When and why is patent valuation relevant for research institutes?

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Patent Valuation

- Lilly's 2nd US patent for PROZAC™ (fluoxetine) declared invalid Aug 9, 2000
- Would otherwise has lasted until Dec 2003
- Lilly share-price falls over 30% i.e. $35.7bn

Patent Valuation - Patent &/or Project value?

- Value of fully commercializing the underlying Invention
  a) in the presence of patent protection
  b) in the absence of patent protection

- Value of the Patent = a) – b)
  - the value of the potential extra profits obtainable from *fully* exploiting the invention in the patent's presence compared with those obtainable without patent protection.

- Patent and Project value are often confused – usually one is looking at the combination but not in all cases

- For a patent to be valuable requires an actual or potential valuable project

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Patent Valuation occurs in and depends on a (business) context or contexts

"Risk, Uncertainty, and Profit"

Frank H. Knight, (1921)
http://www.econlib.org/library/Knight/knRUP.html

- **RISK** : **A Priori probability:** **DICE**
  (based on logic)

  Statistical probability: **INSURANCE**
  (based on ex-ante statistical data)

- **UNCERTAINTY**: **Estimates:** **GUESS**
  (no valid basis/data)

What are patents? - A Calculable Risk or an Incalculable Uncertainty?

European Patent Convention

Article 52

Patentable inventions

(1) European patents shall be granted for any inventions which are susceptible of industrial application, which are new and which involve an inventive step.

Article 54

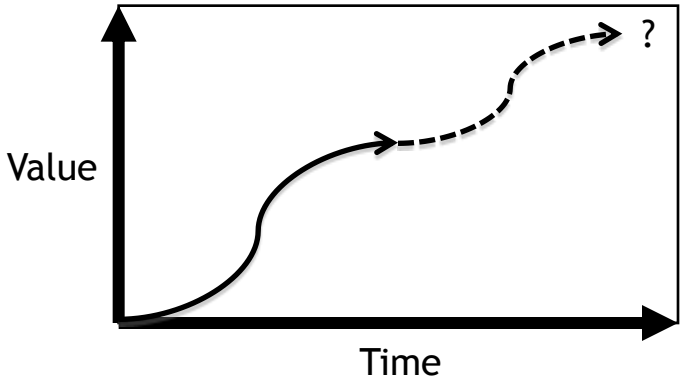
Novelty

(1) An invention shall be considered to be new if it does not form part of the state of the art.

Patented inventions are by definition unique assets…

If Patents are Unique is Patent Valuation Special?

- The underlying assets face the same problems as other assets
  - Valuations based on future returns require estimation of returns
  - Future returns are worth less today due to the time value of money
  - Future returns are uncertain and risky
  - Patents face particular legal risks and uncertainties in the future



