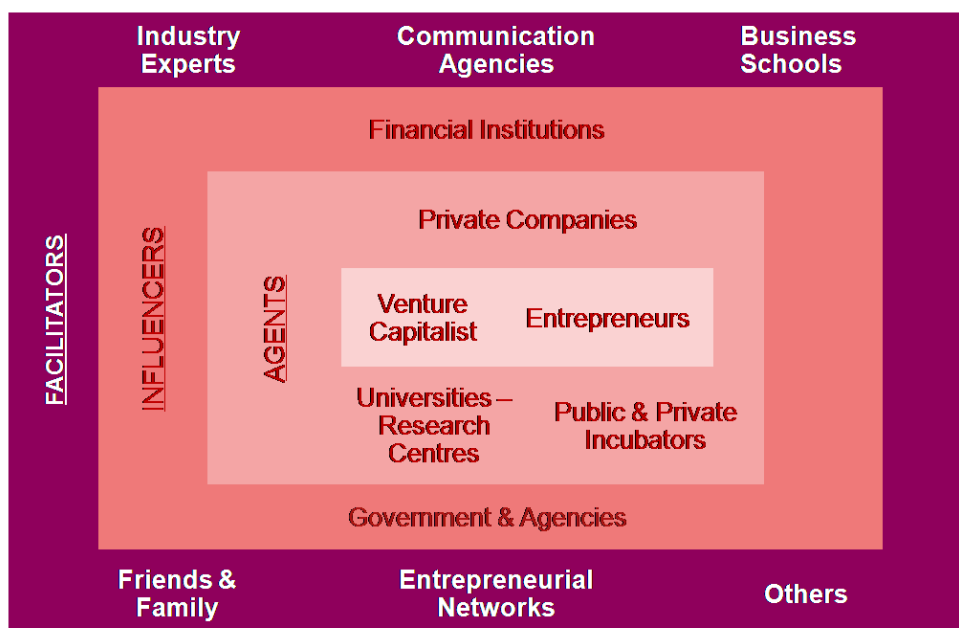
<sup>7</sup> Recommendation on the management of intellectual property in knowledge transfer activities and Code of Practice for universities and other public research organisations, European Commission C(2008)1329, April 10 2008

<sup>8</sup> Joining Forces in a World of Open Innovation: Guidelines for Collaborative Research and Knowledge Transfer between Science and Industry, EIRMA/EUA/EARTO/ProTonEurope, October 2009

F2 Collectively, the system of policies, guidelines and metrics appears founded on the notion of the linear model of innovation.

The current approach to commercialisation is close to the linear model of innovation. In this model, a concept moves step by step from research through development, into production and finally to market. Modern best practice recognises that this is an overly simple model that does not adequately describe the complex processes involved in successful innovation. A far richer view of innovation is to see it as a web of highly iterative processes involving multiple actors in an innovation network or ecosystem. (Figure 1) The ‘open innovation’ approach, now increasingly widely adopted in many industry sectors, is based on this networked principle. Finland is a leading example of this approach through the Otaniemi Technology Hub which acts as the focal point for networking and IP arrangements within the Helsinki region on behalf of several of the HEIs (Appendix D).

Figure 1: Illustrative example of an innovation ecosystem



Source: Arthur D. Little

Policies, measures and metrics based on the linear model are likely to have limited effectiveness. In this model it is tempting to focus public policy on investing in research at the front end of the innovation process. It is assumed that research results will then naturally feed through to successful products and services in the market. Therefore, “more is better”: more deals to commercialise results must lead to more successful companies and products. But success is more likely to follow if:

- Research results are carefully selected for commercialisation on the basis of their market potential. This requires continuing dialogue between researchers and industry, to help shape research agendas and identify potential applications and benefits; and
- Full attention is paid to the often lengthy and difficult process of turning a research result into a proven commercial proposition. This again needs dialogue between the

firm leading the commercialisation, the original researchers and other parties who may provide complementary technologies or be part of the supply and distribution chains.

Policies, measures and metrics should therefore not only encourage deal flow but should also drive:

- **Quality:** concentrate effort and resources on deals with the best commercial prospects. Better quality deals reduce wasted investment on opportunities that go nowhere and, ultimately, lead to a better overall return in terms of job creation and the growth of profitable firms; and
- **Sustainability:** invest time and effort now in building the networks of relationships that will lead to opportunities being identified and deals being done on a more continuous basis.

The SSTI was a great step forward at the time it was written but has some fundamental weaknesses. In particular, it focuses on stimulating the creation of new science and technology and does not focus to any great extent on turning that technology into wealth, for example through building innovation networks. This has led to measures and metrics that focus on finding new technologies in HEIs and pushing them out (through doing deals), with relatively less attention to building relationships, understanding industry needs and supporting onward development after a licence has been signed or a start-up company formed.

Many of those consulted understand the value of quality and sustainability but feel constrained by current metrics to focus on deal flow (metrics are discussed below in Section 2.3 / Finding 9). This leads to some of the dissatisfaction that is so evident today. It is understandable to wish to increase deal flow and, indeed, during the time that the commercialisation system is being built up, deal flow is a good initial aim. However, as discussed in Section 4.4, deal flow rates are now approaching EU norms, suggesting that it is time to move on from simply driving the growth of the commercialisation system. As rapidly as current circumstances permit, it is now important to encourage, not only deal flow itself, but also the quality and sustainability of that flow. Today's focus on the linear model is not wrong but it could be made much better by adding a network dimension. Some ways to do this are suggested later in this report.

**F3** The existing policies and guidelines do not distinguish well between the different types of IP which arise from successful networked interaction with industry.

A consistent message from industry stakeholders concerns the issue of IP being valued by HEIs at greater than its true worth. These stakeholders argue that the gap between having IP and having a commercial product is substantial. The value of the original IP is low, relative to the investment they must make to reach a commercial product. The argument is countered by the TTOs in that they expect a fair market rate for their IP in order to avoid any possibility of contravening EU state aid rules on public sector support for businesses, and also to get the best value for public investment. It is apparent that this issue has evolved because, in essence, the existing system of policies, guidelines and metrics treats all forms of IP, in all states of development, as the same.

In reality, different forms of HEI-industry collaboration will lead to IP at different levels of maturity and therefore needing different treatment. For example, treating basic research as

a valuable, licensable commodity on the same level as the IP which underpins a HEI spin-out leads to agreements with rigid IP conditions that may obstruct knowledge sharing and deter some potential industrial partners from getting involved in the collaboration.

A further effect of this lack of distinction is a fear within the TTOs that their research agreements might be underselling potentially valuable IP. In reality, this is unlikely to be the case - basic research rarely gives rise to outputs of immediate commercial value. Nevertheless, there is nothing in the guidelines that sets out or makes this distinction.

**F4** The existing policies, guidelines and metrics do not take into account the differing times to market for IP arising from different industry sectors.

A further distinction can be made with regard to the scientific domain from which the IP arises, and the implications this has for time-to-market. For example, software firms - whose products have a short development time - may prefer to seek an open source licence agreement for IP emanating from basic software research, drawing on licensing models from the open source community (e.g. GPL and GPL II). In the life sciences sector, where the product development cycle to a clinically viable, approved product is long and costly, a model based on more extensive patenting would be more appropriate.

To deal with these three issues, as a longer-term direction for improvement of the IP arrangements, the following is recommended:

**R1** **Revise the national policies and IP guidelines to recognise the ecosystem nature of innovation and to include a differentiated approach to deal appropriately with IP of various kinds and from different scientific and application domains.**

This topic is dealt with in further detail in Section 2.3, where metrics and their effect on commercialisation behaviour are discussed and in Section 5.3, where the role of the TTO in building portfolios of IP of different kinds is considered.

**F5** Policies, guidelines and measures are perceived to support the IoTs less well than they do the universities.

From the review of documents and from some consultations, it seems that, while the policies and measures are, in principle, aimed at all HEIs, in practice their impact is perceived to be far stronger on the universities than on the IoTs. This seems to miss potential opportunities. It is true that the IoTs have generally not been in existence as long as the universities, many of them produce less IP than the universities and, in some cases they have no research or development capability. However, their mission is, perhaps, more directly related to industry engagement, and their geographic coverage of the country is also wider than that of the universities.

It would be worth considering enhancing support for those IoTs that have, now or in the future, a research and development capability. This would be to develop their role both as

stand-alone providers of applied technology to industry and especially as the applied development provider within multi-institution consortia working on multi-technology solutions to industrial needs. A context for this may emerge from the current work of the high level Strategy Group that is considering a National Strategy for Higher Education in Ireland<sup>9</sup>. Therefore, as a longer-term direction for improvement of the IP arrangements and building on the outcome of the work of the Strategy Group, the following is recommended:

**R2 Review the criteria for TTO support for HEIs, in particular taking into account the IoT role as providers of applied and multi-technology solutions to industrial needs.**

## 2.2 Communication and understanding of national policies and guidelines

**F6 There is an urgent need to build a richer understanding, amongst all stakeholders, of the ambitions and directions embodied in the national policies and guidelines and the need to pursue multiple national priorities.**

Understanding of the ambitions and directions set out in the national policies and guidelines is sometimes poor. While some of those consulted had a comprehensive understanding of the content of the SSTI and *Smart Economy* documents, more than half seemed aware of the existence of the documents but hazy as to their content. A few were dismissive, arguing that the SSTI is out of date and therefore irrelevant or even that they were too busy to pay attention to such 'high level' documents. Whilst it is apparent that much of the national policy surrounding IP and commercialisation is targeted at the public sector, awareness was extremely low within industry. Almost all consultees had little or no understanding of the national policies and, indeed, some believed that commercialisation is a spontaneous activity at the level of the HEI.

This is seen as a fundamental challenge to be addressed. A good understanding of national ambitions and multiple priorities provides context for IP commercialisation. Unless and until this context is in place, actions to strengthen measures and their implementation will not be fully effective.

The SSTI and *Smart Economy* documents together set the basic framework for the roles and activities of the several funding agencies involved in managing the commercialisation of publicly funded HEI research:

- IDA Ireland (IDA) in promoting Foreign Direct Investment (FDI) in terms of attracting new multinational companies (MNCs) and supporting the expansion and development of existing MNCs in Ireland;
- Enterprise Ireland (EI): promoting the formation and growth of indigenous businesses, both large and small;
- Science Foundation Ireland (SFI): Developing knowledge and trained people through basic and, increasingly, oriented research; and

<sup>9</sup> <http://www.heai.ie/en/node/1303>, accessed January 2010

- The Irish Research Council for Science, Engineering and Technology (IRCSET):  
Developing advanced skills at doctoral and post-doctoral levels.

Evidently these agencies have differing mandates and are therefore likely to have differing views on the best ways to commercialise IP arising from HEI research. Each agency implements the national policy in line with its particular mandate as, indeed, is to be expected, by offering a suite of different measures (discussed in Section 3). As a result, policies and actions by one agency can appear to contradict or even undermine the policies and actions of another agency. A single academic might be in receipt of both SFI and EI funding and therefore be measured on the basis of creating both licences and spin-outs, as well as world class basic research.

This has resulted in confusion and uncertainty amongst stakeholders, to the extent that many believe that “Ireland doesn’t know what it wants”. The messages around attracting FDI, promoting the indigenous industry base and increasing the national skills base are viewed as conflicting rather than complementary. Perceptions vary between stakeholder groups, with MNCs perceiving that the priority is to attract FDI (and that IP should therefore be made available for free) and SMEs and some TTOs believing it should be about building up indigenous industry to create a more sustainable economy for Ireland.

Many of those consulted identified these differences as confusing and a substantial barrier to more effective IP commercialisation. They frequently asked that Ireland should ‘make up its mind’ which of the various ambitions it really wanted to achieve, so that they could focus on that.

However, parallel priorities are inevitable. Evidence from the consultations indicates that Ireland relies heavily on FDI and, simultaneously, requires stimulation of indigenous industry, which is small in scale in relation to other jurisdictions, especially in the SME domain. Achieving these two goals, as well as the ambition of a knowledge-based economy, requires building up the national skills base through the activities of SFI and IRCSET.

The apparently patchy awareness of the content of the various national policy and guideline documents suggests that a necessary first step is for central government and the agencies to find ways to communicate and explain more effectively the underlying thinking in these documents, including the need to accept and deal with multiple ambitions. While there was one view that this should be self-evident from the documents, this is evidently not the case.

A second step is to provide industry, HEIs and their TTOs with better guidance on how to reconcile the differing national ambitions in specific cases. It may be that in certain types of situation one ambition should normally take precedence. In others, a balanced or compromise position should be preferred.

**F7** The DETI is best placed to take the lead in building understanding of the need for multiple ambitions and of how to deal with them.

The DETI would appear to be the appropriate body to promote a better understanding of the spirit and intent of national policy, directly and through its agencies (taking into account the positions of other important stakeholder bodies that are not formally linked to the DETI) and to provide guidance on how to reconcile different national ambitions in specific types of situation. The fact that there is so much uncertainty amongst those dealing with commercialisation on a day to day basis suggests that there is more that DETI can do to meet

this challenge, both independently and through consultation with other agencies not directly reporting to DETI. The following short-term action is therefore recommended:

**R3** DETI to promote understanding of national policy on IP commercialisation and provide guidance on how to deal with differing national policy objectives in specific situations.

### 2.3 Extent to which policies and guidelines are fit for purpose

This section focuses on two issues where consultations showed there is room for change: guidelines and metrics.

#### Guidelines

Whilst the national policy documents set out the framework for stimulating IP exploitation, it is left to the guidelines (the various Codes of Practice and funding agency guidelines, rules and templates) to show how individual commercialisation arrangements should be structured. The guidelines are deliberately broad to allow individual TTOs to negotiate agreements on commercial terms on a case-by-case basis.

**F8** The present guidelines are insufficient.

There is a view, broadly shared by all the stakeholders consulted, that these guidelines are not sufficiently prescriptive. Whilst the guidelines are not considered inappropriate, there is a consensus view across all consultees that the guidelines are too broad - offering a menu of issues to consider but leaving too much uncertainty about what is the preferred set of terms in commercialisation agreements. One exception to this general criticism is the more prescriptive rules on IP set by Enterprise Ireland specifically pertaining to its Innovation Partnership Programme (see Annex I for a description). These rules were frequently cited as an example of good practice for how to establish such an agreement.

A further view, also consistently expressed, is that, while the templates on offer to the TTOs from the different funding agencies are individually useful, their sheer variety adds further complexity to the situation. Some consultees were also concerned at the potential for contradictions between templates issued by different agencies - even when the individual templates, such as the Innovation Partnership rules, are seen as helpful. These differences reflect the different mandates of the agencies - a further example of the consequences, discussed above, of multiple national ambitions.

This lack of prescription means that, from an industry point of view, there is a lack of consistency in negotiation behaviour from one deal to the next or when comparing TTOs. It also means that the TTOs' customers (i.e. industry and the academic community) have no clear expectations of the starting point in negotiating a deal. This has resulted in:

- TTOs starting from scratch and “reinventing the wheel” each time they negotiate an agreement or relying on models they have developed themselves, rather than using a common starting point;
- Larger companies, especially MNCs, feeling able to insist on what may be very favourable terms for them (e.g. regarding non-exclusive royalty-free rights, access to

background IP, capped fees allowing them to access the rest of the IP for a fixed price) but which may not be as favourable for the HEI or for Ireland as a whole;

- Smaller companies without this degree of negotiating power being disadvantaged; and
- MNCs finding the IP agreements on offer so variable and in conflict with their corporate IP policies (often imposed by corporate functions based overseas) that they simply walk away from the deal.

More prescriptive national model agreements and principles will be helpful, for two reasons:

1. Greater prescription would help all parties to reach equitable agreements more readily. A known and consistent initial position enables negotiations to get going more smoothly, reduces complications caused by any expectations of an excessively one-sided deal and makes Irish HEIs and their IP more attractive to industry. In some cases, knowing in advance approximately what to expect might help those involved to decide not even to open negotiations, thus avoiding wasting time and effort on painful negotiation of an unsatisfactory deal.
2. Greater prescription would have the important additional function of clarifying what position on IP would best satisfy the multiple national ambitions. One mechanism for DETI to communicate the intent of national policy, in line with Recommendation R3 above, is to provide more prescriptive templates, together with guidance on how to select the optimum template and how far the template requirements may be altered through negotiation.

Some qualifications apply to these arguments:

- National model agreements and principles must be developed on a single, multi-agency basis and applied consistently by all the agencies. Only in this way will the benefits of clarity of purpose and consistency of expectations be achieved.
- More prescriptive model agreements and principles must tread a “narrow channel” between specificity and rigidity. They must clearly specify what is expected as the norm while also defining where and to what extent there is room to fine tune each agreement. The negotiating parties must be in no doubt as to the norm, while having the freedom to take into account the nature of the situation and to seek to frame an agreement around that, rather than having to force fit their agreement into a rigid template.
- Over time the need for tight prescription is likely to reduce and the limits on the room to negotiate could widen. As the preferred IP position becomes known and established there should be fewer instances of a party demanding an extreme position. At the same time, TTOs, as they gain experience, will need to rely less on prescriptive templates to support their negotiating position and will be more able to take advantage of wider room to negotiate to structure good agreements.

In terms of examples elsewhere, on which to base Irish model agreements, the UK Lambert Agreements and their associated decision support tools provide a possible starting point (see Appendix B for a full description). In particular, the recent second set of Agreements, aimed at multi-party collaborations (as distinct from the first set, which dealt primarily with bi-party agreements), offer a useful example. Other prescriptive models exist elsewhere - for example the EU Framework Programme model contracts and the national models in France and Germany. HEIs in the United States often publish clear principles on their websites which potential licensees are expected to accept - principles that are largely consistent amongst the institutions as they are framed by legislation such as the Bayh-Dole Act (see Appendix C for a



full description). In all cases, these models are no more than starting points, which then must be adapted to suit Ireland's national policy and legislative environment.

It is suggested, as a starting point for consideration, the following minimum set of three models. The first two differ in the relative weight they give to the two national goals of developing indigenous industry and encouraging FDI.

**Model A:** The normal starting point for negotiation of collaborative research and development agreements. Ownership of foreground IP remains with the HEI. The HEI also retains a perpetual right to use the IP for teaching and research purposes. The HEI provides access to the IP under licence. Licences may, for example, be permanent, bearing a fair value royalty and either exclusive in a defined field or non-exclusive; or for a limited period to protect the industrial partner's position during evaluation and be either non-exclusive and royalty-free or exclusive for a lump sum fee. This model is broadly in line with Ireland's current policies and guidelines and with emerging EU practice. Applied consistently, this model would provide a 'level playing field' for negotiations involving most industrial partners, including SMEs and other indigenous companies.

**Model B:** An alternative to Model A for use in well defined circumstances where Ireland wishes to offer especially attractive terms to industry, in particular to favoured MNCs. In this model, wide and largely unrestricted access to foreground IP is granted to the industrial partner, preferably with a perpetual non-exclusive royalty-free licence back to the HEI to use the IP for teaching and research purposes. Assignment of IP ownership, in those cases where this is important for the industrial partner, is also possible though not preferred. This model would provide an alternative 'level playing field' for negotiations involving specified types of company. As most MNCs are likely to have their own preferred agreement templates, this model should set out principles but need not provide detailed text. An important requirement of this model is that DETI, as part of the action proposed in Recommendation R3 above, defines clearly under what conditions this Model B may be used.

**Model C:** The normal starting point for negotiations in contract research and development situations, where the industrial partner specifies the scope and direction of the work and pays most or all of the full economic costs of the work. The HEI assigns ownership to the industrial partner. This is broadly in line with Ireland's existing policies and guidelines and with European practice.

On the basis of the above discussion the following short-term action is recommended:

- R4** Through bottom-up consultation between the TTOs and the funding agencies, develop a set of national model agreements and principles that:
- Set out the preferred terms applying to IP, primarily on ownership and access, consistent with Ireland's national policies and guidelines and reflecting Ireland's response to the emerging EU position;
  - Allow the TTOs flexibility in negotiating the financial and other terms of an agreement on a case-by-case basis including, within clearly understood boundaries, variations on ownership and access;
  - Are common to, and consistently used by, all agencies;
  - Recognise the different needs of different types of company (such as SMEs vs. MNCs) and create an appropriate playing field for each type.

## Metrics

Table 2 below sets out the metrics currently used to assess the performance of TTOs. EI requires the TTOs to report their commercialisation metrics on a quarterly basis.

**Table 2: Summary of performance metrics used by EI, SFI and IDA in measuring commercialisation outputs from Ireland's HEIs**

	EI	SFI	IDA
Metrics	<p>Metrics directly relevant to commercialisation are used. These include:</p> <ul style="list-style-type: none"> <li>Disclosures</li> <li>Spin-outs</li> <li>Licences, options exercised and assignments</li> <li>Patents filed*</li> </ul> <p>Similar metrics to IDA Ireland for measuring success within client base are also used</p>	<p>Wide range of metrics, depending on funding programme</p> <p>Those programmes which have commercial outcomes (e.g. CSETs, strategic research cluster programmes) use numbers of spin-outs as a metric</p> <p>Data on disclosures, licences and patents are also collected</p>	<p>Overall activity in this domain measured as a target for level of R&amp;D activity compared to other countries, in terms of:</p> <ul style="list-style-type: none"> <li>Whether the company is investing in R&amp;D&amp;I in Ireland</li> <li>Increased spend on R&amp;D</li> <li>Impact of outcome of project on products and processes (e.g. cost savings)</li> <li>Increased company income owing to investment in IP</li> </ul>
Uses	<p>Used to provide competitive funding to support further commercialisation in the HEIs</p>	<p>Used to make funding decisions for long term programmes</p> <p>Performance of each programme against these metrics reviewed externally each year</p>	N/A

\* Patents filed not used to make funding decisions

At present, the metrics used by EI are the primary measure of commercialisation activity used in Ireland. These are a relatively narrow set of output metrics and focus on the number of transactions conducted by the TTOs. The effectiveness, or otherwise, of these metrics was raised by stakeholders as an issue in every round table held during the course of this review.

**F9 The metrics used to measure commercialisation performance distort behaviour.**

The funding agencies' choice to use these metrics is understandable, in part as a way to encourage TTOs to do more deals (a point highlighted in the recent 'wise men' review of the TTO system<sup>10</sup>). The current financial crisis puts pressure on the agencies to focus on short-term outputs, which to an extent is driven by DETI's desire to see a return on investment from the measures. However, it does appear that this is having some unfortunate, if unintentional, side effects.

