From Science to Growth 2.0

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Stephen Allott 13 August 2026

From Science to Growth 2.0

By Stephen Allott

Never has so much been spent on so many ideas for so little a result.

Pharma and Software are different. Both are good. But they are different.

But Cambridge always had a plan. Secretly Built the Ring. It's Now Ready to Rock.

EXECUTIVE SUMMARY

Our UK Government in 2026 spends over £20 billion per year on funding science itself (according to the ONS). This is hugely valuable and will continue to grow to £22 billion by 2029. The challenge is to get full value from it.

Having funded the science, they spend a further £12 billion per year trying to turn that science into growth and amplify its economic impact. I counted 19 different types of spend on these mechanism amplifiers.

There is also the R & D tax credit. Costing a whopping £7.6 billion per year, this subsidy goes to companies who "work on innovative projects in science and technology …. and seek an advance in a field … by resolving an uncertainty" (source Gov.UK). They want businesses to develop new products using science which doesn't, actually work - yet.

The aim has been to grow new global technology market leaders. Looking at the global league tables, the results have been pitiful. The results are in *Selling Less of the Family Silver*. Doctor David Connell, a senior business research academic at Cambridge University, lays out the facts in his recent report.

Where do British technology companies rank in the international business league tables?

- In biotech there are zero British companies in the top 100.
- In software there is just one – Sage – in the top 100.
- In semiconductors, there is just one, ARM, at 40th in the top 100.
- In electronics just one, RS Group, but it is merely a distributor.
- In instruments just one at 10th place
- In medical devices just one at 25th place.
- In pharma there are two at 8th and 19th places.
- In old fashioned chemicals, there are three in the top 100.

The number of new UK admissions to PwC's Global 100 Software Leaders list and the league table for the 100 largest semiconductor companies this century has been zero.

Supporters of the Cambridge University Computer Laboratory expected this failure. 25 years ago, we made a plan. Working in stealth mode, we built the Cambridge Computer Lab Ring. Note that the Cambridge University Computer Laboratory is now called the “Cambridge University Department of Computer Science and Technology”.

The Cambridge Computer Lab Ring (the “Ring”) is the Route to take UK tech to Victory.

There are 8 products. Each is and will be measured, improved and developed using world class product management.

1. Lab students receive the best education and a lifetime benefit from their degree.

2. Companies are matched with and hire the best fit graduates using the Supporters Club.

3. Ring members perform better than peers in their jobs and command a premium.

4. Ring members (Lab graduates) receive best in class lifetime recognition and rewards.

5. Ring members transitioning to Start-Up careers receive the best support.

6. Ring Hall of Fame companies receive a full spectrum product offering of customer access, talent access both technical and managerial, management educational access and strategy advice.

7. Department faculty at Cambridge therefore can expect

    a. The highest pay and rewards
    b. The best students to teach and supervise
    c. The most enriching lifetime relationships with former students in industry.
    d. The best facilities.
    e. The most productive, generous and aesthetic office space.
    f. The most high-powered support staff.
    g. The best quality of life for their partners and families.

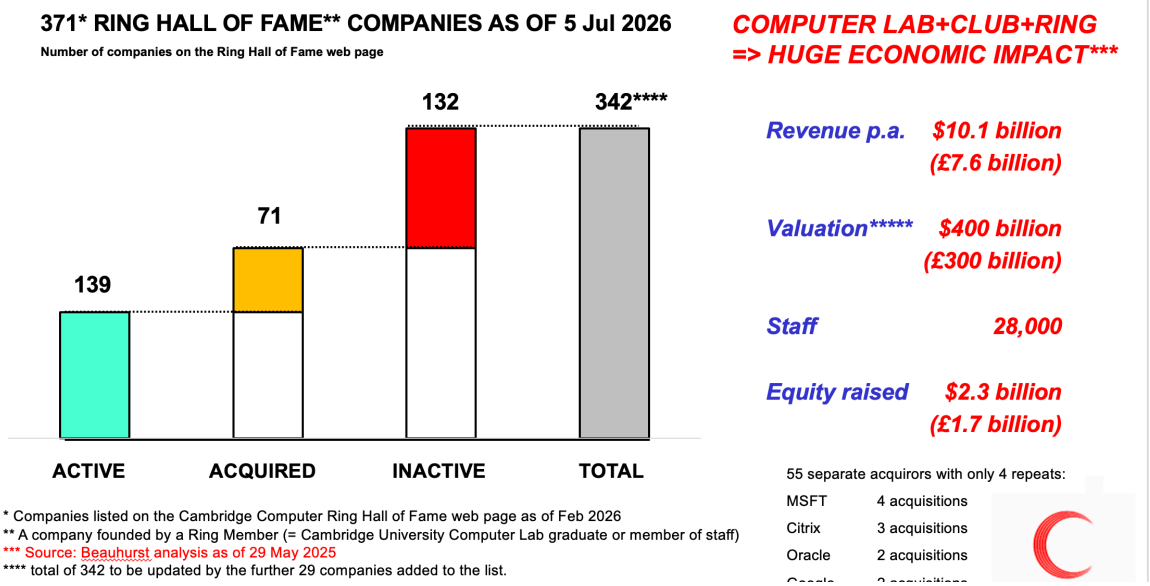
8. Donors receive the most satisfying psychological reward for making Cambridge a University of the Future rather than the past.

Kaizen is used on every product to achieve continuous improvement.

These products are marketed and sold worldwide attracting the world’s best people to Cambridge.

And here are our results. The value of our Ring Hall of Fame companies reached $400 billion in 2026.

400 billion reasons to Ring Cambridge.

