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GLOBAL EDUCATION DIALOGUES

The East Asia Series

2013-2014

Oxford University Spin-Out Experience

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Isis Innovation Ltd

Topics to discuss

- Why create spin-out companies?
- What needs to exist in the university environment – what helps promote spin-out company creation?
- New companies based on Oxford research – Isis Innovation approach
- Thinking about business strategy
- Case studies and what can go wrong

Why did Oxford create these spin-outs?

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
2012	4	Intelligent Ultrasound, OxEHealth, Oxford Vacmedix, Run3D

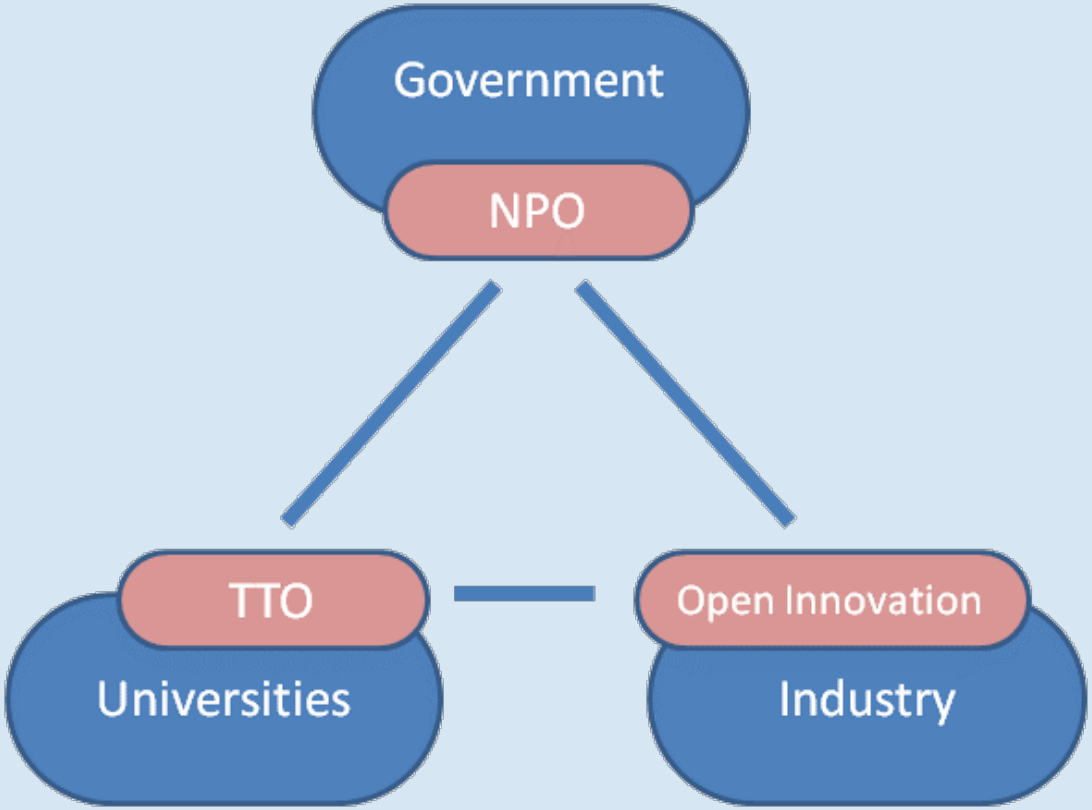
Total external investment to date in 66 spin-outs 2000-2012: **£340m**

£46m 1st round Seed/Business Angels – average amount invested £850k; 1/3rd > £1m invested.

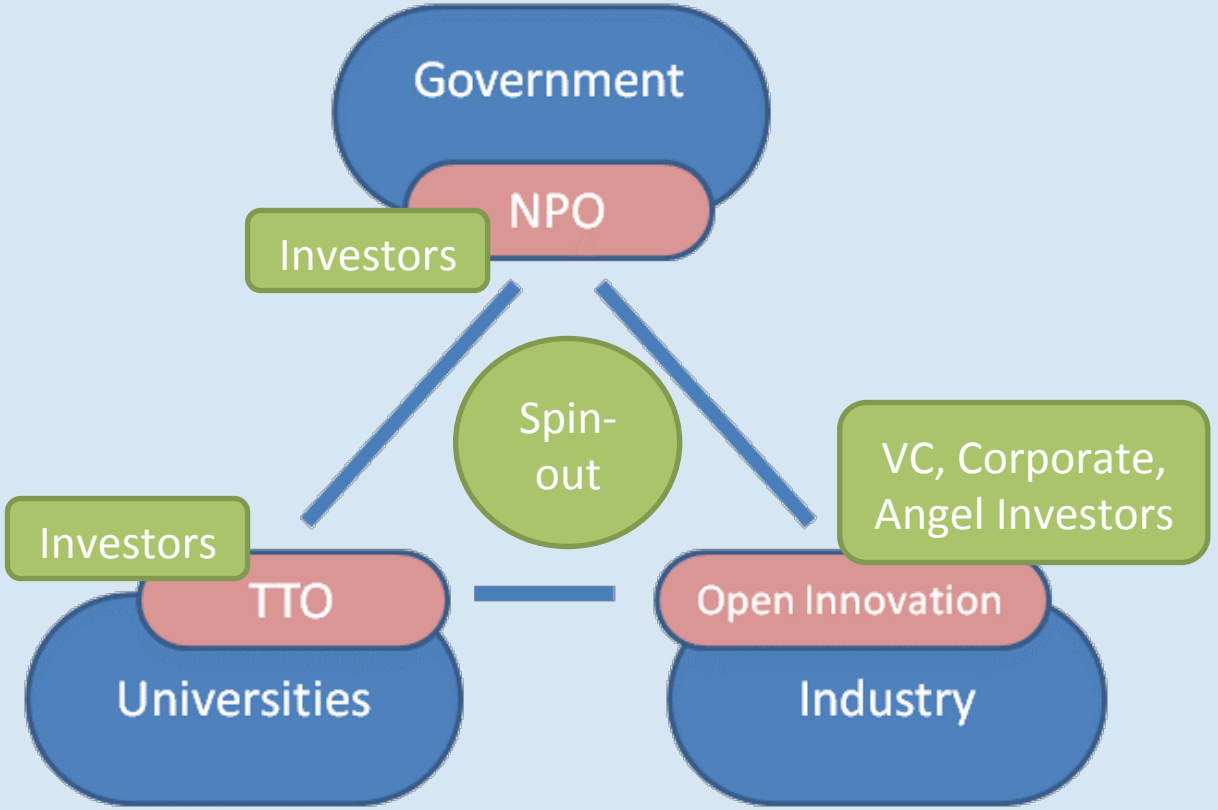
£294m follow-on Venture/Institution Capital

