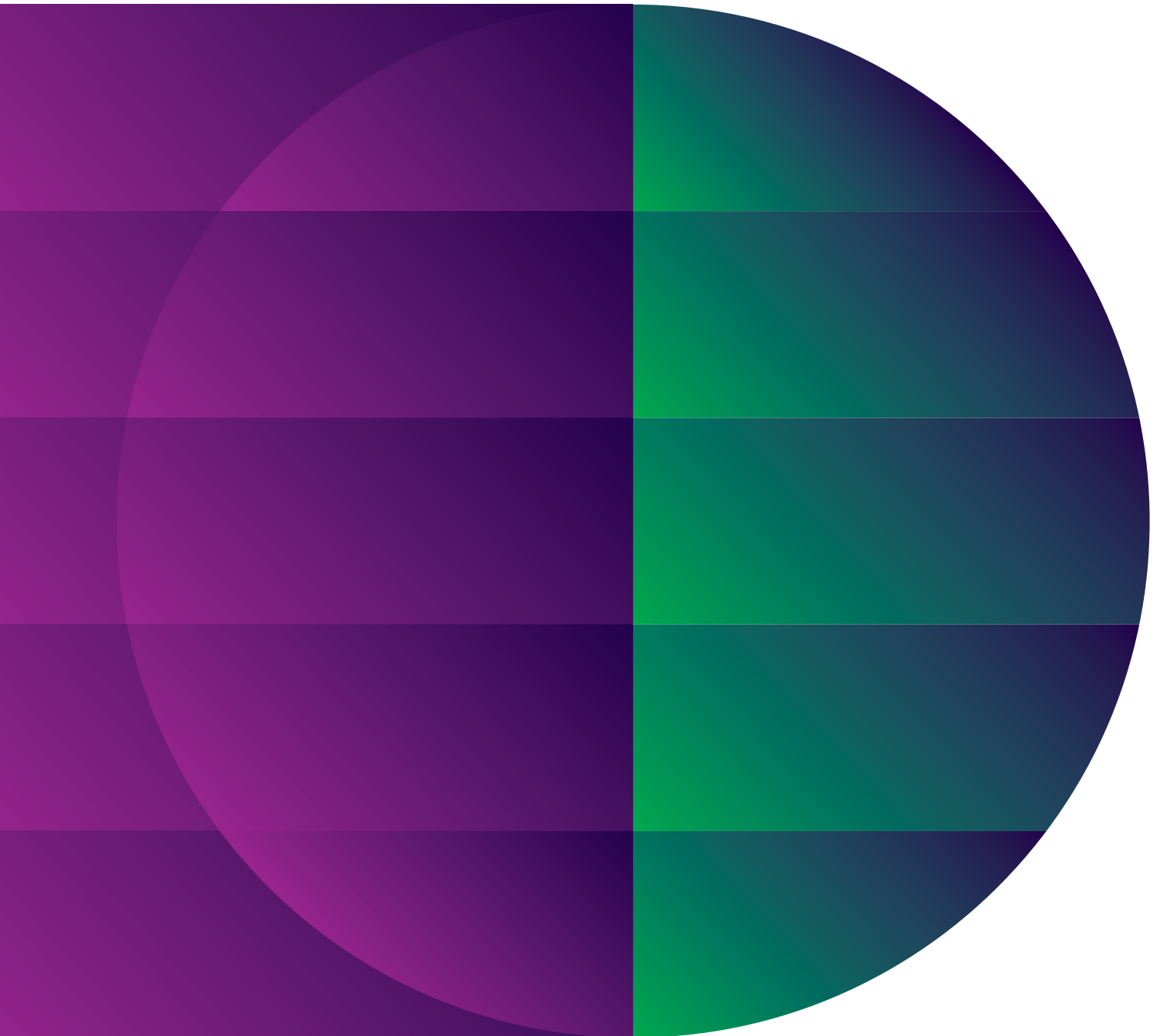


# KTI REVIEW AND ANNUAL KNOWLEDGE TRANSFER SURVEY **2017**



Supported by

# In 2017

**164**

LOAs to RPO  
intellectual  
property signed



**1,324**

live research  
collaboration  
agreements  
with industry



**670**

new consultancy  
services agreements  
signed



**111**

spin-outs thriving  
at least three years  
post-incorporation  
at the end of 2017



**82%**

of companies that  
signed collaboration  
agreements with  
RPOs were based  
in Ireland



**21**

new spin-out  
companies  
were formed



**94%**

collaboration  
agreements with  
the SME sector were  
with Irish SMEs



**€563m**

RPO research  
expenditure



**24**

new products and  
services were launched  
on the market in 2017  
as the result of a  
licence from an RPO



**116**

new patent  
applications were  
filed by RPOs



**455**

new invention  
disclosures



**915**

jobs in Active Spin-  
out Companies



# Contents

This publication details Knowledge Transfer Ireland's activities during 2017 and highlights some of the knowledge transfer outcomes from the sector. As part of our work, KTI collects and analyses data from Ireland's universities, Institutes of Technology and other State-funded research organisations, together termed Research Performing Organisations (RPOs), to produce the national Annual Knowledge Transfer Survey (AKTS). The AKTS tracks business engagement and commercialisation between the commercial sector and RPOs. The AKTS is published jointly with the Higher Education Authority. The AKTS2017 can be found in the second part of this publication.

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# From the Director



Commercialisation of publicly funded research in Ireland is still young and it has built a strong track record in a relatively short time. This is due, in great part, to a combination of a system-wide approach to research commercialisation and to the people who deliver it – researchers, entrepreneurs, R&D leaders in business and the technology transfer offices.

We have a clear national policy for research commercialisation that aims to “Maximise the economic and societal benefits and returns to Ireland from its public investment in research” and encourages our universities and institutes to make commercialisation decisions that support this intent and to “Maximise the benefit of commercialisation to Ireland rather than maximise returns...”. This was re-affirmed early in 2018 in a joint statement from the Department of Education and Department of Business Enterprise and Innovation “We want our education system to be the best in Europe by 2026. Knowledge transfer, including commercialisation, is a key mission of our higher education institutions and is important to delivering on this ambition.”

Creating this fertile landscape has allowed knowledge transfer to flourish. Providing clear objectives has set the direction for growth. Measuring how well this has been achieved is not straightforward, and presents a challenge for many advanced nations. Volume of activity and revenue return are one set of measures. The broader impacts of knowledge transfer and commercialisation also need to be considered in the equation to properly assess success and economic and social return. As the recent MacMillan review of good practice in technology transfer in the UK stated: “technology transfer tends to be expensive and very few – if any – universities worldwide make money from technology transfer. Technology transfer is generally a cost to universities, not a source of additional revenue, though it can lead to other revenues or benefits.”

Through our work supporting the knowledge transfer system, KTI actively promotes good practice and best in class outcomes. This publication brings this together in one place. Through a combination of data, external reports and case studies a more holistic picture of performance can be drawn and success appreciated. The case studies that we have included in the publication give a flavour of the richness of knowledge transfer from the RPO sector and highlight some of the real impacts of commercialisation - the development of jobs, products, new and improved services that make things better for people at a personal, local and national level. Examples range from consultancy services that support commercial product development to disruptive technologies that create new business and jobs in the regions. There are two special features on navigating the research landscape and spin-out companies from Universities.

To complement this, we have produced an animated video, “What is Knowledge Transfer”, to explain knowledge transfer and the various ways in which publicly funded research is developed to benefit enterprise, the economy and society. It’s available on the KTI YouTube channel.



Our work would not be possible without the support from Enterprise Ireland and the Irish Universities Association, who together in 2017 renewed their funding commitment to KTI. We also benefit from the time, advice and enduring support given by the members of our Industry Advisory Board. I am very grateful to all the people who work with us formally and informally, to drive forward the knowledge transfer agenda.

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

## Who we are

Knowledge Transfer Ireland (KTI) was created as the result of the recommendation from a Government-led task force that reviewed the state of business-research base engagement in 2012 and is embedded in the Government Report “Putting Public Research to work for Ireland” and in the national strategy for science, technology and innovation “Innovation 2020”. KTI was formally launched in May 2014 as a partnership between Enterprise Ireland and the Irish Universities Association.



## What we do

As the national office with oversight of the knowledge transfer system, KTI’s mission is to make it simple for industry and entrepreneurs to benefit from Irish research and expertise. We reach out to enterprise, raising awareness of the benefits of working with the research base and the resources available to support that engagement – from finding partners and technology opportunities to cementing the relationship through formal contracts. Through our communications and events and through our work with agencies, Government Departments and associations to input into policy and practice, we support the knowledge transfer environment. KTI manages a programme of funding from Enterprise Ireland that helps sustain the technology transfer offices within the Higher Education sector. Our reviews and publications report and reflect on system performance.

### Over the past four years

- .....
- Over 134,000 visitors to KTI website**
- .....
- Created 11 Practical Guides, 25 Model Agreements, 5 Pro Forma Templates**
- .....
- Hosted 5 conferences, 7 workshops and masterclasses**
- .....
- 34 Impact Awards presented across 4 award ceremonies**
- .....
- Involved 3 Expert Groups and undertook a range of consultations**
- .....
- Produced national IP Protocol 2016**
- .....
- Managed €28.5m funding under TTSI2 & €34.5m under TTSI3**
- .....
- 37 TT staff hold the global RTTP credential**
- .....
- 40 FTE in TTOs funded (TTSI3)**
- .....
- International profile built, meetings and presentations to 25 countries**
- .....
- Delivered 4 Annual Knowledge Transfer Surveys (AKTS)**
- .....
- Undertook 3 AKTS Outcomes Reports**

# How we operate

KTI is based within Enterprise Ireland with co-funding from the IUA. We engage formally with the industry and investor community through the KTI Industry Advisory Board (IAB). We are accountable to the Department of Business, Enterprise and Innovation and to the Presidents of the Irish universities.

## KTI Industry Advisory Board

The KTI Industry Advisory Board 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 of the Industry Advisory Board during 2017 and 2018

Brian Dalton, Department of Business Enterprise & Innovation  
Karl Flannery<sup>†</sup>, Storm Technology Ltd (Chair to February 2018)  
Brendan Hogan, Aerogen Limited  
Helen McBreen, Atlantic Bridge Capital  
Tony McEnroe, SiriusXT Limited  
Keith O'Neill, Abbott Laboratories (Chair from February 2018)  
John O'Sullivan<sup>†</sup>, ACT Venture Capital Limited  
Richie Paul, Alkermes Pharma Ireland Limited  
Alan Phelan<sup>†</sup>, SourceDogg  
Ena Prosser<sup>†</sup>, Fountain Healthcare Partners  
Malcolm Skingle<sup>†</sup>, GlaxoSmithKline plc  
Jim Walsh, Trinity Biotech plc

## Knowledge Transfer Stakeholder Forum

The Knowledge Transfer Stakeholder Forum (KTSF) brings together representatives from the major funding agencies and the university and IoT sector with a direct interest in 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 of the KTSF 2017 and 2018

Jennifer Brennan, Technological Higher Education Association (THEA)  
Liam Brown, Limerick Institute of Technology  
Peter Brown, Irish Research Council  
Alison Campbell, KTI (Chair)  
Leo Clancy, IDA Ireland  
David Corkery, University College Cork (for the Irish Knowledge Transfer and Innovation Group of HEIs)  
Ned Costello<sup>†</sup>, Irish Universities Association (IUA)  
Brian Dalton, Department of Business, Enterprise and Innovation  
Richard Howell, Department of Agriculture, Food and the Marine  
Gemma Irvine, Higher Education Authority  
Eucharía Meehan<sup>††</sup>, Irish Research Council  
Jim Miley, Irish Universities Association (IUA)  
Gearoid Mooney, Enterprise Ireland  
Darrin Morrissey, Science Foundation Ireland  
David Murphy<sup>†</sup>, NUI Galway (for the Irish Knowledge Transfer and Innovation Group of HEIs)  
Maíread O'Driscoll, Health Research Board  
Ray O'Neill, Maynooth University

<sup>†</sup> Alan, Ena, John, Karl and Malcolm reached the end of their terms on the IAB during 2017 and 2018. We are extremely grateful to them for their advice, vision and support during their years on the Board.

<sup>††</sup> We extend our gratitude to Ned, David and Eucharía who stepped down from the Forum during 2017/18. Their contributions have been greatly appreciated.

## Contact

To find out more about our work and who to talk to, visit our website at [www.knowledgetransferireland.com](http://www.knowledgetransferireland.com)

## The KTI Team



**Alison Campbell**  
Director



**Michelle O'Reilly**  
Operations Manager



**Elizabeth Carvill**  
Communications Manager



**Siobhan Horan**  
Programme Manager



**Rowena Elliott**  
Projects Executive



**Ursula O'Keeffe**  
Administrator

During 2017 we benefitted from having two students in the team who were participants in Enterprise Ireland's Work Experience Placement Programme: Tadhg Hanlon and then Ronan Devaney. Christine Crawford joined in October 2017 as Communications Manager (maternity cover).

# Research and Innovation in the Higher Education Sector - Views from the Top

We asked two Vice Presidents for Research and Innovation why knowledge transfer matters to them and to the sector. Here's what they had to say.



**Professor Anita Maguire** is Vice President for Research & Innovation at University College Cork and has held this position since 2011. She is also Professor of Pharmaceutical Chemistry and Co-PI Synthesis & Solid State Pharmaceutical Centre (SSPC). She was elected a Member of the Royal Irish Academy in 2014.

University College Cork's strategic mission is *"Creating, understanding and sharing knowledge and applying it for the good of all"* and one of our key strategic goals is to *"Be a leading university for research, discovery, innovation, entrepreneurship, commercialisation and societal impact"*. This explicit commitment to creating and applying knowledge underlines the centrality of knowledge transfer as an integral element of our Research and Innovation strategy. Creating and nurturing effective long-term partnerships with the enterprise sector is a key priority, building on research expertise, infrastructure and ideas, complementing the role of the HEI sector in growing and developing the work force of the future. Effective knowledge transfer allows the UCC research community to expand the impact of their work, through transforming their novel technologies and ideas into products that benefit the local community and society more broadly, in addition to delivering potential economic benefits to our region and the country. For example, strategic relationships have been developed with global leaders, such as Rockley Photonics, Intel, United Technologies Research, State Street Bank and others, as part of our innovation ambitions. UCC Intellectual Property is found in products ranging from microelectronics to digestive health to anti money laundering software. Recently two of our spinout companies, based on IP emanating from research programmes over the past two decades, have been acquired by major international multinationals - Oculus and Agilent. Most significantly the acquirers have decided to invest locally and retain R&D activities in the region close to the research expertise, creating high value long term employment opportunities for our graduates and bringing significant inward investment. This trend is reminiscent of early steps leading to vibrant regional growth, where industry clusters around innovative universities.

The impact of knowledge transfer has accelerated in recent years in UCC, as it has in our sister HEIs across the state, thanks to the increased professional experience of our teams and the improved coherence nationally enabled through KTI. National initiatives which incentivise interinstitutional collaboration starting with PRTL1 and more recently through the SFI funded Research Centres, complemented by KTI funded Technology Transfer Consortia, ensure that the research and innovation activities are shared across HEIs maximising the sharing of best practise and creative collaboration. The Bridge Network linking knowledge transfer in UCC, CIT, Teagasc and IT Tralee ensures KT expertise and experience is shared to improve commercial outcomes for all. Our KT impact, and that across the State, has been underpinned by sustained investment in the research landscape a national system that actively funds research at the academic-industry interface, particularly led by EI and SFI.

