



**KTI** Knowledge  
Transfer Ireland



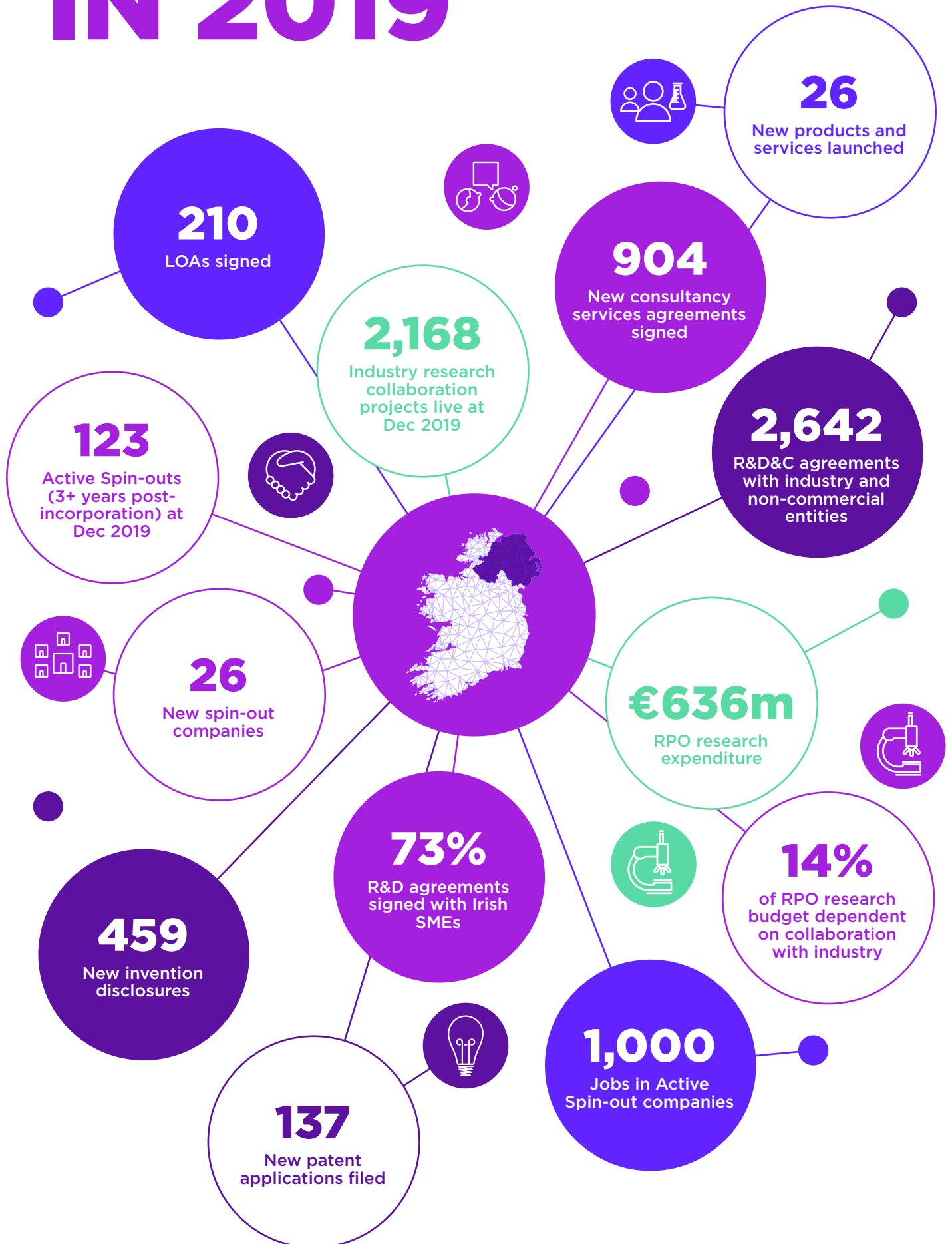
**KTI REVIEW AND  
ANNUAL KNOWLEDGE  
TRANSFER SURVEY  
2019**

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# IN 2019





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## FOREWORD

### STEPHEN CREANER

*Executive Director - Food, Industrial,  
Life Sciences & Innovation, Enterprise Ireland*

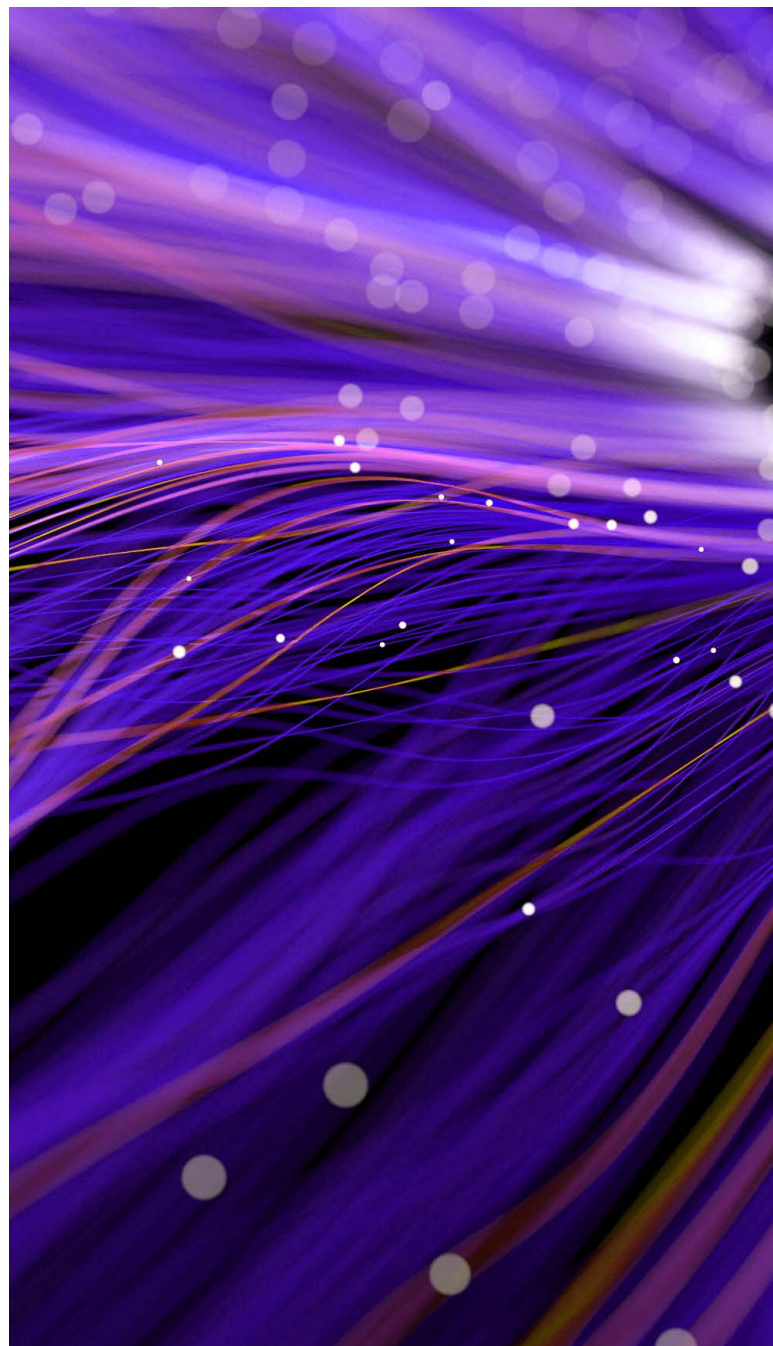


**The pace of change has never been faster than it is today. Competitive performance is accelerating in every industry, primarily driven by rapid advancements in enabling technology capabilities.**

As performance in the competitive environment accelerates, businesses who do not have the capability to innovate effectively will eventually find that they are no longer competitive. Indeed, in some instances they will be disrupted by more innovative competitors or even new entrants into their sector. More than ever, this matters now.

This year's European Innovation Scoreboard (EIS) now places Ireland in the 'strong innovators' group, ranking ninth in the EU. Providing a comparative assessment of the research and innovation performance of the EU Member States, Ireland ranks top for employment impact and sales impacts of innovation and scores well for having a significant amount of international scientific co-publications. However, Ireland scored low when it came to R&D expenditure in the public sector and private co-funding of public R&D expenditure. This is no time for complacency.

It is imperative that the Enterprise Ireland (EI) client base innovates more effectively to be sustainable in a rapidly changing and turbulent, competitive environment.



EI's innovation position reflects the current and future needs of the EI client and is consistent with government policy and can be summed up as follows - *“For enterprise, innovation drives sustainable growth and development through creative new or renewed offerings, organisational configurations, processes, business models and customer experiences that generate, deliver and capture customer value.”*

Enterprise Ireland currently has a comprehensive portfolio of offers for supporting clients with innovation capability building (including collaboration) and project execution. Divided into four main categories EI provides aid direct to companies, one-to-one collaborative funding, one-to-many collaborative funding and manages national enabling structures. Through our support for knowledge transfer activities, EI helps effective engagement for companies with the research base and stimulates the creation of new companies and founders from research, supporting their journey to High Potential Start-Up status (HPSU).

Knowledge Transfer Ireland (KTI) and the Technology Transfer Strengthening Initiative (TTSI) are two of those supports from EI. We have co-funded and hosted KTI since its inception in 2013 and we are pleased with the way in which it is working for the EI client base and across the wider business base in Ireland. KTI is delivering to its objective to make it more straightforward for business and entrepreneurs to connect with, and commercialise, Irish public research.

The TTSI programme, now in its third cycle, complements that work, ensuring that there are commercialisation skills within the third level sector to work with companies and entrepreneurs.

Knowledge Transfer can provide a cost-effective means through which companies, regardless of size, can build on key areas of innovation capability and improve their levels of “innovation intensity”. In doing so, boosting the percentage of total revenue that comes from new products/services and helping them reach that tipping point at which productivity increases. Both are critical in the current environment.

This Review provides a snapshot of the outputs and impacts from the Irish Knowledge Transfer system in the past year. It shows how the various supports work together to build value and the importance of the various elements of State investment to drive innovation from research. This knowledge transfer system, combined with the agility and resilience that we have seen in recent months, will serve us well for the challenging year ahead.

## REFLECTION, REVIEW AND TO THE FUTURE



ALISON CAMPBELL

*Director, KTI*

**The KTI Review and Annual KT Survey provides the opportunity to look back over the previous year and to consider where we are going, reflecting on trends in knowledge transfer (KT) both locally and internationally. This year, it's impossible to do this without considering where we are now.**

Which is to say that we are facing into uncertainty. But we should not be pessimistic. Trends show a continuing appetite for knowledge transfer from research. We have some firm anchor points: innovation through R&D has proven itself to be a value-add for ambitious companies wanting to compete; deep-tech spin-outs that can hold their own are attractive to investors and purchasers; and investment in the environment that permits such innovation to flourish delivers returns. These will help us in turbulent times, if we pay attention.

Knowledge Transfer is seen as an important component in the innovation ecosystem. So much so that the European Commission last year established the Valorisation Policies and IPR Unit in the Prosperity Directorate of DG Research and Innovation, aimed at enhancing research commercialisation and the use of research results in the broadest sense across Member States. We are engaged with this unit, as it develops its strategies, through our parent body the Department of Business Enterprise and Innovation. During the year we have met with several delegations interested in the model that we have developed in Ireland. It's often easy to lose sight of what has been created here and in the words of one of the people leading the group that visited from Enterprise Estonia "We love the work you have done and what you have built up for Irish enterprises. It's just the best we have seen and it makes sense."

I've been asked recently by some knowledge transfer associations in Europe to contribute my thoughts to their deliberations on the future for KT.



They, and their government agencies, are asking the right questions, such as how to strike the right balance across the different commercialisation channels, what the landscape may look like by year end and how best to configure for the future. There are, however, some more fundamental questions to address first: what does value creation mean and what kind of returns are being sought and by whom? With best intentions by the various actors within research and innovation systems, there are inadvertent tensions created. For example, where the ask is to create more new companies there is also the requirement for more collaboration with existing companies; where return is viewed as one of economic development providing advantage for the companies involved there is pressure on higher education institutions (HEIs) to demonstrate revenue return. And there is a tendency to view HEIs as being all similar, when many have different models and environments in which they are located. There appears to be a common feature, a lack of a balanced national scorecard for KT. In the Annual Knowledge Transfer Survey, we present data on annual research expenditure which permits some normalisation of the results. While our national survey is one of the few internationally that provide granular longitudinal data, these are still relatively simplistic ways to analyse performance which should be regarded in the context of national and institutional strategy and associated resourcing supports.

Metrics have been in focus this year. The European Commission Joint Research Centre issued a report on EU wide harmonisation of KT metrics "[Towards a European-wide set of harmonised indicators](#)", based on the work of an Expert Group that I chaired last year. There was a broad appetite across Member States to work towards increasing the availability of national data and consistency, provided that the data were used for meaningful comparisons. There was frustration in crude benchmarking driving strategies. The report concluded with a set of recommendations for core metrics that consider outputs in the context of inputs. An objective for the Commission is to now disseminate and encourage adoption, which may be helped by ongoing work into composite indicators that can be used more routinely across a range of surveys.

One of the recommendations in the EU report is that data alone are not always enough to explain the value of KT. The AKTS has always provided tangible examples of KT in action and this year is no exception. We've also had some excellent feedback from companies and spin-outs on the merits of the KT system that has been created here in Ireland. Don't take my word for it, take theirs:

**“The expertise of the various academic and TTO members were always a great help in identifying the most viable alternatives for quick and competent results. We greatly appreciated the flexibility and availability of the TTO officers .....particularly helpful when it came to establishing a win-win atmosphere in both the negotiations that led to the licence...”**

**Dr Bernard L. Roy,**

Chief Scientific Officer, Cremo SA, Research Collaboration with UCC 2019

**“The TTO was on-board with our mission from the start, helping us to manage our IP and file patent applications, providing start-up formation supports and training and being flexible and reasonable in regard to licensing terms.”**

**Lucy O’Keeffe,**

CEO and Co-Founder CroiValve (TCD spin-out 2019)

**“The TTO has supported the entire way through the process - engaging on calls, meetings and providing support whenever required. This has been key in progressing through the spinout processes.”**

**Conor Walsh,**

Founder, Visual Insulated Panels (WIT spin-out 2018)

These successes have been made possible by the work across the system. From the entrepreneurial researchers keen to collaborate with companies or to start their own ventures through to the supports that are in place to nurture these interactions and stimulate commercialisation. The Innovation Offices (TTOs) work within their HEIs and across Centres to enable these outcomes. Co-funding under the Enterprise Ireland TTSI programme, managed by KTI, is vital to deliver to national objectives for commercialisation and enterprise engagement. A mid-term review of the programme was carried out during 2019 and the conclusions are presented in this review. In summary, the programme continues to play an effective role in providing on the ground skills to deliver research commercialisation. Innovation Offices are highly collaborative and this drives innovation in practice, a trend that is likely to continue with a range of successful initiatives at home and abroad.

As well as looking back on performance of the Innovation Offices, last year we again took stock of KTI’s contribution to the landscape. We commissioned Frontline Consulting to survey and interview a range of stakeholders and companies to find out their opinions on performance so far and what the future might look like – with or without us in it. The resulting report was encouraging. Established under mandate by the Department for Business Enterprise and Innovation, KTI has become a respected part of the innovation ecosystem and all stakeholders want KTI to continue. KTI’s role helps leverage other research and innovation investments and there was no area of our activities identified for de-prioritisation.

**“Many thanks for the great work KTI is doing to help ‘shorten the runway’ for industry/academia engagement as more of the academic institutions adopt the KTI templates.”**

**Fintan O’Malley,**

Director Research, Development & Innovation, Fidelity Investments Limited

Our work to bring more predictability into the business of engagement with the research base was recognised. The development of the KTI Model Agreements and Practical Guides, such as the Guide to State Aid in RD&I with RPOs, were particularly singled out.



**“The KTI website, in particular the model/template contract documents, are a fantastic resource.”**

**Vivienne Williams,**  
CEO, Cellix Limited

One aspect was highlighted for improvement - we need to be seen more and engage more with companies to help raise awareness of such tools and the journey to working with HEIs. This was something we knew already, resourcing has held us back. But by refocussing our work we committed to more industry engagement in 2020. While we have failed this year to make the type of inroad that we had planned due to the Covid19 restrictions, we have instead seized the opportunity to look at creating online conversations and we have been delighted at the attendance at our webinars, and the excellent feedback we've received.

The significance of the relationship between KTI and Enterprise Ireland's TTSI programme was called out in the report, citing how the two mutually reinforce to drive continuous improvement and adaptability in the system. This has implications for not just the future role of KTI but also for the next cycle of TTSI, from the end of 2021.

As we look to the future, there was a clear message from the review that KTI has an enduring role to provide support and leadership in the KT system. Indeed, there were concerns that in its absence, there would be fragmentation and duplication.

So, our challenge is set. But it will not be an easy one. The forecast is unsettled. Companies will partner carefully and cautiously, investors and founders will be selective, higher education will be under unprecedented financial pressures and more will be expected from the KT system. There is a conversation happening in the USA around carving out of a percentage of Federal research awards for research commercialisation support, recognising the importance of KT to economic recovery. How this plays out, we shall see. That is has been driven by university innovation offices together with their university leadership and well received at federal level is compelling.

Which brings me back to the question of what we want to achieve, and then how we will go about it. We have a national policy for research commercialisation. This is our north star and remains as relevant in 2020 as it was when first set out in the national IP Protocol in 2012. Simply put, the objective is economic development and job creation. Looking to the immediate and longer term, we will need to be more flexible in how we deliver to this. Responses may need re-thinking, success will need to be re-imagined and re-described. It's time to review the scorecard.


## WHAT WE DO PROGRAMME MANAGEMENT

### SUPPORTING THE KNOWLEDGE TRANSFER SYSTEM

**KTI plays a key role in ensuring the KT environment and frameworks are appropriate to help get technology, ideas and expertise from State-funded research into the hands of business and entrepreneurs, swiftly and easily for the benefit of the public and the economy.**

KTI manages the TTSI programme on behalf of Enterprise Ireland. This funding programme, established in 2007, has been instrumental in driving the development of a professional knowledge transfer and research commercialisation resource in Ireland's Higher Education Institutes (HEIs) and other research performers. In 2005, prior to the introduction of TTSI, Irish RPOs transferred technology and IP to industry by way of only 12 licences and created five spin-out companies. By the end of 2019, the system has settled into a steady state of on average 200 Licences (Options and Assignments) each year and 28 new spin-outs.





The current cycle of TTSI (TTSI3) is a €34.5 million programme over five years (2017 – 2021). It provides co-funding to the HEIs to support their Innovation Offices (often called Technology Transfer Offices) and the professional staff within those teams. These offices work with researchers to bring new ideas forward for development into commercial propositions that may be taken to the market by existing and new companies and work with other teams to assist in commercial research contracts.

