LISA Kick-Off – Edited Slide Deck

- From session on 24th Nov 2020
- Business Basics & Entrepreneurship & Innovation
- Please email any comments, questions, request for further materials to: f.reid@ucl.ac.uk

Science-Business
Differences in Values & Vocabulary

Apex of Difference

- Purpose
- Precision – levels of..
- Proof – Metrics
- Scientific concepts and skills that are useful in Business include…..

How business reads this…

- Spectrum of Values from profit max to social impact alongside profit
- Fuzzy, perceptions, social constructions of ‘value’
- Progress measurements as ‘return’
- Thermodynamic equilibrium, data, patterns, complex systems, rationality, imagination, interaction, structures, network, problem-solving.

Purpose

- The purpose of (almost* all) Business is to create sustainable profits for its owners
    - Shareholders hold all the power including over Chief Executive
    - Not-for-profits & Institutions are also under pressure to create income
        - *or prove social/economic impact

Purpose clashes at our Science-Business interface

Business

- Driven by external needs
- Clear goals with shareholder commitments
- Commercial confidentiality

"Academics never deliver"

Researcher

- Self directed
- Next step defined by yesterdays results
- Free exchange of ideas

"Industry is out to cheat us"

So we can expect it can be challenging to build a mutually trusting relationship in creating actual spinouts & licences.

Business

- "A typical business sells either":
  - Product
  - Process
  - Service

What else…?
Answer in Chat

A company may:
- Sell a tangible final product
- Sell a tangible component product
- Sell a service
- Sell a process
- Sell an intangible asset
- ***Sell dreams***

.....Or some combination of the above

- "The business's goal is sustainable generation of profit"
- Value to Owners – (share of profits, *increase in value*)

Types of Business, different rules ?

- Types of company:

  Sole trader, partnership (LLP), private company, public company, franchise

- Constrained by Rules: on Tax, Ownership, Liability, Management, other regulation such as Health & Safety may affect types differently
- Growth internationally is in part a search for the best set of conditions to operate

Regulation is key determinant of constraint for LISA

Question…..One-word answer

What is the only *necessary* and *sufficient* condition for business?

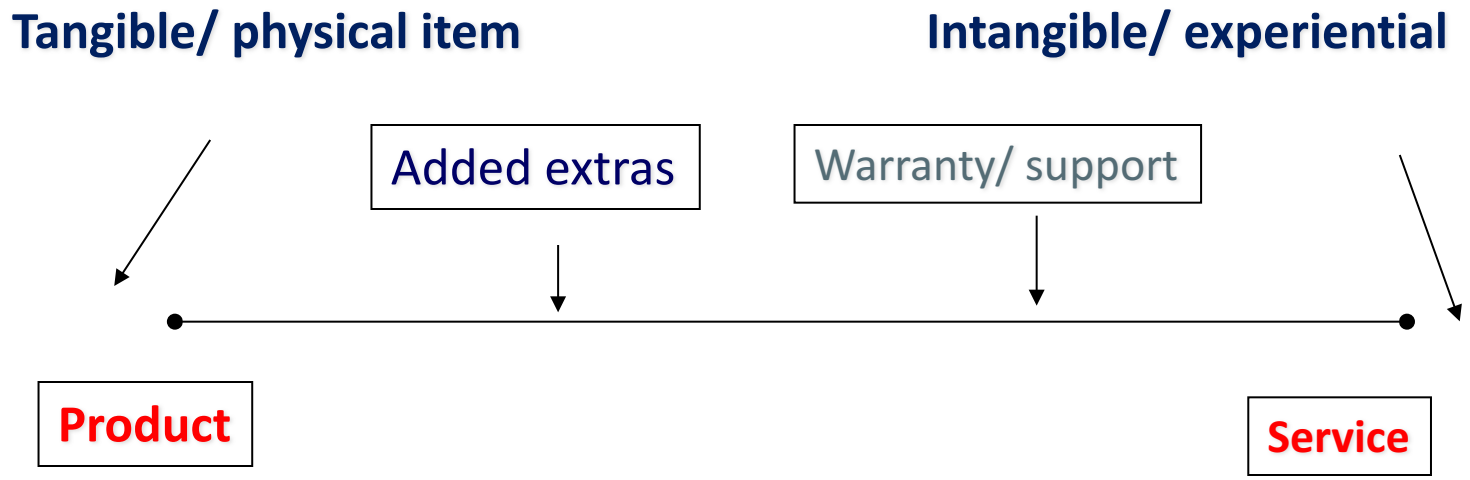
CUSTOMERs!!

What is a Market?

- Set of actual or paying buyers of a product process or service
- Market Economics – Market forces
  - Customers are not the same as users
- Product – Service continuum

Product-Service continuum

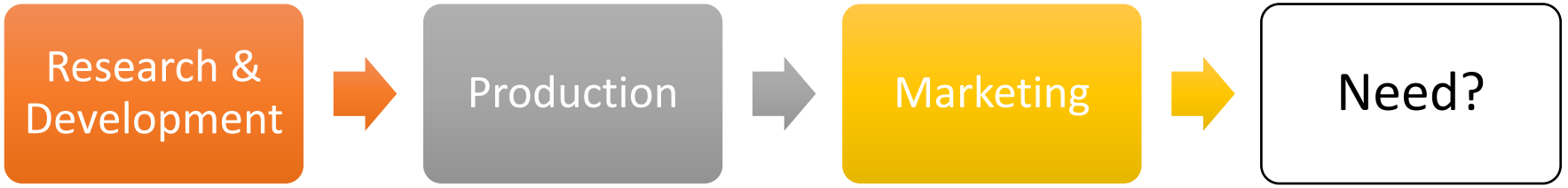
- Services can be seen as bolt-on products to core offering to gain competitive advantage, and vice versa
- **By adding services to products you can make them more 'valuable' to the customer**



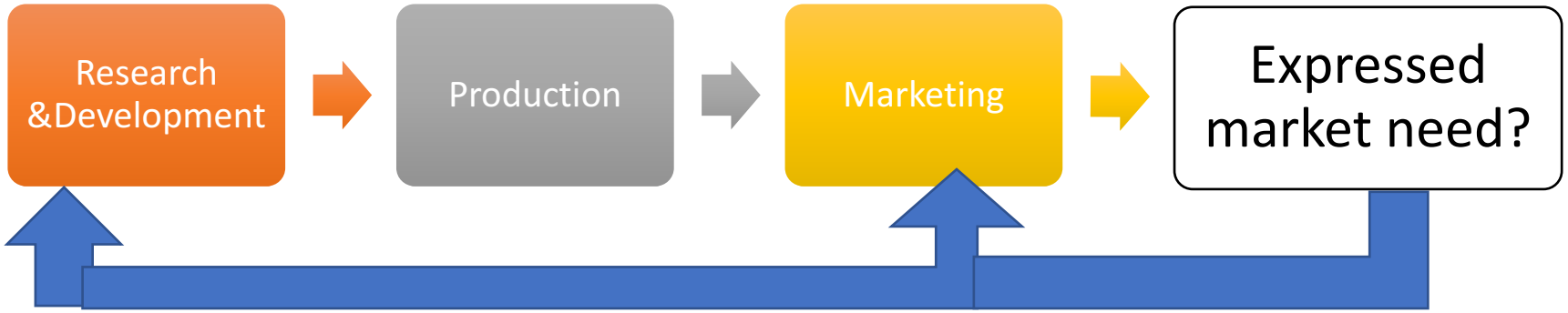
For Actinides science, we have the Customer-User continuum to consider

Technology push vs Market Pull

Technology Push



Market Pull



Here's a good Question….How does an innovation benefit the customer

Reduce effort	Dyson removed the need for dust bags and improved vacuum power
Convenience	The microwave saves time and effort
Enjoyment	Starbucks and other coffee chains transformed the cup of coffee into a lifestyle experience
Excitement	Online gambling
Feel powerful	Alexa – Remote digital assistance

LISA - several sets of “customers” along a complex journey towards ”value”

- Customer = partner (s) who can de-risk the technology as it proceeds towards the market
- Customer & End user* requirements – you can never know enough

