

# Role of Universities in National Innovation

Dr David Secher

University of Cambridge

PraxisAuril

Osaka

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# This Talk

- Introduction
- UK Technology Transfer –  
from Lambert to McMillan. How good?
- The Cambridge Cluster
- Cambridge Enterprise – Role of the University
- PraxisAuril – Importance of Networks

# Introduction



# My Background

Academic bio-medical research

Nearly 40 years in technology transfer

- R&D and product development in a small UK biotechnology company and big US pharma
- Clinical trials in a biomedical research foundation
- Set up and directed TTOs (including Cambridge University)
- Managed university research in regional economic development
- Advised universities and governments globally

2007 Queen's Award for Enterprise Promotion

# 1. Don't Try to Copy Cambridge

- Cambridge (and Stanford and MIT) are extreme examples
- Cambridge works in Cambridge
- Other places have:
  - Different cultures
  - Different environments
  - Different legal and regulatory constraints
  - Different resources
  - Different objectives

## 2. There are Three Types of Academics

- The **Academic**

- Does TT because commercialisation increases their chances of winning research grants

- The **Inventor**

- Does TT because they want to see their ideas benefit society

- The **Entrepreneur**

- Does TT because they want to start their own company

### 3. What about Revenue for the University from Technology Transfer?

Technology transfer is usually not a substantial source of revenue for the university – and usually needs some governmental or other support for up to a decade or more



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# How do Universities bring about Innovation?

- Training graduates
- Staff Mobility(?)
- Research Collaboration
- Sponsored Research / Studentships
- Consultancy
- Licensing
- Spin Out

# University – Business Interactions in UK

9 Government reviews over 15 years making 297 recommendations

Lambert Review (2003):

*“The main challenge for the UK is not about how to increase the supply of commercial ideas from the universities into business. Instead, the question is about how to raise the overall level of demand by business for research from all sources”*

## Government Review (2013)

*“the Government’s objective should be to create a commercial demand for university engagement to which they are already primed to respond.”*

## Government Review (2017)

*“To date, however, the Government’s efforts to increase technology transfer have been disproportionately targeted at the university, rather than the business sector.....The lack of progress forces us to reiterate the recommendation made in our 2013 report, namely for the Government to “create a commercial demand for university engagement to which they are already primed to respond”*

# “Absorptive Capacity”

Big industry is often not interested in university research

- Too early (Proof of Concept Funds)
- Too different
- “Not invented here”
- Different approach to IP

It’s hard work

- Research
- Cold calling
- Under-valuing
- Negotiating the terms

# Collaboration with Big Industry needs:

- Proof of Concept Funds
  - Develop the idea to a stage where business might take an interest
  - In Life Sciences PoC can be \$2-5m!
- Good preparation
  - Academics usually have the best contacts
  - Do your research on industry norms
  - AUTM TransACT database
  - Ask colleagues (AUTM / Praxis networks)
  - Buy a commercial database

