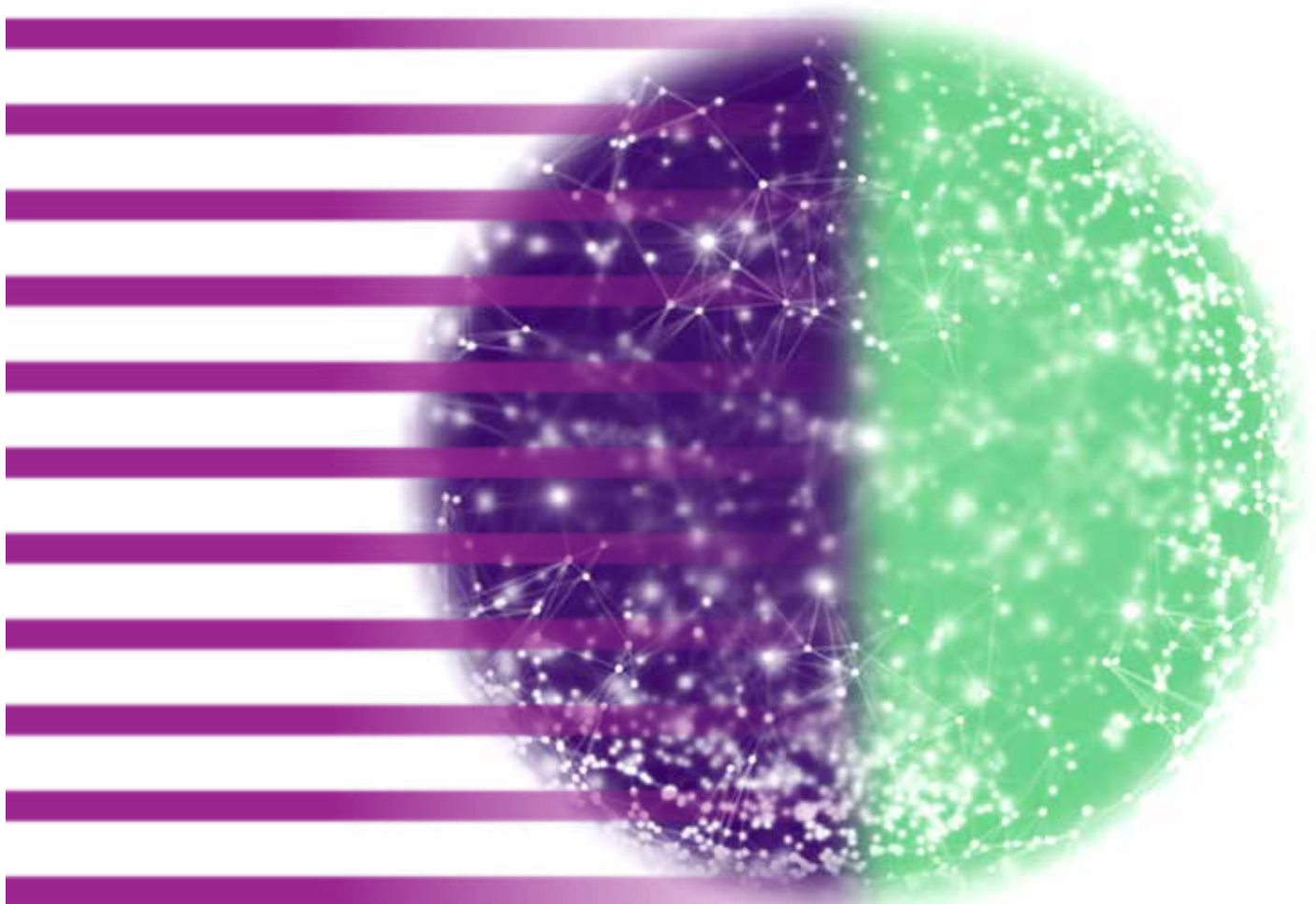




**KTI**  
Knowledge Transfer Ireland  
Where Research & Business Connect

# Annual Review & Annual Knowledge Transfer Survey

2015



# In 2015...

This Annual Review incorporates results from the Annual Knowledge Transfer Survey (AKTS) 2015 which tracks business engagement and commercialisation activity (together referred to as knowledge transfer) between the commercial sector and Ireland's State-funded research performing organisations (RPOs).



## Products on the market

38

new products were launched on the market as the result of a licence from an RPO - a 27% increase on 2014.



## Licences/Options/Assignments (LOAS)

206

LOAs were signed representing a continued increase of 23% on the previous year.



## Collaborative research agreements

748

new collaborative agreements were signed representing a 16% increase on 2014.



## Active research collaborations

1,235

live collaborative research programmes involving RPOs were underway at year end.



## Contract service agreements

597

new contract services agreements were signed during the year.



## Consultancy agreements

372

consultancy agreements were signed during the year.



### Company Location

65%

of companies working with RPOs on collaborative research agreements were based in Ireland.



### Collaboration with Irish SMEs

94%

of collaborative research agreements with the SME sector were with Irish SMEs.



### Collaboration with Irish MNCs

13%

of collaborative research agreements with the MNC sector were with Irish-based MNCs.



### Spin-outs

31

new spin-outs were formed, continuing an upward trend with an increase of 15% on the previous year.



### Active spin-outs

110

active spin-outs were thriving at least three years post-incorporation at the end of the year, an increase of 13% on 2014.



### Jobs in active spin-outs

930

jobs were created in active spin-out companies during the year.



### Priority Patent Applications

118

patent applications were filed, a number consistent with that for the previous year.



### Invention Disclosures

465

new invention disclosures were filed, representing an increase of 10% on 2014.

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# Foreword

The national IP Protocol, published for the first time in 2012, sets out the policy and framework for engagement between industry and the publicly funded research base.



The protocol arose from a strong engagement across the research and IP community from industry and the public sector, reflecting a shared goal of developing a world class innovation ecosystem in Ireland.

Knowledge Transfer Ireland's existence springs from recommendations made by that community, driven by a desire to maximise the accessibility, responsiveness and impact of our knowledge transfer system.

With a commitment to and interest in the impact of research, the Irish Universities Association has worked with Enterprise Ireland to establish Knowledge Transfer Ireland (KTI) and support its development. I am pleased to introduce this Annual Review which looks back on 2015 and demonstrates the significant impact that KTI has had in the short time since its creation.

At the end of 2015, a refreshed version of the Protocol was delivered by KTI to government. Drawing on experience gained since the initial publication of the Protocol, the updated version reflects the maturation of both Ireland's knowledge transfer system and of KTI itself.

Ireland now boasts many success stories resulting from the innovation from our Higher Education Institutes (HEIs). This Annual Review and the associated Annual Knowledge Transfer Survey contained within it, charts the progress that has been made and profiles some of the year's successes, highlighting the role that the HEIs and their TTOs play in the innovation landscape in Ireland.

KTI has an important role to play in co-ordinating the national knowledge transfer system in Ireland. With its focus of making it simpler for business and investors to benefit from State funded research, KTI reaches out to a broad audience that ranges from small, local companies to large multinationals. In addition, KTI continues to support the commercialisation offices in our research performing organisations (RPOs) so that they can effectively work with business and investors to develop Ireland's R&D capability, innovation and growth.

This is illustrated by the KTI awards, which highlight how knowledge transfer and exchange between the public research system and enterprise can strengthen Ireland's competitiveness.

The awards highlight the richness of knowledge exchange, covering services and manufacturing, collaborative projects and spinouts, along with the increasingly important area of consultancy.

Ireland's strategy for research and development, science and technology - *Innovation 2020* - published at the end of 2015 describes Ireland's advances of the past two decades and its ambition to become a global innovation leader driving a strong sustainable economy and better society. To get there, the State acknowledges that a sustained investment in R&D and a commitment to nurturing talent emerging from our HEIs is required.

So much of what Ireland strives for will be achieved through a strong research base, good people on the ground and a cohesive approach within the system to bolster research and innovation. KTI is mandated to help deliver a number of specific objectives within *Innovation 2020* which it can achieve with the support and co-operation of the other major actors in the research and innovation system - including industry itself.

**Ned Costello**

Chief Executive,  
Irish Universities Association

# Setting the context



Enterprise Ireland established Knowledge Transfer Ireland in late 2013 in partnership with the Irish Universities Association.

The aim was to bring a new focus to the interface between public research and industry – through one body taking an overview of the knowledge transfer system and practice and making it easier for companies to engage with state funded research. KTI has become an effective national resource providing a breadth of tools that enable industry to benefit more readily from the wealth of expertise that exists within the Irish research base. Whether this be through R&D collaboration, acquiring novel intellectual property or in the creation of new ventures, the objective is to drive business innovation and competitiveness.

Our vision in Enterprise Ireland is that Irish enterprise will be a powerhouse of economic growth and job creation in Ireland. Innovation is at the heart of gaining competitive advantage in business and central to our clients' ability to compete and win international markets. EI provides a range of supports for in-company R&D and for research collaboration and commercialisation.

We have made a long term commitment, through the EI Technology Transfer Strengthening Initiative (TTSI) programme, to bolster the capability and capacity to support knowledge transfer and commercialisation in our research performing organisations (RPOs).

As a core component of delivery to the innovation agenda, EI has committed to extending this programme for a further five years from 2017 and to pilot new routes for industry to access researcher knowledge and expertise through institutional consultancy offerings.

The positive trajectory of knowledge transfer activity in Ireland is pleasing and can, perhaps, most readily be understood through some of the compelling case studies of innovation from the Irish research base which KTI has captured in this Annual Review.

**Julie Sinnamon**  
CEO, Enterprise Ireland



# Introduction



In this year's Annual Review we share the activities that we led during 2015 and highlight some of the successes enabled by the technology transfer offices within our higher education institutions.

The Review also incorporates the Annual Knowledge Transfer Survey (AKTS) 2015 which tracks business engagement and commercialisation activity between the commercial sector and Ireland's State funded research performing organisations (RPOs). Now in its third year, the AKTS has established Ireland as one of the leading countries monitoring and making available longitudinal studies of knowledge transfer system performance.

KTI's role is to ensure that knowledge transfer in Ireland is as efficient and effective as possible. This Annual Review provides an overview of the core activities carried out in 2015 under each of the three KTI strategic pillars:

- Strengthening the national framework for knowledge transfer
- Supporting the Irish knowledge transfer infrastructure
- Developing Ireland's knowledge transfer system

This Annual Review provides an overview of the core activities under each of these delivery pillars that we carried out during 2015.

Of particular note in 2015 was the delivery of the national IP Protocol. We moved this from the initial consultation phase in 2014 through to presenting a revised document to government in 2015 for publication in January 2016. We developed a further suite of template KTI Model Agreements during 2015 bringing the total available to 28 and which we have found are already proving useful in speeding up negotiation times. These deliverables meet targets set for KTI by the Government in its *Action Plan for Jobs 2015*.

Interest in the KTI events programme continues to grow and we delivered a series of seminars during the year as well as the KTI Impact Awards programme. With the ongoing development of knowledge transfer as a profession in Ireland, I'm very pleased that 20 people working in technology transfer here were awarded the global credential of Registered Technology Transfer Professional (RTTP) bringing the number of RTTP designated people to 23, which pro-rata is higher than any other country.

KTI is responsible for the management and development of Enterprise Ireland's TTSI - the funding

programme that supports research commercialisation through the technology transfer offices in RPOs and is currently in its second round. A proposal for the third round of the TTSI programme was presented to the Board of Enterprise Ireland during 2015 and we look forward to managing awards under this future fund through the process of rigorous international peer review.

I am extremely grateful to our Industry Advisory Board, in particular for their input to the revised IP Protocol and for their ongoing support for the development of KTI's activity. The KT Stakeholder Forum meetings have been very productive with innovation leads from agencies and representatives from the RPO community coming together to discuss system-level issues and to contribute to our initiatives.

The State has set ambitious targets for research and innovation in its Innovation 2020 strategy. I am pleased that KTI has been called upon to play its part in the strategy and look forward to working with all our stakeholders to ensure success.

**Dr. Alison Campbell OBE RTTP**  
Director, Knowledge Transfer Ireland

# Making an Impact in 2015

The work carried out by Knowledge Transfer Ireland throughout 2015 focused upon three strategic pillars:

1.

## Strengthening the National Knowledge Transfer Framework

Responsible for “Inspiring Partnerships –the National IP Protocol.”

Produce and provide practical resources for Industry.

Work with industry and research partners to support knowledge transfer activity.

2.

## Supporting the Irish Knowledge Transfer Infrastructure

Build capacity and capability within Ireland’s knowledge transfer system through targeted funding.

Share best practice within the knowledge transfer community in Ireland.

Recognise excellence in Knowledge Transfer.

Support the knowledge transfer profession in Ireland.

3.

## Developing Ireland’s Knowledge Transfer System

Monitor knowledge transfer activity taking place within Irish publicly funded research organisations.

Report on the performance of Ireland’s knowledge transfer economy, its successes, opportunities and challenges.

Co-ordinate activity within the knowledge transfer system.

Work with Ireland’s knowledge transfer stakeholders.



# 1 Strengthening the National Knowledge Transfer Framework

## 1.1 Inspiring Partnerships - the National IP Protocol 2016

Throughout 2015 KTI supported the Department of Jobs, Enterprise and Innovation through developing a new version of the national IP Protocol. The Protocol was revised to take into account practical experiences since publication of the first Protocol in 2012. Designed to make the process of engagement between business and research performing organisations simple to understand, the new Protocol is consistent with existing policy while reflecting the maturing of the knowledge transfer landscape in Ireland. It provides a framework for best practice, guiding companies and research performing organisations on the expected norms for research-related agreements.

In producing the new Protocol, KTI engaged in an extensive consultative process which involved an open call for feedback, individual and focus group meetings and the establishment of an expert group chaired by KTI Director Alison Campbell. The aim was to draw on the experiences of a broad range of people from industry, technology transfer, research contracting, the investor and entrepreneur community and the funders of research to inform any revisions. Development of the first Protocol had been a substantial body of work and the policy and framework itself required limited amendment. The main focus in producing the new Protocol became about bringing clarity to any “grey” area, about streamlining in-built processes and making the Protocol itself a simpler read. The final version of the new IP Protocol was presented to Cabinet in December 2015 and was approved for publication in 2016.

## 1.2 Practical resources for industry

During the year Knowledge Transfer Ireland continued to deliver a host of resources available to businesses that provide advice and navigation on how to access and benefit from publicly funded research in Ireland. The main channel for this advice is the KTI website through which KTI signposts visitors to the wealth of research and expertise available via its *Find a Research Partner* tool and *Directory of Expert Researchers*. KTI also hosts on its website the national *Directory of Innovation Supports, Research*

*Centres and Technology Centres 2016* launched in December 2015 by the Department of Jobs, Enterprise and Innovation and updated annually.

Moreover the Knowledge Transfer Ireland website has a number of ready-to-use KTI Model Agreements freely available for download. During the year KTI extended this suite of agreements, making available a larger range of templates to cover a variety of situations that occur when industry and the research base work together. These include Model Agreements to cover the following licensing scenarios - Option to IP; Evaluation; Obtaining a Non-Exclusive Royalty-Free licence (NERF). Term Sheet templates were made available for: Licensing; Collaborative Research; IP-related aspects of the Enterprise Ireland Innovation Partnerships Programme and a Model Agreement to cover consultancy was produced.

A highly useful supporting resource provided by Knowledge Transfer Ireland on its website is its range of *KTI Practical Guides*. A guide is available for each type of contract agreement, explaining details of that particular agreement and rationale for clauses and is designed to assist the processes of negotiation and decision making.

There has been positive uptake of our Model Agreements by the research community with both sides (the research base and industry) having found them useful in speeding up the process of negotiation and making it more straightforward.

In addition to producing these publications, KTI worked with stakeholders to support the preparation of the *KTI Model Collaborative Agreements*, published in 2016, to underpin the national IP Protocol. An expert group from industry, research contracting, TTOs from HEIs and research funding agencies met several times during the year, providing advice and sharing experience with KTI to inform these agreements.

KTI has been working more broadly to extend the awareness of these resources for companies directly, through the agencies such as Enterprise Ireland and IDA Ireland and through our work with other organisations with whom we have partnered, such as IRDG.



“DCU started using the model licence agreements in 2015 as well as the Innovation Partnership Heads of Agreements. These have helped greatly to improve the licensing process as they have led to the faster completion of licence drafting. We are delighted to have been able to contribute to the process of developing the Model Agreements”

**Richard Stokes,**  
Invent CEO and DCU  
Director of Innovation

## 2015 success story



### Research collaboration creates new reference standards

Rapidly changing regulation and legislation across a range of industries has led to a dramatic growth in the requirement for reliable testing by properly accredited laboratories. Shannon-based Reagecon Diagnostics is a company that develops, manufactures and exports physical and chemical standards and reagents for laboratories worldwide. Through a research collaboration with Shannon ABC, based at Limerick Institute of Technology (LIT), analytical methods were developed that have resulted in the creation of market place reference standards for dietary fatty acids and biofuel/feed fatty acids. The technology transfer office at Limerick Institute of Technology negotiated the collaboration agreement that underpinned the research project and supported the transfer of the newly developed technologies and methodologies to Reagecon Diagnostics.

Shannon ABC collaborates with industry to provide expertise, services and access to equipment. It applies bio-processing to a variety of different source materials to derive added value in the area of biological products. In collaborating with Reagecon Diagnostics, analytical methods were developed and validated to detect azo-dyes, phthalates, and various breakdown products with defined accuracy values.

The project also extended to developing an expanded panel of fatty acid standards, needed due to the increased use of oils, such as krill and rapeseed, in food products. Shannon ABC also provided onsite training to company scientists. This collaborative research programme was funded through an Enterprise Ireland Innovation Partnership award.

Reagecon Diagnostics will launch the new standards for azo-dyes, phthalates, and fatty acids plus a range of fatty acid standards targeted at the biofuel market in 2016. The company is targeting annual export revenues of €50 million by 2020 together with the creation of 40 new jobs by 2018.

*“We are very pleased with how the project was scoped, the extreme attentiveness and responsiveness of the Shannon ABC team, access to college staff at all levels to facilitate understanding of the importance of the project strategically for us, and the full time availability of the key researchers to dedicate themselves fully and completely to the project. We look forward to more collaboration and research with Shannon ABC”* said John Barron, managing director of Reagecon Diagnostics.

**Added value from the research institution: collaboration, access to expertise.**

## 2 Supporting the Irish Knowledge Transfer Infrastructure

Throughout 2015 Knowledge Transfer Ireland continued to manage the Enterprise Ireland Technology Transfer Strengthening Initiative (TTSI) funding programme and to work with the community of Technology Transfer Offices and Research Performing Organisations (RPOs) to support them in sharing best practice, honing skills and developing talent within the system.


### 2.1 Building capacity and capability through targeted funding

The Technology Transfer Strengthening Initiative (TTSI) is a funding programme of €22.8 million that supports the continued development of technology transfer offices within Ireland’s Higher Education Institutes (HEIs) and research organisations. “Funding through TTSI2 - the second round of the programme - facilitates knowledge transfer related interactions with industry to ensure that business can benefit from access to experts, technology and intellectual property within these RPOs.

