Academic year 2023 – 2024

Research, Innovation and Global Trends

What is innovation? concepts, frameworks, implications

(Week 1, Feb 19, 2024)

Sandro Mendonça

Instituto Superior de Economia e Gestão
UNIVERSIDADE TÉCNICA DE LISBOA

Masters in Innovation and Research for Sustainability

What do we (really) know about innovation?

A complex phenomenon with recurrent features

1. Dealing with the innovation phenomenon
2. Waves of though regarding innovation
3. What is innovation? (really!)
4. The "linear model" (Bush, 1945)
5. The "chain-linked model" (Kline & Rosenberg, 1986)
6. The "multi-channel" model (Caraça et al., 2009)

Critical insight:

Understand the role of innovation in the context of economic and institutional relations as defined in conceptual models on the production of economically useful knowledge.

- 1. studying innovation...

Looking into innovation

Situate the place of innovation in the context of economic and institutional relations as defined in conceptual models on the production of economically useful knowledge.

Arguments partially based on long-standing work:

Caraça, J., B.-Å. Lundvall, S. Mendonça (2009), 'The changing role of science in the innovation process: From Queen to Cinderella?', *Technological Forecasting and Social Change*, Vol. 76, No. 6, pp. 861-7.

Castellacci, F., S. Grodal, S. Mendonca, M. Wibe (2005), "Advances and challenges in innovation studies", Journal of economic issues, Vol. 39, No. 1, pp. 91-121

1. The innovation process

Understanding innovation by using concetual frameworks

Linear model

Not-so-linear model

Even-less-linear model

1. The innovation process

Frames of reference

Linear model (1st geration)

Not-so-linear model (2nd geration)

Even-less-linear model (3rd geration)

1. But this "new era" is different

Innovation is not what it used to be

- The process of change is changing

innovations the mode of producing innovation

- Fusion of resourses and results

product life cycles are getting shorter and overlapping

- Interconnectivity and complexity

sistemic interdependencies and network complementarities

- An economy that is learning-intensive

from stock to flow of knowledge

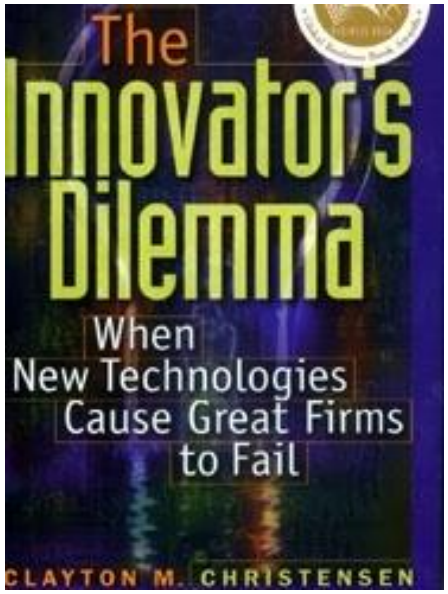
- Access to data and distributed creativity

plural innovation is multi-actor and multi-dimensional

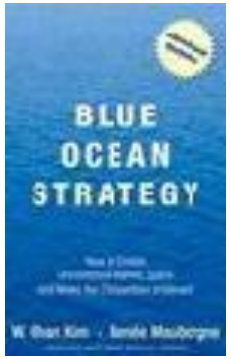
- Intellectual property and openness

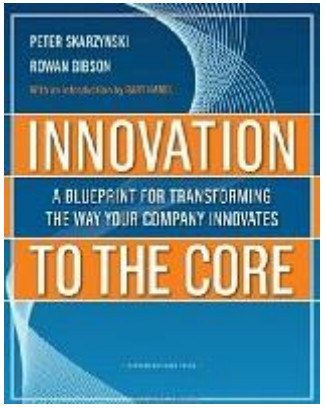
coexistence of appropriability through exclusion and inclusion

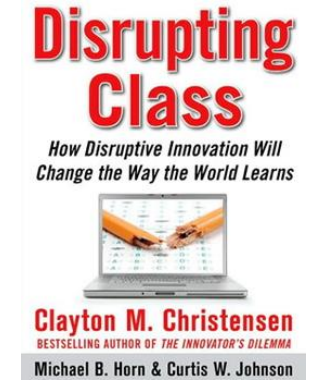
How can a conceptual framework deal with all this?!


The
Innovator's
Dilemma
When
New Technologies
Cause Great Firms
to Fail
CLAYTON M. CHRISTENSEN

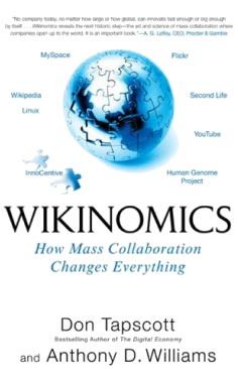

OXFORD
OPEN INNOVATION
Researching a New Paradigm
Edited by Henry Chesbrough,
Wim Vanhaverbeke, & Joel West

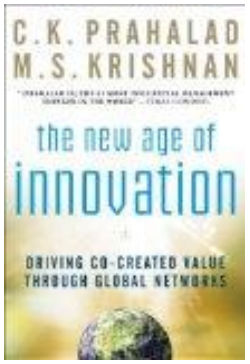

BLUE
OCEAN
STRATEGY
W. Chan Kim · Renée Mauborgne

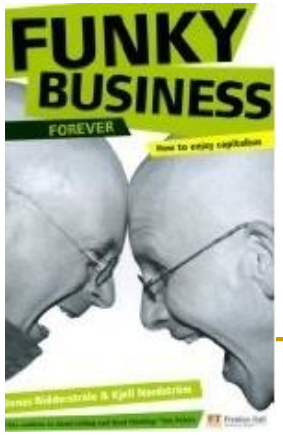

PETER SKARZYNSKI
ROWAN GIBSON
INNOVATION
A BLUEPRINT FOR TRANSFORMING
THE WAY YOUR COMPANY INNOVATES
TO THE CORE

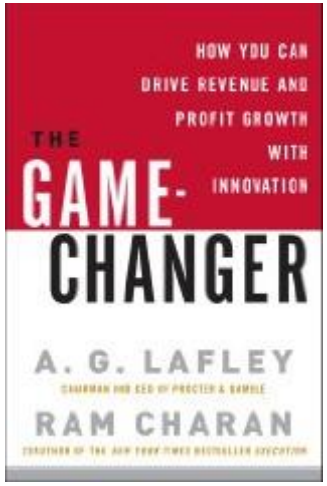

Disrupting
Class
How Disruptive Innovation Will
Change the Way the World Learns
Clayton M. Christensen
BESTSELLING AUTHOR OF THE INNOVATOR'S DILEMMA
Michael B. Horn & Curtis W. Johnson

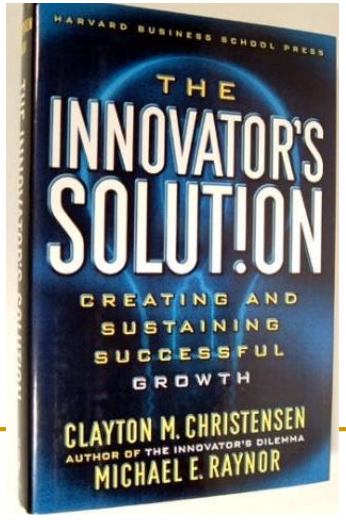

MARKET
REBELS

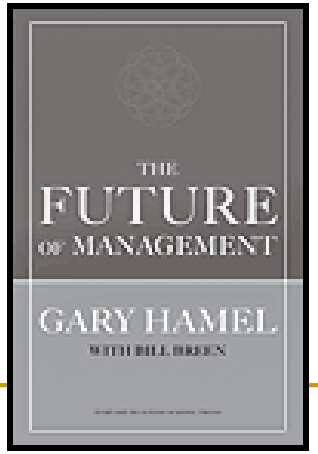

MySpace
Flickr
Wikipedia
Linux
Second Life
YouTube
InnoCentive
Human Genome
Project
WIKINOMICS
How Mass Collaboration
Changes Everything
Don Tapscott
and Anthony D. Williams

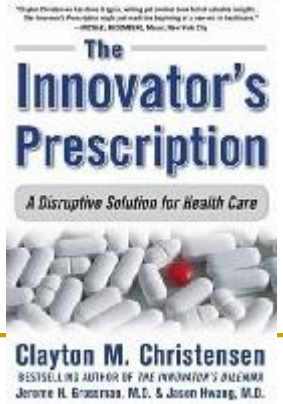

C.K. PRAHALAD
M.S. KRISHNAN
the new age of
innovation
DRIVING CO-CREATED VALUE
THROUGH GLOBAL NETWORKS


FUNKY
BUSINESS
FORever


HOW YOU CAN
DRIVE REVENUE AND
PROFIT GROWTH
WITH
INNOVATION
THE
GAME-
CHANGER
A. G. LAFLEY
RAM CHARAN


HARVARD BUSINESS SCHOOL PRESS
THE
INNOVATOR'S
SOLUTION
CREATING AND
SUSTAINING
SUCCESSFUL
GROWTH
CLAYTON M. CHRISTENSEN
AUTHOR OF THE INNOVATOR'S DILEMMA
MICHAEL E. RAYNOR


THE
FUTURE
OF MANAGEMENT
GARY HAMEL


The
Innovator's
Prescription
A Disruptive Solution for Health Care
Clayton M. Christensen
Jerome H. Grossman, M.D. & Jason Hwang, M.D.

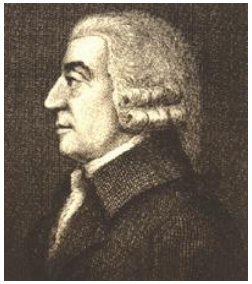

grownup
digital
DON TAPSCOTT

What is behind this airport literature?

- 2.

let us check the analytical backstage...

2. Waves of (western) thought



Adam Smith

Wealth of Nations

1776

1700s → 1940s

ADAM SMITH

Division of labour is the chief cause of the rise of the productive capacity of nations. This is because:

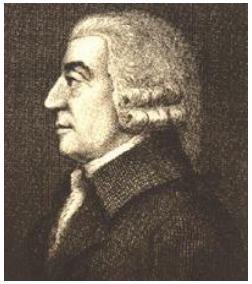
(i) time savings in the handover between tasks and activities;
(ii) the possibility to insert tools and machinery to do the work;
(iii) increased dexterity from practice allowing to do the work better.

That is, a firm will learn even without having na explicit strategy for it: there is the **potential for produtivity gains as time goes by.**

But improvements can also come from the "ingenuity of the makers of the machines" and "philosophers or men of speculation"(a new specialisation)

You can listen to this talk: http://www.bbc.co.uk/programmes/p02xbvgf

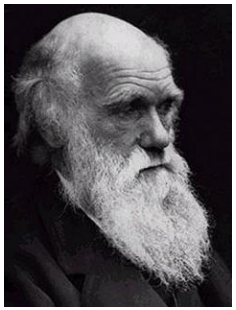
2. Waves of (western) thought



Adam Smith

Wealth of Nations

1776



Charles Darwin

The Origin of Species

1859

1700s → 1940s

CHARLES DARWIN

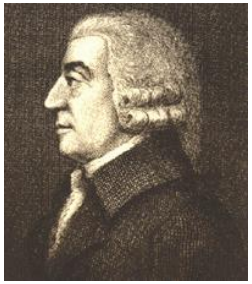
The evolution of species is the outcome of **cumulative drift** that stems from three mechanisms:

(i) variation,
(ii) selection,
(iii) retention.

The success of "**mutations**" is contingent, depends on space-time context. It is always relative, it depends on "*adaptation*" to the conditions of the environment condições (geographical place, historical time).

Take note: evolution is not the survival of the *strongest* (and success of the strongest) but of the *fittest* (the most adjusted to the ecossystem) … it is the "struggle for existence"

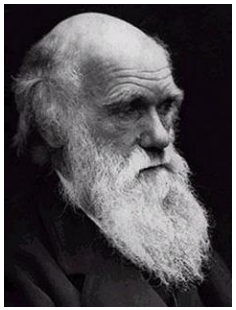
2. Waves of (western) thought



Adam Smith

Wealth of Nations

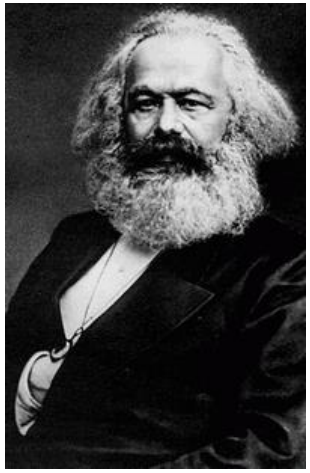
1776



Charles Darwin

The Origin of Species

1859



Marx (e Engels)

Das Kapital

1887

1700s → 1940s

KARL MARX

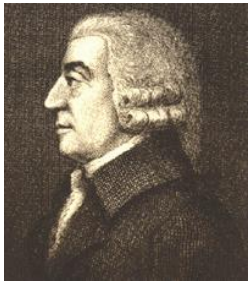
The essence of capitalism is a tendency towards technological transformation leading to more efficient production methods and the replacement of the labour factor with capital and machinery. Oh, and yes:

«The bourgeoisie cannot exist without constantly **revolutionising** the **instruments of production**, and thereby the **relations of production**, and with them the whole relations of society. (…) Constant revolutionising of production, **uninterrupted disturbance** of all social conditions, everlasting uncertainty and agitation distinguish the bourgeois epoch from all earlier ones.»