* stock exchange listing

The Environment



Spin-out Investment



Government

- Priority given to Innovation in Strategy and Policy
- Regulatory Framework (Support, Clarity, Consistency)
- Enforcement of Intellectual Property Rights
- Public Procurement
- **Grant Programmes**
- **Investment Programmes**
- National Patent Office (that supports innovation)
- **Tax incentives** (for early-stage technology investments)

- Sensible Metrics (given to Universities to promote innovation and technology transfer to industry)

University (and TTO)

- Support of Vice-Chancellor & Senior Researchers
- Research Activity/Quality/Links to Industry
- University IP Policy
- Research Management Office (that actively manages research collaboration)
- **Proof-of-Concept and Seed Funds**
- Technology Transfer Office (with a strong position within University)
  - Processes and Procedures
  - Staff (scientific and commercials knowledge, skills, and experience)
  - Patenting Budget and Strategy for International Filing
  - Entrepreneurs-in-Residence?

- Realistic expectations around number of patents filed and likelihood of successful commercial exploitation (financial and non-financial objectives)

Industry (and Professional Advisors)

- Innovative Technology companies
- Availability of Professional Advisers:
  - Patent Agents
  - Bankers
  - Accountants
  - Lawyers
- Business Networks
- **Business Parks and Incubation Centres**
- **Business Angels**
- **Entrepreneurs**
- **Seed and Venture Capital**

Intellectual Property Policy (from October 2000)

- University claims ownership of all employees' and students' IP rights resulting from University research activities

- The University ***assists*** those researchers ***who wish to*** commercialise their research
  - by patenting, licences, **spinout companies** & consultancy

- Researchers share the benefits
  - Royalty shares from licences
  - **Equity in spinout companies**
  - Income from personal consultancy

Technology Transfer Process

UNIVERSITY RESEARCH

TRANSLATIONAL RESEARCH

COMMERCIALISATION WITH INDUSTRY PARTNERS

IDENTIFY → **PROTECT** → **TRANSLATE** → **MARKET** → **LICENSE** → **SPINOUT** → **POST DEAL**

IDENTIFY	PROTECT	TRANSLATE	MARKET	LICENSE	SPINOUT	POST DEAL
- Internal marketing	- Patenting	**- Proof of concept**	- Overview	- Valuation	**- Planning**	- Billing
- Ownership	- Patent strategy	- Development	- Customer targets	- Negotiation	**- Fundraising**	- Distribution
- Evaluation	- Protection	- Endorsement	- Promotion	- Legalise	**- The Team**	- Re-negotiation

Investment Sources

Oxford University Challenge Seed Fund

- Launched with £4m in 1999
- University provided £1m; HM Treasury, Wellcome, Gatsby £3m
- £5.7m invested in 102 projects – development, seed equity
- Resulting in Equity stakes in 31 spin-outs, 4 completed licensing deals & 33 active technology projects. These 31 spin-outs have attracted £80m seed/ venture investment

