

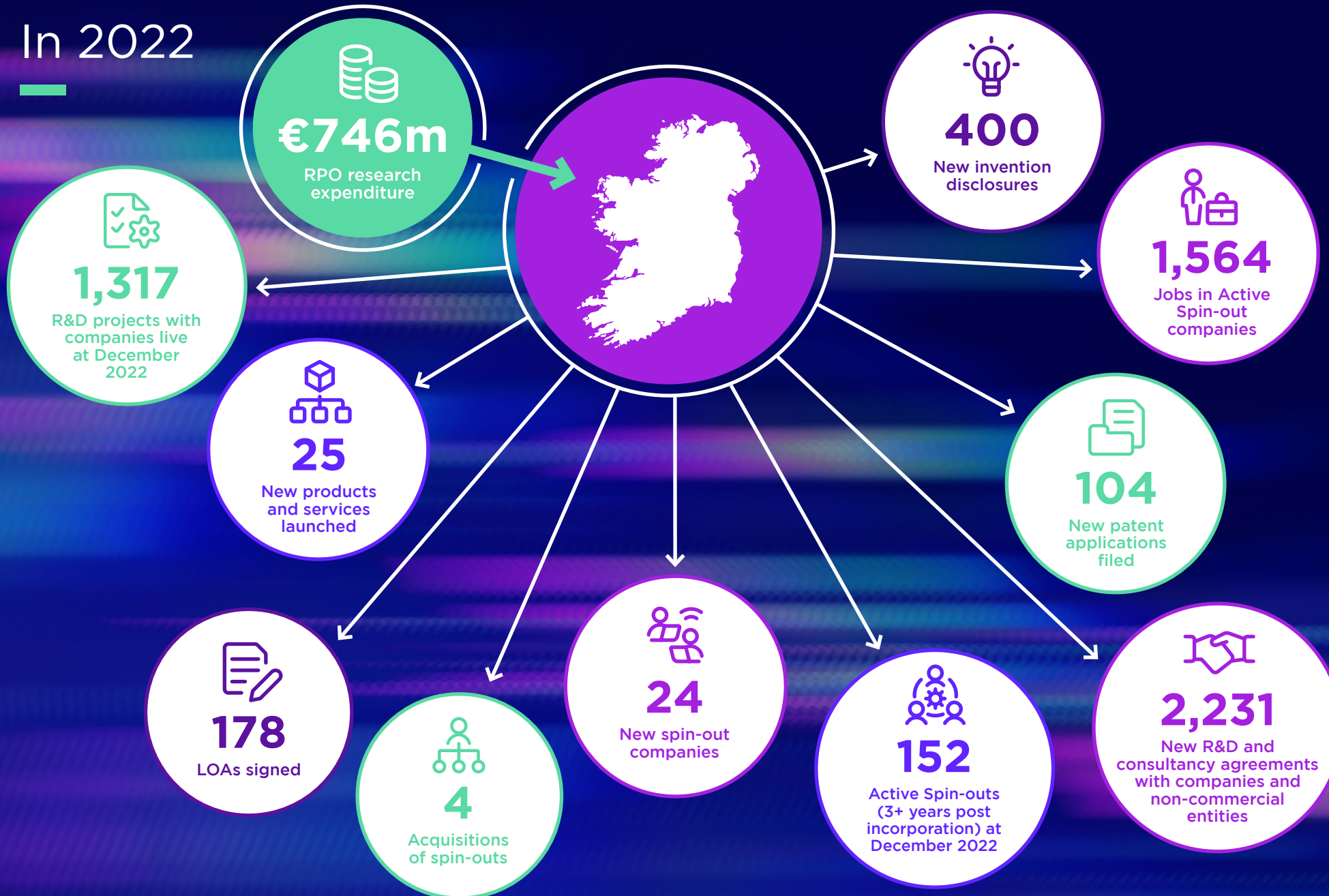


Annual Knowledge Transfer Survey **2022**

Supported by



In 2022



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Marina Donohoe
Head of Research & Innovation,
Enterprise Ireland

Foreword

Ireland's Research & Innovation Strategy, Impact 2030, is a comprehensive plan that aims to position the country as a global leader in research and innovation. It focuses on driving economic growth, creating high-quality jobs and addressing societal challenges through investment in research, development and innovation. The strategy aims to foster collaboration, enhance competitiveness and deliver impactful outcomes for Ireland's economy and society.

Enterprise Ireland, as Ireland's leading Industrial Research & Innovation Agency, plays a vital role in achieving these national research and innovation objectives. Enterprise Ireland's Technology Transfer Strengthening Initiative (TTSI), in place since 2007, serves as a key mechanism for realising these goals. The TTSI programme, managed by Knowledge Transfer Ireland on behalf of Enterprise Ireland, underpins much of the activity that is reported in the Annual Knowledge Transfer Survey (AKTS) and outputs from the research ecosystem.

In the last five years 142 spin-outs, 13,779 Research Collaboration and Consultancy Agreements and 1,020 Licences Options & Assignments have been achieved under the TTSI programme. It is encouraging to see our more mature spin-out companies performing well, creating additional

jobs reflecting the calibre of spin-out companies emerging from our HEIs. Encouragingly, Irish SMEs continue to represent an increasing number of companies engaging with academic research.

While the pace of growth has slowed somewhat in 2022, there is significant opportunity to support more deep-tech, cutting-edge company spin-outs from academic research. Enterprise Ireland will continue to work closely with RPO's on this important agenda. Equally the agency will engage closely with existing clients to encourage them to engage with the Irish research base. This engagement will leverage expertise, access state-of-the-art facilities and connectivity with a pool of specialised talent that will help them compete globally with success.

Enterprise Ireland now plans to deliver KT Boost, a new programme of support designed to boost the number and the calibre of Irish spin-out companies from research. It also aims to advance collaboration between industry and academic research by helping them work together to develop and commercialise innovative ideas that position companies to compete globally with success. Moreover, the new programme will be key to helping Ireland deliver on its national strategy for Research and Innovation.

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The Annual Knowledge Transfer Survey (AKTS) is published by KTI in conjunction with the Higher Education Authority (HEA). It provides a review of business engagement and commercialisation activity (knowledge transfer, KT) in the State funded research sector. Data are submitted to KTI by each Research Performing Organisation (RPO), coordinated by its Technology Transfer Office (TTO)/Innovation Office and include information from other departments such as the Research Office, the Finance Department and individual research departments.

More information about knowledge transfer, including case studies of business impacts, may be found on the KTI website at www.knowledgetransferireland.com

KTI was established in 2014 by the Department of Enterprise, Trade & Employment as a national initiative to maximise access to publicly funded research by companies and entrepreneurs and to help facilitate the commercialisation of that research to deliver impact. To that end, KTI has developed national frameworks and guidelines that standardise the system and make the process of engagement more straightforward. A single portal to research, expertise and how to engage, KTI also offers a broad suite of supporting materials and resources. These include directories and guides, a set of template legal agreements, a tool to find funding to support research and innovation, a comprehensive event calendar and more. KTI's resources are available to companies of all sizes and in all sectors.

The HEA leads the development of the higher education and research system with the objective of creating a coherent system of diverse institutions with distinct missions, which is responsive to the social, cultural and economic development of Ireland and its people and supports the achievement of national objectives.

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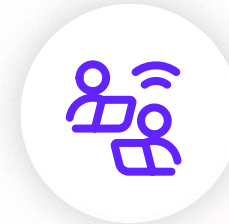
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Imelda Lambkin
Manager Disruptive
Technologies, Innovation
& Knowledge Transfer

The Annual Knowledge Transfer Survey reports on data relating to various areas of knowledge transfer. The data is submitted by Ireland's Higher Education Institutes which in 2022 comprised of eight Universities, five Technological Universities, two Institutes of Technology and two Colleges. Teagasc, the Marine Institute and Irish Manufacturing Research (IMR) also contribute. A complete list of these Research Performing Organisations (RPOs) is provided in Appendix 2.

When comparing the data for 2022 with previous years, there has been a slight downturn. In 2022 the number of spin-out companies was 24 from 8 research performing organisations. The average number of spin-out companies over the period 2018-2022 is 28 per annum. Whilst the number of new spin-out companies has dropped when compared to 2021, the focus appears to be moving towards the creation of higher quality spin-out companies with an expectation that such companies will flourish to become Active Spin-out Companies (3+ years post incorporation) and ultimately Enterprise Ireland High Potential Start-up companies.