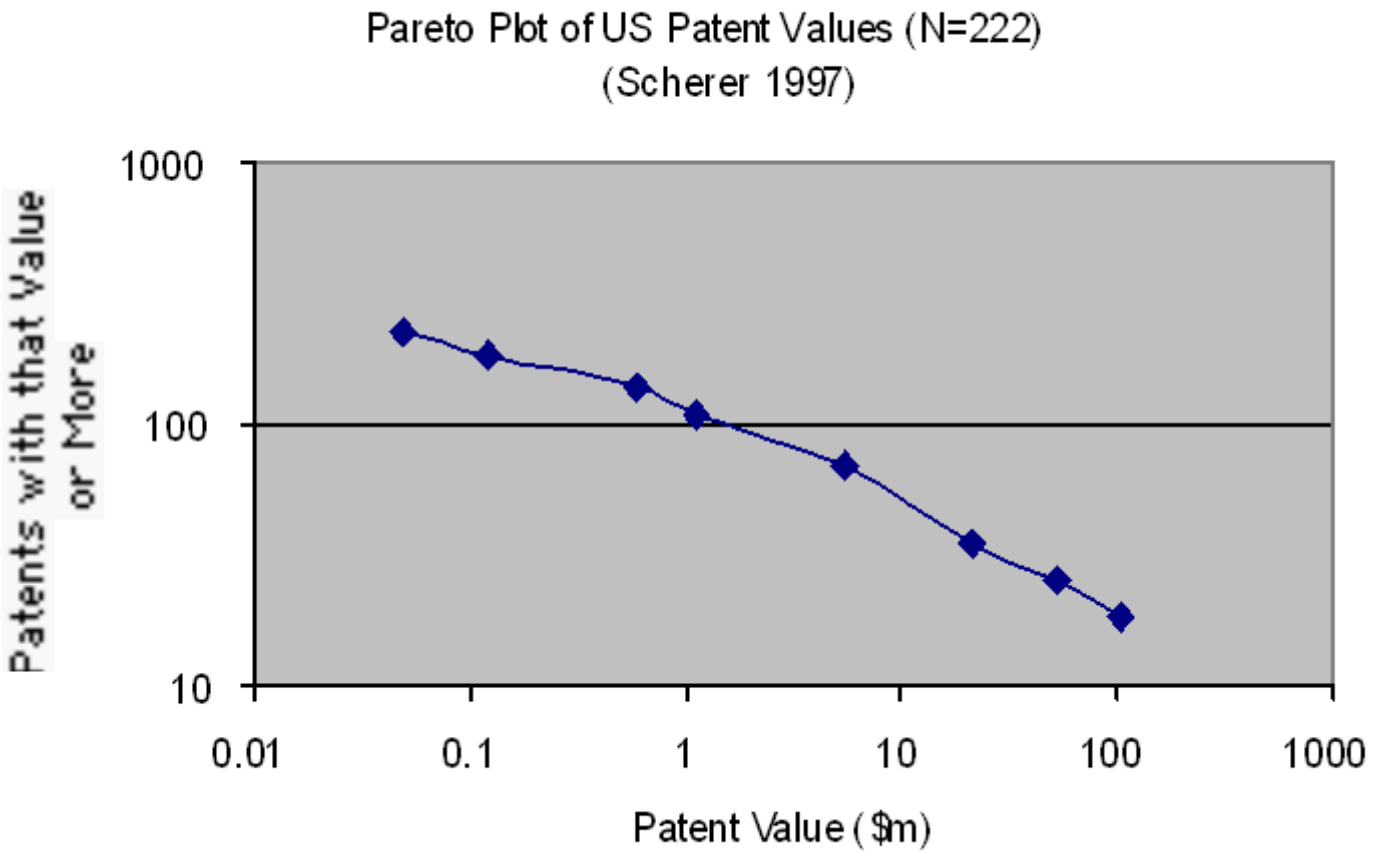
Patent Valuation is technically similar to other valuations

even if patents are still complex assets …

"Patents are like lotteries in which there are a few prizes and a great many blanks"

(The Economist July 26, 1851)

Patent Value Distributions from Interview Data



Little worth Lots - Lots worth little

Patents

- Patent Values may be inherently and uniquely uncertain
  - Patents are not identical frequently traded assets (such as shares)
- A Patent's value depends in part on the underlying project
  - It is distinct - though not easily separable - from the project's value
- A Patent only exists as a result of a series of decisions
  - These decisions all depend on explicit or implicit financial judgments
- Patent valuation is most difficult early in the patent's life
  - Which is just when research institutes / universities often need to value them…

The conventional view of valuation methods

Features Accounted for	Valuation Method	
• **Costs**	**Cost based methods**	Cost/ Market
• **Market** conditions	**Market based methods**	
• **Income**	**Discounted Cashflow**	'Economic'
– Time	- DCF Methods allowing for the time value of money	
– Uncertainty	- DCF Methods allowing for the riskiness of cashflows	
• Flexibility	**DCF Decision Tree Analysis**	
• Changing Risk	**Option Pricing Theory** - Discrete time : Contingent Claim Analysis - Continuous time : Black & Scholes option pricing model	

Most valuation methods involve cost market or income methods

An alternative view : Where does data reflecting Patent Value come from?

What "Patent Value" & "Patent Valuation" mean is often unclear

- **Measurement** / Ex-post
  - (analysis - less difficult & includes past *costs* & market prices)
- **Econometric Estimation** / Ex-ante
  - (prediction - more difficult: using patent data & opinions)
- **Calculation** / Ex Ante
  - (prediction - most difficult: using predicted cashflows/*income*)

Valuation Methods & Value Creation

Valuation Methods depend critically on how value is created :

- The value of many IPRs depend on the value of an underlying business *or businesses* :
  - Understanding these business(es) is critical to understanding the value of the IPRs.
- All businesses involve Value Chains
  - Understanding who is involved in and who else can capture value from the invention
- Businesses can involve many different business models
  - Understanding how these generate value and what alternative business models are available is critical. But...