Since 2013 the TTSI programme has funded eight consortia comprising a total of 24 RPOs. In early 2015, after international panel review, the Royal College of Surgeons in Ireland (RCSI) became the 25th RPO to join the Technology Transfer Strengthening Initiative (TTSI2) programme as a partner of Trinity College Dublin. This means that RCSI gains benefits from on the ground support from the research commercialisation team at Trinity which complements the newly invigorated innovation and industry partnership team at RCSI.

The Board of Enterprise Ireland has approved a third phase of the programme for 2017. This will capitalise on investment to date and will build capacity in new areas such as managing the consultancy provision by researchers and associated contracting with business. Assessment and awards under the new TTSI3 programme will be made during 2016.

### Map of Ireland’s RPO Consortia

-  **Ignite West Consortium**  
National University of Ireland Galway (NUIG)  
Institute of Technology Sligo (ITS)  
Galway Mayo Institute of Technology (GMIT)  
Letterkenny Institute of Technology (LYIT)
-  **University of Limerick Consortium**  
University of Limerick (UL)  
Limerick Institute of Technology (LIT)  
Institute of Technology Tralee (ITT)
-  **UCT Consortium**  
University College Cork (UCC)  
Cork Institute of Technology (CIT)  
Teagasc
-  **Maynooth University Consortium**  
Maynooth University (MU)  
Athlone Institute of Technology (AIT)  
Institute of Technology Carlow (ITC)  
Waterford Institute of Technology (WIT)
-  **University College Dublin Consortium**  
University College Dublin (UCD)  
National College of Art and Design (NCAD)
-  **Dublin City Consortium**  
Dublin City University (DCU)  
Dundalk Institute of Technology (DKIT)
-  **Trinity College Consortium**  
Trinity College Dublin (TCD)  
Royal College of Surgeons in Ireland (RCSI)
-  **DRIC Consortium**  
Dublin Institute of Technology (DIT)  
Institute of Technology Tallaght (ITTD)  
Institute of Technology Blanchardstown (ITB)  
National College of Ireland (NCI)  
Institute of Art Design and Technology (IADT)





*KTI Symposium Speaker Panel from left to right: Leonard Hobbs, Intel Ireland; Philip Noone, Aalto Bio Reagents; Dr Jeanne Bolger, Johnson & Johnson; Alan Phelan, SourceDogg; Brendan Cremen, UCD (Chair).*

## 2.2 Sharing Best Practice

Knowledge Transfer Ireland delivered a series of events attended by research performing organisations, technology transfer offices and the business community. Using different formats, we sought to create an environment at each event to discuss topical issues.

Our flagship symposium was held in November on licensing and was attended by over 150 delegates including those from industry and the research base, entrepreneurs, investors and technology transfer professionals. Unpacking issues around licensing intellectual property for both business-to-business and higher education-to-business, guest speakers at the event included Dr Jeanne Bolger, VP Venture Investments, Johnson & Johnson Innovation; Leonard Hobbs, Director, Global Public Affairs, Intel Ireland; Philip Noone, Managing Director Aalto Bio Reagents and Alan Phelan, CEO SourceDogg who formed a lively panel chaired by Brendan Cremen, Director

of Enterprise and Commercialisation at UCD. In the plenary sessions, solicitor Mark Anderson, Managing Partner of Anderson Law LLP, addressed some of the pitfalls in licensing and Dr Kevin Cullen, CEO of UNSW Innovations, Board Member of the Association of University Technology Managers (AUTM, USA) spoke on the Easy Access IP model under which certain IP is licensed for free by HEIs. Dr Cullen challenged the audience to think about the purpose of technology transfer as a means of supporting the HEI's mission to create and disseminate knowledge, with technology transfer being a valid means of dissemination alongside more traditional routes of publication and teaching. He spoke of how governments worry about the relatively low investment in R&D and innovation by companies. He presented Easy Access IP as a pathway to increase interest in accessing research and expertise in HEIs. This set the context for a review of the potential for adoption of EAIP by institutions in Ireland that KTI, tasked by the government, will undertake in 2016.



## 2015 success story



Dr Kevin McCarthy (left), CEO and Founder of Aficionado Technologies with Dr Brendan Cremen, UCD Director of Enterprise & Commercialisation.

### Making Licensing Simpler – UCD launched new online licensing platform

In November 2015, the UCD technology transfer office (TTO) located at NovaUCD, launched an online licensing platform (<http://licence.ucd.ie>) to promote and license technologies developed at the University. The initiative has delivered not only a significant process improvement but also a market opportunity for UCD.

Potential licensees are presented with three options: 'buy it now', 'obtain a non-commercial licence' and 'make an enquiry'. The easy-to-navigate and search engine optimised licensing platform includes a simple non-negotiable one-page licence agreement and online payments system for the 'buy-it-now' technologies available on the platform. It also incorporates Stripe to accept, manage, and track online credit card payments. This eliminates the need for back office tasks such as manual invoicing or processing of payments and considerably reduces the time required to complete licensing deals.

The upshot sees a range of products that might otherwise be lying dormant or given away by researchers made easily and widely available on a commercial basis and made visible to companies.

*"The online licensing platform provides us with a vehicle to streamline and improve the process of licensing technologies developed at UCD, helping to ensure a better return on the State's investment in research at the University,"* said Dr Ciaran O'Beirne, Manager, Technology Transfer at UCD. *"Previously, the TTO couldn't justify spending significant time negotiating bespoke licences for lower value products. However, the new platform ensures these can now be licensed on a non-exclusive basis to multiple users for a relatively small one-time payment."*

The platform is scalable and was expanded during its development so that interested parties, mainly academic users, can also seek non-commercial licences to certain technologies. It also enables users to make enquiries from the TTO in relation to other UCD technologies that require more bespoke licensing negotiations such as patented inventions.

UCD worked with Aficionado Technologies, a UCD spin-out headquartered at NovaUCD, to develop and launch the technology. UCD has licensed the technology to Aficionado to enable it to market the platform in Ireland and around the world.

**Added value from the research institution: licensing.**



*Minister for Jobs, Enterprise and Innovation, Richard Bruton TD, welcomes delegates to the PraxisUnico Conference in Dublin in June 2015.*

In June, Knowledge Transfer Ireland co-hosted the PraxisUnico annual conference in Dublin, which drew an audience of more than 400 people working in knowledge transfer and research commercialisation. This was the first time the PraxisUnico conference had been held outside the UK and it allowed a broad Irish participation - both in terms of delegates and presenters. Conference themes included collaboration and commercialisation with SMEs, novel approaches to funding supports for innovation and creating successful incubator and accelerator models.

Focusing on the technology transfer community, Knowledge Transfer Ireland held three other specialised events during 2015. In March, following on from the international review of progress under the Enterprise Ireland Technology Transfer Strengthening Initiative (TTSI2) programme, senior staff in the Irish Technology Transfer Offices attended a KTI event that highlighted exemplars of best practice amongst the TTSI-funded Technology Transfer Consortia.

At the start of the year, KTI hosted a Masterclass in social media and in June, we were fortunate to have Jane Muir, Director of the Florida Incubation Hub and Immediate Past President of the Association of University Technology Managers (AUTM) host a Marketing Masterclass for TTOs. Not only do these events focus on specific topics of value to the KTI profession, they also provide an opportunity for colleagues from offices across Ireland to meet, to share experiences and to find new and common ways of working. The KTI Annual KT Community Forum, held each autumn, is a key event in the calendar that brings together all the staff from the technology transfer offices around the country. Our keynote speaker, Dr Kevin Cullen, drew on his international experience of leading research commercialisation to talk about the role of knowledge transfer in the overall research impact agenda and as a founder of the global Alliance of Technology Transfer Professionals (ATTP), he reflected on the development of the technology transfer profession.



## 2015 success story



Paul Dillon, Director Technology Transfer Office at University of Limerick (left) with Ray Friel, School of Law University of Limerick.

### Helping businesses to tackle unseen potential in IP assets

Most businesses are unaware of the true extent of the IP assets they own and simply do not understand how to protect and exploit those assets to the full. Consequently, they are losing millions of euro in unseen asset potential.

In response, the University of Limerick (UL) launched the IP Café in 2015. Addressing the key challenges in unlocking IP assets and managing intellectual property (IP), the IP Café is a comprehensive series of 13 workshops aimed at tackling the commercial aspects of IP including patent protection and international trademark issues.

*“The primary assets of tech intensive companies are no longer factories and machines,” said Paul Dillon, technology transfer director at UL. “Increasingly, the value in a company is in the innovative ideas and concepts underpinning the products and services traded by the company. UL is working actively to enable companies to better manage their intellectual assets through its research and innovation activities.*

*Our IP Café series is seen as a logical step in our efforts to reach out and engage with the industry on this important topic.”*

Ray Friel, Director of the International Commercial and Economic Law research group at the School of Law in UL and convenor of the Café said: *“The IP Law Café is an attempt to bring together everyone interested in IP issues, including business people, scientists, engineers, accountants, lawyers, tax specialists, HR personnel and others, to both learn about the changing IP environment and to start the conversation on a new and radical unified approach to IP management. With a huge number of advantages over other EU countries, Ireland could become a major international IP management hub and IP Café promotes that vision.”*

The free 13-part workshop and networking series began in September 2015 and runs until December 2016.

**Added value from the research institution: IP awareness, networking.**

### 2.3 Recognising Excellence - the KTI Impact Awards

Following the introduction of the KTI Impact Awards with the first presentation in 2014, Knowledge Transfer Ireland continued to pay recognition to notable knowledge transfer success throughout 2015. During the year, KTI rolled out the full awards series. In March, Knowledge Transfer Ireland invited submissions for and presented four awards - the KTI Research2Business Collaborative Impact Award, KTI Licence2Market Award, KTI Spinout Company Award and KTI Consultancy Award.

In November KTI presented two further awards focusing on the excellence of Ireland's technology transfer offices and the people who work in them - the Knowledge Transfer Initiative of the Year Award and Knowledge Transfer Achiever of the Year Award.

#### KTI Research2Business Collaborative Impact Award 2015



This was won by Waterford Institute of Technology for the work undertaken by its RIKON group in supporting service innovation in SMEs. Dr Felicity Kelleher was recognised for her role in co-founding RIKON in 2008 which she now chairs. Facilitating executive development and small firm continuing professional development, RIKON has worked with more than 1000 SMEs to date and has grown from three founders to a team of 30.

*Pictured above is Dr Felicity Kelleher, Waterford Institute of Technology and Winner Research2Business Collaborative Impact Award.*

#### KTI Licence2Market Impact Award 2015



This was won by UCD and its technology transfer office Nova UCD for the licensing of a diagnostic test for BSE. The path to a product began in the early 1990s, through a research project between Professor Mark Rogers of UCD and a company specialising in molecular design. The intellectual property, which comprised both a patent and secret know-how, was licensed to Enfer Scientific who undertook further development of the diagnostic which became one of the first in Europe to achieve regulatory approval. Enfer was a small company with six employees in Tipperary. It expanded, in response to EU regulatory requirements for BSE testing, to become the largest company in Europe involved in testing meat for BSE. UCD earned more than €2million for the deal but more importantly for the university, the licence deal consolidated its relationship with Enfer which has led to ongoing collaborative and contract research projects and employment opportunities.



*KTI Impact Award Winners from UCD (from left to right) Oxymem Academic Founders Professor Eoin Casey and Dr Eoin Syron; Ciaran O'Beirne, UCD Technology Transfer Manager; Minister Damien English of the Department of Jobs, Enterprise and Innovation; Professor Orla Feely, VP for Research, Innovation and Impact at UCD; Alison Campbell Director of KTI and Brendan Cremen, Director of Enterprise and Commercialisation at NovaUCD who accepted the KTI License2Market Impact Award on behalf of Professor Mark Rogers.*

### KTI Consultancy Impact Award 2015



This was won by Waterford Institute of Technology for the materials consultancy services offered by Dr Ramesh Raghavendra and the SEAM (South Eastern Applied Materials) Centre. Launched in 2009, SEAM supports more than 90 multinational and Irish businesses across multiple sectors including biomedical, pharmaceuticals, precision engineering, energy and electronics. SEAM has a significant number of repeat clients who value the services provided. SEAM reinvests revenue to strengthen its equipment infrastructure and human resources to be able to respond to growing and evolving business needs.

*Pictured above is Dr Ramesh Raghavendra, SEAM Director and Winner of the KTI Consultancy Impact Award*

### KTI Spin-Out Company Impact Award 2015



This was won by UCD and its technology transfer office Nova UCD for Oxymem Ltd, a rapidly growing Irish company that spun out from UCD in 2013. Oxymem's patented technology reduces operating costs and improves processes for wastewater treatment. The original invention was disclosed in 2008, demonstrating that the time from idea to commercialisation can be lengthy and that the role played by the TTO in patent protection and prosecution can be vital. The company now has a manufacturing facility and offices in Athlone, Co Westmeath. At the time of the award, the company had created 28 new full-time jobs and has since met its further growth and employment targets.

### Knowledge Transfer Initiative of the Year Award 2015



This was won by the Trinity Research and Innovation team at Trinity College Dublin for the introduction of a new strategic and commercially-focused process for IP management. Having developed an understanding of international best practice, the team undertook a programme of review that has resulted in a stratified IP portfolio with reduction in patent costs, swifter licensing and a concentration and further investment in the lead opportunities within the portfolio.

*Pictured above Trinity Research and Innovation receive their KTI Impact Award for Knowledge Transfer Initiatives of the Year - (from left to right) Alison Campbell, Director KTI; Dr. Ena Prosser, Partner at Fountain Healthcare Ventures, KTI Industry Advisory Board member and Chair of the KTI Awards Judging Panel 2015; Dr. Emily Vereker, Technology Transfer Case Manager at Trinity; Dr. Margaret Woods, Technology Transfer Manager at Trinity and Dr. Diarmuid O'Brien, Director Trinity Research and Innovation.*



## Knowledge Transfer Special Achievers Award 2015

This was won jointly by Graham McMullin of Trinity Research & Innovation in Trinity College Dublin and Emma O'Neill of Invent in DCU. Graham was recognised for achieving a highly complex multi-partner, multi-field licensing arrangement based on IP brought into and created in a collaborative programme with an overseas company. Emma was recognised for her role in formulating, managing and executing a specific neuropharmaceutical therapeutics funding and commercialisation strategy which included securing a financially attractive consultancy and contract research agreement with a major pharmaceutical company client for use of the GMP facility at DCU which contributed significantly to the viability of the facility.



**Dr Graham McMullin MBA RTTP**  
- Technology Transfer Case Manager, Trinity Research & Innovation, Trinity College Dublin.

A Mechanical Engineer, Graham joined Trinity College in 2008 after 13 years in Seagate Technology R&D, to work in technology transfer. He is a member of the Office of Corporate Partnership and Knowledge Exchange, managing the Physical Sciences portfolio. His remit spans from helping researchers apply for blue skies research funding to attracting companies to engage in collaborative or contract research, putting in place appropriate agreements to govern relationships and managing the intellectual property outputs which include patent filing and prosecution, licensing, marketing and spin-out company development.



**Emma O'Neill MSc, RTTP**  
- Director of Business Development for Life Sciences, Invent DCU, Dublin City University

Emma has responsibility for the commercialisation of DCU life sciences research and engages externally with commercial partners to develop life science research collaborations and the commercialisation of DCU's intellectual property through licensing and start-up formation. She also provides IP training courses to DCU researchers and personnel from postgraduate level to senior academics. Emma joined DCU in 2006 as the Intellectual Property Manager for the Biomedical Diagnostics Institute. Before joining DCU, she was IP Manager at NTERA Ltd, an indigenous nanotechnology start-up company. Emma has previously served as a committee member of the Licensing Executives Society, Irish Section.

## 2.4 The KT Profession in Ireland

Since Enterprise Ireland established the TTSI programme in 2009, there has been growth and development in the research commercialisation profession in Ireland. The quality of our people is reflected by the number who have achieved the global credential of Registered Technology Transfer Professional (RTTP). In 2015, 20 new awards of RTTP status were made to staff involved in technology transfer in Ireland, bringing the total at the end of 2015 to 23.

### RTTP Professional

### Affiliation

RTTP Professional	Affiliation
Dr Alison Campbell	Knowledge Transfer Ireland
Mr Ronan Coleman	Cork Institute of Technology
Dr David Corkery	University College Cork
Mr Kevin Dalton	University College Cork
Mr Paul Dillon	University of Limerick
Dr Gordon Elliott	Trinity College Dublin
Mr Tom Flanagan	Dublin Institute of Technology
Dr Carolyn Hughes	Dublin City University
Dr Andrew Marsh	University College Cork
Dr Graham McMullin	Trinity College Dublin
Dr Anthony Morrissey	University College Cork
Dr Peter Olwell	Dublin City University
Mr Patrick O'Boyle	Dublin City University
Ms Emma O'Neill	Dublin City University
Dr James O'Sullivan	Waterford Institute of Technology
Dr Karl Quinn	University College Dublin
Dr Tim Roche	University College Cork
Dr John Scanlan	Maynooth University
Mr Richard Stokes	Dublin City University
Jacinta Thornton	National University of Ireland Galway
Dr Paul Tyndall	Maynooth University
Dr Emily Vereker	Trinity College Dublin
Dr Ena Walsh	Trinity College Dublin



Dr Kevin Cullen (centre), the Alliance for Technology Transfer Professionals (ATTP) Board member, pictured with some of the Irish knowledge transfer community who achieved RTTP status in 2015.

## 3 Developing and Monitoring Ireland's Knowledge Transfer System in Ireland

### 3.1 Annual Knowledge Transfer Survey (AKTS)

The Annual Knowledge Transfer Survey (AKTS) now in its third year, is the means through which data on a range of national knowledge transfer activities are gathered, interpreted and presented in report format. Knowledge Transfer Ireland delivers this full process and publishes the results of the AKTS each year in conjunction with the Higher Education Authority.

The establishment of this annual reporting on national performance across knowledge transfer has been well received by a number of different stakeholders and places Ireland amongst an elite group of countries that are seen to give this importance and to make it transparent.

The results for 2015 are published as part of this Annual Review and can be found in Section 2.

### 3.2 System Review

Knowledge Transfer Ireland undertook a number of other reviews during the year including a deeper dive into some of the data in the AKTS2014 which looked at the 30 new products that made it to the market in 2014 based on licences from RPOs. This piece of work also reviewed the 97 spin-out companies that are still active three or more years post-formation. One such company is Logentrics.

In addition to the AKTS review, KTI commissioned a review of International Policy and Investment in knowledge transfer. The study, by Technopolis, looked at Ireland and six comparator

countries (Denmark, Finland, Israel, New Zealand, Scotland and Singapore) chosen as they are small advanced economies which provide suitable benchmarks for Ireland. The report found that across the seven countries, knowledge transfer is now a political priority in most cases, forming an integral part of national innovation policy. Knowledge transfer is considered a public good that warrants government investment and the seven countries reviewed all invest significant sums to improve knowledge transfer between Public Research Organisations (PROs) and business. With the exception of top Israeli universities, Knowledge Transfer is acknowledged as a cost centre not a profit centre.

All of KTI's reports and publications can be found on our website [www.knowledgetransferireland.com](http://www.knowledgetransferireland.com).