24

New spin-out companies



+9

Active Spin-out Companies employing

1,564

Active Spin-out companies are thriving. At the end of 2022 there were 152 Active Spin-outs representing an increase of 9 on 2021 that employ 1,564. That is an additional 346 full time equivalent jobs in Active Spin-out companies on the previous year.

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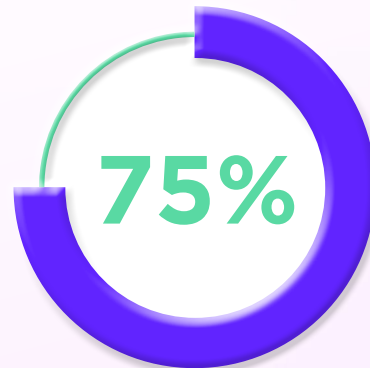
Research projects between companies and RPOs continue to be an activity of critical importance for business. In 2022, 1,179 R&D agreements were signed with companies to commence new research projects. These projects ranged in size from small projects through Innovation Vouchers to larger research projects. At year end there were 1,317 live research projects with industry across all RPOs. Research consultancy agreements with companies, where the results are transferred to the company, are another important output of collaborative research.

In 2022, there were 546 such agreements with industry, 75% of which were with Irish companies.

There were 506 R&D and Consultancy Agreements signed with non-commercial entities comprising 318 Collaborative Research Agreements and 188 Consultancy Agreements. The total number of R&D Agreements and Consultancy Agreements signed in 2022 between industry and non-commercial entities totalled 2,231.

178 licences, options, and assignments (LOAs) were executed in 2022, with 46% of them being licences. The majority of intellectual property licences, options and assignments to companies were patents and software representing 32% and 31% respectively in 2022.

Research expenditure totalled €746m in 2022, an increase of €74m when compared with the previous year and with 7.5% of this research expenditure having been derived from industry. The majority of total research expenditure came from the University Sector at 75%, 15% from the Technological University and Institutes of Technology sector and 10% from Colleges and State Research Organisations.



**of all R&D & Consultancy
Agreements in 2022 were
with Irish Companies**

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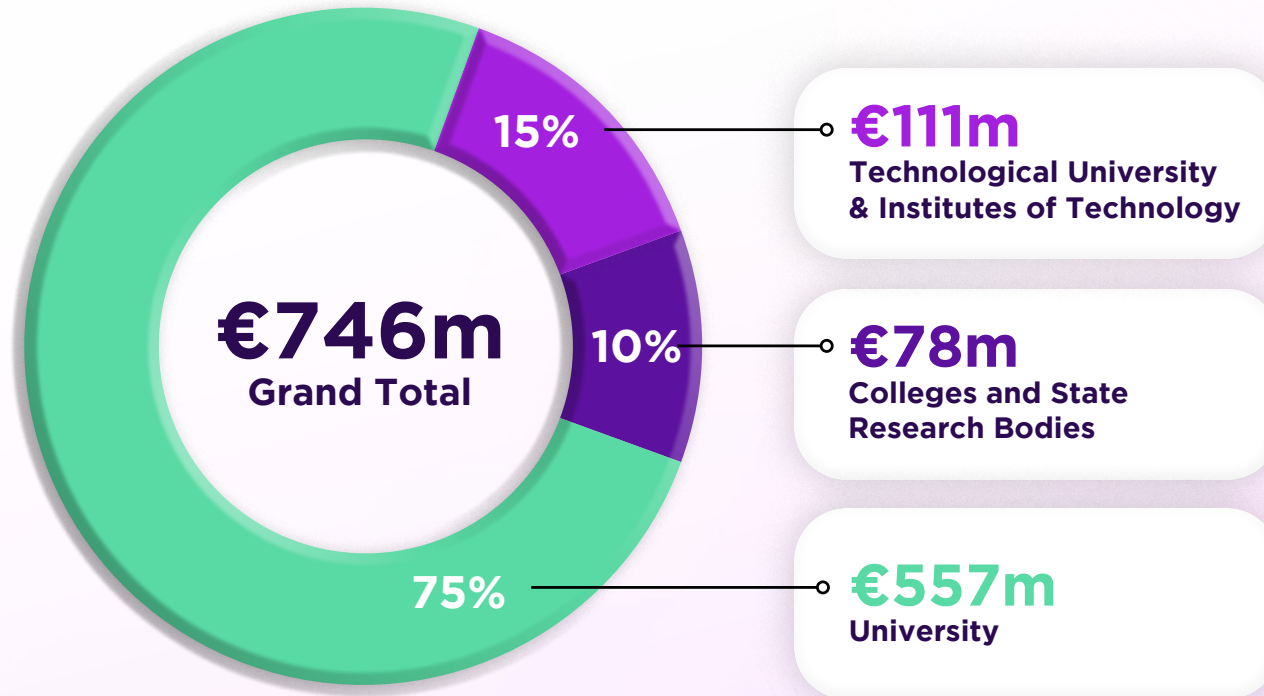
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Research Funding in Ireland

The AKTS uses year-in data on actual research expenditure provided by the individual RPOs to enable a more direct comparison with data from other countries. It does not include block grant and capital expenditure.

The total research expenditure in 2022 was €746 million which is an increase of just over 11% or €74m when compared the previous year.

Research expenditure by type of RPO, 2022



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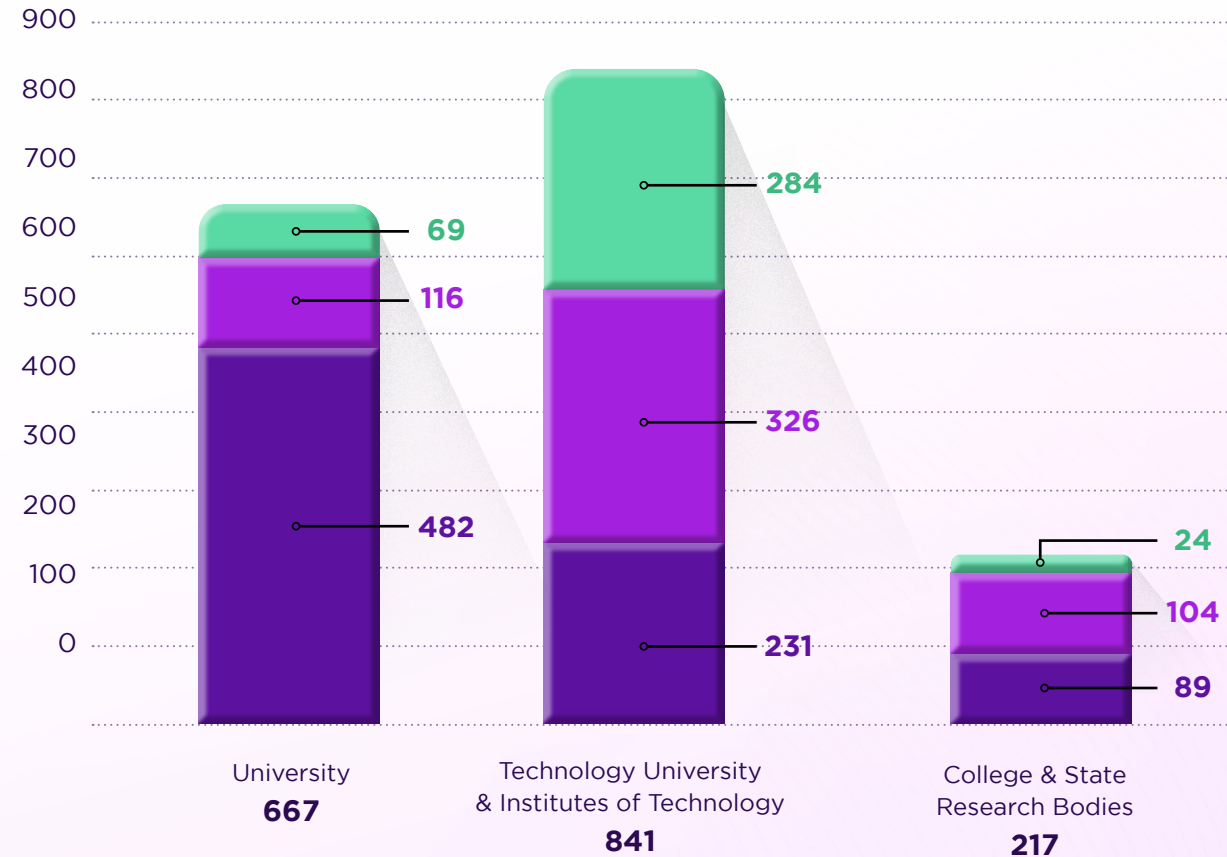
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Collaborative R&D and Consultancy

An important benefit to industry and non-commercial organisations is accessing research and expertise through the RPOs. This may be by way of collaborative projects between industry/non-commercial organisations and the RPO in order to generate new knowledge or access to consultancy services from the RPO.