    "University technology transfer is about the art of the possible" T. Hockaday, Isis

Valuation Methods & Pragmatism

Valuations within an organization *may sometimes* only need to be qualitative :

- Evaluation rather than precise Valuation may sometimes be sufficient
  - Relevant factors may be rated but not quantified :
    - e.g.: size of market, need for investment, royalty rates, margins, market attractiveness, etc.
  - Relative decisions may be possible :
    - e.g.: this project not that project, this project is clearly unattractive given those alternative investment opportunities
  - Many very approximate / qualitative scoring systems are possible
    - These may usefully be used in triage systems
    - Points can be awarded for various features and features weighted to assist decision making

"When in doubt, file an application"

(Grubb, P.W. (1982). "Patents for chemists", OUP)

Is this a justifiable decision making process?

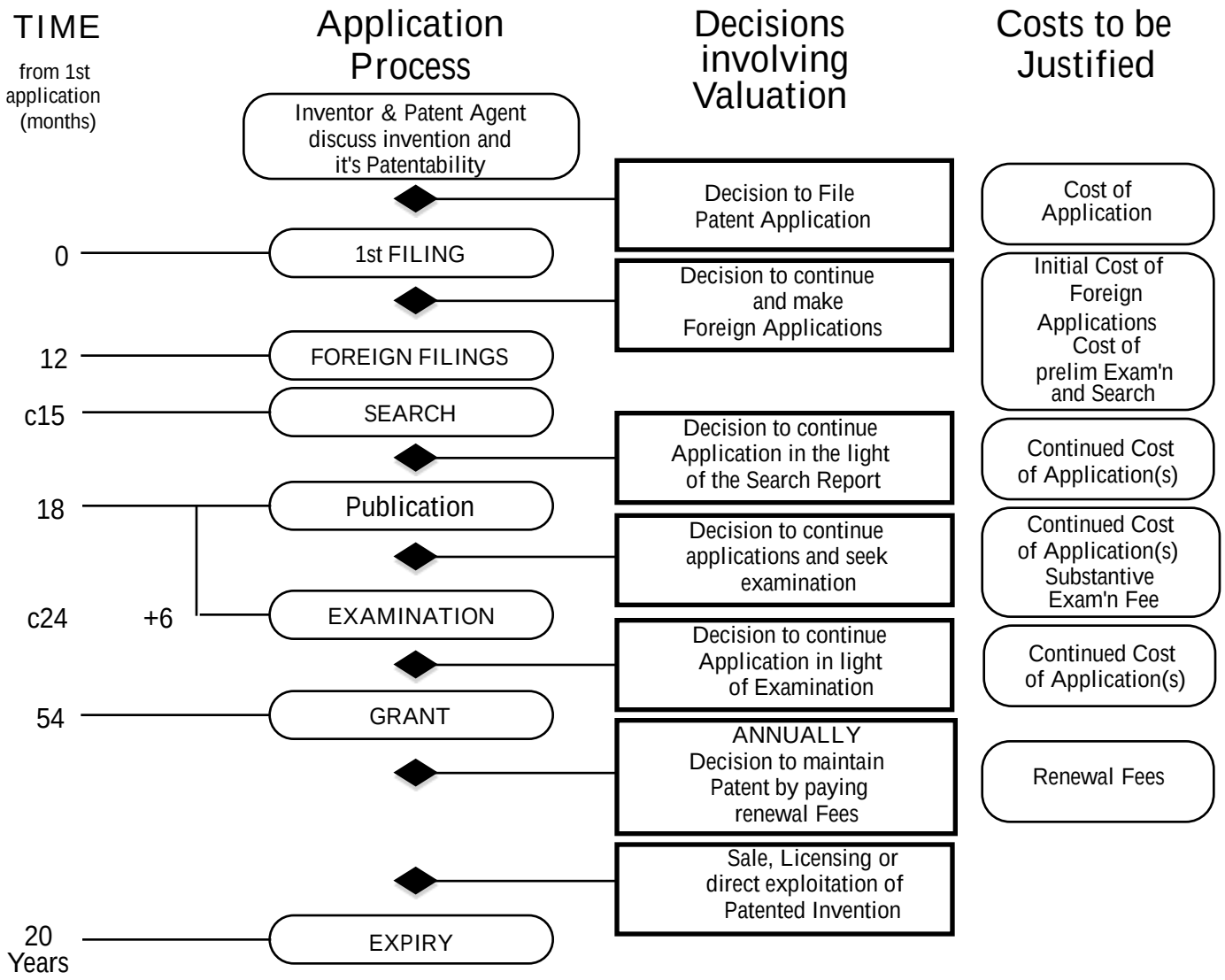
When is patent valuation relevant for research institutes?