First, as already discussed under Finding F2 above, the metrics encourage commercialisation activities that may compromise quality and longer term sustainability:

- A focus on quantity rather than quality: for example, an urge to patent research results that may have no commercial relevance; and
- Weak sustainability: exploiting ideas that already exist at the expense of investing in building the networks and relationships that will lead to new ideas and opportunities for commercialisation of IP in the future. This focus on "low hanging fruit" will result in good numbers of licensing and spin-outs today but declining numbers of deals once immediate opportunities have been dealt with. Some performance figures suggest this decline is already happening (e.g. the dip in numbers of spin-outs in 2008 compared to 2007 across the HEIs<sup>11</sup>, though the spin-out rate appears to have recovered in 2009).

Second, premature commercialisation: A desire to commercialise an idea too early, before it has been taken far enough to understand fully what is the true commercial potential and what is the optimum commercialisation pathway or 'route to money'. This makes it harder for the parties to appreciate the fair market value of the IP.

Third, discomfort and a risk of loss of motivation amongst some TTOs: Many of the consultees were very well aware that the metrics tend to drive TTO behaviour that may satisfy those metrics but which may not be so good for commercialisation and for Ireland's interests, in the long run. They were very uncomfortable with this apparent conflict.

Fourth, increasing criticism and disregard for national policy and guidelines: Some consultees felt that the metrics define what is really wanted, even when this is perceived to conflict with policies and guidelines.

In the longer term, a more successful set of metrics would be to use a balanced scorecard approach, combining measures of current transaction activity (as today) with others that assess the economic and social benefits of the knowledge transferred and the quality of the innovation ecosystem relationships developed by the TTO with both the academic and industrial communities.

Financial metrics will play a part in this scorecard, although these need to be treated with care. Most consultees, including the agencies, acknowledge that measuring the revenues achieved by the HEIs through technology transfer is inappropriate at this time, given that the TTO system is too young to have built up a consistent stream of financial results. Most are also aware that even the largest and most well established university TTO systems, in the US

<sup>10</sup> Enterprise Ireland commissioned independent study: Report on Review of Technology Transfer System in Ireland, 2009

<sup>11</sup> Enterprise Ireland TTSI performance metrics (sourced from Enterprise Ireland commercialisation team)

and UK, do not achieve big returns in terms of economic benefit to the HEI. In the US, for example, commercialisation income represents around 3% of research income on average. Indeed, the benchmarking data indicates that only in a handful of cases do TTOs aim to make a profit, or even break even. It is important to dispel the expectation, held in some quarters, that HEIs can expect commercialisation to make large contributions to their research income.

One source of ideas for metrics is the EU. A recent report<sup>12</sup> published by the European Commission recommended metrics for use across Europe for knowledge transfer activities in public research organizations. The purpose of these metrics is to help demonstrate some of the value that HEIs help to create in the larger society. Recommending a consistent Europe-wide set of metrics is designed to promote coherence and convergence between various existing pan-European and national initiatives to measure and report on such activities. Coherent metrics would make it possible to compare and combine the results of these initiatives in order to get a global view of the European situation and its evolution. It would also enable Member States and individual HEIs to monitor and compare their achievements against each other and against themselves over time, in order to facilitate the identification of possible needs for improvements which would be beneficial for Ireland. Therefore, although the Commission's recommended metrics do not cover all the dimensions of the suggested scoreboard, the Commission's metrics should be included within the scoreboard.

The Commission's recommended core HEI knowledge transfer performance indicators are:

- Research agreements,
- Invention disclosures,
- Patent applications,
- Patent grants,
- Licences executed,
- Licence income earned and
- Spin-offs established.

The Commission report also considers some supplementary indicators that could be used for more detailed monitoring of the core performance indicators:

- Knowledge transfer involving SMEs (i.e. how the HEI has improved the skills or capabilities of the SME),
- Knowledge transfer involving domestic firms,
- Knowledge transfer involving the research organisation's own region,
- Exclusive licences,
- Share of valid patent portfolio that has ever been licensed,
- Patent share of licence income and
- Technology areas for patenting

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<sup>12</sup> *Metrics for knowledge transfer from public research organisations in Europe*: Report from the European Commission's Expert Group on Knowledge Transfer Metrics, EUR23894, European Commission 2009

Other candidate metrics may include:

- Input measures, such as the variety and depth of intra-HEI and external relationships, aimed at driving innovation ecosystem behaviour;
- Process measures which the TTOs can realistically influence: e.g. turning a non-disclosure agreement around in five days;
- Outturn measures, such as (for spin-outs) what the results of the spin-out are or could be (e.g. venture capital commitment, potential transaction value at trade sale or initial public offering, potential economic/social benefit e.g. number of jobs created), numbers of new jobs created, or the extent to which businesses continue to grow after creation;
- Wider measures of economic wealth: For example, measures of gross value added (GVA) or increased turnover for local businesses as the result of engaging with HEIs. This could be drawn from wider economic analyses, taking into account factors such as deadweight, displacement and substitution. The extent to which licence deals are done with domestic companies versus those overseas would represent a useful indication of the extent to which knowledge and wealth are retained in Ireland;
- Measures of “customer satisfaction”: For example, levels of “repeat business”; brand awareness of the HEIs within Ireland and overseas; and success obtained following a particular licence deal; and
- Measures of deal quality: For example, establishing the relationship between numbers of licences relative to licence value, reported on aggregate to identify trends and avoid distortion resulting from a small number of highly lucrative deals.

In introducing any such metrics, care must be taken:

- Not to overburden the TTOs, funding agencies or industry with excessive reporting requirements; and
- To draw on existing sources of information or data collection regimes as much as possible (e.g. wider regional data collection such as measures of GVA).

The following short-term action is, therefore, recommended:

**R5    Develop and implement a broad set of performance metrics, using a balanced scorecard approach, which would combine transaction activity (as it currently does) with knowledge transfer activities. The metrics should encourage a sustainable pipeline of quality IP and ensure wider economic wealth.**

Note that this Recommendation is closely related to the earlier Recommendation R3 to build a deeper understanding of national policy and to provide guidance on how to deal with multiple national ambitions. The choice of metrics sends powerful messages on how to prioritise conflicting aims, so it needs to be fully consistent with the guidance on dealing with multiple ambitions. At the same time, the process of discussing the choice of metrics will help to clarify the issue of managing multiple ambitions, and vice versa.

## 2.4 Consistency with EU policy

As discussed at the beginning of this Section, the national policies and guidelines are broadly in line with current EU practice. The one area where the consultations revealed a substantial degree of uncertainty and frustration is that of compliance with EU state aid rules.

Within the European Union, a Member State is generally not allowed to provide financial aid to a commercial firm as this would distort free market competition. The application of this principle to R&D, especially when a HEI that is funded by the state collaborates with or provides research results to a commercial firm, has long been a contentious area. The rules in this area were clarified and to some degree relaxed from the beginning of 2007, when the current *Community Framework for State Aid for R&D&I*<sup>13</sup> came into force.

These rules do allow direct state aid in some specific circumstances and within limits as to the amounts: for example, for small, innovative companies in the early years of their existence.

Public funding for research can be treated as indirect state aid, when the results of that research are made available to a company on advantageous terms. This is permitted when the amounts involved are below certain thresholds and collaborative research is treated as being outside the state aid provisions altogether if various conditions are met. Under these conditions, those involved can proceed without fear of being penalised for breach of the state aid rules. These conditions are, broadly, that either the industrial partner pays the full cost of the research project or receives rights to the results at fair market value. For more detail, see the *Community Framework* itself or, for example, the discussion and supporting notes in the European *Responsible Partnering* guidelines.

However, difficulties can arise - especially differences in how the rules are applied in different Member States - in the interpretation of the rules in specific cases. These issues of interpretation arise over questions such as the meaning of 'fair market value', the extent of a Member State's freedom to self assess a particular collaboration as not in breach of the state aid rules and, perhaps, because the changes in the rules introduced in 2007 may not yet be fully reflected in national policy or guidelines.

**F10** Ireland's policy on ensuring compliance with EU rules on state aid is widely perceived to be confused and unnecessarily cautious.

EU state aid rules with regard to IP are poorly understood amongst all consultees, although there was an almost universal perception that Ireland has a conservative approach to state aid compared to other European countries and that this puts Ireland at a disadvantage.

This conservative approach was identified by consultees as causing the funding agencies to encourage HEIs to license IP at full commercial market rates, to maintain accurate records of this being the case and to keep such relationships and incentives at arms length and below prescribed thresholds. None of these points is especially onerous. Indeed, the principle of licensing at fair commercial value is widely embedded in codes of practice in many other countries and at EU level in the latest *Commission Recommendation*. Even so, there is a

<sup>13</sup> Official Journal No. C323 of December 30, 2006. Available at [http://eit.europa.eu/fileadmin/Content/Downloads/PDF/kics/community\\_framework\\_state\\_aid.pdf](http://eit.europa.eu/fileadmin/Content/Downloads/PDF/kics/community_framework_state_aid.pdf), accessed December 2009

common perception that not being able to obtain terms below fair market value is a disincentive for some potential industry partners.

While it is understood that Ireland needs to adhere to EU state aid rules, the findings at F3 and F4 above with regard to differentiating between types of IP suggest that there are mechanisms which enable a more favourable outcome for both the HEIs and business. These include:

- For basic research, advocate a “try-before-you-buy” approach, where industry has a limited period of free non-exclusive access to IP generated from the HEIs or exclusive access for a lump sum fee. The suggested ‘Model A’ agreement would include this possibility;
- For applied research, bring industry into a research partnership agreement at the outset of any R&D relationship, where both parties contribute funding in cash or in kind in line with state aid rules. Agree arrangements pertaining to transfer of any viable IP at the outset. There may be scope to grant royalty-free licences if industry makes a substantive contribution elsewhere (e.g. through setting up a research facility on campus); and
- For research closer to market, delay commercialisation for as long as possible so that market prospects are better understood and a fair market value can be established and defended.

These and other approaches appear to be used comfortably by other EU countries. While it is not a comprehensive survey, benchmarking suggests that TTOs in other countries recognise the need to work within state aid rules but do not find this to be such a burden as was described to us as being the case in Ireland. It is suggested that it would be helpful to provide guidance to TTOs and industry on permissible deal structures and recommend the following for short-term action:

**R6 Explore, in discussion between TTOs and funding agencies, approaches to IP commercialisation that remain within state aid rules, document these approaches and use them to provide practical advice on this to TTOs and other stakeholders.**

### 3 Suitability of the set of national measures

This section reviews the set of measures currently in place to support and encourage commercialisation of IP arising from HEI research. In Sections 4 and 5, consideration is given to whether these measures are *suitable in principle* and how *effective* they are *in practice*.

#### 3.1 Appropriateness of the current set of measures

F11 The current set of measures is consistent with the policies set out in the SSTI and Smart Economy documents.

The existing and planned commercialisation support measures broadly comprise funding for collaborative research involving HEIs and industry, tax relief for business IP and research spend within Ireland and specific capacity building funding for the TTOs. Table 3 lists these measures, while Annex I provides more detail.

**Table 3: Summary of existing and planned IP commercialisation measures in Ireland**

Body	Measure	Description	Policy link
DETI	Codes of Practice	Guidelines and basic principles concerning IP commercialisation from publicly funded and public-private collaborative research.	SSTI*
EI	Technology Transfer Support Initiative	A five year initiative (2007-2011) to strengthen institutional competence and capacity building in TTOs.	SSTI
EI	Innovation vouchers	Funds of up to €5,000 for small businesses to access knowledge resources in HEIs.	SSTI
EI	Centralised IP expertise	Central IP support to TTOs in industrial technologies, ICT and life sciences.	SSTI
EI	Commercialisation fund	Annual budget of €13.6 million, seeking to bring academic research to the attention of investors.	SSTI
EI	Intellectual property assistance scheme	Until mid-2009, central funding for patent applications. Now administered locally by TTOs.	SSTI
EI	Incubator and bio-incubator support	A €50 million investment over 10 years, supporting incubator facilities at HEIs.	SSTI
EI	Innovation partnership funding	Financial support of up to 80% of total project costs to firms for collaborative research with HEIs.	SSTI



Body	Measure	Description	Policy link
EI	Competence Centres	Industry-led consortium involving several companies and staffed by researchers from HEIs.	SSTI
SFI	Centres for Science, Engineering & Technology	Long term grants for collaborative research by, multiple academic and industry partners.	SSTI*
SFI	Strategic research cluster programme	Grants with a similar aim to that of the CSET programme, but on a smaller scale and focused on ICT/biotechnology.	SSTI*
EI	Business partners programme	Up to €20K funding for individual entrepreneurs on a defined research project to work with a Principal Investigator (PI) within a HEI to produce a start-up ready company over a six month period.	None - EI initiative
DoF**	R&D tax credits	Businesses can claim tax relief on their total research spend in Ireland. If this has increased since 2003.	<i>Smart Economy</i>
DT***	Innovation Fund Ireland (planned)	Planned €500 million fund to stimulate the venture capital (VC) community and support early stage, research intensive SMEs.	<i>Smart Economy</i>
DT	IP tax relief <sup>14</sup> (announced; awaiting implementation)	Tax relief for the acquisition or licensing of IP assets and expansion of assets which are entitled to benefits.	<i>Smart Economy</i>

\* Set up prior to SSTI but encompassed within it. \*\* DoF: Department of Finance, \*\*\* DT: Department of Taoiseach;

Whilst the detail of each of these measures has not been reviewed, they appear to be consistent with the policies set out in the SSTI and the *Smart Economy* documents and with the provisions for support measures contained in those documents (it is noted that the EI Business Partners Programme has arisen since the *Smart Economy*). The set of measures is internally self-consistent and is consistent with the current EU guidelines and with practices in the comparator countries.

### 3.2 Completeness of the current set of measures

F12 There is an opportunity to provide more support for the development of academic results into propositions that would be considered commercially attractive in the private sector.

<sup>14</sup> Ireland's finance bill, 7<sup>th</sup> May 2009

Considerable effort is usually needed to translate the results of academic research into a commercial proposition which would be attractive to industry and investors. Crossing this ‘valley of death’ is often difficult. The effort needed may include applied development of the initial idea, identifying and sourcing complementary technologies, early evaluation of potential applications and markets, identifying the most attractive exploitation business model (or ‘route to money’) and developing the initial business plan. The academic community is not necessarily, skilled, interested or able (in light of time constraints) to lead on these activities, whilst industry and investors may be reluctant to commit to pursue the idea until these activities have been completed.

Possible consequences include a failure to attract any investor interest and hence not achieve commercialisation; pressure to do a deal too soon, leading to resources being wasted on trying to commercialise an immature idea in the wrong way; protracted disagreements about the potential value of the initial idea and - later - suspicions that one party got a far better deal than the other.

Two issues appear to have given rise to the ‘valley of death’:

1. Lack of sufficient early stage funding
2. Lack of appropriate leadership skills needed to translate the results of academic research into a commercial proposition

### **1. Lack of sufficient early stage funding**

In two of the five round table discussions, consultees highlighted a lack of availability of grow-on and incubation funding to translate an academic-driven idea arising from a HEI to a commercial proposition as being a barrier to the establishment of successful spin-outs. Whilst seed funding is available at the outset of forming a start-up, funding for incubating ideas arising from the HEIs is less available. In one case, the view was expressed that whilst existing initiatives such as the Innovation Partnership and the EI commercialisation “plus” funds (described in Annex 1) are useful measures, the idea may have progressed as far as forming a licensable opportunity, but is not sufficiently incubated to represent a good spin out candidate. It is also noted that there is no intended call for commercialisation “plus” funding in 2010 owing to budgetary constraints.

Some consultees felt that, compared to other countries, Irish companies at seed funding stage are receiving public sector support for ideas which would not be considered by a venture capitalist or business angel in terms of likelihood of commercial success. This suggests that, in pursuit of quantity of transactions through driving and incentivising the *quantity* of spin-outs through policy and metrics, the resultant spin-outs do not always pass the test of *quality* and are unlikely to succeed in the aggressive business funding environment that they will encounter post-incubation.

The problem is most acute when seeking to commercialise the results of entirely publicly funded HEI research, either through licensing or the creation of spin-out companies. When the research involves HEI-industry collaboration, it is more likely that the industry partner will have the interest and resources to develop the commercial proposition so the likelihood that the initial idea will go through to commercialisation is increased.

Whilst existing measures appear capable of going some way to bridge the funding gap, those who have a good understanding of the venture capital sector urged caution against simply providing further publically controlled funding. This is on the basis that venture capitalists are wary of companies which are established using predominantly Government funding, as this

funding will have complex terms and conditions associated with it. Simply injecting further funding could complicate future spin-out arrangements still further.

## **2. Lack of appropriate leadership skills needed to translate the results of academic research into a commercial proposition**

In bridging the gap, EI's business incubator and bio-incubator fund was regarded as a successful initiative that has gone a long way to helping SMEs commence operations. However, a number of the consultees noted that, whilst this is valuable, the incubators do not come associated with dedicated corporate skills, especially individuals who can act as a "CEO" of the candidate company, who can take the idea from the principal investigator (PI) and - whilst keeping the PI fully engaged in a "CTO" (Chief Technology Officer) role - develop the idea in terms of seeking candidate market opportunities, understanding the regulatory environment and developing an investment-ready business plan.

To some extent, these two issues have arisen because Ireland's venture capital and business angel network is small. This has been recognised in the *Smart Economy* document, which sets out provisions for a new €500 million Innovation Venture Fund aimed at attracting major overseas venture capital firms to enter Ireland. Detailed arrangements are currently being finalised for implementation of the Fund, taking account of market developments in the past year, in consultation with the Innovation Task Force. The intention is to establish the fund in early 2010<sup>15</sup>. However, the Fund is unlikely to have a direct impact on the 'valley of death' issue as the venture capital activity it seeks to stimulate is not focused on very early stage investments. The lack of sufficient early-stage seed capital remains a problem.

This means that any further intervention planned by way of stimulating early stage venture capital or in providing commercial skills alongside business incubators must be tested with those in the venture capitalist industry to ensure that the business case for a candidate spin-out is robust, for example, the Irish Technology Leaders Group (ITLG). This is an independent organisation comprised of a number of high level technology leaders in Silicon Valley who are of Irish descent and are committed to helping Ireland address the challenges of embracing new technology opportunities.

EI has also recognised this issue and is considering building follow-on space and establishing a scheme which would bring in experienced entrepreneurs to help run new start-ups through the Business Partners Programme, which associates an entrepreneur with the project whilst keeping the PI in a CTO role. On the basis of these issues, and whilst mindful that efforts are already underway to overcome them, the following short term recommendation is made:

**R7 In setting out future IP commercialisation schemes, develop and implement schemes which will support the translation of the results of academic research into viable commercial propositions, for example by providing appropriate early-stage funding, ensuring that the business case for a candidate spin out is robust or bringing in experienced entrepreneurs to help make new start-ups operational.**

<sup>15</sup> <http://www.kildarestreet.com/wrans/?id=2009-11-17.819.0>, accessed November 2009

### 3.3 Alignment with the needs of stakeholders

**F13** The present emphasis on technology transfer risks disguising the importance of the larger need for knowledge transfer.

The set of measures needs to be aligned with the needs of stakeholders. For policymakers, this is economic wealth, while for many companies this is about getting skills into the organisation and focusing on knowledge rather than technology transfer. As part of the consultation process it was attempted to understand what industry - as the ultimate customers of technology transfer - expects and what measures are needed in order to be aligned with these expectations.

Whilst there were differences in opinion as to what attracts businesses to Ireland, the most attractive incentive was corporation tax, followed closely by the quality of the skills base which businesses can draw on. Access to a high quality IP portfolio in most cases was not a major factor. The MNCs would rather draw on a high quality academic research base to solve their fundamental research problems. This suggests that, at a fundamental level, the role of the HEIs in their “third mission” should focus on *knowledge*, rather than more narrowly on technology transfer.

Framing the measures in light of knowledge rather than technology transfer offers the opportunity to alleviate a concern of the funding agencies, that the MNCs will take Ireland’s IP and exploit it for economic gain overseas (e.g. in low cost manufacturing countries such as China or India, or where their R&D headquarters are located). By focusing on transferring skilled individuals and their knowledge into organisations rather than on legal agreements, this creates a drive to encourage MNCs to establish operations in Ireland, and not export IP elsewhere.

There was a tremendous appetite amongst the MNCs for establishing collaborations of this nature. All of those questioned in this line had strong support for bringing academics in to work on projects - both to bring new ideas and to create a talented, business-aware workforce. This was balanced against them wanting “academics to remain academics” to provide the high quality, basic science they favour.

A stronger focus on knowledge transfer is in line with leading initiatives elsewhere. For example, the *Commission Recommendation* and the experts’ report which played a strong role in shaping it refer to knowledge transfer and Knowledge Transfer Offices throughout, while the recently formed European professional body for those working in the area is known as the Institute for Knowledge Transfer.

The following, as a direction for longer term improvement of the IP arrangements, is therefore recommended:

**R8** Widen the IP Commercialisation schemes to cover broader knowledge transfer (e.g. skills, capabilities and networks) rather than just technology transfer.

**F14** There is a perception amongst consultees that the national measures risk damaging the science base, change too quickly and unduly favour MNCs .

As discussed above, some stakeholders - especially MNCs - prefer a supply of skilled talent, with the IP that resides in their heads, more than access to licensable technology. Whilst the Centres for Science, Engineering and Technology (CSETs) and strategic cluster research programmes were considered successful (if complex from the perspective of IP and licensing), the majority of consultees felt that SFI is doing an outstanding job of improving the basic science base and it is this which attracts large businesses in the first place. Indeed, some expressed dismay that they perceive SFI's remit as drifting away from basic research and towards incentivising research which is more commercially oriented. This drift was seen as especially troubling by those who draw on the basic science base for the generation of fundamental science and new ideas - these consultees would prefer "academics to remain academics".

It is understandable that, through this shift in focus, SFI is attempting to raise awareness of entrepreneurship under the auspices of an ideal of "education for life" - creating a pool of academics who remain focused on basic research but are aware of the commercial implications for the work they are doing. The concerns expressed by some stakeholders may be little more than a misperception of what SFI hopes to achieve by this shift in focus. As an example of the level of misunderstanding apparent, several consultees claimed that SFI expects a CSET to begin producing spin-outs within five years of formation. In reality, there is no blanket requirement for spin-outs within a given timeframe. SFI's expectations from the CSETS are high quality research outputs, global visibility of the partnership, actively engaging with industry and leveraging 25% of input from industry (through cash or in-kind contributions).

