Msc Data Science and Engineering

Managed vs entrepreneurial innovation models

Politecnico di Torino
1859
Department of Management and Production Engineering

> You can't do today's job with yesterday's methods and still be in business tomorrow.

> Every business is a technology business. Whether it’s taxi cabs or taco delivery, today’s enterprises are urgently figuring out ways to manage technology and to turn its disruptive potential to competitive advantage.

(UNTIL) MID1970s | EARLY 1980s | LATE 1990s | 2000s | EARLY 2020s

A SHIFT IN THE INNOVATION PARADIGM

Three elements marked the relative advantage of small firms (over large firms) in innovation:

The decline of market power based on barriers to entry

The emergence of new complex products and systems

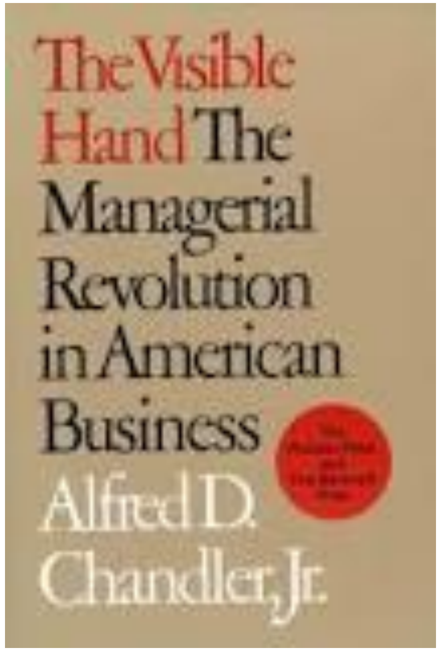
The increasing mobility of workers

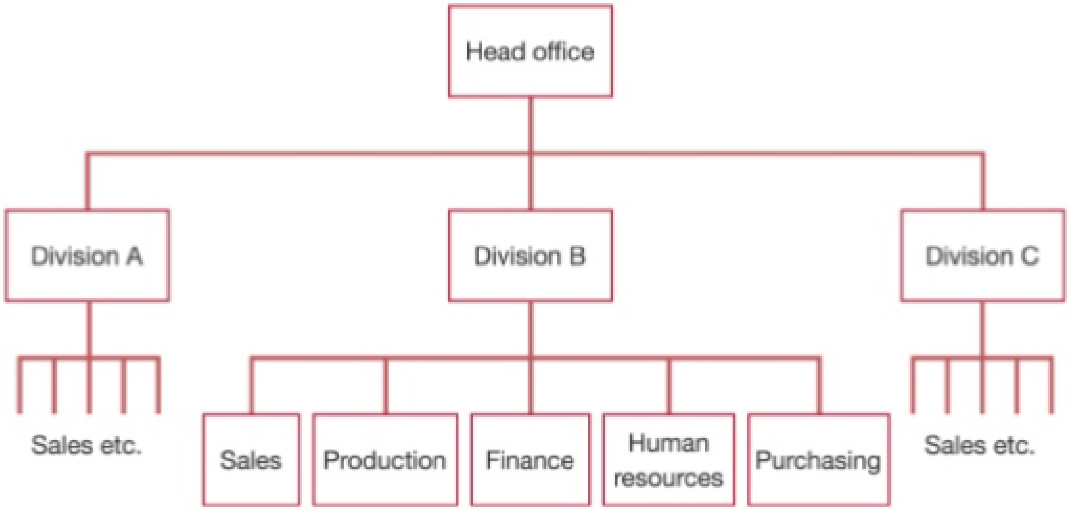
(UNTIL) MID1970s | EARLY 1980s | LATE 1990s | 2000s | EARLY 2020s

What has changed?

The "power of big business"

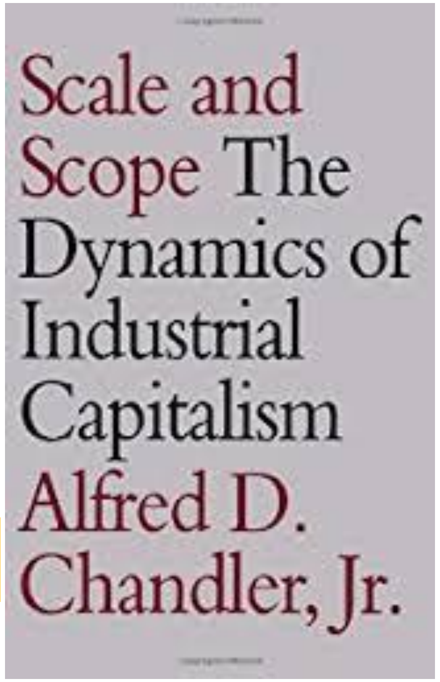
(UNTIL) MID1970s





Firms exist because they can achieve **co-ordination** more effectively than the market

Such gains are more easily realizable when the market for the firm's output creates sufficient **scale economies**.



A decline of market power based on barriers to entry

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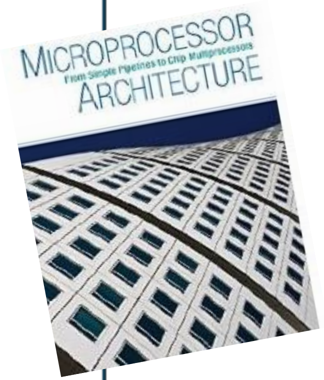
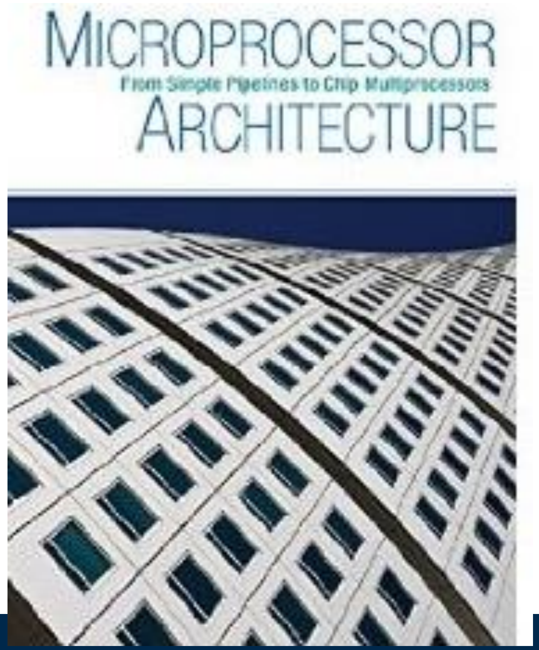
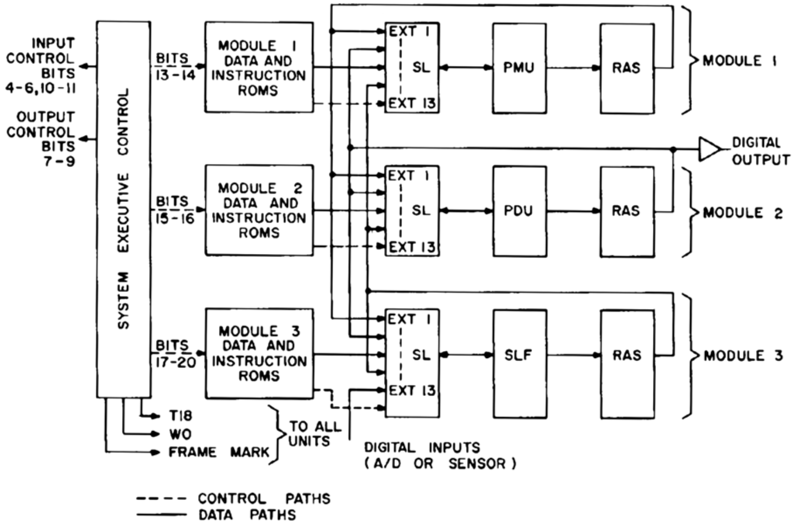
Complex products and systems



EARLY 1980s





Texas Instrument's Gary Boone was awarded U.S. Patent No. 3,757,306 for the single-chip microprocessor architecture «Calculator on a chip»

Source: epo.org

ARCHITECTURAL INNOVATIONS

destroy the usefulness of the architectural knowledge of established firms

A firm may possess knowledge of product components and knowledge of product architecture

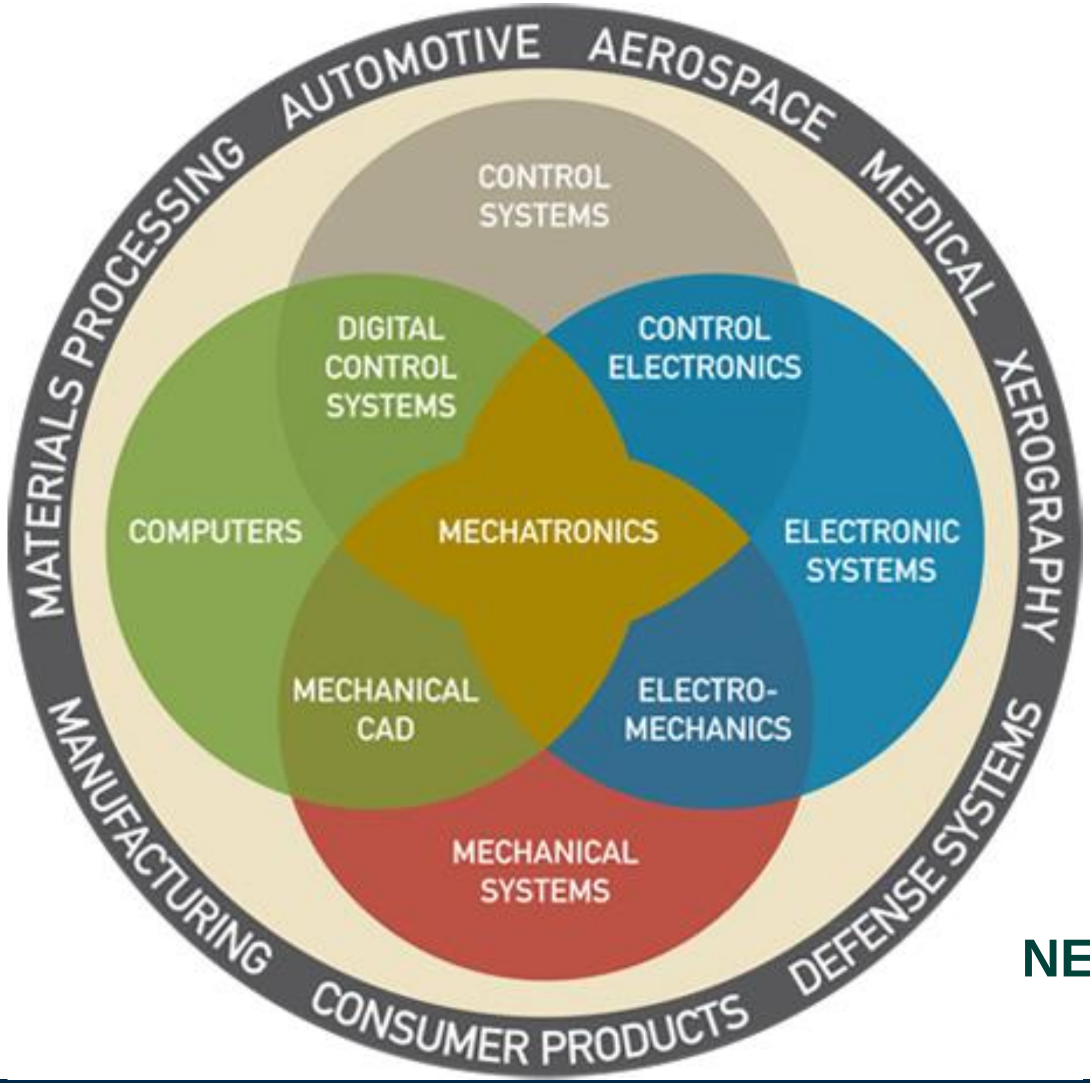
- Innovations that **change the product architecture** (knowledge about how the components are related)
- **do not (necessarily) change the essence of the core technologies** (product sub-systems or modules)

Henderson & Clark's taxonomy of technological innovation

Relationships between components / Reference technologies	Do not change	Change
Change	Modular innovation (e.g. high capacity batteries in cell phones)	Radical innovation (e.g. PCs vs typewriters)
Do not change	Incremental innovation (e.g. faster spinning hard drives)	Architectural innovation (e.g. rear-wheel vs front-wheel drive cars)

TECHNOLOGY FUSION

involves the **transformation of core technologies** that may create entire new industries

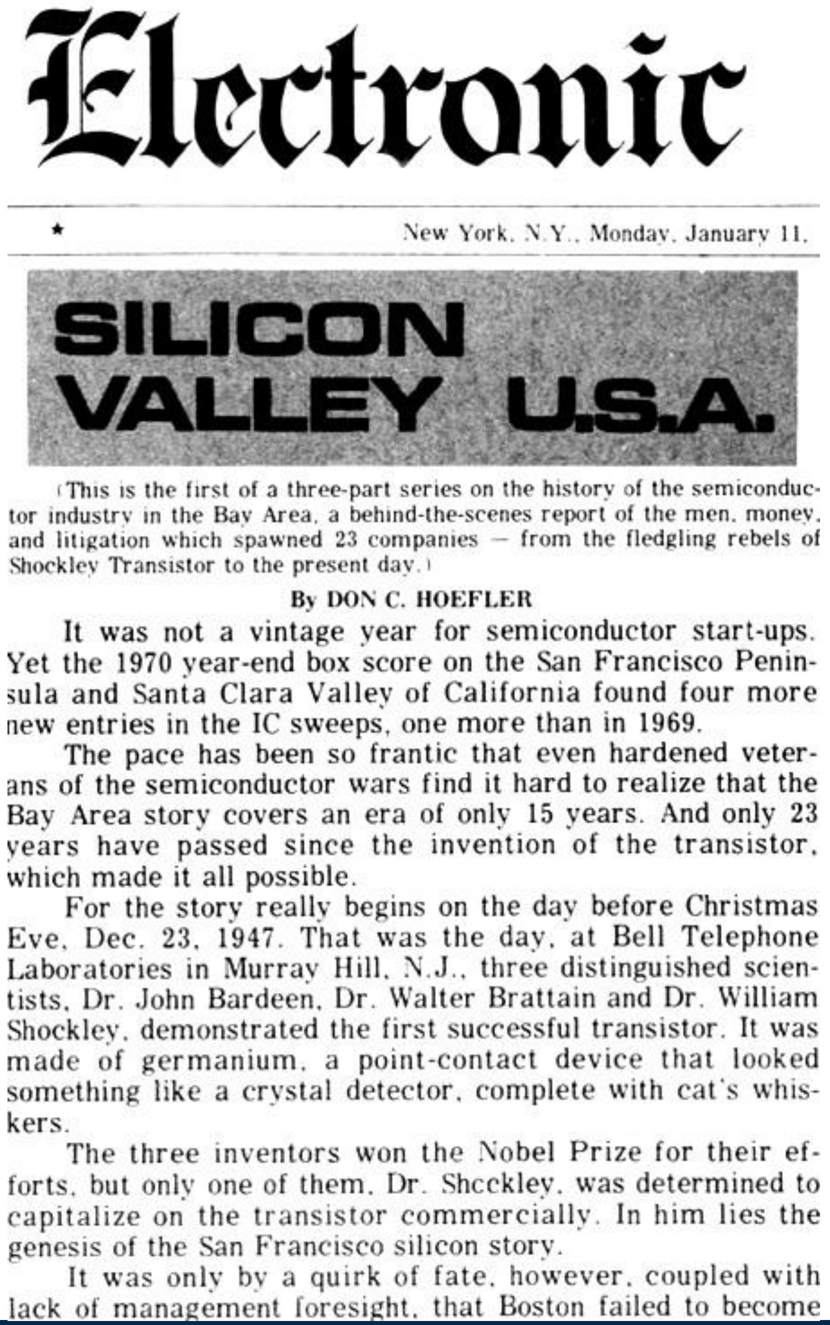


- The fusion of technologies goes **beyond mere combination or complementarity.**
- It blends incremental improvement from **several (often previously separate) fields** to create a product

Japanese companies' mission statements in the '80s:

TOSHIBA «E&E» the merge of energy and electronics (80s)

NEC "C&C ": the integration of computers and communications. (late 70s)



Electronic

★ New York, N.Y., Monday, January 11.

SILICON VALLEY U.S.A.

(This is the first of a three-part series on the history of the semiconductor industry in the Bay Area, a behind-the-scenes report of the men, money, and litigation which spawned 23 companies — from the fledgling rebels of Shockley Transistor to the present day.)

By DON C. HOEFLER

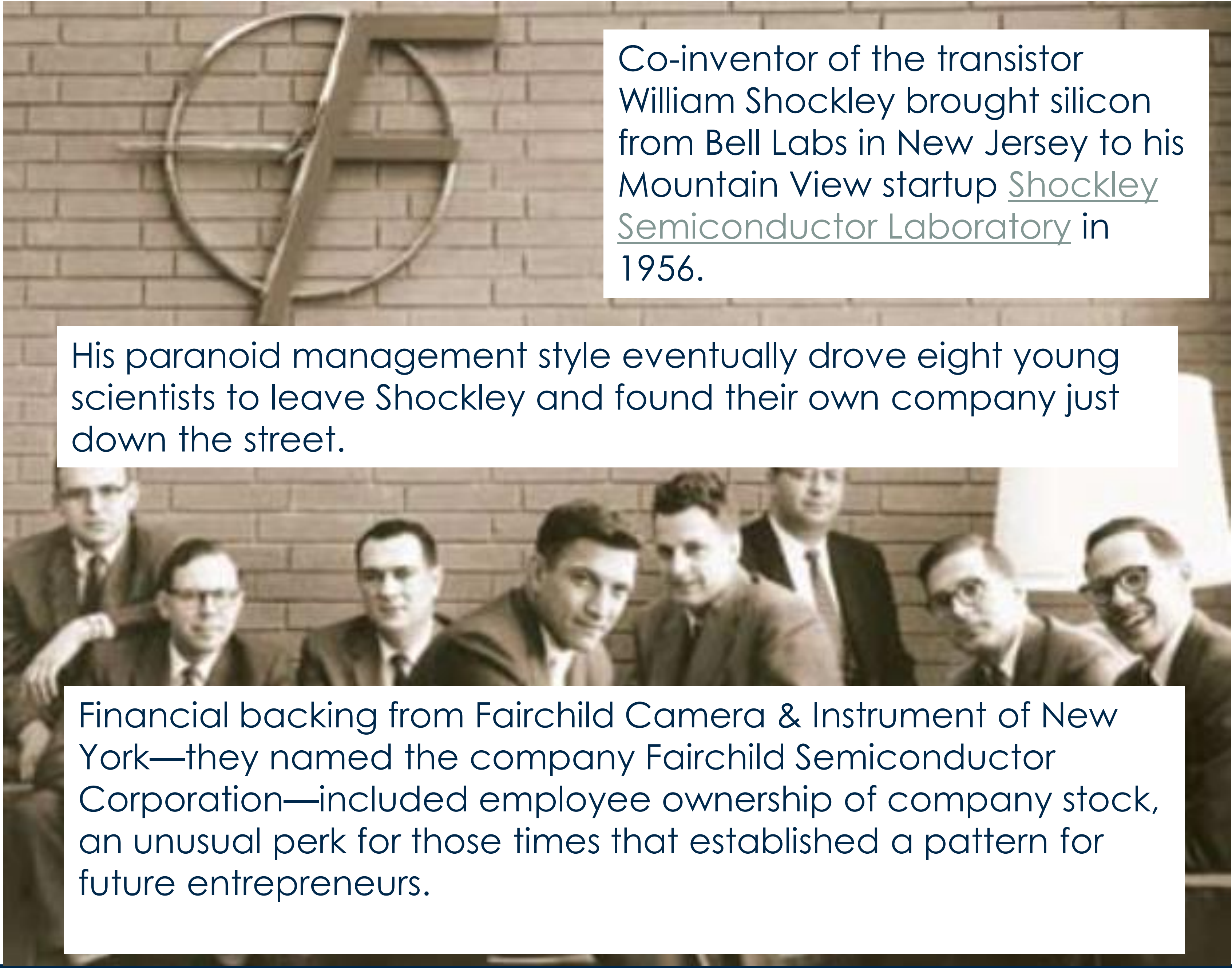
It was not a vintage year for semiconductor start-ups. Yet the 1970 year-end box score on the San Francisco Peninsula and Santa Clara Valley of California found four more new entries in the IC sweeps, one more than in 1969.

The pace has been so frantic that even hardened veterans of the semiconductor wars find it hard to realize that the Bay Area story covers an era of only 15 years. And only 23 years have passed since the invention of the transistor, which made it all possible.

For the story really begins on the day before Christmas Eve, Dec. 23, 1947. That was the day, at Bell Telephone Laboratories in Murray Hill, N.J., three distinguished scientists, Dr. John Bardeen, Dr. Walter Brattain and Dr. William Shockley, demonstrated the first successful transistor. It was made of germanium, a point-contact device that looked something like a crystal detector, complete with cat's whiskers.

The three inventors won the Nobel Prize for their efforts, but only one of them, Dr. Shcckley, was determined to capitalize on the transistor commercially. In him lies the genesis of the San Francisco silicon story.

It was only by a quirk of fate, however, coupled with lack of management foresight, that Boston failed to become



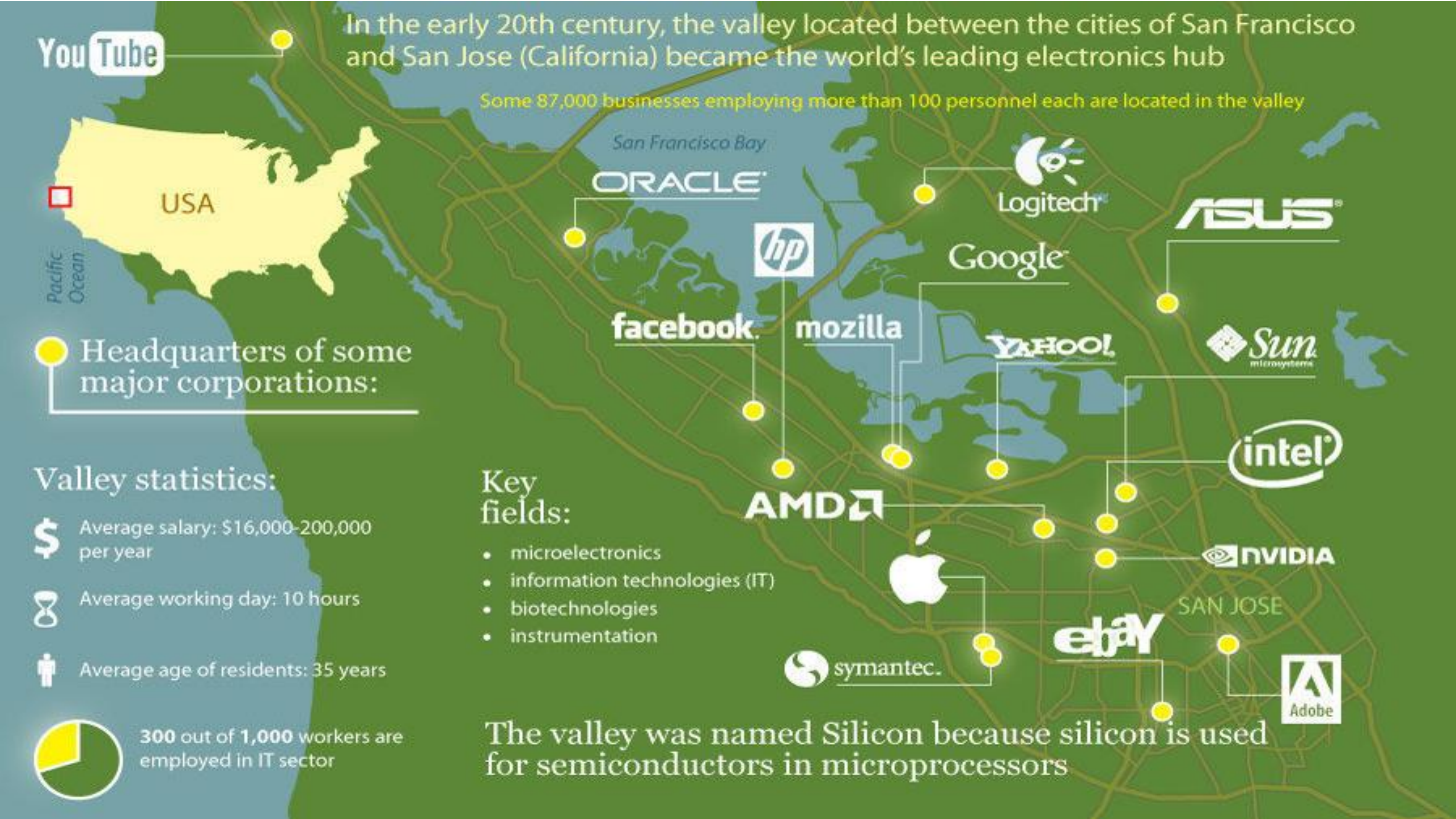
Co-inventor of the transistor William Shockley brought silicon from Bell Labs in New Jersey to his Mountain View startup Shockley Semiconductor Laboratory in 1956.

His paranoid management style eventually drove eight young scientists to leave Shockley and found their own company just down the street.

Financial backing from Fairchild Camera & Instrument of New York—they named the company Fairchild Semiconductor Corporation—included employee ownership of company stock, an unusual perk for those times that established a pattern for future entrepreneurs.

The group's timing was impeccable. One month after opening the doors in 1957, the USSR launched Sputnik creating a demand for advanced silicon transistors in US aerospace systems. Fairchild Semiconductor became an overnight financial and technical success.

Fairchild Semiconductor Corporation, 844 Charleston Road, Palo Alto (CA)

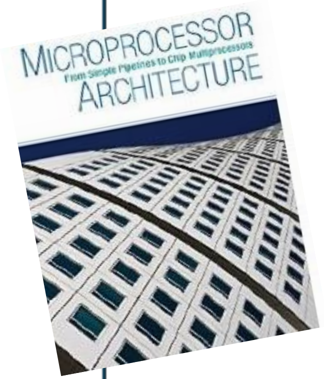

In the early 20th century, the valley located between the cities of San Francisco and San Jose (California) became the world's leading electronics hub
Some 87,000 businesses employing more than 100 personnel each are located in the valley
San Francisco Bay
USA
Pacific Ocean
YouTube
ORACLE
Logitech
ASUS
hp
Google
facebook
mozilla
YAHOO!
Sun microsystems
intel
AMD
NVIDIA
SAN JOSE
ebay
symantec.
Adobe
Headquarters of some major corporations:
Valley statistics:
Average salary: $16,000-200,000 per year
Average working day: 10 hours
Average age of residents: 35 years
300 out of 1,000 workers are employed in IT sector
Key fields:
microelectronics
information technologies (IT)
biotechnologies
instrumentation
The valley was named Silicon because silicon is used for semiconductors in microprocessors

What has changed?

The "power of big business"

(UNTIL) MID1970s

Complex products and systems



EARLY 1980s

Knowledge as the dominant production factor

LATE 1990s

Towards ideas-based production:

Factors:

- The emergence of **novel forms of innovation** (different subsystems and components)
- Knowledge inter-domaining
- An increasing mobility of workers
- A larger **breadth** of knowledge scattered across firms and industries is required to develop innovations
- An «alternative to the shelf»

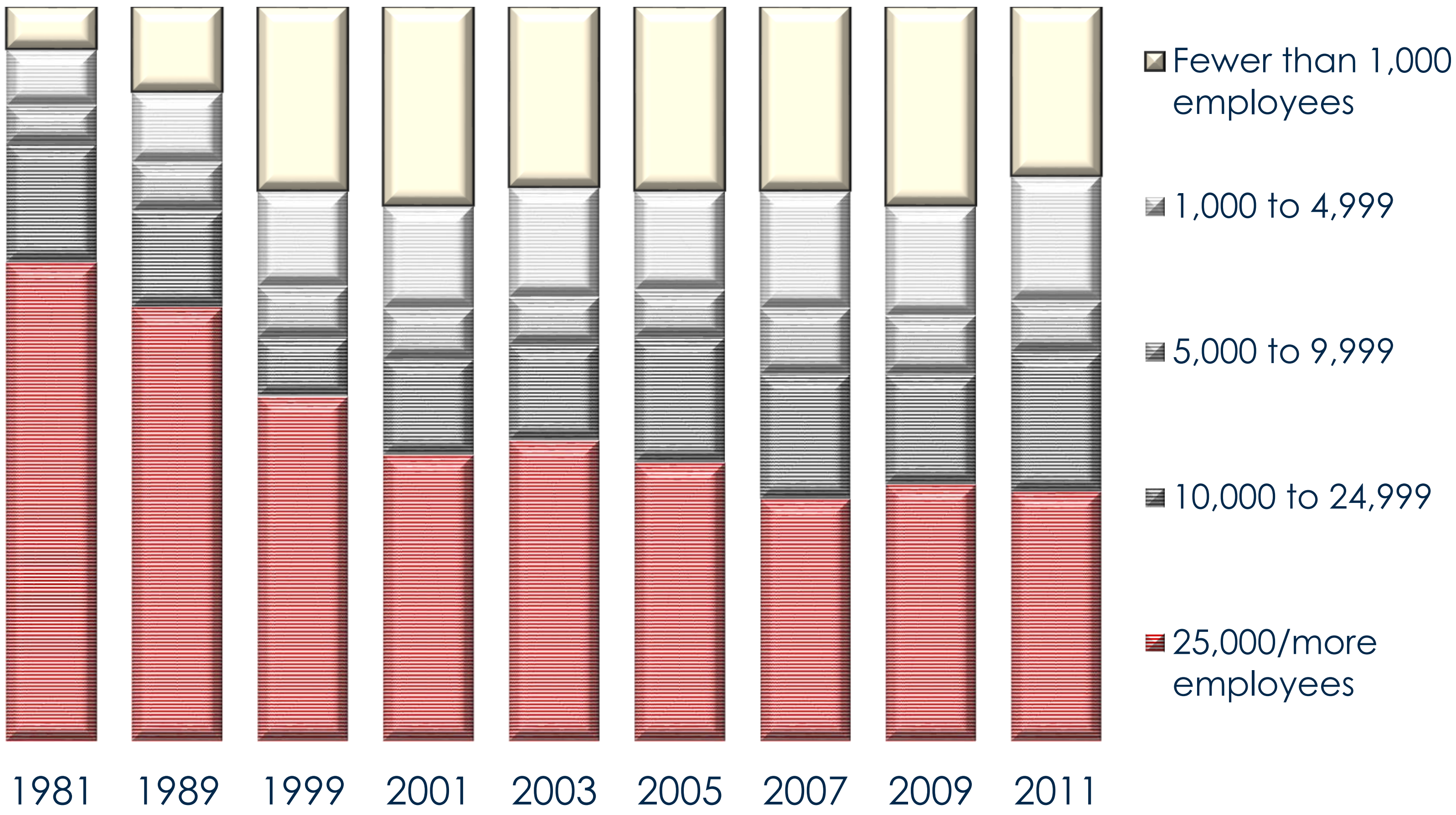
The entrepreneurial innovation model

- Compared *to large companies*' R&D setting, (*exploration of new technologies for existing applications*) **small businesses appeared extremely effective** in the external exploitation of ***new* applications of *new* technologies**

(i.e. new techno-market regimes)

Where is R&D performed?

Share of industrial R&D investments by size of the firm (1981-2011)



Source: US National Science Foundation
Chesbrough (2003;2015)

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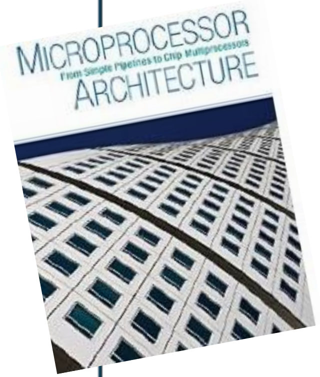
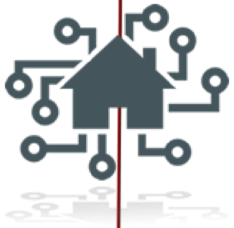
Knowledge as the dominant production factor

The rise of **technology alliances**





(UNTIL) MID1970s

EARLY 1980s

LATE 1990s

2000s

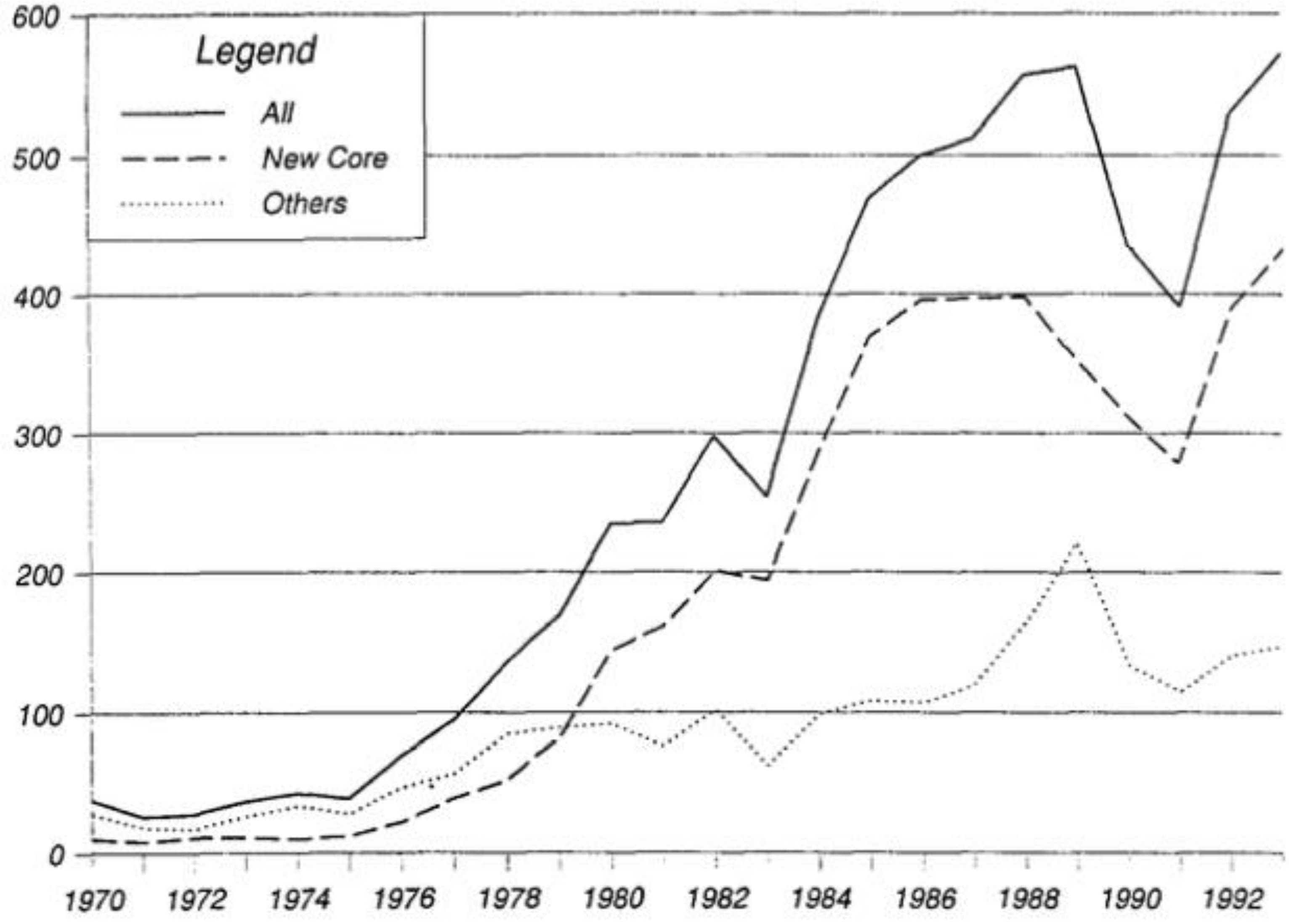


Figure 1. Growth of newly established strategic technology alliances, 1970–1993. Source: MERIT-CATI.

"A process in which ***new opportunities*** *are pursued* ***regardless of the resources*** *the firm actually controls."*

(Stevenson and Jarillo, 1990)

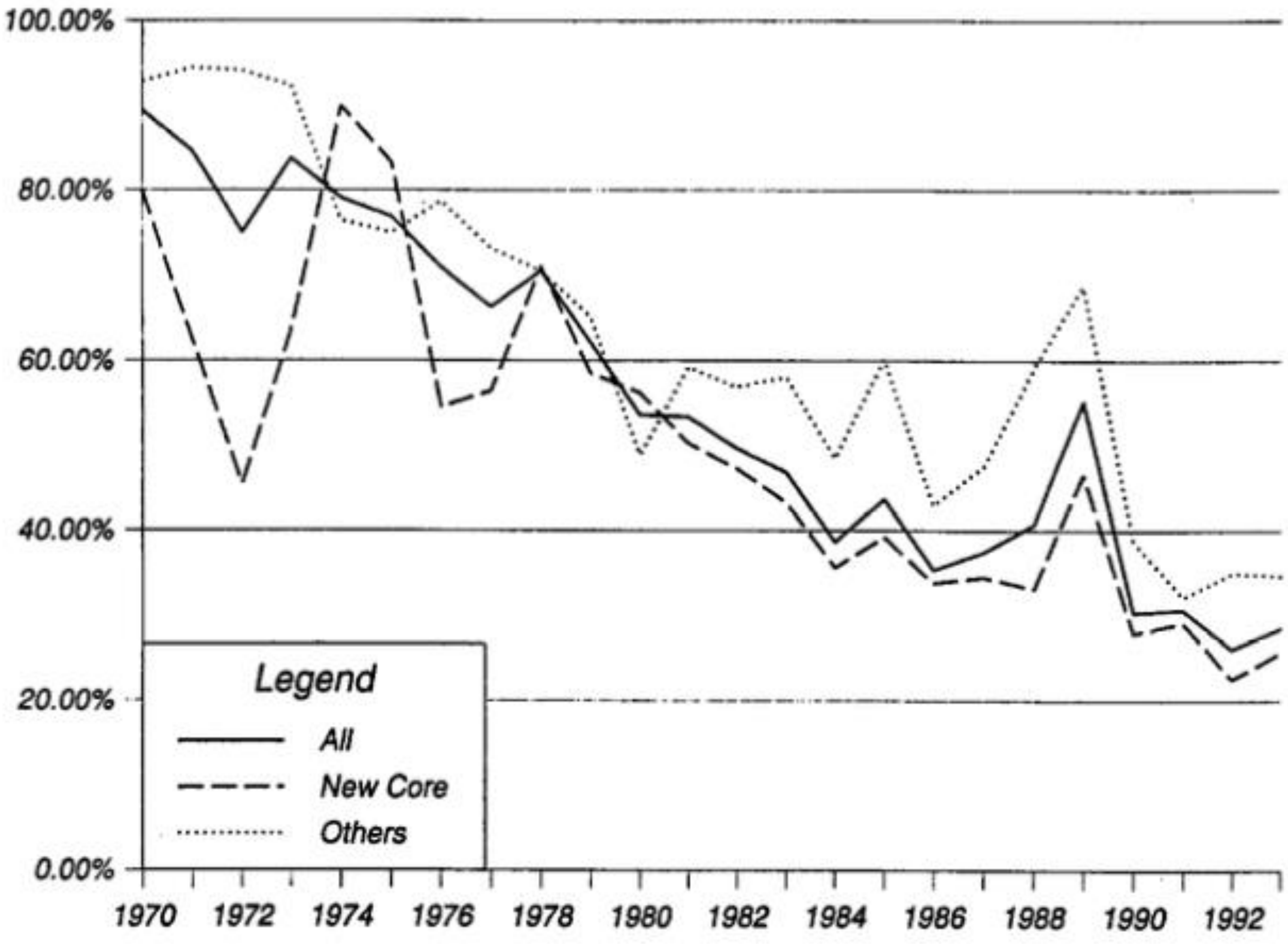


Figure 2. Share of equity modes of strategic technology partnerships, 1970–1993. Source MERIT-CATI.

Erosion factors

Increasing availability and mobility of skilled workers

- **Shorter life cycles** of technology
- **New types of innovation**
- Less focus on R and **more on D**
- **Patents owned by universities**
- Growing **division of labour** in innovation

Increasing capability of external suppliers

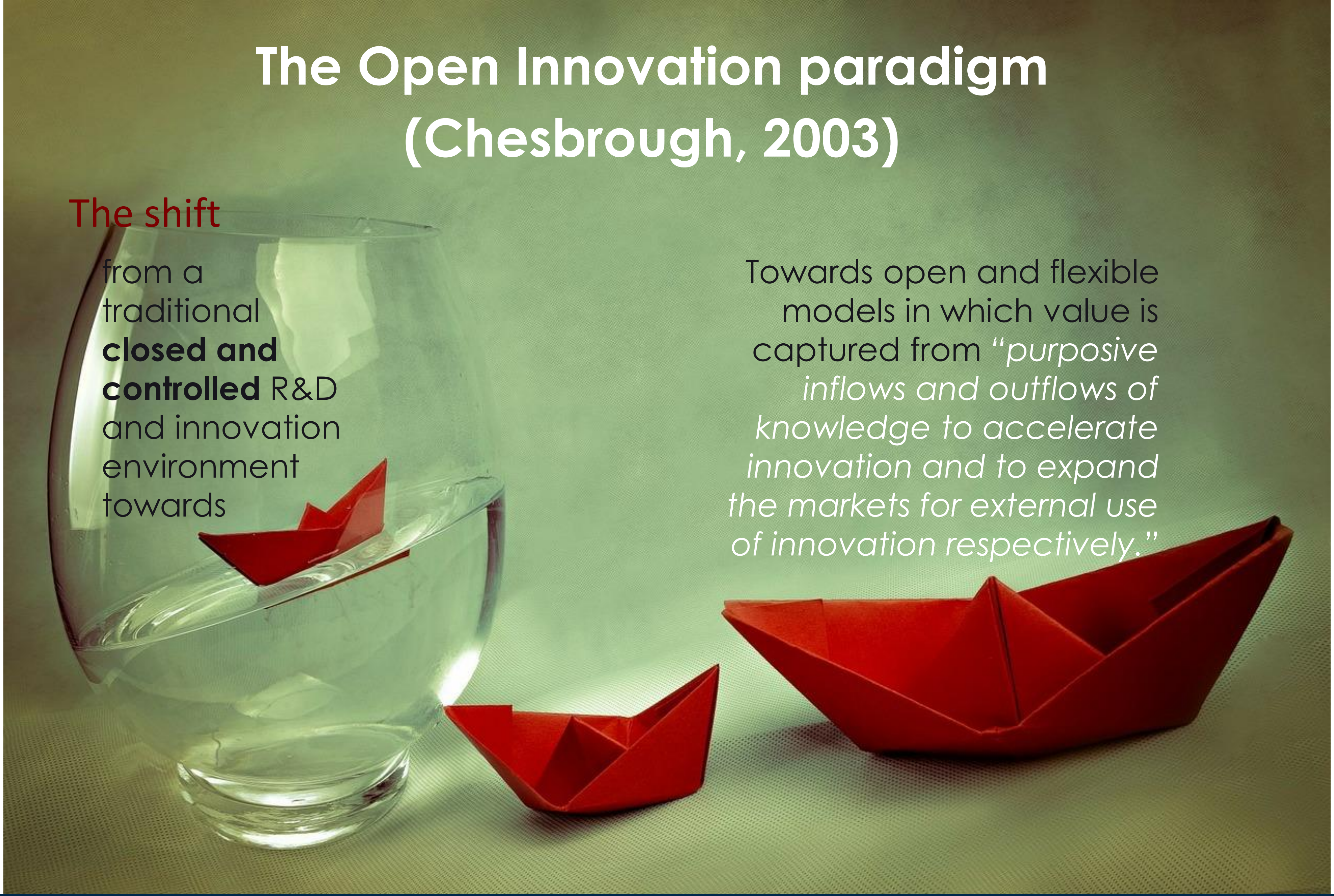
The venture capital market	**External options for ideas sitting on the shelf**

The Open Innovation paradigm (Chesbrough, 2003)

The shift

from a traditional **closed and controlled** R&D and innovation environment towards

Towards open and flexible models in which value is captured from "*purposive inflows and outflows of knowledge to accelerate innovation and to expand the markets for external use of innovation respectively.*"



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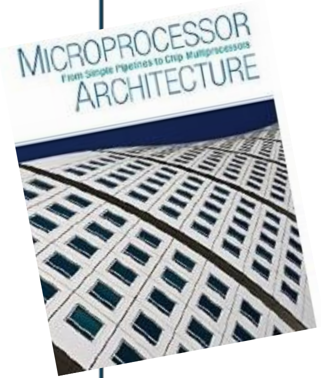

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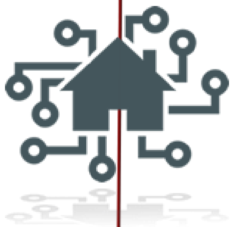


2000s

Industry 4.0

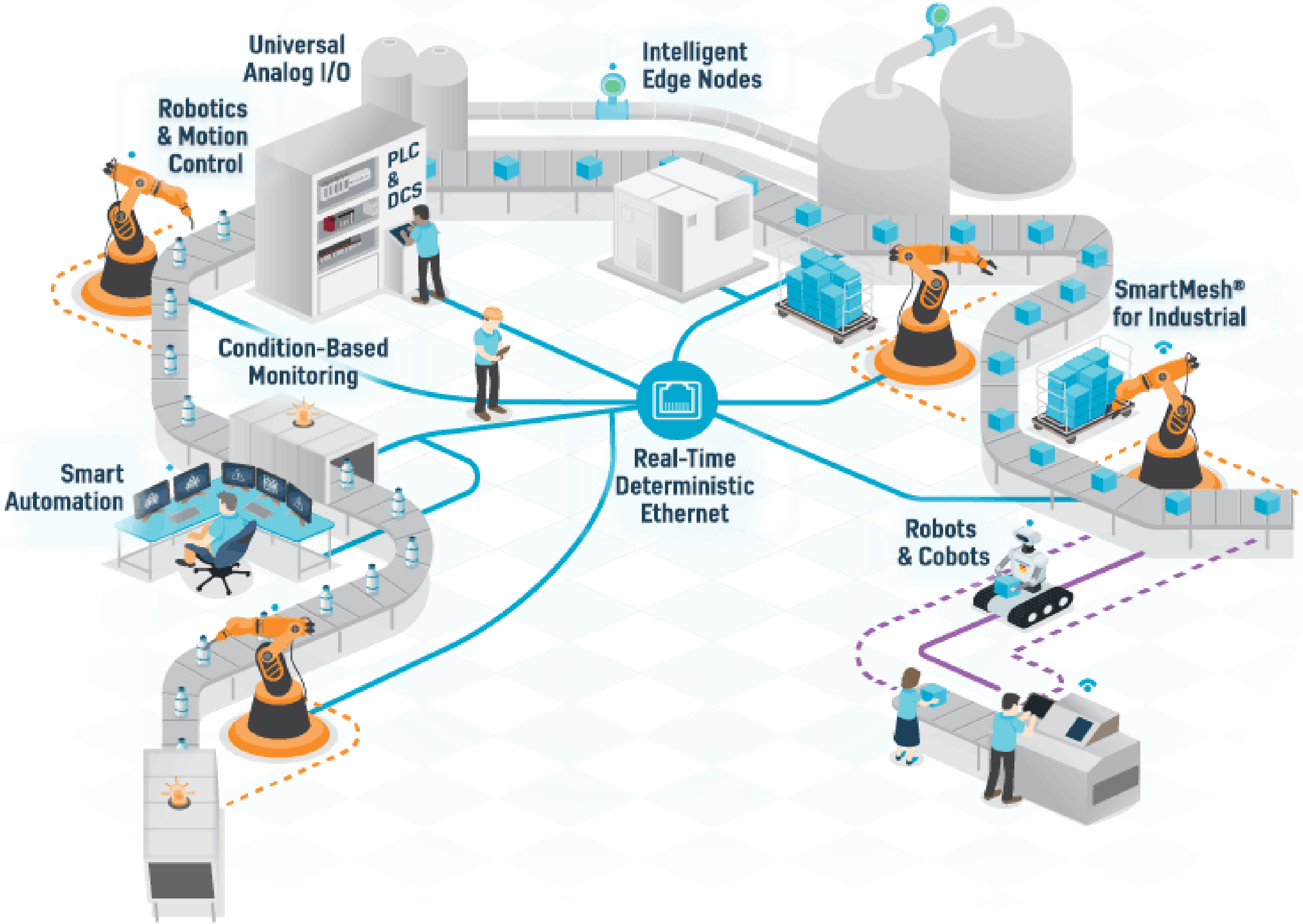
LATE 2010s

The paradigm of connecting

Physical devices enriched with embedded electronics are connected to a network or internet so they **interact**

(man to machine or machine to machine)

facilitating IT-enabled mass customization in manufacturing



FROM “MANAGED” INNOVATION MODELS TO ”ENTREPRENEURIAL” INNOVATION MODELS

APPROACH TO INNOVATION STRATEGY

LARGE FIRMS	SMALL FIRMS
Exploration of new technologies for existing applications	Exploitation of new applications of new technologies
Ownership and control	Use of external resources and competencies
Internal resources planning	Effectuation, pursuit of opportunities
High market power with existing products	Niche strategies

MANAGEMENT CHARACTERISTICS

LARGE FIRMS	SMALL FIRMS
Stage gate processes	Fast decision making
Functional expertise	Motivation and commitment
Accountability	Alignment of R&D and management objectives
Monitoring	Networking

R&D SETTING

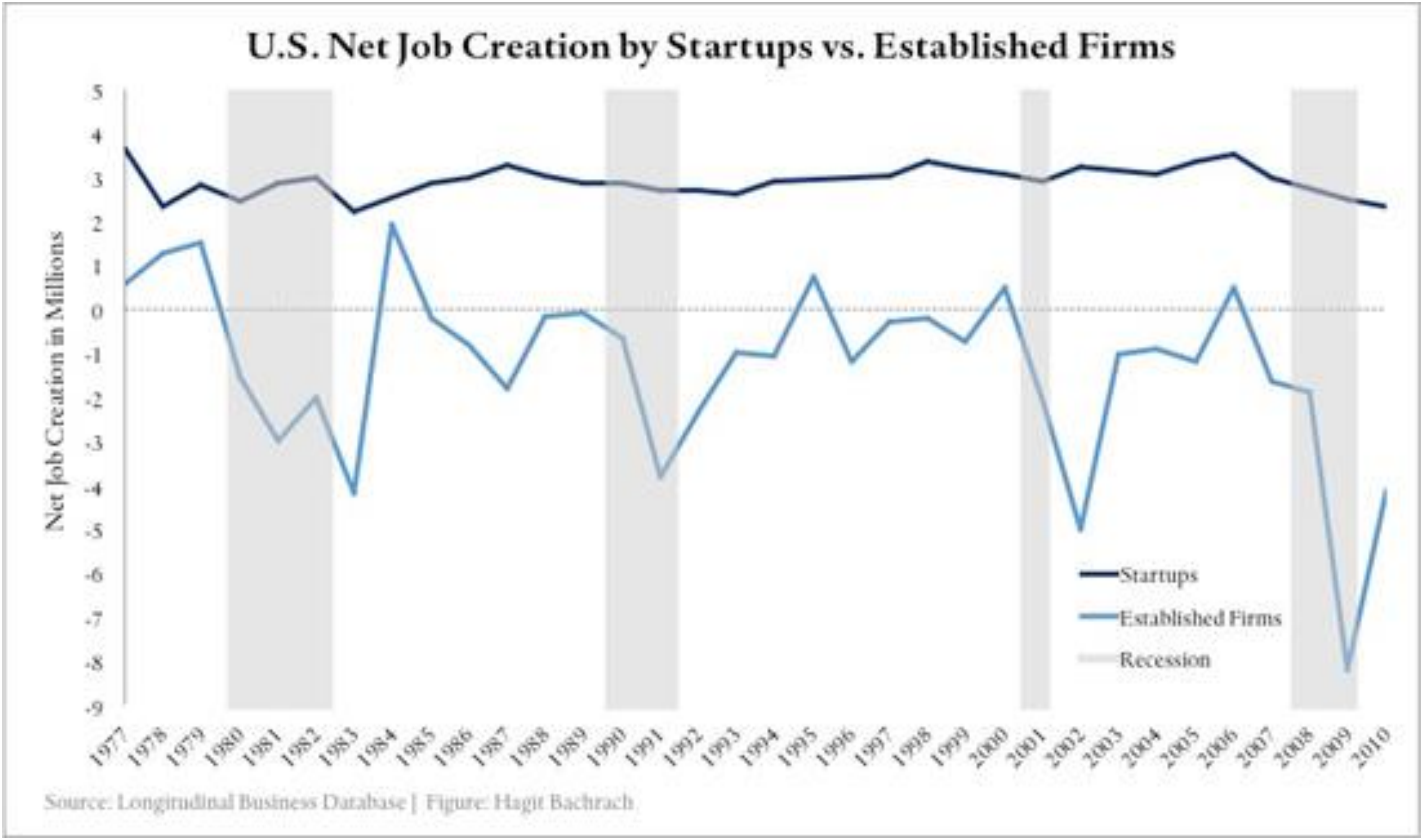
LARGE FIRMS	SMALL FIRMS
Learning economies (long learning curves)	Fast learning, adaptability of routines
Scale economies	Productivity
Systematic research	Problem solving approaches and small R&D operations
High internal expenditure	Skilled employees and collaborative learning

ORGANISATIONAL CONTEXT

LARGE FIRMS	SMALL FIRMS
Specialised employees	Motivated employees
Hierarchy	Flat managerial structure
Multiple internal technological competencies	Use of external networks
Following rules	Breaking rules

COMPETITIVE ADVANTAGE

LARGE FIRMS	SMALL FIRMS
Late stages of product lifecycle	Early stages of product lifecycle
Scale economies	Low barriers to entry
Codified knowledge and entry barriers	Knowledge spillovers and tacit knowledge
Economies of scope, diversification	Capacity for customisation
Formal IP protection	Appropriability of tacit knowledge


U.S. Net Job Creation by Startups vs. Established Firms
Net Job Creation in Millions
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Startups
Established Firms
Recession
Source: Longitudinal Business Database | Figure: Hagit Bachrach

The entrepreneurial economy

"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

Readings

Gagnon, Y. C., & Toulouse, J. M. (1993). Adopting new technologies: an entrepreneurial act. *Technovation*, *13*(7), 411-424.

Hamel, G., & Zanini, M. (2018). The end of bureaucracy. *Harvard Business Review*, *96*(6), 50-59.

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The innovator’s dilemma

How can organizations adapt to change?

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How can organizations adapt to change?

Underlying this question is a rich **debate** resulting in diverse organizational theories:

- competitive advantage (Porter, 1980)
- strategic conflict (Shapiro, 1989)
- organizational ecology (Hannan & Carroll, 1992)
- institutional theory (Meyer & Rowan, 1977)
- the resource-based view of the firm (Barney, 1991)
- dynamic capabilities (Teece, Pisano & Shuen, 1997)

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- **the resource based view of the firm** (Barney, 1991)
- **dynamic capabilities** (Teece, Pisano & Shuen, 1997)

The evolutionary behavior of economic systems

The evolutionary theory of the firm is a lens to study industrial dynamics

Economic **development** is an open ended **dynamic process** characterized by **disequilibrium** where agents **create** and **adapt to novelty** through **learning**

Photo from Scuola Sant'Anna archives.

The emphasis is:

On technological knowledge

On learning (mainly technological)

On selection among heterogeneous firms

Universally available technological knowledge **->** technological change is exogenous **-> R&D activities are separated from production.**

Skills (individual level) and **routines** (organizational level) **define a firm's technological knowledge** which in turn defines its production possibilities

The evolutionary behavior of firms

The evolutionary paradigm is rooted in the idea of **the firm as an information processor** that facilitates the firm's capacity to adapt and process new information.

The behavior of firms is characterized in terms of technological capabilities, workers skills and decision rules.

The connecting elements are called **routines**.

A routine is a sequence of condition-action rules for different tasks, used in response to a selection pressure

Routines are knowledge repositories (the result of past learning efforts) and constitute **the organizational memory of a firm**

Hölzl (200T5) *The evolutionary theory of the firm. Routines, complexity and change*. WU Working Paper

A theory of firm differences and dynamic change

1. **Explains how a firm can be defined**: through the set of routines and competencies that the firm encompasses.

2. **Explains why firms differ**: because they rely on a different set of routines which are firm-specific and cannot be transferred at low cost.

3. **Explains the dynamics of firms**: through the combined mechanisms of searching and selection and the possibility of transforming a set of secondary routines into the core activity.

From production technology to **production knowledge**

beside embodied knowledge in equipment and machinery it includes tacit knowledge, capabilities, skills, heuristics …

This knowledge is **not easily transferable** between firms: it is **stored as routines**

Hölzl (200T5) *The evolutionary theory of the firm. Routines, complexity and change*. WU Working Paper

Two main perspectives

1) Organizational ecology

a theoretical perspective that attempts to explain the emergence, growth, and decline of populations of organizations, relying on environmental selection models of change

Presents evidence suggesting that most organizations are largely inert:

- Change occurs through an **evolutionary process** of **variation-selection-retention.**
- As environments shift, inertial incumbent organizations are replaced by new forms that better fit the changed context

Two main perspectives:

2) Organizational learning

Firms learn and adapt to shifting environmental contexts

- Research on <u>strategy</u>: dynamic capabilities, the ability of a firm to reconfigure assets and existing capabilities, explains long-term competitive advantage.

- Research on <u>organizational design</u>: ambidexterity, the ability of a firm to simultaneously explore and exploit, enables a firm to adapt over time.

The innovator’s dilemma

If you become wildly successful because everything you do is right, you're doomed.

The incumbent's curse

"Incumbents in a particular product generation are so ***enamored with their success*** *or so* ***hampered by their bureaucracy*** *that they fail to introduce next generation of radically new products"*

(Chandy and Tellis, 2000:2)

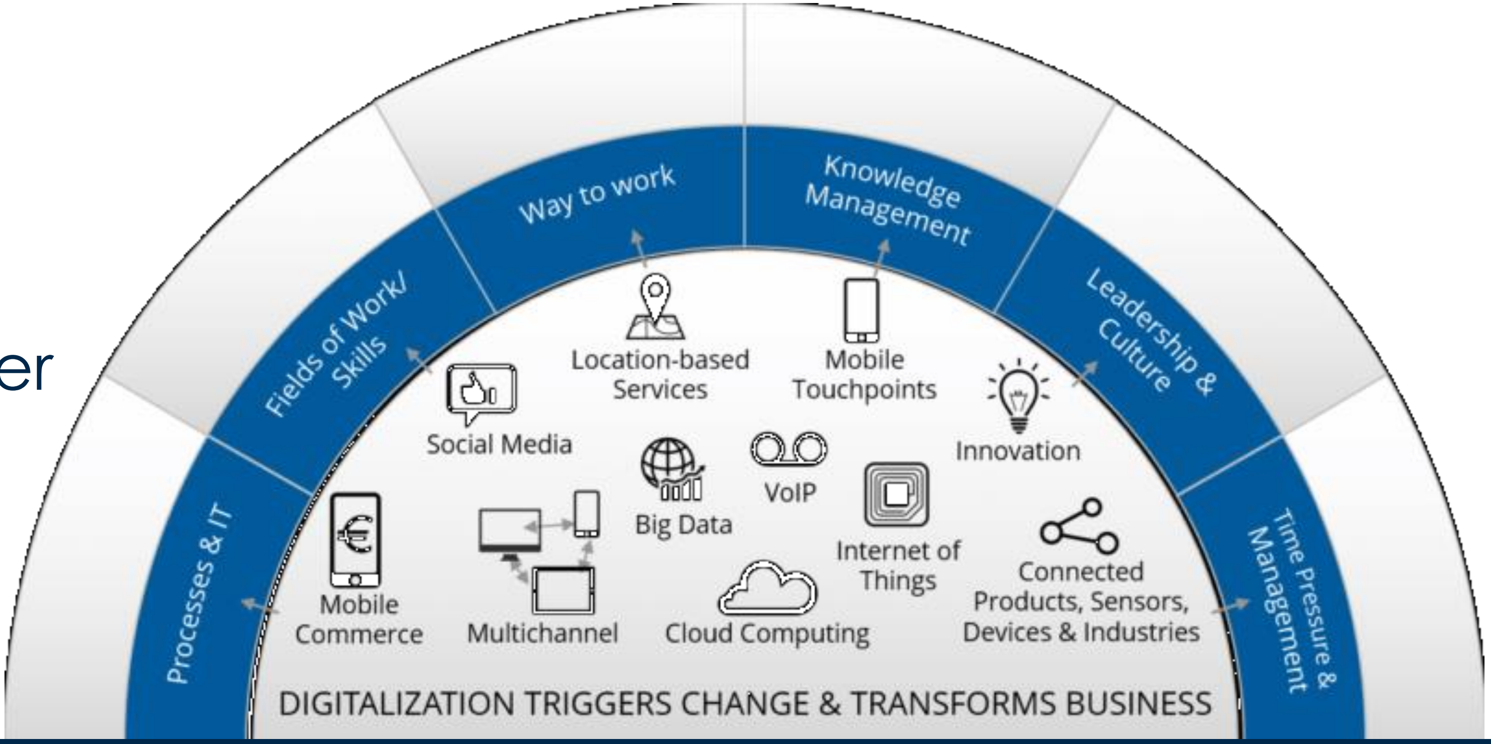
The “success syndrome”

Internal congruence (strategy, structure, culture and people) as a «managerial trap»

(Tushman and O’Reilly 1996)

Discontinuities (turbulence) in the external environment

Pervasive digital technologies / widespread connectivity and convergence introduce **distributed and combinatory innovation processes**
-digitization of products and services
-digitally-enabled peer-to-peer business and platforms
- […]



How can large organizations also be innovative organizations?

Large established firms are confronted with **discontinuous changes** in their environment and **increasing ambiguity**, while their organizational structures are suited for clarity and predictability.

Such changes urge the need for incumbents to develop new and effective innovation strategies geared towards **the development of new capacities**

To avoid being disrupted, incumbents need to develop the capacity **to proactively explore new possibilities *while* generating organizational support** for them.