Aims of Institutional Patent Valuation

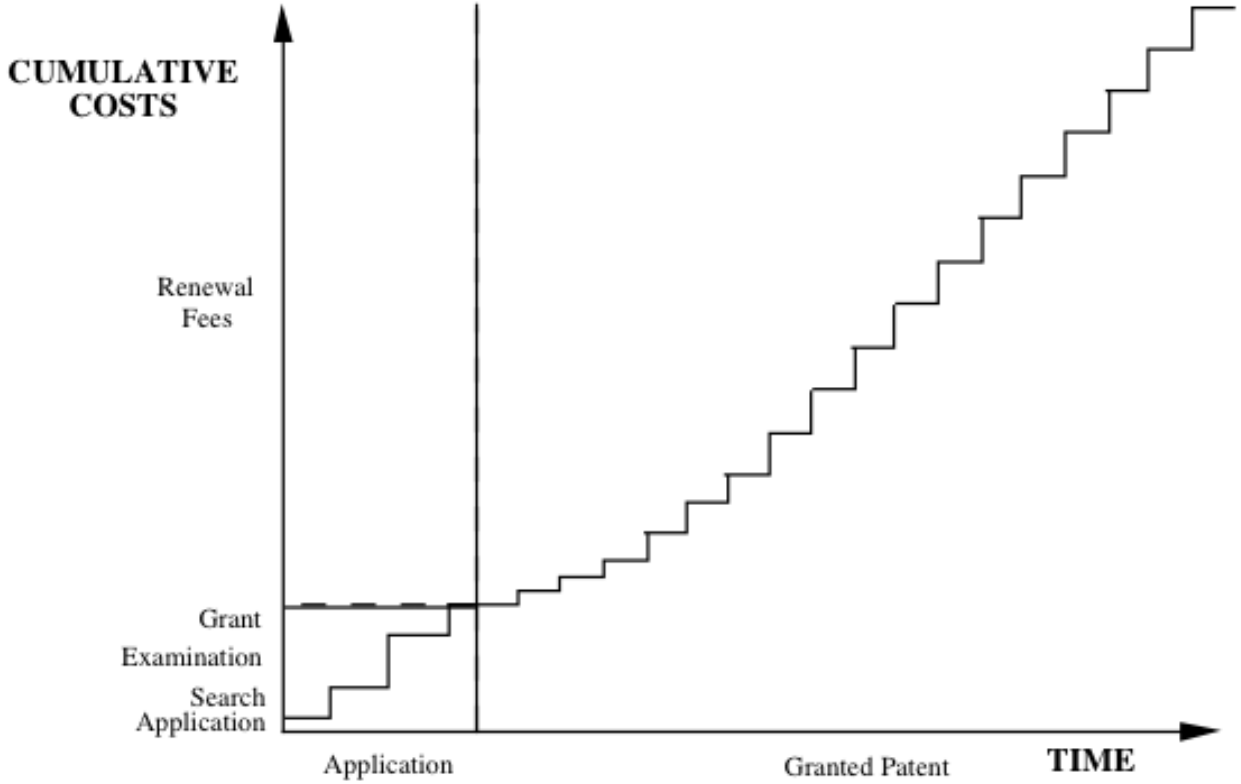
- To support *internal* decision making
- To provide a justifiable value for *external* transactions
- To maximize IP's financial contribution to the institution
- To minimize costs of the valuation (in time / complexity)

Most valuation methods thus represent trade-offs used in such situations

Patent Application Decisions:



Patent Application and Patent Renewal Costs



Patents comprise :

- A complex series of possibilities and possible choices
- Each involving costs and actual or potential benefits
- Which unfold over a limited time period
- Under conditions of considerable uncertainty
- And requiring a continuous series of financial decisions

When are Valuations used?