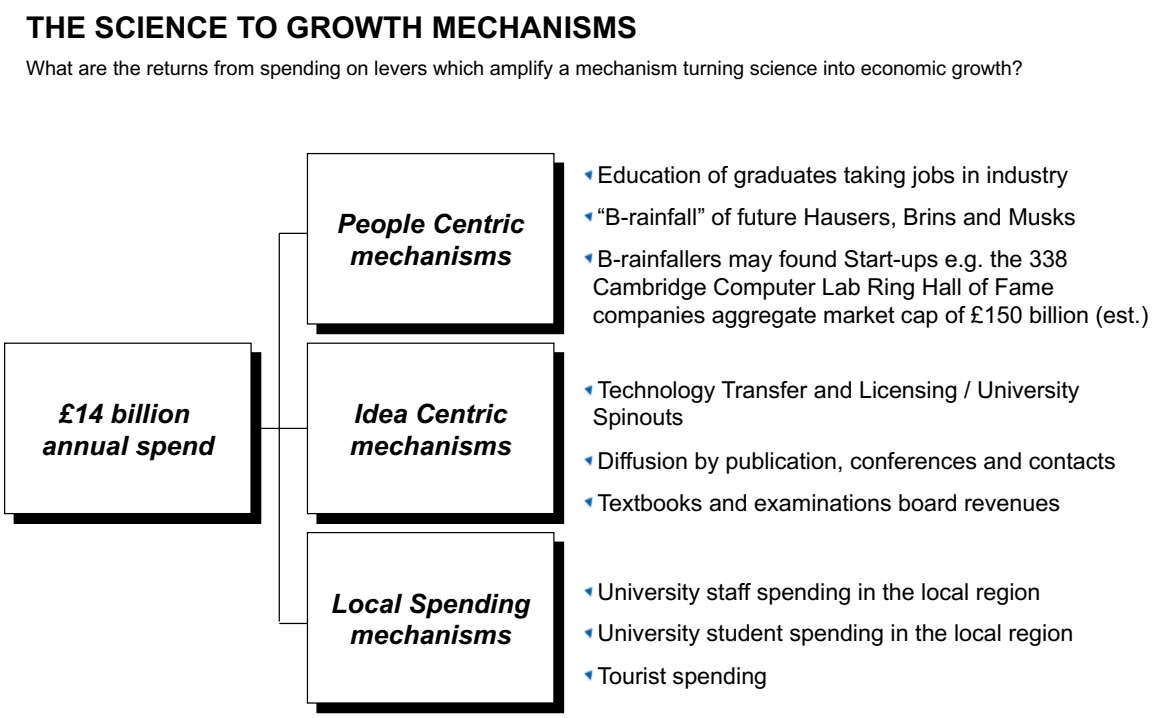


WHERE DID ALL THE MONEY GO?

Were the likely results obvious at the start? Who took the decisions to proceed? Has it been well spent?

One would expect that the £12 billions spent on assistance for innovation would be carefully allocated to get the maximum return on the spending. One would also expect that there are several mechanisms by which innovation leads to economic growth. For each mechanism, there are a range of ways to spend public money to catalyse or amplify the mechanism. One would expect that maximising returns would employ a variety of levers, careful monitoring and fine-tuning adjustments.

To understand the discussion that follows, to understand what has gone wrong and to understand what has to happen in the future to go right, we shall use the following terms.



Science appears to make a country richer. This is the consensus.

"From Science to Growth" means the apparent link between the R & D spend in an economy and economic growth.

- The **"Mechanisms"** by which science leads to growth are numerous and varied, some mechanisms are well known and some obscure. Familiarity is not correlated with size of impact. We have grouped the mechanisms under 3 headings.

  People Centric Mechanisms

  - One mechanism, **"Education"** is the training of technical graduates who take jobs in industry creating value by using their domain training and skills to create products and services bought by customers to solve valuable customer problems.

  - Another mechanism **"B-rainfall"** is where a science university attracts world class business talent to a cluster. Hermann Hauser (born in Austria) went to Cambridge to do a PhD in Physics at the Cavendish Laboratory of the University of Cambridge. Finding himself in Cambridge, he co-founded Acorn Computers, which then begat ARM, the UK's leading semiconductor business now with a market cap of $148 billion. No university spinout or tech transfer

there. No venture capital either. Another example is Redgate Software. As a private company, its value can only be estimated but it is of the order of £1 billion. It is in Cambridge because its 2 founders, Neil Davidson (Maths, Trinity) and Simon Galbraith (Geology, Magdalene) studied at Cambridge and stayed on in the city to live. Each is outstanding as a technologist and business leader respectively. Simon has built up several other very successful software businesses of which he is a director. No university spinout or tech transfer there. No venture capital either. Sergey Brin co-founder of Google (born in Russia) now lives in the Bay Area because he went to Stanford to study Computer Science and stayed there. Brin's father moved to the US with help from a Hebrew charity, the Hebrew Immigrant Aid Society, intended to enable academics to move from Russia to the USA. The early versions of the Google search engine drew from Chinese designs by Robin Li used in Baidu (cited in Larry Page's patent) and were coded by Scott Hassan, a friend of Larry Page. See the Google Case Study in the Appendix.

- The B-rainfallers may do a **Start-Up** themselves (338 examples are catalogued in the Cambridge Computer Lab Ring Hall of Fame) or they may join some-one else's Start-Up or take a job in an established company in the Cluster. This mechanism may be amplified by many levers such as inspiring Start-ups with talks from successful graduates or giving management training.

Idea Centric Mechanisms

- **"University Spinouts" and / or "Technology Transfer"** are the mechanisms by which academic research is commercialised into a business. Research and Knowledge Exchange is included here.

- **"Diffusion"** occurs, for example, by publication and conferences as well as by personal contact.

- **"Educational Exports"** such as exam boards and textbooks.

Local Spending Mechanisms complete the list and consist of spending by University staff, students and by tourists in a local economy and are be counted for completeness.

These mechanisms can be amplified or boosted by **"Catalytic Spending"** on appropriate levers. There are many different levers for each of the 9 mechanisms.

What about learning from the Sergey Brin story where a small grant (a lever) brought his family to the USA. How many more Sergey Brins are out there?

Another lever is improving business functional management skills. Out of the £14 billion to spent to boost the innovation, spending £1 billion on training UK technology company managers on best practice in sales management might boost sales across the entire UK tech industry. Say sales could go up 20%. In 2028, UK IT annual revenues will be $250 billion. A commonplace gain of 20% would be worth a handy extra $50 billion. That alone could fill the Chancellor's black hole. $3 billion to spend on sales management might allow us to head hunt the top 5,000 US sales managers and re-locate them to the UK.

A lever used by Stanford University is inviting successful graduate Start-Up founders to give inspiring talks to students. The Cambridge Computer Lab Building Opening in 2002 featured a Illustrious Alumni panel.

HOW COULD THE MONEY BE BETTER SPENT?

There are many mechanisms to catalyse and many ways to spend amplifying the economic impact. Many more ways than just spending huge sums on university spinouts.

At the minimum, we should expect the Government should be able to:

- List the Mechanisms comprehensively
- Size the Mechanisms both absolutely and relatively
- List the potential of each Mechanism to be boosted by each lever (an act of catalysis e.g. training sales managers)
- Estimate the return on investment of every potential spend on each lever
- Allocate the annual spend of £14 billion to the highest return blend of spending
- Report back on the actual return on investment.

Instead, they seem to have put all our money on university spin outs and tech transfer.

How did this happen. And then what should we try alongside the current policy and observe the results?

Around the millennium, the last Labour government became convinced that academic scientists were well placed to turn science into the economic growth that the country needed. These academic scientists would, thought ministers, get new business ideas from their academic research; then the very same scientists would become great business leaders and grow their ideas into world leading businesses.

This approach turned out to be a poor bet in software and semiconductors and many other sectors. The one clear exception is the pharmaceutical industry, where technology transfer can work well.

Many, many reasons exist for this result, but they fall under 3 headings, weak owners, weak Government and weak businesses themselves. Two specific factors were obvious at the start. Poor ideas combined with poor management offer poor results. And so it proved.