In 2022 R&D and Consultancy Service Agreements with Industry and with Non-Commercial Entities decreased by approximately 18% and 9% respectively when compared to the previous year.

R&D & Consultancy Agreements with Industry by RPO Type, 2022



- Innovation Voucher Agreements
- Consultancy Services
- Research Collaboration Agreements with Industry

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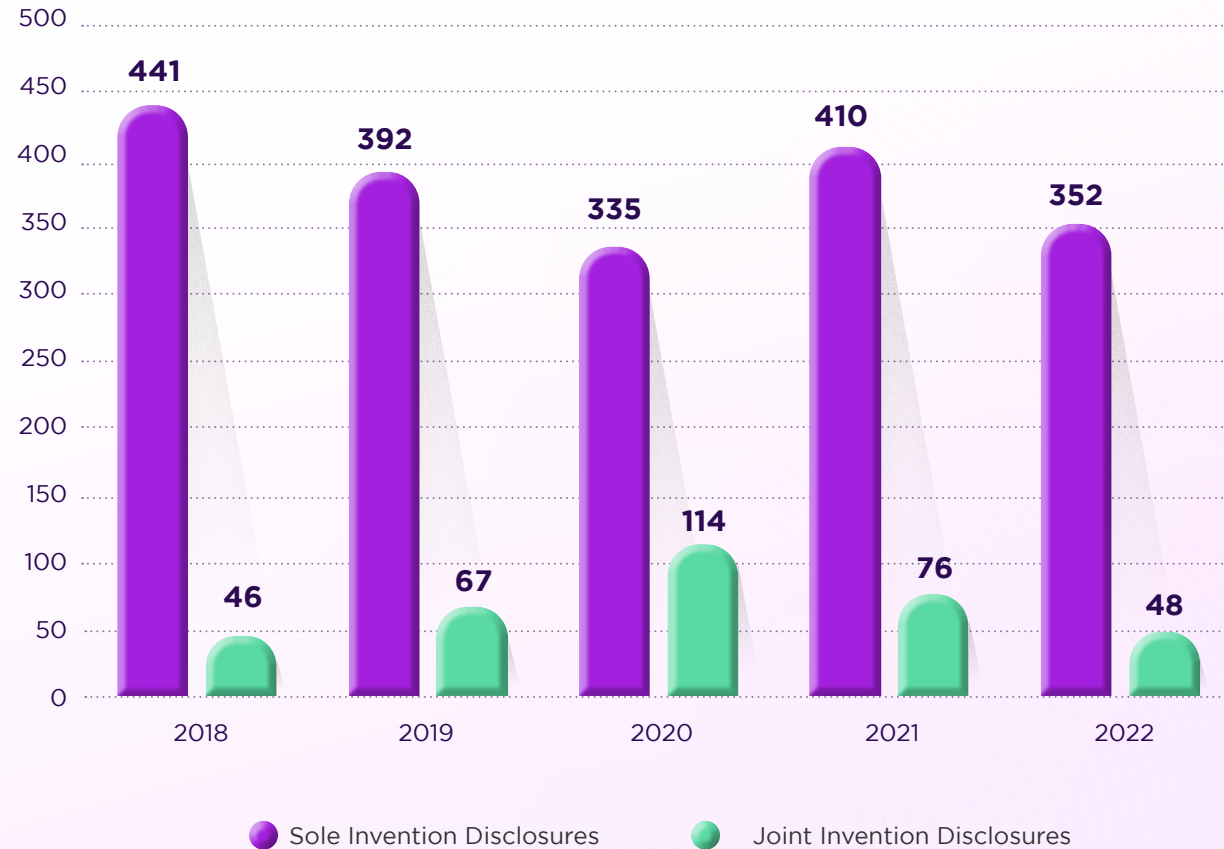
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Inventions, Intellectual Property and Licensing

Over the past five years there has been a total of 2,281 new invention disclosures with a decrease in 2022 of 17.5%. The trend remains that the majority of these are sole invention disclosures where there is just one RPO involved.

Invention Disclosures 2018-2022



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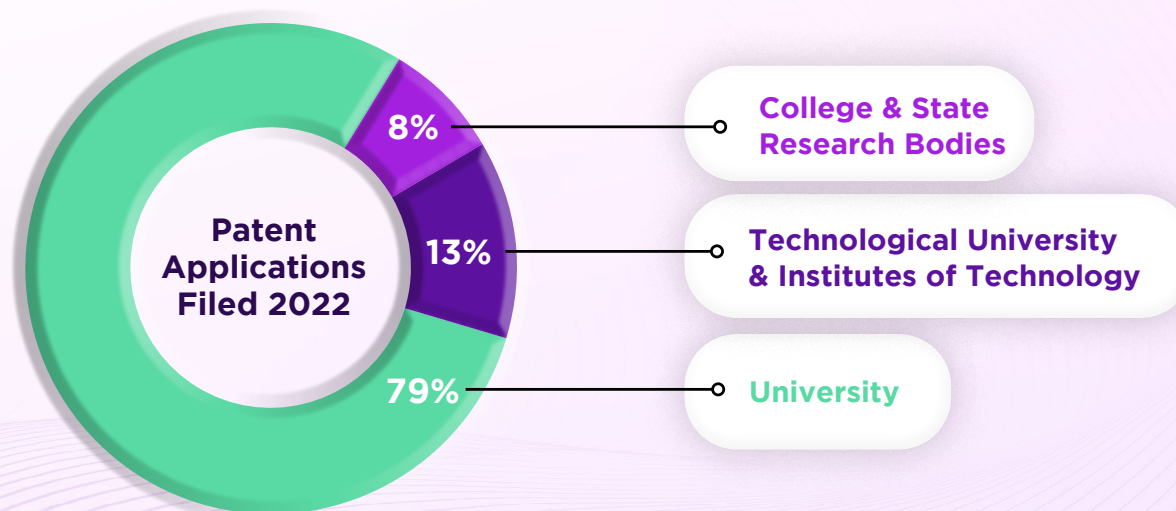
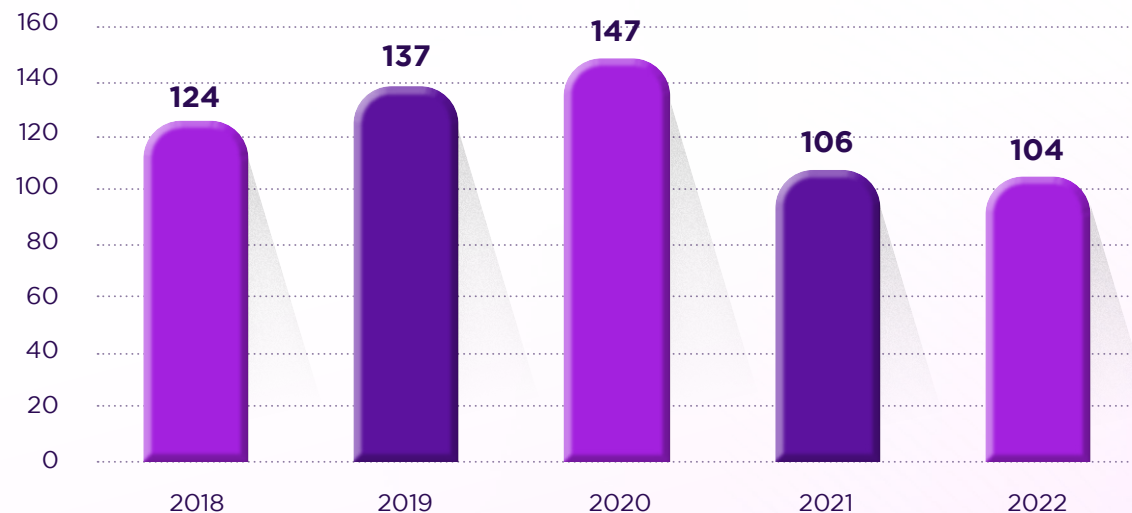
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The number of patents filed in 2022 has remained steady when compared to 2021. Overall, however, this number is down when compared to the average over the last five years which is 124. Of the patents filed in 2021 (106) 63% progressed to PCT applications in 2022, which is an increase on the previous year (2021, 50%). The EPO and UK IPO remain the most popular initial patent filing offices.

