From Open Science to Open Innovation

Henry Chesbrough

Pre-17th Century

Scientists were sponsored by patrons

Patrons sought knowledge and prestige from these scientists

- Races to be first
- Incentives for secrecy
- Duplication of efforts
- Limited dissemination

In parallel first universities were founded:

Leuven (1425), Oxford (1096), Cambridge (1209), etc…

The Royal Society

- First scientific society
- London, 1660
- Philosophical Transactions of the Royal Society, first academic journal, 1665
- By 1699, 30 journals
- By 1790, more than 1,000 journals

A "Cambrian explosion" of National scientific societies throughout the Enlightenment: *Sapere Aude…"dare to know"*).

Examples: Royal Society of London (1662), the Paris Académie Royale des Sciences (1666), and the Berlin Akademie der Wissenschaften (1700) , Academia Scientiarum Imperialis (1724) in St. Petersburg, and the Kungliga Vetenskapsakademien (Royal Swedish Academy of Sciences) (1739).

Merton- The Sociology of Science

- CUDOS form the norms for how science is conducted
- **Communalism** – sharing discoveries, so that scientists give up intellectual property in exchange for social recognition
- **Universalism** –claims to truth are evaluated in terms of universal criteria, and not race, class, gender, religion, etc.
- **Disinterestedness** –objectivity; acting in ways that outwardly appear to be selfless; eschewing personal profit
- **Originality-**novel contributions to understanding
- **Skepticism** – all ideas are subject to rigorous, structured community scrutiny
- Admittedly, an **ideal** as much or more than a reality
    - Salami publications, multiple submissions of essentially the same results,…
    - Ghost/gift authorship
    - Plagiarism
    - False results (i.e. case of plastic fantastic Bell Labs, Tem Cells Korea)

Open Science Today

- Open source (e.g., Linux)
- Open journals, open access (e.g., PLoS)
- Citizen science
- Crowdscience

- "With enough eyes, all bugs are shallow" – R. Stallman
- Superior peer review
- Better ability to reproduce results
- Faster metabolism of knowledge

Is this really true?

Cases like the Schön scandal among many others make me wonder…I ignore if more journals to publish openly gives more quality as a net result because the amount of junk also increases…also you need high quality peer reviewers which represents a capacity problem…taking things to extreme one maybe can say that the explosion of journals and the pressure to have monthly issues of those journals "in the street" make peer review of less quality since professors are subjected to time pressure too (they normally give the papers to students to review). I ignore if there are available studies in peer review quality vs number of channel s to publish scientific data.

Science, however, does not necessarily lead to innovation

- Often unclear how best to apply a new discovery
- Applied science is not as prestigious as “real science”
  - Harder to publish
  - Contrary to academic incentives for promotion and tenure
- Science researchers can be ignorant of practical context, constraints, priorities

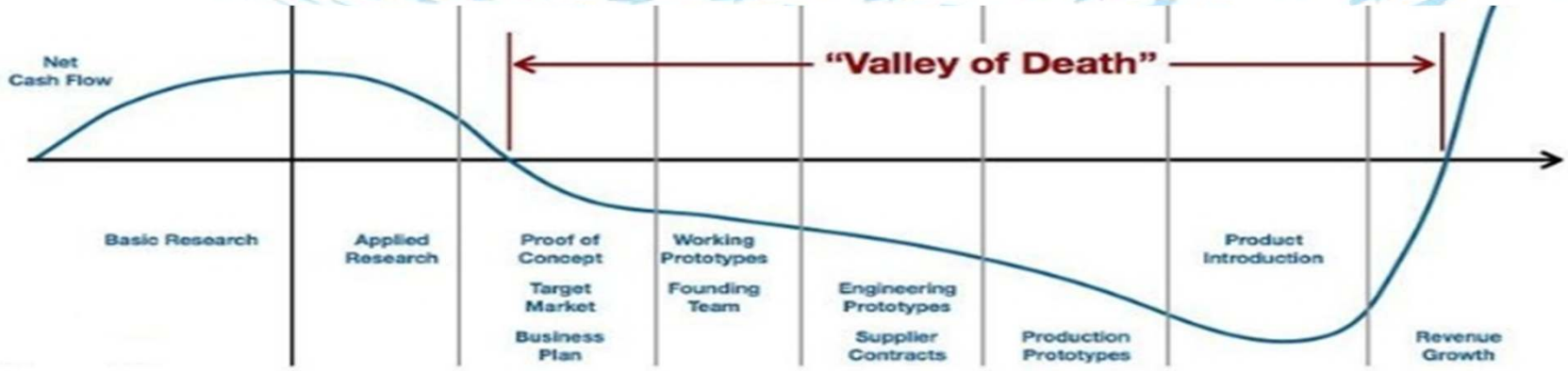
The Lisbon Agenda

- Boost public investment in R&D to stimulate innovation in Europe
  - Goal of 3% of GDP by 2010, set in 2000
  - But implementation fell far short
- Innovation Gap in the EU (European paradox)
  - Strong science
  - But insufficient take-up by industry

The Valley of Death

The concept is that there is a dearth of capital and of motivation to translate scientific discoveries into useful innovations

- Academics aren't motivated by typical scientific reward systems to do application/translation
- Research results are often quite abstract, and lack the clarity to be readily applied by others
- Outside funding (beyond that of the usual funding sources for science) is required
  - How will this capital earn a return?