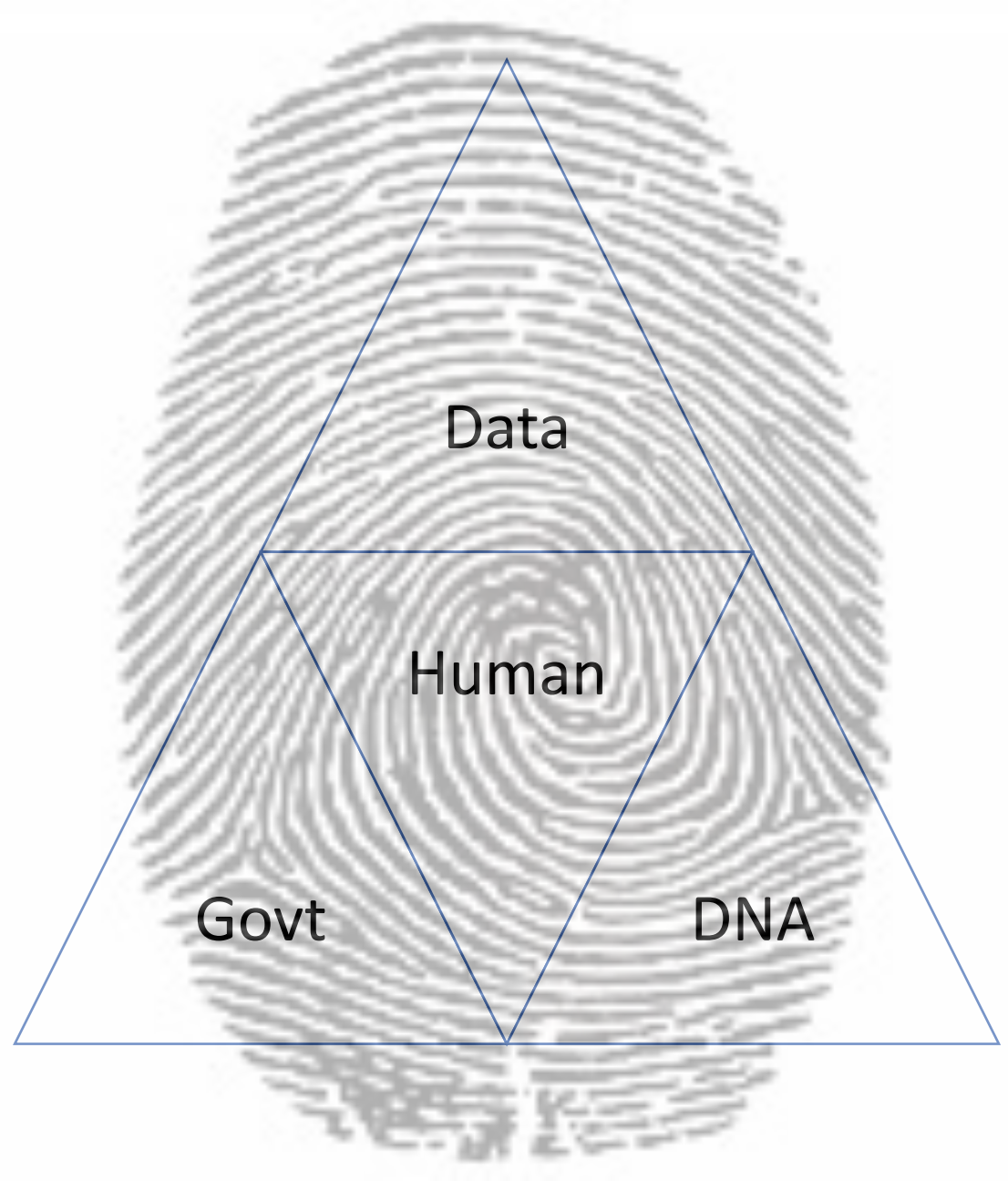
➔ Understand the drivers and constraints of partners/buyers

- * (not the same as customers, but very important)

Classifications - Power & Institutions

This diagram represents one single word
What is it?

THINK FIRST….
Answers in Chat

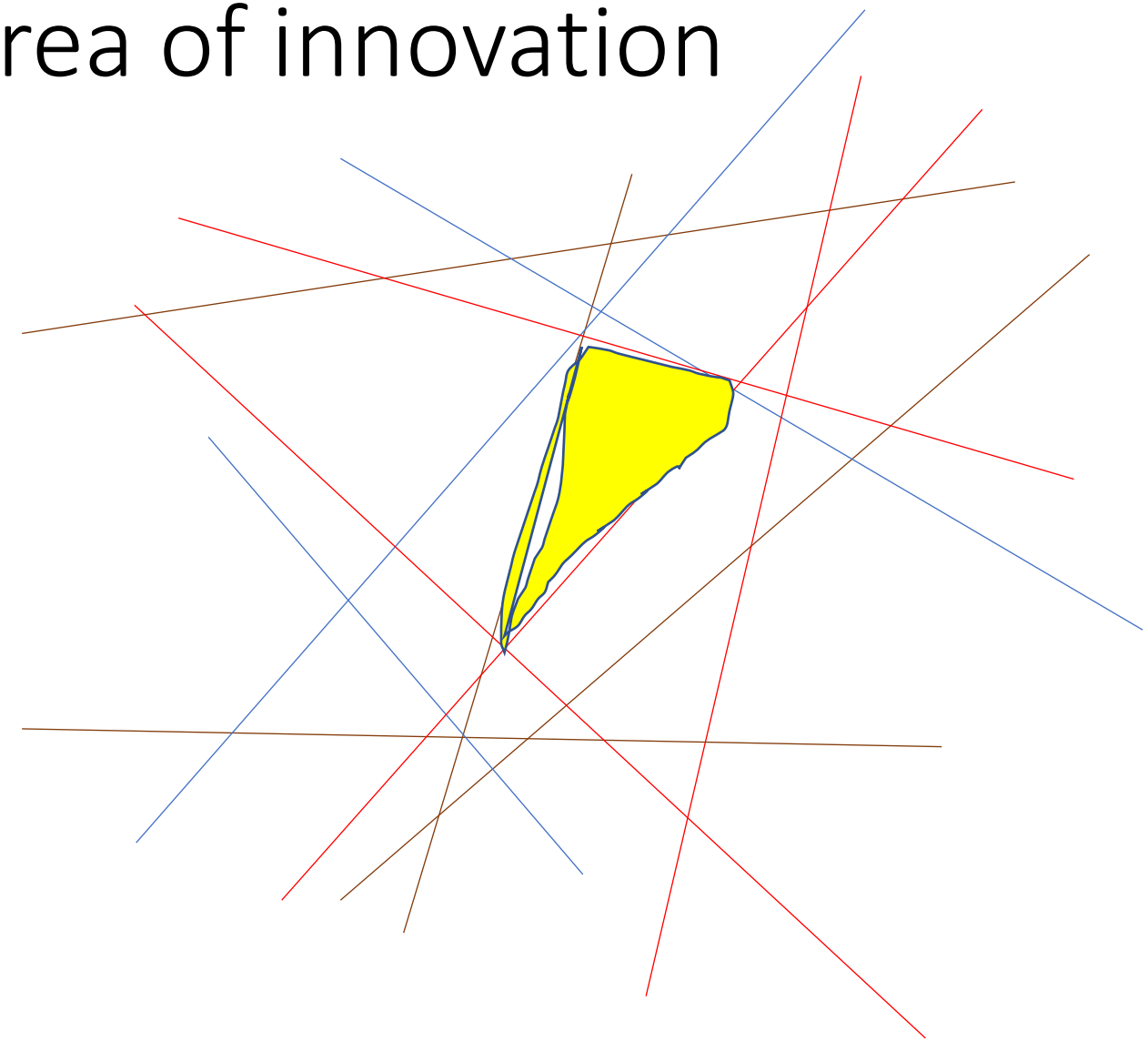


Institutional Behaviours – with a special focus on Regulation

- Institutions set up for a purpose* or to solve a problem
- When they achieve that purpose, then they defend boundaries
- Different shaped problems = hard to reclassify boundaries

- Regulation:
  - National, supra-national and institutional level
  - IP, Clinical trials, Health & Safety, Funding, Classification, etc
  - Grey areas: interpretation; historic nature; alignment across institutional boundaries, concepts of risk

The regulatory picture may not apply easily to your area of innovation



The overlapping layers of regulation – as applied in principle and practice – define the area within which new value *can* be created
Understanding constraint is a source of creativity

Fig.1.

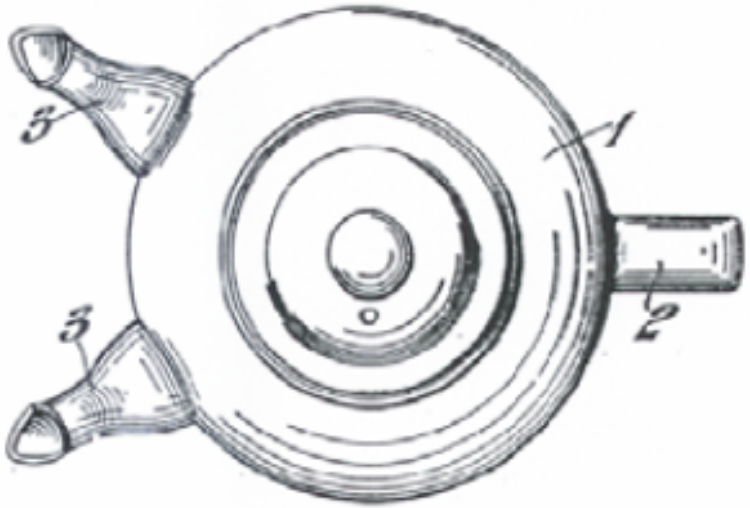


Fig.2.

Patents (Intellectual Property)

Patent application "description" of a twin-spouted tea pot

Prior art

Teapot with one spout

Drawback of prior art

Time-consuming

Problem to solve

Reduce filling time

Solution

Provide a second spout

Advantage of the invention

The time needed to fill multiple cups is reduced

Patents are a *Technical* and an *Economic* Instrument

Four forms of money

- WHICH QUADRANT DOES EACH OF THESE ACTIONS BELONG IN?

