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United Nations
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2335-11

Workshop on Entrepreneurship for Physicists and Engineers from Developing Countries

23 - 27 April 2012

Invention to start--ups Translating best practices from Oxford to developing countries

Rakesh Roshan
ISIS Innovation, Oxford
UK

Invention to start-ups
Translating best practices from Oxford to developing countries

Dr Rakesh Roshan

Isis Innovation

The technology transfer arm of the University of Oxford.

Joint ICTP-TWAS Workshop on Entrepreneurship
for Physicists and Engineers from Developing Countries
Trieste, Italy

April 25, 2012

Oxford and Isis

Oxford University & Isis Innovation Ltd

- **Oxford University** is the oldest university in the English-speaking world
- Highest University Research Spend in the UK
  - £500.6 million (2010/2011)

- **Isis Innovation Ltd** is a profitable company 100% owned by the University of Oxford, established 1987
- A world-class Technology Innovation business
  - Isis 9th highest British filer of PCT patent applicant (WIPO Data, 2010)
  - Highest European University PCT applicant (WIPO Data, 2010)

Institute of Biomedical Engineering

Isis Innovation Ltd

Transferring Technology and Expertise from Oxford

Technology Commercialisation and Innovation Management for the rest of the world (Absolute Innovation Management)

University investment in Isis for protecting Oxford IP
Isis returns several financial and non-financial benefits to the University

Measuring Performance

IP Management

•Isis manages 1629 (631 granted) patents & patent applications; and 460 active licensing deals (annual turnover £10.1m in 2011-12)

Company Creation

•63 new spin-out companies created since 2000

•University currently has equity stake in 51 (4 AIM listed, 1 LSE listed)

•Share value estimated £32m, 1000 employees, £30m+ turnover

Successful stories and exits

• *Oxford PV Limited (Physics) formed in 2010 – excellent recent results – watch this space*

•*Oxford Nanopore Technologies* (Chemistry) have been valued at **$2billion** in February 2012 since it unveiled its new nanopore sequencing platform at the Advances in Genome Biology and Technology meeting in Marco Island, Fla.

• *Oxford Asymmetry* (Chemistry) - Floated on London Stock Exchange in 1998 and acquired by Evotec for **£316m** in 2001

• *Powderject* (Engineering) - Sold to Chiron Corp (now part of Novartis) for **£550m** in 2003

Isis Innovation works in more than 54 countries – Key Locations

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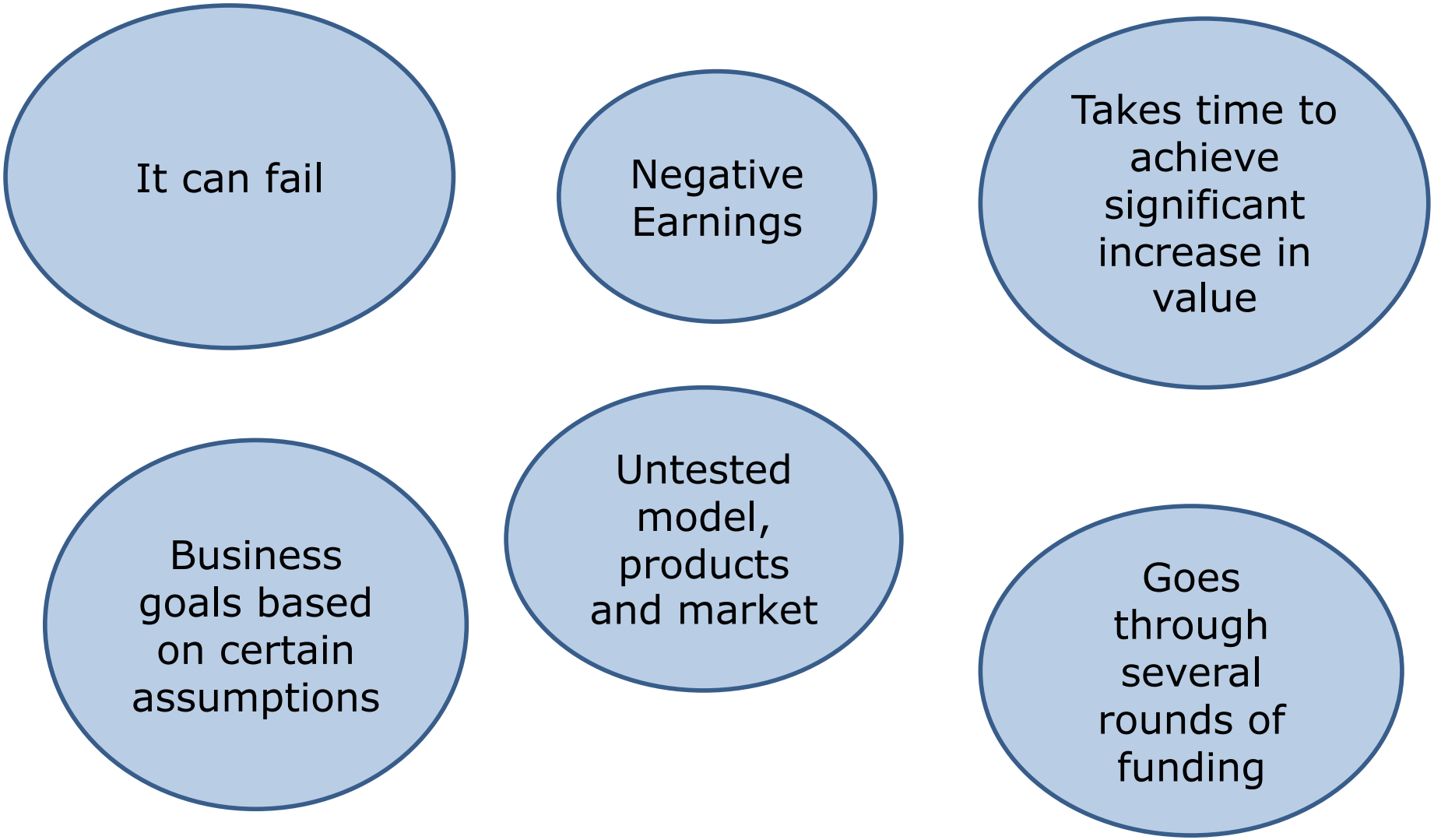
Commercialising Technologies via Spinouts formation

