

Research to Riches

Entrepreneurial Impact Ranking 2019

Measuring the success of UK
universities in converting research
into successful companies

Introduction

Measuring the commercial effectiveness of the UK's universities

The UK's academic institutions are world renowned, which is reflected in ground-breaking achievements such as the discovery of DNA, the jet engine and the world's first electronic programmable computer. The UK ranks third with the number of PhDs it produces (behind USA and Germany)¹ and third in the publication of academic papers (behind USA and China).² Over many decades, work by brilliant minds in science and medicine has resulted in the UK coming second only to the USA for Nobel prizes.

However, while our strength lies in academic research, there are many steps we could take

collectively to improve its commercialisation. The UK has produced a host of successful university spinouts, but there are many unrealised opportunities that have been left in labs or got lost on their funding journey. These could be worth trillions of pounds to the UK economy.

The Entrepreneurial Impact Ranking is an index of the universities that are leading the way in creating and commercialising spinouts. In quantifying their impact, it creates a framework for further transparency, collaboration and improvement throughout the ecosystem.

As the UK's Industrial Strategy places a clear emphasis on academic entrepreneurialism as a driver of economic growth, the Entrepreneurial Impact Ranking aims to bring all key stakeholders together for the UK economy to reap the benefits of our academic excellence.

The Entrepreneurial Impact Ranking provides insights into which universities are best at nurturing research-based innovation.



In this report we refer to a university spinout as a registered company set up to exploit intellectual property that has originated from within a university.

¹Based on OECD (2015), OECD Education at a Glance 2015: OECD Indicators, OECD Publishing, Paris, <http://dx.doi.org/10.1787/eag-2015-en>

²Department for Business, Energy & Industrial Strategy (BEIS), International Comparison of the UK research base 2019, – <https://www.gov.uk/government/publications/international-comparison-of-the-uk-research-base-2019> International Comparison of the UK research base, 2019

Spinout success stories

Over the last 20 years, the UK's academic institutions have shown that they can produce highly successful new companies operating in science and technology:

Name:

Oxford Nanopore Technologies

University:

Oxford University

Speciality:

DNA sequencing

Founded:

2005

Raised £50 million at a £1.7 billion post-money valuation¹ in 2018.

Name:

ARM Holdings

University:

University of Cambridge

Speciality:

A designer of smartphone chips

Founded:

1990

Acquired by Japanese firm Softbank for £24 billion in 2016.

Name:

Ziyo

University:

University of Bristol

Speciality:

Developed glucose binding molecules for the treatment of diabetes

Founded:

2014

Sold to Novo Nordisk for £623 million in 2018.

Name:

Abcam Plc

University:

University of Cambridge

Speciality:

One of the world's leading producers of antibodies

Founded:

1998

A global business exporting to some 140 countries with a market capitalisation of £2.3 billion.

Turning research and science into lucrative companies is an art that has been mastered by some universities better than others. Several reviews (e.g. McMillan, 2016 & Lambert, 2003) have all agreed that there is room for improvement in the UK's approach to commercialisation of research.

The Entrepreneurial Impact Ranking is a benchmark of the universities that are leading the way in capitalising upon the economic potential of academic research.

¹ Pitchbook



The success of leading universities in the USA in creating commercial value from academic research offers an indication as to the opportunity the UK could capitalise on.

26,000

Research by the Massachusetts Institute of Technology has been the genesis for some 26,000 companies.

US\$2 trillion

With a combined annual company turnover of US\$2 trillion.

65%

In nominal terms, that represents 65% of UK annual GDP from just one university.

3.3 million

These have created 3.3 million jobs.

Source: <https://www.kauffman.org/what-we-do/research/2009/08/entrepreneurial-impact-the-role-of-mit>
Entrepreneurial Impact: The Role of MIT: <https://www.kauffman.org/what-we-do/research/2009/08/entrepreneurial-impact-the-role-of-mit>



Measuring universities' impact

The Entrepreneurial Impact Ranking measures UK universities' effectiveness in terms of their production of intellectual property, creation of spinout companies and successful exits from such spinout companies, relative to their total funding.