Customers, surprisingly enough, are the most common source of new business ideas. This is well known and confirmed in the academic literature on innovation. University and Government R & D is the least common source but one.

Seasoned managers and proven entrepreneurs make, most of the time, for the best business managers. Career academics by contrast are rarely successful entrepreneurs. A recent review readily accepts this fact and confirms that most academics do not want to switch careers to business. It is not easy to do both at the same time.

British policy makers have read the many studies that link R&D to economic growth. Tragically, the British did not appreciate there are several distinct mechanisms at work in

"Science to Growth". Commercialisation of academic IPR is merely one of many. Also known as "technology transfer" and "linear model innovation", commercialisation is the aim of "university spinouts."

In 2006, the Hughes Hall, Cambridge University City Lecture, entitled *From Science to Growth,* categorised the mechanisms into 2 types:

1. ***People-centric***
2. ***Idea-centric***

The UK Treasury mandarins knew this. In 2004, the Treasury report called these two things:

- ***Understanding*** the value of others' work – my People-centric
- Making new ***discoveries*** – my Idea-Centric

TREASURY SCIENCE AND INNOVATION REPORT
July 2004

> "Studies show that R & D delivers benefits by allowing an economy to do two things:
>
> - understand and appreciate the value of others' findings and results;
> - and make new discoveries."

Source: http://www.hm-treasury.gov.uk./spending_review/spend_sr04/associated_documents/spending_sr04_science.cfm at p.150

The economic impact of technology innovation matters to everyone in Britain today. We need the "Growth". In the US, technology, software and semiconductors make up more than 37% of the stock market capitalisation. Technology is a very hot sector. Five companies alone account for a fifth of the value on Wall Street. But the Britain is barely represented in global tech. Britain has just two. ARM and Sage are old. In 20 years, not one single global scale new British tech company has come through.

There is no disputing the results of the current policy. Like Soviet communists faced with the failure of communism, the true believers said more communism was needed. When Science did not lead to Growth, those misguided British policy makers ordered up more and yet more Idea Centric policy measures, increased the spending and played for time.

They often looked to the U.S., and they copied some things they observed. Not fully understanding all the key elements of the mechanisms, critical bits were left out when the UK schemes were established. The role of government as a purchaser of innovation and the role of venture capital were imperfectly understood and open goals missed.

- DARPA, which famously built the Internet, became ARIA in the UK. ARIA neatly condemns itself on its website: "ARIA was built to pursue scientific and technological breakthroughs that will take years to play out."

- SBIR, the US government seed funding organisation, became SBRI under which Whitehall invited tenders to solve difficult valuable problems.

In the US, a few US venture capital firms have had huge successes but most of the returns have been concentrated in the top six firms. It is not, therefore, that it is the US VC model that has succeeded. It could be that merely six highly skilled and well-connected firms have done well. Critically, they blend operational partners with financial partners, install seasoned managers in their investments and reduce hiring risk by recycling management teams. Outside, the top six, returns have been lower.

By contrast, it is between rare and unknown for UK venture capital firms to have operational partners with strong tech management track records. Instead, the investing partners are nearly all financial people. The pool of seasoned UK-based tech executives with global scale-up expertise is modest. One current example has £1.8 billion under management. A 2% p.a. management fee would provide £36m to pay staff. With roughly 140 people, that's well over £200,000 per head. They publish profiles of their investing partners. None has a software or semiconductor track record. One "partner" is a former local bank official with consumer mortgage experience. The non-executive chairman has no discernible tech experience.

When university spinouts' sales of product were weak, the poor performance deterred investors. They stayed away. Sales of spinouts' shares were also sluggish. The policy solutions then adopted were more money and more Idea Centric initiatives.

- Increased spending on academic research in the hope of generating more and more ideas so at least one of them would succeed.
- R&D tax credits to subsidise firms to create/develop more ideas
- "Catapult Centres" to bridge the gap to imaginary customers
- "The Patent Box" to reduce taxation and smooth the way
- "The Technology Strategy Board" to supervise the money being spent
- "British Patient Capital" to wait and wait and wait because so little success emerged.
- VC tax breaks to bring sceptical investors to the halt and the lame
- Government equity to match the VCs
- VCTs, EISs and SEISs in an alphabet soup of tax breaks for individual investors
- The government as customer of last resort, required to buy from these failing start-ups even though civil servants are known for conservatism in tech procurement – happier in buying from IBM than a start-up.

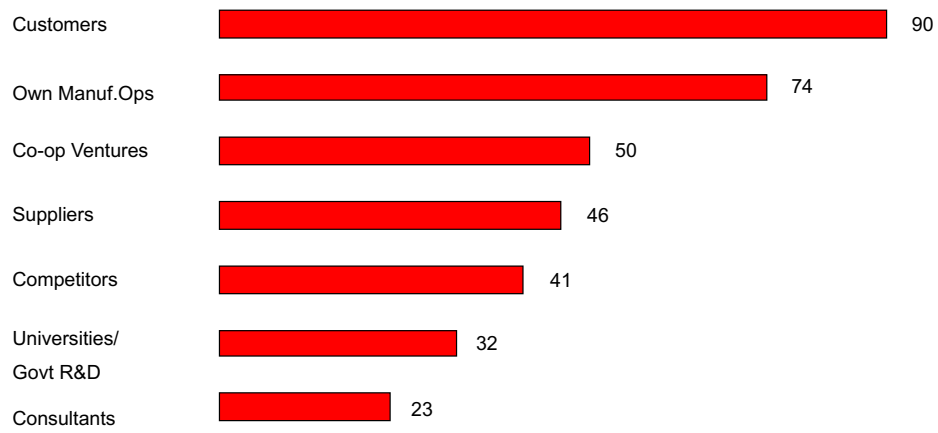
The government had been told by 2006 that the chosen direction might have issues. The lead civil servant, Graeme Reid, was briefed face to face on 29 October 2004. Notes taken during the meeting are recorded in a typed a file note. Handed to him was the peer reviewed article by Professor Barry Bozeman, a leading American tech policy academic. The article says that technology transfer – the Idea Centric model – has "**only modest potential**"

Reid then said: “The government has adopted its 10-year strategy based on tech transfer.” In other words, the politicians were locked in.

Cited 15,000 times since 2019, Bozeman is a recognised leader in his field. Reid said he had never heard of Bozeman. He said that government view was that technology transfer was a key route to economic impact, effectively arguing that Bozeman was wrong. Reid concluded by admitting that a decision had already been taken to start activity and then improve it rather than wait until the perfect system had been designed.

In 2006, *From Science to Growth* was reported in the *Financial Times* and in *Prospect Magazine* and was the subject of a Cambridge University public lecture to the policy community. *From Science to Growth* explored the possible difficulties.