As part of its programme management, in June 2019 KTI invited a group of international KT experts to review mid-term progress under the funding round. Through a combination of submitted reports and meetings with representatives from all TTSI3-funded offices, the panel was able to form an independent view that was able to offer reassurance to Enterprise Ireland that the programme was performing well and was well-managed. The international experts commented on the impressive levels of maturity demonstrated by the Innovation Offices and were impressed by the depth and breadth of activity happening in Ireland. So much so, that several of the panel claimed that they had fresh ideas to take back and try out in their own countries.

The feedback from these types of international review panels is helpful beyond immediate programme governance as it contributes to shaping strategic direction in future programme cycles. Future planning is a significant strand of work that was started in the second half of 2019, which has included consultations with the KT community, IUA and THEA committees and has involved feedback received through the TTSI mid-term review and KTI Review. Plans for the TTSI4 cycle will be reviewed by Enterprise Ireland and the Department of Business, Enterprise and Innovation later in 2020.

A well-functioning knowledge transfer system requires skilled professionals to manage commercial opportunities and broker deals between industry and the research base. KTI encourages staff within the Innovation Offices to apply for the Registered Technology Transfer Practitioner (RTTP) status, the internationally recognised professional standard for research commercialisation practitioners working in HEIs, research organisations and industry. There are now 45 such professionally qualified staff across the Irish KT system, a number that positions us as the country with the highest number in the world of RTTPs per capita. A full list of Ireland's RTTPs is at Appendix 3.

## WHAT WE DO PROVIDE A KT FRAMEWORK

### NATIONAL FRAMEWORK FOR COMMERCIALISATION IRELAND'S IP PROTOCOL 2019

Making the research and innovation system easier to navigate is at KTI's core. To this end, in March 2019 we published the updated national IP Protocol on behalf of the Department of Business, Enterprise and Innovation. This publication serves as a national framework for research engagement and commercialisation, providing guidelines and practical resources.

Building on previous iterations of the Protocol, and drawing on extensive consultation, the new publication includes expanded sections on State Aid and spin-out company formation. To highlight the new publication and to promote its use, KTI delivered a series of roadshows in Cork, Limerick, Galway and Dublin bringing together a combined audience of 270 from Irish industry and academia.



## STATE AID CONSIDERATION IN RESEARCH, DEVELOPMENT & INNOVATION FOR RPOS AND INDUSTRY

KTI delivered a second series of events in 2019 to publicise the publication of its *Practical Guide to State Aid Considerations in Research, Development & Innovation for RPOs and Industry* – a new addition to the KTI suite of practical guides that serve to support the national IP Protocol. Again with a regional focus, we held events in Galway, Cork and Dublin bringing together a combined audience of over 100 people to hear about how best to work within State Aid guidelines when engaging across the research base and companies. The briefings were provided in association with leading law firm Ronan Daly Jermyn which helped KTI produce its Practical Guide.



**“I found the State Aid Roadshow event very useful indeed. Reading the KTI Guide to State Aid, I found that it built upon the event, going into much more detail. I now use the Guide as a ‘go to’ in advance of considering State Aid implications. Like all KTI guides and materials, it is well thought out and very clear.”**

**Aindrias Cullen,**

Intellectual Property & Data Protection Coordinator  
Insight SFI Research Center for Data Analytics

**“The IP Protocol Roadshow was a great opportunity for all relevant stakeholders to meet and discuss the updated KTI IP Protocol. The IP Protocol is both a guide and roadmap for academics, third level institutions, and industry partners who plan to utilise IP generated in a third level institution. The IP Protocol is a tool that should be used by all stakeholders to form the basis of any academic-industry collaboration.”**

**Dr Brendan Boland,**

CEO Loci Orthopaedics (NUI Galway spin-out 2017)

## WHAT WE DO SHARE BEST PRACTICE

### ASTP ANNUAL CONFERENCE

In May 2019, KTI was instrumental in bringing the 20<sup>th</sup> Annual ASTP Conference to Dublin. This pan-European knowledge transfer conference gathered 300 delegates from across Europe to examine the knowledge transfer industry today and the challenges and opportunities that exist. Opened by KTI Director Alison Campbell and Professor Brian MacCraith, who was then President at DCU and Chair of the Irish Universities Association, this conference afforded the Irish knowledge transfer community local access to their international peers. It also served to firmly reinforce Ireland's position and that of KTI at the heart of European knowledge transfer.

**“I found the ASTP 2019 conference really worthwhile. There was a great programme, with excellent international speakers and relevant workshops. Exposure to best practice from KT professionals across different sectors made it a really interesting event.”**

**Dr Caitriona Creely,**

Lead PM, Investigator-Initiated Research and Innovation,  
Pre-Award, Health Research Board



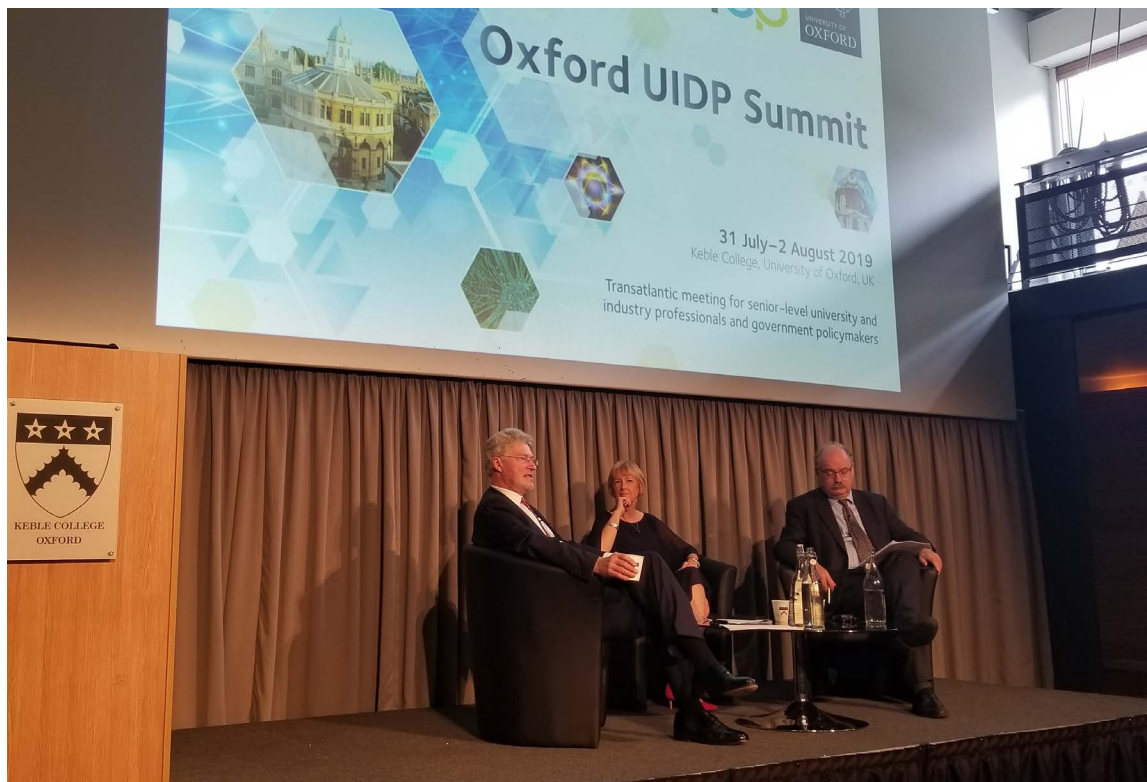


**“The ASTP Annual Conference was a great opportunity to showcase the Irish KT system and all that Ireland has to offer to our peers throughout Europe”.**

**Tom Flanagan,**

Director of Enterprise & Commercialisation, UCD

## OXFORD UIDP SUMMIT



In August 2019, KTI led a small delegation from Ireland across the “triple helix” of industry, academia and government agency to take part at an event in Oxford focussed on international experiences in university-industry partnerships. KTI Director, Alison Campbell was part of the programming committee for the event and chaired the opening plenary panel discussion. The meeting brought together senior US, UK and European thought leaders from industry, universities and government and resulted in a report summarising current thinking and practice in areas as diverse as collaboration, people mobility and metrics. The report is available on the KTI website. In May 2020, we hosted a follow up webinar where the report was presented to an audience of over 150 people from industry, academia and government.

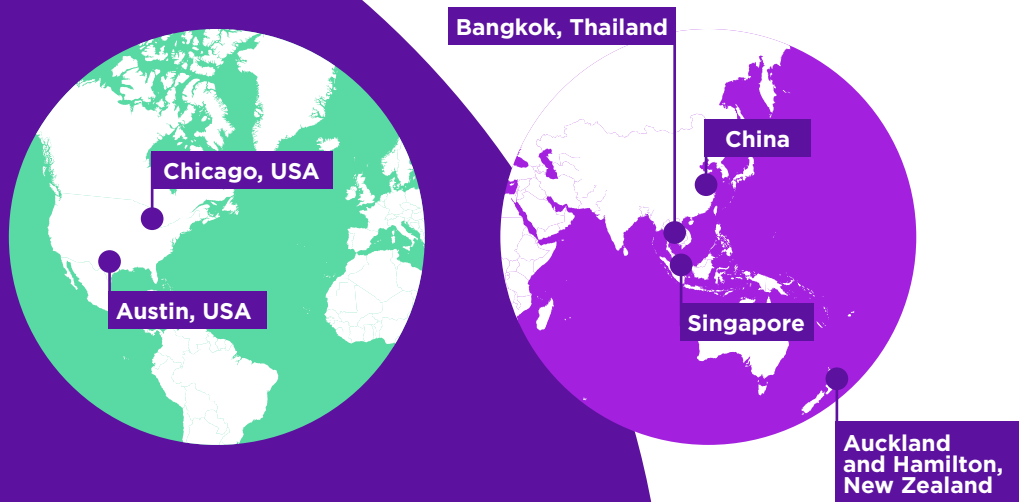
## WHAT WE DO SHARE BEST PRACTICE

As part of our role in promoting knowledge transfer on the international stage, KTI representatives have accepted invitations to speak at and contribute to events throughout the world to share KT best practice, contribute to international policy development and promote the many successes resulting from industry-academia partnerships in Ireland.

Director Alison Campbell served as Chair of the Board of the international technology transfer association AUTM in 2018-19, her term on the Board ending during 2020. We have also connected with KT colleagues worldwide to inform our work and forward plans.

During the year, we have been very much engaged with colleagues from the European Commission, from working alongside the Department of Business, Enterprise and Innovation to present to the newly formed EU Valorisation Policies and IPR Unit, to presentations at the EU JRC TTO Circle meeting that brought leads from EU public research organisations to Dublin. We have also hosted and presented to visiting delegations interested in hearing more about KT and KTI.





Relika Alliksaar Williams, Development Cooperation Exert at Enterprise Estonia, commented:

**“We learned so much from this visit! We were highly impressed by how Ireland as a small country has turned its size into a great strength to be able to achieve outcomes that would otherwise be near impossible in other countries.”**

Dr. Špela Stres, Organizing Committee and Center for Technology Transfer and Innovation (CTT) (Slovenia)

**“In the name of Organizing committee of the Slovenian »International Technology Transfer Conference«, we would like to thank you and express our gratitude for your appreciated support and your presentation. We strongly believe that your contribution has provided solid foundation for future changes and it will greatly help the development of technology transfer offices in Slovenia and research community.”**

## MAKING AN IMPACT INNOVATION IN THE TIME OF CRISIS

### ACCELERATED COMMERCIALISATION HELPS EFFORTS TO COMBAT COVID-19

**The coronavirus pandemic is the biggest crisis faced in recent times. However, by embracing new technological approaches and accelerating commercialisation, the Irish knowledge transfer community has been able to play its part in supporting enterprise and society at large. From spin-out companies uniquely positioned to deliver new solutions, the development of COVID-19 tests through to creating new types of PPE, the impact of Ireland's RPOs has been significant.**

Throughout the country, universities, Institutes of Technology and research institutes have played an important role through activities such as 3D printing of PPE for frontline workers, academic experts inputting to national expert groups and the development of testing centres on many academic and research campuses. Collaborative research between RPOs and the public and private sectors has been significant in the fight against the COVID-19 coronavirus. As has the delivery from spin-out companies based on cutting edge technology from the research base.

Kastus Technologies (an Enterprise Ireland High Potential Start Up, HPSU), licensed technology from DIT (now TU Dublin) that allowed them to pioneer an antimicrobial coating which can provide a 99.99% reduction in harmful bacteria and fungi on a range of products made from glass, metallics and ceramics, with no toxic residues. This technology has been confirmed to be effective against COVID-19.

UL spin-out, MicaNanoTech, another Enterprise Ireland HPSU, has also had success in creating antibacterial coatings for the healthcare sector and intends to have an antiviral coating ready for market in the next 12-18 months. Its current product is used to coat textiles used in healthcare, such as dressings and hospital gowns, in order to kill persistent bugs.

Output Sports, a recent UCD spin-out, has enabled elite athletes to adapt to the challenges posed by social distancing and training from home during lockdown. The technology uses advanced signal processing and machine learning techniques to remotely test certain aspects of athletic performance, while tracking training through an app. Output Sports also has Enterprise Ireland HPSU status.

As a global shortage in COVID-19 testing supplies became apparent at the beginning of April 2020, close collaboration between researchers from CIT, UCC, UL and TEAGASC resulted in the development, manufacture and validation of the so-called 'lysis buffer', a key component of the COVID-19 testing process. The team worked with Eli Lilly to scale up production of the chemical, which has resulted in the availability of thousands of tests in labs throughout Ireland.

Whilst at WIT, experts at the SEAM research centre have been working on a prototype for full face masks with integrated humidity moisture for clinicians and frontline medical staff, which are sealed effectively and which don't fog up. SEAM has been working with local manufacturing companies to ensure that this type of PPE gear won't need to be sourced from outside Ireland in future.

At RCSI, experts developed an early-warning system for "silent hypoxia" which has now been rolled out across the HSE. This dangerous symptom of coronavirus causes blood-oxygen levels to fall without an individual feeling any symptoms or signs that anything is wrong. The newly developed system can map the risk of a patient ending up in ICU and determine the best oxygen strategy for patients. This research and its application is highly beneficial for patient welfare and the management of ICUs.

Research teams at NUIG and UL worked together to develop a novel and versatile solution to sanitise public spaces called 'UVC Drone'. Using drone technology sterilising ultraviolet (UV) light radiation can be spread in a wide variety of public spaces including hospital wards, shopping centres and public transport. The UVC Drone has been programmed with a bespoke AI algorithm to switch on overnight when the premises is unoccupied and recharge itself once cleaning has finished.

It is important to note that the examples highlighted above represent only a small amount of the COVID-19 response across the Irish research system. Researchers and RPOs across the country continue to be immersed in their efforts to find treatments, innovative testing methods and potential vaccines for COVID-19.

Societal challenges, such as those created by the COVID-19 pandemic, underscore the importance of professional infrastructure to allow technologies and expertise to easily be transferred from the research system to industry for public good. KTI plays a key role in ensuring the right infrastructure is in place so that business can easily connect with relevant research expertise.

KTI, working with TTOs, has created a simple, two-page **COVID-19 Non-Exclusive Royalty-Free Licence** (NERF Licence). The COVID-19 NERF provides cutting edge IP free of charge to organisations engaged in critical research and development activities for the sole purposes of diagnosing, preventing, containing, treating and/or minimising the impact of the virus. It remains in place until such time as the World Health Organisation declares the current COVID-19 pandemic to have ended.

# MAKING AN IMPACT RETURNS FROM COMMERCIALISATION

## BEYOND THE BOTTOM LINE

The AKTS tracks the progression of spin-outs and the latest figures show there are now 123 Active Spin-outs (three or more years post formation) across the country. They employ a conservatively estimated 1,000 people. These companies' foundations are firmly embedded in the parent research institution from which they come.

Of the Active Spin-outs, one quarter have been trading for more than 10 years. Some others have been acquired by larger companies, often seeing the anchoring of their R&D and associated jobs in Ireland e.g. FeedHenry that spun out from Waterford IT (acquired by Red Hat) and InfiniLED (acquired by Facebook owned Oculus) that spun out from University College Cork/Tyndall Institute.

Spin-outs from research are known to outperform other types of start-up companies. For example, spin-outs that have gone on to achieve investment from Enterprise Ireland have a failure rate of just 4% which is significantly lower than the 20% rate for those that did not emerge from research.



Many such successes go unmeasured and are difficult to quantify but provide significant overall value to Ireland. Here are just some examples:

## **AVENTAMED**

### *Ear Nose & Throat Medical Devices*

Since its foundation, Aventamed has maintained reciprocally valuable links with its parent institution. Based in CIT's on-campus incubator, the Rubicon Centre, the company has co-designed a testing programme led out of the Health Innovation which informs teaching at CIT. The founders of Aventamed are former staff from CIT who give back time to students and other entrepreneurs, at CIT and nationally, sharing their experience and expertise. The company is an important tenant for CIT's incubation centre, the Rubicon, and also has an agreement in place with CIT to avail of facilities and equipment in the Medical Engineering Design and Innovation Centre. This contract provides income for the self-funding centre, that in itself is a valuable resource for undergraduates and emerging spin-out companies. Aventamed winning the KTI spin-out award in 2016 has enhanced the reputation of the Institute and the Innovation and Enterprise Office as it generated lots of positive publicity at the time. The experience gained by the Innovation & Enterprise team during the spin-out process was invaluable and was applied during negotiations in later spin-outs. The company employs six people and plans to increase this to 15 by the end of 2021.

### **Spun out of technology from Cork Institute of Technology - 2013**

## KASTUS

### *Anti-microbial surface coatings*

In just seven years, Kastus has experienced exceptional growth and development, spurred more recently by the fact its technology has been independently confirmed as effective against COVID-19 coronavirus. Maintaining close links to TU Dublin (formerly Dublin Institute of Technology from which it spun-out), the company funds collaborative research with its parent institution and other RPOs across the Irish system such as Trinity College Dublin (through the SFI AMBER centre), IT Sligo, Athlone IT, UCD, NUI Galway and Queens University Belfast. With a presence still on campus at TU Dublin, Kastus makes itself available to talk with other companies interested in working with TU Dublin on effective collaborative research and research commercialisation. Kastus' CTO supervises PhD students in Sligo IT, Athlone IT and Waterford IT as well as mentoring New Frontiers start-ups within the Greenway Hub incubator at TU Dublin. In June 2020, the European Innovation Council awarded €1.6m to Kastus to fund a current in-house research project, a significant level of funding for the company and an amount that would not otherwise have been available to Irish enterprise. The company currently employs 15 people in Dublin with plans to grow this to 30 by 2022.