- External Transactions
  - Licensing / Purchase / Sale / Joint Ventures
  - Raising Finance / Venture Capital & Valuing Spin-Outs
  - Valuing IP for use as security for debt
- Internal Management
  - Internal IP Management Decisions
    - First Filing, Foreign Filing, Examination, Renewal
  - Accounting and Balance sheet information

Calculation or Measurement preferred by Patentee

(Large old or acquired IP portfolios may be an exception)

- Third party valuations
  - Investment decisions / due diligence
  - Acquiring or Licensing in IP
- Academic Studies

Calculation or Estimation preferred by 3rd Parties

Why is patent valuation relevant for research institutes?

What is the purpose of IPRs?

1. An economic **Incentive** for investment in Intellectual Assets

2. A means of **Diffusing** technical information

3. A means of **Controlling** Intellectual Assets

4. A means of **Packaging / Defining** Intellectual Assets

Promoting IPRs assists technology transfer

What is the purpose of a University?

1. **Learning**
2. **Teaching**
3. **Research**

The Discovery and Dissemination of Knowledge

This goes beyond but is not inconsistent with the financial objectives a firm might pursue

Technology transfer can assist the dissemination of knowledge

Licensing

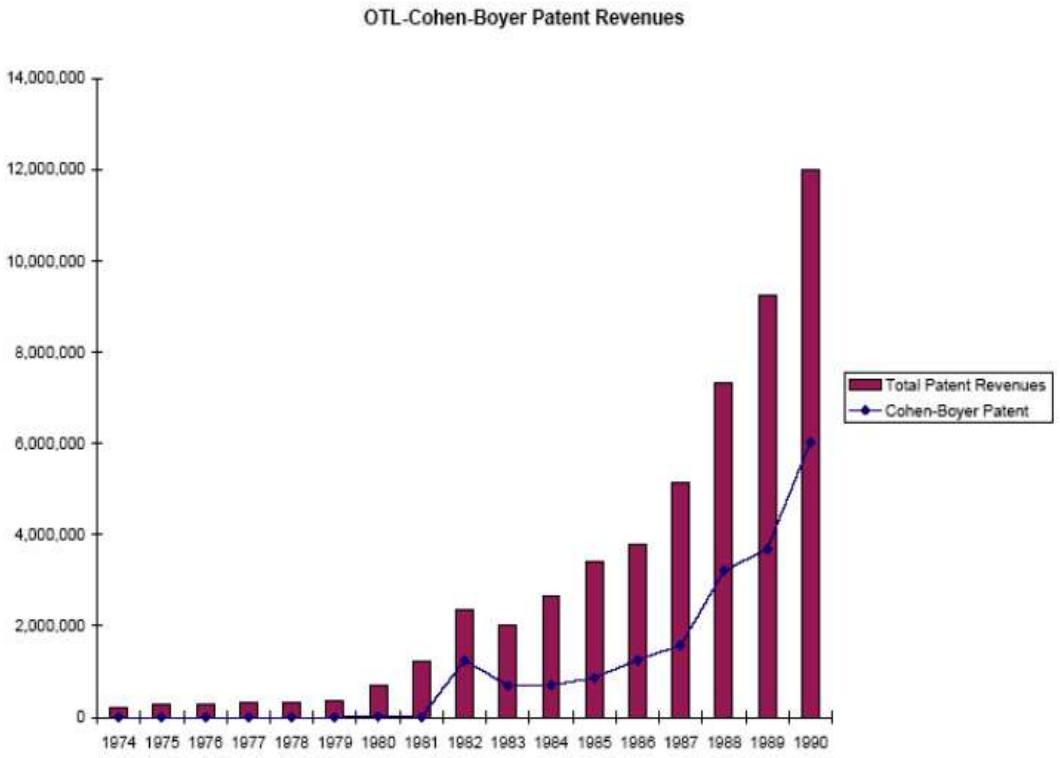
- Cohen - Boyer : Key Patent on Recombinant DNA
  "*Process for Producing Biologically Functional Chimeras*" US 4,327,224

- Paper Nov 1973 - US Application 1974
- US Patent Granted 1980
- US Patent Expired 1997