What about the US? How do they do it?

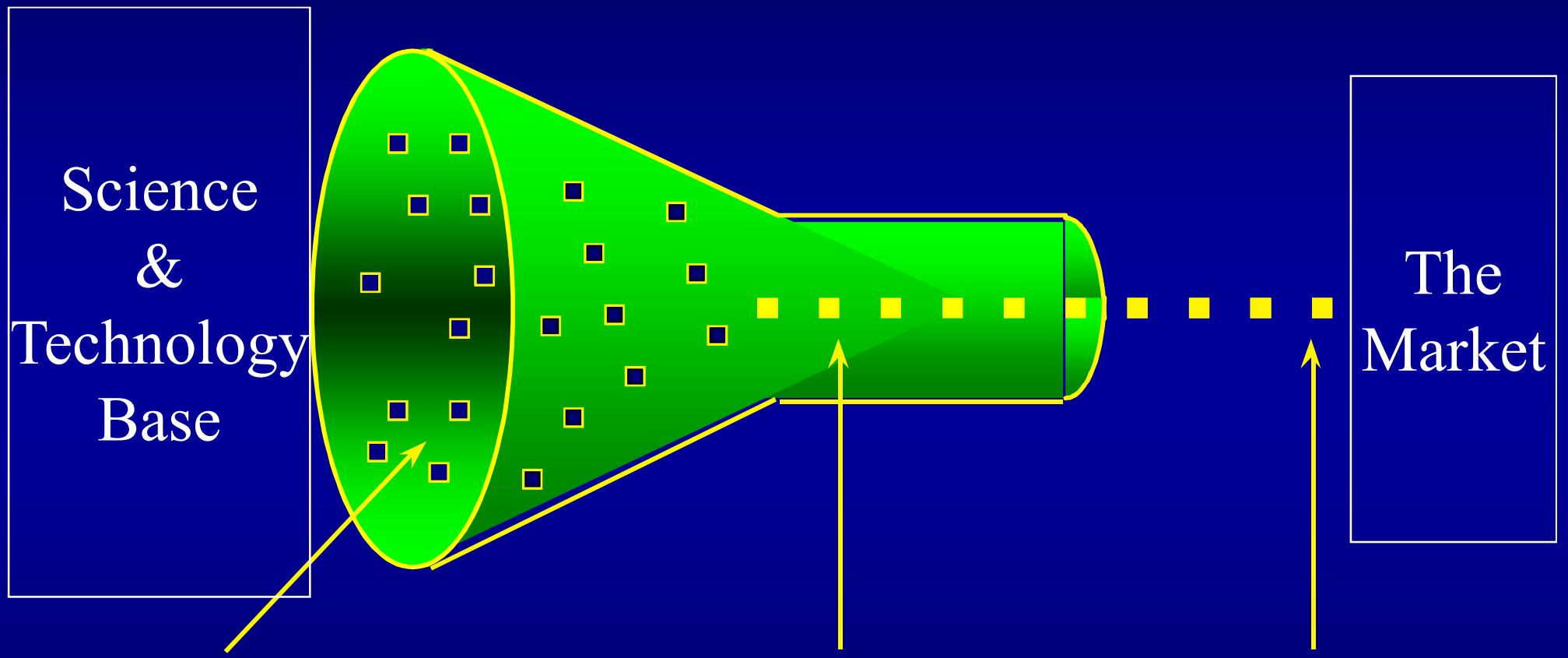
- 19th century, the US was a nation of IP pirates. German, English and French discoveries and inventions led to US copies
- 20th century, US science and technology base grows to equal that of Europe
- Vannevar Bush – Science: The Endless Frontier
  - Defines innovation policy for the US postwar period

The Virtuous Circle for R&D

Closed Innovation

- Alfred Chandler (The Visible Hand: The Managerial Revolution in American Business, 1977).
- ATT Bell Labs, GE, IBM, Merck
- Monopolies and oligopolies can readily support basic science and translation of research results.

A Closed Innovation System



Anomalies in Closed Innovation

- Those who invest in the research, often fail to profit from it
- Spillovers
- Arrow – social benefit of innovation > private rewards of innovation
  - The rationale for the R&D subsidy

What changed?
Five Erosion Factors

- ✓ Increasingly mobile trained workers
- ✓ More capable Universities
- ✓ Diminished US hegemony
- ✓ Erosion of oligopoly market positions
- ✓ Enormous increase in Venture Capital

ESADE
Business School

Diminishing Economies of Scale: US Industrial R&D by Size of Enterprise

Company Size	1981	1989	1999	2005
< 1000 employees	4.4 %	9.2 %	22.5 %	24.1 %
1,000 – 4,999	6.1 %	7.6 %	13.6 %	15.5 %
5,000 – 9,999	5.8 %	5.5 %	9.0 %	8.0 %
10,000 – 24,999	13.1 %	10.0 %	13.6 %	14.8 %
25,000 +	**70.7 %**	**67.7 %**	**41.3 %**	**37.6 %**

Sources: National Science Foundation, Science Resource Studies, Survey of Industrial Research Development, 1991, 1999, 2001, 2006.