- You buy a government income bond
- You are budgeting for a 21st party
- You create a cashflow statement
- You exchange some Euros into Bitcoins

Vocabulary - four key **nouns**

Word	**What does this mean?**
• Asset	• Something that you own
• Capital	• Funds available to generate income
• Equity	• A form of security that represents ownership
• Return	• Income plus gain on an investment

Lots of key **adjectives**

- Net - remaining after all deductions
- Fixed – non-variable over time, ‘set’ not available to be liquidated soon
- Current – Not fixed (asset) available to be liquidated, realistic, within a year
- Tangible/intangible – physical and non-physical
- Accrued – due but not having been paid
- Book - showing in accounts, different from ‘market’
- Residual – at end of useful life
- Working – available for use in running the business
- Deferred – opposite of accruals, received but not yet delivered on
- Operating – ‘actual’ but before deductions
- Discretionary - involving choice (in theory)
- Consolidated – combined (eg group accounts)

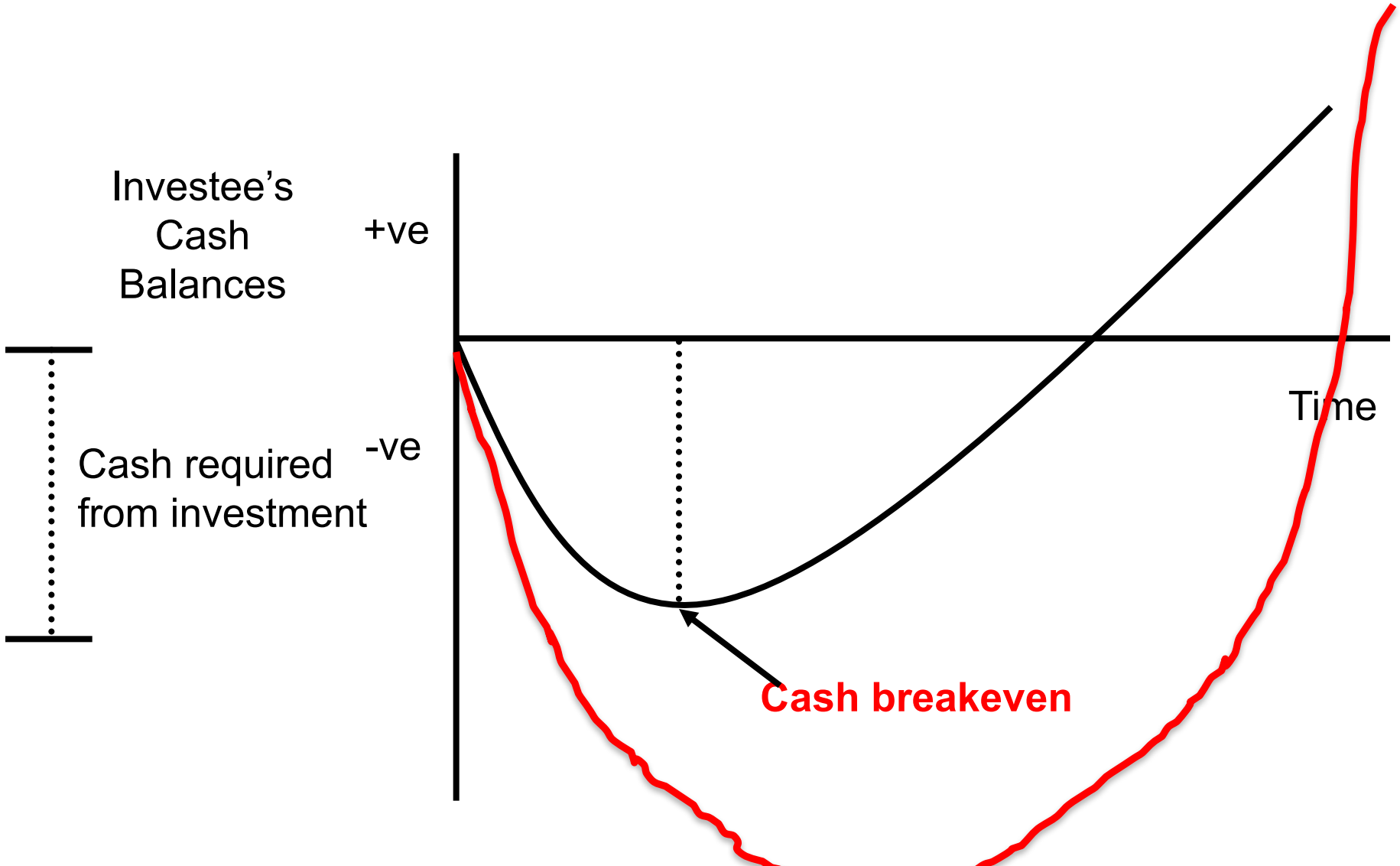
A patent is an intangible fixed asset
Brand is an intangible fixed asset

Investment –

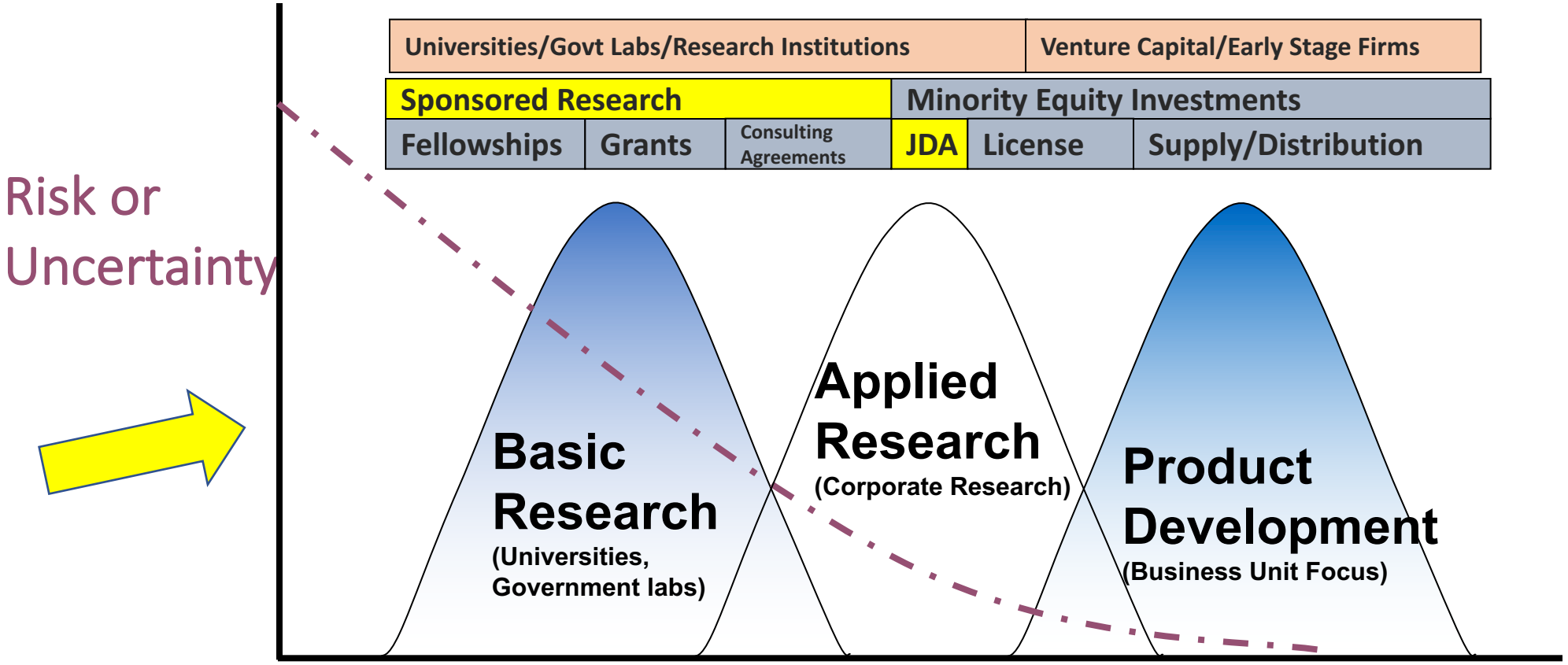
What is the one thing, the one Word that all investors want? (answers in the Chat)

Investment follows “hockey stick” curve

In most R&D-based business: the curve is steep; long-term, heavy-duty cash, risky