Start-ups (typical concerns)



Start-ups (upside)

Preferred stage/ start early

Risks are high and so are the profits

Often best ways of brining Breakthrough '*game changing*' technologies to the market

Competitive edge/ larger share of the market

All the medium/ large companies started at some point

Oxford Spin-outs (post 2000)

2000	7	Third Phase, Mindweavers, Oxford BioSignals, Oxford BioSensors, TolerRx, OXIVA, Pharma DM
2001	7	OxLoc, Oxford Bee Co, Oxford Ancestors, Novarc, Oxford ArchDigital, Natural Motion, Inhibox
2002	9	Pharminox, Minervation, Oxford Biomaterials(Spinox), Zyentia, Oxitec, Oxford Immunotec, Oxford Risk, GlycoForm, BioAnalab
2003	4	Summit(Vastox)*, ReOx, Riotech, OCSI
2004	4	Avacta(OMD)*, G-Nostics, Surface Therapeutics, EKB Technology
2005	5	Oxford Nanopore Technologies, Oxford RF Sensors, Oxbridge Pulsars, Celleron, Oxford Catalysts*
2006	7	TDeltaS, Oxford Medistress, Particle Therapeutic, Aurox, Oxford Advanced Surfaces*, Cytox, OxTox
2007	4	Eykona Technologies, Clinox, Oxford Biodynamics, Crysalin
2008	4	Semmle, Oxford-Emergent TB Consortium, Navetas(ISE), Organox
2009	3	Oxford Financial Computing, Zyoxel, Oxford Yasa Motors
2010	4	OxEms, Kepler Energy, IXO, Oxford PhotoVoltaic
2011	5	Oxyntix, Oxtex, Oxford Multi Spectral, Oxford Imaging Detectors, OCB

Total external investment to date in spin-outs since 2000: **£327m**

£42m 1st round Seed/Business Angels – average amount invested £850k; 1/3rd > £1m invested.

£285m follow-on Venture/Institution Capital * stock exchange listing

Summary of some of our spin-outs

Company	Founded	Employees start/now
Oxford Gene Technology	1995	2/100
Oxonica	1999	1*
Oxford Catalysts	2005	2/90
Oxford RF Sensors	2005	2/30
Oxford Advanced Surfaces	2006	2/20

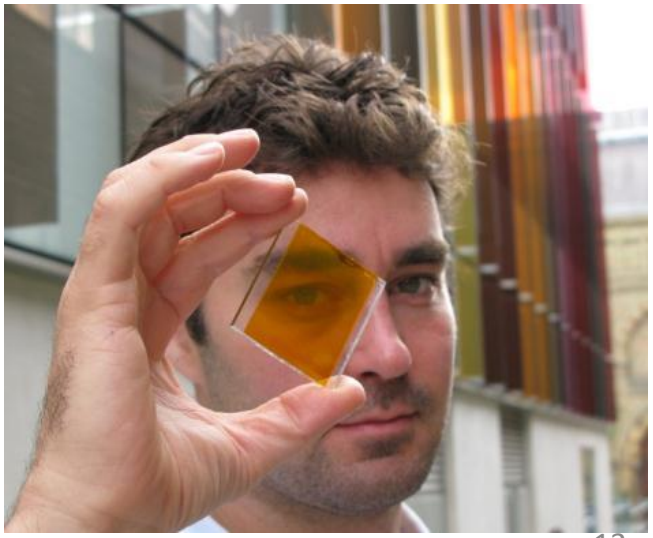
* Reorganised business model at end of 2009

Typical pre-money valuation of spin-out companies: £750K - £1.3M

Spin-out: Oxford Photovoltaics

(http://www.oxfordpv.com/)

- Oxford Photovoltaics Ltd will bring to market low cost, stable and fully scalable (thin film) solar cell technology that combines the benefits of inexpensive abundant organic materials with simple screen printing manufacturing technology
- "Green technology" similar to photosynthesis with wide range of colours and transparency options (solid state version of DSSC)
- Target application: Low cost solar power glazing for buildings and other application areas
- TSB funding of £100k in October 2010
- VC investment of £650k in July 2011