### 3.3 Technology Transfer Management Meetings

KTI meets regularly with the Directors of the TTOs that lead the Technology Transfer Strengthening Initiative (TTSI) consortia and representative partners. There were three such meetings during 2015. In addition to discussing performance through the TTSI programme, the meetings provide an opportunity for more general discussion, bringing underlying knowledge transfer trends to the fore, and unpacking issues surrounding the knowledge transfer. Together KTI and the TTO community can set future direction to address these.

### 3.4 Knowledge Transfer Stakeholder Forum (KTSF)

Established by KTI, the KTSF is a one-of-its kind group comprising innovation leaders from agencies, higher education institutes, TTOs and others with a particular interest in the development of the knowledge transfer system in Ireland. Co-ordinated by KTI, meetings of the forum - of which there were three during 2015 - create the environment for candid discussion around current knowledge transfer issues in Ireland. The forum also affords its members certain insight into the knowledge transfer priorities of the various other stakeholder groups involved. Outcomes from discussions by the forum provide useful input for ongoing KTI strategy and operational planning.

### 3.5 KTI Industry Advisory Board

The KTI Industry Advisory Board (IAB) was established by Knowledge Transfer Ireland to bring together representatives from industry and the investment community so as to enable KTI to gain, first hand, candid feedback on its initiatives and on progress within the sector as a whole. The IAB has been very supportive of KTI's work to date and acts as constructive sounding board and critical friend. Meeting three to four times a year, members continue to inject energy and help KTI maintain its momentum.

*KTI Industry Advisory Board from left to right: Brian Dalton, Department Enterprise, Jobs & Innovation; Karl Flannery, Storm Technology; Mike Devane, American Chamber of Commerce; Alan Phelan, SourceDog; Ena Prosser, Fountain Healthcare Ventures; John O'Sullivan, ACT Venture Capital and; Keith O'Neill, Abbott Laboratories. (Malcolm Skingle, GlaxoSmithKline in absentia).*





### 3.6 Informing National Strategy

In December 2015, the government launched its five year strategy for research and development, science and technology - *Innovation 2020*. This sets out the roadmap for continuing progress towards the goal of making Ireland a Global Innovation Leader. Knowledge Transfer Ireland was one of many groups and organisations that contributed to the final strategy. *Innovation 2020* makes clear the State's intention to "maximise the transfer of knowledge between Research Performing Organisations and enterprise to promote greater applications of research results" and there are a number of key actions within *Innovation 2020* that now lie with KTI to lead. These include co-ordinating the KT framework and infrastructure in Ireland and expanding the resources available through KTI to industry.



*Logentries co-founders Dr Trevor Parsens and Dr Viliam Holub.*

### UCD spin-out Logentries acquired for \$68 million

Logentries, a UCD spin-out provider of log management and data analytics, was acquired in 2015 by US based Rapid7 Inc. The company was actively supported in its development by NovaUCD, the Centre for New Ventures and Entrepreneurs at University College Dublin.

*"NovaUCD was very valuable in helping us define and transform our ideas into a commercially feasible enterprise," said Dr. Parsons. "Our connection with NovaUCD and UCD also gave us credibility. To be able to use the NovaUCD brand and say you're a UCD spin-out company carries weight when you're talking to investors and customers alike."*

Logentries makes log management and analytics accessible to virtually anyone. It provides an easily accessible central location for an organisation's log data where important information can be dynamically tagged, automatically routed, and easily shared across teams and computing platforms. It eliminates the need for an in-house data expert or specialist to interpret and use the data.

The company was co-founded by Dr. Trevor Parsens and Dr. Viliam Holub who participated in the NovaUCD 2010 Campus Company Development

Programme, the forerunner of the UCD VentureLaunch Accelerator Programme. It was the overall winner of that year's programme. It went on to win the NovaUCD Innovation Award in 2013. Just two years later, it was acquired by Rapid 7 for an aggregate purchase price of approximately \$68 million, comprising \$36 million in cash and \$32 million in Rapid7 equity.

Commenting on the acquisition, Dr. Parsons said, "*Rapid7's leading position in the security data and analytics market gives us the opportunity to reach an evolving and expanding market that is looking for lower cost access to machine data, along with advanced security data collection and analytics.*"

Dr. Ciaran O'Beirne, manager, Technology Transfer at UCD is confident that Rapid7 will continue to build its Dublin-based engineering and development team and to invest in its presence in Ireland. "*UCD looks forward to developing mutually beneficial partnerships with Rapid7 in areas of research, innovation and providing access to our pool of talented graduates.*"

**Added value from the research institution: spin-out company development support, spinout company formation, contracts.**

## 4 KTI Mission, Vision and Goals

### Mission

To support business, the public sector and the research base to maximise innovation from State-funded research by exchanging knowledge and getting technology, ideas and expertise into the hands of business and the public sector swiftly and easily for the benefit of the public and the economy.

### Vision

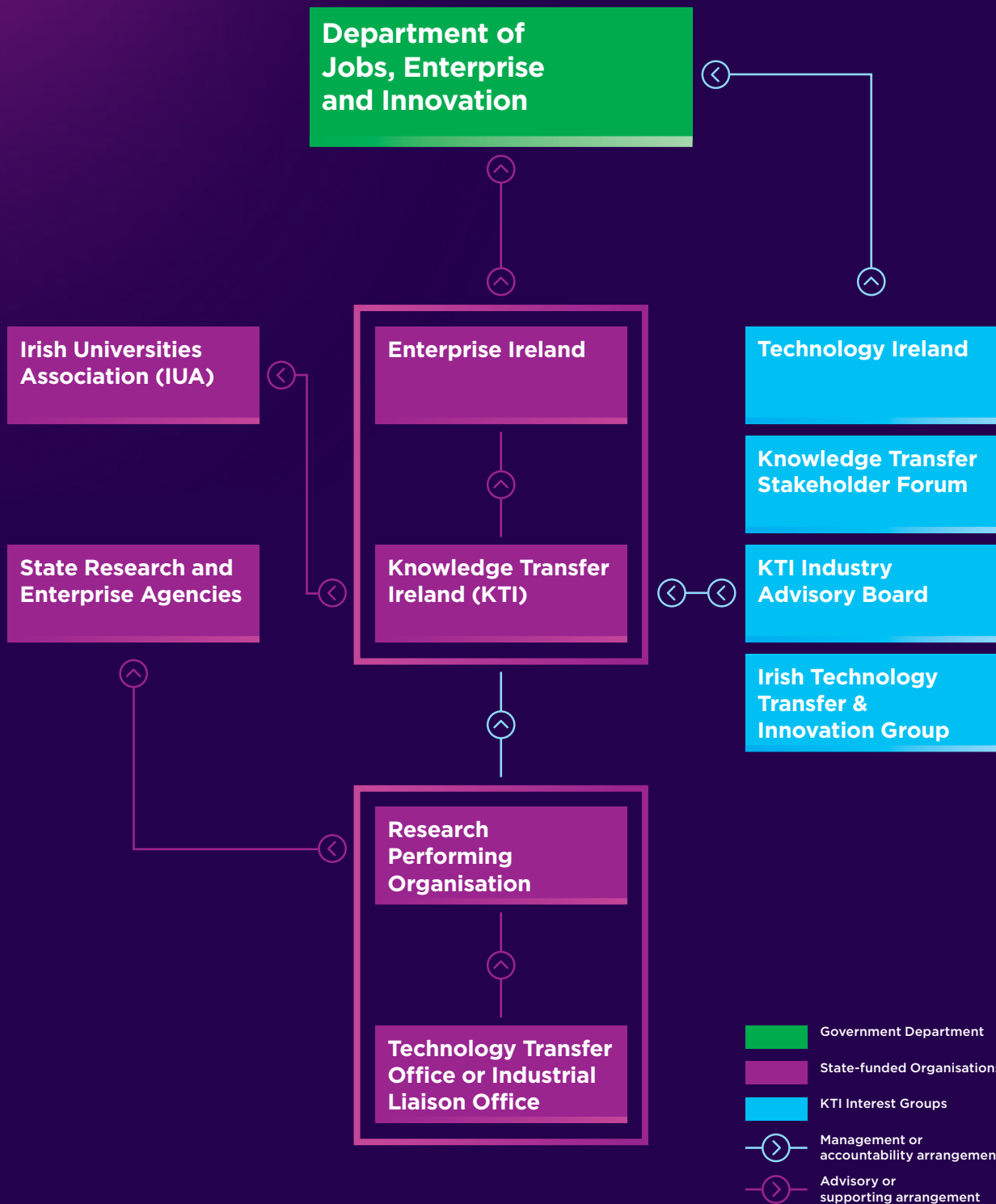
KTI will be recognised and respected as Ireland's central point of reference for business-research base partnership and commercialisation.

### Goals

1. Enabling business to leverage the commercial potential of Irish research and innovation through connecting businesses with cutting-edge research, expertise and opportunities.
2. Taking the guesswork out of knowledge transfer through providing a predictable knowledge transfer system for Ireland.
3. Supporting, developing and building the capacity and capability in the knowledge transfer system in Ireland to deliver a first class service to business and the research community.

### Governance

KTI is supported by Enterprise Ireland and the Irish Universities Association. We are accountable to the Department of Jobs, Enterprise and Innovation and to the presidents of the Irish universities.



## 5 People

### Industry Advisory Board 2015

The KTI Industry Advisory Board (IAB) supports KTI in setting direction and reviewing our activities. Our advisors are industry and investment professionals with experience of working with the academic research base.

#### Members

- Karl Flannery (Chair), Storm Technology
- Brian Dalton, Department of Jobs Enterprise & Innovation
- Mike Devane, American Chamber of Commerce Ireland
- Keith O'Neill, Abbott Laboratories
- John O'Sullivan, ACT Venture Capital
- Alan Phelan, SourceDogg
- Dr Ena Prosser, Fountain Healthcare Ventures
- Dr Malcolm Skingle, GlaxoSmithKline

We extend our thanks to Eadaoin Collins of the Department of Jobs, Enterprise & Innovation and Barry Kennedy from Intel, ICMR, i2e2 who stepped down from the board during the year. Their contribution has been extremely valuable and we are very grateful to them both for the time, energy and commitment that they gave.

### Knowledge Transfer Stakeholder Forum 2015

The Knowledge Transfer Stakeholder Forum (KTSF) represents the major contributors to the knowledge transfer agenda in Ireland. The KTSF meets with KTI to consider issues and initiatives with the aim of developing a shared and consistent knowledge transfer system in Ireland.

#### Members

- Enterprise Ireland – Gearoid Mooney (Joint Chair)
- Irish Universities Association – Ned Costello (Joint Chair)
- Department of Agriculture, Food and the Marine – Richard Howell
- Department of Jobs, Enterprise and Innovation – Brian Dalton/Eadaoin Collins\*
- Health Research Board – Dr Graham Love
- Higher Education Authority – Muiris O'Connor\*
- IDA Ireland – Leo Clancy
- Institutes of Technology Ireland (Chair), Athlone Institute of Technology – Paul Killeen
- Irish Research Council – Dr Eucharía Meehan
- Irish Technology Transfer and Innovation Group (Chair), Dublin Institute of Technology – Tom Flanagan
- Science Foundation Ireland – Dr Darrin Morrissey/Dr Dara Dunican\*

\*We thank Eadaoin Collins of the Department of Jobs, Enterprise and Innovation, Dara Dunican of Science Foundation Ireland and Muiris O'Connor from the Higher Education Authority who stepped down from the Forum during 2015. We are very grateful to them for the valuable contributions to the forum.



*Alison Campbell (front centre) Director pictured with the KTI Team (from left to right) Susan Hanna, TTSI administrator; Elizabeth Carvill, Senior Executive - Communications; Peter O’Fegan, TTSI Operations Manager; Patricia Clare, Senior Executive - Operations Manager; Barry Fennell, Senior Executive - Industry Projects.*

## Contact

At KTI we welcome an open dialogue with all our stakeholders. To talk to us and to find out more about our work:

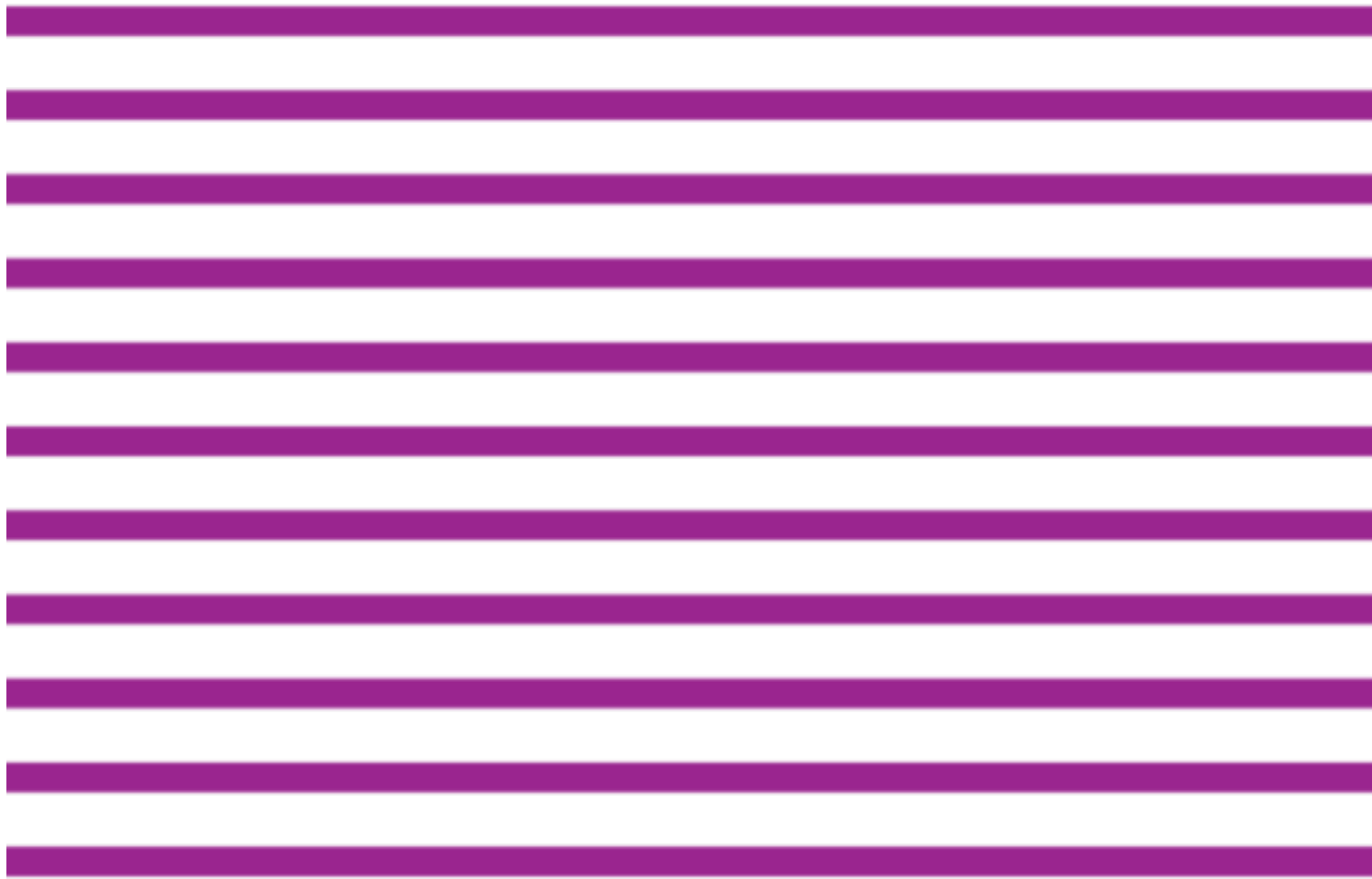
Email:  
[kti@knowledgetransferireland.com](mailto:kti@knowledgetransferireland.com)

Website:  
[www.knowledgetransferireland.com](http://www.knowledgetransferireland.com)

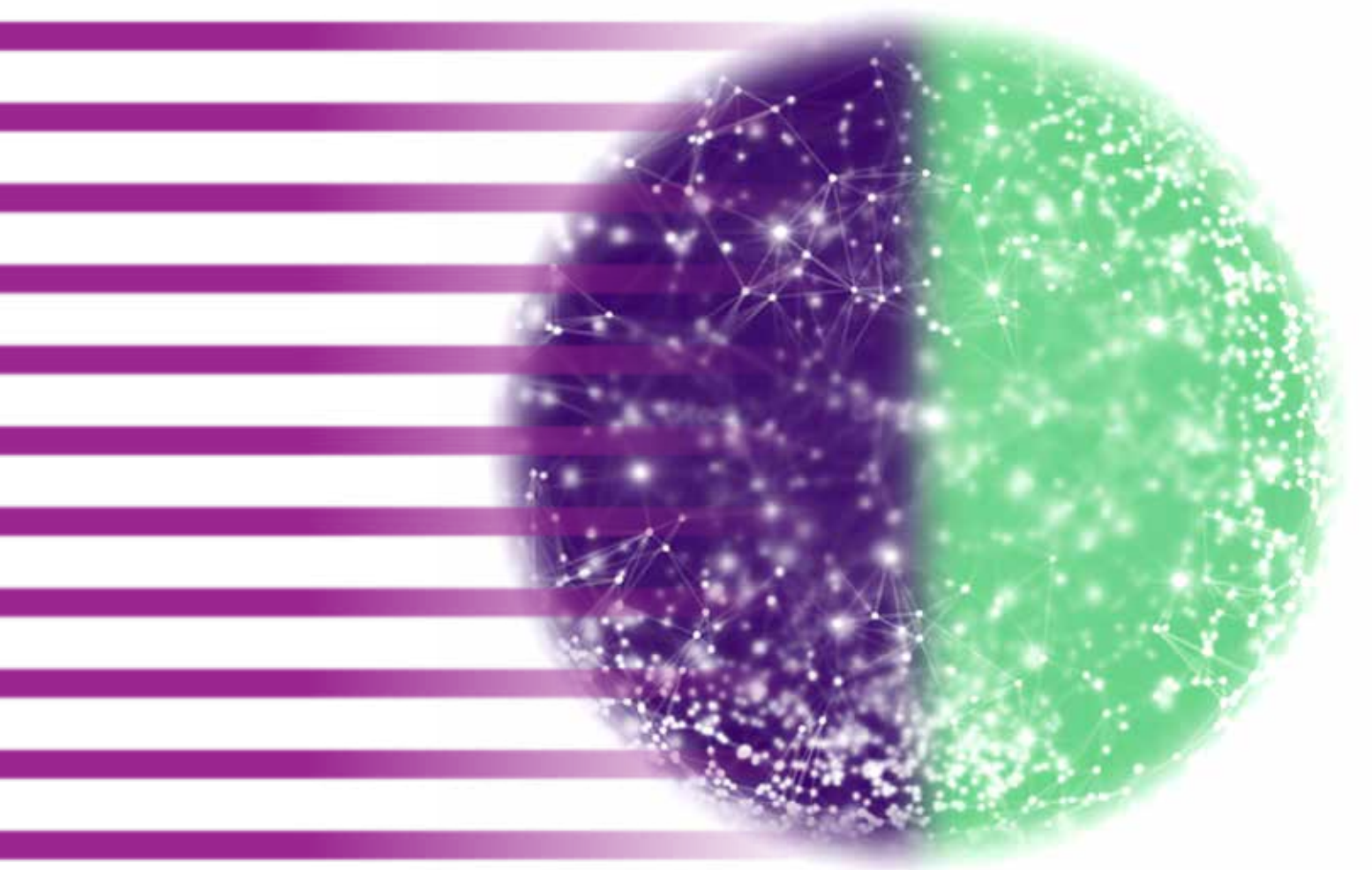
At KTI we come from a diverse background. Some of us have worked in senior roles in industry, others bring years of experience in the knowledge transfer sector, public administration, or marketing and communications. We combine our complementary expertise with a shared passion for responding to and meeting the needs of our stakeholders and driving the Irish knowledge transfer system forward.