Priority patent applications filed 2018-2022



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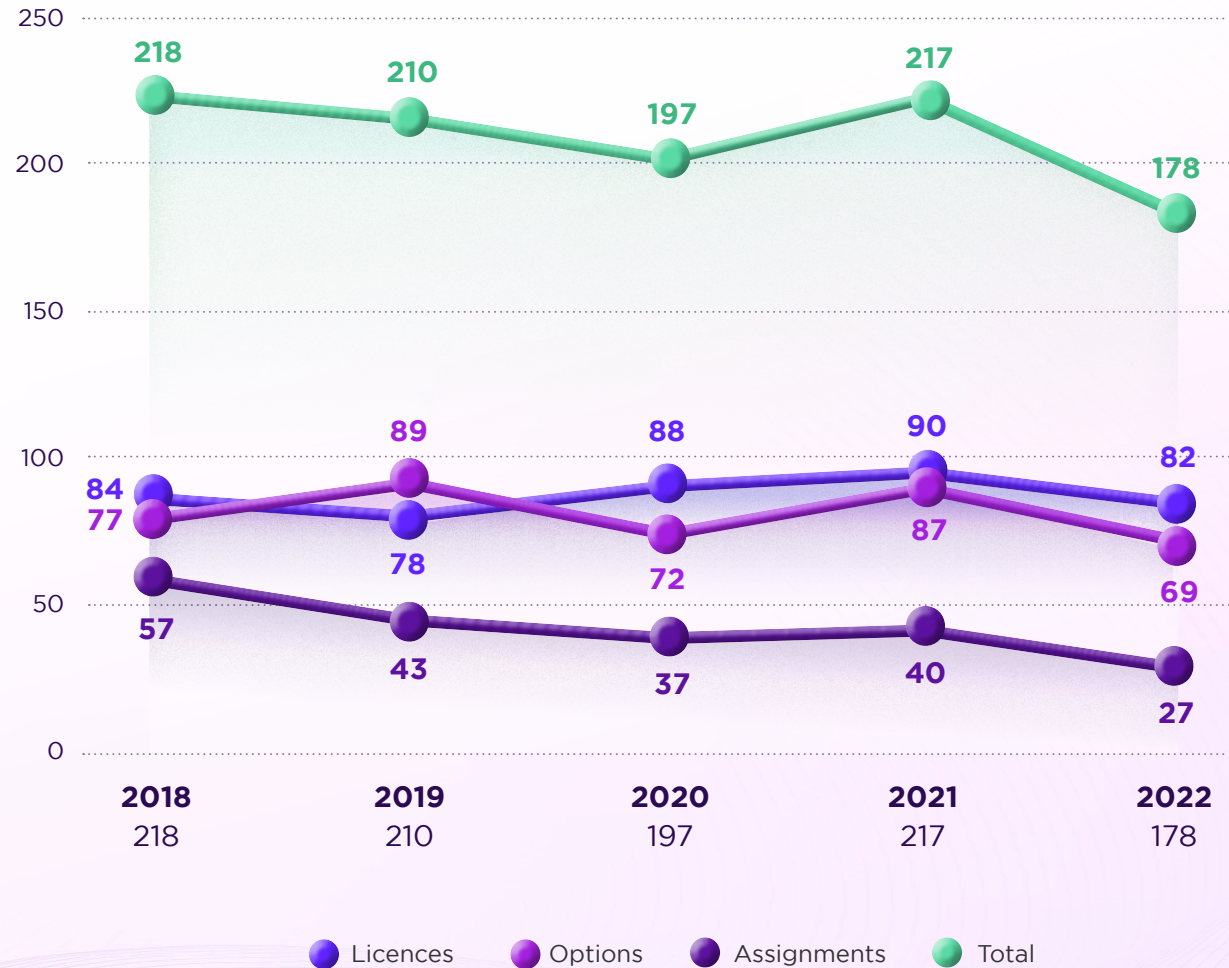
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Licensing

Licences, Options and Assignments (LOAs) have all decreased when compared to the previous year, in total by almost 18% (178, 2022), the aggregate revenue from licences being €2.2m which is the same as the previous year. Looking at the last 5 years there have been 1,020 LOAs issued with the split having been Licences (41%), Options (39%) and Assignments at the lower end of 20%.

Of the 178 LOAs the majority (69%) were issued to Irish companies and compared to the previous year the percentage that were issued to Irish SMEs increased by 4%.

Licences, Options & Assignments executed 2018-2022



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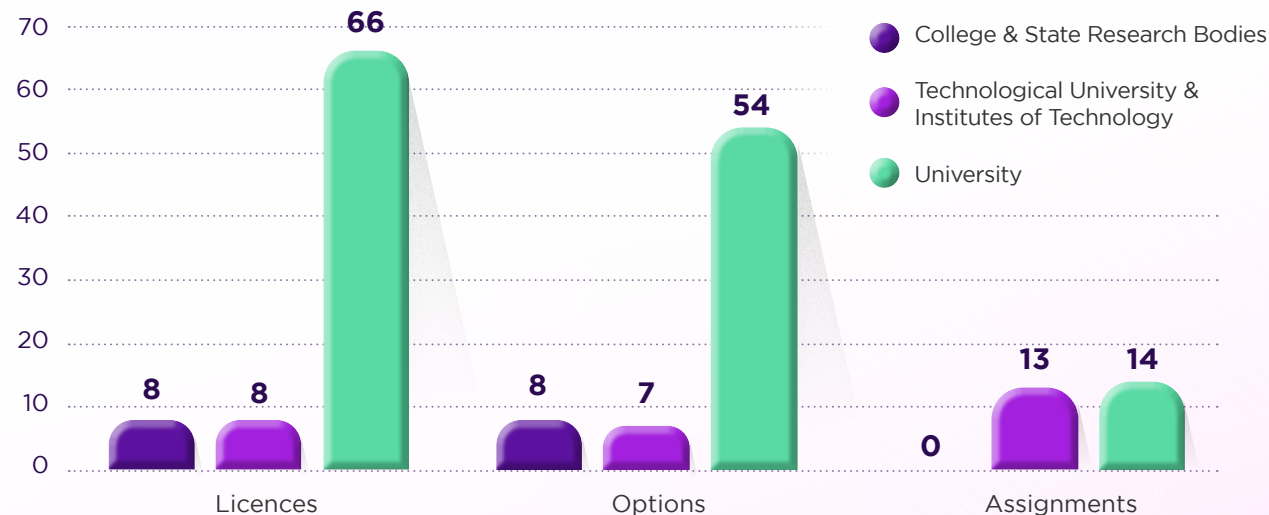
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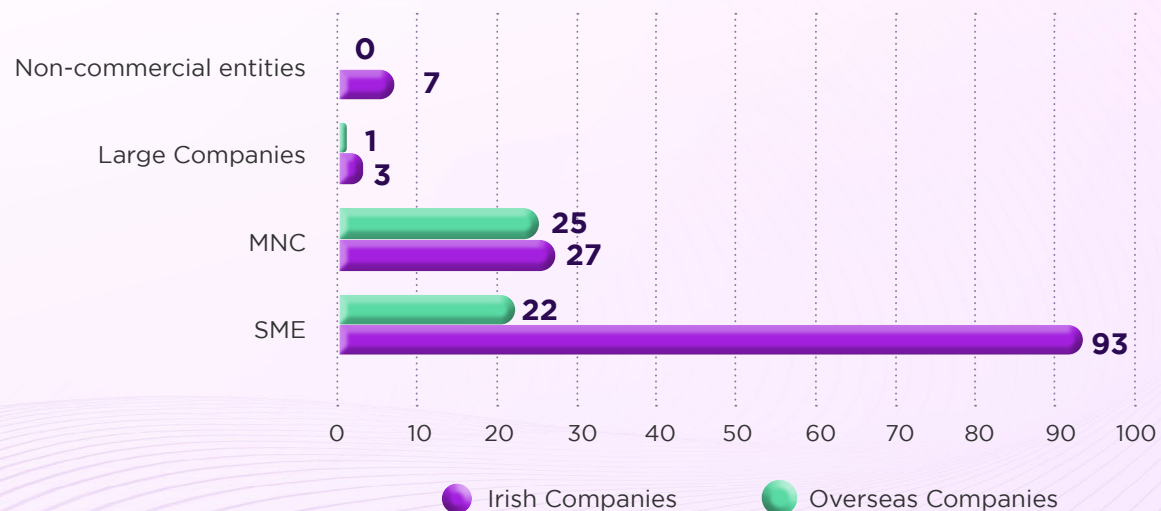
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Licences, Options & Assignments by RPO Type, 2022