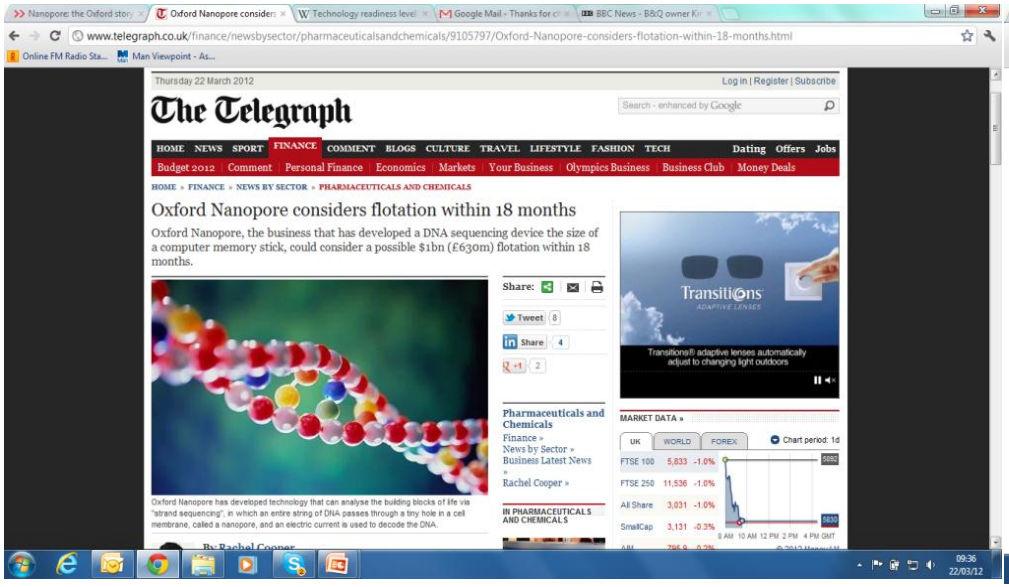
Oxford Nanopore Technologies

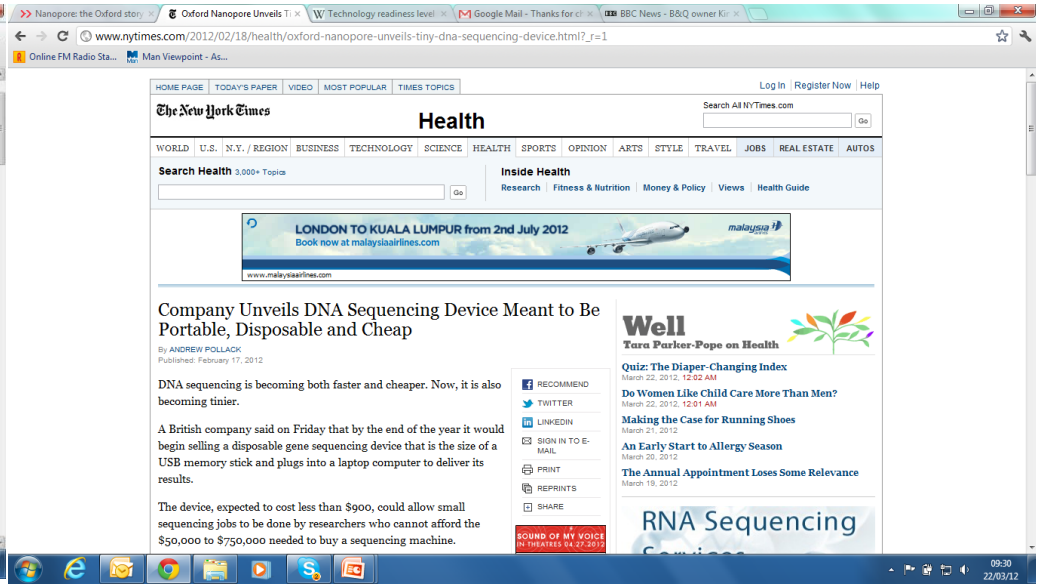
http://www.ox.ac.uk/media/science_blog/120315.html

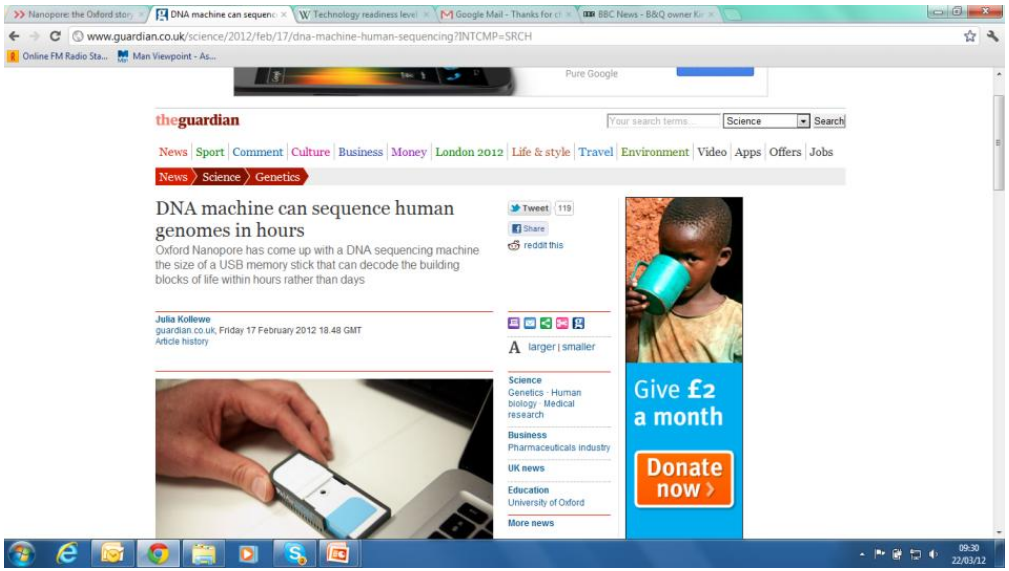
Technology can analyse the building blocks of life via "strand sequencing", in which an entire string of DNA passes through a tiny hole in a cell membrane, called a nanopore, and an electric current is used to decode the DNA.

Earlier this month, Oxford Nanopore presented its technology at a genetic conference in America and also revealed a device the size of a memory stick that is said to sequence DNA more simply and cheaply.

Good attention!







Inventor's experience (Hagan)

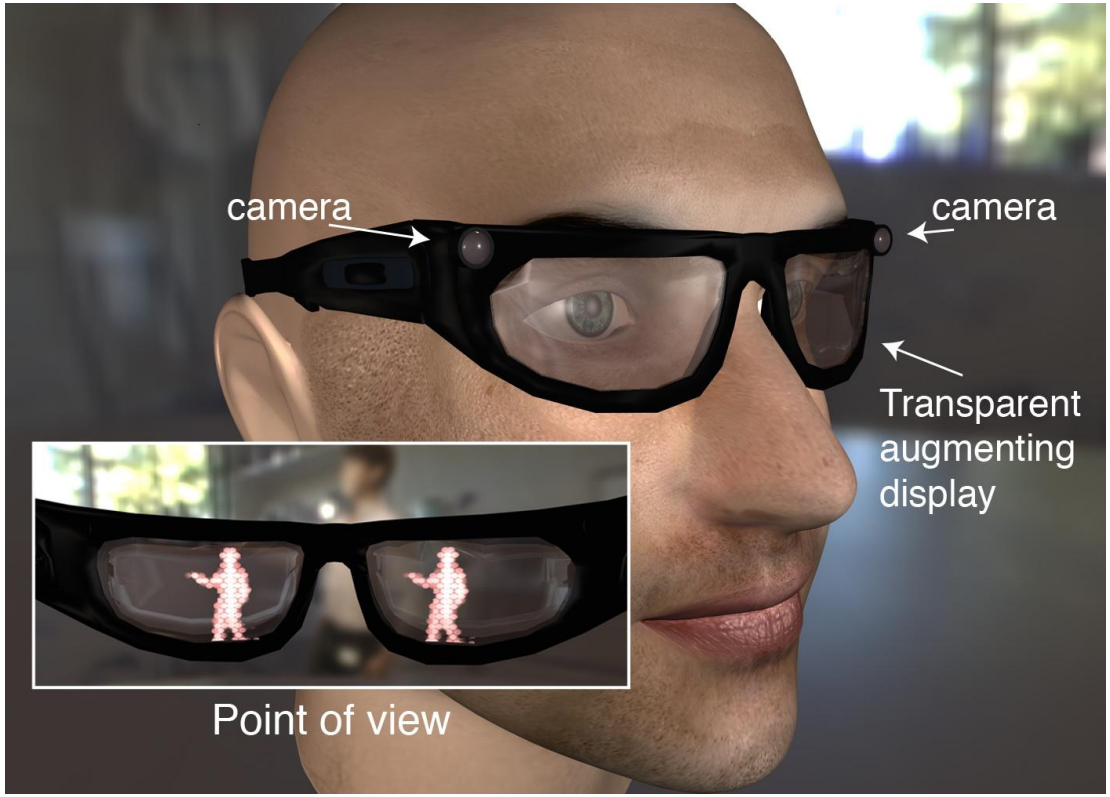
Motivation - He believes that most new commercial exploitation opportunities come from basic research, and instead of research councils and universities trying to plan 'pathways' to new products and services: 'the best way to do initial research is to find good motivated scientists, give them funding and time, and leave them alone.'