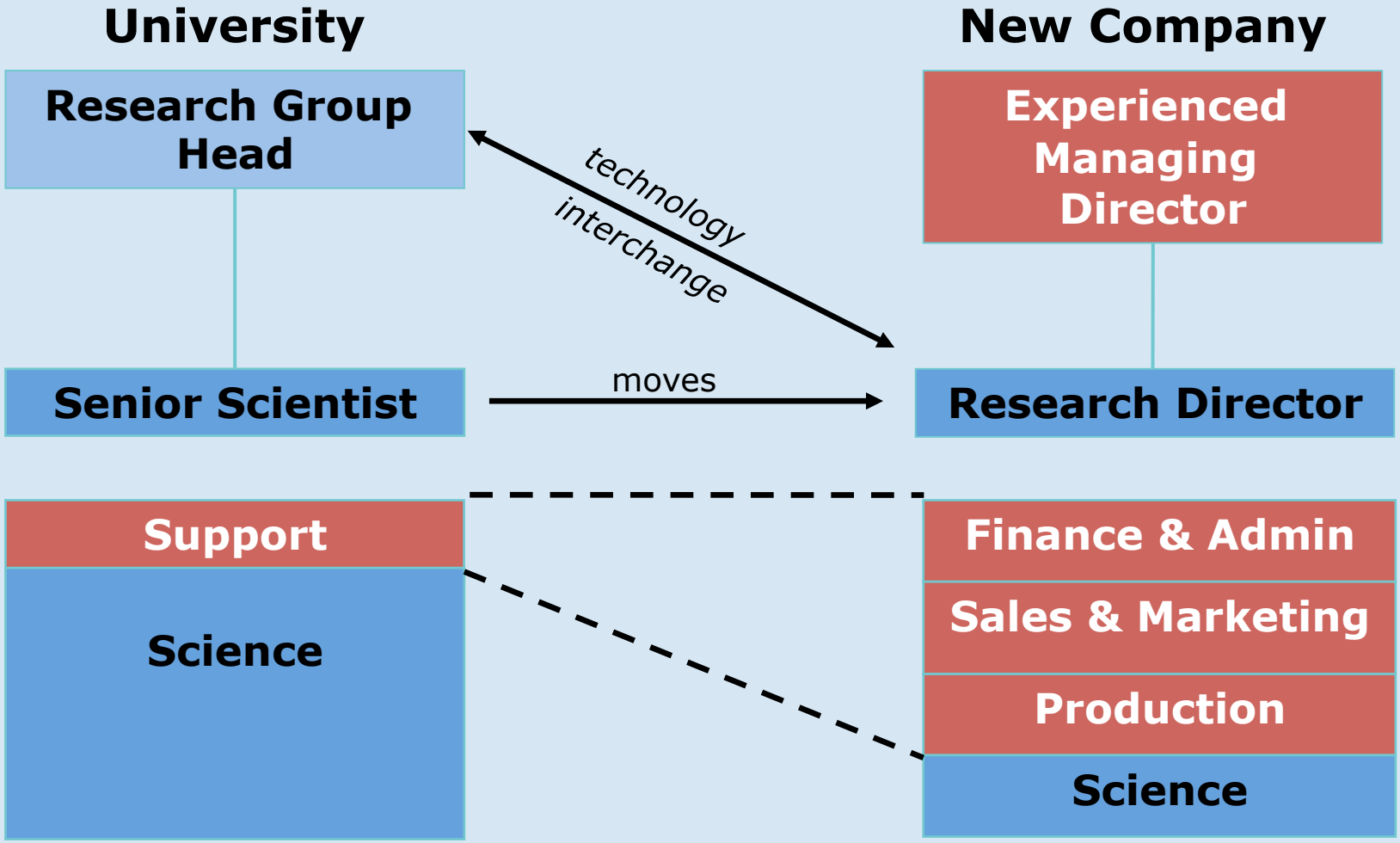
Oxford Invention Fund

- Donations to the University of Oxford as part of Oxford Thinking, the University's overall fund raising Campaign
- Invest in development of new technologies and innovation from Oxford

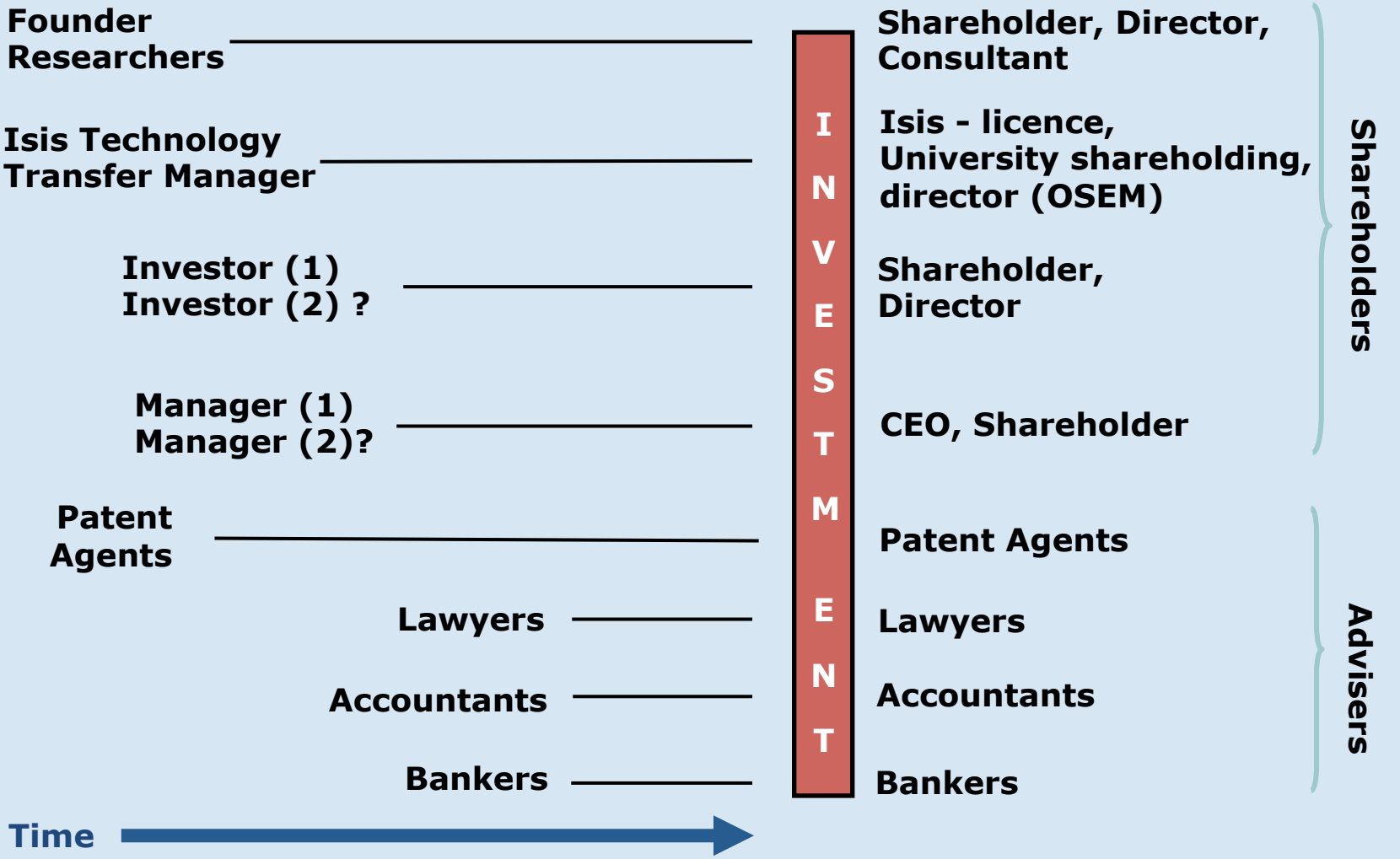
Isis Angels Network

- Business Angels, Seed/Venture Capital
- 100 members
- Events, No Charges

Structure / Resources



Who is involved?



Isis Software Incubator (established in 2010)

- Support for early-stage software ventures from Oxford University
- Assists the creation and development of a software business opportunity, whether or not a company has yet been incorporated
- Isis provides commercial mentoring, negotiation support, services, desk space, access to business networks
- Projects that have a credible business concept and need:
  - Substantial work to develop IP and build a realistic commercial prospect
  - With entrepreneurial founders
  - **But do NOT need patents, investors, full-time management**