Taking its foundation from established academic studies on research commercialisation, the Entrepreneurial Impact Ranking measures the most important data points that influence the creation of spinout companies from universities.

Data was sourced exclusively from the Higher Education Statistics Agency, and there are no subjective or opinion-based measures. The ranking is based on the data points below, put together using data aggregated from 2009–2018. The aggregation is necessary as startups, particularly spinouts, take time to build and develop into successful companies.

The Entrepreneurial Impact Ranking differs from any others because it focuses entirely on universities' capacity to produce quality, investor-ready spinout companies. As such, it offers a

benchmark for understanding relative performance in creating new spinout opportunities. The Entrepreneurial Impact Ranking takes an investor's perspective in that it identifies the UK's universities that produce the most successful spinout companies relative to their total funding.

The combination of data points makes this the most comprehensive ranking of universities: a true reflection of which universities are punching above their weight.

Data points included are:

1. Total funding per university
2. Total spinouts created per university
3. Total disclosures per university
4. Total patents per university
5. Total sales from spinouts per university

Entrepreneurial Impact Ranking – the results



#1

Queen's University Belfast

Over the period measured, Queen's University Belfast has been found to be the most effective in terms of its production of spinout companies and successful exits, relative to the total funding received. Through QUBIS, the commercialisation arm of Queen's, the university has had a number of notable successes such as Kainos, Andor Technology and Fusion Antibodies, all of whom have been listed on the London Stock Exchange. Andor Technology was subsequently purchased by Oxford Instruments in 2013 for £176 million.



