



Per una Teoria Generale dell'Innovazione



Andrea Bonaccorsi

Verso una teoria generale dell'innovazione

Andrea Bonaccorsi

Università di Pisa

IRVAPP-FBK

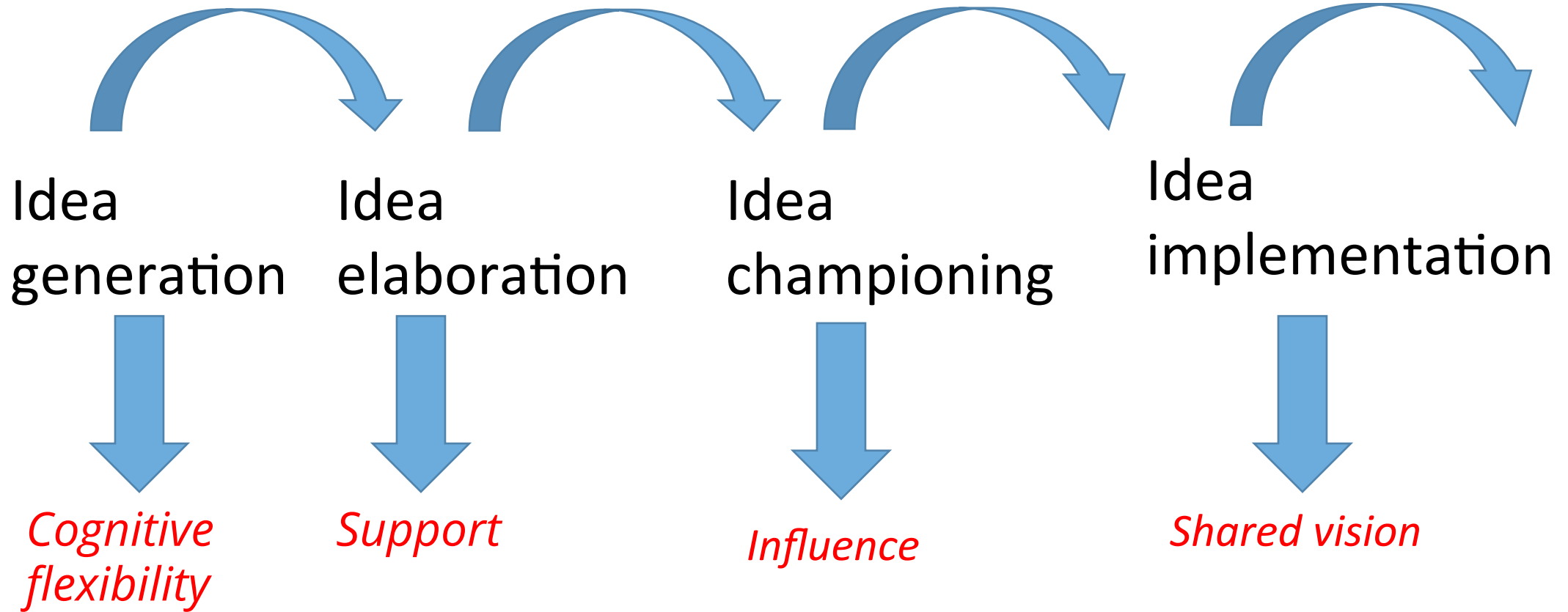
Entopan

10 novembre 2018

Teoria evolutiva della innovazione

- Variazione
- Selezione
- Ritenzione

Idea journey



What do we know about the idea journey?

- Your first idea is wrong. Be flexible, adaptive and resilient
- Produce many (many) ideas
- Look for collaboration
- Look for feedback soon

Your first idea is wrong

Your first idea is wrong.

So, as quickly as possible, implement a careful plan to learn which of your assumptions are flawed.

Rita McGrath, professor of Entrepreneurship



Firephone

170 mn \$ investment, failed one year after launch

Amazon Auctions

Site in competition with e-Bay

Junglee

Site to compare prices, 170 mn \$ investment

I have failed million of times

Jeff Bezos

Founder of Amazon

Indeed, Amazon failed at many things it tried, from auctions to venture capital, and its internal financial analysis showed that at its rate of spending, the company wouldn't be profitable for decades.

But Bezos, who had been on a relentless quest for growth, was able to do what most of us could never do: rewire Amazon and his own brain to begin a drive for efficiency that ultimately crushed the nonbelievers.

Bethany McLean (2013)

Be flexible, adaptive and resilient

Number of times the founders pitched investors before finally succeeding

Company	Number of investor pitches
Skype	40
Cisco	76
Pandora	300
Google	350

Produce many many ideas

If you want to be original, the most important possible thing you could do, is to do a lot of work. Do a huge volume of work.

Ira Glass, producer of *This American Life*

The odds of producing an influential or successful idea are a positive function of the total number of ideas generated.

Dean Simonton, professor of Psychology

Original thinkers will come up with many ideas that are strange mutations, dead ends, and utter failures. The cost is worthwhile because they also generate a larger pool of ideas- especially novel ideas.

Robert Sutton, professor of Strategy

Nothing is more dangerous than an idea when it is the only one you have.