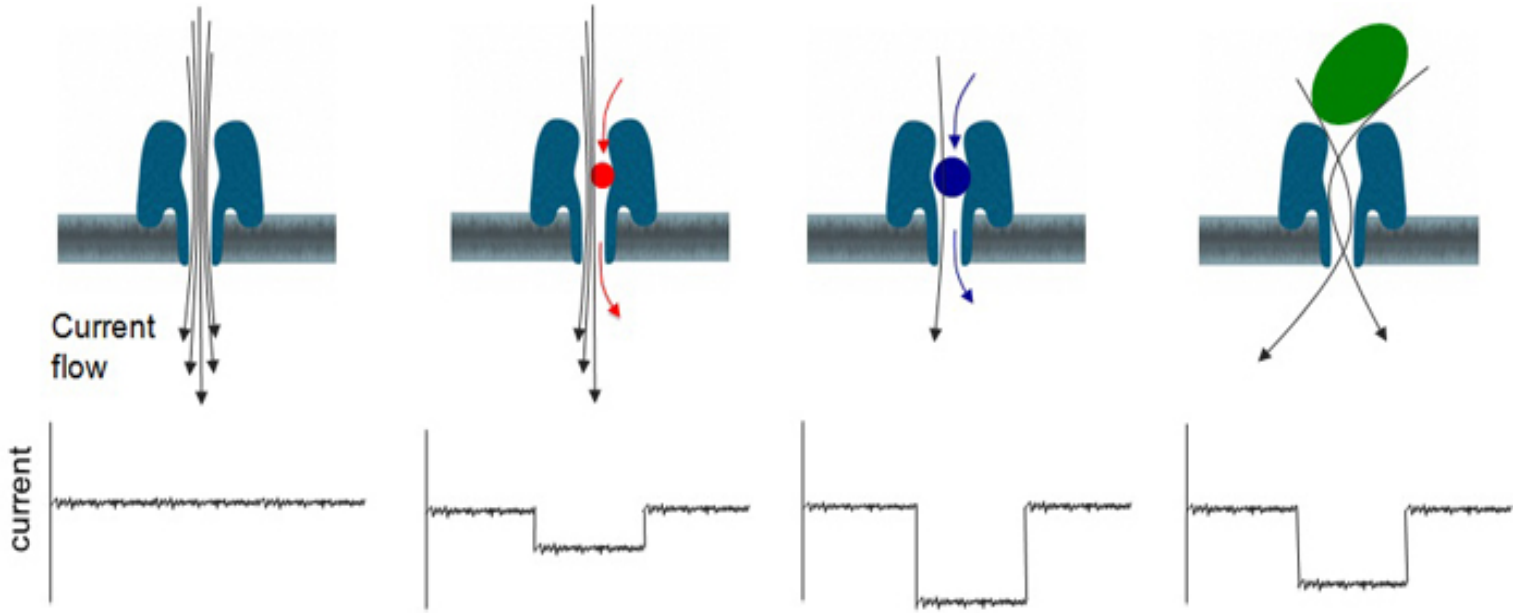


Research & Development Continuum



Nanopore – platform technology

CLEVER IDEA – Work out the DNA of a single molecule



Govt, University grants (cash); proof of concept Year 1

Seed Funding £7.5 m

IP Group Year 2

Seed Funding

£10 m

IP Group Year 3

Illumina £11.9, plus deal, £2.9m private

Investment

Year 5

£17.4m round existing + new investors

Year 6

£25m from existing investors

Year 7

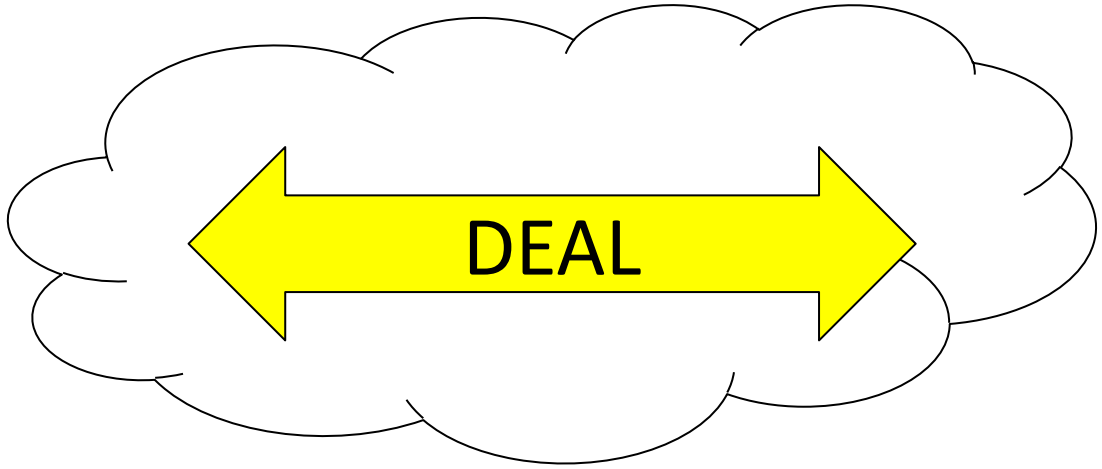
Up-front Summary – who are the investors

- Investors are people who seek financial return on their investment:

- Commercial investors want to grow money they already have
  - Seeks people to invest it in
- Governments, not-for-profits, foundations, charities
  - Step into the high-risk, human benefit space where £investors fear to go; Governments (or not-for-profit organisations) often take the risk in high-risk or early stage ventures, to make them 'investable' by professional investors
- Social investors seek social impact, personal good

This is “Deal” philosophy

BUYERS
(investors)
Growth,
return,
soc/econ
impact



SELLERS
(Innovators)
Capacity to expt
Opportunity
goals
New knowledge

- Deals mean negotiating a solution where everyone gets what they **need** and at least some of what they **want**
- Buyer objectives are often financial, strategic or power related

Match the Funder (left) with the Activity (right)

Type of Funder

- Crowdfunding (grant or equity)
- Government "Innovation" grant or small business support
- Private investment (HNW individuals + friends and family)
- Banks (debt)
- Companies (Corporate venture capital, joint ventures, investment)
- Business Angels (£50,000 to £250,000+)
- Foundations (not for profits, charities)
- Venture Capitalists (£0.5m upwards)
- Private Equity firms (Sovereign Wealth funds (Norway, Middle East)

Activity (what they do, what happens, what they might say)

- Bill & Melinda Gates Foundation funds vaccine development
- Very rich Aunt Florence supports your start-up
- Dear HSBC, please may I borrow £50,000?
- UCL and Mercedes set up a joint venture to develop CPAP ventilators during Covid
- "Let's send the elevator down"; give the team money and the benefit of my experience
- Idea attracts lots of micro-funders who give cash, or buy small piece of business via web platform
- EC Innovation gives R&D cash to nanotech materials start-up
- Big pile of cash and debt buys up the franchise rights to café Patisseries Valerie and opens up branches all over the world
- A patient, long-term funder investing for "national good"
- "We've just invested in the next Uber…"

Flows of money fluctuate around constructions of value, and of opportunity

This is a fuzzy space

Entrepreneurship & Innovation

The One-Minute Summary

- Ideas ⇌ Context = Opportunity
- Opportunity + Implementation = Value creation
- Value + Leadership = Growth potential
- Growth potential + Investment = Profit
  - (or “good change” if we’re after social impact)

- We can apply process and understanding to this
- By not assuming more certainty than there is
- By applying right type of understanding – not “Management 101” to turn uncertainty into knowledge
- Bold Leadership

The One-Minute MBA in five key words

- **Management** = effective allocation and efficient use of scare resources
- **Innovation** = doing things better and different
- **Business Model** = how you arrange business to make money
- **Strategy** = how you arrange resources (army) to conquer the competition/achieve set goals
- **Entrepreneurship** = creating new value

What's more important for successful innovation?

Answer in the Chat

Idea?

Person?

Invention is *much* less important than implementation.

➔ it takes persistence and patience!

Source:The Economist, 18 Feb 2019

Entrepreneur Stereotypes

”The Buccaneer” or “The Pirate” exemplar is Virgin Founder Richard Branson

Working definitions of Entrepreneurship

- = pursuit of opportunity beyond the resources currently controlled
- = creating new value

  - The nature of that opportunity and the ability to create new value from it, depends on the “context” where that opportunity exists
    - “Context” can be geographical, sector, cultural, social, economic and more