INFORMATION SOURCES SUGGESTING NEW R&D PROJECTS
% R&D managers in industry indicating source



Source : Cohen, Nelson & Walsh published in 2002 from 1994 survey

WITH 371 GRAD FOUNDED COMPANIES, THE CAMBRIDGE RING IS THE WORKING MODEL

Has this changed since 1994? I asked GPT 4.0 to list the most common sources of new business ideas. Market research and customer feedback comes top and academic research / publications come bottom. Since 2000, software has taken over. Software development starts with customer requirements. This is now even more axiomatic than it ever was. The rise of agile development has reinforced the notion that the customer is the starting point. It is hard to imagine abstract computer science research regularly leading to new products. Like Xensource, it is more of a rarer thing.

GPT-4o

Assigning specific values to each source of new business ideas can vary greatly depending on industry, market conditions, and personal experience. However, I can suggest a hypothetical percentage distribution that you might find useful:

1. **Market Research**: 20%
2. **Customer Feedback**: 15%
3. **Competitor Analysis**: 12%
4. **Industry Conferences and Networking**: 10%
5. **Online Forums and Social Media**: 10%
6. **Internal Brainstorming Sessions**: 10%
7. **Technological Advancements**: 8%
8. **Personal Experience and Hobbies**: 7%
9. **Franchising Opportunities**: 5%
10. **Academic Research and Publications**: 3%

These percentages represent the potential contribution of each source to generating new business ideas. You can adjust these values based on specific business scenarios or additional insights you might have.

BOZEMAN SAYS PEOPLE MATTER

Barry Bozeman observed that:

"The most obvious advantage of universities over federal laboratories is a vitally important one - students. The presence of students makes a remarkable difference in the output, culture and utility of research. ... students are a means of technology transfer (through post-graduate job placements) and they often provide enduring links as the social glue holding together many faculty scientists and the companies they work with. Roessner at al. (1998) found that the single most important benefit to industry from participation in the NSF Engineering Research Centers, according to the industrial participants themselves, is the ability to hire ERC students and graduates."

Emphasis added

Source :Technology transfer and public policy: a review of research and theory, Research Policy 29 (2000) 627-655 at page 635-636

People are vital components in the business university interface 2 way information transfer. This is shown in the contrast between the two approaches to creating tech businesses outside pharmaceuticals.

The **People Centric** mechanisms can be catalysed to build human capital in a cluster. Here are some more examples of policy levers.

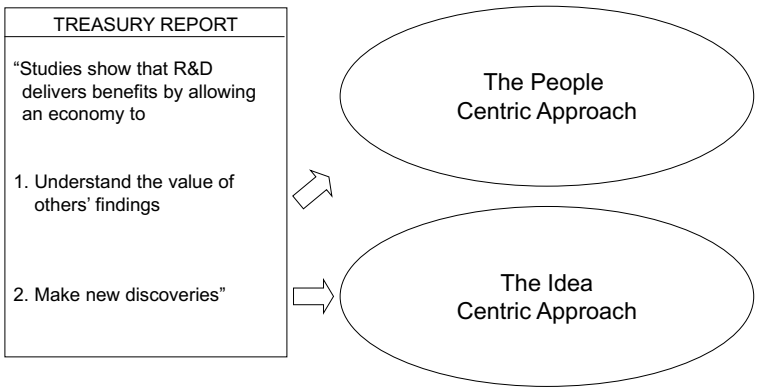
1. B-rainfall of Business leaders and founders can be encouraged in many ways. Professor Richard Florida in his 2002 book "Rise of the Creative Class" identified the *tolerance* in the Bay Area as a key factor in the location decisions of the "creative class". Spending to increase B-rainfall has potential.

2. The Cambridge University Computer Lab Supporters Club brings together the 91 employers looking to recruit Cambridge computer science graduates with candidates.

3. Peer to peer communities such as the Cambridge Computer Lab Ring have been built and used to create value. Seedcamp in London and Y Combinator in the Us are exemplars. Both the Ring and Seedcamp enable companies to recruit talent for free.

The **Idea Centric** mechanisms are based on the translation of abstract research by former academics into new technology businesses. Proven in the realm of Pharmaceuticals and health care related activities it does not translate well to technology such as software and semiconductors.

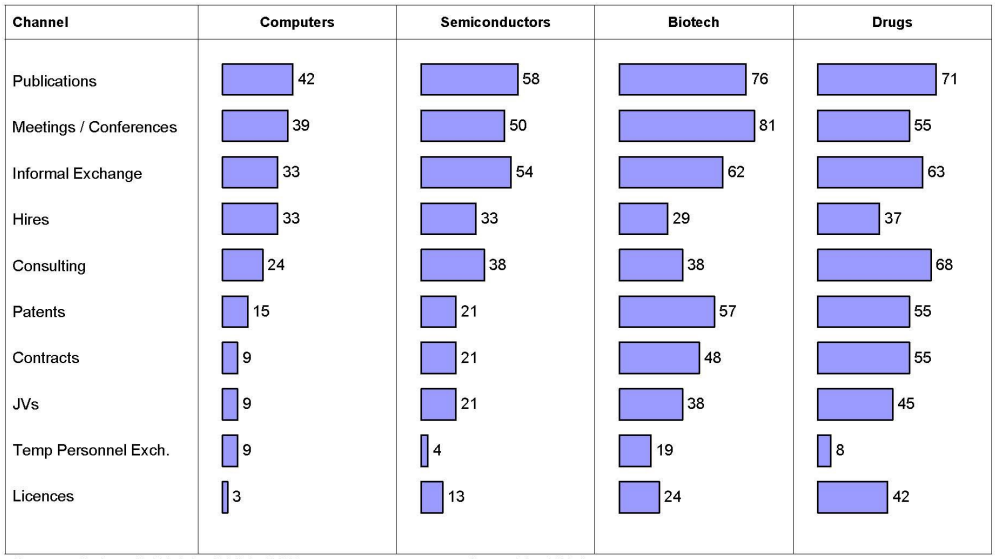
TWO COMPLEMENTARY MECHANISMS TURN SCIENCE INTO GROWTH



Pharmaceuticals are different, an exception that may have misled the civil servants. Look at how the business university interface operates in pharma in this paper from Cohen & Walsh in 2000.

How industry accesses research

Percentage of respondents indicating channel 'moderately' or 'very' important



Source: Cohen & Walsh, 2000. R&D manager survey conducted in 1994.

The chart above shows how the Computer and Drugs sectors access research differently.

- Drugs in general are more research driven.
- Patents (55%), contracts (55%) and licences (42%) are important in drugs.
- Hires (33%) are the 3rd most important channel in computers but are the 2nd smallest channel in drugs.
- Publications, the standard diffusion channel, are the top channel for both.