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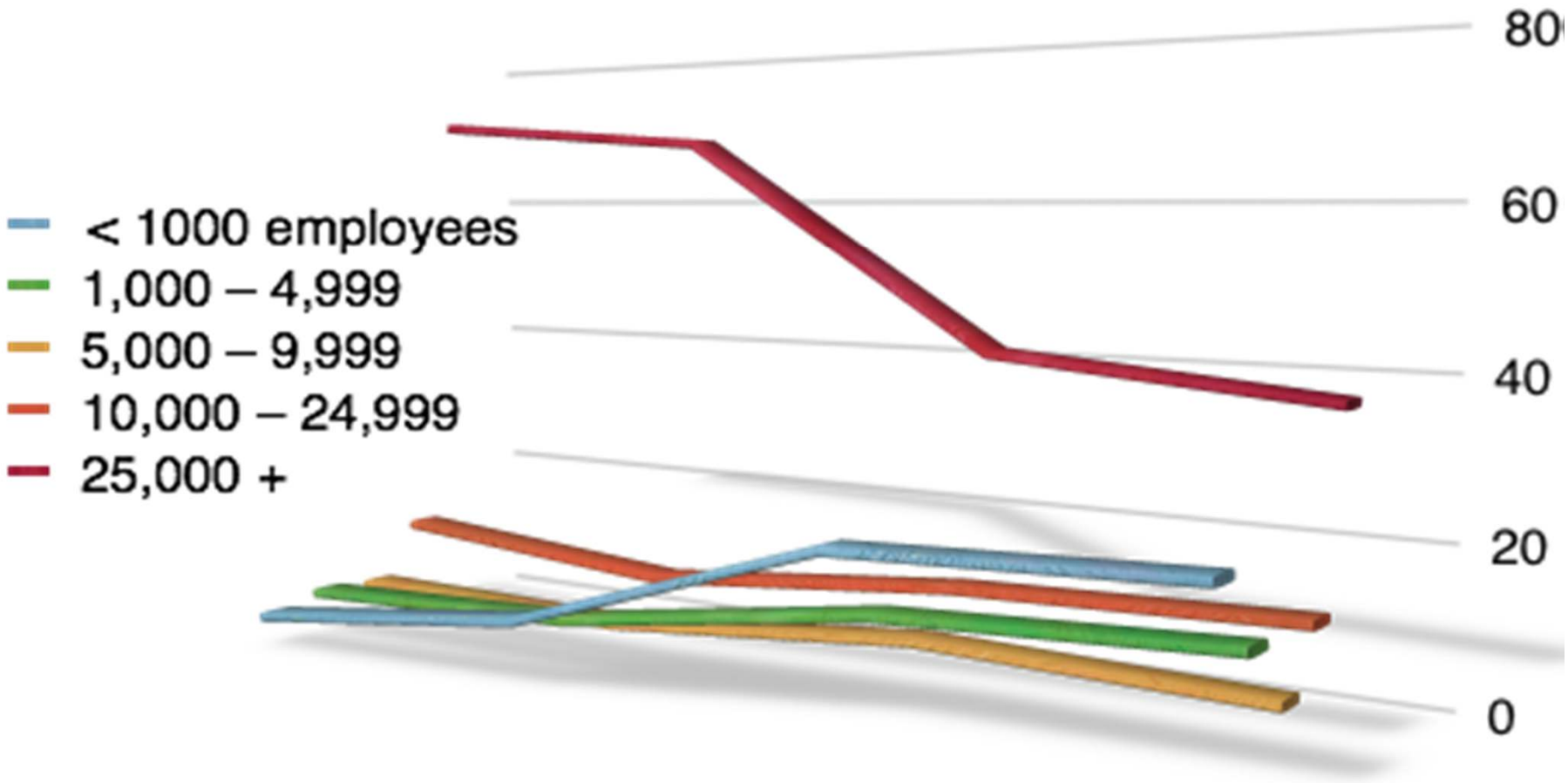