Balancing exploration and exploitation activities

A **core theme** in the discussion :

The **trade-off** in allocating resources between investing in the **exploration** of new knowledge, and the utilization **(exploitation)** of current knowledge

(J. March, 1991)

Exploitation

«The use and development of things already known»
(Levinthal and March 1993)

Exploitation builds strongly on **knowledge-leveraging activities** (on what is already well-established)

However, the process leads to a **high degree of path dependency**
"firms' accumulated exploitation experience reinforces established routines ***within*** *domains"*

(Benner and Tushman, 2003)

EXPLOITATION

Firms **deploy knowledge resources and other assets** to secure returns and a 'safe' way of doing: benefits derive from **"doing what we do better".**

Exploration

“The trouble”: in an **uncertain environment** the potential to secure and defend a competitive position depends on ‘*doing something different*’, that is, radical product or process innovation

This kind of search had been termed ‘**exploration**’ and is the kind that involves ‘*long jumps*’ or **re-orientations** that enable a firm to adopt new attributes and attain new knowledge **outside its domain**

EXPLORATION: SEARCHING THE UNKNOWN UNKNOWNS

Exploration is search, variation, experimentation, discovery, innovation

Returns from exploration and exploitation activities

Compared to returns from exploration, **returns from exploitation** are **more efficient in the short term** but might represent a suboptimal solution

Compared to returns from exploitation, **returns from exploration** are systematically **less certain** and **more remote** in time

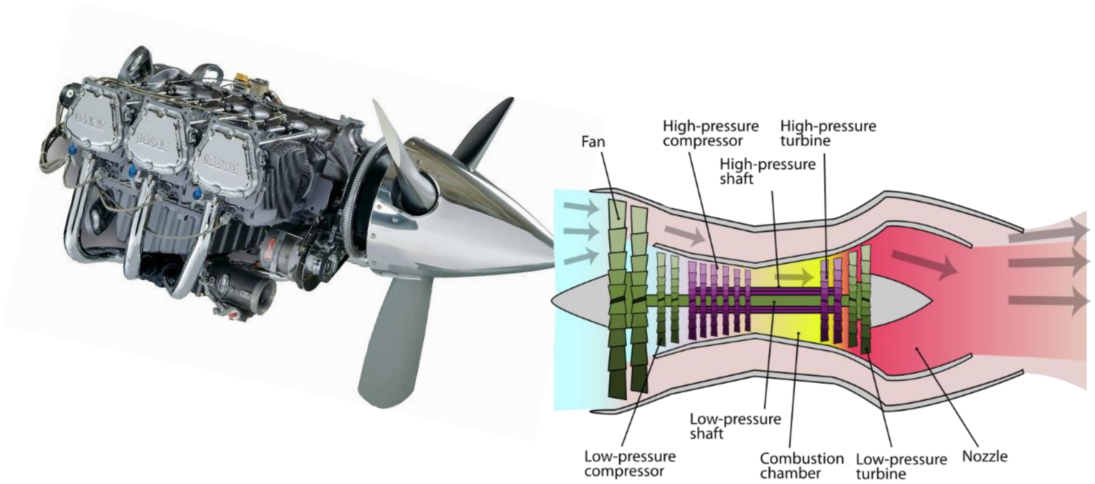
The problem

Despite **Large Enterprises** (LEs) disposing of more resources (financial, human, reputational, customer base, etc.), they seem to be **less effective in introducing radical innovations**, that are often introduced by new entrants.

Defining Radical Innovation

A radical innovation (RI) is defined as "*a new product that incorporates a substantially different core technology* **and** *provides substantially higher customer benefits relative to previous products in the industry*" (Chandy and Tellis 2000:2)

From steam to diesel electric locomotives



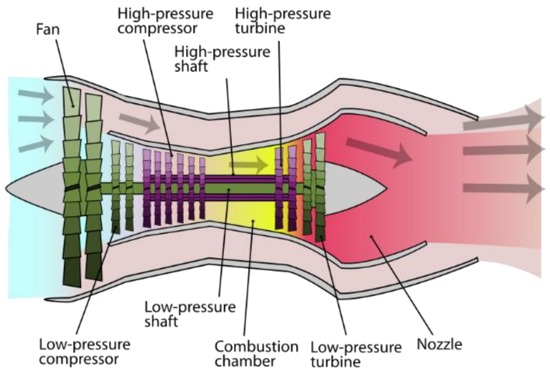
From piston aircraft engines to turbojet

Defining Radical Innovation

Radical innovation research generally considers ***radicalness*** as the result of a process of **new knowledge creation** that gives rise to:

technological discontinuities (Tushman and Anderson, 1986),
departures from current technological trajectories (McDermott and O'Connor 2002)
and from existing practices (Henderson 1993).

From steam to diesel electric locomotives

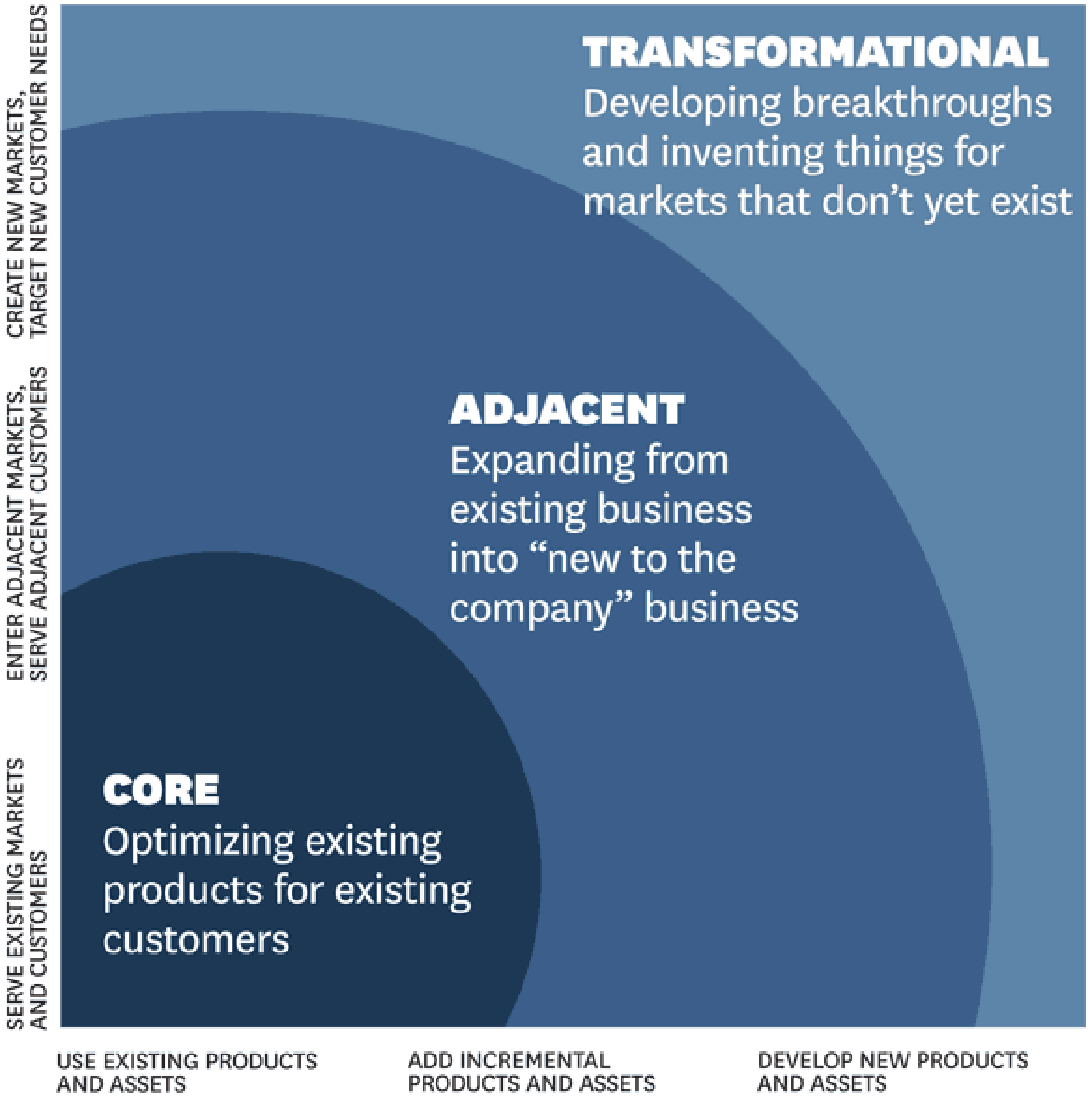


From piston aircraft engines to turbojet

The problem

The relationship between the exploration of **new possibilities** and the exploitation of **core competencies**

The challenge of managing innovation and core business


TRANSFORMATIONAL
Developing breakthroughs and inventing things for markets that don't yet exist
ADJACENT
Expanding from existing business into "new to the company" business
CORE
Optimizing existing products for existing customers
CREATE NEW MARKETS, TARGET NEW CUSTOMER NEEDS
ENTER ADJACENT MARKETS, SERVE ADJACENT CUSTOMERS
SERVE EXISTING MARKETS AND CUSTOMERS
USE EXISTING PRODUCTS AND ASSETS
ADD INCREMENTAL PRODUCTS AND ASSETS
DEVELOP NEW PRODUCTS AND ASSETS

Solutions (?)

Internal Solutions: Structure & People

Structural Ambidexterity

Contextual Ambidexterity

External Solutions: Partners and Ecosystems

Collaborative innovation

Networks and Ecosystems

Internal Solutions

Most organizations manage a degree of '**ambidexterity**' through the use of a combination of approaches across a portfolio.

Knowledge search activity is managed by investment in a range of R&D projects with a few 'blue sky'/high risk outside bets and a concentration of projects around core technological trajectories.

Market search can be similarly structured to develop a deep and responsive understanding of key market segments and some search around peripheral and emergent constituencies.

Internal solutions: Structural ambidexterity

Tushman and O'Reilly (1996): a way to pursue exploration and exploitation **simultaneously**.

Explorative units are separate from exploitative units

In line with the notion of **structural differentiation**, ***it aims at creating specialized subsystems with specific attributes***

(however):

Separating between exploration and exploitation might introduce a **duplication of costs** such as managerial activities, development of practices, creation of new procedures, etc.

Coordination and incentive problems emerge

Structural design solutions

- **Create new organizational structures** within corporate boundaries in which new processes can be developed;
- **Spin out** an independent organization with new processes and values;
- **Acquire** a different organization.

(Christensen and Overdorf 2000)

However, none of these choices is without problems.

e.g. acquisitions represent a common way to get access to new technologies, but often they are not successful due to <u>lack of integration between the acquirer and the target</u>
(Bower 2001).

Internal solutions: Contextual ambidexterity

"*The capacity to simultaneously achieve alignment and adaptability at business-unit level*" (Gibson and Birkinshaw, 2004: 209).

Complementing the structural ambidexterity, contextual ambidexterity focuses on **the role of leaders and human resources** (rather than the creation of dual structures).

Tushman and O'Reilly (1996): stress the importance of **people** in creating ambidexterity, identifying the **leaders** as responsible of the increase of" *the fit between strategy, structure, culture, and processes*".

Ambidexterity archetypes

Ambidexterity archetypes

To date, the literature analyzing how companies organize radical innovation may be classified according to whether **exploration and exploitation** activities are seen as **competing or complementary** activities.

Ambidexterity archetypes

Case A: Exploration and exploitation are seen as **competing** activities:

- Creating separate business units with dual structures (i.e. *structural* or *architectural* or *partitional* ambidexterity);
- Exploration and exploitation take place within the same business unit, but at different points in time (*sequential* or *cyclical* ambidexterity);
- Exploration and exploitation take place sequentially, but across different business units (*reciprocal* ambidexterity).

Ambidexterity archetypes

Case B: **Exploration and exploitation** are seen as **complementary** activities

- *Harmonic* (contextual) ambidexterity. It consists of simultaneous exploration and exploitation in a business unit.

Requires firms to develop mechanisms **facilitating the shift** from exploitation and exploration.

This stream of research looks at strategic shifts, management of conflicts, and changes in structures and routines.

Contextual ambidexterity

Ambidexterity is reached through:

Motivational drivers (Alexander and Knippenberg 2014)
Individual characteristics (de Visser and Faems 2015)
Team composition (Alexander and Knippenberg 2014; McDermott and O'Connor 2002)
Organizational culture (Wang and Rafiq 2014)

External solutions: Collaborative innovation

In contrast to the closed innovation perspective, dominating in many industries until the late '80s, the open (collaborative) innovation paradigm stresses that firms should **combine internal and external ideas to succeed in innovation**

Core premise:

firms rarely possess all the knowledge needed for successful radical innovation (Teece, 1986; Lausen and Salter, 2006),

and therefore need to get **access to external complementary knowledge** in different functional domains

(Lambe and Spekman 1997; Lavie, et al., 2011).

External solutions: Collaborative innovation

Building on this premise, scholars focused on **strategic alliances as external knowledge sources** (Hill and Rothaermel, 2003).

Alliances are crucial for established firms to deal with inertia, maintain flexibility and succeed in contexts of radical technological change

2 streams of research:

Individual alliances (and how they influence radical innovation)

Individual alliances positively influence radical innovation.

Different partners such as universities, high-tech start-ups, or lead users can provide access to different types of knowledge, which stimulates the ability of established firms to engage in radical innovation

(Miotti and Sachwald, 2003; Du, Leten and Vanhaverbeke 2014).

However, alliances with firms in the same industry tend to provide access to similar, or even redundant knowledge, which might actually hamper the development of radical innovations

(Knudsen, 2007).

Managing a portfolio of alliances

"A firm's collection of direct alliances with partners" as the unit of analysis (Lavie, 2007: 1188)

Interdependencies often exist among alliances in a portfolio, which can have major effects on a firm's ability to generate radical innovation (Faems et al., 2005).

Since different partners have different knowledge, partner diversity i.e. number of partner types (e.g. suppliers, clients, competitors, universities) fosters the development and implementation of radical innovations.

An alliance portfolio can therefore be managed as a pool of external knowledge (re)sources

External solutions: networks and ecosystems

The **network of inter-organizational relationships** impacts the firm's innovative outcomes (Powell et al. 1996)

The impact of networks on the innovation performance of a firm depends on the network structures, via:

- knowledge sharing, complementarity, and the emergence of scale economies (direct ties)
- knowledge spill-overs (indirect ties)
- information access (structural holes)

(Ahuja 2000)

External solutions: networks and ecosystems

While the network literature focuses on the social structure's impact on a firm's outcome, **the ecosystem literature looks at the flow of activity within networks** (Adler and Kapoor, 2010).

Firms have to face complex business communities that bring innovations to the market through simultaneous cooperation and competition dynamics (Moore 2003).

"In a business ecosystem, companies coevolve capabilities around an innovation: they work cooperatively and competitively to support new products, satisfy customer needs, and eventually incorporate the next round of innovations" (Moore 1993: 76).

Readings

Christensen, C. M., & Bower, J. L. (1996). Customer power, strategic investment, and the failure of leading firms. *Strategic management journal*, 17(3), 197-218.

Tushman, M. L., Smith, W. K., & Binns, A. (2011). The ambidextrous CEO. *Harvard Business Review, 89*(6), 74-80.

The innovator's dilemma

How can organizations adapt to change?

Politecnico
di Torino
1859
Department
of Management
and Production Engineering

Msc Data Science and Engineering

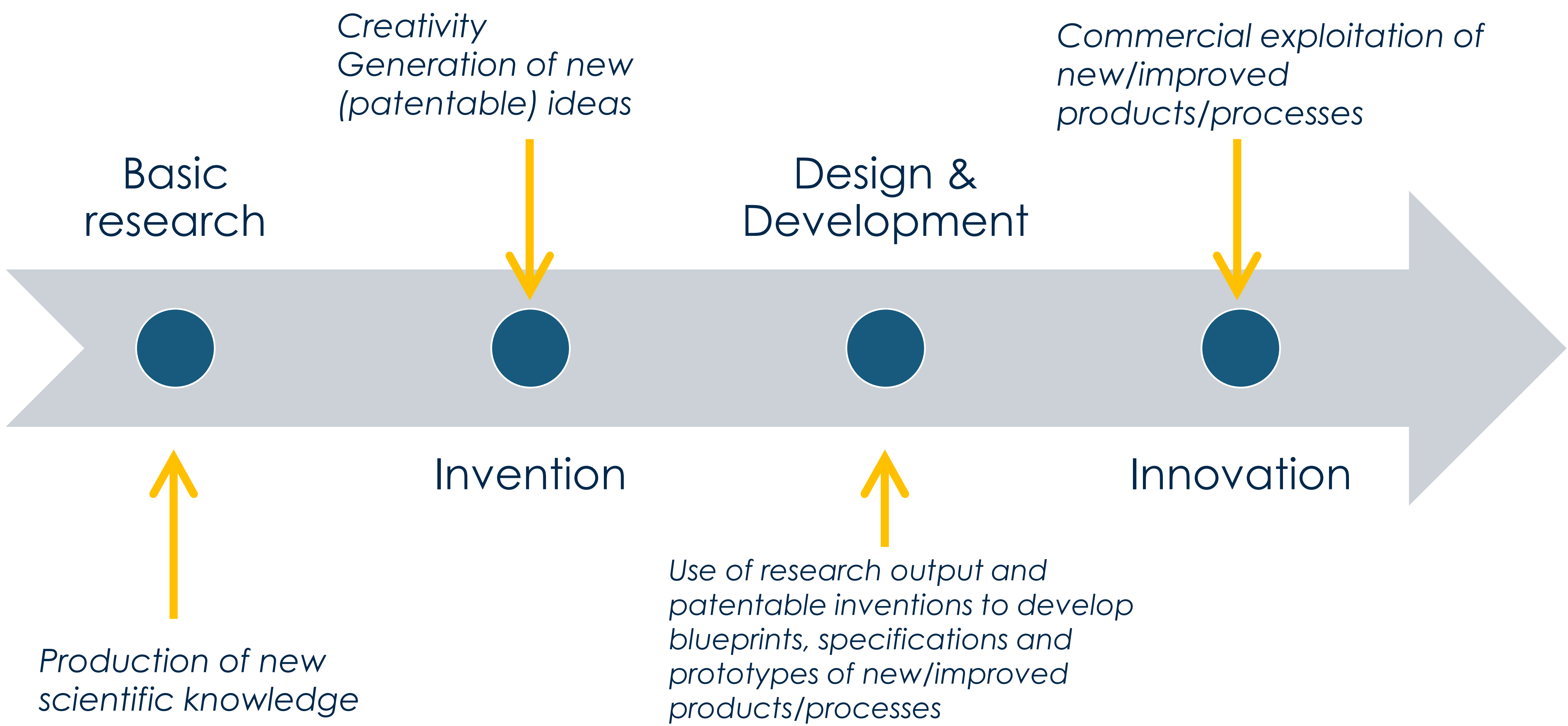
The open innovation paradigm

Politecnico di Torino

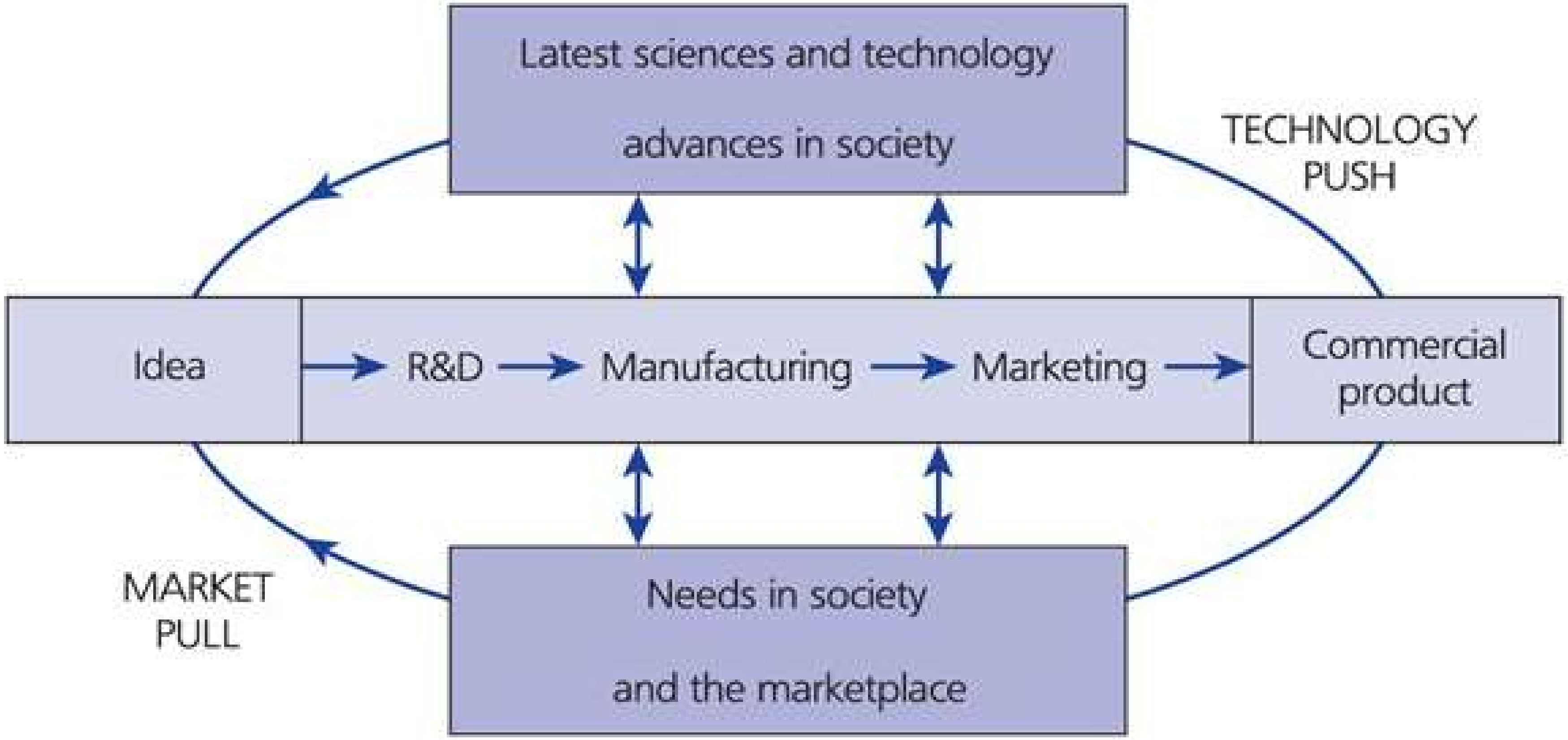
1859

Department of Management and Production Engineering

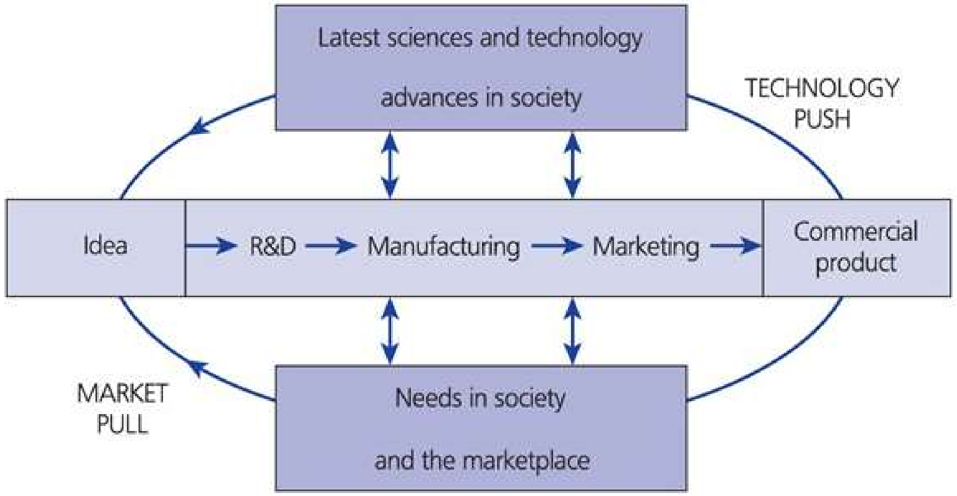
Innovation as a process:



The linear model of innovation



The linear model of innovation turns into vertical integration

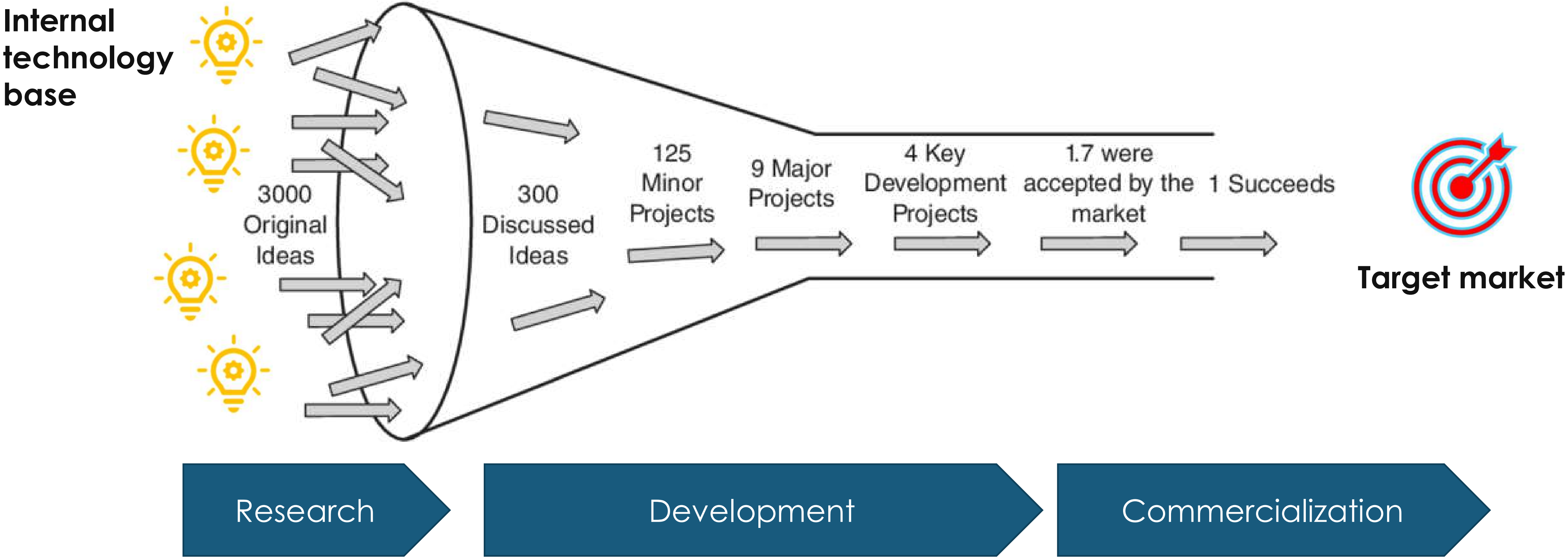


Key characteristics of innovation

Invention
Product
Technology-driven
Internally-generated
Engineering’s job

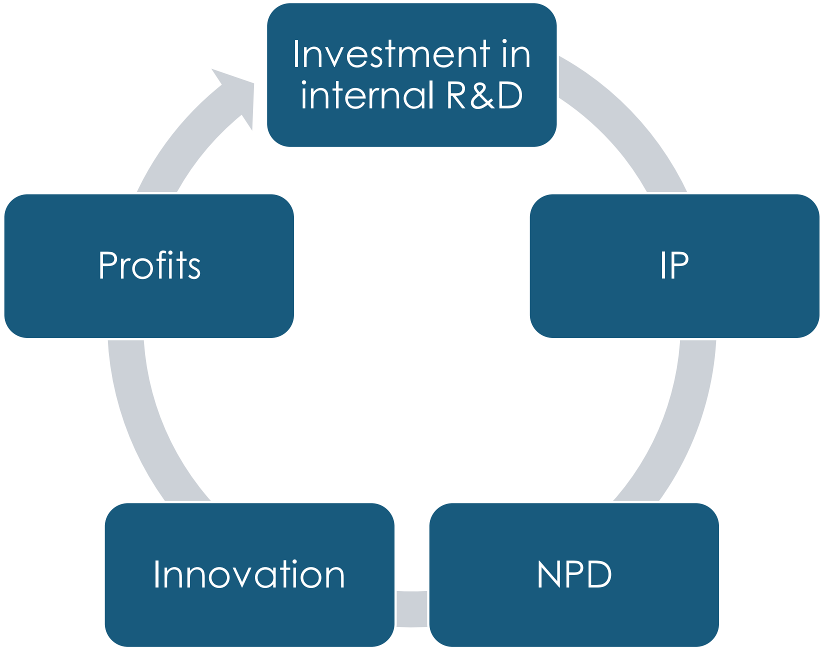
R&D is led by big companies

The «traditional» innovation funnel



Sketch map of the innovation funnel model (using new drug development as an example)
Jin (2002)

«self reliance» in R&D operations

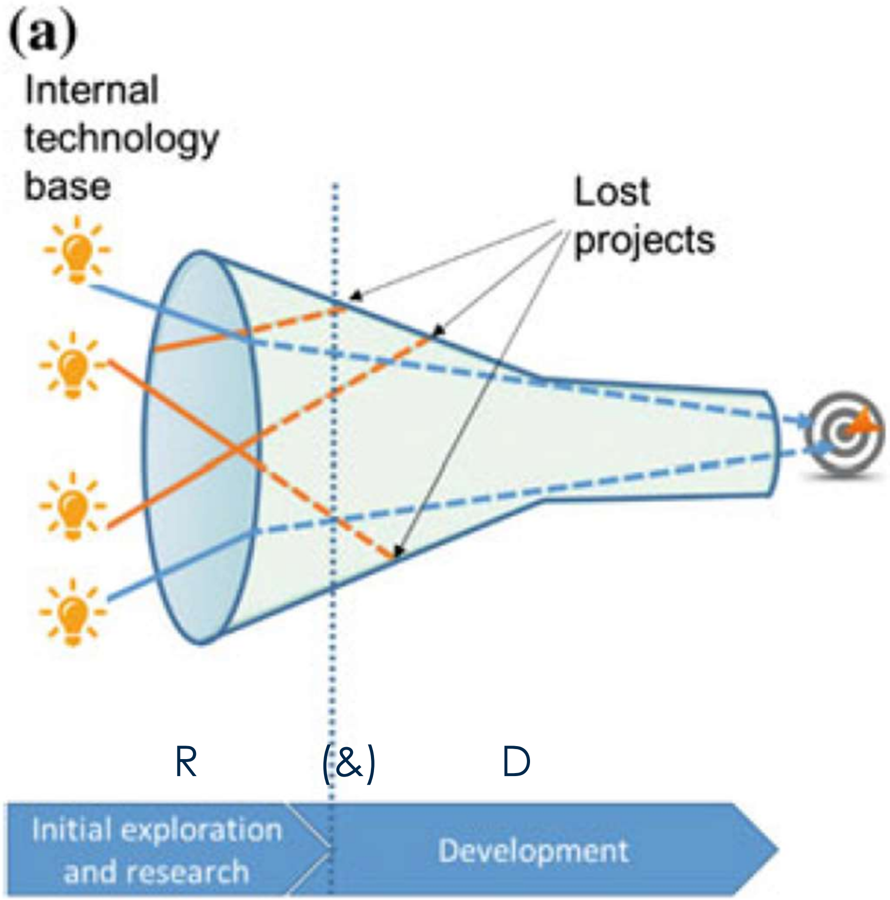


- Large corporations **working at the cutting edge** of scientific research, feature the **best equipment**, are staffed by the best **people,** and focus on long-term R&D programs that are **funded at a significant level**

- The **largest companies** in an industry can fund the most R&D and generally enjoy the most advanced technology as a result.

- Any company that wants to enter the industry would have to make **similarly large, long term investment** in order to compete.

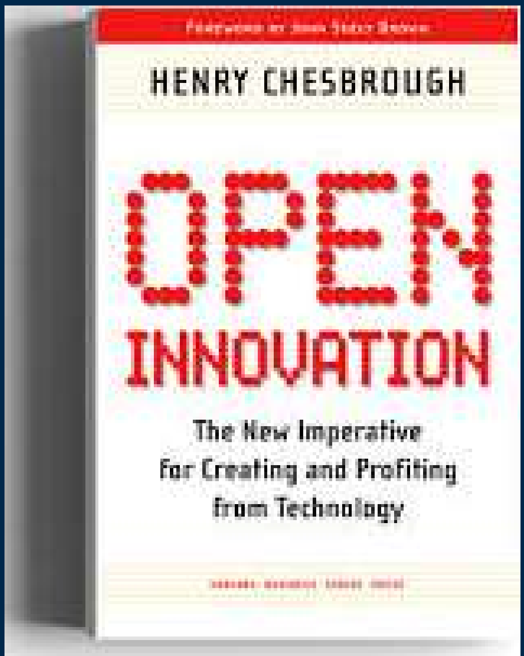
A “Closed” Innovation Model



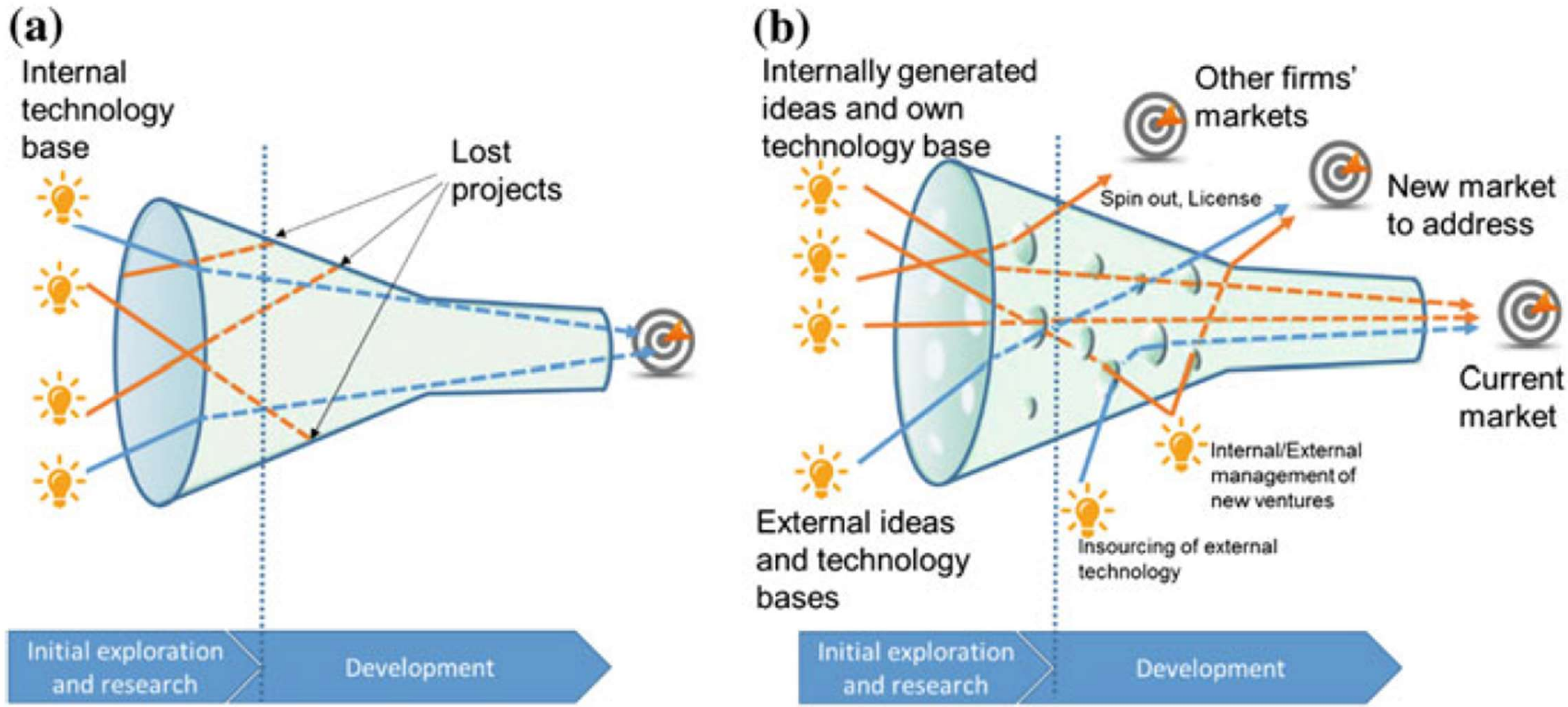
Politecnico di Torino

“The shift from a traditional closed and controlled R&D and innovation environment toward an open and flexible environment”

The **new value** is captured along the value chain from ***purposive inflows and outflows of knowledge*** *to accelerate innovation and to expand the markets for external use of innovation respectively.”*



An Open Innovation Model



Where does the concept come from?

Its definition derives from a long stream of the economics literature on knowledge spillovers arising from R&D activities.

Nelson (1959) observed that basic research generated many such spillovers and that **firms funding that research had only a limited ability to appropriate value** from those spillovers

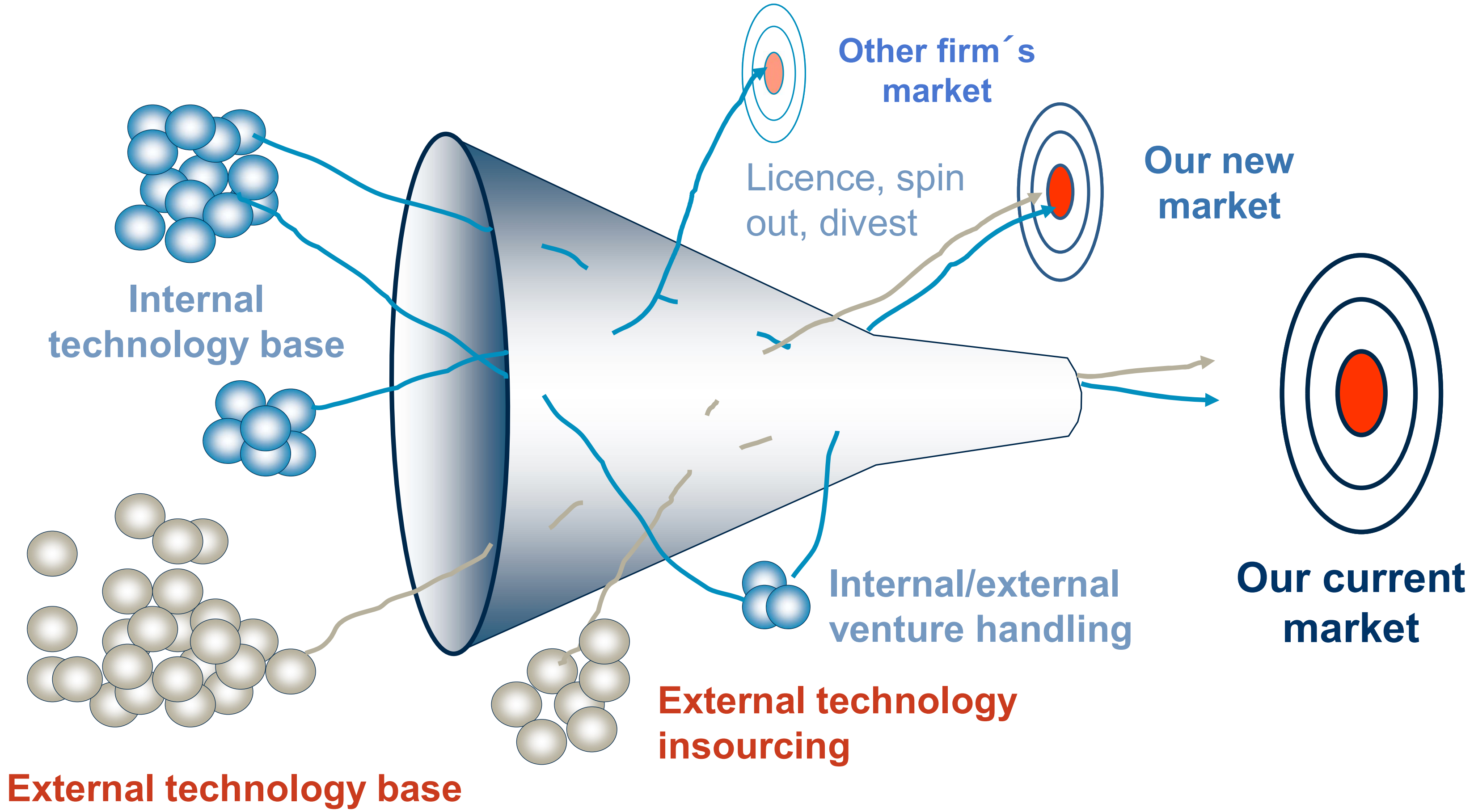
Arrow (1962) also took note of this spillover problem, recognizing that these spillovers meant that **the social return on R&D investments exceeded the private return** enjoyed by the firm undertaking those investments

Cohen and Levinthal (1990) wrote about the importance of **investing in internal research in order to be able to utilize external technologies**, an ability they termed "absorptive capacity.

Rosenberg (1990) asked why firms conduct basic research with their own money. He found that this research **enhanced the firm's ability to use external knowledge**.

Throughout this literature, **spillovers are viewed as the focal firm's cost for undertaking R&D** and they are essentially judged as **unmanageable.** This is the critical conceptual distinction from the open-innovation concept, which proposes that R&D spillovers can be transformed into inflows and outflows of knowledge that can be purposefully managed.

An open innovation model



Contrasting Principles of Innovation

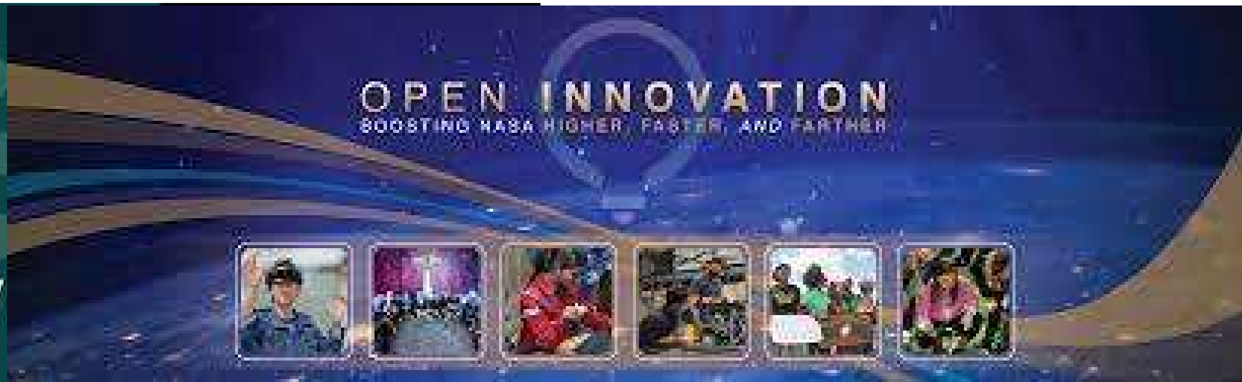
Closed Innovation

- The smart people in our field work for us
- To profit from R&D, we must discover, develop and ship it ourselves
- If we discover it first, we will get it to market first
- If we are the first to commercialize it, we will win
- If we create the most and best ideas, we will win
- We should control our IP, so our competitors don’t profit from our ideas

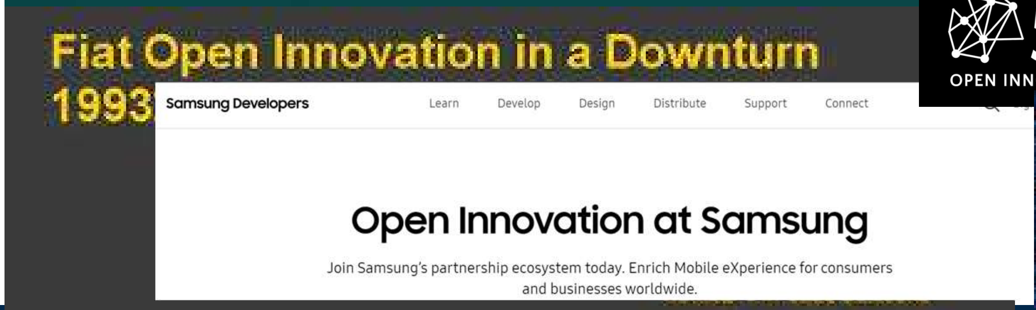
Open Innovation

- Not all the smart people work for us
- External R&D can create value; internal R&D is needed to claim some portion of that value
- We don’t have to originate the research to profit from it
- Building a better business model beats getting to market first
- If we make the best use of internal and external ideas, we will win
- We should profit from others’ use of our IP, and we should buy others IP when it advances our business


INSEAD digital
Global Open Innovation & Sustainability
The ENEL Case
Ernesto Ciorra
Chief Innovability Officer, ENEL
Fabio Tentori (MBA'10D)
Head of Innovation Hubs, Startups & Business Incubation, ENEL
Felipe Monteiro
Senior Affiliate Professor of Strategy, INSEAD
Hayley Moller (MBA'21D)
MBA Student, INSEAD


OPEN INNOVATION
BOOSTING NASA HIGHER, FASTER, AND FARTHER


P&G
Connect + Develop:
Sourcing the creativity of the world

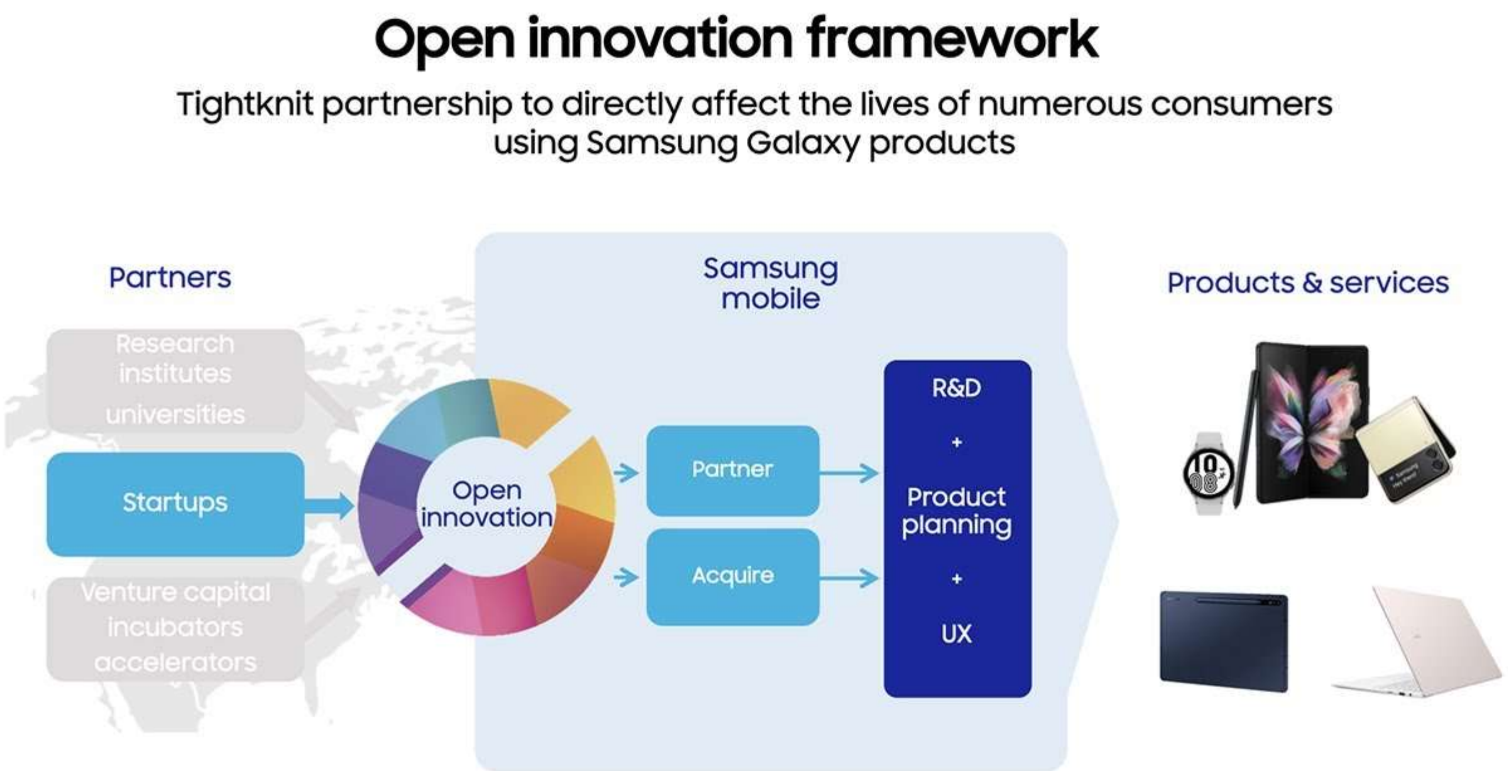

Fiat Open Innovation in a Downturn
1993
Samsung Developers
Learn
Develop
Design
Distribute
Support
Connect
Open Innovation at Samsung
Join Samsung's partnership ecosystem today. Enrich Mobile eXperience for consumers and businesses worldwide.


5G
OPEN INNOVATION LAB


openinnovation
Advancing research together
AstraZeneca

Open innovation @

https://developer.samsung.com/open-innovation



Diverse types of collaboration

Samsung has a major internal R&D unit, but the company is also a proud open innovation advocate.
A portfolio of open innovation activities - especially with startups.

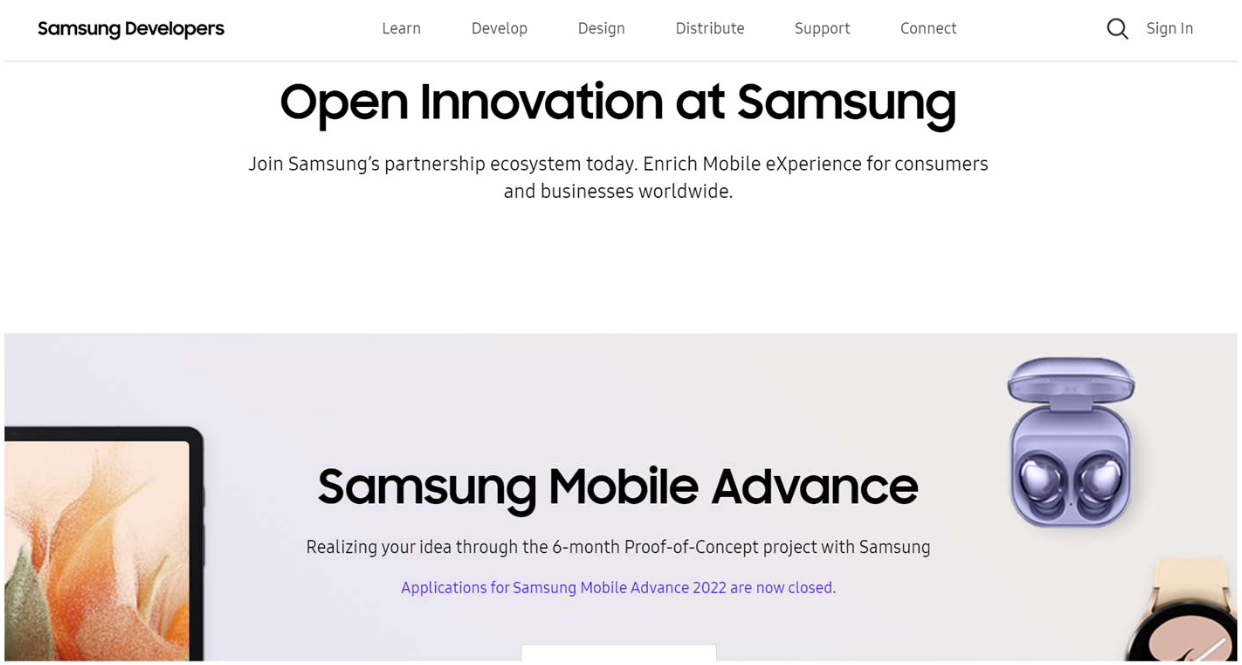
The distinctive trait of Samsung's open innovation strategy is that it has "four legs":

1. Partnerships
2. Ventures
3. Accelerators
4. Acquisitions

Partnerships

R&D (or NPD) collaborations between companies.

Samsung's partnerships aim for new features or for the integrations of modules or new products within Samsung's existing products.

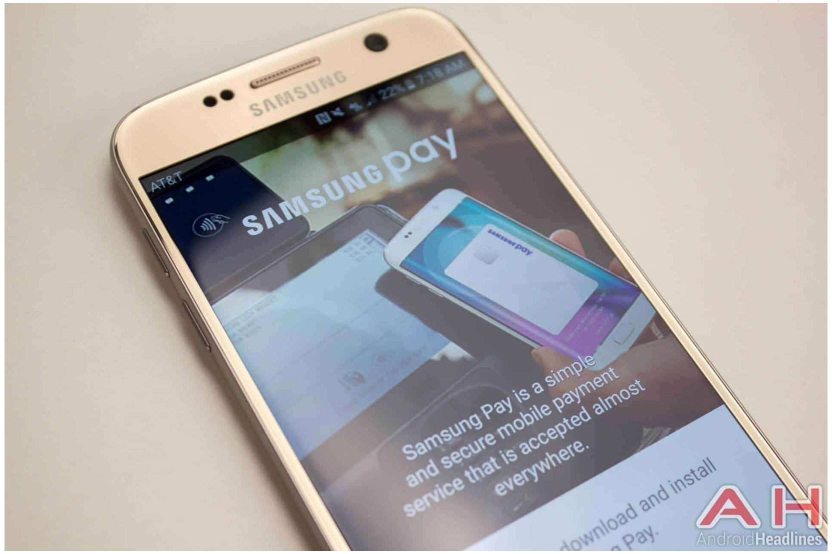


Ventures

http://www.samsungventures.com/

Samsung venture investments into early-stage startups.

- A source of revenue (exits)
- Access to new technologies that Samsung can learn and benefit from
- Low-risk exploration



News

Samsung Pay incorporates Mobeam barcode beaming technology

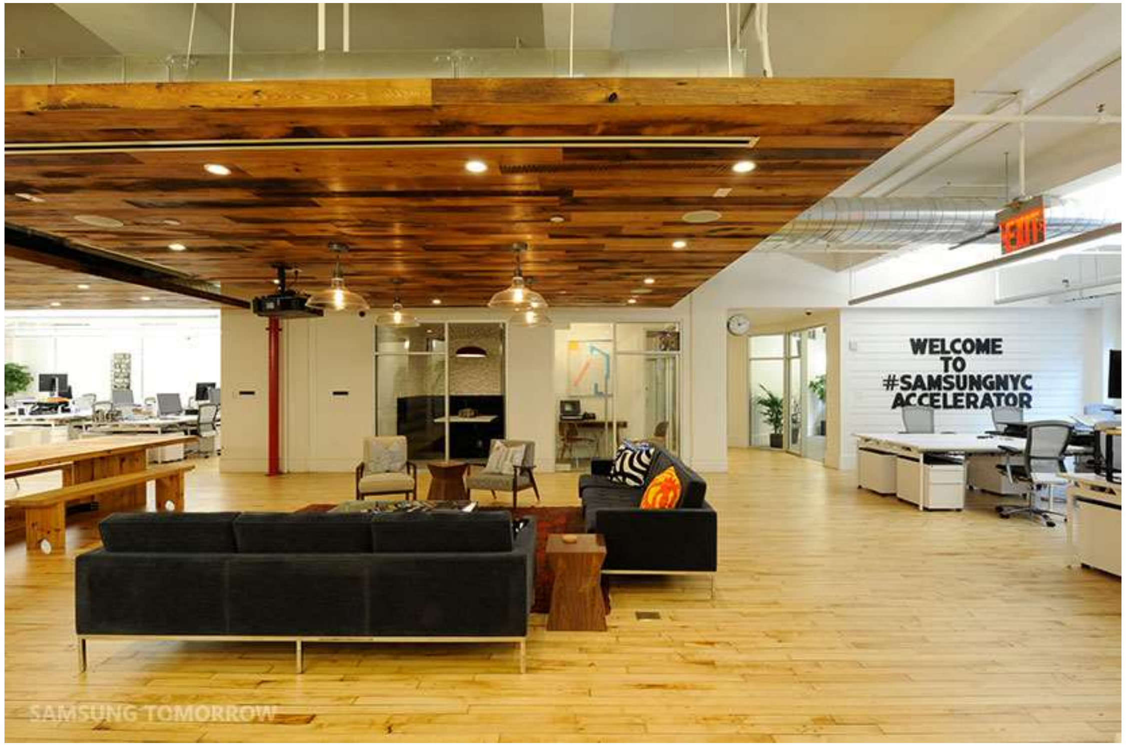
Wednesday 25 May 2016 11:36 CET | News

Mobeam, the global provider of mobile barcode beaming, has announced that its technology has been incorporated into Samsung Pay mobile payment service.

Mobeam technology has been used in Samsung Pay for a number of months for the redemption of gift cards that are barcode based. With the latest Samsung Pay update, Mobeam's beaming technology has been further implemented within Samsung Pay to power the transmission of any barcoded loyalty or membership card at retail POS laser scanners.

Accelerator

http://samsungaccelerator.com/?p=apply



Provides startups with an **empowering** environment (& resources) to foster creativity and accelerate innovation.

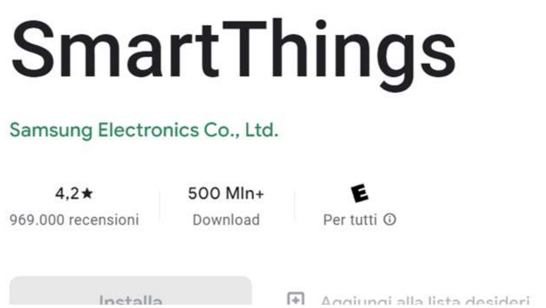
Samsung offers startups an initial investment, facilities, as well as knowledge resources from their pool.

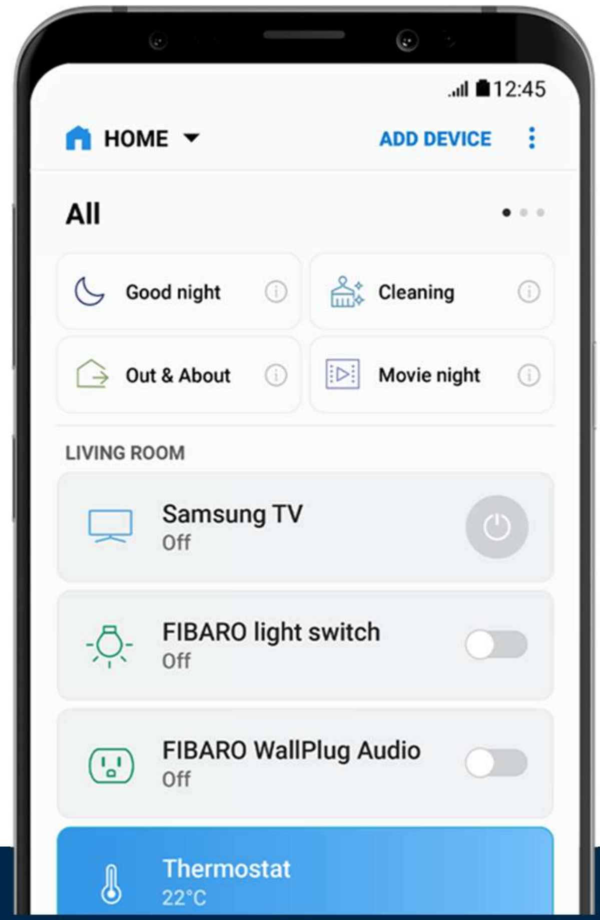
The products stemming from the accelerated startups could become a part of Samsung's product portfolio over time or just serve as learning experiences for the company.

Acquisitions

Samsung brings in startups working on new products that are at the core of Samsung's strategic areas (future).

Acquired companies often remain independent units and can even join the Accelerator program.





Practical takeaways from Samsung case

By collaborating with startups, Samsung benefits from a **variety** of technologies and innovations that smaller companies have already come up with. These companies often have products that can **complement** or be **integrated** into Samsung's own products, creating value for both parties.

Companies that aim for radically new products requiring high initial investments are typically invested in or acquired.

Building an OI strategy: Different kinds of companies at different stages of their lifespan offer different kinds of possibilities. Samsung identifies these companies and figures out the methods that best match the different kinds of opportunities.

Microsoft & Open AI

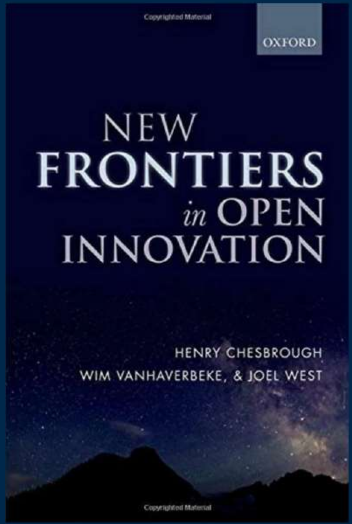
Microsoft and OpenAI extend partnership

Jan 23, 2023 | Microsoft Corporate Blogs

Today, we are announcing the third phase of our long-term partnership with OpenAI through a multiyear, multibillion dollar investment to accelerate AI breakthroughs to ensure these benefits are broadly shared with the world.

This agreement follows our previous investments in 2019 and 2021. It extends our ongoing collaboration across AI supercomputing and research and enables each of us to independently commercialize the resulting advanced AI technologies.