in Karl Marx & Friedrich Engels (1948), *The Manifesto of the Comunist Party*

You can also check: http://www.bbc.co.uk/programmes/p02h7dlv

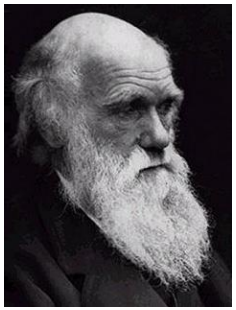
2. Waves of (western) thought



Adam Smith

Wealth of Nations

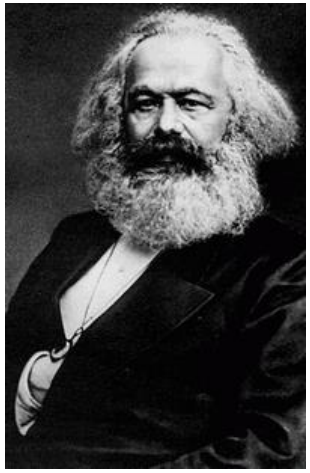
1776



Charles Darwin

The Origin of Species

1859

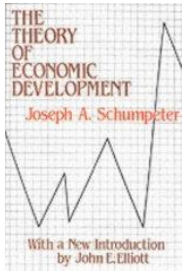


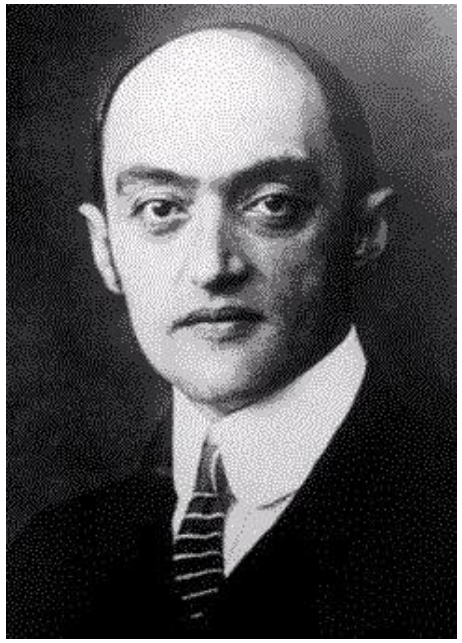
Marx (e Engels)

Das Kapital

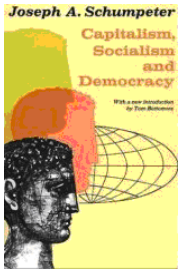
1887

1934





Joseph Schumpeter



1943

1700s

1940s

JOSEPH SCHUMPETER

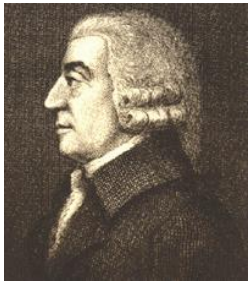
« The essential point to grasp is that in dealing with capitalism we are dealing with an evolutionary process.»

«…in capitalist reality as distinguished from its textbook picture, it is not that kind of competition which counts but the competition from the **new commodity, the new technology, the new source of supply, the new type of organization which commands a decisive cost or quality advantage** and which strikes not at the margins of the profits and the outputs of the existing firms but at their foundations and their very lives."

J.A. Schumpeter (1942), *Capitalism, Socialism, and Democracy*

Ver esta ilustração: https://www.youtube.com/watch?v=YNhO5wHib98

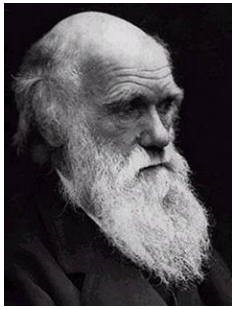
2. Waves of (western) thought



Adam Smith

Wealth of Nations

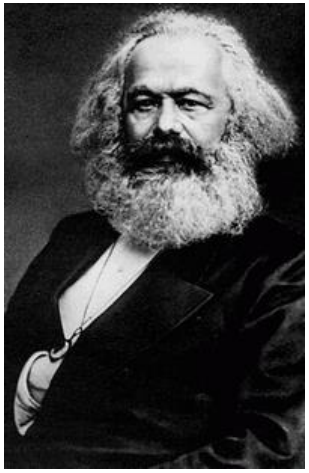
1776



Charles Darwin

The Origin of Species

1859

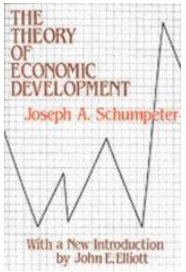


Marx (e Engels)

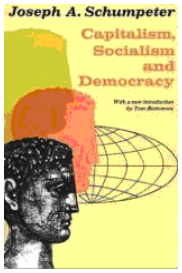
Das Kapital

1887

1934



Joseph Schumpeter



1943

1700s

1940s

J.D. Bernal

The Social Function of Science, 1939

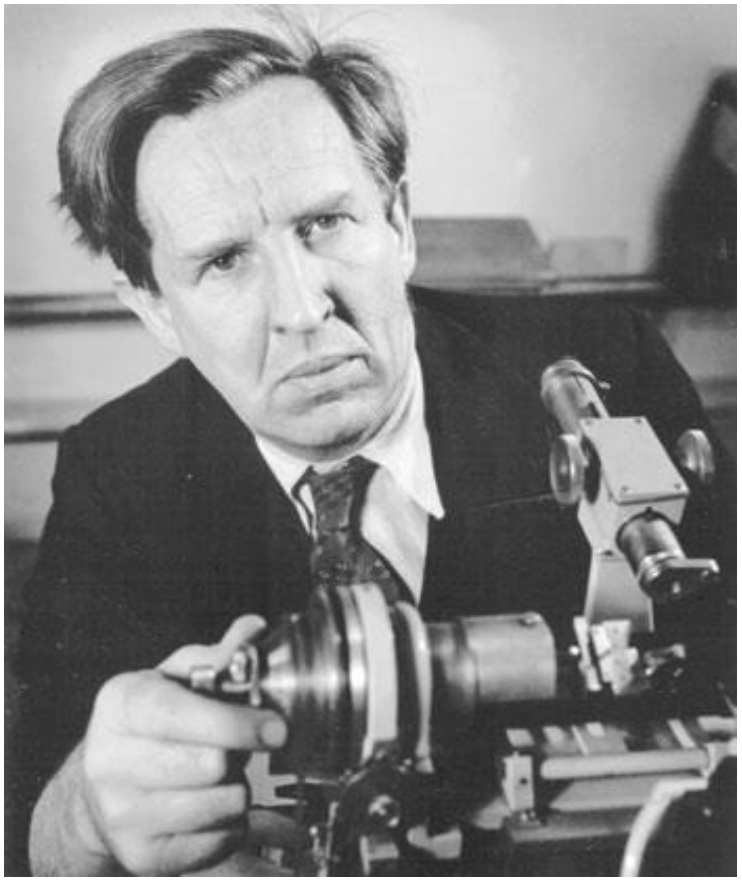
Vannevar Bush

Science: The Endless Frontier

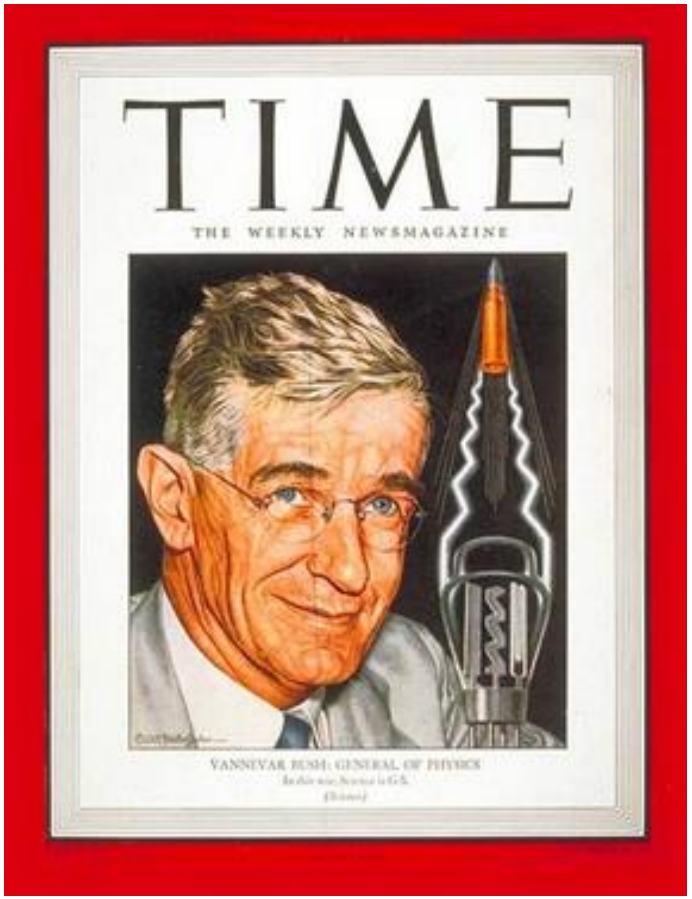
1945

Emergence of science & technology policy

Research and Innovation for the society and the economy



http://bit.ly/1z2qfK8



http://bit.ly/1z2qfK8

- 3.

innovation…
what she is not

Now, … how to apply theory to reality?

http://bit.ly/1omNCWS

3. Schumpeter on innovation

Endogenising change:

Innovations "**are not evenly distributed in time, but that on the contrary they tend to cluster, to come about in bunches, simply because first some, and then most firms follow in the wake of successful innovation.**"

Source: Schumpeter (1939, p. 75).

"**stationary capitalism is a contradiction in terms**."

Source: Schumpeter (1951, p. 174)

(1883-1950)

3. Defining innovation

New Combinations

What?

3. Defining innovation

New Combinations

What?

Who?

3. Defining innovation

New Combinations

What?

Who?

Novelty?

3. Defining innovation

New Combinations

What?

Who?

Novelty?

Impact?

3. Defining innovation

New Combinations

What?

Who?

Novelty?

Impact?

Level?

3. Defining innovation

New Combinations

What?

Who?

Novelty?

Impact?

Level?

Type?

3. Defining innovation

Schumpeter

New Combinations

What? (invention, innovation, diffusion)

Who? (first mover vs fast second)

Novelty? (variable viewpoints)

Impact? (radical vs incremental)

Level? (architectural or modular)

Type? (product, process, organizational, marketing)

Note: the evolution of a good

Evolution

This refers to a gradual and linear process where a new category replaces (usually completely) the old one. The telephone is a good example of this.

The telephone was invented in 1876. It changed the world.

The first transcontinental call from New York to San Francisco was made in 1915. By the 1920s, rotary phones were in homes across the world. This continued into 1970s, when keypads replaced the rotary version.

In 1973, Motorola made a breakthrough with the revolutionary DynaTAC mobile phone.

Mobile phones became sleeker through the 1990s, with Nokia leading the charge. In 1992, the first text "sms" created a new form of communication.

In 2000, Japan released the first camera phone. This led to the convergence of the Internet and the mobile phone, and how information is transferred.

Blackberry and Palm led the competition to incorporate emails into mobiles.

In 2007, Apple introduced the iPhone and, within a year, Google unveiled Android. Since then, smartphones have evolved into mobile devices that are as fast as computers were just a generation ago.

Note: the evolution of a service

Tui chief says differentiation is key to survival in tough tourism sector

Personalised bookings and a push into experiences market help operator to beat rivals

ALICE HANCOCK — DÜSSELDORF

There are few more nerve-racking moments on holiday than the walk between the hotel reception and your room after you check in.

"Usually the blood pressure goes up and then you see the room and you either say 'wow' or you say 'God, let's change it'," said Friedrich Joussen, chief executive of the Anglo-German package tour operator Tui.

Tui's guests should no longer have to suffer this uncertainty, he said. For an extra €10-€15 per night, they can choose rooms with morning or evening sun, be close to the restaurant, or even specify a particular number.

Despite demand for package holidays remaining stable, traditional operators have had to adapt to compete with online booking services providing holidaygoers with hundreds of options.

The pressures on the industry were laid bare by the collapse in September of Thomas Cook, Tui's longtime rival, after it failed to put together a restructuring package with its debtholders.

"For the remaining players, I think the short term is very clear. It's positive. We have less competition," said Mr Joussen. "But long term, that's a question we need to ask ourselves: what happened and why it happened? And why we don't want it to happen to us?".

Since September, Tui has tried to take advantage of the weaker competition, announcing it will increase its airline capacity by 2m seats next summer and adding 135 former Thomas Cook hotels to its books.

Last month, it made a bid for the Thomas Cook brand but was beaten by Fosun, the Chinese conglomerate that was the failed group's majority shareholder.

Mr Joussen put Thomas Cook's failure down to "too little differentiation".

"When you have no differentiation, you are head to head competing with the internet. People are fine with packages because it's comfort. People are not fine with being treated like anybody else."

The capability to offer personalised booking "is something which will change our whole company", Mr Joussen claimed. Around 30 per cent of Tui customers were opting to pay extra to book a specific room — with options also including proximity to restaurants for parents using baby monitors.

Mr Joussen started his career as a software engineer before joining Vodafone Germany to lead one of its first internet marketing campaigns in 1996.

Since he took over at Tui in 2013, the Hanover-based but UK-listed group, which was formed following the merger of Tui AG and First Choice in 2007, has steadily diversified away from the traditional tour operator model of buying up capacity in hotels in the winter to flog to customers in the summer. It has invested in its own hotels and online offering.

The company has not been immune to the pressures faced by the travel sector and has issued two profit warnings this year: one due to weakness of the pound and shifts in consumer demand, the other to the grounding of the Boeing 737 Max jet, which it has said will cost €300m this year.

Tui customers can choose rooms with morning or evening sun

For the year to September 2018 Tui increased revenue by 5 per cent to €19.5bn and underlying earnings by 4 per cent to €1.15bn.

But this year earnings are expected to fall by about a quarter to around €870m-€880m depending on currency fluctuations, as weaker demand continues.

In October, analysts at Morgan Stanley downgraded Tui's shares saying that the benefit from Thomas Cook's collapse would not be "immediately obvious" as it depended on competitors' reaction and consumer confidence in package holidays.

They added that the 737 Max groundings and Brexit would continue to weigh on earnings in 2020.

Tui's next move is to push into the £150bn-a-year activities and experiences market, following its acquisition of the online activity booking platform Musement in 2018 for €35.5m.

Tui has doubled the number of Musement's employees to 260 and plans to expand the number of bolt-on holiday activities, such as hot air ballooning in the Moroccan desert.

But it is not the only travel company eyeing up this market. Airbnb launched its experiences platform in 2016, while Booking.com and TripAdvisor, both bought activity aggregation businesses in 2018.