Merck's Conclusion

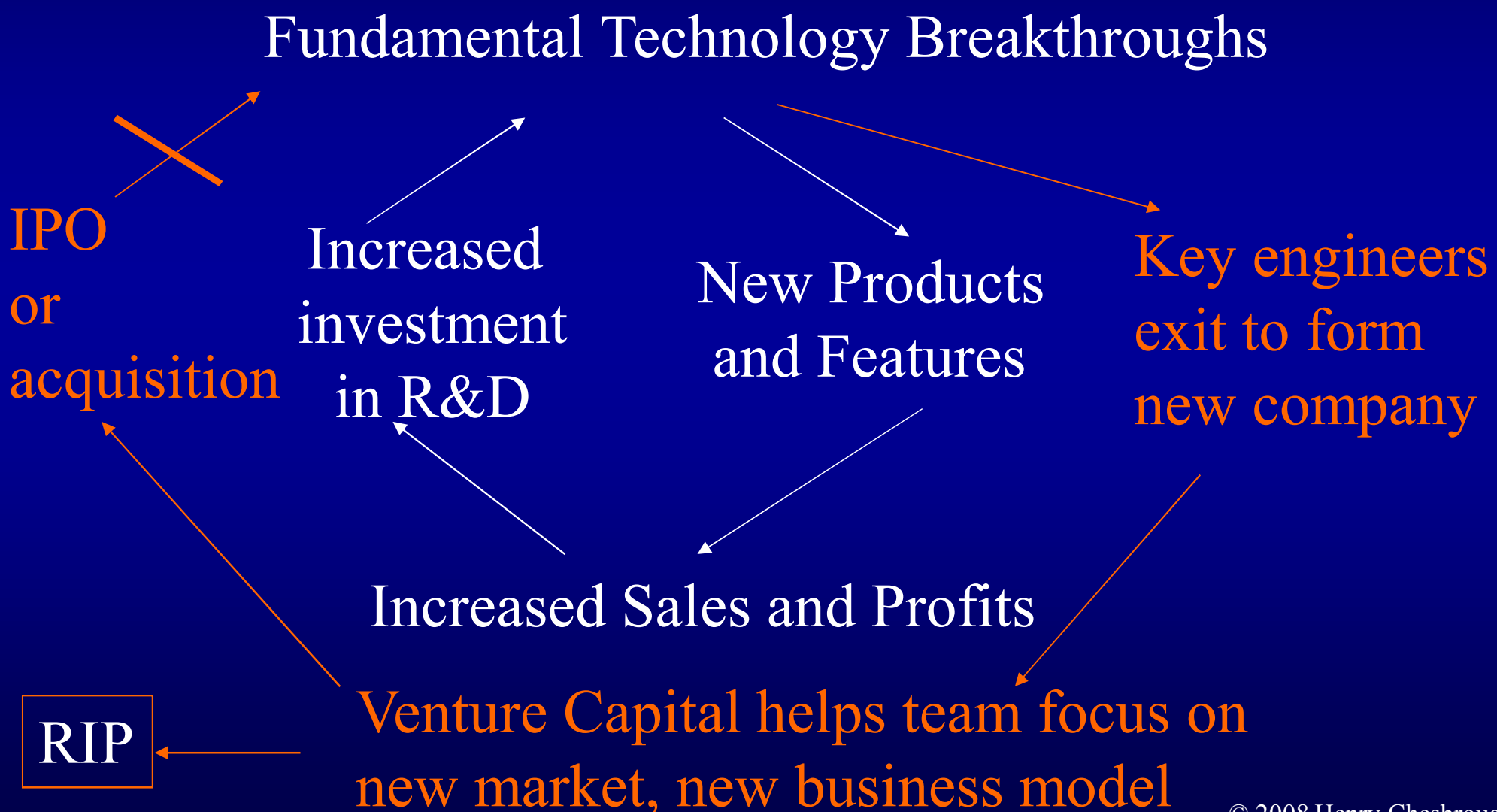
"Merck accounts for about 1% of the world's biomedical research. To tap into the other 99%, we must actively reach out….

"The cascade of human knowledge flowing from biotechnology and the unraveling of the human genome… is far too complex for any one company to handle alone."

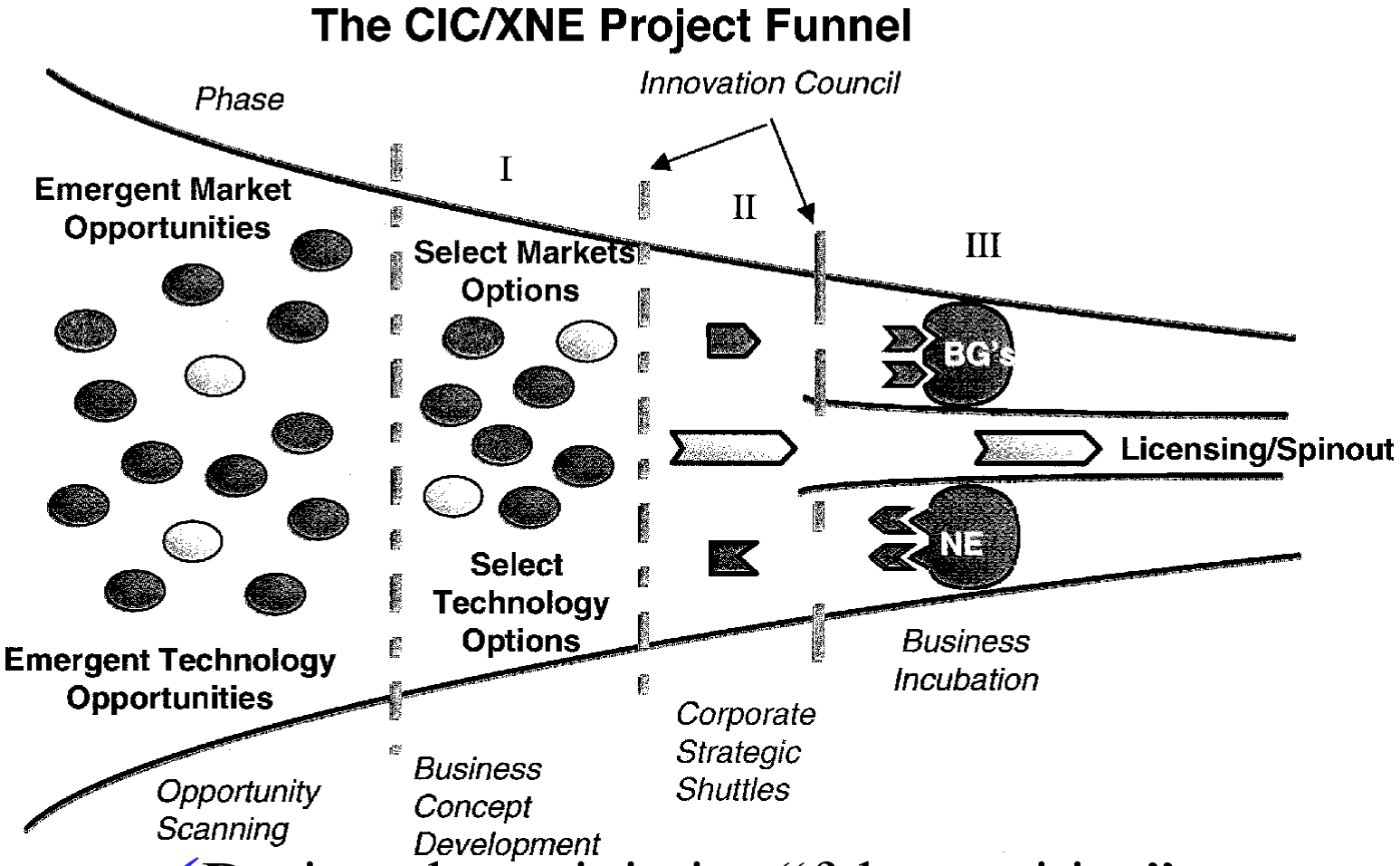
“Not all the smart people work for you.”