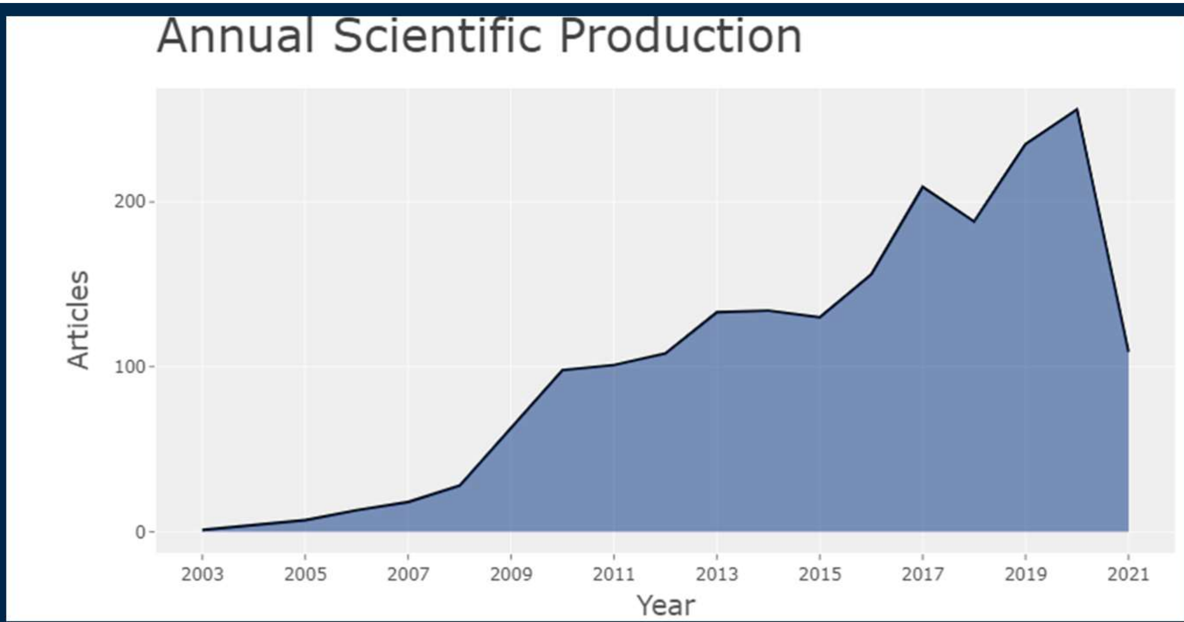
OpenAI | Microsoft

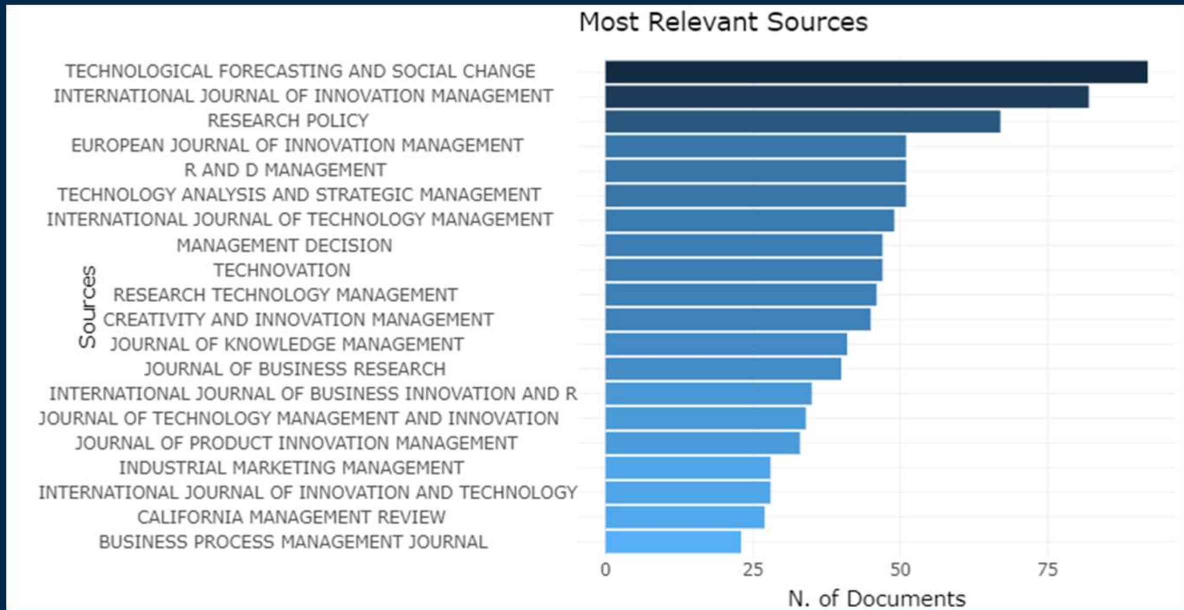


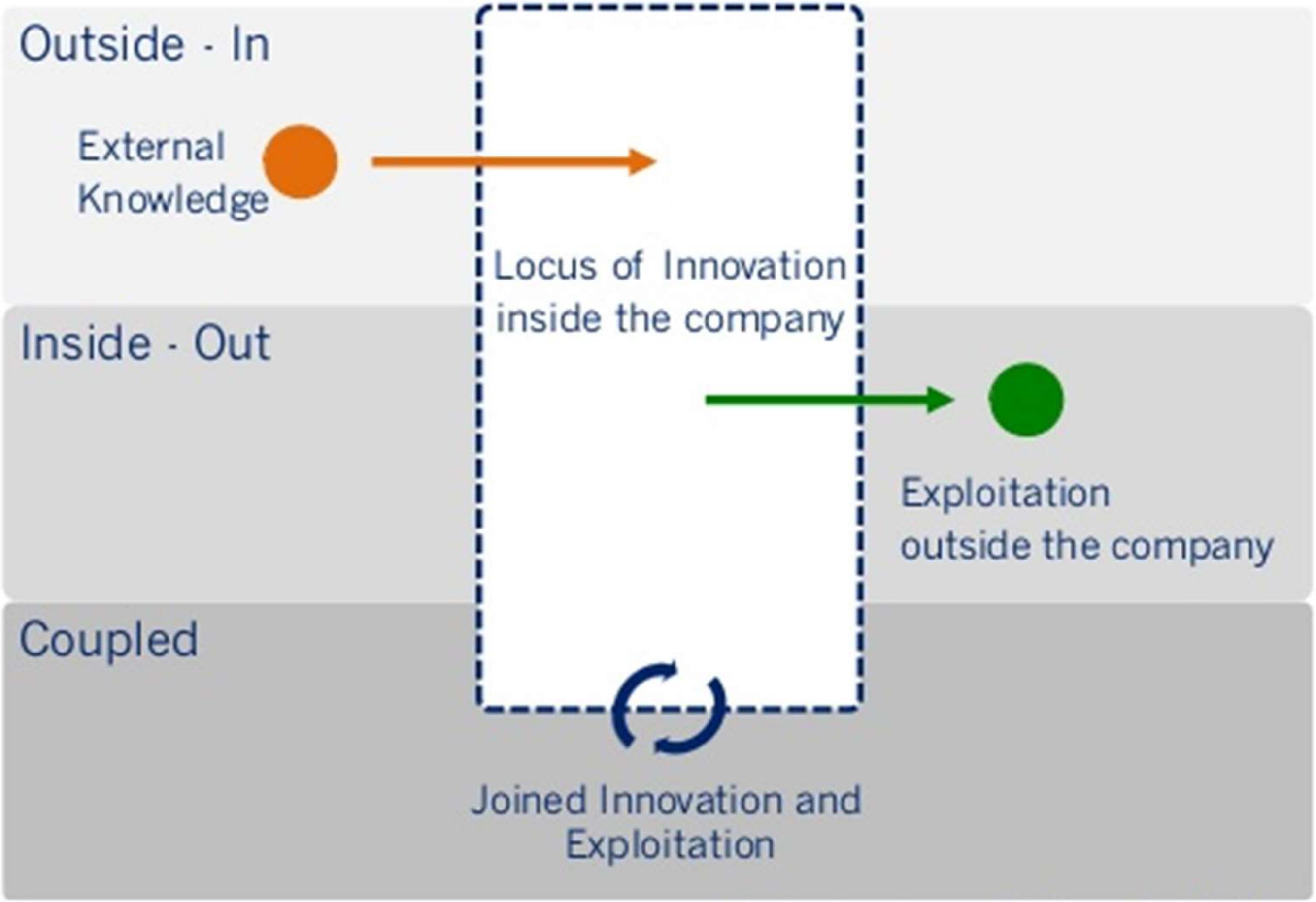
“a distributed innovation process based on ***purposively managed knowledge flows across organizational boundaries****, using pecuniary and non-pecuniary mechanisms in line with the organization’s business model.”*

Chesbrough, H., & Bogers, M. (2014). Explicating open innovation: Clarifying an emerging paradigm for understanding innovation.

New Frontiers in Open Innovation. Oxford: Oxford University Press



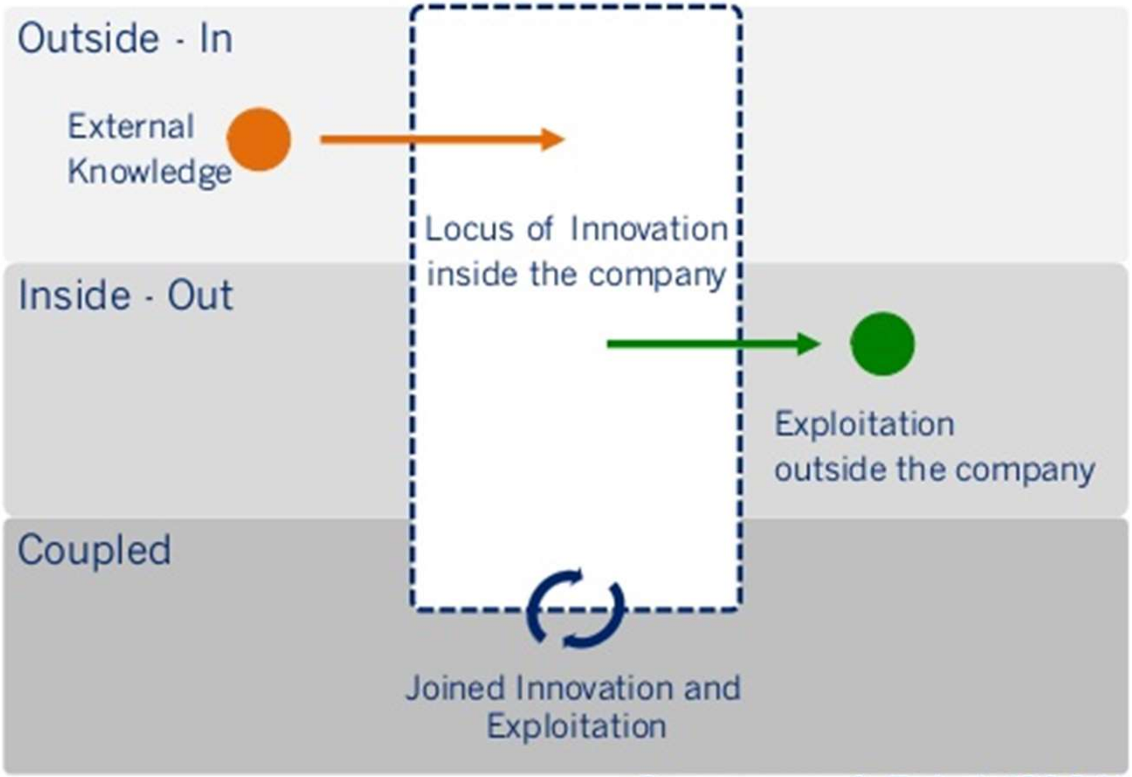




Open Innovation: a process perspective

GASSMAN & ENKEL (2004)
ENKEL, GASSMAN AND CHESBROUGH (2009)

Outside-in Open Innovation



Gassmann & Enkel (2004)

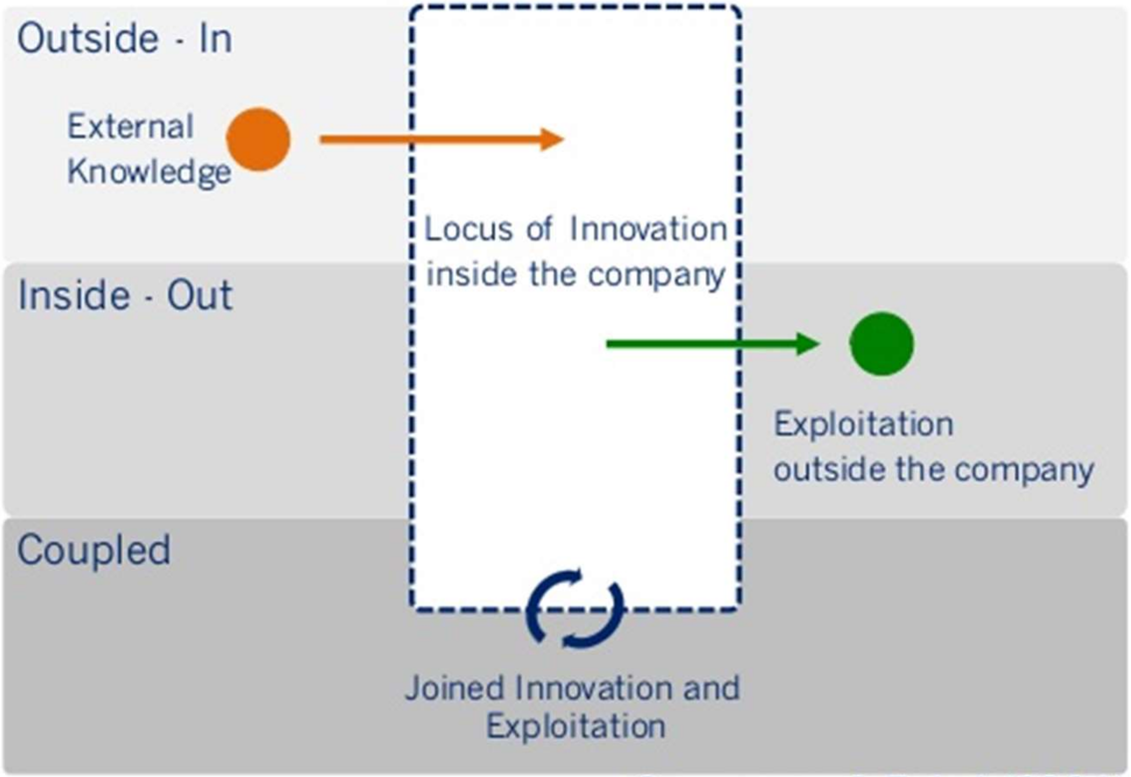
The **outside-in process**: enriching the company's internal knowledge base through external knowledge sourcing

(the integration of **suppliers**, **customers**, competitors' […] knowledge)

↓

Internal R&D is used to increase the firm's **absorptive capacity**

Inside-out Open Innovation

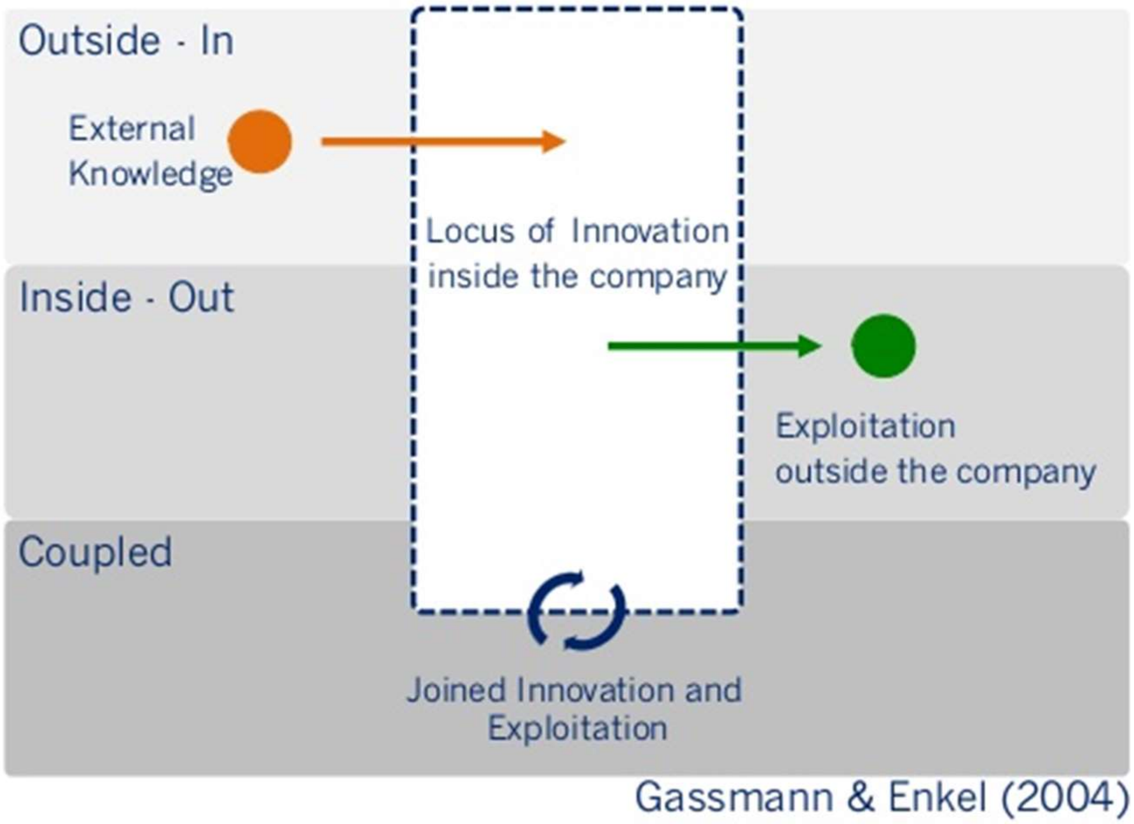


Gassmann & Enkel (2004)

The **inside-out process Accelerating innovation through internal knowledge revealing** (bringing internal –unused- ideas to new paths to the market),

(selling IP, exploiting technology through interorganizational partnerships)

Coupled Open Innovation



The **coupled process** refers to co-creation with (mainly) complementary partners during which give and take are crucial for success.

(alliances, cooperation, and joint ventures)

A FAD OR A PHENOMENON?
SOME FINDINGS FROM THE LITERATURE

Executive study
UC Berkeley and
Fraunhofer

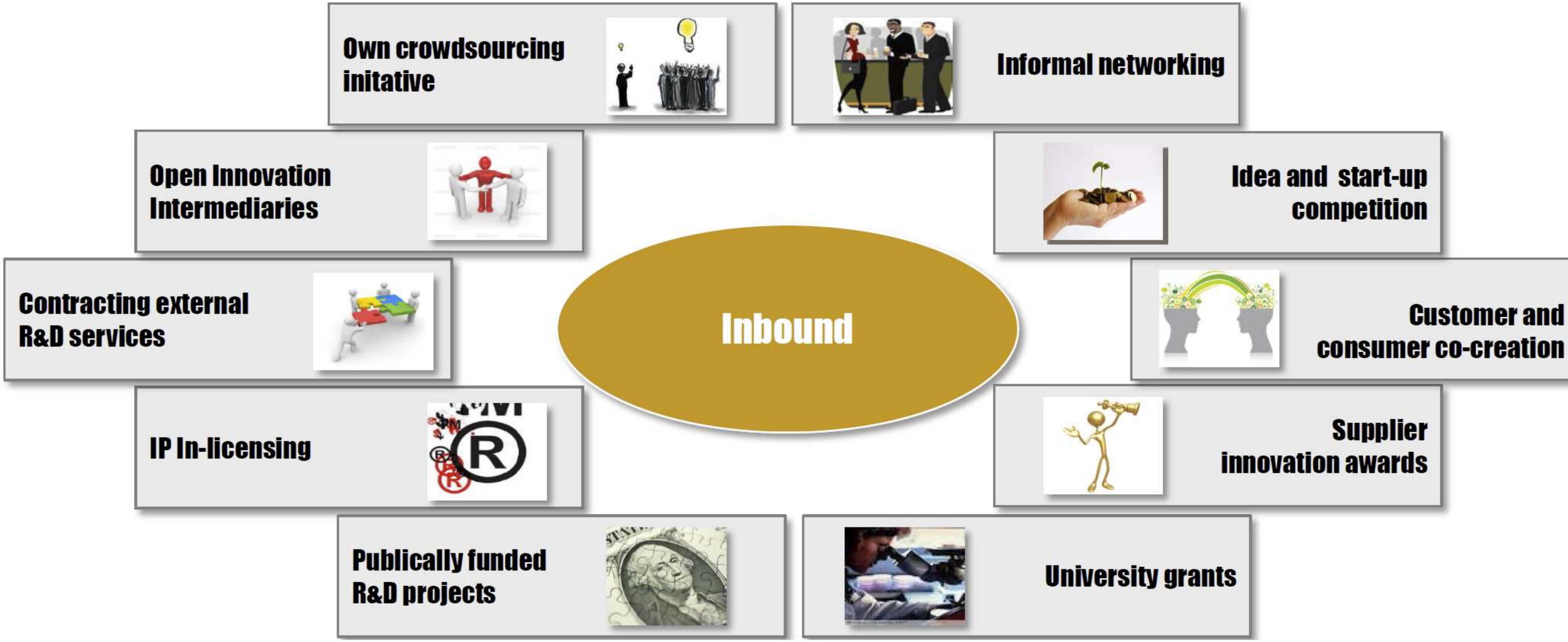
Fraunhofer

- Study among the largest firms in Europe and US
  - Firm criteria: >1000 employees and >250 million USD in sales
  - Key informants: CEO, COO, or CTO at headquarter
- Data collection
  October– December 2012
- 125 datasets

Adoption of open innovation	78% practice open innovation today
Abandonment	No firm has abandoned open innovation
Open innovation experience	Median of 5 years
Management support	71 % have increased management support
Intensity	82 % have increased open innovation activity

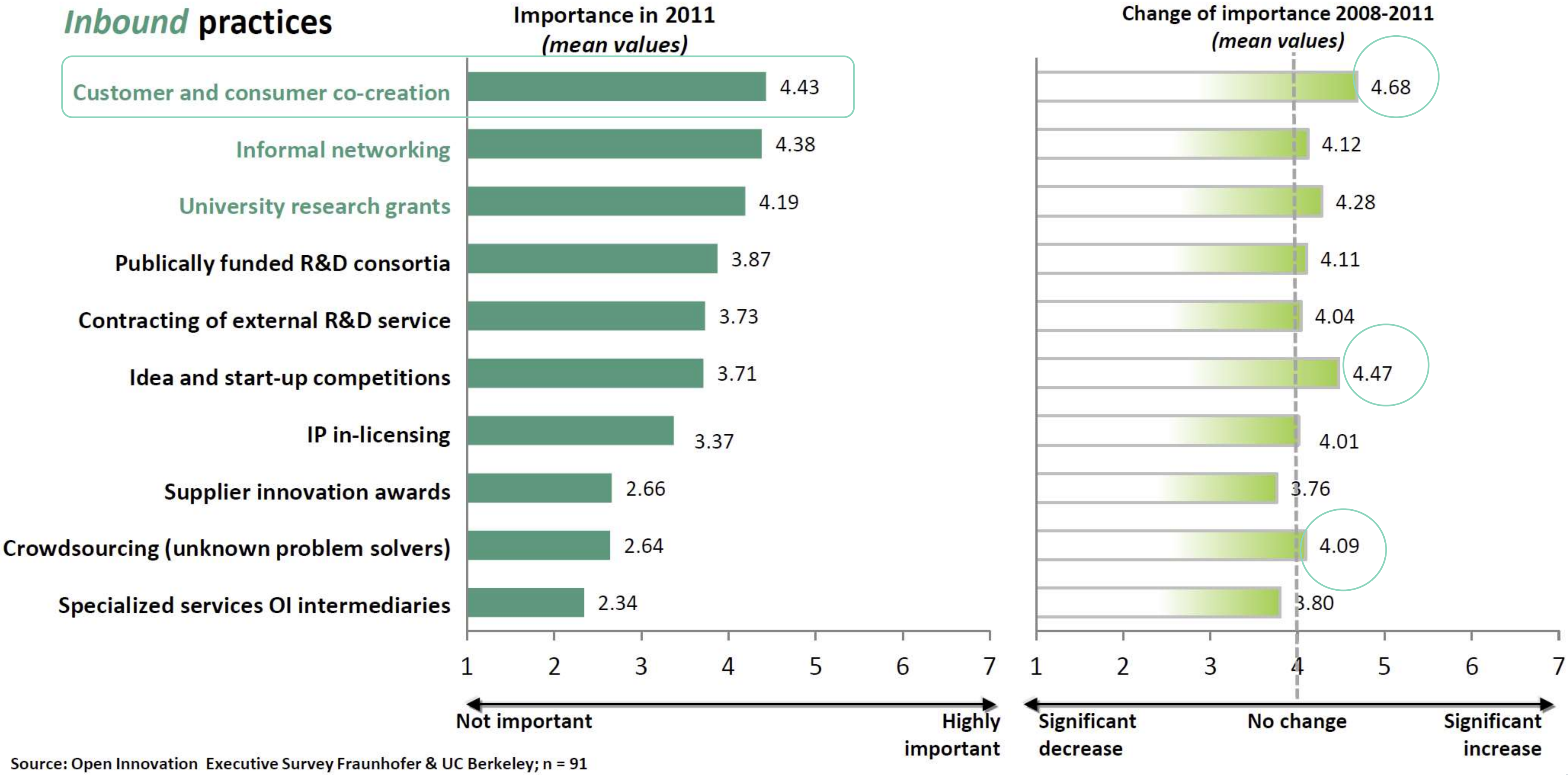
Chesbrough and Brunswicker, 2013

THERE ARE A RANGE OF INBOUND PRACTICES



Chesbrough and Brunswicker, 2013

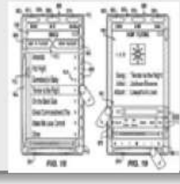
CO-CREATION WITH USERS MATTERS THE MOST



Source: Open Innovation Executive Survey Fraunhofer & UC Berkeley; n = 91

AND THERE ALSO DIFFERENT KINDS OF OUTBOUND PRACTICES

IP out-licensing and patent selling



Donations to commons or non-profits

Outbound

Corporate business Incubation and business venturing

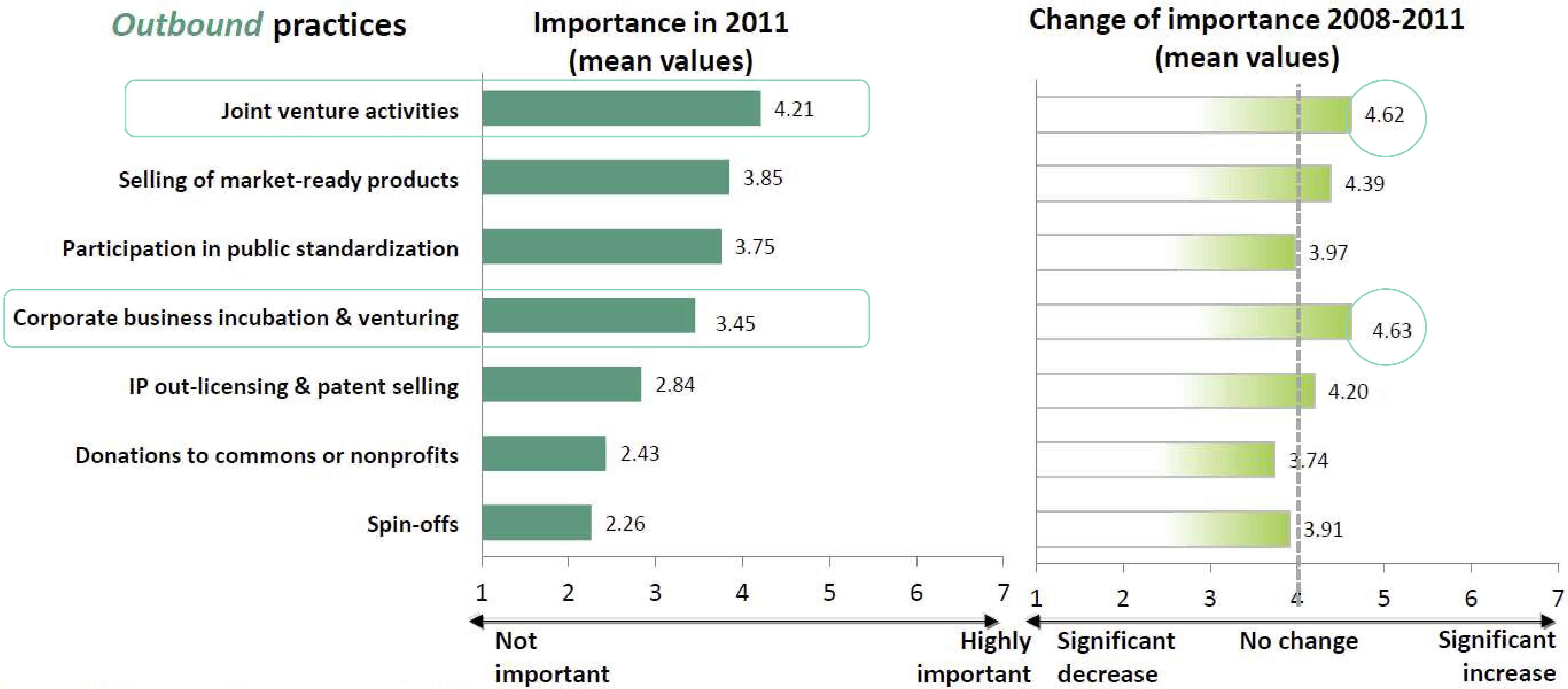
Participation in standardization

Joint venture activities with external partners

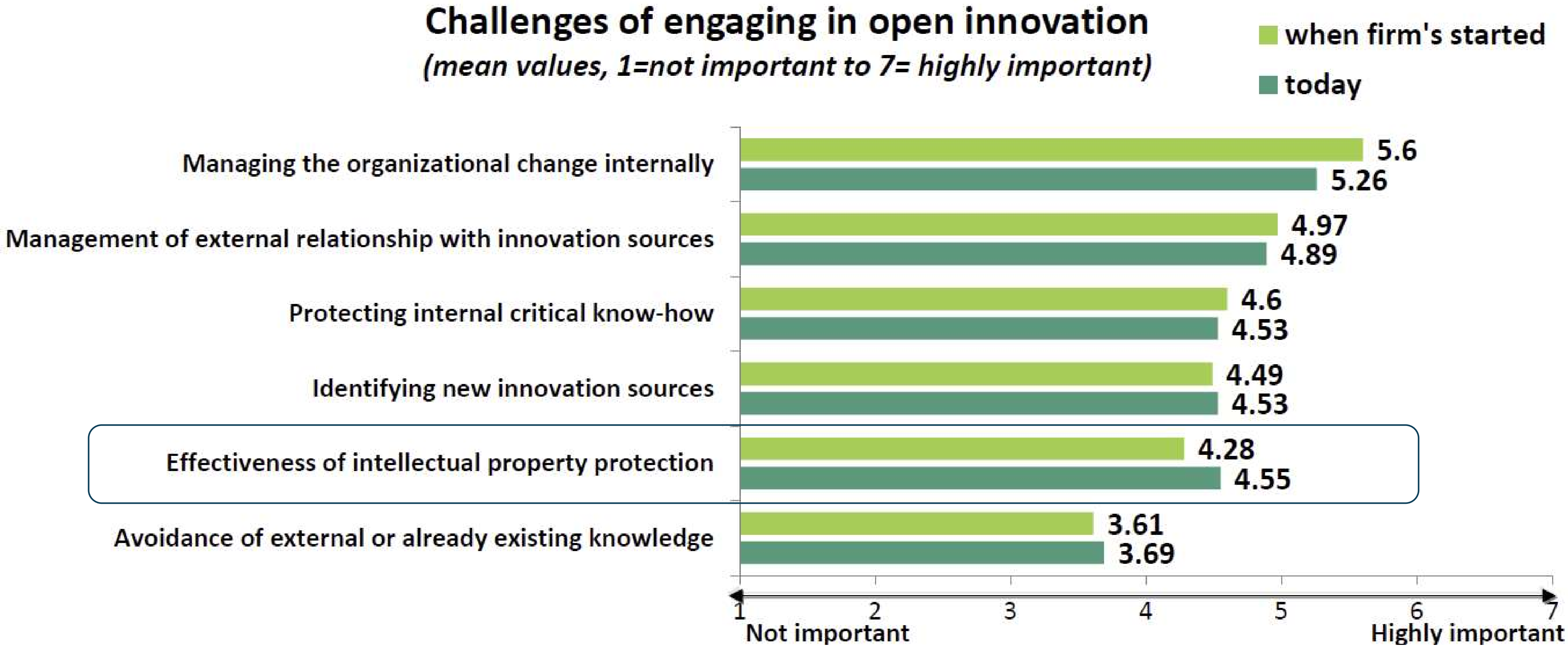
Participation in standardization

Selling of market-ready ideas

«TRADITIONAL» PRACTICES ARE THE MOST POPULAR ONES



Source: Open Innovation Executive Survey Fraunhofer & UC Berkeley; n = 91



Source: Open Innovation Executive Survey Fraunhofer & UC Berkeley; n = 91

Available online at www.sciencedirect.com
ScienceDirect
Technovation 29 (2009) 423–437
technovation
www.elsevier.com/locate/technovation

Open innovation in SMEs: Trends, motives and management challenges

Vareska van de Vrande[a,*], Jeroen P.J. de Jong[b], Wim Vanhaverbeke[c], Maurice de Rochemont[d]

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[c] Faculty of Business Studies, Hasselt University, Belgium
[d] Eindhoven University of Technology, The Netherlands

Motives to adopt open innovation practices

Category	Examples	Technology exploitation			Technology exploration		
		Venturing ($n = 83$) (%)	Employee involvement ($n = 256$) (%)	Customer involvement ($n = 232$) (%)	External networking ($n = 175$) (%)	External participation ($n = 94$) (%)	Outsourcing R&D ($n = 134$) (%)
Control	Increased control over activities, better organization of complex processes	1	9	1	1	3	1
Focus	Fit with core competencies, clear focus of firm activities	8	–	–	1	1	3
Innovation process	Improved product development, process-/market innovation, integration of new technologies	23	–	19	21	24	8
Knowledge	Gain knowledge, bring expertise to the firm	4	–	5	35	6	44
Costs	Cost management, profitability, efficiency	13	–	2	2	11	9
Capacity	Cannot do it alone, counterbalance lack of capacity	1	–	3	7	5	13
Market	Keep up with current market developments, customers, increase growth and/or market share	3	13	61	22	36	14
Utilization	Optimal use of talents, knowledge, qualities, and initiatives of employees	–	30	–	–	–	–
Policy	Organization principles, management conviction that involvement of employees is desirable	–	15	–	–	–	–
Motivation	Involvement of employees in the innovation process increases their motivation and commitment	–	22	–	–	–	–
Other		19	11	9	11	14	8
Total		100	100	100	100	100	100

Hampering factors when adopting open innovation practices

Category	Examples	Technology exploitation			Technology exploration		
		Venturing ($n = 40$) (%)	Employee involvement ($n = 88$) (%)	Customer involvement ($n = 68$) (%)	External networking ($n = 53$) (%)	External participation ($n = 45$) (%)	Outsourcing R&D ($n = 57$) (%)
Administration	Bureaucracy, administrative burdens, conflicting rules	28	–	–	10	13	19
Finance	Obtaining financial resources	10	–	–	5	–	4
Knowledge	Lack of technological knowledge, competent personnel, or legal/administrative knowledge	5	–	–	–	5	–
Marketing	Insufficient market intelligence, market affinity, marketing problems of products	10	–	–	–	5	–
Organization/ culture	Balancing innovation and daily tasks, communication problems, aligning partners, organization of innovation	35	–	30	48	75	36
Resources	Costs of innovation, time needed	5	17	10	7	–	10
IPR	Ownership of developed innovations, user rights when different parties cooperate	–	–	10	5	–	–
Quality of partners	Partner does not meet expectations, deadlines are not met	–	–	–	24	–	28
Adoption	Adoption problems, customer requirements misjudged	–	–	14	–	–	–
Demand	Customer demand too specific, innovation appears not to fit the market	–	–	28	–	–	–
Competences	Employees lack knowledge/competences, not enough labor flexibility	–	24	–	–	–	–
Commitment	Lack of employee commitment, resistance to change	–	51	–	–	–	–
Idea management	Employees have too many ideas, no management support	–	8	–	–	–	–
Other		7	–	8	1	2	3
Total		100	100	100	100	100	100

Open Business models

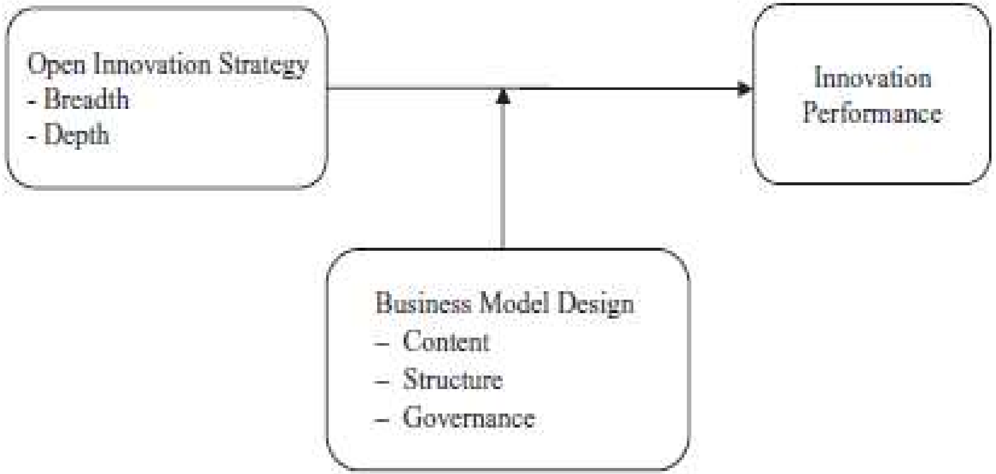
Companies that have successfully capitalized on integrating external knowledge into their innovation processes primarily **stand out in organizational terms**

They are characterized by **organizational flexibility** and a **willingness to restructure their existing business models** to accommodate open innovation strategies

The business model

A business model represents the content, structure, and governance of transactions inside the company and between the company and its external partners in support of the company's **creation, delivery and capture of value**

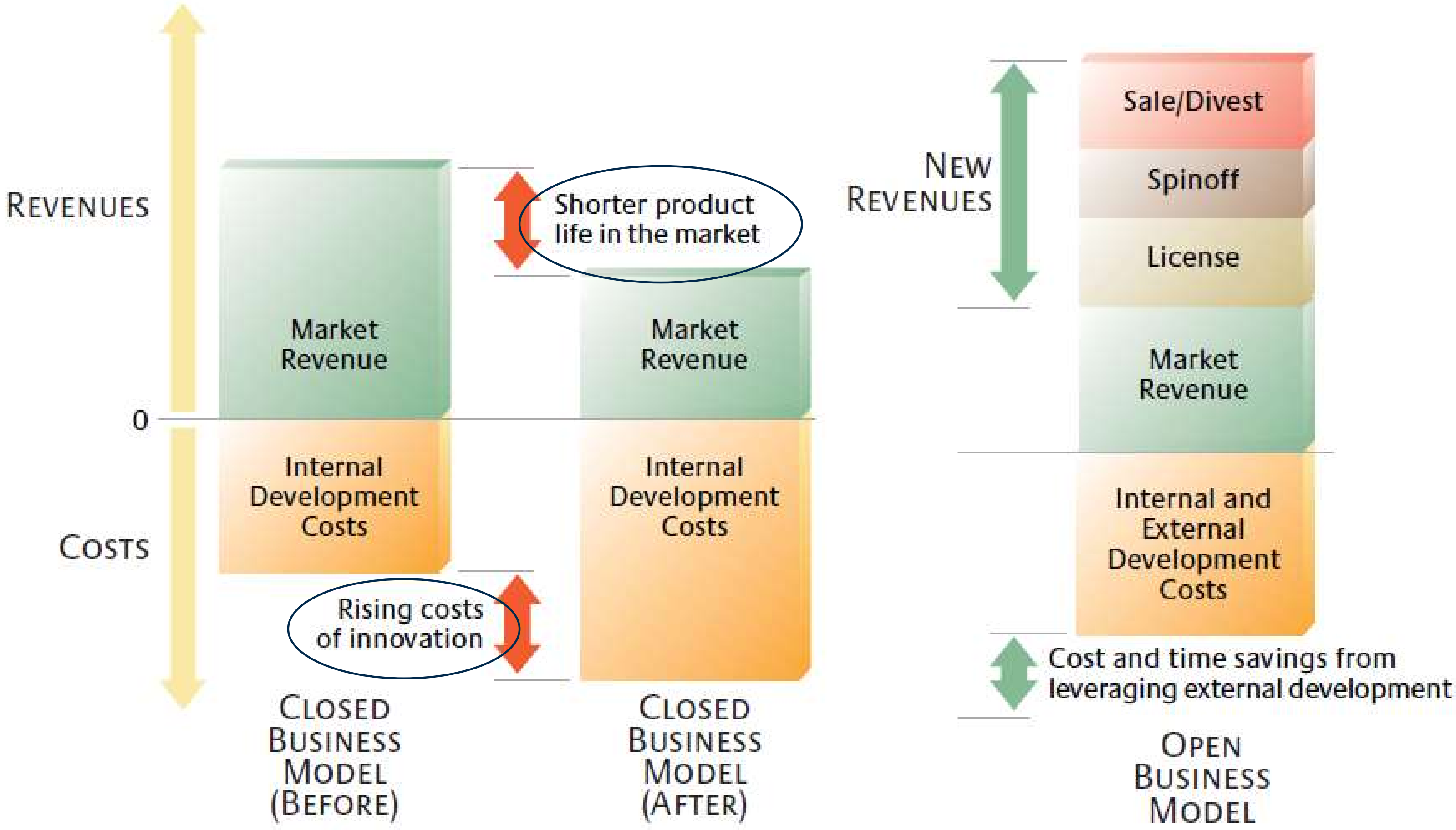
- Zott, C., & Amit, R. (2008) The fit between product market strategy and business model: Implications for firm performance. Strategic Management Journal 29(1), 1–26.
- Zott, C., & Amit, R. (2010) Business model design: An activity system perspective. Long Range Planning 43(2–3), 216–226.



Empirical evidence strongly suggests that **organizational design**, **practices** and **capabilities** need to be **aligned** with open innovation strategies, so as to positively influence the sourcing of knowledge from external parties and its subsequent exploitation for innovation.

- Foss, N. J., Laursen, K., & Pedersen, T. (2011) Linking customer interaction and innovation: The mediating role of new organizational practices. *Organization Science* 22(4), 980–999.

Open business models



Chesbrough, H. W. (2007). Why companies should have open business models. *MIT Sloan management review*, *48*(2), 22.

Open business models

Saebi, T., & Foss, N. J. (2015). Business models for open innovation: Matching heterogeneous open innovation strategies with business model dimensions. European Management Journal, 33(3), 201-213.

	Four open innovation strategies			
	Market-based innovation strategy	Crowd-based innovation strategy	Collaborative innovation strategy	Network-based innovation strategy
Business model dimensions	**Efficiency-centric open business model**	**User-centric open business model**	**Collaborative open business model**	**Open platform business model**
Content	• Efficiency-centered value proposition, enabled by reduction in transaction and coordination costs	• User-centered value proposition, input from communities of users	• Radical innovations and opening up of new target segment	• Business model acts as open-innovation platform for multiple stakeholders
Structure	• Redefinition of role of internal R&D system • Efficiency-centered structure	• Ideation phase of innovation process "outsourced" to the crowd	• Users/suppliers/customers/competitors become key partner in innovation process	• Re-organization of the production and distributional system • Need for complementary internal network
Governance	• Monetary remuneration for external knowledge provider • Use of "integration experts" to absorb market-available knowledge	• Monetary prizes or recognition for external knowledge providers • Incentives to engage and manage communities of users for own employees	• Contract based, sharing of rewards on organizational level with external knowledge provider • Incentives for own employees to engage with lead users and alliance partners	• Provide incentives for own employees to engage with multitude of knowledge partners (individuals, companies, communities) • Re-distribution of risks and rewards

Readings

Chesbrough, H.W. (2003) The era of open innovation *MIT SLOAN Management Review* Vol. 44, No. 3 Reprint #4435

Chesbrough, H. W (2019). *Open Innovation in the 21st Century*. In: Open innovation results: Going beyond the hype and getting down to business. Oxford University Press.

Msc Data Science and Engineering

The open innovation paradigm

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How open is innovation?

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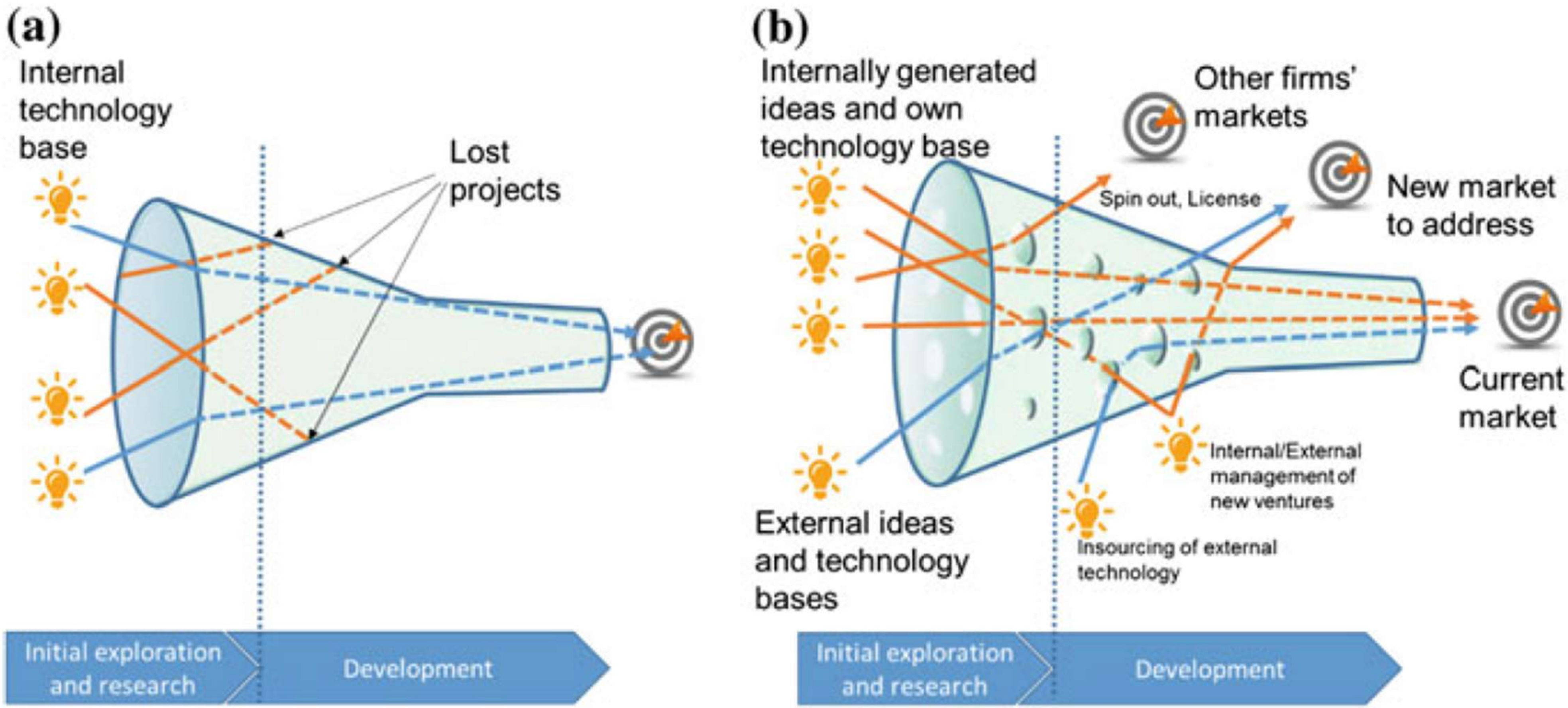
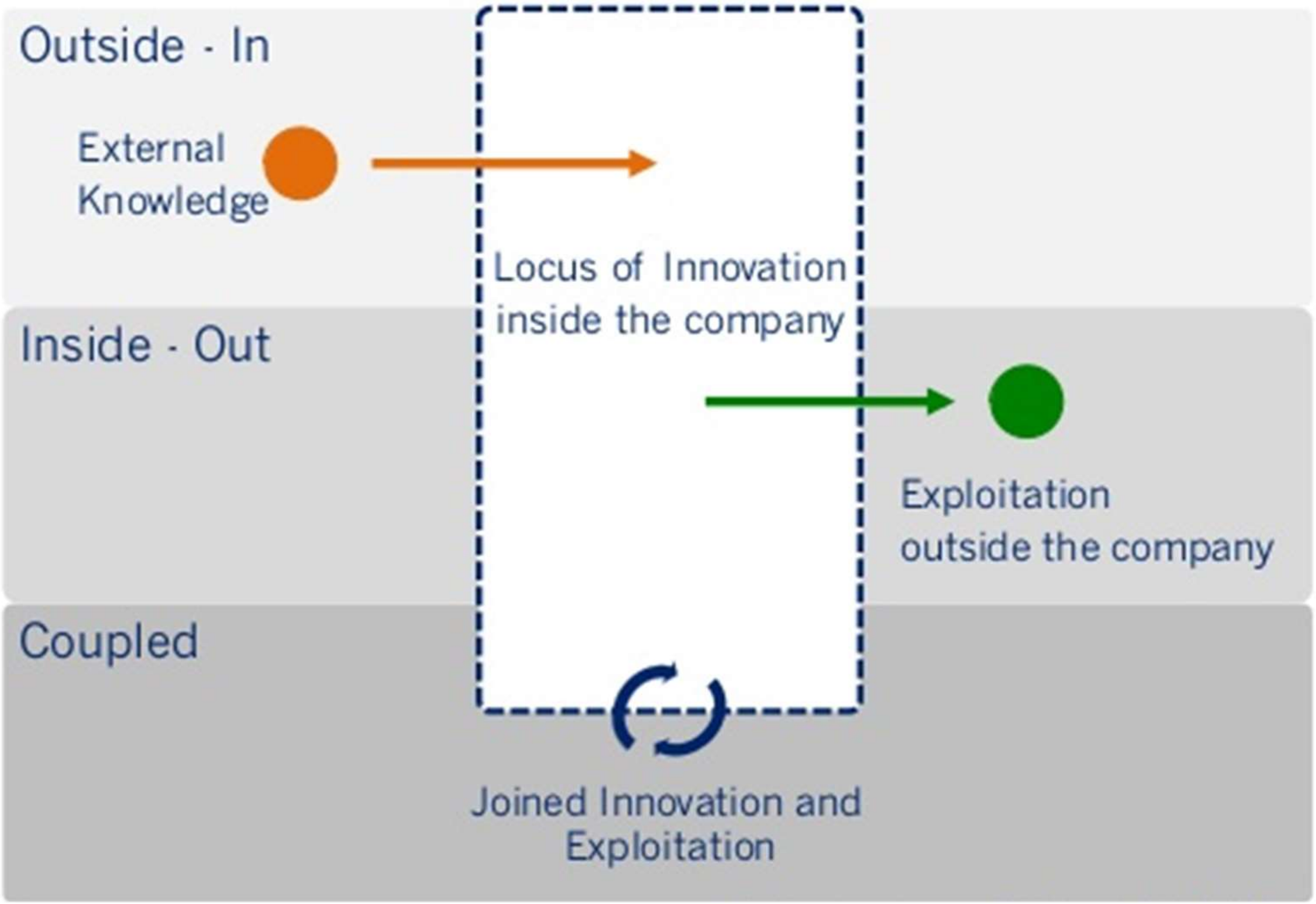
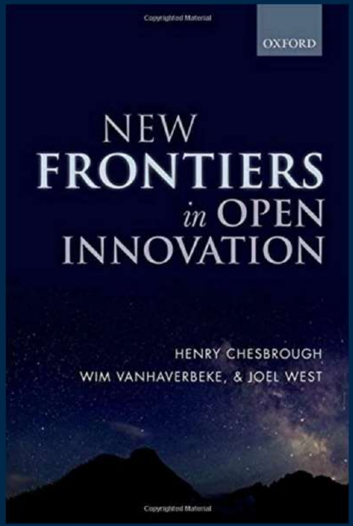
An Open Innovation Model

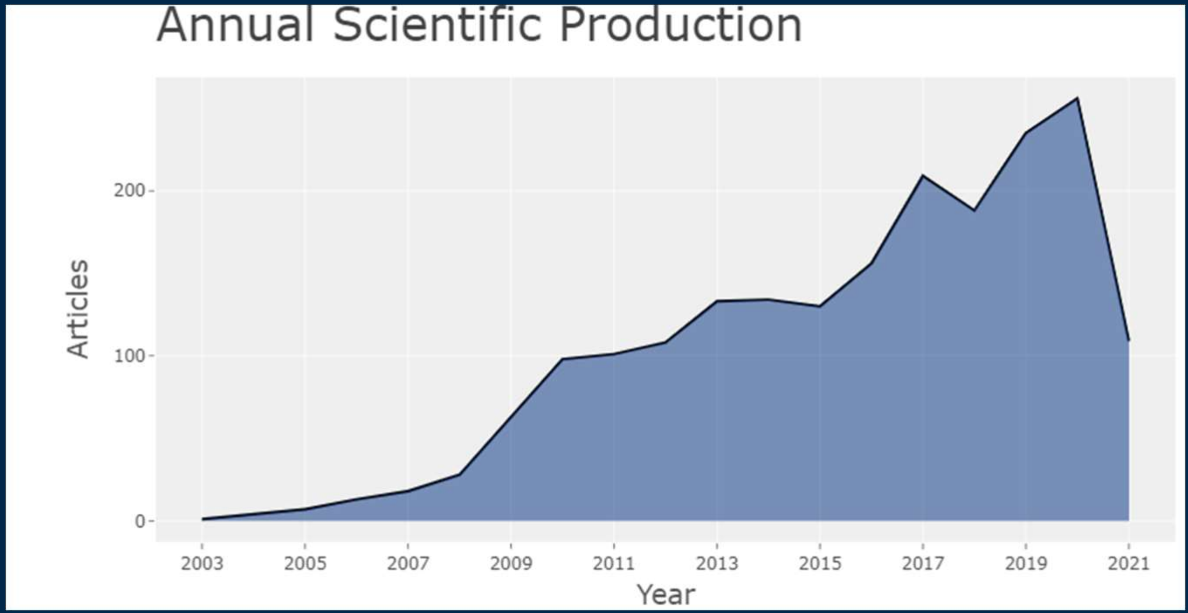




Open Innovation: a process perspective



"a distributed innovation process based on ***purposively managed knowledge flows across organizational boundaries****, using pecuniary and non-pecuniary mechanisms in line with the organization's business model."*



How open is innovation?

How open is innovation?

L. DAHLANDER, L.M. GANN, 2010

- Overview of the literature
- How many types of "openness"?
- Advantages and disadvantages of different types of "openness"

How open is innovation?

L. DAHLANDER, L.M. GANN, 2010

Table 3
Structure of our different forms of openness.

	Inbound innovation	Outbound innovation
Pecuniary	Acquiring	Selling
Non-pecuniary	Sourcing	Revealing

Overview
Of the literature:
Thomson's Web of Knowledge (ISI) – 150 journals (up to 2009)

Clarify the definition of "openness used in the literature
- Different definitions and focal points
- Use of openness is not coherent

Categorize different forms of openness (open innovation modes) according to:
- Direction
- Type of compensation

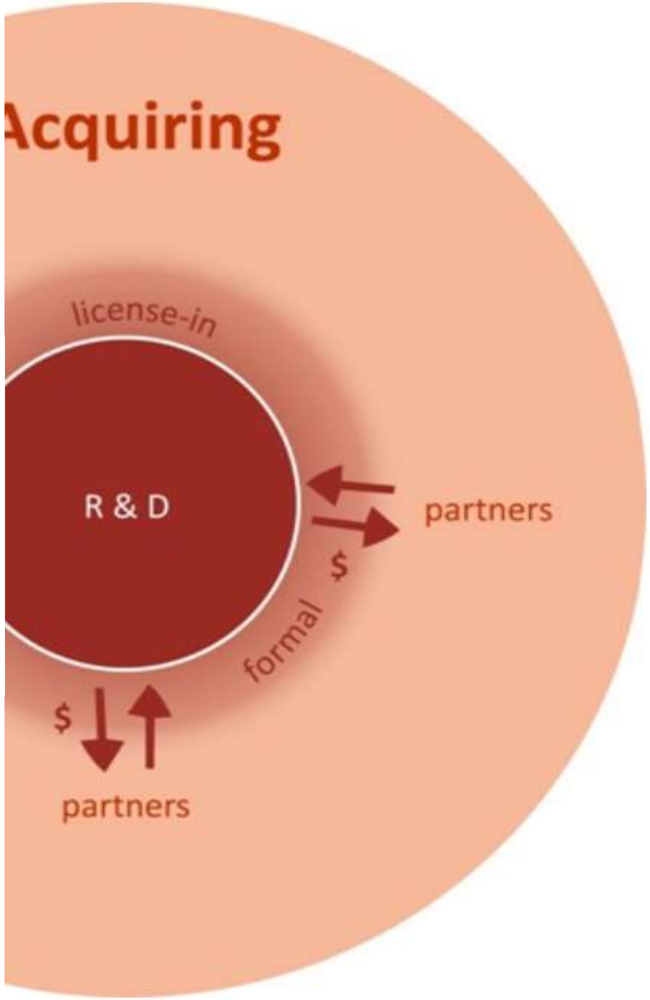
Frame the advantages and disadvantages of each open innovation mode

How open is innovation?

Table 3
Structure of our different forms of openness.

	Inbound innovation	Outbound innovation
Pecuniary	Acquiring	Selling
Non-pecuniary	Sourcing	Revealing

- Inbound open innovation
- Pecuniary open innovation
- **External inventions & input to the innovation process**
- IP in-licensing; technology acquisition

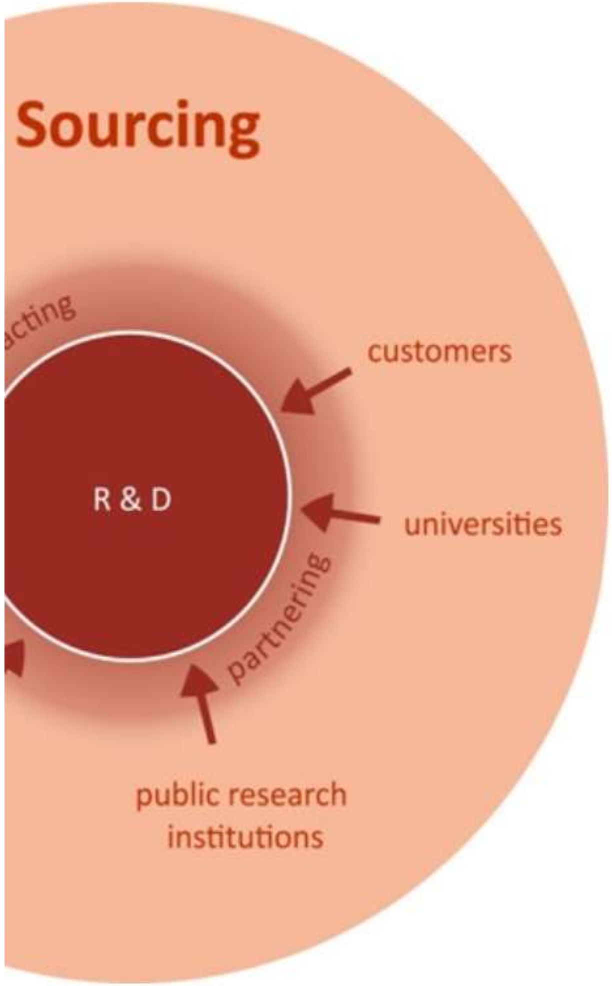


How open is innovation?

Table 3
Structure of our different forms of openness.

	Inbound innovation	Outbound innovation
Pecuniary	Acquiring	Selling
Non-pecuniary	Sourcing	Revealing

- Inbound open innovation
- Non-pecuniary open innovation
- **Sourcing external ideas & knowledge**
- R&D alliances; collaboration with universities and public research centers (PRCs); customer / user involvement.



How open is innovation?

Table 3
Structure of our different forms of openness.

	Inbound innovation	Outbound innovation
Pecuniary	Acquiring	Selling
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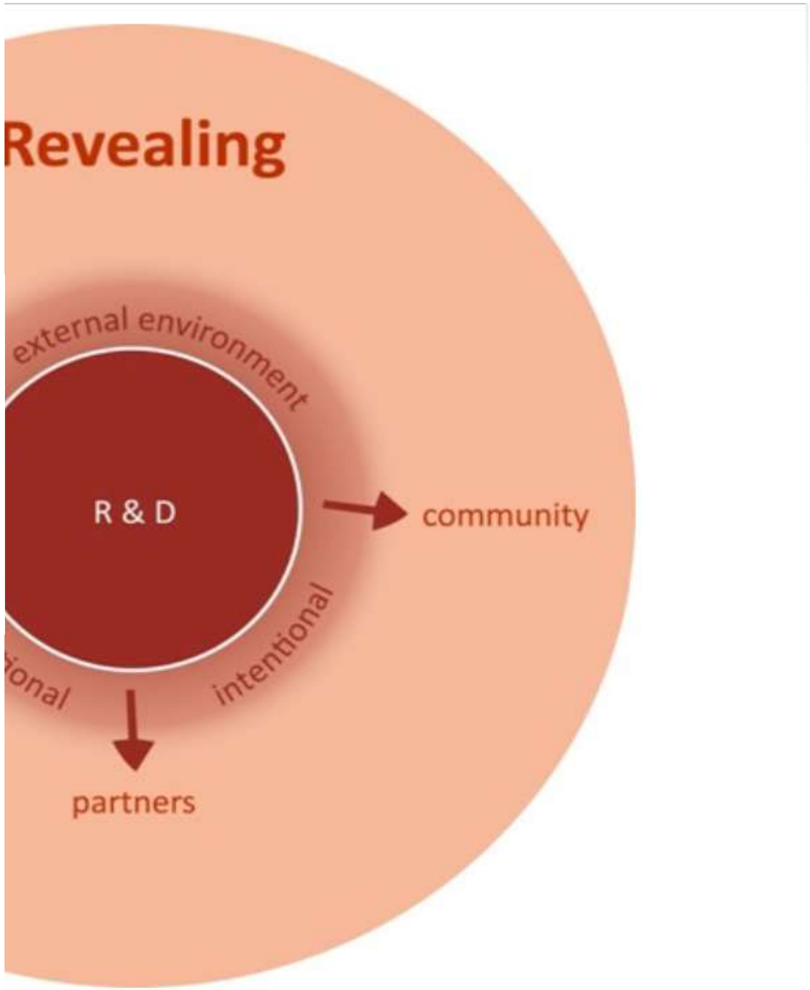
- Outbound open innovation
- Non-pecuniary open innovation
- **Revealing internal knowledge to the external environment**
- Non-equity alliances for external technology development; cooperation agreements with customers and clients (co-development)

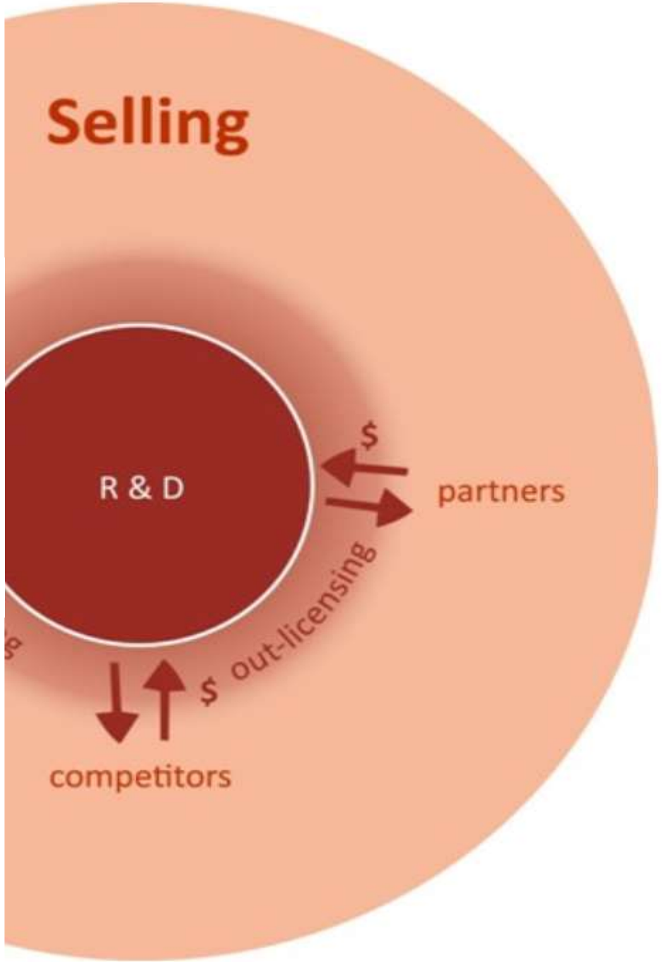


How open is innovation?