Richard Clarke, an analyst at Bernstein, said Tui's control over its hotels, activities and airline made it more immune than most to the encroachment of tech companies.

"What we've seen for the last 10 years is that package holidays as a segment has retained share. Within that it's difficult, because of the control Tui has over its content, for Expedia and Booking to muscle in."

Greater risks to the business come from macro concerns such as the environment and Brexit although Mr Joussen said he was not convinced by *"flygskam"* — or "flight-shaming" — a movement that started in Sweden, which is encouraging people across Europe to stop taking as many flights.

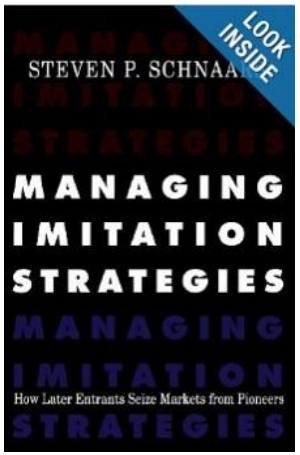
"It turns out that in the winter Sweden is very dark. And in the winter season, a lot of Swedes don't want to sit in the dark. To Spain [on] a train is a long journey," Mr Joussen said.

Source: FT, 18 November, 2019, p. 1

Note: diffusion is not simply the spread of the same

Source: FT, 25 July, 2015, p. 1

Note: imitation is more common than innovation, but is not easy!

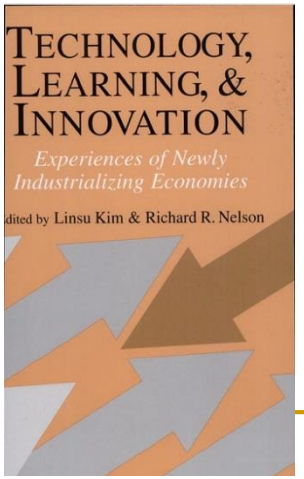


http://bit.ly/1hq4FT6

Imitiation is not all alike !

Duplicative imitaton

- illegal copy (contrafaction and piracy)
- legal reproduction (licences or pastiches)



http://amzn.to/1cgNwIl

Criative adaptation

- Creative adaptation (same template but different style)
- Different quality (better than the original)
- Market translation (extrapolating to another arena)

Note: old innovation are persistent and do not disapear imediately

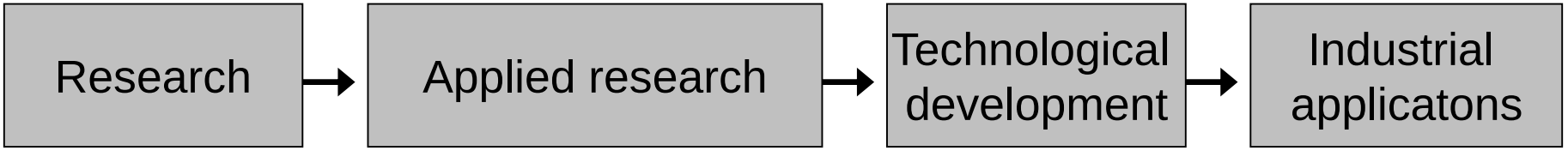
"When reactors at the Fukushima nuclear plant went into meltdown in 2011, operators tried to send a fax to alert authorities in the nearby town of Namie."

Source: *Financial Times*, 19 Aug 2014, p. 8

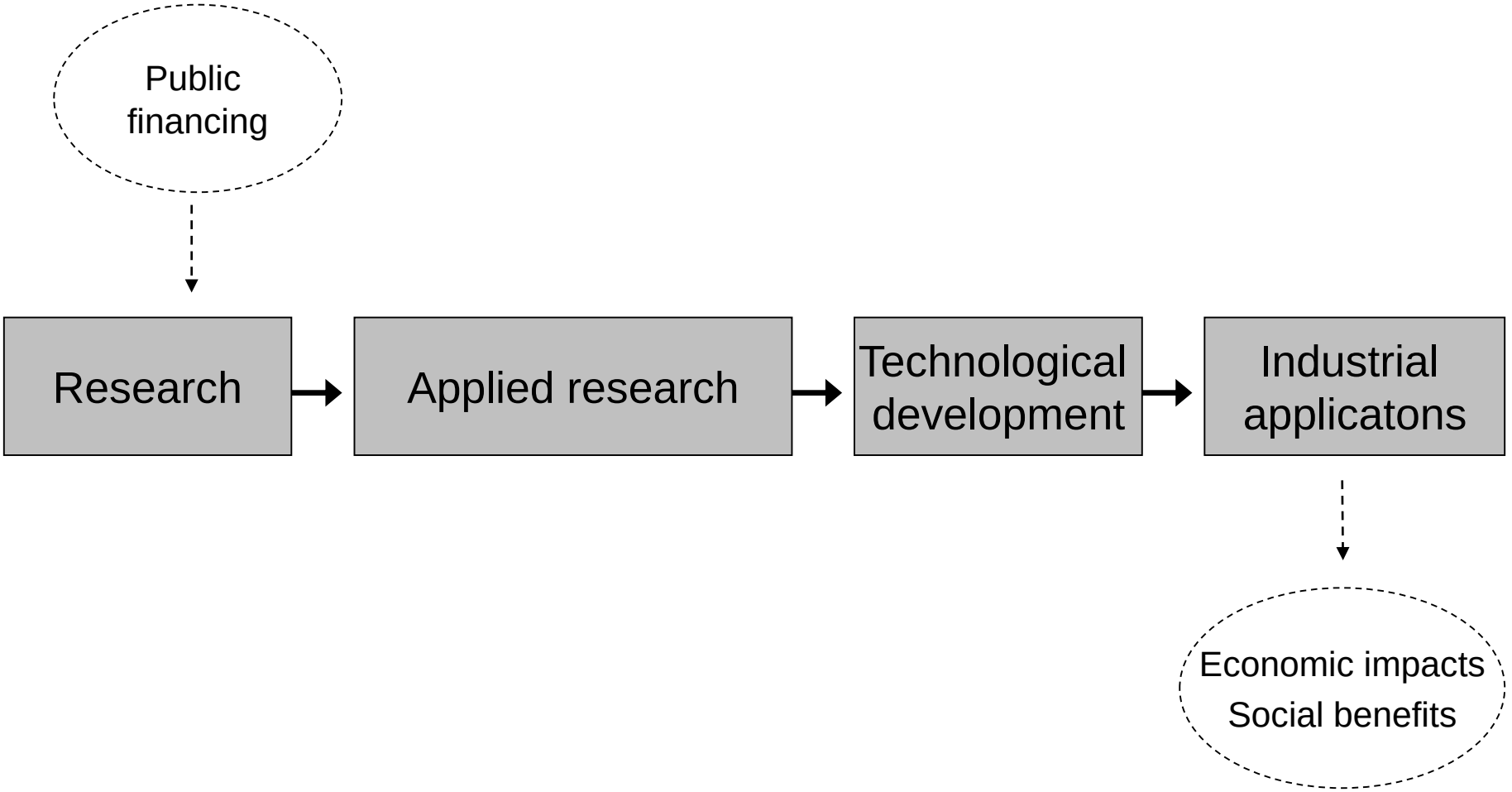
- 4.

  the linear model...

4. The linear model



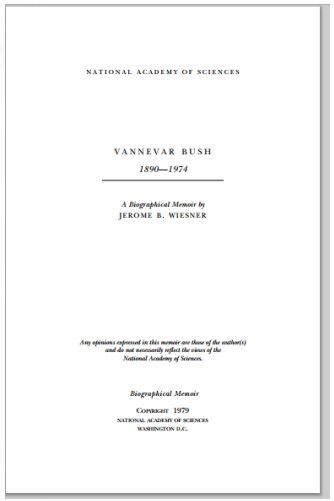
4. The linear model



LINEAR MODEL

- *The key insight is*: Science is the seed, the fruits are new and better products

- Chicago World's Fair de 1933 : "**Science Finds, Industry Applies**"
- Intellectual constructs are supposed to drive socio-economic progress
- Separation is clear between "theory" and "practice"
- Planning dominates the process, the rest is a sequence of events
- The "market failure" reasoning is embeded into the model



NATIONAL ACADEMY OF SCIENCES

VANNEVAR BUSH

1890—1974

A Biographical Memoir by
JEROME B. WIESNER

Any opinions expressed in this memoir are those of the author(s) and do not necessarily reflect the views of the National Academy of Sciences.

Biographical Memoir

Book is here:

http://bit.ly/1s7UYz6

and also here…
http://1.usa.gov/1p4sdA9

a report titled "Science—The Endless Frontier," which provided a blueprint for far-reaching federal policies. "One of our hopes is that after the war there will be full employment," Bush said in the report. "To create more jobs we must make new and better and cheaper products. We want plenty of new, vigorous enterprises. But new products and processes are not born full-grown. They are founded on new principles and new conceptions which in turn result from basic scientific research. Basic scientific research is scientific capital."

Use of the term "basic research" was not a casual choice. Bush explained later: "There were some on Capitol Hill who felt that the real need of the postwar effort would be the support of inventors and gadgeteers, and to whom science meant just that. When talking matters over with some of these, it was well to avoid the word fundamental and use basic instead."† To provide an organization for the support of basic research, Bush proposed the creation of a National Research Foundation, which would administer fellowships and scholarships and would "place its research contracts or grants not only with those institutions which have a demonstrated research capacity but also with other institutions whose latent talent or creative atmosphere affords promise of research success."

Dr. Bush Writes a Report: "Science—The Endless Frontier"

In reply to F.D.R.'s request, Bush recommended a postwar National Research Foundation.

J. M. England

The author is special assistant to the director and historian of the National Science Foundation, Washington, D.C. 20550.

In a letter written on Pearl Harbor Day 1944, Palmer Putnam, who as a wartime scientist had turned his talents as engineer and yachtsman to developing amphibious vehicles, asked his friend Carroll Wilson a series of questions (*1*): "Please tell me what I may know about the background of the President's letter to Bush. Did Bush write it? Did Bush ask for it? . . . Is it welcome to Bush? Will he carry out the requested studies? Are they under way? By whom?"

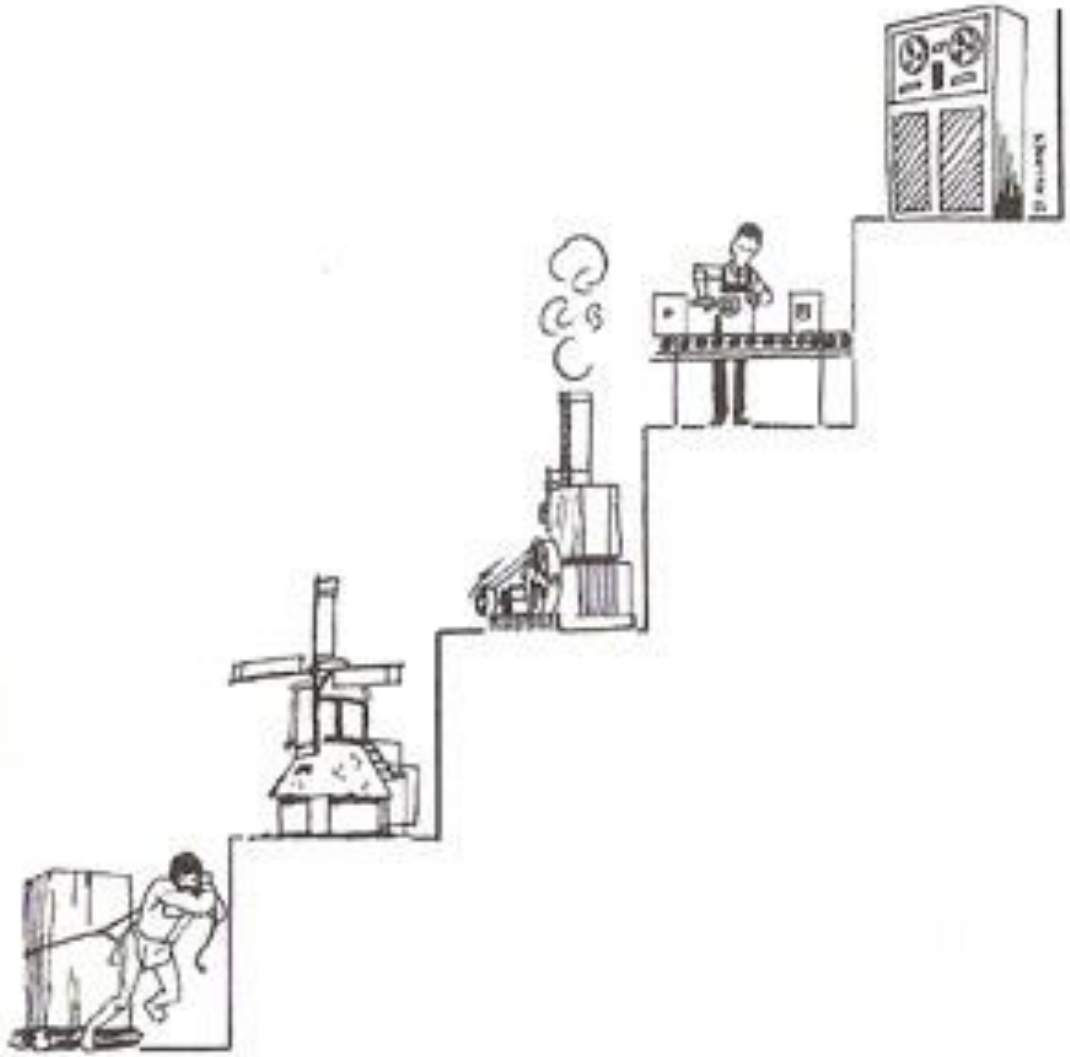
Wilson sent a prompt reply: "As to the President's letter to Bush, Bush did not write it nor did he ask for it, but he had the opportunity to see it before it was sent and made some suggestions which were incorporated. . . . Bush welcomes the letter and is now organizing studies to enable him to reply on the four numbered items." Wilson expected all four studies to be completed within two months (*2*).