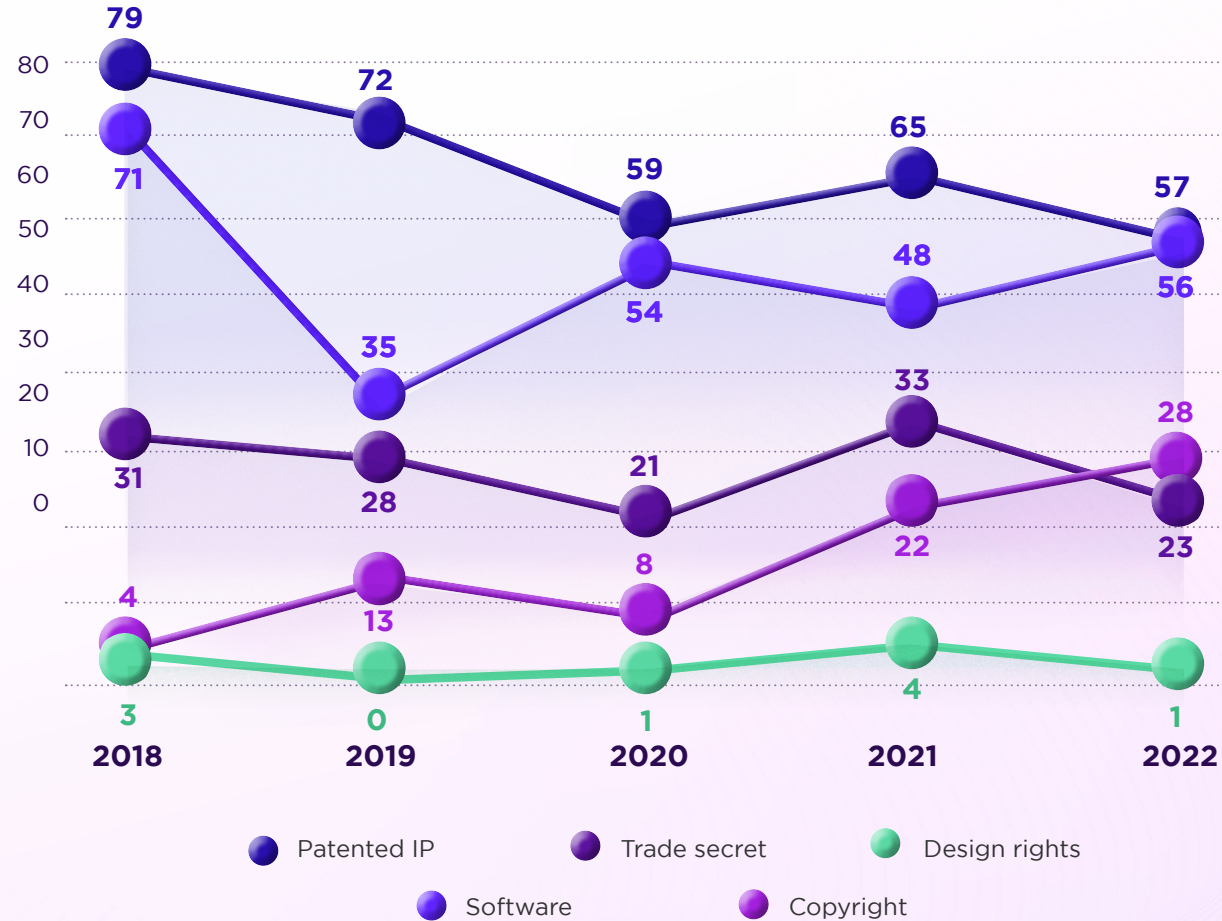
Licences, Options & Assignments by Company Type 2022





Main types of Intellectual Property in LOAs, 2018-2022

Over the period 2018 to 2022 Patented IP continues to be the most prevalent type of intellectual property in LOAs. Looking at the total in the graph below it accounts for 41% of the five year total (43%, 2017-2021) with Software not far behind accounting for 32% of the total (34%, 2017-2021).



NOTE: there are other response categories not covered in the above, e.g. Research Materials, plus other please specify (e.g. know how, etc.)

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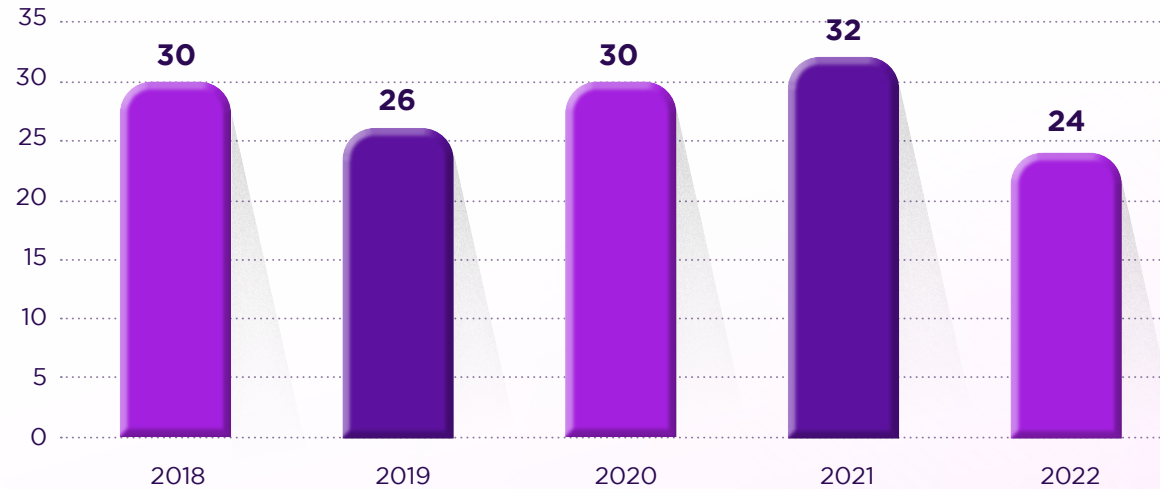
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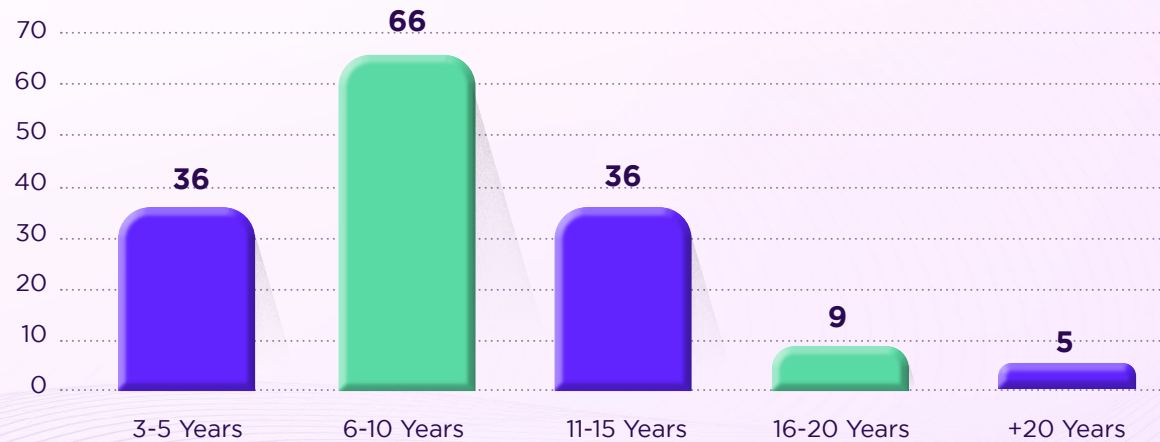
In 2022 24 new companies spun-out from 8 of the RPOs, in the previous year this figure was 32 from 11 RPOs. The total number of new companies that spun out from RPOs over this period totals 147, an average of 28 per year. Four spin-out companies were either acquired or merged with another company in 2022.

The aggregated number of spin-outs across all RPOs where the RPO holds equity or share options was 193 in 2022, a decrease of 9 on the previous year. There were 152 Active Spin-outs (at least 3 years post formation) at the end of 2022 that employ a combined 1,564 Full Time Equivalents. This is an increase of 346 on the previous year. It is important to note that this figure relates to the employment as at the end of 2022 and does not take account of people employed over the lifetime of the spin-out.