Oxford incubators & science parks

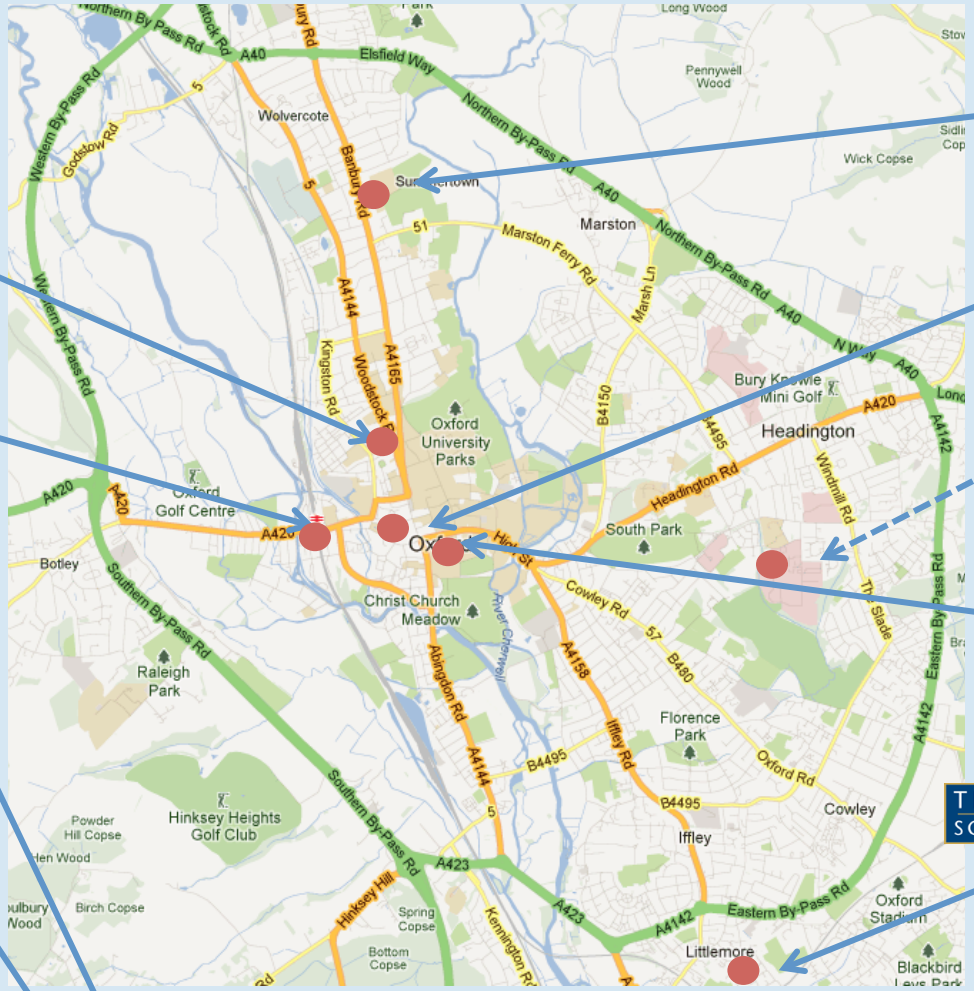
Begbroke Science Park

Oxford Entrepreneurs Incubator

Oxford Low Carbon Hub

Harwell

Milton Park



Isis Software Incubator

Oxford Centre for Innovation *Oxford Magnet*

Oxford BioEscalator

Oxford Hub

Oxford Science Park

Source: Google Maps

Open Innovation for more than 20 years

- **Oxford Innovation Society** established by Isis in 1990 to foster University/business links
- Invited membership
- Trusted “Open Innovation” Network
- Access to Oxford Academics
- International contacts
- First view of Oxford technologies
- Now extending reach:
  - Hong Kong
  - Madrid

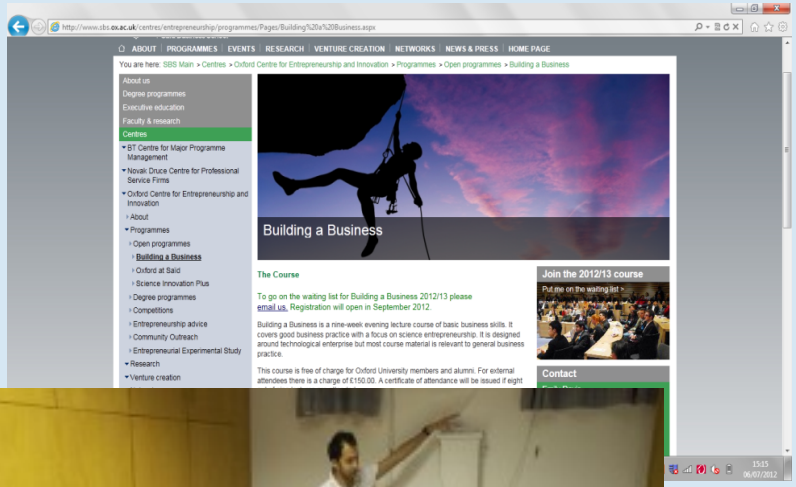
Entrepreneurial Culture

"Oxford Centre for Entrepreneurship & Innovation"

- Brings together innovators from across the world as well as the high-tech companies based around Oxford
- Programmes
  - Building a Business
  - Medical Innovation
  - Oxford at Saïd – Research in a Nutshell
  - Executive Training: Scenarios Planning, Finance
- Activities
  - The SBS Venture Fund
  - 'Idea Idol' competition
  - 'Start a Company' Scheme
- Isis supports student society *Oxford Entrepreneurs*

oxford | centre for entrepreneurship and innovation

Student Entrepreneurs



OXFORD ENTREPRENEURS
www.oxfordentrepreneurs.co.uk

Business Strategy – before business plan

- A strategy is not a vague objective to be "the best" in a certain market or a random future sales target
- A strategy takes time and effort to develop – it provides guidance to allow founders and staff to choose the best actions to achieve defined commercial objectives, and those activities that should be avoided as a distraction
- A strategy is built by evaluating the strengths and weaknesses of competitors, diagnosing a problem or opportunity, and determining how to use a company's assets to make real impact – hard work to win a strategic "insight"
- A cohesive strategy that brings together many elements towards a specific set of objectives is itself a competitive advantage
- A strategy can make use of all types of innovation – business process, service offering, not just technology – an innovation allows a company to differentiate itself from its competitors, and can provide a sustainable competitive advantage if it is difficult to copy/duplicate

Process to define strategy

1. Review the business environment (any emerging trends) and **competitors** (relative strengths and weaknesses)
2. Identify your business objectives
3. Diagnose the reasons why these objectives have not already been achieved, and what would really need to change for this to happen
4. Identify your guiding principles - approaches to make these changes happen
5. List specific actions, short term and medium term, so that people know how to implement these guiding principles
6. Measure results and refine

Checkpoint: Competition

- Has a comprehensive competitor analysis been completed, and is it regularly reviewed?
- In relation to competitors, do we understand their:
  - business model
  - customer base
  - cost model
  - relationship with suppliers and distributors/end users
  - established capabilities (technical and business processes)
  - approach/openness to innovation
  - company culture/industrial relations
  - brand

Checkpoint: Objectives

- Are commercial objectives built upon an understanding of the company's:
  - existing strengths, assets, capabilities
  - existing/predicted client base
  - market drivers/trends
  - the diagnosis of a problem/opportunity

- Are target customers clearly identified – can "buyers" be named?