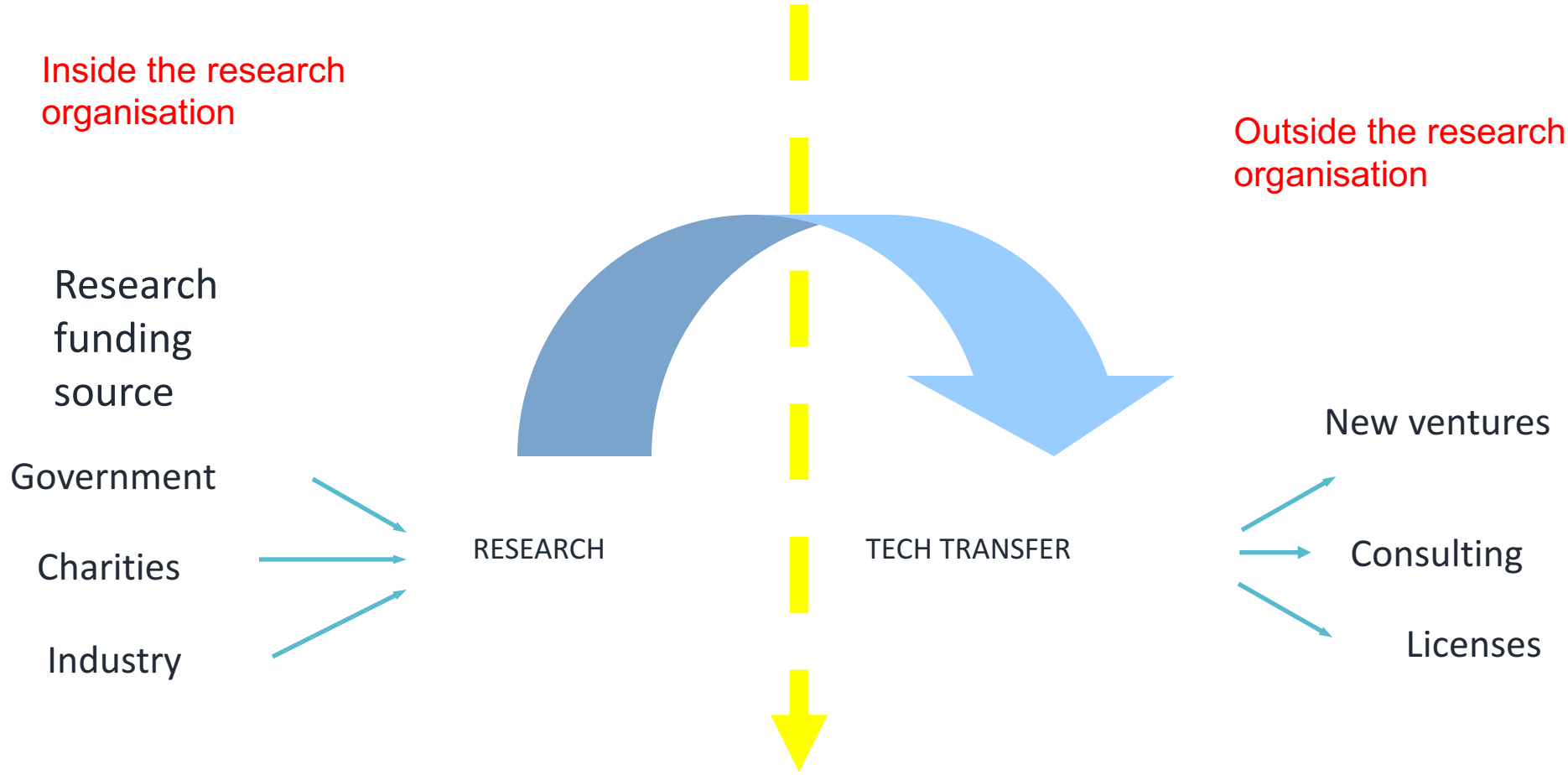
One Minute Summary, of what entrepreneurs do

- Entrepreneurs bring in money in three ways
- sell to customers **(income**)
- borrow money (**debt**)
- Get people to **invest**

- This is not just about cash but about *value*
- Entrepreneurs can *create new value* by:
  - creating an asset (patent, company, licence) that is then sold;
  - creating ownership structures that raise more money and can be sold;
  - or a derivative of that asset (trading on share prices, options, price fluctuations)

Translate that into…
routes to value for researchers

Assignment of intellectual property rights



The key moment is the transfer of Intellectual Property

Where are you now? Commercial knowledge transfer routes from position of researchers

- Licensing
- Creating a company using a research organisation's intellectual property (Spinout)
- Creating a company not from within an organisation, where there is no intellectual property, or you own it (Start-up)
- Consultancy

Do you need a company? Why not licence

> “Roche makes access to its PCR patent portfolio readily available worldwide through licensing programs. Roche offers companies rights to make PCR products for human or veterinary diagnostic testing, and also licenses labs to perform PCR-based testing. Roche's out-licensing programs encompass not only the field of diagnostics but that of diagnostics research as well, which applies to activities related to research, development and improvement of products and processes for the human diagnostics field. Our *in-licensing* efforts focus on supporting the development of innovative, novel molecular diagnostics tests.”