The future is exciting for knowledge transfer, with significant relationships established between the Irish public research community and industry. Among the key challenges is the fact that cutting-edge companies operate in a global market, and, accordingly, if we are to compete our research must be globally leading, not just nationally competitive. Critically, knowledge transfer is a long-term game - investment in research can take decades to reach an exciting commercial outcome and is a complex non-linear process. Sustaining teams and ideas over this timescale can be very challenging with expectations of KT outcomes on a shorter timescale. Resilience and 'staying the course' are key attributes. One thing is sure - without an active research landscape, commercial knowledge transfer outcomes cannot be generated. The long-term R&I policy commitment evident at government level, despite the economic challenges over the past decade is to be commended in this regard. Identifying commercial champions to take IP and transform this into viable companies and matching these with the creative and innovative researchers is always challenging and could be described as an art form!

As a country, with long term commitment to sustained supports to deliver both high quality research and effective professional knowledge transfer, we can be optimistic about the future.





**Dr Liam Brown** is Limerick Institute of Technology's Vice President Research, Development and Innovation. He has a rich experience in research-industry interaction having managed Enterprise Ireland's largest collaborative R&D programme, operated in conjunction with the IDA, Technology Centres and prior to that was a European Framework National Contact Point for R&D.

Innovation in the HEI sector is no longer a luxury but is a necessity to survive and thrive in a globally competitive landscape. LIT is an innovative regionally focused Higher Education Institute with a national and international outlook. We empower our diverse student body by providing a quality higher education experience enabling economic, social and cultural development. Our vision is to be a leading provider of higher education that is student centred, research informed, industry relevant and accessible for all. Active leadership in education, enterprise and engagement is our operational philosophy. Research, Development, Innovation (RDI) and knowledge transfer are central to LIT's strategy. We engage actively with industry, business and the community and our proactive approach to the creation and support of new enterprise contributes significantly to the development of the local and regional economy.

With five campuses and co-located Enterprise Centres, across Limerick, Tipperary and Clare, on an annual basis LIT supports over one hundred start-ups, a mix of entrepreneurial spin-ins and spin-outs. When this is combined with our R&D engagements with established firms – SMEs and multinationals from the region and beyond, it creates a critical mass and scale. Through this we have been able to develop specialist core areas in fields relevant such as Biotechnology and Food, Health and Wellness, Industry 4.0/Internet of Things, Sustainable Energy, Rural Development and Social Enterprise. We bring focus to modern day societal challenges including social care, gender, migration and are a centre for Design, Fashion, Fine art and the Creative sector.

The world has evolved significantly in the last number of years and the pace of change has been accelerating at a rate that makes it difficult for industry to keep up. It is no longer possible for organisations to react, and instead they must innovate, adapt and advance technologically. As one of our partners, John Neilan, Director of New Ventures at Cook Medical says: *"To maintain and develop our competitive edge, we have a clear focus on innovation and knowledge transfer. Active engagement with the third level sector is a key aspect of our strategy and is critical to our business sector. Successful outcomes for us are dependent not only on expertise, which is paramount but HEIs must also be agile, responsive, collaborative and focused on delivery. We expect that this approach will continue to deliver innovative solutions to our company and the wider sector, which is an absolute necessity for national competitiveness and further investment in Ireland."*

The LIT RDI approach is strategically orientated, market led, impact focused high-quality research projects and enterprise and development services which form the foundation of research excellence at LIT. Through dedicated partnerships between LIT researchers and industry partners our aim is to create a blueprint to remove traditional obstacles to innovation and revolutionise the way the public and private sector work together to bring research developments and advancements to the marketplace for societal benefit and to create new innovative opportunities for current and future learners which benefit industry and the wider community.

Nationally it is critical that RDI activities continue to have a strong applied focus, delivering specific innovative outputs in partnership with industry, community and other external stakeholders. Innovation in the HEI sector must be continually pursued and it is vital that national policy continues to support the funding and delivery of focused RDI which addresses regional needs with national and international development perspectives. It is important to engage on a deeper level with community, enterprise, industry and education providers in the region to deliver a more cohesive offering to all stakeholders. In summary a clear focus, agility, responsiveness and collaboration will continue to be the hallmarks of innovation in the HEI sector.

Businesses that have used KTI resources tell us that they find them helpful. Whilst encouraging, the challenge still remains to raise awareness among the companies and entrepreneurs who are not yet familiar with the KTI tools.



*Barry Fennell, KTI, with Minister of State for Training, Skills, Innovation, Research and Development, John Halligan TD and Tom Kelly, Enterprise Ireland, at the National Ploughing Championships.*

## Making connections

During 2017 we continued outreach through a variety of channels, including referrals from colleagues across the agencies. Throughout the year, KTI attended a number of externally hosted events, both in Dublin and in the regions, where we met companies and often presented on our work. These included the National Ploughing Championships, Enterprise Ireland's International Markets Week, IBEC Medtech conference, IRDG regional events and the University Industry Innovation Network conference.

Now in its fourth year, the annual KTI Summit is becoming recognised as a regular feature in the innovation landscape. "Accelerating Ideas", held in September, attracted around 200 delegates, 40% of whom were from industry. There was a range of plenary and panel sessions involving Irish and international speakers from industry, the investment community and from the knowledge transfer profession. They shared their experiences of research collaboration, new venture creation and insights on innovation. As well as gaining new perspectives, the Summit was a great opportunity for networking.

Communications across print, radio and digital media secured over €799,210 worth of coverage during the year. This included features in Irish Times, Sunday Independent, Irish Examiner and Silicon Republic. We grew our social media presence and engagement through targeted activity, doubling the number of Twitter profile visits and growing our Twitter follower base by 31% in 2017. KTI's LinkedIn audience increased by 57%. The monthly LinkedIn blog from the Director, which is used to highlight KTI resources and publications and to provide topical commentary, receives an average of 4,000 impressions. The quarterly KTI Newsletter, introduced during 2016, performed well in 2017 with a 25% increase in subscribers by the end of the year, bringing readership to over 1,000. The number of visitors to the KTI web portal increased by 9% in 2017 on the previous year, with over 44,000 visitors.

There continues to be international interest in KTI and its role in the national ecosystem. We hosted visits, gave talks and met with representatives from Australia, China, India, Lithuania, New Zealand, Singapore and UK. After visiting in 2016, Singapore developed its own National IP Protocol which was launched in 2017.

## New tools and resources

We developed and launched the "Find R&D Funding" tool on the KTI website. Simple and comprehensive, it is an interactive resource for companies interested in engaging in R&D, either alone or in collaboration with the research base. Regularly updated, "Find R&D Funding" provides information on the various sources of funding, incentives and other supports available.

This tool is complemented by a more detailed "Directory of Centres" on the KTI website which builds on the 2016 DJEI Directory and is updated to provide links to all the centres of scale funded through Enterprise Ireland and Science Foundation Ireland. In 2017 this was expanded to include the EI Technology Gateways.



## Policy and practice

KTI works with a number of agencies and departments to further support the development of knowledge transfer and to make the process of engaging with the research base in Ireland simple and more straightforward.

Together with the Higher Education Authority, we commissioned an external review of Intellectual Property Policies & Procedures in Higher Education. The report was presented to the Department of Education and Department of Business, Enterprise and Innovation in December 2017 and published in early 2018. The report recognised that commercialisation of intellectual property is an important area of activity for higher education institutions and is a system that has evolved rapidly over a short time. The report concluded that the higher education institutions demonstrate good practice, particularly in the management of IP commercialisation, and identified some areas for improvement in streamlining IP policies and in the management of conflicts of interest. The report is available on the KTI website.

During the year, the Irish Research Council published new terms and conditions for its Fellowships programmes with industry. This included making available template agreements which KTI assisted the Council to prepare.

KTI has contributed to culture change in an unobtrusive way and is developing an increasingly strong and trusted 'brand'.

## System Performance

The last Annual Knowledge Transfer Survey, was published in June 2017. The survey, undertaken with the Higher Education Authority, details system performance across the broad spectrum of knowledge transfer and commercialisation.

The follow-on "Outcomes Report" provides further detail on the products, services and Active Spin-outs that have arisen from the research base and work of the TTOs. It was published in November.

We also published several reports including the results of the externally commissioned "Review of the Performance of the Irish Technology Transfer System 2013-2016" and the "International Panel Review of KTI Progress 2014-2017". The review of KTI concluded that we had achieved a great deal in a short time, with very limited resources, and noted that success and achievements were endorsed by all stakeholders - particularly those from industry. KTI has contributed to culture change in an unobtrusive way and is developing an increasingly strong and trusted 'brand'.

# Celebrating success

The annual **KTI Impact Awards 2017** brought together over 160 people from industry, academia and the technology transfer profession to celebrate some of the successes in knowledge transfer.

The awards recognise the outcomes from commercialisation of research and the people in the technology transfer offices across the country who make those successes possible. Submissions were judged across seven categories by a panel of international experts, and the awards were presented at the ceremony, in March, by Minister of State for Training, Skills, Innovation, Research and Development, John Halligan TD.



Winners of the 2017 KTI Impact Awards



## Licence2Market Award

Teagasc, the agriculture and food development authority, licensed novel technology to Ornua Cooperative Ltd that enabled the company to manufacture cheese in countries with a shortage of fresh milk. This led to Ornua opening a multi-million euro cheese manufacturing plant in Saudi Arabia. With plans to extend its product range, the company demonstrated strong growth plans to fill the capacity of the plant over the next five years.



## Consultancy Award

The Rusal Aughinish Alumina plant in Limerick sought the expertise of researchers at MACSI (a group of mathematical modelers and scientific computational analysts) at the University of Limerick to develop bespoke systems for their aluminium extraction business. The company wanted to ensure that the quality of their extracted products would not be affected in the event of a loss of power at their plants. This project resulted in a staggering 200pc increase in the accuracy of prediction of product quality, enhancing the overall efficiency and decision-making of the plant.



### KTI Collaborative Research Award

Ceramicx, a Cork-based heat processing specialist, worked with a team of engineers from Trinity College Dublin to develop a first-of-its-kind 3D infrared IR heat detector which has major implications for industry and manufacturing, reducing waste and saving on costs. The product helped Ceramicx increase sales, which jumped by 32% between 2015 and 2017, and employee numbers, which grew by 50% in the five years since the project began



### KTI Initiative of the Year

Trinity College Dublin and University College Dublin working together established the €60 million University Bridge fund, managed by Atlantic Bridge, in 2016. The purpose of the fund is to meet funding gaps through earlier investment in science-based companies, building executive teams and creating the capacity to follow the investment. The fund ensures that Ireland is now internationally competitive from a campus company and scaling perspective.



### KTI Achiever of the Year

Paul Maguire, Senior Licensing Executive in ICT and Engineering at Dublin Institute of Technology's technology transfer office, personally supported the creation of 19 new companies for DIT and its partner Institutes of Technology and developed over 50 new industry engagements. This was significant delivery which boosted innovation for DIT and its partners.



### Spin-Out Company Award

Kastus was spun out from Dublin Institute of Technology to develop technology that can be used during production processes to render any glass, ceramic or metallic surface 99.99% resistant to superbugs like MRSA, ecoli and other fungi. With multi-million euro revenue projections, the company secured VC investment from the Atlantic Bridge University Fund and began to grow the company staff.



### Mature Spin-Out Award

UCC spin-out company, InfiniLED Ltd, was founded in 2011. The company creates low power micro-LED display technology. In 2016, it was acquired by Facebook-owned virtual reality company Oculus. This has led to significant inward investment in Cork and the creation of high skilled jobs in the region.

# Enabling Knowledge Transfer

The Technology Transfer Strengthening Initiative (TTSI) is the only funding programme that supports the infrastructure and resourcing of technology transfer offices (TTOs) to encourage the development of a world class knowledge and technology transfer system in Ireland. The third phase of this Enterprise Ireland funded programme, which is managed by KTI, commenced in 2017.

Over the previous funding cycles, TTSI1 put people in place to start a process of technology transfer and TTSI2 successfully continued to encourage the embedding of commercialisation in higher education activities. TTSI3 focuses on encouraging high quality outcomes from the technology transfer system and simplifying engagement for industry with Research Performing Organisations (RPOs) - including Universities and State Research Bodies. TTSI3 is a five-year, €34.5 million programme. Funding is provided to eight consortia, comprising 26 RPOs.

The Managed Consultancy Services Pilot Programme is a new initiative under TTSI3. Its objective is to extend the range of ways in which industry can benefit from access to knowledge and expertise in HEIs and to have this managed in a way that ensures ease of access, ease of transaction and simplicity and consistency in those processes. The programme is designed to pump prime professionalisation of the management of this consultancy activity leading to self-sustaining “managed consultancy” support that fulfils this strategic objective. Co-ordinated by KTI, the universities that are participating in the pilot are sharing and developing best practice as they develop the service.

Following the conclusion of the TTSI2 funding programme we commissioned an independent “Review of the Performance of the Irish Technology Transfer System (2013 - 2016)”. The evaluation demonstrates that the TTSI programme has had a key role to play in the development and delivery of technology transfer activity in the State. In this second phase, TTSI2 had successfully built on the earlier TTSI1 programme and there was evidence of steady performance in licensing activity and spinout company creation. Combined with effective policies and resources nationally, the programme has enabled a more consistent experience for companies engaging with RPOs and businesses generally rate the TTOs with which they interact highly. Within the RPOs, Researchers were overwhelmingly positive about TTOs. The contribution of Knowledge Transfer Ireland and the National IP Protocol was rated highly and the role of KTI was viewed as a key driver of change.

KTI has encouraged technology transfer office staff to apply for the global credential of Registered Technology Transfer Professional (RTTP). Another three people received recognition in 2017, bringing the total number of accredited RTTPs in universities, institutes of technology and State research organisation to 37.

A group of experienced knowledge transfer practitioners representing RPOs throughout Ireland came together at the KTI Annual Conference 2017 to form a KT Community of Practice. The aim of the group is to share common interests and solve common problems in all aspects of negotiating and executing knowledge transfer agreements. The group continues to organise specialist training seminars to support professional development within the KT sector in Ireland.

# Navigating the Research Landscape

## **NORTH EAST/NORTH WEST**

Dundalk Institute of Technology  
Institute of Technology Sligo  
Letterkenny Institute of Technology

## **WEST**

Galway-Mayo Institute of Technology  
Marine Institute  
National University of Ireland, Galway

## **MID-WEST**

Institute of Technology Tralee  
Limerick Institute of Technology  
University of Limerick



## **DUBLIN**

Dublin City University  
Dublin Institute of Technology  
IADT Dun Laoghaire  
Institute of Technology,  
Blanchardstown  
Institute of Technology Tallaght  
National College of Art and Design  
National College of Ireland  
Royal College of Surgeons Ireland  
Trinity College Dublin  
University College Dublin

## **MIDLANDS/MID-EAST**

Athlone Institute of Technology  
Maynooth University

## **SOUTH/SOUTH EAST**

Cork Institute of Technology  
Institute of Technology Carlow  
Teagasc  
University College Cork  
Waterford Institute of Technology

The KTI website offers searchable information on the research landscape. Here we explain how the different types of organisations and focussed research groupings fit together and how they engage with industry.

The KTI website makes it simple to navigate the research landscape and to find out about who to contact. We provide information on universities, Institutes of Technology, other colleges and research organisations and their technology transfer offices. Through the Directory of Centres and Gateways, we provide information about individual State funded R&D centres of scale.

## **Higher Education Institutes (HEIs) and other colleges**

### **Universities**

There are seven universities, from the oldest, Trinity College Dublin, founded in 1592, to the newest, Dublin City University DCU, established in 1989. The quest for excellence is their bedrock and they are internationally recognised for quality in education, research and the overall student experience. They rank in the top 600 universities worldwide. The universities advance knowledge through teaching, scholarly research and scientific investigation and all are active in knowledge transfer and external engagement. Each university has a dedicated Technology Transfer Office responsible for IP and commercialisation and interactions with companies.