**Spun out of technology from TU Dublin 2013**

## PRECISION BIOTICS

### *Probiotic Health Supplements*

Irish company PrecisionBiotics, previously Alimentary Health, produces patented probiotics. The company was bought in June 2020 by Danish biotechnology group Novozymes for €80m to expand its business in the area of biological solutions for mouth and gut health. The sale will benefit shareholders including University College Cork, Enterprise Ireland and dozens of private investors alongside top executives at the probiotic gut health company. The company retains close ties to UCC and being part of the Novozymes family now gives the company a real global presence. This deal is the biggest to date among microbiology start-ups spun out of the Irish universities sector. Two years ago, Trinity-linked Nuritas hit the headlines when that biotech firm, which uses data mining of molecules in food to develop supplements and medical treatments, secured a €30m loan from the European Investment Bank (EIB).

**Spun out of technology from University College Cork in 1999.**



## ICONIC TRANSLATION MACHINES

### *Machine Translation & Artificial Intelligence*

In June 2020, Dublin City University spin-out company Iconic Translation Machines was acquired by London-based, AIM-listed, RWS Holdings in a deal worth up to \$20 million (€17.8 million). Iconic develops machine translation and artificial intelligence software for a range of industries including legal, life sciences, high tech and others. The company's products help their enterprise customers translate more content quickly, accurately and in a cost effective manner. Iconic was originally launched in 2013 based on proprietary technology developed from years of research at DCU's ADAPT Research Centre funded by Science Foundation Ireland (SFI). RWS is the world's leading language, intellectual property support services and localisation provider. Headquartered in the United Kingdom RWS has an international client base of blue chip customers and has offices across five continents. The companies have worked closely for a number of years prior to the acquisition. Iconic has been working closely with the RWS Life Sciences division to provide translation solution to the company's pharmaceutical customers. The acquisition greatly strengthens RWS's capabilities in service-offerings in the neural machine translation solutions sector. Iconic will now become a new division within the RWS. The acquisition is a success for Iconic's original investors who include Bloom Equity, the Boole Investment Syndicate who are part of the Halo Business Network (HBAN) and Enterprise Ireland.

### **Spun out of technology from DCU in 2013**

## OXYMEM

### *Water Treatment Technology*

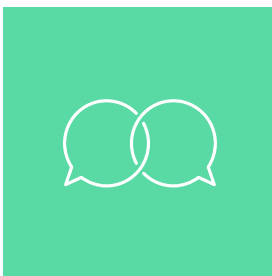
In December 2019 DuPont acquired full ownership of the UCD spin-out company OxyMem Limited. The Athlone based company with 60 employees was co-founded by Wayne Byrne, Prof Eoin Casey and Dr Eoin Syron in 2013 as a spin-out from the UCD School of Chemical and Bioprocess Engineering and was the overall winner of The Irish Times Innovation awards in 2014. DuPont already had a sizable equity stake in the company through a previous investment and exercised its option to acquire all outstanding shares. The deal allows OxyMem to scale its patent protected Membrane Aerated Biofilm Reactor (MABR) technology to meet the growing demand for the treatment and purification of municipal and industrial wastewater. The deal is one in a series of four acquisitions by DuPont in the clean water space as part of the company's strategy to drive growth and innovation through access to new manufacturing capabilities, geographies and technologies.

### **Spun out of technology from University College Dublin in 2013**

# MAKING AN IMPACT IRELAND'S KNOWLEDGE TRANSFER COMMUNITY

## KTI IMPACT AWARDS

Each year, KTI hosts its annual Knowledge Transfer Impact Awards to highlight and celebrate the successes coming through the Irish knowledge transfer system. More specifically, the awards recognise the role played by the Innovation Offices, industry liaison offices and their people in delivering those successes. In November 2019, KTI announced winners across 5 categories:



**COLLABORATIVE  
RESEARCH**

### UCD AND GLANBIA

University College Dublin & Glanbia worked together on a collaborative research project for two years that resulted in an award of €22 million in 2018 under EU Horizon 2020 for a new project called AgriChemWhey. This was the biggest win under the particular fund and the first dairy project to be awarded funding under the particular programme. AgriChemWhey established a new facility in Tipperary on the site of the former Lisheen mines which will transform dairy waste products into high-value biobased products for growing global markets.



## CONSULTANCY

### UCC & ABBOTT NUTRITION

Abbott Nutrition sought advice from UCC to assist with better understanding, prediction and control of mechanical integrity of agglomerated nutritional powders during transport, storage and packing in the factory. The consultancy led to the team at Abbott in Cootehill implementing changes to their powder conveying process as well as modifying equipment on-site. Learnings from the project were also shared across other Abbott nutritional powder manufacturing sites in Spain and Singapore helping to raise the internal profile of Cootehill as a leader in product understanding and process development.



## LICENCE 2 MARKET

### UNIVERSITY COLLEGE DUBLIN & ATLANTIC THERAPEUTICS

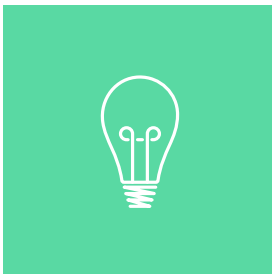
The Atlantic Therapeutics INNOVO therapy device is an externally worn electrical muscle stimulator that is the first ever transcutaneous electrical stimulator cleared by the FDA as a safe, clinically effective and non-invasive product to treat stress urinary incontinence. The technology underpinning INNOVO, comprising a now granted patent application and associated know-how, was developed in collaboration with UCD and was licensed originally to BioMedical Research (BMR) and in 2017 transferred to Atlantic Therapeutics. The company is headquartered in Galway with offices in UK, France, Germany and the US.



## SPIN-OUT COMPANY

### DUNDALK IT & NOVA LEAH

Nova Leah provides platform and software tools which allow both medical device manufacturers and institutional users (e.g. hospitals) to quickly automate the process of identifying and mitigating software vulnerabilities within their product portfolios. It also plays a major role in providing documentary evidence of compliance for regulatory bodies. The company has achieved exceptional successes in a short time that include raising significant rounds of seed funding, rapid sales growth and signing deals with several Tier 1 Healthcare companies including Boston Scientific. The success of Nova Leah has been significant for DkIT in raising awareness of its research activities and encouraging the entrepreneurial environment.



## KNOWLEDGE TRANSFER ACHIEVER OF THE YEAR

### Joint Winners:

**FIONA NEARY** led the initiative to create an additional innovation space in NUI Galway that resulted in creating a new 6500 sq ft lab space with potential to house up to 60 life sciences jobs and has secured funding to create BioExcel, the first medtech accelerator in the country in her role as Innovation Operations Manager, NUI Galway.

**ANTHONY MORRISSEY** has been involved in knowledge transfer since it began in 2007 and in that time his successes have included the management of 48 licences and the formation of five spin out companies as Case Manager at the UCC Innovation Office.

Special Recognition was also paid in 2019 to **Anu Sahni** of **National College of Ireland** for her work in developing knowledge transfer awareness within the RPO.

## INTERNATIONAL WOMEN'S DAY

On 8th March 2019, International Women's Day, President Michael D Higgins and his wife Sabina hosted an event at Áras an Uachtaráin to highlight the work of women in the sciences. Alison Campbell, Director of KTI was very pleased to be invited to join the group of 150 women and was able to bring as guests the two women who lead the Innovation Offices at RCSI, Aoife Gallagher, and at CIT, Josette O'Mullane



## DR JOHN SCANLAN

### KT LEADER AND FRIEND



Dr John Scanlan, Director of Maynooth University Commercialisation Office, a dear colleague in the Irish knowledge and technology transfer community, died on 23<sup>rd</sup> October 2019. John joined the university, NUIM as it was then, in 2005 to set up the Commercialisation Office. In 2013, under the Enterprise Ireland TTSI programme, he established a consortium with AIT, IT Carlow and WIT, sharing the skills and expertise of the office at Maynooth with a wider group of HEIs. A great collaborator, driven by fairness and a practical approach, the consortium developed well and has been often called out by external reviewers as an exemplar of consortium good practice.

John was a super leader, mentor and friend to his own team and to the wider KT network. And he was a man of courtesy, always sure to thank KTI for our work. Small words which went a long way. One of the things that people have said about John is that he was straightforward - and he was measured. He was an effective influencer and when John made a point, you listened. That made him a great asset to many of us in the Irish KT community and his thoughtful ideas have been well received and acted on.

John's vision and energy was recognised both in Ireland and further afield. His views were often invited at a European level and he contributed to the international KT environment through his involvement with the European association for knowledge transfer, ASTP, co-publishing with colleagues in the field.

Many across the knowledge transfer community, the founders, investors, companies and researchers that worked with him will have their own memories of John. One thing is for sure. He has left a lasting impact - on knowledge transfer activity in Maynooth University, on the wider system and on the people that he touched.

## HOW WE OPERATE

### 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. We are always grateful to the time that they give to KTI, both in formal Board meetings and outside of those. Towards the end of 2019 Colette Reilly took up a new posting within the Department of Public Expenditure and Reform. Colette provided great contribution to KTI and we were sad to see her go but pleased to welcome Alan Kelly as the new representative from the Department of Business, Enterprise and Innovation.

#### Members of the Industry Advisory Board

- Keith O’Neill, Abbott Laboratories (Chair)
- Brendan Hogan, Aerogen Limited
- Alan Kelly, Department of Business Enterprise and Innovation
- Helen McBreen, Atlantic Bridge Capital
- Tony McEnroe, SiriusXT Limited
- Richie Paul, Alkermes Pharma Ireland Ltd
- Jim Walsh, Trinity Biotech

The IAB has been of great help this year in assisting in developing the future strategy for KTI.

### KNOWLEDGE TRANSFER STAKEHOLDER FORUM

Through the Knowledge Transfer Stakeholder Forum (KTSF) we bring together representatives with a direct interest in knowledge transfer from the major funding agencies and the university and Institute of Technology sector to discuss various hot topics relating to research commercialisation and industry engagement.

#### Members of the KTSF during 2019

- Marcus Breathnach, Department of Business, Enterprise and Innovation
- Jennifer Brennan, Technological Higher Education Association
- Liam Brown, Limerick Institute of Technology
- Peter Brown, Irish Research Council
- Alison Campbell, Knowledge Transfer Ireland (Chair)
- Leo Clancy, IDA Ireland
- Tim Conlon, Higher Education Authority
- David Corkery, University College Cork (for the Irish Knowledge Transfer and Innovation Group of HEIs)
- Richard Howell, Department of Agriculture, Food and Marine
- Lisa Keating, Irish University Association
- Alan Kelly, Department of Business, Enterprise and Innovation
- Jim Miley, Irish University Association
- Gearoid Mooney, Enterprise Ireland
- Mairead O’Driscoll, Health Research Board
- Ray O’Neill, Maynooth University
- Ciaran Seoige, Science Foundation Ireland

## KTI TEAM



**ALISON CAMPBELL**  
Director



**ELIZABETH CARVILL**  
Communications  
Manager



**ROWENA ELLIOTT**  
Projects Executive



**SIOBHAN HORAN**  
Industry/Partner  
Engagement Manager



**MICHELLE O'REILLY**  
Programme  
& Operations Manager



**URSULA O'KEEFE**  
Administrator

During 2019 and 2020, we benefitted from having two students who participated in the Enterprise Ireland Work Placement Programme – Chloe McMorrow and then Conan Ngo.



# ANNUAL KNOWLEDGE TRANSFER SURVEY 2019



The Annual Review of Business Interaction and  
Commercialisation from Publicly-Funded Research in Ireland

# 1. INTRODUCTION

**The Annual Knowledge Transfer Survey (AKTS) is published by KTI in conjunction with the Higher Education Authority (HEA) with data collected from Research Performing Organisations<sup>1</sup> (RPOs). It provides a review of business engagement and commercialisation activity, often referred to as knowledge transfer (KT), in the State funded research sector. This is the sixth time the report has been published.**

The objectives for knowledge transfer are described in the national policy for research commercialisation: to maximise the uptake of technology, IP and ideas to drive innovation in companies (existing and new) leading to economic and social benefit.

Data is submitted to KTI by each RPO, co-ordinated by its Technology Transfer Office (TTO) (sometimes called the Innovation Office) and requires information from other departments such as the Research Office, the Finance Department and sometimes from individual research departments. Data collection for the AKTS places a significant burden on the TTOs and KTI wishes to thank them for their continued support and contribution to this survey.

With the formation in January 2019 of Ireland's first Technological University, TU Dublin (formed from DIT, IT Blanchardstown and IT Tallaght) and RCSI gaining university status, the way in which RPOs are grouped for analysis has changed this year. For a breakdown of RPO by reporting sector see Appendix 2.

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, Technological University, Institutes of Technology, Colleges and other State-funded entities undertaking research, see Appendix 2

## 2. EXECUTIVE SUMMARY

**Submission to the AKTS is from Ireland's Higher Education Institutes (eight universities, one Technological University, eleven Institutes of Technology and two Colleges). Teagasc and the Marine Institute also contribute. A complete list of these RPOs is provided in Appendix 2.**

Data this year suggest a steady state has been achieved in national performance in knowledge transfer. This is across new commercial opportunities disclosed, licensing activity and spin-out company formation. There are a couple of areas that have seen an increase in volume: the number of ongoing research collaboration projects between industry and RPOs and the number of new patent applications filed. These may be due to the increasing State support for collaboration, through programmes from Enterprise Ireland and SFI, including the EI Technology Centres and SFI Centres for which company involvement is integral. Indeed, it appears that 14% of the annual research expenditure within RPOs in 2019 was dependant on research collaboration with industry (where funding is derived from companies and the State). The increase in patent activity may, in part, be due to an increased strategic patent budget for some HEIs under the Enterprise Ireland Technology Transfer Strengthening Initiative (TTSI3 programme) which commenced in 2017.

Research projects between companies and RPOs are significant pillars of RD&I activity. Over 1,200 new agreements were signed for R&D projects (Research Collaborations and Innovation Voucher projects). When access to expertise through consultancy agreements is included the total figure for new contracts entered into between companies and RPOs increases to over 2,000. The new R&D engagements were with over 900 individual companies, with some companies engaging with more than one RPO and on more than one R&D contract. 84% of these engagements were with Irish companies and 73% were with Irish SMEs. There were 2,642 ongoing research collaboration projects (fully or part-funded by the company collaborator) live at 31 December 2019 which represents an increase of 19% on 2018.

Companies access new intellectual property through licensing and assignment and may also be granted a time limited option to decide whether to take a licence. In 2019, there were 210 licence, option and assignment agreements (LOA) signed with companies which is in line with five-year averages. Of these, 77% were with Irish companies, which is consistent with 2018, and 50% of all LOAs were signed with Irish SMEs. The majority of LOAs were to patented IP and software, at 34% and 17% respectively. 2019 saw 26 new product and service launches on the market by companies as a result of a licence from an RPO.

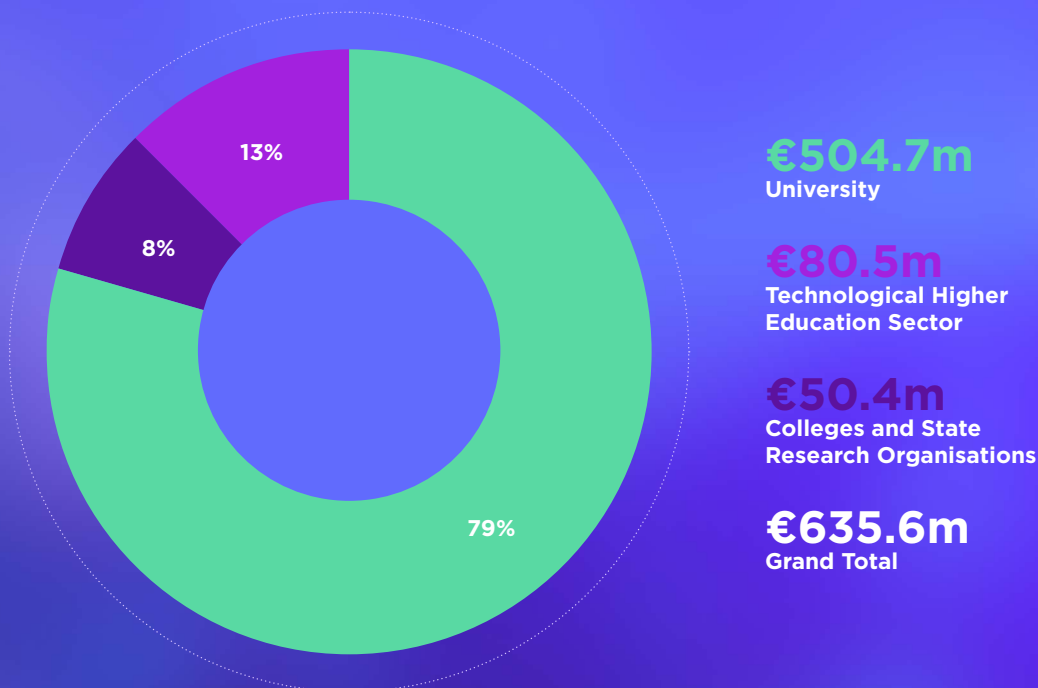
Spin-out companies provide a significant route to innovate, developing cutting edge technology and intellectual property and creating new high-value jobs. The 26 new spin-outs formed in 2019 is in line with five-year trends. Considering those "Active Spin-out" companies from RPOs that are three years or more post-formation and that employ staff and have investment and/or turnover, there were 123 at the end of 2019. Together they are estimated to employ (a conservative) 1,000 people. The majority of Active Spin-outs (79%) have been in existence for over 5 years, with one of these older than 10 years. One university spin-out was acquired in 2019.

### 3. RESEARCH FUNDING IN IRELAND

Research expenditure, which represents the total expenditures on all types of basic and applied research in the RPOs from all funding sources: government, industry, non-profit foundations, etc., has increased in line with a continued increase in research activity. The total reported for 2019 is €636 million (€599 million, 2018). The University sector accounted for most of the research expenditure at approximately 79% (€505 million). The Technological Higher Education sector accounted for approximately 13% (€79 million) and the Colleges and State Research Organisations sector (NCAD, NCI, Marine Institute and Teagasc) accounted for 8% (€50 million). This is a similar profile to previous years.

Research expenditure figures are provided by the individual RPO Finance Departments. Research expenditure excludes block grant and capital expenditure, costs of administrative support and capital expenditures on new equipment, buildings or land. The Higher Education R&D (HERD) budget includes the wider range of investments. The latest published figure available for the HERD Survey is €748.8m for 2016-2017. The use of research expenditure data in the AKTS allows a more direct comparison with university data from other countries.

**Figure 1:**  
Research expenditure by type of RPO, 2019



## 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. This may be in the form of research projects with the RPO or access to consultancy services. More detail on definitions of these types of engagement can be found in the Glossary at Appendix 4.

The number of new R&D agreements entered into with companies is largely steady state when year to year single point anomalies are taken into account. In 2019 1,262 new contracts were signed. Of these, 84% (1064) were with Irish companies and 73% (918) were with Irish SMEs, again a fairly stable picture year on year. The volume of research collaboration projects ongoing with industry at the end of 2019 shows a marked increase of 18% over the previous year.