Emile Chartier, journalist, 1868-1951

The only way to have good ideas is to have many.

Albert Einstein



Shakespeare

37 plays

154 sonnets

Picasso

1,800 paintings

1,200 sculptures

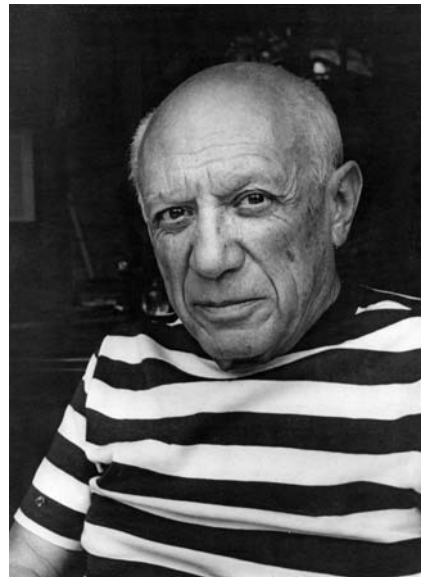
2,800 ceramics

12,000 drawings



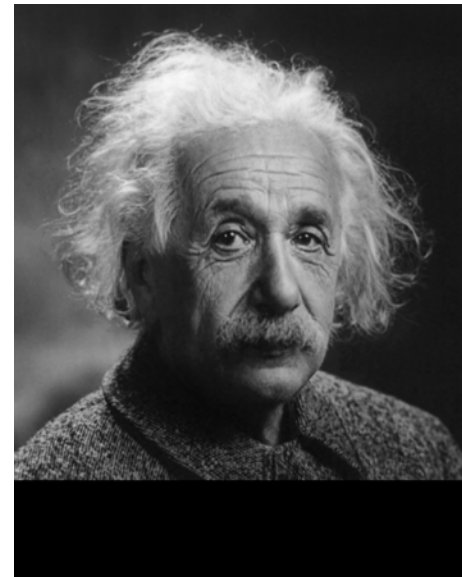
Beethoven

650 pieces



Mozart

600 pieces



Bach

➤ 1,000 pieces

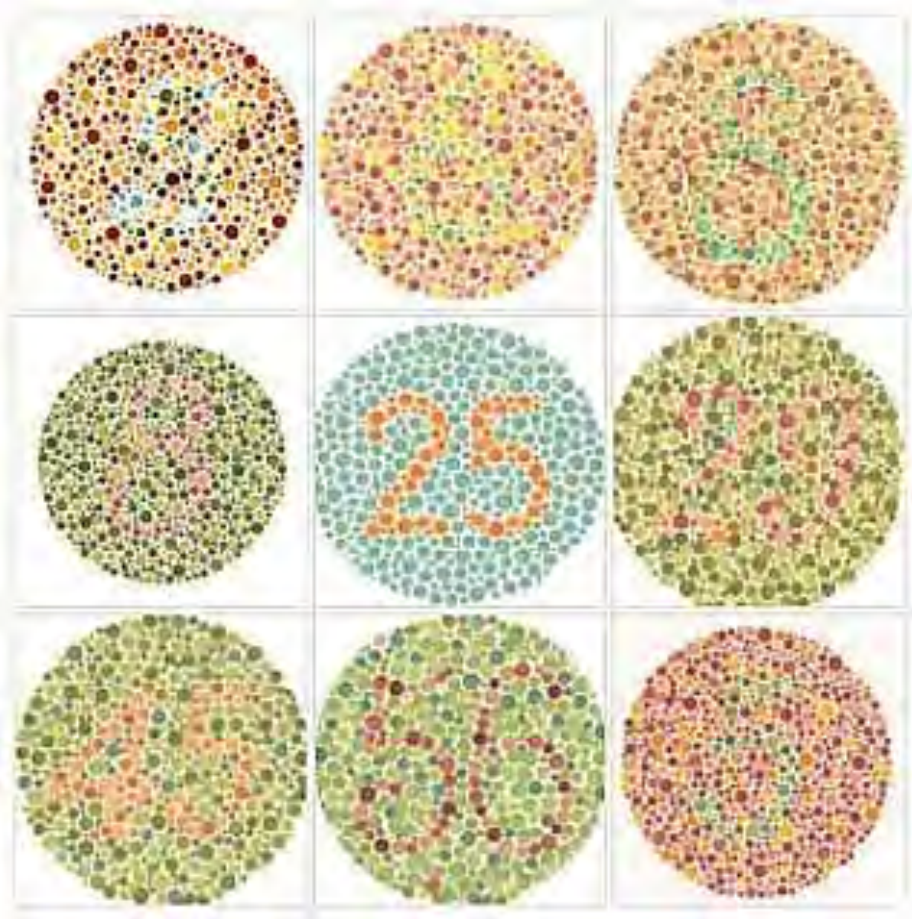
Einstein

248 publications



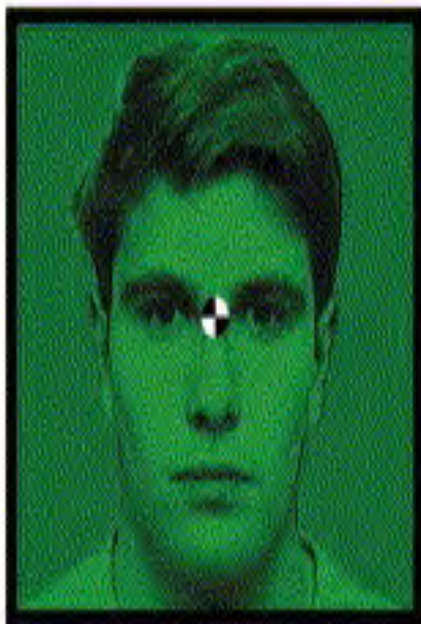
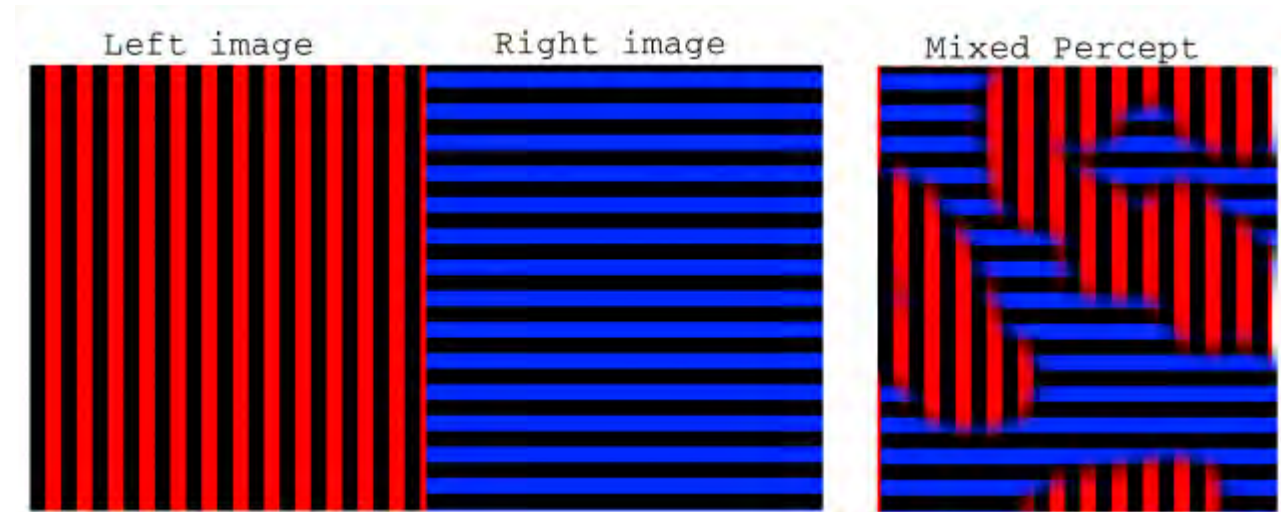
You gotta kiss a lot of frogs before you find a prince
Dean Kamen

Creative people «see things differently»



Innovation begins with an eye (IDEO)

Binocular rivalry



People tend to alternate between right-eye and left-eye representation

Sometimes people form a mixed percept image by merging the two images

Mixed percept has

- High variability between individuals
- Low variability within individuals (across time and tasks)

Openness to experience

One of the five constructs of the «**Big Five**» **personality measurement tool** largely adopted in psychology

- Flexible and inclusive cognition («Breadth, depth and permeability of consciousness»)
- Open people are more curious and creative
- Open people are more motivated to explore the world and engage with possibilities
- Open people process stimuli that others ignore
- Flexibility in binding of different representational elements in the brain
- Openness predicts performance on divergent thinking (identify multiple divergent uses for ordinary objects)
- Openness implies a reduction in latent inhibition

People high on the Openness scale form mixed percept images with more frequency than others: they «see things differently».

The effect is magnified by the external context (positive mood for mixed percept).



Training of rats to respond across three operanda

- a key
- a left lever
- a right lever

Response sequences were reinforced through the delivery of food.



Experimental control

- Some of the keys do not deliver food
- Rats rapidly learn to avoid these keys

Extinction of resources

- Experimenter manipulate the conditions by eliminating resources in one of the keys
- When rats experience shortage of food, «occasionally try something different»
- Surprisingly, rats try the keys that previously were found ineffective
- Reduction in reward expectation increases variation in the form of behavior
- Animals engage in novel or unusual behavior in situations where they have learned that positive reinforcement is unlikely

Innovative behavior is triggered by **unsatisfactory performance**



The collage experiment

Students were asked to give a short speech on their dream job. They were randomly assigned to a positive- or negative-feedback condition (e.g. smiles and vertical nods vs. frowns and horizontal shakes).

After the speech was over, the subjects were given glue, paper and colored felt to make a collage.

Those with negative-feedback created much better collages.