Bill Joy, founder of Sun, currently VC

The Virtuous Circle Broken

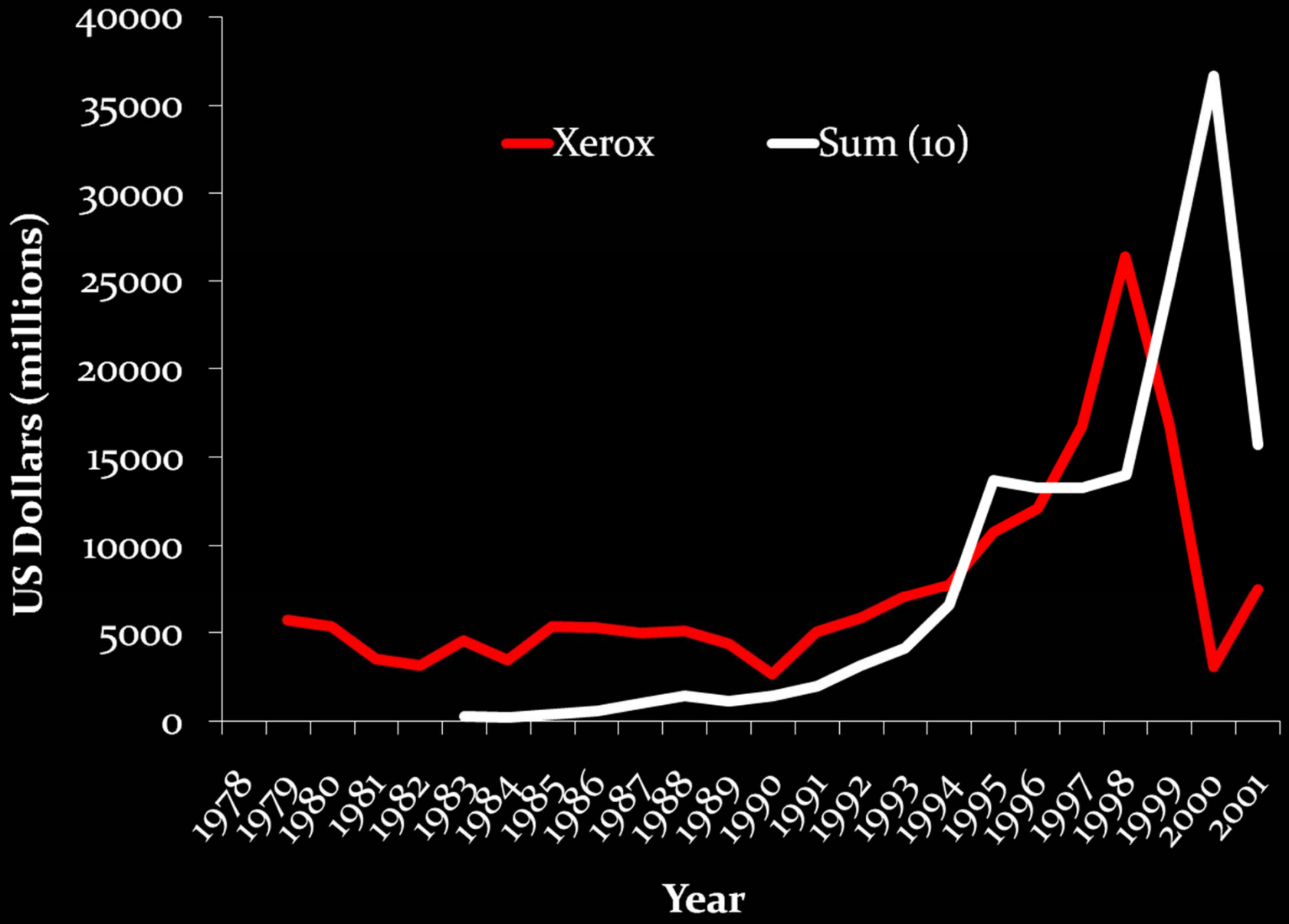


Xerox's Business Model, and Project Evaluation Errors



- ✓ Designed to minimize "false positive" errors
- ☠ Ignores risk of "false negative" errors