- $35bn Product Sales

- Licensing Revenues $255m from approx 467 licensees for Stanford OTL

Licensing requires justifying investment in the activities and institutions which make such licensing possible



(Source: Stanford OTL & M.Feldman, 2005)

University IPRs - Financial Reality

- The aim is not to turn Universities into Venture Capitalists but to avoid giving away Universities' share of research revenues

- Successful Inventions are Rare :
  e.g. Yale University 1982-1996
  - 850 Invention Disclosures $20million Revenue
  - 70% of Revenue comes from 10 disclosures
  - 90% of Revenue comes from 33 disclosures
  - Only 12% of disclosures (102) generated more than $10,000

- The probability of success is small but the potential returns high

Comprehensive but also Selective IP portfolio management is needed

IP Portfolio management needs IP and Patent valuation to help allocate resources

Technology Transfer Offices - Key Factors

- Funding Future Research
  - Providing for distribution of Research revenues
- Managing an IPR Portfolio
- Exploiting Past Research
  - Licensing
  - Venture Capital & Spin Out formation

A. Who owns the IPRs?

B. How are IPR revenues distributed?

C. What resources and skills are needed by TTOs?

All of these factors involve IP and Patent valuation – particularly to justify investment

Resources and Skills needed by TTOs

- Top-level University Support
  - as well as good relations with the university's inventors
- Funding/Investment to support initial IPR costs
  - Patent Applications, Etc.
- Entrepreneurial Technology Transfer Office Staff
  - with experience of IP contract management
  - with technical and commercial assessment skills
  - able to sell IP advisory services to University Researchers
- Wide-ranging commercial and legal contacts
- Speed - Able to act quickly to protect IP assets
  - Able to act quickly so as not to hinder academic publication

Research Institute and University patents must help not hinder research
a) they must be seen to add value - but b) they need investment

OXFORD CATALYSTS
FUELLING A CLEANER WORLD

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OVERVIEW

Oxford Catalysts produces specialty catalysts for the generation of clean fuels, from both conventional fossil fuels and renewable sources such as biomass.

INNOVATING ENERGY

Our patented intellectual property and technology is the result of almost 19 years of research at the University of Oxford's prestigious Wolfson Catalysis Centre, headed by company co-founder Professor Malcolm Green, one of the world's most respected inorganic chemists.

Each of our catalysts boasts several of the following key benefits:

- Greater cost effectiveness
- Higher productivity
- Better selectivity (leading to higher quality output)
- Increased resistance to contaminants
- Longer operational life

Core products include catalysts for the following markets:

- **Petro/chemicals**: removing sulphur from gasoline/diesel and converting natural gas or coal into ultra-clean liquid fuels
- **Fuel Cells**: generating hydrogen-on-demand from methanol starting at room temperature or from conventional hydrocarbon fuels by reforming at higher temperatures
- **Biogas Conversion**: transforming waste methane into the chemical building blocks of liquid fuels
- **Portable Steam**: creating superheated steam instantaneously from methanol and hydrogen peroxide

http://www.oxfordcatalysts.com

April 2006:

Oxford Catalysts raised £15 million through the Alternative Investment Market (AIM) of the London Stock Exchange

Both the academic founders and the University of Oxford retain significant shareholdings in Oxford Catalysts.

Spin Outs

Advantages

- separation of Business from core Organisation
- better value extraction compared to Licensing (the main alternative)
- opportunities to raise capital to gain resources for exploitation
- retention of some control

Disadvantages

- more complex : inventors, university/organisation + investors
- critical reliance on people
- need to sell the business idea to investors
- need for many advisors : lawyers, banks, brokers, etc.
- need for initial seed capital to get the process going

Spinouts, Licensing indeed any effective sale of revenue from patented technology involves valuation