Some consultees were also troubled by what they perceived as a tendency for SFI and the other funding agencies to change their aims and policies too quickly. This may be based partly on truth, as change is to be expected when a system is still young and evolving, and especially when, as in recent times, there are severe additional financial pressures driving change. It seems, however, that there are also some misperceptions here, which underline the need for any change programme to be very carefully communicated to all those affected.

A broad cross-section of the consultees indicated that they perceive the set of national measures as tending to favour attracting MNCs rather than supporting indigenous businesses. They also indicated that the indigenous business sector is small, compared to that in other countries. This was considered a potential risk in the current situation where TTOs are incentivised to maximise the number of licence deals done, as there may not be enough domestic companies interested or able to take licences.

The following is therefore recommended as a short-term action:

**R9** Clarify for the benefit of all stakeholders, but especially for industry, what the current objectives of the funding agencies are. Clarify also how SFI, in stressing commercial relevance of research balances this objective against the objective of developing a highly skilled pool of talent, and clarify how this balance is expected to change.

## 4. Effectiveness of measures at national level

In this section, consideration is given to what extent the various measures related to IP commercialisation are effectively managed at national level, in particular by the funding agencies.

### 4.1 Communication of measures to national bodies

Finding F6 reflects the urgent need to build a richer understanding, amongst all stakeholders, of the ambitions and directions embodied in the national policies and guidelines and of the need to pursue multiple priorities. Whilst the state agencies felt that the overarching goal of Government was clear, they observed that guidance was lacking regarding IP.

Recommendation R3, concerning the role of DETI in providing top-level guidance on the interpretation of policy should resolve this issue.

### 4.2 Processes for implementing national level measures

F15 Consultees considered the processes used for implementing the national measures were effective, with the Innovation Partnership programme highlighted as a particular success due to the transparent way it handles IP.

In spite of the gaps identified by the consultees in the national measures, measures to encourage IP exploitation from the HEIs were typically very well regarded. Ireland as a whole was considered as being reactive to industry needs. Notable successes included those programmes which involved joint funding with academia, such as the Innovation Partnership scheme, which was singled out consistently as being effective in stimulating industry relevant research and unambiguous in terms of the IP arrangements associated with them.

Though not directly relevant to IP exploitation from the HEIs, IDA's direct interventions with industry were universally regarded as being of exceptionally high quality. SFI's efforts in stimulating basic research were identified in some cases as being world class. EI's interventions were considered generous in comparison to other countries as well as important for stimulating indigenous companies and helping them to market overseas. All consultees said that EI's interventions were essential for any HEI commercialisation activity to take place and felt that, without this intervention, the IP commercialisation process in Ireland would not have been able to progress as far as it has done today, especially with regard to the effectiveness of the Technology Transfer Support Initiative (TTSI).

F16 Given that many of the measures are recently established, some of them - such as the EI IP assistance scheme - are progressively evolving to more advanced systems; in some cases this is perceived as instability.

The national measures have been established very recently and some continue to evolve. An example is EI's IP assistance scheme which, until mid-2009, was a centralised source of funding to cover costs incurred by HEIs, other public institutions and private individuals in protecting their IP. This has recently evolved into a system in which funds are provided to the TTOs in proportion to their level of patenting activity, for them to spend on IP protection at their own discretion, however, this arrangement may be revised again in the near future. In some instances, this was perceived by the consultees as a withdrawal of the fund and a sign of instability of the system, although this appears to have been an issue of miscommunication. The restructuring of the fund is more widely perceived as moving away from a model intended simply to increase the level of IP activity in HEIs and towards a more targeted, discretionary spend. The continuing evolution of IP arrangements is not confined to Ireland - Finland's measures are evolving in a similar manner as the HEIs gain more autonomy in making commercialisation decisions, rather than their IP being handled centrally (Appendix D).

**F17** Stakeholders from industry and the HEIs felt that they could be better consulted when revising existing measures and developing new ones, suggesting a lack of engagement with stakeholders defining the measures.

The MNC consultees collectively felt that they had a limited view of the types of national measure which were available to them and were not involved in the development of these measures. Whilst most were familiar with the major funding streams which involved large scale industry collaboration (notably the CSET programme and to a lesser extent the strategic research cluster programme) or taxation incentives, others were less familiar with collaborative grant funds or planned interventions. Whilst the TTOs were much more familiar with the measures, a small proportion felt that the funding agencies tended not to consult very widely before making changes to measures which would have quite far reaching effects and that there was scope for the agencies collectively and the TTOs to work better in setting up initiatives before they start. As an example, the TTOs reported that there were cases of students sponsored abroad whose offers were made direct to the students, which has the potential to conflict with established IP rules within each HEI, even though the HEI will ultimately bear the legal liability for the consequences of an agreement.

Findings F16 and F17 suggest that the agencies can do more to inform and consult with stakeholders. The following short-term action is therefore recommended:

**R10** Develop a systematic mechanism for engaging key industry and HEI stakeholders in government and agency work to develop new IP Commercialisation schemes and/or to modify existing ones.

**F18** Perceptions of the behaviour of Enterprise Ireland in controlling TTO activities cause some difficulties when finalising deals.

On a number of occasions, consultees reported what they saw as unhelpful interventions by Enterprise Ireland in their attempts to close deals:

- From the perspectives of both businesses and the TTOs, instances when Enterprise Ireland has withdrawn funding late in the negotiation process, often when other funders have already committed their contributions;
- From the perspective of TTOs, examples of a deal being negotiated with an industry partner, only for the Agency to veto the deal at a late stage on the basis that the return on investment was insufficient from the Agency's perspective; and
- From the perspective of businesses, a surprising level of stringency in auditing requirements for grant claims, with most transactions said to require an auditor's certificate (compared with the norm in obtaining funding from EU Framework Programmes where grant claims require only selective auditing).

While these consultee remarks were relatively infrequent, they do raise an important issue of TTO governance and motivation. It is perfectly proper for funding agencies to set financial and quality standards that TTOs should meet when negotiating deals involving publicly funded research and then to exercise an oversight function to ensure those standards are met. It also seems reasonable, when the TTO system and individual TTO staff are inexperienced and building up competence, for agencies to monitor developments very closely - even at the risk of being accused of micromanagement.

Eventually, however, the preferable situation will be to set standards and leave TTOs free to work autonomously to those standards (perhaps with a ceiling on their authority, above which a deal must be referred back to the agency for approval). This approach:

- Motivates TTO staff by signalling trust in their ability to negotiate sensible deals;
- Speeds up the deal-making process, by cutting out an agency review step; and
- Puts the responsibility for the deal decision where it belongs - with the HEI.

It is noted that the recent move to put IP protection funds into the hands of the TTOs is a step in this direction. Also, local TTO decision authority does not stop TTOs calling on support and advice from the agencies if they wish. In particular, TTOs should be encouraged to use agency support to have spin-out proposals thoroughly reviewed by external panels of advisors.

It is also noted that EI's Consent Committee is formally only concerned with the geographic destination of transferred technology. Stakeholder concerns about over-management by the agencies may therefore be at least partly a matter of misperception of EI's behaviour towards deal approval. The following short-term action is recommended:

**R11** Emphasise the position that HEIs, through their TTO Director, are clearly empowered to do deals without being required to seek agency approval, provided those deals meet national standards for quality, financial terms, maximum deal size and, where appropriate, geographic destination.



### 4.3 Effectiveness of process governance for national measures

F19 Whilst opinions vary, on balance a decentralised model of TTOs is favoured for Ireland, supported by strengthened centralised IP management skills and stronger linkages between TTOs .

The concept of a centralised TTO for the whole of Ireland came up frequently throughout the consultations. When the TTSI was set up, some argued for a single central TTO, on the grounds of critical mass and efficiency. However, a decentralised model was adopted on the basis that individual HEIs needed to have control of and responsibility for their own commercialisation activities. Currently, EI maintains a centralised commercialisation competence which the TTOs can draw on, which is primarily business facing and is organised into sector specific groups in Information & Communication Technologies (ICT), industrial technologies and life sciences.

A wide range of opinions was expressed as to whether a single centralised TTO was feasible or desirable and how the existing central function could be made more effective:

- The TTOs generally felt there was a need for personal relationships with the researchers for outreach and education;
- The industry stakeholders felt that they would prefer a single “one stop shop” where they could access candidate ideas and IP from a single repository but that there would still be linkages required within institutions; and
- The state agencies offered a range of perspectives, including a commercial, professionally run centralised operation although this was tempered by the view that the UK’s attempt to do this (through the British Technology Group) was ultimately not effective.

While the benefits of critical mass and economies of scale are attractive, total centralisation is not appropriate for the following reasons:

- A crucial function of the TTOs is networking and relationship management, both with the academic community and with national and, in particular, local industry. Physical TTO presence is important for building this innovation ecosystem;
- Having the TTO physically and organisationally located within the HEI encourages the HEI to pay attention to it and its mission; and
- The commercialisation process requires commitment at all levels within the HEI, and having the TTO office reporting to the HEI is essential to ensure that this happens.

However, there is a case for providing certain functions partially or wholly through a central organisation, where this would allow better quality and/or lower cost than a distributed approach. For example:

- Specialist skills such as legal counsel, patent research and structuring of especially complex multi-party deals such as those associated with the CSETs. A TTO would only come across such complex deals infrequently, such as when the CSETs are renewed, and so is unlikely to build up deep skills in-house. Central legal counsel and patent specialists could reduce total expenditure on such services, given that few TTOs have all they need in-house so must rely on buying external services;

- Building on the existing networking amongst the TTOs to develop a more cohesive group that could work systematically to assemble commercially attractive packages of cross-discipline and cross-institution technologies, share common approaches and negotiating positions, and learn from shared experiences and common professional development programmes. This could be stand-alone or under the umbrella of, for example, the Association for University Research and Industry Links (AURIL) or the Institute for Knowledge Transfer;
- A centralised IP exchange where ideas could be brokered, rather like a financial services centre (rather than a bank, which would be perceived as an out of date repository). This would respond to industry’s preference for a “one-stop-shop” for Ireland’s IP - an initial port of call for those new to Ireland, or those well established but seeking new, innovative ideas, perhaps in a sector in which they don’t normally operate;
- Building on peer-to-peer networking between academics within the HEIs and industry directly, perhaps through drawing on elements of best practice from the London Technology Network (LTN), the London component of the Enterprise Europe Network. LTN coordinates with junior researchers within University departments to identify potentially useful technologies, funds Principal Investigators to carry out industry relevant work for a small proportion of their time and helps to match these opportunities with industry (further details in Appendix B); and
- Advising TTOs and other interested parties on how to resolve issues arising in individual deal negotiations. In particular, as discussed in Section 2, perceived conflicts between the various national ambitions for commercialisation, and between the requirements of the various agencies, can create uncertainty.

It is not clear in which organisation this central function should be. At first sight, EI is an obvious location, since EI already provides some central support. However:

- It is understood that EI may not have the resources to provide a function that serves the needs of all the agencies;
- On grounds of good governance practice, it is not ideal for one agency to be responsible for providing services to meet the requirements of all agencies and advise on how to deal with conflicts between those requirements; and
- The benchmarking data suggests that peer-to-peer networking works best outside of Government departmental control (Appendix B).

This suggests that, ideally, a central commercialisation support and advisory function should be located outside and independent of the present agency structure. Such a separate function might logically look to DETI, as the body with overall policy responsibility, for direction.

Over time, evolution to such a structure would be appropriate, either by creating a new organisation or expanding the role of an existing organisation. For the time being, creating a new organisation is unlikely to be attractive: it could be seen as simply adding to the confusion caused by the wide variety of organisations already involved and, in the present financial climate, would be wholly inappropriate. As a pragmatic alternative the following short-term action is recommended:

**R12** Whilst ensuring that effective decentralised TTOs are maintained in HEIs, revise and widen the scope and remit of EI's existing central support services for TTOs with, for example, legal services etc.

#### 4.4 Resourcing of national measures

**F20** The national measures appear to be adequately resourced in terms of value and timescales associated with funding, although there are concerns around how this will change given the economic situation.

Several consultees from industry identified that some competitive national funding programmes were, with life spans of 3-5 years, too short term to be effective and created fluctuations in the research relationships. However, competitive programme funding will improve research quality by selecting those research providers which are most able to deliver the best work, and allow funding to be re-focused on important science priorities. A greater concern is the sustainability of the funding for more long term initiatives, such as the TTSI. Several of the funding agencies said that they expected funding cut-backs, which could jeopardise the effectiveness of some measures and, ultimately, of the entire IP commercialisation system.

Consultation with DETI indicates that those core streams of longer term funding which underpin the success of the national measures, such as the TTSI, will be maintained as a priority. EI confirms that, in principle, the TTSI will be maintained in some form as a priority going beyond its current end in 2011. Nevertheless, there remains a great deal of uncertainty amongst TTO staff. Any reductions in funding for the national measures will need to be handled carefully by the state bodies to ensure that:

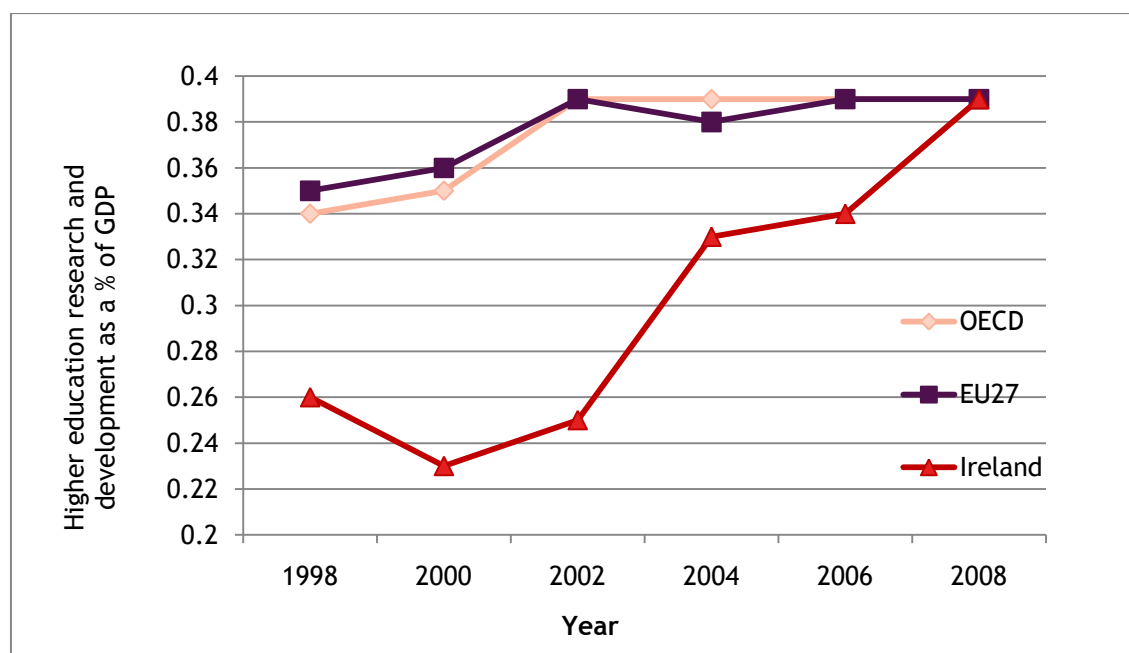
- The basic underpinning resources such as the TTSI are preserved to ensure that the commercialisation system can continue to function;
- The prospects for continued funding (even if this is at a reduced level) are clearly communicated to the TTOs such that they feel they have the resources to remain motivated and work effectively; and
- Any changes to the national measures are made with the intention of improving efficiency, rather than cost savings *per se*.

The issue of continued central funding for the TTOs is discussed further in Section 5.4 and Recommendation R17 below.

**F21** In comparison with international standards and whilst mindful that Ireland's system is still relatively new, the national measures are performing well above expectations, are achieving good value for money and are approaching EU norms.

Although substantial investment into public sector R&D has only built up over the past decade, the effects are already demonstrable. Contributions to GDP resulting from HEI performed R&D is now comparable with other EU27 and OECD countries (Figure 2). In terms of the existing innovation indicators used by EI (patents, licences and spin-outs), the national measures are exceeding pre-defined targets, with the exception of a considerable dip in spin-outs in 2008, which has triggered the launch of new initiatives such as the Business Partners Programme (Table 3). An independent review commissioned by EI this year by senior TTO executives from abroad (the so-called 'wise men' report) reinforces the view that, given that the measures and policies remain relatively nascent, the HEIs are performing well above expectations<sup>16</sup>. Collectively, this suggests that given these circumstances and the recognition that the measures will evolve still further over time, Ireland is receiving good value for money from its investment in stimulating IP commercialisation.

**Figure 2:** Higher education sector performed R&D as a percentage of gross domestic product (GDP) 1998 - 2008



Source: Forfás Research and Development statistics, 2009

<sup>16</sup> Enterprise Ireland commissioned independent study: Report on Review of Technology Transfer System in Ireland, 2009

**Table 4: Technology transfer outputs from Ireland's higher education institutes (2007-2009)**

Metric	2007			2008			2009		
	Actual	Target	Deviation	Actual	Target	Deviation	Actual	Target	Deviation
Patents filed	124	119	+ 4%	202	135	+ 50%	144	164	- 12%
LOAs*	56	40	+ 40%	67	52	+ 29%	94	64	+ 47 %
Spin-outs	13	17	- 24%	7	16	- 56%	35	27	+ 30%

Source: Enterprise Ireland TTSI data. Figures are for all HEIs, IoTs and Teagasc.

\*LOAs: Licences, Options exercised, Assignments

There were some remarks that scoring highly on performance metrics that only count numbers of transactions says little about the quality of those transactions. As discussed above, while it is noted that an emphasis on quantity risks compromising quality, the TTOs at least deserve credit for delivering on the targets they were set. It is too soon to assume that quantity has been achieved at the expense of quality; time will tell if the transactions to date will lead to commercial success. However, it is noted that, at least in the case of new company formations, the deals have gained support from EI's external advisers and, in some cases, attracted substantial venture capital support. This suggests that these, at least, were 'quality' propositions.

## 5 Effectiveness of measures at institutional level

This section considers the effectiveness of the IP arrangements at the level of the HEIs by first looking at how well the HEIs understand the arrangements and second how well the HEIs are implementing them in terms of performance, governance, resources and culture. This discussion should be seen as complementing the ‘wise men’ review of the TTOs carried out earlier this year<sup>17</sup>. This report naturally overlaps with that review to some extent but has not attempted to duplicate it.

### 5.1 Communication of measures by national bodies to institutions

**F22** Whilst mechanisms are in place for communication between the state agencies and HEIs, these are not always fully effective.

Most of the TTO staff consulted were well aware of the range of measures that exist although the understanding of the content of those measures was, in a few cases, rather uncertain. As was noted in Section 2, the understanding of the wider policy context was much patchier. Some staff were clearly interested and informed but, at the other extreme, one or two found the policy context so unclear, contradictory and rapidly changing that they preferred to pay very little attention to it.

Throughout the course of this engagement, there were several instances of incomplete communication between the agencies and the HEIs, leading to perceptions that do not necessarily match reality. Some of these are already mentioned in previous Sections. Examples include:

- The perception that SFI’s remit and the metrics by which it assesses HEIs’ performance are changing rapidly and without proper thought about the impact on research agreements already in progress. This issue is not so much about change *per se*, but more to do with keeping those affected by it fully informed on the nature of the change, on new expectations and on how to deal with the legacy of current initiatives that were launched and structured to meet former objectives;
- Confusion about SFI’s requirement for CSETs to create spin-outs within a given timeframe. There appears to be great uncertainty as to whether this is actually a requirement although SFI have confirmed that it is not;
- Low awareness of the current status of EI’s scheme for funding the costs of obtaining IP protection. This scheme has recently evolved from a centralised source of funding to a devolved one. Several consultees from the TTOs believed that the scheme had stopped altogether. This can be interpreted as an issue around understanding, as documentation communicating this change exists; and

<sup>17</sup> Enterprise Ireland commissioned independent study: Report on Review of Technology Transfer System in Ireland, 2009

- Concerns about the sustainability of central funding to support the TTOs, which has created a great fear amongst TTO staff that they will not keep their jobs after their current contracts come to a close. Whilst a degree of uncertainty in the current economic climate is inevitable, the agencies could do a better job of explaining what may happen when current TTSI funding ends.

There were also perceptions that what is published on the agencies' websites often bears little resemblance to the actual state of affairs, and that many of the changes are conveyed only by word of mouth. A minority of the consultees from the HEIs felt that unless they maintain strong personal contacts within an agency, it can be hard to keep in touch, and should their key contact move away, they lose their ability to stay informed.

At present, the chief communication mechanism is the quarterly meetings chaired by EI, and attended by representatives of the TTOs, SFI and IDA. Several of the consultees from the HEIs felt that, whilst these were useful discussion fora, the level of action arising from them on the part of the agencies was somewhat limited. These quarterly meetings are complemented by agency announcements from time to time, mainly by email.

Much is to be gained by improving the effectiveness of communications, so that HEIs in general and TTO staff in particular fully understand the range, content, rationale and likely evolution of the measures in place. This will help to reduce their levels of uncertainty and frustration while also enabling them to achieve more. Choosing the best set of communication pathways, balancing effectiveness against cost, is best done jointly by the agencies and TTOs (including DETI and the central support and advisory function in Recommendation R12). Some possibilities are:

- Producing a regular (perhaps monthly) 'Commercialisation News' that announces and explains new and changed measures, lists latest transactions, including the 'learning points' taken from the experience of each one and describes in more detail a case study of a successful deal, including the benefits created for each stakeholder and for Ireland as a whole. This could be achieved by, for example, creating a new publication by the enhanced central support function referred to above; or extending the scope and target audience of EI's 'Technology Ireland' bi-monthly journal, the current remit of which is to draw exciting new technological developments to the attention of EI's investment companies;
- More frequent face-to-face meetings of Agency and TTO staff, with more emphasis on 'master classes' to look in depth at how to make a particular measure work well or how to deal with a challenging aspect of deal structure or negotiation;
- When agency-TTO meetings deal with decisions or actions, more emphasis on formalising action planning, accountability and reporting; and
- Publishing all the above on a dedicated and frequently updated website, with links from all agency and HEI sites (a site that could, for example, be maintained by the enhanced central support function).

While suggesting case studies, it is also noted that there seems to be little attempt to publicise successful examples of collaboration and commercialisation. Several examples were described in the course of this review but with the comment attached that 'we haven't done anything with this'. This is a great missed opportunity, as role models are powerful ways to encourage others. Commercialisation successes, if well and widely publicised, will not only help TTOs to feel pride in their work but will show industry what can be done and HEIs the value of the 'third mission'.