LINEAR MODEL ONLY REALLY WORKS IN PHARMA

> "We also find that there are some clear differences in the impacts of public research across industries. In this regard, the pharmaceutical industry stands out as an anomaly along many dimensions. There is no other industry where public research - and particularly a basic science (i.e. biology) is thought to be so relevant. ... the linear model may characterize the innovation process better in this industry than in others."

Source : W.M. Cohen & J.P. Walsh, "Public Research, Patents and Implications for Industrial R&D in the Drug, Biotechnology, Semiconductor and Computer Industries," in C.W. Wessner, ed., Capitalizing on New Needs and New Opportunities: Government-Industry Partnerships in Biotechnology and Information Technologies, Washington, D.C.: National Academy Press, 200

The successful commercialisation of pharmaceutical research in the US and UK might have led to the mistaken assumption that this model would work across all sectors. The exception became the rule. And it was wrong.

Meanwhile, back at the customer interface, some successful UK tech businesses such as ARM, Micromuse and Redgate Software did grow up. Idea Centric advocates noticed that the successes did not fit their Idea Centric model. These inconvenient examples were:

- Inspired by customer requirements
- Global from day one
- Self-funded from profits
- Free of VC involvement
- Operating without formal boards (pre IPO)
- Led by seasoned executives or talented entrepreneurs.

- Hungry for outside management knowledge

ARM was a response to an Apple requirement. Micromuse built the Netcool/OMNIbus fault management tool for British Telecom. Netcool became the global market leader. Redgate SQL/Compare was an internal tool.

Like Thomas Kuhn's Structure of Scientific Revolutions, these successful customer-led UK businesses were challenges to the Idea Centric paradigm.

How did I discover this? After working at Micromuse, I worked full time for three years from 2001 to 2004 as a Visitor in the Cambridge University Computer Science and Technology Department (then called the "Computer Laboratory"). I worked on strategy for the head of department. In 2002, I founded the Cambridge Computer Lab Ring and I re-booted the Supporters' Club of companies recruiting graduates. My title was Director of Development. Today that title would mean fund raising. But I was not fund raising. I was doing 'Fund Creating": observing how the most economically productive business university interface in Europe actually worked and then helping our Ring members get richer.

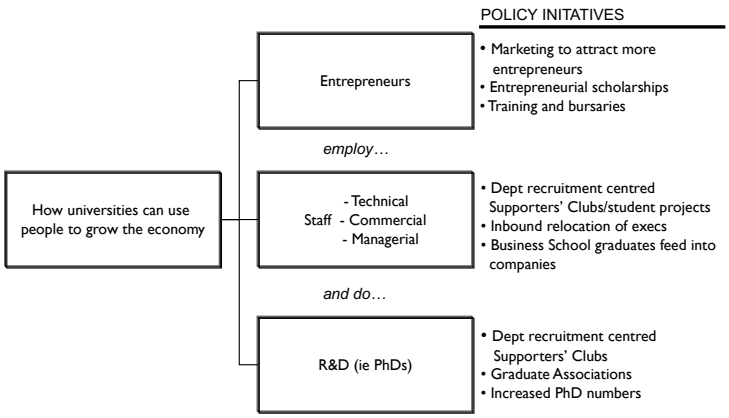
Dr. Elizabeth Garnsey invited me to give a talk to her students in the Institute for Manufacturing in the Engineering Department about the Micromuse case study. She had studied the Cambridge Phenomenon and found that VC-funded businesses were six times more likely to sell out i.e. "Build to Flip". I found her work was very helpful indeed.

Ms. Jan Samols was recruited as the Director-General of the Ring and shared my office. We catalogued all the companies founded by our Ring members – the Computer Labs' graduates). The Ring Hall of Fame now numbers 338 companies which have a collective market capitalisation of close to £140 billion – an oddly similar figure to the amount spent by government on catalysing innovation. Jan also relaunched the Supporters' Club of companies recruiting graduates. It had dwindled to 2 companies by 2002. Today, 91 companies now recruit the Labs' grads through the Supporters Club.

We observed that self-funded businesses learnt to build and sell products that delighted customers and learnt to make their internal processes more efficient, hire great people and improve continuously. VC-funded businesses learnt how to sell stock and build organisations that met their investors' inexpert prejudices. The top-class VC-funded founders learnt how to build organisations that others wanted to acquire. They called it "pre-wiring an exit".

Here is my 2006 People Centric Plan.

THE PEOPLE CENTRIC PLAN



Source : Stephen Allott

We need to spend public money thoughtfully to get the best return.

Pharma and Software work differently.

There is still time. We need a revolution now.

ENDS

Note on Business Cases

How does one do a business case for a policy intervention given the twin problems of projecting future cashflows and there is no counter factual?

This is in my view a conventional Treasury social value assessment combined with a NPV model approach.

Current policies should be subject to the discipline of a business case. These should be zero based with no grandfathering of current policies and practices.

The Tripos exam question will be:

1. List comprehensively all the mechanisms which lead from science to growth
2. Describe how each mechanism operates
3. Describe the levers which can boost each mechanism i.e. how each might be catalysed with money
4. Scope the return function of each boosting lever
5. Explain how the return might vary with the circumstances of any particular case
6. Estimate the potential returns on interventions for a set of Cambridge start-ups (e.g. for the Cambridge Ring) where a start-up includes a graduate founded company located anywhere or located in the UK or in a CB post code
7. Estimate the sum of Idea Centric interventions outside Pharma that have been made in Cambridge University
8. Estimate the Social Value / NPV of those interventions in fact
9. Estimate the Social Value / NPV had those interventions gone to start-ups
10 Compute the difference (the public value foregone)

HUGHES HALL

CAMBRIDGE UNIVERSITY

2006 CITY LECTURE

"From Science to Growth"

What exactly is the mechanism by which scientific research turns into economic growth?

6 March 2006

Stephen Allott
City Fellow Hughes Hall
Executive chairman and co-founder Trinamo Ltd.

DATA APPENDIX

What are the facts of the Google case?

Sergey Mikhailovich Brin

In 1977, after his father returned from a mathematics conference in Warsaw, Poland, Mikhail Brin announced that it was time for the family to emigrate. In May 1979, they were granted their official exit visas and were allowed to leave the country.[8]

The Brin family lived in Vienna and Paris while Mikhail Brin secured a teaching position at the University of Maryland with help from Anatole Katok. During this time, the Brin family received support and assistance from the Hebrew Immigrant Aid Society. They arrived in the United States on October 25, 1979. his father, a professor in the department of mathematics at the University of Maryland, encouraged him to learn mathematics

Brin immigrated to the United States from the Soviet Union at the age of six. He earned his bachelor's degree at the University of Maryland, College Park, following in his father's and grandfather's[*citation needed*] footsteps by studying mathematics as well as computer science.
In September 1990, Brin enrolled in the University of Maryland, where he received his Bachelor of Science from the Department of Computer Science in 1993 with honors in computer science and mathematics at the age of 19.[11] In 1993, he interned at Wolfram Research, the developers of Mathematica.[11]
After graduation, in September 1993, he enrolled in Stanford University to acquire a PhD in computer science. Brin began his graduate study in computer science at Stanford University on a graduate fellowship from the National Science Foundation, receiving an M.S. in computer science in 1995.[12] There he met Page, with whom he built a web search engine.