Xerox: Great at Chess, Lousy at Poker

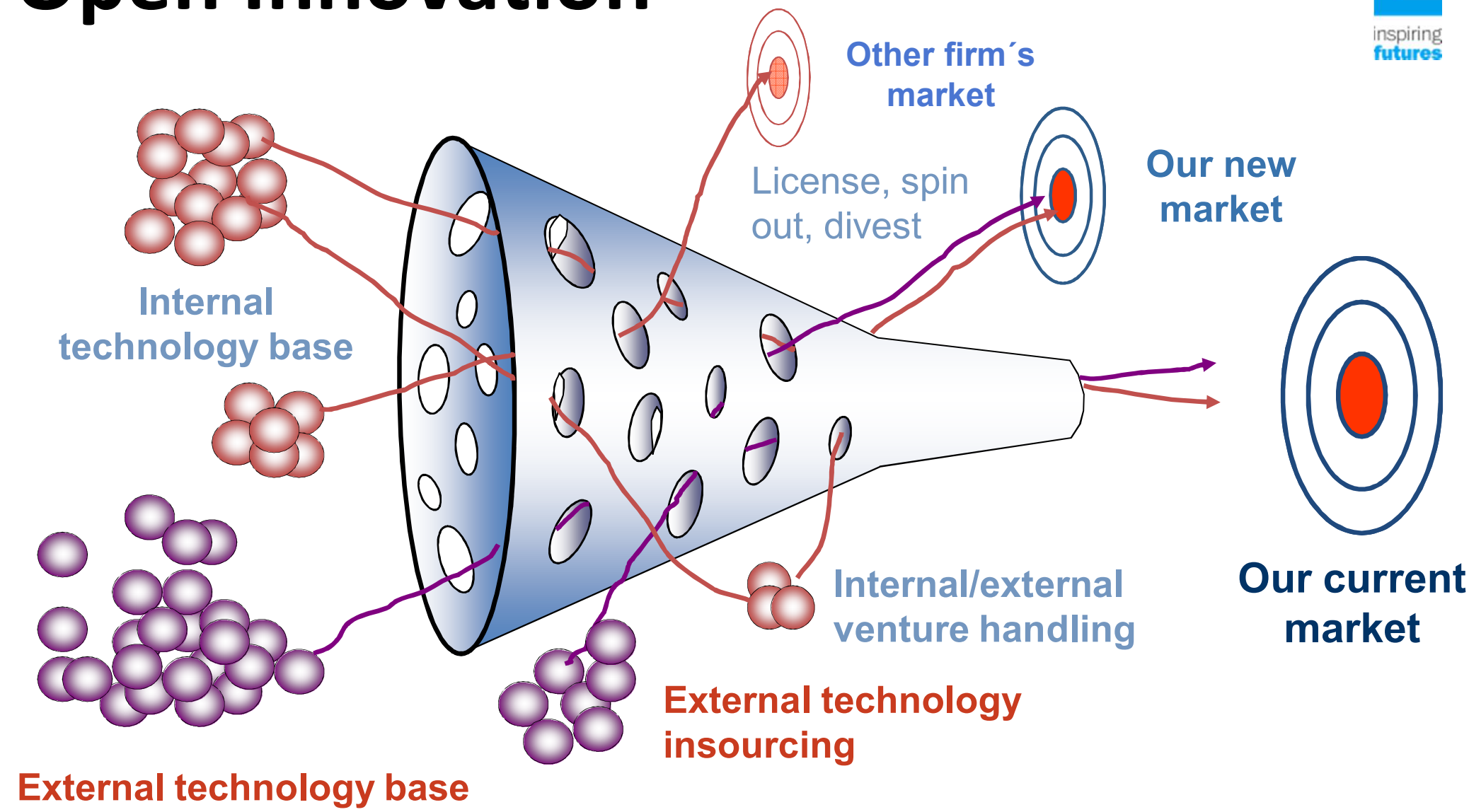


What is Innovation?

inspiring futures

Before	After
Invention	Commercialization
Product	Business, including process and biz model
Technology-driven	Business/value-driven
Internally generated	Internal Integration of int. and ext. stuff
Engineering's job	Everyone's job