The following short-term action is therefore recommended:

**R13 Identify, jointly between Agencies and HEIs/TTOs, and implement ways to enrich existing formal communication and dissemination mechanisms, for example by a regular news publication, ‘master class’ meetings, action accountability and reporting and a dedicated website. Include wide dissemination of commercialisation success stories amongst all stakeholders, ensuring that processes for capturing feedback are in place.**

## 5.2 Processes for implementing institution-level measures

**F23 Institution outputs are very good.**

As discussed in Finding F21, given that many institutional level measures are relatively new, when comparing the metrics published by EI with international benchmarks, it is evident that Ireland’s IP performance in terms of quantity of patenting activity, licence deals and spin-outs is outstanding (Table 3, above). This is especially remarkable given that much of the TTO system and many institution level measures are still relatively new. As well as the level of overall commercialisation activity, notable achievements have included:

- Setting up functional TTO teams in a very short space of time and achieving a performance level about which the recent ‘wise men’ review spoke highly;
- Stemming the flow of IP leakage out of the universities through raising awareness amongst researchers; and
- Fostering a culture of not embarking on collaborative work until the necessary agreements are in place.

**F24 Opinions diverge considerably as to who is responsible for assuring the integrity of IP and the extent to which the TTOs are required to be responsible for issuing warranties and liabilities.**

There was a great divergence of opinion amongst the consultees as to the extent to which the TTOs are expected to assure the integrity of IP under consideration for licensing and the extent to which they ought to provide any warranties or assume liability for lack thereof. This issue was identified as one of the major sources of difficulty and delay in negotiating agreements in Ireland, compared to elsewhere, and one of the reasons why some academics perceived the TTOs as being “roadblocks” to a successful deal.

Some industry consultees expected the IP offered by HEIs to be “clean” and assured to be free of any possible third party claims or liabilities. They reported that obtaining warranties to this effect this had been a problem, especially with the CSET agreements where partners had not wished to assume liabilities any higher than the amount they had contributed to the partnerships.



Other consultees were more positive. Some said that they would usually seek to establish a non-disclosure agreement at the outset to ensure no leakage of new ideas and would check the integrity of the IP themselves, a view shared by those from the venture capital community. Others, particularly from the software domain, took it for granted that the IP may be compromised in terms of its integrity (e.g. through containing open source material) and accepted that they would take the kernel of an idea forwards themselves, developing it in-house until they were sure it was robustly defensible.

From the perspective of the TTOs, there was a universally expressed fear of leaving the HEI exposed in the event of a high value licensing deal going wrong and a desire to make any transaction as watertight as possible, even on occasions where the IP involved pertained to basic research with little immediate commercial value.

This concern over warranties appears to be the result of several factors, including the relative newness of the Irish TTO system and hence some inexperience and lack of confidence. This is exacerbated by (at least a perception of) a weak Irish negotiating position, caused by a lack of funds to match the power of the MNCs' teams of lawyers and by pressures from some directions within Ireland not to fight too hard for fear of driving the company away. It also reflects the earlier observation in Section 2.1 of the need to distinguish between the different types of IP. But, more importantly, it highlights confusion in roles between the different parties involved.

Good practice in other countries (the United States, for example) is to expect that the HEIs take reasonable care in ensuring the integrity of their IP as it is created, seeking external professional advice from patent attorneys as necessary. TTO staff can play an important role in helping to achieve this. They should not be doing exhaustive retrospective due diligence over the integrity of IP when it comes to doing a deal, although they should be able to warrant that the IP is 'clean' *to the best of their knowledge*. Their role in the transaction is that of a facilitator: bringing industry, patent attorneys and the researcher together to agree the best way forward, and setting out a clear but reasonable stance at the outset as to what the HEI's position is with regard to an equitable return, taking into account the nature of the IP involved.

Industry should expect warranties from the HEI that it has taken all reasonable steps to ensure that the IP is clean but cannot expect an absolute guarantee that this is so. It should assume the responsibility of conducting the due diligence required to ensure that the IP is watertight before entering an agreement with a HEI. Indeed, many businesses' corporate policy requires them to do this. Many businesses come to the table expecting to find some flaws around the defensibility of the IP and are well versed in how to handle such eventualities. Indeed, in many cases, industry consultees acknowledged that their own corporate legal processes at head office were often one of the main contributors to delays in a transaction.

What would help to reduce the level of concern on this issue, and shorten deal times is to have a clear and common national position statement setting out what, in the typical case, industry can expect HEIs to warrant and what is therefore left to industry to manage. This position statement should specify any differences in approach for different fields of IP (for example, software versus pharmaceuticals) and any quanta of liability that HEIs might accept in given types of situation. This position statement should ideally be developed jointly between the agencies, the HEIs and TTOs and representatives of industry such as the Irish Business and Employers' Confederation (IBEC).

This leads to the following two recommendations for short-term action:

**R14** To ensure reasonable levels of IP integrity which at least meets international best practice, HEIs, with support from their TTOs, should work together to enhance their systems to develop a consistent approach to achieve this aim.

**R15** Agree, jointly between agencies, HEIs and industry, and publish a common position statement setting out what warranties of IP integrity industry can reasonably expect HEIs to give.

### 5.3 Effectiveness of process governance for institutional measures

**F25** TTOs find it difficult to spend enough time building relationships due to the pressure to spend substantial time on “reactive” activities.

The TTOs estimate that their efforts are split 80% on reactive work (handling IP agreements and negotiations and supporting partnership initiatives) and 20% on proactive work (IP scouting, building links with academics, marketing and engagement with companies, and training). Many of them feel they are “close to drowning” in the volume of reactive work required, and find it hard to prioritise scouting and relationship management over protecting the HEI’s liabilities.

Those with experience of technology transfer outside Ireland - including the ‘wise men’ in their recent review of the TTOs - acknowledge that the optimum route to success in technology transfer is to grow the level of quality deal flow coming out of the organisation. This means that, rather than focusing only on achieving the maximum revenue from a single licence deal, there is a need to increase the overall number of deals and, in so doing, to build stronger relationships with industry and with the TTO’s own academic community. This is a consequence of the networked or ecosystem model of innovation discussed earlier in this report. In this model, powerful innovation is a product of dense and effective webs of relationships.

In parallel with managing a wide portfolio of relationships, TTOs should expect to manage a portfolio of commercialisation opportunities: a range of ideas from early research results to licence opportunities and spin-outs, in each case with relevance to certain relationships. The portfolio should include not just isolated ideas but also packages of ideas and technologies (including complementary technologies from sources outside the HEI) that form bundles with higher potential commercialisation value than the sum of the parts.

The portfolio of ideas and bundles should then be actively promoted through the relationship network. For example, many conferences (such as Bio in the US) contain partnering forums involving academics and industry representatives. Pharmaceutical companies are particularly extensively involved in partnering through forums such as this. TTOs would do well to attend such events. The national ‘IP exchange’ discussed in Section 4.3 would support this.

This suggests that, as well as the greater emphasis on deal flow recommended by the ‘wise men’, there needs to be a greater proportion of TTO time spent on IP portfolio and relationship building and management, within their academic communities, amongst local and national firms and horizontally across HEIs in order to exploit multi-institution and multi-technology opportunities.

Of course, spending more time on relationships is only possible if TTOs can spend less time on their current ‘reactive’ work. Steps that may help include:

- Strengthening TTOs’ knowledge of the national policies and commercialisation support measures;
- Establishing a clear national position on warranties; and
- Reviewing, with their parent HEIs, to what extent TTOs should take on work that might in other countries be dealt with by a separate research office, such as reviewing research agreements. Some TTOs acknowledged that this was technically outside their remit but they did it anyway, partly because they recognised the lack of appropriate skills elsewhere in the HEI and partly because it was a useful way for them to be aware of everything going on that might be relevant to them. Nevertheless, HEIs should question if this is the best way to use scarce TTO resources and consider either increasing that resource or developing their research office function.

The following action for longer term improvement of the IP arrangements is therefore recommended:

**R16** Each HEI should develop a commercialisation strategy, TTO mandate and performance metrics which takes into account the importance of the role of building and managing relationships and IP portfolios and reduces the levels of effort TTOs spend on ‘reactive’ activities.

#### 5.4 Resourcing of institutional measures

**F26** There is a consensus that the TTOs have adequate resources in terms of headcount but that they need to be up-skilled.

Staffing levels in the TTOs are broadly in line with international benchmarks, with some exceptions such as the TTOs at some major UK universities.

Skill levels vary amongst TTOs but are generally high. Many staff are highly experienced, although some are fresh from university. Most have business backgrounds and many combine PhDs with business skills. At some TTOs, all the staff come from outside the academic world - some are specialists in IP management, some with formal qualifications. This is broadly comparable with other countries (see Appendices B and C for examples from the UK and US).

TTOs are not availing of all training resources. Part of the budget EI provides for TTOs includes specific amounts for travel and training for each member of professional staff and for membership of professional bodies (e.g. AURIL). EI also holds three or four training and networking events each year. PraxisUnico (the UK not-for-profit organisation set up to support innovation & commercialisation of public sector research for social and economic impact) has

recently been used to deliver training on marketing, spin -out creation and valuing technologies. Despite all that is offered, the take up rate is not sufficient to absorb the entire available budget. TTOs do take training on specific topics when they feel the need but generally do not have the time to invest more in professional development.

**F27** TTOs typically have no in-house dedicated legal staff.

Few HEIs have any general in-house legal support (even in the research offices) and none of the TTOs have their own in-house IP lawyers. They regret this as it forces them to spend large amounts of money on fees for external lawyers and patent attorneys and requires them to spend their own time reviewing legal agreements rather than scouting and relationship building. In some instances, those with legal training within the TTOs are asked to review legal agreements which are not connected with their technology transfer remit. By contrast, TTOs in other countries typically contain specialised legal support. The TTOs at the main universities in Singapore are supported internally by IP lawyers (Appendix D) whilst some of the US HEIs deliberately separate research contractual negotiations from commercialisation activities within the TTO (e.g. Stanford University, Appendix C). The earlier Recommendation R12 to establish a central pool of specialist skills would help to address these issues.

**F28** There is an unrealistic expectation that TTOs can be profitable and that commercialisation deals can bring in funds to support research budgets.

Some TTOs perceive their parent HEIs as expecting IP commercialisation to contribute substantial revenue. This expectation is unrealistic. Even in the US, widely perceived to be the most advanced commercialisation culture in the world, average income from commercialisation is only around 3% of research revenue. The average in Europe is much less. It is understood that at least some of the Irish HEIs do accept that they are not aiming to make money from technology transfer.

It is worth noting that the mission statement of Cambridge Enterprise, recently voted the UK's best TTO, puts earning money as the third of its three aims, after aiding knowledge transfer from the university and aiding staff and students to make their ideas more commercially successful. This illustrates the principle that the chief purpose of HEI IP commercialisation is public good - knowledge and technology transfer for the benefit of society - and not making money. That said, it is reasonable to expect established TTOs to cover their costs. This, however, takes time. International experience suggests it takes at least ten years for a new TTO to build up its portfolio of IP and relationships to the point of financial breakeven (Cambridge and Stanford Universities are at this point (Appendices B and C) but continue to plough revenues from commercialisation activities back into the University. Given Ireland's smaller scale, this may take longer and HEIs and funding agencies should expect to continue financial support for their TTOs for several years to come.

This issue, as discussed above in Section 4.4, is particularly urgent in view of the risks that continued uncertainty about central government funding of the TTOs, beyond the term of the current TTSI, may cause key TTO staff to leave. The following short-term action is therefore recommended:

**R17** Review the arrangements for continued central and financial support for TTOs beyond the term of the current five year Technology Transfer Support Initiative (TTSI) cycle and provide clarity in the near term to the TTO staff because given the relative recent set up of the current TTO structures and Ireland's scale of activity it is unlikely that TTOs will be commercially self-sustaining in the short to medium term.

**F29** Networking between TTOs and their use of professional bodies is good and can be better.

The frequency with which TTO staff described their informal networking and exchanging of advice amongst each other and with contacts in similar situations abroad is impressive. This is positive and to be encouraged.

There is a lack of use by the TTOs of the various relevant professional associations, such as AURIL, Proton Europe and the Institute for Knowledge Transfer. Whilst a few TTO staff are very actively involved in these bodies, many are not and some seem to be unaware of their existence. This is a missed opportunity as these associations offer a wealth of experience, advice and continuing professional development. It should, however, be noted that most TTO staff are fairly new and, it seems, have so far been too busy to consider these associations. In time, however, they should seek to take advantage of the expertise of these associations. It is also possible that one role of the enhanced central support and advisory function described in Recommendation R12 could be to 'mine' these associations for good ideas and disseminate these ideas to TTOs, for example via the enhanced communication mechanisms described in Recommendation R13.

## 5.5 Culture within institutions

**F30** Institutional support for TTOs is patchy.

Some TTOs enjoy strong support from individuals at senior management level within their parent HEIs. There is, however, a widespread perception amongst TTO staff that the HEIs are not fully committed to having a TTO within the institution. This is seen partly as a financial issue (HEIs having little money to spend on TTO activities) and also as a consequence of a deeper lack of conviction that HEIs should pursue a 'third mission'.

F31 'Third Mission' is not considered a legitimate activity for HEIs.

Whilst TTOs enjoy strong support from certain key senior staff in their parent HEIs, the general position seems to be that the HEIs, especially the older universities, are unconvinced that the Third Mission is a legitimate activity for them. They are therefore not inclined to fund TTO activities. While the central agencies may wish to encourage more HEI commitment to Third Mission activities, it is not realistic to expect the HEIs to pay for all the costs of their TTO function. Central funding for TTOs will be needed beyond the current five-year TTSI contract period, to ensure that the commercialisation activity is maintained and to offer reassurance to staff in the TTOs.

More fundamentally, it will be important for all stakeholders to recognise that the primary reason for a HEI to maintain a technology transfer function is for the public good. Universities, in particular, may see this as a more valuable companion to their teaching and research missions than a commercial mission.

During consultation exercise it transpired that some HEIs received contributions from funding agencies towards overheads (such as IT and library facilities) but who choose not to allocate any of this overhead money towards their TTO, arguing that the TTO should pay its own way. This is an unrealistic expectation in the short term. Present financial constraints are fully understandable. However, if the commercialisation process is to continue and develop further, the HEIs and the agencies (in particular, EI as the agency responsible for the TTSI) cannot avoid deliberating and reaching agreement as to how the TTOs are to be supported over the next several years. This must be completed in advance of the end of the current TTSI funding.

Issues to consider in this discussion include:

- Licensing for exploitation outside Ireland. At present, this is, understandably, not encouraged. However, on the basis that any income is better than none, Ireland might choose to accept commercialisation deals that would help to reduce the amount of its own public funding for the TTOs;
- HEI ownership share in spin-outs. HEIs should do all they can to maximise their eventual return. We have heard of instances where HEIs have demanded non-dilution clauses in spin-out agreements to protect their ownership share in subsequent funding rounds. It seems unlikely that this will be acceptable to many potential investors. A better strategy may be to accept a smaller share but to do everything possible to help promote the rapid growth of the total value of the business; and
- Investment in active incubation facilities. Building on the previous point, one way to grow total value is to develop early stage ideas and start-up companies in 'hot house' incubators. Although incubators do exist, many simply provide space, without offering business skill support. Enterprise Ireland is seeking to readdress this imbalance by initiating a scheme to bring in 'serial entrepreneurs' to help run newly founded businesses within the incubators, taking the pressure away from the TTOs and academics to do this.

**F32** Concerns about the time taken to complete a deal are only partly justified.

There were many complaints, from a wide variety of stakeholders, about what is seen as the excessive length of time it can take to complete the negotiations to do a deal. TTOs are blamed for being obstructive or overly cautious.

In part, this criticism is unfair. Deals can indeed take a long time to complete, for example:

- At Cambridge Enterprise, the established and successful TTO at Cambridge University, can take anywhere between a week and six months to complete a deal from the point where a potential partner company is found. From initial invention disclosure to a deal can take up to two years (Appendix B). Irish TTO performance compares favourably with this; and
- Deals with MNCs can apparently be delayed for long periods waiting for the company's head office legal staff to find time to deal with the draft agreement.

Even so, there does seem to be room to speed up the deal process. The Recommendations in this report will help by:

- Strengthening TTO skills and confidence by better communications between themselves, the TTOs and the agencies and by making more use of experience and ideas available through the knowledge transfer professional associations;
- Developing and publishing more prescriptive model contracts with the promise that negotiation can proceed very quickly if these model terms are accepted without further negotiation (an approach typical of US TTOs, for example); and
- Providing a national position statement dealing with warranties on IP integrity.

An additional useful action will be to keep better records of how much time is taken on each of the various steps in negotiations and then set metrics to drive performance on those steps over which TTOs have control. It is worth noting that, while many complain that 'it takes too long', it is hard to determine which parts of the negotiation process is felt to take too long. The following short-term action is therefore recommended:

**R18** While the time taken to do a deal is typical by international comparison there is an opportunity for Ireland to be quicker than everyone else. This can be achieved by setting up a standard list of elements of the deal process and record the time taken for each element of the negotiation process. Based on this analysis, agree realistic targets for TTOs for the maximum time allowed for each element over which they have control.

## Annex I: Summary of national measures

**Table 5: Summary of existing and planned IP and commercialisation measures in Ireland provided by SFI, EI and IDA Ireland**

	Measure	Description	Policy link
EI	Technology Transfer Support Initiative (TTSI)	<p>A five year initiative (2007-2011) with a budget of €30 million<sup>18</sup>, administered competitively to TTOs to strengthen institutional competence and enable capacity building</p> <p>Funds can be used for recruitment, training (both within Ireland and through international networks such as ProTon and Auril) , IP scouting, policy and process support)</p> <p>To date, 10 institutes have been approved for funding totalling, €17.1 million. The initiative has given rise to 30 trained TTO professionals</p>	SSTI
EI	Innovation vouchers	<p>Funds of up to €5,000 for small businesses to access knowledge resources in HEIs from specified providers</p> <p>Enables businesses to draw on the HEIs to develop a particular solution on their behalf</p> <p>Can be used for most forms of innovation (e.g. product and business model development, supply chain work, product testing and tailored training)</p>	SSTI
EI	Centralised IP expertise	<p>EI provides centralised IP support as follows:</p> <p>Administration of funding (commercialisation, intellectual property and incubator / bioincubator funding, described individually in the table below)</p> <p>Access to wider capabilities of EI (e.g. expert support from EI Bio Research team)</p> <p>Direct TT support to the TTOs through access to 30 sector-specific commercialisation staff, primarily in the life sciences and ICT sectors</p> <p>Administration of centralised funding sources: Commercialisation fund; Technology transfer fund; Intellectual property fund</p>	SSTI

<sup>18</sup> <http://www.enterprise-ireland.com/ResearchInnovate/Research+Commercialisation/Technology+Transfer+Strengthening+Initiative.htm>, accessed November 2009



	Measure	Description	Policy link
		<p>Diffusion of information to HEIs, e.g. the Applied Research Forum in June 2009 which provided an opportunity for publicly-funded researchers to focus on the issues and benefits associated with the commercialisation of their research)</p> <p>Diffusion of information to industry, e.g. the BIG IDEAS Showcase in October 2009 which communicated ideas from the HEIs to industry)</p> <p>EI advice and seed funding to campus companies</p>	
EI	Commercialisation fund	<p>Annual budget of €13.6 million, seeking to bring academic research to the attention of investors. Whilst no call for applications is expected in 2010, three tranches of funding have in the past been made available to academic researchers:</p> <p>Proof of Concept phase: Aims to support academic researchers to explore innovative scientific concepts with commercial potential. Grants of €50k to €100k may be awarded for up to 12 months</p> <p>Technology Development phase: Assists researchers in accomplishing substantive applied research projects, where underlying technologies are sound and market opportunity is high. Grants of €100k to €400k may be awarded for 18 to 36 months</p> <p>Commercialisation Plus fund: Funding for initiatives which have reached advanced discussions with commercialisation partners but need to address specific market validation issues. Responses are typically prepared jointly with the institute's TTO</p>	SSTI
EI	Intellectual property assistance scheme	<p>Until mid-2009, the Enterprise Ireland IP Assistance Scheme provides advice on protection, development and commercialisation of inventions, and funded patent applications for HEIs, other public institutions and private individuals<sup>19</sup></p> <p>This fund has now evolved into a total of some €2.4 million which is administered to the TTOs directly, for discretionary spend on the protection of IP</p>	SSTI

<sup>19</sup> Enterprise Ireland Intellectual Property Assistance Scheme Guidance Notes. Available at: [http://www.enterprise-ireland.com/NR/rdonlyres/59978C0C-44BE-4D6A-B924-760879D752F4/0/IP\\_brochureC2.doc](http://www.enterprise-ireland.com/NR/rdonlyres/59978C0C-44BE-4D6A-B924-760879D752F4/0/IP_brochureC2.doc), accessed November 2009

	Measure	Description	Policy link
		The fund is distributed according to the relative level of patent activity taking place within each institution and has been communicated effectively to the TTOs	
EI	Incubator and bioincubator support	<p>A €50 million investment over 10 years with the support of the European Regional Development Fund in providing 22 business incubator facilities at 16 IoTs and 5 universities, providing office space for start-ups emerging from the university and the wider region</p> <p>The funding has also provided for the establishment of six specialist bio-incubation facilities linked universities<sup>20</sup></p>	SSTI
EI	Innovation partnership funding	<p>Annual budget of €7.1 million to provide financial support of up to 80% of total project costs to companies who engage in collaborative research projects with HEIs</p> <p>At least one of the participating companies must be located in Ireland, and there is no limit to the number of partnerships that a company can hold at one time</p> <p>Proposal process and administration of the project is managed by the participating third level research institution<sup>21</sup>.</p>	SSTI
SFI	Centres for Science, Engineering & Technology (CSETs)	<p>Long term competitive grants of between Grants normally ranging from €1 to €5 million per year for up to five years, involving multiple academic and industry partners<sup>22</sup>. Ten CSETs are currently being funded, in software, energy technologies and life sciences</p> <p>Seeks to create centres formed by clusters of internationally competitive researchers from the third-level sector and industry, particularly Irish-based industry</p> <p>CSETs able to source further funding from other Irish Agencies and the EU to enable their continued existence</p>	SSTI / National Development Plan

<sup>20</sup> <http://www.enterprise-ireland.com/NR/rdonlyres/4DB1F73A-4D05-4A19-86D3-B3A6ED934EB9/0/IncubationBrochureFullPDF.pdf>, accessed November 2009