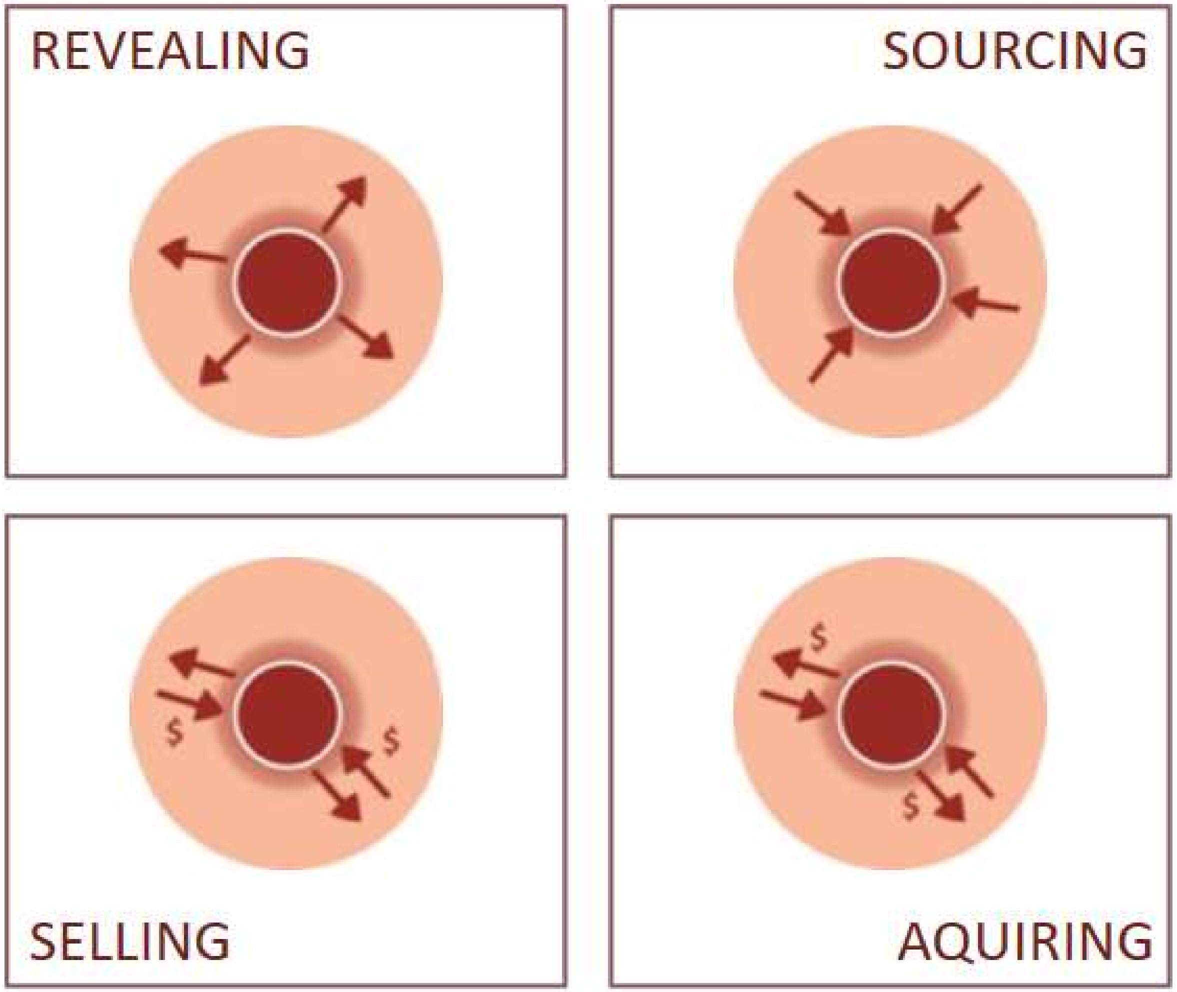
Table 3
Structure of our different forms of openness.

	Inbound innovation	Outbound innovation
Pecuniary	Acquiring	Selling
Non-pecuniary	Sourcing	Revealing

- Outbound open innovation
- Pecuniary open innovation
- **Out-licensing or selling technologies in the marketplace**

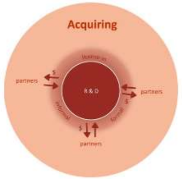


How open is innovation?



Inbound-comparison

Sourcing



Acquiring

Sourcing

- Access to a broad range of ideas and knowledge
- Create synergies between own processes and external ideas = profitable new products

Acquiring

- Many benefits but requires expertise (absorptive capacity)
- Exclusive access to knowledge and resources of the partners

---

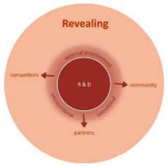
Sourcing

- Over search = difficulties to choose and combining multiple alternatives
- Lost focus=rely heavily on external (re)sources

Acquiring

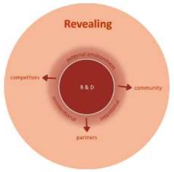
- If too similar to existing practices = very hard to come up with new contributions
- If too distant = difficult to align with existing practices

Outbound-comparison



Revealing

- Collective development of innovative solutions (e.g. open-source software)
- Escaping myopia of protectiveness
- Gaining legitimacy from the environment



Selling

- Firms can fully leverage their R&D investments
- Profiting by partnering with actors adept (e.g. in the value chain) by bringing inventions to the market

- Difficulties in capturing value
- Disclosure problems = patents, IPR
- Decide which internal resources should be revealed = some leak to the competitor

- Several obstacles to overcome:

- Significant transaction costs
- A clear implementation strategy

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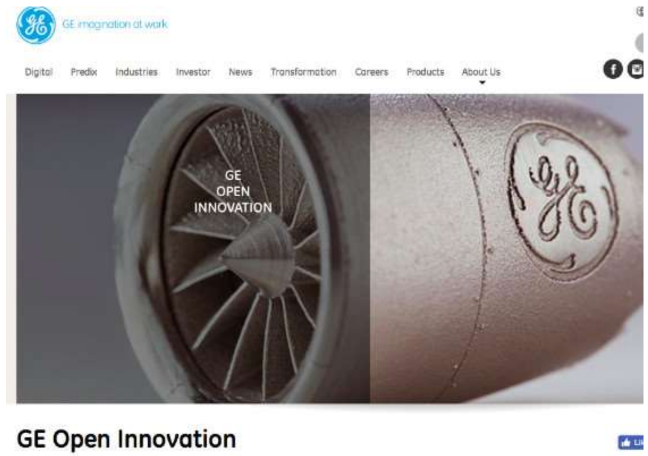
**Open innovation enables success.
Yet, without practical implementation, there's very little benefit from open innovation.
The execution is what many businesses struggle with so, that needs some further clarification.**

What is open innovation in practice?
(powered by HYPE)

Open innovation strategies

Open innovation is a modern paradigm that aims to achieve ideation and innovation in companies by **using both external and internal sources of knowledge**. Many believe that open innovation boosts innovation and R&D work in organizations.



GE launches innovation initiatives **challenges** for just about anyone to participate in.

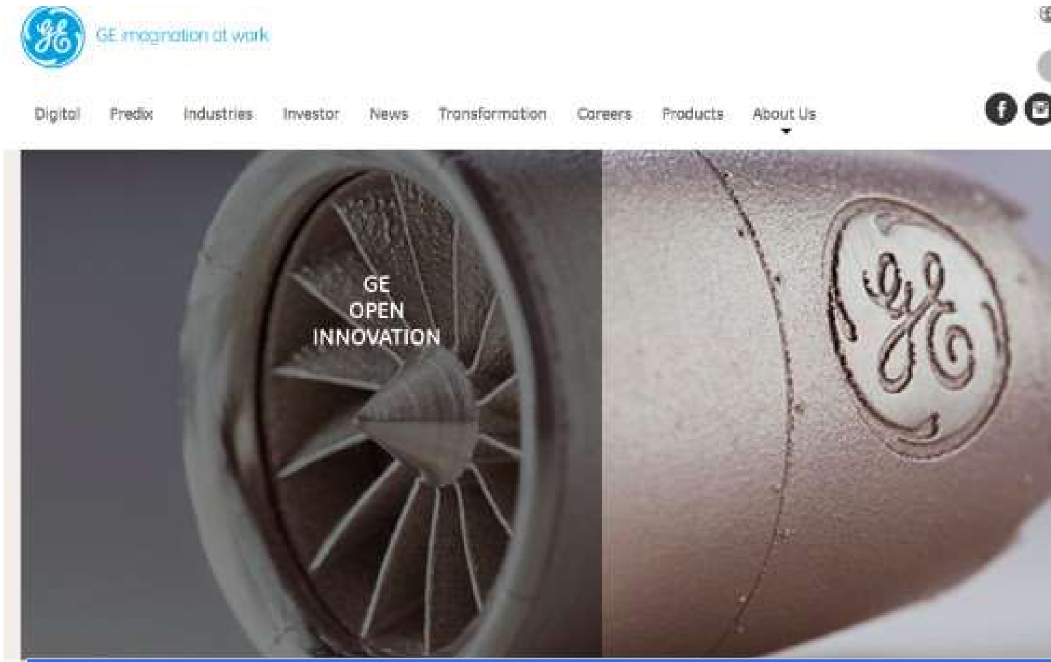
The objective is to gain new **solutions** for GE, that are developed based on challenge winning suggestions.

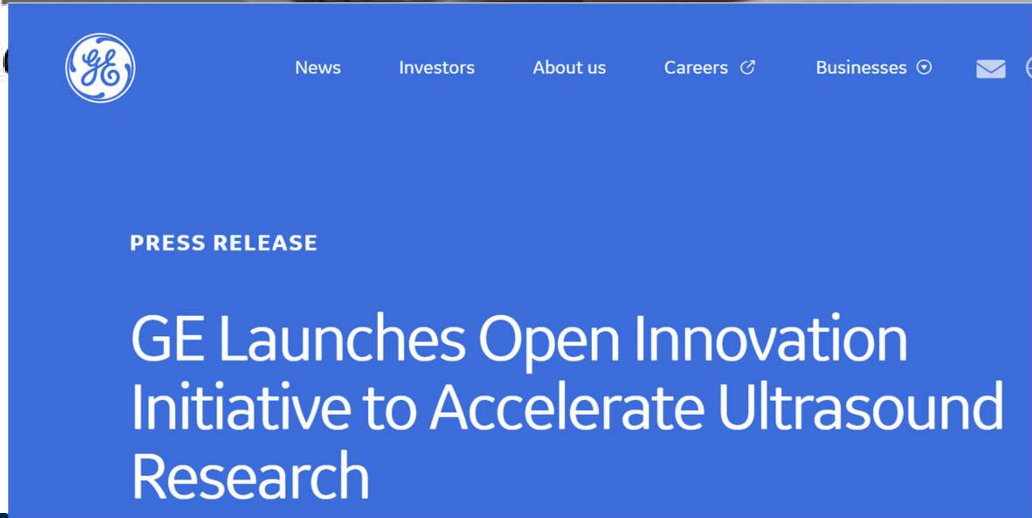
- The problems are defined in the assignments: *"Solving scarcity through water reuse"* or *"Develop new Ultrasound diagnostic and treatment applications"*

All cases have quite clear problem definitions

- The timelines and next steps for each of the challenges are communicated clearly for each initiative

- The ownership of the submissions remains with the creator





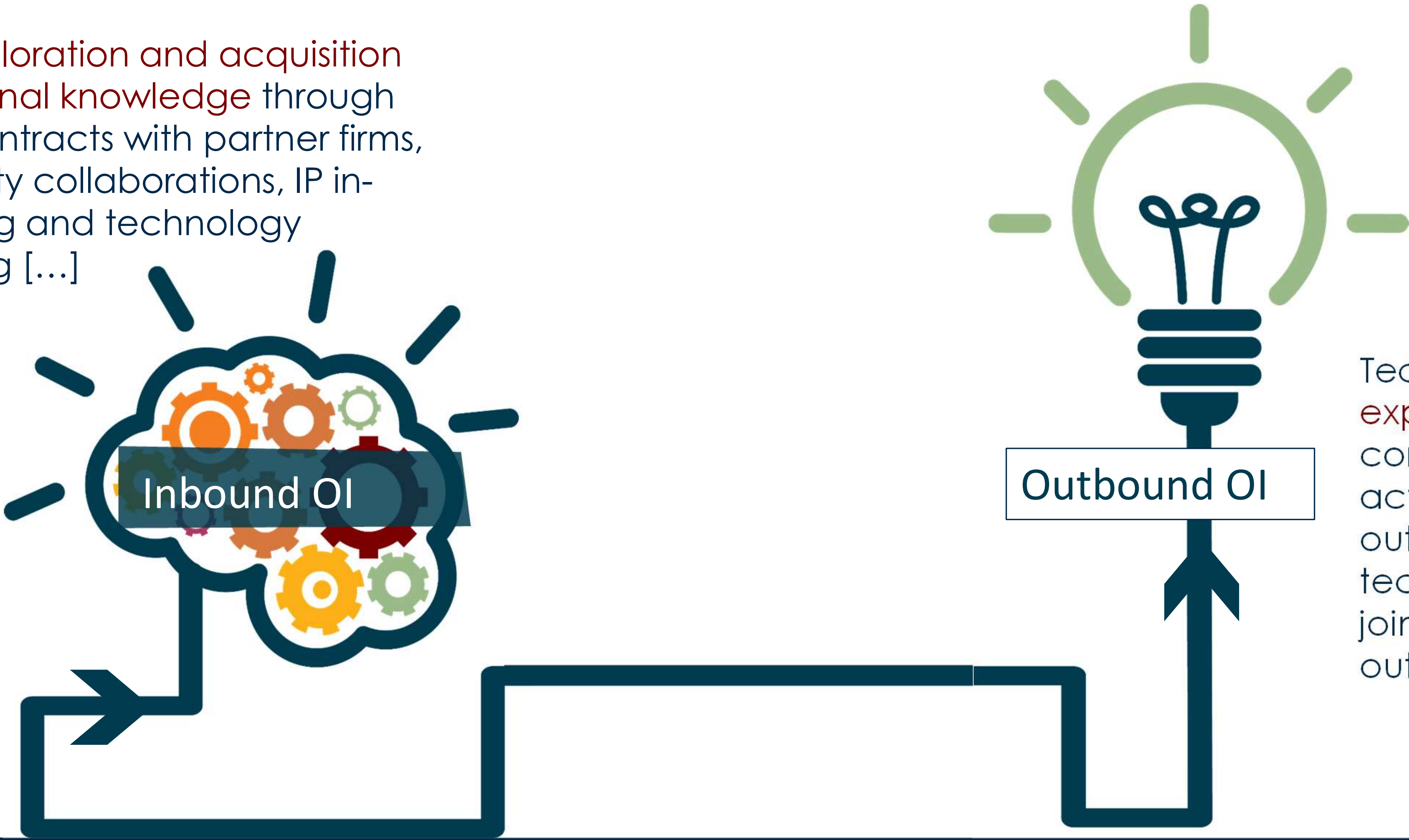
Open Innovation Strategies

take different forms,

defined by the combination of different innovation sources

Open Innovation (OI) Activities

The exploration and acquisition of external knowledge through R&D contracts with partner firms, university collaborations, IP in-licensing and technology sourcing […]



Technology exploitation and commercialization activities through IP out-licensing, technology selling, joint ventures, spin-outs

Some practical examples

- mostly based on data ;) -

Quirky - Crowdsourcing product ideas to be manufactured

The concept:

- You can put your **product idea** up on Quirky and others within the Quirky **community** can **comment** and **contribute** to your idea.
- If the idea is good and gains **traction**, it can be **developed further** by people on Quirky.
- Quirky members have a **wide range of skills**: everyone can collaborate with those that complement that expertise.

Thus:

The product is developed by the community.

The best products are chosen by Quirky for manufacturing and sold at the Quirky store. The process at this point is financed by Quirky.

But why would people share their expertise and develop ideas that are then manufactured and sold by Quirky?

If the product ends up being a success you can earn *money* from being part of developing it. If the idea is originally yours, you may get *royalties* depending upon its success.
This is what makes Quirky an active platform with an active community.

Takeaways

There is a way to get people ideating for you even for free.

By **assessing problems** that many have to deal with or by **creating challenging tasks**, a community emerges and people get motivated to collaborate with the company.

To cultivate this collaboration and create an active community, an appealing online presence will go a long way

United Genomes Project – When openness accelerates science

Most of the medical R&D is still done in the traditional (closed), costly and slow way.

The United Genomes Project (UGP) was established to solve this problem.

The project uses open science to create medical innovations in Africa through its open source genetic database.

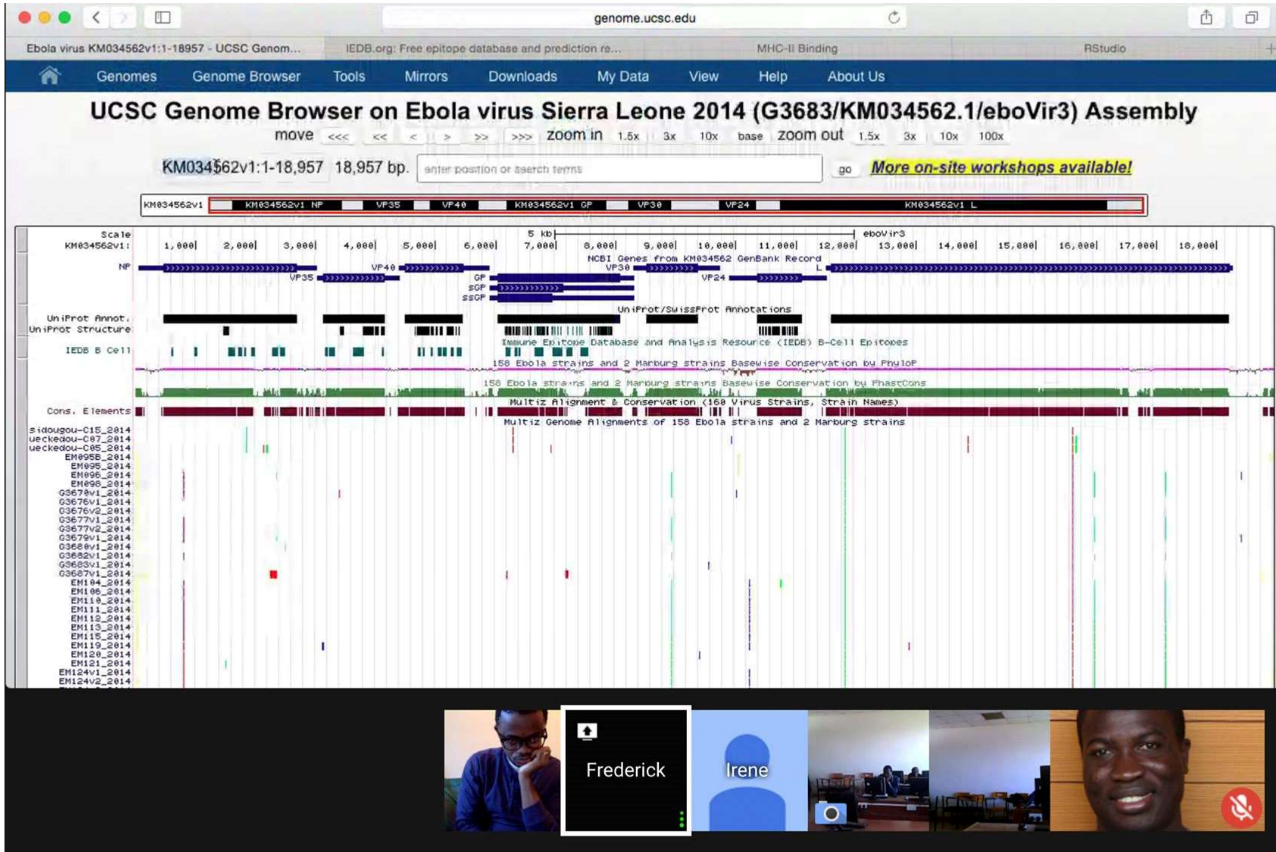
Gaining **knowledge of different genomes** is important because different medicines actually work differently in the human body depending on DNA.

The UGP makes it possible for African medical professionals and aspiring practitioners to use this open data to create new innovations.

Takeaways

Open innovation could speed up R&D and NPD drastically.

- UGP enables cost-efficient innovation to take place **anywhere**.
- As diversity is a source of novelty in innovation the platform makes it possible for anyone with adequate skills to participate.
- UGP enables Genomic Medicine in Africa through data and education to train the next generation of scientists



Mozilla – Building an open community

Mozilla is an **open-source software development platform.**
In open-source software development, **the source code of a product is open** and anyone can be a developer.

Open-source software development aims for **free products** that **anyone can contribute to.**
This means that you get diverse people all over the world to engage in the projects.

Mozilla has been at the forefront in advancing collaborative product development and the activities are carried out by Mozilla's community (both volunteers and paid employees).

Takeaways

The importance of fostering a community to get open innovation benefits.

As there are plenty of examples on the benefits of open innovation communities, it's also worth it to learn from open-source communities.

How could you benefit from opening up parts of your R&D to create this kind of a community?

Talented people join Mozilla's communities to learn, get experience, meet people, contribute to the product and maybe to be hired at some point. They seem to have their offerings for community members in order.

Facebook - Using Hackathons to generate new features

Hackatons are an internal open innovation initiative within Facebook.

The idea of these hackathons is that any employee can generate new ideas and innovations and make initial versions of them.

When employees meet each other *across* the departments and other barriers that they normally have, they actually share tacit knowledge, a sense of team spirit across the company and build meaningful relationships

The “like” button & the Pride Flag Feature

Hackatons are very productive for Facebook.

The like-button, live chat, the Facebook timeline and the pride flag feature are all ideas that have sprouted from Facebook hackathons.

The idea of the pride flag feature, coined by two Facebook interns. Through the hackathon, it fastly spread throughout the company and ended up being released for public use.

Takeaways

Employees are knowledge workers and many companies pay them for their creative thinking.

Anyone can have a groundbreaking idea and it pays off to listen to them.

Many companies benefit from involving the whole body of employees in their innovation activities

Opening up innovation internally has both short-term and long-term benefits.

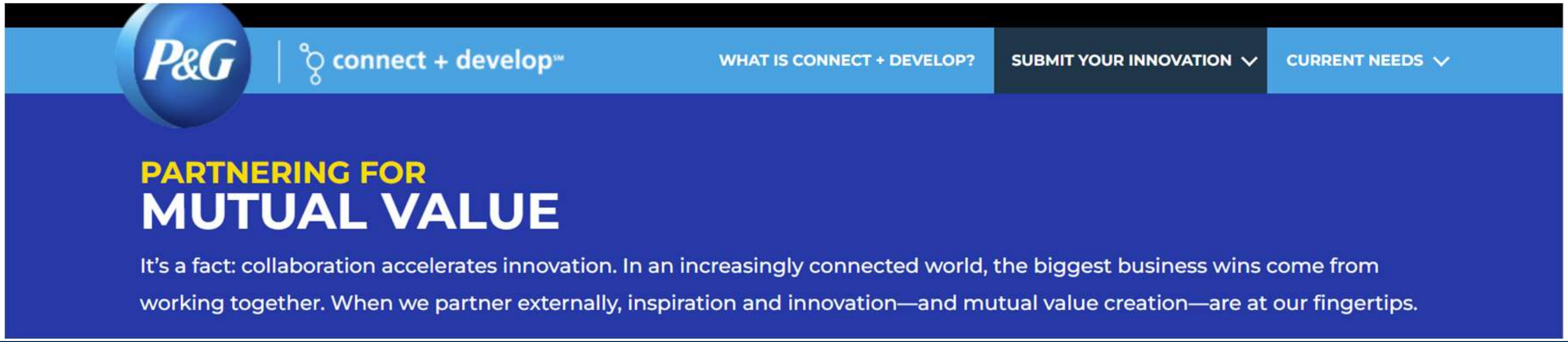
- In the **short term**, the company can get new ideas to develop the business.
- In the **long term,** inside-in open innovation can be a great tool to motivate employees and boost the development of both their thinking and skills.

P&G - open about needs

P&G's Connect + Develop program was launched in 2013.

Through the C+D platform, P&G **communicates** its needs to innovators that can **access** detailed information (specific needs) and **submit** their ideas to the site.

As P&G communicates its needs openly, **it creates competition for the solution providers** as well, which is of course great news for P&G.



Takeaways

- Letting others know the company's needs and problems makes it possible for others to propose customized solutions, which enhances competition.
- Opening up about problems and needs can also bring great connections (lower search costs)
- Collaborative relationships can also last for decades, ending up in acquisitions or joint ventures.
- Being open gives large companies the best chance to get outside-the-box solutions that wouldn't have thought themselves.

  P&G and Philips created own trusted communities that they can share problems with.

Apple - Value creation through open platforms

Apps on iOS products are based on the idea of an open (multisided) platform

It is first and foremost the quality and the wide range of apps available for Apple products that makes them so valuable.

iPhone users have all kinds of needs that phone makers or operating system makers don't have a clue about.

Some are interested in their health, others are into mobile gaming, some in news, books and music etc.

With all the possible apps, users can customize their experience exactly like they want to, and all of this benefits both the platform and the users.

Takeaways

Openness to external knowledge is not a binary strategic choice.

Companies can restrict (or enlarge) the degree of openness in open innovation.

What Apple does is that it **regulates** and **controls** its open innovation so that application developers can create their products to work in the Apple environment.

This way they can be distributed through Apple's channels with little to no visibility in the other aspects of Apple's internal R&D.

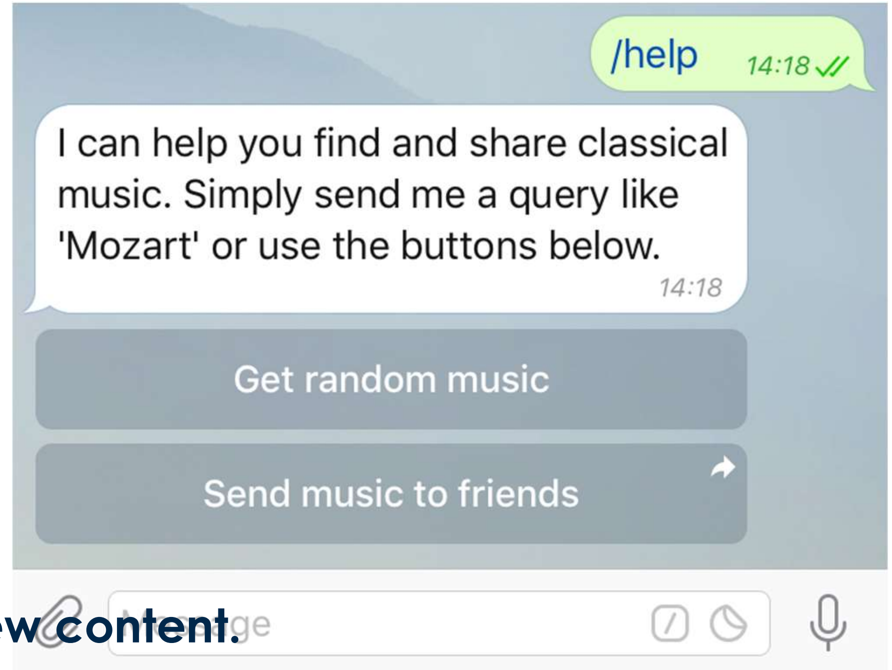
Regulating openness means that also the outcome possibilities of collaboration are restricted.

Due to Apple having a great brand and a winning platform, a high level of control is possible for them

Telegram - Enabling users to create content

What makes Telegram different from WhatsApp?
The degree to which users can contribute to its content.

Users with any developing skills can **create** their own stickers and bots (i.e. their own content) on the platform and **share** it via open API.



Instant messaging is a very competitive market.
Telegram has gained a lot of users because of its ease and openness to users
The Telegram company sometimes grants prizes for new content.

Takeaways

When users can create almost any kind of feature they want, the company can benefit from the best (most "impactful") innovations.

(Telegram even brings the most popular features forward to all users)

- The company lets users create what they want on its platform as it might just be enough to differentiate Telegram from its competitors
- Also, having the users configure a product to exactly match their needs creates a positive lock-in effect.

Why would you want to change the product to a substitute, when others can't be made to match your preferences?

Open Innovation Activities

The central role of users

An increasing **convergence** between **open innovation** and **user-led innovation**

The «Boater»

"It is not often that a new innovation in the Infants' wear field goes over with the immediate success of your Boaters......"

In the late 1940s, Marion Donovan created a new kind of diaper, an envelope-like plastic cover with an absorbent insert. a cover that would stop the contents of a dirty nappy from soiling bed linen.
Despite interest amongst local mothers she couldn't persuade anyone to manufacture the Boater.
Her invention, patented in 1951, netted her a million dollars (nearly $10 million in today's money) and paved the way for the development of the disposable diaper as we know it today.

The «Pampers»

<u>Victor Mills</u>, a researcher with Procter and Gamble, also had the frustrations of nappy changing for his grandchildren as a source of unlikely inspiration. Equally fed up with the difficulty (and accompanying mess) of changing he set up a research project to improve the experience by making a disposable nappy.

After experimenting with various materials they came up with a garment based on polyethylene wrapper around an absorbent paper pulp filler – and in 1961 Pampers were born.

Fifty years later they sold around $10bn around the world.

It’s not just the nappies …

Owen Maclaren was a successful aircraft engineer and pilot who had developed the retractable undercarriage for the Spitfire during the 1930s.

On a trip to the US with his grandchildren in 1960 he was struck by the difficulties his daughter was having in taking her child’s pushchair on board the plane. On the flight he began wondering about making some sort of collapsible version. He saw the connection between the mechanisms used in retractable undercarriages and his daughter’s problem and began working on the idea; in 1965 the first Maclaren buggy was launched, an idea which has gone on to grow an entire market segment around collapsible travel aids for children.

User-led innovations

Born not in the R&D or design labs of big companies but in the experience of **users dealing with a problem**.

What all user-led innovations have in common is a mixture of:

Frustration – because something doesn't work and the annoyance fuels a desire to make it better.

Courage – to get stuck in and try, take some risks, experiment.

Tolerance - the first prototypes might not work as well as planned

Patience - it takes time to learn and refine the solutions so that they can work for others.

James Dyson

The starting point for James Dyson was frustration at the **lack of suction in his bag-based vacuum cleaner** – a journey which began in his garden shed and ended with the creation of a global business worth close to $2bn in sales was a model of persistence.

But his attempts to come up with the better vacuum cleaner involved over 5000 prototypes and 5 years of hard slog!

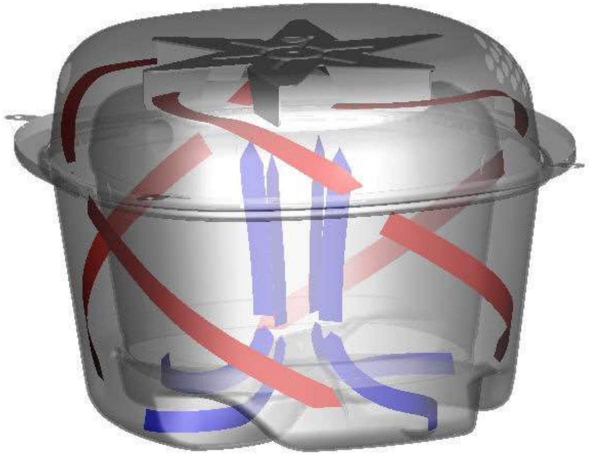
Reed Hastings

Frustration is a powerful and natural source of innovation: *Why do I have to wait so long? What was the point of that…..? If only they would…?'*
In short, you have begun an innovation process in your mind.

Annoyed at Blockbuster's 'late fees' charge for renting a video Reed Hastings went home and **began converting his annoyance into plans for a new business offering a better deal for customers**.

'Netflix' didn't arrive overnight and it now offers far more than 'no late fees'

Fred van der Weij



Fred was not happy with the results he achieved with the fat-free fryer he bought via a television sales ad.

By 2007, he had found a way to **optimize the fryer** so that it worked properly. At that time, however, he did not have the financial means or business insight to market the product properly. Coincidentally, Fred met Hans Brocker. After working for Braun as a commercial director for 24 years, Hans started a company that guides inventors in marketing their ideas.

He immediately recognized the potential of Fred's invention and became a shareholder of KCS which was tapped to manage the new product.

They subsequently filed for a patent. Two years later, the prototype was ready and Hans and Fred developed the product strategy.

They were considering whether to produce the product themselves or sell the idea.

The airfrier

Since 2005, Philips had been trying to develop **a fryer that makes the frying process healthier.** They had the **technology** (rapid air), but were struggling to transform it into a consumer product.

The product they initially developed was too complex and too expensive.

Early in 2009, KCS, the small company owned by Fred van der Weij and Hans Brocker contacted them. Godwin Zwanenburg, the Innovation Lead at Philips Consumer Lifestyle, presented the idea to his commercial team, and they decided to sign a letter of intent.

The product passed every test, and Philips decided to sign a **licensing agreement** with the inventors. The Airfryer was introduced in 2010.

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How open is innovation?

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Barriers to innovation and the «paradox of openness»

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Department of Management and Production Engineering
1859

What hampers innovation?

Innovating firms are likely to face several challenges, and experience different types of barriers:

Revealed barriers

The degree of difficulty of the innovation process:

"The firm's awareness of the difficulties of engagement in innovation activities, based on direct experience" (D'Este et al.)

Barriers experienced by firms already engaged in innovation activities

Deterring barriers

The obstacles preventing firms from committing to innovation:

"A barrier that is seen by firms as being insurmountable" (D'Este et al.)

Barriers that might deter some firms from any engagement in innovation activities

Revealed barriers to innovation

A paradox: The greater the firm's involvement in R&D and other innovation activities, the greater will be the importance attached to the barriers to innovation

Studies tend to explain this (somewhat surprising) finding due to innovators being more likely to have **experienced** the barriers to innovation and, therefore, being more likely to **recognize** their importance.

"it is plausible that certain problems are not effectively encountered until firms face them. [. . .] innovative firms face problems and more innovative firms have more problems".

Based on the relationship between innovation efforts and innovation obstacles

Revealed barriers to innovation

Barrier factors	Barrier items
Cost factors	Excessive perceived economic risks
	Direct innovation costs too high
	Cost of finance
	Availability of finance
Knowledge factors	Lack of qualified personnel
	Lack of information on technology
	Lack of information on markets
Market factors	Market dominated by established enterprises
	Uncertain demand for innovative goods/services
Regulation factors	Need to meet UK Government regulations
	Need to meet EU regulations

Deterring barriers to innovation

Barriers inducing deterring effects: different streams of the literature in the fields of innovation management and industrial organization.

These research strands investigate, for instance, **why different types of companies are likely to confront different types of barriers to innovation**. Distinctions are made, for example, between large established firms and small new firms

The innovation profiles of different groups of firms differ due, among other factors, to the types of obstacles to innovation that they face.

Deterring barriers in large established firms

Large established firms experience barriers to innovation due to **path dependence** and **lock-in**, which result in **resistance to adjusting competencies and previously successful organizational practices**

Organizational inertia and structured routines may:

- limit the ability of incumbent firms to identify new opportunities and adapt to environmental changes
- strenghten the resistance to engage in radical innovation to avoid cannibalizing existing products or destabilizing core competencies
- foster a narrow commitment to a few main customers (Christensen, 1997).

Deterring barriers in new firms

The obstacles faced by new firms may be related, principally, to **lack of resources** and **market structure**.

Lack of resources (liabilities of newness and smallness): knowledge and organizational skills, such as the lack of expertise in the technologies used in manufacturing-intensive sectors, lack of finance, lack of complementary innovation assets

Market structure: in the traditions of both Schumpeter (1942) and Arrow (1962), may impose severe constraints in the form of competition, firm size and appropriability conditions

Innovation barriers and barriers for open innovation

Innovation barriers and barriers for open innovation

Innovation barriers inhibit firms from innovation activities, whereas **open innovation barriers** are obstacles to opening up those processes.

Revealed barriers become deterring barriers when it comes to opening up the innovation process

Open innovation barriers

- Internal barriers (factors within the firm)vs. external barriers (factors outside the company).
- finance- and risk-related obstacles,
- market- and industry-related obstacles
- knowledge- and attitude-related obstacles

Internal barriers for open innovation

Financial barriers
Legal barriers
Difficulties in finding right partners
Cultural differences
Resources misfit
Negative experience from past cooperation
Risk of creating new competitor
Lack of trust
Risk of unequal distribution of income from innovation
Lack of aim alignment
Employees' resistance

Internal barriers for open innovation

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Financial and legal barriers

Opening up innovation processes to external partners may be very costly.

It requires additional resources and firms (especially small ones) may lack internal financial resources.

Some firms may additionally experience administrative and legal barriers when engaging in open innovation, e.g. high cost of external source of finance, high transaction costs

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Search costs, cultural differences, low resource fit

Network theory: one of the most common (deterring) barriers is the **difficulty in finding the right partners.**

Very often, companies search for partners with **complementary resources** to have fast **access** to new knowledge and assets and benefit from **mutual learning** (by interacting)

Barriers in external search may arise due to insufficient knowledge of partners, or to low resource fit between entities

Open innovation may be also inhibited due to cultural differences between partners:

firms from different (distant) industries or firms with different corporate cultures may not be able to cooperate in innovation, as they speak different languages, or apply different modes of organization, or bureaucratic elements

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Lack of trust (risk aversion)

Some barriers can be related to previous negative experiences with open innovation and the lack of trust between partners.

Opening up the innovation process to external partners may be associated with:

- loss of know-how and ideas, including intended as well as unintended knowledge spillovers
- opportunistic behavior of partners, free-riding
- unclear task distribution, misunderstandings between partners, and an unfair income distribution
- ineffective or inappropriate legal protection of innovations
- threat of emergence of a new competitor.

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Employees' resistance


Human resources factors

Adoption of open innovation may be also hindered by factors related to **human resources slack**:
Lack of qualified personnel
Lack of adequate managerial competences

And to **employees' resistance**:
The not invented here syndrome
The not shared here syndrome

Human resources factors

Adoption of open innovation may be also hindered by factors related to **human resources slack**:

Lack of qualified personnel

Lack of adequate managerial competences

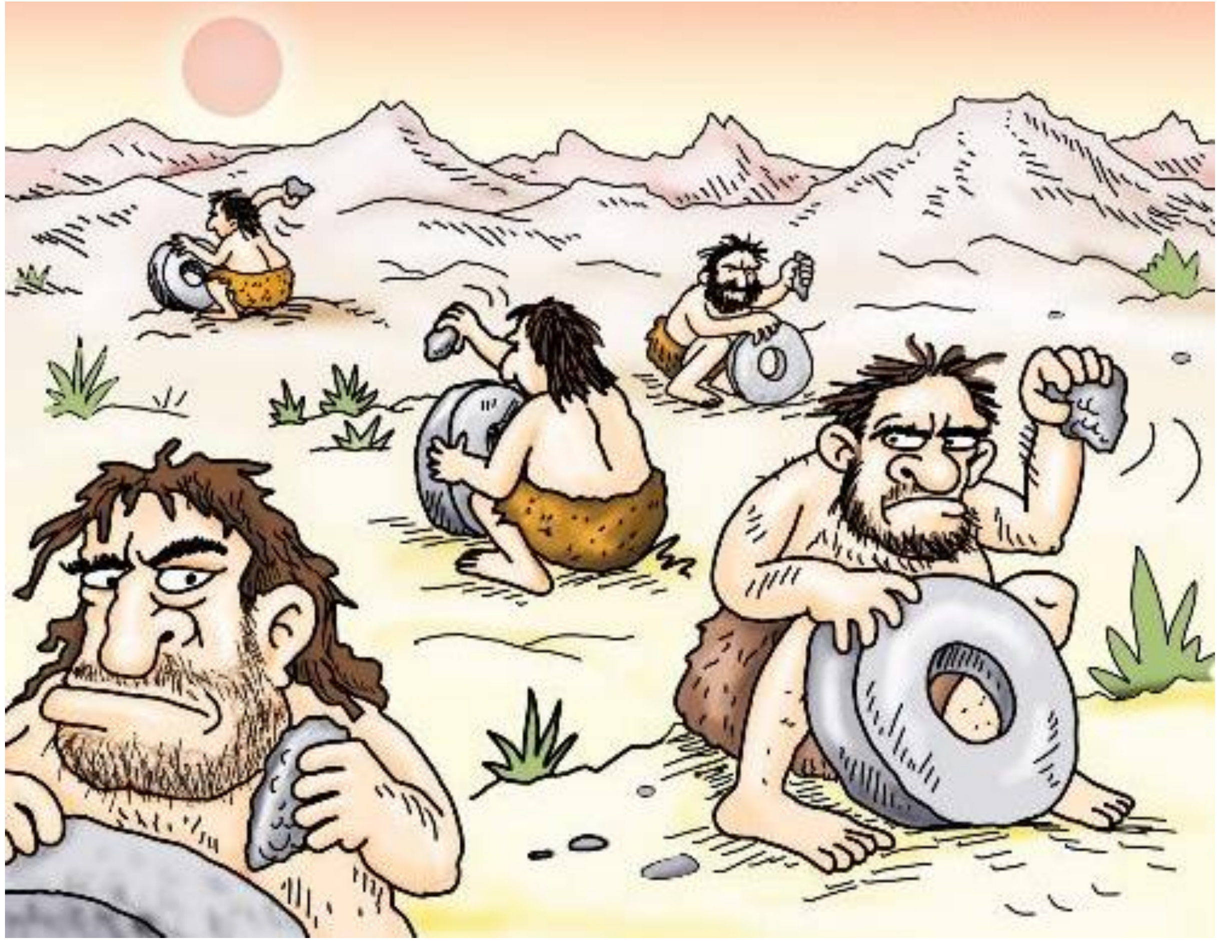
And to **employees' resistance**:

The not invented here syndrome

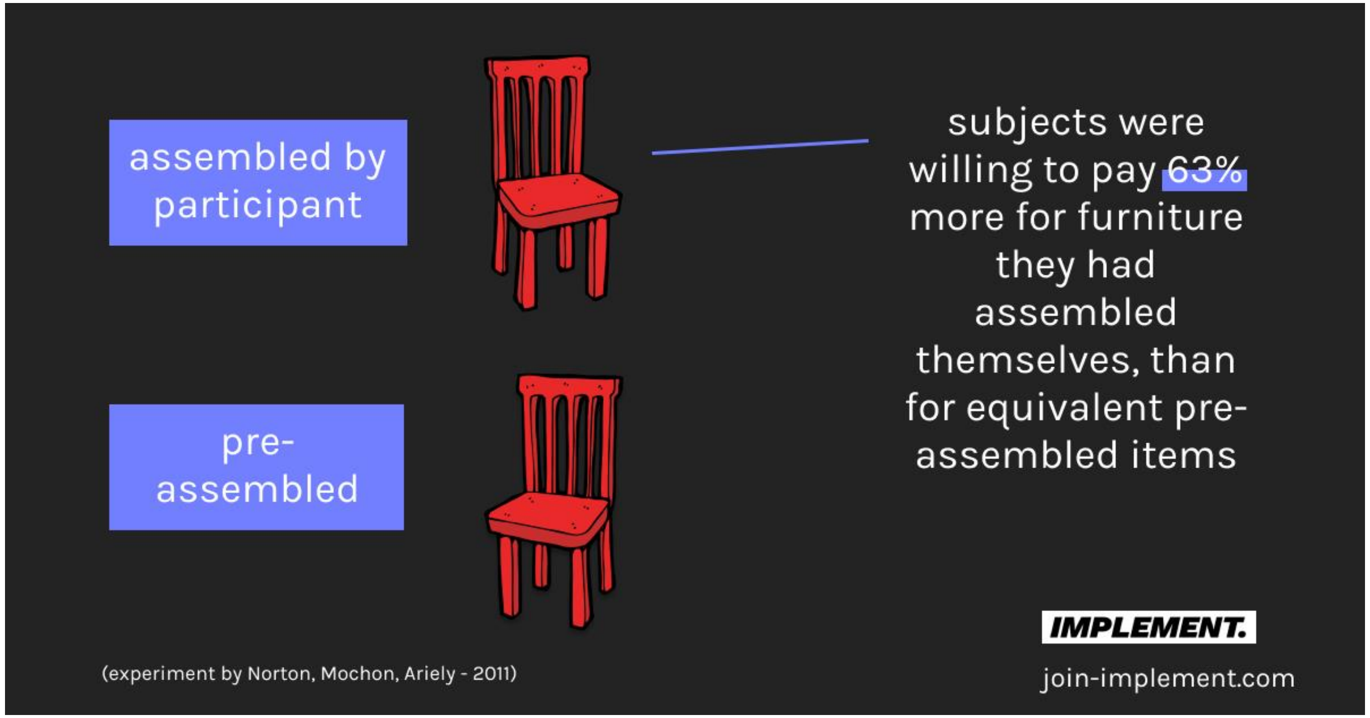
The not shared here syndrome

A ‘quintessential’ deterring barrier : the «not invented here syndrome»

Not invented here: the unwillingness to adopt an idea or product because it originates from another culture



Not invented here & the «Ikea effect»



«Not invented here»

NIH is a **negative disposition toward external knowledge**, and it can play a triggering role **in rejecting valuable external ideas**.

Instead of evaluating the external knowledge rationally, NIH attitude leads to **underestimating the potential of new external knowledge** based on biases and prejudice, which may make firms arrive at a (harmful) suboptimal point.

The fundamental sources of NIH would be **knowledge externalities** – i.e., the degree of knowledge **variety** in terms of the functional, geographic and disciplinary boundary.

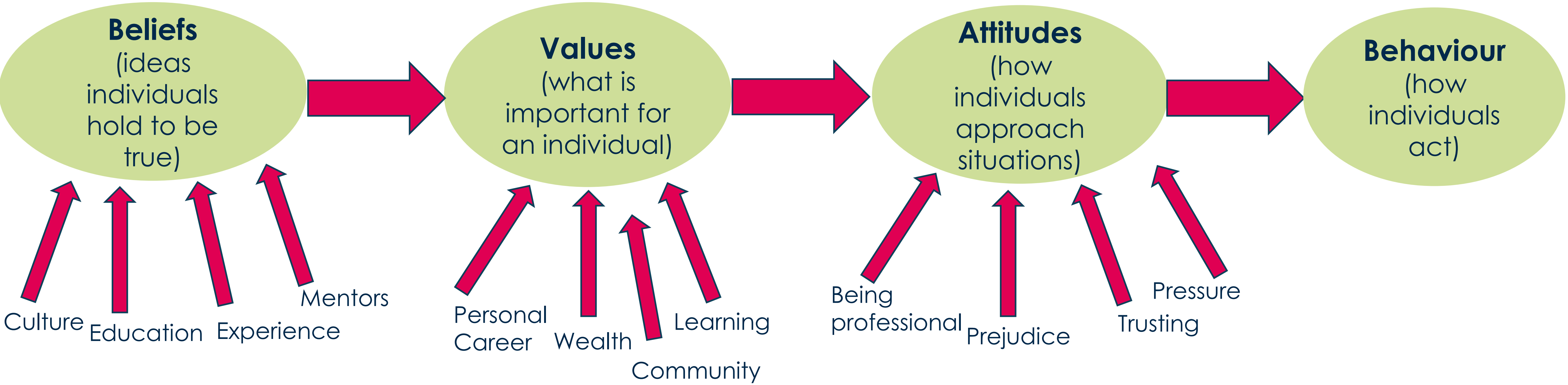
Thus, the **intensity of NIH** mirrors the degree to how much a firm's knowledge is different from other kinds of external knowledge (based, e.g. on operational function, academic discipline, and regional context).

Not invented here as an attitude-based bias

1. Our employees have negative attitudes to applying ideas and technologies from outside.

2. Our employees do not regard the application of external knowledge as valuable as the application of knowledge generated inside

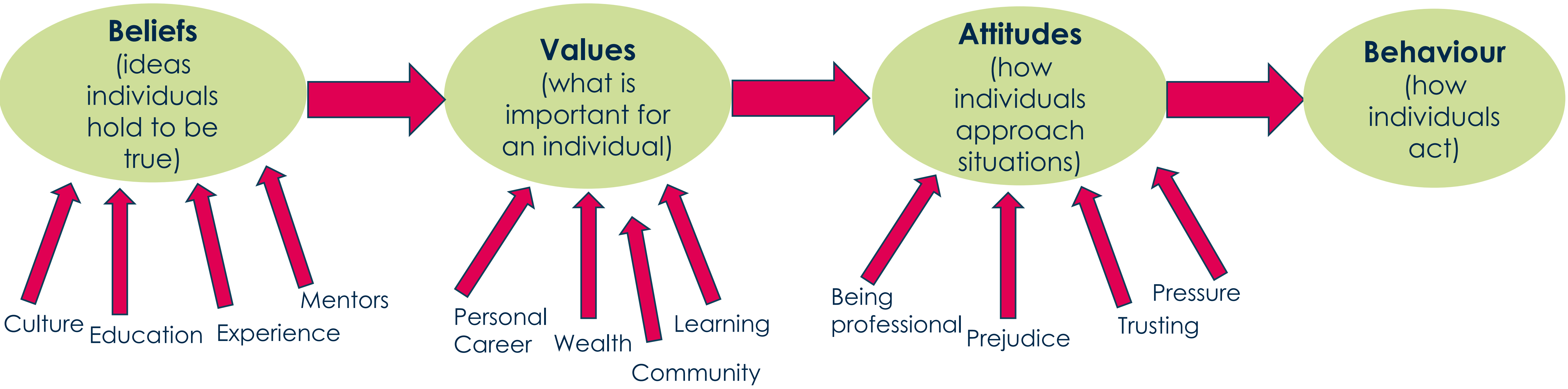
3. Our employees have never received and used knowledge from external sources.



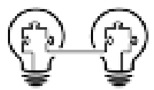
The attitude-behaviour link

*"The management team [of our partner company] saw us as being incompetent and, in hindsight. The employees who **felt the assignment belonged to their R&D department** wouldn't let go of it."*

Quote from the CEO of an engineering consultancy.



NIHs and decision patterns

Yes, but…	Has been tried before	Our customers won't accept it	We are too small for that	We are not Apple
We left that business years ago	We can invent it ourselves	We are the market leader	That's only a start-up	It already exists
Let's develop it ourselves	The new guy doesn't know the rules yet		We have our own R&D department	This won't survive in our sector
It's against the rules	Impossible to make money with that	We are not in that business	It is not designed for that	That's too simple
The boss won't like it	The market is not ready for this	Since when did you become an expert at…	Not for our department	Open innovation is a hype

The attitude-behavior link: NIH and Open innovation

Not invented here attitude:
External knowledge is not valuable

«Openness»
To external knowledge

1. Our employees have negative attitudes to applying ideas and technologies from outside.
2. Our employees do not regard the application of external knowledge as valuable as the application of knowledge generated inside
3. Our employees have never received and used knowledge from external sources.

- Used the internet to search for new trends or technology
- Reading technical magazines
- Used information from trade organizations
- Participated in innovation related fairs or shows
- Purchased R&D work from others
- Purchased licenses, patents or know-how
- Worked with lead users
- Used innovation brokers

De-biasing mechanisms:
«Doing from scratch would lead us back quite a lot and will cost a lot»

- Training programmes
- Employee training (improving skills, sustain responsibilities share vision, create a shared culture leadership)
- Competence building programs
- Incentive programs: promotions, pay raises and performance evaluations
- Standard adoption
- Establishing new processes

External barriers for open innovation

Market maturity

Lack of competitive pressure

Lack of external financial support

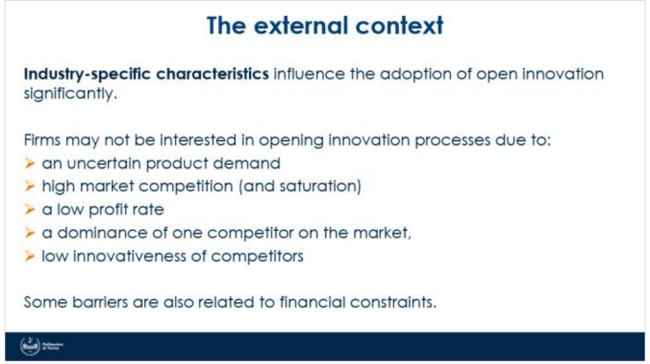
Oversearch

Handling Selective Revealing: Disclosure Paradox

Appropriating profits coming from innovation

Sustaining negotiation, coordination and transaction costs

External barriers for open innovation



Market maturity

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Handling Selective Revealing; Disclosure Paradox

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The external context

Industry-specific characteristics influence the adoption of open innovation significantly.

Firms may not be interested in opening innovation processes due to:

- an uncertain product demand
- high market competition (and saturation)
- a low profit rate
- a dominance of one competitor on the market,
- low innovativeness of competitors

Some barriers are also related to financial constraints.

External barriers for open innovation

Market maturity

Lack of competitive pressure

Lack of external financial support

Oversearch

Handling Selective Revealing; Disclosure Paradox

Appropriating profits coming from innovation

Sustaining negotiation, coordination and transaction costs

External knowledge search

A central part of the innovation process concerns **the way firms go about organizing search for new ideas** that have commercial potential.

*Firms often **invest** considerable amounts of time, money and other resources **in the search** for new innovative opportunities. Such investment increases the **ability** to create, use, and recombine new and existing knowledge*

Using a wide range of external actors and knowledge sources makes the firm embedded in loosely coupled **networks** of different actors:

"Open innovators" are those that **integrate** these external sources into their innovation processes and competitive strategy.

The network of relationships between the firm and its external environment can play an important role in shaping performance.

Variety of external knowledge search

External search helps organizations to **find sources of variety**, allowing them to create new combinations of technologies and knowledge.

The use of different knowledge sources is partly **shaped by the external environment**: availability of technological opportunities, degree of turbulence, search activities of other firms:

- In industries with **high levels of technological opportunities** (and extensive investments in search by other firms) a firm will often need to **search more widely and deeply** in order to gain access to critical knowledge sources.

- In industries with **low technological opportunities (**and modest investments in search by other firms), a firm has **weaker incentives to draw from external knowledge sources** and may instead rely on internal sources.

External knowledge search strategies

Different **strategies for using external sources of knowledge** influence innovative **performance**.

Strategic approach: **managing knowledge search channels** that firms use in their search for innovative opportunities, *such as suppliers of equipment, materials, software, universities, and public research centers, customers and users, competitors […]*

The concept of **search channels** shifts attention toward **the type and number of pathways of exchange** between a firm and its environment and toward **the degree of its interaction within each of these search channels.**

Variety of knowledge sources and search strategies

Search activities of different firms in an industry are subject to considerable **variety**

Variety is a product of different (past and present) managerial choices about how best to organize the search for, and the development of new products.

In this respect, an organization's search processes are rooted in its previous experience as past success conditions future behavior (path dependency).

Thus, it is **difficult** for many organizations to determine the **'optimal' search strategy** in terms of being 'broader and/or deeper', especially in situations of turbulence

Knowledge search and innovation performance

Open for innovation: organizations that invest in broader and deeper **search** may have a greater **ability to adapt to change**, and therefore to **innovate**.

Differences in innovative performance are based on differences in how firms deploy knowledge from different sources, and over time:

- **Search depth**, i.e., how the firm reuses its existing knowledge
- **Search breadth**, i.e., how widely the firm explores new knowledge

These concepts are an extension of March's (1991) distinction between **exploration** and **exploitation**, contrasting the differences between **local** and **distant search** processes.

External search breadth

External search breadth can be defined by **the number of different search channels that a firm draws upon in its innovative activities**.

Firms often go through a period of *trial and error* to learn how to gain knowledge from an external source.
It requires extensive effort and time to build up an understanding of the norms, habits, and routines of different external knowledge channels.

This process of **learning to absorb external knowledge** is subject to considerable uncertainty:
it is difficult for managers to know ex *ante* which external source will be the most rewarding before engaging in the relationship

«Oversearch»

As search strategies are rooted in the past experiences and future expectations of managers, such experience and expectations may lead firms to over-search the external environment with a detrimental outcome as the result

'Over-search' may have a negative influence on performance:

1) **The 'absorptive capacity problem':** too many ideas for the firm to manage and choose between.

2) **The 'timing' problem**: many innovative ideas may come at the wrong time and in the wrong place to be fully exploited

3) **The 'attention allocation problem'**: few of these ideas are taken seriously or given the required level of attention or effort to bring them into implementation

External search depth

Search for new ideas is not just about scanning a wide number of sources; it also involves **drawing knowledge from external sources more or less intensively**.

For each of these sources, firms need to **sustain a pattern of interaction** over time, building up a **shared understanding** and common ways of working together.

Assessing the depth (the intensity of a firm's contacts with different external sources) provides a mechanism for understanding **the way firms search deeply within the innovation system** and **how** these **external sources are integrated into internal innovative efforts**.

«Oversearch»

(+) On the one side, **firms that draw deeply from external sources will be more innovative**, because they are able to build and sustain virtuous exchanges and collaborations with external actors.

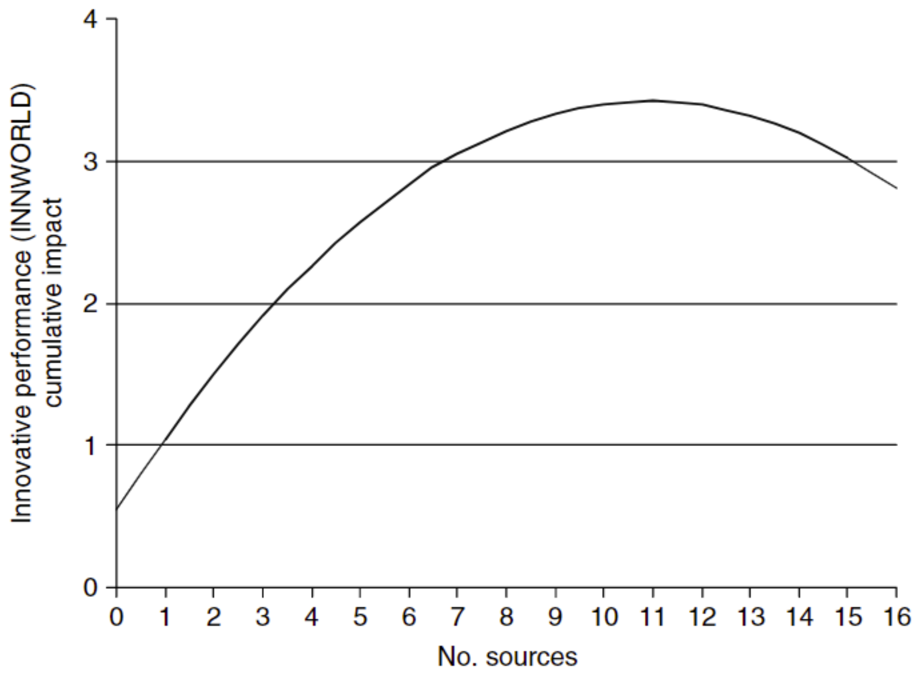
(-) On the other side - as in the case of search breadth —some firms can become **too deeply reliant on external sources for innovation**.

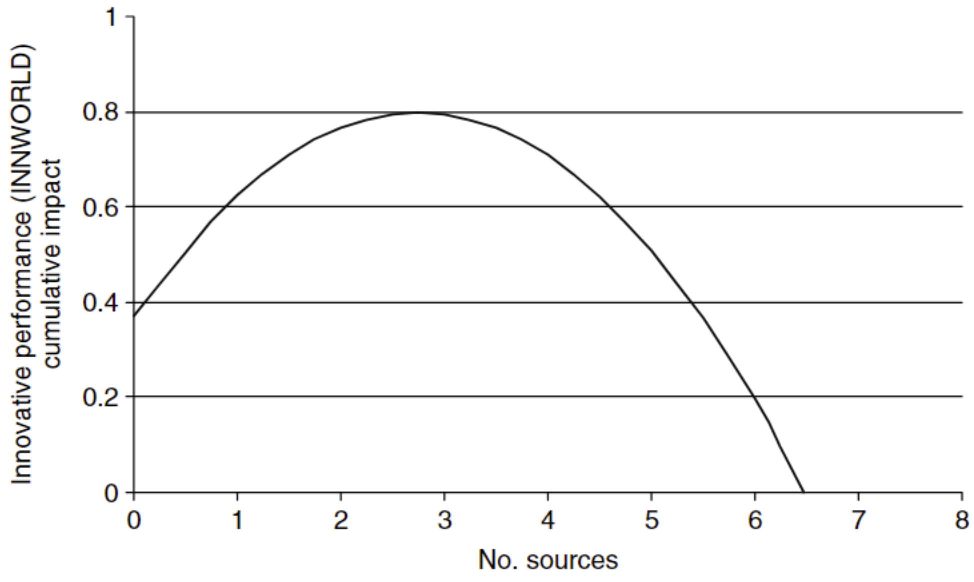
Maintaining deep links with external resources requires further investments, planning capacity and attention.