Checkpoint: Coherent/Focused?

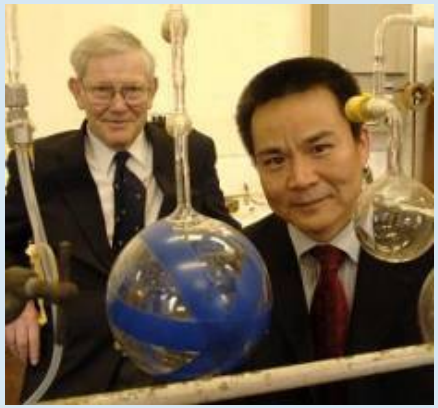
- Given relative strengths and weaknesses, is there a clear strategy (guiding policies and set of actions) for bringing together different aspects of business operations to focus on a clearly defined problem/opportunity?
- Has the response of competitors been evaluated?
- Has the likelihood of new entrants to the market been considered?
- Does the management team understand which innovation will deliver the greatest benefit to the end user/customer?
- What will go wrong – have mitigating actions been identified?
- Is there a realistic timeline for achieving the stated commercial objectives?
- Does the management team have access to industry experience in similar markets and/or with similar products/services?

Case Study – Oxford Catalysts

Academic background

- Prof Malcolm Green
  - Joined Department of Chemistry at Oxford in 1963
  - 1975 First catalysis paper published
  - 1987 Fundamental advances on partial oxidation catalysis (published in Nature 1990)

- Dr Tiancun Xiao
  - Visiting professor Beijing University of Chemical Engineering
  - Joined Oxford Chemistry's Wolfson Catalysis Centre 1999
  - Royal Society BP Aramco Research Fellow



The invention

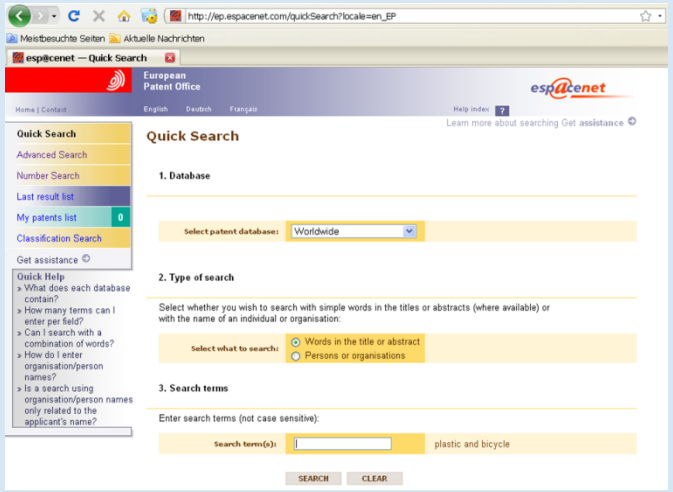
- In the year 2000, Tiancun manufactured catalysts that were:
  - cheaper than existing catalysts
  - delivered the same high levels of performance

- Malcolm and Tiancun now needed to decide what to do next

- They approached the technology transfer company for the University of Oxford

1. Could a patent be filed?

- Did the invention meet basic patent requirements?
  - novel
  - inventive
  - industrial application
  - permitted
- Did the University have the rights to own the invention?
- Prior Art searches



2. Sensible to file a patent?

- The invention passed all the tests to apply for a valid patent but would this make financial sense?
- Initial market due diligence:
  - Was there a need for this technology?
  - Did the team think it could make a profit?
- Was now the right time to file a patent?
- What about “freedom to operate”?
- The decision was taken to file a patent in the UK

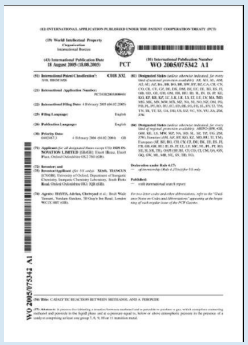
First patent filed - 2001

- Patent Application filed 28th June 2001

  - Application No: GB0115850
  - Applicant: Isis Innovation Ltd
  - Inventors: Malcolm Green, Tiancun Xiao

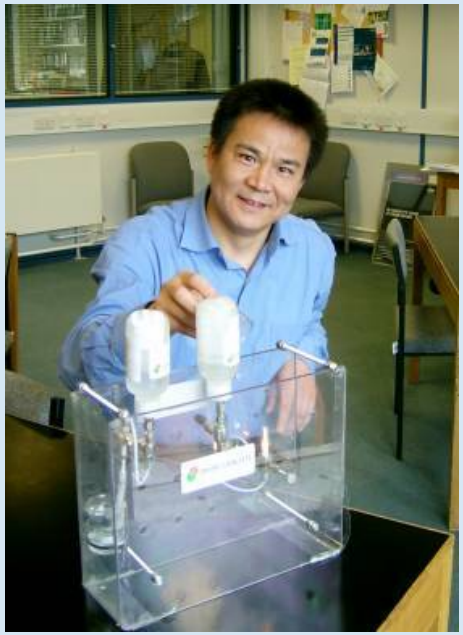
- The technology transfer manager worked with Malcolm and Tiancun to supply the patent agent with the information needed to draft the patent

- A patent agent will draft the claims in a patent to cover as much as possible



Early stage funding

- Xiao and Green awarded £124,500 in June 2001
  - Patent 2
  - Commercially focused development



- Business Development Fellowship
  - Funded Dr Xiao 2003-2004
  - Patent 3
  - Without it – no Dr Xiao and no spin-out!

- Proof of concept award September 2004
  - £24,500 for building a prototype
  - “Invaluable for showing to potential investors”
  - Patent 4

Where to now?