The letter they referred to was one from President Roosevelt to Vannevar Bush, director of the Office of Scientific Research and Development (OSRD). After expressing his belief that OSRD's wartime experience might "be used in the days of peace ahead for the improvement of the national health, the creation of new enterprises bringing new jobs, and the betterment of the national standard of living," President Roosevelt asked for Bush's recommendations on four questions (*3*): (i) How can scientific knowledge developed during the war be released to the world quickly? (ii) How can a program of medical research be organized to continue the attack on disease? (iii) How can the government assist research by public and private organizations? (iv) Can a program be suggested to develop the scientific talent of American youth to ensure high-quality research in the future? As Wilson, who was Bush's executive assistant, indicated in his reply to Putnam, Bush quickly organized groups to help make recommendations on these four matters.

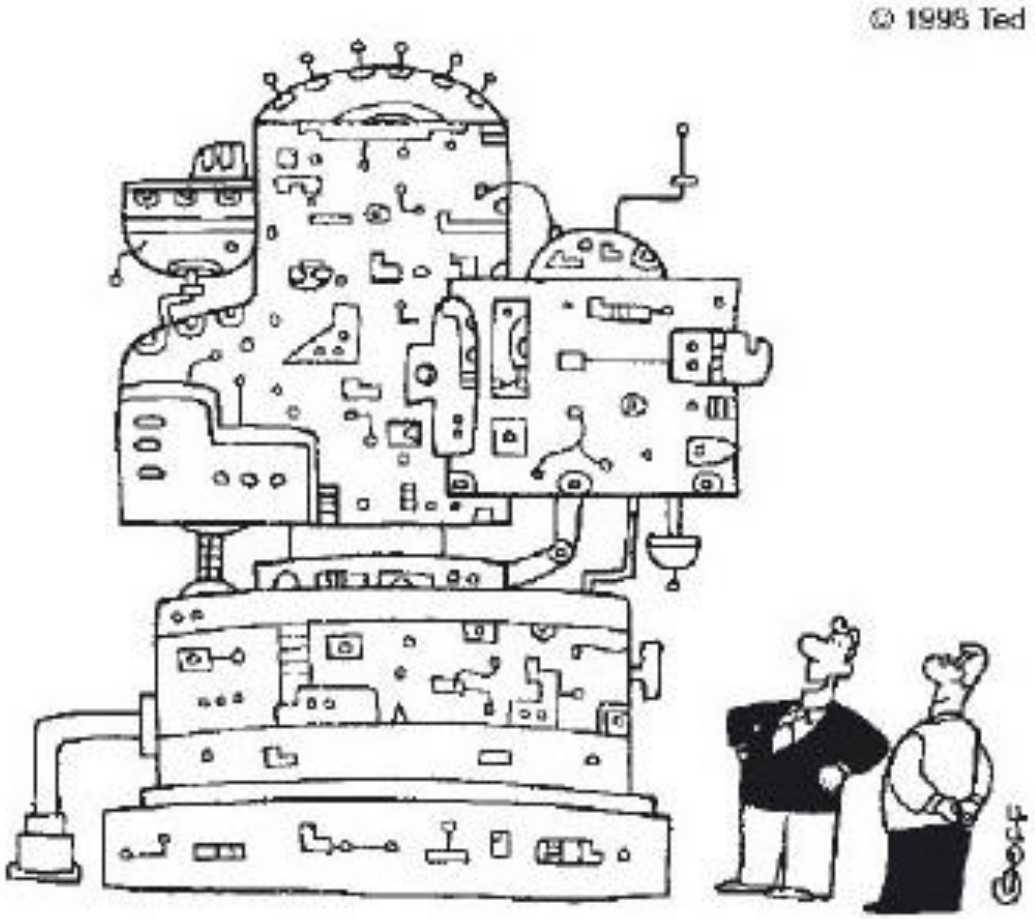
Wilson's letter contradicts the general assumption that Bush himself originated the President's request. Worries about a possible return of the bread lines of the Great Depression probably had more to do with the letter's genesis than did concern for postwar support of science. The idea for the letter very likely came from Oscar Cox, general counsel of the Foreign Economic Administration, rather than from inside OSRD. Cox, who had worked closely with Bush in establishing the National Defense Research Committee (NDRC) and OSRD, reached an agreement with Harry Hopkins several weeks before the November election that the President should call on Bush for a report. Cox's rough draft of the proposed letter, dated 18 October, shows a concern simply "to utilize our war-time discoveries, research and development to create fuller peace-time employment." Bush was to "prepare and submit . . . a list of those discoveries which to your knowledge and judgment are likely to have ready peace-time application." This "inventory of ideas" would "stimulate thinking by enterprising business" and suggest the creation of new industries (*4*, *5*).

Yet if Bush did not originate the President's letter, he characteristically seized the opportunity to see that it asked the "right questions" (*6*). The full-employment emphasis of Cox's draft was soon substantially broadened.

Science 9 January 1976: Vol. 191 no. 4222 pp. 41-47



TECHNOLOGICAL PROGRESS IS SAID TO RESEMBLE A FLIGHT OF STAIRS.



"Magnificent invention! Now, let's get the people in Marketing to figure out what it can do!"

- 5.

  going beyond this model...

5. Research *on* innovation

Nelson (1959), "The simple economics of basic scientific research"

Nelson (ed.) (1962) *The Rate and Direction of Inventive Activity*

Rosenberg (1963), "Technological change in the machine-tool industry"

Landes (1969) *The Unbound Prometheus*

SPRU's SAPPHO Project, 1970s

1950

1970s

5. Research *on* innovation

Nelson (1959), "The simple economics of basic scientific research"

Nelson (ed.) (1962) *The Rate and Direction of Inventive Activity*

Rosenberg (1963), "Technological change in the machine-tool industry"

De la Solla Price (1963), *Little Science, Big Science*

Mansfield (1963) "Size of firm, market structure and innovation")

Schmookler (1966) *Invention and Economic Growth*

Landes (1969) *The Unbound Prometheus*

Jewkes et al (1969), *The Sources of Invention*

SPRU's SAPPHO Project, 1970s

1950s

1970s

National Science Foundation 1950

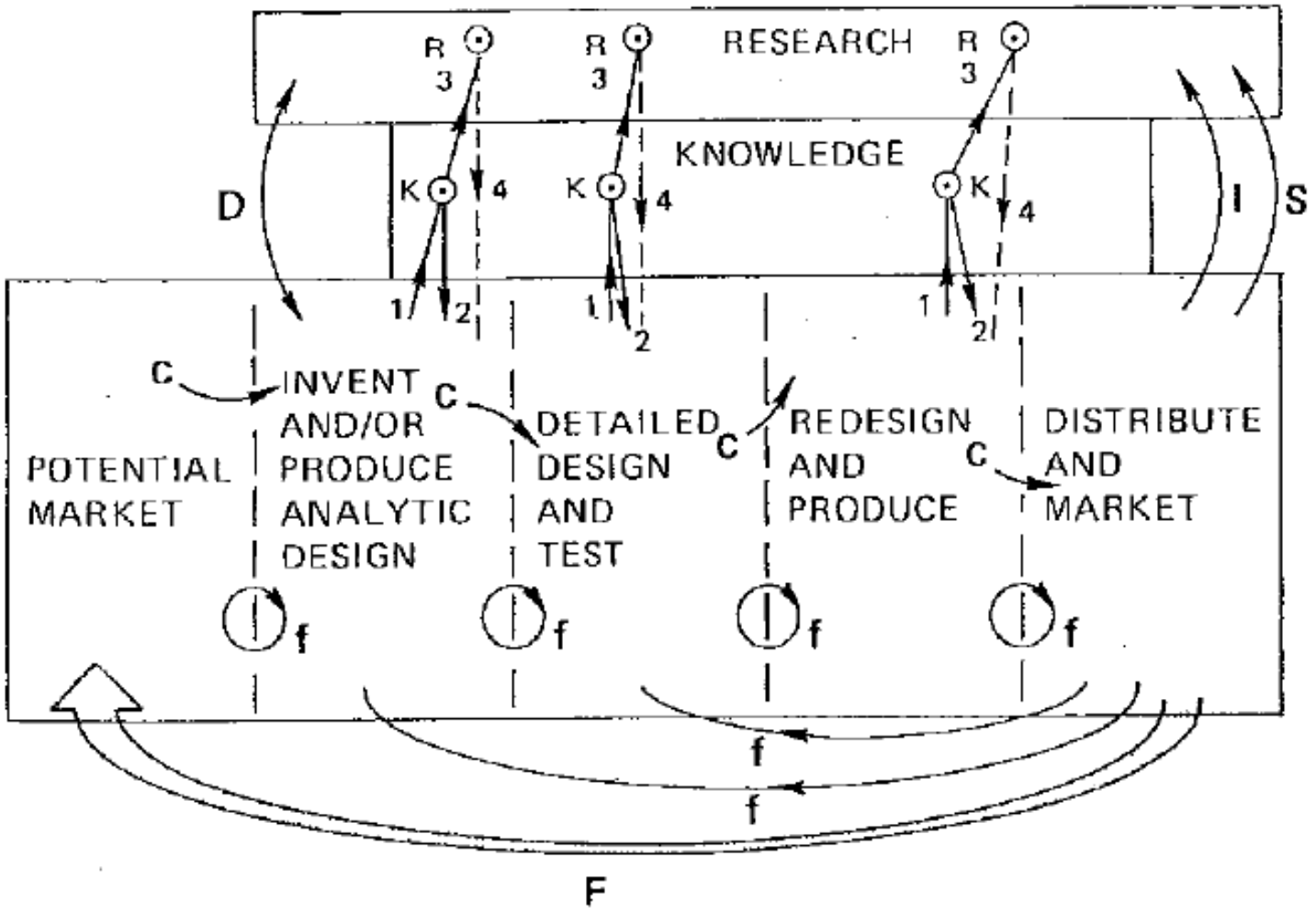
RAND Corporation group on Economics of R&D

(D)ARPA 1958

OECD's Frascati Manual 1963

SPRU 1964

5. Chain-linked model



Kline and Rosenberg (1986), "An overview of innovation"

CHAIN-LINKED MODEL

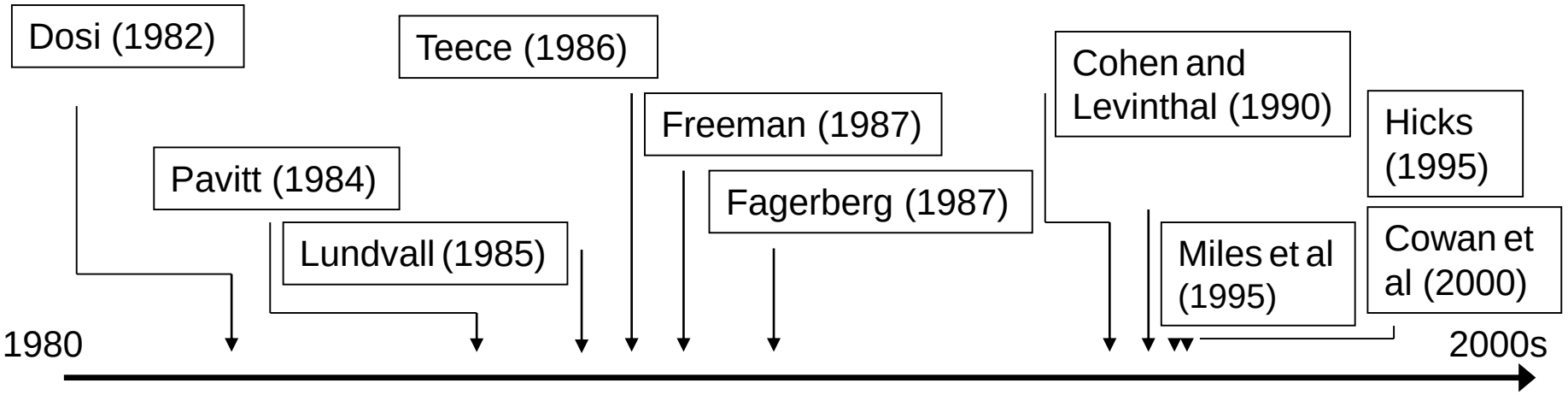
- *The key insight is*: All starts in the market, but what matters is iteration

- Technological innovation has not value in itself, only in the market place
- The innovation process combines technological and non-technlogical elements
- Innovative products go through plenty of non-trivial mutations in their lifecycle
- The process of creating innovations leads to the creation of new science
- Innovation is price to pay to keep alive in the market

- 6.

  going even more beyond...