# Annual Knowledge Transfer Survey 2015

The annual review of business interaction and commercialisation from publicly-funded research in Ireland







# 1 Executive summary

The Annual Knowledge Transfer Survey (AKTS) is a review of business engagement and commercialisation activity (knowledge transfer<sup>1</sup>). It is collected in conjunction with the Higher Education Authority (HEA). This is the third time that this annual survey has been published.

The purpose of knowledge transfer from the research base is to maximise the flow of technology, IP and ideas into companies and the public sector to bring products and services to the market for social and economic benefit. Many of the positive impacts of knowledge transfer cannot be captured by simple quantitative measures alone. While this report contains some examples of business impacts, more information is available through the body of case studies which may be found on the KTI website at [www.knowledgetransferireland.com](http://www.knowledgetransferireland.com).

The AKTS 2015 presents data for the period 1 January - 31 December 2015. A limited number of changes were made to the data collected in the 2015 AKTS to bring definitions in line with those in the national IP Protocol. These were specifically related to Collaborative and Contract Research which are now broken down as: Collaborative Research - wholly funded by industry; Collaborative Research - part funded by industry and; Contracted Services. This has the effect of making direct comparisons with previous years less intuitive.

The RPOs comprise Ireland's seven Universities and 14 Institutes of Technology; three specialist research institutes: the Royal College of Surgeons, the National College of Art & Design (NCAD) and the National College of Ireland (NCI); and the State research bodies: the Marine Institute and Teagasc. A complete list of RPOs is provided in Appendix 2.

This year 25 RPOs responded to the survey, undertaken on behalf of Knowledge Transfer Ireland by Insight Statistical Consulting. One institution<sup>2</sup> failed to provide a return. There were 23 respondents in AKTS 2014.

The main contact at the RPO for the purpose of this survey was its technology transfer office (TTO)<sup>3</sup>. The survey required other departments in the RPO to support the TTO in providing data. These were mainly the Research Office and the Finance Department, although in some cases information is provided by individual research departments. This placed a significant burden on the TTOs in coordinating the returns. In some limited cases, there were partial returns where RPOs do not routinely capture certain data and this is flagged in the relevant sections of this report.

This report highlights a range of ways in which RPOs support the innovation ecosystem and in particular the ways in which research and expertise is shared and developed with, and by, business. This by no means covers the full gamut of innovation support within the RPOs, which also provide talent development, for instance, in many forms, including entrepreneurial training and work placements.

The report also captures information on "non-commercial" entities that work with the RPOs. Frequently these organisations are within the public or charitable sectors. The volume of engagement with these non-commercial organisations across the types of interactions in this survey tends to be low. This may be due to less use being made of the innovation potential in the research base by the public sector and the fact that information on these engagements may not be routinely recorded. Mapping such engagements often rests with the Research Office and/or takes place by way of consultancy activity that may be undertaken directly by the researcher with the client. In both cases the data may not be readily available to the TTO (which has been the lead entity in the RPO for completion of this survey).

Information reported in this survey spans the process of intellectual property commercialisation from invention disclosure through protection to licensing. It describes the level of business engagement with RPOs as evidenced through: collaborative research; contract services; consultancy and use of RPO facilities and equipment.

Twenty-five of Ireland's RPOs reported combined expenditure on research in 2015 of €536 million (one institution did not respond to the survey this year). The RPO sector executed 1,717 new collaborative research, contract services and consultancy agreements, and signed 206 LOAs.

The AKTS 2015 captures outputs from knowledge transfer such as products on the market derived from licensing from an RPO and revenue returns to the RPO. There is a time lag between licensing by an RPO and the licensee companies bringing new products and services to the market. In 2015, 38 new products and services were launched on the market by companies, based on licences executed in previous years with an RPO.

The report looks at the volume of spin-out companies created and those surviving beyond their first three years, including further information on those "active spin-outs" reported in the AKTS 2014. During 2015, 31 new spin-out companies were created from within RPOs. The survey begins to collect data on start-up companies (staff or student ventures that are not based on RPO IP). These data are not routinely recorded within RPOs and most of the information available relates to start-ups that the TTO has advised or that are based in the RPO's incubator.

The report starts to assess the longer-term viability of spin-out companies. In 2015, the sector reported 110 active spin-outs from RPOs. These are companies, which are at least three years post-incorporation, that have drawn on IP and expertise from the RPO and in which the RPO will have taken a founding equity stake and/or licensed IP to the spin-out. Active spin-outs have at least one paid employee and have raised investment and/or have booked sales revenue. The AKTS also reports on the review that was undertaken of the 97 active spin-outs that were declared in the previous 2014 survey. These 2014 active spin-outs, as of 2015, collectively employ over 930 people.

The role of the TTOs is broad and the demands on their time and expertise ever increasing. TTOs support RPOs across a wide range of activities including seeking and/or managing research contracts from government organisations and negotiating contracts with industry relating to collaboration, consultancy, contract services and CPD. TTOs also assist with evaluating new intellectual property, IP protection and management, licensing, spin-out company creation, managing incubation facilities, student enterprise training and building KT networks.

KTI wishes to thank the Technology Transfer Offices and Industrial Liaison Offices in the RPOs for their contribution to this survey and in particular their co-ordination within their RPOs to provide data across the expanded range of indicators. Additionally, KTI would like to acknowledge the expert support provided by Fiona Brady to produce this survey report.

<sup>1</sup> See glossary at Appendix 3

<sup>2</sup> IT Sligo

<sup>3</sup> See glossary at Appendix 3

## 2 Research funding in Ireland

**Figure 1:**  
Research expenditures  
by type of RPO, 2015



- ABOVE**  
University  
€404.2m, 75.5%
- Institute of Technology  
€68m, 12.8%
- Specialist Institute  
€17.1m, 3.2%
- State Research Body  
€45.9m, 8.6%

Ireland's total investment in Higher Education R&D (HERD), as published in 2012 by Forfás, Ireland's policy advisory board for enterprise, trade, science, technology and innovation, was €640.2 million for 2012 (latest figure available).

The total research expenditure (less block grant) for 2015 was provided by the RPOs from their Finance Departments. It is approximately €536 million, up 4% on 2014. This represents the total expenditures on all types of basic and applied research in Irish RPOs from all funding sources: government, industry, non-profit foundations, etc. It excludes any academic costs dedicated to research, costs of administrative support and capital expenditures on new equipment, buildings or land.

In Figure 1, it can be seen that the University sector accounted for the majority of all research expenditure at 75.5% (€404M). The Institutes of Technology sector accounted for 12.8% (€68M) of the State's expenditure on research. The Specialist Institute sector (RCSI, NCAD, NCI) spent €17 million on research (3.2%) and the State Research Bodies (Marine Institute and Teagasc) expended 8.6% (€46M) on research.

Of the total research expenditure, just 6.2% was related to research revenue from the private sector, which is low by international standards.

On average, the percentage of research expenditure by universities derived from private sector sources ranged from 2.4% to 11% with an average of 7% which is consistent with the previous year's average. In contrast, the Institutes of Technology average was 7%, down from 9% the previous year and similar to 2013, suggesting a relatively steady state. However the range this year was 0- 17% which was narrower than 2014 which was 0-32%.

# 3 Business access to research and expertise within Ireland's RPOs

One of the principal ways that business benefits from working with RPOs is through access to research and expertise. This is most frequently through three different categories of engagement:

- 1. Collaborative research programmes** are where the RPO and company work together on a research project of mutual interest. Funding may be solely from the company or may be part-funded by the company with some level of co-funding from government sources.
- 2. Contract services projects** are where the company specifies the work to be undertaken by the RPO and pays the costs of the work programme, but not a commercial fee (as is the case for consultancy). They may include projects that involve a "work order". These projects are not considered "research" as the intention is not to create new knowledge but rather to provide a particular solution.

- 3. Consultancy** involves the RPO providing professional-level work to an external client organisation through an academic, researcher or other member of RPO staff in exchange for a full commercial fee. This work does not require new research activity and publication is not expected.

This year the definition of collaborative research has been changed to align with that in the national IP Protocol. Whereas research projects conducted with industry and wholly funded by industry were previously referred to as "contract research" they are now referred to as Collaborative Research Agreements wholly-funded by industry. Where a company contributes to part of the cost of a research programme, such arrangements are described as Collaborative Research Agreements part-funded by industry.

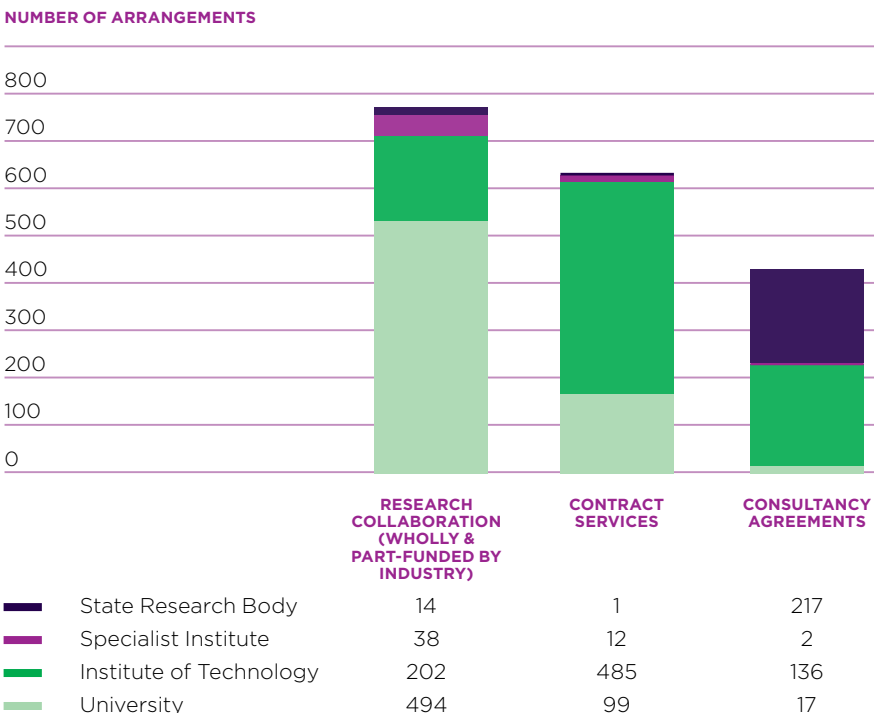
The definitions of Contract Services and Consultancy are meant to differentiate between work done by an RPO to solve a company's problems using company funding (Contract Services) and work undertaken priced at a full commercial rate (Consultancy).

The definitions appear to have assisted the RPOs by bringing more clarity around Collaborative Research. Contract Services and Consultancy data are more problematic to collect as the engagements are often not managed centrally.

The total number of research collaboration agreements executed between industry and RPOs in 2015 has risen by 16% on the previous year to 748. There has been a drop in the number of Contract Services Agreements reported in 2015.

The total number of each R&D type of agreement entered into by the relevant groups of RPOs in 2015 is illustrated in Figure 2 which demonstrates a propensity for collaborative research. The high figure for consultancy contracts in the State Research Body sector is reflective of Teagasc's mission to provide consultancy to the agri-food sector.

**Figure 2:** Number of research, contract services and consultancy agreements in 2015 by RPO type





### 3.1. Working with Irish companies

From the information provided on sharing research and expertise with companies, 72% of companies with whom the RPOs have executed an engagement agreement are based in Ireland, which is fairly consistent with 70% last year. 96% of engagements with SMEs are with Irish SMEs (92% in 2014) and 18% of engagements with MNCs are with Irish-located companies which is an unexpected drop on the previous year (44% in 2014) causing us to review the definition of Irish located MNC for next year's survey.

### 3.2. Collaborative Research with industry

The total number of collaborative agreements executed by the RPOs in 2015 was 748 and this is mainly accounted for by the University sector with 494 agreements (66%). Of these, 315 companies were repeat engagements within the past three years which was up on the previous year's figure of 250.

Results indicate that 65% of collaboration agreements signed by RPOs in 2015 were with Irish companies. Of these, 69% were projects co-funded by the State and 31% were fully funded by an Irish company.

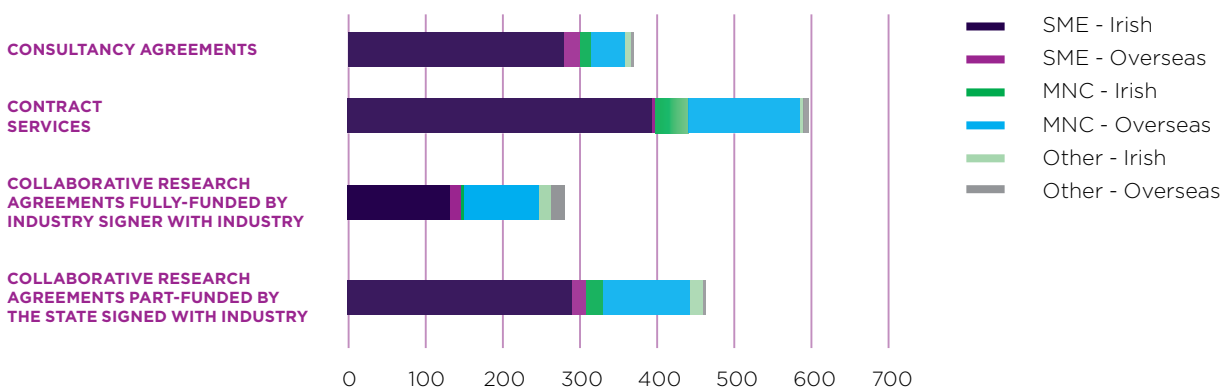
The number of collaborative research agreements fully-funded by industry was 282 (38%) whilst a further 466 (62%) were part-funded by industry.

#### 3.2.1. Revenue from collaborative research agreements with industry

The AKTS asked for research expenditure in the year relating to collaborative research with industry. The request, including breakdown of cash and in-kind contributions agreements, caused some difficulty for a number of RPOs. Whilst in-kind contributions are tracked for research funders in respect of their funded research centres, "in-kind" is not a routinely recorded figure within an RPO. 20 of the 25 RPOs<sup>4</sup> returning data were able to provide information about the direct cash expenditure for collaborative research agreements, with a further four reporting zero.

€47.5 million of the total research expenditure within an RPO that was considered to be related to a funding contribution from the private sector was reported during 2015. This represents an increase of 3% on the previous year. It is approximately 9% of the total research expenditure in the year, up 1% on 2014.

**Figure 3:** Location of companies with whom the RPO has executed a collaborative research, contract services or consultancy agreement 2015



<sup>4</sup> Data not returned by NUIG



At the signing of a memorandum of understanding between Trinity and Intel: Trinity's Provost and President Patrick Prendergast (left) and Eamonn Sinnott, General Manager Intel Ireland & VP Technology Manufacturing Group, Intel.

## Strategic engagement - Intel and Trinity College Dublin

Trinity has a long history of research collaboration with Intel and in September 2015 this deepened to a new level with the signing of a memorandum of understanding (MOU). This reflects the different ways in which the company and the university benefit from working together.

*"Intel has been proactively developing the research and innovation footprint of its operation in Ireland over the last 25 years through the strong relationships it has built with academic institutions and the innovation community," said Eamonn Sinnott, vice-president Technology and Manufacturing Group at Intel Corporation and general manager Intel Ireland.*

*"Our partnership with Trinity has been multi-faceted and has contributed to many of the recent innovation successes for Intel Ireland. The signing of this agreement signals a new strategic approach to our engagement which will consolidate and build on that longstanding relationship."*

The MOU, which is the first of its kind for Intel, set out three areas of focus all centred on knowledge transfer. These are: research and innovation; talent development and; policy development.

The first area focusses on research and innovation. Dr. Diarmuid O'Brien, director of Research and Innovation at Trinity College Dublin, explains, *"Intel has six researchers in residence based full time at Trinity working on collaborative projects as diverse as new materials for semiconductor chips and establishing a national IOT network. These researchers link back into Intel both in Ireland and the United States to create a seamless interface where ideas, breakthroughs and people can flow between Trinity and Intel."*

The most impactful form of knowledge transfer is 'people transfer' and Intel has recruited more than 30 PhD trained researchers from Trinity in the last number of years. With this in mind, the second strand of the MOU relates to talent development. To support the pipeline of the brightest research talent, Intel is working with Trinity to redevelop its curriculum and is sponsoring final year undergraduate and PhD students.

The final strand of the MOU covers policy development. *"Both Trinity and Intel are committed to Ireland having a world class research ecosystem and a university system containing top-ranked universities. We are working together to ensure Trinity has an internationally leading research environment which can support the future development of talent and research breakthroughs,"* said Dr. O'Brien.

**Added value from research institution: research collaboration, access to expertise and people.**



**Figure 4:**  
Revenue from consultancy  
by RPO type



### 3.3 Contracted services and consultancy for business

In addition to working together on collaborative research projects to pursue new knowledge, RPOs provide practical solutions to companies by undertaking more directed and applied studies and providing consultancy services and advice.

This year, to reflect the more precise definitions of collaborative research, contracted service work was separated out as a category in its own right. This kind of work is tailored to a particular area of interest or a problem posed by a company or non-commercial entity and includes activities that might be in the form of a "work order". In many cases, these projects may be managed locally within the RPO and there may be no central collection of information on contracts signed. There were 597 such contracts reported with industry and a further seven with non-commercial entities in 2015. This is likely to be an underestimate of the volume of support of this nature that the RPO community provides to business. The Institutes of Technology sector accounted for 81% of contracted service agreements reported.

Consultancy has similar issues of under-reporting because the majority of the activity is not managed as "institutional consultancy" but handled as a direct engagement between a researcher and the client. This is due in part to current legislative frameworks.

The number of consultancy agreements with industry reported in 2014 was 407 and this decreased in 2015 to 372. As in previous years, Teagasc accounted for the bulk of consultancy agreements, at 58%. The Institutes of Technology accounted for a further 37% of consultancy agreements (136) up from 25% in the previous year. The university sector accounted for only 5% of consultancy reported which is likely to reflect the current practice of non-institutional activity, due to the reasons discussed above.

#### 3.3.1 Revenue from contract services and consultancy to business

Four of the 25 RPOs returning data in the AKTS2015 were unable to provide details on gross revenue from contracted services. A further eight returned a zero sum. Of the 13 that were able to provide information, the gross revenue was €2.4 million. This inability to report is likely to be related to the fact that in some cases the contracts and finances are not managed centrally. The figure can be assumed to be an under-representation of revenue from this activity.