### **Institutes of Technology**

The Institutes of Technology (IoTs) are state-recognised third level institutions focused on teaching and purpose-driven research. They allow students to progress from two-year (higher certificate) programmes through primary degree to Masters and PhD awards and such awards are fully integrated with the highest award levels of the Irish National Framework of Qualifications. IoTs support knowledge transfer and external engagement and each has staff resource, often through an Industry Liaison or Innovation Office, to support these activities. Each IoT manages an on-campus incubator which supports early stage start-up companies and several host Enterprise Ireland funded Technology Gateways.

### **Other colleges**

In addition to universities and Institutes of Technology, there are a number of other third level and postgraduate institutions, several of which provide specialist training and focussed research in disciplines such as medicine and art. These include: the Royal College of Surgeons in Ireland, the National College of Art and Design, and the National College of Ireland.

# State Research Centres of scale

## SFI Research Centres

Science Foundation Ireland funds large-scale research centres focused on thematic areas of research that are considered to be of major economic impact for Ireland including pharmaceuticals, software, digital content, big data, telecommunications, photonics, medical devices, nanotechnology, marine and renewable energy, functional foods, perinatal research, applied geosciences, agri-food, advanced and smart manufacturing, neurological diseases and the bioeconomy. Centres are hosted by a university and draw in researchers from across various universities and IoTs to form a critical mass of focussed research expertise. The Centres actively collaborate with, and are co-funded by, both Irish and international companies, large and small, in areas of mutual research interest. SFI Research Centres are open to engagement with potential new industrial partners at any time. Centres have dedicated business engagement managers who work through the appropriate University Technology Transfer and research contracts office to complete new collaborative research agreements.





### Enterprise Ireland/IDA Ireland Technology Centres

Technology Centres are collaborative entities established and led by industry, focussed around a common agreed research programme for their sector or area of interest. Technology Centres are a joint initiative between Enterprise Ireland and IDA Ireland and participation is open to Irish companies, large and small, and multinationals. Technology Centres will have a lead university and involve highly qualified researchers and research teams across a number of universities and IoTs, undertaking market-focused strategic RDI for the benefit of industry. Over time (typically five to eight years), the company group is expected to match the State investment through cash and in-kind co-funding or research. There are 14 Technology Centres in areas of energy research; cloud computing; E-learning; pharmaceutical manufacturing; connected health; data analytics; dairy processing; food for health; governance compliance & risk; manufacturing research; composites; IT innovation; meat; and microelectronics. Technology Centres will work through the appropriate University Technology Transfer and research support offices in respect of intellectual property and contractual issues.



# Enterprise Ireland Technology Gateways

**LETTERKENNY IT  
WISAR**  
Wireless Solutions

**IT SLIGO  
PEM**  
Precision Engineering  
and Manufacturing

**GMIT GALWAY  
MET**  
Medical and Engineering  
Technologies

**LIMERICK IT  
SHANNON ABC**  
Applied Biotechnology

**IT TRALEE  
iMaR**  
Intelligent Mechatronics and RFID

**SHANNON ABC**  
Applied Biotechnology

**CORK INSTITUTE  
OF TECHNOLOGY  
CAPPA**  
Innovation Through Light  
**TEC**  
Embedded Systems

**ATHLONE IT  
APT**  
Polymer Technologies  
**COMAND**  
Connected Media

**DIT  
CREST**  
Coatings Innovations

**IT TALLAGHT  
MICRA**  
Bio Diagnostics

**IT CARLOW  
DESIGN+**  
Applied Design

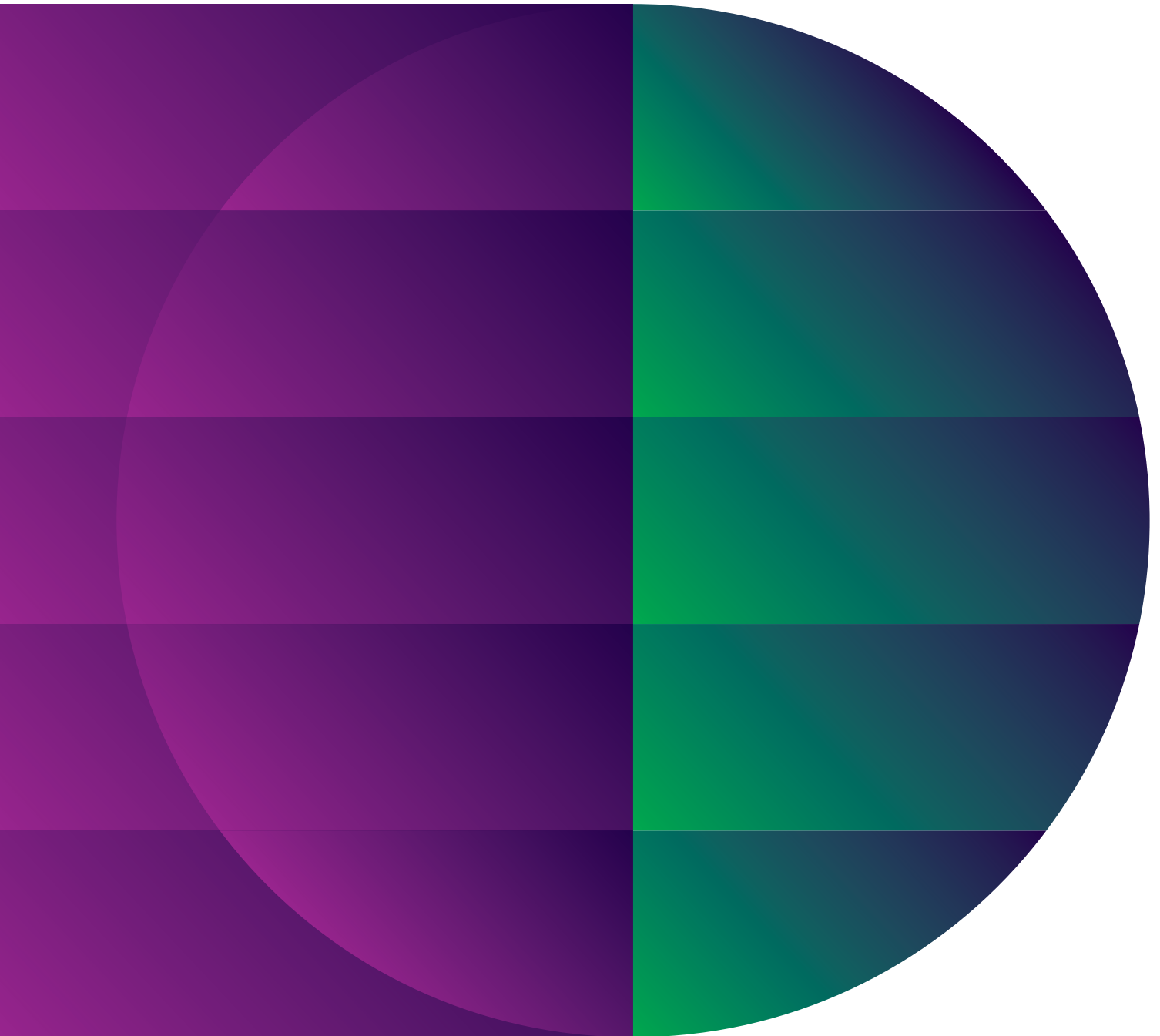
**WATERFORD INSTITUTE  
OF TECHNOLOGY  
SEAM**  
Engineered Materials  
**PMBRC**  
Pharmaceutical and  
Healthcare  
**TSSG**  
Mobile Services

The Enterprise Ireland Technology Gateway Programme was established to increase the level of interaction between the Institutes of Technology and Industry. The network consists of 15 industry focused Gateways based in 11 Institutes of Technology spread across the country. Gateways are open access points for Irish industry of all sizes and deliver technology solutions for companies close to their market needs. In the past five years, 46% of the total funding for industry projects has come directly from the companies.

Research areas covered include: pharma and healthcare; medical technologies and diagnostics; engineering; manufacturing; applied biotechnology; polymer technologies; coatings; mobile services; wireless systems; embedded systems; light technologies; connected media; and applied design. As a network, companies can leverage the expertise of over 300 industry focused researchers, together with access to specialist equipment and facilities across the 11 IoTs, via a single local point of contact – the Gateway Business Development Manager.

**TECHNOLOGY GATEWAYS**  
delivering solutions for industry  
an Enterprise Ireland network

# ANNUAL KNOWLEDGE TRANSFER SURVEY **2017**



# 1

## Introduction

The Annual Knowledge Transfer Survey (AKTS) is a review of business engagement and commercialisation activity (knowledge transfer).

The AKTS is produced by KTI in conjunction with the Higher Education Authority (HEA) with data collected from Research Performing Organisations<sup>1</sup> (RPOs). This is the fourth time that this annual survey has been published and it provides a longitudinal study on knowledge transfer performance in Ireland.

The purpose of knowledge transfer with the research base is to maximise the flow of technology, IP and ideas. In turn this enables companies (existing and new) and the public sector, to drive innovation leading to economic and social benefit. The AKTS covers the range of KT activities that include licensing, spin-out creation, intellectual property commercialisation and business engagement such as collaborative research, consultancy services and use of facilities and equipment.

The main contact at the RPO for this survey was its technology transfer office (TTO)<sup>2</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. KTI wishes to thank the Technology Transfer Offices and Industrial Liaison Offices in the RPOs for their continued support and contribution to this survey.

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).



<sup>1</sup> RPOs are the Universities, Institutes of Technology and other State-funded entities undertaking research, see Appendix 2

<sup>2</sup> See glossary at Appendix 4

# 2

## Executive summary

The AKTS 2017 presents data for the period 1 January - 31 December 2017. Data are collected on behalf of KTI and the HEA by Insight Statistical Consulting.

The RPOs that are required to submit to the AKTS comprise Ireland's seven Universities and fourteen Institutes of Technology and five further institutions engaged in research. A complete list of RPOs is provided in Appendix 2. This year there was an excellent response with 25/26 RPOs submitting data to the survey. One institution, IT Sligo, failed to provide a return and the AKTS report should be read with that in mind. In some limited cases, there were partial returns, mainly where RPOs do not routinely capture certain data, and this is flagged in the relevant sections of this report.

It is apparent from the survey that activity and output measures are stabilising, with trends suggesting figures of 450-500 invention disclosures and 115-120 priority patent applications per annum. The annual rate of spin-out company formation is around 20-30 new companies per year. The number of licences, options and assignments executed has varied a little, but not wildly, with an average of around 160-170 per year.

When it comes to collaboration with companies, the new and tighter definitions introduced in 2016 don't permit direct granular annual comparison. The most meaningful way to explore trends is through combining figures for collaboration agreements and consultancy services and comparing with previous totals for collaborative research, contract research and consultancy agreements. Whilst there is some fluctuation over the past three years it may settle out at around 2,000 new agreements per year. However, as consultancy work is not well captured within the RPOs, these data may be erratic.

What is clear is that collaboration with Irish companies is thriving. This year 82% of companies that signed collaboration agreements with RPOs were based in Ireland and 94% of collaboration agreements signed with the SME sector were with Irish SMEs. More generally, over 1,000 different companies have signed agreements with RPOs relating to research related projects and there are over 300 companies for whom this is a repeat engagement over the past three years.

As a follow-on from the AKTS, outcome measures are investigated. The number of new product and service launches on the market by companies, as a result of a licence from an RPO, has varied between 24-38 over the past three years. With the small numbers involved any change can appear a large discrepancy. Of the 93 products and services that were reported as launched in prior AKTS 2013-2015, 67 (72%) were still available on the market. Those which were licensed into RPO spin-outs appear to be more likely to still be available.

Active Spin-out companies, three years and more post-formation, declared in year are also followed up. As this is cumulative, the number of such companies has been growing in recent years. There is much to be positive about. Looking back to the 78 Active Spin-outs reported in 2013, 83% were found to be either still independently active or successfully acquired or merged with another company by the end 2016. It is estimated that the Active Spin-outs reported in 2016 employ around 1,000 people. Similar outcome studies have been commissioned on the 24 products and services launched and the 111 Active Spin-outs reported in this AKTS2017.

To generate these outputs there is significant work undertaken within the technology transfer offices in the RPOs. The role includes: supporting the RPO in preparation of funding proposals; negotiating a range of contracts with industry relating to collaboration and consultancy services; evaluating new intellectual property, IP protection and management, licensing, spin-out company creation, managing incubation facilities, student enterprise training and building KT networks.

# 3

## Research funding in Ireland

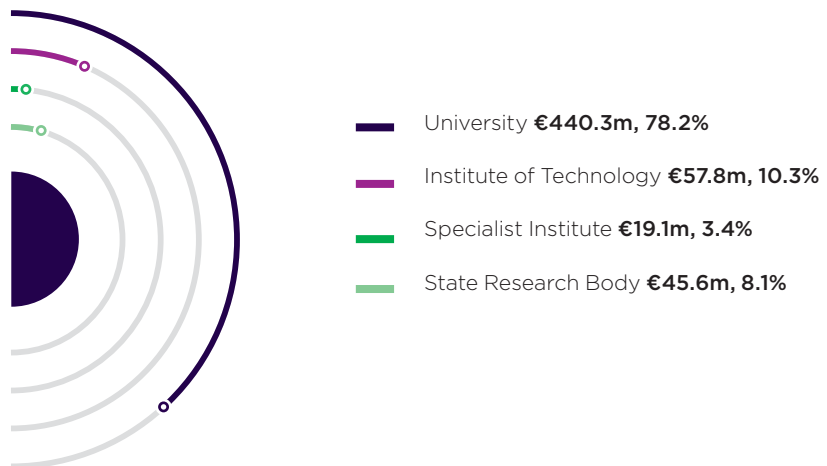
The latest figure available for Ireland's total investment in Higher Education R&D (HERD) is €730million for 2014/15.

The figure for research expenditure (less block grant) by the RPOs in 2017 was provided by the individual Finance Departments. The total is approximately €563 million (€535 million, 2016). 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.

The University sector accounted for most of the research expenditure at approximately 78% (€440 million). The Institutes of Technology sector accounted for approximately 10% (€58 million). The Specialist Institute sector (RCSI, NCAD, NCI) and the State Research Bodies (Marine Institute and Teagasc) accounted for the rest. This is a similar profile to the previous year.



Figure 1: Research expenditures by type of RPO, 2017



# 4

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

One of the principle ways that business benefits from working with RPOs is through access to research and expertise.

### Collaborative Research

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.

Characteristics of collaborative research with industry: *The purpose of collaborative research is the generation of new knowledge. Typically, there will be an expectation of publication although the project may be governed by aspects of confidentiality. Intellectual property may be created and how the company benefits will be determined in the collaboration agreement and will depend on the contribution to the project made by the company.*

### Consultancy Services

Consultancy services projects are where 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 commercial fee. The work is specified (or agreed) by the client against deliverables agreed with the RPO.

Characteristics of consultancy services: *The purpose of consultancy is not typically the generation of new knowledge, rather it draws on existing knowledge. There will usually be no expectation of publication, results will be confidential and will be transferred to the client. The type of work might typically involve one or more of the following: advice; analysis; production of a report. Projects will generally be of a short term.*

Contracts relating to Enterprise Ireland Innovation Vouchers are broken out as a specific category under Collaborative Research to provide more detail and consistency in reporting. Consultancy Services includes contracted services and consultancy advice. It is worth noting that data relating to Consultancy are traditionally more problematic to collect as the engagements are often not managed centrally within the RPO.