The university sector (eight universities) accounts for the majority of collaborative research agreements signed (57%). There has been an increase in volume in the Technological Higher Education Sector (11 HEIs) compared to the previous year, moving from 22% to 36% of collaborative research agreements signed. This is, in part, due to the large number of agreements entered into by one IoT. The Technological Higher Education Sector signed 73% of the contracts relating to shorter term projects through Consultancy Services and Innovation Voucher projects.

On the face of it, the number of Collaborative Research Agreements signed with companies (part and wholly funded by the company) has decreased this year by 14% compared to 2018 (637 vs. 745). Of these, the proportion of new projects fully funded by industry has dropped to 56% (60%, 2018). At 357 this is a decrease on the 2018 figure of 445. However, this is due in large part to an exceptional data return in 2018 from one university that caused a one-off spike which, if excluded, suggests that there is steady state of activity between the two years. Disruptive Technologies Innovation Fund (DTIF) contracts are not included in the analysis. While these are significant projects involving collaboration between companies (often several) and RPOs, the funding is disbursed directly to each party. When the Innovation Voucher funded projects are included, the total number of agreements signed by RPOs that relate to R&D projects with companies rises to 1,262 (1,293, 2018).

In 2019, the number of Consultancy Services Agreements signed with industry was 751, down from 818 the previous year. Five RPOs reported no consultancy agreements signed with industry in 2019. For the remaining 17 RPOs the number of contacts signed ranged from 1-173. When combined, the total number of R&D agreements (including Innovation Voucher funded projects) and Consultancy Service Agreements executed with industry in 2019 was 2,013. This represents a slight decrease of 5% on 2018 (2,114).

The total number of each type of agreement entered by the relevant groups of RPOs in 2019 is illustrated in Figure 2.

## COLLABORATION

### HUAWEI & DCU

# SUCCESSFUL COLLABORATIVE RESEARCH LEADS TO FURTHER ENGAGEMENT BETWEEN UNIVERSITY AND MULTINATIONAL

Huawei has launched its own video streaming service in China, similar to Netflix or Amazon. To make videos easy to search, to insert adverts intelligently or to make recommendations, it is important to know the content of the video in detail. To date, this is usually done manually by viewers tagging scenes as they watch. Huawei undertook a collaborative research project in 2017 with the SFI funded Insight Centre at DCU to investigate the use of AI techniques to do this automatically. The project was a success and led to patentable IP assigned to the company.

The research has advanced state of the art video tagging techniques and will enable Huawei to differentiate its video service and to look at other applications in its product portfolio. The success of this project led to further research collaborations between DCU and Huawei.

In 2019, both organisations embarked on a significant research project focussed on 5G networking technologies. The ambitious research will see a multi-million euro Huawei investment and multiple project collaborations between Huawei and DCU.

The innovation office at DCU (DCU Invent) was involved from the outset of the collaboration and worked closely with Huawei on legal agreements, funding mechanisms for the project as well as developing and managing a work plan. DCU Invent also recorded deliverables from the project to enable the licensing/assignment of the project IP at the end of the project.

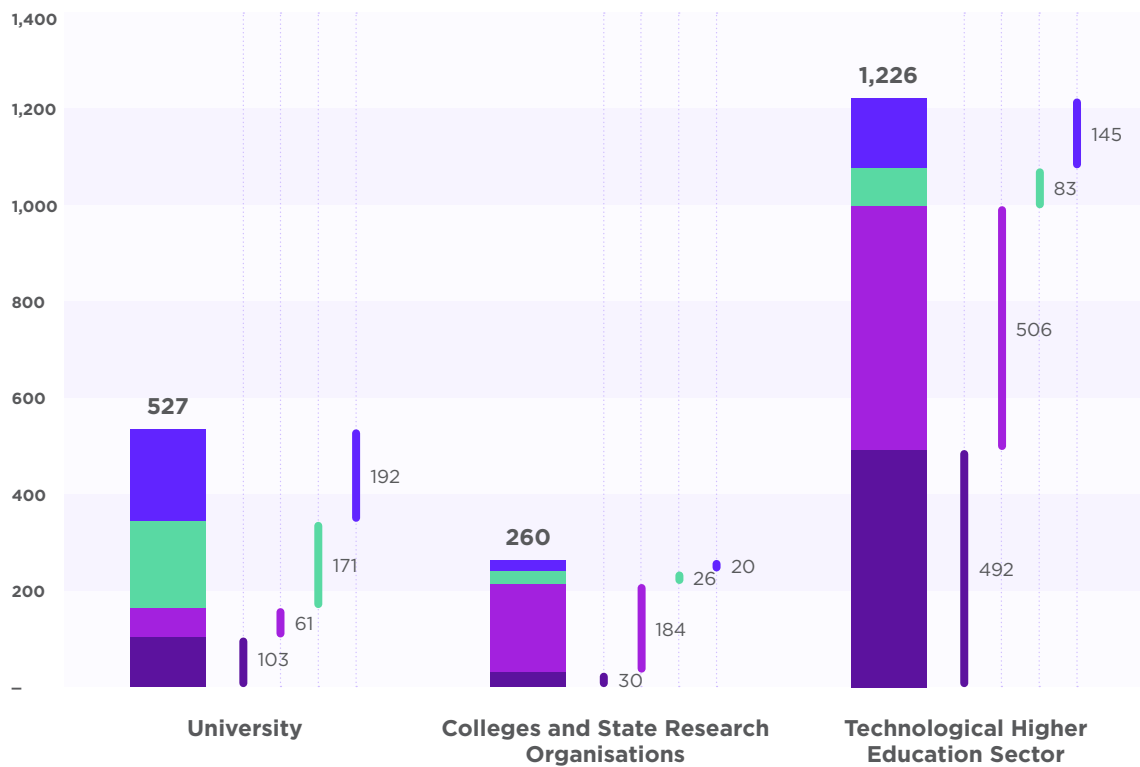
Speaking of the research relationship, Derek Collins, Director of Industry & Academia Research Collaboration at Huawei's Irish Research Centre in Dublin said

**"Huawei continues to work closely with the researchers in the Insight Centre at Dublin City University to develop new technologies and advance the state-of-the-art Machine Learning and Cloud Computing techniques. DCU Invent has been very helpful at all stages of this process and we look forward to our continued collaboration with DCU and plan more projects like this in the future."**

Huawei also works with other universities in Ireland, including those with SFI centres Insight, ADAPT and Lero. Professor Noel O'Connor, CEO at Insight in DCU attributes the wider engagement between the company and Irish HEIs to the work with DCU saying

**"We have worked with Huawei on a number of other projects. I believe this initial research collaboration helped build confidence in the Irish research system as Huawei are now engaged with other SFI Centres and universities."**

**Figure 2:**  
**Number of R&D and consultancy services agreements with industry in 2019 by RPO type**



- Research Collaboration Agreements (wholly funded by industry)
- Research Collaboration Agreements (part-funded by industry)
- Consultancy Services Agreements
- Innovation Voucher Agreements

The above data look at new agreements signed in the year. The AKTS also takes a snapshot of ongoing projects as at year end. There were 2,168 research collaboration projects (fully or part-funded by the company collaborator) live at 31 December 2019. This is an increase of 18% on 2018.

#### 4.1 Working with Irish companies

From the information provided about sharing research and expertise with companies, 70% of Research Collaboration agreements (wholly or part funded by industry, excluding Innovation Voucher funded projects) signed by RPOs in 2019 were with Irish companies (65% 2018) and, of these, 48% were with Irish SMEs (309). 56% of the collaborations entered into with Irish companies were fully funded by the company, the same as the previous year.

## COLLABORATION

### LEO PHARMA & RCSI

## GLOBAL PHARMA FIRM AND IRISH UNIVERSITY WORKING TOGETHER ON NEW BREAST CANCER RESEARCH

RCSI hosts the Irish Centre for Vascular Biology (ICVB) led by Professor James O'Donnell. This centre comprises an integrated network of research groups across Irish hospitals and universities in Ireland and Northern Ireland that are actively engaged in the field of vascular research. This concept arose out of the International Society of Thrombosis and Haemostasis conference held at RCSI in 2018 that also yielded a collaborative research project between RCSI's Dr Jamie O'Sullivan (based in the ICVB) and LEO Pharma, one of Ireland's longest established multinational pharmaceutical companies with a significant presence in the Irish pharmaceutical market over the last 60 years.

The aim of this two-year study, which began in 2019, is to better understand how breast cancer cells exploit the coagulation system to propagate cancer spread in the body and how this may be inhibited by anti-thrombotic agents. Cancer patients have a high risk of developing blood clots or thrombosis with clot formation or thrombosis being the second leading cause of death for all cancer patients. This study is an entirely novel approach and represents the first systematic investigation into the role coagulation proteins play in breast cancer metastasis.

LEO Pharma is a world leader in thrombotic (blood clotting) care and has contributed funding as well as significant intellectual property to the study. The company has also offered a medical education grant to enable the researchers involved. RCSI brings specific know-how relating to novel interactions between coagulation proteins and breast cancer cells and how this interaction can be weakened by the anti-thrombotic agents formulated by LEO Pharma.

The Research and Innovation Office at RCSI enabled this collaboration through helping the company understand from the start RCSI's approach to industry collaboration, providing contract negotiation support and securing funding for the project under the RCSI Strategic Industry Partnership Seed Fund. Principal Investigator Dr Jamie O'Sullivan commented,

**"This collaboration, and the support provided by RCSI Office of Research and Innovation and LEO Pharma has facilitated expansion of my research group, attracting a talented international postdoctoral fellow and helped me develop unique collaborative links with world class innovative researchers."**

And although the study is still underway, several new collaborations for RCSI have already resulted as a direct result of work stemming from it such as with the Olivia Newton-John Cancer Research Institute, Victoria Australia and Beaumont Hospital in Dublin. LEO plans for further collaboration with RCSI beyond this initial engagement with Khalid Aouidat, VP Global Thrombosis Strategy at LEO Pharma commenting that

**"Following a successful study we hope to be able to expand our collaboration with Dr. O'Sullivan in line with the strategic objectives of the RCSI seed fund on other co-funded schemes within this field of research."**



## COLLABORATION

STATSports & DUNDALK IT

# TOP INTERNATIONAL ATHLETES BENEFIT FROM TECHNOLOGY DEVELOPED THROUGH RESEARCH PARTNERSHIP

SME STATSports acquires and analyses player data for elite sports teams with a client list that includes UK, Spanish and Italian premier league soccer teams and international soccer and rugby teams. With its origins in the DkIT Regional Development Centre, the company has enjoyed a longstanding research relationship with DkIT. STATSports is an Enterprise Ireland client company.

In 2015 a formal collaborative research project began with Professor Fergal McCaffery (director of the Regulated Software Research Centre at DkIT) and a wider research team led by Dr Derek Flood, funded through the SFI LERO Centre. This project sought to develop a wearable technology software development and testing environment to enable STATSports to efficiently develop software applications that make use of the latest medical device software development, security and privacy processes.

The project was successful and by May 2019, STATSports had fully applied and tested security protocols and controls in place to allow software developers to integrate them into the company's next generation of its Apex product range. The company and DkIT have continued their relationship, working together on further research projects. The company also hired a member of the research team at DkIT thus further strengthening the links.

Speaking of the collaboration Paul Johnson, General Manager at STATSports, explained some of the benefits of this close collaborative relationship:

**"Our engagement with the Regulated Software Research Centre in DkIT through the Lero funded project has been very beneficial for STATSports.**

**It has enabled us to put cutting edge medical device software development processes in place that will greatly assist us as we look towards providing solutions for the wellbeing and healthcare domains".**

The Regional Development Centre at DkIT supported the collaboration from early incubation, entrepreneur support programmes, placement students, development of collaboration projects, applications for funding, contract development and review and IP protection. The relationship with STATSports has developed and evolved and has become an important component within DkIT's wider Corporate Partnership Programme.

At the end of 2019 STATSports and DkIT were part of a successful Co-Innovate Strand 5 Cluster Partnership with InterTradelreland to collaborate on research to explore an enhanced development of the technology platform for a new segment of the market.

Speaking of the relationship between DkIT and STATSports, Aidan Browne, Head of Innovation & Business Development at DkIT said:

**"Over the past decade we have collaborated extensively with STATSports through a range of support initiatives crossing incubation and entrepreneur support programmes, research and development, student projects, student placements and innovation schemes. The level of focus by both organisations to continue to strengthen the strategic partnership is acknowledged with the success of this collaboration and provides a catalyst to increased engagement and opportunity scoping."**

Irish companies account for 99% (617) of agreements signed in 2019 in respect of Innovation Voucher projects, which was the same as the previous year, and 97% of Innovation Voucher projects were with Irish SMEs.

Taking the new contracts signed in 2019 for Research Collaborations and Innovation Voucher projects together, 84% (1064) were with Irish companies and 73% (918) were with Irish SMEs.

Of the Consultancy Services agreements executed with industry in 2019, 58% (438) were with Irish companies (69% in 2018) and 44% (332) of consultancy agreements were with Irish SMEs.

**Figure 3:**  
Locations of companies with whom the RPO has executed an R&D or consultancy services agreement in 2019, by number of agreements

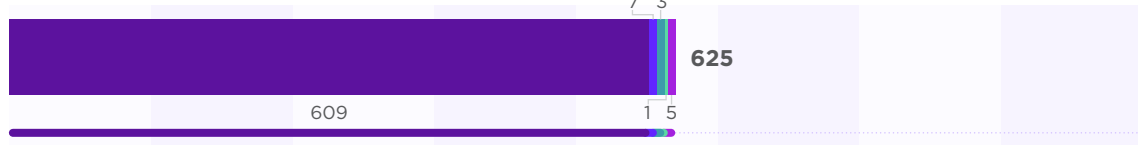
**Research Collaboration Agreements** (wholly funded by industry)



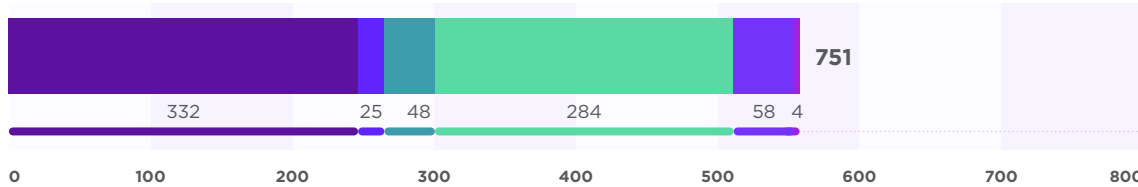
**Research Collaboration Agreements** (part-funded by industry)



**Innovation Vouchers**



**Consultancy Services Agreements**



- SME Irish
- MNC Irish
- Large Co Irish
- SME Overseas
- MNC Overseas
- Large Co Overseas

Irish companies account for 99% (617) of agreements signed in 2019 in respect of Innovation Voucher projects, which was the same as the previous year. Of the Consultancy Services agreements executed with industry in 2019, 58% (438) were with Irish companies (69% in 2018).

## 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 the year that came directly from industry-related projects. The agreement may have been signed in previous years but the project (and associated draw down of funding) will have been live in 2019. RPOs were asked for the percentage of research expenditure that related to direct funding from industry. This was 8% which equates to €53 million.

Recognising the importance of leveraged funding, the RPOs were asked for the first time to provide information on the percentage of their annual research expenditure that had been derived through collaboration with industry. This includes direct funding from industry plus any associated State funding of the project. This shows the significance of research involving enterprise to RPO research funding as 14% (€88m) of their research expenditure was directly attributable to research collaboration projects with industry. It also reveals a potential vulnerability should the level of industry engagement with RPOs decrease. There was marked variation within the sectors with, on average, the percentage of research expenditure by universities derived from industry ranging from 3% to 46% and for the Technological Higher Education sector ranging from 4% to 42%. Three institutions do not currently analyse data by industry-related contribution to research expenditure (NUI Galway, Dún Laoghaire Institute of Art, Design and Technology and the Marine Institute).

### 4.2.2. Revenue from Consultancy Services to business

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. From the data returned under the AKTS, gross revenue from Consultancy Services was €4.6m (€4.1 million, 2018). Six of the RPOs returned a zero sum and in some cases this is because they do not collect such data<sup>2</sup>. In the university sector the revenue range was from €0k to €95k, the Technological Higher Education sector range was from €0k to €950k; and in the Colleges and State Research Organisations sector the range was from €0k to €2.4m. Teagasc reported the highest Consultancy Services revenue amongst all institutes, reflecting its mission.

<sup>2</sup> DKIT, IADT, LIT, LYIT, NCI & Marine Institute

### 4.3 Access to research & expertise by non-commercial entities

Research and expertise is valuable to a wide range of external organisations, including non-commercial entities such as public bodies, charities and NGOs. The EI TTSI programme has a part to play in supporting the development of the wider ecosystem. For example, through funding the development of service units within TTO/Innovation Office to support consultancy engagements. For the second year, the AKTS reports on research and consultancy agreements with non-commercial entities to provide a more complete picture of external engagement by the RPOs.

There were 476 Collaborative Research Agreements and 153 consultancy agreements, a total of 629 agreements, signed with non-commercial entities in 2019. There was great variance in returns, with a range of 2-173 contracts signed. Eight RPOs returned zero. The range of consultancy agreements signed with non-commercial entities was 1-19. Nine RPOs reported no consultancy agreements executed.

Research expenditure in 2019 related to collaboration with non-commercial entities (including where a component of the collaborative project budget was provided by the State) was €29.3m across 13 RPOs. The majority (€25.3m) was from the University sector and €3.5m from Teagasc.

Consultancy Services to non-commercial entities resulted in €2 million revenue. Around 49% of this was from services supplied by the Technological Higher Education sector, 26% from the University sector; and 25% from the Colleges and State Research Organisations sector, with the majority of services supplied by Teagasc.



## COLLABORATION

INISHOWEN RIVERS TRUST  
& TRINITY COLLEGE DUBLIN

# ACADEMIC EXPERTISE FUTURE-PROOFS FOR FLOODING

Inishowen in Donegal suffered severe flooding in 2017, causing substantial damage to land and property. The Inishowen Rivers Trust subsequently engaged Dr Mary Bourke of the School of Geography at Trinity College Dublin as a consultant to advise on alleviating future flood damage.

Dr Bourke is a leading academic in the field of extreme environmental events, and extensively researched methods of using the natural landscape to alleviate impacts of flooding. The project was funded by the Office of Public Works, and Dr Bourke worked with the Trust and local community to determine specific measures for implementation, which are now being progressed to application.

Dr Joanne Conroy, Consultancy Development Manager for CONSULT Trinity, based in Trinity Research and Innovation and funded under the Enterprise Ireland's TTSI programme, supported the engagement. Dr Bourke reported that this was

**"extremely helpful as the processing of the project could be taken out of my hands and I knew I was effectively legally protected. Dr Conroy engaged in knowledgeable discussions around risks. It was very beneficial to have the costing of the project arranged on my behalf, and I could use the funding from this project to fund PhD students."**

This project was also written up as a case study by Consultancy Development Officer Dr Kate Smyth to promote Trinity academic consultancy opportunities. Discussions are ongoing between Dr Bourke, the Trust, and local community about how best to apply the findings to actively combat flooding in the region.