Given that consultancy is not run institutionally, the data returned by the RPOs are also an underestimate of the value of consultancy activity from across the RPO sector. Of the 25 RPOs that returned data in the AKTS 2015, three were unable to supply financial data for consultancy and a further seven returned a zero sum. Of the remaining 15, the total consultancy revenue from industry reported for the year was €3.7 million, down by 36% on €5.8 million the previous year. When consultancy revenue from non-commercial sources is included, the total increased to €5.1 million.

Of the 20 Higher Education Institutes returning data to the AKTS2015 (all seven universities and 13 IoTs), 18 reported on consultancy revenue, with four of them declaring zero revenue. Teagasc reported the majority of consultancy revenue.

## 2015 success story



### Growing business, growing support to business

The South Eastern Applied Materials (SEAM) Research Centre at Waterford Institute of Technology (WIT) has an impressive track record of growth. As a leading technology gateway for engineered materials technologies, SEAM finds solutions for industry problems across diverse sectors such as biomedical, pharma, precision engineering, energy and electronics. It carried out more than 900 directly funded industry projects within six years of its launch in 2009. During that period SEAM secured over €8 million in funding from diverse sources including directly funded industry projects, Enterprise Ireland and the EU FP7 programme.

*"We grew from a staff of two in 2009 to employing 13 in 2015, with plans to recruit more in 2016," said SEAM Director, Dr. Raghavendra. "There has been significant growth in projects that are funded 100% by industries which now account for over 80% of work completed by the centre."*

The technical issues that SEAM deals with are real world problems that impact on a company's profit margin and its ability to survive in the highly competitive world of technological innovation. To date, SEAM has worked with over 120 multinational and indigenous company clients. Key to its success is Seam's approach to relationship building. *"We foster a strong customer-centric culture with a mission to establish long term business relationships with our customers, becoming an extension of their organisation, understanding their business and delivering on their technology needs,"* said Dr. Raghavendra.

The centre's growth continues. In collaboration with three industrial partners (Boston Scientific, Schivo and Lisnabrin), SEAM launched a metal 3D printing programme that aims to manufacture intricate metallic components and parts with complex 3D structures. To facilitate this programme, SEAM doubled the footprint of its facility in 2015 and is positioning itself to offer this technology to other Irish precision engineering and manufacturing sectors by early 2017.

Waterford-based precision engineering firm Schivo initially engaged with SEAM on projects involving material analysis issues and process improvement challenges, according to Jonathan Downey, strategic projects manager at Schivo Group. *"We now view SEAM as a complementary extension to our business. As well as being a benefit to our existing customers, our access to SEAM supports Schivo's continual expansion to new markets and technologies. The recent 3D metal printing collaboration with SEAM is a testament to this."*

**Added value from the research institution: consultancy, access to facilities and equipment.**

**SCHIVO**  
...engineering Partnerships

## 4 Research, contract services and consultancy with non-commercial organisations

The use of research and the expertise within the RPO system by the public sector in Ireland offers a real opportunity to innovate and one which the AKTS can now start to track over time.

Following on from last year, the survey asked for information on non-commercial research partners and consultancy clients. This year contract service agreements have also been included. The types of non-commercial organisations include public sector organisations, non-governmental organisations and charities. In the previous year the total number of research-related contracts and consultancy agreements was 181. Taking into account the re-classification in 2015, the volume has grown to 248 (collaborative research, contract services and consultancy). The number of collaborative research agreements signed with non-commercial entities has been a significant contributor, rising sharply from 52 in 2014 to 154 in 2015.

### 4.1 Revenue from contract services and consultancy with non-commercial organisations

Consultancy revenue from non-commercial organisations was €1.5 million in 2015, with seven of the 25 RPOs reporting revenue. Only one institution reported any revenue from contract services with non-commercial organisations, at €2,025.

**Table 1:** Number of research and consultancy agreements executed in year with non-commercial organisations

Type	Number of contracts signed	% of total number of contracts of this type
Collaborative research	154	17
Consultancy	87	19
Contract service	7	1



# 5 Invention disclosures

The first step in the process of commercialising a new piece of technology takes the form of an invention disclosure. The researcher discusses with the TTO a tangible discovery or development that they have made and, if merited, details are submitted in writing.

The TTO undertakes a preliminary commercial assessment of the invention and, if it is accepted into the TTO system for further development, this is recorded on an Invention Disclosure Form (IDF). The IDF contains the basic information needed to evaluate the intellectual property associated with the invention and, where appropriate, to protect and commercialise it.

In 2015, there were 465 invention disclosures, an increase of 10% on 2014 (423) which reverses the 9% dip in the previous year. The majority were in the University sector (70%, 327) and 22% (100) were in the Institute of Technology sector. 4% were in the Specialist Institutes group (20) with a further 4% (18) being made in the State Research Body sector.

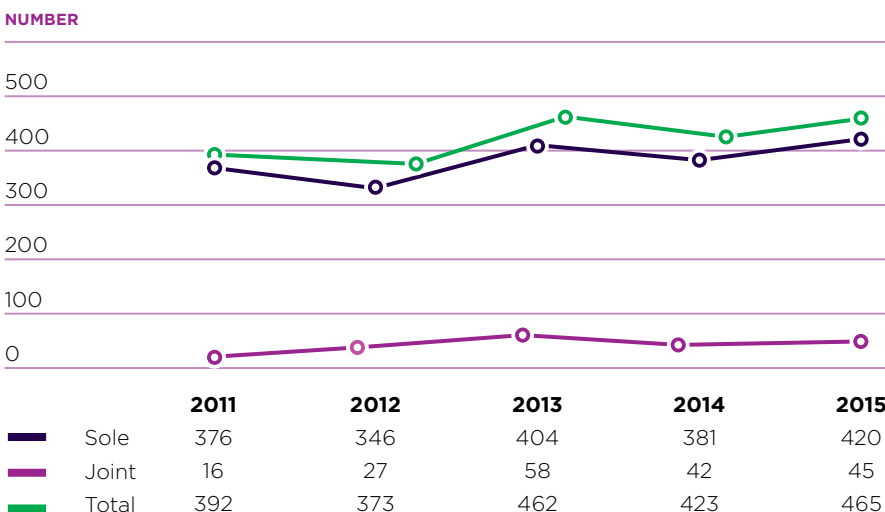
For the purpose of this survey, both sole and joint invention disclosures are recorded. Sole invention disclosures are those made by researchers working in only one institution and submitted only to that RPO. Joint invention disclosures are disclosures relating to the same invention where the inventors involved work for different RPOs and where each inventor has separately disclosed their invention to their employing institution. Any subsequent IP protection and commercialisation is usually undertaken by the RPO that is best placed to lead, under an arrangement with the other RPO called an Inter-Institutional Agreement (IIA).

Figure 5 shows the number of sole and joint invention disclosures received in 2015 and the five year trend.

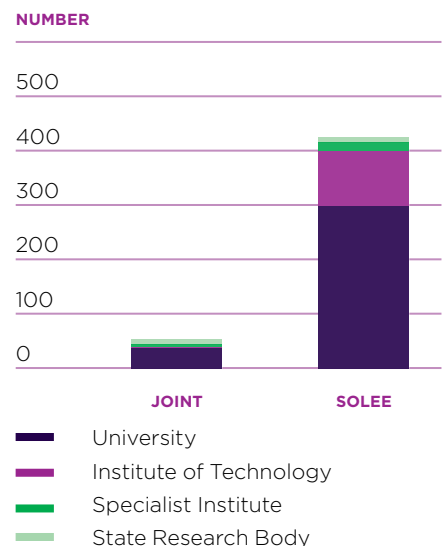
As shown in Figure 5, 90% of disclosures were sole disclosures (420) and 10% of disclosures were joint (45). There was an expectation that joint disclosures would continue to rise over time as more collaborative research is now undertaken across RPOs and more inter-institutional research centres have been established in recent years, which should give rise to more joint IP. However the volume of joint invention disclosures seems relatively steady. It will be interesting to see how this trend develops over the next few years.

Figure 6 illustrates that 295 (70%) of sole IDFs were submitted in the University sector and, of the joint IDFs, 32 (71%) were in the University sector. The latter suggests that there was greater collaboration amongst University researchers leading to the generation of more joint IP from the University sector.

**Figure 5:**  
Invention disclosures, 2011 – 2015



**Figure 6:**  
Invention disclosures in 2015 by RPO type



## 6 Patent activity

A patent confers upon its holder, for a limited period, the right to exclude others from exploiting (making, using, selling, importing) the patented invention, except with the consent of the owner of the patent. A patent is a form of “industrial property”, which can be assigned, transferred, licensed or used by the owner. Filing a patent application with a national patent office is the first step in seeking protection for the invention and establishes a priority date for the invention.

Not all applications are filed with the Irish Patent Office as patent applicants often prefer to file direct in territories where the invention may be commercialised, or direct with the European Patent Office (EPO). Filings are also made with the UK IP Office (UKIPO) to expedite the official “search” relating to the application so that the RPO has a better understanding of patentability and claims required at the end of the priority year. This early search can also point the way to potential competitors and licensees. The results of this process give applicants greater confidence in deciding whether to pursue, abandon or alter the patent application.

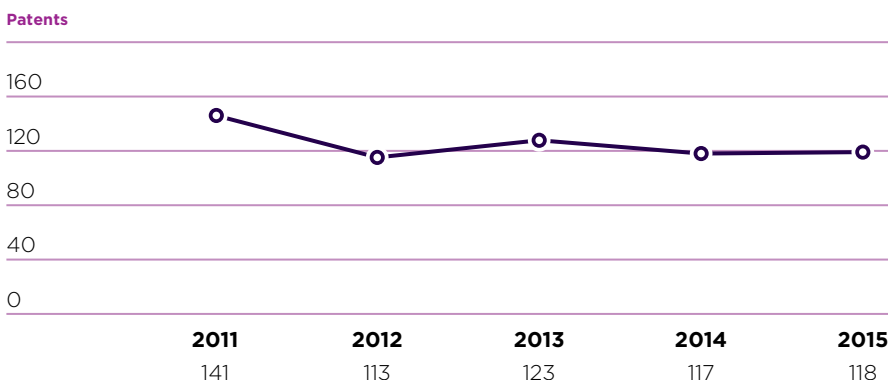
### 6.1 RPO patent portfolio

The number of patent families owned by the RPOs at the end of 2015 was 611. This has increased from 585 in the previous year with the biggest increase in the portfolio held by the universities, which together hold 84% of the RPO patent estate. This may reflect the maturity of the university TTOs. A patent family may include patent applications or granted patents that derive from the same original filing.

### 6.2 Initial patent filings

To understand the level of new IP being protected, in cases where initial patent applications were filed for the same invention in more than one jurisdiction, only one priority patent application filed is counted in the year of application. On this basis, the number of new patent filings claimed in 2015 was 118 which was consistent with the 117 filed in 2014. The average total number of priority patent applications each year over the past four years has been 117 and the 2015 data suggest that the number of priority filings is reaching a steady level.

**Figure 7:** Priority patent applications over the past five years



## 2015 success story



*AmbiSense Founders – Professor Dermot Diamond, Director of the National Centre for Sensor Research at DCU, Dr Fiachra Collins, CTO AmbiSense and Stephen McNulty, CEO AmbiSense.*

### From research to global product launch: the AmbiSense story

Dublin City University (DCU) spin-out company AmbiSense was formed in 2014 with the help of Invent, DCU's technology transfer office, based on access to R&D expertise and novel IP and technology. AmbiSense launched its products to Irish customers in 2015 and, in just over a year of trading, delivered over 30 customer installations across Ireland, the UK, Poland and Australia. The company currently employs five people in Ireland and the UK with production of its devices in Dublin.

Conducting research at DCU's National Centre for Sensor Research (NCSR), Dr. Fiachra Collins, now CTO at AmbiSense, developed a disruptive sensor technology that automates the process of environmental monitoring, producing quality data at a fraction of prevailing costs. The sensor technology is being used to design and manufacture in-field analytical instruments for monitoring gas and air, via wireless sensor networks. IP licensed by DCU to AmbiSense formed the basis of this first product line.

Invent worked closely with Dr. Collins and the research group headed by Professor Dermot Diamond to obtain early-stage funding to develop the technology. *"The research was initially funded by the Environmental Protection Agency (EPA),"* said Dr. Carolyn Hughes, business development director (Physical Sciences) at Invent DCU. *"We then sought further funding from Enterprise Ireland's commercialisation fund to advance prototype development and explore its commercial viability by conducting field trials with prospective customers including county councils."*

Invent worked with the academic founders to identify a suitable CEO who would help drive business development. *"Stephen McNulty, who has extensive knowledge of the environmental services sector, immediately recognised the commercial potential of the AmbiSense platform,"* said Dr. Hughes. *"Invent engaged with Stephen through the EI Business Partner programme, which enabled him to evaluate the business opportunity, develop a business plan for AmbiSense and raise investment funding."*

While the company is initially focused on the landfill and land remediation markets, there are significant opportunities to scale the business in other markets including gas exploration, waste to energy/anaerobic digestion, mining, and monitoring outdoor/indoor air quality. It is well positioned in the growing Industrial Internet-of-Things (IIoT) market.

AmbiSense was one of five companies to win an award at the prestigious European Venture Summit in Düsseldorf in December 2015. *"To be acknowledged as being in the top five most pioneering European cleantech start-ups is a real honour for the AmbiSense team,"* said McNulty.

**Added value from the research institution: spin-out company development, spin-out company contracts, intellectual property, licensing, expertise.**

**Figure 8:**  
Initial priority patent filing jurisdictions



- ABOVE**  
Irish Patent Office  
5%
- UK Patent Office  
42%
- EPO  
25%
- USPTO  
28%

The choice of priority patent filing territories is diverse. The UK IPO is the favoured jurisdiction with 42% of initial priority filings made in 2015. The USPTO and EPO are next with 28% and 25% respectively. Just 5% (6) of initial filings are made in the Irish patent office which is similar to the previous year. Figure 8 shows this breakdown.

The initial filing trends over the past three years are shown in Table 2.

As shown in Figure 9, the University sector accounted for three-quarters (75.4%) of all priority patent applications made by RPOs in 2015. The IoTs accounted for 17% of the filings made, and the remainder coming from Specialist Institutes (5%) and State Research Bodies (2.5%). This is fairly consistent with the distribution seen in 2014.

**Table 2:**  
Changes in choice of offices for initial patent filings 2013 - 2015

Patent Office	2013 % (rounded)	2014 % (rounded)	2015% (rounded)
Irish PO	3	6	5
UK IPO	41	36	42
EPO	29	41	25
USPTO	23	17	28
Other	4	-	-

**Figure 9:**  
Initial priority patent  
filing jurisdictions



**Figure 10:**  
Number of patents granted  
each year, 2011 - 2015

### 6.3 PCT applications

The Patent Cooperation Treaty (PCT) makes it possible to seek patent protection for an invention in a large number of countries simultaneously by filing an international patent application. The PCT application can take its priority date from an initial national filing and so a PCT application is usually made 12 months after the first filing.

Of the 117 initial filings made in 2014, 55% were progressed to PCT applications in 2015<sup>5</sup>, with 64 PCT filings in 2015, consistent with the previous year's figure of 63. This was an increase on 2014 where 51% progressed to PCT filing.

The range of progression from initial application to PCT amongst the RPOs was from 30-100%. In the university sector the range was 39-65% and for the IoTs 50-100%. However given the small number of filings made by some of the IoTs, these data are not particularly meaningful.

Eighteen months after a PCT application has been filed, it must be nationalised in individual countries and regions selected from those previously designated in international applications. This is a costly procedure and patent applications are often licensed prior to this stage. Where they are not yet licensed, the RPO will only progress to this stage if the invention shows significant commercial promise. The data on national filings relate to such filings made in the name of the RPO and which may be paid for by the RPO or by the licensee (by way of the licence contract). In 2015, 48 PCT applications entered the national phase. In 2014 the figure was 37. The majority of these nationalised applications (85%) were made by the University sector.

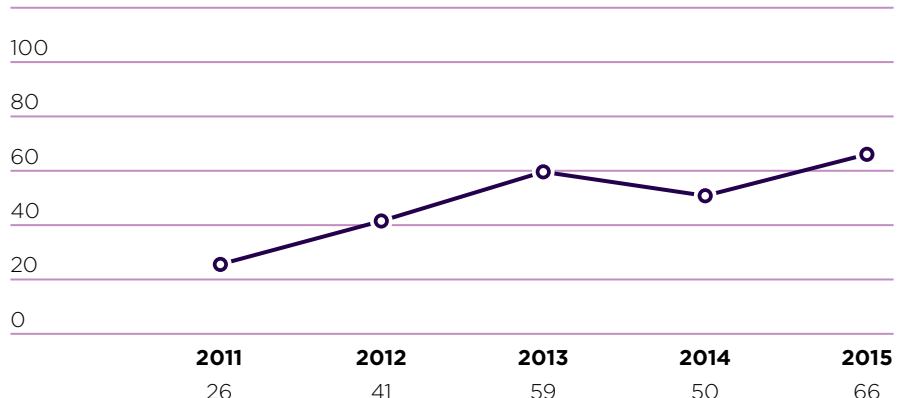
### 6.4 Patents granted

The total number of patents granted in 2015 has increased from 50 in 2014 to 66 in 2015. The majority of these patents (80%) were granted to inventions from the University sector. The rate of patent grant is not linear and depends on the complexity of prosecution within the relevant patent office and also where the application is being examined as some patent offices are more or less stringent in their approaches. The data as gathered therefore do not lend themselves to linking back to original filing. For the purposes of this analysis, patents granted in each territory in the year are counted even if they are related to the same original patent filing. The five year trend in the number of patents granted from 2011 to 2015 is shown in Figure 10.

### 6.5 Reimbursement of patent costs

Ten out of 25 RPOs said that they were able to achieve some reimbursement of patent costs from licensees in 2015. This ranged from €6,600 to over €39,000.

Patents



<sup>5</sup> NUIG were unable to provide data



## 7 Licensing of rights

**Figure 11:**  
LOAs by type



Information was sought on all licences, options and assignments (LOAs) for all types of intellectual property generated in the institutions, including copyright, know-how, patents and trademarks. For this purpose, the terms were defined as follows:

- A **licence** is an agreement between an RPO and one or more third parties, whereby intellectual property rights are transferred for the purpose of commercialisation. The RPO retains ownership of the intellectual property but permits the licensee to exploit it in accordance with contractual terms and conditions.
- An **option** agreement is one in which the RPO grants a potential licensee or assignee a period of exclusivity during which it can decide whether it may wish to take a licence to the intellectual property and negotiate the terms of a licence agreement. The option period may include **evaluation** of the IP by the potential licensee (including assessing the technology). This is called an Option & Evaluation agreement.
- An **assignment** is an agreement transferring ownership of intellectual property rights from the RPO to a third party.