The total number of collaboration agreements (including innovation voucher funded projects) and consultancy services agreements executed with industry in 2017 was 1,896. This represents a decrease of 8% on 2016 (2,072). Overall the RPOs have signed collaboration agreements with 1044 different companies and there were 306 repeat engagements with the same company, or companies, within the past three years, similar to the previous year's figure of 315. There were 1324 research collaboration projects<sup>3</sup> (wholly and part-funded) with industry live at 31 December 2017.

The number of Collaborative Research Agreements (part- and wholly-funded by industry) has fallen again this year by 9% to 684 (721, 2016). However, it is interesting to note that, for the first time, the number of Collaborative Research Agreements signed that relate to projects fully funded by industry has risen (427, 2017; 346, 2016) and the proportion of fully-funded agreements dominated part funded, at 62% of total. When the Innovation Voucher funded projects are included, the total number of agreements signed that related to collaborative projects rises to 1226 (1243, 2016).

In 2017, the number of Consultancy Services Agreements signed with industry dropped by 19% to 670 from 829 the previous year<sup>4</sup>. A further 114 consultancy agreements were signed with non-commercial entities<sup>5</sup>.



<sup>3</sup> In addition to AKTS non-responder IT Sligo, no data were provided by IT Tallaght, Letterkenny IT, NCI

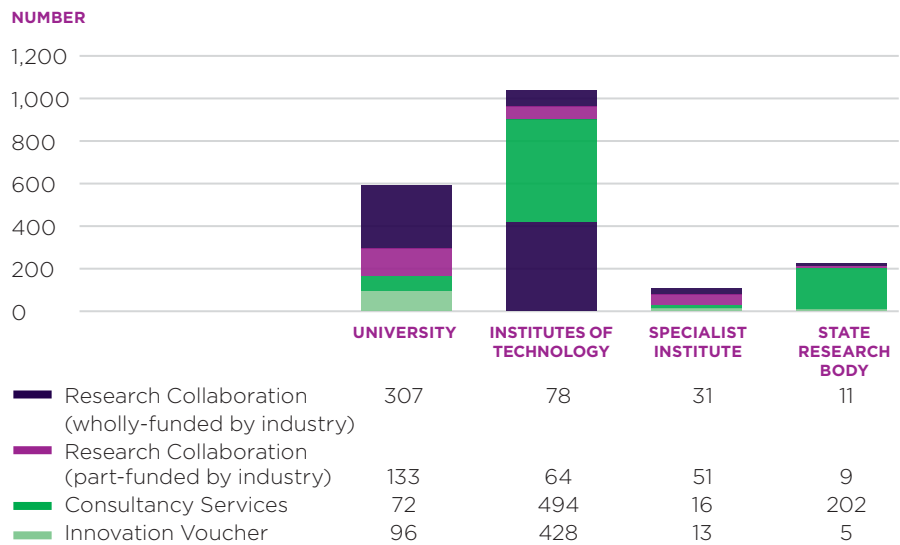
<sup>4</sup> In addition to AKTS non-responder IT Sligo, no data were provided by NCI

<sup>5</sup> In addition to AKTS non-responder IT Sligo, no data were provided by Letterkenny IT, NCAD

## Business access to research and expertise within Ireland's RPOs (continued)

The total number of each type of agreement entered by the relevant groups of RPOs in 2017 is illustrated in Figure 2 which demonstrates a propensity for collaborative research in the university and specialist institution groups. The IoT group shows a greater propensity to engage in shorter term projects through Consultancy Services and projects funded by companies through Innovation Vouchers. The high figure for Consultancy Services in the State Research Body is reflective of Teagasc's mission to provide consultancy to the agri-food sector.

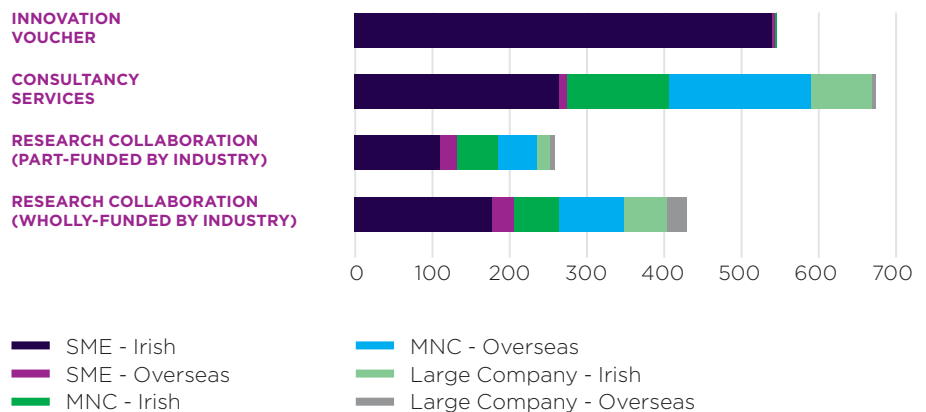
**Figure 2: Number of collaboration and consultancy services agreements with industry in 2017 by RPO type**



### 4.1 Working with Irish companies

From the information provided about sharing research and expertise with companies, 82% of companies with whom the RPOs have executed collaborative agreements (including Innovation Voucher projects) are based in Ireland, (78% 2016). 94% of collaboration engagements with SMEs are with Irish SMEs. When Consultancy engagements are included this figure rises to 94% and 43% of engagements with MNCs are with Irish-located companies, both of which are fairly consistent with the 2016 figures.

**Figure 3: Locations of companies with whom the RPO has executed a collaborative research or consultancy services agreement in 2017, by number of agreements signed**

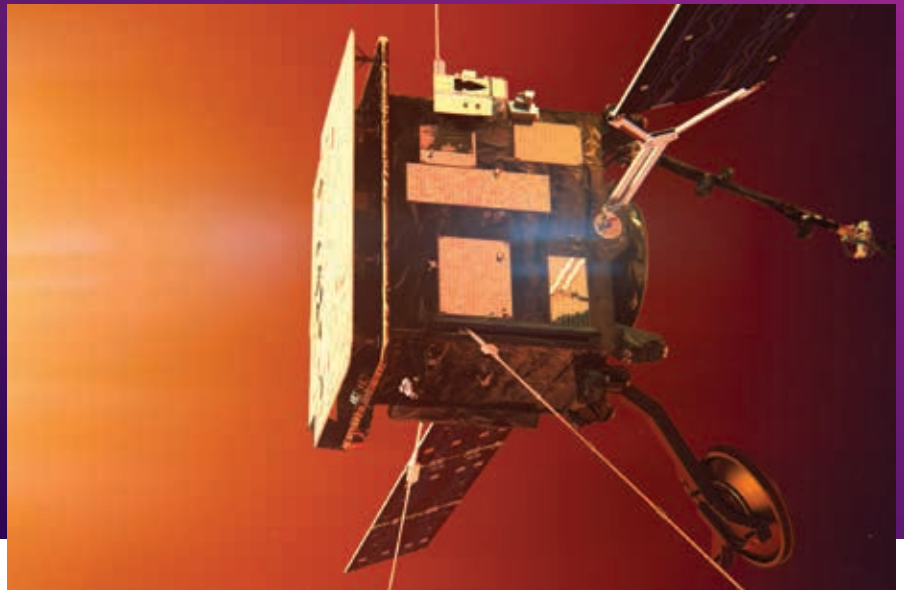




## University College Dublin technology takes flight

**Underpinning funding  
sources include**  
European Space Agency

**Added value from the TTO**  
Relationship Management,  
Contract Negotiation,  
Intellectual Property Protection,  
Licensing, Support for Funding



ENBIO is a world leading, specialised coatings company. The company invented a technology called CoBlast, which offers industry the potential to redefine the performance, function and value of metals across all sectors.

Deep space travel poses many significant environmental challenges to spacecraft. To minimise the risk, protective outer coatings are required. ENBIO had worked with the European Space Agency (ESA) to develop a thermal control coating. When ESA asked the company for a white version, ENBIO contacted Dr Kenneth Stanton from the School of Mechanical and Materials Engineering in UCD for help. This was the start of a long-term collaborative research project leading to the development and commercial delivery, in 2017, of SolarWhite, a thermo-optical coating developed to reflect radiation and protect spacecrafts.

Rigorously tested for space-flight readiness, it is the only qualified white coating on the €1.7 billion Solar Orbiter mission. In 2017, ENBIO secured additional funding to further develop SolarWhite. It has doubled its workforce, located both in Dublin and Clonmel including locating new laboratories at UCD to maximise the benefits of the research and has benefitted from recruitment of graduates and postgraduates involved in the collaboration over the years.

“Collaborative Research with UCD not only led to a breakthrough technology but enabled us to double our workforce, and was transformative for the company’s business model”. John O’Donoghue, CEO, ENBIO

The TTO supported ENBIO in its research collaborations at UCD, filing a patent application and subsequently licensing the patented technology to the company. Additional support has been provided to assist the company to locate at NovaUCD and in the application process for additional research funding.

# 4

## Business access to research and expertise within Ireland's RPOs (continued)

Breaking this down further, results indicate that 68% of Research Collaboration agreements (wholly or part funded by industry, excluding Innovation Voucher funded projects) signed by RPOs in 2017 were with Irish companies (62% 2016). Of these Research Collaboration agreements with Irish companies, 38% were projects co-funded by the State (59%, 2016) and 62% were fully funded by an Irish company (41%, 2016). Of the Research Collaboration Agreements signed with Irish companies (part and wholly funded by the company) 61% were with Irish SMEs (286), 24% with Irish-based MNCs (110) and a further 15% (72) with large Irish companies.

Irish companies were reported to account for 99% (538) of agreements signed in 2017 in respect of Innovation Voucher projects, which was the same as the previous year. Of the Consultancy Services agreements executed with industry in 2017, 70% were with Irish companies (77% in 2016).

### 4.2 Revenue from agreements with industry

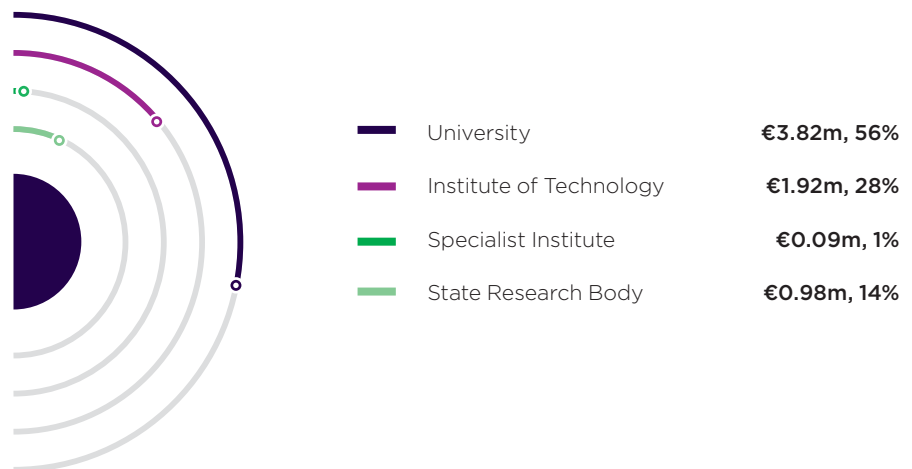
#### 4.2.1. Revenue from research agreements with industry

The AKTS asked for the percentage of research expenditure in year that was derived from industry-related projects. The agreement may have been signed in previous years but the project (and associated funding drawn down) will be live in 2017. The RPOs<sup>6</sup> reported on percentage of research expenditure from industry sources which equates to approximately €58 million (€49 million 2016). At 10% this is improving on previous years (8% 2016). On average, the percentage of research expenditure by universities derived from industry ranged from 1 to 13% and for the IoTs from 0 to 19%.

#### 4.2.2. Revenue from Consultancy Services to business

The gross revenue from Consultancy Services was €6.8 million<sup>7</sup>. Seven of the RPOs returned a zero sum. Gross revenue in the previous year was €3.7 million. In the university sector the range was €0 - €3.7 million and in the IoT sector €0 - €1.1 million. Teagasc reported most Consultancy Services revenue amongst the remaining institutes, reflecting its mission. Given that consultancy activity tends not to be managed institutionally and in many cases the contracts and finances are not managed centrally, the data returned by the RPOs are likely to be an underestimate of the value of consultancy activity from across the RPO sector.

**Figure 4: Revenue from consultancy services by RPO type 2017**



A further €1.5 million revenue was received from Consultancy Services to non-commercial entities. Around half of this was from services supplied by Teagasc, 27% from the IoT sector, and 24% from the university sector.

<sup>6</sup> In addition to AKTS non-responder IT Sligo, no data were provided by IADT, Marine Institute, NCI.

<sup>7</sup> In addition to AKTS non-responder IT Sligo, no data were provided by NCI

## Pumping product development through access to consultancy services

Added value from the TTO  
Contract Support, Intellectual  
Property Management



# SULZER

Sulzer Pumps Ireland has a wide range of pump manufacturing capabilities including machining, assembly, motor winding, packaging and shipping of submersible pumps ranging from 100W to 52kW for use in the wastewater industry. The Wexford facility currently employs 270 people. Sulzer's contact with SEAM group, led by Dr Ramesh Raghavendra at Waterford institute of Technology, began in September 2015 with the re-design of a rotorshaft on the XFP PE3 submersible, solids-handling sewage pump. This is the second largest pump built at the Sulzer plant in Wexford with P2 of 22kW. SEAM utilized a wide range of analysis techniques on PE3 pumps and studied numerous field samples leading to investigation of a number of design options with the final option validated by Sulzer. The company proceeded to prototyping with a minimum of cost and high confidence and, in January 2017, over 5000 units were shipped to customers. There have been zero shaft or fixing screw failures reported. The interaction with Sulzer has been of great benefit to SEAM and has broadened its capabilities and opened new business opportunities.

“SEAM provide a complete materials investigation, design support and failure analysis service. Design improvements implemented on the XFP PE3... based on the above collaboration with SEAM have proven to be entirely successful”. Ben Breen, Product Development Manager at Sulzer.

The project cemented the Sulzer-SEAM relationship and there has been subsequent work from Sulzer in many different materials-related areas. The TTO supported contracting with Sulzer and the management of Intellectual Property within the project and also advised on funding models.

# 5

## Invention disclosures

An invention disclosure records a tangible discovery or development.

The Invention Disclosure Form (IDF) contains the basic information needed to evaluate the intellectual property associated with the invention and, where appropriate, to protect and commercialise it.

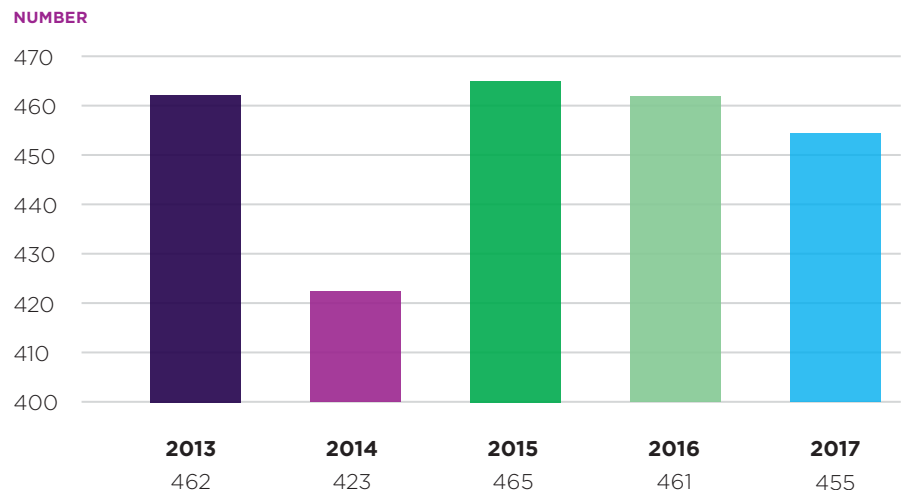
In 2017, there were 455 invention disclosures reported (461, 2016) with the proportional split across the different types of RPO broadly similar to the previous year<sup>8</sup>. The majority of IDFs were in the University sector 72% (330). A further 18% (82) were in the Institute of Technology sector; 5% (21) in the Specialist Institutes group; and 5% (22) and in the State Research Body sector.