Dr Bourke is also exploring similar projects elsewhere in Ireland, which may lead to collaborative research and new knowledge in the areas of environmental sustainability, biodiversity and climate change. According to Trish Murphy, Project Officer at Inishowen Rivers Trust:

**"The high level of competency and knowledge provided by the university has been evident, and is a valuable experience for the Trust. It has enabled the Trust to deliver a high-quality project, which can be utilised by the relevant agencies and may lead to further collaborations in this field with other NGOs and contacts beyond Ireland. By engaging with the university, the research carried out in Inishowen can be published in academic journals, further highlighting the work of the Trust and advancing knowledge of this topic in Ireland. The Consultancy Office allowed the Trust to deal with the administrative aspect of the project separately from the research aspect, ensuring that the project has effectively satisfied the requirements of the funders."**

Dr Declan Weldon, head of Trinity's TTO, stated that

**"This consultancy project demonstrates how academic excellence can have a direct and timely influence on critical issues affecting our environment. CONSULT Trinity measures success primarily through both academic and client satisfaction, both of which are demonstrated well in this project."**

## CONSULTANCY

### WATER TECHNOLOGIES LTD & CIT

## SUCCESSFUL ACADEMIC CONSULTANCY LEADS TO FURTHER PROJECTS

Water Technologies Ltd (WTL) is a leader in industrial water treatment company providing services to clients across several sectors. The company wanted to develop a process to identify surfactants (substances that act as detergents and dispersants) using a simple spectroscopic test which would allow them to safely handle and replace legacy formulations. To this end, the company engaged with CIT under the Enterprise Ireland Innovation Voucher initiative.

Killian Barton, a researcher in the EI funded Technology Gateway, CAPP (Centre for Advanced Photonics and Process Analysis) in Cork Institute of Technology proposed a project that would address the company's need. This involved the preparation of a spectroscopic database of the surfactant materials already present in the company's inventory against which legacy formulations could be assessed. The database was tested against a trial set of 'unknown' formulations and was seen to perform well, identifying each test sample. This database has subsequently been used on formulations where WTL have taken over management of an industrial cleaning process and are required to identify the formulations that were in use previously. This allows for time saving and safe handling of these materials.

As a result of this initial engagement, Water Technologies Ltd worked with CAPP at CIT on more than 30 subsequent, short-term research projects relating to the company's processes and products.

These include aspects relating to their performance in the dairy, drinks and pharma industries and each interaction was funded directly by WTL. The Innovation and Enterprise Office at CIT has provided contract management advice to CAPP.

CAPP and WTL are currently exploring several avenues for further studies based on the work to date.

Speaking of the value of this engagement to the company, Joe Harrington, Development & Formulation Chemist, WTL said

**"CAPP has provided our business with the ability to trouble shoot on site issues, develop new innovative product formulations, and continue to give our customers the confidence that we have a strong scientific resource when needed. Our experience with CAPP has been very satisfactory to date. Always very helpful and accommodating."**

Equally, engaging with WTL on this project has afforded CAPP the chance to develop the Centre's internal capability. Killian Barton, Postdoctoral Researcher on the project said

**"Collaborating with WTL has provided valuable insight into the practical and technical challenges that are encountered in a range of industrial contexts and how the expertise in CAPP can be adapted to provide useful and prompt support."**

Commenting on the relationship with WTL, Josette O'Mullane, CIT Innovation and Enterprise Manager said,

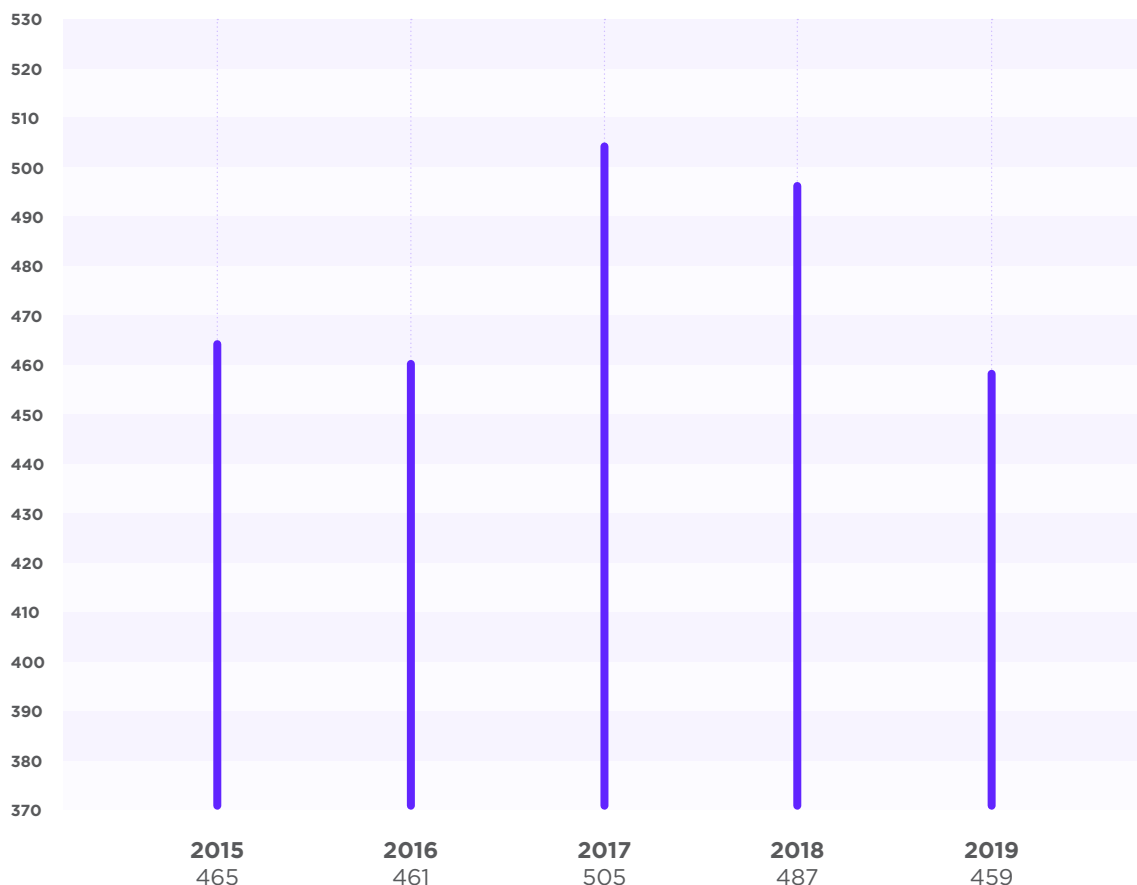
**"Water Technologies Ltd is a well established employer in Cork and we are delighted with this ongoing relationship, and with CAPP's expanding base of industrial clients."**

## 5. INVENTION DISCLOSURES

An invention disclosure records a tangible discovery or development reported to the TTO/Innovation Office for assessment of commercial viability. The average number of disclosures over five years is 475 and at 459, the 2019 figure is within range, although down on the previous year (487, 2018). Consistent with previous years, the majority of IDFs (Invention Disclosure Forms) filed in the TTOs were in the University sector 75% (341). A further 18% (84) were in the Technological Higher Education sector; and 7% (34) and in the Colleges and State Research Organisations sector.

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 2019 15% of disclosures were joint (67) which is an increase on 2018 which was (9%, 46).

**Figure 4:**  
Invention disclosures, 2015 - 2019



## 6. PATENT ACTIVITY

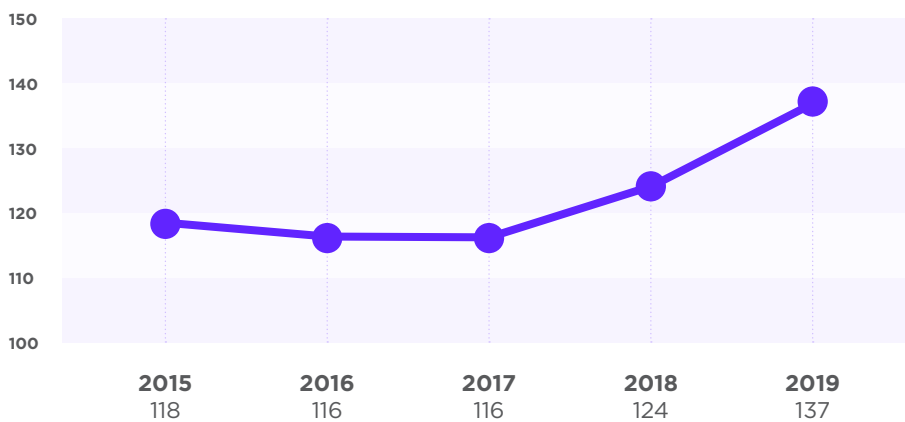
A patent confers upon its holder, for a limited period, the right to exclude others from exploiting (making, using, selling, importing) the patented invention, except with the consent of the owner of the patent.

The number of new patent applications filed has been increasing over the past three years with 137 new filings in 2019, up 8% on the previous year. The university sector maintains its share of 75% of all new patenting activity, however the Technological Higher Education sector dropped from 17% to 5%. Of all the patent applications filed in the previous year, 57% progressed to the next phase, entry into PCT (Patent Cooperation Treaty), which fits comfortably in the three year range of 42% - 67%.

### 6.1 Initial patent filings

Filing a patent application with a national patent office is the first step in seeking protection for an invention and establishes a priority date for the invention. 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 2019 was 137, up 8% on the previous year.

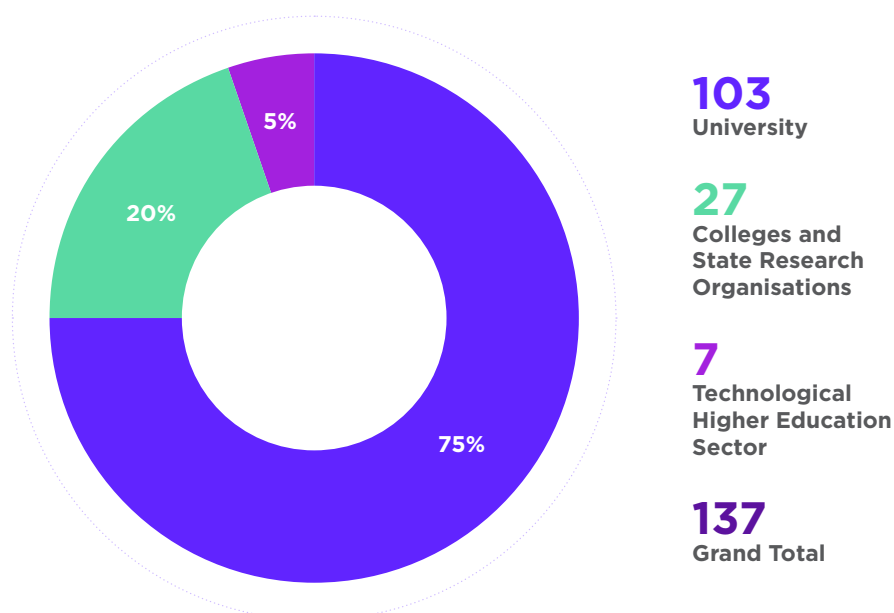
**Figure 5:**  
Priority patent applications, 2015-2019





The split is similar to previous years with the University sector accounting for three-quarters (75%) of all priority patent applications made by RPOs in 2019 (76%, 2018), the Technological Higher Education sector accounted for 5% of the filings made (17%, 2018), and the Colleges and State Research Organisations sector was responsible for the remaining 20% of filings.

**Figure 6:**  
**Patent Filings in 2019 by RPO type**



### 6.1.1 Patent filing jurisdictions

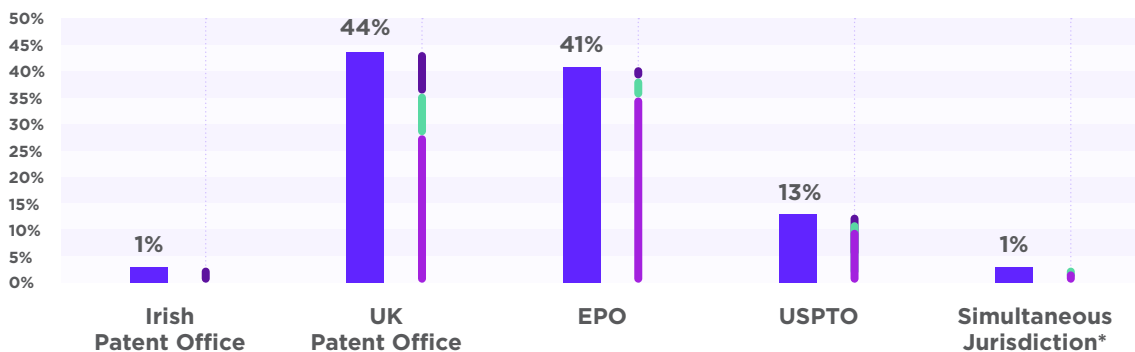
The choice of priority patent filing territories is diverse. Not all applications are filed initially with the Irish Patent Office as patent applicants often prefer to file direct in territories where the invention may be commercialised, or where examination may be timely and may provide information to aid decision making.

The UK IPO is the favoured jurisdiction with 44% of initial priority patents filed there in 2019 (54%, 2018). The EPO is next with 41% (24%, 2018). The level of priority filings made in the Irish patent office has been consistently low over the lifetime of this survey at 1-4% of all initial filings. In 2019 two RPO priority filings (1%) were made by through the Irish patent Office in 2019. Figure 7 shows this breakdown.

**Figure 7:**  
Initial priority patent filing jurisdictions

Type of RPO	Irish Patent Office	UK Patent Office	EPO	USPTO	SIMULTANEOUS JURISDICTION*	Total
University	0	39	49	14	1	103
Technological Higher Education Sector	0	11	5	3	1	20
Colleges and State Research Organisations	2	11	3	1	0	17
<b>Grand Total</b>	<b>2</b>	<b>61</b>	<b>57</b>	<b>18</b>	<b>2</b>	<b>140</b>
%	1%	44%	41%	13%	1%	100%

\* Multiple filings in more than one jurisdiction



### 6.1.2 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. A PCT application is an international filing which is made 12 months after the first filing.

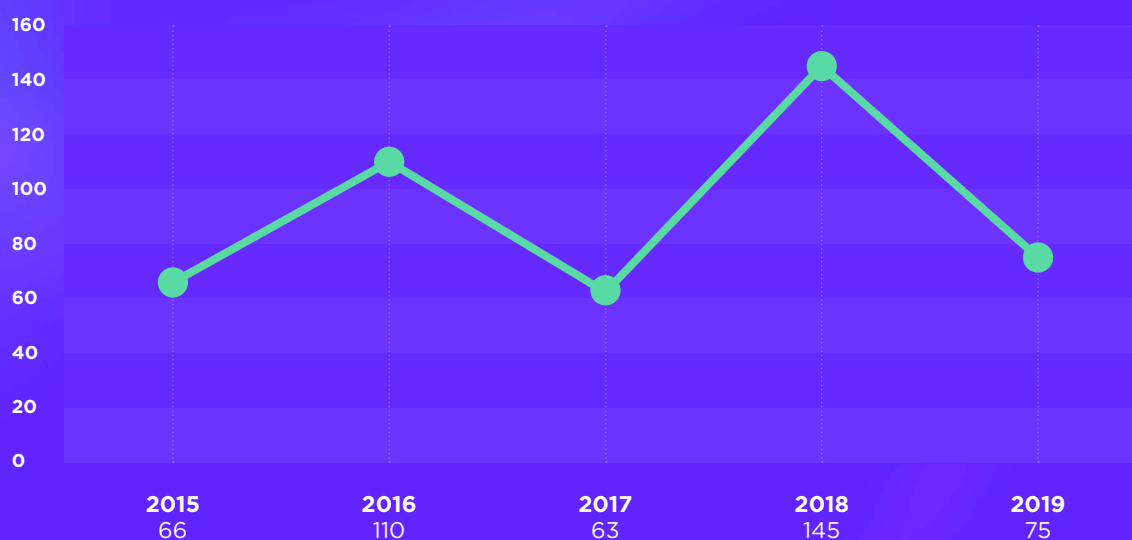
The RPOs reported that, of the 127 initial filings made in 2018, 73 (57%) were progressed to PCT applications in 2019. All universities progressed some initial filings to PCT during 2019 and the range was 36-89%. Five RPOs in the Technological Higher Education sector reported progressing patent applications to PCT and the range for those that did was 27-100%. In the Colleges and State Research Organisations sector only Teagasc progressed patent applications to PCT with a 75% progression rate.

Eighteen months after a PCT application has been filed, it can enter national prosecution in individual countries. This is a costly procedure and patent applications are often licensed prior to this stage. If a patent application is assigned to a company it will no longer be in the name of the RPO. The data on national filings relate to such filings made in the name of the RPO show that, in 2019, 50 PCT applications entered the national phase (35, 2018). Most of these nationalised applications (86%) were made by the University sector (eight universities). The Technological Higher Education and Colleges sector progressed three patent applications (10%) into the national phase with the remaining 4% from Teagasc in the State Research Organisations sector.

### 6.3 Patents granted

The total number of patents granted in 2019 was 75, this is down on the previous year (145, 2018). This decrease is primarily due to the unusual event of a large portfolio of patents being granted to one university simultaneously in many EU jurisdictions in 2018. For comparison, in 2017, 63 patents were granted. Most of the granted patents in 2019 (87%) were granted to inventions from the University sector (92%, 2018). Patent grant depends on the complexity of prosecution within the relevant patent office and can take many years. In addition, if a patent application is assigned to a third party, the RPO is no longer party to the grant. Hence the number of granted patents is not necessarily an indicator of success within any one year. 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 2015 to 2019 is shown in Figure 8.

**Figure 8:**  
Number of patents granted each year



#### 6.3.1 RPO patent portfolio

The number of patent families (patent applications or granted patents that derive from the same original filing) owned by the RPOs at the end of 2019 was 750. This has increased from 646 in the previous year. The biggest share of the portfolio is held by the universities, which together hold 86% of the RPO patent estate (84%, 2018).

#### 6.3.2 Reimbursement of patent costs

Seven RPOs (six universities and Teagasc) said that they achieved some reimbursement of patent costs from licensees in 2019. The range of reimbursement across these RPOs was from €5,000 to just over €60,000.

## COLLABORATION

### ORIGIN ENTERPRISES & UCD

# RESEARCH COLLABORATION AND INTELLECTUAL PROPERTY GO HAND IN HAND

Origin Enterprises is an agri-services group that provides expert on-farm agronomy services, including technology and strategic advice for arable, fruit and vegetable growers. In 2017 the company entered into a significant multi-million Euro collaborative research project with University College Dublin.