Open Innovation

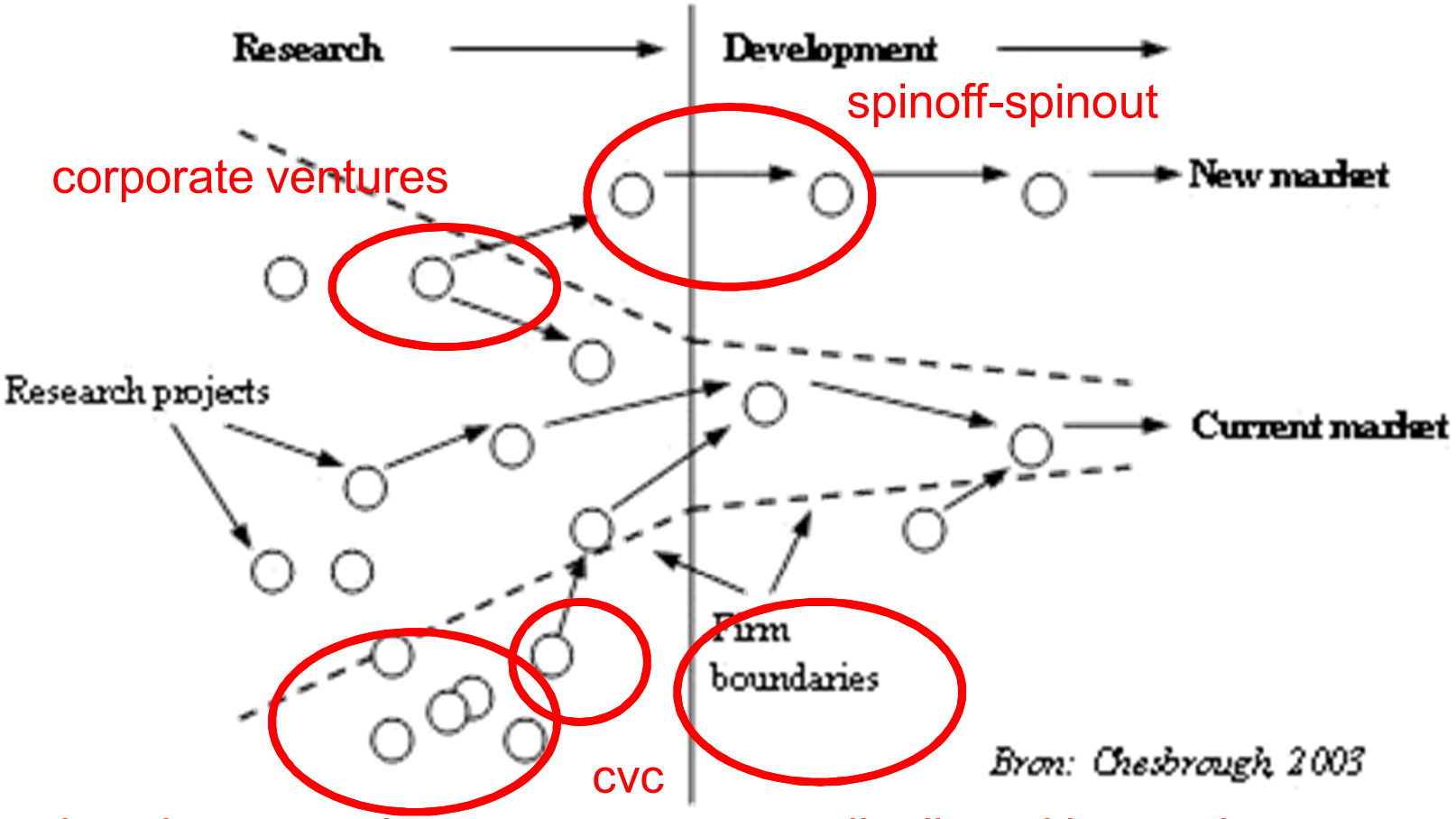


Stolen with pride from Prof Henry Chesbrough UC Berkeley, Open Innovation: Renewing Growth from Industrial R&D, 10th Annual Innovation Convergence, Minneapolis Sept 27, 2004

The Two Parts to Open Innovation

1. Outside-in: fuel your business model with extensive use of external sources of knowledge, in addition to your own
   - E.g., P&G's Connect and Develop
2. Inside-out: let your unused and under-used knowledge go outside to find alternative business models

Open Innovation



Knowledge Assets:
The building blocks of Innovation

inspiring futures

What is knowledge?
- Structure: tacit vs. explicit
- Diffusion: inside vs. outside

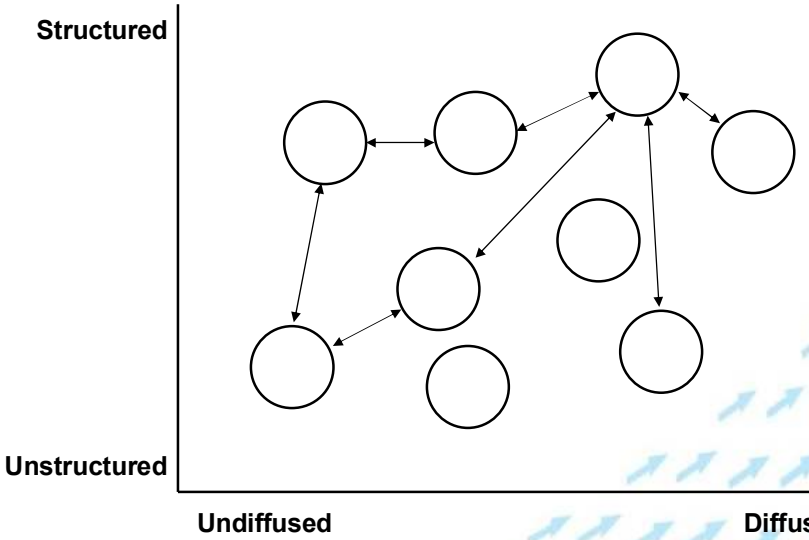
What knowledge do you need?
- Network of critical knowledge assets