If a firm relies on too many deep relationships with many external sources, it will exhibit lower innovative performance.

Market Sources	Suppliers of equipment, materials, components, or software Clients or customers Competitors Consultants Commercial laboratories/R&D enterprises
Institutional Sources	Universities or other higher education institutes Government research organizations Other public sector, e.g., business links, government offices Private research institutes
Other sources	Professional conferences, meetings Trade associations Technical/trade press, computer databases Fairs, exhibitions
Specialized sources	Technical standards Health and safety standards and regulations Environmental standards and regulations

Firms' innovative performance is (in part) a function of its search behaviour





Readings

D'Este, P., Iammarino, S., Savona, M., & von Tunzelmann, N. (2012). What hampers innovation? Revealed barriers versus deterring barriers. *Research policy*, *41*(2), 482-488.

Laursen, K., & Salter, A. (2006). Open for innovation: the role of openness in explaining innovation performance among UK manufacturing firms. *Strategic management journal*, *27*(2), 131-150.

Msc Data Science and Engineering

What hampers innovation?

Barriers to innovation and the «paradoxes of openness»

Politecnico di Torino
1859
Department
of Management
and Production Engineering

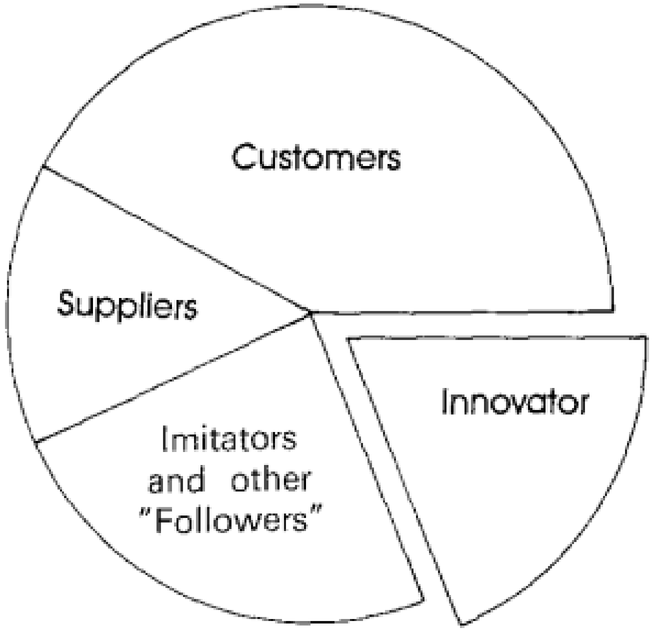
Msc Data Science and Engineering

Profiting from innovation

Politecnico di Torino
1859
Department of Management and Production Engineering

Who profits from innovation?

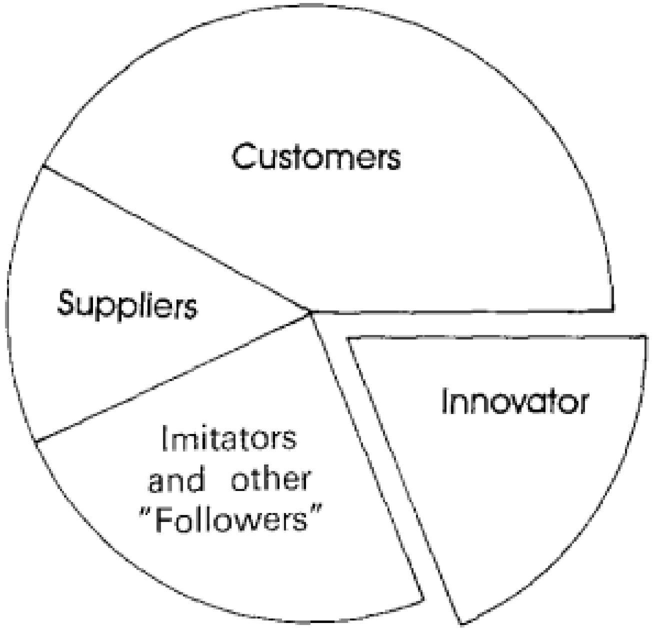
Innovating companies aren't always the profit reapers.



What determines the share of profits captured by the innovator?

Innovating firms often fail to obtain significant economic returns from an innovation while customers, imitators and other industry participants benefit.

Who profits from innovation?



What determines the share of profits captured by the innovator?

Value creation -> total additional benefit created for the customers (transforming an input to an output)

Value capture -> your ability as a business to 'capture' that value yourself (retained profit).

If there are innovators who lose…

…there must be followers-imitators who win

The Xerox Star

The Xerox 8010 Information System, (the Xerox Star), was a Xerox Corp. computer system marketed in 1981, and consisting of a series of workstations linked together via LAN.

It proposed for the first time **a series of single-user computers connected via local area network (LAN).**

The workstations were the first commercialized computers in history to be equipped with a graphical user interface with windows, icons, mouse and pointing system.

The Xerox Star proved to be a computer with remarkable features, but too far ahead of its time.
The computer, in its first version, was
- too expensive ($16,595)
- too difficult to integrate with new features and applications,

(ten years before…)

Apple asked to visit the PARC labs for seeing Xerox's GUI prototypes and talking to engineers and developers.

Xerox received an option on a package of shares in Apple, which was in the process of going public at the time.

The one at PARC was only a demonstration and that there was no passing of material or code

Apple's men reimplemented, rethought and completed Xerox's still immature ideas in a different and original way.

Apple’s Lisa

Apple introduces **Lisa, a $9,995 PC for business users.**

Many of its innovations such as the graphical user interface, a mouse, and document-centric computing, were taken from the Alto computer developed at Xerox PARC.

Jobs recalled that he and the Lisa team were very relieved when they saw the Xerox Star: “We knew they hadn’t done it right and that we could–at a fraction of the price.”

Apple's perspicacity in putting the PARC's nascent ideas into practice was eventually understood even by the PARC researchers themselves: some of them switched to Cupertino because they were frustrated with Xerox's shortsightedness and worked on the Lisa and various Apple projects throughout the 1980s.

A key failure

Xerox sued Apple in December 1989, seeking >$150 million in damages.

It asserted that the screen display of Apple's Macintosh computer unlawfully used copyrighted technology that Xerox had developed and incorporated in a computer called the Star, which was introduced in 1981, three years before the Macintosh

Apple replied that while it might have borrowed ideas from Xerox, ideas were not protected by copyrights, only the way the ideas were expressed.

> "They [Xerox management] were copier-heads who had no clue about what a computer could do… Xerox could have owned the entire computer industry."
> (Walter Isaacson in Steve Jobs)

Most of Xerox's Suit Against Apple Barred

Profiting from innovation

Teece, 1986

Building blocks

1) Appropriability regimes

2) Dominant design paradigm

3) Complementary assets

Building blocks

1) Appropriability regimes

2) Dominant design paradigm

3) Complementary assets

Tight appropriability - the innovation is easy to protect

Appropriability

Weak appropriability - the innovation is difficult to protect

IP protection mechanisms

- Patents
- Copyrights
- Trade secrets

Nature of the technology

- Product vs process
- Tacit vs. codified technological knowledge

Appropriability measures the degree to which innovating firms can keep the economic value created by this innovation (**profits**) **to themselves**, instead of having to share it with customers and suppliers and/or being imitated by incumbents.

Appropriability regimes

Tight appropriability regimes:

imitation is difficult because of legal protection and/or tacit technological knowledge

New entrants have high potential for disruption

Weak appropriability regimes:

imitation is easy because of low legal protection and/or codified technological knowledge

New entrants may quickly be imitated by competitors/followers

Appropriation mechanisms

A crucial element within a firm's technological innovation strategy is determining whether and how to protect it.

Patents do not (always) work in practice as they work in theory → Often patents provide little protection, because the legal requirements for upholding their validity or for proving their infringement are high

The degree to which knowledge is tacit (or codified) affects the ease of imitation → In some industries, particularly when innovation is embedded in processes, trade secrets are a viable alternative to patents

Appropriation mechanisms

Sometimes, not strongly protecting technology from imitation **is to the firm's competitive advantage.**

- IP protection is very effective in the pharma industry, where technologies are inherently hard to imitate

- In industries characterized by increasing returns (scale effects, network effects) firms may be willing to lose money in the short term to improve their technology's rate of diffusion (i.e. to rise the position of dominant design)

TESLA

Encouraging other producers and providers of complementary goods to support the technology development may increase its rate of diffusion

- Network effects
- Scale effects

All Our Patent Are Belong To You

Elon Musk, CEO, June 12, 2014

Yesterday, there was a wall of Tesla patents in the lobby of our Palo Alto headquarters. That is no longer the case. They have been removed, in the spirit of the open source movement, for the advancement of electric vehicle technology.

Tesla Motors was created to accelerate the advent of sustainable transport. If we clear a path to the creation of compelling electric vehicles, but then lay intellectual property landmines behind us to inhibit others, we are acting in a manner contrary to that goal. Tesla will not initiate patent lawsuits against anyone who, in good faith, wants to use our technology.

When I started out with my first company, Zip2, I thought patents were a good thing and worked hard to obtain them. And maybe they were good long ago, but too often these days they serve merely to stifle progress, entrench the positions of giant corporations and enrich

"Our true competition is not the small trickle of non-Tesla electric cars being produced, but rather the enormous flood of gasoline cars pouring out of the world's factories every day"
Elon Musk

Building blocks

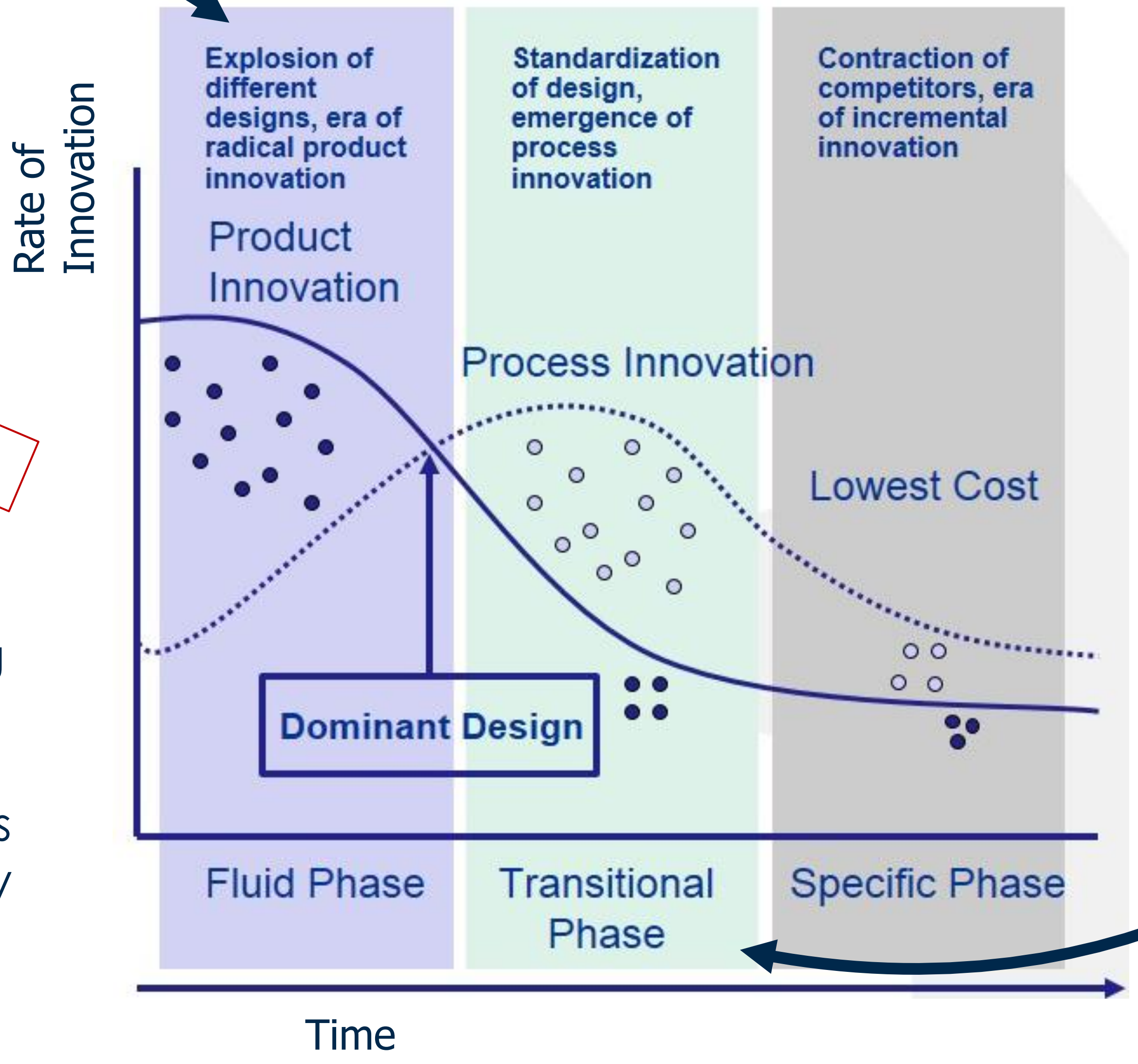
1) Appropriability regime

2) Dominant design paradigm

3) Complementary assets

Dominant design paradigm

APPROPRIABILITY REGIME



Pre-paradigmatic design phase: competition among designs
- Product designs are fluid
- Manufacturing processes are loose and adaptively organized
- Trial and error

Paradigmatic design phase:
competition shifts to price and away from design
focus on lowering unit costs

Utterback, 1995

When a dominant design emerges, the innovator might well end up positioned disadvantageously relative to a follower.

When **imitation** is possible and there's space for **design modification** before the emergence of a dominant design, **followers have good chances** of having their modified products anointed as the industry standard , to the great disadvantages of the innovator

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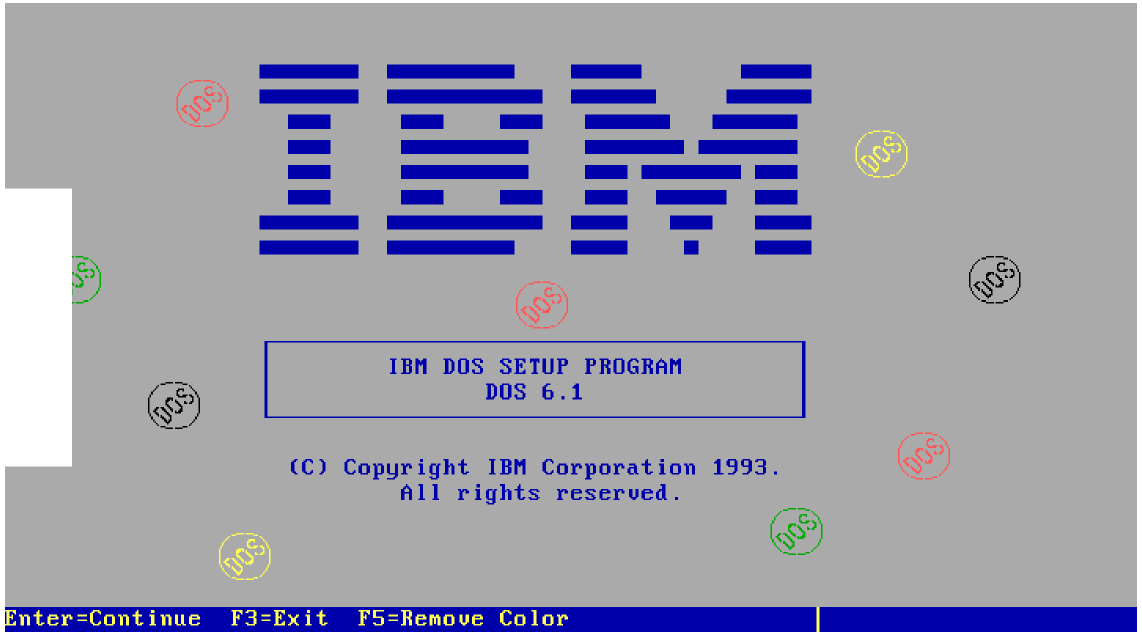
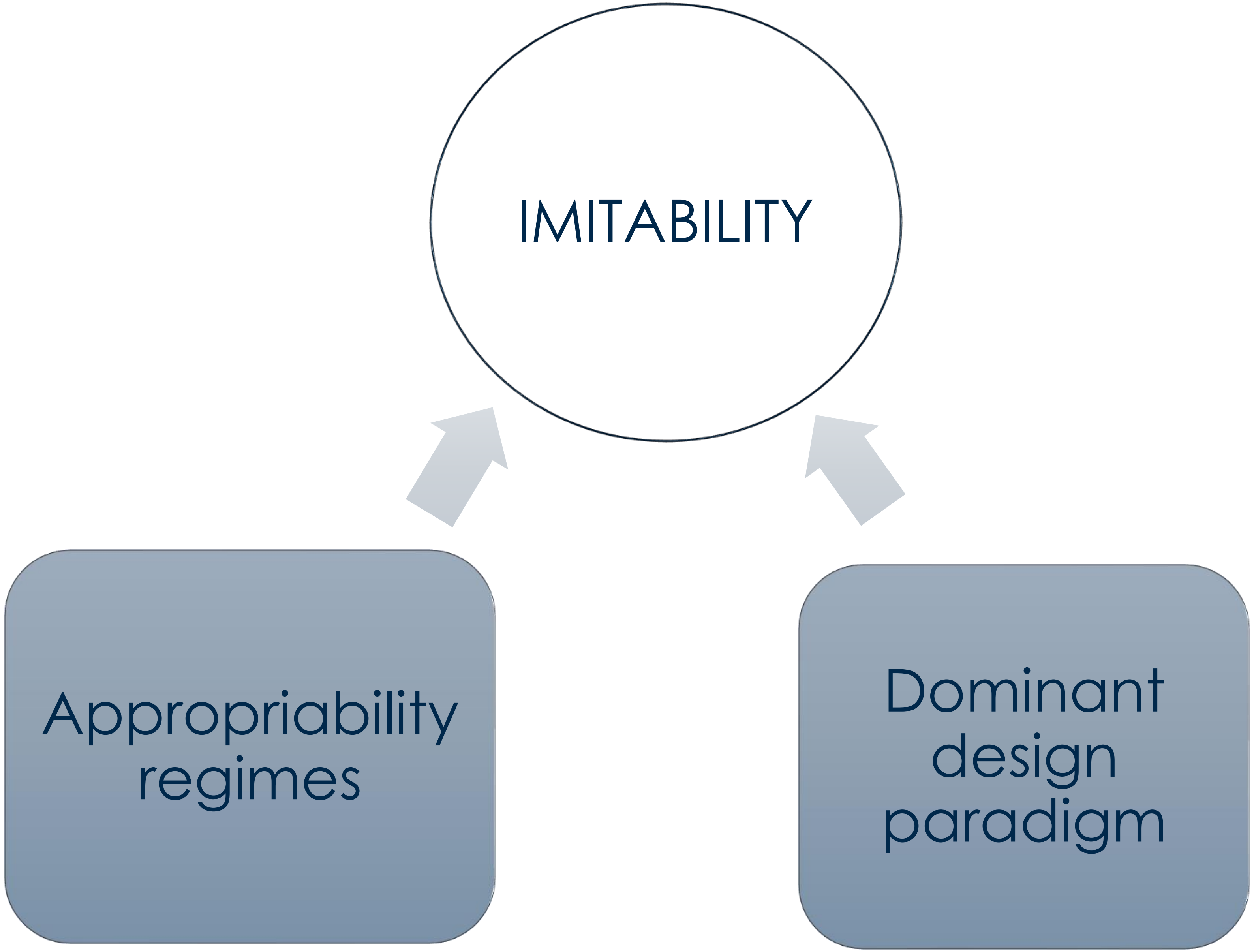



IMITABILITY
Appropriability regimes
Dominant design paradigm

Building blocks

1) Appropriability regimes

2) Dominant design paradigm

3) Complementary assets

Complementary assets

In almost all cases, successful commercialization requires that the know-how be utilized with other assets

(i.e. the infrastructure that is required to produce them, bring them to the market, provide customer service, and so on).

Examples:

- Manufacturing, Marketing, Distribution channels, after sales support
- Components and supporting technologies (e.g. software)

> COMPLEMENTARITY IN ECONOMICS: "the total economic value added by combining certain complementary factors in a production system, exceeds the value that would be generated by applying these production factors in isolation."

Generic complementary assets

Complementary assets of **general-purpose**, don't need to be tailored to the innovation

Example: manufacturing facilities, office space, transportation, sales channels

It will be easy for the new entrant to contract these assets from suppliers, and enter without significant investment

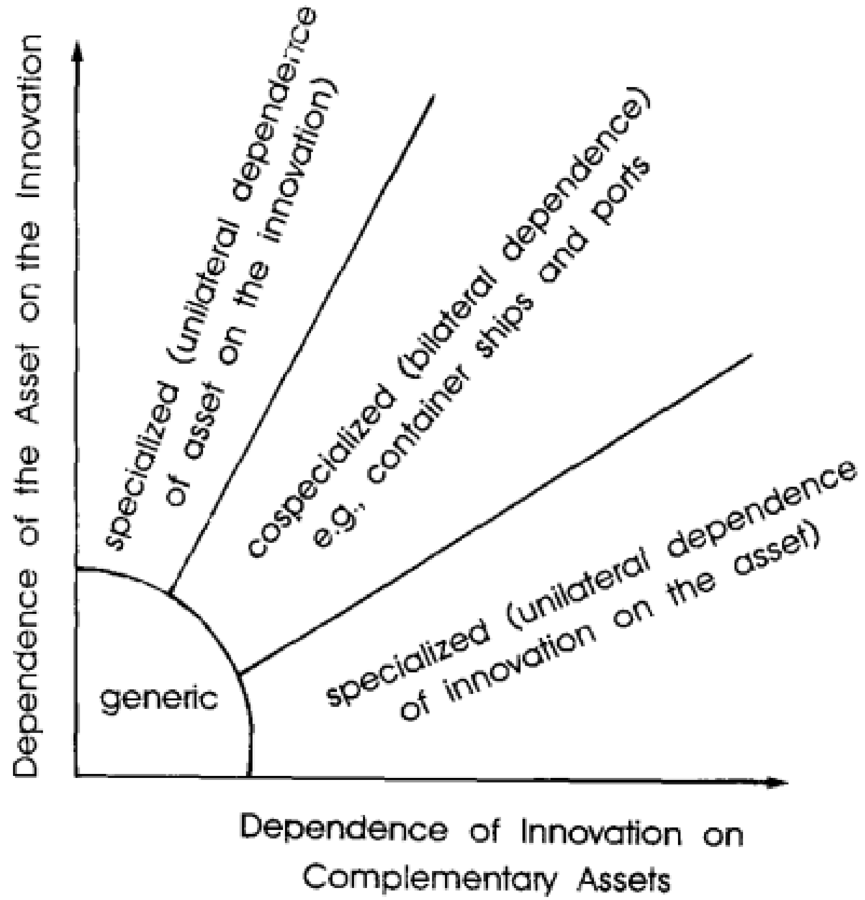


Fig. 6. Complementary assets: Generic, specialized, and cospecialized.

Specialized complementary assets

Unilateral dependence of the innovation on complementary asset or of the asset on the innovation

Example: customized software; assembly lines; high skilled labor

The specific nature of specialized assets will either force the entrant to build or buy the assets himself (i.e.to integrate) or to finance suppliers in order to have them take care of it.

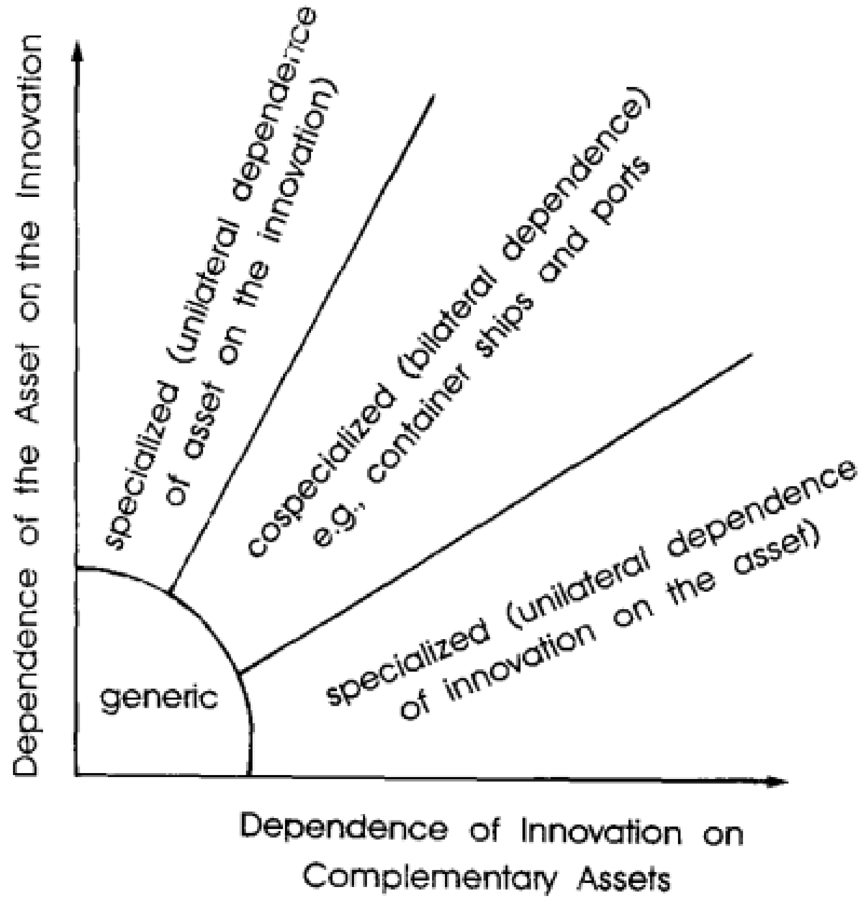


Fig. 6. Complementary assets: Generic, specialized, and cospecialized.

Co-specialized complementary assets

Bi-lateral dependence on the innovation

Example: Strong biotech patents and manufacturing/marketing/distribution resources of large pharma companies

Asset specificity can be a red flag to either party in a contract negotiation. It generally calls for a long-term business commitment.

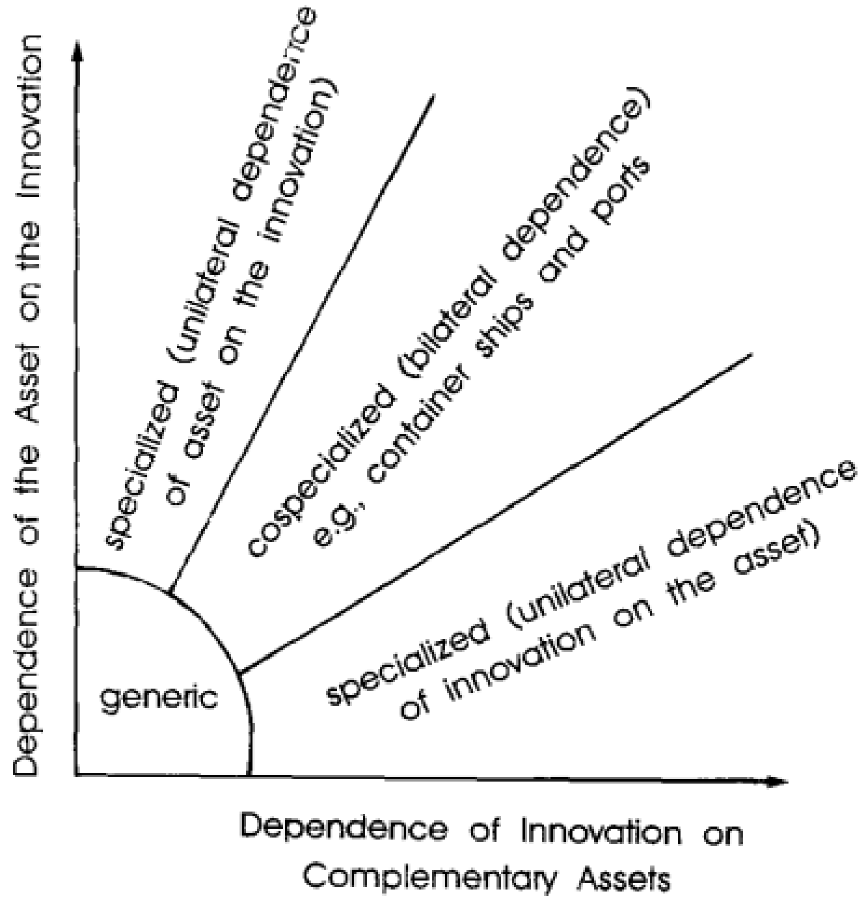


Fig. 6. Complementary assets: Generic, specialized, and cospecialized.

Implications for profitability

Teece, 1986

Tight appropriability regimes

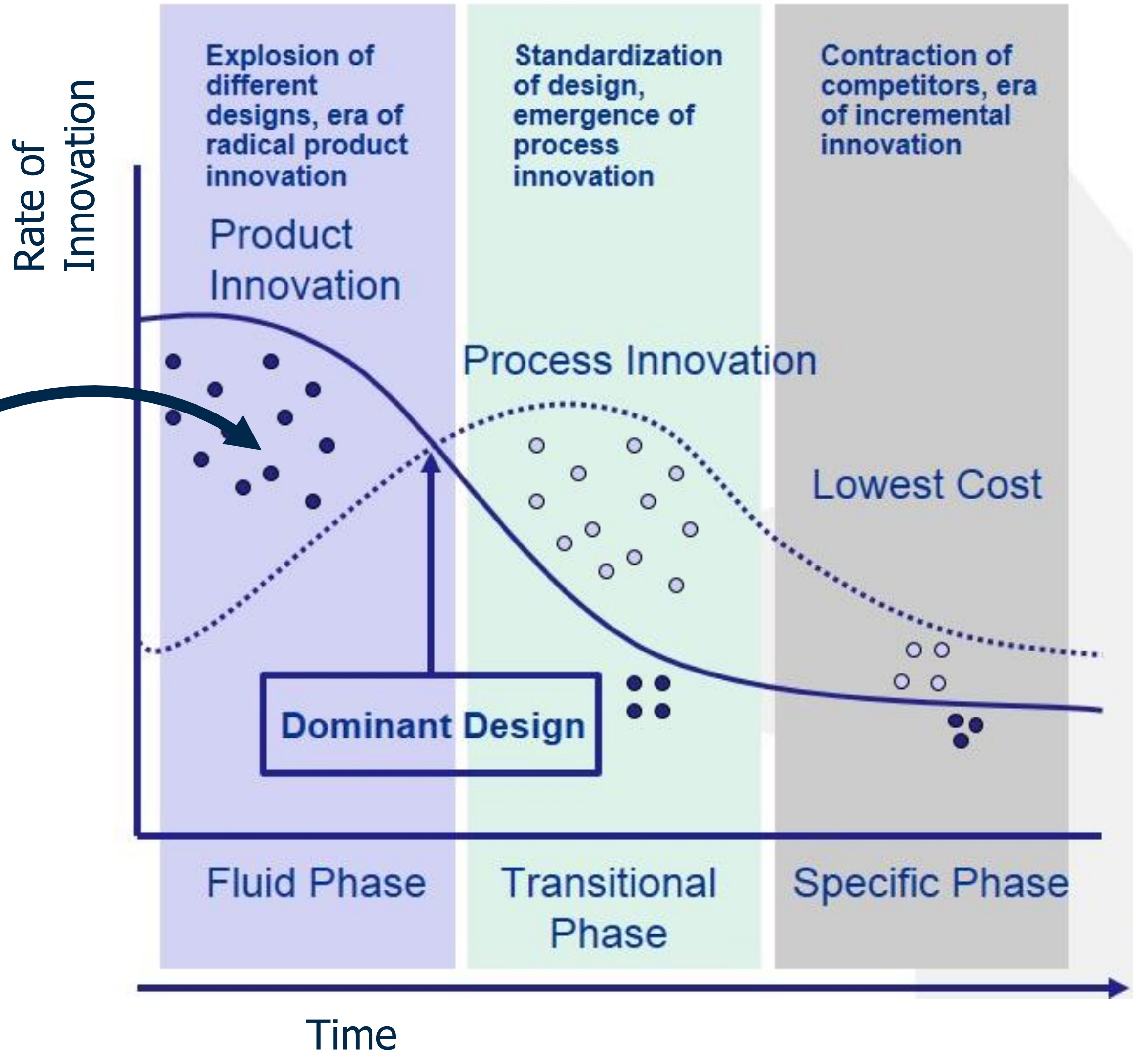
*If the **innovator** does not possess the **desiderable** endowment of complementary assets, **IP protection** will afford the innovator the time to access these assets**

If the complementary assets are specialized or co-specialized contractual relationships are exposed to **hazards .*

TIGHT APPROPRIABILITY

e.g. a sound product concept but a wrong design

Patents (or difficulty of imitation) afford the innovator the time needed to perform the trials and get the right design before being eclipsed by imitators



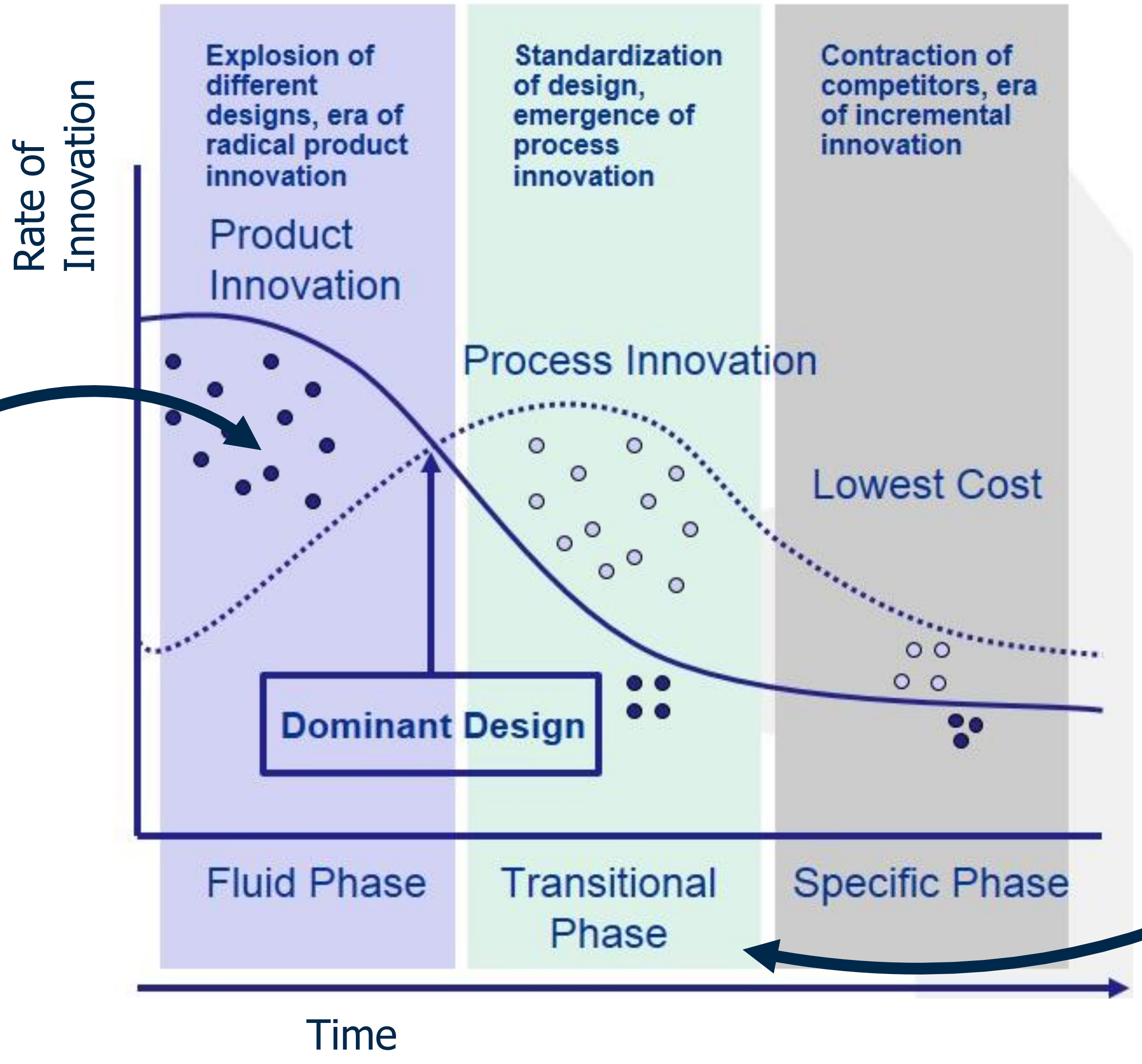
Important

Tight appropriability is the exception rather than the rule

Innovators must turn to business **strategy** if they are to keep imitators/followers/incumbents at bay

WEAK APPROPRIABILITY

e.g. a sound product concept but a wrong design



Let the design «float»

Strictly couple to the market (users need) to get evidence on the design that will be dominant

The probability to possess the dominant design will be higher:

- The lower the cost of prototyping
- The more the firm is tightly coupled to the market

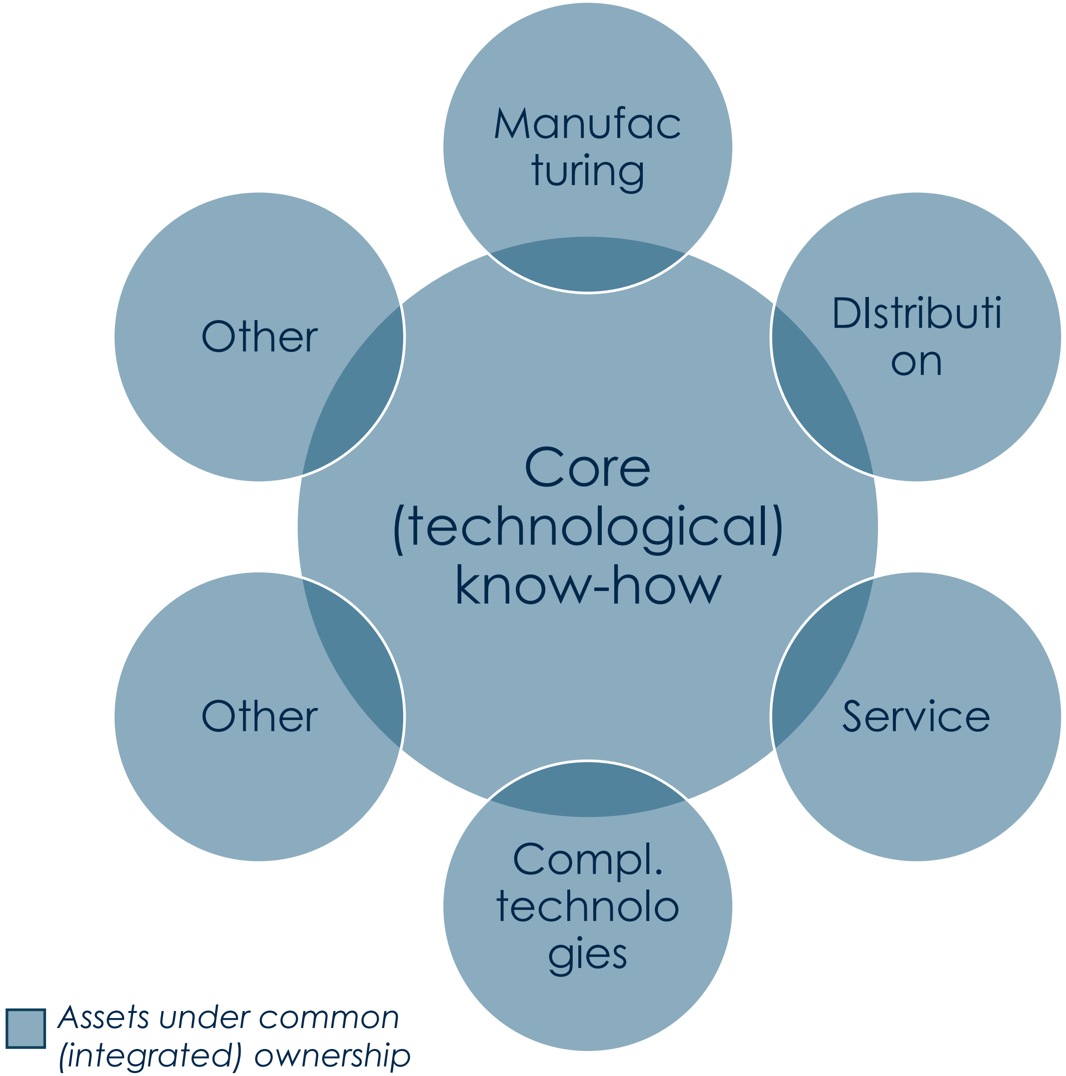
Teece, 1986

Weak appropriability regimes

- Access to complementary assets becomes critical
- Specialized assets are sunk investments* and cannot be accessed easily by contract - risks high for the party making the dedicated investments
- Firms who control co-specialized assets are advantageously positioned relative to an innovator

**(i.e. investments that could be valueless if the relatioship between the innovator and the licensee breaks down)*

Strategic choices: control over critical assets



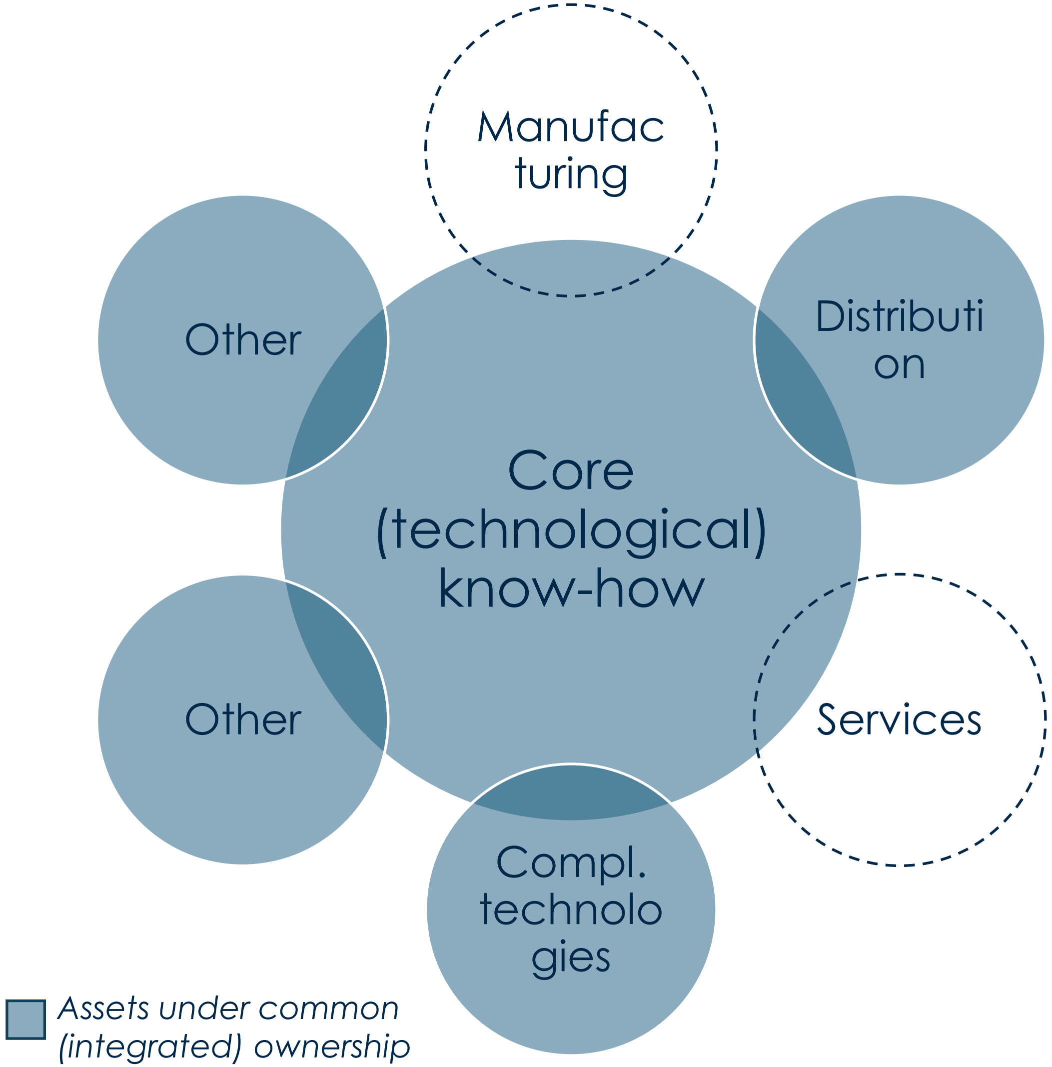
Complementary assets internalized for innovation.

Case 1: the innovator <u>integrates all the complementary assets</u>

The variety of assets and competences which need to be accessed is likely to be quite large, even for only modestly complex technologies.

Complete integration is likely to be unnecessary as well as prohibitively expensive.

Strategic choices: control over critical assets



Complementary assets internalized for innovation.

Case 2: the innovator <u>subcontracts for manufacturing and services</u>

The innovator could attempt to access these assets through **contractual relationships** (e.g. component supply contracts, fabrication contracts, service contracts, etc.).

In many instances such contracts may suffice, although it **sometimes exposes the innovator to various hazards and dependencies**

Contractual strategies

ADVANTAGES

- Lower or no upfront capital expenditures (build or buy the assets)

- Gain added credibility

Cipher Data Products, Inc. contracted with IBM to develop a low-priced version of IBM's 3480 0.5 inch streaming cartridge drive, which is likely to become the industry standard.

As Cipher management points out, "*one of the biggest advantages to dealing with IBM is that, once you've created a product that meets the high quality standards necessary to sell into the IBM world, you can sell into any arena.*"

Teece, 1986

Contractual strategies

DISADVANTAGES AND RISKS

- Risk that the partner won't perform acording to the innovator's perception

- Danger that the partner may imitate the innovator's technology

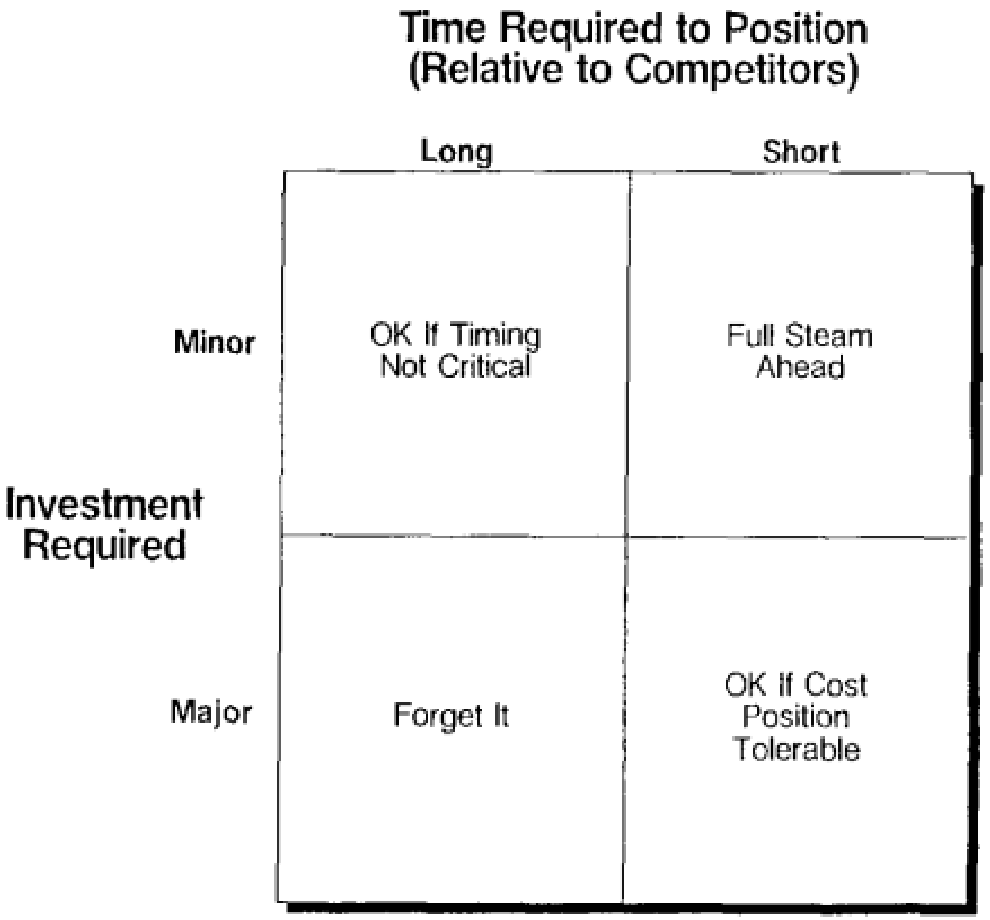
- Moral Hazard

- *It is very difficult to write, execute and enforce complex development contracts, particularly when the design of the new product is «floating»*

- *It may be difficult to induce suppliers to make costly irreversible commitments which depend for their success on the success of innovation*

Teece, 1986

The difficult strategic decisions arise in situations where the appropriability regime is weak and specialized assets are critical to profitable commercialization

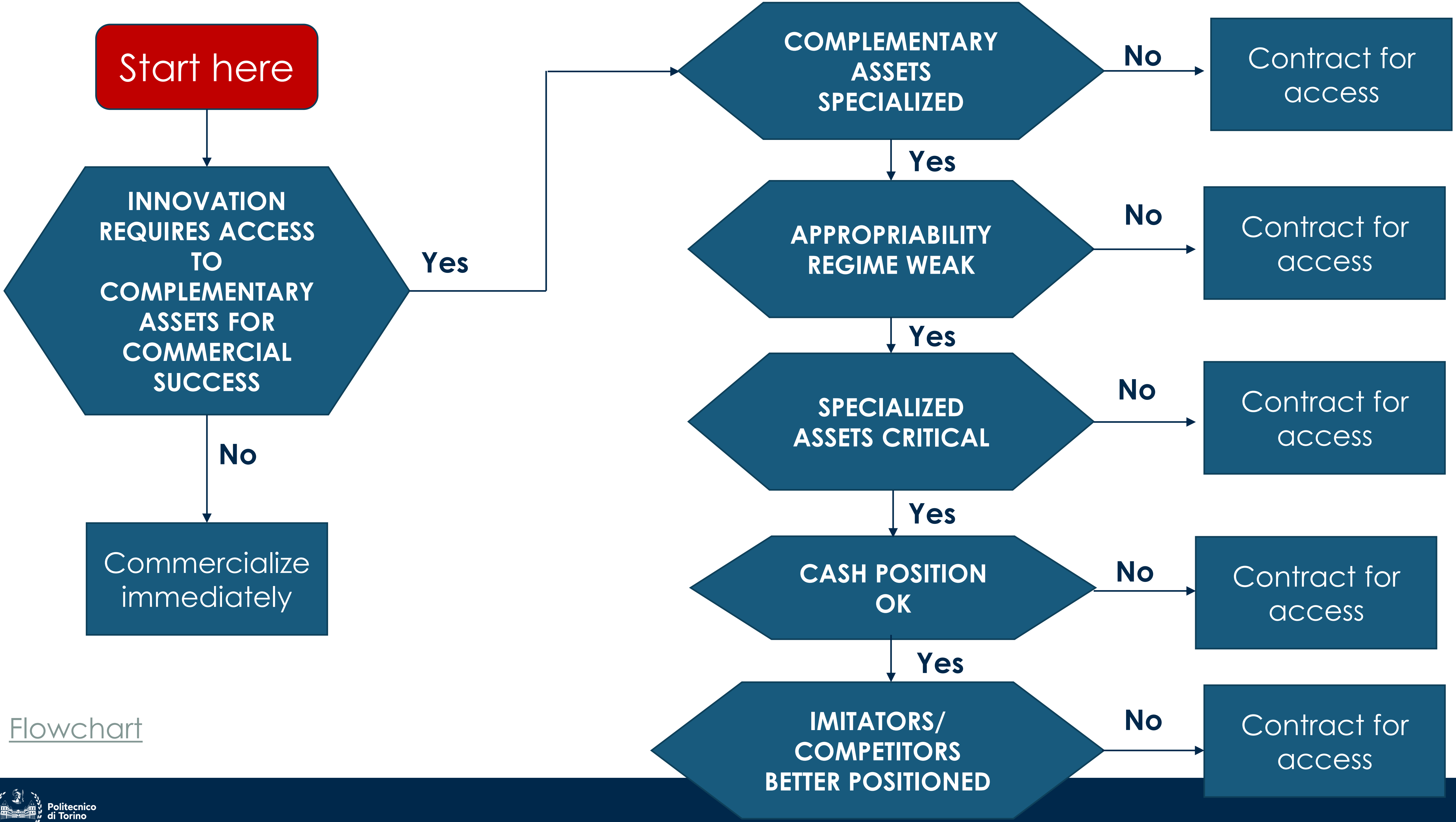


When imitation is easy, strategic moves to build or buy specialized complementary assets must occur with due reference to the moves of competitors.

There is no point moving to build a specialized asset if one's imitators can do it faster and cheaper.

Complementary assets

Imitability		Freely available (or unimportant)	Tightly held (or important)
	High	Difficult to make profits	Holder of assets profits
	Low	Innovator profits	Highest bargaining power profits


Start here
INNOVATION REQUIRES ACCESS TO COMPLEMENTARY ASSETS FOR COMMERCIAL SUCCESS
No
Commercialize immediately
Yes
COMPLEMENTARY ASSETS SPECIALIZED
No
Contract for access
Yes
APPROPRIABILITY REGIME WEAK
No
Contract for access
Yes
SPECIALIZED ASSETS CRITICAL
No
Contract for access
Yes
CASH POSITION OK
No
Contract for access
Yes
IMITATORS/ COMPETITORS BETTER POSITIONED
No
Contract for access

Flowchart

Msc Data Science and Engineering

Appropriation strategies

Politecnico di Torino
1859
Department of Management and Production Engineering

Overview

A crucial element within a firm's technological innovation strategy is determining whether and how to protect it.

Traditionally, economics and strategy have emphasized the importance of protecting innovation in order to be the primary beneficiary of the economic returns

Sometimes, not strongly protecting technology from imitation is to the firm's competitive advantage.

Appropriability

The degree to which a firm can capture the rents from innovation

The appropriability of an innovation is determined by how easily/quickly competitors can imitate the innovation.

The mechanisms to protect innovation – and their effectiveness- vary significantly within and across industries:

- IP protection is very effective in the pharma industry, where technologies are inherently hard to imitate
- In industries characterized by increasing returns (scale effects, network effects) firms may be willing to lose money in the short term to improve their technology's rate of diffusion (i.e. to rise the position of dominant design)

Encouraging other producers and providers of complementary goods to support the technology development may increase its rate of diffusion and its likelihood of becoming a dominant design:

- Network effects
- Scale effects

TESLA

All Our Patent Are Belong To You

Elon Musk, CEO, June 12, 2014

Yesterday, there was a wall of Tesla patents in the lobby of our Palo Alto headquarters. That is no longer the case. They have been removed, in the spirit of the open source movement, for the advancement of electric vehicle technology.

Tesla Motors was created to accelerate the advent of sustainable transport. If we clear a path to the creation of compelling electric vehicles, but then lay intellectual property landmines behind us to inhibit others, we are acting in a manner contrary to that goal. Tesla will not initiate patent lawsuits against anyone who, in good faith, wants to use our technology.

When I started out with my first company, Zip2, I thought patents were a good thing and worked hard to obtain them. And maybe they were good long ago, but too often these days they serve merely to stifle progress, entrench the positions of giant corporations and enrich

"Our true competition is not the small trickle of non-Tesla electric cars being produced, but rather the enormous flood of gasoline cars pouring out of the world's factories every day"
Elon Musk

https://www.tesla.com/blog/all-our-patent-are-belong-you

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Proprietary systems vs. Open systems

Proprietary systems

Based on a technology that is **company-owned** and **protected** through patents, copyrights, secrecy

Such technologies may be legally produced or augmented only by their developers

(partially) Proprietary systems

Many technologies that were once proprietary or partially proprietary systems become open systems once their patents expire.

- pre-expiration strategies (e.g. generic drugs markets)
- market exclusivities

Open systems

The technology used in a product/process is **not protected**.

Such technologies may be based on available standards or be new technologies that are openly diffused to other producers

Advantages of protection

- Proprietary systems offer higher rent **appropriability** from technological innovation.

  The developing firm has more money and incentive to invest in R&D, NPD, promotion, and distribution.

- Protecting the technology gives the developing firm **architectural control** over the technology.

  The firm's ability to determine the structure and operation of the technology and its compatibility with other goods or services

Advantages of diffusion

- Competition among producers may drive the price of the technology down, making it **more attractive to customers**.

- Both customers and complementary goods providers may also **perceive the technology as better** (or its future more certain) if there are multiple companies backing the technology.

Incentives for protection

- **Control over fragmentation**
  For technologies in which standardization and compatibility are important, external development could put the integrity of the core product at risk

- Incentives for **architectural control** over the evolution of a technology are high if a firm is a significant producer of complements of a technology. Architectural control enables the firm to direct the development efforts put into the technology (exploitation of core competencies)

Incentives for diffusion

- **Lack of resources (capital, technological expertise)**
  If a firm does not have significant resources to invest in developing new functionalities it may be difficult to produce a technology that has an initial performance level/rate of improvement that the market would find attractive

- **Lack of production/market capabilities**
  If a firm is unable to produce a technology at sufficient volume/quality levels or market the technology with sufficient intensity then protecting the technology (so that the firm is the sole provider) may hinder its adoption

Openness and protection

The open innovation paradigm: to innovate, firms often need to **draw knowledge from and collaborate with a large number of external actors** organization.

At the same time, firms need to be focused on **capturing the returns from their innovative ideas.**

A **paradox**: **the creation of innovations often requires openness, but the commercialization of innovations requires protection**.

Openness and protection

How are firms' open innovation choices linked to their need to protect their knowledge?

- to obtain knowledge, organizations have to **reveal** some parts of their own knowledge to external actors
- managers make their firm **"open"** by engaging with a broad set of external actors in their innovation activities, but also have to **protect** their own firm's knowledge from being copied by competitors

Appropriability and openness generally go hand-in-hand

However, high levels of appropriability are associated with decreasing levels of openness

Does appropriability enable or retard open innovation?

Appropriation strategy: a firm's approach to **protecting relevant internal knowledge** against being copied and to **appropriating the returns** from innovative activities

Appropriating the benefits from innovation requires managerial attention and **effort**: applying for patents, establishing a market lead time, keeping key technologies secret from competitors […]

Degree of appropriation

Appropriation efforts have a major influence on the firm's approach to open innovation (and vice-versa): whom the firm works with, where it looks for ideas, how it organizes its own innovative activities

Degree of openness

«soft» forms of openness and appropriation

Search strategies span across a range of different sources or channels in the innovation system (breadth/depth):

Each of these channels involves interacting with a different community of practice, with perhaps opposing sets of institutional norms, languages, and rules.

Firms choosing to work with external actors need to develop **organizational practices** that are suited to the domain in which they search.

External search can be seen as **a form of "soft" openness**, typically involving drawing knowledge from external parties without entering into legally binding agreements

«hard» forms of openness and appropriation

Differently from search, **collaboration** can be described as **a "hard"** (but profitable) **form of openness.**

The setting up of formal collaborations is more problematic for managers

Openness through collaboration:

- provides firms with access to complementary resources to enable the successful development of new products and processes
- may also enable firms to be more adept at commercializing shared ideas

Formal collaboration requires a firm and its external partner to adhere to an agreed **"structure" for the exchange**, and to put in place a set of **appropriability mechanisms**

Appropriation mechanisms

Appropriation mechanisms allow managers to capture rents from its organization's knowledge assets.

The importance attributed to a range of Appropriation mechanisms can be considered the "appropriability strategy" of a firm

- **Formal mechanisms**, include patents, trademarks, registration of designs
- **Informal mechanisms** include, secrecy, lead times, product complexity

Appropriation mechanisms

Formal and informal mechanisms generally appear to be **complements**.

The application of a **mix** of protection mechanisms is important for firms to:

- ensure their technology is not copied by others
- inform negotiations over collaboration with a range of external parties

Openness and appropriability

There is a complex and intimate relation between how firms try to **appropriate** rents or profits from their innovations, and ***how open*** these firms are to the external environment

Commonly, firms fear "involuntary outgoing spillovers", that is, leakage of critical knowledge about the firm's innovation efforts to its competitors:

Examples:

- knowing where a firm is focusing its innovative efforts could provide important information to skilled rivals about how to shape their own search efforts and target the same markets
- even if legal protection methods are enforceable, skilled rivals may be able to invent around existing patents relatively quickly

Openness and appropriability: formal mechanisms

- The **value of formal types of IP protection** mechanisms is limited to their defensibility in legal suits and/or the firm's ability to demonstrate a credible threat in a legal intervention

- In addition, many of the key features of modern innovations do not lend themselves to formal IP protection as they relate to customer experience or the "look and feel" of a product.

- Also, informal protection mechanisms, such as secrecy, can be breached by competitors by "poaching" workers from incumbent firms or reverse engineering their products.