Page told his ideas to Scott Hassan, who began writing the code to implement Page's ideas.[3]

PageRank was influenced by a similar page-ranking and site-scoring algorithm earlier used for RankDex, developed by Robin Li in 1996. Larry Page's patent for PageRank filed in 1998 includes a citation to Li's earlier patent. Li later went on to create the Chinese search engine Baidu in 2000.[22][23][24]

The program became popular at Stanford, and they discontinued their PhD studies to start up Google in Susan Wojcicki's garage in Menlo Park.[4]

Digital advertising by search results was a critical Google commercial innovation.

UNIVERSITY SPIN OUTS

Performance data Source: Independent review of university spin-out companies

Investment into university spin-outs has increased from £1.11 billion in the academic year 2015/16, to £5.29 billion in 2021/22.

“Creating a successful spin-out requires a confluence of technical and commercial skills, as well as other legal, negotiation, and problem-solving skills, especially in a spin-out’s early phases. **Academic founders** tend to be experts on subject matter and technical aspects with little or no formal commercial training, meaning that they often **do not have the necessary non-technical skills to create a spin-out on their own, and sometimes may not have the skills or the desire to be a CEO.”**

“In addition, many spin-outs are in deep-tech sectors that require specialised skills and market knowledge that are difficult to come by.”

From Beauhurst
Since 2011, 1718 university spinouts have been founded. 68 today are “established”. 4% of the total. The rest are “seed” or ‘Venture” or closed.

Over £2 billion was invested in 2022. [different from the £5.29 billion figure above] Over 20 years at that rate, it could be up to £40 billion of equity investment. This correlates exactly with the figure from the independent review.

Research spending was £16bn in 2021/2022. How much of this might end up in a spinout? Say 10%? That could mean £1.6 bn times 10 years is £16bn of value travelling into spinouts.
Amount invested over 10 years could be of the order of £40bn + £10 bn = £50 bn

So £50 billion (est.) to establish 68 firms, over £730 million per firm.

Of the Top 15, just one is software and has since been sold.

The number one is Oxford Nanopore. Founded 2005. Does DNA sequencing. Looks research related and not strictly “Computer Hardware”. Its over 20 years old.

13 or 14 of the top 15 are pharma and healthcare, in line with the Cohen & Walsh.

Kainos (software) is claimed to be a Queens Uni Belfast spinout to IPO but it is not. It’s a bespoke software development company.

What university resources (staff, buildings, equipment, funds) have also gone into this and what are the true returns?

Rank	Spinout	Valuation	University	Industry	acquired/merged
1	Oxford Nanopore Technologies	£2.4 billion	University of Oxford	Computer Hardware	Private
2	Ceres Power (LON: CWR)	£2.0 billion	Imperial College London	Energy Equipment	Public
3	Exscientia	£784.5 million	University of Dundee	Pharmaceuticals and Biotechnology	Private
4	NightstaRx	£664.6 million	University of Oxford	Pharmaceuticals and Biotechnology	Acquired/merged
5	Ziylo	£616.6 million	University of Bristol	Healthcare Devices and Supplies	Acquired/merged
6	MeiraGTx	£467.4 million	University College London	Pharmaceuticals and Biotechnology	Public
7	Oxford Immunotec	£424.8 million	University of Oxford	Healthcare Devices and Supplies	Public
8	Perspectum	£419.6 million	University of Oxford	Healthcare Devices and Supplies	Private
9	Vaccitech (NAS: VACC)	£387.6 million	University of Oxford	Pharmaceuticals and Biotechnology	Public
10	Orchard Therapeutics (NAS: ORTX)	£384.0 million	University College London	Pharmaceuticals and Biotechnology	Public
11	Autolus (NAS: AUTL)	£354.8 million	University College London	Pharmaceuticals and Biotechnology	Public
12	Proximagen	£354.8 million	King's College London	Healthcare Services	Acquired/merged
13	Semmle	£334.0 million	University of Oxford	Software	Acquired/merged
14	Synairgen (LON: SNG)	£331.5 million	University of Southampton	Pharmaceuticals and Biotechnology	Public
15	Fixed Phage	£294.4 million	University of Strathclyde	Pharmaceuticals and Biotechnology	Private

Executive summary

Henry Whorwood
Head of Research and Consultancy at Beauhurst

In the UK, academic institutions are at the forefront of creating cutting-edge research and intellectual property (IP), and spinouts are one of the main ways of commercialising that IP. The UK government has recognised the importance of spinouts to the UK — as contributors to the economy and as a strategic source of new technologies. In March, the government launched a review into university spinouts to determine the most effective means of commercialising research.

> **The UK government has recognised the importance of spinouts to the UK — as contributors to the economy and as a strategic source of new technologies.**

As of January 2023, there are 1,166 active spinouts from UK academic institutions, accounting for 2.52% of the nation's high-growth company ecosystem. These spinouts have demonstrated an impressive ability to raise investment, securing 9.11% of all equity finance raised by private UK companies in 2022.

As industry attention on spinouts increases — asking questions about whether there are enough of them and whether they're set up for success — it's worth remembering the UK has a significant number of promising ventures relative to our population. Among the 1,166 active spinouts, 56.5% are in the seed stage, indicating strong growth potential for innovation within the UK and providing a robust foundation for achieving greater heights in science and technology.

1,718
total number of spinouts tracked since 2011 in the UK, with 1,166 active

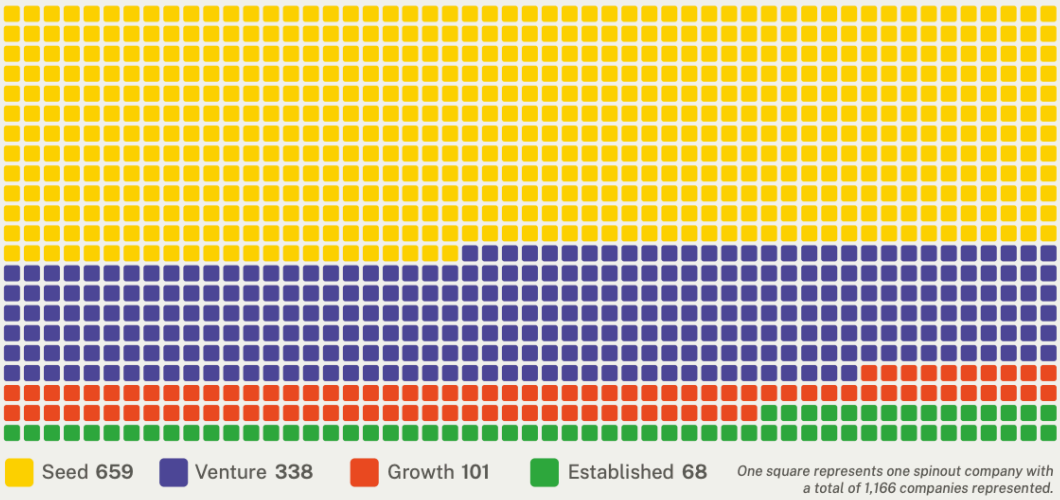
£2.13b
equity investment received by UK spinouts in 2022