### 7.1 Licences, options and assignments (LOA)

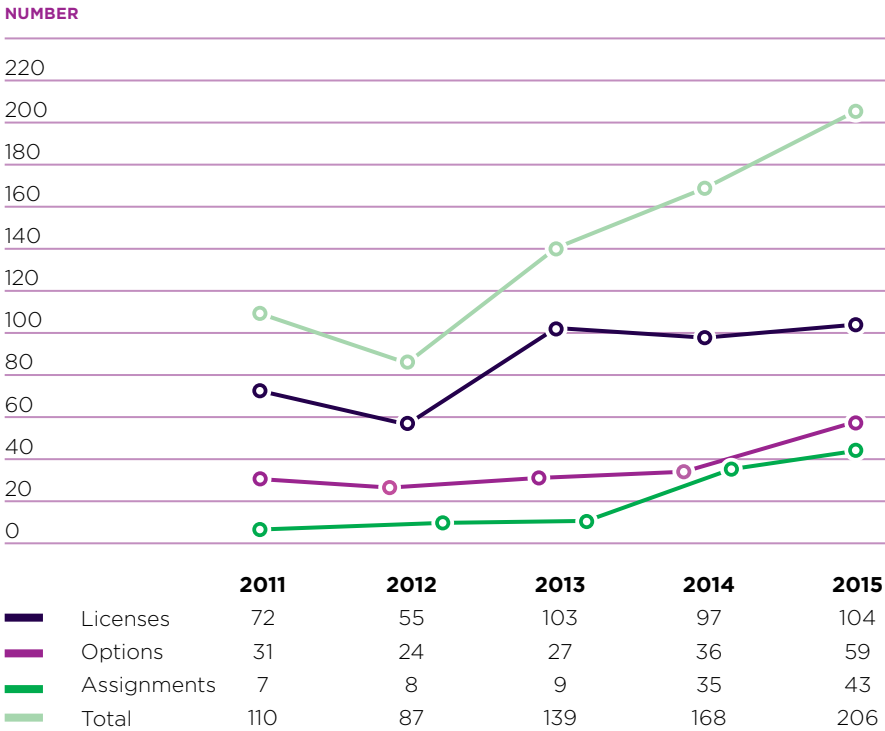
Growth continues in the total number of licences, options and assignments executed by RPOs. In 2015, 206 LOAs were signed, up 23% on the 2014 figure of 168, which itself was an increase of 21% on the previous year. Licensing tends to be the dominant activity, at 50% of all LOAs signed (58% in 2014). Options accounted for 29% of LOAs signed. Despite the IP Protocol preferring that assignments are used only in limited cases, there is a growing trend. Nine assignments were signed in 2013 compared with 35 in 2014 and 43 in 2015. The breakdown is shown in Figure 11.

These trends across licensing, options and assignments can be seen in Figure 12.

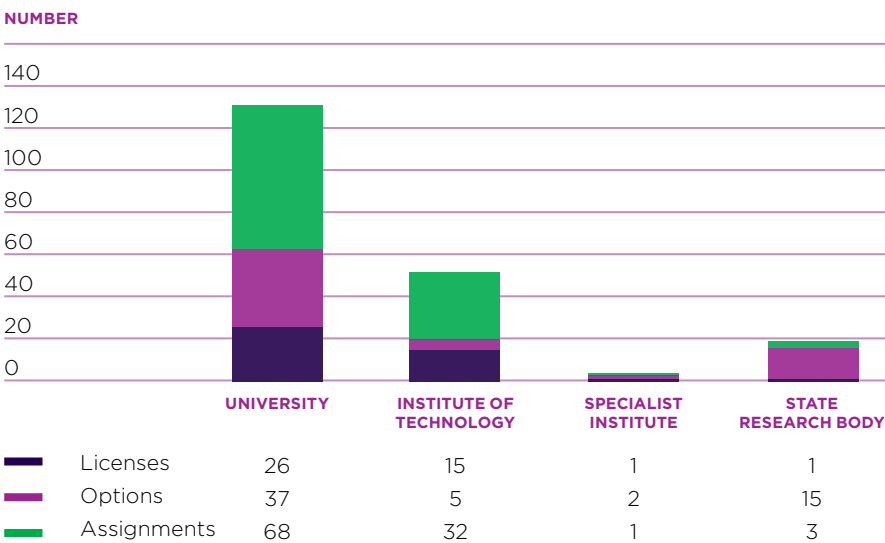
A breakdown of licensing type by RPOs in Figure 13 shows that the University sector executed the majority of LOAs (64%) in 2015 (75% in 2014).

The total number of licence, option and assignment agreements active at the end of 2015 was 680 of which 76% were in the University sector. Figure 14 shows the increase in the cumulative portfolio of active agreements over the past five years.

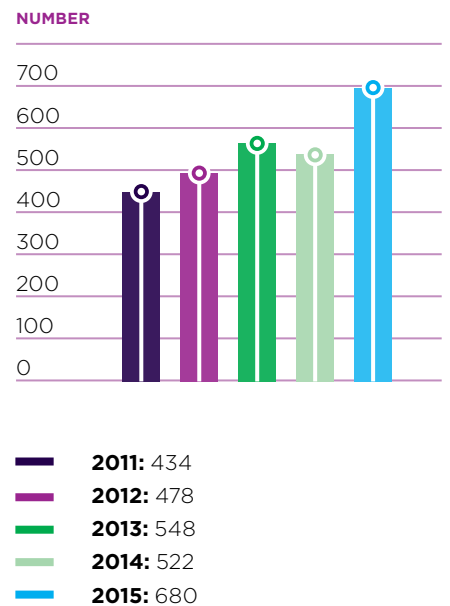
**Figure 12:**  
Total number of licences, options and assignments executed, 2011 - 2015



**Figure 13:**  
Type and number of licences, options and assignments executed in 2015 by RPO



**Figure 14:**  
Total current licence and assignment portfolio, 2011-2015

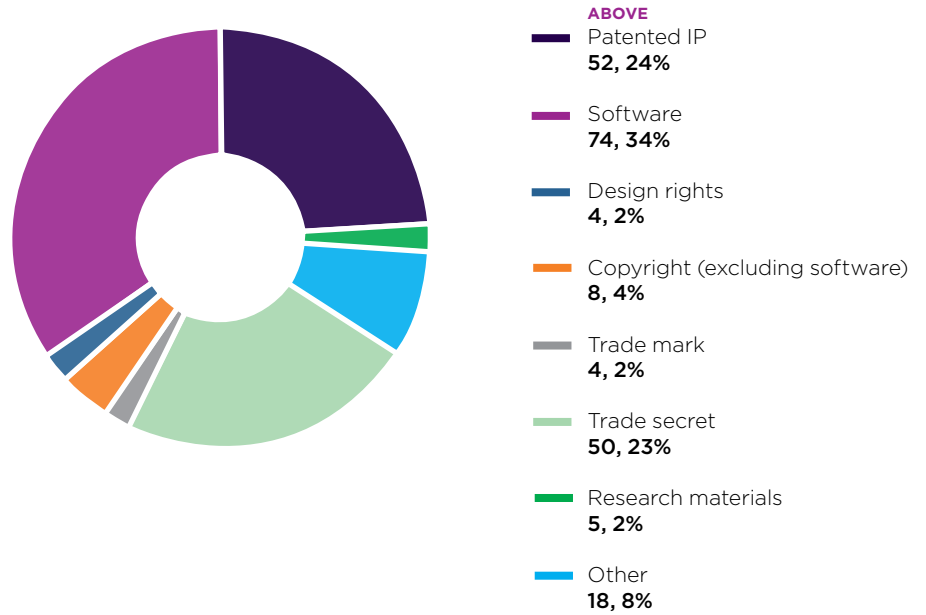


### 7.2 Types of IP licensed

Figure 15 shows the types of intellectual property that were the subject of licence agreements during 2015. More than one piece of IP may be licensed within one agreement e.g. software and know-how.

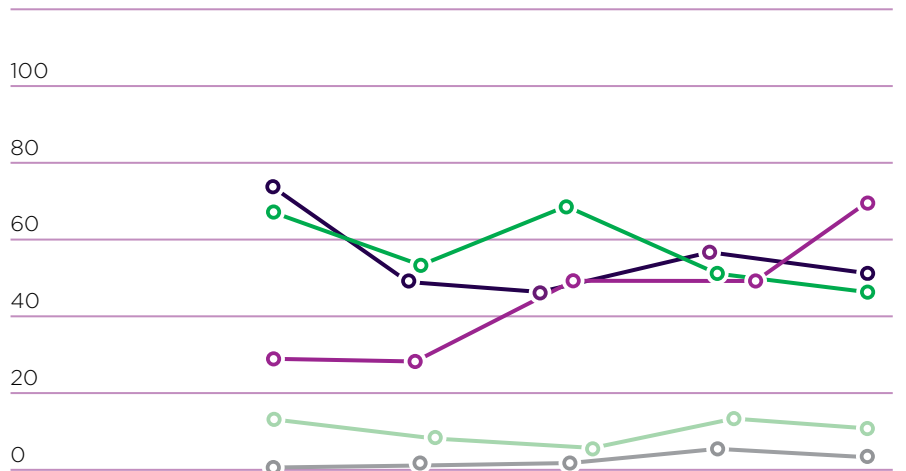
Trends over the past five years are shown in Figure 16 which indicates a steady rise in software licensing. Patent IP appears to be at a steady state whilst low level of copyright licences means that small yearly changes are amplified in a trends analysis.

**Figure 15:**  
Underpinning IP



**Figure 16:**  
Type of intellectual property in LOAs, 2011 - 2015

NUMBER



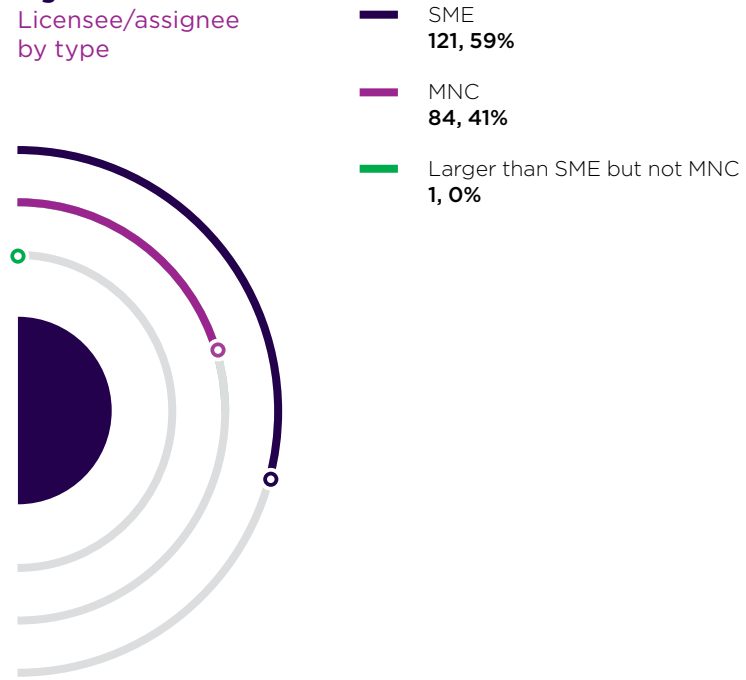
	2011	2012	2013	2014	2015
Patented IP	76	52	49	58	52
Software	33	32	53	53	74
Trade secret	66	46	64	56	50
Copyright	16	8	5	17	8
Design rights	1	2	2	5	4

### 7.3 Licensees

Figure 17 shows the types of organisations with which agreements were made in 2015. The majority of LOAs were transacted with SMEs (59%) which is down on the proportion last year (71%) as there has been an upward shift in the percentage of LOAs signed with multinational companies (Irish-based and non-Irish based) to 41% (23% in 2014). Licensing to another RPO, for example in the case of joint inventorship or patent bundling, has been excluded from the analysis.

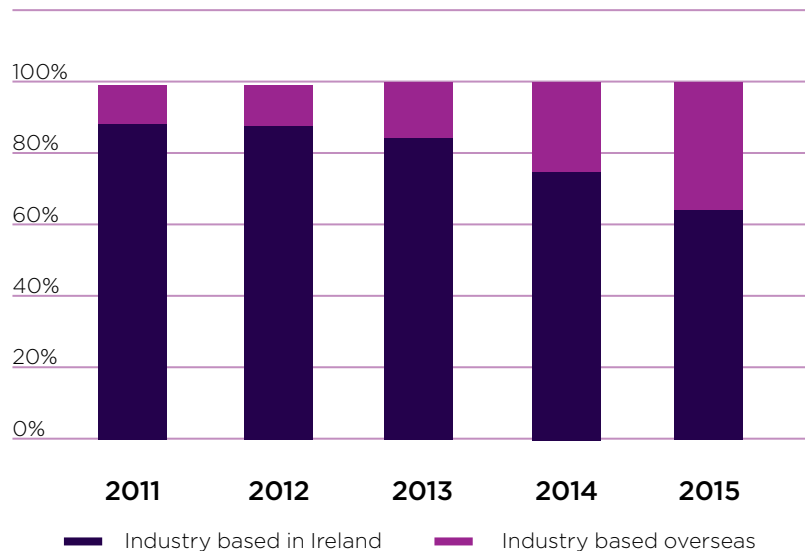
The number of LOAs signed with Irish companies has declined in the past two years, from 90% in 2011 to 69% in 2015. This might be accounted for by a variety of factors including the increase in collaborative research with non-Irish companies which leads to licensing, the depth of the IP for which an overseas company may be more likely to pay a commercial rate or the prevalence of Irish companies in the sectors in which the licences are executed. Whilst this trend could be viewed as disappointing from an Irish firm perspective it can equally be viewed as positive, suggesting a perceived value in the quality of the IP generated by Irish RPOs and that Irish TTOs are able to compete internationally and negotiate licences with overseas companies. Often a licence is part of, or leads to, another type of engagement relationship which potentially has implications for FDI.

**Figure 17:**  
Licensee/assignee by type



**Figure 18:**  
Location of licensee companies with whom LOAs executed

**PERCENTAGE OF LOAS EXECUTED WITH INDUSTRY**



## 2015 success story

### 7.4 Material transfer agreements (MTAs)

A further type of agreement is a material transfer agreement, under which the institution transfers tangible research materials to another entity, and the recipient uses the materials for their own research purposes. The agreement specifies the rights of the provider and the recipient with respect to the materials and any derivatives. MTAs may be granted to or received from a commercial entity or another research organisation. Frequently, the transfer is out to a company by way of a licence agreement. 138 out-going MTAs to companies were signed in 2015, a decrease on the 174 in 2014. The majority of MTAs in 2015 were reported by the University sector (81%).

### 7.5 Products on the market

38 previous licences from the Irish RPOs led to market launches of products or services in 2015. 23 of these (61%) were from six Universities and 11 were from four IoTs. Four products or services were brought to market related to licences from Teagasc.

#### 7.5.1 A deeper dive into products launched in 2014

A third party review, commissioned by KTI, was undertaken by IP Pragmatics to examine new products and services that came onto the market in 2014 based on licences from Irish RPOs reported in the AKTS2014. The available and validated data from the AKTS 2014 identified 30 such products. Once IP has been transferred, the RPO may not be aware of the contribution of their IP to the products or services offered by licensees, particularly when the IP leads to improvements in existing products, rather than the development of a completely new product line. Therefore the number returned will be an underestimate of the contribution made by licences from RPOs to new launches.

The bulk of the products launched in 2014 (90%) were based on licences to Irish companies.

The majority of the licensees (90%) were SMEs. When classified by Research Prioritisation areas, as for last year, the bulk of the licensees are in the ICT or Health and Med Tech sectors. However a significant number fall outside of these classification themes.

Looking at the underpinning intellectual property, 59% of the underpinning licences were related to patent protected IP (33%) and to software (26%). This is a slight decrease on the previous year, with the majority of the change being in relation to software-based products.



### DIT licenses ground-breaking rubber testing technology to Bridgestone Global

Dynamet, a breakthrough enabling technology for rubber testing and analysis, was developed by researchers in DIT Bolton Street between 2011 and 2016 and licensed to Bridgestone by DIT Hothouse, the technology transfer office at Dublin Institute of Technology.

Dynamet, which stands for 'dynamic multi-axial elastomer testing', uses the bubble inflation method to subject elastomer samples to equi-biaxial fatigue loading, allowing rubber samples to be tested whilst being stretched in two directions simultaneously, according to researcher Mark Johnson at DIT's School of Manufacturing and Design Engineering.

After identifying the Dynamet technology as having immediate commercial application, DIT Hothouse worked quickly to protect the intellectual property, develop a commercialisation strategy and launch a direct marketing campaign targeted at companies in the rubber product space.

The technology will allow Bridgestone to perform accelerated usage and testing across its various tyres and industrial rubber products, like conveyor belts and rubber tracks.

Dynamet is a platform technology with potential applications extending beyond the rubber industry, enabling DIT Hothouse to license the technology to companies across diverse sectors. "We intend to launch a new marketing campaign in summer 2016 targeted at companies in the medical industry for use of the technology to characterise blood vessels, such as the aorta, in the design of the next generation of stents and vascular implants", said Paul Maguire, Licensing Executive at DIT Hothouse.

**Added value from the research institution: intellectual property, licensing.**



## 2015 success story



### Google brings Trinity immersive audio technology to virtual reality

In January 2015 Google acquired Thrive Audio and its associated intellectual property from Trinity College Dublin. The Thrive audio technology provides realistic audio systems for virtual reality (VR) and gaming headsets.

Trinity filed patents for the audio technology which was developed during four years of research and development at Trinity College Dublin conducted by Professor Frank Boland and his audio research group which included postgraduate engineers Ian Kelly, Brian O'Toole and Marcin Gorzel.

*"We assigned three separate patents and the associated software to Google as part of the deal and it also hired the team involved in the project,"* said Kevin Ennis, Trinity's communications and marketing officer.

Virtual reality has been predicted as the next big transformative tech platform with the potential to enable innovation in gaming, creative industries, online learning, health sciences, product design and environmental design. *"Companies such as Google are investing significantly in virtual reality and the expertise and technology at Thrive Audio will be used to support Google's growing activity in this area,"* said Ennis.

Google is currently investing in its Cardboard platform, which is named for its fold-out cardboard viewer for use with a smartphone and intended as a low-cost way to encourage interest and development in VR applications.

*"We're excited to welcome the Thrive Audio team from the School of Engineering in Trinity College Dublin to Google,"* said a Google spokesperson. *"With Thrive's ambisonic surround sound technology, we can start bringing immersive audio to virtual reality."*

Thrive's headphone audio system recreates an ultra-realistic soundfield at the listener's ears including height and depth. *"Our technology stems from over a decade of internationally acknowledged research into spatial audio. Thrive can now deliver highly realistic, dynamic and very efficient soundfields which react in real time to listener's movements providing the most realistic VR experience,"* said Professor Boland. *"Google's acquisition of Thrive enables innovative technology to be successfully commercialised, taking an idea from the lab through to the market place."*

The research and technology was supported by a range of funding sources including Enterprise Ireland's Commercialisation Fund, State and industry R&D awards and PhD grants from Trinity. The audio research group of Professor Boland in the Department of Electronic & Electrical Engineering continues, with the support of Science Foundation Ireland's Investigators Programme, to study novel challenges in spatial audio. These studies are a part of Trinity's work in the Creative Technologies research theme.

**Added value from the research institution: intellectual property, licensing.**

## 2015 success story

### Biotech spin-out Avectas attracts interest from global pharma sector

Biotech company Avectas is a Maynooth University spin-out whose platform technology is based on eight years of research by Dr. Michael Maguire and Dr. Shirley O'Dea who founded the company in 2011. Having negotiated a licence from Maynooth University for the use of their patented spray technologies, they have continued to develop these in pursuit of new therapeutic applications.