# MIT Survey of Global Expert Opinion

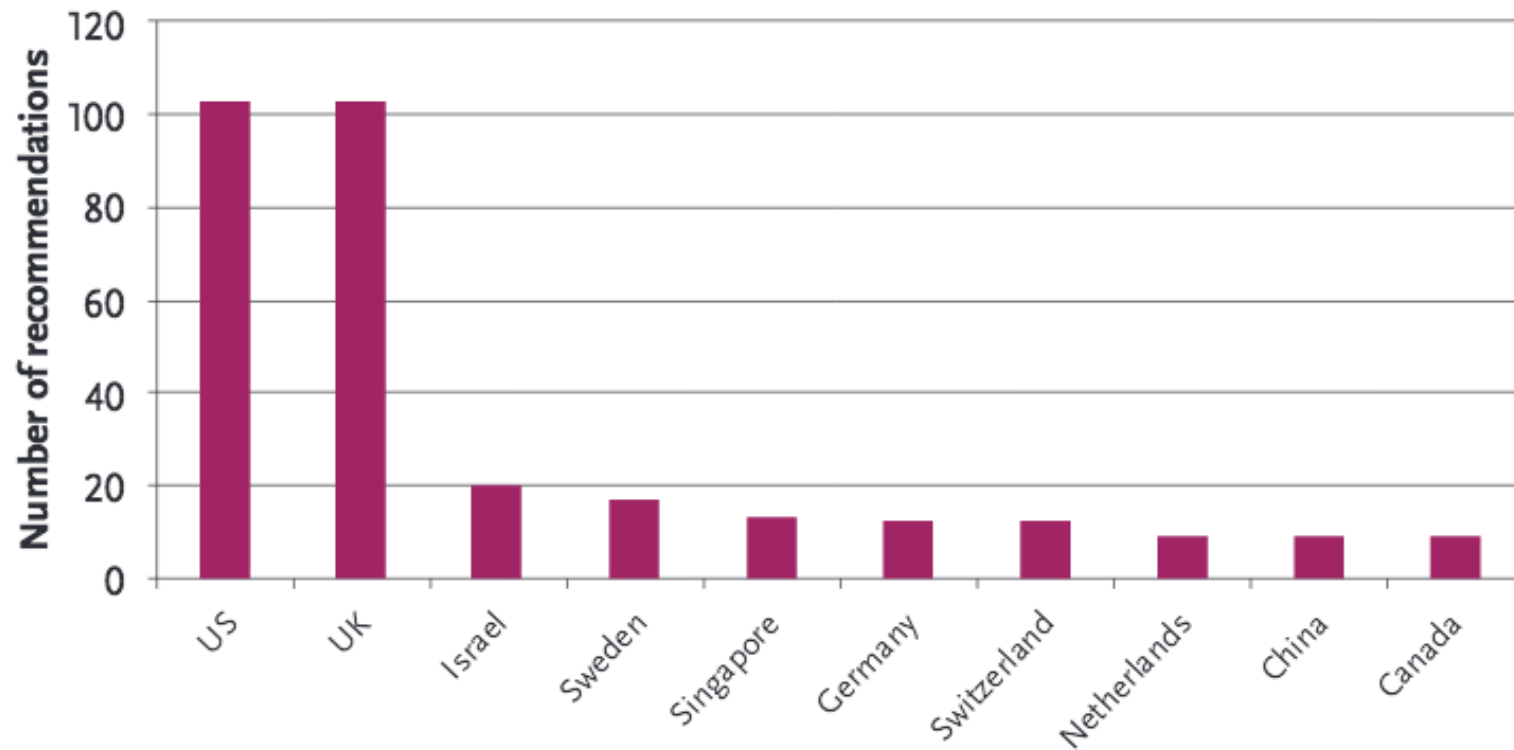


Figure 7. The most frequently cited countries in response to the question *'Which universities would you identify as having created/supported the world's most successful technology innovation ecosystems?'*, with the results adjusted for country of residence of the interviewee.

# The UK's Industrial Strategy



UK Research and Innovation [+ Add to myFT](#)

## Post-Brexit industrial strategy must have science at its heart

Britain's great research universities are the envy of the rest of the world, writes John Kingman

COMMENT

DECEMBER 14 2016, 12:01AM, THE TIMES

## Why the smart money is being invested in university research

## Theresa May makes science a Brexit priority

19 January 2017 by [Eleanor Beal and Laura Wilton, Senior Policy Advisers](#)

# Changing Role of Research Universities

Research and universities used to be funded as something a civilised society did.

Research today is an investment taxpayers make for which they expect a return on investment to the nation and society



# The Values of a Research University

“Excellence and Relevance”

*Professor Sir Leszek Borysiewicz, Former Vice-Chancellor,  
University of Cambridge May 2012*

# Research as a National Investment is Not New!

- Royal Observatory at Greenwich set up to tackle navigation at sea through astronomy (17<sup>th</sup> century)
- Victorian universities a partnership between industrialists and academia
- US Land Grant universities
- Medical Research Council set up to tackle tuberculosis

# How Good is University Technology Transfer?

- Academia-Industry Technology Transfer Contributed Up to \$1.18 Trillion to U.S. Economy Since 1996  
[www.bio.org/media/press-release/report-shows-academia-industry-technology-transfer-contributed-118-trillion-us-e](http://www.bio.org/media/press-release/report-shows-academia-industry-technology-transfer-contributed-118-trillion-us-e)
- HE Business and Community Interaction Survey 2015/16  
[www.hesa.ac.uk/data-and-analysis/publications/hebci-2015-16](http://www.hesa.ac.uk/data-and-analysis/publications/hebci-2015-16)
- BUT what about quality?