Spin-Outs Established, 2018-2022



Active Spin-Outs - No. of Years Incorporated



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COMMERCIALISATION



Luminate Medical

(University of Galway)

Luminate Medical produces devices to reduce chemotherapy induced alopecia. The company spun out of University of Galway in 2021 having licensed patented IP and know-how from the university and having benefited from Enterprise Ireland's BioInnovate Programme and Commercialisation Fund. Since spinning out the company team has grown to 13.

Having raised \$2.9M in private financing seed round alongside €6.5M in grant funding under the Disruptive Technologies Innovation Fund, the company developed its first two products

– a hair loss product and peripheral neuropathy product. Luminate launched its first human clinical trial in hair loss indication in April 2023.

From the outset, the TTO at University of Galway provided support to the company, agreeing Terms Sheet, managing subsequent licensing of intellectual property from the university and shareholder agreements.

The TTO continues to work alongside the company.



The TTO was supportive in our company formation by working with us to meet the requirements of investors to fund the spin-out.

Aaron Hannon,
CEO & Co-Founder

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COMMERCIALISATION



MoveAhead Games

(Dublin City University)

MoveAhead Games spun out from Dublin City University in 2022 having licensed a custom-built dataset and software from the university. MoveAhead has produced the first motion tracking and movement analytics platform built specially for children with version 2.0 of the product having been successfully launched to market. The platform serves as a movement engine that seeks to address the growing challenge of physical inactivity amongst children worldwide.

Having secured initial funding of €1M from angel investors the company went on to achieve Enterprise Ireland HPSU status and successfully secured HPSU match-funding.

The TTO team at DCU worked closely with the company team from the early stages of exploring commercialisation potential to help them avail of the Enterprise Ireland Commercialisation Fund in 2020. The TTO provided guidance throughout the spin-out process ensuring a smooth licensing process and shareholder negotiations.



The TTO was an invaluable support to us throughout the Commercialisation Fund and spin-out process. It has helped to demystify the process and helped us access Enterprise Ireland and other supports.

Jamie McGann,
Co-Founder & CPO

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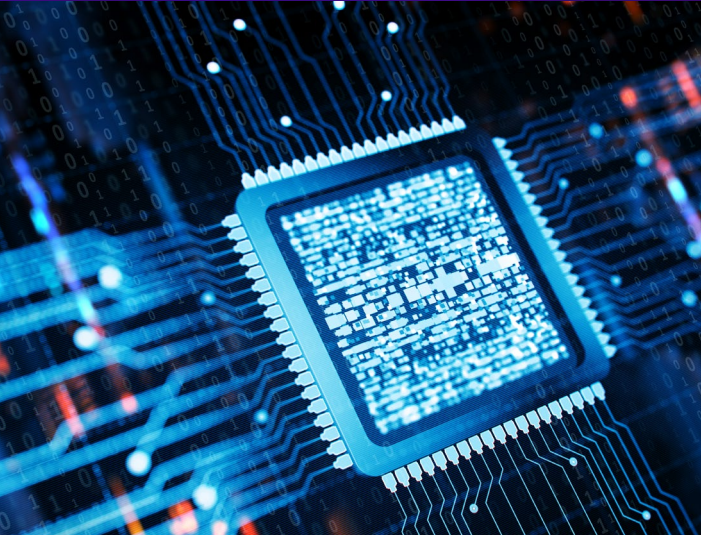
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ProvEye Limited

(University College Dublin)

ProvEye has developed an AI-powered digital image analysis platform that provides quantitative information about productivity and sustainability on agricultural land. The company spun out of UCD in 2019 having developed technology with support from the Enterprise Ireland Commercialisation Fund and Career-FIT programme.

ProvEye achieved Enterprise Ireland HPSU status in 2022, has raised €1M in investment and secured €225K funding from ESA. In 2022, the company won the Ornuu Most Innovative AgTech Startup and now has trials underway with 6 companies globally

in Ireland, UK, Europe, the US and Africa. Company turnover is anticipated to grow by 350% by end of 2023.

The TTO has worked with the company from inception, supporting its formation and subsequent growth and continues to engage with and support the company which is located NovaUCD.



The TTO helped the founders navigate the pre-spin-out phase of the company especially around the areas of IP policy, commercial development and milestones and setting up the company itself. The subsequent support from UCD was key to the growth of the company as it scales internationally.

Dr Jerome O'Connell,
Co-Founder ProvEye

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Ulysses Neuroscience Ltd

(Trinity College Dublin)

Ulysses Neuroscience provides pre-clinical and clinical research services to pharmaceutical companies worldwide to advance the knowledge and treatment of brain disorders and rare diseases. Based on over 20 years of research, the company has developed significant expertise in patient-centric and translational research in the field of neurological drug discovery.

Established in 2019, the company now generates more than €1M in revenue per year. It has achieved Enterprise Ireland HPSU status and received its first HPSU Feasibility Grant. Ulysses works with 13 pharmaceutical companies from around the world including US, Japan and the EU and is seeking to expand the US, EU and Japanese market in the field of rare diseases of which there are 6,000 worldwide affecting 4% of the global population. The first international branch of the company opened in April 2023.

The TTO at Trinity College Dublin has supported the company since its inception and throughout its growth to date.



The support of Trinity's TTO has been invaluable for the foundation and growing of Ulysses as well as for building a fruitful relationship with Enterprise Ireland. We aim to continue this productive partnership with the TTO.

Professor Massimiliano Bianchi,
Founder Ulysses Neuroscience

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Cotter Agritech Ltd

(Atlantic TU)

Cotter Agritech Ltd has developed the award-winning Cotter Crate and SmartWorm app. The Cotter Crate is innovative solution to help sheep farmers reduce handling time and labour costs associated with worming animals. It also tackles worm resistance amongst animals by reducing wormer-use by approximately 40% and by identifying worm resilient replacements.

With the support of two Enterprise Ireland Innovation Vouchers, the company worked with the PEM Technology Gateway at Atlantic TU Sligo to identify and design changes to the first prototype of the Cotter Crate.

The goal was to improve, simplify and achieve cost reduction at the manufacturing stage of the Cotter Crate and the project resulted in an affordable, robust, highly mobile, lighter product with a lifespan of at least 10 years on a farm.

The product has successfully launched in Ireland and the UK and further enhancements to the product are expected. The TTO provided support throughout the project and the company is expected to continue working with the research team at the PEM Technology Gateway.



Through access to their expertise in design for manufacturing, we have been enabled to achieve our goal of getting this product launched.

Nick Cotter,
Director Cotter Agritech Ltd

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Wind Energy Ireland

(University College Cork)

Wind Energy Ireland is a representative body for the Irish wind industry, working to promote wind energy as an essential, economical and environmentally-friendly part of the country's low-carbon energy future. They wanted to create a roadmap to a climate neutral future and to explain how Ireland can achieve this goal by identifying technologies, concepts and interventions required to reach a net zero economy.

With support from the consultancy team at the TTO in University College Cork, the company engaged a leading expert in the field of clean energy, Dr Paul Deane based at MaREI in UCC. Together they produced a report that included recommendations to help achieve government objectives and inform future direction for the sector. The report was widely publicised and Wind Energy Ireland continues to work with the team at UCC having commissioned a further report as a result of the original piece of work.



The TTO's agility, professionalism and expertise made all of the contractual elements straightforward and uncomplicated.

Paul Deane,
MaREI Research Centre

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Immcell Ltd

(Teagasc)

Immcell is an Irish SME that develops, manufactures and markets innovative plant-based functional food ingredients for the food industry. Through the Enterprise Ireland Innovation Voucher scheme, the company engaged a team at Teagasc to leverage expertise in plant-based food processing by-product valorisation. The project subsequently developed into an EI Innovation Partnership project that was aimed at valorising rapeseed meal, an underutilised by-product of the rapeseed oil industry, to generate a high-value plant-based protein ingredient.

The project resulted in the development of a novel plant protein extraction process for the production of a highly nutritious, clean label, rapeseed protein ingredient for use in a wide range of food products in international markets and for which a patent has been filed.

The TTO at Teagasc was instrumental from negotiating the initial collaboration agreement and supporting the work between company and research team and management of IP that resulted. The company continues to work with Teagasc and the Technology Transfer Office there.



The TTO in Teagasc assisted the process from the initial stage to licensing without hindrance allowing for the project work to be the focus and ultimately executed.