- PCR

  Invented by Kay Mullis, working for Cetus Corp

  Hoffman LaRoche buys patents in 1992

- Broad applications

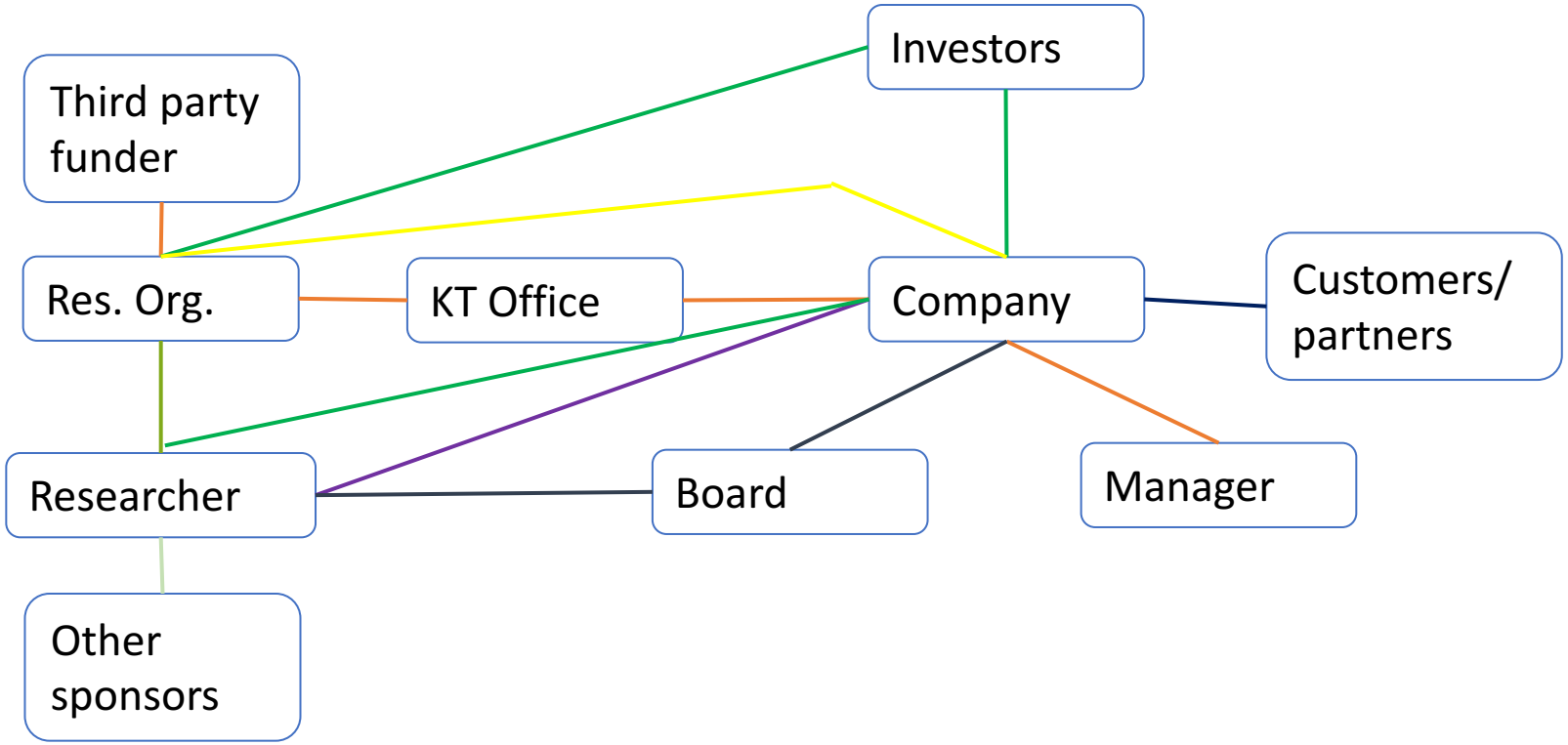
- Patent controversy

Licensing

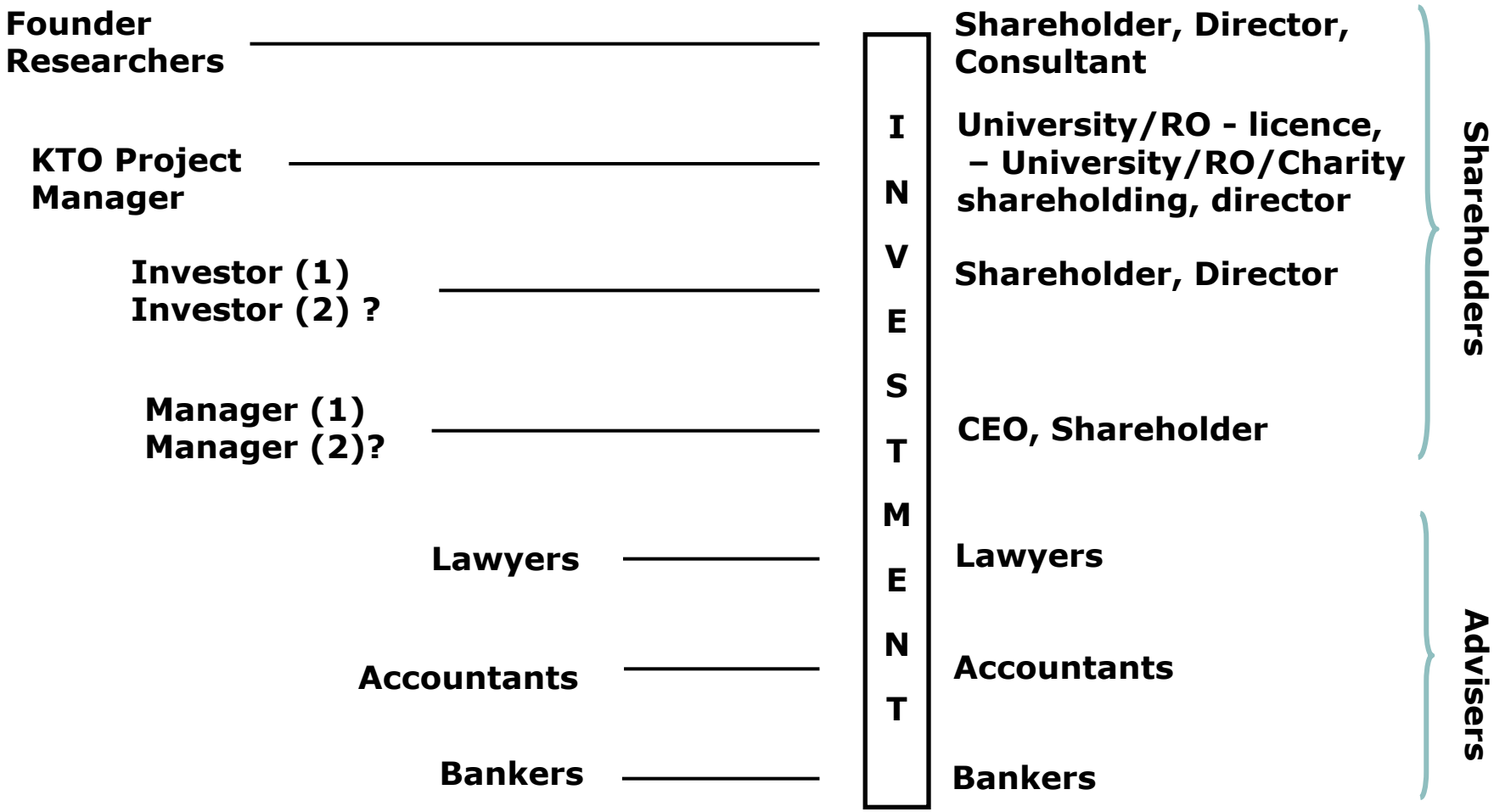
- The grant of a licence allows a third party to use your intellectual property for their business - usually in exchange for money
- You can grant more than one licence for each piece of intellectual property; you can grant licences containing several IP rights
- Licensing to an existing business can be less risky than licensing to a new start-up

Licensing Agreements

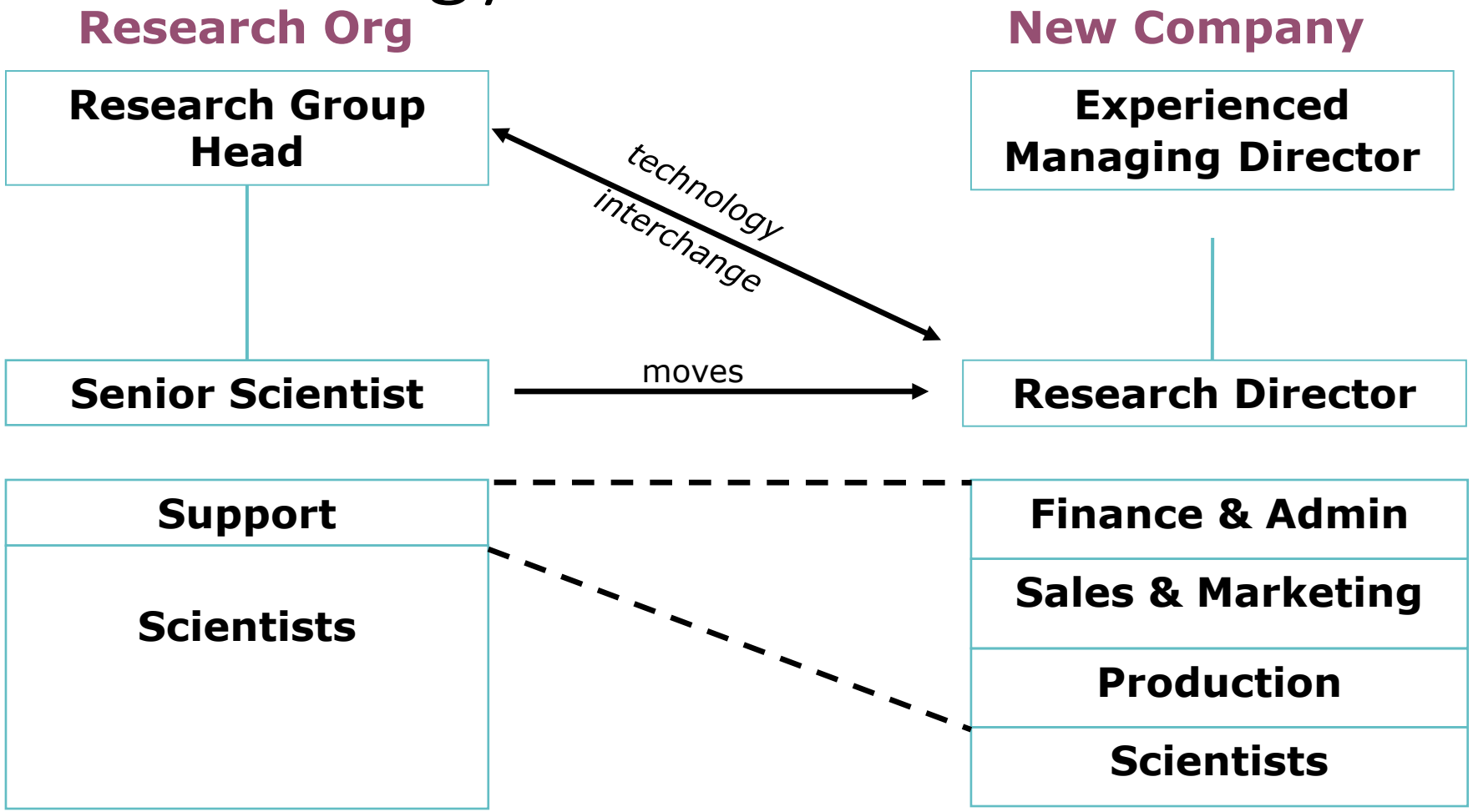
can be complicated…the lines represent agreements…in a simple case