# Peer Review of TTOs

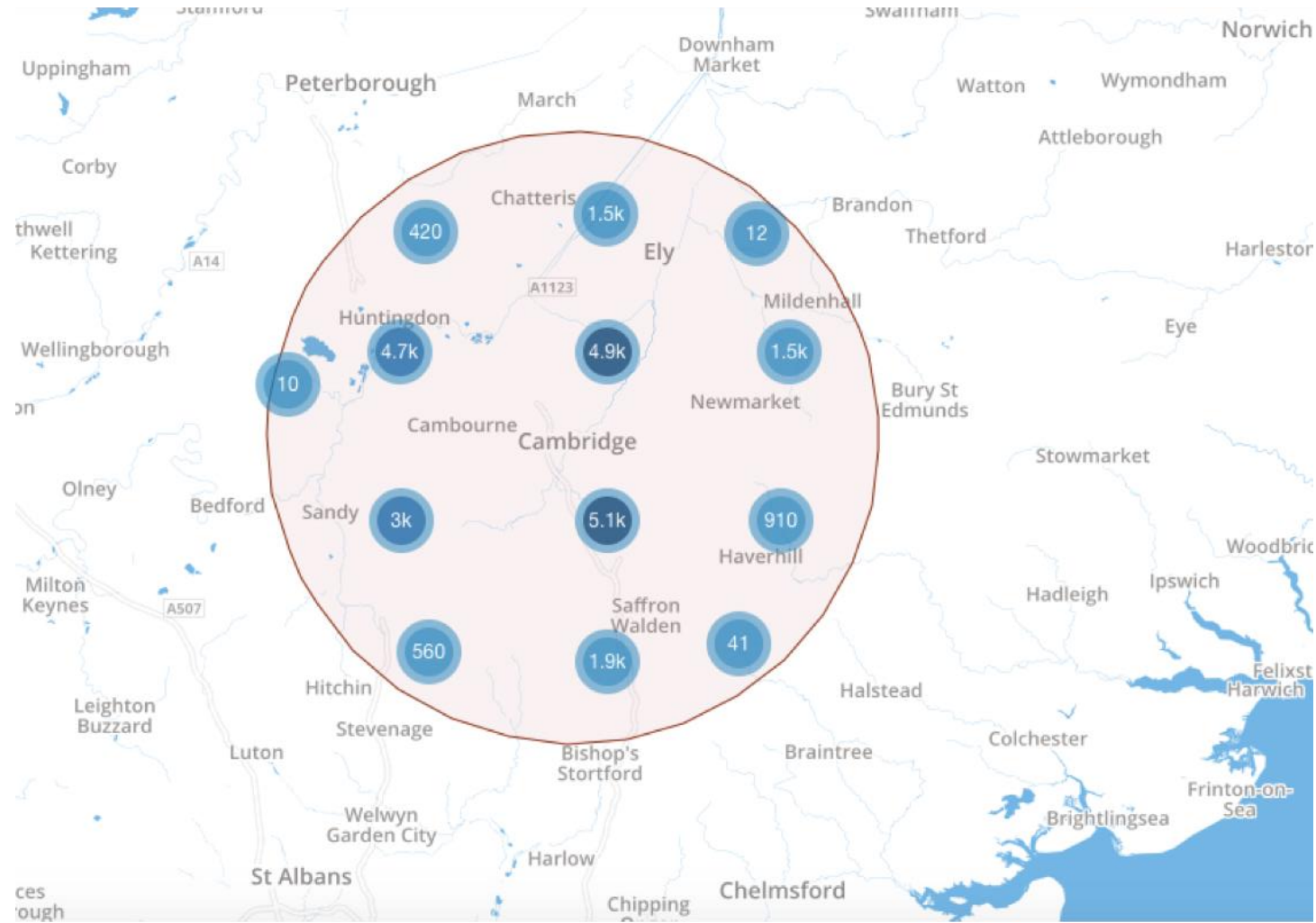
- Till now sporadic, low profile and inconsistent
- Propose voluntary national standards (Gold, Silver, Bronze?) based on peer review and site visit
- Offer training to those TTOs that wish to improve their standard
- No “one-size-fits-all”, but evaluation based on self-assessed objectives