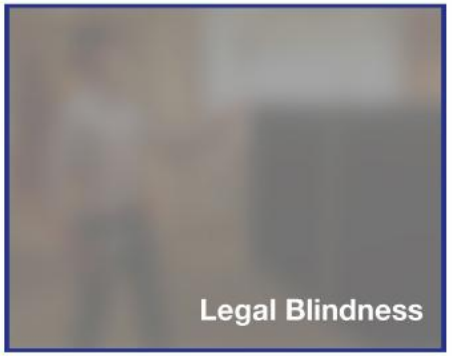
Support- Hagan tells me: 'we need to make it simple for academics to form a company, don't make them have to take a year out from their academic work or quit their university job to get things going.' The support he received from Isis Innovation and others around the University indeed made spinning out a firm 'relatively easy'.

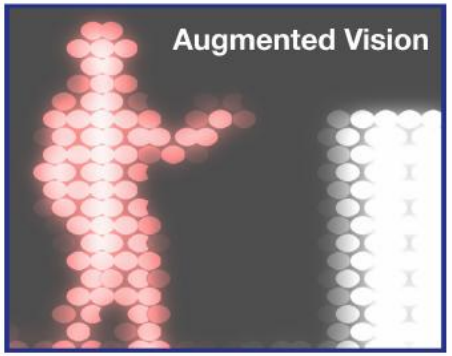
Choice- Despite his role as the firm's founder, a board member, and long-time scientific adviser, Hagan didn't become its CEO; 'my interest was always in the basic research' he says. Instead, he continued to work with his team on the scientific challenges of understanding nanopores and what they can do, publishing papers that were useful to both the spinout and others interested in the potential of this emerging technology.