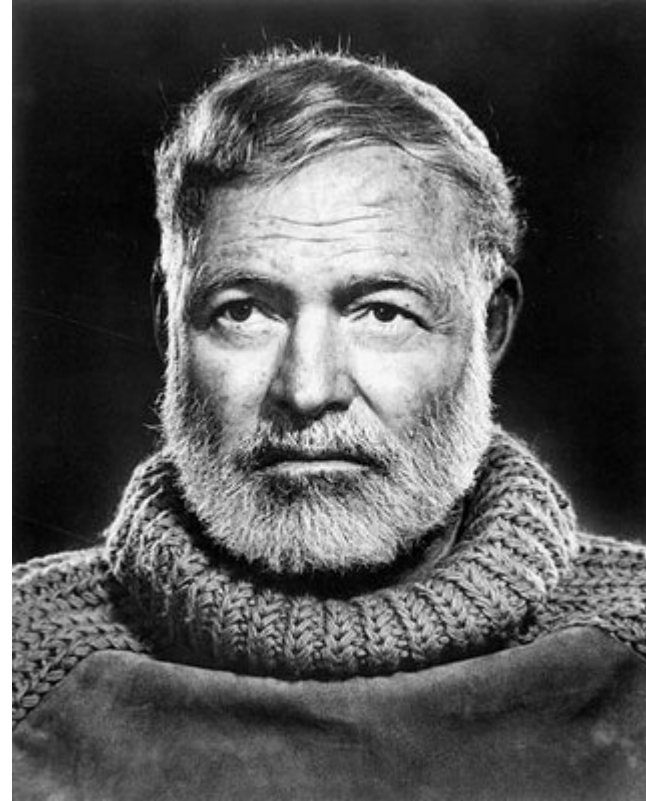
Sadness improved their focus and made them more likely to persist with the creative challenge.





Jackson Pollack

Sylvia Plath



Ernest Hemingway



Virginia Woolf

Look for collaboration in your team

Innovation greatly benefits from the experience of friendship

- collaborative circles
- «Great Groups»

Innovation is a team enterprise, not a Lone Ranger business

Collaborative circles

Innovation often flourishes from a personal friendship between the innovators.

Monet, Manet, Degas and Renoir

Freud and his friends

Social reformers Elizabeth Cady Stanton and Susan B. Anthony

Lewis, Tolkien and the Inklings

The Fugitive poets

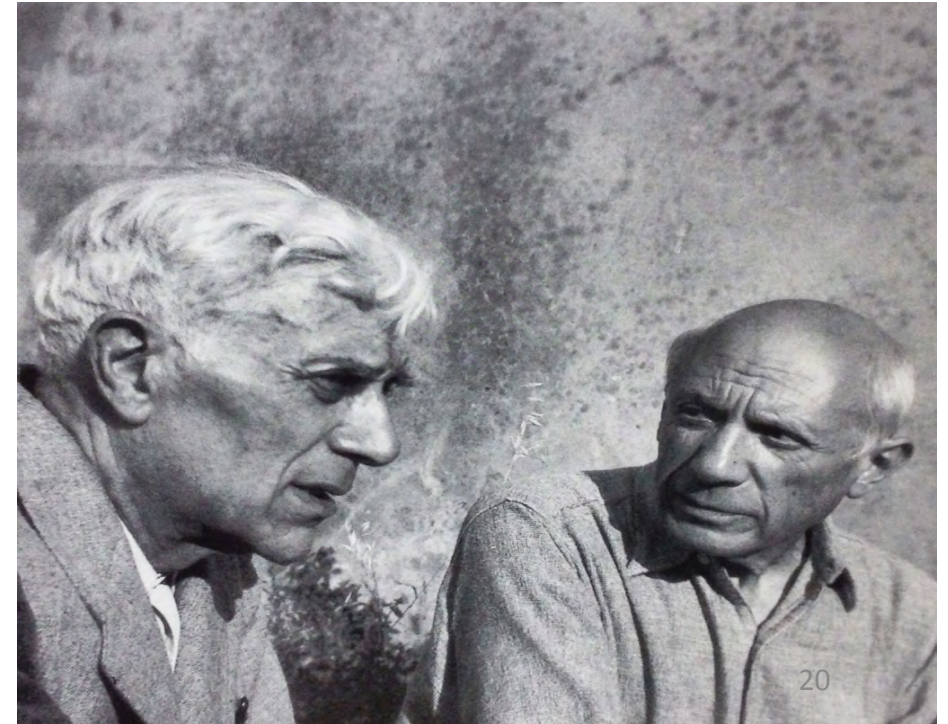
Conrad and Maddox Ford

Picasso and Braque (1909-1914)

Almost every evening, either I went to Braque's studio or Braque came to mine. Each of us had to see what the other had done during the day. We criticized each other's work.

A canvas wasn't finished unless both of us felt it was.