Openness and appropriability: informal mechanisms

The effectiveness of informal appropriability mechanisms has progressively decreased:

- In the case of lead times or first-mover advantages, these can dissipate quickly in the face of strong **competition** and **rapid technological change**
- **Knowledge as a production factor**: firms often operate in environments of leaky knowledge, strong competition from skilled and experienced competitors, and the threat of new firms entering their product markets.
- Some of these competitors may have access to considerable **complementary assets** which may outnumber and be more effective than the incumbent firm's own assets and capabilities

The paradox of disclosure

To gain access to and convince potential partners of the benefits of knowledge exchange, it is necessary to **negotiate** formal contracts or at least informal agreements based on a degree of mutual understanding.

External partners will require enough information about an idea to develop some belief in its eventual successful commercialization.

In other words: partners need to know about the idea before they invest in it.

> The paradox of disclosure: "In trading ideas, the willingness-to-pay of potential buyers depends on their knowledge of the idea, yet the knowledge of the idea implies that potential buyers need not pay in order to exploit it" (Gans and Stern, 2003: 338).

Disclosure increases the bargaining power of the buyer and reduces the power of the innovator

Open innovation and appropriability: enabling mechanisms

- “**Selective revealing**”: often firms (e.g. in the context of open source software) rely on a strategy that involves **partial disclosure** of some central part of the traded knowledge **while controlling access** to other parts of the knowledge.

- “**Signalling**”: firms can use protection mechanisms to send quality signals to other parties (reputation).

Emphasis on appropriability may be interpreted by external parties as:

- signaling the focal firm’s possession of valuable technological knowledge and, consequently, its potential value as a collaborator(or an attractive investment object).
- signaling to potential partners the firm’s awareness of the importance of appropriability mechanisms, such as patents or secrecy

Open innovation and appropriability: retarding mechanisms

Over-emphasis on protection mechanisms can have significant negative consequences for the possibilities for external collaboration:

- Legal departments can put strict limits on individual employees exchanging knowledge across the firm boundary, and adopt a defensive stance in order to ensure priority for subsequent patent claims
- Many large firms require their staff to obtain permission from the legal team before engaging with external parties, which acts as a significant hurdle to working with new external partners
- Legal departments often require collaboration agreements to be in place before embarking on an exchange with an external party, and complex negotiations may hamper the development of emergent collaboration.

Appropriability challenges in open innovation

While some emphasis on appropriability sends a positive signal to potential collaborators, too strong focus on appropriability could be interpreted as signaling that the collaboration with the focal firm will be difficult (i.e. conflicts over control and ownership of knowledge might ensue).

Application of overly restrictive protection mechanisms might reduce the interest of firm managers in collaboration, and scare off external actors

The firm's appropriability strategy is linked closely to the firm's level of openness.

Firms need to **disclose** some knowledge to gain from external parties, but they need also to **protect** parts of their knowledge if they are to gain value from the exchange.

Too strong emphasis on appropriability will weaken the relationship between appropriability and (soft or hard) forms of openness.

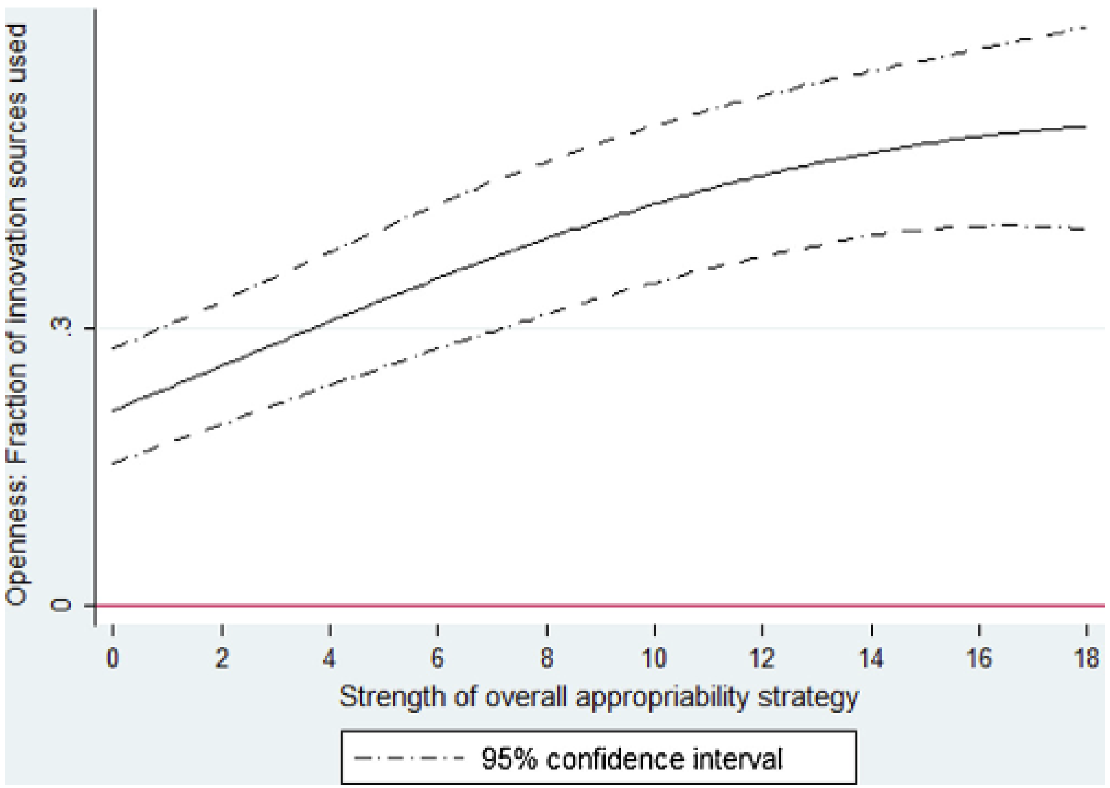


Fig. 1. Relationship between external search breadth and the strength of firms' appropriability strategies.

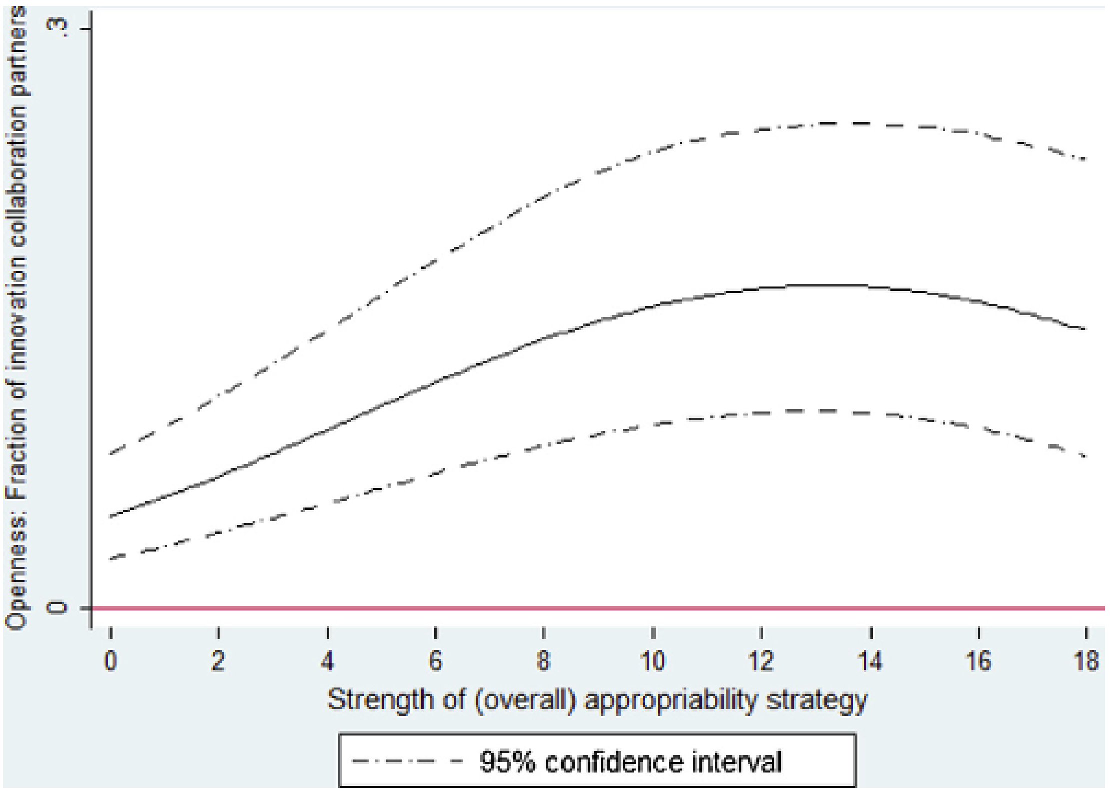


Fig. 2. Relationship between breadth of collaboration and the strength of firms' appropriability strategies.

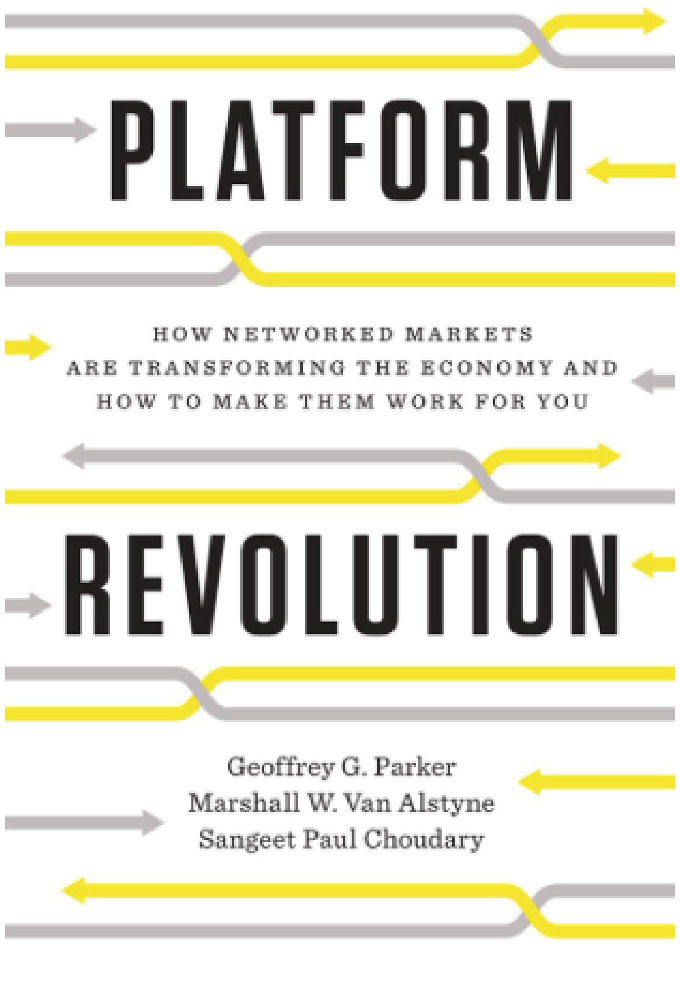
Msc Data Science and Engineering

Technology platforms and the digital economy

Politecnico di Torino
Department of Management and Production Engineering

PLATFORMS PROVIDE VALUED CONNECTIONS AMONG THEIR PARTICIPANTS.

THE NATURE OF THOSE CONNECTIONS AND THE VALUE THEY PROVIDE VARY WIDELY



HOLLYWOOD DOES NOT MAKE MOVIES ANYMORE, THEY MAKE LICENSING PLATFORMS

Jessica Mae Stover,
director, screenwriter and actor

I think there will be an increasing convergence between content and commerce, that it will be about following consumers instead of making consumers come to you, and I am especially excited about the various platforms that will allow more and more access to customers.
Natalie Massenet, founder and CEO, Net-a-porter

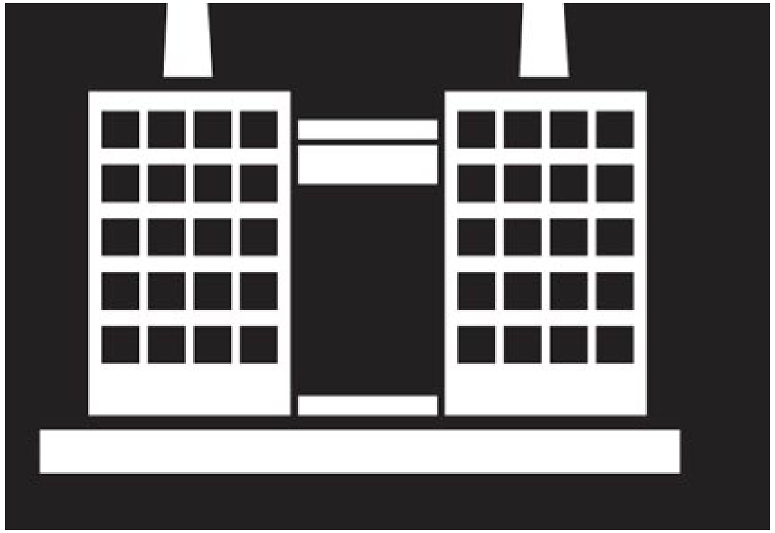
"Angry Birds is one of the fastest-growing online products I've seen, growing even faster than Skype, and the company has done a brilliant job of extending it across different platforms
and merchandise".
NIKLAS ZENNSTROM, serial entrepreneur and founder of Skype

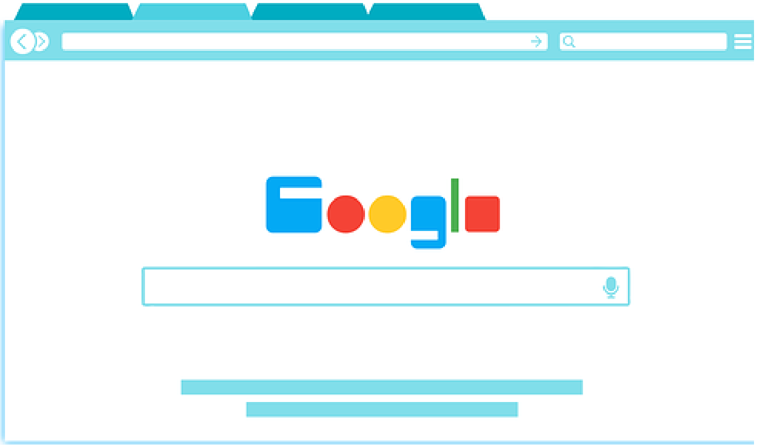
SANDY CARTER, VP SOCIAL BUSINESS AT IBM

«Your social platform will become the motherboard of your business»

«You need to look no further than Apple's iPhone to see how fast brilliantly written software presented on a beautifully designed device with a spectacular user interface will throw all the accepted notions about pricing, billing platforms and brand loyalty right out the window.»

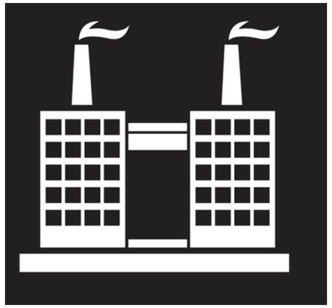
Edgar Bronfman, Jr. – Accreative LCC, private equity





The evolution of problem-solving approaches

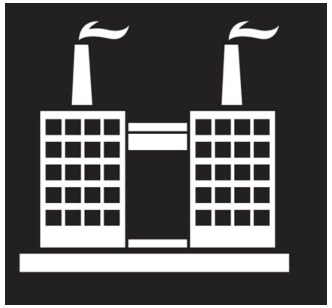
Industrial age: the "Stuff approach"



If there's a customer or market problem, you set up factories and **build more stuff**.

SOURCE: SANGEET PAUL CHOUDARY
A PLATFORM-THINKING APPROACH TO INNOVATION – WIRED INSIGHTS 2014/01

Industrial age: the "Stuff approach"



If there's a customer or market problem, you set up factories and **build more stuff**.

Google age: the "Optimization" approach

Enter algorithms.
You have stuff out there which is sub-optimally distributed. Aggregate all the information and leverage algorithms to optimally match the right stuff with a consumer's desire

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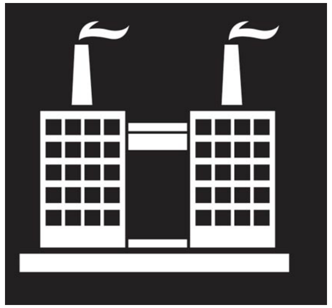
Industrial age: the "Stuff approach"



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You have stuff out there which is sub-optimally distributed. Aggregate all the information and leverage algorithms to optimally match the right stuff with a consumer's desire

Today's age: the "Platform" approach

Platform thinking.
Create more inventory without creating more stuff

PROBLEM:

I'm traveling to city X and I need to end myself some accommodation.

"Stuff"	"Optimization"	"Platform"

Sheraton
HOTELS & RESORTS

Create more stuff. Build more hotels. If there are fewer rooms than tourists, buy some land, put up a hotel and create more rooms.

KAYAK

There are a lot of hotels out there but travelers do not necessarily have all the information to make the choice they want to. Let's aggregate this inventory and create a reliable search engine. Let's build review sites to help make the right decision

How can we redefine travelers' accommodation? How about enabling anyone with a spare room and mattress to run their own BnB?

PROBLEM:

I need to know about what's happening around the world

"Stuff"	"Optimization"	"Platform"
«Put more journalists on the job, churn out more content and get the news out to more channels».	Rank news stories and serve readers with the matches closest to what they're looking for.	Redefine the journalist. Everyone can create and distribute news now

Products vs. platforms

PRODUCT

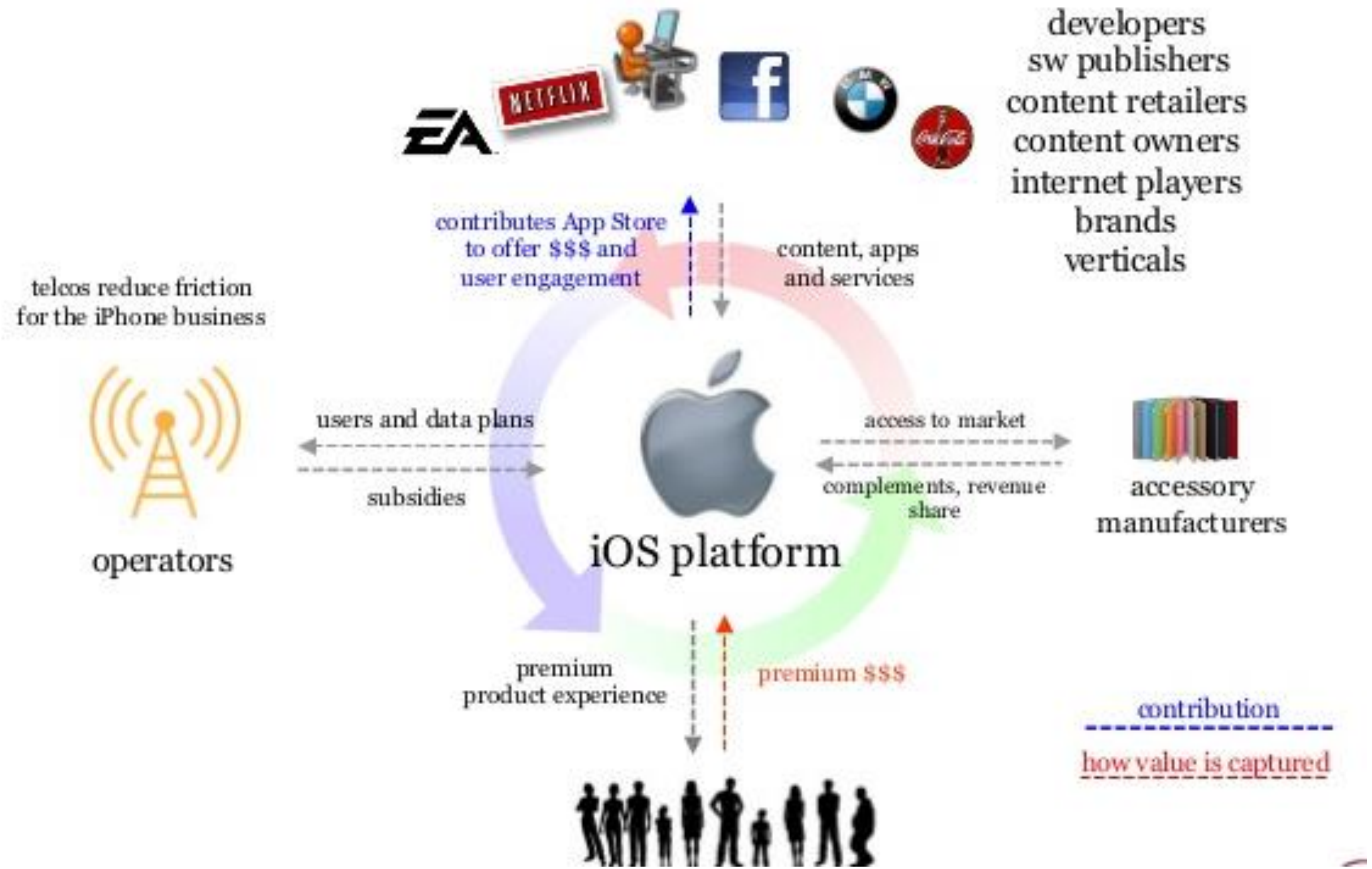
- A product is a good, an idea, a method, an information, object or service that **serves a need** or **satisfies a want**
- After buying it, you have some **exclusive ownership or access**
- Iphones and GoPros, Microsoft Office and Adobe Photoshop, Candy Crush and The New York Times mobile apps are **products**
- You might pay a flat price, a SaaS fee, trade your attention for ads, get some amount of free usage or partake in in-app purchases, but the concept is the same: **you buy or sign up for something, and *use* it**

PLATFORM

- The distinguishing aspect of a platform is **the ability for others to build products** and ultimately generate revenue on top of it,
- Platforms generate revenue by **taking a cut of proceeds**, and **costs tend to scale** in proportion to their use
- Amazon Web Services, iOS and Android, American Express, eBay, Facebook, Skype, Vogue magazine, Yellow Pages, YouTube, Uber, airBnB are **platforms**
- Many platforms emerge as **the byproduct of a successful product solution**

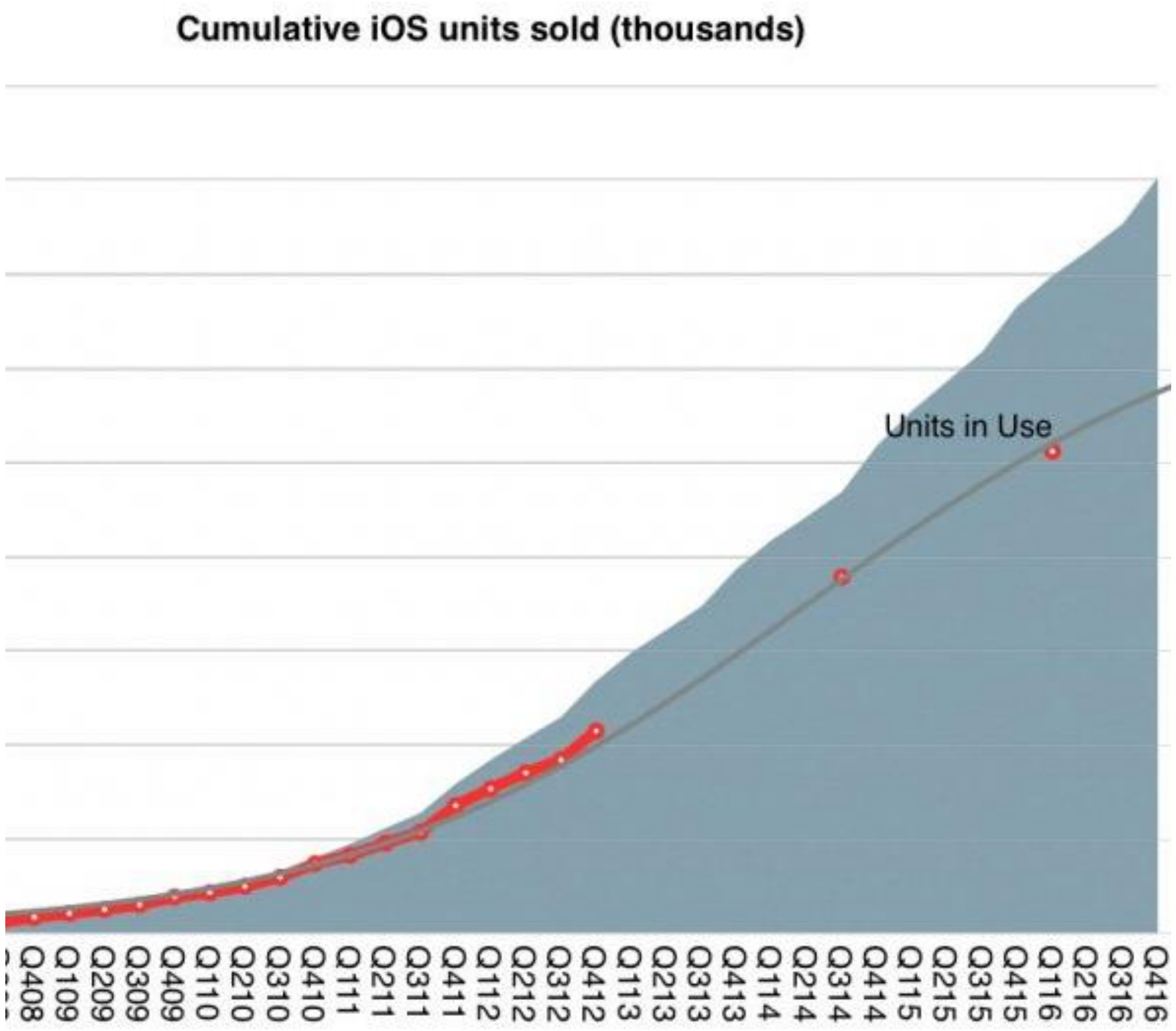
The mechanics of Apple iOS ecosystem

ecosystem around iOS platform is designed to drive hardware sales



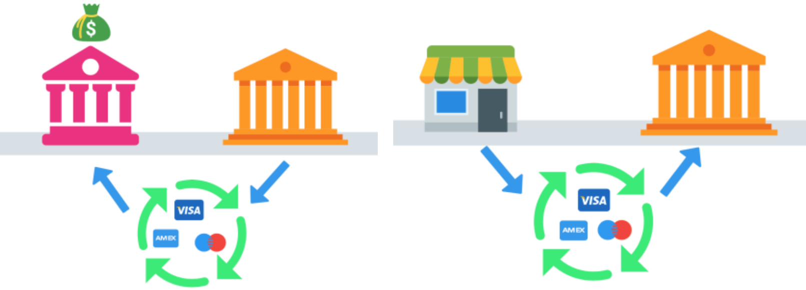
Scaling based on network effects

The iPhone enabled the iOS empire *which includes the iPod touch, the iPad, the Apple Watch and Apple TV whose combined total unit sales will reach 1.75 billion units over 10 years.*

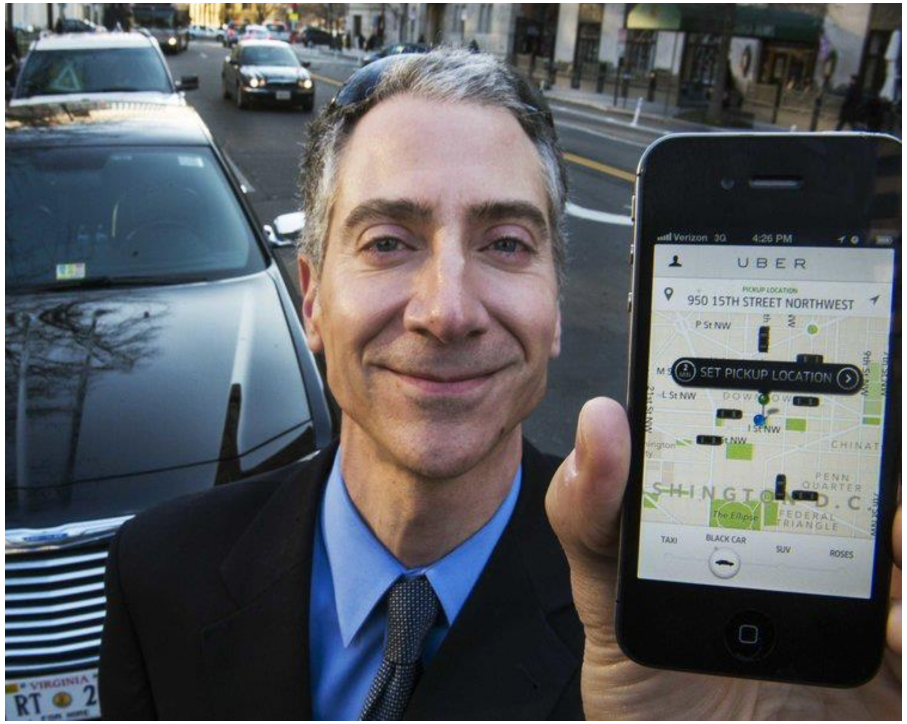


Platforms are not a new concept


The New York Times
MONEY & INVESTING
BUSINESS DAILY
Jobless rate is expected to stay high


VISA
AMEX
VISA
AMEX


Barbie
Fashion Add-Ons
Hair Originals


UBER
950 15TH STREET NORTHWEST
SET PICKUP LOCATION

Used with permission from Microsoft

Windows 95 (August 1995)

Bill Gates got it immediately

«The key to creating a successful platform is building a thriving ecosystem around it to get the network effects going.

The more programs that run on Windows, the more users will want it, and therefore the more attractive it will be to developers».

… while it took 20 years for Steve Jobs to grasp the value of platforms

1976-2003: Apple was long a product-first company.

Mr. Jobs preferred beautifully designed products that worked in isolation.

October 2003: Apple released iTunes for Windows, so Apple's hit iPod music player could enter the larger market of PC users.

June 2007: after initially resisting, Mr. Jobs announced that outside developers would be allowed to create software applications for the iPhone.

Soon, its App Store took off.

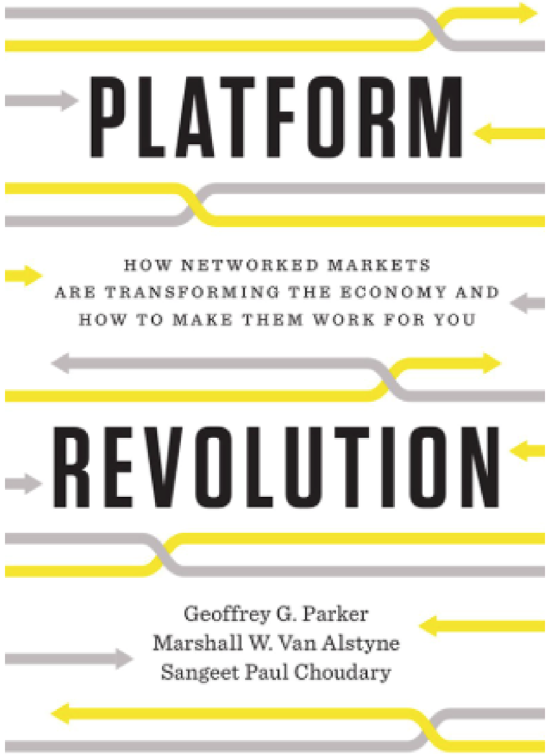
What if the two had partnered at the time?

The fundamental goal of a platform is to enable interactions between producers and consumers.

It achieves its goal by:

- *Architecting **incentives** that repeatedly pull these participants to the platform,*
- *Providing a central **infrastructure** on which participants create and exchange value,*
- ***Matching** participants with each other and with content/goods/services created on the platform*

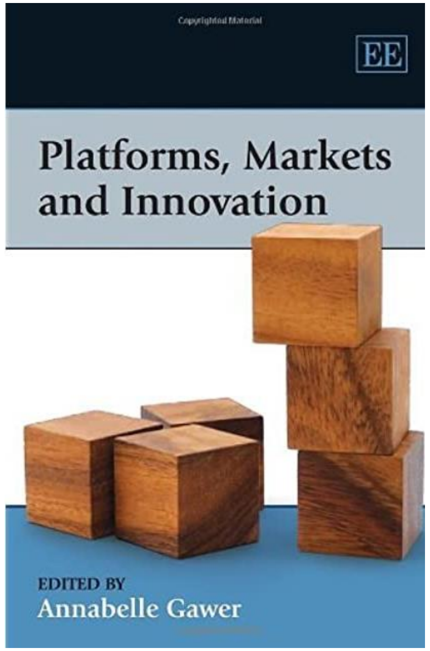
What is a platform?



A platform is a plug-and-play business model that allows ***multiple types of participants*** *to* ***connect*** *to it,* ***interact*** *with each other and* ***create and exchange value****.*

- *At the* ***technology layer****,* external developers can extend platform functionality using APIs.
- *At the* ***business layer****,*_users (producers) can create value on the platform for other users (consumers) to consume.

(broad) definition of platforms



Technology layer

Platforms are **technological building blocks** (technologies, products, or services) that act as a foundation **on top of which** an array of firms, organized **in a set of interdependent firms** (‘‘ecosystems”) develop a set of **inter-related products, technologies and services**

Market layer

Platform refers to an undertaking operating in **two (or multi)-sided markets**, which uses the internet to **enable interactions between two or more distinct but interdependent groups** of users so as to **generate value for at least one of the groups**. Certain platforms also qualify as intermediary service providers.

Platforms: markets or technologies?

The engineering perspective: **Platforms as technological architectures**

- Platforms are purposefully designed technological architectures that **facilitate innovation**.
- Platforms have a **modular type of technological architecture**, with interfaces (API) being fundamental for modularity.
- The design and use of platforms help firms to achieve **economies of scope in production and design** – allowing for economies of scope in innovation.

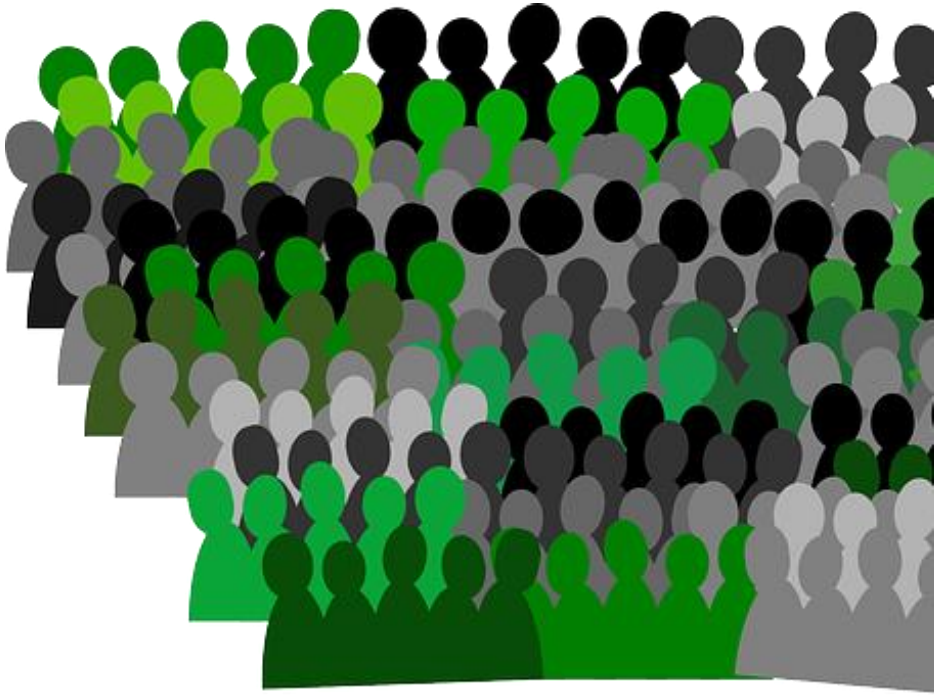
Platforms: markets or technologies?

The economics perspective: **Platforms as markets**

- Platforms fundamentally create value by acting as **conduits between two (or more) categories of consumers** who would not have been able to connect or transact without the platform.

- **Platforms create value by coordinating these groups** of consumers.

- In the economic view this coordination is effectuated through **pricing**

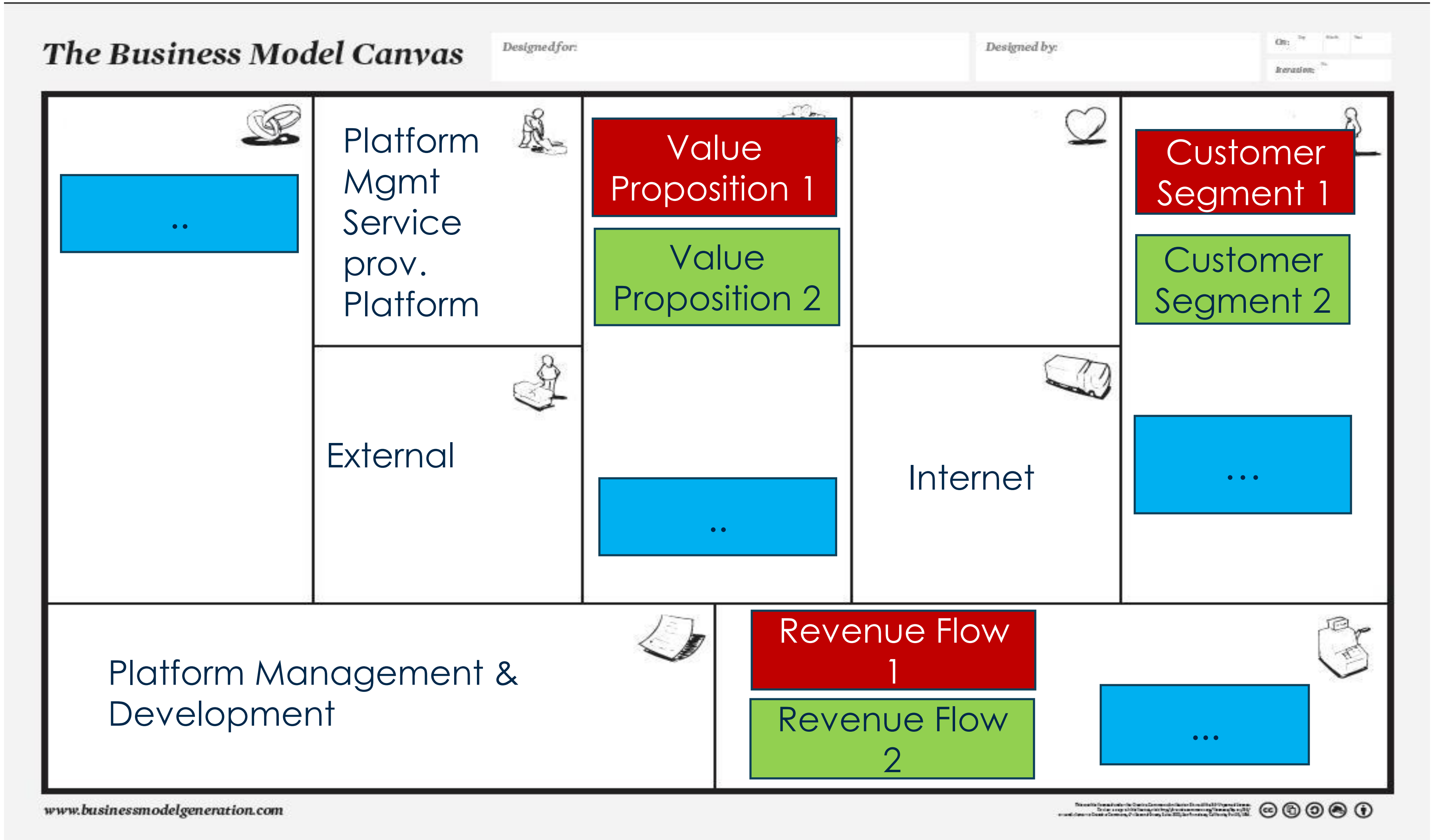


A. Gawer / Research Policy 43 (2014) 1239–1249

Multi-Sided Platforms

- MULTI-SIDED PLATFORMS bring together 2 or more distinct but interdependent groups of customers.
- Such platforms are of value to one group of customers ONLY if other groups of customers are also present.
- The platform creates value by FACILITATING INTERACTIONS between the different groups.
- A multi-sided platform grows in value to the extent that it attracts more users, a phenomenon known as the NETWORK EFFECT

Multi-Sided Platforms



Multi-Sided Platforms - Examples

WHAT ARE MULTI-SIDED BUSINESS MODELS?

*A multi-sided business is a platform which **connects two or more distinct user groups that provide benefits to each other***

In the simplest case, a two-sided platform connects buyers and sellers

UBER

Connecting drivers and passengers

amazon

Connecting buyers and sellers

airbnb

Connecting homestays and tourists

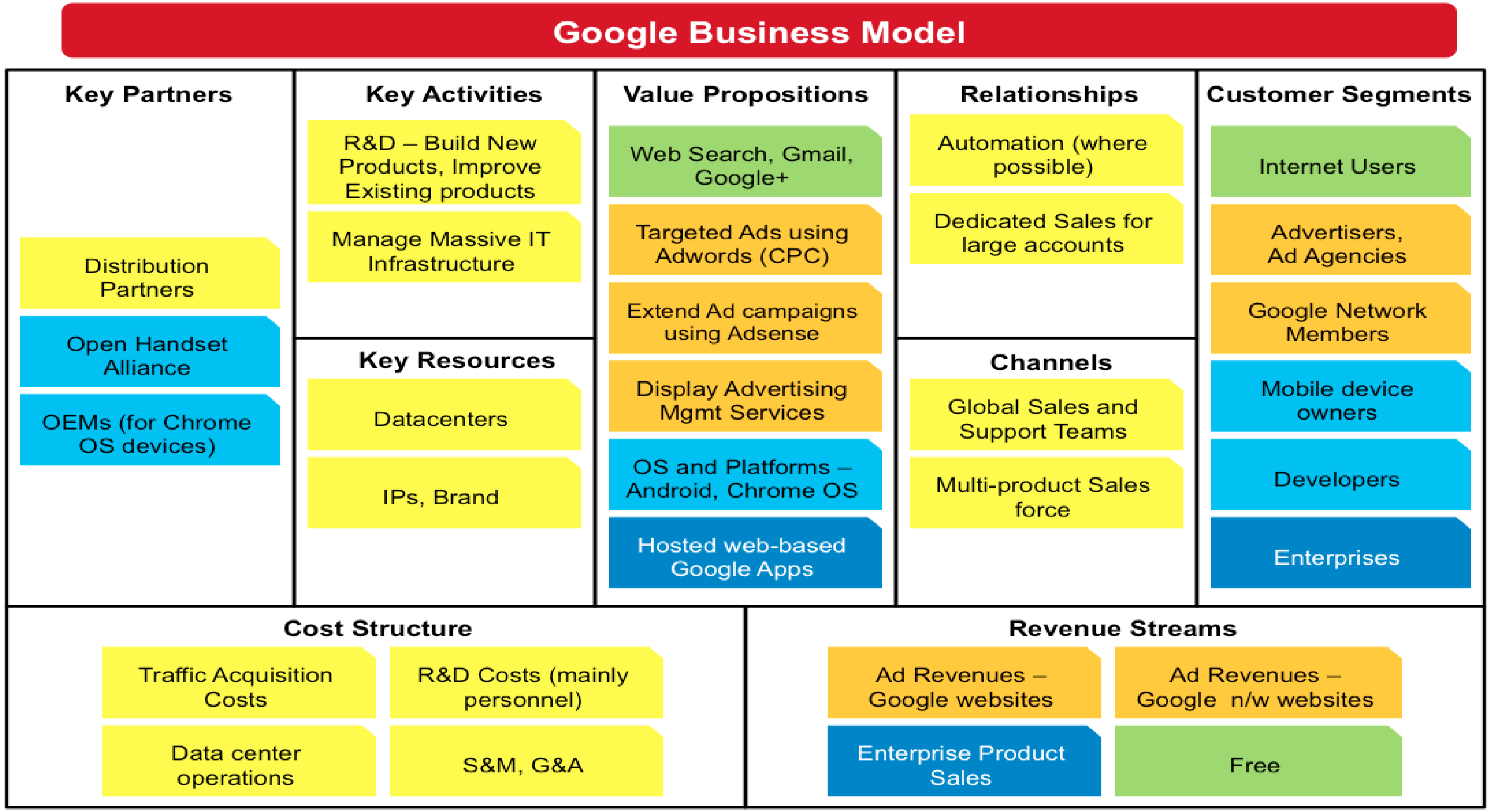
Google play

Connecting app developers and mobile users

jitha.me

Multi-Sided Platforms - Examples

Multi-Sided Platforms – Google



www.businessmodelgeneration.com

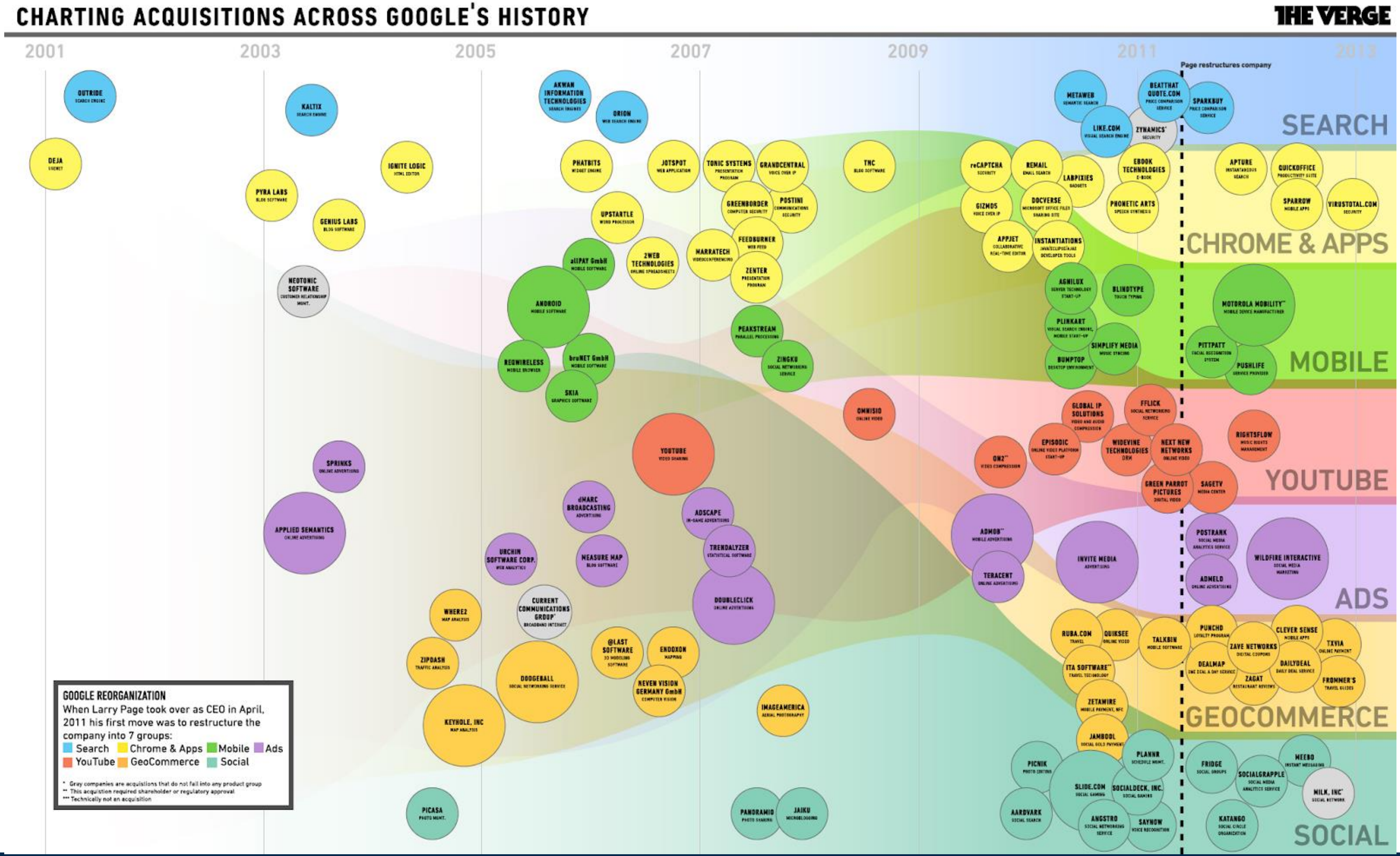
Multi-Sided Platforms - Google

- Google brings together 4 interdependent groups of customesr:
  - Internet users
  - Advertisers
  - Developers
  - Enterprises

- Google has a value only if all the groups of customers are also present in the platforms.

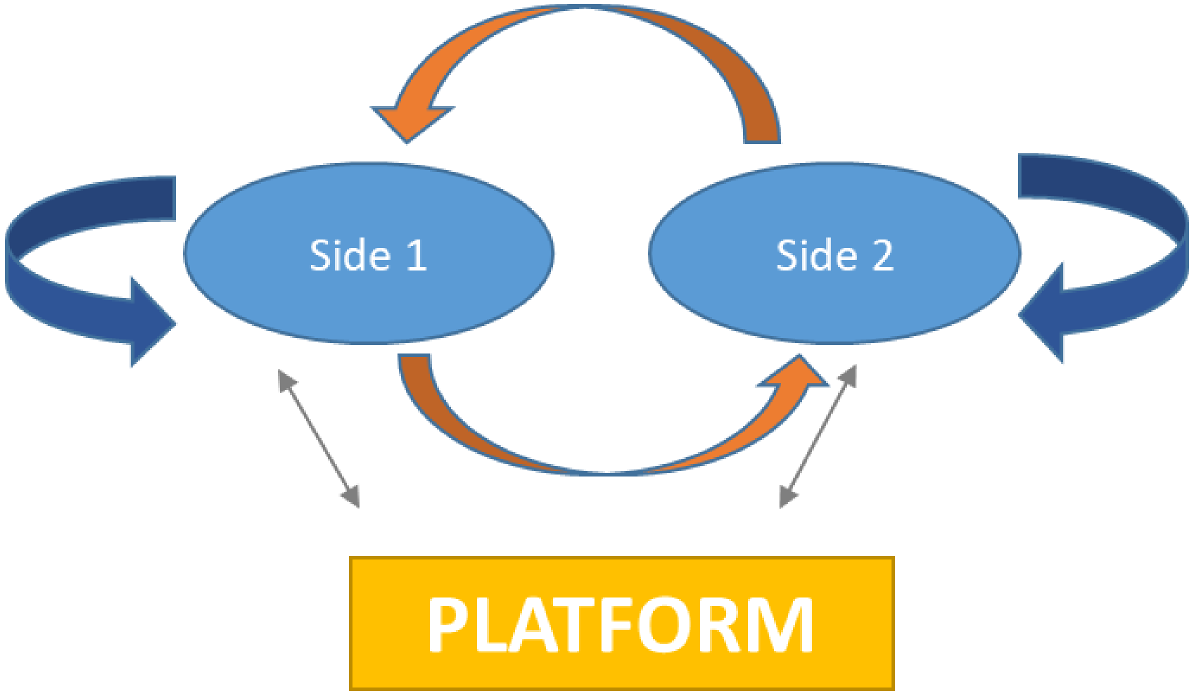
- Google creates value by FACILITATING INTERACTIONS between the different groups. → **NETWORK EFFECT**

Platform businesses can expand rapidly



Platforms as «multi-sided markets»

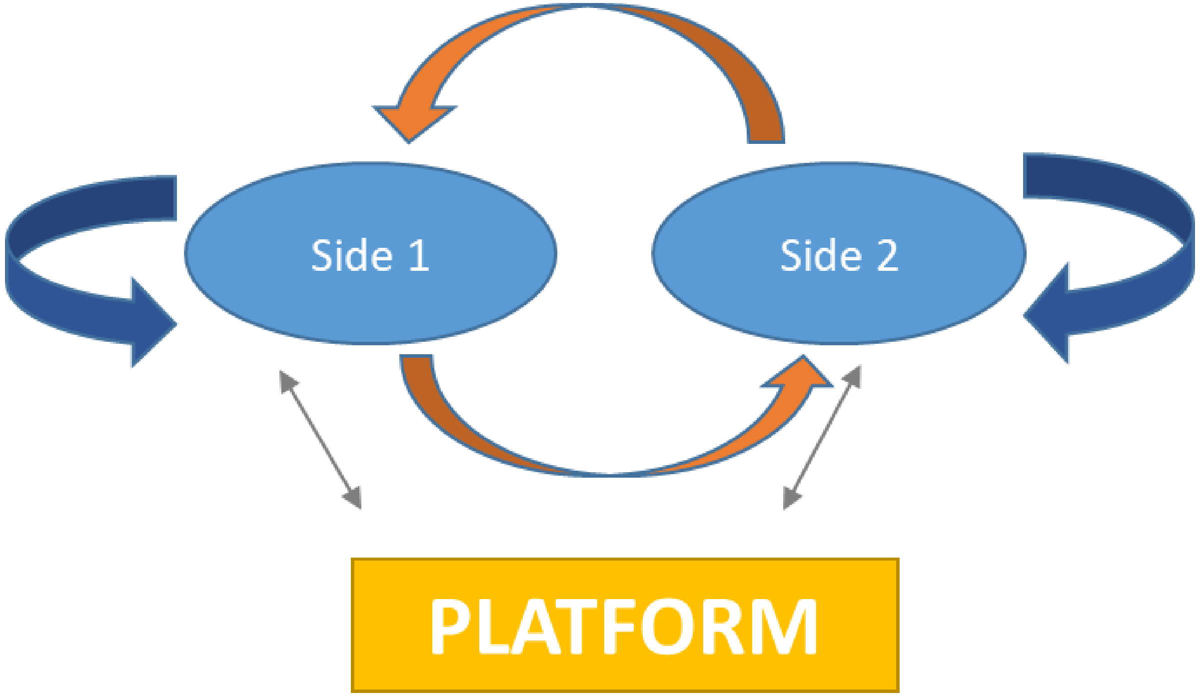
Markets involving **two or more groups of agents** interacting via 'platforms' where one group's benefit from joining a platform depends on the size of the other group that joins the platform



Essential to most economic definitions of multi-sided markets are the existence of **direct and indirect network effects** that arise between the "sides" of the market

(two or more different groups of customers who need each other in some way)

Platforms as «multi-sided markets»



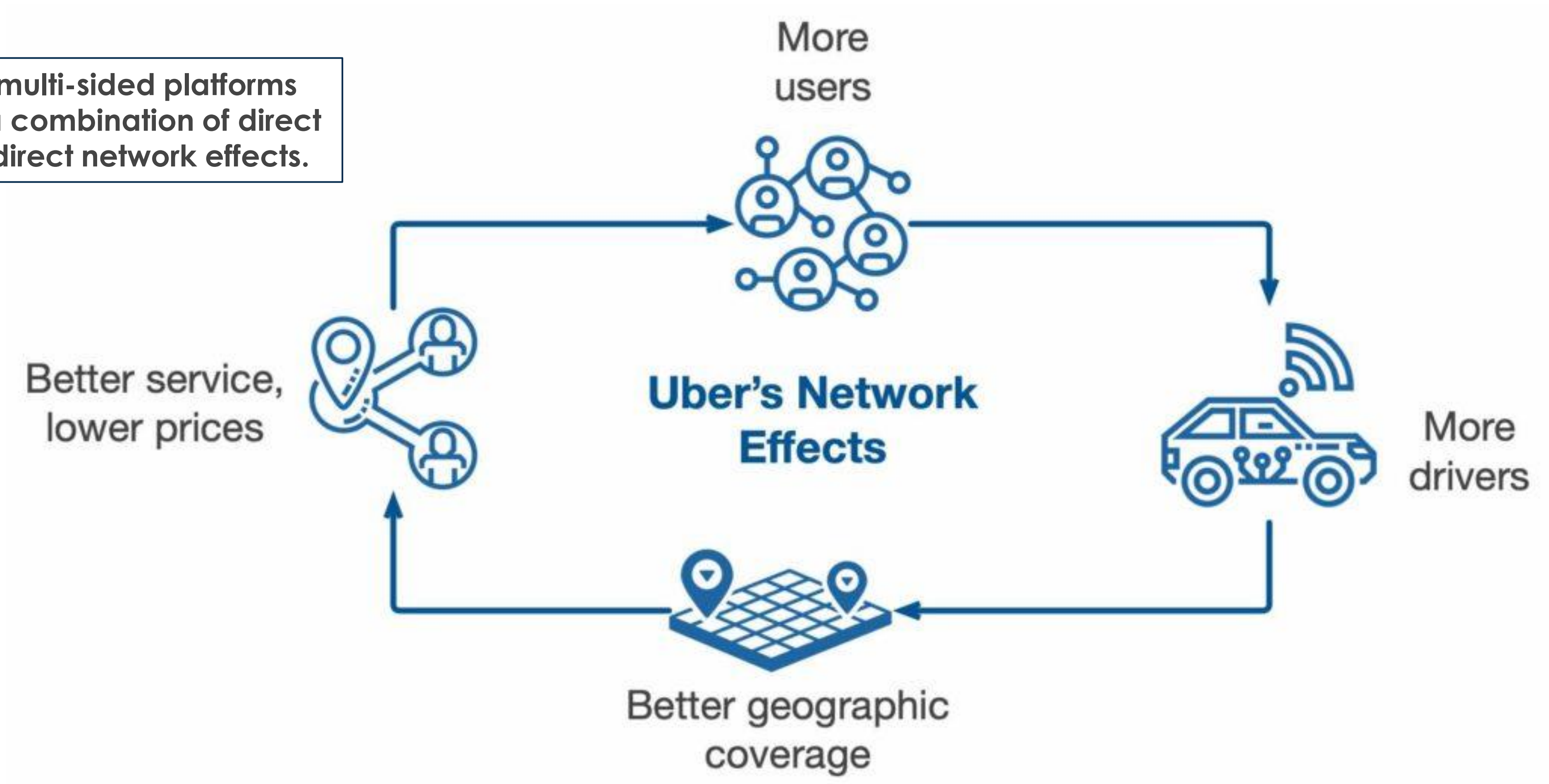
An **intermediary (the platform)** facilitates coordination more efficiently than bilateral relationships, minimizing transaction costs and partially internalizing the externalities between groups

Direct network effects (same-side network effects)
arise when <u>the benefit</u> of a technology <u>to a user depends positively on the number of other users</u> of this technology
(e.g. in a telephone network, or the network of Skype users).

Indirect network effects (cross-side network effects)
arise when users of one group benefit from an increased presence of users from a different group
(e.g. Ebay sellers benefit from a higher number of buyers).

Example: Uber's network effects

Most multi-sided platforms entail a combination of direct and indirect network effects.