56.5%
proportion of active UK spinouts at the seed stage as of January 2023

17.8%
lowest average stake taken by universities over the past decade

Growth stages

Stage of evolution of active spinouts (snapshot January 2023)



As of January 2023, there are 1,166 active spinouts in the UK. Of these companies, 659 (56.5%) are still at seed stage, a similar proportion to the 59.5% that were at seed stage in January 2022. This is a promising sign that there is a replenishment of innovative companies operating at this early stage that may go on to be future growth champions. Building on this, a number of companies have developed into growth (101) or established (68) stage companies. This includes Pheon Therapeutics, a developer of antibody-drug conjugates to treat cancers. The King's College London spinout was incorporated in 2015 and has since received £55.5m in equity investment.

1,166
active UK spinouts (January 2023)

56.5%
active UK spinouts at the seed stage (January 2023)

Dominant sectors

Top sectors by number of spinouts (January 2023)

Pharmaceuticals	309
Research tools/reagents	279
Analytics, insight, tools	237
CleanTech	150
Clinical diagnostics	147
Software-as-a-service (SaaS)	129
Medical devices	127
Materials technology	106
Mobile apps	68
Nanotechnology	67
Security services (physical and virtual)	59
Medical instrumentation	58
Educational services	50
Healthcare products	49
Internet platform	48
Desktop software	44
Chemicals	41
Semiconductors	34
Electrical components	33
Machinery	32

The life sciences sector continues to lead the way, with pharmaceuticals (309) and research tools/reagents (279) topping the sectoral ranking for spinouts. Academic institutions are pivotal to the sector, which utilises extensive research and state-of-the-art facilities to further scientific innovation. Clinical diagnostics (147), medical devices (127) and materials technology (106) are among the top sectors for similar reasons.

This year, the ranking includes the following subsectors under the heading of CleanTech: clean energy generation, energy reduction technology and other clean technology. The equivalent figure for last year was 128, representing a 17.2% increase in the number of spinouts operating in the sector. As the world pushes for net zero greenhouse gas emissions, innovation within CleanTech becomes ever more important and it is no surprise to see spinouts innovating in the sector. This highlights how spinouts are at the forefront of technological advancements within the UK, tackling the most pressing global problems. For example, Carbon8 Systems, spun out from the University of Greenwich, develops technology that captures waste carbon dioxide and can be integrated with industrial processes to do so.

Dominant sectors

Top emerging sectors by number of spinouts (January 2023)

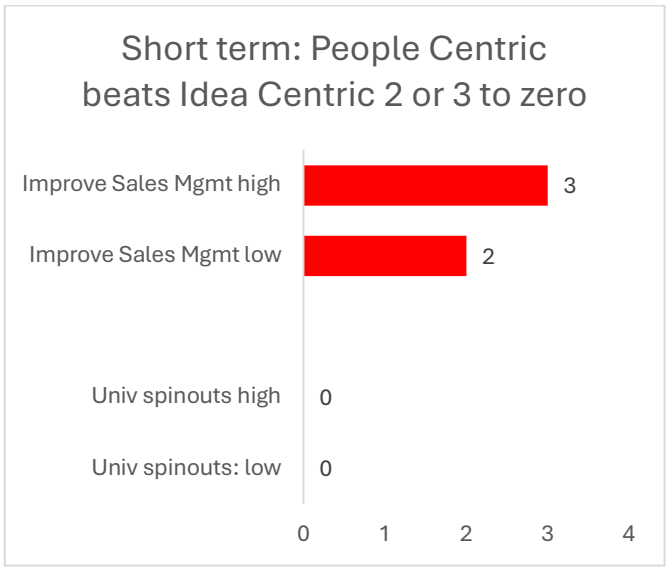
Artificial Intelligence	156
Genomics	88
Precision medicine	77
eHealth	54
Big data	47
Digital security	42
Wearables	38
Internet of Things	38
Regenerative medicine	33
EdTech	27
3D printing	26
Virtual reality	25
Graphene	24
Quantum	20
Synthetic biology	18
Augmented reality	17
Robotics	16
AssistiveTech	15
Image and voice recognition	14
Cloud computing	14

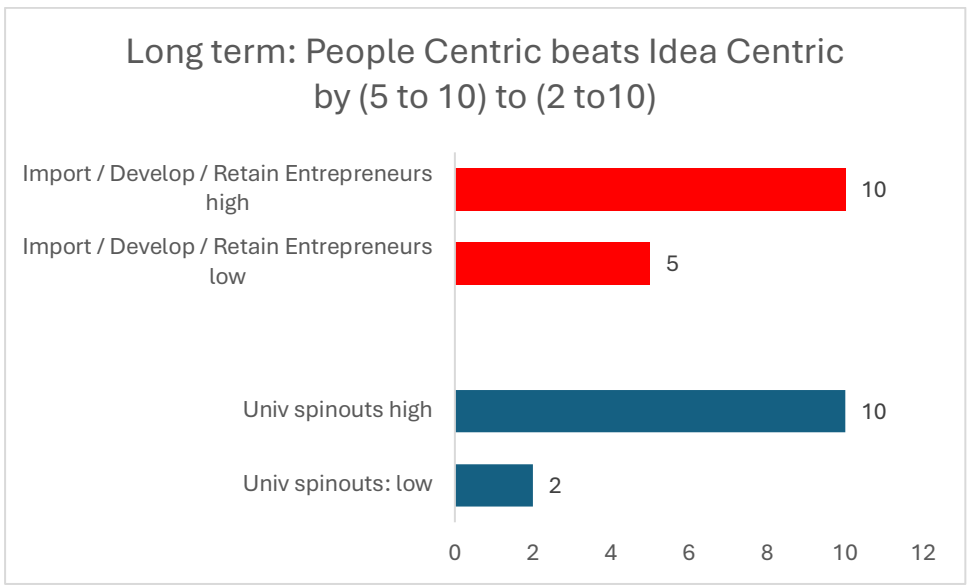
Emerging sectors are areas of technological innovation and application that lie outside of existing sector classifications. These categories seek to capture business activity at the cutting edge of technology and new business models, creating exciting and disruptive opportunities for investors, entrepreneurs and businesses looking to stay ahead of the curve.