6. The research goes on



6. The research goes on

Dosi (1982)

Hughes (1982)

Pavitt (1984)

Lundvall (1985)

Teece (1986)

David (1985)

Freeman (1987)

Fagerberg (1987)

Arthur (1989)

Cohen and Levinthal (1990)

Henderson and Clark (1991)

Freeman (1991)

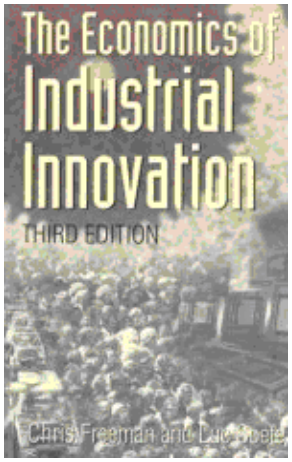
Miles et al (1995)

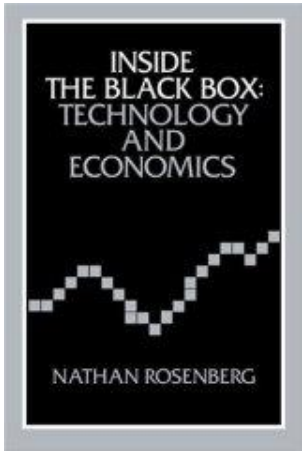
Hicks (1995)

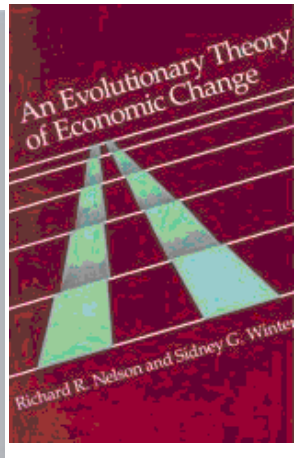
Cowan et al (2000)

1980 — 2000s

(1982)







Dosi, Freeman, Nelson, Silverber and Soete (1988)

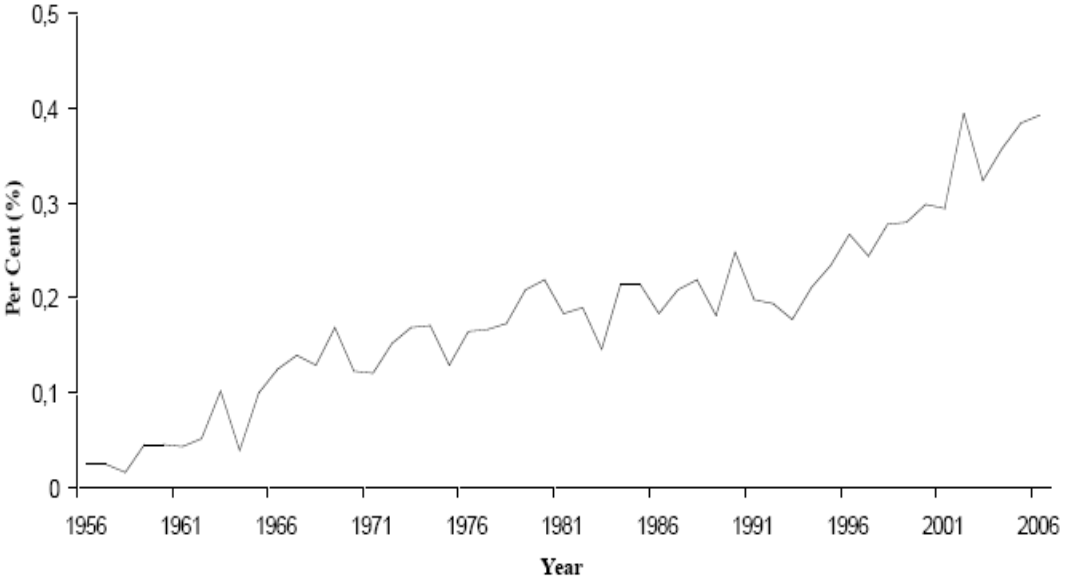
Lundvall (1992)

Freeman and Louçã (2001)

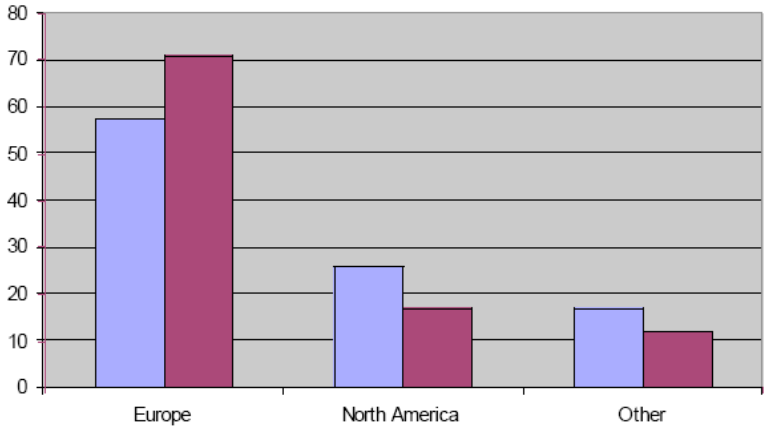
Fagerberg, Mowery and Nelson (2004)

6. The research goes on

Articles with "innovation" in the title among the social sciences



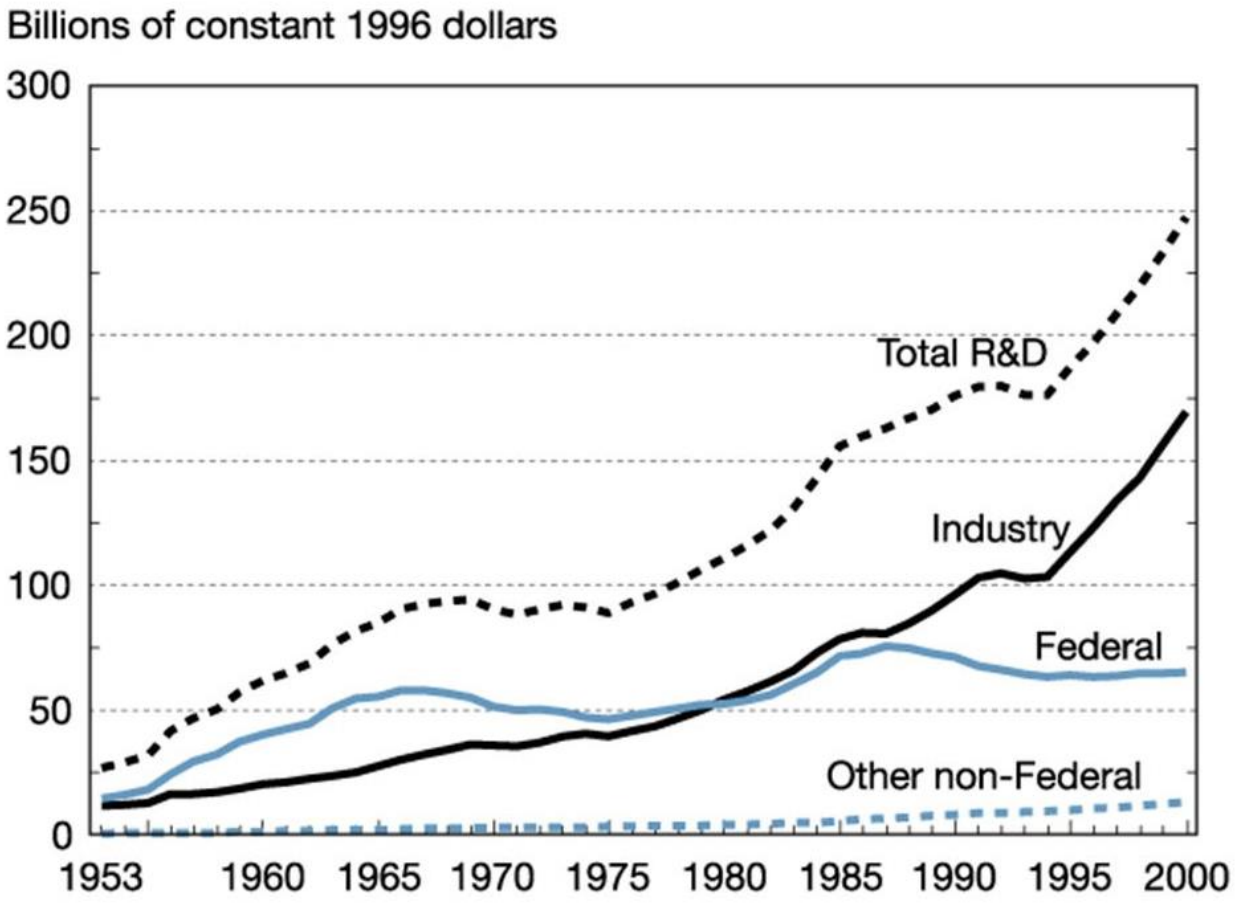
Where is innovation studied?



Source: Fagerberg and Verspagen (2009)

6. The research goes on

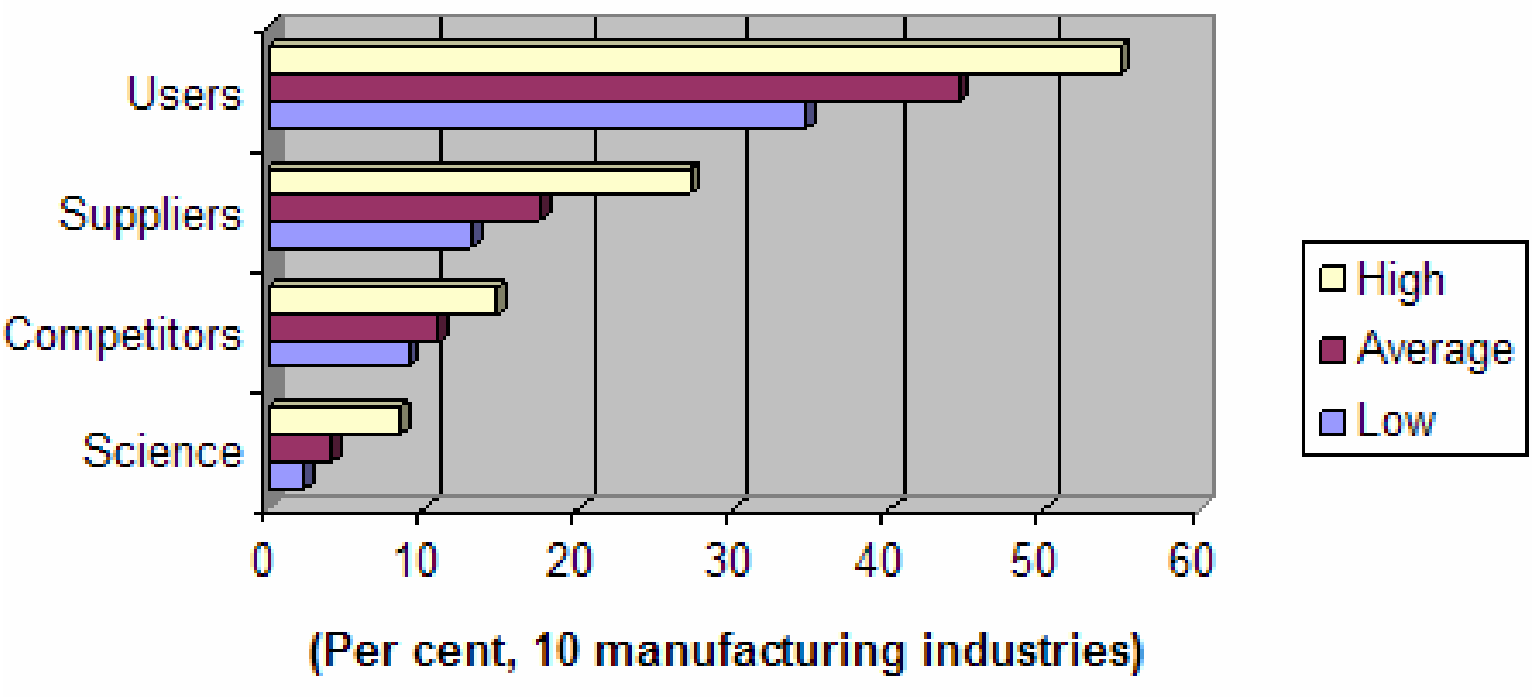
US: sources of R&D funding



Science: National Science Board, *Science and Engineering Indicators*

6. The research goes on

Diversity of learning sources



Source: Fagerberg (2004)

6. The research goes on

A "novel mode" of knowledge production

Source: Many-Eyes (2009)

ELSEVIER

Technological Forecasting & Social Change

Technological Forecasting & Social Change
An International Journal

Technical note

The changing role of science in the innovation process: From Queen to Cinderella?

João Caraça [a,b,*], Bengt-Åke Lundvall [c], Sandro Mendonça [d,e]

[a] Gulbenkian Foundation, Lisbon, Portugal
[b] ISEG, Technical University of Lisbon, Lisbon, Portugal
[c] Department of Business Studies, Aalborg University, Aalborg, Denmark
[d] Department of Economics, ISCTE-Lisbon University Institute, Lisbon, Portugal
[e] SPRU, University of Sussex, Brighton, UK

ARTICLE INFO

Article history:
Received 12 April 2008
Received in revised form 12 August 2008
Accepted 12 August 2008

Keywords:
Science
Innovation
Innovation process
Conceptual model

ABSTRACT

An overview of how the role of science in relation to innovation has been defined over the past five decades is given, showing a change from a linear to a chain-linked model of interpretation. A third analytical grid, leading to a new model is proposed, summarizing the current research on the nature of economically useful knowledge, the diversity of intervening players in learning and the outcomes of innovation. While the chain-linked view surpassed the linear model by emphasising that science is part of the process but not necessarily the initiating step, we need today to explicitly acknowledge the multi-player dimension of innovation and the wider institutional setting where distinct forms of learning take place. The reason is simple: almost all high added value products embody elements of scientific knowledge. But science is only one of a plurality of other sources of knowledge that induce innovation-based growth. More attention should also be given to understanding markets and organisations.

1. Introduction[1]

No single activity has had a deeper and broader impact on modern society than science. Science as culture has shaped our contemporary institutions and in western societies it has imposed a world outlook where it is assumed that in principle everything can be explained without reference to the gods. Without science we would not have experienced the consequences of the Pill, the Bomb, Voyager or the Computer. The impact of scientific progress on the economy has been equally dramatic. Almost all artefacts and services characterised by high added value embody elements of scientific knowledge. Drugs embody results from research in biology, chemistry, biochemistry and genetic engineering. Software and hardware embody advanced mathematics, physics and system engineering. Increasingly services depend on the use of advanced information technology, and on mobilising methods and insights from psychology, sociology, economics and management sciences.