Spin-out Elements



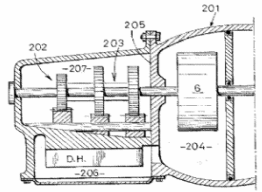
Spin-out Strategy



Ownership – control and assets

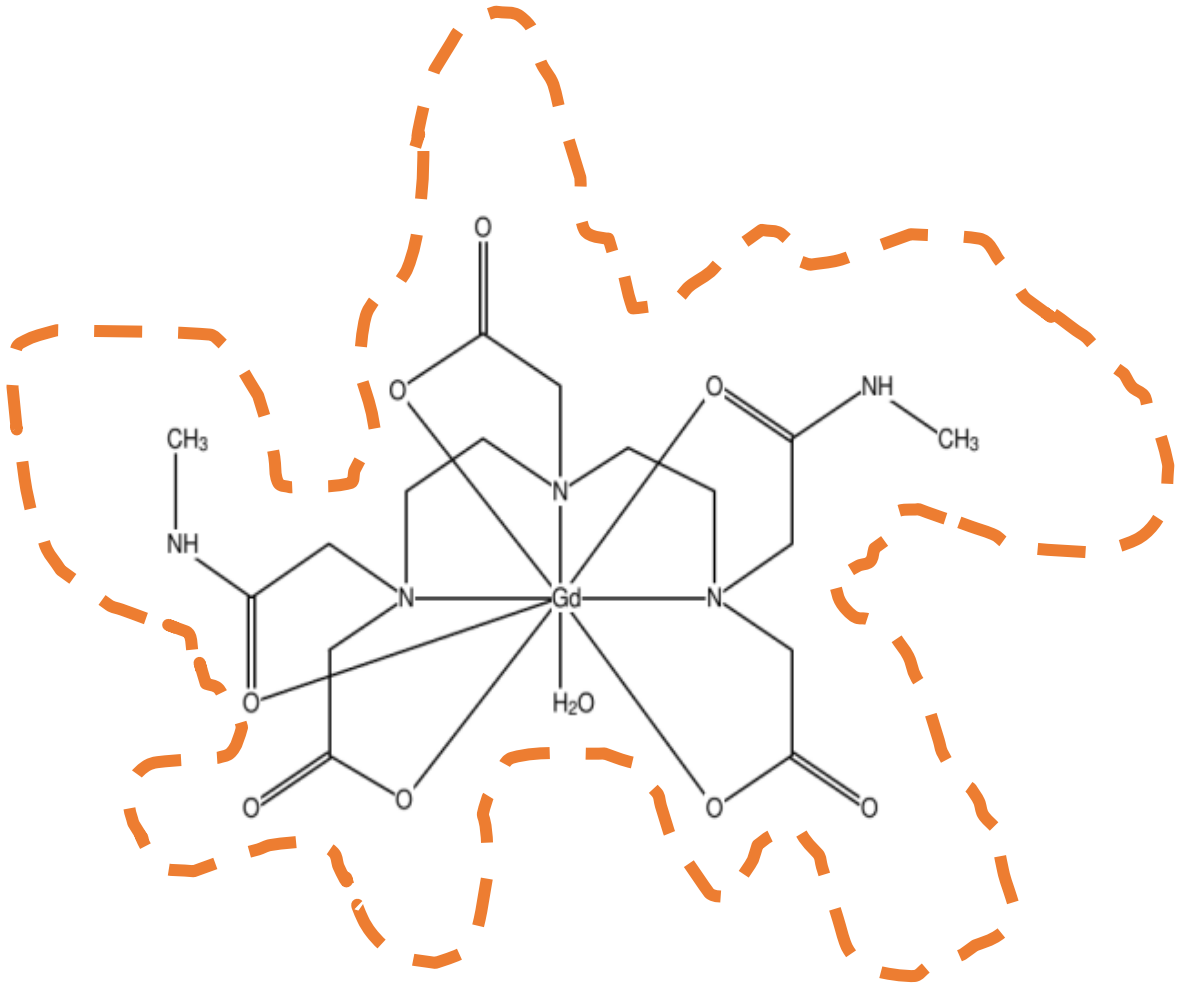
Intellectual property

Legal right	What for?	How?
Patents	**New inventions**	**Application and examination**
Copyright	Original creative or artistic forms	Exists automatically
Trade marks	Distinctive identification of products or services	Use and/c registratic
Registered designs	External appearance	Registratio
Trade secrets	Valuable information not known to the public	Reasonable e to keep sec



Let's not forget Plant Rights

Something simple in intellectual property: It’s easier if you can draw a line around it



Let’s Zoom out again – what makes an opportunity?

Setting, environment

➔ Only by looking at the interaction between an idea and the setting where it will be used can we see if it is an opportunity

Complex trade systems – changing fast (every day in the UK)

(idea + context) = opportunity:

Ideas or Innovations exist in complex *eco-systems,* the interaction between them defines whether they are just an idea or an actual opportunity

National-level influences on entrepreneurship and innovation

- Demographics
- Values
  - Religion
- Political community
- National cultural aspects

Social scientists say that opportunities come from…..

- Difficult problems – eg computer security, Covid 19, medical, environment
- Curious, observant behaviour ("new eyes")
- Large-scale trends: eg ageing, pandemics, new tech business models, (de-) regulation, political change, supply chain disruption, *new knowledge*
- Adapting or Copying or Combining things that have been successful elsewhere

Think….
Which of these categories is the most valuable source of opportunity?

Categories of Opportunities

- Increasing value of a product or service, eg Wine
- New application of existing means, eg credit cards (re—framing)
- Creating mass markets, eg social media, interface businesses
- Expanding reach, geographical/online
- Innovation in processes, eg Amazon, FedEx, low cost airlines
- Customisation for individuals, eg Internet of Things, wearables, ‘quantified self’
- Working the supply chain

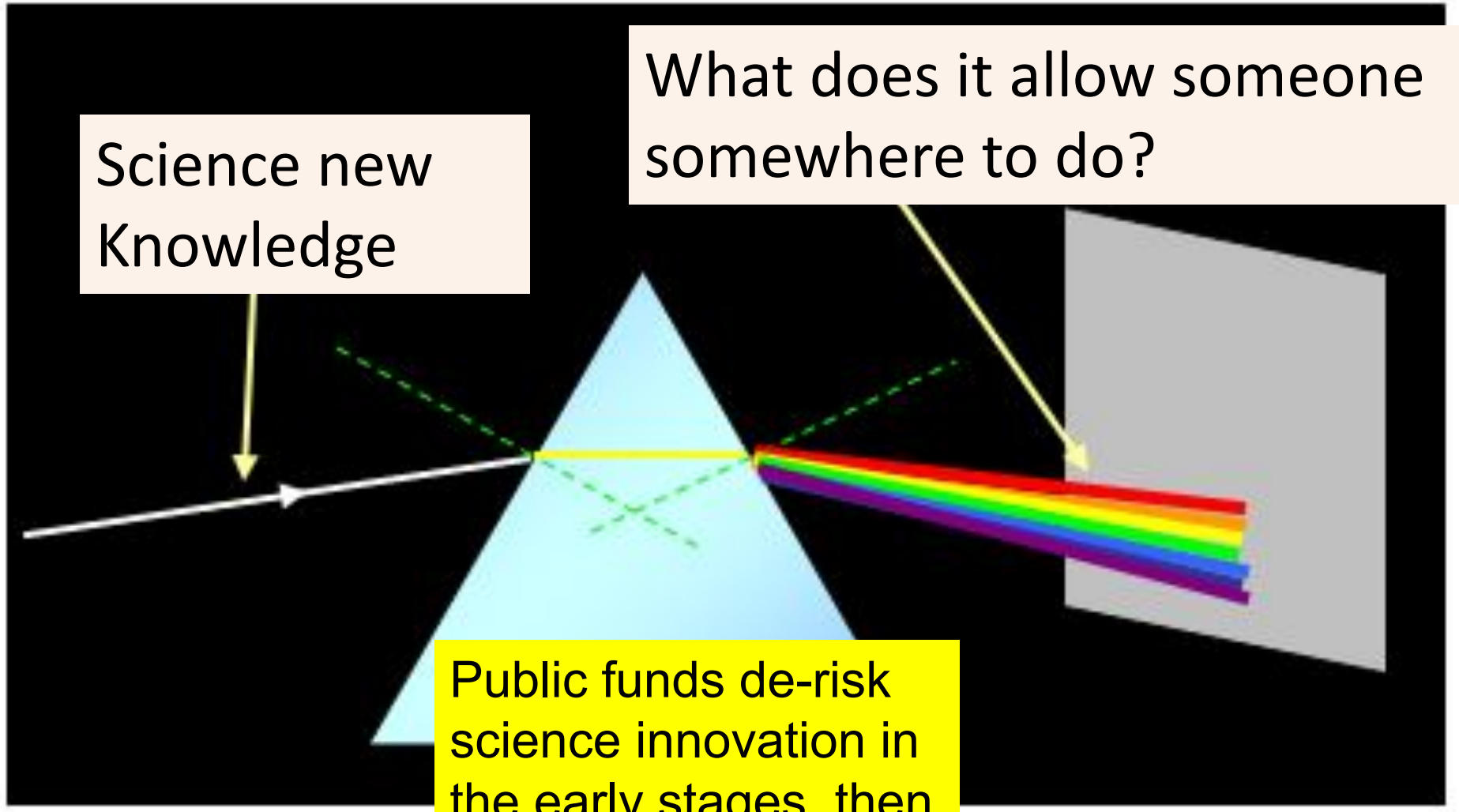
Customer Focus - What it is & What does it allows business to do? For patents…