Where is the knowledge located?
- Internal vs. external

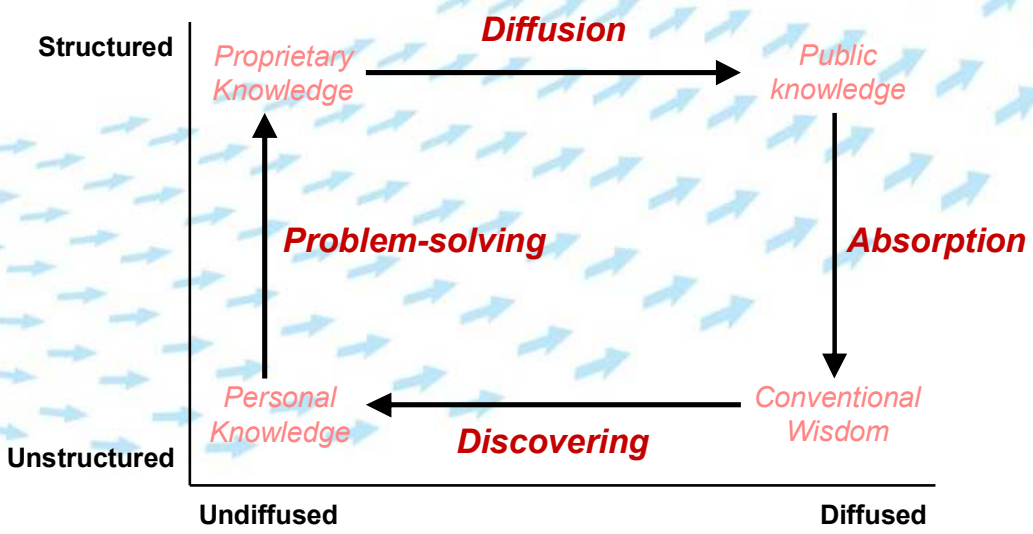
➢ Map critical knowledge assets!

Mapping knowledge assets that underpin innovation

- A network of critical knowledge assets



- Purposive inflows and outflows of knowledge



The Role of Startups

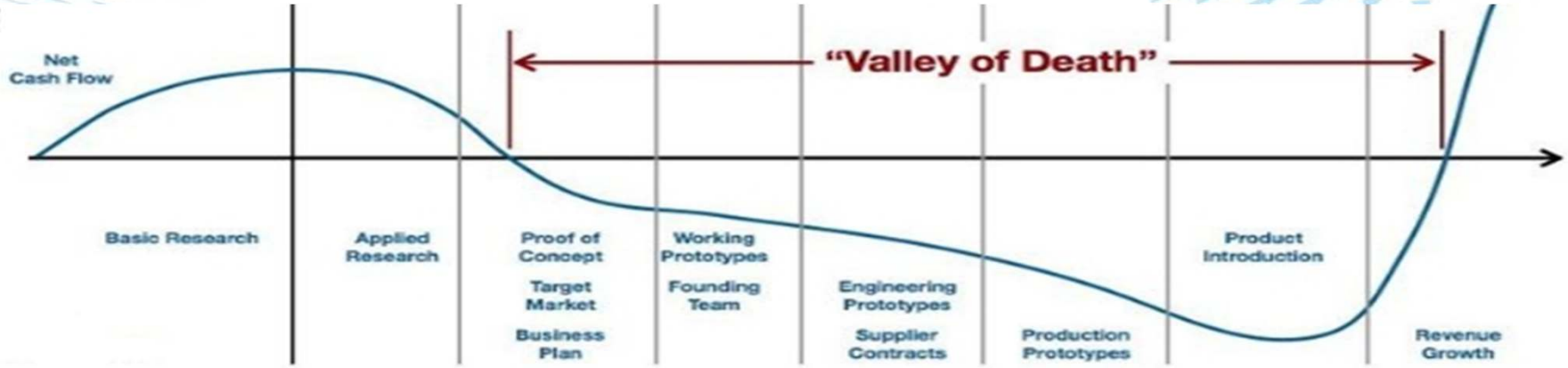
- Steve Blank: a startup is a temporary organization in search of a scalable business model
- Startups innovate business models as much or more as new technologies
- Most fail, but even the failures stimulate others in the industry
- Large firms become more agile when surrounded by startups
- Some large firms are learning to work with startups as part of their innovation process

ATTRACT – Mobilizing EU research to “cross the valley”

Three key areas:

- ✓ Breakthrough ICT technology and applications.
- ✓ High performance materials and applications.
- ✓ Health Physics technology and applications.

Industry partners together with SMEs and Startups providing both capacity and agility




Thank You!!