In a society where money and economic growth are regarded as the most valid indicators of performance, it is tempting for advocates of science to point to the economic impact as the major argument for why the public should support science. For policymakers it is equally tempting to operate on the basis of a simple model of innovation and growth, where investment in science is seen not only as a necessary but also as a sufficient condition for innovation-based growth. It is characteristic that the

6. Multi-channel model

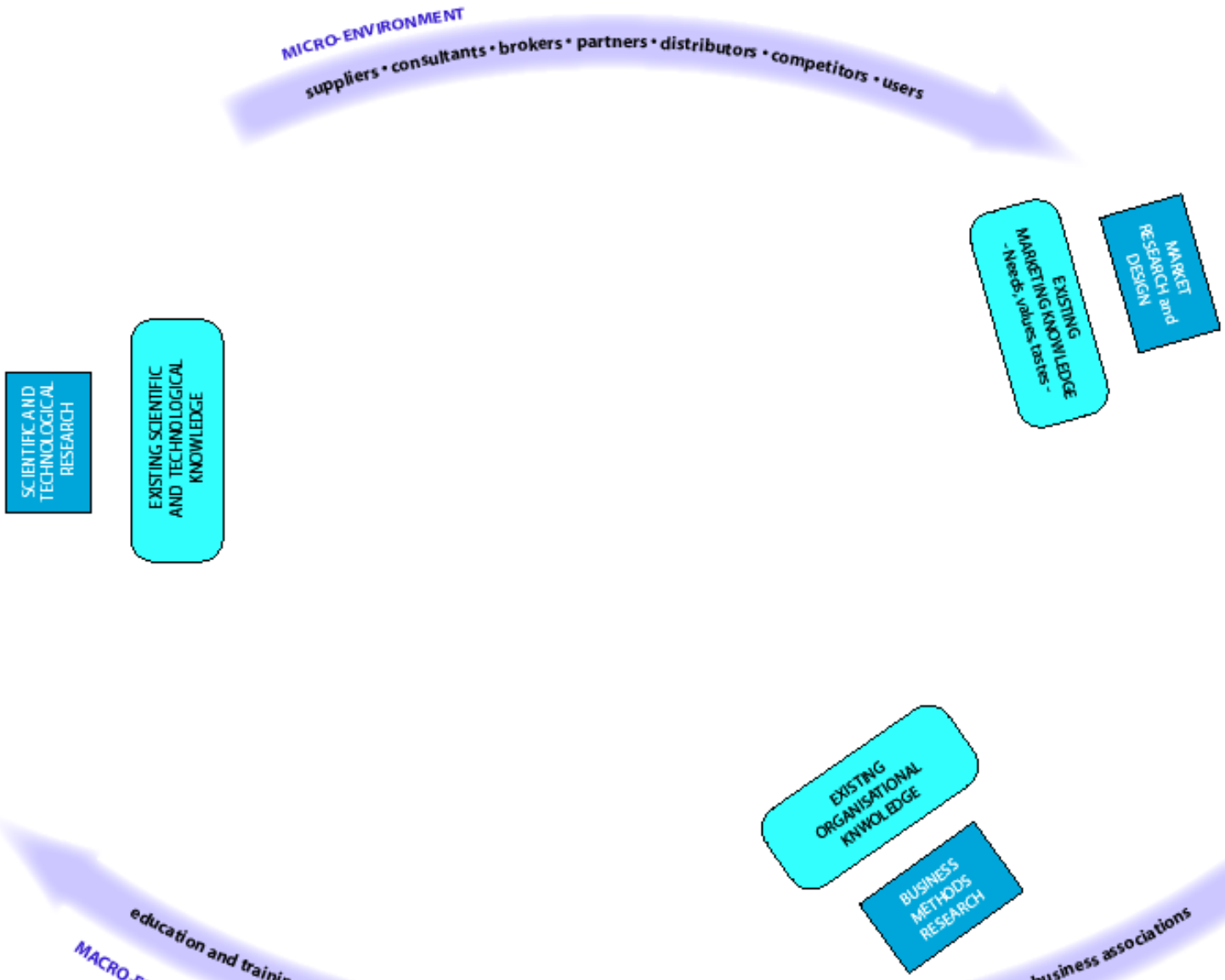
Re-re-inventing the innovation model

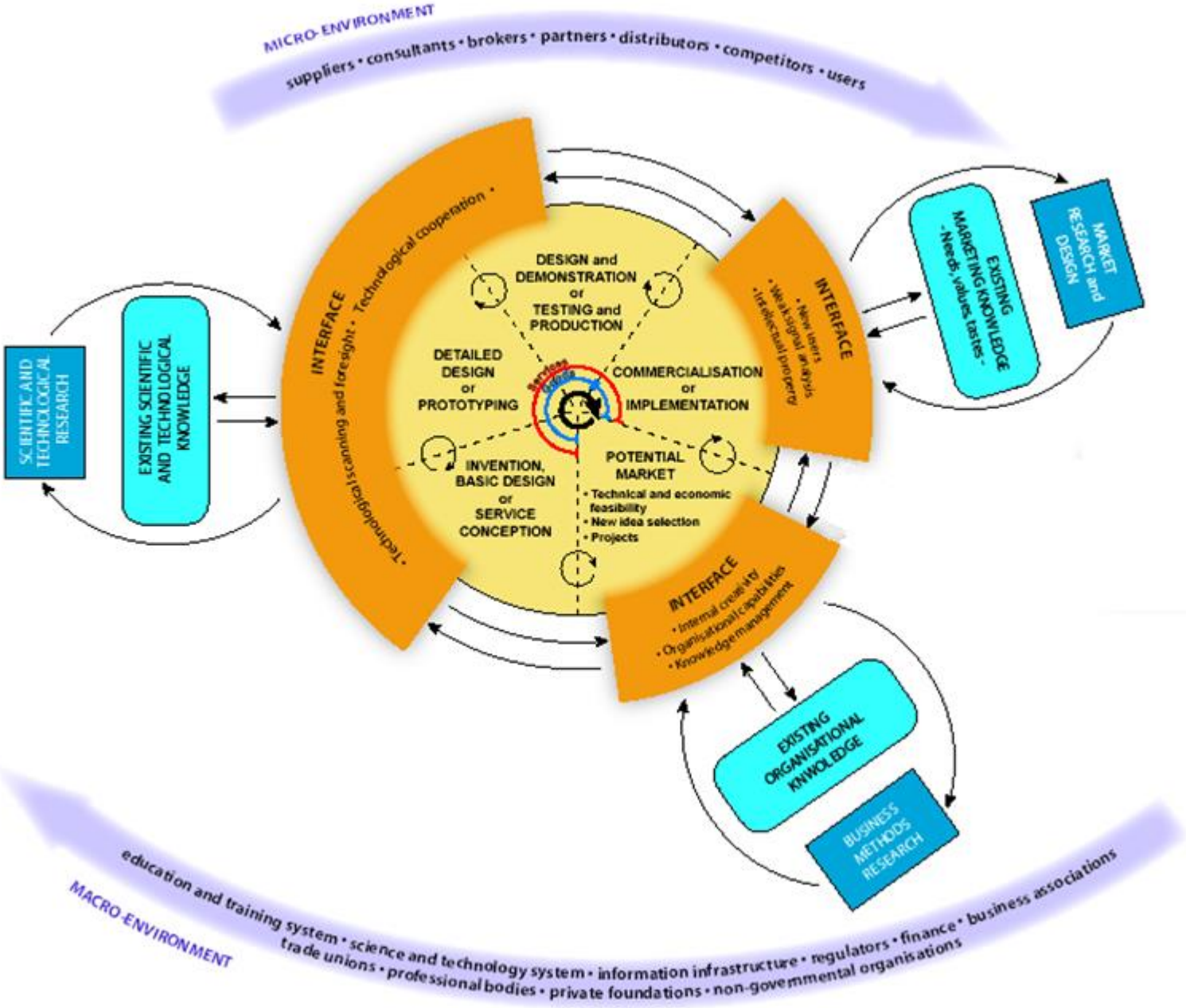
- Innovation as continuos and interactive moment
- Economics transformation depends of science but also experimentation
- Experimentation depends on openess

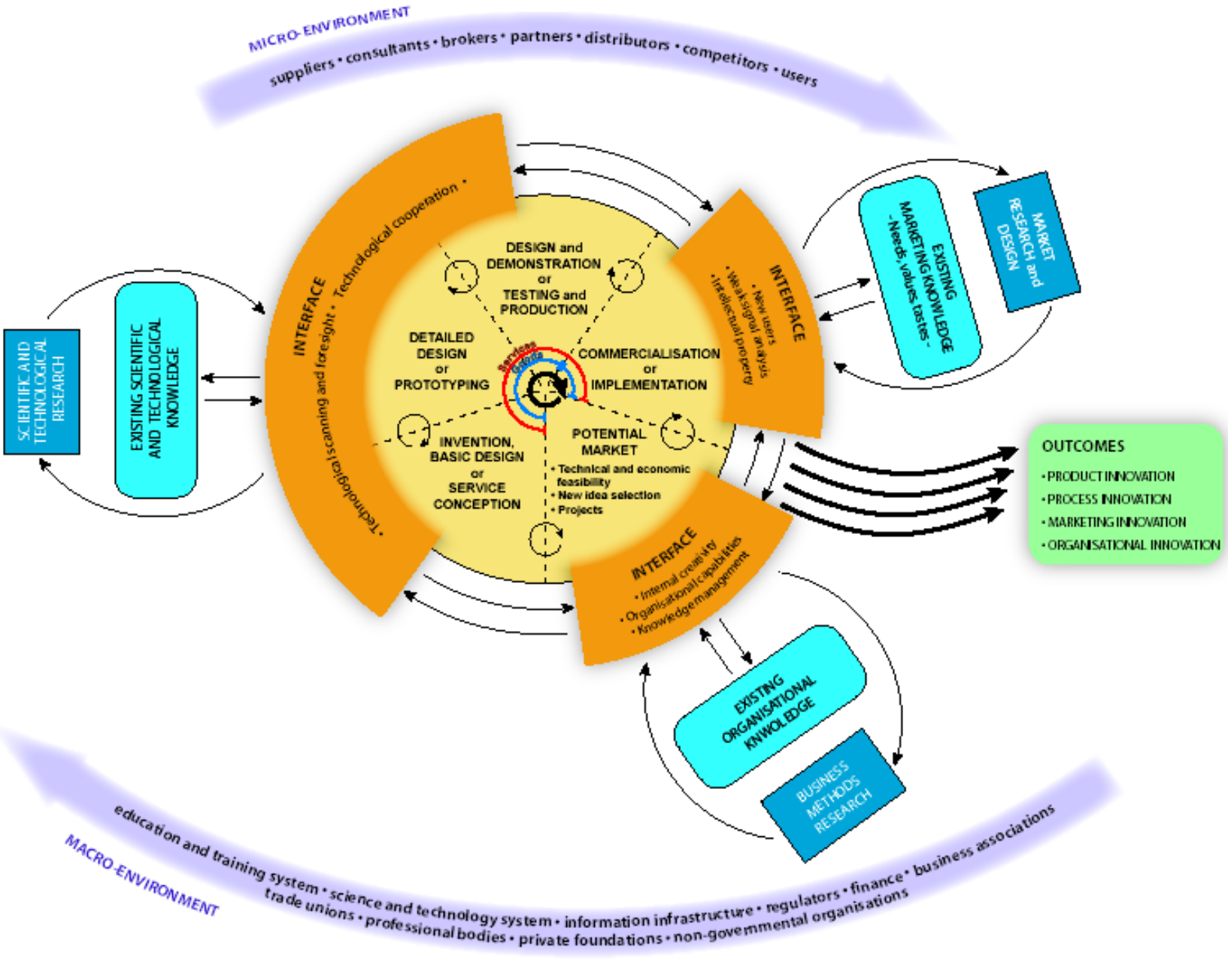
Three forms of openness:

- To nature (Science & Technology)
- To governance (Organizing)
- To the market (Marketing)


MICRO-ENVIRONMENT
suppliers • consultants • brokers • partners • distributors • competitors • users
MACRO-ENVIRONMENT
education and training system • science and technology system • information infrastructure • regulators • finance • business associations
trade unions • professional bodies • private foundations • non-governmental organisations


MICRO-ENVIRONMENT
suppliers • consultants • brokers • partners • distributors • competitors • users
EXISTING MARKETING KNOWLEDGE -Needs, values, tastes-
MARKET RESEARCH and DESIGN
SCIENTIFIC AND TECHNOLOGICAL RESEARCH
EXISTING SCIENTIFIC AND TECHNOLOGICAL KNOWLEDGE
EXISTING ORGANISATIONAL KNWOLEDGE
BUSINESS METHODS RESEARCH
MACRO-ENVIRONMENT
education and training system • science and technology system • information infrastructure • regulators • finance • business associations
trade unions • professional bodies • private foundations • non-governmental organisations


MICRO-ENVIRONMENT
suppliers • consultants • brokers • partners • distributors • competitors • users
SCIENTIFIC AND TECHNOLOGICAL RESEARCH
EXISTING SCIENTIFIC AND TECHNOLOGICAL KNOWLEDGE
INTERFACE
• Technological cooperation •
• Technological scanning and foresight •
DESIGN and DEMONSTRATION or TESTING and PRODUCTION
DETAILED DESIGN or PROTOTYPING
COMMERCIALISATION or IMPLEMENTATION
INVENTION, BASIC DESIGN or SERVICE CONCEPTION
POTENTIAL MARKET
• Technical and economic feasibility
• New idea selection
• Projects
INTERFACE
• New users
• Weak signal analysis
• Intellectual property
EXISTING MARKETING KNOWLEDGE
-Needs, values, tastes -
MARKET RESEARCH and DESIGN
INTERFACE
• Internal creativity
• Organisational capabilities
• Knowledge management
EXISTING ORGANISATIONAL KNWOLEDGE
BUSINESS METHODS RESEARCH
MACRO-ENVIRONMENT
education and training system • science and technology system • information infrastructure • regulators • finance • business associations
trade unions • professional bodies • private foundations • non-governmental organisations


MICRO-ENVIRONMENT
suppliers • consultants • brokers • partners • distributors • competitors • users
SCIENTIFIC AND TECHNOLOGICAL RESEARCH
EXISTING SCIENTIFIC AND TECHNOLOGICAL KNOWLEDGE
INTERFACE
• Technological cooperation •
• Technological scanning and foresight •
DESIGN and DEMONSTRATION or TESTING and PRODUCTION
DETAILED DESIGN or PROTOTYPING
COMMERCIALISATION or IMPLEMENTATION
INVENTION, BASIC DESIGN or SERVICE CONCEPTION
POTENTIAL MARKET
• Technical and economic feasibility
• New idea selection
• Projects
Service Design
INTERFACE
• New users
• Weak signal analysis
• Intellectual property
EXISTING MARKETING KNOWLEDGE -Needs, values, tastes-
MARKET RESEARCH and DESIGN
INTERFACE
• Internal creativity
• Organisational capabilities
• Knowledge management
EXISTING ORGANISATIONAL KNWOLEDGE
BUSINESS METHODS RESEARCH
OUTCOMES
• PRODUCT INNOVATION
• PROCESS INNOVATION
• MARKETING INNOVATION
• ORGANISATIONAL INNOVATION
MACRO-ENVIRONMENT
education and training system • science and technology system • information infrastructure • regulators • finance • business associations
trade unions • professional bodies • private foundations • non-governmental organisations

3rd generation (Caraça *et al.*, 2009)

If innovation is the basis of sustainable competitive advantage, the question is how to generate ***dynamic capabilities*** that allow us to develop and deliver innovative solutions to new and old problems.