The project, called CONSUS (crop optimising through sensing, understanding and visualisation), is a €17.6 million project co-funded by Origin and SFI. The purpose of CONSUS is to carry out original research and development in the field of digital agriculture and to embody that in an advanced in-season decision support system for arable farmers. This will increase yield, provide better yield prediction and reduce the use of agri-inputs. Additionally, other subsidiary projects aim to improve sensing, provide biological alternatives to pesticides and deal with problems such as soil compaction. The project involves 52 new research and software engineer hires in addition to the 19 academics from across four schools in UCD (Computer Science, Biosystems and Food Engineering, Agriculture and Food Science, and Biology and Environmental Science).

The Technology Transfer Office (TTO) based in NovaUCD led the contract negotiations with Origin. The TTO also undertook the due diligence on background IP introduced into the project, including software and datasets, to ensure such background IP was unencumbered and could be licensed to Origin Enterprises.

The TTO supported the development of a coherent IP strategy and provided IP training workshops to researchers from both UCD and Origin. To date, the project has yielded three patent applications for which the TTO carried out the assessments and co-ordinated the patenting process. An evaluation licence to the IP has been executed and further licences are at negotiation stage.

The project is contributing directly to the R&D strategy of the company as Derek Wilson, Chief Information Officer at Origin said

**"The collaboration has made research progress towards a core R&D goal of the company which is to take its existing agricultural platform to the next level by including machine learning innovations among others."**

Equally, UCD has benefitted by being able to recruit and work with a large cohort of new researchers thus enhancing UCD's reputation in this field. Through the collaboration, the researchers have access to work with a leading agronomy company with real-life data on an ongoing basis. Professor Gregory O'Hare, Lead Principal Investigator, said

**"This symbiotic collaboration has proven highly successful and mutually beneficial bringing together the considerable research expertise of UCD, researchers of the highest quality recruited globally and access to significant and leading-edge company assets both in the form of skilled practitioners and technologically advanced farm-based facilities."**

## 7. LICENSING

Rights to intellectual property, including copyright, know-how, patents and trademarks are granted through licence, option and assignment agreements (LOAs). For a more detailed description of these types of agreements, see the Glossary at Appendix 4.

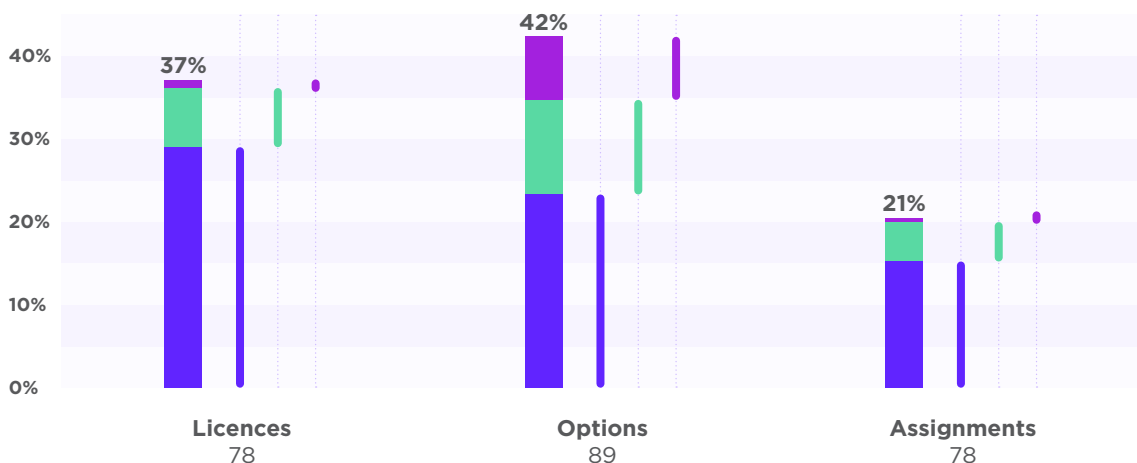
At 210, the 2019 figure fits with the five-year average of 197 LOAs signed. However, when the types of agreements are explored, over the past three years the number of licences has dropped (down 30% from 2016) while the number of options (agreements that give the company time to consider if it wishes to take a licence) has increased (doubled since 2016). That said, the number of LOA to patented intellectual property have increased by 40% since 2016. Taken together, this may suggest that trends are towards more complex licensing rather than volume. This will be considered in further detail with the TTOs.

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

In 2019, 210 LOAs were signed (218, 2018).

**Figure 9:**  
LOAs by type 2019

Type of RPO	Licences	Options	Assignments	Total
University	61	49	32	142
Technological Higher Education sector	15	24	10	49
Colleges and State Research Organisations	2	16	1	19
<b>Grand Total</b>	<b>78</b>	<b>89</b>	<b>43</b>	<b>210</b>
%	37%	42%	21%	100%



There has been a slow decline in the number of licences signed while the number of options (that give a potential licensee time to decide whether it wishes to take a licence) have seen a marked increase over time. This can be seen in Figure 10 which shows five-year trends.

**Figure 10:**  
Total number of licences, options and assignments executed, 2015 - 2019



A breakdown of licensing type by RPOs in Figure 11 shows that the University sector executed most LOAs 68% (67%, 2018) and that 43% of these university IP transactions were licence, against an RPO average of 50%. Licensing accounted for 30% of the total LOAs in the Technological Higher Education sector.

## SPIN-OUT

AtriAN Medical from NUI GALWAY

# PIONEERING NEW TREATMENT FOR COMMON HEART CONDITION

Spin-out company AtriAN Medical has developed a pioneering new treatment for Atrial Fibrillation – the most common form of abnormal heart rhythm affecting millions of people worldwide. The company resulted from a collaboration between NUI Galway and Mayo Clinic in the US was spun out of NUI Galway in 2019 having licensed IP from the university.

The technology underpinning the formation of the company originated at Mayo Clinic and was further developed in NUI Galway under an Enterprise Ireland Commercialisation Fund programme. This approach was facilitated by an over-arching agreement between Enterprise Ireland and Mayo Clinic to enable collaboration between Mayo Clinic and Irish third level institutions. Both NUI Galway and Mayo Clinic have taken equity in the company.

The NUI Galway Innovation Office was involved from the inception of the company, providing support for the team at the outset in their application for and implementation of the EI Commercialisation Fund for the project. It also facilitated arrangements with the Mayo Clinic to enable the team at NUI Galway to advance the IP and worked with the founders to develop and implement a patenting strategy. The Innovation Office negotiated licensing the technology to the company and concluded the shareholders agreement with the parties.

AtriAN has located in the NUI Galway Innovation Centre and continues to work with the university on further development of the technology having achieved €1.1m funding in the Disruptive Technology Innovation Fund (DTIF). The company is an Enterprise Ireland HPSU.



In addition, the company has raised €2.35m in Seed Funding to complete a First-In-Human trial with the first patient to be treated in late 2020. AtriAN has also been awarded €2.3m in the European Horizon 2020 SME instrument.

Speaking of the funding raised by AtriAN Medical, Dr Jacinta Thornton of the NUI Galway Innovation Office said

**“Having supported the development and management of the technology over the last number of years in NUI Galway, we congratulate the company on securing this investment and we commend them on reaching this important milestone.”**

Also speaking of the company’s recent financial success, Mr Ken Coffey, Co-founder and Chief Executive Officer of AtriAN Medical commented,

**“We want to thank our investors who were vital in being able to progress this novel and exciting technology into the clinic. We were delighted and thrilled with the incredible support from the team at NUI Galway and our friends at Mayo Clinic in the US.”**

**Figure 11:**  
**Type and number of licences, options and assignments executed in 2019 by RPO type**



The total number of licence, option and assignment agreements that were active at the end of 2019 was 980. This was an increase of 7% on the previous year (839, 2018). The majority, 68%, were in the University sector (77%, 2018).



**7.2 Types of IP licensed**

Figure 12 shows the types of intellectual property that were the subject of licence, option or assignment agreements over the past five years. Patents/patent applications and software dominate. In 2019 34% of LOAs were to patented IP and 17% to software. LOAs were issued for other types of IP (not covered in Figure 11), namely Trade Secret (13%), Research Materials (7%) and Other (23%). The category “other” includes proprietary strains, non-patented IP and know-how. More than one piece of IP may be licensed within one agreement e.g. software or patent application plus know-how.

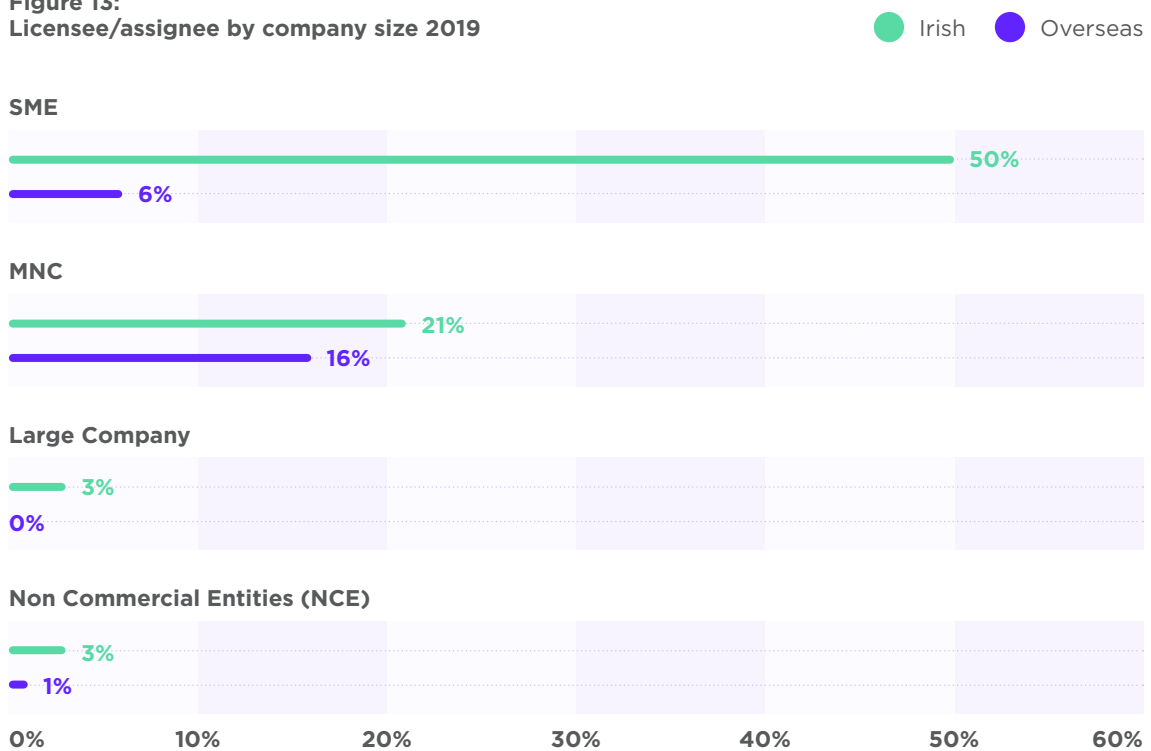
**Figure 12:**  
Underpinning IP and major types of intellectual property in LOAs, 2015 - 2019



### Licensee Types and Locations

In Figure 13, the types of organisations to whom LOAs were granted in 2019 shows that most LOAs (56%) were transacted with SMEs (63% in 2018) and the majority of LOAs were to Irish companies 77% (76% in 2018). Of these Irish licensees, 65% were Irish SMEs. Of the non-Irish companies, LOAs were predominantly executed with MNCs (69%).

**Figure 13:**  
Licensee/assignee by company size 2019



### 7.3 Material Transfer Agreements (MTAs)

Research materials may be transferred to another entity under an MTA which specifies the terms of use. MTAs may be granted to or received from a commercial entity or another research organisation. 115 out-going MTAs to companies were signed in 2019 (102, 2018), the majority of which (90%) were reported by the University sector (91%, 2018).

### 7.4 Products on the market

Of previous licences from the Irish RPOs to companies, 26 led to market launches of products or services in 2019 (33, 2018). Of these, 19 (73%) were from Universities and 5 (20%) were from three RPOs in the Technological Higher Education sector. The remaining two product/services launched were from Teagasc.

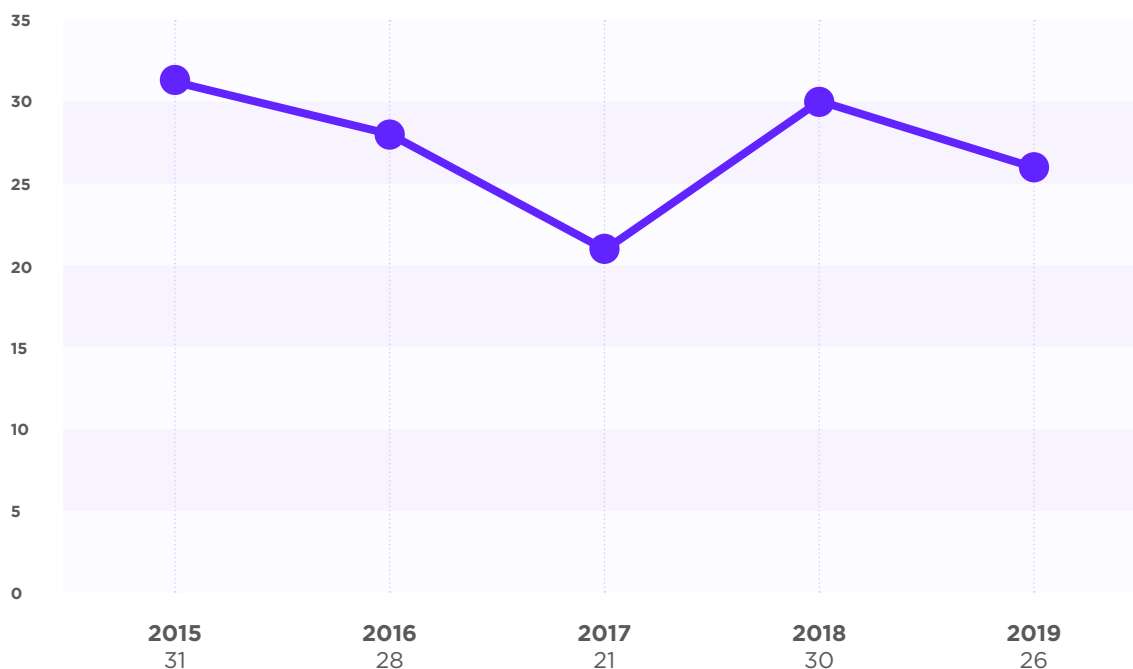
## 8. COMPANY CREATION

The differences between a spin-out and a start-up company are described in the Glossary at Appendix 4.

The median number of spin-outs over the last five years is 27 and in 2019 26 new spin-out companies were formed from 10 RPOs. Of these, 73% (19) were from 6 universities and 19% were from two institutes in the Technological Higher Education sector (5). Two of the spin-outs arose jointly from UCC and Teagasc.

There were 123 Active Spin-outs (3 years or more post-formation) at the end of 2019 which together are estimated to employ (a conservative) 1,000 people. The majority of Active Spin-outs (79%) have been in existence for over 5 years. One university spin-out was acquired in 2019.

**Figure 14:**  
Spin-outs established, 2015 - 2019



The aggregate number of spin-out companies across the RPO sector (where the RPO holds equity or share options) at the end of 2019, was 191 (190, 2018). The University sector accounts for 82% of this portfolio.

There were 32 start-ups reported, by four universities and two from the Technological Higher Education sector. As start-ups are created independently from the RPOs, the numbers provided are estimated and likely to be under-reported in this survey.

### 8.1 Active Spin-out companies

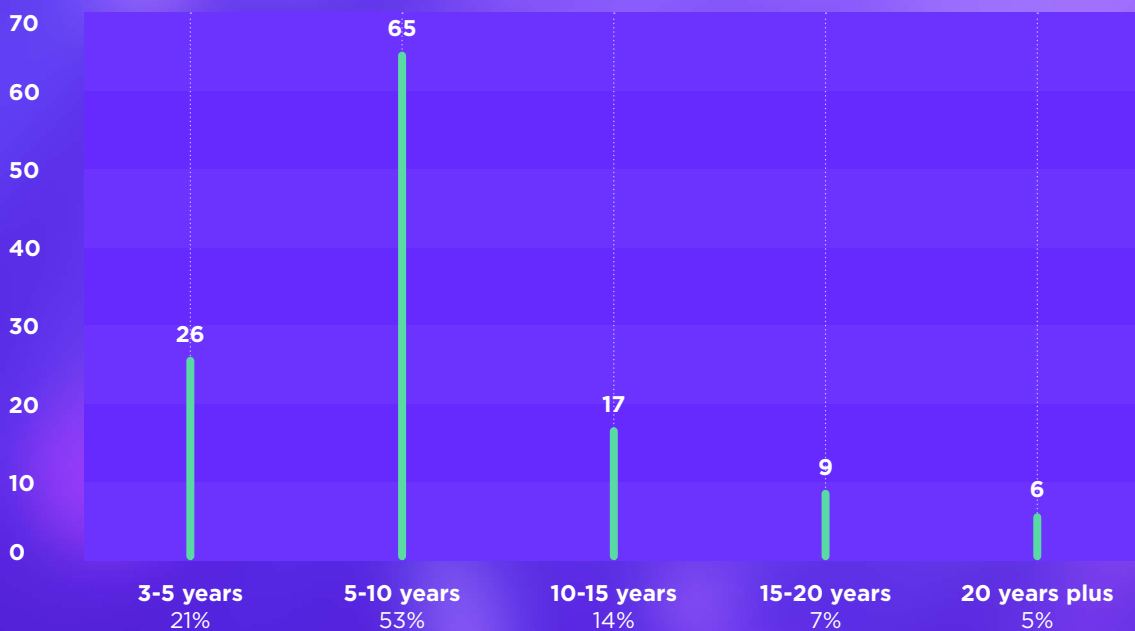
An Active Spin-out is defined as an RPO-created spin-out company that is at least three years post-formation. At the end of the reference year, an Active Spin-out has at least one paid employee and has raised equity and/or has booked sales revenue.

There were 123 Active Spin-outs reported at the end of 2019. Of these, 101 were from the University sector (82%) with 17 coming from the Technological Higher Education sector (14%) and 5 (4%) from the Colleges and State Related Organisations sector. This is consistent with previous years.

The majority of Active Spin-outs are 5-10 years old (53%) and 26% have been in existence for over 10 years. This is shown in Figure 15.

It is estimated by the TTOs that Active Spin-outs employ about a thousand people, which is a slightly lower estimate than a KTI commissioned study into 2017 data that suggested the number then was 1160. These conservative estimates do not take into account the number of people employed over the lifetime of the spin-outs and do not include spin-out companies that are less than three years old or that have gone on to successful acquisitions. It is reasonable to assume that jobs created through spin-out companies is well in excess of 1,000.