Conor O'Daly,
Chief Executive Officer, Immcell Limited

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Spectral MD Holdings Ltd

(Royal College of Surgeons in Ireland)

Spectral MD Holdings Ltd is a US company specialising in imaging technology that provides clinicians with faster and more accurate treatment decisions in wound care. The company's DeepView® wound imaging system, uses AI and multispectral imaging to provide clinicians with immediate wound healing prediction information that is not visible to the human eye.

In 2020, the company engaged in a collaborative research project with the School of Nursing and Midwifery at the Royal College of Surgeons in Ireland. The project helped identify the potential use of Spectral's DeepView® technology in the diagnosis and treatment of Diabetic Foot Ulcers. These ulcers affect millions of patients globally each year and have the potential to require multiple treatments, develop gangrene and lead to amputation. They also come at an extreme costs and burden to the healthcare system.



We are delighted to partner with such a world-renowned institution. Working in partnership with RCSI's Skin Wounds and Trauma Research Center and Office of Research and Innovation, we have successfully navigated the development of this relationship that harnesses our collective expertise.

Marc Dudek,

Director of Corporate Development, Spectral MD

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Logitech Europe

(University of Limerick)

Logitech is a global leader designing products and experiences that connect people to the digital world around them. The company sought to expand its research efforts beyond hardware into the discipline of sports science so as to better understand essential skills and training techniques that enable peak performance in gaming and e-sports.

The gaming and e-sports industry is a multi-billion euro industry. Whilst training principles for players in traditional sports are well established, much less is known about how gamers can improve their performance levels through best practice guidelines and optimised gaming equipment.



The collaboration with the company was so successful due to the mutual understanding between researchers and company partners of each others needs and challenges. The TTO provided invaluable advice and guidance from the outset and has always been very responsive, efficient and open in their communication with the research group.

Prof. Mark Campbell,
Department of Physical Education and Sport Science and Lero

Having previously worked with the SFI Research Centre LERO in 2015 and with UCC, Logitech engaged with a research team from the Department of Physical Education and Sport Science at the University of Limerick. The university team provided expertise in the field of elite sports performers whilst Logitech brought experience of having worked with top e-sports organisations as well as specialised equipment and testing platforms.

Results from the project have led to Logitech launching a new software training tool for competitive computer gamers looking to be coached and to improve aspects of their gaming skills. Logitech in Cork has become the centre for Logitech e-sports research and has created a software team based at Logitech's Cork site.

The TTO at the University of Limerick was involved from the outset supporting the project agreements, negotiating IP and providing IP management support and continues to provide support as there are a number of projects currently underway and running to 2026.

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Appendix 1. Summary Data by RPO

Selected data relating to the returns made by the 20 RPOs are presented in tables A1-C2.

A1: Research Expenditure, research agreements and consultancy with Industry 2022: University, Colleges & State Research Organisations

RPO	Research expenditures (less block grant) in the reference year (€)	Research Expenditure derived from Industry	Number of Collaborative Research Agreements with Industry	Number of Innovation Vouchers with Industry	Number of Consultancy Agreements with Industry	Total Number of Collaboration, innovation voucher and consultancy services agreements with industry
University						
Dublin City University	32,475,141	2,221,300	30	3	1	34
Maynooth University	48,041,803	1,782,351	33	7	8	48
University of Galway	78,950,735	6,316,059	40	1	2	43
Royal College of Surgeons in Ireland	25,904,883	2,538,679	37	-	7	44
Trinity College Dublin	117,853,311	7,519,041	75	28	24	127
University College Cork	113,261,529	9,174,184	126	4	23	153
University College Dublin	99,574,588	4,879,155	105	22	32	159
University of Limerick	41,338,530	5,456,686	36	4	19	59
Total	557,400,520	39,887,454	482	69	116	667
College & State Research Organisations						
National College of Art and Design	133,890	33,473	14	8	17	39
National College of Ireland	203,000	-	-	3	-	3
Teagasc	57,100,000	9,707,000	39	11	60	110
Irish Manufacturing Research (IMR)	10,212,065	510,603	36	2	27	65
Marine Institute	9,870,000	-	-	-	-	-
Total	77,518,955	10,251,076	89	24	104	217

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A2: Research Expenditure, research agreements and consultancy with Industry 2022: Technological University & Institutes of Technology

RPO	Research expenditures (less block grant) in the reference year (€)	Research Expenditure derived from Industry	Number of Collaborative Research Agreements with Industry	Number of Innovation Vouchers with Industry	Number of Consultancy Agreements with Industry	Total Number of Collaboration, innovation voucher and consultancy services agreements with industry
Technological University/Institutes of Technology						
Atlantic Technological University	17,175,846	643,922	58	38	51	147
Munster Technological University	26,200,503	2,221,803	20	49	69	138
South East Technological University	22,903,915	936,926	76	108	54	238
Technological University Dublin	24,992,194	849,735	10	14	38	62
Technological University of the Shannon	12,408,491	1,737,189	39	50	113	202
Dundalk Institute of Technology	5,900,000	590,000	20	17	-	37
Dun Laoghaire IADT	1,255,338	-	8	8	1	17
Total	110,836,287	6,979,574	231	284	326	841
Grand Total	745,755,762	57,118,104	802	377	546	1,725

A3: Research Expenditure, research agreements and consultancy with non-commercial entities 2022: University, Colleges & State Research Organisations

RPO	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
University					
Dublin City University	32,475,141	4,043,155	2	8	10
Maynooth University	48,041,803	634,152	28	27	55
University of Galway	78,950,735	7,895,074	10	-	10
Royal College of Surgeons in Ireland	25,904,883	4,429,735	11	1	12
Trinity College Dublin	117,853,311	5,220,902	73	16	89
University College Cork	113,261,529	4,190,677	36	16	52
University College Dublin	99,574,588	8,782,479	134	29	163
University of Limerick	41,338,530	1,281,494	2	4	6
Total	557,400,520	36,477,668	296	101	397
College & State Research Organisations					
National College of Art and Design	133,890	30,795	2	14	16
National College of Ireland	203,000	-	-	-	-
Teagasc	57,100,000	4,568,000	-	4	4
Irish Manufacturing Research (IMR)	10,212,065	-	-	-	-
Marine Institute	9,870,000	-	-	-	-
Total	77,518,955	4,598,795	2	18	20

A4: Research Expenditure, research agreements and consultancy with non-commercial entities 2022: Technological University & Institutes of Technology

RPO	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
Technological University/Institute of Technology					
Atlantic Technological University	17,175,846	-	9	10	19
Munster Technological University	26,200,503	-	-	46	46
South East Technological University	22,903,915	541,218	6	9	15
Technological University Dublin	24,992,194	-	1	1	2
Technological University of the Shannon	12,408,491	124,085	2	3	5
Dundalk Institute of Technology	5,900,000	-	2	-	2
Dun Laoghaire IADT	1,255,338	-	-	-	-
Total	110,836,287	665,303	20	69	89
Grand Total	745,755,762	41,741,765	318	188	506

B1: IP and IP Transactions 2022: University, Colleges & State Research Organisations

RPO	Total number of invention/ software disclosures received during the year	Total number of new patent applications filed during the year	Previously filed priority patent applications filed progressed to PCT in year	Total number of patents granted in year	Total number of patent families owned by the RPO at year end	Total number of licences, options and assignments executed (LOAs)	Market launches of products or services in year based on RPO licence
University							
Dublin City University	31	9	3	11	69	20	7
Maynooth University	6	4	2	5	18	2	0
University of Galway	39	8	3	16	99	15	2
Royal College of Surgeons in Ireland	14	4	7	5	34	5	1
Trinity College Dublin	54	19	5	65	156	23	4
University College Cork	57	14	12	7	73	31	0
University College Dublin	77	21	14	14	144	27	2
University of Limerick	23	3	8	12	73	11	2
Total	301	82	54	135	666	134	18
College & State Research Organisations							
National College of Art and Design	1	2	0	0	0	0	0
National College of Ireland	2	0	0	0	0	0	0
Teagasc	23	6	5	2	36	14	3
Irish Manufacturing Research (IMR)	1	0	0	0	0	2	0
Marine Institute	1	0	0	0	0	0	0
Total	28	8	5	2	36	16	3

B2: IP and IP Transactions 2022: Technological University & Institutes of Technology