Creating a University IP Culture

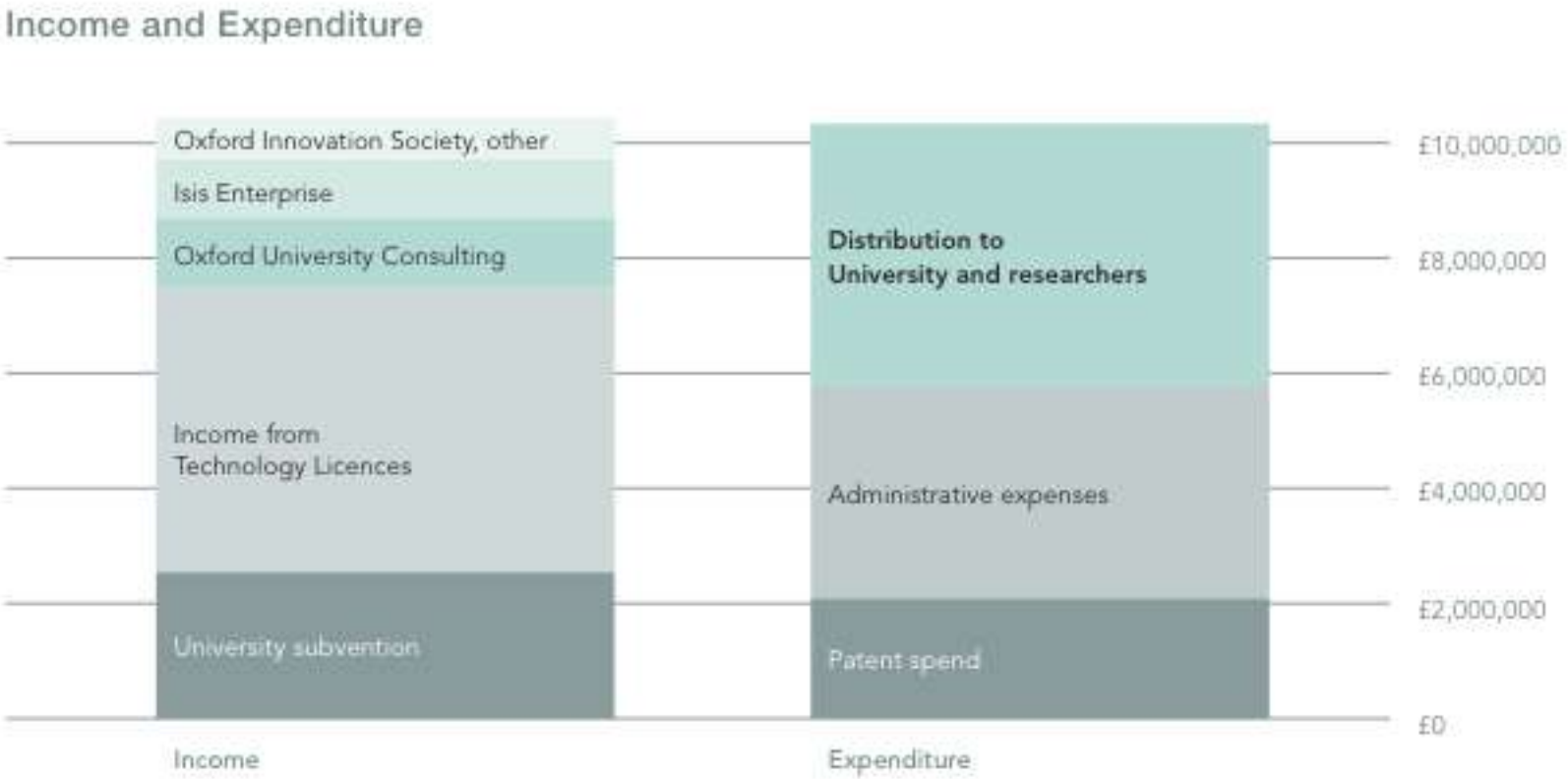
Creating an IP culture in a University requires :

- **Top down organizational support of and investment in a University TLO**
  - Investment in the TLO's successful/justifiable commercialization of IP
  - Provision of wise IP Policy formation and IP advice
- **Attention to academic interests and academic concerns**
  - Understanding is needed of the pressures on and motivation of :
    - university researchers
    - industry and investors
    - law faculty members
  - Attention to potential conflicts of interest (COI) and creation of a good COI policy
- **Bottom up motivation and involvement of Researchers**
  - University TLO and RSO activity must be such that it is in *the researchers interest* to seek their advice and help rather than ignore IPRs or seek help elsewhere
- **IP awareness promotion activity by the TLO & others**
  - opportunities for researchers to learn more about essential IP awareness