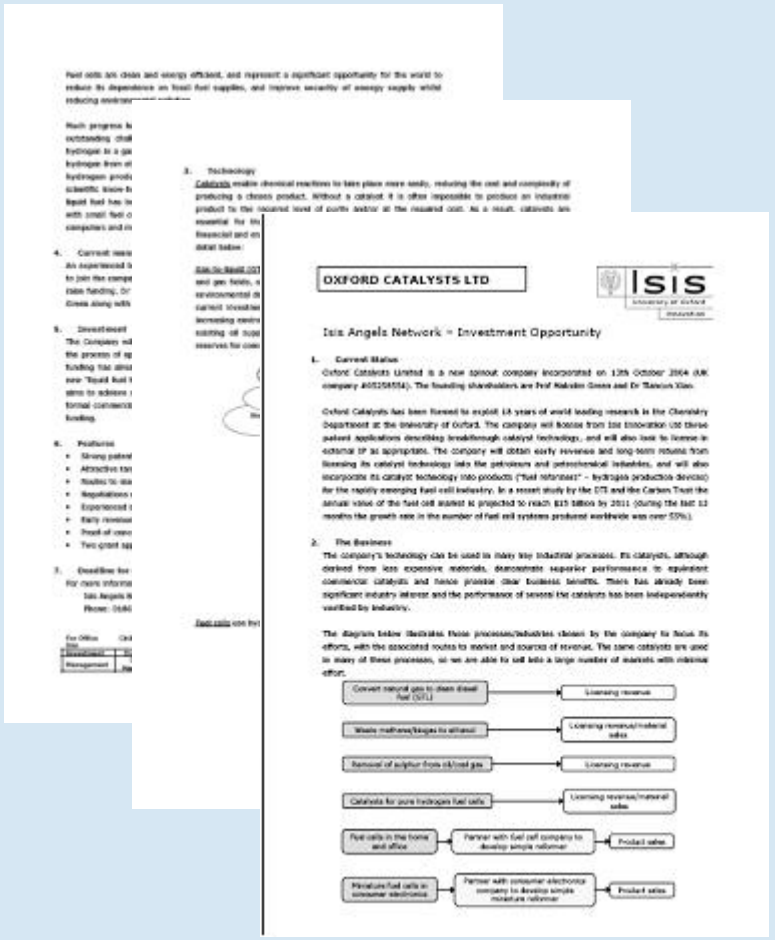
- A decision needed to be made in early 2004
  - License the technology to an existing company or form a spinout company?
- Two patents related to the petrochemical industry, two related to the emerging fuel cell sector
  - Significant investment was needed
  - An entrepreneurial approach was needed for the fuel cell sector
  - Chemical industry experience was needed for the petrochemical sector
- There was a potential loss of value if the IP was split up, but a potential loss of focus if it was kept together
- Tiancun was also keen to keep working on the technology
- The decision was taken to create a new company

Company formed (October 2004)

- Many challenges
- A management team needs to be brought together
- Tiancun and Malcolm were joined first by Will Barton and later by Roy Lipski
- Business Plan is continuously refined
- Investors ask many questions about the patents
- The inventors are involved in explaining the science to investors, and helping to paint a vision for the future

Pitching

- Investment briefing sent to 100+ business angels
- Many venture capitalists contacted
- Isis Angels Network investor presentation
- Presented at Libraries House/ Carbon Trust event
- Presented at *Venturefest*
  - won the elevator pitch competition, the first £1000 for the company



The initial proposal

- Targets for the business
- Capital required
  - £500,000 to £1.5m sought
  - More => too much dilution
  - Less => insufficient funds to get off the ground
- Offer to investors:

  Investment of £1.3m at a valuation of £2.7m
- Very difficult to put a value on a brand new company
  - No sales, assets, track record…
  - Net present value calculations need so many assumptions that they are not that useful

Doing the “deal”

- Management, management, management
- Corporate finance or “deal-doing” skills
- A flexible approach… patience!
- Maintaining trust
- Managing:
  - Investors
  - Founders
  - Customers
  - Spin-out management
  - Lawyers, patent attorneys, etc.

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NEW OXFORD SPIN-OUT TO CATALYSE A CLEANER FUTURE

OXFORD CATALYSTS LTD

The latest spin-out company from Isis Innovation and the University, Oxford Catalysts Ltd, plans to develop and exploit novel catalyst technology for the energy industry which is both cost-effective and environmentally friendly.

Oxford Catalysts, the forty-sixth company spun out by Isis Innovation since 1997, develops catalyst technology for the petroleum refining and petrochemical industry, selected areas of the fuel cell industry and the processing of waste biogas.

The company is based on technology which has been developed over 10 years at Oxford by Dr Tiancun Xiao, of the Wolfson Catalysis Centre, the Chemistry Department and Professor Malcolm Green, of the Inorganic Chemistry Department. Both founders have world-wide reputations in catalysis science. Isis Innovation holds a series of patent applications on the intellectual property rights and has licensed them to the Company.

The founders have developed catalysts that can be used to transform waste methane, natural gas or coal into hydrogen for use with fuel cells, or into pure liquid fuels that can be used for engines or heating and are easy to transport. Further applications include the partial oxidation of natural gas and removal of sulphur from crude oil. The basis of the technology is an innovative method for catalyst preparation, which gives catalysts that are extremely active, selective and long lasting.

In April 2005 Dr Xiao won a Carbon Trust Innovation Award (Isis Newsletter summer 2005) for the development of technology that will help to exploit the commercial potential of methane, transforming waste methane into useful products. 'There are many sources of waste methane, ranging from agricultural waste and landfill to flare-off from oil production,' said Dr Xiao. 'Capturing the methane is important not only due to its high energetic value, but also because it is a very powerful greenhouse gas – 22 times worse than carbon dioxide – and its presence in the atmosphere contributes to global warming.'

Oxford Catalysts will also exploit catalyst technology that produces hydrogen from a liquid fuel containing methanol, starting from room temperature. This existing technology is capable of being miniaturised for portable fuel cell applications and has received significant commercial interest already.