Pablo Picasso



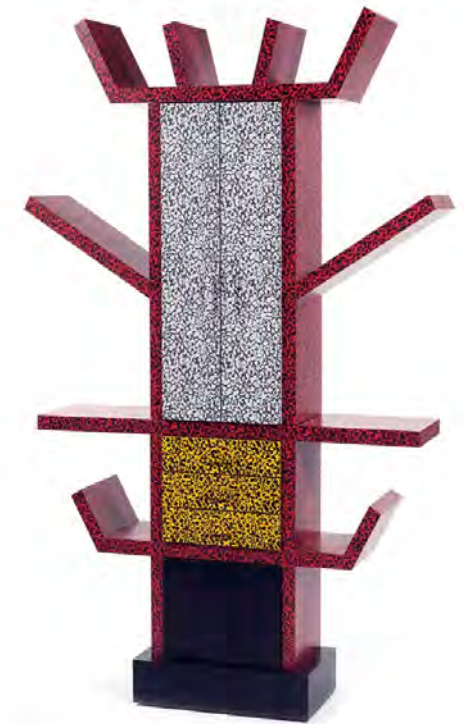
Collaborative circles/2

Memphis Milano (1981-1987)

- Collective of designers (Ettore Sottsass, Aldo Cibic, Marco Zanini, Michele De Lucchi, Matteo Thun and others)
- Reaction against minimalism and «good design»
- Post-modernism and kitsch
- Use of poor materials (polipropilene, glass)
- Large impact on industrial design and Made in Italy (Kartell, Artemide)



Michele De Lucchi, *First chair*



Ettore Sottsass, *Casablanca*



Great Groups

parc[®]
Palo Alto Research Center



People

- Superb people
- Intrinsically motivated

Leader

- Strong leader
- Leader and group create each other
- Leader attracts talented people who smell excitement
- Share information effectively
- Free people from trivial duties
- Protects the group

Collaboration

- People who want to work together
- Isolated from the external world but connected
- Equity in allocation of tasks
- Oriented towards the task-
«action places» that deliver

Motivation

- Doing something vital
- Challenging task
- Always have an enemy
- Often have a dark side
- Optimistic

Look for feedback soon

One of the most recent commercial failures (Segway) was due to the inability of the company to listen to feedback.

Limitations of the product

- No substitution of cars
- Wrong market target
- Too large to be used to overcome traffic in town
- Substitution of bicycles- but too expensive
- No way to manage the parking
- No opportunity to hang bags to a hook

Enthusiastic support of Steve Jobs

- Intuition
- Overconfidence



Look for your peers' evaluation

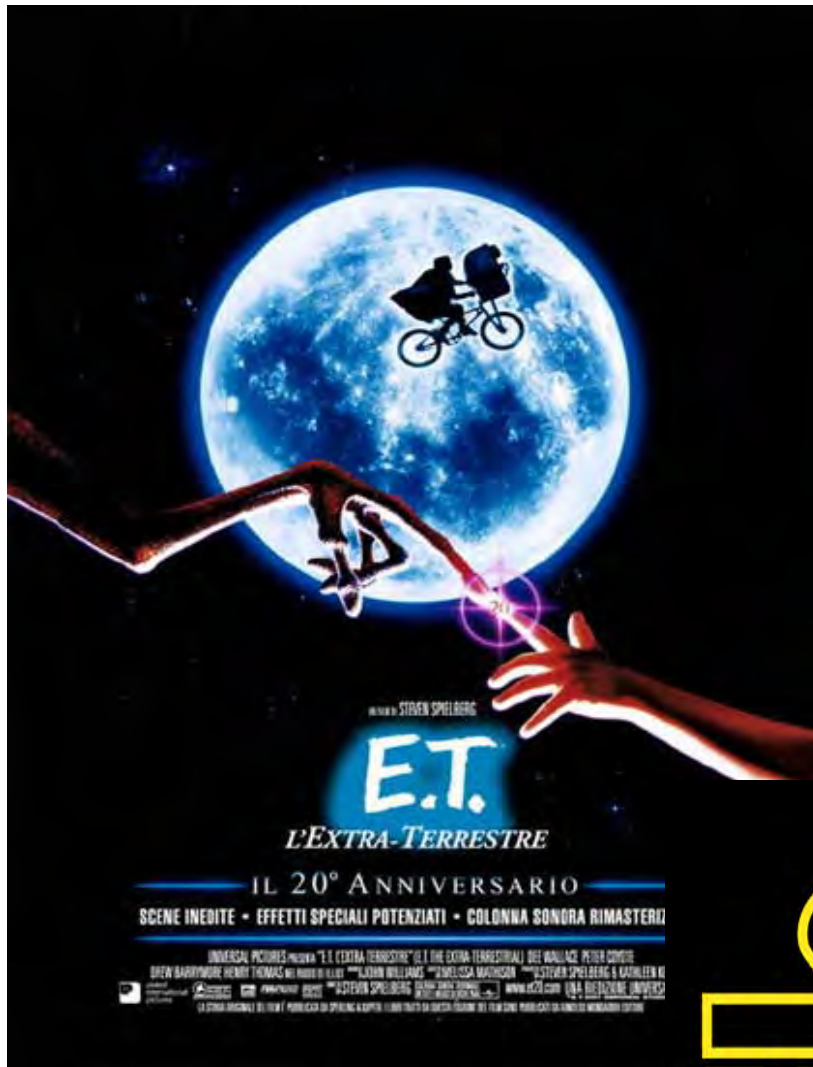
Experts are not necessarily the best source for evaluating novel ideas

- the more expertise and experience people gain, the more entrenched they become in a particular way of viewing the world
- the more successful people have been in the past, the worse they perform when they enter a new environment
- experience is a good source of judgment only in predictable environments

Managers are risk-averse

Audiences and **crowds** are somewhat better- but not necessarily- it depends on who are in the group