**Figure 15:**  
**Active Spin-outs – # of Years Incorporated**



## 8.2 Company exits

One spin-out was acquired during 2019. This was DCU spin-out Xcelerator Machine Translations that was acquired by Keyword Studios.

## 8.3 Company incubation

All Higher Education Institutes (HEIs – universities and IoTs) have an associated incubator facility in which early stage companies can develop. In addition to space for the company, services offered to the incubated company include advice on IP, networking events and access to professional services. The total number of incubator clients at the end of 2019 was 899 (945 in 2018). The majority were based in Technological Higher Education sector incubators (712) with 186 in University incubators. A total of 309 new companies entered HEI incubators and 263 exited during the year.



## SPIN-OUT

### VARADIS FROM UCC

## PRODUCING RADIATION DEVICES FOR USE ACROSS MULTIPLE SECTORS

UCC spin-out company Varadis manufactures and sells radiation devices called RADFETS for use in medical, space, safety, environmental, laboratory and other applications.

The company was formed in 2019 through a series of funding supports that moved the technology from the lab to an investible business. Fundamental to this was the Innovation Office at UCC working with the Tyndall National Institute to undertake an EI Feasibility Study followed by a successful application for EI Commercialisation Funding of €600,000.

The Commercialisation Fund award allowed for standardisation of the fabrication process, improving the yield and increasing the device sensitivity of RADFETS beyond what had already been possible at Tyndall.

The Innovation Office licensed the underpinning intellectual property to the company and supported through drafting of a shareholder's agreement. Brad Wrigley recognises the key role played by the Innovation Office in bringing about the formation of the company

Varadis continues to work closely with UCC and Tyndall where there are ongoing collaborations. The company is also an Enterprise Ireland HPSU.

To date the company's customer base has grown significantly across both the space exploration and government sectors. Varadis now has over twenty new contracts with satellite manufacturers in the US, AsiaPac and EMEA. The company plans to build greater presence within the Enterprise, Healthcare, Government and Industrial sectors and has partnered with three separate distribution partners in North America, Asia and Europe. Varadis has also entered into early-stage strategic alliances with two key technology partners on larger system opportunities that plan to open up new and exciting opportunities. Company sales in 2019 exceeded initial pre-spinout forecasts.

Varadis' devices are currently fabricated and research and development continues via a collaboration with Tyndall and the European Space Agency.

**"The complexity of the IP and Tech Transfer was certainly something that was underestimated by the Varadis team when the spin-out process kicked-off, given the challenge of transferring out IP from 20+ years of research, while at the same time balancing Tyndall's requirements to continue research in the area. The Innovation Office at UCC was an integral partner throughout the process, bringing together all the key parties, including enabling the involvement of the academic founders in the venture".**

## SPIN-OUT

TerminusDB  
FROM TRINITY COLLEGE DUBLIN

# REVOLUTIONISING REVISION CONTROL FOR STRUCTURED DATA

Spin-out company from Trinity College Dublin, TerminusDB is bringing the revision control revolution to data. The company, previously known as DataChemist, is behind the open source graph database, TerminusDB. TerminusDB and TerminusHub allows you to easily collaborate with versioned complex data. It transforms messy and inconsistent data sets of the real world into clean, structured and integrated data that you can easily share or integrate into a pipeline.

Headquartered in Dublin, TerminusDB spun out from Trinity College Dublin in 2017 and is funded by Atlantic Bridge and Enterprise Ireland and is focused on delivering for data people: DBAs, Data Scientists, DevOps and DataOps.

Co-founders Kevin Feeney and Gavin Mendel-Gleason, both fellows at the School of Computer Science and Statistics at Trinity College Dublin, are now CEO and CTO of the company respectively.

The company has its foundation in intellectual property that came about through research undertaken during a Horizon 2020 project called ALIGNED. Initial funding was through a capital seed round of \$1.2 million led by Atlantic Bridge and including Enterprise Ireland. The company licensed software and know-how from Trinity College Dublin and the university also holds an equity stake in the company.

**“We saw first-hand how the technology behind TerminusDB can bring clarity and insight to researchers handling large and complex data sets.**

**We’re confident that they will be able to translate this research into the commercial world, highlighting Ireland’s growing excellence in the tech space”**

commented Leonard Hobbs, Director of Trinity Research and Innovation at Trinity College Dublin. The TTO office supported the formation of the company from raising finance, management of Intellectual Property, introducing the company to potential customers and participating in joint events.

The company has also paid homage to the support it has received from the office. As Kevin Feeney puts it

**“A smooth licence negotiation process from term sheet agreement to final execution greatly assisted our initial fundraising seed round. The campus company approval process in Trinity is well documented and as a result largely seamless. In particular, the fact that the role of Startup Development Manager exists, shows how Trinity values outcomes that are mutually beneficial to both the University and the company.”**

TerminusDB has won several accolades that include the Trinity Innovation Awards and Data Science Awards and it is now classified as an Enterprise Ireland HPSU. In November 2019, the company announced its expansion by opening an R&D hub in Utrecht in the Netherlands where it employs 2 people in addition to the 9 staff in its headquarters in Ireland.

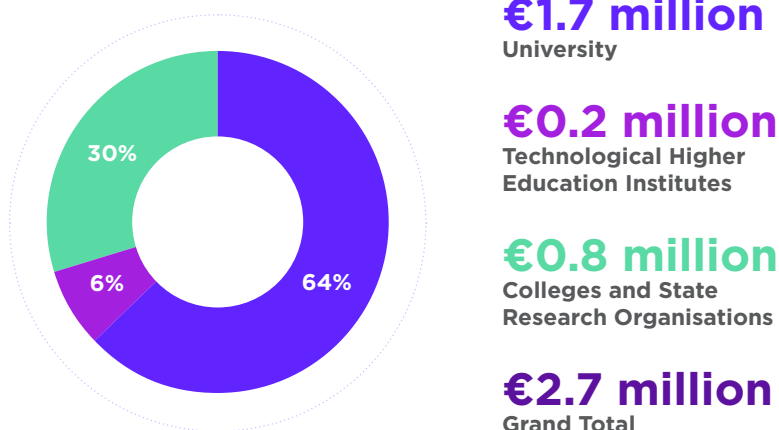
## 9. REVENUE GENERATION FROM LICENSING AND SPIN-OUTS

### 9.1 Licence revenue

The gross 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 may include licence issue fees, annual fees, royalties, option fees and milestones, termination and cash-in payments.

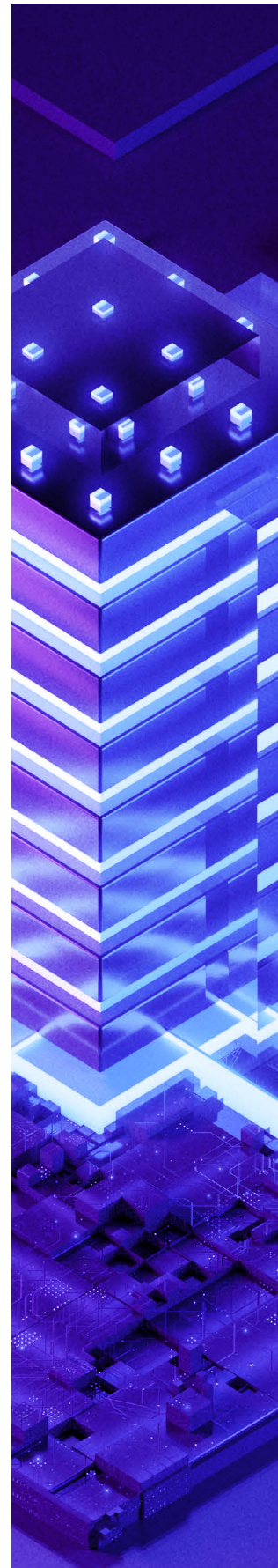
All eight universities reported revenue from licensing while only six out of the 12 in the Technological Higher Education sector generated licence income. From the data provided, the aggregate revenue from licensing in 2019 was €2.7 million (€1.7 million, 2018). Licence revenue in the Colleges and State Research Organisations sector accounted for 30% of all licence revenue in the year. This was due to royalty streams from the sale of plant varieties.

**Figure 16:**  
Licence revenue by RPO sector 2019



### 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. There was no realised revenue from the sale of equity in 2019 and only one university achieved a dividend return (€180k).

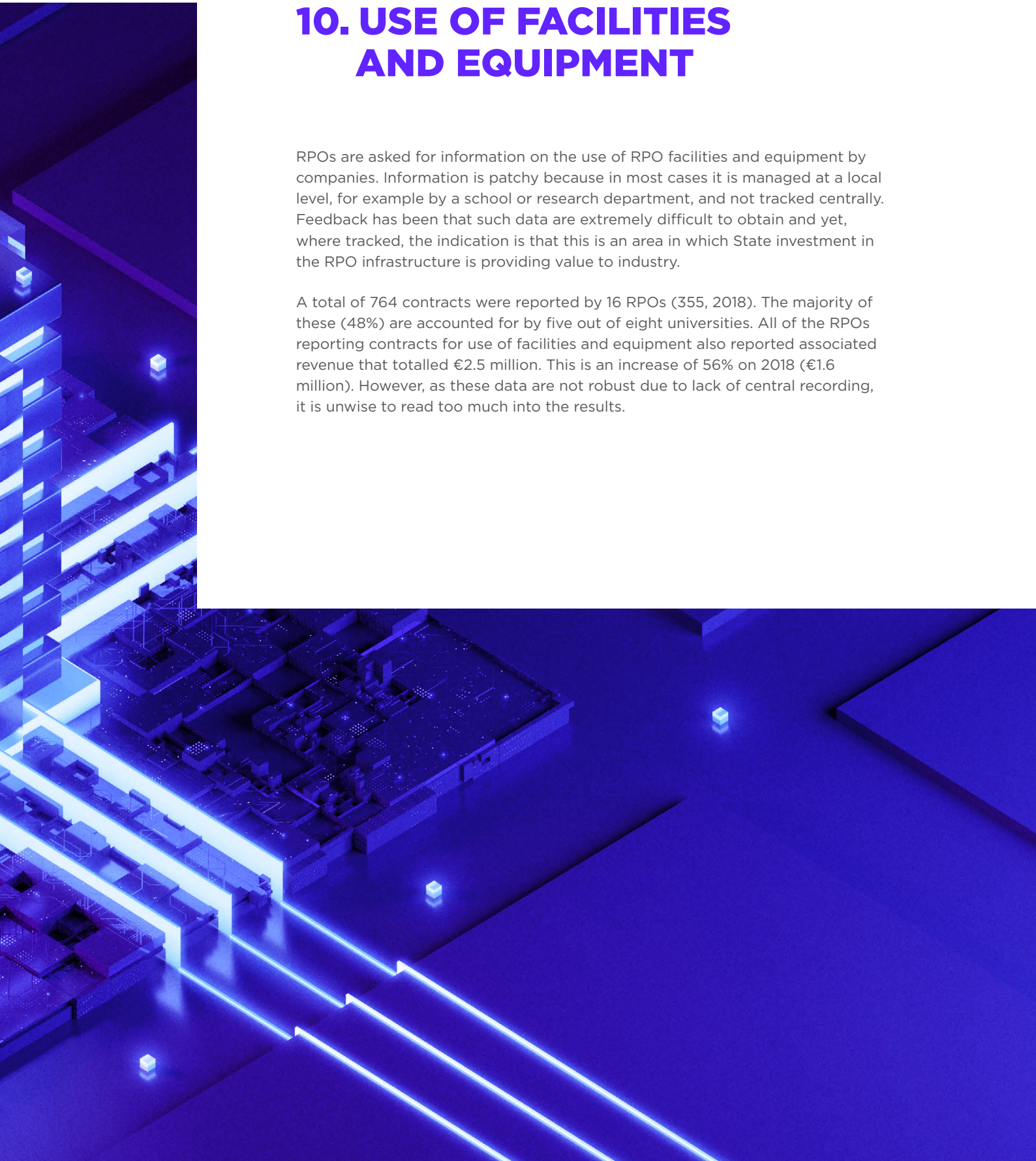




## 10. USE OF FACILITIES AND EQUIPMENT

RPOs are asked for information on the use of RPO facilities and equipment by companies. Information is patchy because in most cases it is managed at a 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 tracked, the indication is that this is an area in which State investment in the RPO infrastructure is providing value to industry.

A total of 764 contracts were reported by 16 RPOs (355, 2018). The majority of these (48%) are accounted for by five out of eight universities. All of the RPOs reporting contracts for use of facilities and equipment also reported associated revenue that totalled €2.5 million. This is an increase of 56% on 2018 (€1.6 million). However, as these data are not robust due to lack of central recording, it is unwise to read too much into the results.



## 11. SUMMARY OF COMMERCIALISATION REVENUE

The majority of revenue (95%) is derived from industry engagements including Collaborative Research (this includes projects jointly funded by industry and the State), Innovation Voucher projects and Consultancy Services. Commercialisation revenue from licensing, spinout dividends and equity sale adds a further 3% in revenue with use of facilities and equipment contributing a further 2%.

The data presented in Figure 17 exclude research collaboration and consultancy services with non-commercial entities and exclude general research income (non-industry project related) from State or other non-profit research funding sources e.g. research funding agencies, charities.

**Figure 17:**  
Revenue from commercialisation activities with industry



## COLLABORATION

### NELIPAK HEALTHCARE PACKAGING & ATHLONE IT

## REVOLUTIONISING MEDTECH PACKAGING SMART STERILISATION

Nelipak Healthcare Packaging is a leader in the design, development and manufacture of custom-designed healthcare packaging for the medical device and pharmaceutical industries, serving customers from some of the largest and most reputable medical device and pharmaceutical companies in the world. The company values the research and expertise available at Athlone IT and has engaged across several research projects.

Most recently, Nelipak engaged in a collaborative research project with the Smart Polymers Research Group in the Materials Research Institute at AIT. The Materials Research Institute is one of the largest melt processing research groups in Ireland. Carried out under an Enterprise Ireland Innovation Partnership project that completed in 2019, the results of the research have positioned Nelipak to develop a novel self-sterilising packaging system that will revolutionise the field of medical device sterilisation.

Speaking of the research undertaken Dr Luke Geever, Principal Investigator at the Materials Research Institute and Technology Innovation Manager at the Enterprise Ireland funded Applied Polymer Technologies Gateway at Athlone IT said

**"This research is innovative across the medical device packaging and sterilisation markets and holds potential to make the sterilisation process more efficient in a market which has remained relatively unchanged until recent developments have called for more cost effective and timely sterilisation processes. If developed successfully, the novel self-sterilising packaging system will lead to a system that will be a game changer in the field of medical device sterilisation."**

Nelipak and AIT have secured funding from Enterprise Ireland for a second Innovation Partnership that is currently underway.

The Innovation and Enterprise Office at Athlone IT supported the collaborative arrangement from the outset including the preparation of agreements and reviewing project progress and completion. The office was also involved in the identification of IP generated during the project. The Innovation and Enterprise Office has facilitated and supported the follow-on Innovation Partnership that is currently underway and continues to work with and support the parties involved.

Speaking of the support received Seán Egan, Global Director of Marketing & Voice of Customer Development at Nelipak said

**"The technical know-how and support from AIT has been instrumental in gaining support from the wider business to continue the partnership through the next phases and helping bring industry partners on-board to provide support with next steps."**

He also expects significant market potential to open up as a result of the research with Athlone IT saying

**"It's envisaged that additional markets beyond medical device OEMs will become available to Nelipak following successful commercialisation of the results. The success to date has encouraged Nelipak to look at further opportunities to engage in research collaboration with AIT around material technology."**

## COLLABORATION

Molecule RnD & UL

# COLLABORATIVE RESEARCH RESULTS IN OPENING OF NEW FACILITY ON LIMERICK CAMPUS

Molecule is a US investment company that engages directly with scientists to develop technologies that have the potential to be cutting-edge, effective solutions by solving grand challenges facing humanity and the planet such as clean water, energy, sustainable development. As a direct result of a research collaboration at the University of Limerick it established Molecule RnD Ltd in Limerick to accelerate the commercialisation of the research results.

In 2018, Molecule fully funded a collaborative research project with Prof Michael Zaworotko of the Department of Chemical & Environmental Sciences at the University of Limerick to develop one of his patented energy efficient water capture technologies into new materials.

This research project has resulted in a novel means through which traditional dehumidifiers can be transformed into water generating equipment thus helping the global energy efficiency and water crises. Speaking of this discovery, Professor Michael Zaworotko said

**“This is a very exciting development, both for me personally and our research team, as it demonstrates how quite fundamental research can have a very high impact in addressing global scale problems.”**

Such was the success of the collaboration that in 2019 Molecule established Molecule RnD Ltd in Limerick to accelerate the commercialisation of the research results. The company has built working prototypes, has a vertical supply chain in the USA, and is offering pilot-project demonstration programs during 2020 to approved interested parties.

It is currently accepting applications for funded demonstration unit pilot programmes for 2020-21.