Readings

Gawer, A. (2014). Bridging differing perspectives on technological platforms: Toward an integrative framework. *Research policy*

Msc Data Science and Engineering

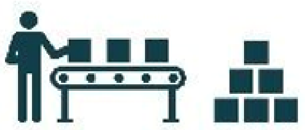
Industry 4.0 and the digital transformation

Politecnico di Torino
1859
Department of Management and Production Engineering

Technology drivers

1st 1784

Steam power
mechanical
production
equipment



2nd 1870

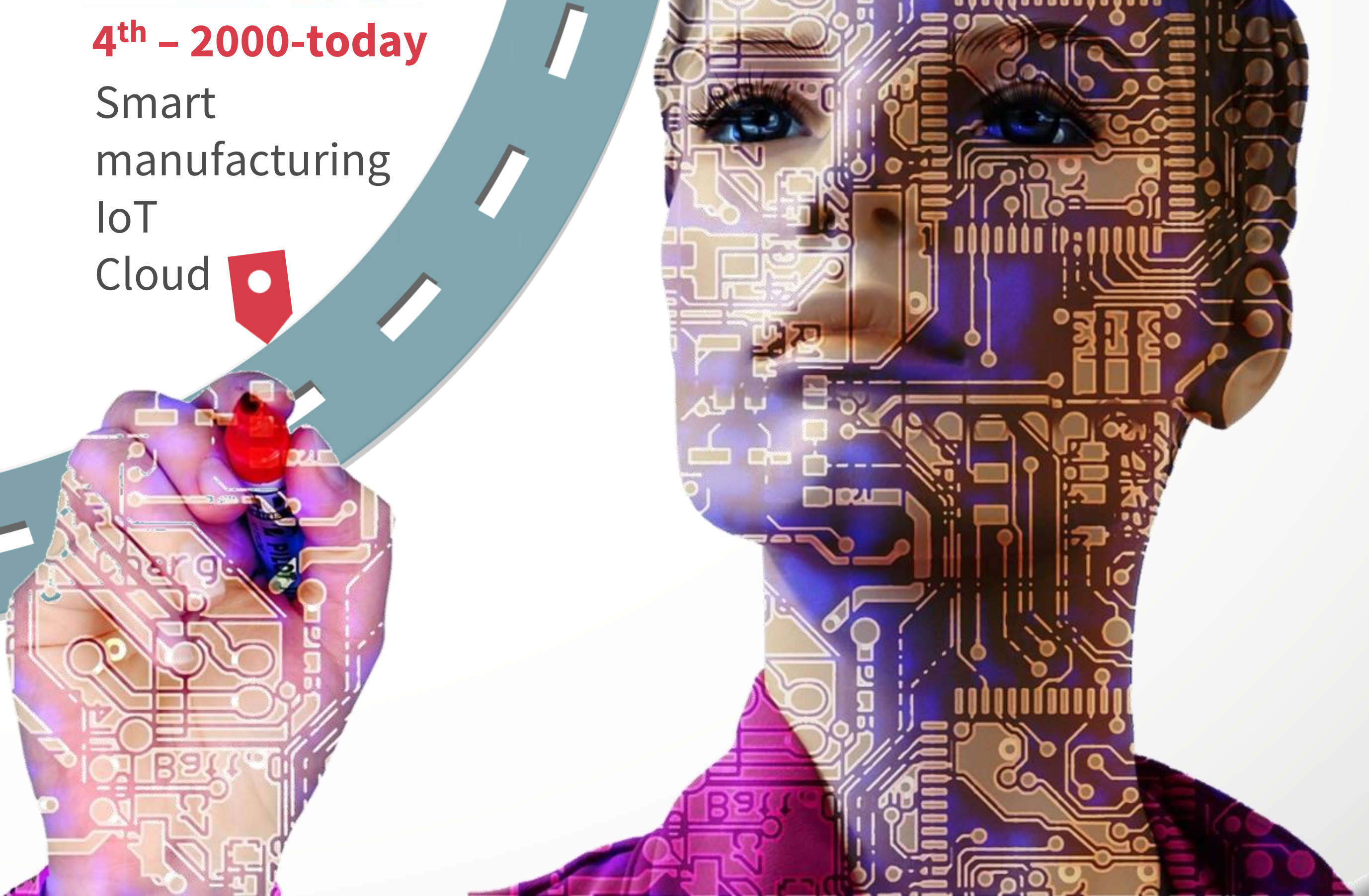
Mass production
Assembly line
Electrical energy

3rd 1969

Automation,
software and
electronics (ICT)

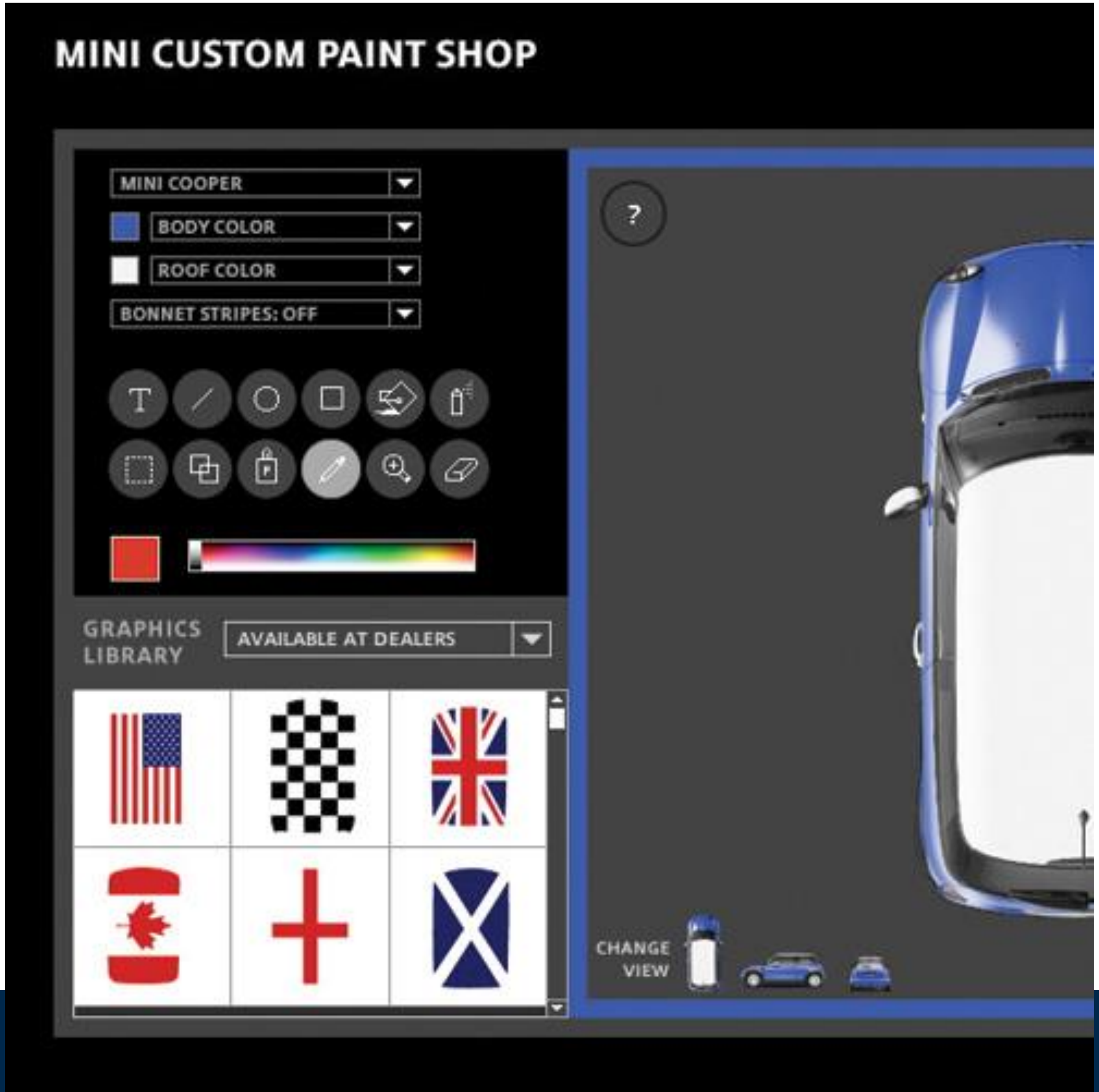
4th – 2000-today

Smart
manufacturing
IoT
Cloud



Key concepts of Industry 4.0

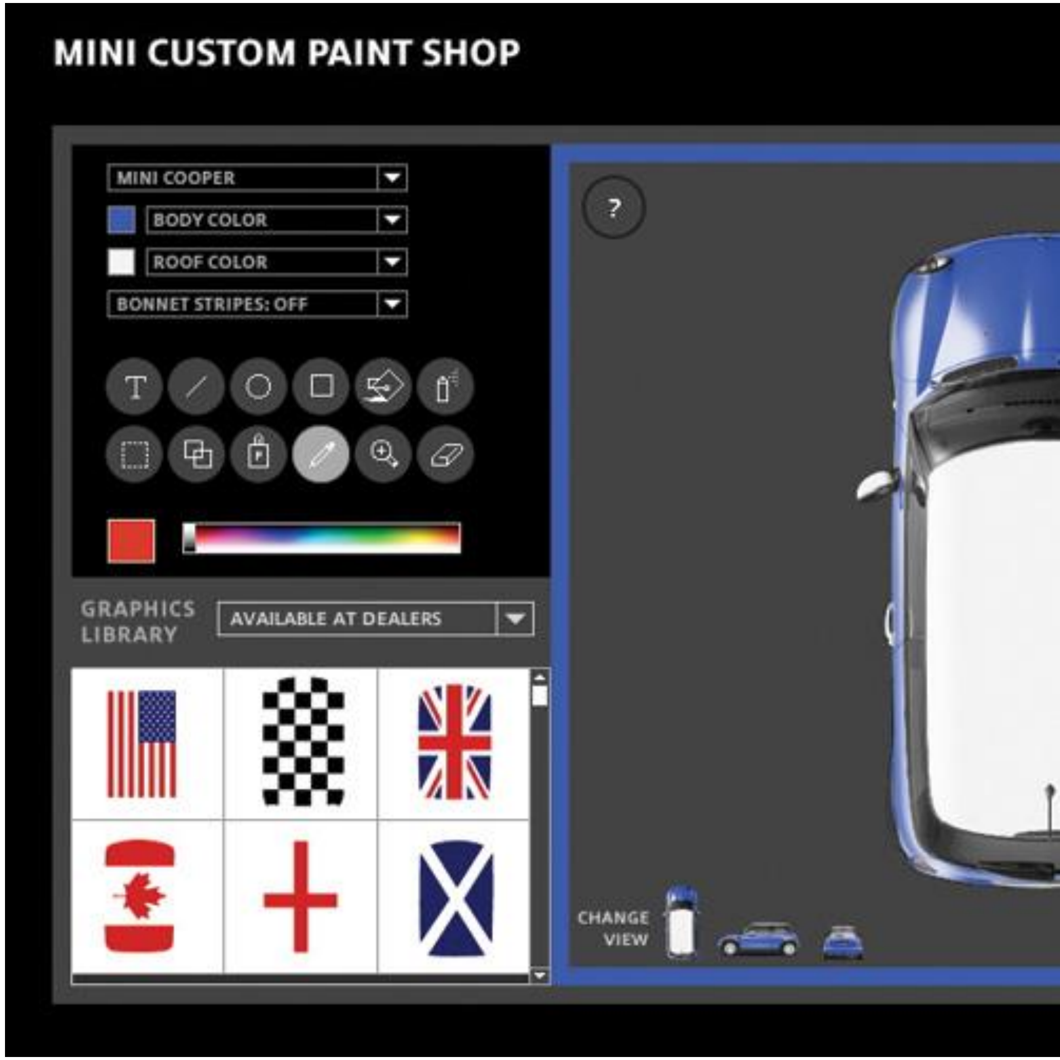
Industry 4.0 is the paradigm of **connecting** different kinds of physical <u>devices</u> enriched with <u>embedded electronics</u> to a **<u>network or internet</u>** so they **<u>interact</u>** (man to machine or machine to machine) facilitating **IT-enabled mass customization** in manufacturing



Mass customization

Production strategy of goods and services geared towards satisfying the individual needs of customers and **simultaneously** preserving the efficiency of mass production (low production costs and thus low selling prices)

The strategy assumes that manufacturing companies have considerable flexibility in the production and assembly stages and interact with customers; these communicate their specific needs or choose the desired product configuration from the many possible alternatives.



Key concepts of Industry 4.0

Transformation of manufacturing processes with the help of IoT platforms into **cyber-physical systems** that are increasingly adaptable, digitalized, interconnected and demand-driven.

This process allows for customized personalized and high quality products

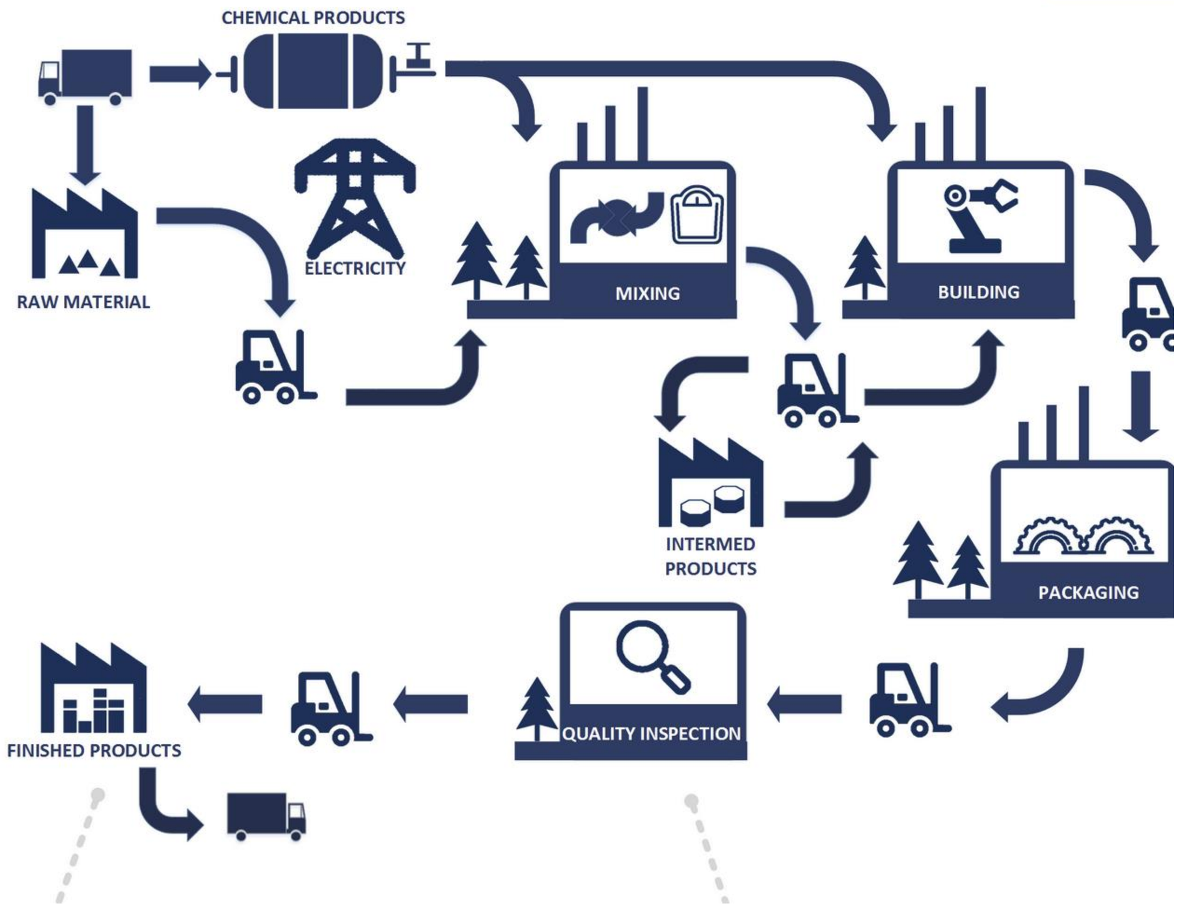
Source: Tao et al., 2019

Key concepts of Industry 4.0

For Industry 4.0 production, it is essential to implement both **<u>horizontal and vertical integration of the value network and the production</u>** inside the factory

Dynamic workflows:

- Customer involvement in the process
- Intelligent communication systems in demand, production and logistics (extended supply chain)
- Connect and exchange information throughout the value chain
- Networking *within* the company from the manufacturing level (e.g. manufacturing sites) to the market level through IT systems



Key concepts of Industry 4.0

The Connected Factory in Action

INNOVATION

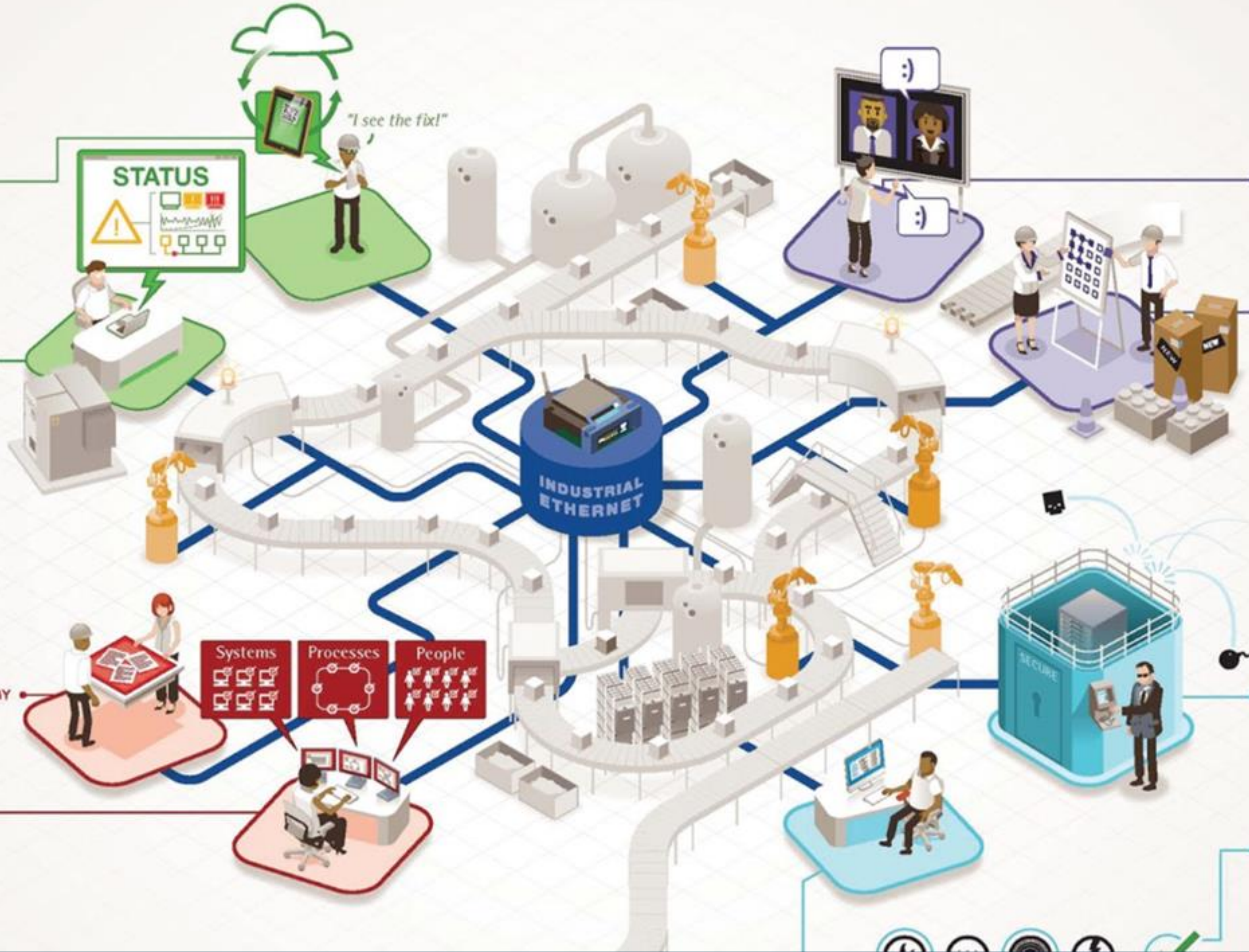
TAP COMMERCIAL INNOVATION
Mobilize employees and supervisors to move across the factory floor and access data wherever they are. The iPad and other like devices are making their way into industrial settings — along with an expectation that much of the commercial innovation it brings will also apply to industrial activities.

CONNECT ENGINEERS WITH MACHINES (M2M)
Apply predictive maintenance. Gain early warnings when production, machinery or network performance is about to degrade.

EFFICIENCY

LINK INFORMATION & OPERATIONAL TECHNOLOGY
Bridge the gap from data center to control room to collaborate and share best practices and common goals between manufacturing and IT.

OPTIMIZE ASSETS
Identify where your people, equipment, works in process and finished goods are in real-time. Adjust the schedule and inventory on the fly.



AGILITY

CONNECT & COLLABORATE EXTERNALLY
Extend visibility beyond your four walls. Link the extended supply chain and distribution to create dynamic workflows. Help and expertise are available in an instant.

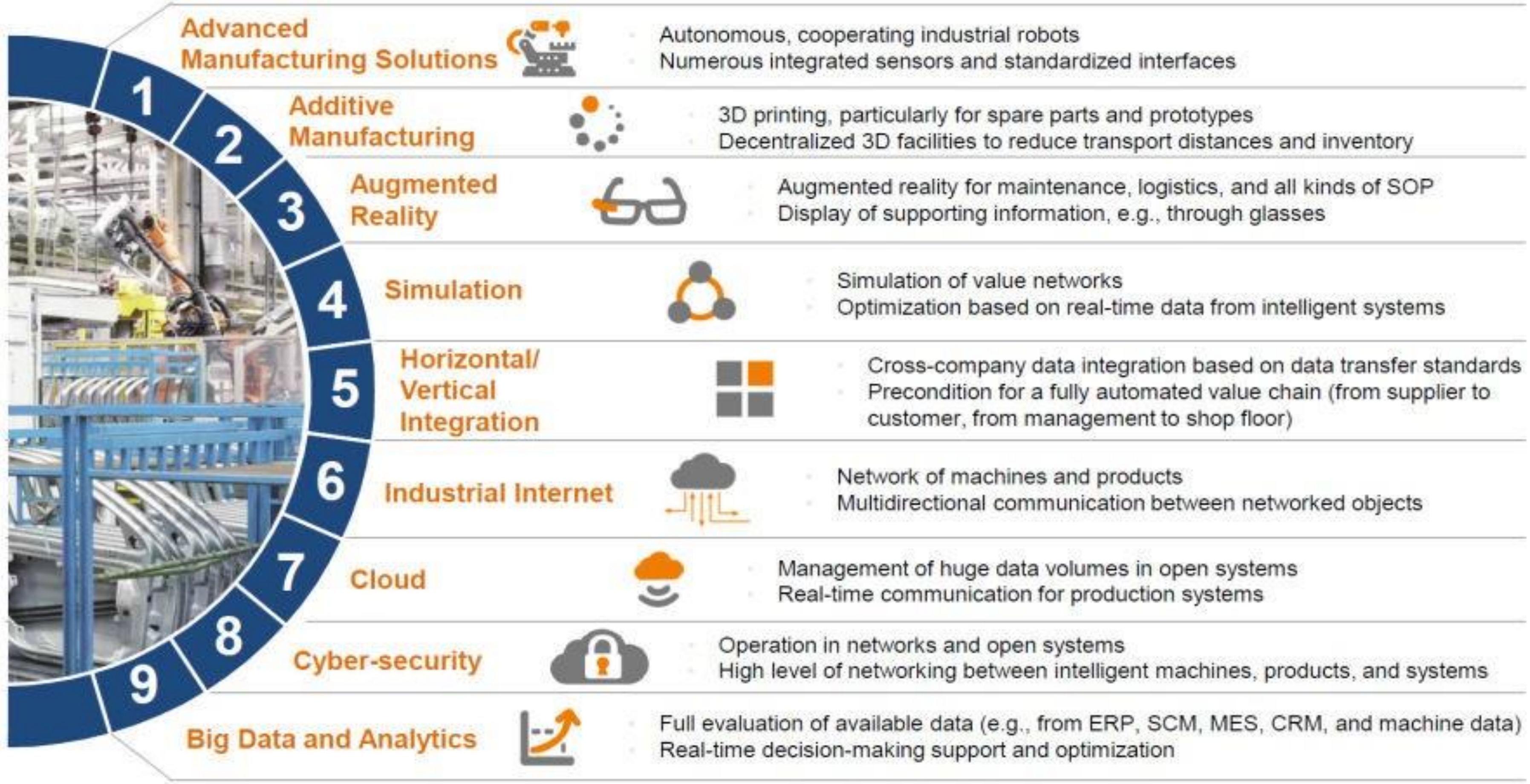
EXPANDABLE INFRASTRUCTURE
Design and build an Industrial Ethernet infrastructure to minimize cost and effort to expand or improve processes. One infrastructure for safety, control, SCADA, Physical Security, and LAN.

RISK

SECURE PHYSICAL & CYBER ASSETS
Traditional security devices, like keypad entry systems, call boxes and security cameras, need power from Industrial Ethernet cables, with secure networks, to protect your processes, people, and plans from cyber sabotage.

MAXIMIZE UPTIME
Design ruggedized industrial networking infrastructure that will endure in harsh environments with redundant communications, power and configuration backup — especially for business processes

Industry 4.0 technologies



Source: Boston Consulting Group (BCG)

Industry 4.0 levers & value drivers

Source: Mc Kinsey & Co.

Industry 4.0: the origins

The term **Industrie 4.0** was used for the first time in 2011 by a team of scientists the German Academy of Sciences and Engineering (Acatech)

An initiative taken by the German government in November 2011 as part of the broader **High-Tech Strategy 2020 Action Plan**

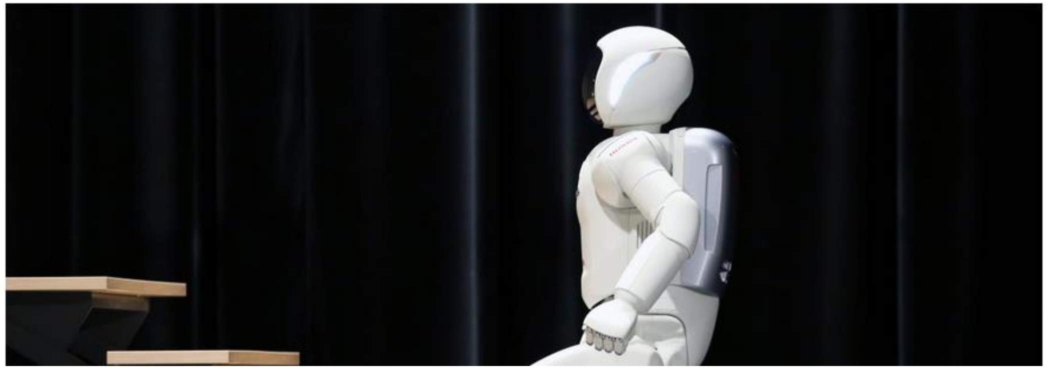
Its aim was to **define and implement a strategy of digitization of national manufacturing**, to be carried out through innovation projects and then technology transfer within 10-15 years, to deliver leadership in the German manufacturing industry in the following decades

FOREIGN AFFAIRS

The Fourth Industrial Revolution

What It Means and How to Respond

By Klaus Schwab December 12, 2015



Klaus Schwab, executive chairman of the World Economic Forum (WEF), introduced the phrase to a wider audience in a 2015 article published by Foreign Affairs.

Industry 4.0: the origins

"Mastering the Fourth Industrial Revolution" was the 2016 theme of the World Economic Forum Annual Meeting, in Davos-Klosters, Switzerland

On October 10, 2016, the Forum announced the opening of its Centre for the Fourth Industrial Revolution in San Francisco.

WORLD ECONOMIC FORUM

Media | News Releases

New Forum Center to Advance Global Cooperation on Fourth Industrial Revolution

Published

10 Oct 2016

2016

Share

Adrian Monck, Public Engagement, Tel.: +41 79 615 16
Email: adrian.monck@weforum.org

· The World Economic Forum will announce today at 15.
Pacific Time the opening of its new Center for the Fourt
Industrial Revolution in San Francisco

· The Center will be dedicated to advancing the global conversation on science and technology governance for the benefit of society at large

National Industry 4.0 Plans

- **March 2017**: France, Germany and Italy initiate a trilateral cooperation to promote the digitisation of the manufacturing sector and to support the European Union's efforts in this area.

- The cooperation brings together the **implementing bodies of the national strategies for Industry 4.0**:
  - Plattform Industrie 4.0 for Germany
  - Alliance Industrie du Futur for France
  - Piano Impresa 4.0 for Italy

- **Shared Action Plan** – a joint roadmap for trilateral cooperation on digitizing the manufacturing industry (Turin, 20 June 2017)

National Industry 4.0 Plans

Three **working groups** (WG):

WG1 –**Standardisation** - Lead: Plattform Industrie 4.0 (Germany)

Goal: to identify relevant technical standards for the digitization of manufacturing, and to propose forms of harmonization of the regulatory framework.

WG2 -**SMEs Engagement** and testbeds - Lead: Piano Impresa 4.0 (Italy)

Goal: Supporting the digitization process of SMEs, by mapping, promoting and networking relevant **use cases** for I4.0 technologies in the three countries.

WG3 -**European-level policies supporting group** - Lead: Alliance Industrie du Futur (France)

Goal: to exchange best practices in policy programmes and related implementing measures, and to develop coordinated positions in international forums, with particular reference to EU bodies.

National Industry 4.0 Plan (Impresa 4.0)

Strategic measures

Innovative investments

>10 bn €
private investments increase in 2017/18

+11 bn €
R&D&I private expenditure over the '17-'20 period (exceeding 2% of GDP)

+2,6 €B
volume of early stage investments mobilized over the '17-'20 period

Skills

200.000
academic students and **3.000** managers qualified on I4.0 topics

+100%
Doubling students attending vocational schools on I4.0 topics

~1,400
Industrial PhDs focused on I4.0 (out of ~5.000 included in NRP[1])

Setup of National Competence Centers

Complementary measures

Enabling Infrastructures

100%
of Italian companies with access to 30 Mbps connectivity within 2020

50%
of Italian companies with access to 100 Mbps connectivity within 2020

6 consortia
regarding IoT standards , monitored by Italian representatives

Additional measures

+1 bn €
Reform and refinancing of Public Guarantee Fund for 2017

+1 bn €
Support measures on large scale investments focused on I4.0

+0.1 bn €
Strong investment on digital sales chains (Made in Italy plan)

Strengthening of productivity-salary taxation exchange

Digital Transformation (DT)

At its inception, predominantly discussed in the information systems literature (Unified Theory of Technology Acceptance and Adoption)

More recently, increasing attention has been paid to DT by management scholars and multidisciplinary researchers

Evolution from a focus on the technological aspects of DT (IT-enabled transformation) **to a wider view** that encompasses its **strategic, managerial, and organizational implications**

Digital Transformation (DT)

In contrast to IT-enabled organizational transformation, which focuses mainly on the optimization of operational processes within organizations, **DT transcends the boundaries of organizations:**

- **DT (re)defines an organization's value proposition** and even implies the development of **new organizational identities**
- **DT is expected to have (positive and negative) implications** that go beyond the organization's immediate remit and impact society in its broadest terms.
- **DT affects individuals** both within and outside those companies embracing digital technologies, as well as **organizational business models, platforms and ecosystems, industries** (Autio et al., 2018).

DT definitions

The majority of studies in innovation management focus on DT at the organizational level

Verhoeg et al., 2019: " The adoption of digital technologies and the replacement of non-digital processes with digital ones, leading to organization-wide changes and the emergence of new business models, or the modification of existing ones"

Hess et al. (2016) :"*the changes that digital technologies can bring to a company's business model, products, organizational structures, or processes*".

Nadkarni and Prugl (2020): "*organizational change triggered by digital technologies,*"

Hanelt et al. (2020): "*organizational change that is triggered and shaped by the wide-spread diffusion of digital technologies*".

Crucially, this overlooks other levels of analysis

Defining DT as a multi-level phenomenon

*DT involves a **socioeconomic change** across individuals, organizations, ecosystems, and societies that is **shaped** by the adoption and utilization of **digital technologies***

Key elements in this definition:

"socioeconomic change" (expressing the multi-level nature of the phenomenon),

"shaped" (referring to the overarching role of DT beyond the mere triggering),

"digital technologies" (which can be causes, contingencies, and outcomes of the sociotechnical change).

4 levels of analysis:

Dabrowska et al (2022)

The Individual level

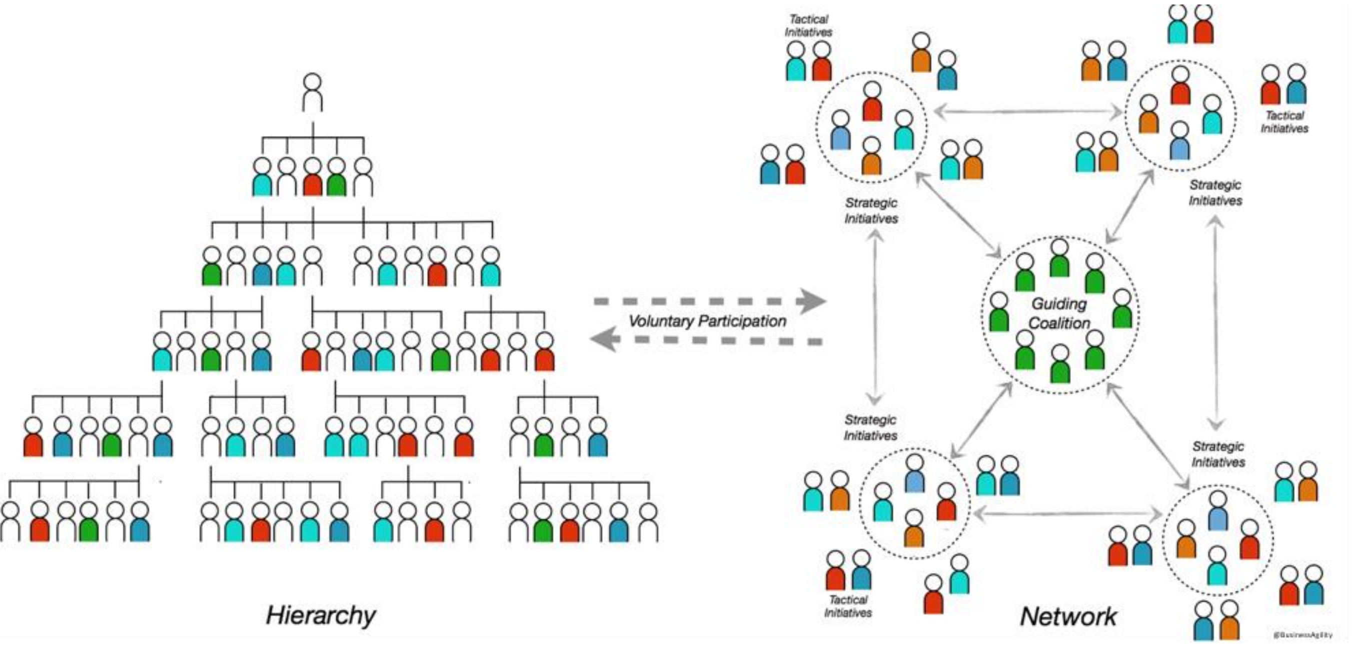
Digital transformation **challenges and changes human behaviour, knowledge processing capacity and skills/abilities**

An opportunity and a threat:

- Digital empowerment vs. forced adoption
- Digital immersion vs. resistance and avoidance

The social dilemma of digitalization: inclusion vs. exclusion

Dabrowska et al (2022)



The Organizational level

Digital transformation **challenges and changes organizational processes, models and structures:**

- An organizational renewal opportunity vs. an externally forced change
- Organizational transformation vs. organizational disruption
- Interwining digital and organizational processes vs. digital as separate organizational tools

Digital champions vs. digital laggards

The Ecosystem level

Digital transformation challenges **and changes the connectivity and generativity of organizational actors in ecosystems**

- Digital ecosystems vs. digital transformation of ecosystems
- Digital ecosystem design principles vs. separately implementing DT into ecosystem governance
- Unlocking ecosystem generativity vs. providing connectivity

Digital operability vs. digital scalability

Dabrowska et al (2022)

The Geopolitical level

Digital transformation **challenging and changing national and global institutions, regulations, norms and culture**

Socio-economic transition, opportunity vs. threat:

- Digitalization as means for national/global democreatization vs. surveillance and control
- Digital free market vs mopopoly approach

Economic growth vs. power and control

Strategic and managerial implications of DT

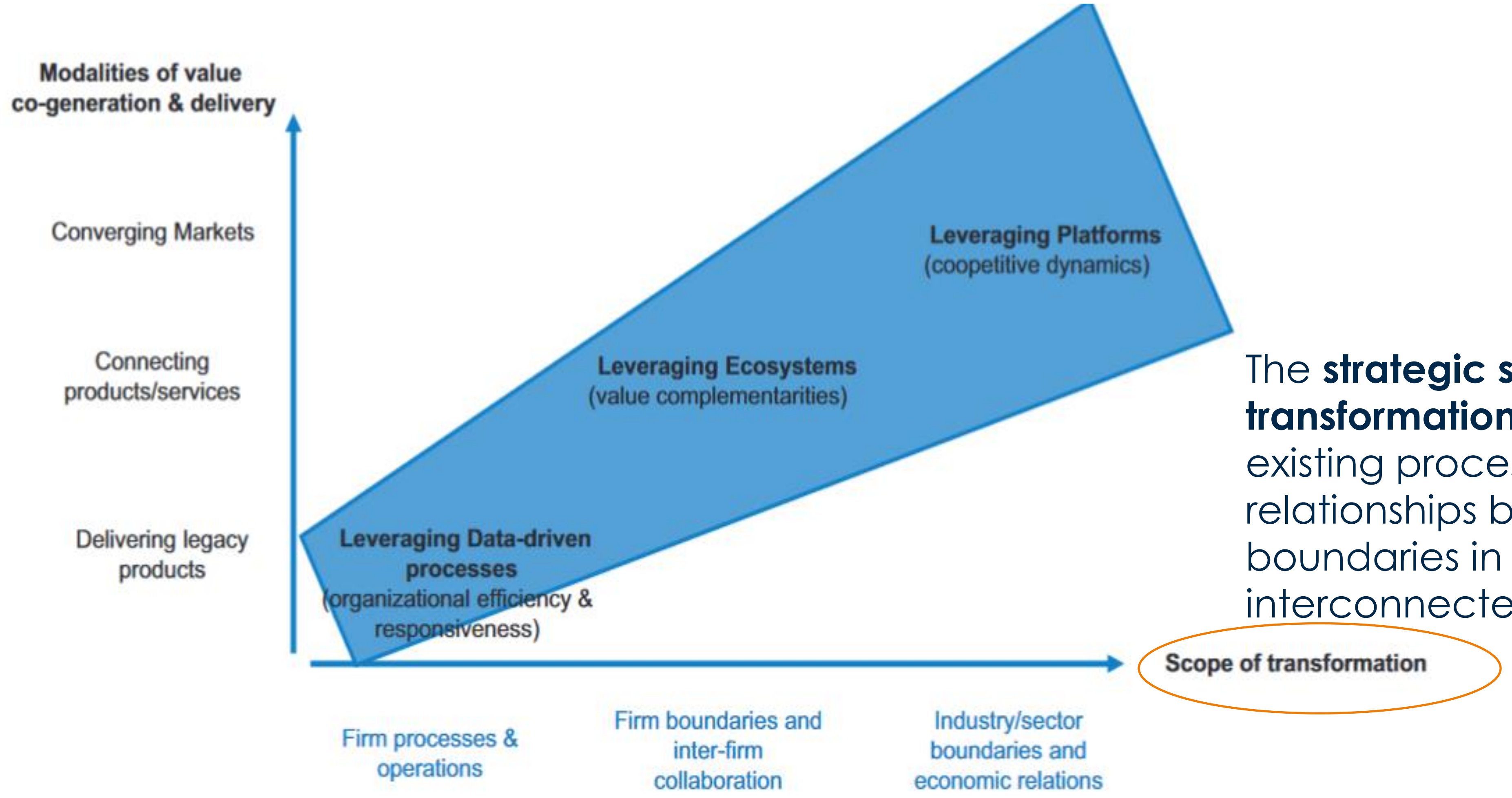
Digital transformation is not just a traditional IT back-end process: it **affects the organization as a whole**

A notable transformation in the firms' boundaries, processes, structures, roles, and interactions: **new ways of organizing firms' value chains and interfirm relationships** (digital ecosystems, digital marketplaces)

Digital artifacts foster:

Generativity — the technology system's "capacity to produce unprompted change driven by large, varied, and uncoordinated audiences"
Modularization - of interfirm collaborative relationships.

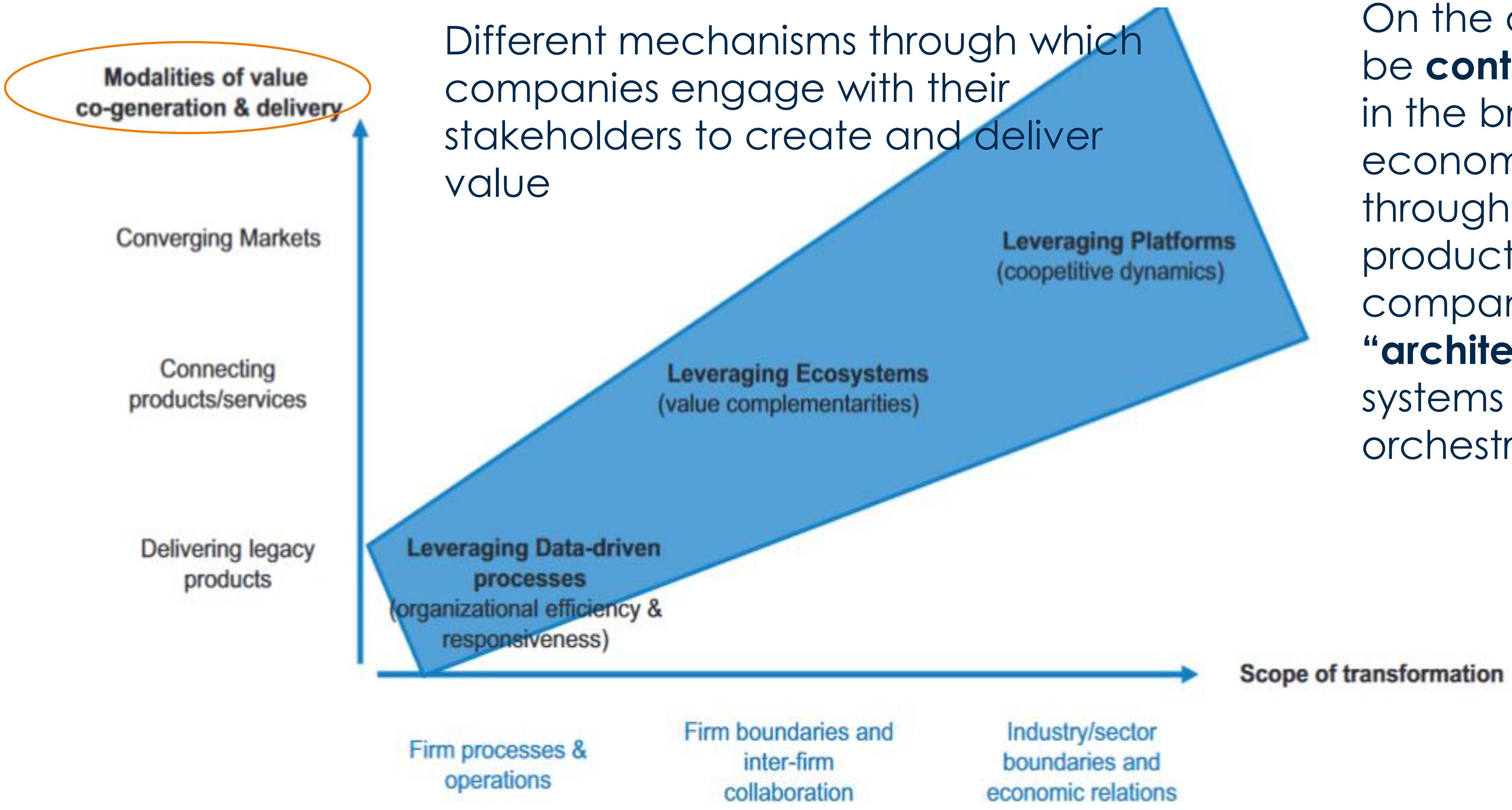
Strategic and managerial implications of DT



The **strategic scope of the transformation** can range from rewiring existing processes to redefining relationships beyond a company's own boundaries in a broader web of interconnected relationships

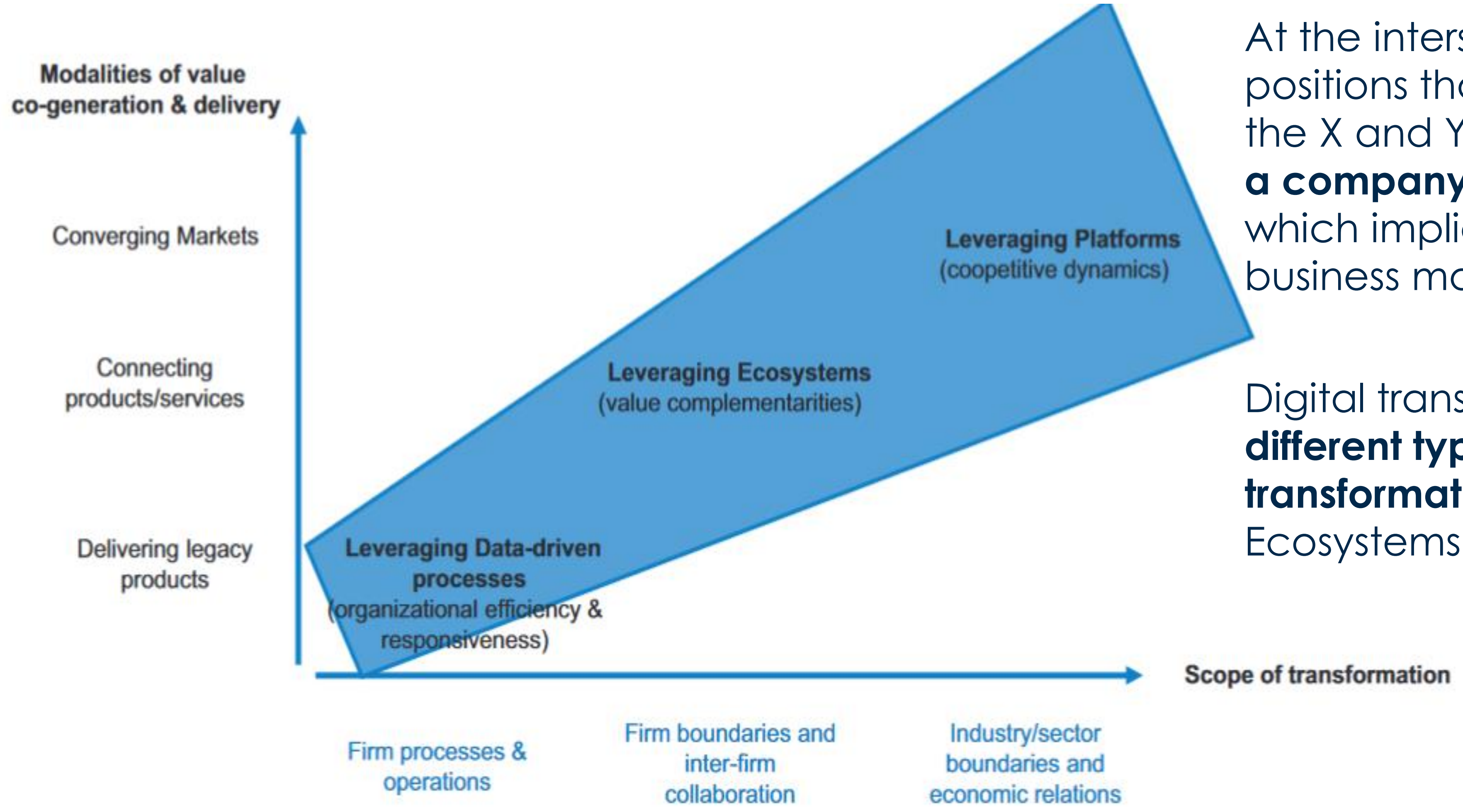
Strategic and managerial implications of DT

Different mechanisms through which companies engage with their stakeholders to create and deliver value



On the one hand, companies can be **contributors** to value co-delivery in the broader new connected economic systems, delivering value through their core, legacy products. On the other hand, companies can become the **"architects"** of entire new value systems by designing and orchestrating ecosystems

Strategic and managerial implications of DT



At the intersections of the different positions that companies can take on the X and Y axes, lay the **key elements of a company's digital transformation,** which implies changes in the whole business model.

Digital transformation results in **three different types of business model transformation:** Data-Driven Processes, Ecosystems, and Platforms.

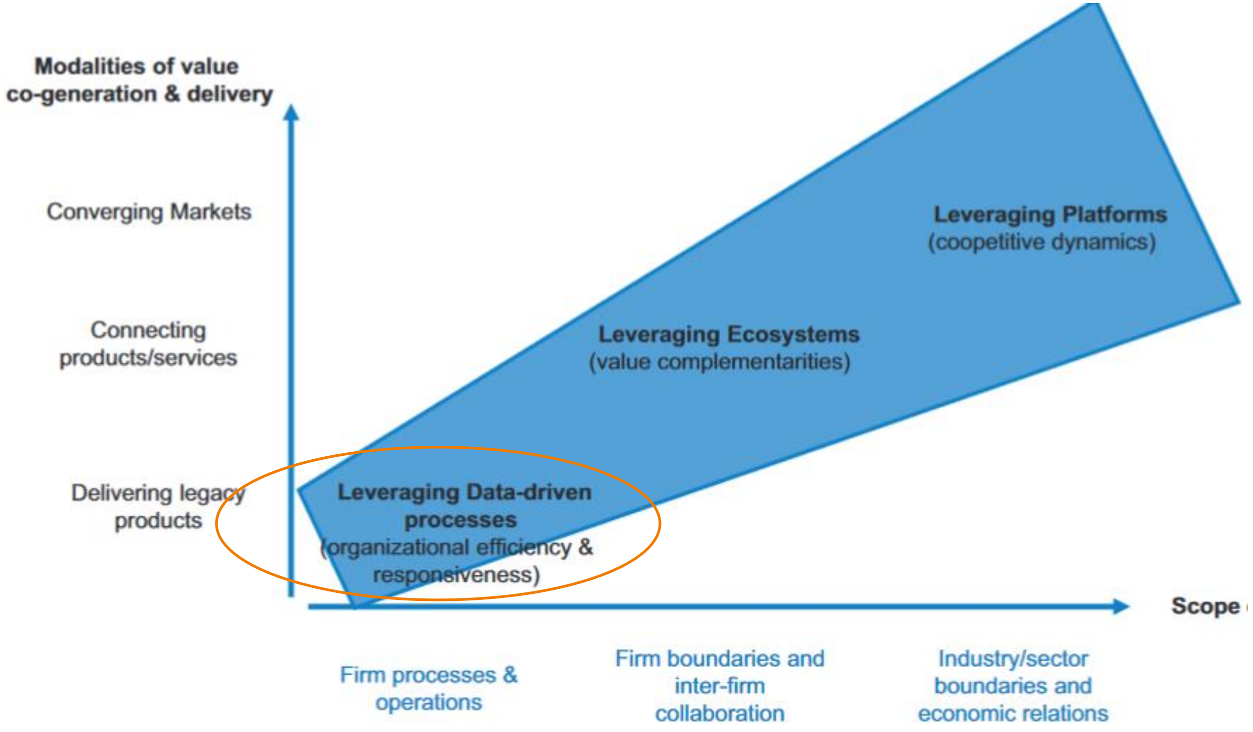
Digital BM : leveraging Data-driven processes

- Imply changes in the internal processes at the level of a firm's operations (monitoring, optimization, efficiency) that are **typical of any shift of a technology**.

- Overall, they happen within the **same management paradigm**.
- **Inward focus:** limited options for value co-creation with external firms

- Firms **enhance market competitiveness** as greater efficiency translates into greater profit margins, and greater organizational responsiveness translates in a higher ability to retain customers

- The firm's **competitive standing might be quickly eroded** to the extent that the industry and the market evolve rapidly toward new value production and delivery models



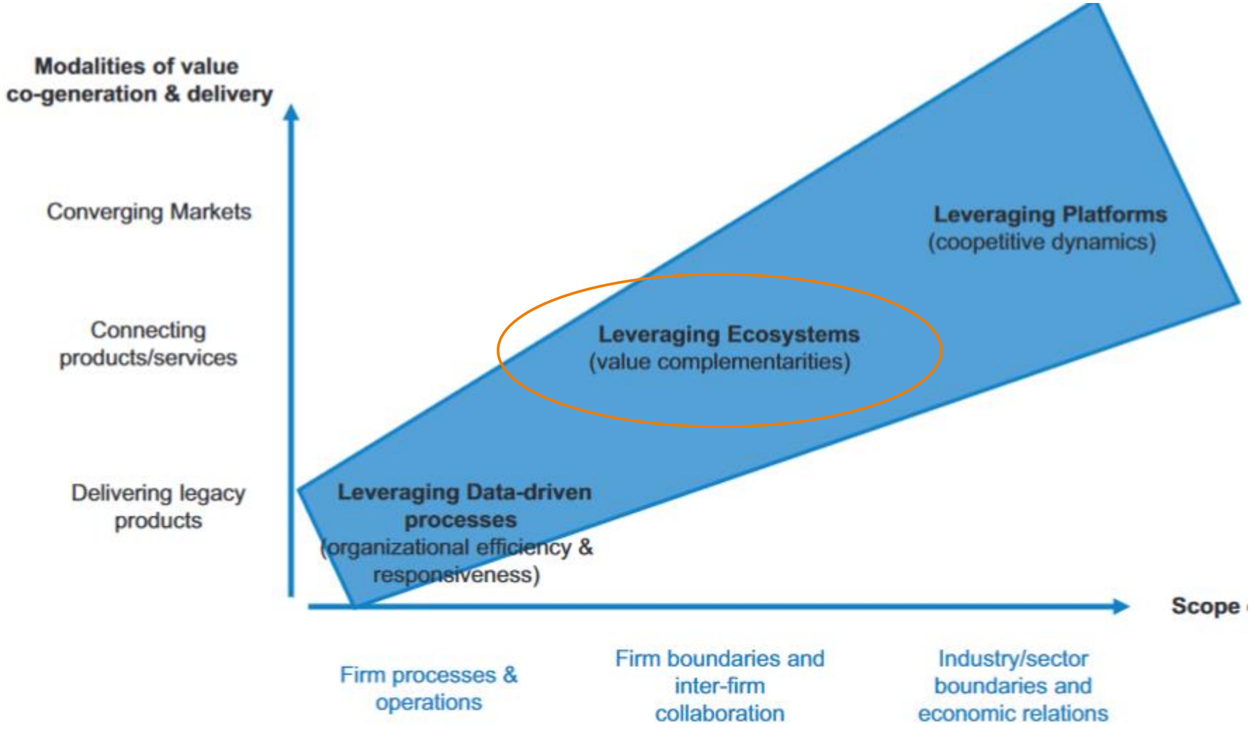
Digital BM adaptation: leveraging ecosystems

- Digital technologies can offer new means to collaborate with other firms, to establish **new interfirm routines** for sharing information and resources

- The **impact** of transformation goes **beyond the firm boundaries**, affecting the level of complementarities across firms' activities and products.
- Besides changing the logic of value creation, this can lead to **increased interconnection and interdependence** across the set of firms forming the ecosystem.

- It allows firms to **coordinate** their activities without the need to form ad hoc hierarchical organizational structures

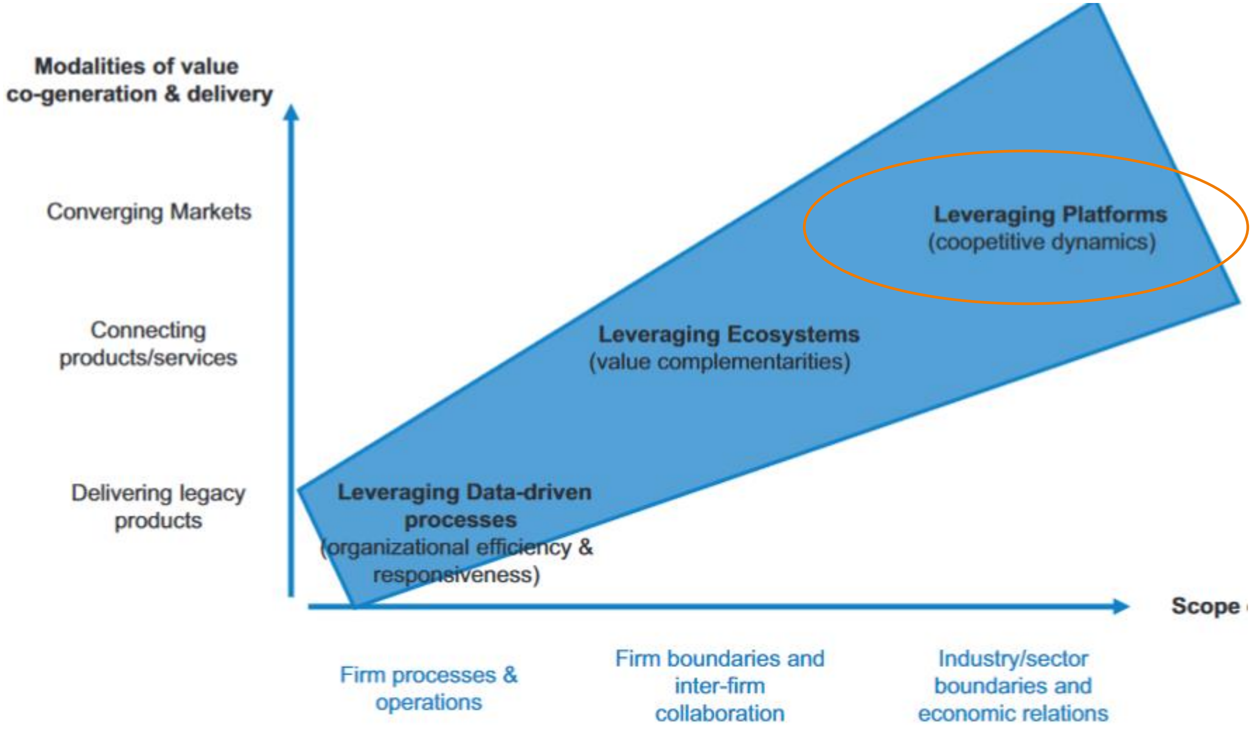
- **Firms in the ecosystem act as a collective enterprise** with open, permeable boundaries; **digitally enabled interfirm routines** offer the new **governance mechanism** to regulate interfirm collaborative relationships and incentives for value production.



Digital BM adaptation: leveraging platforms

Alter the way companies generate and deliver value to final customers therefore **changing the competitive dynamics**

- Transform the shape of a market and expand the overall value by **enabling complementarity between different products** (which then expands the consumption options for customers)
- With value shifting increasingly from a stand-alone product to platform systems, **product market boundaries are no longer relevant** for defining the type and intensity of competition.



- Amazon Marketplace leverages the data traffic generated by its users and providers to facilitate transactions through an efficient matched market;
- Google's Search or Maps leverage their scale and scope to enable the searching and sharing of relevant information

Readings

Dąbrowska, J., Almpanopoulou, A., Brem, A., Chesbrough, H., Marullo, C. [....] & Ritala, P. (2022). Digital transformation, for better or worse: a critical multi-level research agenda. *R&D Management*.

Cennamo, C., Dagnino, G. B., Di Minin, A., & Lanzolla, G. (2020). Managing digital transformation: scope of transformation and modalities of value Co-generation and delivery. *California Management Review*

Msc Data Science and Engineering

Digital innovation, data-based innovation and value creation

Politecnico di Torino
1859
Department of Management and Production Engineering

Contents

Digital innovation and data-based innovation
Characteristics of data as digital entities
Data and digital innovation
The process of data-based value creation
Data and organizations

Readings

Alaimo, C., Kallinikos, J., & Aaltonen, A. (2020). Data and value. In *Handbook of digital innovation*. Edward Elgar.

Alaimo, C., & Kallinikos, J. (2022). Organizations decentered: data objects, technology and knowledge. *Organization Science*,

Digital innovation

“the creation of (and consequent change in) market offerings, business processes, or models that result from the use of digital technology”
(Nambisan et al. 2017, p. 224).

It is driven by the efforts of “carrying out of new combinations of digital and physical components” to produce new market offerings (Yoo et al. 2010, p. 725).

Digital innovation **results** from a continuous flow of **augmenting, expanding, integrating data into infrastructures and broad ecosystems**
Mobile/wearable computing, social media, blockchain, virtual and augmented reality, cloud computing services, data analytics and machine learning, robotics, Internet of Things, 3D printing

Digital innovation **reshapes** the nature, the process and the outcomes of innovation

Digital innovation

Digital technologies have fueled unprecedented **forms of innovation that cut across traditional industry/sectoral boundaries**, embrace networks, ecosystems, and communities, and **accelerate ideation, development**, **and evolution of associated products and services**.

The now common examples of Uber, Airbnb, or new Fintech ecosystems make the point.

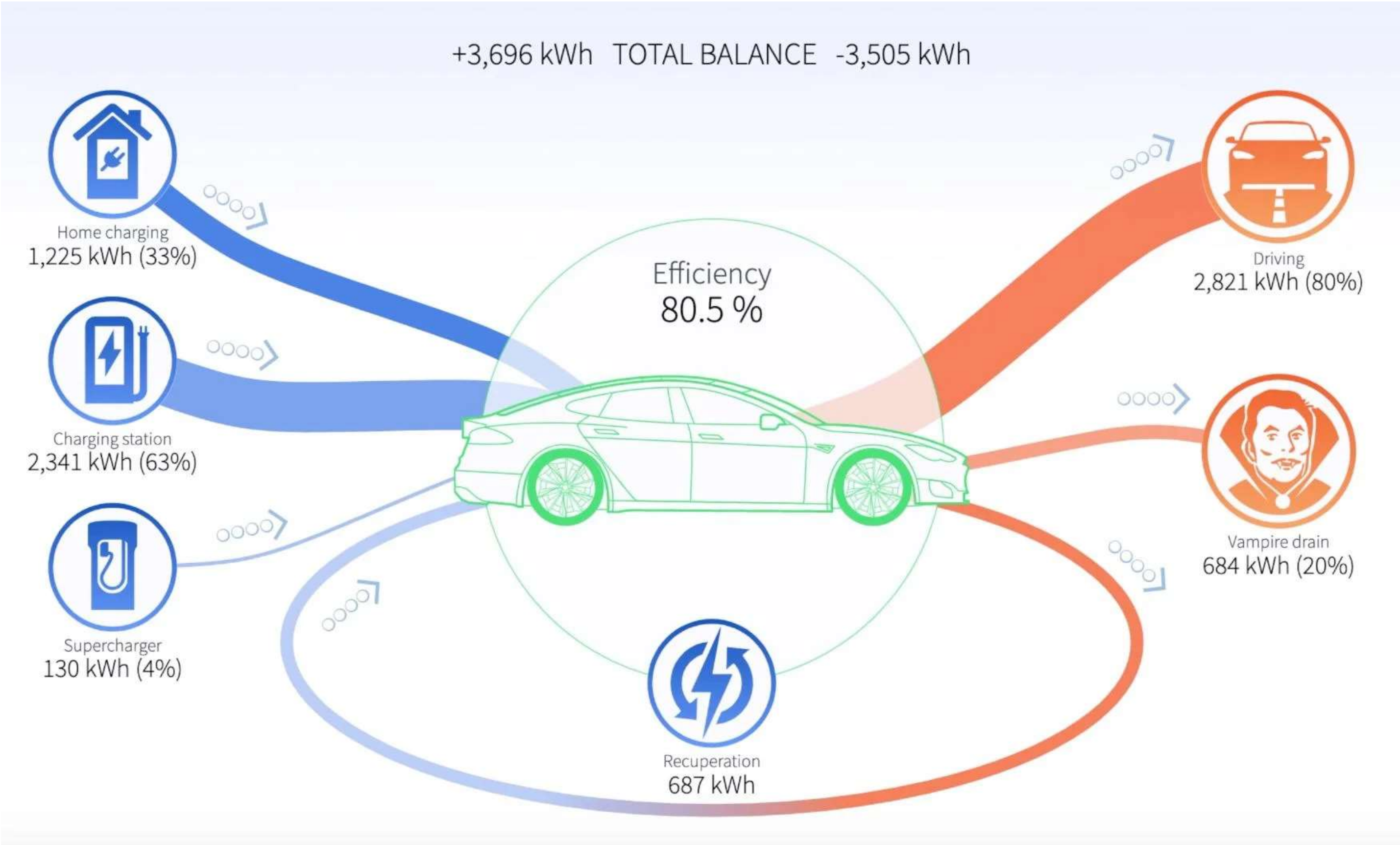
Similarly, the infusion of digital capabilities and resulting **platformization of physical products** (e.g. cars) allows for increasingly fluid and dynamic value propositions that reshape industry structures

Tesla relies on data to improve autopilot, to optimize hardware designs, to proactively detect faults, and to optimize load on the electrical grid.

Tesla collects data from cars, superchargers, and stationary batteries and use it to make these products better and customers safer.

Tesla: automaker or data company?

Since 2018, Tesla has collected over 3 billion miles of real world driving data



AI Factories

- **Human dispatchers** decide which car is chosen

- **Human centered** decisions (e.g. loans)

Uber

- **Algorithm** decides which car is chosen

蚂蚁集团
ANT GROUP

- Built on Digital Core
- **No Humans on its critical operations** (*AI runs the show*)
- Serves 10x customers of the largest US bank with 1/10 of employees

Managerial decisions are embedded in software, which digitizes many processes that have traditionally carried out by humans

Data pipelines

Organizations *gather, input, clean, integrate and safeguard data in a systematic, sustainable and scalable way*.