<sup>21</sup> <http://www.enterprise-ireland.com/ResearchInnovate/R+and+D+Collaboration/Innovation+Partnerships.htm> accessed December 2009

<sup>22</sup> The Centres for Science, Engineering & Technology Grants programme of Science Foundation Ireland

	Measure	Description	Policy link
		SFI requires cost-sharing by industrial partners that totals at least 25% of the total SFI direct costs investment. Cost-sharing may include direct sponsorship of CSET activities, in-kind equipment and infrastructure, and valuable intellectual capital <sup>23</sup>	
SFI	Strategic research cluster programme	Competitive grants with a similar premise to the CSET programme, but on a smaller scale and focused at the ICT, energy and biotechnology sectors  Grants range from €500,000 to €1,500,000 direct costs per year over a three year period (extendable by a further two years following a successful scientific and strategic progress review)	SSTI / National Development Plan
EI	Business partners programme	Up to €20K funding for individual entrepreneurs on a defined research project to produce a start-up ready company over a six month period	None - EI initiative
DF	R&D tax credits	Businesses can claim 10% tax relief on their total research spend in Ireland. If this has increased incrementally since 2003, 25% tax relief is available on this additional value. If >10% of R&D activity is contracted out, this does not qualify for tax relief	Smart Economy
EI	Innovation Fund Ireland <i>(announced, awaiting implementation)</i>	Planned €500 million “Innovation Fund - Ireland” to stimulate VC community and support early stage, research intensive SMEs  Operated in coordination with existing EI financial supports for SMEs  Includes more favourable tax treatment of the carried interest of venture capital	Smart Economy
DT	IP tax relief <sup>24</sup> <i>(announced; awaiting implementation)</i>	Tax relief for the acquisition or licensing of IP assets  Expansion of the range of assets which are entitled to benefit from the current exemption from stamp duty for the transfer of IP assets	Smart Economy

Abbreviations: DT: Department of Taoiseach, DF: Department of Finance

<sup>23</sup> SFI, 2006. CSET call for proposals. Available online at [http://www.sfi.ie/uploads/documents/upload/CSET\\_2006\\_Call\\_for\\_Proposals\\_v3.pdf](http://www.sfi.ie/uploads/documents/upload/CSET_2006_Call_for_Proposals_v3.pdf), accessed December 2009

<sup>24</sup> Ireland’s finance bill, 7<sup>th</sup> May 2009

## Annex II: List of consultees

Forfás is very grateful for the valuable contributions from the following stakeholder and benchmark organisations:

<b>Government and State Agencies</b>
Department for Agriculture, Fisheries and Food - DAFF
Department of Communications, Energy and Natural Resources - DCENR
Department for Enterprise, Trade and Innovation - DETI
Enterprise Ireland - EI
Higher Education Authority - HEA
Irish Research Council for Science, Engineering and Technology - IRCSET
IDA Ireland
Science Foundation Ireland - SFI
Innovation Task Force
Advisory Council for Science, Technology and Innovation
<b>Public Research Organisations</b>
Marine Institute
Teagasc
Dublin City University
National University of Ireland, Galway
National University of Maynooth
Trinity College Dublin
University College Cork
University College Dublin
Institutes of Technology of Ireland
Irish Universities Association

**Technology Transfer Offices:**

Cork Institute of Technology

Dublin City University

Dublin Institute of Technology

National University of Ireland, Galway

National University of Maynooth

Trinity College Dublin

University College Cork

University College Dublin

Waterford Institute of Technology

University of Limerick

**Industry and industry bodies**

Analog Devices

Carbon Group

Carbery Group

Cisco

Delta Partners

Firecomms Limited

Fountain Healthcare Partners

Hewlett Packard

IBM

Intel

Intune Networks

Johnson &amp; Johnson

S3 Group

SocoWave Limited

Storm Technology

Wyeth Manufacturing

Irish Business and Employers Confederation - IBEC

Irish Medical Devices Association - IMDA

**International benchmarks**

Cambridge Enterprise

London Technology Network

Massachusetts Institute of Technology

Nanyang Technological University, Singapore

## Annex III: Consultative Group

Name	Organisation
Leo Bishop	IDA
Jeanne Bolger	Johnson & Johnson
Ruth Freeman	SFI
Karen Hynes	Forfás
Eucharía Meehan	HEA
Joe Moore	Socowave
Feargal Ó'Móráin	EI
Richard Stokes	Invent DCU (TTO)
Jonathan Walsh	Intel
Catherine MacEnri	Forfás - Chair

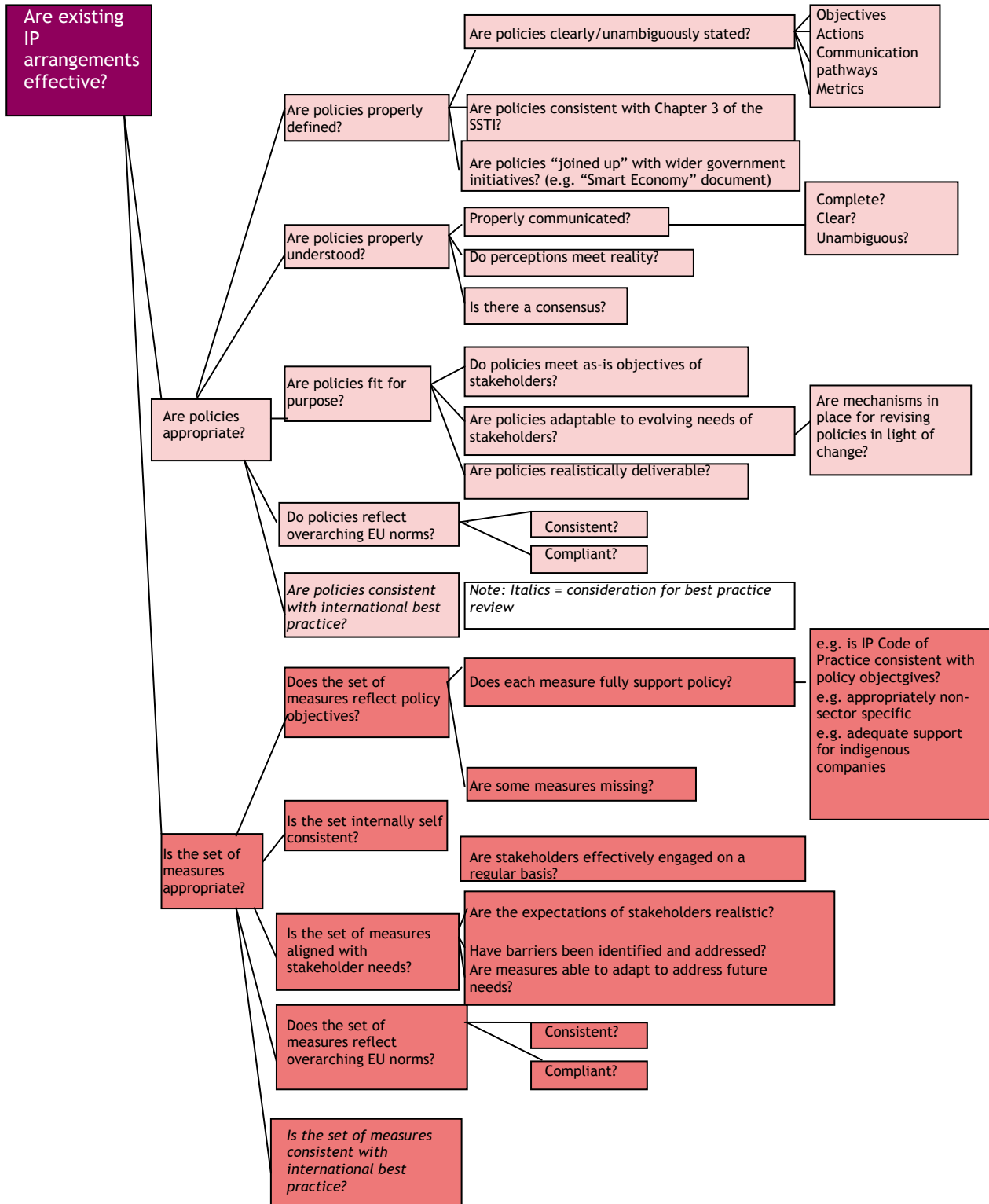
The Steering Group for the Review was Technology Ireland (TI) which is chaired by the Office of Science, Technology and Innovation in DETI. The following are the other organisations who are members of TI: EI, Forfás, HEA, IDA and SFI.

## Research and Analysis

Name	Organisation
Karen Hynes	Forfás
Paula Maguire	Forfás
Catherine MacEnri	Forfás

Annex IV: Issues analysis structure

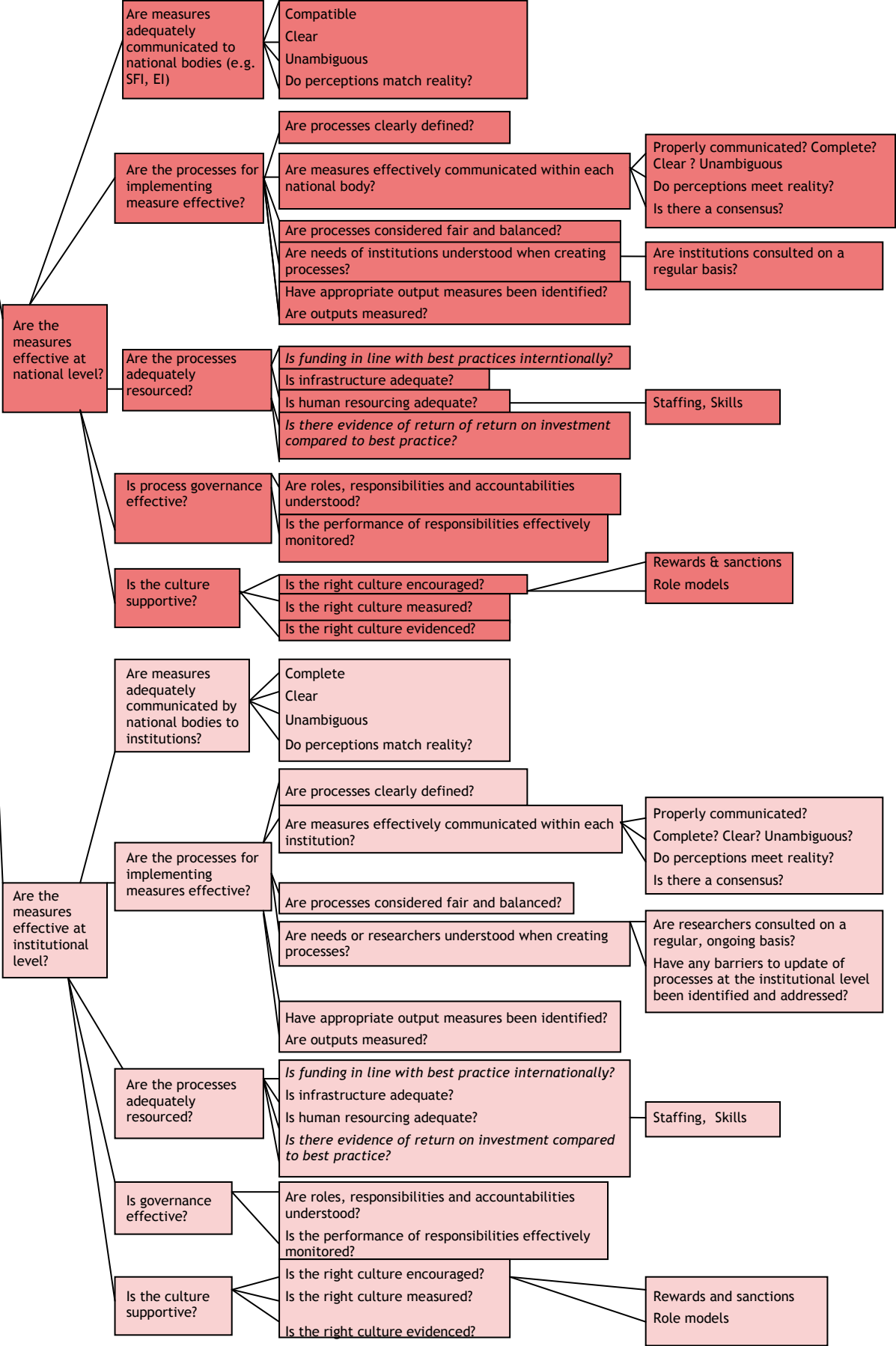
Figure 3: Issues analysis structure



Source: Arthur D. Little in consultation with Forfás, October 2009



Are existing IP arrangements effective?



## Annex V: Glossary

Acronym	Full Name
AURIL	Association for University Research & Industry Links
CEO	Chief Executive Officer
CREST	EU Scientific and Technical Research Committee
CTO	Chief Technology Officer
CSET	Centre for Science, Engineering & Technology
DETI	Department for Enterprise, Trade & Innovation
DoF	Department of Finance
DT	Department of the Taoiseach
EI	Enterprise Ireland
EPA	Environmental Protection Agency
EU	European Union
FDI	Foreign Direct Investment
GPL	General Public Licence
GVA	Gross Value Added
HEA	Higher Education Authority
HEI	Higher Education Institute
IBEC	Irish Business and Employers' Confederation
ICT	Information & Communication Technologies
IDA	IDA Ireland
IoT	Institute of Technology
IP	Intellectual Property
IPR	Intellectual Property Rights
IRCSET	Irish Research Council for Science, Engineering & Technology
KT	Knowledge Transfer

Acronym	Full Name
LTN	London Technology Network
MNC	Multinational Company
PI	Principal Investigator
PRO	Public Research Organisation
ProTon Europe	The European Knowledge Transfer Association
R&D	Research & Development
R&D&I	Research & Development & Innovation
SFI	Science Foundation Ireland
SME	Small to Medium Enterprise
SSTI	Strategy for Science, Technology and Innovation
TTO	Technology Transfer Office
TTSI	Technology Transfer Support Initiative
VC	Venture Capital

## Appendix A: Arrangements at the European level

There has been much discussion of knowledge and technology transfer, including the IP issues involved, at European level in recent years. The aim has been to find ways to improve industry-academic research collaboration and technology commercialisation throughout the European Union (EU). At an overall policy level, this is regarded as a key requirement for achieving the ‘Lisbon Agenda’, which aspires to build a more innovative and successful European region<sup>25</sup>.

### A.1 Relevance of European level guidance to Ireland

Significant progress has been made, both in building shared understanding of issues and in developing policy recommendations and practical guidelines. These EU-level recommendations and guidelines are careful to respect the autonomy of Member States to decide their own legislation and measures in this area, and are therefore not mandatory. Nevertheless, Member States such as Ireland should be well aware of the developing EU-level consensus position and take it into account when shaping their national policies, for at least two reasons:

- The EU-level recommendations and guidelines do represent a broad consensus on how to manage IP issues arising in the commercialisation of publicly funded research. They have been developed by leading practitioners from industry and academia. They therefore provide a useful and authoritative reference when developing national policies and measures;
- The consensus position may in time become the norm across Europe, especially if it is adopted within any future European Innovation Act, and therefore would define a ‘level playing field’ across the EU. Ireland would then need to ensure that it offered an environment to domestic businesses and especially to inward investors that was at least no worse than this. Alternatively, it could consider adopting a national position that would give it a positive advantage.

The chief document setting out the current position at pan-European level is the *Commission Recommendation*<sup>26</sup> issued by the European Commission in April 2008. This document aims to ensure that knowledge transfer is made a strategic mission in public institutions and that incentives, capacities and skills are developed within institutions to promote effective exploitation of IP. It includes a Code of Practice that offers a common standard across the EU on issues such as IP ownership and licence arrangements, though it stops short of attempting to prescribe commercial conditions such as royalty rates.

The European Council considered the *Commission Recommendation* in May 2008 and adopted a Council Resolution<sup>27</sup> that: invites Member States to support the Recommendation and to

<sup>25</sup> Putting knowledge into practice: A broad-based innovation strategy for the EU. European Commission COM(2006)502

<sup>26</sup> Recommendation on the management of intellectual property in knowledge transfer activities and Code of Practice for universities and other public research organisations, European Commission C(2008)1329, April 10 2008.

<sup>27</sup> Council of the European Union, Outcome of proceedings 10323/08, June 4, 2008. See also the published brochure containing both the Commission Recommendation and the Council Resolution: European Commission 2008, ISSN 1018-5593, ISBN 978-92-79-09850-5

promote the effective take-up of the Code of Practice; calls upon universities and other public research organisations to implement the Code of Practice; and invites Member States and the Commission to establish governance arrangements, including the monitoring and evaluation of the take up and impact of the Recommendation and Code of Practice. Member States, including Ireland, are expected to report their progress in implementation in July 2010 and every two years after that. The Commission recommendations are set out in Box 1 below.

#### Box 1: Commission Recommendations to Member States

- Ensure that public research organisations define knowledge transfer as a strategic priority and develop and publicise respective policies and procedures.
- Support the development of knowledge transfer capacities and skills, also promote broad dissemination of research results while enabling protection of intellectual property.
- Cooperate and take steps to ensure coherence of ownership regimes and to facilitate cross-border collaborations and knowledge transfer.
- Ensure equitable and fair treatment of all participants in international R&D collaborations (ownership and access rights to IP).
- Take steps to ensure the widest possible implementation of the Code of Practice.
- Designate a national contact point, the tasks of which should include the coordination of measures regarding knowledge transfer in liaison with similar contact points in other Member States.
- Inform the Commission by 15 July 2010 and every two years thereafter of measures taken on the basis of this Recommendation, as well as their impact.
- Encourage public research organisations to establish and publicise policies and procedures for the management of intellectual property in line with the Code of Practice.

The Commission Recommendation is in three parts:

- Recommendations to Member States for establishing or adapting intellectual property / knowledge transfer policies (see summary in Box 1);
- Code of Practice for universities and HEIs, with operational principles for setting up institutional policies and knowledge transfer systems (see summary in Box 2); and
- List of best practice examples for Member States to support implementation of the recommendations.

Amongst the detailed recommendations, there are four main principles which relate directly to IP, these are set out in Table 6.

**Table 6: European level IP commercialisation guidance - principles**

Principle	Description
Aims	While proactive IP/knowledge transfer may generate additional revenues for the public research organisation (PRO), this should not be considered the prime objective.
Ownership	<p>Foreground IP:</p> <p>Collaborative research: the party who generates the IP (but can vary this in the terms of contract).</p> <p>Contract research: the party who pays.</p> <p>Background IP: not affected by the project.</p>
Access rights	Parties to a research project should have access to each others' foreground and background, for project purposes or for exploitation, on terms reflecting their tasks and contributions to the project.
Licences	<p>The PRO should reserve adequate rights to facilitate dissemination and further research.</p> <p>Licences for exploitation purposes should involve adequate compensation, financial or otherwise.</p> <p>Avoid granting exclusive licences without any limitation to a specific field of use.</p>

Source: Council of the European Union, Outcome of proceedings 10323/08, June 4, 2008

The Code of Practice consists of three sets of principles (see Box 2):

- The principles for an internal **intellectual property policy** constitute the basic set of principles which public research organisations should implement in order to effectively manage the intellectual property resulting from their own, or collaborative, activities in the field of research and development;
- The principles for a **knowledge transfer policy** complement those relating to IP policy by focusing more specifically on the active transfer and exploitation of such intellectual property, regardless of whether or not it is protected by IP rights; and
- The principles for **collaborative and contract research** are meant to concern all kinds of research activities conducted or funded jointly by a public research organisation and the private sector, including in particular collaborative research (where all parties carry out R&D tasks) and contract research (where R&D is contracted out to a public research organization by a private company).

**Box 2: Code of Practice****1) Principles for an internal intellectual property policy**

- IP policy should be a long-term strategy and mission of the PRO, easily accessible with a contact point responsible. It should contain clear rules for staff and students; cover the disclosure of new ideas of commercial interest; ownership of research results; engagement with third parties and publication / dissemination policy
- Develop policy in line with education and research mission regarding identification, possible exploitation, protection of IP, open access policies etc.
- Creation of IP portfolios, setting up IP pools where appropriate.
- Training for IP awareness and basic skills in IP and knowledge transfer (KT).
- Incentives.

**2) Principles for a knowledge transfer policy**

- Consider different exploitation mechanisms and partners (e.g. spin-offs, innovation support service etc.)
- Have own or access to professional knowledge transfer service (advice on legal, financial, commercial, IPR etc.)
- Develop and publicise a licensing policy (transfer of ownership or exclusive licence?)
- Have clear principles on financial returns from KT revenues between pro, department, inventor.
- Monitor IP protection and KT activities and make them visible.

**3) Principles regarding collaborative and contract research**

- Rules should be compatible with mission of each party.
- IP-related issues should be clarified at management level and as early as possible (identification of Foreground and Background, access rights, sharing of revenues etc.)
- Ownership of foreground in collaborative and contract research should be clarified and negotiated.
- Access rights should be clarified from the beginning of project.

**A.2 Future IP arrangements at the European level**

Several follow-up actions are now under way, which include:

- Commission-Stakeholder partnership through a biannual Knowledge Transfer Thematic Forum to discuss the implementation of the Code of Practice, to exchange best practice and to develop further guidelines;

- Commission-Member State partnership through the CREST group for the monitoring and evaluation of impact of the recommendation, exchange of best practices and identifying new policy initiatives; and
- Commission work on governance arrangements, for example the mechanisms for the July 2010 reporting by Member States of their progress in implementing the Recommendation.

### A.3 European guidelines and tools

In addition to the April 2008 Commission Recommendation, several other documents provide useful guidance at a pan-European level.

#### A.3.1 Expert Group report on management of intellectual property in publicly funded research organisations (2004)<sup>28</sup>

This important report laid the foundations for much of the subsequent thinking at EU level on IP management policy and guidelines. The detailed discussion of the issues is still valuable today as a briefing for anyone wanting to understand this topic.

The report includes a review of the background; discusses the situation and problem areas as seen in 2003 when the report was written; and examines options for action by the public research organisations, industry and public authorities. Its key messages are:

- The active involvement of European HEIs in managing and transferring their IP to industry is not in conflict with their education and research missions, but will become a key consideration in attracting students, scientists and further research funding as well as supporting the mission of achieving socio-economic benefits to society through the dissemination of research results;
- HEIs should pursue knowledge transfer through industry collaborative research and spin-out company formation (the networked model of innovation) as well as through licensing (a linear model of innovation). This networked model is more effective than a pure linear model approach in producing socio-economic benefits from publicly funded research;
- Best practice is to vest initial ownership of results and inventions funded by public funds to the PRO where the research has been conducted;
- Active involvement of HEIs in the creation of sustainable spinout companies should be encouraged, including downstream support for these companies after they have left the nurturing environment of a PRO; and
- Knowledge and technology transfer staff in HEIs need to be well supported through specialist training, accreditation and professional networks.