Oxford Bionics

A visual aid that helps the "blind" brain process visual information







285 millions are vision impaired

Well received by the market

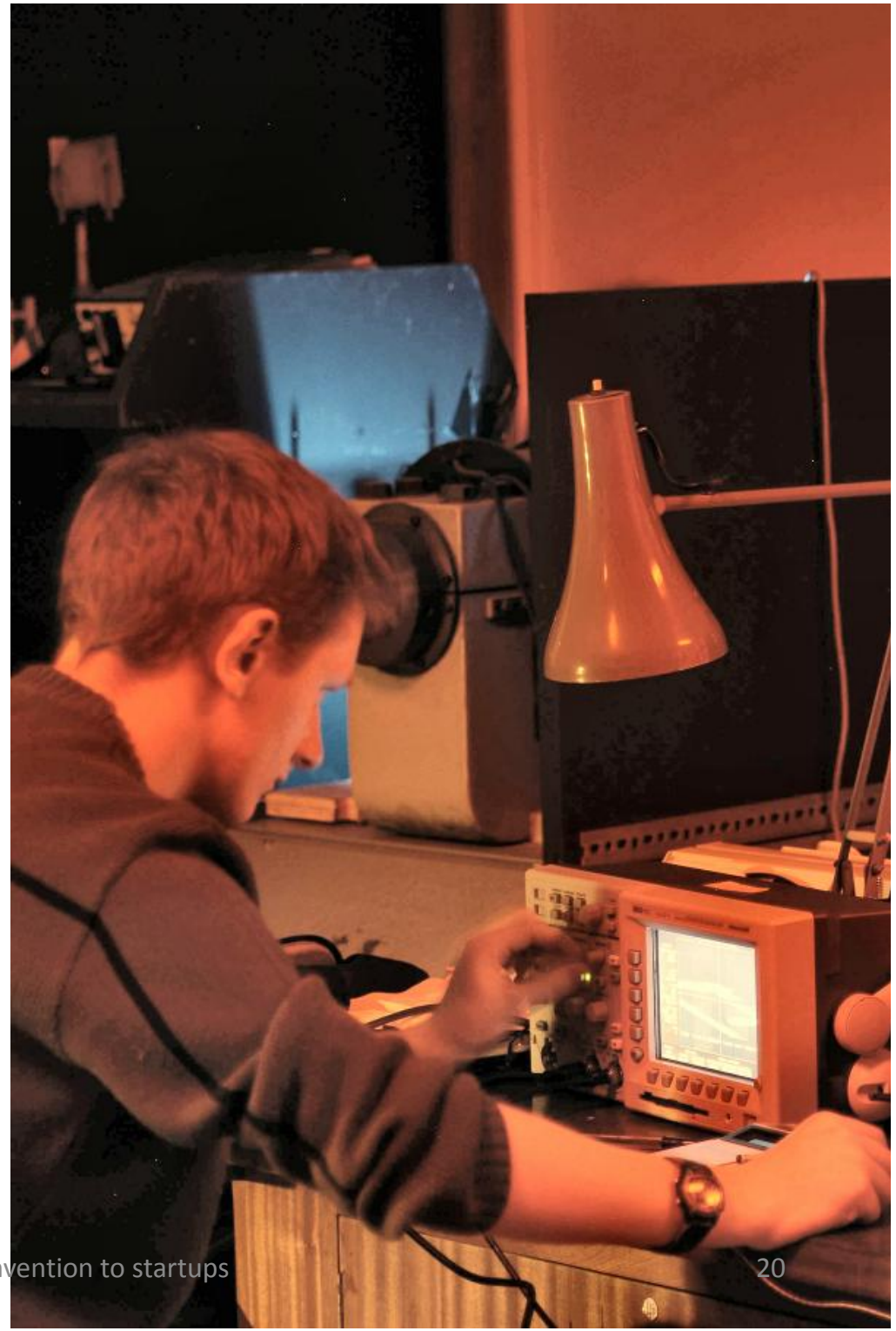
- International media

- Exhibitions

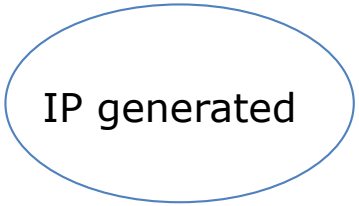
- Parliamentary report for Assistive Technology 2012

Structuring Spinouts

(A marriage of technology and investment)



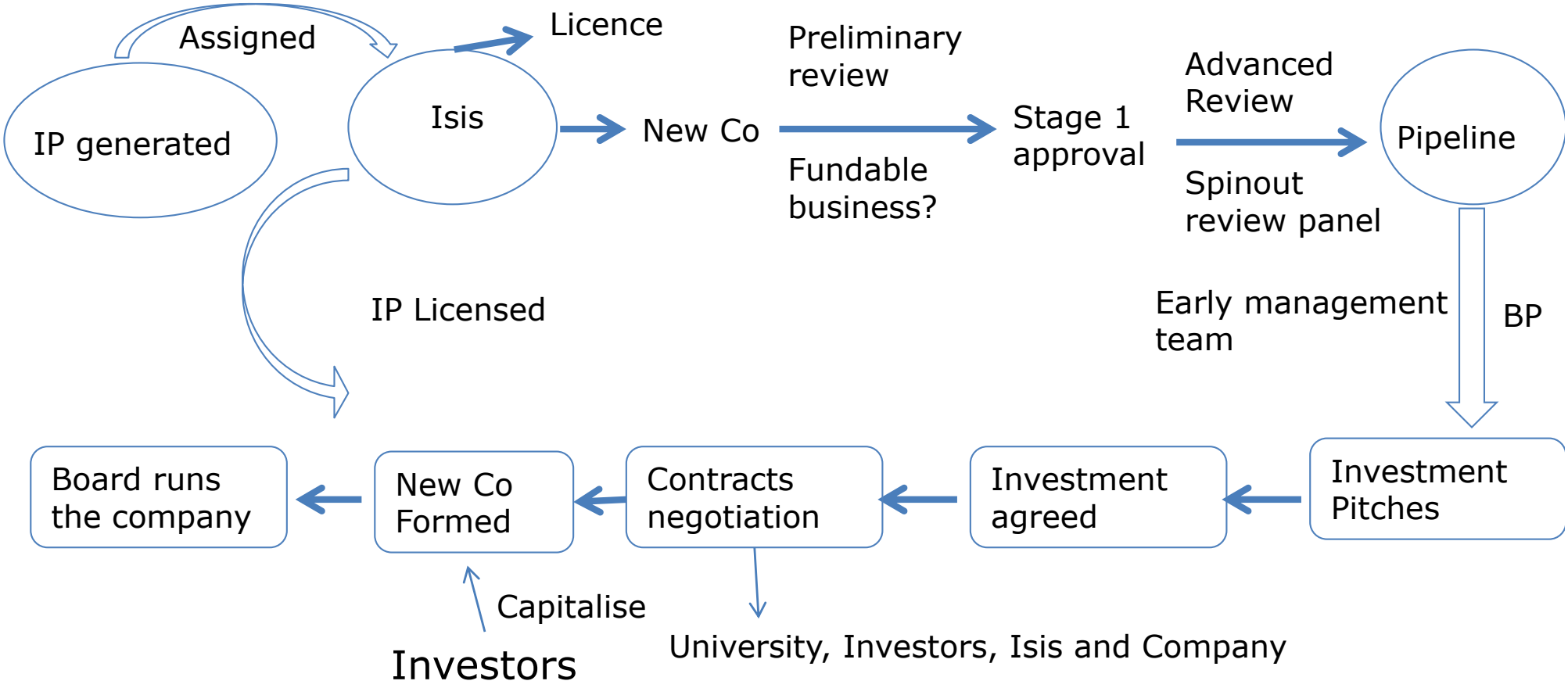
Structuring Oxford Spin-outs



Commercialising technologies (early days)

Why spinout?
Can it be licensed?
What are the academics motivation?
Can he afford the time?
Is the idea fundable?
Is it a platform technology - having several applications (metamaterials)?
How big is the market?
Is the market ready (Spintronics)?
What is the readiness level of the technology?
Cost Vs Performance?
Competition?
Reliance on external factors/ Supply chain?