- Data is the **essential input** of AI factories.
- Companies are **"*datafying*"** industries = *systematically extract data from transactions that are naturally ongoing in any business*.

- Receives Millions of Ratings per day.
- Receives Several Millions stream play per day (including duration, device...)
- Each item in databases have rich metadata (e.g. actors, genre..)
- Other than internal data, Netflix gather information from external sources (e.g. critics)

Efficient pipelines rely on **integrated data sources**, **consistent information**, **clean data**

Netflix. From content distribution to content generation

"We have projection models that help us understand, for a given idea or area, how large we think an audience size might be, given certain attributes about it. We have a construct for genres that basically gives us areas where we have a bunch of programs and others that are areas of opportunity."
Cindy Holland, vice president of original series at Netflix

Five years after Netflix's gamble with "House of Cards," the company plans to release about 700 original TV series, movies and other types of programming around the world this year. [2018]

Netflix teases 'fitting end' to defining series 'House of Cards'

By Lisa Richwine 3 MIN READ

BEVERLY HILLS, Calif. (Reuters) - A Netflix Inc executive promised on Sunday a "fitting end" to the streaming service's acclaimed political drama "House of Cards" but did not divulge how the series wrote out scandal-tainted star Kevin Spacey.

Slideshow (2 images)

A broadened perspective on (digital) innovation

Due to its encompassing nature and potentially deep effects across settings, technologies, and organizational functions, **digital innovation is a transdisciplinary topic**.

- It **questions many paradigmatic assumptions held in social science and management fields** (economics, psychology, sociology, communication, marketing, entrepreneurship, strategy, organizational behavior, finance, design, cognitive science, technology management, information systems, public policy, and social welfare).

-it **calls for closer collaboration with computer science, data analytics, and software engineering**
to understand the nature, architecture, and features of emerging technologies and to evaluate more faithfully their potential effects.

Source: Nambisan et al. 2020

A broadened perspective on (digital) innovation

As the fusion between digital and physical expands its scope, **digital innovations fuel and are fueled by previously remote fields**
e.g. engineering (mechanical, material, and chemical), science (physics, chemistry, and biology), and medicine.

Also, as **the impact of digital innovations penetrates every aspect of human lives** beyond organized economic activities:
it calls for collaboration with scholars in fields such as humanities, law, education, and journalism.

Such a broadened perspective emphasizes the need of a more realistic and coherent **understanding of the implications of digital innovation**
on economic, social, behavioral, political, legal, technological, scientific, moral, and ethical, and scientific issues.

Source: Nambisan et al. 2020

Digital goods

Digital innovation and value creation are conditioned by the intrinsic **attributes of digital artifacts**.

Digital artifact in information science, is any undesired or unintended alteration in data introduced in a digital process by an involved technique and/or technology.

Digital artifact can be of any content types including text, audio, video, image, animation or a combination of them.

In computer and information science, ***ontology*** is a technical term denoting *an artifact that is designed for a purpose*, -> to enable the modeling of knowledge about *some* domain, real or imagined.

Source: Alaimo et al. 2020

Digital goods

Digital innovation and value creation are conditioned by the intrinsic **attributes of digital artifacts**.

Contrasting with the fixed constitution of physical things, digital artifacts are ***interactive***, ***expandable*** *and* ***refigurable*** *(designed to enable the modeling of knowledge about some domain.*

These ***ontological* attributes** join hand with the ***economic* qualities** of digital goods:

- Non rivalry
- Editability
- Portability
- (Instability)

Source: Alaimo et al. 2020

Digital goods

NON RIVALRY - Like all digital goods, digital data are claimed to be ***nonrival goods*** (non-depletable upon use)
Therefore, **data are infinitely reusable**.

EDITABILITY - Data are perpetually editable:
Being a medium of signification and representation, digital data are steadily revisable, pliable, renewable, expandable [...]

Source: Alaimo et al. 2020

Digital goods

PORTABILITY - In the context of the Web and the online ventures it allows, **data are portable across settings, platforms and organizations**

Thus by implication, data are **re-contextualizable**: it possible to use data to tell stories other than those linked to their origin and "conventional use"

INSTABILITY - The attributes of editability, portability and re-contextualizability accentuate the problems of **status, meaning and referential instability of data.**

The attributes of data as digital goods introduce additional **decouplings between the content data carry and the economic or organizational realities to which that content is supposed to refer**

Source: Alaimo et al. 2020

Data and digital innovation

Innovation has always been contingent on the ability to combine different resources and technologies

Major industrial redefined and largely expanded the *modes* through which industrial components and technologies could be *brought to bear upon another*, and catalyzed massive innovation across industrial and social fields

Still, a case can be made that, **as distinct from their predecessors, digital artifacts** are characterized by the far looser coupling or **unbundling of the *function(s)* they perform from whatever material foundation** (e.g. an IT system)

Data is created, *constructed*, it is not like a resource (an object)

The relative independence of apps, web pages or audio files from their hosting devices or systems is the case in point.

Source: Nambisan et al. 2020

Data-based innovation

The low dependence on their material substrate (the function(s) they perform within e.g. components) renders digital artifacts able to **transcend the technological trajectories** of the engineering principles on which different families of industrial goods are usually based.

Example: Spare parts of industrial goods are usually substitutable or re-utilizable only across a range of <u>similar</u> goods or components.

A software library or plugin, by contrast, may in principle be used <u>across</u> a far larger spectrum of functions, components and services.

These conditions, establish a greater **freedom of (re)combination**

Source: Alaimo et al. 2020

Msc Data Science and Engineering

Data-based innovation and value creation

Politecnico di Torino
1859
Department of Management and Production Engineering

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Source: Alaimo et al. 2020

Data as the engine of transformative development

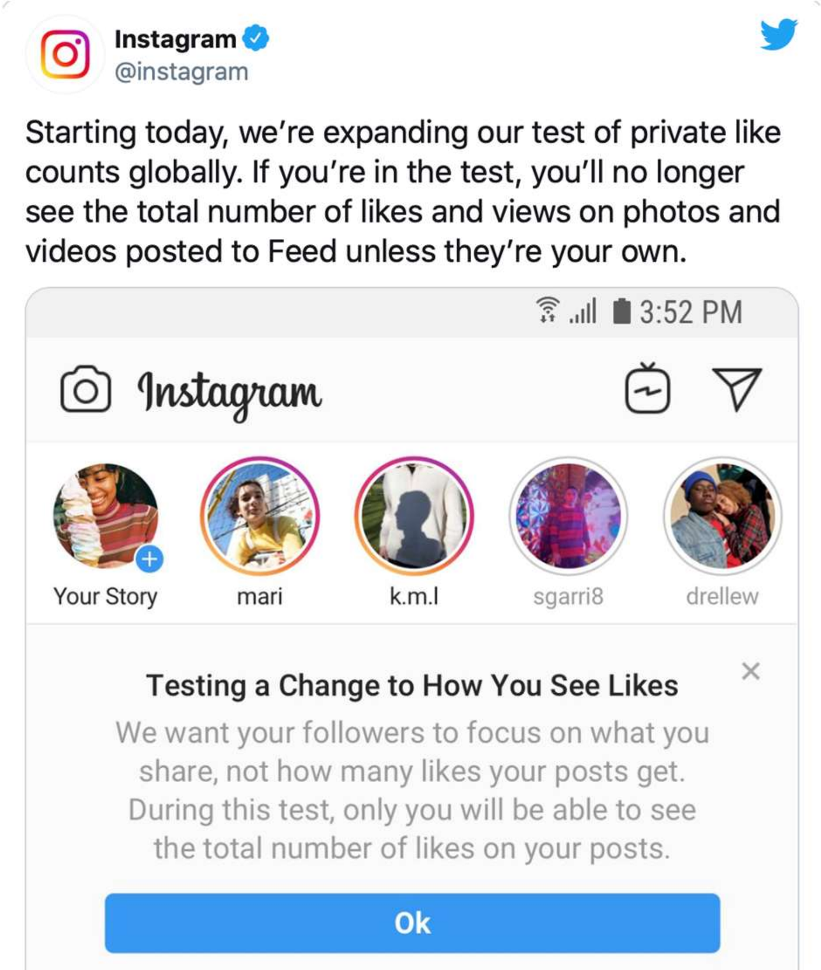
Unleashed from the physical bounds, **the functions of digital artifacts are potentially recombinant at a far larger scale** and across different types of product fields

The difference between innovation and transformation:

- digital technology not only profoundly changes traditional technology (e.g. photography) but also **creates new behaviours and new types of business that did not exist** (e.g. instagram)

-value is created along paths in which **actors' involvement with systems and artifacts take other forms than just recombination**

Experimentation platforms



Experimentation Platform: *mechanism through which hypotheses regarding new predictions and decisions ensure that business implications suggested by algorithms have the* ***intended*** ***causal effect****.*

Data as a *medium*

While often treated as resources (objects), the role data play in digital innovation cannot be addressed to recombinant innovation and architectural principles such as modularity.

Data are not components of larger entities: only seldom they embody functions (such as those of components).

Data are carriers of facts, sign tokens of **actual or potential meanings**, media through which people construct and share the realities they confront.

In dealing with digital innovation and value creation, the root metaphor should not be construction but **meaning** or **knowledge making.**

Source: Alaimo et al. 2020

Data as a *medium*

Data are sign tokens used to describe, index, represent or perform reality.

Server logs, transaction records, likes on social media are (simple!) examples

Due to their nature as marks, data are by definition **cognitive elements** that fulfil a different function than that of modules.

- Being marks, they operate at a far more elementary or granular layer of reality than that of bigger functional entities, such as modules or components
- Data seldom have a self-sufficient functionality of modules or components (pre-requisite for recombinant relations in innovation)

Data-based innovation

The underlying purpose of data-based innovation is not the making of a composite entity, -a product, out of smaller functional pieces- but **learning and discovery** *via* reading, inferring or predicting.

Insight and **knowledge** emerge out of the exploration of the content (information) data carry.

Data are seldom *resources* (that can be handled, or repackaged) but, crucially, ***a medium of signification*** (representation, design …)

For this reason, data-based innovation and value creation are processes of **writing** and **reading**, attribution/**inference making:** broadly, **meaning and knowledge construction**.

Source: Alaimo et al. 2020

Data-based innovation and digital innovation

Though closely associated, **digital and data-based innovation should not be conflated with one another**.

Data are not software modules (even though they need computer programs to produce, store and, more generally, deal with):

a ***datum*** operates at a far more granular level as a **mark** that **encodes** an **incidence** that is **recorded as a singular instance for further use**.

Server logs, transaction records, or likes on social media put together can scarcely become programs or, more generally, components of larger entities in the sense of recombinant innovation.

Source: Alaimo et al. 2020

Data based value creation

In *the context of large volumes of data* (big data), *innovation and value creation are aided by statistics* and other technological operations that extract, transform or parse chunks of data.

This does not alter the fundamental fact that **data-based value creation is meaning-contingent**.

Source: Alaimo et al. 2020

The debate on data analytics

This is by large a specialized debate on the statistical tools and techniques for crunching data with the view of extracting patterns (data mining) between data items that may not be immediately discernible or available.

Data analytics copes with data as predominantly **technical entities** that can be variously processed, cross-referenced, clustered and computed by mostly automated processes to deliver one or another insight.

While tacitly assumed to be carriers of meanings and knowledge, in practice, **meaning** as data-contingent process of knowledge development and value creation **is not explicitly analyzed.**

Data-based value creation is an economic and semiotic process at the same time, in which <u>utility</u> and <u>meaning</u> steadily cross one another

Source: Alaimo et al. 2020

Data based value creation

Data-based value creation is meaning-contingent.

Most work with data is about drawing **insights, inferences or predictions** from them, *even though critical operations by which these aims are pursued are standardized or even automated*.

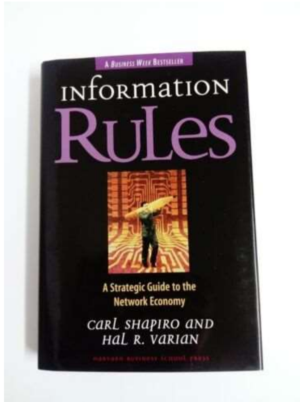
For these reasons, **understanding data-based value creation** requires a serious confrontation with **what sort of entities digital data are**

Source: Alaimo et al. 2020

Characteristics of data as digital entities

- Non rivalry
- Editability
- Portability
- (Instability)

Non-rivalry



Like all digital goods, digital data are claimed to be ***nonrival goods*** (non-depletable upon use) (Shapiro and Varian 1999)
Therefore, **data are infinitely reusable**.

This attribute of data has several **implications**:

- data-based goods can be costly to produce but, once in place, they can be reproduced or re-used as final goods or resources for the production of other goods with little or no additional cost
- data are assumed to be ubiquitous, yet hardly more than a resource, component or commodity variously implicated in the dealings of the actors involved
- Linked to the concept of scarcity (which it challenges), non rival quality of digital goods can be drawn upon to develop economic propositions which are very different compared to those that mark the economics of industrial age

Source: Alaimo et al. 2016

Editability

Data are perpetually editable: **editability is a pervasive quality of data:**
Being a medium of signification and representation, digital data
are steadily revisable, pliable, renewable, expandable […]).

Data-based innovation and value creation are linked to data editability:
Key instances of editability - Aggregation, filtering, reordering and expansion of data are all essential steps in data-based innovation and value creation affording a **renewable** repository of meanings

Source: Alaimo et al. 2016

Portability (re-contextualizability)

In the context of the Web and the online ventures it allows, **data are portable across settings, platforms and organizations**

Thus by implication, data are **re-contextualizable**: it possible to use data to tell stories other than those linked to their origin and "conventional use"

Taken together, these attributes render digital data amenable to steady shifts and changes that condition their utility and economic relevance

Source: Alaimo et al. 2016

Instability of data

The attributes of editability, portability and re-contextualizability accentuate the **problems of status, meaning and referential instability of data**.

The attributes of data as digital goods introduce additional **decouplings between the content** data carry **and the economic or organizational realities to which that content is supposed to refer**

This further perplex their meaning and relevance.

These conditions are present across most industries in which data currently play a key role but acquire **particular importance in the case of platforms that do not trade physical products nor services**.

Source: Alaimo et al. 2016

Evolution of TripAdvisor

TripAdvisor, does not trade hotel rooms or places, but *information about rooms and travels* computed out of various types of constantly updated data sources (e.g. room availability, reviews and ratings, other user generated content, transaction data)

Alone or in combination these data are amenable to wide interpretation.

- Kick-off: Search database and travel advertising platform
- Social Media Platform and Inter-Platform Connectivity. Travel reviews and options, places review. Inside: share insights on locations
  Go lists: publish lists of places where people travelled.
- End-to-end service ecosystem: Hotel price comparison; Instant booking and instant reservation. Travel agency features (Viator)

Source: Aaimo et al. 2016

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Characteristics of data as digital entities

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- **Editability**
- **Portability**
- **(Instability)**

Economic Relevance of Data-based Goods

The issue of value creation recur time and again in the industry contexts where data support the goods/ services or goods that are produced and exchanged (digital platforms and social media)

- What is the value, social relevance and reality purchase of reviews and ratings of hotels and places in TripAdvisor or other platforms?
- What does a hotel popularity index in fact represent?
- To which degree does a user browser activity tracked by cookies represent individual human user behavior at the other end?
- How similar are users portrayed as similar on the basis of their clicking behavior on music social media platforms such as Spotify or Last.fm or film streaming platforms such as Amazon or Netflix?

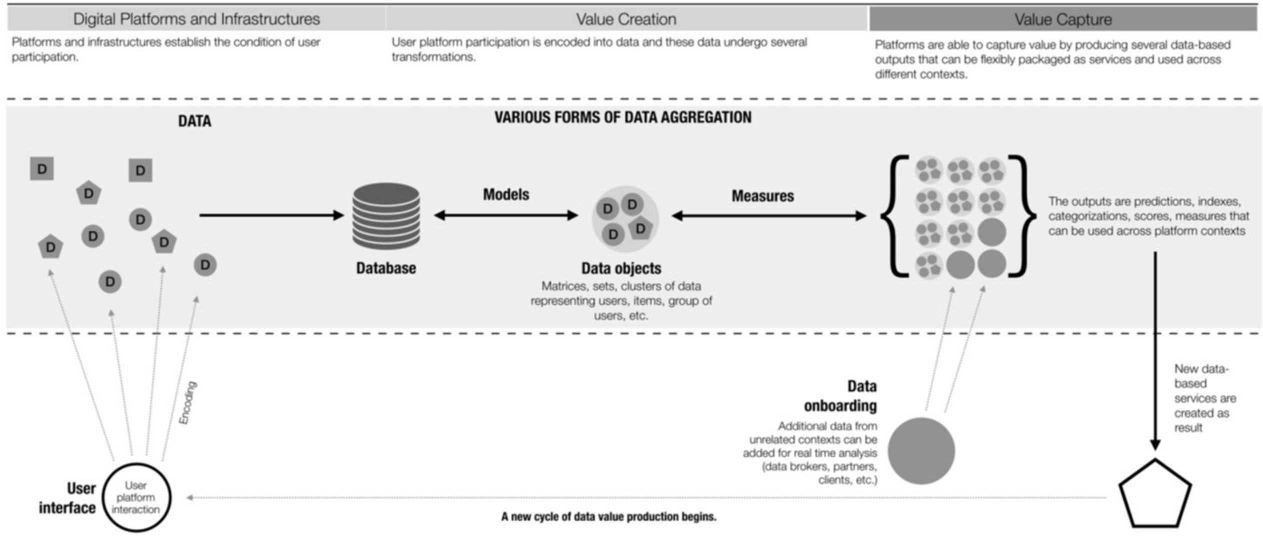
These questions are at the heart of the process of data-based value creation.

Source: Alaimo et al. 2020

Data-based value creation

The path from data to resources or services that carry real or potential value for several stakeholders is far from straightforward.

- Data have to be collected or produced under particular conditions
- Subsequently cleansed, aggregated and ultimately transformed to indicators, measures or other quantified descriptions
- The **relevance** and **value** of these metrics/indicators have subsequently to be **agreed** upon by the people and business organizations they concern and made part of their routines and pursuits



The "journey" from data to goods or services (data value chain) is a complex technical and social process.

Source: Alaimo et al. 2020

User-platform interaction

Digital platforms attract large **populations of users** representing hugely varying circumstances, interests, skills and inclinations.

Such **variability** represents an opportunity but can also be a problem that is typically met with the clear specification of the terms under which user participation is arranged.

The specification of the **terms of participation** by end users and other third parties (e.g. advertisers, analytics companies) are essential **prerequisites** for obtaining data that can be standardized. This massively expands the computational operations that can be performed on these data.

Platforms do not simply facilitate user activities but above all **establish the conditions of user interaction**, by designing user interfaces, and developing the platform features that deliver the data that support their business operations

Source: Alaimo et al. 2020

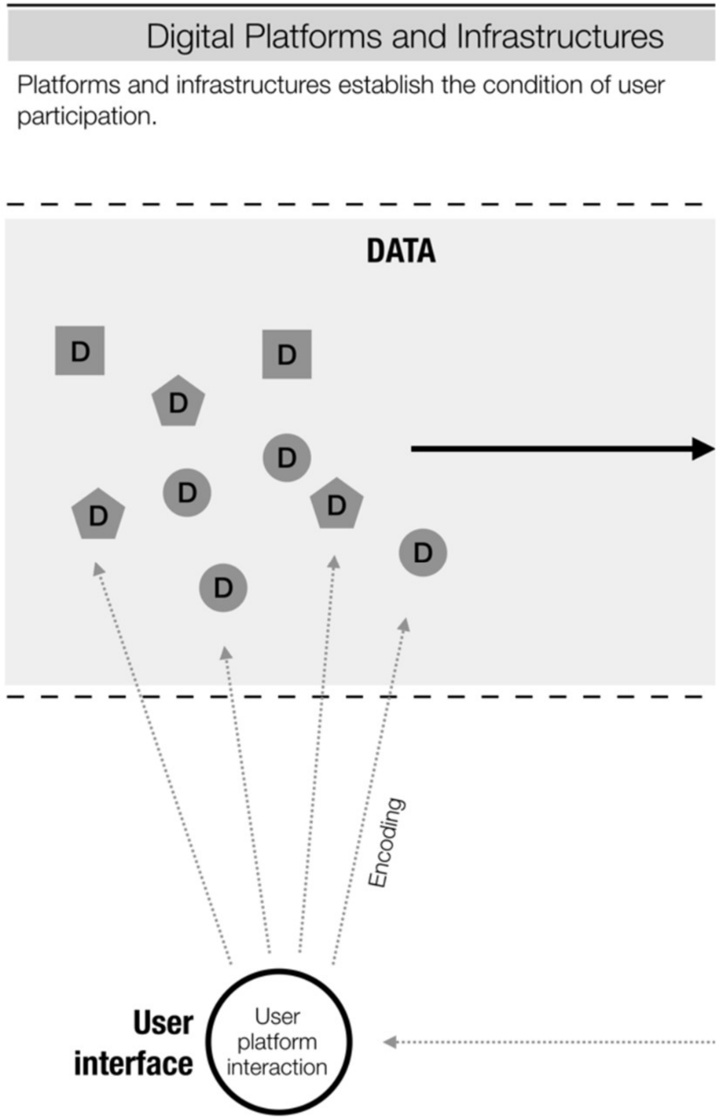
User interface

The design of the platform user interface is key to **shaping the forms by which users participate in the platform**.

Such forms usually include a few standardized **actions** (explicit or implicit) that serve the purpose of **attracting, categorizing and modeling user behavior** and encoding it into data.

Via **encoding**, user participation is standardized enough to allow the production, storing and aggregation of data and the further derivation of measures, indexes and scores

On this basis, these data enter the circuits of the digital economy



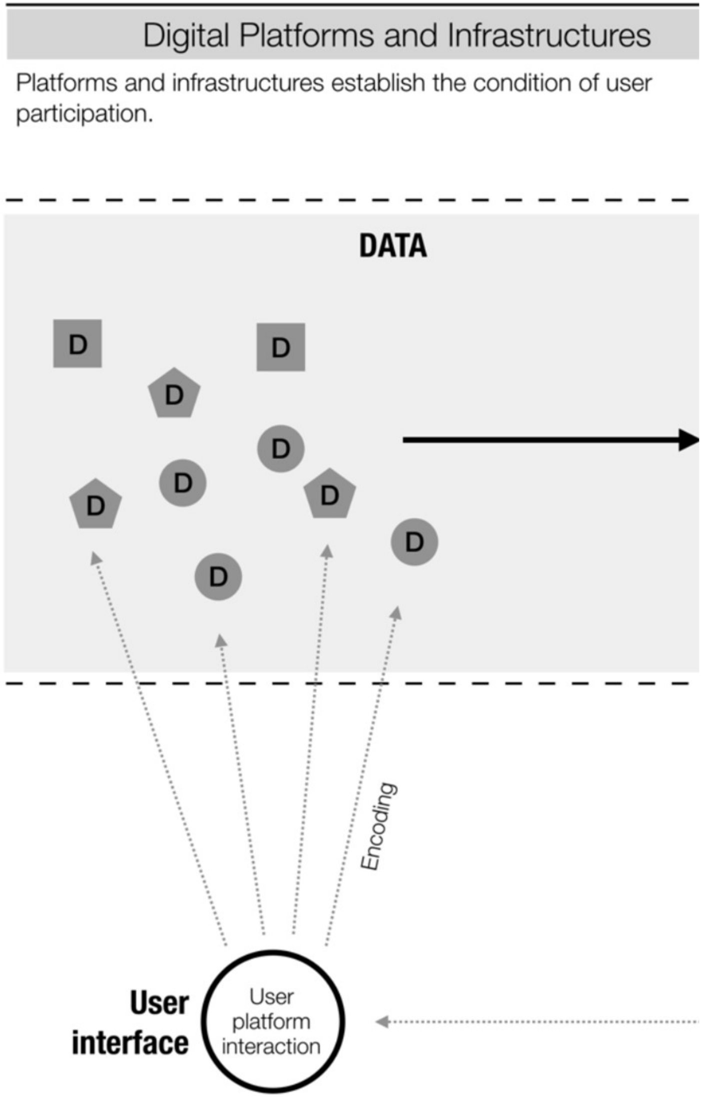
Source: Alaimo et al. 2020

Encoding

The encoding of the terms of user participation marks the **de-coupling (separation) between data tokens and the states of external reality** that data tokens are supposed to represent.

Through the **digital *medium***, platforms design **standardized forms of participation** that **generate data** that must be broadly **compatible with the operational requirements of the technologies and systems they deploy**.

The data trace left behind from, e.g. a Facebook like, **represents a real-life behavior** (e.g. approval, consent or preference), but it ends up **encoding a behavior defined by the platform** which is a different thing.



Source: Alaimo et al. 2020

Disjunction between data and reality

Encoding requires a disjunction from the reality it seeks to address or represent.

The space such **disjunction** creates is filled with assumptions that, **depending on the actors and the technology involved, specify the terms by which data are linked to what they encode** (at various degrees).

e.g. Transaction-data on Amazon, Play data on Spotify, signals on Fitbit ane increasingly reliant on the presence of defined technological parameters than on the real life actions behind

On digital platforms, the disjunction between data and reality is reinforced by the fact that platforms actively seek to reach and maintain a large and active user base by making user platform participation easy, addictive and engaging.

Such conditions may widen the gap between data and the social reality to which they are linked.

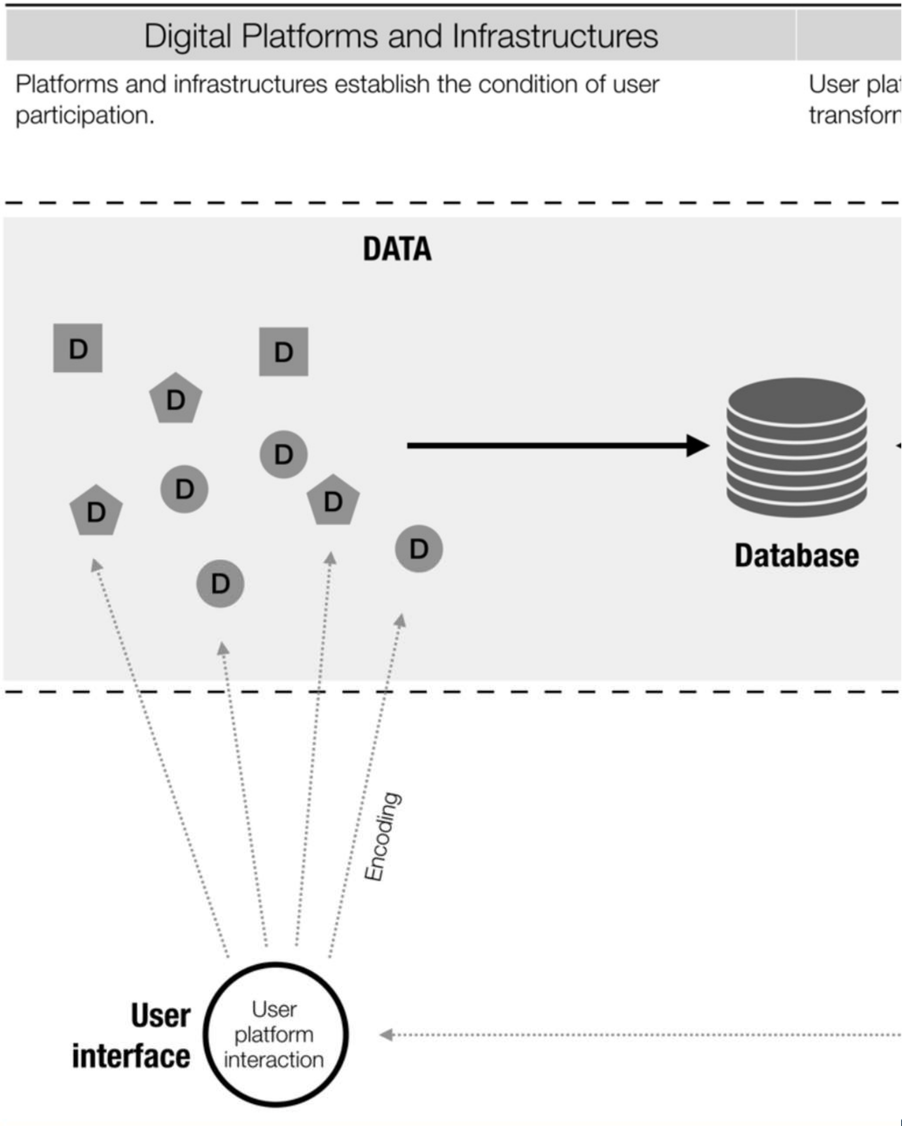
Source: Alaimo et al. 2020

Data editing

Standardized data are the raw material for further operations.

Once the suite of actions engineered by the platform (or the signals received by the sensors) are encoded into data, a number of operations are set to transform the individually meaningless data tokens into something else.

- Data are cleansed and stored into databases which work under specific criteria, i.e. computational efficiency, security, flexibility in creation of data relations etc.
- Data-editing operations are meant to transform a miscellaneous set of standardized data into a cleaned and ordered dataset that can serve different purposes.



Source: Alaimo et al. 2020

Data objects

A second group of transformative and value-making operations (aggregation, filtering, modelling and similar processes) are employed to **construct meaningful relations among** highly granular and **disconnected digital traces.**

The complexity and variety of these operations, has exponentially increased with the application of machine learning and AI solutions, making it often difficult to inspect and assess them.

The main output of these operations is the **creation of *new entities* out of *data relations***.

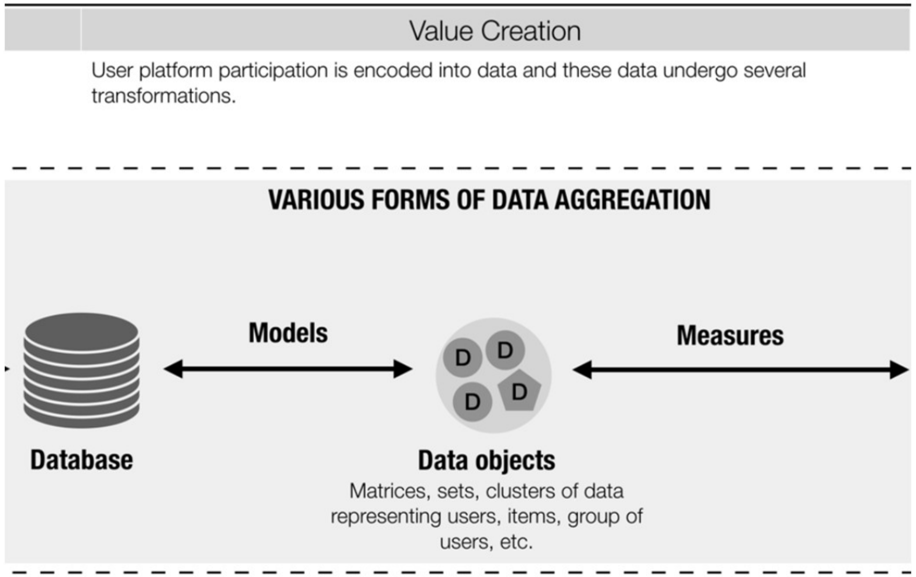
Data objects created out of aggregated data, such as profiles of users, can be drawn together by applying measures of similarity to constitute clusters of similar users or items.

Source: Alaimo et al. 2020

Value creation from data aggregation

Value here is created by <u>constructing new data objects </u>that can be further <u>changed</u> or <u>modified</u> by <u>putting them in relation with other data</u>.

The making of data objects is a fundamental passage in the data value chain as it establishes a new data entity that, in being continuously editable, becomes a *knowledge entity*.



For example:
Data *-> Clicks history*
Aggregation-*> Individuals are represented as clusters of clicks that can be mathematically related to each other along dimensions (e.g. clicks on luxury travel destinations, number of likes on tracks played)*
Data objects *-> Measures of similarity create data objects (e.g. communities) that open further possibilities of computation*

Source: Alaimo et al. 2020

Value creation from data aggregation

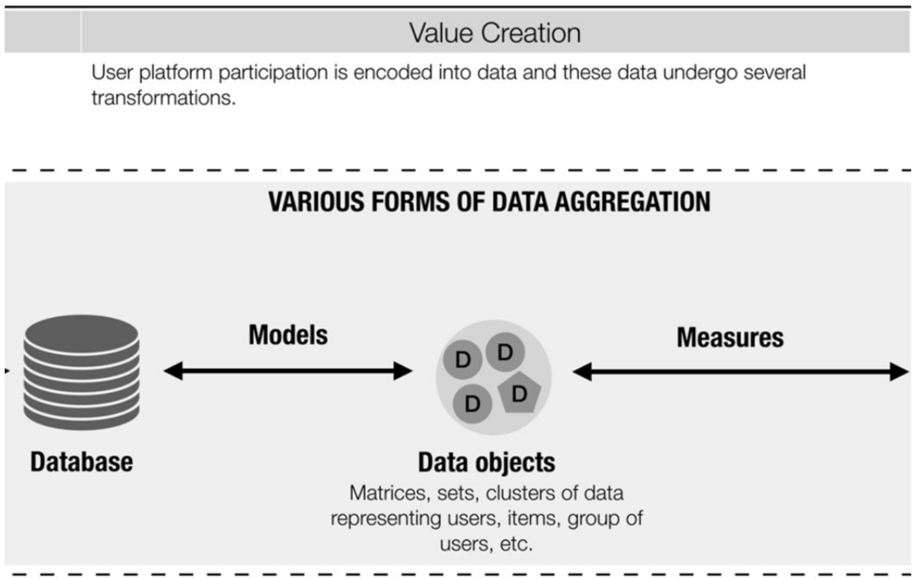
Aggregation **scales up from the level of single data tokens toward an increasing number of data objects** out of an existing data pool.

Usually at this point more data can be added.

The **syndication** with other data sets is used often to **provide additional or alternative references to the data procured by platform participation**.

New data can be procured by fresh action updates or by onboarding external datasets.

e.g. Facebook's lookalike audiences



Source: Alaimo et al. 2020

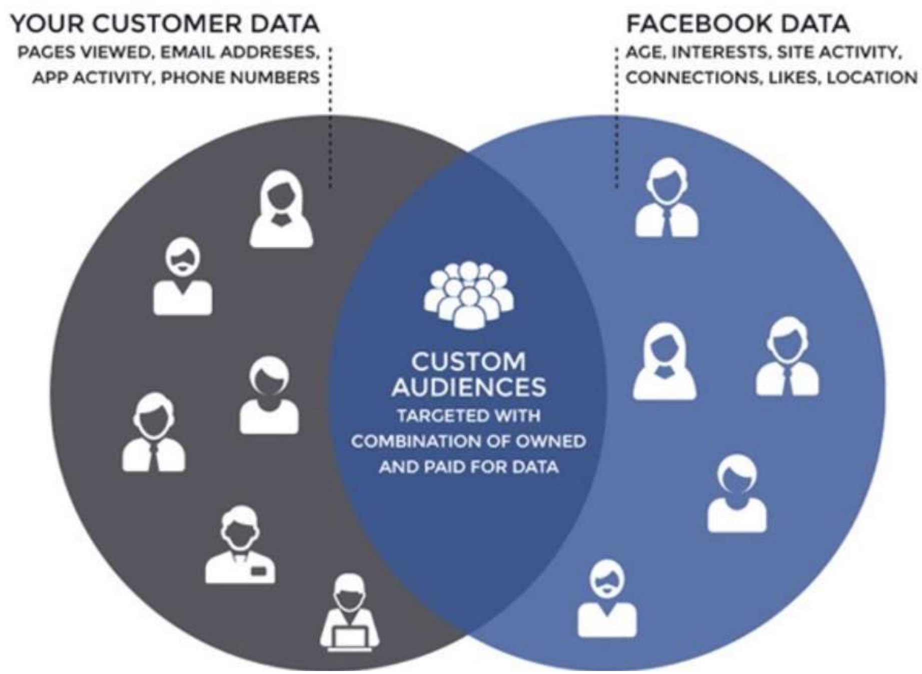
Facebook’s lookalike audiences

After mass encoding of likes and other digital traces *FB* makes data objects as user profiles and piles up user profiles in clusters of similar users along several dimensions.

FB also onboards additional data from partners (data brokers), from clients (CRM or data from marketers) or from Meta itself (e.g. data from Instagram) for the creation of lookalike audiences.

Lookalike audiences are potential audiences constructed on the basis of their similarity with existing audiences.

FB constructs them by correlating large volumes of **data** supposedly **signalling common interests between the members of a projected audience** (custom audiences for a determined product) **and FB users** (lookalike audiences).



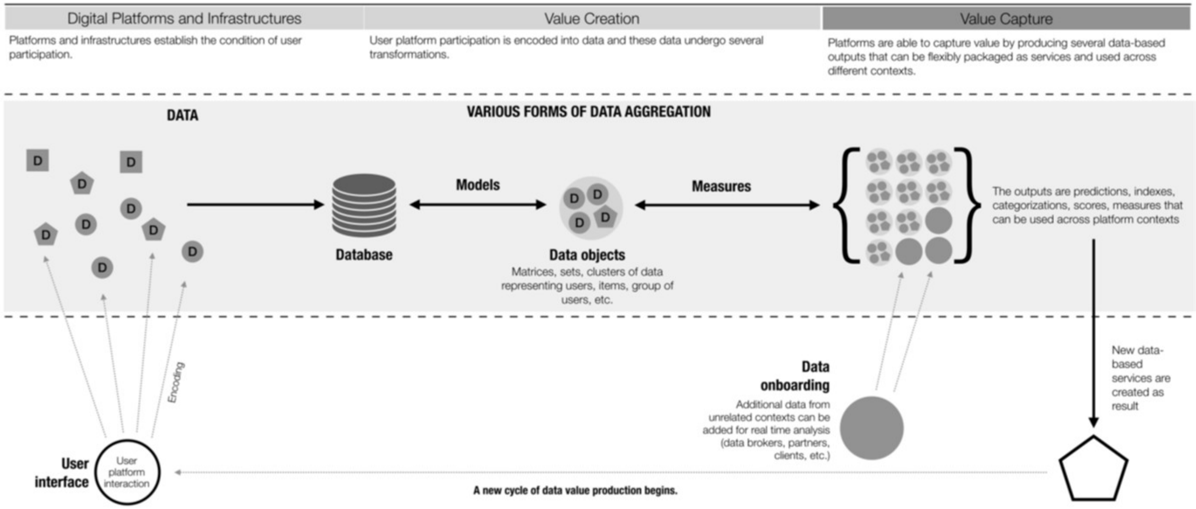
Value capture and appropriation

The packaging of data objects into data-based goods and services is the final step in the **transformation of data** from actions or signals **to valuable commodities**.

Differently from other value chain models:

- large parts of this process happen in realtime

e.g. buying a lookalike audience on Facebook happens in a few seconds as a result of an interaction initiated by platform stakeholders (marketers)



- Processes are contingent on heterogeneous user signals or requests

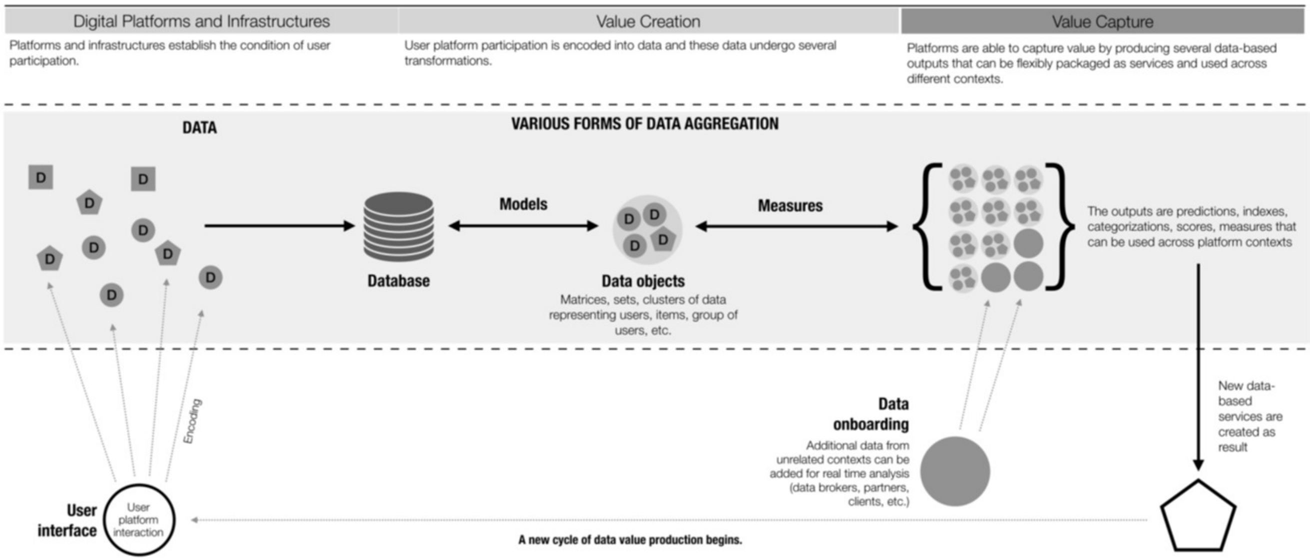
e.g. click or scrolling a page may be the signal that triggers the computation and packaging of a personalized suggestion

This does not imply that end users or stakeholders are aware of how the process operates or mindful of their participation.

Cycles of value production

The outputs of the processes of data value chain have a considerable impact upon future user behavior on platforms and opportunities offered to individual users, which conditions further cycles of data-based value creation

Data are used to derive personalized suggestions and optimize platform operations as well as as instruments in structuring relationships with other platforms and external stakeholders.



Source: Alaimo et al. 2020

Msc Data Science and Engineering

Innovation management

Politecnico di Torino
Department of Management and Production Engineering

What is the appropriate framework for understanding an innovation strategy?

Innovation

a source of uncertainty and change in the external environment

a major competitive resource within the firm

What is the appropriate framework for understanding innovation strategy?

strategy

noun [C/U]

US

/ˈstræt̬·ə·dʒi/

a long-range plan for achieving something or reaching a goal, or the skill of making such plans.

The debate on Corporate strategy

Two approaches to innovation strategy
(related to the characteristics of technological innovation)
as part of a long-standing debate

The ‘**rationalist**’ approach

The ‘**incrementalist**’ approach

?

Rationalist strategy

Influenced by military experience.

Strategy consists of the following steps:

Describe, understand and analyze the environment
Determine a course of action
Carry out the decided course of action

Rational action follows linear models: appraise, determine and act.

The Corporate equivalent : SWOT analysis

Advantages and disadvantages of a rationalist strategy

+

- Be **conscious of trends** in the competitive environment
- **Prepare** for a changing future
- Put **attention to the longer term**, given the daily pressures
- Ensure **coherence in objectives and actions** at large

−

- **Corporate objectives** (establish a distintive competence) **are different from military ones** (destroy the enemy)
- Too much concentration on the corporate enemy can result in strategies **mobilizing resources for monopoly power at the expense of profitable niche markets**
- **Complexity and fast change in the external environment** (corporate strenghts and weakenesses are difficult to identify before the benefit of practical experience

Incrementalist strategy

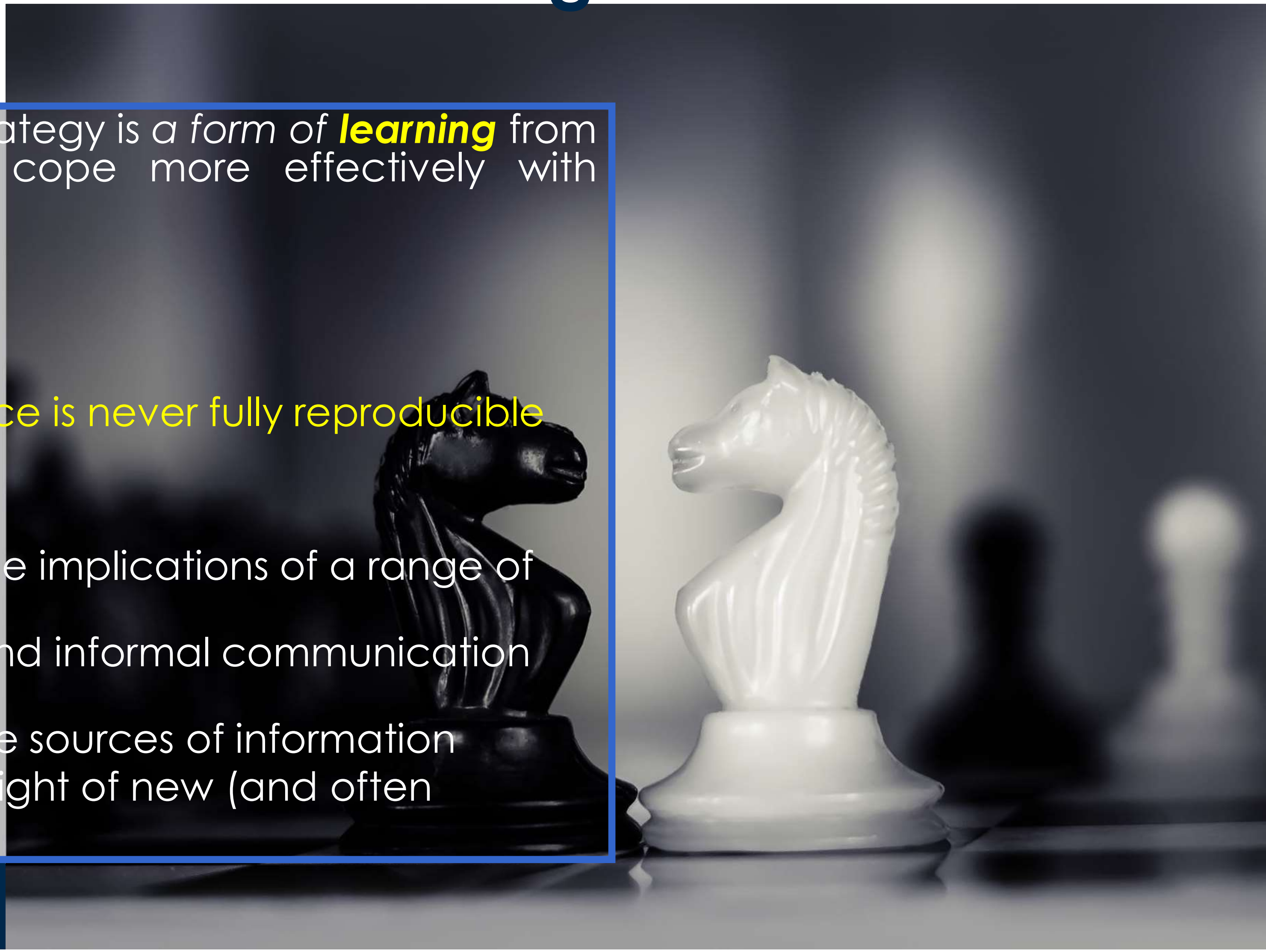
Firm has only very imperfect knowledge of its environment, of its owh strenghts and weakenesses and on the direction of change.

It must be ready to adapt its strategy in the light of new information and understanding.

In such circumstances, an efficient procedure is:

- Make deliberate steps (or changes) towards a stated objective
- Measure and evaluate the effects of the steps (changes)
- Adjust (if necessary) the objectives and decide in the next step

Rationalist or incrementalist strategies for innovation?

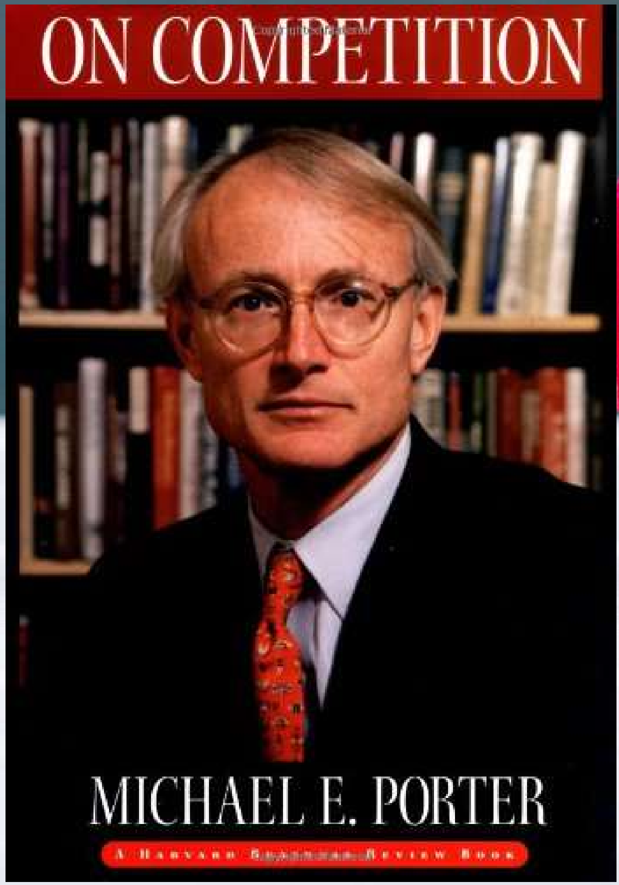


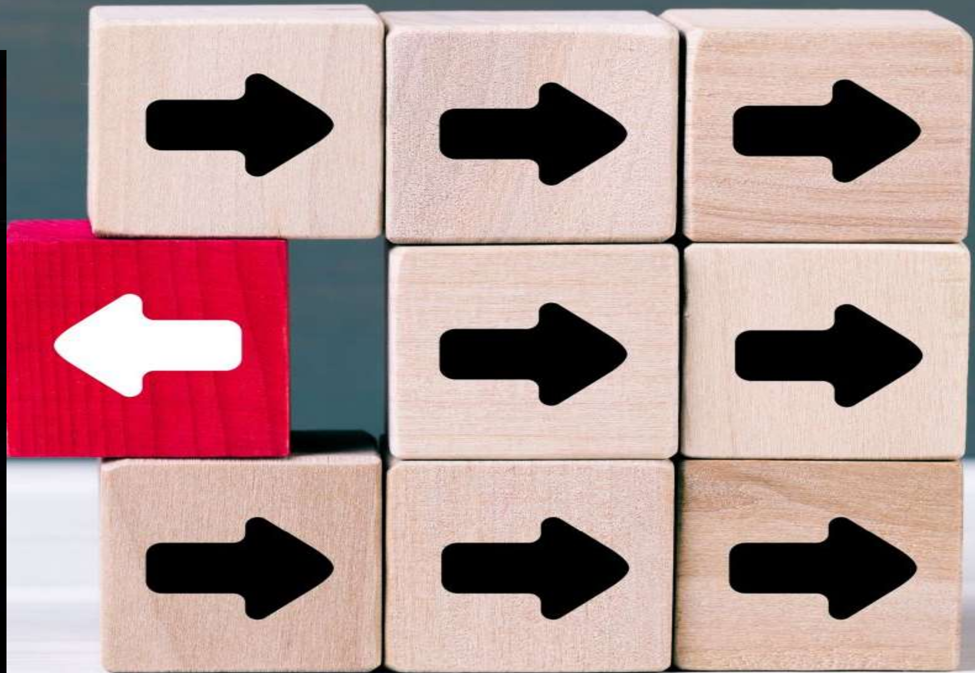
The definition of a corporate strategy is *a form of* ***learning*** from <u>analysis</u> and <u>experience</u>, to cope more effectively with complexity and change.

Successful management practice is never fully reproducible

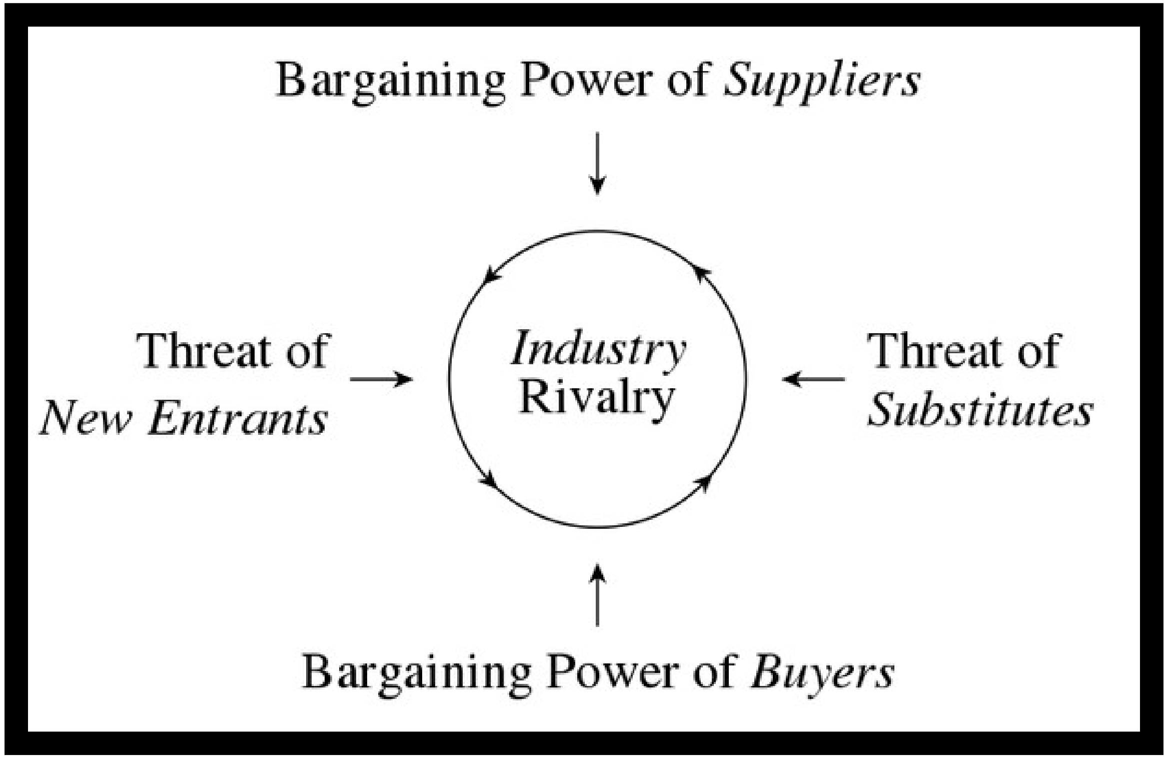
- Given uncertainty, explore the implications of a range of possible future trends
- Ensure broad participation and informal communication channels
- Encourage the use of multiple sources of information
- Plan to change strategies in light of new (and often unexpected) evidence.

Technology and competitive analysis





Five forces drive industry competition



- Relations with suppliers
- Relations with buyers
- New entrants
- Substitute products
- Rivalry among established firms

"The goal of competitive strategy is to find a position within an industry where the company can best defend against these competitive forces or can influence them in its favour"

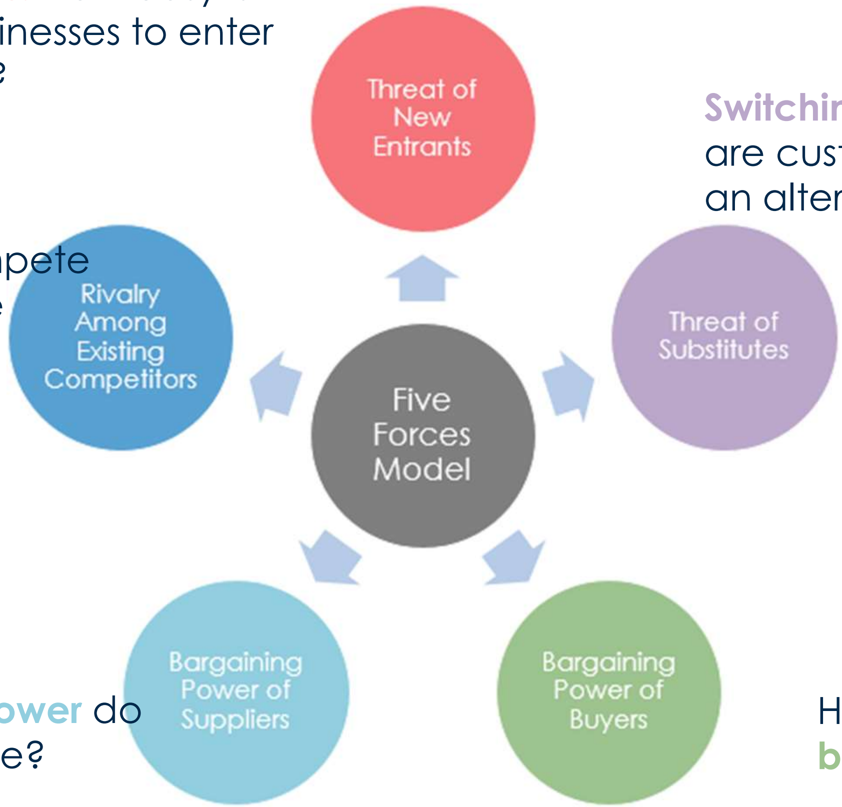
- **Technological change can influence all five forces**

Five forces drive industry competition

Entry barriers: How easy is for new businesses to enter the market?

Switching costs: how likely are customers to switch to an alternative?

How many firms compete and how much is the **market** growing?



How much **power** do **suppliers** have?

How much **power** do **buyers** have?

Technological change & the five forces

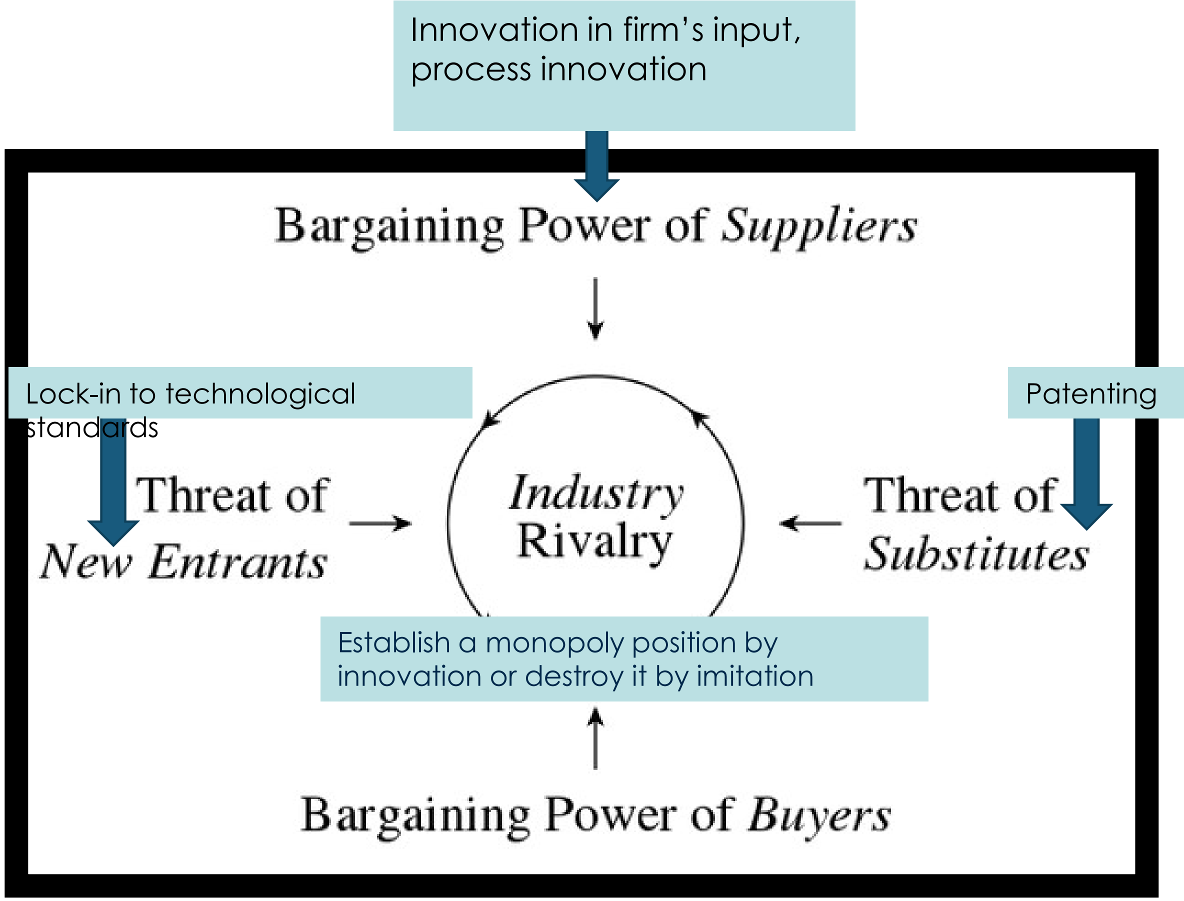


Table of contents

Innovation Management

What is innovation?

Which factors foster the diffusion of innovation?

What are technological trajectories and how they unfold?

How can big organizations adapt to technological change?

How are new firms founded out of R&D projects?

Strategic Management

How do companies set their strategic objectives?

How is R&D and innovation related to organizational learning?

How to collaborate in innovation while protecting your knowledge?

How to appropriate the «returns from innovation»?

What is digital transformation?

Data-based innovation: how to create value out of it?

Expected learning outcomes

At the end of the course, students should be able to:

› Understand the **concepts** and the **dynamics** of **technology and innovation**

› Understand the main approaches to **corporate strategy** in innovation management and their evolution

› Develop the ability to discuss how **knowledge management and innovation** affect **external competition** and **organizational change**

› Find out the strategic role of **data-based innovation** and **value creation** in the digital transformation era

› Familiarize with typical **business vocabulary**

Reading materials

- Cantamessa, Montagna (2016) Management of Innovation and Product Development. Springer, London

- Tidd, Bessant (2018) Managing innovation: integrating Technological, Market and Organizational change 6th Edition, Wiley, NY

Contain all the theoretical knowledge tackled during lectures

Lecture slides and other mandatory reading materials will be uploaded on *Portale della Didattica*

Assessment and grading criteria for ONSITE exam

Written exam:

will evaluate the degree to which students have learned and understood the main theoretical concepts.

It will lead to a **score of 20/30** based on a mixture of:

- Closed questions,
- Open questions
- A short commentary to a text.

Group project work

will evaluate the degree to which students are able to apply theoretical concepts in practice.

It will lead to a **score of 10/30**

based on the following evaluation dimensions:

- Theoretical soundness
- Internal coherence
- Business acumen
- Presentation quality