For this survey joint invention disclosures are also recorded. Joint invention disclosures relate 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). In 2017 11% of disclosures were joint (50).

**Figure 5: Invention disclosures in 2017 by RPO type**



**Figure 6: Invention disclosures, 2013 – 2017**



<sup>8</sup> In addition to AKTS non-responder IT Sligo, no data were provided by Letterkenny IT

# 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.

### 6.1 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 made in 2017 was 116<sup>9</sup>. This appears to be a consistent trend.

**Figure 7: Priority patent applications, 2013-2017**

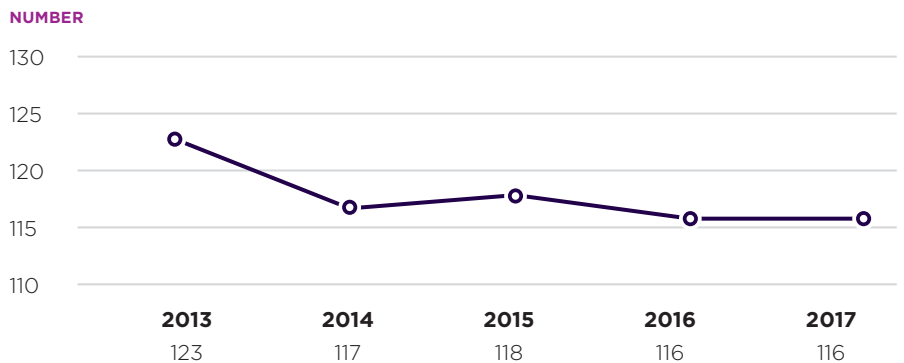


Figure 8 shows a similar split to previous years, with the University sector accounting for three-quarters (78%) of all priority patent applications made by RPOs in 2017 (77%, 2016). The IoTs accounted for 15% of the filings made (17%, 2015). The Specialist Institutes and State Research Bodies were responsible for the remaining 7% of filings.

**Figure 8: Invention disclosures in 2017 by RPO type**

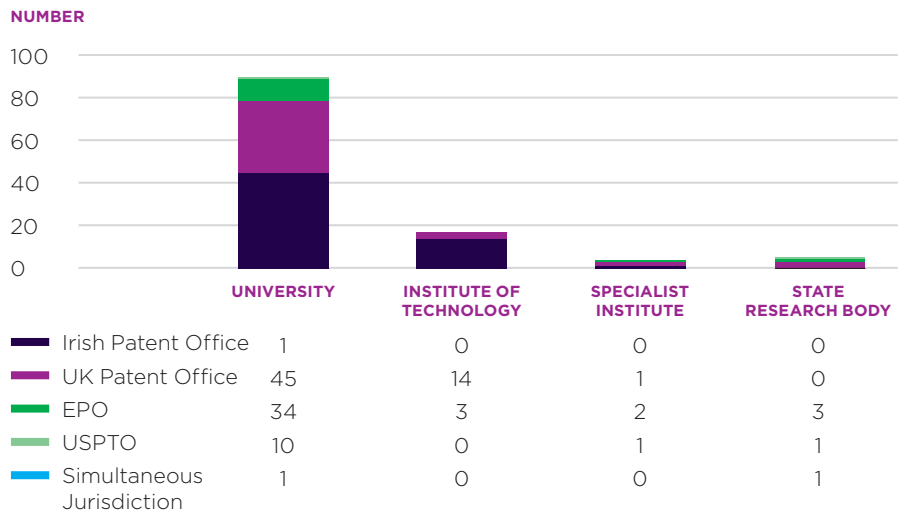


<sup>9</sup> In addition to AKTS non-responder IT Sligo, no data were provided by Letterkenny IT, NCAD

### 6.1.1. Patent filing jurisdictions

The choice of priority patent filing territories is diverse. Not all applications are filed initially 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 for the applicant 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. The UK IPO is the favoured jurisdiction with 52% of initial priority filings made in 2017 (54%, 2016). The EPO is next with 36% (27%, 2016). The level of priority filings made in the Irish patent office has been similar over the earlier three years (4%) however only one (1) of RPO priority filings was made through the Irish patent Office in 2017. Figure 9 shows this breakdown.

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



### 6.2 PCT applications and nationalisation

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

The RPOs reported that, of the 116 initial filings made in 2016, 49 (42%) were progressed to PCT applications in 2017<sup>10</sup>. All universities progressed some initial filings to PCT during 2017 and the range was 14-50%. Only three IoTs reported progressing patent applications to PCT and the range for those that did was 50-100%. That only three IoTs progressed initial patent applications may be due, in part, to the limited number of filings made in the IoT sector and to the lack of budget to enter PCT phase.

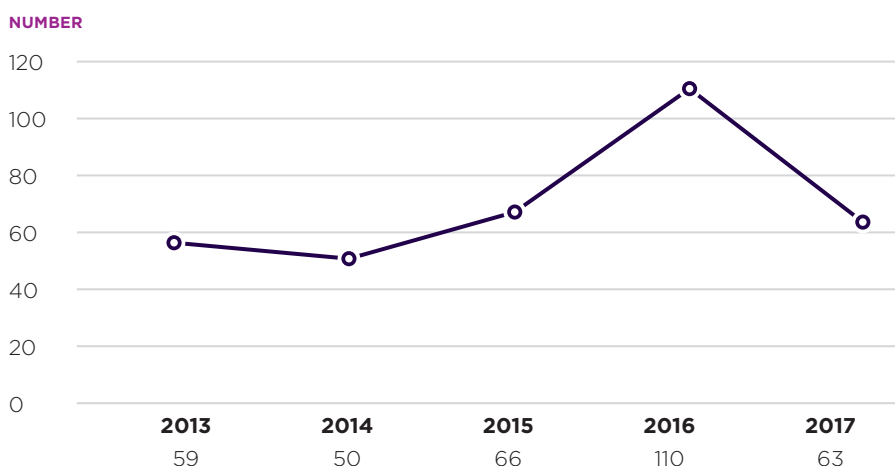
<sup>10</sup> In addition to AKTS non-responder IT Sligo, no data were provided by Letterkenny IT

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 2017, 43 PCT applications entered the national phase (36, 2016). Most of these nationalised applications (93%) were made by the University sector (six universities) whilst two IoTs accounted for the 7% of nationalised patent applications in that sector.

### 6.3 Patents granted

The total number of patents granted in 2017 was 63<sup>11</sup>, down 43% on the previous year (110, 2016) but bringing the numbers granted back to earlier levels. Most of these patents (83%) were granted to inventions from the University sector (91%, 2016). Patent grant depends on the complexity of prosecution within the relevant patent office and takes place of a long time frame, so absolute numbers are not necessarily an indicator of success within any one year. The data as gathered 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 2013 to 2017 is shown in Figure 10.

**Figure 10: Number of patents granted each year, 2013 - 2017**



### 6.4 RPO patent portfolio

The number of patent families owned by the RPOs at the end of 2017 was 712<sup>11</sup>. This has increased from 662 in the previous year. The biggest share of the portfolio is held by the universities, which together hold 86% of the RPO patent estate (88%, 2016). 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.

### 6.5 Reimbursement of patent costs

Six RPOs said that they achieved some reimbursement of patent costs from licensees in 2017. This ranged from just under €4,000 to over €98,000.

<sup>11</sup> In addition to AKTS non-responder IT Sligo, no data were provided by Letterkenny IT

Rights to intellectual property, including copyright, know-how, patents and trademarks are granted through licences, options and assignments (LOAs).

### 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 an agreement 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.

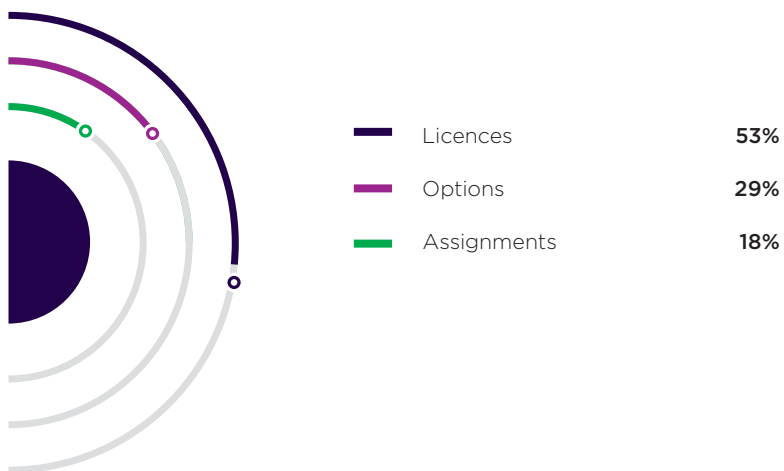
### An assignment

Is an agreement transferring ownership of intellectual property rights from the RPO to a third party.

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

The total number of licences, options and assignments executed by RPOs has dropped by 12% from 2016. In 2017, 164 LOAs were signed<sup>12</sup> (186, 2016). Licensing remains the dominant route to transfer rights, at 53% of all LOAs signed (60% in 2016). Options accounted for 29% of LOAs signed (22%, 2016). Despite the IP Protocol preferring that assignments are used only in limited cases, they account for 18% of the LOAs signed which is the same as for 2016. The breakdown is shown in Figure 11.

Figure 11: LOAs by type 2017



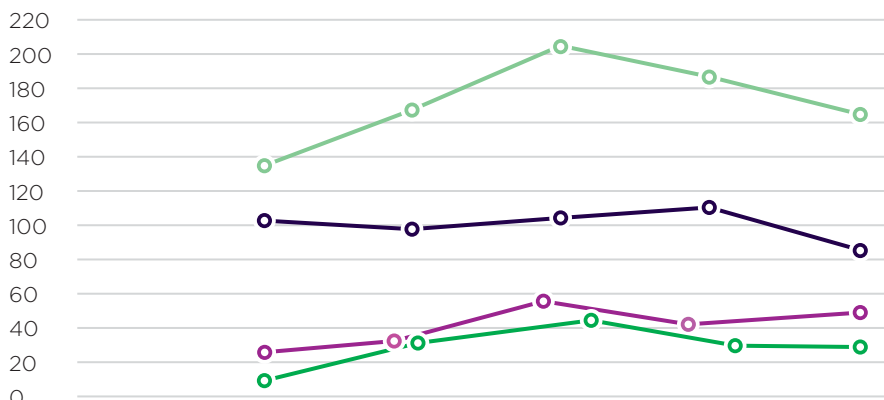
<sup>12</sup> In addition to AKTS non-responder IT Sligo, no data were provided by Letterkenny IT



The five-year trends across licensing, options and assignments can be seen in Figure 12.

**Figure 12: Total number of licences, options and assignments executed, 2013 - 2017**

**NUMBER**

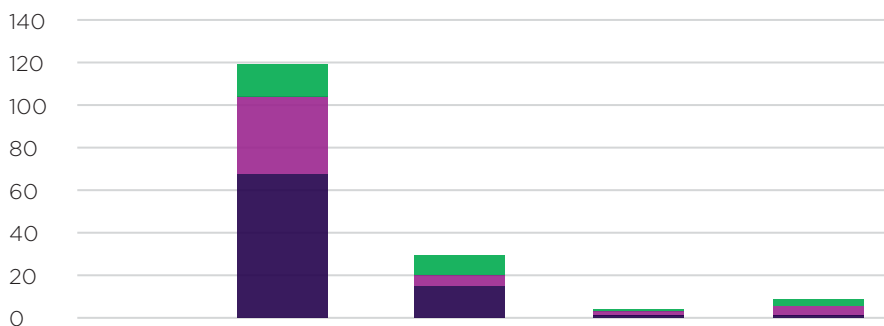


	2013	2014	2015	2016	2017
Licences	103	97	104	111	86
Options	27	36	59	41	48
Assignments	9	35	43	34	30
Total	139	168	206	186	164

A breakdown of licensing type by RPOs in Figure 13 shows that the University sector executed most LOAs 73% (72%, 2016) and that 56% of university IP transactions were licence. Licensing accounted for 48% of the total LOAs in the IoT sector. The number of assignments within the IoT sector was a large 35% in 2017, whereas in 2016 it was a more reasonable 11%.

**Figure 13: Type and number of licences, options and assignments executed in 2017 by RPO type**

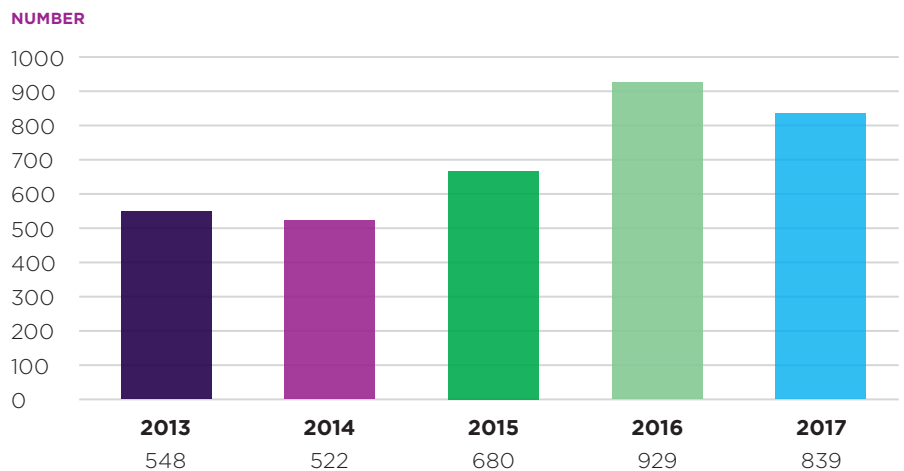
**NUMBER**



	UNIVERSITY	INSTITUTE OF TECHNOLOGY	SPECIALIST INSTITUTE	STATE RESEARCH BODY
Licences	67	15	2	2
Options	38	5	1	4
Assignments	14	11	2	3
Total	119	31	5	9

The total number of licence, option and assignment agreements that were active at the end of 2017 was 839. This was down 10% on the previous year (929, 2016) but similar to 2015. The majority, 77%, were in the University sector (78%, 2016). Figure 14 shows that the cumulative portfolio of active agreements has been steadily increasing until 2017. This might suggest that some of the earlier licences have expired.