Entrepreneurial Impact Ranking 2019 - Top 10



1. Queen's University Belfast



6. The University of Dundee



2. The University of Cambridge



7. The University of Nottingham



3. Cardiff University



8. King's College London



4. Queen Mary University of London



9. The University of Oxford



5. The University of Leeds



10. Imperial College of Science, Technology and Medicine

Entrepreneurial Impact Ranking 2019

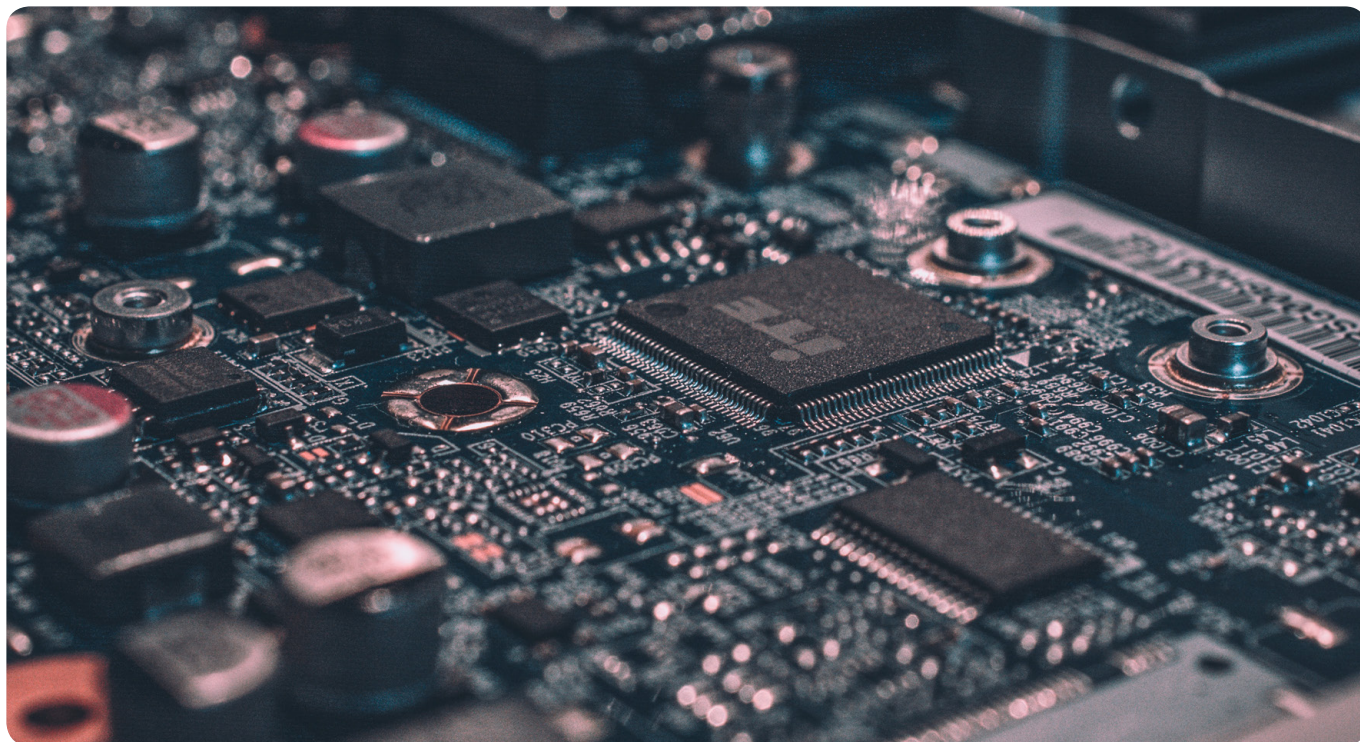
Rank	University name	EIR score
1	The Queen's University of Belfast	112.31
2	The University of Cambridge	95.10
3	Cardiff University	86.14
4	Queen Mary University of London	85.79
5	The University of Leeds	81.21
6	The University of Dundee	80.39
7	University of Nottingham	79.01
8	King's College London	72.99
9	The University of Oxford	72.54
10	Imperial College of Science, Technology and Medicine	68.56
11	The University of York	67.71
12	The University of Aberdeen	62.82
13	Royal Holloway and Bedford New College	60.99
14	University of Ulster	59.87
15	University of South Wales	59.35
16	The University of Manchester	59.26
17	University of Durham	58.25
18	University College London	57.89
19	The University of Strathclyde	57.46
20	The University of Glasgow	57.17
21	The University of Bradford	56.51
22	The University of Salford	56.33
23	The University of Warwick	55.86
24	The University of Bath	55.78
25	The University of East Anglia	55.64

Rank	University name	EIR score
26	The University of Bristol	55.48
27	Glasgow Caledonian University	53.32
28	The University of Leicester	53.26
29	The University of Exeter	53.04
30	Loughborough University	52.37
31	The University of Southampton	51.58
32	The University of Sunderland	47.55
33	The University of Birmingham	46.26
34	Coventry University	40.76
35	The Institute of Cancer Research	35.31
36	The University of Sheffield	29.54
37	Royal College of Art	29.42
38	University of Plymouth	29.40
39	Oxford Brookes University	28.87
40	Edinburgh Napier University	28.74
41	St George's, University of London	28.70
42	Staffordshire University	28.58
43	The University of Wolverhampton	28.44
44	The Royal Veterinary College	28.26
45	Middlesex University	28.23
46	The Manchester Metropolitan University	28.18
47	University of the Arts, London	27.95
48	Aston University	27.95
49	City, University of London	27.91
50	The Robert Gordon University	27.85

The numeric score attributed to each university is formed from the combination of the following data points (all publicly available and sourced from the Higher Education Statistics Agency): total funding per university, total spinouts created per university, total disclosures per university, total patents per university, total sales from spinouts per university. The Top 100 UK universities by EIR Score are included in the Entrepreneurial Impact Ranking.