*"Our core objective is to develop innovative therapies especially in the area of gene editing, cell therapy and immune therapy. We have a number of programmes based on our patented spray technologies for delivery of therapeutic agents to cells in vitro and in vivo,"* said Dr. O'Dea. The technology directs a fine spray dispersal of therapeutic agents (such as proteins, antibodies and DNA) to cells including immune and stem cells, ex-vivo (outside an organism) and to tissues in-vivo (within a living organism).

The company's first products were developed under its electrospinning and electro spraying brand Spraybase, which is used for research in many industries including cosmetics, food science, medicine and pharmaceuticals. Spraybase is a CE marked, customisable, benchtop instrument used for electro spraying and electrospinning a wide range of polymers. Spraybase devices are now used in more than 150 academic and industry research laboratories around the world.

Whilst Spraybase instruments enable the fabrication of biocompatible cellular scaffolds and structures, Avectas has advanced its technology to enable the introduction of molecules directly into cells. This approach offers the potential not just to treat but to cure some rare diseases.

Five years after spinning out Avectas is one of the anchor tenants in the MaynoothWorks business incubator. *"Our ongoing relationship with the University has helped us in several ways,"* said Dr. Maguire. *"We benefitted from the sensible business approach taken by the University during the spin-out and technology licensing process; several of our excellent staff have come from the University talent pool; and our migration into the flexible new facilities in MaynoothWorks is giving us a terrific competitive edge."*

Avectas has a research team of 18 people at its office in Dublin and a US office in Cambridge, Massachusetts. The commercialisation of its technology has been supported by Irish Government and EU grants, Enterprise Ireland and the EU FP7 Programme.

The company's research is attracting the interest of the pharmaceutical industry with some of the largest global pharma companies evaluating Avectas' technology. A recent multi-million euro collaboration with Adapt Pharma will support continued development of Avectas' technology platform with the aim of advancing therapeutics across a number of disease areas.

**Added value from the research institution: intellectual property, licence, spin-out support, incubator facility.**

*Dr Michael Maguire and Dr Shirley O'Dea, co-founders of Avectas.*



# 8 Company creation

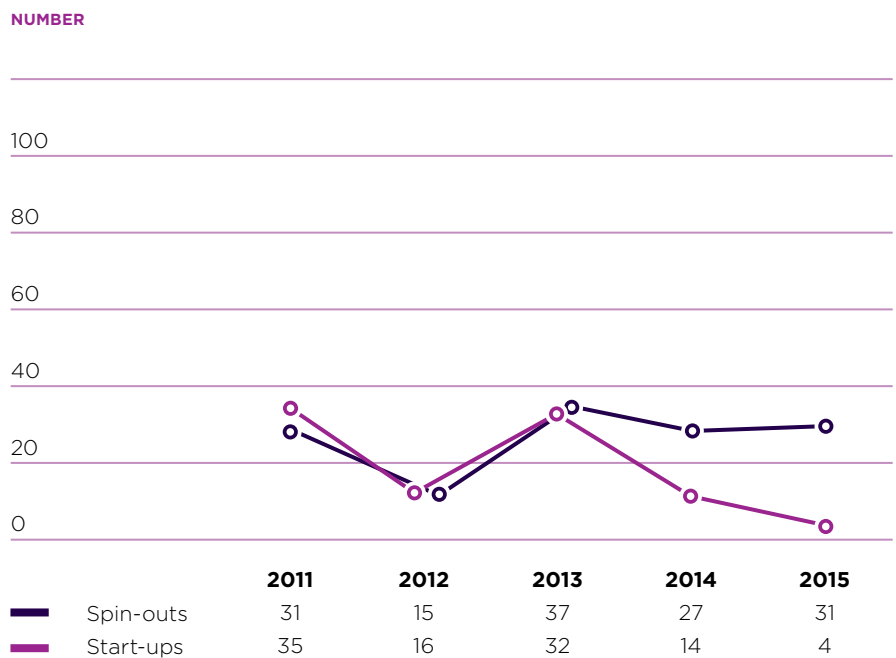
Information was sought on the number of spin-out and start-up companies established from RPOs in 2015. Sustainability of spin-out companies was also studied.

- A **spin-out** is a new incorporated business based primarily on knowledge and/or intellectual property originating from the RPO and in which the RPO holds equity and/or has executed a licence to the IP to the company.
- A **start-up** is a company formed by staff or students in the RPO not based on knowledge or intellectual property generated by the RPO and where there is no formal IP licence or equity share with the RPO.
- A **spin-in** is a company formed external to the RPO, which is not based on RPO IP, research or resources, and which does not involve RPO staff or students. In becoming a spin-in, the company becomes based in the RPO (for example, within an incubator) and/or provides equity to the RPO in exchange for access to business services from the TTO.

A total of 31 new companies were spun-out from 12 of the RPOs in 2015, up from 27 in 2014. Of these, 17 (55%) were from the University sector and 13 (42%) from the IoT with a further one from Teagasc. There were four staff start-ups recorded in the year, all in the IoT sector. A further 32 student start-ups were recorded across the university and IoT sectors. As start-ups are created independently from the RPOs, they will be under-reported. Figure 19 shows the number of spin-outs and recorded start-ups established in the five year period from 2011 to 2015 which have a licence agreement from the RPO and/or an equity share. This demonstrates the lumpy and unpredictable nature of company creation.

The aggregate number of spin-out companies in which an RPO holds equity or share options, at the end of 2015, was 159, up from 2014's figure of 156. The University sector accounts for 79% of this portfolio.

**Figure 19:** Spin-outs and start-ups established, 2011-2015.



**Figure 20:**  
Active spin-outs at end of 2015 that are three or more years post-incorporation



### 8.1 Active spin-out companies

An active spin-out is defined as an RPO-created spin-out company that, as at the end of the reference year, has at least one paid employee and has raised equity and/or has booked sales revenue. It is an incorporated entity which at the time of formation was dependent on the exploitation of specific intellectual property rights of the RPO. The RPO will have executed a licence to the spin-out for the IPR and/or will hold equity in the spin-out. This category excludes start-ups and spin-ins.

There were 110 active spin-outs at the end of 2015 that were at least three years post-incorporation, up from the 97 reported in the AKTS2014. Of these, 91 were from the University sector (83%) with an increase to 15 (from 10 in 2014) coming from the Institutes of Technology sector (14%). The distribution is shown in Figure 20.

#### 8.1.1 A deeper dive into the active spin-outs reported in AKTS 2014

The data on active spin-out companies provided to the AKTS 2014 were explored further as a part of a review undertaken on behalf of KTI by IP Pragmatics. The review also looked at data on those spin-outs that achieved a successful exit such as a trade sale so as to capture further impacts from RPO spin-outs.

Of the 97 spin-out companies reported by the RPOs as being active three or more years post formation, 64% are in the ICT or Health and Med Tech sectors. Of these active spin-out companies, many have accessed more than one type of intellectual property to underpin their business. Patented technology constituted 45% of underpinning RPO licences and software a further 28%, which remains consistent with the previous year.

All but one (99%) of the active spin-outs are still located in Ireland, often remaining near their founding institution. Of these companies, the study found that 32 (33%) have established offices and/or appointed distribution agents in at least one overseas territory. This is an increase on last year, when 23 (29%) had an overseas presence. Many of the others are trading abroad directly from their base in Ireland.

Looking back to formation date, the 32 spin-outs reported in 2013 as being formed in the 21 years prior to the introduction of the Enterprise Ireland TTSI programme in 2007, remain active. A further 65 currently active spin-outs had been formed in the five year period 2007-2011. Between them, RPO spin-out companies that remained active in 2014 provided employment for more than 930 people, up 41% on the previous year’s study. This figure was derived from a best estimate of headcount data (number of FTEs on 31 December 2014), based on RPO information and public data, and used to assign the companies to a headcount bracket to give an idea of their size.

Although investment data were not available for all the companies, IP Pragmatics determined that these spin-outs have raised in excess of €245 million in aggregate, based on the data available for 44 companies that have disclosed the amount of their investments. Nearly half of these have raised between € 1-10 million.



## 2015 success story

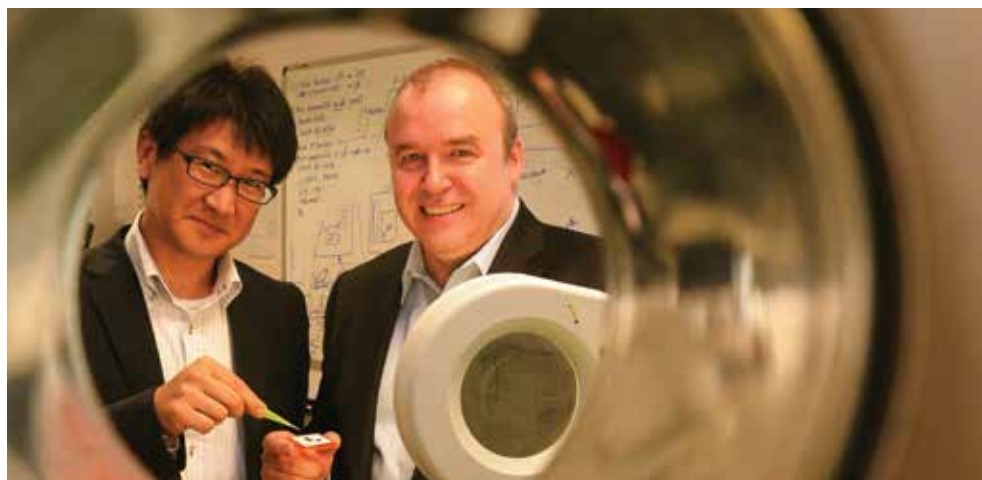
### 8.2 Spin-in companies

Many RPOs, frequently through their TTO, play a significant role in supporting early stage companies that are formed outside of the RPO with no initial connection to it. In becoming a spin-in the company becomes based in the RPO (for example, within an HEI incubator) and/or provides equity to the RPO in exchange for access to business services from the TTO. The total number of spin-in companies reported as being supported by the RPOs in 2015 was 355.

### 8.3 Company incubation

All Higher Education Institutes (HEIs – universities and IoTs) have an associated incubator facility in which early stage companies can develop. In addition to space for the company, services offered to the incubated company include advice on IP, networking events and access to professional services. According to the 22 RPOs that returned data the total number of incubator clients at the end of 2015 was 754 (755 in 2014). The majority were based in IoT incubators (573) with 162 in University incubators and a further 19 companies supported in the NCAD and NCI incubators. A total of 295 new companies entered HEI incubators and 213 exited during the year.

It is hard to be precise about the total number of FTE (full time equivalent) staff associated with the companies incubated. However, the RPOs returning data provided a figure for the number of incubated company FTEs of 2280, up on the 1676 reported in 2014 (partial reporting).



*Pictured at the Cork headquarters of Powervation following the announcement of its acquisition – Jun Lida, Director ROHM Semiconductor and Mike Smith, SVP & GM ROHM Semiconductor.*

### University spin-out company acquired for \$70 million

Powervation, a University of Limerick (UL) spin-out company that develops digital power management system-on-chip (SoC) solutions, sold in 2015 to ROHM Semiconductor (Japan) for approximately \$70 million in an all-cash transaction.

Since its creation in 2006 the company, headquartered in Cork, has established itself as a leading innovator in digital power controllers serving high performance computing, cloud and communications infrastructure markets.

*“UL was delighted to be associated with an acquisition of this scale,” said Paul Dillon, technology transfer director at UL. “The ecosystem of commercialisation and innovation expertise and supports here in UL together with our focus on enterprise engagement played an important role in creating an environment that supports large-scale spin-out activity of this nature.”*

Powervation was formed on the back of research undertaken at the Circuits and Systems Research Centre (CSRC) in UL's Department of Electronic and Computer Engineering. The research that led to a number of patent applications filed by the UL technology transfer office (TTO) was funded by a number of Enterprise Ireland commercialisation grants.

The company founding team comprised four staff from the CSRC: Dr. Karl Rinne, Dr. Eamonn O'Malley, Antoine Russell and Alana Dunne. UL acquired equity in the company as part of the overall spinout arrangements. Three patent applications were licensed by UL to the company under agreements negotiated by the UL Technology Transfer Office.

Powervation secured initial funding of €250,000 from Shannon Development and this was followed by a Series A funding round of €7 million by a syndicate involving Intel Capital, Scottish Equity Partners (SEP) and VentureTech Alliance. Between 2007 and 2015 the company raised a further €25 million which brought in new investors. The UL Technology Transfer Office supported all funding rounds and was heavily involved in the final trade sale transactions.

**Added value from the research institution: spin-out company creation, spin-out company contracts, intellectual property, licensing.**



## 9 Revenue generation from licensing and spin-outs

**Figure 21:**  
Licence revenue by RPO sector



Revenue generation from licensing IP or from the realisation of spin-out equity may be considered a proxy for success. Certainly it is a metric that is used in international analysis of technology transfer performance. However, it is important to put revenue generation in context.

Firstly, the objective of transferring IP into a company (existing or new) is to support business innovation and competitive advantage. This in turn should lead to the development of new services and products for the benefit of society and the economy. The relationship between business and entrepreneurs with RPOs is more sophisticated than simple rights acquisition; value is added through the other interactions that businesses have with the RPOs, such as access to expertise through research contracts and consultancy.

That said, revenue generation by the Irish RPO system tends to be lower than in other countries. This is due, in part, to the fact that the Irish TTO system is still relatively new (TTSI investment only commenced in 2007) and it takes many years for commercial prospects to yield revenue returns, either via royalties on product sales or through realisations of equity investment. Related to this, RPOs are frequently compelled to license IP too early, before real value has been developed. This is due to limited patent budgets which mean the RPO is often unable to take patent applications beyond PCT stage and so early rights to new IP are often granted to companies as part of research agreements. It is also due to the nature and appetite of the licensee. Irish SMEs and MNCs are often reluctant to share revenue with the RPO and frequently try to demand free ownership rather than take a licence on commercial terms, resulting in a high proportion of revenue-neutral assignments (see section 7.1).

### 9.1 Licence revenue

The revenue from all types of know-how and IP (patents, copyright, designs, material transfer agreements, confidentiality agreements, plant breeder rights, etc.) before disbursement to the inventor or other parties was surveyed. Revenue includes licence issue fees, annual fees, royalties, option fees and milestones, termination and cash-in payments.

All but one of the 25 RPOs reporting data to the AKTS this year were able to provide a figure for licence income<sup>6</sup>. All six universities that returned data reported revenue from licensing whilst only four out of 13 IoTs reporting in this survey generated licence income. From the data provided, the aggregate revenue from licensing in 2015 was over €5.6 million, up three-fold on the 2014 figure of €1.8 million. This differential can be accounted for by a few, very significant deals in the year. The majority of licence income (74%) was related to the licensing in the university sector whereas last year it related mainly to the sale of crop and plan varieties by Teagasc.

### 9.2 Revenue from equity in spin-out companies<sup>7</sup>

The realisation of equity is unpredictable, depending on external factors such as the maturity of the spin-out and market forces. Only three RPOs (all university sector) realised revenue from the sale of spin-out company equity in 2015. The total revenue was over €2.9 million, up on the €1.4 million reported last year.

<sup>6</sup> University of Limerick unable to disaggregate and submitted combined licence, dividend and equity revenue only

<sup>7</sup> UCC provided no return University of Limerick unable to disaggregate and submitted combined licence, dividend and equity revenue only

# 10 Use of facilities and equipment

**Figure 22:**  
Number of contracts with companies for the use of facilities and equipment by RPO type



- ABOVE**
- University  
877, 82%
- Institute of Technology  
145, 14%
- Specialist Institute  
20, 2%
- State research Body  
26, 2%

The survey asked for information on the use of RPO facilities and equipment. Information is patchy because in the majority of cases the use of facilities and equipment by external organisations is managed at the local level, for example by a school or research department, and not tracked centrally. Feedback has been that such data are extremely difficult to obtain and yet, where it has been tracked by some RPOs, the indication is that this is an area in which State investment in the RPO infrastructure is providing value to industry.

23 of the 25 RPOs that responded to the survey were able to supply information and, of these, six said that there were no contracts executed for the use of facilities or equipment. A total of 1068 contracts were recorded by 17 RPOs, up on the 869 contracts recorded by 12 RPOs in 2014. The majority of these are accounted for by Trinity with 67% of the share.

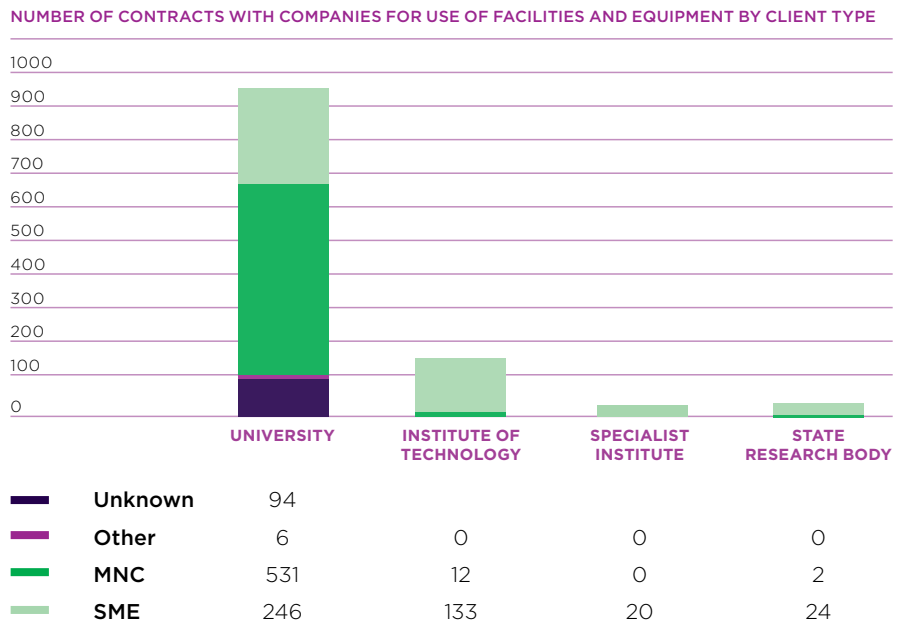
The split by client is illustrated in Figure 23 which shows 51% of contracts were with MNCs, 40% with SMEs and 1% with non-commercial (non-academic) entities.

There is another 9% which does not have the client type identified by the RPO.

## 10.1 Revenue from access to facilities and equipment

Of the 23 RPOs<sup>8</sup> (out of the 25 for AKTS 2015) that returned information on the use of facilities and equipment by business, 12 reported revenue generation, the most significant being from UCD. The total gross revenue reported was €2.7 million, down from €4.3 million in 2014 but from the €1.2 million reported for 2013.