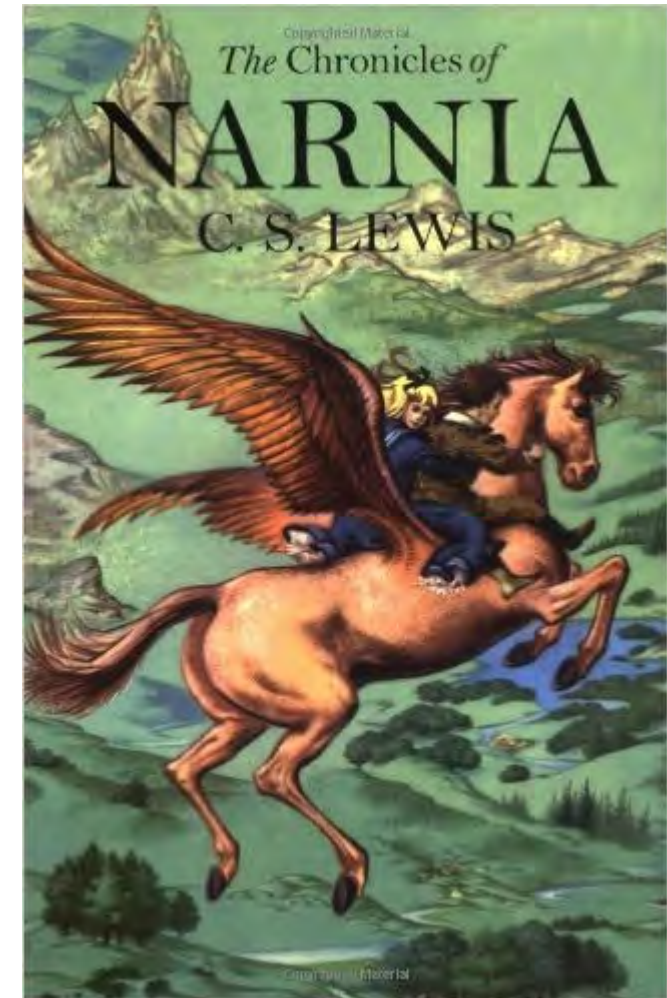
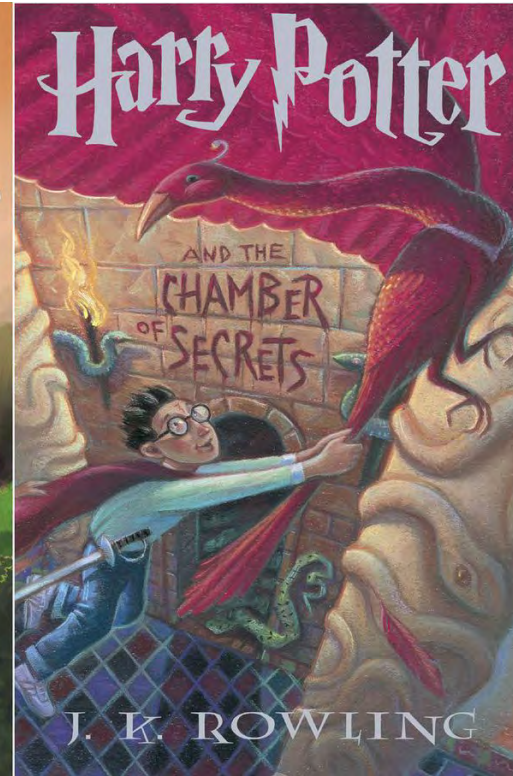
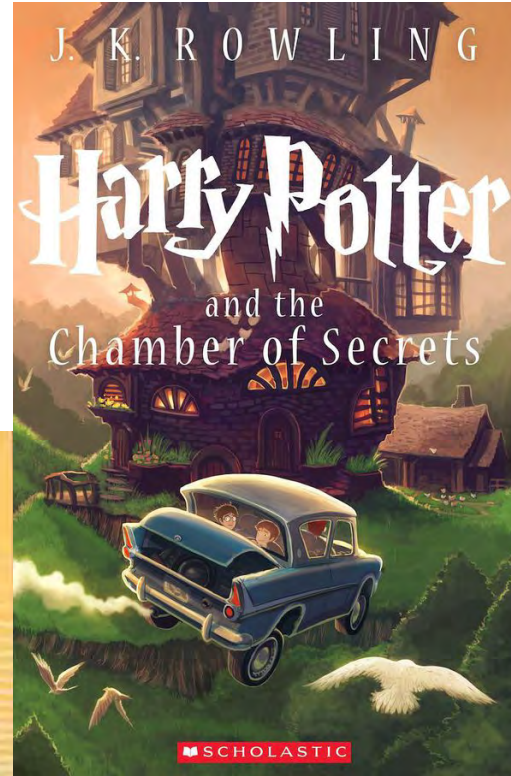
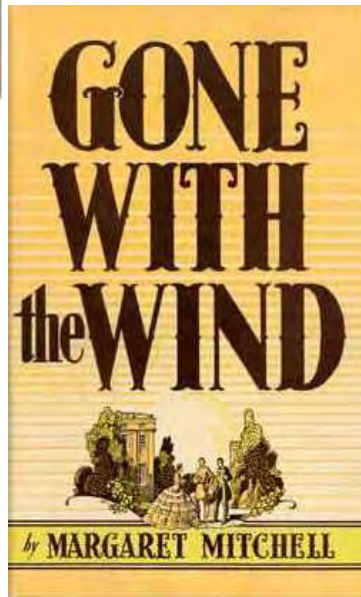
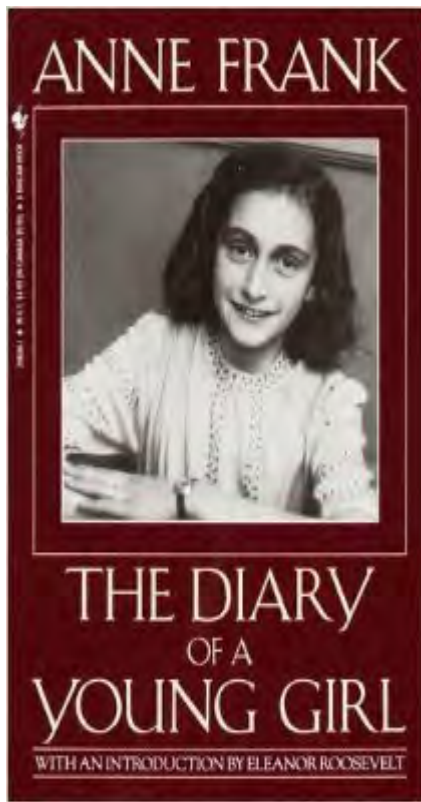
The best source of test for novel ideas are **peers**