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# Cambridge Cluster

- 25,000 companies around Cambridge
- See [www.camclustermap.com](http://www.camclustermap.com)



# Europe's Most Successful Technology Cluster

25 new technology start-ups per week

Cambridge is granted more patents per capita than the next six UK cities combined

2 x \$10Bn



16x \$1Bn



A vibrant Cambridge Cluster Economy

19 science parks, 4,300 cluster companies  
59,000 employees £11Bn+ t/o

World leading underpinning science

Whittle Turing Darwin Watson & Crick  
Babbage Rutherford Sanger.....  
96 Nobel Prize Winners and 1 Oscar

# Sainsbury Review – 2007

- Clusters of knowledge-intensive firms tend to form around large research universities
- Universities are one of the driving forces behind the formation of clusters. They promote innovation and entrepreneurship, not only by spinning out companies, but also by creating an appropriate microenvironment to attract innovation-based companies and foreign R&D facilities.
- [www.rsc.org/images/sainsbury\\_review051007\\_tcm18-103118.pdf](http://www.rsc.org/images/sainsbury_review051007_tcm18-103118.pdf)



# What Others Say

“The phenomenon of Cambridge, its university and its cluster, is an inspiring reminder of the great power of human ingenuity to create new enterprises and industries, to make life better and more productive for all of us.”

*Bill Gates*

“Cambridge is a world-renowned bioscience hotspot that rivals the likes of San Francisco and Boston”

*Pascal Soriot, CEO, AstraZeneca*

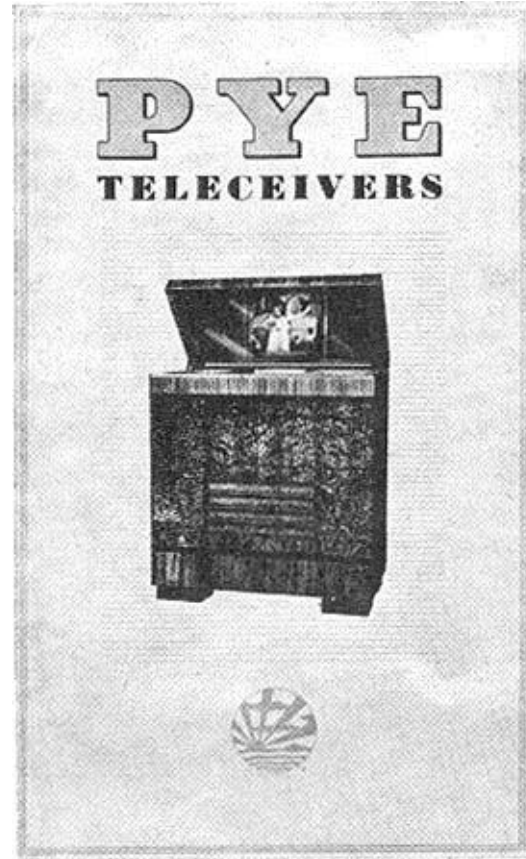
“Cambridge is a safe place to do risky things”

*Andy Richards, entrepreneur and angel*

# Innovation is in the University's DNA



Cambridge University  
Press: 1534

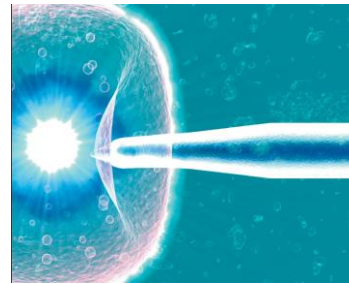
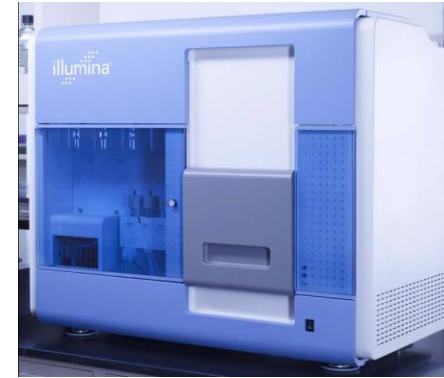