**Figure 23:**  
Number of contracts with companies for use of facilities and equipment by client type

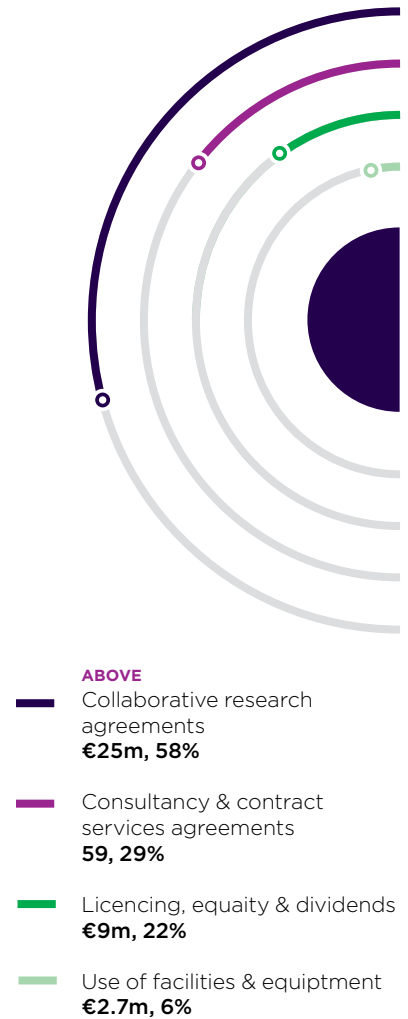


<sup>8</sup> Data not supplied by UCC, NUIG

# 11 Summary of commercialisation revenue

The percentage of commercialisation revenue achieved in 2015 from licensing and equity sale was 22% (no return on dividends in year) whilst revenue from engagement with industry (collaborative research, contract services and consultancy) accounted for 72% of the total revenue in year. (The data presented in Figure 24 exclude research income from State or other non-profit research funding sources e.g. research funding agencies, charities).

**Figure 24:** Revenue from commercialisation activities



**Table 3:** Revenue breakdown by source

Type of RPO	Collaborative research agreements	Consultancy & contract services agreements	Licensing, equity & dividends	Use of facilities & equipment	Total
University	€16,034,219	€671,010	€7,972,462	€1,761,267	€26,438,958
Institute of Technology	€7,671,785	€3,738,705	€248,124	€522,040	€12,180,654
Specialist Institute	€216,637	€2,250	€0	€250,000	€468,887
State Research Body	€1,165,327	€1,692,577	€1,178,079	€176,017	€4,212,000
<b>Total</b>	<b>€25,087,968</b>	<b>€6,104,542</b>	<b>€9,398,665</b>	<b>€2,709,324</b>	<b>€43,300,499</b>

## 12 Knowledge transfer infrastructure



Knowledge transfer is supported within RPOs through dedicated teams. These may range from a full technology transfer office (TTO) within a larger institution to an individual working part-time in a smaller institution. The functions are referred to differently.

*Networking at the KTI Symposium 2015 – (from left to right) Breda Lynch, Industrial Liaison Manager, Athlone Institute of Technology; Josette O’Mullane, Industrial Liaison Manager, Cork Institute of Technology and Kathryn Kiely, Industry Services Manager at Waterford Institute of Technology.*

For example: “Technology Transfer”; “Industrial Liaison”; Knowledge Exchange”; “Innovation Office” etc. The range of activities in which the majority of TTOs/ILOs engage has been expanding. They are all involved in supporting the transfer of technology, IP and knowledge between business and the RPO through related activities such as intellectual property management, licensing, partnering with industry, and the creation of new companies.

For the smaller IoTs, this activity is supported by their TTSI programme consortium lead partner. Additionally, staff in the majority of TTOs and ILOs are directly involved in providing support to the incubator facility. In some cases the incubator support staff are part of the ILO. TTO and ILO staff also play varying roles in supporting staff and student enterprise, delivering entrepreneurial training and supporting business plan competitions. In a few cases TTO/ILO staff support consultancy contracts.

# Appendix 1

## Summary data by RPO

Selected data relating to the returns made by the 25 RPOs (listed at A, below) are presented. Where an RPO was unable to return data, the entry is greyed out.

The data cannot be viewed as league tables of performance. Activity and outcomes depend on a complex range of factors which include the RPO mission, activity and research base. For example, one RPO may be more focused on working with many local companies on small-scale projects whilst another larger RPO may have a greater breadth and depth of research in an area that lends itself to a more national or international engagement and creation of IP. Other factors include the resourcing to support KT activity and how long a TTO/ILO has been in existence. It also needs to be recognised that some of the information requested had to be obtained from different departments within the RPO and not all data may be captured with the same level of detail.

### A: Year of foundation of TTO/ILO

#### University

Dublin City University	2007
Maynooth University	2005
NUI Galway	2005
Trinity College Dublin	1987
University College Cork	1982 (2006)
University College Dublin	2003
University of Limerick	2005

#### Specialist and State Research Organisations

National College of Art and Design	2013
National College of Ireland	2011
Royal College of Surgeons in Ireland	2007
Marine Institute	
Teagasc	2011

#### Institutes of Technology

Athlone Institute of Technology	2008
Cork Institute of Technology	2009
Dublin Institute of Technology	2007
Dundalk Institute of Technology	2012
Galway-Mayo Institute of Technology	2008
Dun Laoghaire IADT	2012
Institute of Technology Blanchardstown	2000
Institute of Technology Carlow	2008
Institute of Technology Sligo	
Institute of Technology Tralee	2009
Institute of Technology Tallaght	2000
Limerick Institute of Technology	2008
Letterkenny Institute of Technology	1998
Waterford Institute of Technology	2008



## B1: Research expenditure, research agreements and consultancy 2015: University, Specialist and State research organisations

	Research expenditures (€) (less block grant) in the reference year	Industry	Number of collaborative research agreements with industry	Number of contract services agreements with industry	Number of consultancy agreements with industry	Total Number of Collaboration, contract services and consultancy agreements with industry
<b>University</b>						
Dublin City University	€40,000,000	€4,220,000	87	0	4	91
Maynooth University	€18,101,466	€1,321,407	64	0	2	66
NUI Galway	€51,698,318	€3,766,072	71			71
Trinity College Dublin	€91,474,215	€2,195,381	98	0	5	103
University College Cork	€89,819,378	€6,287,356	38	32	4	74
University College Dublin	€84,982,000	€3,016,861	88	67	2	157
University of Limerick	€28,094,842	€3,090,433	48			48
<b>Specialist and State research organisations</b>						
National College of Art and Design	€123,000	€27,552	18	12	0	30
National College of Ireland	€80,000	€0	0		0	0
Royal College of Surgeons in Ireland	€16,890,521	€793,854	20	0	2	22
Marine Institute	€5,200,000	€0	0	0	0	0
Teagasc	€40,700,000	€3,256,000	14	1	217	232

## B2: Research expenditure, research agreements and consultancy 2015: Institutes of Technology

	Research expenditures (€) (less block grant) in the reference year	Industry	Number of collaborative research agreements with industry	Number of contract services agreements with industry	Number of consultancy agreements with industry	Total Number of Collaboration, contract services and consultancy agreements with industry
<b>Institutes of Technology</b>						
Athlone Institute of Technology	€3,466,303	€277,304	14	126	2	142
Cork Institute of Technology	€15,492,468	€2,649,212	48	49	60	157
Dublin Institute of Technology	€14,600,000	€438,000	28	0	4	32
Dundalk Institute of Technology	€5,200,000	€136,760	26	0	0	26
Galway-Mayo Institute of Technology	€872,000	€50,308	4	17	0	21
Dun Laoghaire IADT	€421,075	€29,475	18	0	1	19
Institute of Technology Blanchardstown	€840,310	€75,628	0	6	0	6
Institute of Technology Carlow	€1,559,600	€162,458	47	9	28	84
Institute of Technology Sligo						
Institute of Technology Tralee	€1,568,420	€109,789	3	16	3	22
Institute of Technology Tallaght	€1,870,987	€225,641	3	9	24	36
Limerick Institute of Technology	€1,976,774	€113,071	2	0	0	2
Letterkenny Institute of Technology	€1,189,000	€0	2	12	1	15
Waterford Institute of Technology	€19,383,970	€775,359	7	241	13	261

## C1: IP and IP transactions 2015: University, Specialist and State research organisations

	Total number of qualified invention/software disclosures received during the year (sole and joint)	Total number of new patent applications filed during the year	Previously filed priority patent applications filed progressed to PCT in year %	Total number of patents granted in year	Total number of patent families owned by the RPO at year end	Total number of licences, options and assignments executed (LOAs)	Market launches of products or services in year based on RPO licence
<b>University</b>							
Dublin City University	35	15	30.0	15	72	<b>25</b>	6
Maynooth University	16	4	50.0	3	16	<b>7</b>	1
NUI Galway	49	10		13	88	<b>6</b>	0
Trinity College Dublin	59	17	62.0	9	130	<b>25</b>	6
University College Cork	68	12	65.0	10	71	<b>21</b>	4
University College Dublin	60	20	39.0	3	87	<b>22</b>	1
University of Limerick	40	10	50.0	0	51	<b>25</b>	5
<b>Specialist and State research organisations</b>							
National College of Art and Design	4	6	0.0	1	0	<b>0</b>	0
National College of Ireland	5	0	0.0	0	0	<b>0</b>	0
Royal College of Surgeons in Ireland	11	0	0.0	2	22	<b>4</b>	0
Marine Institute	0	0	0.0	0	0	<b>0</b>	0
Teagasc	18	3	75.0	3	21	<b>19</b>	4

## C2: IP and IP transactions 2015: Institutes of Technology

	Total number of qualified invention/ software disclosures received during the year (sole and joint)	Total number of new patent applications filed during the year	Previously filed priority patent applications filed progressed to PCT in year %	Total number of patents granted in year	Total number of patent families owned by the RPO at year end	Total number of licences, options and assignments executed (LOAs)	Market launches of products or services in year based on RPO licence
<b>Institutes of Technology</b>							
Athlone Institute of Technology	4	1	50.0	0	0	<b>6</b>	1
Cork Institute of Technology	20	0	50.0	3	11	<b>4</b>	1
Dublin Institute of Technology	35	14	62.5	3	29	<b>18</b>	5
Dundalk Institute of Technology	6	1	0.0	0	0	<b>7</b>	0
Galway-Mayo Institute of Technology	2	0	0.0	0	0	<b>0</b>	0
Dun Laoghaire IADT	1	0	0.0	0	0	<b>0</b>	0
Institute of Technology Blanchardstown	1	0	100.0	0	1	<b>1</b>	0
Institute of Technology Carlow	7	0	0.0	0	0	<b>1</b>	0
Institute of Technology Sligo							
Institute of Technology Tralee	2	0	0.0	0	0	<b>0</b>	0
Institute of Technology Tallaght	7	0	0.0	0	2	<b>6</b>	0
Limerick Institute of Technology	5	2	0.0	0	0	<b>0</b>	0
Letterkenny Institute of Technology	1	0	0.0	0	0	<b>0</b>	0
Waterford Institute of Technology	9	3	66.0	1	10	<b>9</b>	4

## D1: Spin-out companies, incubation & use of facilities 2015: University, Specialist and State research organisations

	Number of spin-outs established during the year	Number of staff start-ups established during the year	Number of Active spin-outs in existence at the end of the year	Number of companies supported within the incubator in year	Number of contracts with companies for use of facilities and equipment at the RPO
<b>University</b>					
Dublin City University	4	0	7	31	7
Maynooth University	1		7	8	2
NUI Galway	0	0	13	33	
Trinity College Dublin	3		25	10	718
University College Cork	3	0	9	17	
University College Dublin	4	0	21	36	56
University of Limerick	2		9	27	94
<b>Specialist and State Research Organisations</b>					
National College of Art and Design	0	0	1	3	4
National College of Ireland	0	0	0	16	16
Royal College of Surgeons in Ireland	0	0	2		0
Marine Institute	0	0	0	0	0
Teagasc	1	0	1	0	26



## D2: Spin-out companies, incubation & use of facilities 2015: Institutes of Technology

	Number of spin-outs established during the year	Number of staff start-ups established during the year	Number of Active spin-outs in existence at the end of the year	Number of companies supported within the incubator in year	Number of contracts with companies for use of facilities and equipment at the RPO
<b>Institutes of Technology</b>					
Athlone Institute of Technology	1	0	0	25	9
Cork Institute of Technology	1	1	0	67	2
Dublin Institute of Technology	6	3	10	76	5
Dundalk Institute of Technology	3	0	0	23	0
Galway-Mayo Institute of Technology	0	0	0	33	22
Dun Laoghaire IADT	0	0	1	41	0
Institute of Technology Blanchardstown	0	0	1	50	1
Institute of Technology Carlow	0	0	1	26	32
Institute of Technology Sligo					
Institute of Technology Tralee	0	0	1	24	1
Institute of Technology Tallaght	0	0	0	47	57
Limerick Institute of Technology	0	0	0	100	0
Letterkenny Institute of Technology	0	0	0	35	0
Waterford Institute of Technology	2		1	26	16

# Appendix 2

## List of Research Performing Organisations (RPOs)

Reporting Sector	Institution
	University College Dublin
	Dublin City University
	University College Cork
<b>University</b>	National University of Ireland Galway
	Maynooth University
	Trinity College Dublin
	University of Limerick - partial return only
<b>Institute of Technology</b>	Dublin Institute of Technology
	Waterford Institute of Technology
	Cork Institute of Technology
	Athlone Institute of Technology
	Institute of Technology Blanchardstown
	Institute of Technology Carlow
	Dundalk Institute of Technology
	Dun Laoghaire Institute of Art, Design & Technology
	Galway-Mayo Institute of Technology
	Letterkenny Institute of Technology
	Limerick Institute of Technology
	Institute of Technology Sligo
	Institute of Technology Tallaght
Institute of Technology Tralee	
<b>Specialist Institute</b>	National College of Ireland
	National College of Art and Design
<b>State Research Body</b>	Royal College of Surgeons in Ireland
	Marine Institute- partial return only
	Teagasc

# Appendix 3

## Glossary

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<b>Active spin-out</b>	An Active Spin-out is an RPO-created spin-out company that, as at the end of the reference year, has at least one paid employee and has raised equity and/or it has booked sales revenue. It is an incorporated entity which at the time of formation was dependent on the exploitation of specific intellectual property rights of the RPO. The RPO will have executed a licence to the spin-out for the IPR and/or will hold equity in the spin-out. (Excludes start-ups and spin-ins).
<b>Assignment</b>	Contract transferring ownership of right in IP to a third party.
<b>Collaborative research agreement</b>	Contractual arrangement covering a research project/programme between a third party and an RPO. The project/programme may be fully-funded by the third party or funded partly by the State and partly (in cash and/or in kind, including participation in the research itself) by the third party. Collaborative research may involve two or more parties. This covers research itself so, for example, there would be an expectation of publication, it might be tackling fundamental questions, and the outputs would not be guaranteed. (Excludes contract services, consultancy, academic collaborations and research grants).
<b>Consultancy agreement</b>	Contractual arrangement in which the RPO provides professional-level work to an external client organisation through an academic, researcher or other member of RPO staff in exchange for a full commercial fee. The work is specified (or agreed) by the client against deliverables agreed with the RPO. (Excludes collaborative research, contract services and research grants).
<b>Contract services</b>	Contractual arrangement in which the RPO undertakes a project for a third party but doesn't charge a commercial fee. These projects are not considered "research" as the intention is not to create new knowledge but rather to provide a particular solution. Publication is not expected. This includes agreements that may involve a "work order". (Excludes collaborative research, consultancy, academic collaborations and research grants).
<b>Equity</b>	Shareholding in a legal entity.
<b>FTE</b>	Full Time Equivalent - People working part-time are only included for the fraction that they are employed.
<b>Incubator</b>	A dedicated facility on the RPO campus in which early stage companies are housed and supported (pre- and post-formation). The facility may offer desk space, laboratory space or a mix of both.

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<b>Invention disclosure</b>	The invention disclosure is the first actual recording of an invention, and is a step in the IP management process that could potentially lead to commercialisation of technology. The researcher and TTO/ILO will complete an Invention Disclosure Form (IDF), which is a written, signed, and dated record of an invention that has in some way been reduced to practice i.e. it is tangible. The IDF contains basic information, including supporting data, which helps to evaluate and subsequently protect and, potentially, commercialise the intellectual property associated with an invention. The TTO/ILO will have undertaken initial assessment of the invention disclosure before it is accepted into the TTO/ILO portfolio for further commercial analysis.
<b>ILO</b>	Industry Liaison Office – the team responsible for managing KT services, including intellectual property management, licensing, partnering with industry and the creation of new companies.
<b>Joint invention/software disclosure</b>	Simultaneous reporting of an Invention Disclosure for the same invention or software to more than one RPO that has been created jointly by more than one RPO via the TTO/ILO.
<b>KT</b>	Knowledge transfer – the sharing of expertise, capability, technology and intellectual property between the research base and industry or the public sector with the aim of developing new or improved products, processes and services that deliver societal and economic benefit.
<b>Licence</b>	A contract under which IP rights are transferred from one party to another for the purpose of commercialisation.
<b>LOA - Licence, Option or Assignment</b>	A contract under which IP results are transferred, or agreed to be transferred, from one party to the other for the purpose of commercialisation.
<b>MNC</b>	A multinational corporation that has its facilities and other assets in at least one country other than its home country. Such companies have offices and/or factories in different countries and usually have a centralised head office where they coordinate global management.
<b>MNC Irish</b>	HQ based in Ireland.
<b>Non-commercial entity</b>	Public sector organisation or charity.
<b>Option</b>	A contract under which the RPO grants a potential licensee a period of exclusivity during which it can decide whether it may wish to take a licence to the intellectual property and negotiate the terms of a licence agreement. The option period may include evaluation of the IP by the potential licensee (including assessing the technology). This is may be called an Option & Evaluation agreement.

<b>PCT</b>	Patent Cooperation Treaty -the Treaty makes it possible to seek patent protection for an invention simultaneously in each of a large number of countries by filing an “international” patent application.
<b>Priority filing</b>	The first filing of a patent application which will establish a priority date from which all national patents will derive. Depending on patent strategy the priority filing may be done as a provisional application or national patent application or regional or international (PCT) patent application.
<b>Reference year</b>	The twelve-month reporting period from January 1st to December 31st.
<b>Research grant</b>	An award to an RPO by a research funding agency (e.g. government agency, charity) to perform a programme of research with the intention of disseminating the research results. Typical research funders may include: SFI, ERC, Wellcome Trust.
<b>RPO</b>	Research Performing Organisations. Universities, institutes of technology and other research institutions funded primarily by public funds. Also referred to as PRO (Public Research Organisations).
<b>SME</b>	Has up to 249 employees and has either an annual turnover not exceeding €50 million or an annual balance sheet total not exceeding €43 million.
<b>SME Irish</b>	HQ based in Ireland.
<b>Sole invention / software disclosure</b>	An Invention Disclosure for an invention or software created by one RPO and reported to that RPO via the TTO/ILO.
<b>Spin-in</b>	Company formed external to the RPO, which is not based on RPO IP, research or resources, and which does not involve RPO staff or students. In becoming a spin-in the company becomes based in the RPO (e.g. within an incubator) and/or provides equity to the RPO in exchange for access to business services from the TTO.
<b>Spin-out</b>	A spin-out company is a new, incorporated business based primarily on knowledge and/or intellectual property originating from the RPO in which the RPO holds equity and/or has a licence to the IP.
<b>Start-up</b>	Company formed by staff or students from the RPO not based on knowledge or IP generated by the RPO and where there is no formal IP licence or equity share with the RPO. (Excludes spin-out or spin-in companies).
<b>TTO</b>	Technology Transfer Office – the team responsible for managing KT services, including intellectual property management, licensing, partnering with industry and the creation of new companies.







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