Structuring Oxford Spin-outs

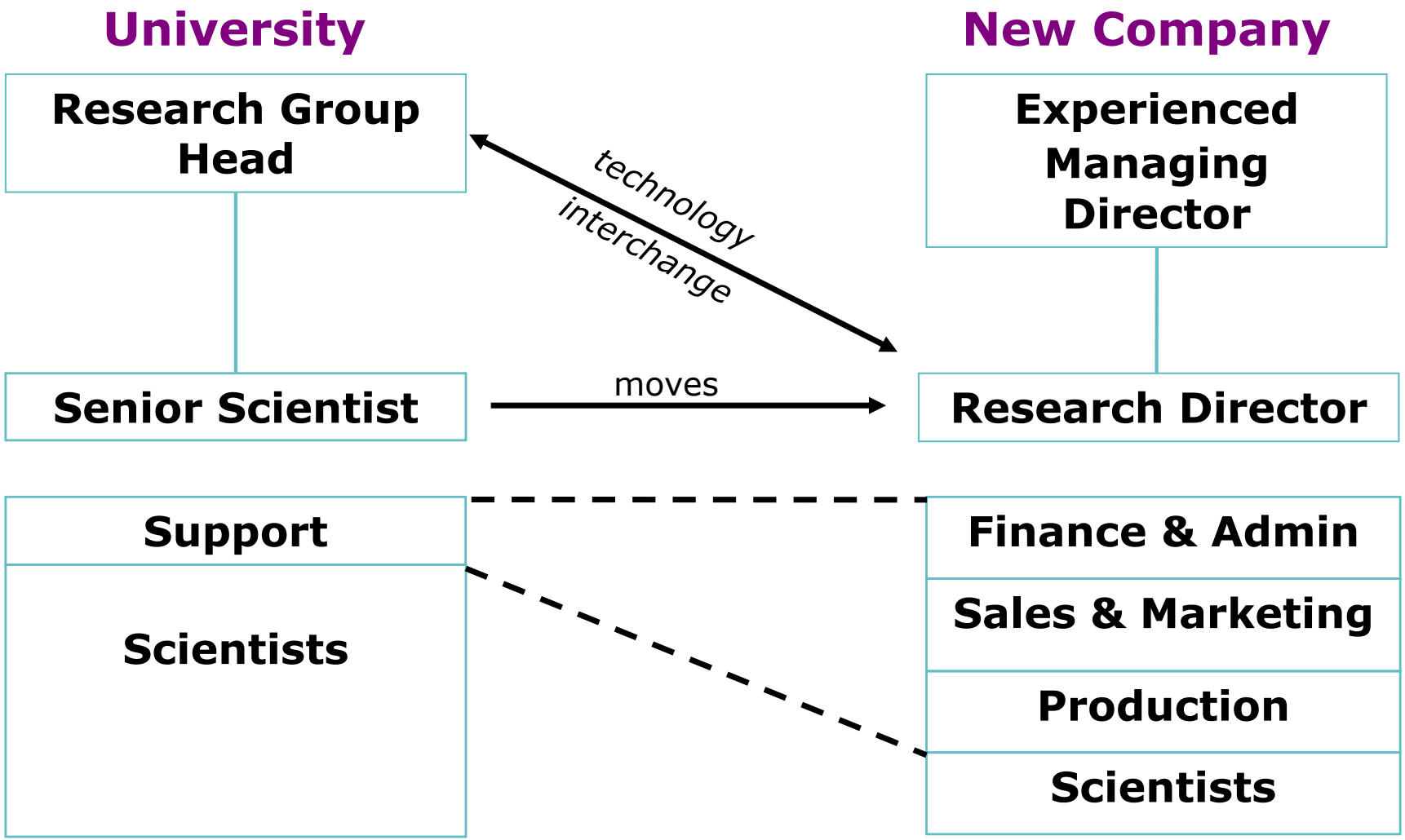


Everyone in the ecosystem shares the risk (CEO, Isis, Service Providers)
All the shareholders are treated equally (academics, University and investors)
Not keen on forming shell companies
Communication holds the key and Project Managers has no vested interest
Convince private investors the merits
Hard work, always takes longer than one thinks, a measure of luck needed.