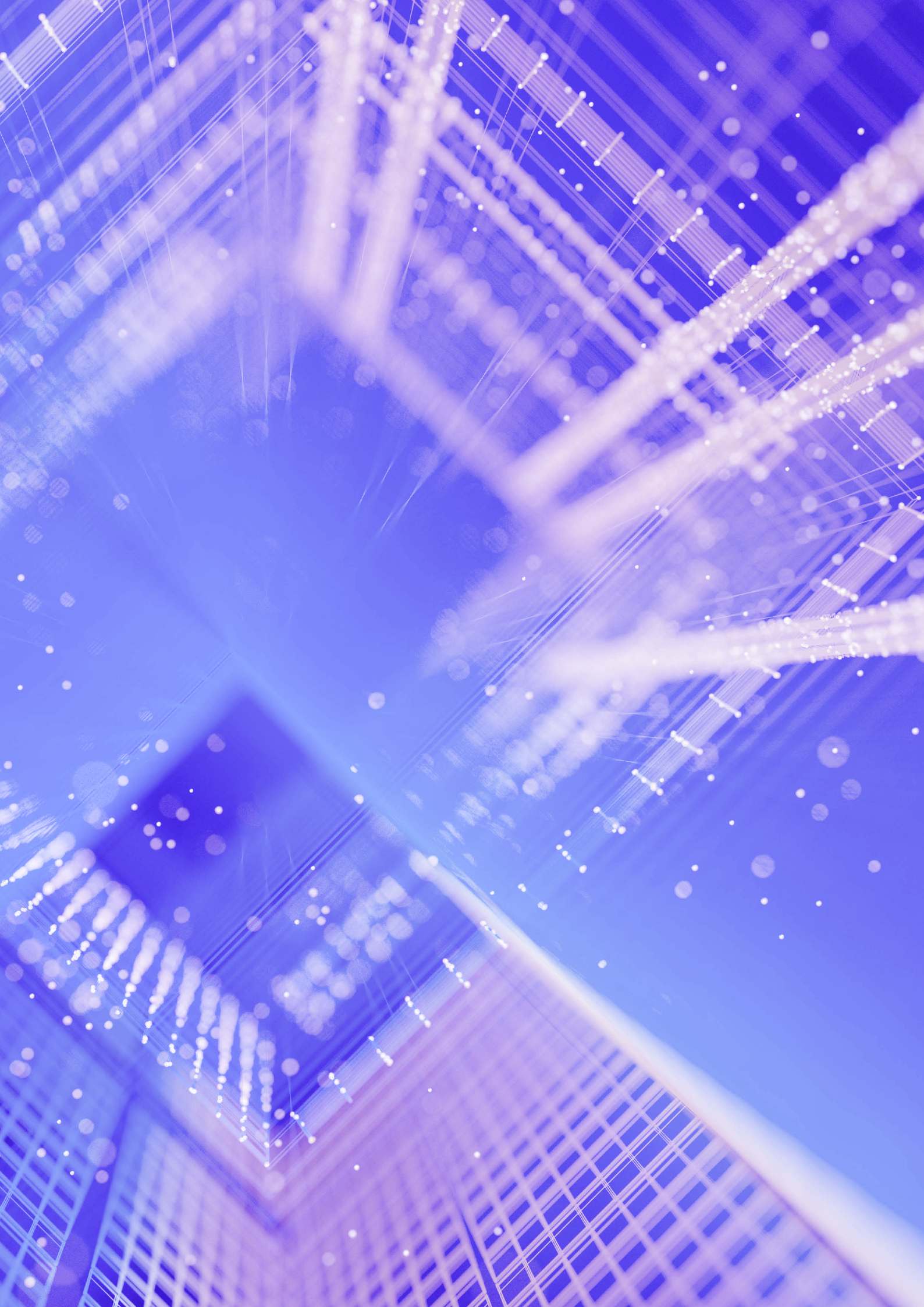
Speaking of the value of the collaboration, Kurt Francis, Molecule’s CTO said

**“We approached Mike to develop a material for us that could help solve the global water crisis. Our teams meshed to bridge the gap between academic scientific research with real world product development, engineering and business development.”**

The Innovation Office/TTO at UL was involved from the outset of this collaboration having advised on the development of the initial work packages and having negotiated the research agreement with Molecule and two subsequent research agreements for the projects that followed. The office has dealt with patent applications arising from the projects and negotiated licence arrangements. It helped secure Ireland as a preferred location for Molecule’s R&D facility which directly led to the formation of Molecule RND Ltd in the Nexus Innovation Centre on the UL campus. In addition, the TTO has facilitated access for the company to legal, financial and other Irish based advisors and researchers.

Professor Zaworotko recognised the support received from the TTO

**“Margaret Lawlor [at the TTO in UL] played a pivotal role in enabling the engagement between my research team and the company. Her support was very proactive, highly professional and she showed enormous persistence and stamina to make this arrangement happen.”**



## APPENDIX 1. SUMMARY DATA BY RPO

Selected data relating to the returns made by the 24 RPOs are presented in tables A1-C2.

The data should not 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 commercialisation 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 with Industry 2019: University, Colleges & State Research Organisations

University	Research expenditures (€) (less block grant) in the reference year	Research Expenditure derived directly 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	€36,923,518	€3,286,193	46	19	1	66
Maynooth University	€28,067,172	€477,142	37	9	5	51
NUI Galway	€71,021,434	€2,741,427	46	8	7	61
Royal College of Surgeons in Ireland	€21,866,566	€2,186,657	29	1	1	31
Trinity College Dublin	€103,470,305	€5,483,926	70	36	8	114
University College Cork	€105,489,428	€12,658,731	46	15	6	67
University College Dublin	€100,830,000	€6,957,270	50	13	23	86
University of Limerick	€37,003,235	€5,291,463	39	2	10	51
<b>Total</b>	<b>€504,671,658</b>	<b>€39,082,809</b>	<b>363</b>	<b>103</b>	<b>61</b>	<b>527</b>
<b>College &amp; State Research Organisations</b>						
National College of Art and Design	€130,561	€30,029	21	5	11	0
National College of Ireland	€303,000	€9,090	1	4	0	0
Marine Institute	€6,100,000	€0	0	0	0	0
Teagasc	€43,850,000	€7,454,500	24	21	173	0
<b>Total</b>	<b>€50,383,561</b>	<b>€7,493,619</b>	<b>46</b>	<b>30</b>	<b>184</b>	<b>0</b>

## APPENDIX 1. SUMMARY DATA BY RPO (CONTINUED)

### A2: Research Expenditure, research agreements and consultancy with Industry 2019: Technological University & Institutes of Technology

	Research expenditures (€) (less block grant) in the reference year	Research Expenditure derived directly 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
<b>Technological University</b>						
TU Dublin	€17,771,720	€604,238	36	17	45	98
<b>Total</b>	<b>€17,771,720</b>	<b>€604,238</b>	<b>36</b>	<b>17</b>	<b>45</b>	<b>98</b>
<b>Institutes of Technology</b>						
Athlone Institute of Technology	€4,978,752	€448,088	17	47	153	217
Cork Institute of Technology	€14,314,322	€2,643,855	17	63	115	195
Dundalk Institute of Technology	€4,250,000	€425,000	9	17	0	26
Galway-Mayo Institute of Technology	€3,187,610	€223,133	7	11	1	19
Dun Laoghaire IADT	€413,389	€5,374	0	10	0	10
Institute of Technology Carlow	€3,418,209	€170,910	8	89	14	111
Institute of Technology Sligo	€4,731,000	€0	12	108	1	121
Institute of Technology Tralee	€2,737,538	€547,508	11	21	2	34
Letterkenny Institute of Technology	€1,642,211	€82,111	17	20	0	37
Limerick Institute of Technology	€2,242,980	€224,298	13	26	2	41
Waterford Institute of Technology	€20,815,520	€832,621	81	63	173	317
<b>Total</b>	<b>€62,731,531</b>	<b>€5,602,897</b>	<b>192</b>	<b>475</b>	<b>461</b>	<b>1128</b>
<b>Grand Total A1 &amp; A2</b>	<b>€635,558,470</b>	<b>€52,783,564</b>	<b>637</b>	<b>625</b>	<b>751</b>	<b>2,013</b>

## APPENDIX 1. SUMMARY DATA BY RPO (CONTINUED)

### A3: Research Expenditure, research agreements and consultancy with non-commercial entities 2019: University, Colleges & State Research Organisations

University	Research expenditures (€) (less block grant) in the reference year	Research Expenditure derived from non-commercial entities	Number of collaborative research agreements with non-commercial entities	Number of consultancy services agreements with non-commercial entities	Total Number of Collaboration and consultancy services agreements with non-commercial entities
Dublin City University	€36,923,518	€3,227,115	2	0	2
Maynooth University	€28,067,172	€519,243	4	19	23
NUI Galway	€71,021,434	€518,456	0	2	2
Royal College of Surgeons in Ireland	€21,866,566	€3,717,316	2	1	3
Trinity College Dublin	€103,470,305	€4,656,164	98	9	107
University College Cork	€105,489,428	€3,164,683	175	12	187
University College Dublin	€100,830,000	€8,106,732	105	15	120
University of Limerick	€37,003,235	€1,369,120	5	0	5
<b>Total</b>	<b>€504,671,658</b>	<b>€25,278,829</b>	<b>391</b>	<b>58</b>	<b>449</b>
<b>College &amp; State Research Organisations</b>					
National College of Art and Design	€130,561	€10,445	19	5	24
National College of Ireland	€303,000	€0	0	0	0
Marine Institute	€6,100,000	€0	0	0	0
Teagasc	€43,850,000	€3,508,000	3	49	52
<b>Total</b>	<b>€50,383,561</b>	<b>€3,518,445</b>	<b>22</b>	<b>54</b>	<b>76</b>



## APPENDIX 1. SUMMARY DATA BY RPO (CONTINUED)

### A4: Research Expenditure, research agreements and consultancy with non-commercial entities 2019: Technological University & Institutes of Technology

	Research expenditures (€) (less block grant) in the reference year	Research Expenditure derived from non-commercial entities	Number of collaborative research agreements with non-commercial entities	Number of consultancy services agreements with non-commercial entities	Total Number of Collaboration and consultancy services agreements with non-commercial entities
<b>Technological University</b>					
TU Dublin	€17,771,720	€0	0	1	1
<b>Total</b>	<b>€17,771,720</b>	<b>€0</b>	<b>0</b>	<b>1</b>	<b>1</b>
<b>Institutes of Technology</b>					
Athlone Institute of Technology	€4,978,752	€0	10	12	22
Cork Institute of Technology	€14,314,322	€0	0	10	10
Dundalk Institute of Technology	€4,250,000	€0	0	1	1
Galway-Mayo Institute of Technology	€3,187,610	€0	9	7	16
Dun Laoghaire IADT	€413,389	€18,065	2	0	2
Institute of Technology Carlow	€3,418,209	€68,364	2	0	2
Institute of Technology Sligo	€4,731,000	€0	10	3	13
Institute of Technology Tralee	€2,737,538	€0	0	0	0
Letterkenny Institute of Technology	€1,642,211	€0	0	0	0
Limerick Institute of Technology	€2,242,980	€0	23	0	23
Waterford Institute of Technology	€20,815,520	€416,310	7	7	14
<b>Total</b>	<b>€62,731,531</b>	<b>€502,740</b>	<b>63</b>	<b>40</b>	<b>103</b>
<b>Grand Total A3 &amp; A4</b>	<b>€635,558,470</b>	<b>€29,300,014</b>	<b>476</b>	<b>153</b>	<b>629</b>

## APPENDIX 1. SUMMARY DATA BY RPO (CONTINUED)

### B1: IP and IP Transactions 2019: University, Colleges & 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 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	27	10	36%	6	64	27	3
Maynooth University	8	5	40%	1	28	4	0
NUI Galway	58	11	75%	10	126	18	2
Royal College of Surgeons in Ireland	18	5	50%	1	26	5	1
Trinity College Dublin	57	16	80%	20	136	23	7
University College Cork	77	22	68%	9	69	35	1
University College Dublin	75	23	50%	10	116	25	4
University of Limerick	21	11	89%	8	77	5	1
<b>Total</b>	<b>341</b>	<b>103</b>		<b>65</b>	<b>642</b>	<b>142</b>	<b>19</b>
<b>Colleges and State Research Organisations</b>							
National College of Art and Design	6	1	0%	0	0	0	0
National College of Ireland	3	0	0%	0	0	1	0
Marine Institute	0	0	0%	0	0	0	0
Teagasc	25	6	75%	2	28	18	2
<b>Total</b>	<b>34</b>	<b>7</b>		<b>2</b>	<b>28</b>	<b>19</b>	<b>2</b>

## APPENDIX 1. SUMMARY DATA BY RPO (CONTINUED)

### B2: IP and IP Transactions 2019: Technological University & 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 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>Technological University</b>							
TU Dublin	28	11	27%	3	40	16	2
	28	11		3	40	16	2
<b>Institutes of Technology</b>							
Athlone Institute of Technology	6	0	0%	0	0	3	0
Cork Institute of Technology	16	3	0%	3	13	11	2
Dundalk Institute of Technology	9	0	0%	0	1	2	0
Galway-Mayo Institute of Technology	2	1	0%	0	0	0	1
Dun Laoghaire IADT	0	0	0%	0	0	0	0
Institute of Technology Carlow	4	0	100%	0	1	1	0
Institute of Technology Sligo	3	6	100%	1	8	0	0
Institute of Technology Tralee	2	1	33%	0	0	5	0
Letterkenny Institute of Technology	1	0	0%	0	0	0	0
Limerick Institute of Technology	5	0	0%	0	0	1	0
Waterford Institute of Technology	8	5	33%	1	17	10	0
<b>Total</b>	<b>56</b>	<b>16</b>		<b>5</b>	<b>40</b>	<b>33</b>	<b>3</b>
<b>Grand Total B1 &amp; B2</b>	<b>459</b>	<b>137</b>		<b>75</b>	<b>750</b>	<b>210</b>	<b>26</b>

## APPENDIX 1. SUMMARY DATA BY RPO (CONTINUED)

### C1: Spin-out companies, incubation and use of facilities 2019: University, Colleges & State Research Organisations

	<sup>1</sup> Number of spin-outs established during the year	<sup>2</sup> 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 spin-outs merged or acquired during the year	Number of companies supported within the incubator in the year	Number of contracts with companies for use of facilities and equipment at the RPO
<b>University</b>						
Dublin City University	1	10	8	1	36	17
Maynooth University	0	0	7	0	31	24
NUI Galway	1	0	10	0	36	0
Royal College of Surgeons in Ireland	0	0	1	0	0	1
Trinity College Dublin	6	5	30	0	50	22
University College Cork	5	10	14	0	14	0
University College Dublin	5	3	18	1	0	0
University of Limerick	2	0	13	0	19	303
<b>Total</b>	<b>19</b>	<b>28</b>	<b>101</b>	<b>2</b>	<b>186</b>	<b>367</b>
<b>Colleges and State Research Organisations</b>						
National College of Art and Design	0	0	1	0	1	0
National College of Ireland	1	0	1	0	0	0
Marine Institute	0	0	0	0	0	0
Teagasc	2	0	3	0	0	32
<b>Total</b>	<b>2</b>	<b>0</b>	<b>5</b>	<b>0</b>	<b>1</b>	<b>32</b>

<sup>1</sup>Note on spin-outs associated with two HEIs

<sup>2</sup>Estimated figure

## APPENDIX 1. SUMMARY DATA BY RPO (CONTINUED)

### C2: Spin-out companies, incubation and use of facilities 2019: Technological University & Institutes of Technology

	<sup>1</sup> Number of spin-outs established during the year	<sup>2</sup> 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 spin-outs merged or acquired during the year	Number of companies supported within the incubator in the year	Number of contracts with companies for use of facilities and equipment at the RPO
<b>Technological University</b>						
TU Dublin	3	0	5	0	205	25
	<b>3</b>	<b>0</b>	<b>5</b>	<b>0</b>	<b>205</b>	<b>25</b>
<b>Institutes of Technology</b>						
Athlone Institute of Technology	0	0	0	0	29	20
Cork Institute of Technology	0	3	4	0	75	108
Dundalk Institute of Technology	0	0	2	0	37	0
Galway-Mayo Institute of Technology	0	0	0	0	71	60
Dun Laoghaire IADT	0	1	0	0	29	3
Institute of Technology Carlow	0	0	1	0	41	5
Institute of Technology Sligo	0	0	0	0	40	4
Institute of Technology Tralee	0	0	1	0	37	1
Letterkenny Institute of Technology	0	0	0	0	50	0
Limerick Institute of Technology	0	0	0	0	68	93
Waterford Institute of Technology	2	0	4	0	30	46
<b>Total</b>	<b>2</b>	<b>4</b>	<b>12</b>	<b>0</b>	<b>507</b>	<b>340</b>
<b>Grand Total C1 &amp; C2</b>	<b>26</b>	<b>32</b>	<b>123</b>	<b>2</b>	<b>899</b>	<b>764</b>

<sup>1</sup>Note on spin-outs associated with two HEIs

<sup>2</sup>Estimated figure

## 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
	NUI Galway	2005
	Royal College of Surgeons in Ireland	2007
	Trinity College Dublin	1987
	University College Cork	1982
	University College Dublin	2003
	University of Limerick	2005
<b>Technological University</b>		
	TU Dublin	2000
<b>Institutes of Technology</b>		
	Athlone Institute of Technology	2008
	Cork Institute of Technology	2009
	Dundalk Institute of Technology	2012
	Dun Laoghaire IADT	2012
	Galway-Mayo Institute of Technology	2008
	Institute of Technology Carlow	2008
	Institute of Technology Sligo	N/A
	Institute of Technology Tralee	2009
	Letterkenny Institute of Technology	1998
	Limerick Institute of Technology	2008
	Waterford Institute of Technology	2008
<b>Colleges</b>		
	National College of Art and Design	2013
	National College of Ireland	2011
<b>State Research Organisations</b>		
	Marine Institute	N/A
	Teagasc	2011

## APPENDIX 3. IRELAND'S INTERNATIONALLY RECOGNISED TECHNOLOGY TRANSFER PROFESSIONALS

2010

**Dr Alison Campbell**  
Knowledge Transfer Ireland

2012

**Mr Tom Flanagan**  
University College Dublin

**Mr Ronan Coleman**  
Cork Institute of Technology

**Dr Graham McMullin**  
Trinity College Dublin

**Dr Tim Roche**  
Formium  
ex. University College Cork

**Dr David Corkery**  
University College Cork

**Dr Anthony Morrissey**  
University College Cork

**Mr Richard Stokes**  
Dublin City University

**Mr Kevin Dalton**  
University College Cork

**Mr Patrick O'Boyle**  
Dublin City University

**Dr Jacinta Thornton**  
NUI Galway

2015

**Mr Paul Dillon**  
University of Limerick

**Dr Peter Olwell**  
Dublin City University

**Dr Paul Tyndall**  
University College Dublin

**Dr Gordon Elliott**  
Trinity College Dublin

**Ms Emma O'Neill**  
Dublin City University

**Dr Emily Vereker**  
Health Research Board  
ex. Trinity College Dublin

**Dr Carolyn Hughes**  
Dublin City University

**Dr James O'Sullivan**  
Waterford Institute of  
Technology

**Dr Ena Walsh**  
University College Dublin

**Dr Andrew Marsh**  
University College Cork

**Dr Karl Quinn**  
Genomics Medicine Ireland  
ex. University College Dublin

2016

**Dr Seamus Browne**  
Royal College of Surgeons

**Dr Derek John**  
Royal College of Surgeons  
in Ireland

**Mr Conor Morris**  
University of Limerick

**Mr Peter Conlon**  
Maynooth University

**Dr Margaret Lawlor**  
University of Limerick

**Mr Kieran O'Connell**  
TU Dublin

**Dr Aoife Gallagher**  
Royal College of Surgeons  
in Ireland

**Ms Breda Lynch**  
Athlone Institute of Technology

**Dr Miriam Walsh**  
Teagasc

**Mr John Gleeson**  
University of Limerick

**Mr Neil McLoughlin**  
Dundalk Institute of Technology

2017

**Dr Stacey Kelly**  
University College Dublin

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## 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 spinout.

### 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 Equivalent - 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 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.



### 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.

### 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

Contract transferring intellectual property rights for the purpose of commercialisation in accordance with contractual terms and conditions.

### 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 (NCE)

Public sector organisation or charity.

### Option

A contract under which a potential licensee is granted 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.

### R&D Agreements

Research Collaboration Agreements (wholly and part-funded) plus Innovation Vouchers.

### R&D&C Agreements

Research Collaboration Agreements (wholly and part-funded), Innovation Vouchers and Consultancy Agreements.

### Research Expenditure

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

### 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.

### 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 spinout 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. Sometimes called Innovation Office.





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