Pye: 1896



Cambridge Instruments:  
1881

# Cambridge changing the world



# Recent inward investors in Cambridge



# MIT Survey of Global Expert Opinion

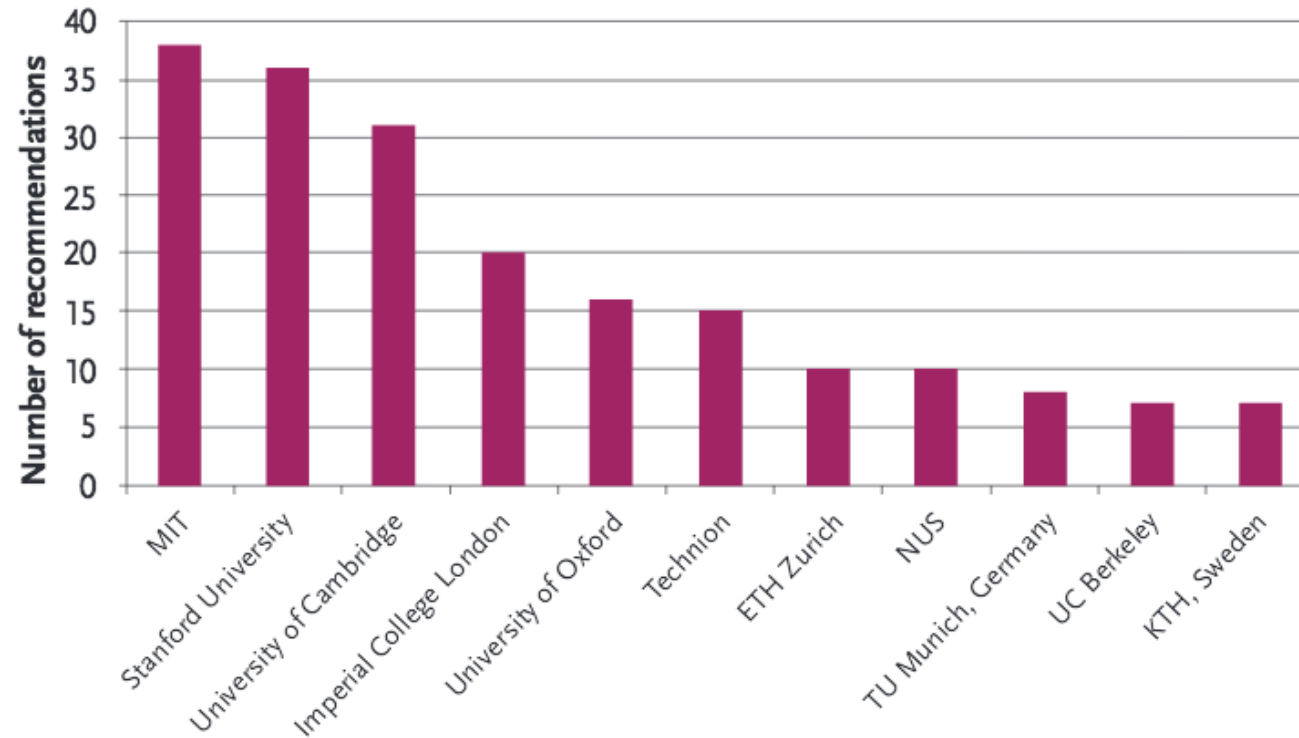


Figure 6. Top ten responses to the question *'Which universities would you identify as having created/supported the world's most successful technology innovation ecosystems?'*, with the results adjusted for country of residence of the interviewee.

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The Mission of Cambridge University is ...

... to contribute to society through the pursuit of education, learning, and research at the highest international levels of excellence.

# Cambridge Enterprise (TTO)

The objectives of CE Limited are, in order of importance, to:

- aid the transfer of knowledge from the University via commercialisation
- aid staff and students in making their ideas more commercially successful
- produce a financial return for inventors, departments and the University



# Cambridge Enterprise - Some Indicators

**359** consultancy contracts signed

**141** new technology disclosures

**159** new patent filings

**£6.5m** translational funding won with the support of Cambridge Enterprise

**13** companies receiving new or follow-on investment

123 Licenses signed in 2014-15

50% of consultancy contracts signed within 2 weeks

**1,000** active IP, licensing and consultancy projects and more than **65** equity contracts, working with more than **1,458** researchers at all stages of the commercialisation process.