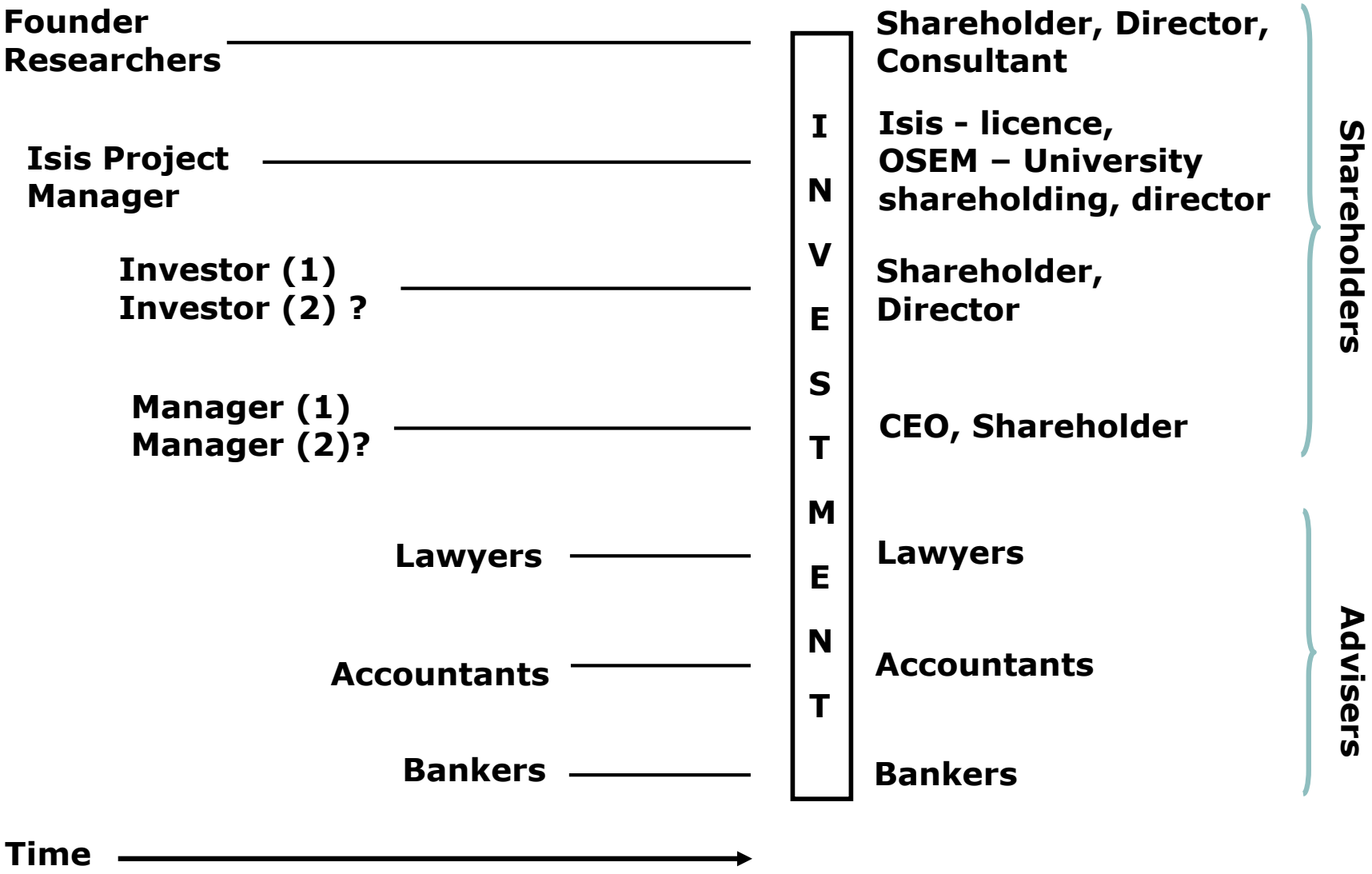
Completion of the marriage

- Celebration
- Best wishes + Farewell

Spin-out Strategy



Spin-outs – The Players



Being creative

As its getting quite complex

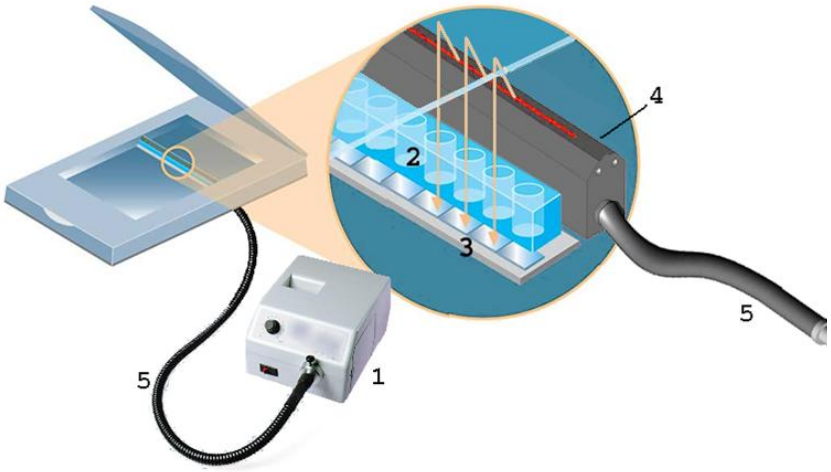
NESTA is the National Endowment for Science, Technology and the Arts - an independent body with a mission to make the UK more innovative. Recent NESTA report suggests that investment activity is now lower than after the dotcom crash => Seed and first round funds are hard hit

- Rising expectation bars (risk adverse) - OxEMA
- Incubated for long
- Tranched payments – threshold is lower for investors – milestone dependent
- Bootstrap model
- Interesting mix of investors: value and supply chain, often more than five angel investors
- JV's (Strategic partners)
- Closer to the money – New eco-system - subsidiaries on day one – OMS limited

Oxford Multispectral Limited

http://oxfordmultispectral.com/

1. Spinning out a company from the Classics Department (Oxford and UK's first)
2. Securing investment from mainland China followed by a significant manufacturing deal
3. Excellent Press
4. Interested customers include several border control agencies



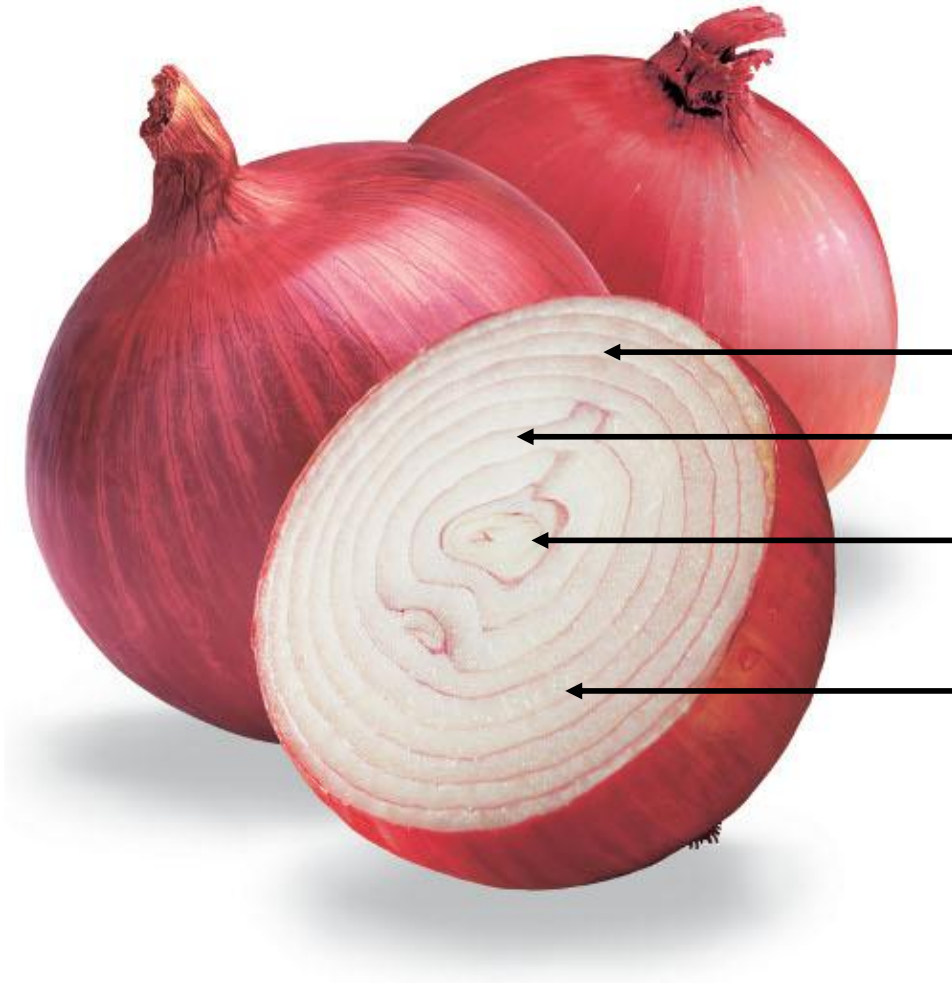
Oxford Imaging Detectors

Produce market leading Imaging Solutions for Scientific Applications

- TEM is the prime market
- Patented technologies from Oxford University
- Breakeven after 18 months
- Investor is a large Japanese Corporate and is also the first customer holding 50% of TEM market