Rank	University name	EIR score
51	Cranfield University	27.76
52	The University of Hull	27.68
53	Brunel University	27.58
54	The Nottingham Trent University	27.52
55	De Montfort University	27.50
56	The University of Kent	27.46
57	Falmouth University	27.08
58	Bangor University	26.96
59	University of the West of England, Bristol	26.94
60	The University of Edinburgh	26.79
61	The University of Central Lancashire	26.27
62	Heriot-Watt University	26.26
63	Bournemouth University	25.94
64	Keele University	25.50
65	The University of Liverpool	25.17
66	Swansea University	24.91
67	University of Hertfordshire	24.54
68	The University of Lancaster	24.05
69	The University of Surrey	23.89
70	The University of Reading	23.71
71	Aberystwyth University	23.38
72	The University of Sussex	22.98
73	Liverpool John Moores University	22.96
74	The University of the West of Scotland	22.05
75	The University of Huddersfield	21.49

Rank	University name	EIR score
76	The University of Portsmouth	21.46
77	Sheffield Hallam University	21.23
78	The University of Essex	20.09
79	The Arts University Bournemouth	20.00
80	Birmingham City University	19.69
81	The University of Greenwich	18.69
82	The University of Westminster	18.24
83	The Open University	17.91
84	Birkbeck College	17.87
85	University of Abertay Dundee	17.78
86	University of Northumbria at Newcastle	17.51
87	London South Bank University	17.18
88	The University of Lincoln	15.95
89	Newcastle University	14.88
90	London Metropolitan University	14.85
91	Anglia Ruskin University	14.63
92	Roehampton University	14.31
93	The University of Brighton	13.82
94	The University of Northampton	10.74
95	The University of Bolton	9.95
96	Newman University	9.95
97	University of Bedfordshire	9.67
98	Goldsmiths College	9.62
99	University of Wales Trinity Saint David	9.13
100	London School of Hygiene and Tropical Medicine	8.17



The Entrepreneurial Impact Ranking is unique in having a sole focus on UK universities' track record of success with spinouts.

The prominence of the UK's universities in terms of academic output grew internationally over the 9-year time period that data was collected for this ranking. While our Oxbridge institutions progressed further in the top ten of the world's leading research universities, the University of Edinburgh went from 54 to 31 and the University of Manchester improved from 41 to 33, according to the Academic Ranking of World Universities. In essence, the UK's universities are improving their research output internationally, so there is no better time to make the most of this excellence commercially.

Throughout the total 9-year period that the Entrepreneurial Impact Ranking spans, the UK's universities produced a total of 38,248 disclosures and 9,526 patents. Patents and disclosures

are the fuel that fire academic entrepreneurialism, and the resource we have in the UK is world-leading. Although most people are familiar with patents, disclosures are less well known. A disclosure is triggered when a university researcher submits a new idea to their university technology transfer office for potential commercialisation and/or knowledge transfer.

A critical factor in understanding the Entrepreneurial Impact Ranking is that it is adjusted to take account of the total funding that universities receive. This ensures that the ranking is fair for all universities and doesn't overly weight in favour of well-known Russell Group institutions that are exceptionally competitive when it comes to winning funding. So while some less familiar names can be found towards the top of

the ranking and some of the more prestigious institutions found outside the top 20, it is important to think about this in terms of efficiency of producing quality spinouts relative to total funding received. Nevertheless, this helps identify some hidden gems, as well as some of the UK's sleeping giants.

The objective of the Entrepreneurial Impact Ranking is to better understand which universities perform best in terms of producing high quality spinout companies consistently, and to bring the entire ecosystem together as a whole (investors, corporates, talent networks, universities, funding agencies and policymakers) to collaborate on helping the entire ecosystem thrive, and ultimately for the UK to be a global leader in academic entrepreneurialism.

Key factors influencing the ability of academic entrepreneurs to build spinout companies

Funding for proof of concept and prototyping

Why do only a few ventures succeed where so many others fail? One answer lies in the challenge of ensuring funding while taking ideas through to proof of concept and prototyping. For academics to get their ideas through the earliest stages of development they must cross what has come to be known as 'the valley of death.'

For example, Oxford Nanopore was only able to make the leap after it received early stage proof-of-concept funding from leading patient capital fund IP Group. This kind of support is very similar to university-raised early stage funding. But whatever form it takes, the reality is that many ventures don't have access to it and fall by the wayside.