False negatives
by studio
executives



False negatives in publishing



The Circus study



- 150 videos of circus acts from **creators** around the world
- 339 **circus professionals** — including both creators and managers — watch 10 videos and try to predict how successful each video would be with the **audience**
- test of the predictions on a sample of 13,248 audience members

Creators

- poor forecasters of their own ideas
- overestimation of the success

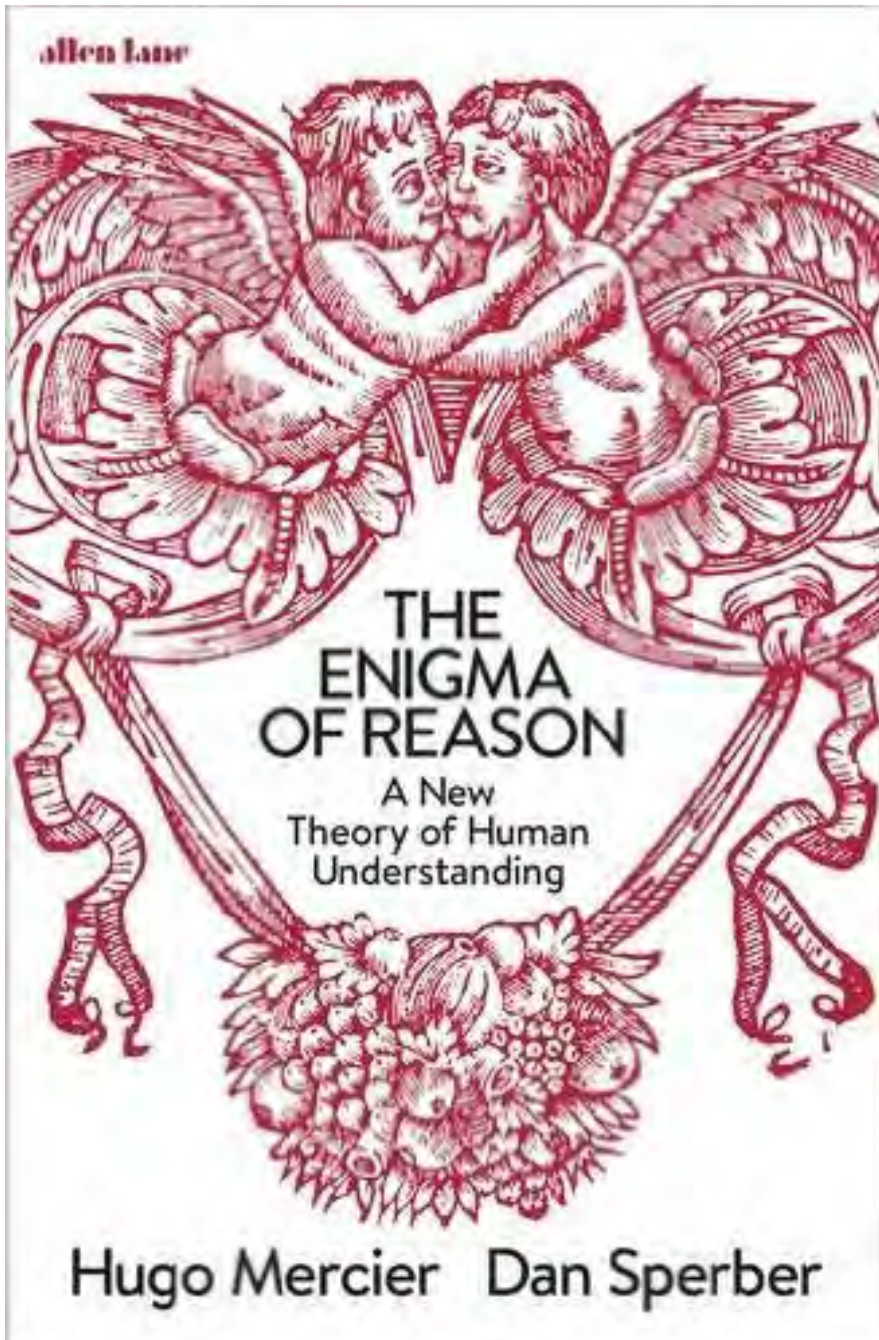
Managers

- poor forecasters
- underevaluation of novel ideas in favor of conventional performers