# Income, Costs and Investments – 2014-15

- Income from technology transfer – £27.7 million
- Distributions to academics, the University and others – £22.5 million
- Costs (staff and other operating costs) – £3.3 million
- Investment in patent assets (patent and proof of concept) – £1 million
- Charitable donation made to the University – £3.4 million
- £3.8m invested in 13 spin out companies

# Cambridge Enterprise Investment Funds

- Seed Funds - £18m cash, 2.4x ROI, 100x leverage of third party investment.
- UCEF – Alumni investment fund based on tax break.  
Raises ~£2m p.a. in typically 5 days
- Cambridge Innovation Capital - £50m follow on fund to seed investments but also invests in Cambridge Cluster companies.
- Apollo Therapeutics (with GSK, J&J, Astra Zeneca, Imperial and UCL); £40m “PoC on steroids” for drug development.

# Small inputs can have big outcomes

- Solexa sold to Illumina for \$650m in 2007 (now an \$30Bn company); started with £100,000 seed
- BlueGnome sold to Illumina in 2012 for \$100m (100x return) started with £75k seed investment
- Astex Therapeutics sold to Otsuka Pharmaceuticals for \$886m in 2013; started with £250k seed
- Horizon Discovery £121m IPO in 2014 ; started with £36,000 seed investment

## Small inputs can have big outcomes (2)

- XO1 sold to Janssen Pharmaceuticals in 2015; started with a £40k PoC award and £250k seed
- VocallQ sold to Apple started with £250k seed
- Cambridge CMOS Sensors sold to AMS started with £134k seed
- Cambridge Epigentix started with PoC and £500k seed; \$20m invested by Google and Sequoia
- Carrick started with £250k seed raised a \$95m A round.

# UNIVERSITY VENTURE FUND BENCHMARKING REPORT 2017

UNIVERSITY VENTURE FUND BENCHMARKING REPORT 2017



KAUST



Global

University

Venturing

# Headline Results

- The world's first report to identify, analyse, and discuss the operations of UVFs from funds around the world.
- 187 funds operating at POC, UVF, VC, and Patient Capital levels.
- \$14.9bn in funds identified worldwide.

# Fund Value Breakdown

Proof of Concept	\$1Bn
Seed Funds	\$144 M
University Venture Funds	\$5.4 Bn
Patient Capital	\$5.5 Bn
Venture Capital	\$2.9 Bn
Student-led Funds	\$7 M



# Fund Value by Country

UK	\$5 Bn
US	\$4.5 Bn
China	\$2 Bn
France	\$1 Bn
Japan	\$560 M

# The Driver is Societal Benefit not Profit

- *“financial contributions of patent licensing to most university operating budgets are modest at best, and negative for a great many institutions”*\*
- Only 15% of US university TTOs break even
  - The 15% are generally in a serendipitous big win
  - Stanford OTL is currently wrestling with the end of its functional antibody patent royalties which are 60% of their total license income. So are MIT and Columbia
- CE costs the University ~£4.3m p.a. to run including Proof of Concept Fund

*\*Furthering America's research enterprise, US National Academies (2014).*

# The Driver

But there is a high economic return on investment\*

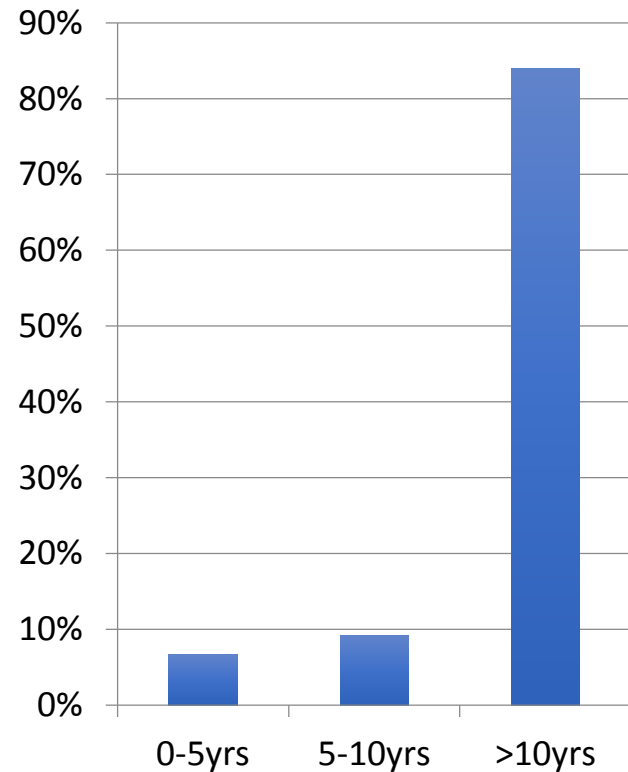
- Average across England for HEIF is 7.3x monetised and 2.4x non-monetised
- Top six are 22.5x, bottom one is 1.5x