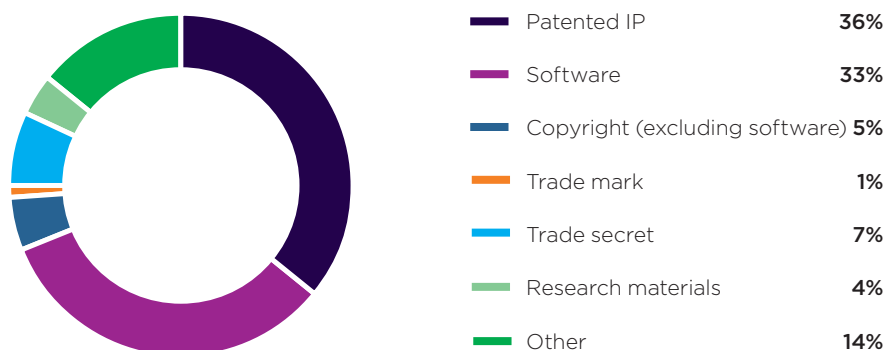
**Figure 14: Total current licence and assignment portfolio, 2013 - 2017**



### 7.2 Types of IP licensed

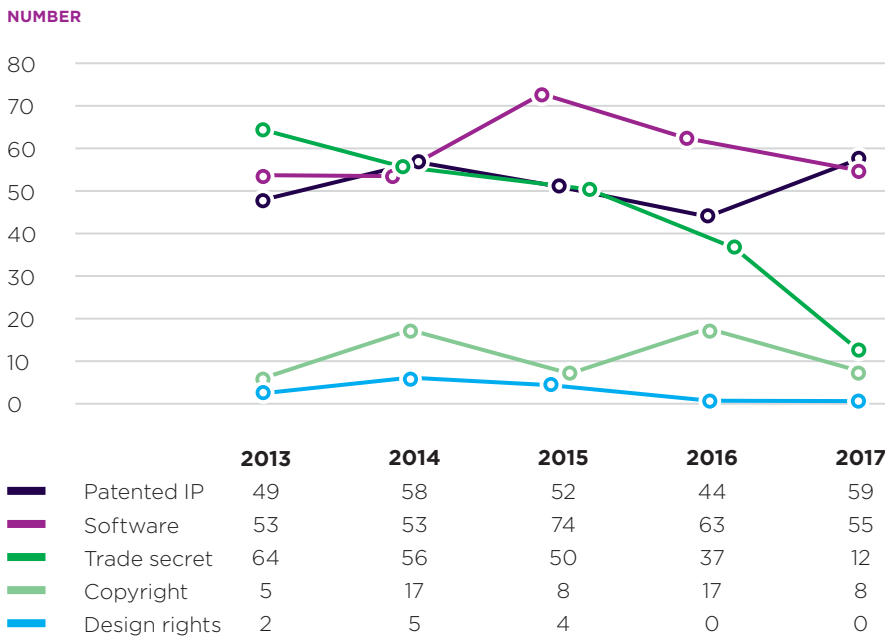
Figure 15 shows the types of intellectual property that were the subject of licence agreements during 2017. More than one piece of IP may be licensed within one agreement e.g. software plus know-how. This year, the category “other” includes biological materials, video and know-how.

**Figure 15: Underpinning IP**



Trends over the past five years are shown in Figure 16 which indicates that the majority of licences are to patented IP and to software. The buoyancy in software licensing, combined with copyright licences, is indicative of the vibrant ICT sector which depends less on patented IP. Licences to trade secrets are declining.

**Figure 16: Major types of intellectual property in LOAs, 2013 - 2017**



### 7.3 Licensees

Figure 17 shows the types of organisations with which agreements were made in 2017. Most LOAs (63%) were transacted with SMEs (72% in 2016).

**Figure 17: Licensee/assignee by company size 2017**



Of the LOAs signed, 76% were with Irish companies (80%,2016). Of these Irish contracts, 83% were with Irish SMEs. Of the non-Irish companies, LOAs were predominantly executed with MNCs (70%).

#### 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. 87 out-going MTAs to companies were signed in 2017 (129, 2016). Most MTAs (93%) were reported by the University sector (94%, 2016).

#### 7.5 Products on the market

Of previous licences from the Irish RPOs, 24 led to market launches of products or services in 2017<sup>13</sup> (26, 2016). Of these, 17 (70%) were from five Universities and six (26%) were from two IoTs. The remaining product/service launch was from a licence from Teagasc. One of the product launches was based on a licence to joint IP from two universities.

#### 7.6 A deeper dive into products launched and reported in the AKTS2016

A third-party review, commissioned by KTI, was undertaken by IP Pragmatics to look into the new products and services that came onto the market in 2016 based on licences from Irish RPOs as reported in the AKTS2016. 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 available and validated data from the AKTS 2016 identified 24 products and services which derived from licences from RPOs were brought to market by 18 different companies based on licences from 11 RPOs. The bulk of these (89%) were based on licences to Irish companies. Of the licensee companies, 40% had been spin-outs from the RPO. When classified by Research Prioritisation areas, the manufacturing and materials sector was the most active (30%) for new products and services in 2016. In the previous two years, the bulk of the licensees were in the ICT sector (42%). In 2016, a total of 29 different types of IP were transferred to generate the 24 products and services. As in previous years, about a third of the licences are based on patents originally filed by the RPO. A slightly smaller number of the licences are based on software code and algorithms. Other types of intellectual property, such as copyright or plant variety rights are also used where appropriate.

<sup>13</sup> In addition to AKTS non-responder IT Sligo, no data were provided by Letterkenny IT

## Licence leads to product launches and company growth

Underpinning funding sources include Enterprise Ireland

Added value from the TTO Licensing; Relationship Management

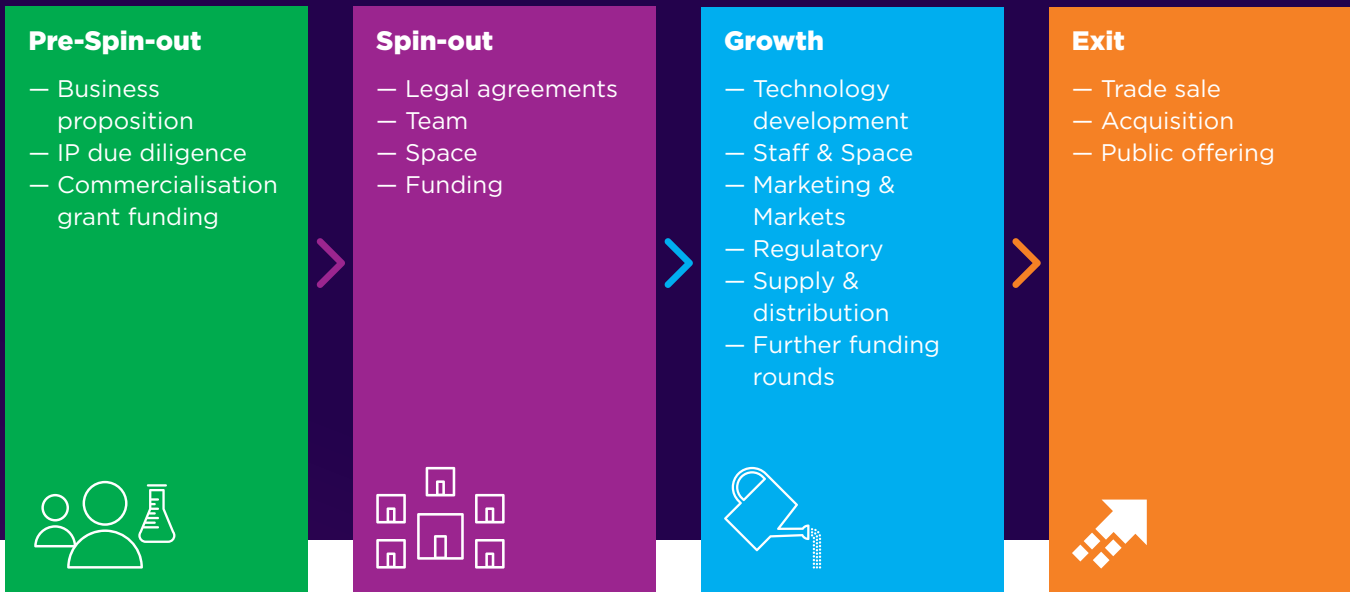


Qpercom has become a global leader in providing advanced assessment solutions and expertise to institutions worldwide. Its software solutions are used in high stakes evaluation-based exams, such as those of medicine and law, and in other scenarios where assessing a person's capabilities in a fair and accurate manner is paramount. Qpercom claims 70% reduction in administration time and elimination of human error by taking out the laborious paper trail. A 2008 spin-out from NUIG, Qpercom took a licence to copyright-protected material and know-how relating to Management Information Systems (MIS) technology and in 2017 launched a new product to market, Qpercom Entrust, based on this licence. It is an Entrustable Professional Activity (EPA) management software tool across mobile and web-based platform and was created and rolled out in the College of Anaesthetists of Ireland (CAI).

An EPA is a key task of a discipline that an individual can be trusted to perform in a given health care context, once sufficient competence has been demonstrated. Until the new software tool was launched, EPAs were paper-based and inaccessible to educationalists, registrars and consultants. The product was nominated for three national awards in 2017. The product is now being developed for international markets and the team has grown to eight.

The TTO at NUIG led the licence negotiation and has been pro-active in supporting from early days of technology development through to housing the company in the university incubator facility.

# Focus on Spin-Outs



The company development pathway can take many years and often requires many rounds of investment to get the products and services ready for the market. This section presents a high-level overview of the spin-out process and timelines through a snapshot of four spin-out companies that have achieved success.

Commercialisation of intellectual property is an important area of activity for higher education institutions worldwide, supporting their broad mission to disseminate research results.

Spin-out companies are one demonstration of the contribution that excellent research makes to society and the economy. They may lead to the development of ground-breaking new products and services, enhancing quality of life, health and the environment. The growth of these new businesses generates high value employment opportunities and have a knock-on effect on the commercial health of other companies in the supply chain.

#### **A note on investment funding rounds**

At company formation, funding begins with seed capital which nurtures the idea for the company. It will support initial market research and development work and will help employ a team to do this work. The seed phase is roughly around €200,000 to €2 million and investors will need to have an appetite for risk. Series A funding will follow if there is enough confidence generated in the business based on performance to date. It may be used for further development and testing and to scale the product. The investors tend to come from more traditional venture capital firms and sums raised may be in the range of approximately €2 million - €15 million. Later stage investments may fall into the Series B and Series C categories which are considerably larger involving a different group of investors. Typically, the company will have grown sufficiently in interest to other parties that it will become involved in a merger or acquisition by another company after several early investment rounds.

# Oculus Research Ireland – spin-out acquisition drives creation of high quality R&D jobs in Cork

## Commercialisation timeline

- First patent application filed 2003
- Company formed 2011
- First investment 2012
- Acquisition 2016



### Summary

InfiniLED Ltd was a University College Cork (UCC) spin-out company based on microLED Display (mLED) technology developed at the Tyndall Institute. mLED ILED Displays are the next generation of energy efficient display technology for applications ranging from wearables to TVs. The company was established in 2011 and took a licence to a suite of patent applications that had been developed by UCC, at Tyndall, the first being filed in 2003. After two rounds of private investment in 2012 and 2015, the company was acquired by Oculus (a Facebook company) in 2016. Post-acquisition the company expanded its operations in Cork to develop the technology. There are now over 40 people in Oculus in high quality research & engineering posts.

### Establishment of the company

InfiniLED Ltd was spun out of UCC's Tyndall National Institute in 2011. The technology is based on the patented Micro-LED breakthrough developed by Brian Corbett and Pleun Maaskant from many years research in the field with significant funding support from Enterprise Ireland. UCC staff member Bill Henry joined the company when it was founded. The CEO was Joe O'Keeffe, who had been a CEO of previous UCC spinouts. InfiniLED was housed initially in Tyndall's Lee Maltings complex, a dedicated space for industry partners in their research domain.

### Company progress

The company moved to a city centre premises as it expanded and agreed access to technical facilities in Tyndall to support the company R&D effort through a formal access agreement. Since acquisition, the UCC technology is now being integrated into the Oculus development programme, with high quality research and technology jobs created in the region. The potential for further research opportunities with UCC and Oculus is now being explored.

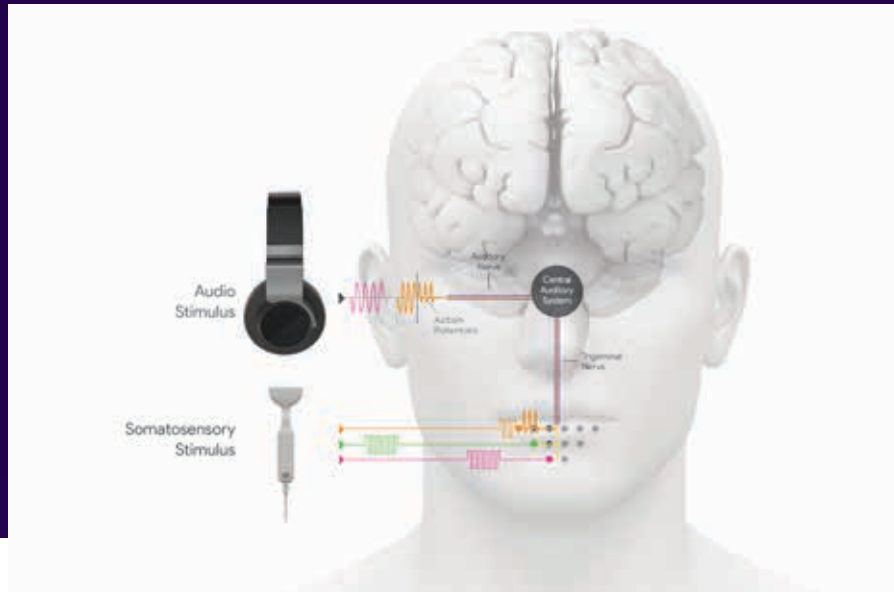
### Investment

InfiniLED secured two rounds of private investment in 2012 and again in 2015. In 2016, the company was acquired by the Facebook owned company, Oculus. Exact amounts of investment are undisclosed.

## Neuromod Devices – a spin-out company from Maynooth University developing a new treatment for sufferers of tinnitus

### Commercialisation timeline

- First patent application filed 2010
- Company formed 2010
- First investment 2011
- Latest investment, Series A, 2015



### Summary

Neuromod Devices is a Maynooth University spin-out company which has brought a medical device for the treatment of tinnitus (ringing in the ears) to the market. The company currently employs 15 FTE in Dublin, consisting mostly of scientists, engineers and clinicians. The company has plans to grow to 30 FTE employees by 2019. The company was created in 2010. It has a licence to two patents - one from Maynooth University and one jointly-owned by Maynooth University and City University New York (CUNY). The company has received over €7.7M in external investment over four rounds from 2011 to 2015.

### Establishment of the company

The company was formed in 2010 based on intellectual property arising from research undertaken by PhD student Ross O'Neill working with PhD supervisor Prof Barak Pearlmutter and a directed Proof of Concept project, funded by Enterprise Ireland with the aim of developing commercial aspects of the research. On completion of his PhD O'Neill formed the company. The first investment was raised from private investors in 2011. Two patent applications were licensed to the company - one solely owned by Maynooth University and one filed by Maynooth University jointly with CUNY. Maynooth University negotiated with CUNY to take the commercialisation lead and to share revenue in respect of the joint patent application (as is the international norm). The University took equity in the company upon formation and granted a royalty-bearing license to the first patent in 2010, and later (2013) granted a royalty-bearing licence to the jointly patented intellectual property.

### Company progress

As a Class IIa medical device, the Neuromod tinnitus remediation device needs to go through research and development followed by clinical trials and then regulatory approvals before it can be sold as device for which medical claims can be made. It took five years from company formation to obtain a CE Mark for the device. This is a mandatory certification mark that indicates conformity with health, safety, and environmental protection standards for products sold within the European Economic Area (EEA). Neuromod then began a large-scale multi-site clinical trial of the device in 2016 (St. James's Hospital, Dublin and University Hospital Regensburg, Germany). This trial is due to complete at the end of 2018.

### Investment

The degree of R&D and testing to reach the market requires considerable investment. Neuromod Devices raised over €2M in seed funding from 2011-2014. It then raised a further €5.5m from Fountain Healthcare Partners in a Series A investment round in 2015. In each of the investment rounds, the fixed percentage equity that Maynooth University held at the outset was diluted as the value of the company increased and more money was invested by external parties.