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<sup>28</sup> Expert Group report: Management of intellectual property in publicly funded research organisations: towards European guidelines, European Commission EUR20915EN (2004) available at <http://ec.europa.eu/research/era/pdf/iprmanagementguidelines-report.pdf>



### A.3.2 The European Responsible Partnering Handbook <sup>29</sup>

This Handbook, first issued in 2005 and recently updated, provides a set of voluntary guidelines for managing research collaborations between companies and publicly-funded research organisations, including universities. It was produced as a joint initiative by industry, academia and research and technology organisations across Europe. The guidelines are designed to help effective technology transfer and commercialisation while respecting the different missions of the partners.

The Handbook provides an important set of principles for how industry and public research should work together, including the need for effective management of intellectual property. They stop short of prescribing the terms of an IP agreement, pointing instead to existing models such as the Lambert Agreements and advocating the use, where possible, of such ‘templates with options’. They do, though, set out some general principles for dealing with IP:

- Each party should own the foreground IP that it generates;
- Access rights to background IP by each partner should be sufficient for project execution and for the results to be put to their intended use;
- There should be a differentiation between ownership and use. Giving partners efficient (sometimes exclusive) rights of use and ways of defending these rights can be sufficient;
- Careful consideration should be given to the ownership of inventions created jointly. While joint ownership may be a possibility, this can lead to unintended problems and should generally be avoided where possible;
- Each party will expect fair compensation for the commercial use of the inventions that it has helped generate. Deciding what is fair will depend on the nature of the collaboration but also on a sense of realism about future costs and risks; and
- Licences may be non-exclusive to multiple licensees (to ensure maximum use of the knowledge concerned) or exclusive for defined uses that the licensee is committed to develop.

### A.3.3 Tools to help structure an IP transfer agreement

For reference, these include:

- CREST Toolkit for collaborative research. <sup>30</sup>
- CREST Cross-Border Collaboration Decision Guide. <sup>31</sup>
- ProTon Europe’s collection of good practice examples. <sup>32</sup>

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<sup>29</sup> Joining Forces in a World of Open Innovation: Guidelines for Collaborative Research and Knowledge Transfer between Science and Industry, EIRMA/EUA/EARTO/ProTonEurope, October 2009

<sup>30</sup> [www.ipo.gov.uk/crestreport.pdf](http://www.ipo.gov.uk/crestreport.pdf), accessed November 2009

<sup>31</sup> [http://ec.europa.eu/invest-in-research/policy/rd\\_collab\\_en.htm](http://ec.europa.eu/invest-in-research/policy/rd_collab_en.htm) accessed November 2009

<sup>32</sup> [www.protoneurope.org/examples/goodpractice](http://www.protoneurope.org/examples/goodpractice) accessed November 2009

## Appendix B: Benchmarking data - United Kingdom

### B.1 Summary

The UK represents an example of best practice in regard to providing the Lambert template IP agreements for the commercialisation of IP from the HEIs, which have been largely regarded as successful and reflect the recommendation for a similar set of model contracts in Ireland (Recommendation R4). The UK has put considerable impetus behind training initiatives for TTO staff to up skill them in terms of IP management, and draws extensively on national and international networks to do so (e.g. AURIL and ProTon Europe). It is noticeable from the UK's situation - which includes some large HEIs with substantial research budgets and outputs - that in most cases, TTOs are not profitable or seek to break even, with the remaining funds being channelled back into the University departments.

### B.2 Implications for Ireland

**Legal framework:** The Lambert agreements provide a starting point for setting out IP arrangements within business-university collaborations and serve as a useful starting point for reconciling the existing template agreements within Ireland.

**Funding for capacity building:** The Higher Education Innovation Fund (HEIF), through a permanent stream of funding guaranteed to each HEI, funds knowledge transfer with a smaller competitive element to support high impact, innovative projects. This is not dissimilar to the TTSI initiative in Ireland, though the technology transfer officers within the UK are paid for through HEIF, a separate entity promoting innovation within HEIs.

**Models of technology transfer organisation:** The UK's TTOs vary between a separate limited company; an internal but distinct technology transfer office or a pooled technology transfer entity representing several HEIs. This is in contrast to the situation in Ireland, where the TTO is typically embedded within the HEI. Few of the UK's TTOs break even, though these tend to be associated HEIs with very large research outputs.

**Skills:** There is recognition that the level of professional skills within the TTOs needs to be improved, such that HEIF has provided a knowledge transfer capacity building programme. This reflects Finding 26 in this report, which suggests that in some instances there is scope for the TTOs in Ireland to be upskilled.

**Staffing the TTO:** The TTOs typically comprise 10-40 people with industry or consultancy backgrounds. Functional roles are usually quite well defined, though internal structures of the TTOs vary considerably in terms of their scope and remit. Some TTOs have additional funding capabilities, manage incubators and offer consultancy services, though they are typically well resourced for coverage of their additional remit.

### B.3 Policy

In March 2008 the Government published its White Paper called 'Innovation Nation' which set out what Government will do to ensure innovation can flourish across every area of the economy. This stressed the need to bring about best use of IP in the economy and undertook that amongst other things that Government would support widespread training in IP management, provide online resources for IP licensing between businesses and develop those for HEI-business collaborations, and promote exploitation of IP in universities.

#### B.4 Legal framework

There is no equivalent of the US Bayh-Dole Act in the UK (or almost anywhere else in Europe, for that matter). Instead, in the UK and generally across Europe, national employment law and the various national laws governing the various forms of IP, such as patents and copyright, create a framework in which IP created as a result of employment belongs to the employer. Where two or more organisations collaborate in a research project, the ownership and rights in the arising IP are left for the partners to agree amongst themselves.

A major exception to the employer-ownership principle has traditionally been the ‘professor’s privilege’, under which an academic (not his university) owned the IP arising from his work. That has largely disappeared, Sweden, Italy and Finland being among the few countries left where this is still the norm. Interestingly, the abolition of professor’s privilege has often been said to be necessary to support better technology transfer and IP exploitation, yet the Swedish experience of successful exploitation suggests that, if other conditions are right, professor’s privilege need not be a barrier.

It is worth noting that whilst the UK ownership situation is clearly in favour of the HEI, the same clarity is not evident throughout Europe, due to differences in national legal systems. For example, Germany abolished professor’s privilege in 2002 but academic staff still retain some rights to their work due to clauses on academic freedom built into the German Constitution. The UK’s common law system does not provide similar clauses.

As elsewhere, the UK saw long ago that technology transfer from HEIs was hampered by the difficulty of setting up a mutually satisfactory agreement between the parties. Guidelines now exist to help smooth the negotiation of these agreements. The chief set of guidelines at present are the Lambert Agreements, developed as part of the Lambert Review<sup>33</sup> of HEI-industry collaboration conducted in 2002 by Richard Lambert, for the Department of Trade & Industry.

The review provided an extensive set of recommendations, including that model agreements should be developed. A task force chaired by Lambert then developed five model agreements, aimed at simplifying HEI-industry relationships by providing known, standard starting points from which the parties could negotiate their specific agreement (Box A).

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<sup>33</sup> Available at [www.hm-treasury.gov.uk/lambert\\_review\\_business\\_university\\_collab.htm](http://www.hm-treasury.gov.uk/lambert_review_business_university_collab.htm), accessed November 2009

### Box A: The key points of the five Lambert Research Collaboration Model Agreements

- Lambert Model Agreement 1 - the University owns the IP in the Results and grants a non-exclusive licence for the Sponsor and its Group Companies to use the Results in a specified business area (field) and/or a geographical area (territory);
- Lambert Model Agreement 2 - the University owns the IP in the Results and licences the Sponsor and its Group Companies to use the Results in a specified field and/or territory, and the Sponsor has a right to negotiate to acquire an exclusive licence in relation to certain Results;
- Lambert Model Agreement 3 - the University owns the IP in the Results and licences the Sponsor and its Group Companies to use the Results in a specified field and/or territory and the Sponsor has a right to negotiate to take an assignment of the IP in certain Results;
- Lambert Model Agreement 4 - the Sponsor owns the IP in the Results, but rights are reserved to allow the University to use the Results for academic purposes (including academic publication) on certain conditions to protect the confidentiality of the Sponsor's information and so as not to jeopardise the possibility of the Sponsor obtaining a patent for the Results; and
- Lambert Model Agreement 5 - the Sponsor owns the IP in the Results, and the University has no right to publish the Results. (This sort of agreement is usually referred to as a Contract Research or Research Services Agreement, rather than a Collaborative Research Agreement).

Important points to note about the Lambert Agreements are:

- These are agreements solely between the university (often represented by its technology transfer office or company) and an industrial partner. The academic inventor is not a party to any of the agreements since in the UK the academic has no ownership rights in his technology;
- The concept of joint ownership does not appear in any of the five models. In every case, either the university or the industrial partner owns the Intellectual Property Rights (IPR);
- Three of the five models give ownership to the university. The Lambert Review took the position that, in general, the starting point for any business-university negotiation should be university ownership, with the industrial partner entitled to exploitation rights; and
- The five models are bi-lateral so are not readily applied to a consortium agreement. In October 2008, four model consortium agreements (Agreements A to D) were introduced to deal with this (Box B).

### Box B: The key points of the four Lambert Model Consortium Agreements

- Lambert Model Agreement A - Each member of the Consortium owns the IP in the Results that it creates and grants each of the other parties a non-exclusive licence to use those Results for the purposes of the Project and for any other purpose;
- Lambert Model Agreement B - The other parties in the Agreement assign their IP in the Results to the Lead Exploitation Party who undertakes to exploit the Results (alternatively, the Lead Exploitation Party is granted an exclusive licence);
- Lambert Model Agreement C - Each party takes an assignment of IP in the Results that are germane to its core business and undertakes to exploit those Results; and
- Lambert Model Agreement D - Each member of the Consortium owns the IP in the Results that it creates and grants each of the other parties a non-exclusive licence to use those Results for the purposes of the Project only. If any member of the Consortium wishes to negotiate a licence to allow it to exploit the IP of another member or to take an assignment of that IP, the owner of that IP undertakes to negotiate a licence or assignment.

The Lambert Agreements are supported by the “Lambert Tool Kit”<sup>34</sup> developed by a group representing HEI technology transfer organisations, government and industry, and launched in December 2008. This contains the full texts of the agreements and, for the five bi-lateral models, a decision guide to help the parties decide which model to follow. There is no guide for the consortium agreements as there are so many permutations of projects and parties.

In 2004, following the Lambert Review, the Government published a ten-year investment framework for science and innovation, which included support for virtually all the recommendations of the Lambert Review<sup>35</sup> including funding for capacity building.

### B.5 Funding for capacity building

The Higher Education Innovation Fund (HEIF) is the chief government funding programme designed to build knowledge transfer capacity in English HEIs (devolved assemblies of Scotland, Wales and Northern Ireland have their own support mechanisms). Funding is provided through the Higher Education Funding Council for England (HEFCE).

By the third funding round, in 2005-2006, HEIF had developed such that, as part of the Government's commitment to a permanent stream of funding to support the ‘third mission’ capacity, the majority of the funds were allocated by a funding formula with every HEI guaranteed an allocation. In addition, there was a smaller competitive element designed to support high impact innovative projects. In the current, fourth, round of funding, the Government and HEFCE announced that the budget would increase to £150 million per annum in 2010-2011. HEIF has moved to fully formulaic allocations, building on the formula used for the third round, putting further emphasis on performance and spreading the benefits of HEIF more widely across the HE sector.

<sup>34</sup> [www.innovation.gov.uk/lambertagreements](http://www.innovation.gov.uk/lambertagreements), accessed November 2009

<sup>35</sup> Available from [www.hm-treasury.gov.uk/lambert\\_review\\_business\\_university\\_collab.htm](http://www.hm-treasury.gov.uk/lambert_review_business_university_collab.htm), accessed November 2009

In addition to HEIF, the UK Research Councils offer a range of services and financial support for HEI knowledge transfer. A web portal<sup>36</sup> to help researchers and businesses find funding for knowledge transfer opportunities was launched in February 2009, by Research Councils UK. This is a 'one-stop-shop' which gives details of all seven research councils' knowledge transfer schemes and activities and how to get involved.

## B.6 Skills

Improving the level of professional skills amongst KT managers has been a concern for many years. A report<sup>37</sup> prepared for the then Department of Trade & Industry in 2001 found that KT staff in HEIs were well educated with a wide variety of background experience; but that there were several weaknesses:

- There were too few skilled KT professionals to meet demand;
- The level of KT skills varied widely. While this was to some extent appropriate, given the variety of needs, there were gaps especially in more strategic and entrepreneurial skills. This was thought to be a legacy of the past tendency for HEIs to regard KT as a marginal or administrative function, not part of the strategic core of the institution, and therefore to appoint staff from within, as administrators with no specialist relevant skills;
- Many of the skills needed were no different to those required in other professions; but it is the execution of these skills in the particular HEI context which is important and needs to be developed; and
- While training and continuing professional development programmes were available, they tended not to deal with the context issue and were poorly coordinated, not well known and hard to find.

The report therefore recommended that government take an initiative to ensure the ready availability of a consistent nation-wide programme of both induction and continuing skills development, with accreditation as a way to recognise and increase the status of the KT profession; all supported by a new 'KT Knowledge Centre' to represent and be a resource for the profession.

Similar recommendations also came from the Lambert Review two years later. The Government accepted these recommendations and in 2004 allocated £1million from the Higher Education Infrastructure Fund (HEIF) for a new national knowledge transfer capacity building programme, supported by the Department of Trade & Industry and implemented jointly by the Association for University Research & Industry Links (AURIL), PRAXIS (the UK university technology transfer training programme) and the University Companies Association (UNICO) now combined as PraxisUnico (see following section for details of these organisations). AURIL was supported to create a national system for the induction, training, development, and accreditation of knowledge transfer professionals, including through the establishment of a new national Knowledge Transfer Institute; UNICO strengthened its programme of guides and training conferences for technology transfer professionals; and Praxis expanded the number and range of its short courses.

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<sup>36</sup> [www.rcuk.ac.uk/innovation/ktportal](http://www.rcuk.ac.uk/innovation/ktportal), accessed November 2009

<sup>37</sup> *Business Interface Training Provision (BITS) Review*, report for the DTI by Oakland Innovation, March 2002

## B.7 Supporting organisations and services

At least three organisations represent knowledge transfer professionals in the UK:

### **The Association for University Research & Industry Links (AURIL)<sup>38</sup>**

AURIL is the professional association that represents all practitioners involved in knowledge creation, development and exchange between researchers and industry in the UK and Ireland to ensure that new ideas, technologies and innovations flow from their organisation into the market place. AURIL offers a Continuing Professional Development programme for its members and collaborated with the Open University to launch, in October 2007, a Post-Graduate Certificate in Knowledge Transfer, the first such formal award in Europe.

### **PraxisUnico<sup>39</sup>**

PraxisUnico is an educational not-for-profit organisation set up to support innovation and commercialisation of public sector and charity research for social and economic impact. It encourages innovation and acts as a voice for the research commercialisation profession, facilitating the interaction between the public sector research base, business and government. PraxisUnico provides a forum for best practice exchange, underpinned by first-class training and development programmes.

### **The Institute for Knowledge Transfer (IKT)<sup>40</sup>**

IKT was launched in May 2007 as one result of the Lambert Review. IKT aims to be the professional body for knowledge transfer professionals in the UK and Ireland. It intends to set standards for development of the knowledge transfer profession and address issues surrounding accreditation, certification and training. Though UK-based, its scope includes the whole of the island of Ireland; its governing body includes representatives from the Republic of Ireland. Existing or planned services of IKT include formal training and certification, a web-based knowledge portal, online tools for members to manage their continuing professional development, an on-line journal, and a programme of events, all aimed at sharing best practice and strengthening knowledge transfer capabilities.

### **Other support and initiatives:**

The London Technology Network (LTN)<sup>41</sup> operates as an independent Regional Development Agency (RDA) and EU funded component of the Enterprise Europe network (some 500 comparable organisations across 40 countries). LTN's model is to operate as the trusted partner of choice to promote peer-to-peer collaboration between HEIs and business through collaborative research. LTN interacts with the HEIs through funding c. 90 principal investigators in leading HEIs for 20% of their time, and organises events to bring the HEIs into contact with businesses. Its services are essentially free to the collaborators involved.

The Higher Education Funding Council for England and the Government's Office of Science & Innovation have collaborated for some time to produce a website offering good practices in knowledge transfer<sup>42</sup>. The purpose of this website is to provide a dynamic resource for all those involved in HEI knowledge transfer and exchange to share and advance good practice, thereby enhancing the effectiveness and impact of HEI knowledge transfer and exchange

<sup>38</sup> [www.auril.org.uk](http://www.auril.org.uk), accessed April 2010

<sup>39</sup> [www.praxisunico.org.uk](http://www.praxisunico.org.uk), accessed April 2010

<sup>40</sup> [www.ikt.org.uk](http://www.ikt.org.uk), accessed April 2010

<sup>41</sup> <http://www.ltnetwork.org/default.asp>, accessed April 2010

<sup>42</sup> [www.ktgoodpractice.org](http://www.ktgoodpractice.org)



activity. Since late 2007, this service is being delivered under the Institute for Knowledge Transfer brand.

The Intellectual Property Office (IPO)<sup>43</sup>, formerly known as the Patent Office, offers a wide variety of advice to firms and HEIs. These include guides to the application process for patents trade marks, design registration and so on. The IPO is very active in developing best practices, standardised approaches and support tools (such as an on-line 'IP health check'). It has also collaborated with AURIL to produce *A Guide to Managing Intellectual Property: Strategic Decision-Making in Universities*<sup>44</sup> which sets out current UK thinking on best practice not so much at the level of technology transfer professionals but for university senior management.

Business Link<sup>45</sup> provides advice on building a business, including IP management, to firms in England. Advisory services in Scotland include the Innovators Advisory and Counselling Services for Scotland (ICASS)<sup>46</sup> and The Intellectual Asset Centre<sup>47</sup>; in Wales, Business Eye<sup>48</sup>; and in Northern Ireland, Invest Northern Ireland<sup>49</sup>.

There are several commercial operations that provide technology transfer services. Innovation Xchange UK Limited, for example, has a network of intermediaries who visit universities and companies frequently, identifying and matching needs and opportunities. Other organisations work on a multinational scale (Figure 4).

**Figure 4: Examples of commercial technology transfer companies**

	<ul style="list-style-type: none"> <li>■ Helps research organisations to exploit intellectual property and technology. Looks for substantial market opportunities for products, services or cooperative relationships with third parties</li> <li>■ Offers services including consulting, technology evaluation, licensing expertise and an on-line marketplace</li> </ul>
	<ul style="list-style-type: none"> <li>■ Establishes close, long-term relationships to commercialize technologies and innovations through spin-out ventures</li> </ul>

<sup>43</sup> [www.ipo.gov.uk](http://www.ipo.gov.uk)

<sup>44</sup> [www.ipo.gov.uk/managingipoverview.pdf](http://www.ipo.gov.uk/managingipoverview.pdf)

<sup>45</sup> [www.businesslink.gov.uk](http://www.businesslink.gov.uk)

<sup>46</sup> [www.icass.co.uk](http://www.icass.co.uk)

<sup>47</sup> [www.ia-centre.org.uk](http://www.ia-centre.org.uk)

<sup>48</sup> [www.businessseye.org.uk](http://www.businessseye.org.uk)

<sup>49</sup> [www.investni.com](http://www.investni.com)



## B.8 Models of technology transfer organisation

Most UK universities have some form of recognisable technology transfer office, though organisational forms vary. At one extreme, a popular model is the separate (though usually wholly university-owned) limited company, with tight links to the university's academic community but having its own legal identity and culture and able to do deals, manage assets and attract and reward its staff on a fully commercial basis. Leading examples are at Cambridge, Oxford, Manchester and Imperial. In the case of Imperial, its technology transfer business (Imperial Innovations Group) went so far as to float on the Alternative Investment Market in 2007, in order to access more funding for its investments.

Another common model is the internal but organisationally distinct technology transfer office, with examples including Newcastle and Cardiff. In some cases, groups of universities have pooled their technology transfer operations into a single entity: examples include the White Rose alliance, in the north of England, SETsquared, which commercialises IP from the universities of Bath, Bristol, Southampton and Surrey and Biofusion which does the same for Sheffield and Cardiff. These entities may be separate companies owned by the parent universities, or completely independent firms, specialising in technology commercialisation, which have a long-term strategic partnership with the universities (e.g. Biofusion).

It is noticeable that even those TTOs which operate as independent, university controlled entities do not seek to be profitable - though the leaders break even. For example, Cambridge Enterprise generated £8.8 million income received from consultancy fees, licensing fees and royalties, excluding licensing equity realisations, of which 82% was returned to academics and University departments and a further 7% invested in patent assets<sup>50</sup>. The TTO as a whole just about broke even (with a nominal loss of £274,000 in 2007/8). Whilst a return of around £7.2 million to the HEI from university deals is a good return, given that the Cambridge University annual R&D budget is around £1 billion, it is very small in relative terms. This suggests that even those TTOs operating in a very large university with an entrepreneurially minded academic base and strong industry links should not seek substantive financial return on technology transfer.

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<sup>50</sup> <http://www.enterprise.cam.ac.uk/aboutus.php?sub=41>, accessed November 2009

## B.9 Sharing the rewards

This is in line with the common US figure of 40% (a share that can be found in other countries as well, such as Japan). Some examples are shown in Table 7 below.

**Table 7: Revenue sharing in selected TTOs - United Kingdom (%)**

	Inventor	TTO	Department	University
<b>Oxford (Isis)</b>				
0 - £100k	61	30	0	9
£100k - £1M	31.5	30	17.5	21
>£1M				
<b>Cambridge (Cambridge Enterprise)</b>				
0 - £100k	90	5	5	
£100k - £200k	60	20	20	
>£200k	34	33	33	
<b>Sheffield (Biofusion)</b>				
All income	40	60		
<b>Cardiff</b>				
0 - £2k	100			
£2k - £42k	60		20	20
£42k - £200k	50		25	25
>£200k	30		35	35

Source: Oxford, Cambridge, Sheffield and Cardiff TTOs; Arthur D. Little analysis

## B.10 Staffing the TTO

Staff numbers within the TTOs vary considerably from 10-40, with industry or consultancy backgrounds, with larger examples including Manchester, Sheffield, Imperial, Oxford and Cambridge. Typically, the roles within the TTOs are well defined, with TTO staff coming from a variety of backgrounds, depending on the function in which they are involved, although the way in which the TTOs are structured internally varies considerably. For example, Sheffield University's TTO operations - which are contained within the University's Research and Innovation Office - contain specific contract managers, externally facing research and innovation officers, and a dedicated commercialisation of IP team which handles patents and

licensing. At Cambridge, around 18 people are involved in the technology transfer and consultancy services component of Cambridge Enterprise (which also handles seed funding), with backgrounds in industry or consultancy and functional experience in technology transfer or licensing.