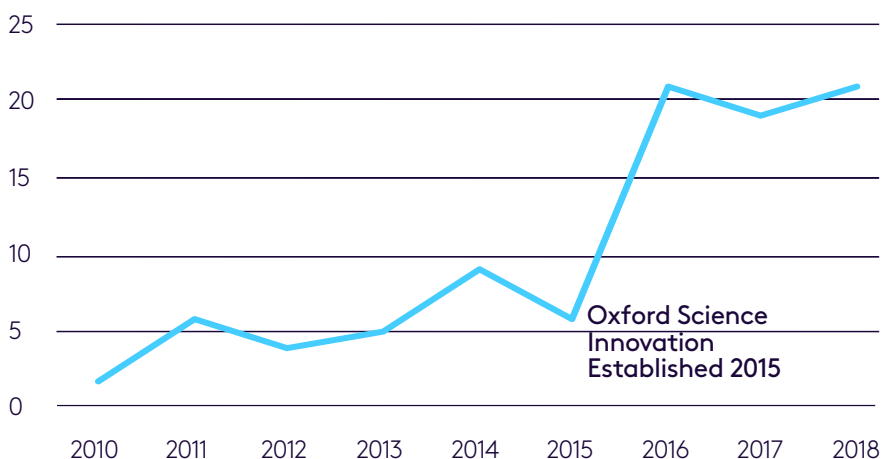
The ranking results bear this out. Universities that have performed well are those that have raised funds specifically to bridge this gap, or are closely associated with funds established to help alleviate the pain point. Imperial College (ranked 10), partnering with Imperial Innovations; the University of Oxford (ranked 9), allied with Oxford Sciences Innovations; and the University of Cambridge (ranked 2), working with Cambridge Enterprise and Cambridge Innovation Capital, all feature in the ranking's top 10. The graph below shows how the number of spinouts has increased since Oxford Science Innovation was established.

The top-ranked institution, Queen's University Belfast, has a range of customer-discovery programmes within its 'tech transfer company' QUBIS that are designed to validate market interest in early stage research discoveries. These include running Innovate UK's Innovation to Commercialisation of University Research programme, and its own Lean Launchpad. Queen's uses this approach to rapidly filter opportunities, and then focus its support and investment on the best companies.

Brian McCaul, CEO at QUBIS Ltd, added:

"It is a testament to the world-class research and ambitious companies that have emerged in recent years that Queen's University Belfast, via QUBIS, has achieved first place in this ranking. With a history of strong support for commercialisation from the University's senior management, which has included early university cash investment, Queen's is helping inspirational founders develop pioneering technology engendered at the university and make their mark in industry on the global stage."

Oxford University Spinouts Created



Talent

Aside from funding, the issue of talent is consistently a challenging issue for academic-led spinouts. Generally speaking, the skills required are highly sought after by many industries, and it is extremely difficult to persuade highly skilled people to opt for higher risk spinout companies in the face of offers from more established enterprises. In many ways, the war for talent is amplified in the world of academic spinouts.

Another challenge for spinouts is that academic's understanding of the commercial world tends to be poor. This is due in part to the fact that academic achievement is measured largely by the number of publications and citations a researcher delivers known as 'publish or perish' and there are limited incentives for researchers to engage with industry.

Nevertheless, there is more that could be achieved through collaboration across the entire ecosystem and by raising the profile of the UK as the go-to market for academic entrepreneurs to raise investment and build businesses.



Collaboration

Between universities:

A key aspect of the higher-ranking institutions' work is collaboration with other universities, leading to positive effects for spinouts. An interesting example comes from arts colleges collaborating with larger technical universities. The Royal College of Art (ranked 37), working with Imperial College (ranked 10), and Falmouth University (ranked 57), working with the University of Exeter (ranked 29), have achieved their rankings through sharing very different and specialised skillsets to support new ventures.

The Helix Centre shows collaboration in practice. It's a digital health innovation lab based at St Mary's Hospital in London, launched in 2014 as a joint venture between Imperial College London and the Royal College of Art. At Helix, interdisciplinary teams of product designers, software engineers, clinicians and scientists come together with

patients, families and professionals to develop and trial new products and services that improve health outcomes.