## **Powervation** – University of Limerick spin-out operating as a subsidiary of a multinational company headquartered in Cork accessing global markets

### **Commercialisation timeline**

- First patent application filed 2003
- Company formed 2006
- First investment 2006
- Acquisition 2015



### **Summary**

Powervation is a leading innovator in digital power controllers serving high performance computing, cloud and communications infrastructure markets. It employs over 40 people at its headquarters in Cork. A University of Limerick spin-out company, it was established in 2006 and ten years later, after raising over €32M private investment, the company was acquired by a Japanese multinational and operates as a fully-owned subsidiary, and the company's principal digital power design centre, in Cork. The company was based on novel technology from the University. The University licensed several patent applications to Powervation, the first of which was filed in 2003.

### **Establishment of the company**

The science was developed over a number of years from research in University of Limerick's Circuits and Systems Research Centre, within the Department of Electronic and Computer Engineering, leading to a protectable invention in 2003. A second patent application was filed in 2006 and a third the following year. The underpinning research was funded from national and European sources. The company founding team comprised four staff from the CSRC: Dr. Karl Rinne, Dr. Eamonn O'Malley, Antoine Russell and Alan Dunne.

### **Company progress**

The technology is based on digital power management system-on-chip (SoC) solutions. The company developed its proprietary control platform and secured industry leading customers. Through acquisition by ROHM, the combination of Powervation's platform with ROHM's leading analog power technology and global market access has enabled the company to address a broad range of fast growing market opportunities,

### **Investment**

The degree of R&D and testing to reach the market requires considerable investment. In 2006 Powervation raised seed funding of €250K from Shannon Development and this was followed by a Series A round of investment of €7M from a venture capital syndicate the following year. Over the next eight years the company secured a further €25M in capital. In 2015 Powervation was acquired by Rohm Semiconductor (Japan). Rohm C expanded Powervation's Cork office to >40 people in 2017. As the company developed and as the external investment ramped up, the fixed percentage equity that University of Limerick held at the outset was diluted.

# OxyMem Ltd. – UCD Spin out company disrupts wastewater treatment market

## Commercialisation timeline

- First patent application filed 2008
- Company formed 2013
- Initial seed investment 2013
- Latest round corporate investment 2016



## Summary

OxyMem Ltd. is a rapidly growing Irish company that spun out from University College Dublin (UCD) in 2013 with a licence to technology that has the potential to disrupt wastewater treatment. The company has raised in excess of €5.5M investment. It has its headquarters and a 25,000sq ft manufacturing facility in Athlone, County Westmeath and currently employs approx. 30 people in a range of functions such as research, manufacturing, marketing and finance.

## Establishment of the company

The technology underpinning OxyMem was developed by Prof Eoin Casey and his team in the UCD School of Chemical and Bioprocess Engineering over an 8-10-year timeframe. Company founders were Prof Casey and Dr. Eoin Syron, whose PhD thesis focused on membrane aerated biofilm reactors. Wayne Byrne joined as a commercialisation advisor and then as managing director on incorporation in 2013. UCD filed the initial patent application in 2008 which was prosecuted to grant in both Europe and the USA. The IP was licensed to the company in 2013. The company raised seed funding in 2013.

## Company progress

OxyMem is servicing a compelling market demand for energy efficient wastewater treatment which is an extremely energy intensive process and can use up to 2.5% of all electrical power produced in a developed country. The market for secondary treatment systems for wastewater is in excess of \$30 Billion. In the three years after formation, the company conducted validation field trials with major UK water utility companies. R&D and manufacturing continues. OxyMem has now achieved sales of its Generation 4 product in key markets and is currently working on development of Generation 5. OxyMem is one of the few companies in the world today that can offer process and operational advantages without increasing the cost of the capital equipment.

## Investment

The company has to date raised in excess of €5.5M, including a strategic investment by Dow Chemical Company. These investments have taken place in tranches since incorporation, the last significant investment occurring in 2017 by oil giant Saudi Aramco. The net effect of these investments is the dilution of UCD's initial equity stake.

# 8

## Company creation

The number of new companies created and sustainability of spin-outs is recorded.

### Spin-out

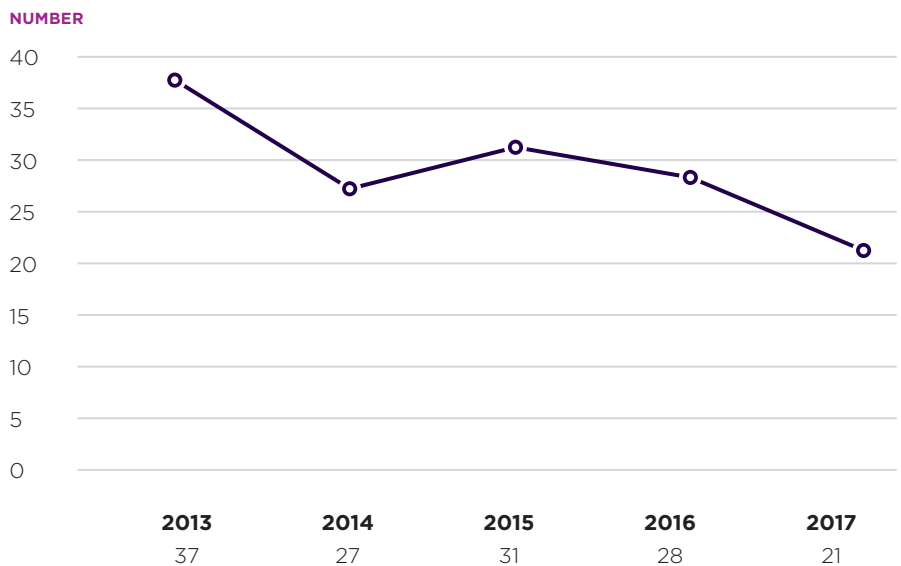
A spin-out is an incorporated entity which at the time of formation was dependent on the exploitation of specific intellectual property rights of the RPO. The rights to the company can be linked to a specific researcher who was within the RPO at the time of company formation and who would be considered an academic founder. The RPO will hold equity in the spin-out and/or has issued the company with a licence to the IP.

### Start-up

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 total of 21 new companies were spun-out from 10 of the RPOs in 2017<sup>14</sup> (26, 2016). Whilst this represents a 19% decrease on the previous year, where numbers are low the deviation appears more pronounced. However, there is a clear downward trend in the number of new spin-outs over the past five years. This may not be a negative as it may reflect the quality of the propositions that are now being taken forward as spin-outs. There were 31 start-ups reported<sup>15</sup>, by three universities and three IoTs. As start-ups are created independently from the RPOs, they will be under-reported in this survey. No spin-outs were merged or acquired during 2017.

Figure 18: Spin-outs established, 2013 – 2017



The aggregate number of spin-out companies in which an RPO holds equity or share options, at the end of 2017, was 193 (161, 2016). The University sector accounts for 85% of this portfolio.

<sup>14</sup> In addition to AKTS non-responder IT Sligo, no data were provided by Letterkenny IT

<sup>15</sup> In addition to AKTS non-responder IT Sligo, no data were provided by Letterkenny IT, Maynooth University, University of Limerick

### 8.1 Active spin-out companies

An Active Spin-out is defined as an RPO-created spin-out company that is at least three years post-formation (three years since being reported as an RPO Spin-out) and, 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.

There were 111 Active Spin-outs reported at the end of 2017<sup>16</sup> that were at least three years post-incorporation. Of these, 93 were from the University sector (84%) with 14 coming from the Institutes of Technology sector (12%). This is consistent with the previous year. The distribution is shown in Figure 19.

**Figure 19: Active Spin-outs at end of 2017 that are three or more years post-incorporation**



#### 8.1.1. A deeper dive into the Active Spin-outs reported in AKTS 2016

The data on active spin-out companies provided to the AKTS 2016 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 to capture further impacts from RPO spin-outs.

Of the 119 spin-out companies reported by the RPOs as being active three or more years post formation, one was a joint spin-out from two RPOs and had been counted twice. In other cases, some of the Active Spin-outs had been incorrectly classified. This brought the total of fully validated Active Spin-outs in 2016 to 109. Approximately 40% of the companies were between 3 and 5 years old, with a similar proportion being 6-10 years old. The majority (90) of these Active Spin-outs have come out of the Universities.

<sup>16</sup> In addition to AKTS non-responder IT Sligo, no data were provided by Letterkenny IT

Active Spin-outs predominate in the ICT (35%) and Health and Med Tech (28%) sectors followed by Manufacturing & Materials (17%). More than one type of IP may be used as the foundation for any individual spin-out, and the total number of different types of IP reported was 144. In aggregate, 35% of the 2016 Active Spin-outs were built around patents and 26% on software code and algorithms (26%) and 32% on know-how (32%).

The majority of the companies remain micro companies (39% have 5 or fewer employees, 22% have between 6 and 10). This figure was derived from a variety of public data sources. Some are growing, however, and four companies now have over 50 employees. As a group, the Active Spin-out companies currently provide employment for at least 960 people. This is a reduction from the number reported last year, but this is mainly due to some of the larger companies being excluded from this year's analysis because they have been acquired or merged with another company and no longer fit the current definition of an Active Spin-out.

Only one of the Active Spin-outs is based outside Ireland (this company is based in the UK). In common with other spin-outs across the world, many of the companies choose to establish themselves close to their founding institution. This allows them to retain close links and perhaps continue collaborative research with their RPO. Some may also be based in RPO-associated incubation facilities.

## 8.2 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 25 RPOs that returned data, the total number of incubator clients at the end of 2017 was 956 (734 in 2016). The majority were based in IoT incubators (752) with 188 in University incubators and a further 16 companies supported in the NCAD, NCI and Teagasc incubators. A total of 285 new companies entered HEI incubators and 191 exited during the year.

## RCSI spin-out on the path to becoming a leading provider of tissue regeneration therapies

### Underpinning funding sources include

Enterprise Ireland, Science Foundation Ireland, Health Research Board, European Research Council

### Added value from the TTO

Company formation, Intellectual Property Strategy and Management, Funding Advice, Licensing



Surgacoll™ Technologies is an innovative venture-funded medical device company supplying novel tissue regeneration products for the surgical treatment of disease of the bone, cartilage and other human tissue. The company was spun-out of RCSI in 2012 with a foundational licence to two ground-breaking RCSI technologies in the regenerative medicine space: HydroxyColl and ChondroColl. The company's lead product, HydroxyColl, is a medical implant designed to replace the use of patient's own bone tissue when repairing bone damaged by trauma or cancer. In November 2015, the company obtained CE Mark market approval for HydroxyColl and the first sale took place in 2017. Surgacoll is now seeking approval from the FDA to market HydroxyColl in the USA. The company's second product, ChondroColl, repairs articular joints by stimulating host stem cells to regenerate both bone and cartilage, using the composition and architecture of the biomaterial to actively direct tissue formation.

ChondroColl is highly effective in the treatment of early joint cartilage damage, particularly in the knee and is a significant advance for sports medicine. It is currently undergoing the European CE marking process. The Company continues to expand its manufacturing and R&D activities within Ireland and now employs eight FTE.

The Innovation Office at RCSI supported company development from the outset, assisting with commercialisation funding applications, IP portfolio development and protection and prosecution and licensing. Both licensed patents are now granted in many jurisdictions. The Innovation Team maintains an active dialog with the company and supports it through the establishment of new research collaborations, showcasing and licensing new technologies of interest.

# 9

## Revenue generation from licensing and spin-outs

Annual revenue return from licensing and sale of equity is recorded.

Revenue generation from licensing IP or from the realisation of spin-out equity may be considered a proxy for success. However, it is important to put revenue generation in context. Consistent with the national Policy for Research Commercialisation, the objective of commercialisation by RPOs 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 enterprise has with the RPOs, such as access to expertise through research contracts and consultancy.

### 9.1 Licence revenue

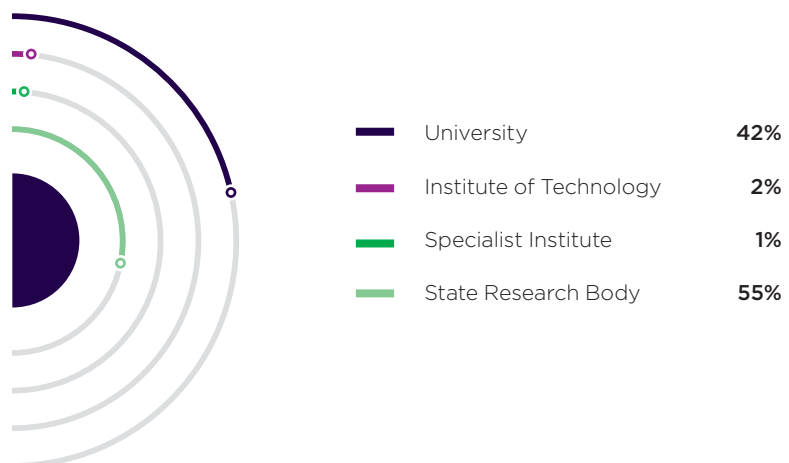
The revenue from all types of know-how and IP (patents, copyright, designs, material transfer agreements, confidentiality agreements, plant breeder rights, etc.) before disbursement to the inventor or other parties was surveyed. Revenue includes licence issue fees, annual fees, royalties, option fees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

All seven universities reported revenue from licensing whilst only four out of the 13 IoTs reporting in this survey generated licence income. From the data provided, the aggregate revenue from licensing in 2017 was €1.7 million<sup>17</sup> (€2.7 million, 2016; €5.6 million, 2015). The larger figure in the previous years was due to a few, very significant deals. Licence revenue in the State Research Sector accounted for 55% of all licence revenue in the year. This was due to royalty streams from the sale of plant varieties.

### 9.2 Revenue from equity and dividends in spin-out companies

The realisation of equity is unpredictable, depending on external factors such as the maturity of the spin-out and market forces. Two universities realised revenue from the sale of equity in a spin-out company in 2017 and one university achieved a dividend return<sup>17</sup>. The total revenue from equity sale and dividends was €1.2 million (€3 million 2016).

Figure 20: Licence revenue by RPO sector 2017



<sup>17</sup> In addition to AKTS non-responder IT Sligo, no data provided by Letterkenny IT

# 10

## Use of facilities and equipment

Access to facilities and equipment in RPOs can be highly beneficial to companies.

The survey asked for information on the use of RPO facilities and equipment. Information is patchy because in most 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.

A total of 219 contracts were reported by just 12 RPOs<sup>18</sup> (848, 2016; 1068, 2015). The majority of these (63%) are accounted for by the four universities that returned data. All but one of the RPOs reporting contracts also reported revenue generation. The total gross revenue reported was €1.1 million. This suggests a continued decline in revenue as seen over the past four years. However, as these data are not robust, due to lack of central recording, it is unwise to read too much into the results.



<sup>18</sup> In addition to AKTS non-responder IT Sligo, no data were provided by Letterkenny IT, NUIG, UCC, UCD



# 11

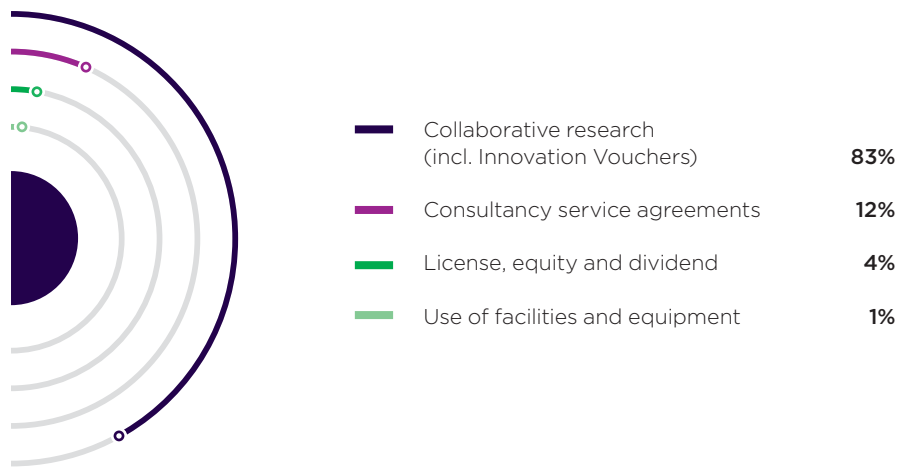
## Summary of commercialisation revenue

Revenue generated through the various types of knowledge transfer activity is considered.