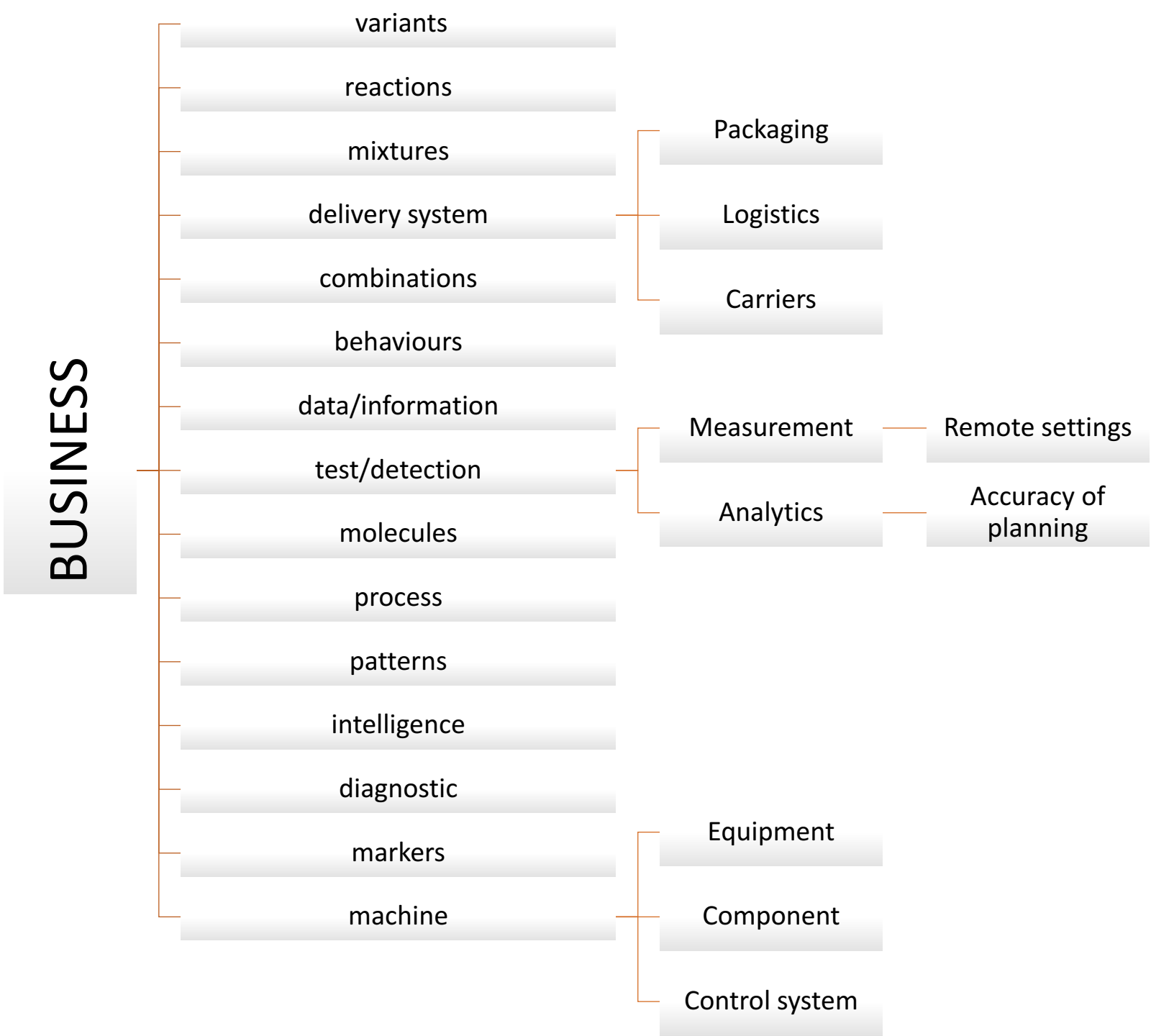
Intellectual Property is:

- A set of legal rights that describe and define ownership of ‘something new’

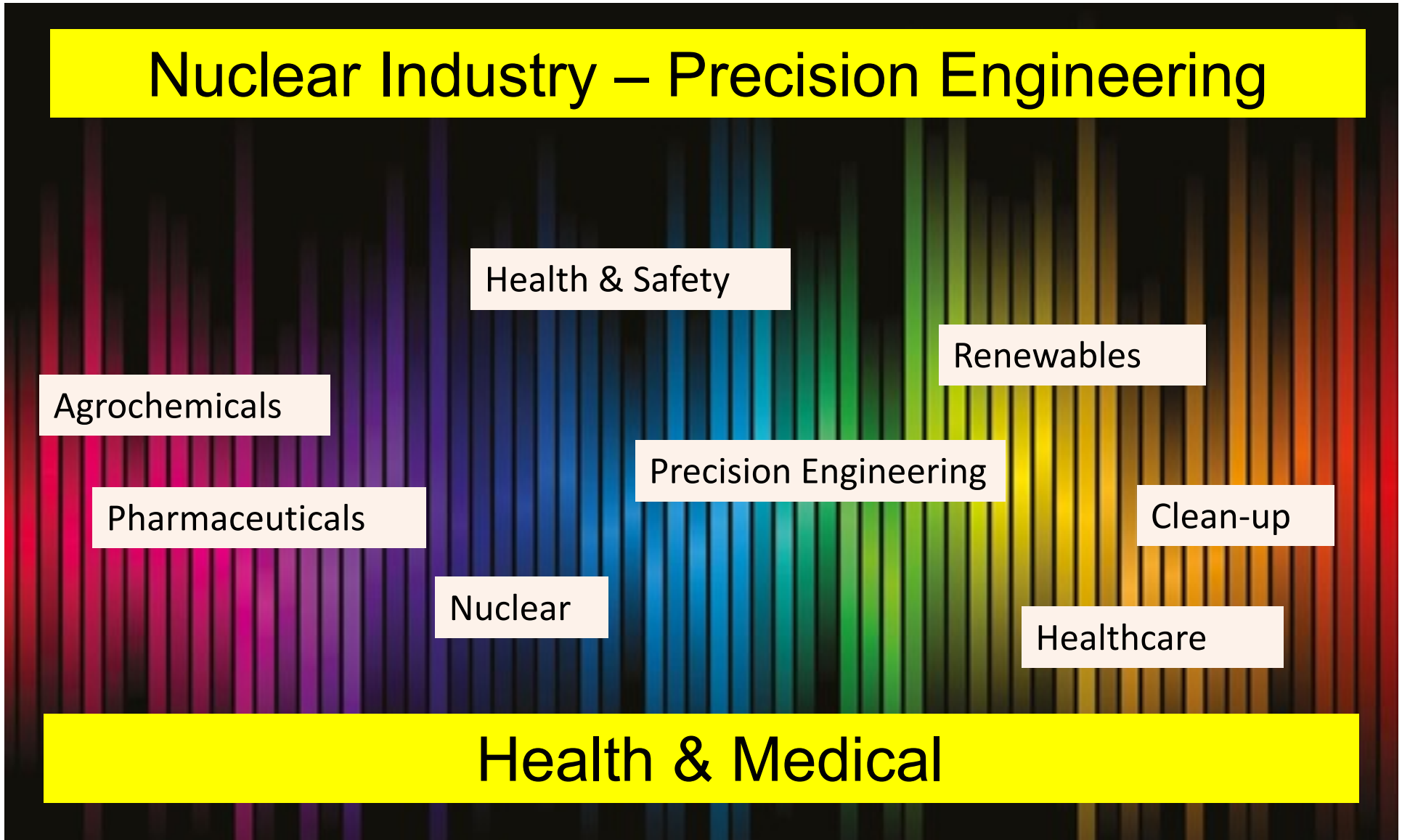
Intellectual Property allows you to…

- Build fences
- Stop other people from doing things
- Inflate share price
- Pump up reputation, particularly “innovation” reputation
- Maintain control over your territory
- Bully smaller competitors with litigation
- Takeover whole areas of technology
- Use it as a betting tool –
- Create business models around litigation payouts
- Protect your small company’s ideas against the big players
- Measure innovation


Science new Knowledge
What does it allow someone somewhere to do?
Public funds de-risk science innovation in the early stages, then private sector money


BUSINESS
variants
reactions
mixtures
delivery system
Packaging
Logistics
Carriers
combinations
behaviours
data/information
test/detection
Measurement
Remote settings
Analytics
Accuracy of planning
molecules
process
patterns
intelligence
diagnostic
markers
machine
Equipment
Component
Control system

Sectors integrated around LISA areas



Some particular market-facing considerations for LISA areas

- Cost-benefit
- Public-private
- Partnership/risk management
- Skills, maintenance
- Alignment with existing practice, machinery
- Few customers/partners
- Cost of sales
- Existing behaviours/safety considerations
- Health & Safety

Exercise – Technology Triage for early-stage technologies

You are Director of Innovation in a research organisation, which we call 'The University' here. Below are four research-based ideas that have come to you for resources. These resources might be for example – help with patent costs, advice and expertise, creating a spinout company. The goals of your research organisation in commercialising science are a) income generation b) protection of University intellectual property and c) social benefit. You can only choose one – which one will you choose, and why?

1. CAMERA PROJECTOR

A researcher in the Department of Electrical Engineering brings to you a working prototype of a digital camera modified to be used as a digital projector for powerpoint presentations for example. The invention is unpublished and is the work of a team of researchers involved in European Framework funded research programme. The invention is patentable. There is clear demand for the technology as a portable replacement for digital projectors; it works!

2. MALARIA INVENTION

A team of researchers in the University's Research Centre for Tropical Diseases arranges a meeting with you to discuss very impressive new, unpublished results for a new vaccine candidate for anti-malaria vaccination, twice as effective as other vaccine candidates in clinical trials. The Professor has filed a number of patent applications with you before on her other vaccine work, and is a consultant to a global pharmaceutical company. The team are committed to working with you to file patents and get the technology to the market.

3. TENT

A team of researchers in your university has designed a new, lightweight, rapidly erected tent for all applications from leisure to defence. The requirement for an easily transported and rapidly erected tent or shelter system is essential for military and emergency aid situations, civilian applications and the leisure industry. Using a series of simple mechanical linkages a 2D sub-unit can be easily expanded to provide temporary accommodation of high strength suitable for use in a wide range of climatic conditions. The invention is patentable.

4. MULTIPLE SCLEROSIS DISEASE

Researchers in the University's Department of Public Health have developed a questionnnaire for the specific measure of health status of patients with Multiple Sclerosis. The researchers receive many requests to use it, and they want advice on how to commercialise it. There have been numerous academic journal publications on the questionnaire as it has evolved over time, and been used in different patient studies. It contains 25 questions, covering 8 aspects of quality of life. The instrument was developed on the basis of interviews with people diagnosed with the disease. It has been widely validated, and translated into over fifty languages.