*\*HEFCE: Assessing the Economic Impacts of the Higher Education Innovation Fund (2015)*

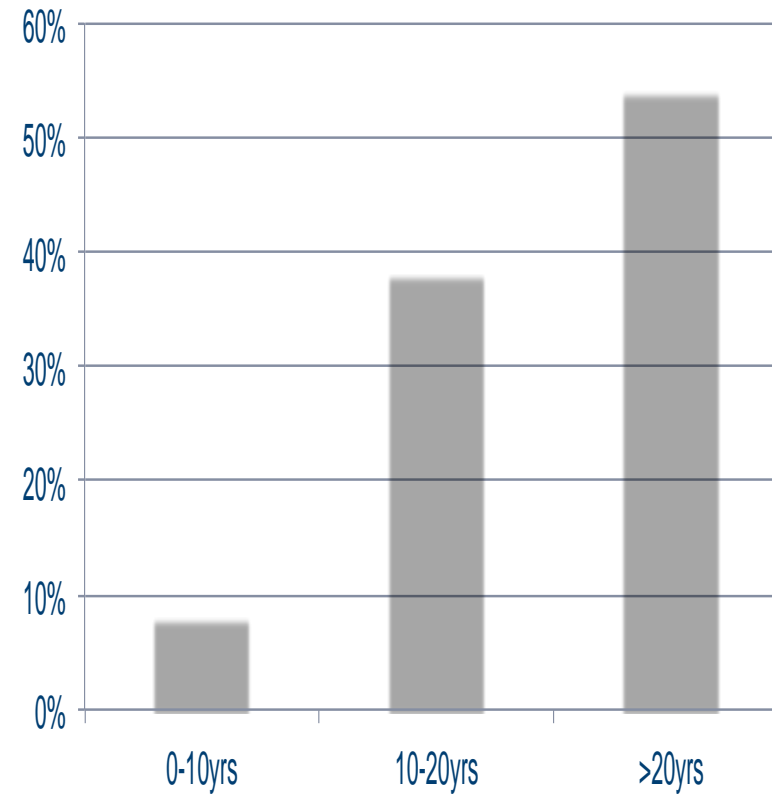
# But it can take time.....

## Income vs Age of IP

### Cambridge



### University of California



# Decision making

## **Things we think about**

- If it's successful will it make a significant difference?
- If yes, how do we make it happen?

## **Things we don't think about**

- Valuation
- Exit Value
- Return on Investment
- Due diligence

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# Praxis

- To meet short-term need for trained staff in UK TTOs
- Chance meeting of Secher with Lita Nelsen (MIT)
- Considered the alternatives?
- Gathered some knowledgeable friends
- Bold experiment in Bristol 2002
- Initial focus on UK, now global

# PraxisAuril

200+ universities and stakeholder organisations

Training and best practice shared with practitioners from  
40 countries

Total number of individuals trained to date: 4,255

[www.praxisunico.org.uk](http://www.praxisunico.org.uk)



# Courses offered

Fundamentals of Technology Transfer

Practical Licensing

Advanced Licensing

Software commercialization

Research contracts

New Venture creation from university IP

Managing consultancy

Strategic Partnerships

Etc. - and bespoke

# PraxisAuril Process

- Short courses (2.5 days), minimizing time away from the office
- "Residential"—allow after-hours socializing
- Small classes (40-50 maximum) allowing interactive sessions, teamwork, getting to know each other
- Offered in cities around the country in reasonably priced locations
- Low tuition fee, so "rank and file" — not just directors —are sent to courses

# Lessons learned

- The need for training was very great; no requirement for "promotion"
- Small, interactive classes are most effective
- "Practitioners teaching practitioners" is far more effective than professional trainers — bring the "real world" into the classroom
- "Community" is as important as training

PRAXISAURIL.ORG.UK

NEW WEBSITE COMING SOON



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***dss15@cam.ac.uk***