### B.11 Examples of TTOs

#### Cambridge University

Cambridge University sits at the heart of one of Europe's top innovation and high-technology clusters. There are over 1,000 innovation-based companies in the city, with a strong emphasis in IT and the life sciences. The cluster was ranked fourth in Europe for total institutional investment in 2006 and first in Europe for investment per capita.<sup>51</sup>

The university has significantly developed its technology transfer arrangements in recent years. First, in 2004 the university brought together into one organisation three previously separate and weakly connected departments: one managing the consulting services provided by academics, another providing seed funding for new ventures, and the technology transfer office which dealt with IP management and licensing. The new organisation, Cambridge Enterprise,<sup>52</sup> has the overview and cohesion necessary to promote exploitation more effectively.

Then, in 2005, the university changed its rules on ownership of intellectual property arising from research, to bring them into line with the rest of the UK and much of continental Europe by abolishing 'professor's privilege'. Rather than ownership and exploitation rights automatically belonging to the researcher, academics are now required to disclose their inventions to the university, which assumes ownership and has first refusal on exploitation. Though fiercely resisted at the time, many academics seeing the change as repressive and likely to kill the 'Cambridge phenomenon', these new arrangements are becoming accepted as providing benefits through closer collaboration between academics and investors. Cambridge Enterprises' efforts to promote the value of exploitation and its enabling role have helped this change in attitudes.

In the next step, in 2007, Cambridge Enterprises became a separate limited company, wholly owned by the university, but now able to attract funds, pay its staff and do deals on a fully commercial basis. This model for an HEI technology transfer operation, involving tight working links with the academic community but having its own legal and cultural identity, is now popular in the UK: other examples include Isis Innovation (Oxford) and Imperial Innovations Group (Imperial College, London).

Through Cambridge Enterprise, the university has aggressively developed its IP exploitation business. In 2007-2008 it filed 83 patent applications, closed 80 IP deals, held equity in 68 companies, generated £8.8 million in consultancy and licensing fees and royalties and distributed £8 million to the academics and departments who were stakeholders in the IP. However, making money is not the primary aim. Cambridge Enterprise' mandate has three components which are, in order of precedence:

1. aid the transfer of knowledge from the University via commercialisation;
2. aid staff and students in making their ideas more commercially successful; and
3. produce a financial return for inventors, departments and the University.

<sup>51</sup> Cambridge Cluster Report, Library House 2007

<sup>52</sup> <http://www.enterprise.cam.ac.uk>, accessed December 2009

Cambridge Enterprise is quick to warn that the pay-off from commercialisation can take time. From initial disclosure of an idea, it may be ten years before it becomes clear if, from a revenue generation point of view, it is a winner. Part of the job is therefore to manage the expectations of the university and of the individual academics about not only the likely size of the returns but also their timing.

Activities by Cambridge Enterprise include:

- Structuring and launching spin-outs;
- Regular meetings with Cambridge Enterprise Venture Partners, a group of early-stage funds, to get feedback on potential new technology opportunities;
- Mentoring events where academics meet with mentors, some of whom are local investors, who give them critical advice on what they are doing right and wrong; and
- Investor forums, where actual or potential spin-outs make pitches to venture capitalists and business angels. On this point, it is significant that several major venture capital firms have offices in Cambridge; though not formally connected to the university, being close gives them early insights into emerging ideas and makes them more accessible as sources of feedback.

### **Manchester University**

Manchester has a clearly stated IP policy, introduced in 2006 and closely linked to the university's Strategic Plan 2015. This sets out principles around revenue sharing and ownership, which is transferred to the University of Manchester Intellectual Property Limited (UMIP) as its agent to deal with the protection and commercialisation of intellectual property and know-how. Staff members are required to disclose IP to UMIP which then decides whether to protect and commercialise. A limited company with almost 40 employees, the company consists of faculty oriented business management teams backed up by a central corporate office which provides company secretarial, marketing, legal and financial expertise. The Manchester Technology Fund, a £6 million investment created by the University provides early stage equity for spin-out and start-up companies, investing at any stage from prototype/demonstrator development to start-up, in amounts from £10,000 to £250,000. The Fund works with early stage companies to assess market opportunity and conduct IP due diligence prior to making a substantive financial commitment.

The functions of UMIP are to:

- Manage IP created at Manchester University;
- Identify, protect and evaluate the commercial potential of research from all faculties;
- Commercialise IP via the most appropriate route: sale, licence or spin-out;
- Manage the University's patent budget, manage its Proof of Principle awards and provide access to spin-out investment funds; and
- Maintain contact with industry experts, consultants, professional advisers and investors.

A separate University owned company, the University of Manchester Incubator Company (UMIC) provides facilities and business support for spin-outs, external SMEs or satellite subsidiaries from larger companies and comprises:

- A bioscience incubator with the capability to set up a fully functional biotechnology laboratory, including necessary containment capabilities;
- The Core Technology Facility, which comprises modular grow-on space for larger companies, funded by NWDA (Northwest Regional Development Agency) and ERDF (European Regional Development Fund); and
- The North Campus Incubator, providing office facilities.

## Appendix C: Benchmarking data - United States

### C.1 Summary

The situation in the US exemplifies a more prescriptive policy stance towards IP ownership and commercialisation from the HEIs. As with the UK, models of TTO organisation vary considerably between individual HEIs. The activities of the Association of University Technology Managers (AUTM) demonstrate a shift towards considering the wider impacts of technology transfer in terms of increasing wider economic wealth (including social implications), as well as financial gain.

### C.2 Implications for Ireland

**Policy:** Unlike most European countries, the United States maintains binding legislation (the Bayh-Dole Act) enabling publically funded institutions to elect to maintain ownership of their IP. This is in contrast to the situation in Ireland, which allows high flexibility at present. The recommendation for setting out Ireland's stance on the preferred terms applying to IP, primarily on ownership and access (Recommendation 4) and in terms of roles and responsibilities in issuing warranties and liabilities (Recommendation 15) go some way towards a more solidified stance on IP in Ireland, but - in common with other European countries - do not suggest that this should be made legally binding.

**Funding for capacity building:** Whilst US HEIs contribute towards the operation of their TTOs in most instances, the Small Business Technology Transfer Program provides substantive funding to encourage collaboration between SMEs and HEIs in high-tech areas. Whilst on a much larger scale to the situation in Ireland, the role of the National Science Foundation (NSF) in this capacity is not dissimilar to that of SFI in Ireland.

**Staffing and skills:** Senior TTO staff are highly competent and comparable to those found in similar roles in the private sector. More junior staff tend to be less well skilled. This has implications for incentivising TTO staff and has been one of the reasons behind a shift towards some of the US TTOs becoming independent companies, such that they can pay their staff commercial rates to attract the best people.

**Supporting organisations and services:** The Association of University Technology Managers (AUTM) provides professional development for TTOs and showcases how technology transfer can contribute to wider impacts on the US economy as well as financial grounds. Ireland has the opportunity to draw on comparable organisations (e.g. ProTon Europe) for such activities, and many of the TTOs already do so.

**Models of TTOs:** As with the UK, technology transfer models in the US tend towards a specific office retained within the organisation, with some shifting towards a model involving a separate company.

**Sharing the rewards:** Whilst revenue sharing is not fixed, inventors typically receive 30-40% of any financial return, with the remainder transferred to the Department once IP costs have been refunded to the TTO. This is slightly higher but not dissimilar to revenue sharing elsewhere internationally.

### C.3 Policy and legal framework

The US has had important legislation on technology transfer in place for many years. Some other countries have more recently followed the same path, such as Japan, Korea and Taiwan, though Europe as a whole has preferred to avoid legislation, finding voluntary codes of practice more appropriate.

The chief piece of legislation is the 1981 Bayh-Dole Act. Until then, the US government retained the title to inventions created with federal funds in locations such as the country's universities and government funded research centres and agencies. The federal government was funding 50% of all research in the country but very little was being commercialised: results went into the public domain but because the private sector could not get IP rights it would tend to leave government-funded technology alone. Bayh-Dole was a recognition that there would be significant public benefit if universities were able to own the IP in inventions made on their premises and by their employees and so became directly involved in the commercialisation process: something that would allow for licensing and other types of collaboration in a way that would incentivise businesses and investors to help take the inventions to market.

Bayh-Dole sets out uniform rules on the ownership of intellectual property created as a result of publicly funded academic research. In doing so, it is widely regarded as having helped to encourage widespread technology transfer, partnerships between private investors and universities and the creation of thousands of spin-out companies. It has been credited with kick-starting the biotechnology industry and securing American leadership in a wide range of technological areas. A detailed review of the Act for the US Congress in 2006<sup>53</sup> concluded it had largely benefited the public by encouraging technological advances and their commercialisation.

Not everyone likes Bayh-Dole. A strong minority opposed it coming into law, mainly on the grounds that it would lead to publicly funded knowledge assets being used to benefit large corporations. It is still criticised today, some claiming that it has encouraged universities to focus too much on making money and that their technology transfer offices have become greedy, as well as overly bureaucratic and incompetent - charges vigorously denied by the Association of University Technology Managers (AUTM), the US professional body for technology transfer professionals.

Despite the criticisms, Bayh-Dole's primary effect of putting IP into the hands of the organisations where it was created has produced results. For example, the AUTM 2005 Licensing Survey reported 4,932 new licences signed and 628 start-up companies formed in that year. The scale of activity is impressive, Bayh-Dole affecting over 200 universities and 700 research centres conducting more than \$100billion annually.

The main features of the Bayh-Dole Act are:

- Title to an invention sponsored in whole or in part by the Federal Government is with the university, unless the university chooses not to take title;
- If the university elects to take title, it is expected to file for patent(s) and must show due diligence in finding a licensee that will develop commercial products;
- The university is expected to give preference in licensing to small businesses;
- The university must share a portion of the royalty income with the inventor;

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<sup>53</sup> The Bayh-Dole Act: Selected issues in patent policy and the commercialisation of technology, Congressional Research Services, 2006

- The Federal Government is granted a royalty-free non-exclusive licence for Government procurement purposes only; and
- The Government retains march-in rights to undertake commercialisation if the university does not fulfil its obligations.

A second piece of relevant legislation from the same time as Bayh-Dole is the Stevenson Wydler Innovation Act. This authorises federal laboratories to conduct co-operative research and development agreements (CRADAs) with private firms and to assign any resulting patents to these firms. Until 1980, it was not very attractive for industry to collaborate with federal laboratories because results were never exclusively available to them. The purpose of this law was to increase technology transfer.

Little changed immediately due to Stevenson Wydler. Therefore Congress added the following items in 1986 (amended by the Federal Technology Transfer Act (FTTA)) and 1989: clear mechanism and contractual agreements defined for co-operation between federal laboratories, industry and government agencies and federal labs were allowed to accept money for funds and licence fees, which was an important incentive.

#### C.4 Funding for capacity building

Whilst many of the HEIs contribute towards the operation of their TTOs in the US, the National Science Foundation (NSF), the international comparator to SFI operates a substantive source of funding for incentivising small businesses to work with Universities, or to conduct Government funded work independently.

NSF operates the Small Business Innovation Research & Small Business Technology Transfer Programs (SBIR/STTR)<sup>54</sup>, which together comprise around \$2billion awarded to high-tech SMEs in the areas which NSF operates (all fields of fundamental science and engineering, except for medical sciences, with a focus on mathematics, computer science, economics and the social sciences). This is a substantive investment: by comparison, NSF's total annual budget is around \$6.06 billion, which comprises 20% of all federally supported basic research.

The SBIR/STTR Programmes aim to increase the incentive and opportunity for small firms to undertake cutting-edge, high risk, high quality scientific, engineering, or science/engineering education research that would have a high potential economic payoff if the research is successful. The STTR programme focuses on joint venture opportunities for small businesses and non-profit research institutions, and NSF expects synergism in the proposed research under this programme. A team approach is required in which at least one research investigator is employed by the SME as the Principal Investigator and at least one investigator is employed by the research institution. The STTR Programme provides up to \$850,000 in early-stage R&D funding directly to small companies working cooperatively with researchers at universities and other research institutions. Small companies retain the intellectual property rights to technologies they develop under these programmes.

Other funding initiatives are offered by the National Institutes of Health (in the healthcare and medical sectors), the Defense Advanced Research Projects Agency (in the military sector) and the National Institute of Food and Agriculture which has a primary role in funding the extensive network of US Land-Grant universities and research stations. They are distinct from NSF in that they maintain their own research facilities, which have technology transfer capabilities; they either contribute towards the STTR programme, or use a Cooperative

<sup>54</sup> <http://www.sbir.gov/index.html> accessed December 2009



Research and Development Agreement (CRADA) to interact between the Government owned research agency and industry.<sup>55</sup> NSF operates no laboratories itself but does support National Research Centers, user facilities, certain oceanographic vessels and Antarctic research stations.

### C.5 Skills and staffing

Senior figures, such as directors of technology transfer offices, are frequently highly competent people who would be equally at home in similar positions in the private sector. Their salaries and employment terms reflect this. However, at more junior levels, research by the Association of University Technology Managers in 2004 showed that technology transfer offices are often understaffed and that the staff they do have tend to be relatively less able than their private sector equivalents and do not stay in post for as long. This is largely because universities pay less well than in the private sector; they also avoid the commission-based forms of compensation often found in industry<sup>56</sup>.

For this reason, it has become more common for universities to separate out their technology transfer operations into separate companies. Such separate companies are better able to pay their staff on private sector terms, including commission, and thus attract higher quality staff. This tendency to separate technology transfer operations is similar to the model frequently found in the UK, though fundamentally the US tends to rely more on IP than on people: HEIs in the UK (and in other countries such as Canada and Australia) spend less proportionally on patenting and more on their staff.

### C.6 Supporting organisations and services

The body representing the HEI technology transfer resources in the US is the Association of University Technology Managers (AUTM). AUTM's main activities include professional development of its members, thorough dissemination of information, best practices, publications and events; providing support materials such as toolkits and guides; serving as an informal network for members (including an expanding membership outside the US) and representing and promoting technology transfer.

AUTM has for a long time promoted the benefits of technology transfer and IP exploitation on financial grounds. In recent years it has also begun to point to the wider social benefits through, for example, its Better World Project, a series of initiatives designed to showcase examples of technology transfer benefitting peoples' lives<sup>57</sup>. AUTM publishes a *Technology Transfer Practice Manual*<sup>58</sup> as one way to share experience and good practice, and to support a known and consistent approach across its member TTOs.

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<sup>55</sup> Capart, G., Sandelin, J., 2004. Models of, and missions for, transfer offices from public research organisations

<sup>56</sup> Keating, D.: *Academic incentives*, IP Investor, 1(7) pp 28-29, May 2007

<sup>57</sup> See, for example, *The Better World Report: Technology Transfer Stories: 25 Inventions That Changed the World*, AUTM

<sup>58</sup> [www.autm.net/TTP\\_Manual\\_Third\\_Edition/2866.htm](http://www.autm.net/TTP_Manual_Third_Edition/2866.htm)

### C.7 Models of technology transfer organisation

The TTOs in most US HEIs are either an integrated part of the organisation (in some instances are combined with the research offices) or, increasingly, a separate entity owned or sponsored by the HEI which handles IP on the HEI's behalf. The TTOs are tasked with managing the IP arising from the HEI, and in some cases have a wider brief in maintaining sources of proof-of-concept funding and incubation facilities, though with the larger HEIs with a higher research output, this tends to focus more on doing licence deals.

For example, Penn State University maintains a Research and Technology Transfer Organization, which comprises an Industrial Research Office, an IP Office, and control over an Innovation Park. Stanford University maintains an Office of Technology Licensing, which focuses on this activity. This model is similar at MIT, which maintains a specific licensing office, but also creates linkages with serial entrepreneurs in helping with seed funding and spin-outs. The model differs at Washington State University, where IP management is handled by the Washington State University Research Foundation (WSURF) which operates as a not-for-profit organisation and provides seed funding and incubator facilities.

### C.8 Sharing the rewards

By law (the Bayh Dole Act) inventors must receive a share of any financial return, with the rest used only for research and education purposes. The amount of the academic's share is not laid down though, in practice, a share of around 40% is the norm, with the university (and sometimes the academic's department or college) taking the rest. The university share usually includes the amount needed to support the TTO. Some examples are shown in Table 8 below.

**Table 8: Revenue sharing in selected TTOs - United States (%)**

	Inventor	TTO	Department	University
<b>Illinois (Chicago)</b>				
All income	40		20	40
<b>Yale</b>				
0 - \$100k	50			50
\$100k - \$200k	40			60
>\$200k	30			70
<b>Stanford</b>				
All income	28	15	56*	

Source: websites of relevant institutions. \*Department share at Stanford is split between Department and School

## C.9 Examples of TTOs

### Massachusetts Institute of Technology (MIT)

MIT is recognised for its academic strength and its ability to apply that strength to industry. MIT spend \$643 million on research in 2008. In each of the past five years its Technology Licensing Office has signed more than 100 option and licence agreements, of which 20 to 25 each year were to start-up companies formed to exploit the technology<sup>59</sup>. MIT allows its researchers to hold IP jointly with corporate researchers on joint discoveries, and allows sponsors to negotiate exclusive licences to technologies they funded. Overseas firms have the same rights to license MIT IP as US firms. Three organisations within MIT have roles to play in technology transfer and IP exploitation:

#### *The Industrial Liaison Program (ILP)*

The ILP is a 'one-stop-shop' for companies wanting to access MIT talent. Companies join the ILP for an annual fee and are assigned a liaison officer. The programme had approximately 200 member firms in 2009, of whom about half were funding research, exchanging staff or attending educational programmes. The rest use the ILP for technology scanning, its information services or as a recruiting tool. Each liaison officer handles around 12 to 14 companies from one of three groups: pharmaceuticals, chemicals, petrochemicals and medical devices; IT, telecoms, financial and other services; and heavy industry.

#### *The Deshpande Center*

The Center resides within MIT's School of Engineering and provides funds and support to accelerate the migration of ideas from the lab to practical commercial application. It relies on volunteers from entrepreneurs and investors to provide support to ventures. Since its formation in 2002, the Center has funded more than 80 projects, provided over \$9 million in grants. Eighteen projects have spun out of the Center into commercial ventures, attracting around \$140 million in outside financing.

#### *The Technology Licensing Office*

The office handles the licensing of the intellectual property resulting from research in the MIT Lincoln Laboratory and the Broad Institute. It helps MIT inventors to protect their technology and to license that technology to existing companies and start-ups, and comprises 33 staff (licensing specialists, IP managers and finance and administration). In 2008, the Office issued 122 US patents (at a cost of \$16 million), completed 68 licensing deals and founded 20 spin-out companies. The Office generated \$89 million in cash income, and \$66 million in royalties.

### Stanford University

Established in 1970 and one of the oldest TTOs, Stanford's Office of Technology Licensing (OTL) has served as the benchmark model for technology transfer for many other organisations, setting some important principles for the role of a TTO. The OTL remains a single office embedded within the University, employs 33 staff, and maintains a separate, though wholly owned Industrial Contracts Office to primarily handle material transfer and similar research agreements. OTL pitches itself as a market focused organisation. It employs no legal counsel and takes no responsibilities for issuing a warranty on an invention, though it makes use of outside counsel, although such oversight is not required if an agreement does not deviate from the university's standard practices of granting no warranty on an invention<sup>60</sup>.

<sup>59</sup> <http://web.mit.edu/facts/research.html>, accessed November 2009

<sup>60</sup> The Innovation Incubator: Technology transfer at Stanford University. <http://www.strategy-business.com/article/13494?gko=e8e48>, accessed December 2009

OTL is self supporting and generates substantial revenues through royalties (\$62.5 million in 2007/08 and \$1.2 billion since 1970) though this must be again set within the context of Stanford's overall research budget of \$1.13 billion<sup>61</sup>, and that much of these revenues date back to licence agreements in the 1970's<sup>62</sup>. Revenues totalling 66% (once operating costs of OTL have been removed and the inventor has received a share) are ploughed back in to University schools and departments (Table 7).

OTL has also given ~\$43.5 million to a Research Incentive Fund, administered by the Dean of Research. The Stanford Management Company (SMC) was formed in 1990 to manage the income producing assets of Stanford, such as the endowment (an estimated \$8 billion in 2004), real estate and income producing properties donated to Stanford.

OTL works with the inventor to develop a licensing strategy, consider the technical and market risks, decide whether to patent the invention, and identifying a product champion within a company before negotiating a licensing agreement. There is a belief that licensing agreements are the beginning of a relationship that lasts many years, so they believe in having one person handle it cradle to grave. OTL offers flexibility around offering commercial terms, depending on the licensee's ability to pay, and companies often provide generous grants and collaborate with the University when granted favourable licence rates.

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<sup>61</sup> <http://www.stanford.edu/about/facts/research.html>, accessed December 2009

<sup>62</sup> Capart, G., Sandelin, J., 2004. Models of, and missions for, transfer offices from public research organisations

## Appendix D: Benchmarking data - Finland

### D.1 Summary

Finland represents a good example of networked or open innovation through initiatives such as the Otaniemi Technology Hub which handles the networking and IP arrangements within the Helsinki region and the strength of the Technical Research Centre of Finland (VTT) which acts as a state-owned contract research organisation. The TTOs within each HEI have low visibility, especially given that until recently the HEIs were not able to conduct business activities - though this policy has been recently revised.

### D.2 Implications for Ireland

**Policy:** Finland is a top-performing country in networked research and innovation and is adopting new strategies to make HEIs more business orientated. Given that the HEIs have a limited role and visibility independently in technology transfer, the success of Finland indicates, in part, that a networked approach of “open innovation” can be beneficial in terms of achieving lasting relationships and economies of scale within a relatively small geography.

**Legal framework:** Finland’s IP legal framework is currently in a phase of change given the new role of the HEIs. IP ownership, in terms of the inventor’s right to retain ownership of “basic research” as under of the “professor’s privilege”, is highlighted as a persistent issue which differs from most of the rest of Europe, and one which remains under consideration.