In preparing to spin out Oxford Catalysts, Isis Innovation was greatly supported by Oxford University's Begbroke Science Park, which runs the Oxford Enterprise Fellowship programme. The programme awarded a Technology Enterprise Fellowship to Dr Xiao which allowed him to concentrate for a year on developing the technology and commercial interest.

Dr Tiancun Xiao, of the Wolfson Catalysis Centre, the Chemistry Department

Professor Peter Dobson, Academic Director of Begbroke Science Park and the Enterprise Fellowship programme, said: 'Enabling successes like this is what the Begbroke Enterprise Fellowship is all about. We're very proud of what has been achieved by Dr Xiao and the other Enterprise Fellows and are looking forward to be able to help others in the future.'

The investment round of £500,000 was led by IP2IPO Group plc with additional investment from Top Technology Ventures, IP2IPO's venture capital fund management subsidiary. Isis Innovation and IP2IPO worked in close partnership to prepare Oxford Catalysts for investment. Dave Norwood, IP2IPO's Chief Executive, said: 'Oxford Catalysts represents a very exciting investment for IP2IPO with ground-breaking technology which has the potential to make a significant impact in both increasing fuel efficiency in the petroleum and petrochemical industry and supplying catalysts to the growing waste biogas and fuel cell industries.'

Tim Cook, the Managing Director of Isis Innovation, said 'Technologies which Oxford Catalyst offers have a very wide application, and will lead to huge energy economies. We look forward to a successful future for the company'.

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£500k first round funding raised Dec 2005

An opportunity..

- Within 2 months of seed investment, decision to go for IPO
  - Cost of £120,000 to abort
  - Very favourable market conditions
  - Development of Board, new members
  - Much work in a short timeframe
- The pros and cons of flotation
  - Rapid route to significant finance, avoids tyranny of annual investment rounds
  - Puts a very young company in the public eye
- Further negotiations
  - Pressure on terms of the Isis IP licence

Oxford Catalysts Plc (now Velocys Plc)

- First patent filed in June 2001
- Received £150k proof-of-concept funding
- Oxford Catalysts Ltd created in 2005, initially with £500k seed funding
- Oxford Catalysts Plc floated on AIM in early 2006, raising £15m
- Acquired Velocys Inc in 2008 and has now taken this name; employs 90 people at sites in the UK (near Oxford) and in the US
- Market cap £173 million (3 Feb 2014)

www.velocys.com

Lessons?

- Patience and belief
- Invest seed money carefully but do not be afraid
- Problems will arise – look flexibly for solutions
- Inventors must provide the driving force
- Technology transfer can keep the project on track

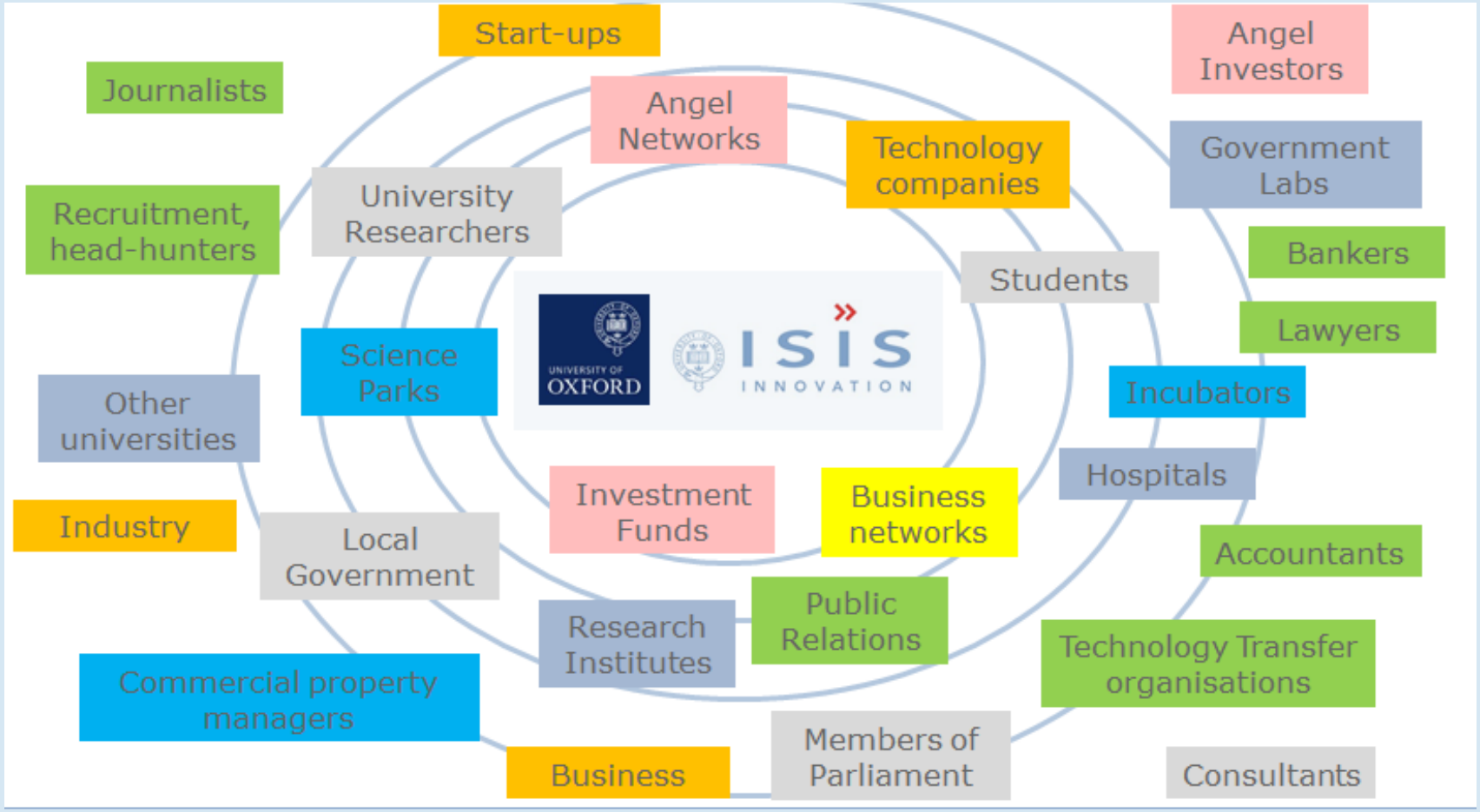
Oxford Catalysts Timeline (1)