How to manage innovation:

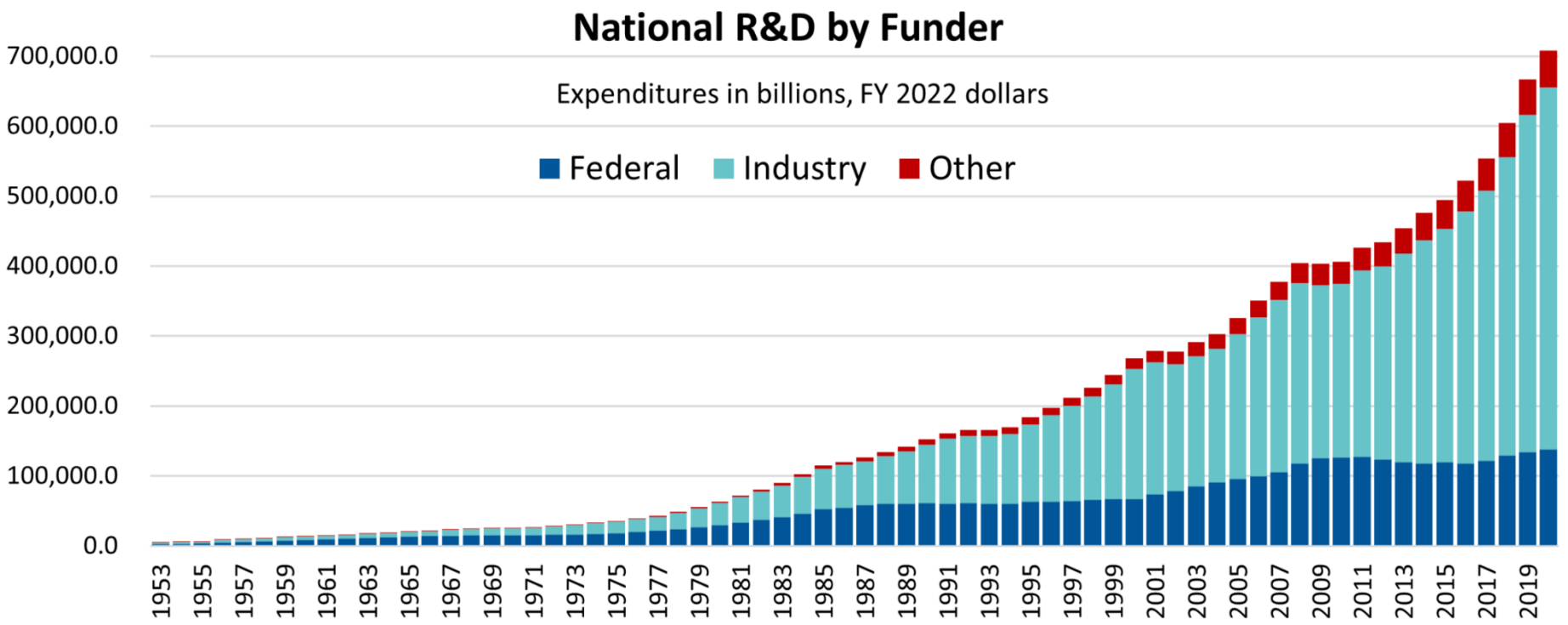
- indegenous problem-solving **(inventive capacity)**
- interfaces **(absorptive capacity)**
- networking with stakeholder **(coordenation capacity)**

MULTI-CHANNEL MODEL

- *The Key insight*: Innovation is plural, interactive learning is what matters

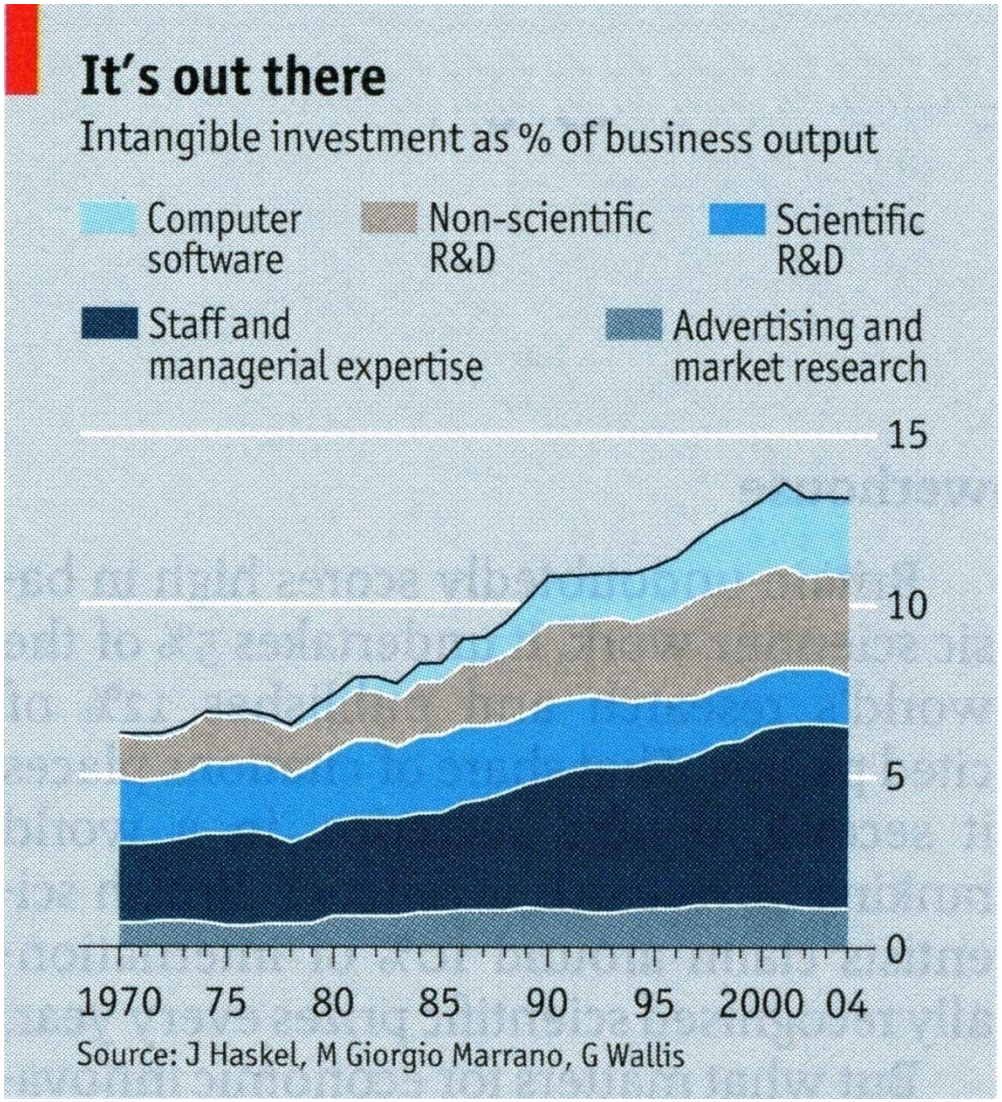
- Context is always present, it is heterogeneous and rugged
- No actor innovates isolated and not in a void but in networks
- There are multiple sources of innovation, and multiple kinds of innovation
- There is more to innovation than just science & technology
- The logic "systems failure" is embedded in the framework

R&D: Diversifying sources



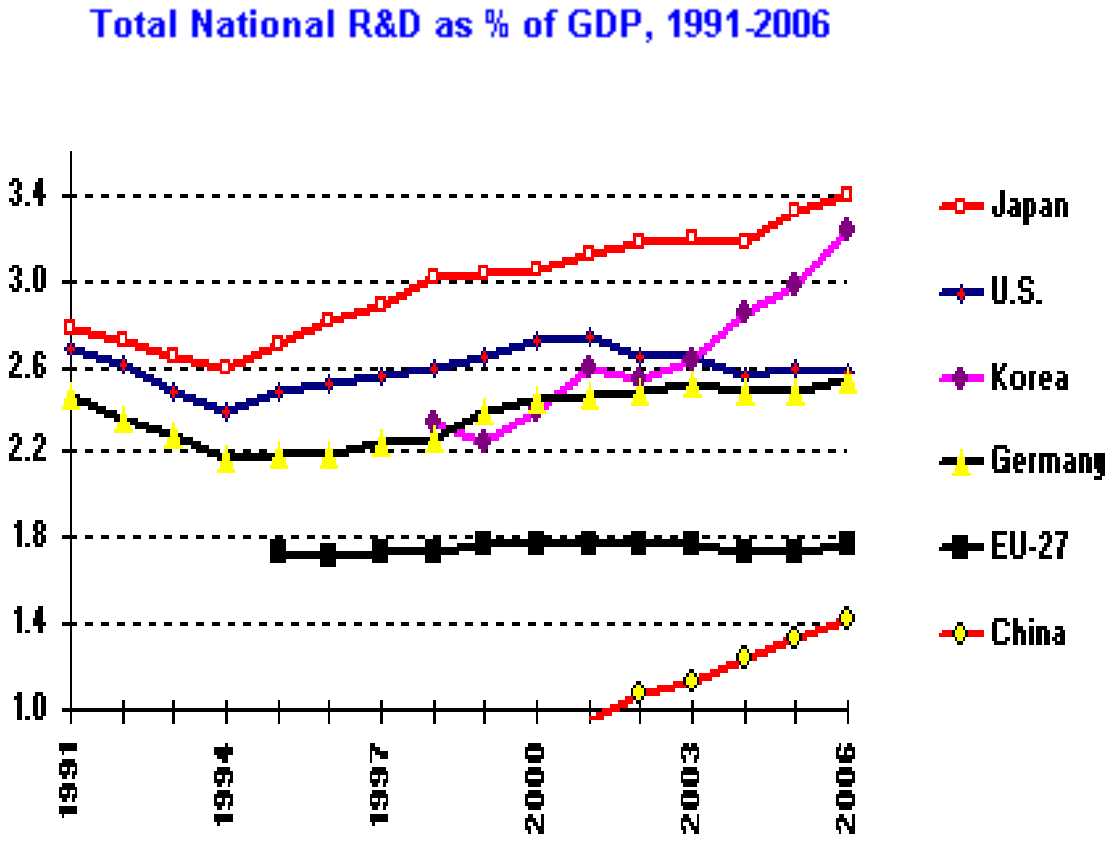
Source: AAA (2008), dados NSF

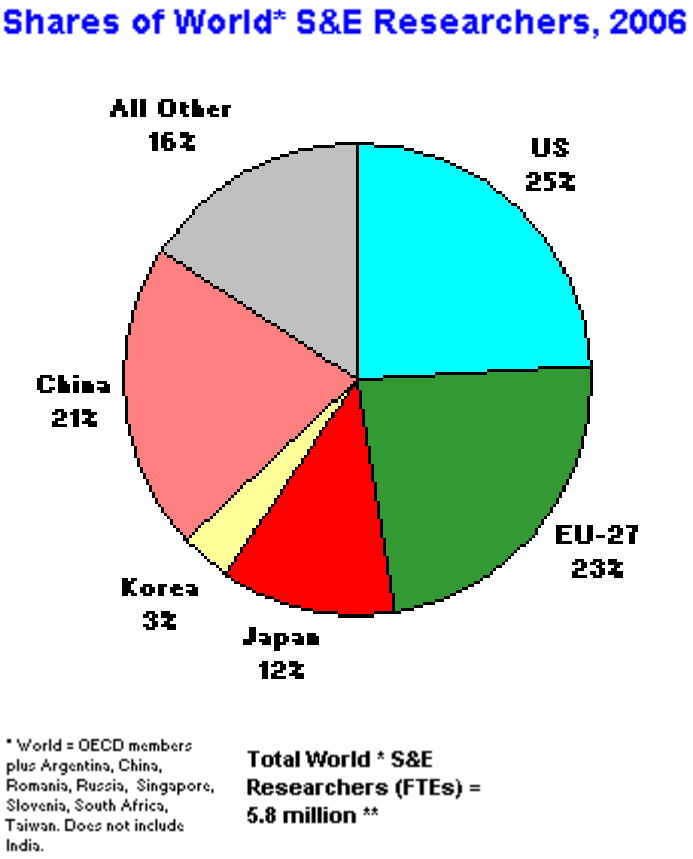
R&D is not enough



Source: *The Economist*, August 4, 2007

The rise of the "other" innovators

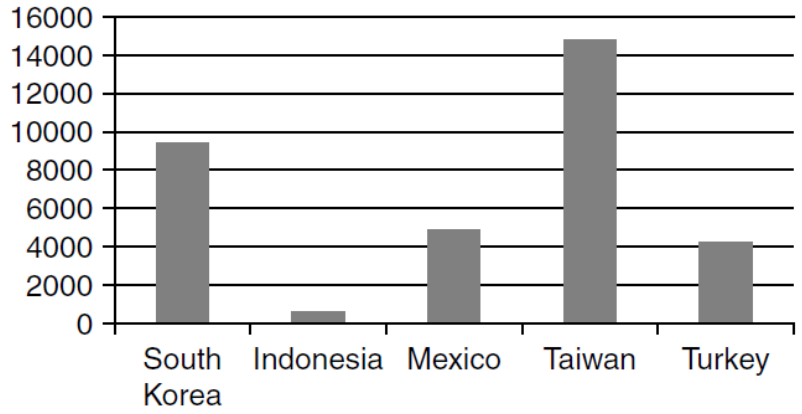




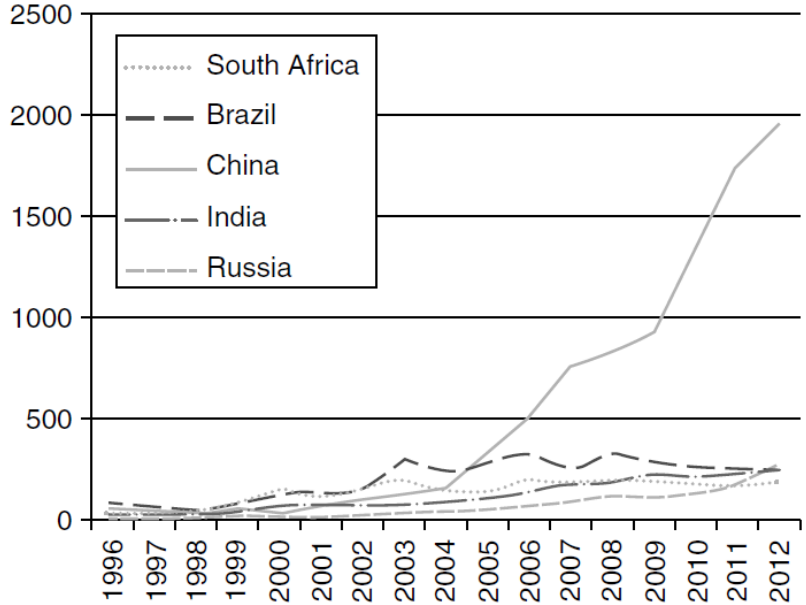
Fonte: AAA (2009), dados NSF

“Soft innovation”, commercial capabilities, trademark indicator

Applications by other emergent economies, aggregate 1996–2012.