RPO	Total number of invention/ software disclosures received during the year	Total number of new patent applications filed during the year	Previously filed priority patent applications filed progressed to PCT in year	Total number of patents granted in year	Total number of patent families owned by the RPO at year end	Total number of licences, options and assignments executed (LOAs)	Market launches of products or services in year based on RPO licence
Technological University/Institutes of Technology							
Atlantic Technological University	3	0	0	0	0	1	0
Munster Technological University	19	7	3	1	8	10	2
South East Technological University	13	2	1	0	21	4	0
Technological University Dublin	21	5	3	1	37	10	2
Technological University of the Shannon	4	0	1	0	0	2	0
Dundalk Institute of Technology	2	0	0	0	1	0	0
Dun Laoghaire IADT	9	0	0	0	0	1	0
Total	71	14	8	2	67	28	4
Grand Total	400	104	67	139	769	178	25

C1: Spin-out companies, incubation and use of facilities 2022: University, Colleges & State Research Organisations

RPO	Number of spin-outs established during the year	Number of staff or student start-ups established during the year	Number of Active spin-outs in existence at the end of the year	Number of spin-outs merged or acquired during the year	Number of contracts with companies for use of facilities and equipment at the RPO
University					
Dublin City University	3	0	14	0	11
Maynooth University	0	0	5	0	7
University of Galway	4	0	16	0	0
Royal College of Surgeons in Ireland	2	0	1	0	0
Trinity College Dublin	5	3	37	1	7
University College Cork	2	4	16	1	0
University College Dublin	6	0	19	2	0
University of Limerick	0	0	18	0	34
Total	22	7	126	4	59
College & State Research Organisations					
National College of Art and Design	0	0	0	0	0
National College of Ireland	0	0	1	0	0
Teagasc	0	0	4	0	15
Irish Manufacturing Research (IMR)	0	0	0	0	0
Marine Institute	0	0	0	0	0
Total	0	0	5	0	15

C2: Spin-out companies, incubation and use of facilities 2022: Technological University & Institutes of Technology

RPO	Number of spin-outs established during the year	Number of staff or student start-ups established during the year	Number of Active spin-outs in existence at the end of the year	Number of spin-outs merged or acquired during the year	Number of contracts with companies for use of facilities and equipment at the RPO
Technological University/Institutes of Technology					
Atlantic Technological University	0	0	1	0	39
Munster Technological University	0	0	5	0	105
South East Technological University	1	0	8	0	21
Technological University Dublin	1	0	6	0	0
Technological University of the Shannon	0	0	0	0	16
Dundalk Institute of Technology	0	0	1	0	0
Dun Laoghaire IADT	0	0	0	0	0
Total	2	0	21	0	181
Grand Total	24	7	152	4	255

Appendix 2. List of Research Performing Organisations (RPOs)

Reporting Sector	Institution	Year of foundation of TTO
University		
	Dublin City University	2007
	Maynooth University	2005
	University of 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
Colleges and State Research Organisations		
	Irish Manufacturing Research (IMR)	N/A
	National College of Art and Design	2013
	National College of Ireland	2011
	Marine Institute	N/A
	Teagasc	2011
Technological University		
	Technological University Dublin	2000
	Technological University of the Shannon	2008
	Munster Technological University	2009
	Atlantic Technological University (Galway, Sligo, Letterkenny)	2008, 2017, 1998
	South East Technological University	2008
Institutes of Technology		
	Dundalk Institute of Technology	2012
	Dún Laoghaire Institute of Art, Design and Technology	2012

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Appendix 3. Ireland's Internationally Recognised Technology Transfer Professionals

2012	Mr Tom Flanagan	University College Dublin
2015	Dr Andrew Marsh	IBM ex. TU-Dublin
2015	Dr Anthony Morrissey	University College Cork
2015	Dr Carolyn Hughes	Dublin City University
2015	Dr David Corkery	University College Cork
2015	Dr Emily Vereker	Health Research Board ex. Trinity College Dublin
2015	Dr Ena Walsh	University College Dublin
2015	Dr Gordon Elliott	Trinity College Dublin
2015	Dr Graham McMullin	Trinity College Dublin
2015	Dr Jacinta Thornton	University of Galway
2015	Dr James O'Sullivan	South East Technological University
2015	Dr Karl Quinn	Genomics Medicine Ireland ex. University College Dublin
2015	Dr Paul Tyndall	Maynooth University
2015	Dr Peter Olwell	Dublin City University
2015	Dr Tim Roche	Formium ex. University College Cork
2015	Mr Kevin Dalton	University College Cork
2015	Mr Patrick O'Boyle	Dublin City University
2015	Mr Paul Dillon	University of Limerick
2015	Mr Richard Stokes	Independent Consultant ex. Dublin City University
2015	Mr Ronan Coleman	Munster Technological University
2015	Ms Emma O'Neill	Trinity College Dublin
2016	Dr Aoife Gallagher	Royal College of Surgeons in Ireland
2016	Dr Derek John	Royal College of Surgeons in Ireland

2016	Dr Margaret Lawlor	University of Limerick
2016	Dr Miriam Walsh	Teagasc
2016	Dr Seamus Browne	Royal College of Surgeons in Ireland
2016	Mr Conor Morris	University of Limerick
2016	Mr John Gleeson	CONFIRM ex University of Limerick
2016	Mr Kieran O'Connell	Technological University - Dublin
2016	Mr Neil McLoughlin	Dundalk Institute of Technology
2016	Mr Peter Conlon	Maynooth University
2016	Ms Breda Lynch	Technological University of the Shannon
2017	Dr Kieran Ryan	University of Galway
2017	Dr Paul Maguire	Technological University - Dublin
2017	Dr Siobhan Mac Sweeney	Munster Technological University
2017	Dr Stacey Kelly	University College Dublin
2018	Dr Joan O'Sullivan	University of Limerick
2018	Mr David Murphy	University of Galway
2019	Mr Aidan Browne	Dundalk Institute of Technology
2019	Mr Brian Ogilvie	South East Technological University
2019	Mr Ian Gallivan	University of Galway
2020	Dr Samantha Williams	Trinity College Dublin
2020	Dr Stephen Donoghue	University College Dublin
2020	Mr David Gardiner	Technological University - Dublin
2020	Ms Josette O'Mullane	Munster Technological University
2021	Mr Brian Callaghy	Trinity College Dublin
2021	Mr Michael Lonergan	Technological University of the Shannon

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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 spin-out.

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

Collaborative Research: A research project/ programme between an industry party and an RPO. The project/programme may be:- wholly-funded by the industry party or; partfunded by the industry party (in cash and/or in kind, including participation in the research itself) and part-funded by the State or other external sources. Collaborative research may involve two or more parties. Characteristics of collaborative research with industry: The purpose of collaborative research is the generation of new knowledge. Typically, there will be an expectation of publication although the project

may be governed by aspects of confidentiality. Intellectual property may be created and how the company benefits will be determined in the collaboration agreement and will depend on the contribution to the project made by the company. (Excludes contract services, consultancy, innovation vouchers, academic collaborations and research grants).

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

collaboration, Training and provision of Continuing Professional Development (CPD)).

Equity: Shareholding in a legal entity.

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

Incubator: A dedicated facility on the RPO campus in which early stage companies are housed and supported (pre- and post-formation). The facility may offer desk space, laboratory space or a mix of both.

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

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

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and subsequently, potentially, protect and commercialise the intellectual property. For avoidance of doubt, the IP may be software.

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

Joint Invention/Software Disclosure: Simultaneous reporting of an Invention Disclosure for the same invention or software to more than one RPO that has been created jointly by more than one RPO via the TTO/ILO.

KT: Knowledge transfer – the sharing of expertise, capability, technology and intellectual property between the research base and industry or the public sector with the aim of developing new or improved products, processes and services that deliver societal and economic benefit. Knowledge Transfer Ireland.

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. 51Annual Knowledge Transfer Survey 2020

Large Company - Irish: A Large Company which is based in Ireland. Licence A contract under which IP rights are transferred from one party to another for the purpose of commercialisation.

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.

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R&D&C Agreements: Research Collaboration Agreements (wholly and part-funded), Innovation Vouchers and Consultancy Agreements.

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

Research Expenditure: This represents the total expenditures on all types of basic and applied research in Irish RPOs from all funding sources: government, industry, nonprofit 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. Sole invention / software disclosure. An Invention Disclosure for an invention or software created by one RPO and reported to that RPO via the TTO/ILO.

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

Start-up: Company formed by staff or students from the RPO not based on knowledge or IP generated by the RPO and where there is no formal IP licence or equity share with the RPO.

TTO: Technology Transfer Office – the team responsible for managing KT services, including intellectual property management, licensing, partnering with industry and the creation of new companies.

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