Most of revenue comes from industry engagements (Collaborative Research, Innovation Voucher projects and Consultancy Services with industry) at 95% of revenue. Commercialisation revenue from licensing and from spin-out dividends and equity sale, adds 4% in commercialisation revenue. Use of facilities and equipment contributes 1%.

The data presented in Figure 21 exclude consultancy services with non-commercial entities and research income from State or other non-profit research funding sources e.g. research funding agencies, charities.

**Figure 21: Revenue from commercialisation activities**



# Appendix 1

## Summary data by RPO

Selected data relating to the returns made by the 25 RPOs are presented in tables A1-C2. 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 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.

### A1: Research expenditure, research agreements and consultancy 2017

University, Specialist and State research organisations

University	Research expenditures (less block grant) in the reference year	Research expenditures derived from industry	Number of collaborative research agreements with industry	Number of innovation voucher project agreements with industry	Number of consultancy services agreements with industry	Total Number of Collaboration, innovation voucher and consultancy services agreements with industry
Dublin City University	€35,789,872	€2,641,293	66	7	2	75
Maynooth University	€27,535,262	€302,888	75	2	2	79
NUI Galway	€54,841,830	€6,855,229	37	12	0	49
Trinity College Dublin	€103,551,403	€4,142,056	76	15	2	93
University College Cork	€99,921,277	€10,991,340	44	23	3	70
University College Dublin	€85,070,000	€4,593,780	101	23	30	154
University of Limerick	€33,592,086	€4,770,076	41	14	9	64
<b>Total</b>	<b>€440,301,730</b>	<b>€34,296,662</b>	<b>440</b>	<b>96</b>	<b>48</b>	<b>584</b>
<b>Specialist and State Research Organisations</b>						
National College of Art and Design	€135,450	€12,732	61	5	12	78
National College of Ireland	€180,000		0	7	0	7
Royal College of Surgeons in Ireland	€18,778,701	€1,877,870	21	1	1	23
Marine Institute	€5,800,000		0	0	0	0
Teagasc	€39,850,000	€6,774,500	20	5	149	174
<b>Total</b>	<b>€64,744,151</b>	<b>€8,665,102</b>	<b>102</b>	<b>18</b>	<b>162</b>	<b>282</b>

## A2: Research expenditure, research agreements and consultancy 2017

### Institutes of Technology

Institute of Technology	Research expenditures (less block grant) in the reference year	Research expenditures derived from industry	Number of collaborative research agreements with industry	Number of innovation voucher project agreements with industry	Number of consultancy services agreements with industry	Total Number of Collaboration, innovation voucher and consultancy services agreements with industry
Athlone Institute of Technology	€3,830,256	€421,328	21	64	118	203
Cork Institute of Technology	€12,509,396	€2,036,530	23	58	94	175
Dublin Institute of Technology	€14,800,000	€634,920	20	21	53	94
Dundalk Institute of Technology	€1,900,000	€190,000	6	15	1	22
Dun Laoghaire IADT	€63,285	€6,961	1	5	1	7
Galway-Mayo Institute of Technology	€2,028,970	€188,694	5	12	4	21
Institute of Technology Blanchardstown	€676,829	€46,092	0	1	0	1
Institute of Technology Carlow	€2,366,000	€160,888	21	58	3	82
Institute of Technology Sligo						
Institute of Technology Tralee	€1,761,634	€211,396	5	21	5	31
Institute of Technology Tallaght	€1,741,764	€331,806	7	4	30	41
Letterkenny Institute of Technology	€811,000	€40,550	1	22	3	26
Limerick Institute of Technology	€1,205,843	€75,968	13	38	0	51
Waterford Institute of Technology	€14,101,981	€1,043,547	19	109	148	276
<b>Total</b>	<b>€57,796,958</b>	<b>€5,388,680</b>	<b>142</b>	<b>428</b>	<b>460</b>	<b>1030</b>

### B1: IP and IP transactions 2017

#### University, Specialist and State research organisations

	Total number of invention/software disclosures received during the year	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	30	11	14	10	70	26	0
Maynooth University	13	1	4	0	10	10	1
NUI Galway	51	8	4	4	172	15	1
Trinity College Dublin	68	23	38	9	111	16	7
University College Cork	62	13	33	19	79	26	0
University College Dublin	72	20	5	7	101	21	7
University of Limerick	34	14	29	3	68	5	1
<b>Total</b>	<b>330</b>	<b>90</b>		<b>52</b>	<b>611</b>	<b>119</b>	<b>17</b>
<b>Specialist and State Research Organisations</b>							
National College of Art and Design	2		0	1	0	0	0
National College of Ireland	5	0	0	0		0	0
Royal College of Surgeons in Ireland	14	5	100	3	20	5	0
Marine Institute	0	0	0	0	0	0	0
Teagasc	22	4	100	4	24	9	1
<b>Total</b>	<b>43</b>	<b>9</b>		<b>8</b>	<b>44</b>	<b>14</b>	<b>1</b>

## B2: IP and IP transactions 2017

### 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 patents 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	5	0	0	0	0	4	0
Cork Institute of Technology	18	3	100	2	15	5	0
Dublin Institute of Technology	29	6	55	1	27	14	5
Dundalk Institute of Technology	4	0	0	0	1	2	0
Dun Laoghaire IADT	1	0	0	0	0	0	0
Galway-Mayo Institute of Technology	0	1	0	0	0	0	0
Institute of Technology Blanchardstown	1	0	0	0	0	0	0
Institute of Technology Carlow	3	1	0	0	1	0	0
Institute of Technology Sligo							
Institute of Technology Tralee	2	0	0	0	0	0	0
Institute of Technology Tallaght	5	2	0	0	4	1	0
Letterkenny Institute of Technology							0
Limerick Institute of Technology	5	0	0	0	0	1	0
Waterford Institute of Technology	9	4	50	0	9	4	1
<b>Total</b>	<b>82</b>	<b>17</b>		<b>3</b>	<b>57</b>	<b>31</b>	<b>6</b>

### C1: Spin-out companies, incubation and use of facilities 2017

#### University, Specialist and State research organisations

	Number of spin-outs established during the year	Number of staff or student 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	0	10	9	25	35
Maynooth University	2		7	31	2
NUI Galway	2	0	12	34	
Trinity College Dublin	2	6	27	27	21
University College Cork	4	10	10	14	
University College Dublin	4	0	18	29	
University of Limerick	2		10	28	80
<b>Total</b>	<b>16</b>	<b>26</b>	<b>93</b>	<b>188</b>	<b>138</b>
<b>Specialist and State Research Organisations</b>					
National College of Art and Design	0	1	1	5	0
National College of Ireland	0	0	0	7	0
Royal College of Surgeons in Ireland	0	0	2	0	0
Marine Institute	0	0	0	0	0
Teagasc	1	0	1	4	41
<b>Total</b>	<b>1</b>	<b>1</b>	<b>4</b>	<b>16</b>	<b>41</b>

## C2: Spin-out companies, incubation and use of facilities 2017

### Institutes of Technology

	Number of spin-outs established during the year	Number of staff or student 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
Institutes of Technology					
Athlone Institute of Technology	0	0	0	27	0
Cork Institute of Technology	1	3	2	78	1
Dublin Institute of Technology	2	0	7	88	1
Dundalk Institute of Technology	0	0	0	18	0
Dun Laoghaire IADT	0	0	0	16	0
Galway-Mayo Institute of Technology	0	0	0	70	23
Institute of Technology Blanchardstown	0	0	1	205	0
Institute of Technology Carlow	0	0	1	33	1
Institute of Technology Sligo					
Institute of Technology Tralee	0	0	1	27	1
Institute of Technology Tallaght	0	0	0	45	5
Letterkenny Institute of Technology				50	
Limerick Institute of Technology	1	1	0	65	0
Waterford Institute of Technology	0	0	2	30	8
<b>Total</b>	<b>4</b>	<b>4</b>	<b>14</b>	<b>752</b>	<b>40</b>

# Appendix 2

## List of Research Performing Organisations (RPOs)

Reporting Sector	Institution	Year of foundation of TTO
<b>University</b>	Dublin City University	2007
	Maynooth University	2005
	National University of Ireland Galway	2005
	Trinity College Dublin	1987
	University College Dublin	2003
	University College Cork	1982
	University of Limerick	2005
	<b>Institute of Technology</b>	Athlone Institute of Technology
Cork Institute of Technology		2009
Dublin Institute of Technology		2007
Dundalk Institute of Technology		2012
Dun Laoghaire Institute of Art, Design & Technology		2012
Galway-Mayo Institute of Technology		2008
Institute of Technology Blanchardstown		2000
Institute of Technology Carlow		2008
Institute of Technology Sligo		
Institute of Technology Tallaght		2000
Institute of Technology Tralee		2009
Letterkenny Institute of Technology		1998
Limerick Institute of Technology		2008
Waterford Institute of Technology		2008
<b>Specialist Institute</b>		National College of Art and Design
	National College of Ireland	2011
	Royal College of Surgeons in Ireland	2007
<b>State Body Sector</b>	Marine Institute	n/a
	Teagasc	2011

Did not return data



# Appendix 3

## The international RTTP Qualification

### Ireland's Recognised Technology Transfer Professionals

Seamus Browne	Royal College of Surgeons in Ireland
Alison Campbell	Knowledge Transfer Ireland
Ronan Coleman	Cork Institute of Technology
Peter Conlon	Maynooth University
David Corkery	University College Cork
Kevin Dalton	University College Cork
Paul Dillon	University of Limerick
Gordon Elliott	Trinity College Dublin
Tom Flanagan	University College Dublin
Aoife Gallagher	Royal College of Surgeons in Ireland
John Gleeson	University of Limerick
Carolyn Hughes	Dublin City University
Derek John	Royal College of Surgeons in Ireland
Stacey Kelly	University College Dublin
Margaret Lawlor	University of Limerick
Breda Lynch	Athlone Institute of Technology
Siobhan McSweeney	Institute of Technology Tralee
Paul Maguire	Dublin Institute of Technology
Andrew Marsh	University College Cork
Neil McLoughlin	Dundalk Institute of Technology
Conor Morris	University of Limerick
Anthony Morrissey	University College Cork
Patrick O'Boyle	Dublin City University
Kieran O'Connell	Dublin Institute of Technology
Peter Olwell	Dublin City University
Emma O'Neill	Dublin City University
James O'Sullivan	Waterford Institute of Technology
Karl Quinn	Genomics Medicine Ireland ex. University College Dublin
Tim Roche	Formium ex. University College Cork
Kieran Ryan	NUI Galway
John Scanlan	Maynooth University
Richard Stokes	Dublin City University
Jacinta Thornton	NUI Galway
Paul Tyndall	University College Dublin
Emily Vereker	Trinity College Dublin
Miriam Walsh	Teagasc
Ena Walsh	University College Dublin

# Appendix 4

## Glossary

### Active Spin-out

An Active Spin-out is an RPO-created spin-out company that is at least three years post-formation (three years since being reported as an RPO spin-out) and, 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.

### Assignment

Contract transferring ownership of right in IP to a third party.

### Collaborative research

A research project/programme between an industry party and an RPO. The project/programme may be: wholly-funded by the industry party or; part-funded by the industry party (in cash and/or in kind, including participation in the research itself) and part-funded by the State or other external sources. Collaborative research may involve two or more parties.

Characteristics of collaborative research with industry: The purpose of collaborative research is the generation of new knowledge. Typically, there will be an expectation of publication although the project may be governed by aspects of confidentiality. Intellectual property may be created and how the company benefits will be determined in the collaboration agreement and will depend on the contribution to the project made by the company.

(Excludes contract services, consultancy, innovation vouchers, academic collaborations and research grants).

### Consultancy Services

RPO provides professional-level work to an external client organisation through an academic, researcher or other member of RPO staff in exchange for a commercial fee. The work is specified (or agreed) by the client against deliverables agreed with the RPO. May include Consultancy agreements, "Contract services" agreements and projects contracted under a work order. Characteristics of consultancy services: The purpose of consultancy is not typically the generation of new knowledge, rather it draws on existing knowledge. There will usually be no expectation of publication, results will be confidential and will be transferred to the client. The type of work might typically involve one or more of the following: advice; analysis; production of a report. Projects will generally be of a short term.

(Excludes collaborative research, research grants, Academic collaboration, Training and provision of Continuing Professional Development (CPD)).

### Equity

Shareholding in a legal entity.

### FTE

Full Time Equivalents - People working part-time are only included for the fraction that they are employed.

### Incubator

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.

### Innovation Vouchers

Innovation Vouchers worth €5,000 are available to assist a company or companies to explore a business opportunity or problem with a registered knowledge provider (i.e. higher education institutes, public research bodies).

### Invention disclosure

The invention disclosure is the first actual recording of potential new intellectual property (IP). The researcher/inventor and TTO/ILO will complete an Invention Disclosure Form (IDF) which is a written, signed and dated record. The IDF contains basic information, including supporting data, which helps to evaluate and subsequently, potentially, protect and commercialise the intellectual property. For avoidance of doubt, the IP may be software.

### ILO

Industry Liaison Office - the team responsible for managing KT services, including intellectual property management, licensing, partnering with industry and the creation of new companies.

### Joint invention/ software disclosure

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.

### KT

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.

### Large Company

A company which is based in one country only and which has more than 250 employees and has either an annual turnover greater than €50M or an annual Balance Sheet total greater than €43M.

### Large Company Irish

A Large Company which is based in Ireland

### **Licence**

A contract under which IP rights are transferred from one party to another for the purpose of commercialisation.

### **LOA - Licence, Option or Assignment**

A contract under which IP results are transferred, or agreed to be transferred, from one party to the other for the purpose of commercialisation.

### **MNC**

A multi-national 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 co-ordinate global management.

### **MNC Irish**

An MNC which has its HQ based in Ireland and/or which has a significant R&D presence in Ireland.

### **Non-commercial entity**

Public sector organisation or charity.

### **Option**

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 may be called an Option & Evaluation agreement.

### **PCT**

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.

### **Priority filing**

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.

### **Reference year**

The twelve-month reporting period from January 1st to December 31st.

### **Research grant**

An academic grant not involving industry. 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 and in which an industry party is not involved. Typical research funders may include; SFI, ERC, Wellcome Trust etc.

### **RPO**

Research Performing Organisations. Universities, institutes of technology and other research institutions funded primarily by public funds.

### **SME**

Has less than 250 employees and has either an annual turnover not exceeding €50m or an annual Balance Sheet total not exceeding €43M.

### **SME Irish**

SME which has its head office in Ireland.

### **Sole invention / software disclosure**

An Invention Disclosure for an invention or software created by one RPO and reported to that RPO via the TTO/ILO.

### **Spin-out**

A spin-out company is an incorporated entity which at the time of formation was dependent on the exploitation of specific intellectual property rights of the RPO. The rights to the company can be linked to a specific researcher who was within the RPO at the time of company formation and who would be considered an academic founder. The RPO will hold equity in the spin-out and/or has issued the company with a licence to the IP.

### **Start-up**

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.

### **TTO**

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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