**Funding for capacity building:** The main sources of funding come from Tekes, the government funding agency for technology and innovation and Sitra, an independent Government sponsored innovation fund. The Academy of Finland focuses its funding streams on basic research, teaching and skills development. The role of Tekes encompasses FDI and indigenous businesses, whilst the Sitra model reflects a candidate model for Recommendation 7 in this report, which sets out the case for an increased, venture capital backed and professionally run source of grow-on funding, which takes the idea out of the hands of researchers and exposes it to the proper venture capital community to see test its potential before investing more time and effort in an idea.

**Models of TTOs:** Finland’s HEIs operate their technology transfer activities through the centralised Otaniemi Technology Hub. VTT has sufficient scale and expertise to transfer technology independently as well as through the network. The Technology Hub is notable in its “outward facing” nature, focusing on the importance of establishing individual relationships within the Finnish business community through its “soft landing” programme.

### D.3 Policy

Finland has for many years been regarded as one of the top-performing countries in Europe on research intensity and innovation performance, particularly through its publically sponsored contract research body the Technical Research Centre of Finland (VTT) and collectively under the auspices of the Otaniemi Technology Hub. In terms of commercialising research from the HEIs, until recently the HEIs were not allowed to conduct business activities, and most profits from technology transfer were handed over to the state.

Finland faced further challenges of sustaining its position as a leading innovator in certain high-technology sectors (notably electronics and telecoms) while at the same time, adopting a broader innovation policy that focuses on broader sectors and better drawing on the

capabilities of Finland's HEIs. In response, the Government adopted a new National Innovation Strategy<sup>63</sup> in August 2008. The strategy has four main thrusts: creating innovation-friendly markets; strengthening R&D resources; creating more flexible and adaptable human resources, finance and organizational structures; and fostering a culture that promotes innovation.

In support of the National Innovation Strategy, the government launched a National IP Strategy Initiative in November 2007 aimed at identifying how the country's IP system should evolve. Part of this strategy has involved a restructuring of the HEI sector to provide it with greater flexibility and autonomy under the new University Act of September 2009 (with compliance required by the HEIs from 2010 onwards). The new Act requires a "conversion of universities from governmental institutions into independent juristic persons of public law", whilst continuing to "uphold the government responsibility to fulfil their public mission". This reform is anticipated to make the universities more flexible and to provide them with incentives to profit from business activities (including joint ventures), donations and capital income, which previously did not exist.

#### D.4 Legal framework

As a result of these top-level changes, Finland is currently undergoing a turbulent period in its IP legislation, and since some of this legislation has only been introduced very recently, there are still variations in the ways in which HEIs approach this framework as they look for the best approach.

Finland's legal framework is structured similarly to most other European nations, with an exception being the legal position relating to IP ownership emanating from the HEIs. While most nations transfer IP ownership to the employer (with most countries removing the 'professor's privilege' exception), in Finnish law this varies. The Universities Act (as a component of the National IP strategy) will give the HEIs new rights to any IP created as part of 'contract research', for research funded in some part (or fully) by an external source or sources. However, any IP produced as a result of basic HEI research funds remains the property of the researcher, with the HEI receiving secondary rights, in case the researcher does not utilise them. Whilst the inventor is obliged to disclose a piece of IP to the HEI so it can be appropriately protected, lengthy negotiations are often required to establish whether the research is 'open' or 'contractual'. These issues are further complicated when foreign researchers take part in the project and application of national legislation is not as straightforward.

As with any reform, some foreseen challenges are emerging. Not all universities are endowed with sufficient frameworks to foster large amounts of high-quality collaboration between industry and universities. Collaboration is further complicated by the challenge of recruiting commercial expertise into universities, in order to guide and represent universities in the collaboration process, due to the high opportunity cost. As a result, Finland has been subject to some criticism of the lengthy and bureaucratic nature of its IP legislation.

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<sup>63</sup> [www.innovaatiostrategia.fi/en/overview](http://www.innovaatiostrategia.fi/en/overview), accessed December 2009

### D.5 Funding for capacity building

The main research funding body in Finland is Tekes, the Finnish Funding Agency for Technology and Innovation. Tekes seeks to stimulate indigenous enterprise as well as attract FDI in both the public and private sectors. It brings a notable focus on encouraging a dynamic network of large companies, small businesses and public-private partnerships to develop a competitive and stable economy. In 2008, Tekes saw the completion of 1,954 projects, and funded another 1,983 R&D projects, of which 68% were corporate projects, with the remaining 32% for research projects in universities and research institutes.

The Tekes Strategic Centres for Science, Technology and Innovation (SHOKs) programme provides centres for collaboration, is part of its technology transfer reform towards a more open culture of innovation. Recently set up a part of the Universities act, as a combined programme between Tekes and the Academy of Finland, the SHOKs are a network of centres for University and Industry collaboration. Part company-owned, part university-owned, the SHOKs seek to renew and regenerate industry clusters with more radical innovations, with successful collaboration as their primary goal.

Working alongside Tekes, though not as orientated towards financing research and businesses, is Sitra, an independent innovation fund. With an independent fund under Finnish parliament supervision and duties stipulated in law, Sitra exists to fund research at all stages, acting as a venture partner for projects and businesses for the public good, and supporting both public and private sector research.

The Academy of Finland is the prime funding agency for basic research in Finland, and focuses its funding streams on the HEIs and public research organisations, with the remit of promoting high quality science. In evaluating funding decisions, consideration is given to the potential impact of the research on society, business and industry.

### D.6 Supporting organisations and services

IP Finland - a subsidiary of IP Europe - is a private company specialising in the commercialisation of research-based IP in Finland, and is the main supporting organisation for commercialising IP. It defines itself as an “Intellectual Property exploitation” company, is privately owned and makes substantive investment in the Finnish HEIs. It recently committed €5 million to spin out companies from the University of Helsinki, as part of a partnership with the university. In May 2008, IP Finland and Tekes together committed over €213 million over five years for research into materials technologies. Other organisations of note include Finpro, an association founded by Finnish companies. Its aim is to support the internationalisation of small and medium sized companies. It provides support to the industry including university collaboration, and also works alongside Tekes.

### D.7 Models of technology transfer organisation

The technology transfer role of HEIs has been somewhat constrained in the past, such that the TTOs within each HEI - such as they are - have a limited presence (the University of Helsinki clearly sets out its top line mandate as being teaching and research, for example). VTT has sufficient scale to handle its own technology transfer activities; the HEIs together with VTT operate through the successful Otaniemi Technology Hub.

### The Technical Research Centre of Finland (VTT)

VTT is the biggest multitechnological contract research organisation in Northern Europe, and a not-for-profit part of the Finnish innovation system under the auspices of the Ministry of Employment and the Economy. VTT operates in the biotechnology; energy, pulp and paper; ICT; industrial systems; materials and building and microtechnologies and sensors sectors. VTT operates a partnership and partial outsourcing model in working with industry. It also delivers publically commissioned research using funding from the Academy of Finland, Tekes and the European Commission, for example through its “spearhead and major initiatives” programmes, which seek to overcome challenges specific to Finland. VTT also offers consultancy services in technology foresighting and IP and innovation management.

VTT has the highest output in the country in terms of patenting and licence deals, the revenues for which go towards covering IP expenses. VTT’s model focuses on fostering collaboration and long term relationships with other research organisations, such that the way in which IP is handled depends on the relationship with the client organisation. Publically funded IP is retained within the organisation.

### Helsinki University of Technology (TKK) and the Otaniemi Technology Hub

TKK is the main technology focused university in Finland and is part of the Otaniemi Technology Hub, recognised by the EU as one of the most innovative regions in Europe, with around 600 high-tech companies ranging from start-ups to multinationals. Otaniemi International Innovation Centre is TKK’s service unit, providing expertise on IP rights and contractual issues, as well as support with applications for research funding. It is the primary centre responsible for engagement with industry, and is the most developed TTO in Finland.

The Technology Hub provides a “one-stop-shop” for new investment into the Helsinki region referred to as the Otaniemi soft landing services<sup>64</sup>, which comprises:

- Provision of a specific case manager and personal business advisor;
- Access to the Otaniemi International Network, consisting of Finnish-international employees, entrepreneurs, researchers and students;
- Tailored matchmaking services to guide partnering activities; and
- Business intelligence on Finnish and Scandinavian markets.

As part of the University Act reform, TKK is merging with two other HEIs in the greater Helsinki area to form the new Aalto University from January 2010. The other institutions are The Helsinki School of Economics and the University of Art and Design Helsinki. The merger is expected to open up new possibilities in multi-disciplinary research and innovation exploiting synergies of the three institutions. It is anticipated it will facilitate more focused research and innovation in sectors where Finland is recognised as having a competitive market position (such as technology and design) and therefore providing opportunities for stronger linkages between academia and industry.

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<sup>64</sup> [http://www.otaniemi.fi/portal/our\\_services/otaniemi\\_soft\\_landing\\_services/](http://www.otaniemi.fi/portal/our_services/otaniemi_soft_landing_services/) accessed December 2009



## Appendix E: Benchmarking data - Singapore

### E.1 Summary

Singapore slightly outperforms Ireland in terms of innovation output from its HEIs and research institutes. This can be attributed in part to the HEIs being more commercially oriented. Singapore is similar to Ireland in terms of very open and flexible IP policy and guidelines - which causes difficulties in establishing collaborations. Singapore differs in terms of the TTOs being considered an administrative component of the HEIs with specific legal support assigned to each.

### E.2 Implications for Ireland

**Policy:** There is no explicit policy governing IP emanating from HEIs and research institutes in Singapore. The perception is that this is not needed, since desire for industry collaboration is high within institutions. This is in contrast to Ireland, where the “third mission” is considered a more peripheral activity to the traditional roles of teaching and research. That Singapore’s situation does not appear to require much regulation suggests that the HEIs are more business focused.

**Legal framework:** Singapore’s IP legal framework is broadly based on that of the UK. Decisions concerning IP ownership are left for individual institutions to agree with licensees, and no formal national level guidelines or rules are provided. This is comparable with the situation in Ireland in terms of low prescription, though anecdotal evidence from our consultations suggests that because of a lack of a uniform stance over IP, negotiations can be difficult.

**Funding for capacity building:** The Enterprise Development Board stimulates FDI and indigenous businesses in Singapore. The Agency for Science, Technology and Research (A\*STAR) funds some research within the Universities and centrally manages IP from Singapore’s national research institutions and partnerships. To some extent, this reflects the remit of IDA and Enterprise Ireland, with the exception that A\*STAR takes full responsibility for commercialising IP from its institutions centrally, although this role does not encompass IP originating from the HEIs.

**Supporting organisations and services:** The Singapore patent office plays a strong role in improving IP awareness amongst institutions. Additional training is provided through a separate Government funded IP academy. The role of the patent office does not differ greatly from that of the Irish Patent Office, though anecdotal evidence suggests that the office in Singapore also works towards fostering collaboration between HEIs and industry.

**Models of TTOs:** Singapore’s technology transfer offices are almost all located within Singapore’s different universities as part of the University administration. They are funded and held accountable by their parent universities. This is in contrast to the situation in Ireland, though this reflects that the HEIs in Singapore have a greater appetite for interactions with business.

**Staffing and skills in TTOs:** The vast majority of TTO staff in Singapore come from industry, with little or no staff from an academic background. Expertise in the areas of research handled is considered mandatory. This is broadly comparable with the TTOs in Ireland, whose staff come from business backgrounds often combined with sector specific knowledge.

### E.3 Policy

Singapore has worked hard to evolve from a manufacturing-intensive economy twenty years ago towards a knowledge- and innovation-based economy today. The country offers a very open innovation profile with a broad international network and a high level of international R&D collaboration. It has been very successful in attracting global talent to do research there and many international companies have set up R&D activities. Two thirds of the country's spending on R&D is by the private sector.

Focusing on few fields and financing key programmes in the long term are distinct features of Singapore's national strategy and policies. Current government strategy is to target support for a few strategic fields of R&D, where Singapore has a competitive edge and existing strengths can be further leveraged by increased public investment in R&D.

There is no explicit policy stance for the commercialisation of IP from HEIs as such. The Singapore government appears to instead focus on getting industry to collaborate with universities, providing funding through bodies such as A\*STAR. It appears to be that the government does not have to issue policy incentives for the HEIs because they already have a philosophy that the university must impact the rest of society as positively as possible, and that it is part of the duty of the university to make the results of its research commercially available for business.

### E.4 Legal framework

Singapore does not have an equivalent to the Bayh-Dole Act that exists in the US, but does have various national laws governing specific forms of IP, forming a framework in which IP created as the result of employment is owned by the employer. Singapore does not have a recognised 'professors privilege', so in the case of universities, the issue of ownership is left to the individual institutions. Parts of these laws are directly modelled on UK laws, with only minor changes, especially in laws governing patents.

Unlike the UK however, Singapore does not have a set of templates guidelines equivalent to the Lambert agreements. Instead, HEIs derive their own standard agreements and templates on the basis of national IP law, which is used on a case-by-case basis. For example, the National University of Singapore (NUS) maintains guidelines for signing MoUs and agreements, disclosure forms and checklists and an IP policy.

The IP policy specifies that commercialisation efforts should be under the auspices of doing so for the greater good for Singapore. It also sets out the university's expectations around IP ownership, disclosure requirements, empowerment of the University to commercialise the IP as best it sees fit, revenue sharing and dispute resolution - though there is some flexibility in these requirements.

### E.5 Funding for capacity building

The Enterprise Development Board stimulates FDI and indigenous businesses in Singapore. A\*STAR funds some research within the Universities and centrally manages IP from Singapore's national research institutions and partnerships

Singapore enjoys a very developed network of funding organisations for industry collaboration and technology transfer. As such, Singapore has two main funding bodies, which provide the majority of funding for technology transfer beyond basic university funding: the Agency for Science, Technology and Research (A\*STAR) and the Enterprise Development Board (EDB).

Both are major sources of government funding, directing funds through R&D grants for companies.

The EDB is the lead government agency for economic development in Singapore through attracting FDI, growing indigenous industry and working with other Government agencies to ensure the country's business environment remains competitive. In terms of technology transfer initiatives, the EDB uses the Start-up Enterprise Development Scheme (SEEDS), which offers equity matching funds for early start-ups who rely on university-created research. Over 100 companies have so far enjoyed funds from the EDB.

A\*STAR is Singapore's lead government agency, dedicated to fostering high quality research and scientific talent. It has roles in overseeing and coordinating public sector research, particularly in biomedical science, physical science and engineering through internal research councils. A\*STAR oversees 14 research institutes and seven consortia located in Biopolis and Fusionopolis, and supports extramural research with the universities, hospital research centres, and other local and international partners through grant calls and thematic research programmes.

In terms of commercialisation, Exploit Technologies Pte Ltd - the marketing and commercial arm of A\*STAR, manages the IP portfolio of A\*STAR's research institutes and centres centrally. It promotes the institutes' research capabilities and facilitates the efficient transfer of A\*STAR's technologies to industry, ensuring that new intellectual properties generated by their researchers are exploited to produce tangible products and services. Exploit Technologies offers a range of commercialisation funding opportunities, including:

- Commercialisation of Technology fund, which seeks to bridge the gap between an academic idea and a successful enterprise through short term gap funding for 3-12 months<sup>65</sup>;
- "Go to Market" processes for licensing and spin-outs, which comprises technology transfer professionals based centrally to lead licensing deals, and support for entrepreneurs in creating spin-offs by advising on business case development and sources of venture funding; and
- "Biz incubation" processes for flagship technologies identified early in their development for accelerated progression towards creating a novel industry sector in Singapore.

## E.6 Supporting organisations and services

Singapore has one main central organisation which helps facilitate collaboration, aimed at providing support to businesses and is small enough not to require a formal government technology transfer network.

Singapore has one main organisation which helps facilitate university - industry collaboration; the Intellectual Property Office of Singapore (IPOS). Launched in 2001, IPOS has a variety of IP related functions, such as acting as an advisor to the general public and business on IP, regulating the IP industry, and advising the government on IP policy. It does not however provide much support for universities. This is because most universities have either developed their own offices capable of handling any collaboration, or they are involved in a network which provides the same capability. Thus the IPOS is often only initially involved in

<sup>65</sup> [http://www.exploit-tech.com/cos/o.x?c=/etp\\_tec/pagetree&func=view&rid=5427](http://www.exploit-tech.com/cos/o.x?c=/etp_tec/pagetree&func=view&rid=5427), accessed December 2009

the collaboration process, directing businesses towards the relevant universities or other support organisations such as A\*STAR or EDB. The IPOS also provides the government with advice on IP policy and even administrating some of Singapore's IP legislation.

An example of a policy for which the role of IPOS was crucial is the Intellectual Property Education and Resource Centre (IPERC), a programme aimed at bringing IP awareness to the public as a whole, providing an education and training unit, as well as producing information packs on various different types of IP.

The Intellectual Property Academy (IPA) is another government initiative. Founded in 2003 the IPA aimed to “be a leading centre of excellence for executive IP education and thought leadership development”, as well as “a world-class resource for the development of knowledge and capabilities in the protection, exploitation and management of IP”. Though considerably smaller than IPOS, both in scale and impact, it has become a focal point for individual education and research into IP, and plays a key role in educating and broadening Singapore's IP understanding and capability. It also has a particular emphasis on individual entrepreneurship, something that is a recurring theme in government IP support, which also limits its importance within the Singapore technology transfer industry.

Singapore is small enough that no formal network is required between the different technology transfer organisations. Instead, they meet in conferences once or twice a year, depending on necessity. The National University of Singapore (NUS) TTO is part of the global technology transfer network, the Association of University Technology Managers (AUTM).

### **E.7 Models of technology transfer organisation**

Most Singapore universities have a recognisable technology transfer office, though each office is run internally and is largely bespoke for each university, such as the National University of Singapore's Industry Liaison Office (ILO). These offices are largely run as administrative offices as part of the university. The government does not offer any funding, recommendations, guidelines, or legislation on how these offices are either run or how their performance should be measured.

All TTOs within universities are held accountable only to the university to which it is a part of. How their performance is measured, however, varies considerably. The less developed TTOs, such as the office in Nanyang Technological University, measure their performance through the simple measures of how many start-ups they are assisting, and how much money they are generating through licensing. The more established National University of Singapore, (NUS enterprise) however, has taken a very different approach. Their performance is measured by considering their impact on business, the economy, and society, as well as the start-up and licensing statistics, and computing them into a matrix, with the idea to have a more ‘holistic approach’ to measuring performance. This approach was developed after simple indicators of numbers of start-ups and licensing revenues were considered to be too variable and beyond the office's control. This measurement can be seen as indicative of Singapore's culture and attitude towards the role of university in the economy and business.

The proportion of work between start-ups and licensing appears to be roughly 50-50 for most TTOs, though naturally, some TTOs are aimed at specifically licence, or, more often, start-ups, such as the NUS Enterprise Incubator Ecosystem.

Universities with less developed internal TTOs have pooled their technology transfer options in the recently formed Technology Transfer Network, founded by:

- Technologies of the Agency for Science,
- Technology and Research Nanyang Technopreneurship Center,
- Nanyang Technological University,
- Nanyang Polytechnic,
- Ngee Ann Polytechnic,
- Republic Polytechnic,
- Singapore Management University,
- Singapore Polytechnic and
- Temasek Polytechnic.

### E.8 Sharing the rewards

As in the UK there is no standard across Singapore for how the financial results of exploitation are shared. Table 9 below gives examples for NUS and Nanyang. It is apparent that inventors get a larger proportion of revenue generated by their research when the value of the research is high. This is perhaps the result of a more explicit emphasis put on individual entrepreneurship, seen elsewhere in the supporting government organisations.

**Table 9: Revenue sharing in selected TTOs - Singapore (%)**

Body	Inventor	TTO	Department	University
NUS	50%	0	30%	20%
NTU	<\$500k	0	0	25%
	>500k	A decreasing proportion for inventor as royalties increase		

Source: WIPO. Figures are in US Dollars. NTU: Nanyang Technical University; NUS: National University of Singapore

### E.9 Staffing and skills in TTOs

Most, if not all staff in TTOs in Singapore come from an industry background. There appears to be a definite understanding that their job is to facilitate industry collaboration with the universities output, rather than the other way around. The only specific requirement the staff have is that they must be qualified and knowledgeable enough to fully understand the research output, but also have enough business acumen to be of value to the businesses the TTO comes into contact with. This normally means someone from a business background with a degree in science or engineering relevant to the domain they work in. In the case of the NUS ILO, the TTO also has lawyers as part of its office. They are only general lawyers, however, principally there to deal with agreements whilst any patent attorney work is outsourced.

## E.10 Examples of TTOs

### Nanyang Technological University

One of the major research universities in Singapore, NTU is specifically aimed at nurturing entrepreneurial and creative talent through diverse academic disciplines. As such, the university has both a dedicated office to matters of IP and technology transfer, the Innovation & Technology Transfer Office (ITTO) which provides internal initiatives, comprising:

- An innovation centre which allows entrepreneurs to access laboratory and office space for nominal rent; and
- A proof of concept fund and grant scheme.


### National University of Singapore

The National University of Singapore (NUS) is the largest and most well known university in Singapore. Its technology transfer entity, NUS Enterprise is branded as a University level-cluster, is the parent entity of the following:

- NUS Entrepreneurship Centre - Educational role in encouraging entrepreneurship;
- NUS Enterprise Incubator Ecosystem - Formerly known as venture support, and providing infrastructure support founded by NUS alumni, staff, and students; and
- NUS Overseas College - Targets undergraduates with academic ability and entrepreneurial drive, giving them international experience.

The Industry Liaison Office (ILO), now part of NUS Enterprise, is aimed at facilitating collaboration between businesses and HEIs, protecting NUS IP, and translating NUS research into products and technologies. Last year ILO launched the R2M platform to give a portal for IP and technology transfer and a focal point for activities such as forums, seminars and focus group discussions.





**Forfás**

Wilton Park House  
Wilton Place  
Dublin 2

Tel: +353 1 607 3000  
Fax: +353 1 607 3030  
Email: [info@forfas.ie](mailto:info@forfas.ie)  
[www.forfas.ie](http://www.forfas.ie)

**Department of Enterprise, Trade & Innovation**

23 Kildare Street  
Dublin 2

Tel: +353 1 631 2121  
LoCall: 1890 220222  
Fax: +353 1 607 3030  
Email: [info@deti.ie](mailto:info@deti.ie)  
[www.deti.ie](http://www.deti.ie)