Artificial Intelligence (156) tops the emerging sector ranking as founders continue to find use cases for the new technology across a range of sectors: from drug discovery to agricultural forecasting. It is likely the sector will continue to flourish, as it has done over the past year, particularly with the new wave of generative AI companies coming into the spotlight following the rapid adoption of OpenAI's ChatGPT.

As a new addition to the rankings, genomics (88) also ranks highly amongst the emerging sectors for spinout companies. Falling within the life sciences, it is well-suited to the academic spinout model as the area benefits significantly from the early-stage research produced by leading institutions. The sector includes bit.bio, a spinout from the University of Cambridge, which develops new therapies and research tools using genetically reprogrammed stem cells.

GPT 4.0 says returns from People Centric initiatives beat Idea Centric initiative returns over BOTH the short and the longer term.





The time scale of benefit needs to be considered, not just the absolute figure. The very high WACC for early stage risky activities is so high (e.g. 50%) that returns that take years to arrive are effectively worthless after only 8 years.

Top exits

Top IPOs undergone by spinouts by market capitalisation (2013-2022)

Oxford Nanopore Technologies	£3.38b
Exscientia	£2.37b
Orchard Therapeutics	£950m
Adaptimmune	£772m
Intelligent Energy	£639m
Circassia	£581m
Achilles Therapeutics	£529m
Autolus	£498m
Freeline Therapeutics	£476m
NuCana	£346m
MeiraGTx	£304m
Kainos	£164m
Oxford BioDynamics	£136m
Xeros	£80m
Abzena	£78m
Diurnal	£75m
Oncimmune	£66m
Mirriad	£63m
Redx Pharma	£55m
C4X Discovery	£31m

Top acquisitions of spinouts by company value or consideration paid (2013-2022)

Ziylo	£623m
Gyroscope Therapeutics	£587m
MiroBio	£356m
NaturalMotion	£320m
Inivata	£280m
Heptares	£259m
Oxitec	£103m
Quethera	£85.0m
Atopix	£63.7m
Process Systems Enterprise	£58.0m
Cobalt Light Systems	£40.0m
VocalIQ	£38.7m
Permasense	£30.6m
Cambridge CMOS Sensors	£30.3m
Haemostatix	£28.0m
Flusso	£28.0m
The Floow	£23.5m
Bloomsbury AI	£22.8m
Cizzle Biotech	£21.0m
Puridify	£12.6m

Exits in 2022 Exits 2013-2021

Stephen Allott M.A. Cantab.

NASDAQ President, CFO and Director Led the MUSE IPO 1998 **Artificial Intelligence** expert since 2016 **Digital Transformation** expert since 2011 **Internet** expert since 1995 **Strategy Consultant ex McKinsey** since 1990 **Computer Industry** executive since 1985 **Legal Expert** Barrister since 1981	

Stephen Allott *M.A. Trinity College, Cambridge University*
Barrister (called to the Bar 1981 at Gray's Inn)
Quondam City Fellow of Hughes Hall, Cambridge University, 2004 - 2008

Chairman of Cronofy Ltd. (2020 to date)
Chairman Tarigo Ltd. (2024 to date)
Member, Cambridge University Dept. of Computer Science & Technology (2001 to date)
Founder of the Cambridge Computer Lab Ring : (2002 to date)
The 338 Ring Hall of Fame companies founded by Ring members are worth £120 billion.
Seedcamp Venture Partner Emeritus from (2018 to date)

Author Seedcamp Sales Tales published on Medium
Author London: the AI Growth Capital of Europe Report for the Mayor of London.
Author: Failed State: Broken Britain is Broke published on Medium
Hughes Hall City Lecturer 2006 From Science to Growth. *What exactly is the mechanism by which scientific research turns into economic growth?*

After working for ***Xerox Corporation***, then the thirteenth largest computer company in the world, Stephen was the first lawyer hired outside the USA by ***Sun Microsystems Inc***. As a strategy consultant for ***McKinsey & Company***, he specialised in telecoms, technology and the internet digital revolution.

He was President, Chief Financial Officer and a main board director of ***Micromuse Inc.*** (NASDAQ: MUSE) the London origin software company. Reaching over $7 billion in market capitalisation, Micromuse is still the most valuable UK origin organically grown software company.

Stephen was the youngest ever chairman of the ***Bar Association for Commerce, Finance & Industry*** and served as an elected member of the ***Bar Council*** of England and Wales. Appointed as the first ever ***Crown Representative* for Small and Medium Enterprise** in the ***Cabinet Office*** of the Government of the United Kingdom, Stephen led business development of the ***G-Cloud Digital Marketplace***. At 5.5 billion euros in annual sales, the G-Cloud Digital Marketplace is the largest online sales platform in the UK, bigger than Tesco, and the 5th largest in Europe. In venture capital, he was Venture Partner at Fidelity Ventures (London) and is Venture Partner Emeritus at Seedcamp.

He has 8 years of experience in Artificial Intelligence ("AI"). First working in AI in 2016 when he joined consultancy ***CognitionX*** and ran its research department. In this role, he delivered the first London AI industry baseline report to the Mayor of London in June 2018. '*London the AI Growth Capital of Europe*'. It catalogued over 700 London AI businesses.

He keynoted the first ***Kainos p.l.c.*** sponsored Belfast AI conference, AI Con, in 2019. His speech 'Time to Act' warned that social media addiction would enable AI based computational propaganda and persuasion technology to be used not only in political control but also in sales and marketing.

He has held 12 chairman roles:

- AIM listed COE Group p.l.c. (exit to Digital Barriers p.l.c.).
- Bar Association for Commerce, Finance & Industry
- Tideway Ltd. (Apax investment exit to BMC Software)
- Jacobs Rimell Ltd. (Fidelity Ventures investment exit to AMDOCS)
- Applied Generics Ltd. (Pentech investment exit to TomTom)
- PARC Technology Ltd. (Imperial College and 3i investment exit to Cisco)
- InforSense Ltd. (Imperial College & Fleming Ventures exit to ID Business Solns)
- Redgate Software Ltd. (privately owned) chairman of the Council of Advisers
- Pebblecode Ltd. (private sale)
- Trinamo Ltd. (private sale)
- Cronofy Ltd. (Founder owned minority investors Seedcamp and Fabric Ventures)
- Tarigo Ltd. (privately owned)

Published writings, speeches and lectures.

Sales Tales in 24 chapters

London AI Growth Capital - Report to the Mayor of London

From Science to Growth : Hughes Hall City Lecture

People not Ideas, Prospect Magazine

Appointment of Crown Rep SME in the Cabinet Office

G-Cloud Digital Marketplace

Building a world leading tech company: the Micromuse IPO story told at Trinity College Cambridge

Civil Service World: Allott

Business of Software conference speeches

Seven Minutes of Unconventional Wisdom

“Time to act”: AI Con Keynote 2019