Investment involves Valuation

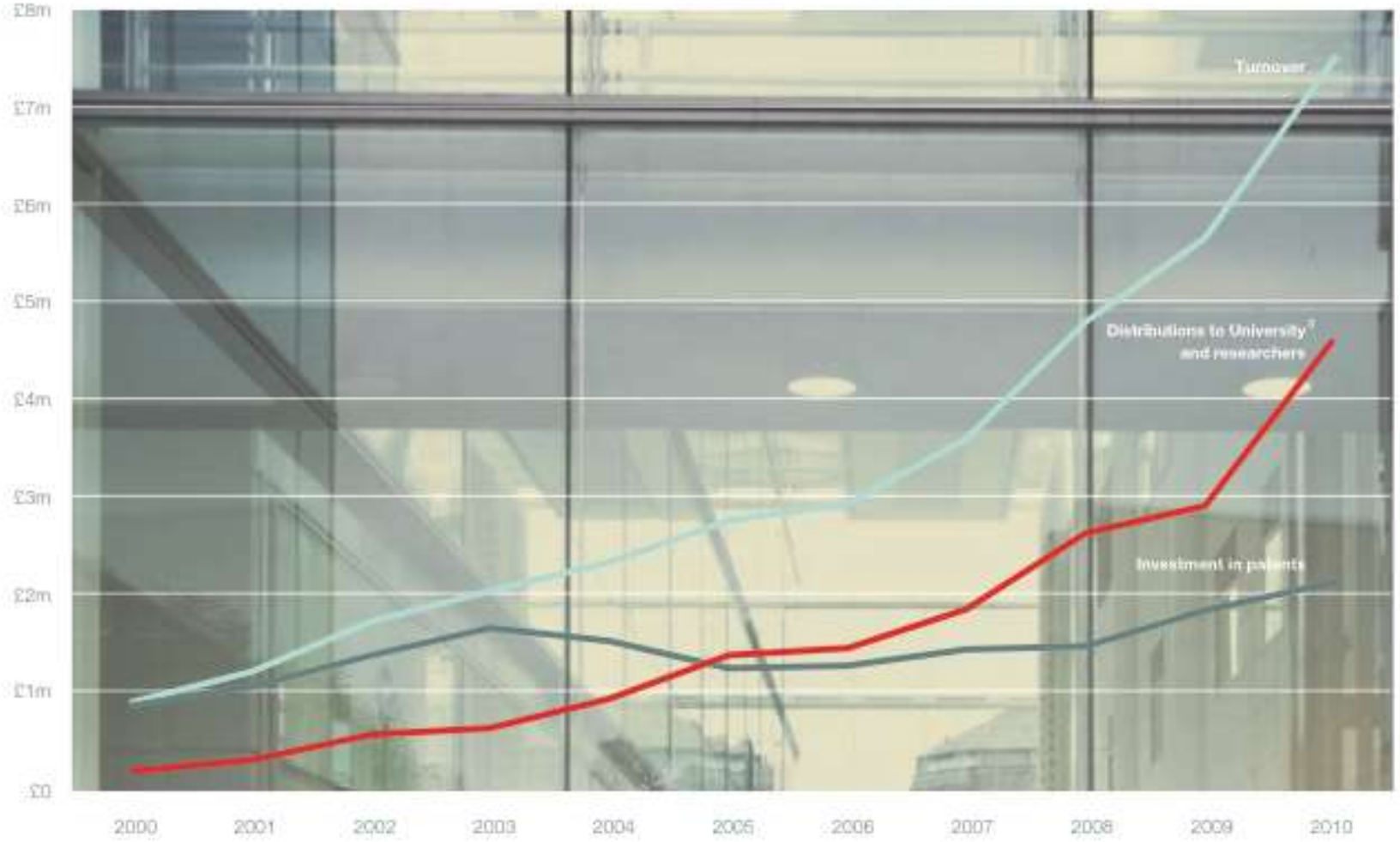
Isis Innovation Annual Report 2010

Isis Innovation Annual Report 2010



http://www.isis-innovation.com/documents/IsisAnnualReport2010.pdf

Isis performance from 2000



Isis Innovation Ltd is wholly owned by the University of Oxford.

Conclusions

In a Research Institution / University

Patent & IP valuation more generally is essential to :

- Manage the process of obtaining Patents and IP
- Manage the process of exploiting Patents and IP
- Justify and plan investment in these processes.

Patent valuation thus contributes to the institution/university's broader aims of disseminating research results