Aggregate applications by the BRICS, 1996–2012.



7 National adaptive advantages

Soft innovation and marketing capabilities in periods of crisis and change

Sandro Mendonça

1. Introduction

Economic history does not play dice. Innovation is a profound and pervasive process that has made humanity come a long way. Approaching this process also requires a panoramic awareness in order to capture techno-economic change in its different guises and details. Innovation is, indeed, a many splintered phenomenon. This study argues for the continuous development of new methodological perspectives as innovation itself continues to make history unfold. Research on innovation has to adapt as the external environment itself changes. When the economic context changes fast and violently, like during the “Great Recession” or “Little Depression” period, the reasons pushing for analytical innovation can only increase. Such efforts may uncover, for instance, deeper weaknesses in the beleaguered European periphery than those already much discussed. It may well be that such countries have been under-investing in innovation more severely than previously realised.

One purpose of innovation studies is to bring us ever-updated knowledge regarding the structure and dynamics of creative and complex economic systems. The economy, as a multivariate and evolving ensemble of knowledge and value-added activities, becomes an ever-fertile ground where genuine learning can take place among those observers concerned with the realism of their hypotheses and the appropriateness of their policy conclusions. A novelty-intensive economic reality thus calls for innovation in the working tools and raw materials themselves, that is, the concepts and data economists use to go about their trade. Innovation in theories and evidence must keep pace with the innovation phenomena themselves. There is a need to keep working and to push the boundaries of approaches and develop new ones. New combinations of intellectual devices and empirical evidence can bridge the gap between the world and our understanding of it. Like in wonderland, the innovation economics programme has to keep moving in order not to lose ground.

Our goal here is to explore ways of mapping and measuring non-technological innovation. But how to explore the softer side of innovation when innovation studies, and neo-Schumpeterian economics in particular, still suffer from a science and technology bias? One way is to focus on the more intangible side of new products made available to customers. A key observation is that new or

Fonte: Mendonça (2014),

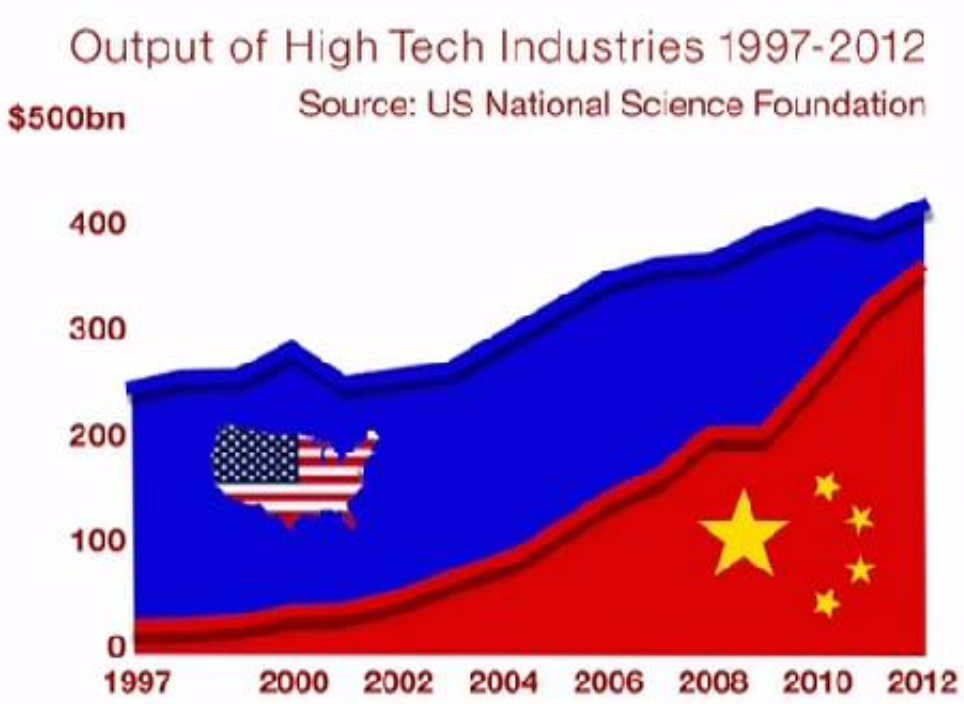
New modes of innovation

UK on India

Low-tech

Frugal innovation

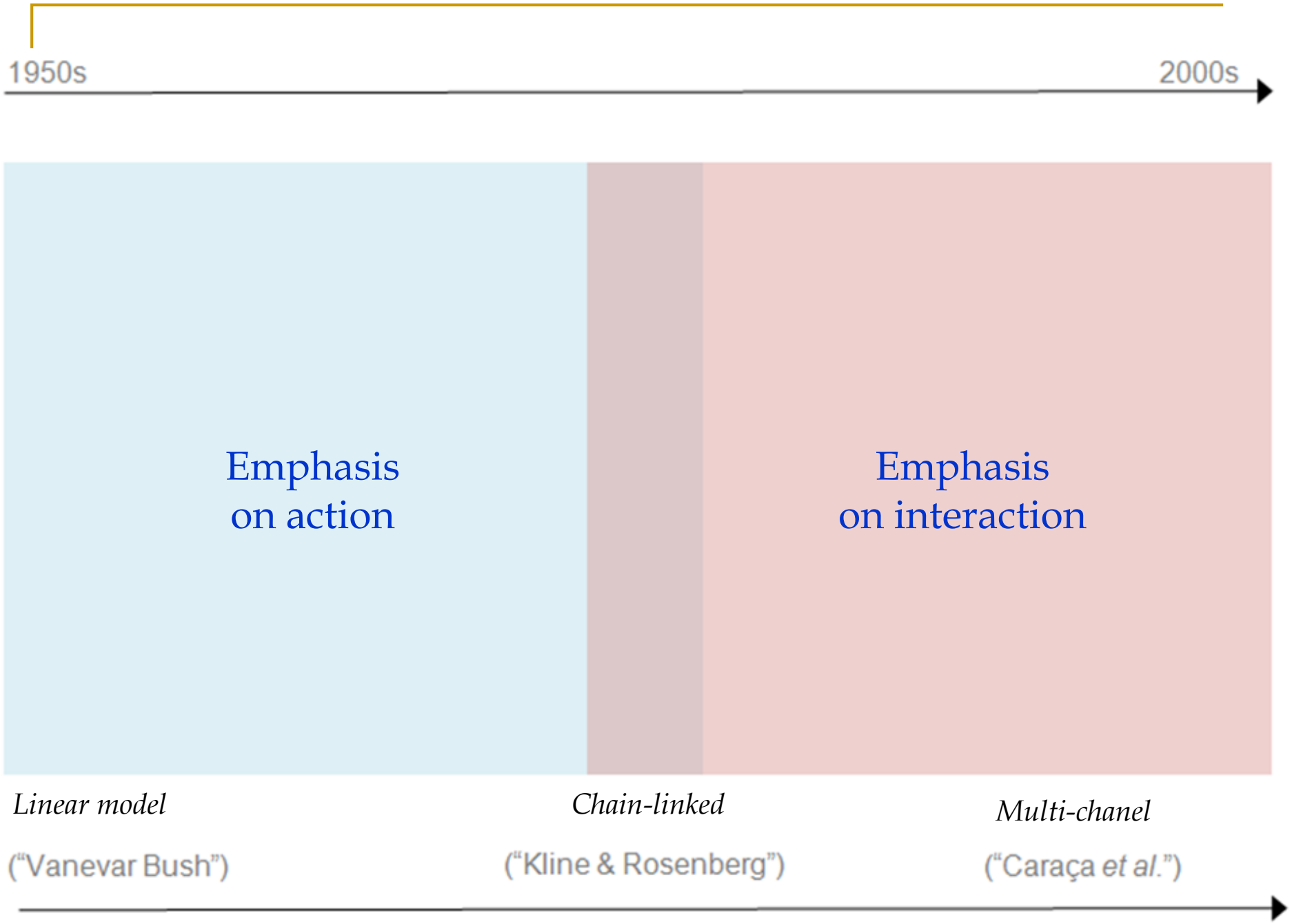
US on China



High-tech

Re-innovation

So...


1950s
2000s
Emphasis
on action
Emphasis
on interaction
Linear model
("Vanevar Bush")
Chain-linked
("Kline & Rosenberg")
Multi-chanel
("Caraça et al.")

That is….

Summing up

1st generation (V. Bush)

R&D push > Technological innovation > Market introduction

2nd generation (Kleine & Rosenberg)

Market needs > Technological innovation > Interative developments

3rd generation (Caraça *et al.*)

Context > multi-knowledge/multi-actor dynamics > Plural innovation

(i.e. institutional envelope > complexity > range of results-resources)

Summing up (again)

1st generation (V. Bush)

Logic and rationalism

2nd generation (Kleine & Rosenberg)

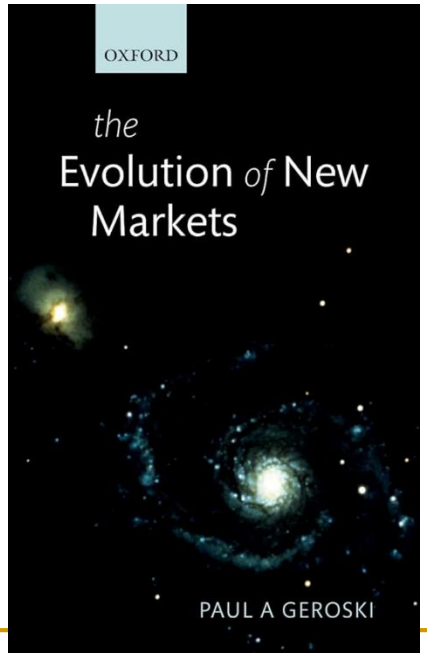
Iterative and tentative

3rd generation (Caraça *et al.*)

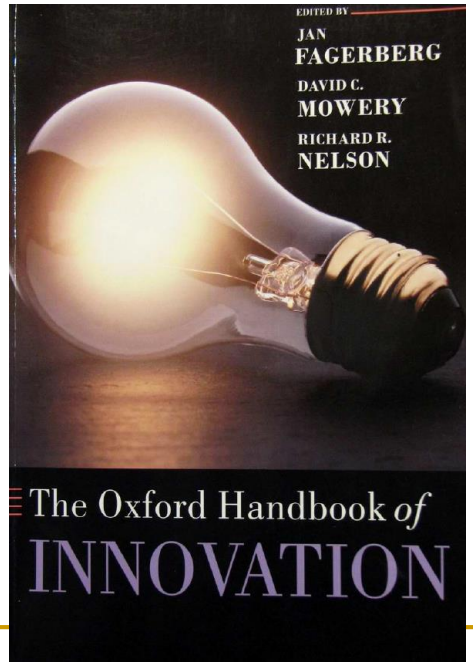
Emergent and co-evolutive

7. Conclusions

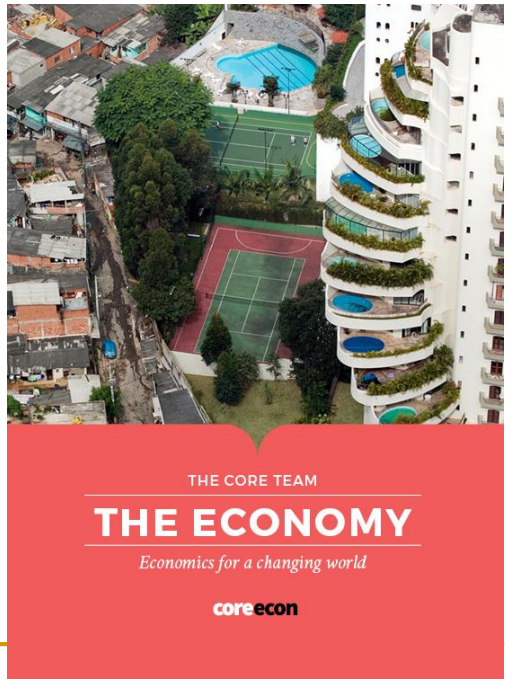
- **Definitions** and **distinctions**
- Conceptual **frameworks**
- Inovation is a mix of **learning** processes



(2003)



(2004)



(2022)