Translating skills elsewhere – developing countries

Managing disparate interests with multi parties in the Innovation Ecosystem



Innovative companies, investors, entrepreneurs,

University People – Researchers, TTO, Administrators

Professional advisers – patent attorneys, lawyers, accountants, banks, commercial property managers, pr, head-hunters, consultants, students, journalists

Other universities

Observations and Challenges

- IP policy – who owns the IP, Framework to allow effective translation of research
- Fragmented Ecosytem - lack of depth understanding of this regime
- Very few support to advance the development of early stage technologies, Valley of Death translational funds
- Lack of dedicated IP budget for protection
- Framework for commercialisation – CSIR labs in India
- A few VC funds - reliance on banks
- Less appetite for early stage investment –too risky

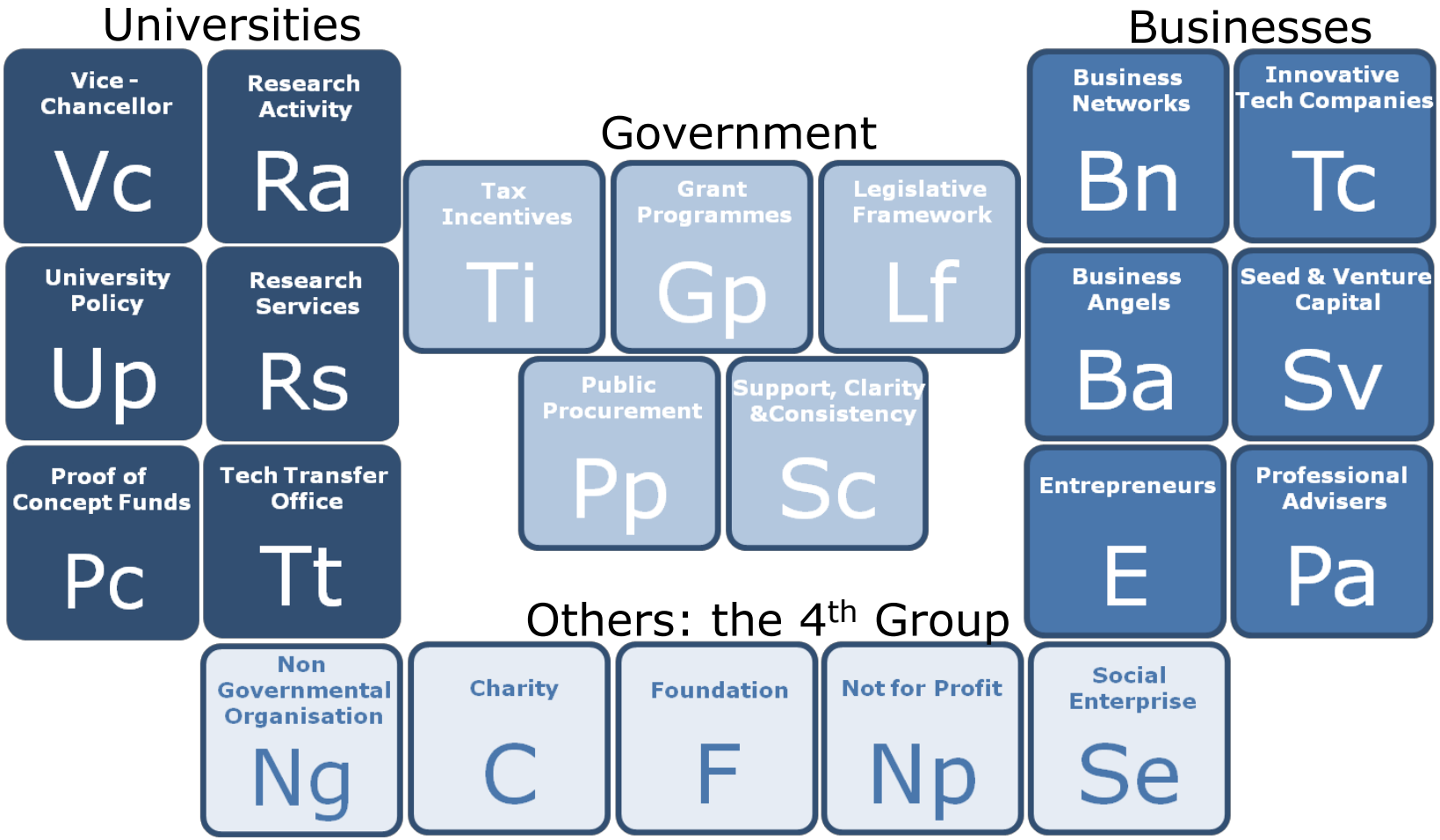
Observations and Challenges

- Interest exists – needs confidence building
- Fundamental research gets some encouragement in Industry
- Government support not at the same par as developed countries such as tax incentives to early stage technology companies/ startups (university based)
- Encouragement to investors to invest in start ups
- Surge of Science Parks and Technology Parks – Improve academia/industry relationship and can act as incubation centers
- "Money is there but need good technologies" – China and India
- We need investment to scale up our technologies – Columbia/Brazil

Isis' international engagements

- Building upon its solid track record of commercialisation success of innovations at Oxford, Isis works with governments, science parks, universities, research institutes, and companies (SME's and multinationals) in more than 50 countries.
- Innovation Ecosystem study and setting up Technology Transfer Offices
- Isis Venture Fund
- Development Centers for SME's and large corporate
- We link technology providers with technology seekers and work with other key players in the innovation ecosystem.

Innovation Ecosystem – Successful TT Activities



It’s a long term investment

Validating the model

Believe in yourself and do not give up

Thank you for your attention