- **1999** Dr Tiancun Xiao joins Chemistry Department Catalysis Centre
- **2001** Researchers approach Isis Innovation – First patent filed
  - University Challenge Seed Fund award £124,500 to finance Dr Xiao
- **2003** Commercial discussions begun with major petro-chemical companies
- **2004** Building the spin-out proposition
  - June - Win Elevator Pitch - Venturefest Business Plan competition
  - Sept - Proof of Concept award (£25k) for bench top demonstrator
  - Dec - Dr Will Barton becomes involved
- **2005** Investment Presentations and investment
  - January - Investment presentations
  - March - Isis Angels Network investor presentations
  - May - Investment syndicate forming
  - Sept - Lead consortium makes investment offer
  - Nov - Introduction of Roy Lipski to team
  - Dec - Investment of £500,000 and launch of spin-out

Oxford Catalysts Timeline (2)

- **2006** Flotation
  - February - Decision to float on AIM stock market
  - April - AIM float: £15m raised at total post-money valuation of £65m
  - Oct - 14 employees, new offices and laboratory
- **2007** Building the infrastructure
  - July - £4m new investment through new shares placing
  - Dec - 25 employees, 7 different nationalities
- **2008** Expansion
  - Jan - Expansion of lab and office facilities (doubled)
  - Mar - State-of-art high-throughput catalyst screening reactors delivered
  - Nov - £10m investment raised to allow acquisition of *Velocys Inc* ($35m part cash, part shares) and to provide further working capital
- **2009** Consolidation - total of 90 employees based in the UK and US
- **2010-12** Demonstration projects with industry partners
- **2013** Moving to commercial sales
  - Jan – £30 million share placing
  - Apr – Fully commercial sales (reactor system $8million)
  - Sept – Renamed *Velocys Plc* and open office in Houston, US

Lots of groups involved…



Oxford Advanced Surfaces Plc

- 2006 - spun out by Isis Innovation
- 2007 - listed on AIM through a reverse takeover (market capitalisation £60m)
  - coating technology able to modify the surface properties of polymers, glass, and even diamond
  - coatings can change colouration, adhesion, and the biocidal activity of surfaces
- markets include electronics, specialty fibres, textiles, laminates and composites, biomedical materials, photovoltaics, solid state lighting, fuel cells

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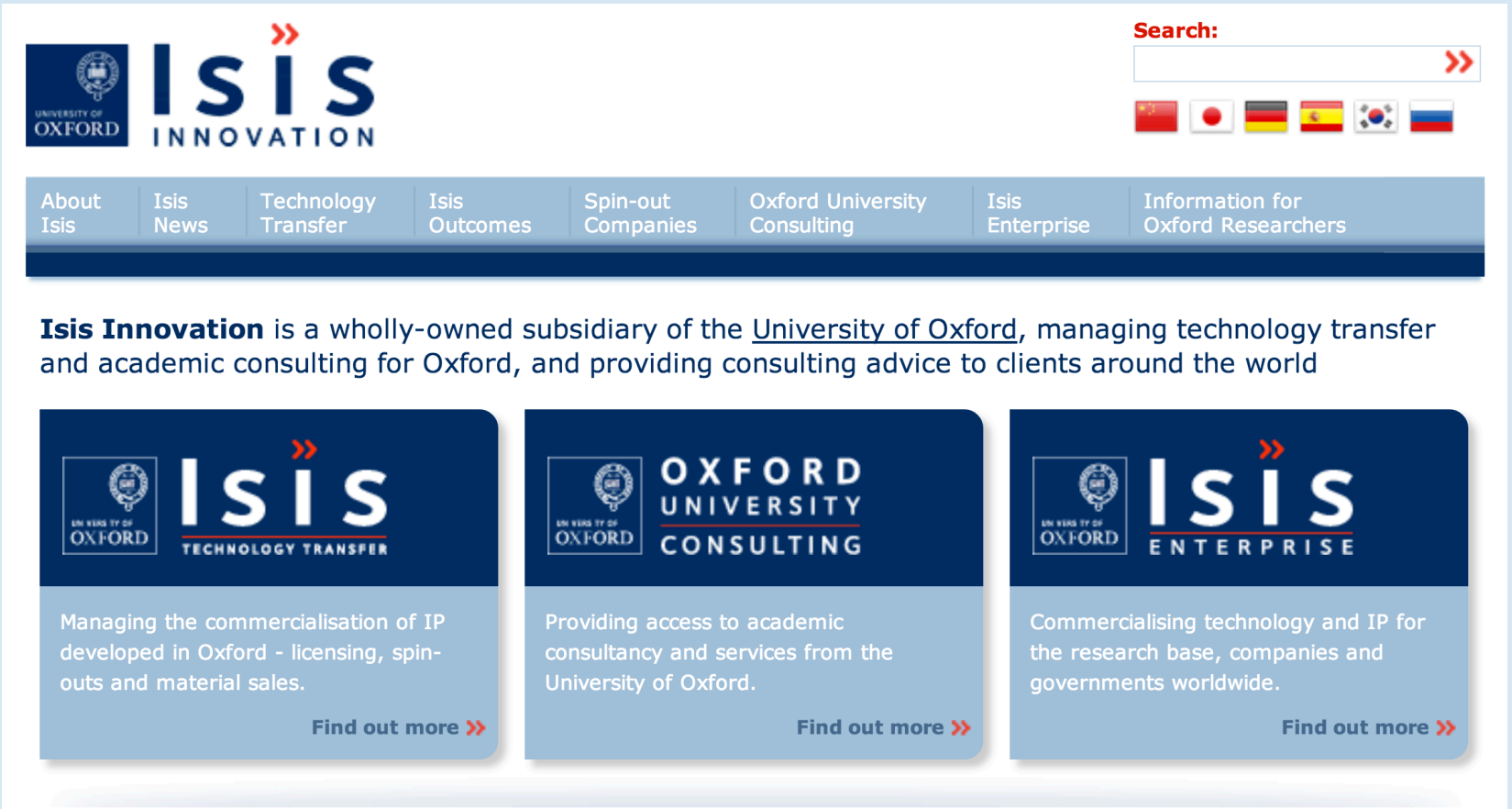

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