According to Helix Centre's Managing Director, Daniel Dickens, "big tech firms and startups alike are looking to innovate in healthcare. Our collaborative approach means we're able to attract and retain the world-class talent across design, engineering and clinical research that we need to compete."

One of Helix's first digital products was acquired by Google DeepMind, and subsequent solutions have recently spun out as startup ventures. A new collaboration now sees Helix Centre as part of the £20 million research partnership between Imperial College London and the University of Surrey (ranked 69) to launch the Dementia Care Technology Centre, funded by

the UK's Dementia Research Institute, which aims to develop connected home solutions for people living with dementia and their carers.

Collaboration increases scale and capacity, with recent developments indicating that this is recognised by the government. The University of Manchester (ranked 16) recently received £5 million from its 'Connecting Capability Fund', a £100 million vehicle that supports university collaboration in research commercialisation. The aim is to use this money to work up a far bigger fund that will invest in the outputs of Leeds (ranked 5), Sheffield (ranked 36) and Manchester universities. Over time, this could create a northern powerhouse specifically for university spinouts, which rests on collaboration.

Collaboration between universities allows for the wide-ranging support that spinouts need to realise their commercial potential.

Collaboration throughout the ecosystem:

One area of particular opportunity for collaboration throughout the early stage / deep tech ecosystem is between different profiles of investors. It is often assumed that all investors are the same; however, the venture and patient capital communities break down into specific skills sets that could complement one another through more collaboration. Combining the skills of technically excellent, very early stage investors with the financial and commercial skills of scale-up investors is a particular area of opportunity.

Understanding tech demand:

Corporate engagement is often the missing component in connecting academic laboratories with real-world problems. It is widely acknowledged that more extensive collaboration would help focus innovation efforts towards the most relevant commercial opportunities.



Conclusion

The UK's universities have a strong focus on supporting spinouts, with a great deal of activity and a few notable successes. Clearly there is no lack of academic ability in the UK. The truth is that building companies from academic research is not easy. Generally speaking, the commercial skillset required is far rarer and more challenging to recruit into early stage enterprises.

Furthermore, the levels of investment and infrastructure required to even get to proof of concept dwarf those of more

conventional software-based startups. Similarly, the cycle times to market and exit for investors are much longer. All in all, there are far greater complexities, risks and expenses associated with getting world-class scientific research into the commercial arena.

In measuring the relative effectiveness of UK universities' work in this area, the Entrepreneurial Impact Ranking provides some signposts for the future. Infusions from funds providing backing at proof of concept stage mean that

academia's sleeping giants are starting to stir. Similarly, collaborations between universities mean emerging ventures can benefit from more well-rounded support, so aiding their future success.

At Octopus Ventures we recognise the potential for the UK to become a global leader in academic entrepreneurialism. Our hope is that this report acts as a small first step on a much bigger journey to ensure that the teams nurturing the next wave of innovation in university laboratories are set up for success.



Authors

About Octopus Ventures

Octopus Ventures is one of the largest VCs in Europe, with £1.2 billion under management. Our investment team is focused on investing in the areas we believe have the potential to change the world.

We recognise the potential of universities to power the UK economy. At Octopus Ventures, we have a whole team dedicated to investing in deep tech. We know that in this area, the really significant advances are often happening, slowly and quietly, in university laboratories and research centres. We believe that UK universities have a key role to play in providing more support for this work.

octopusventures.com

About Ideas 2 Impact

Octopus Ventures worked with Ideas 2 Impact (i2i) on this research. An innovation and fundraising consultancy, i2i helps organisations raise funds for research and commercialisation, as well as putting together pathfinder teams for the development of new spinout companies.

i2i's founder Alisdair Jones has worked with universities for over a decade, both investing in early stage research-based companies and producing research on the UK's early stage ecosystem. This is alongside promoting the research portfolios of over 500 universities across 40 countries.

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