Who performed better in predicting the success of novel circus acts?

Creators evaluating their peers' creation

- recognition of the value of the novel idea
- understanding performances that deviate from conventional circus art



Human reason developed to support the need to interact with others in a complex social organization.

People use arguments to persuade others.

In persuasion people select the favourable arguments and discard contrary evidence

We are much better in evaluating others' ideas than evaluating our own ideas.

Four successive stages on the exceptional artist's path to fame

1. Peer recognition
2. Critical recognition
3. Patronage by dealers and collectors
4. Public acclaim

Sir Alan Bowness
Former Director of Tate Gallery



Damien Hirst, ***The physical impossibilities of death in the mind of someone living*** (1991)

Damien Hirst, **For the love of God** (2007)





Head VI (1949)

Francis Bacon



Study for a self-portrait. Tryptich 1985-86.



Tryptic. May-June 1973 (1973)

Creativity

Expertise

- domain knowledge and skills

Cognition (creative thinking)

- divergent thinking

Conation (personality traits and motivational factors)

- risk taking
- openness to experience
- information seeking
- sensation seeking/ novelty seeking

Culture

- social acceptance of novelty
- anxiety generated by the mismatch between one's own preferences and others

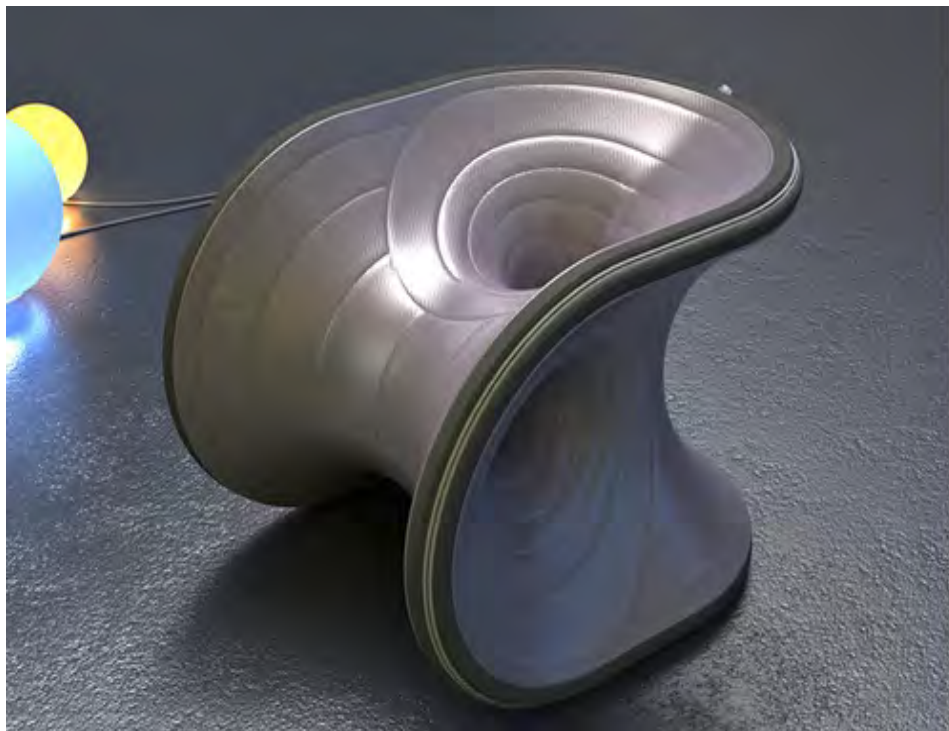
Break the cognitive path dependency

Creative thinking must overcome the natural tendency of human cognition to exploit existing knowledge in usual ways, or
fixedness

In the search for novel *and useful* ideas, there is a need to overcome

functional fixedness

or the tendency to attribute to objects those functions that have been traditionally attributed to them («mental block against using an object in a new way that is required to solve a problem»:
Duncker, 1945).







Objects are cognitively associated to the uses they are commonly intended for



The Swiffer story



Procter & Gamble asked a market research company to study a way to eliminate the thin layer of dust that remains over the floor of houses.

When Continuum came up with the idea of Swiffer, it was initially rejected.

The committee that was overseeing the project was formed mainly by people from the detergent businesses.

P&G had asked a new detergent, at the end of the day.

Luckily enough (for P&G) the project was eventually approved. The Swiffer product lines account for more than 2bn \$.





Is there a
fundamental
difference
between these
four browsers?

Not really.

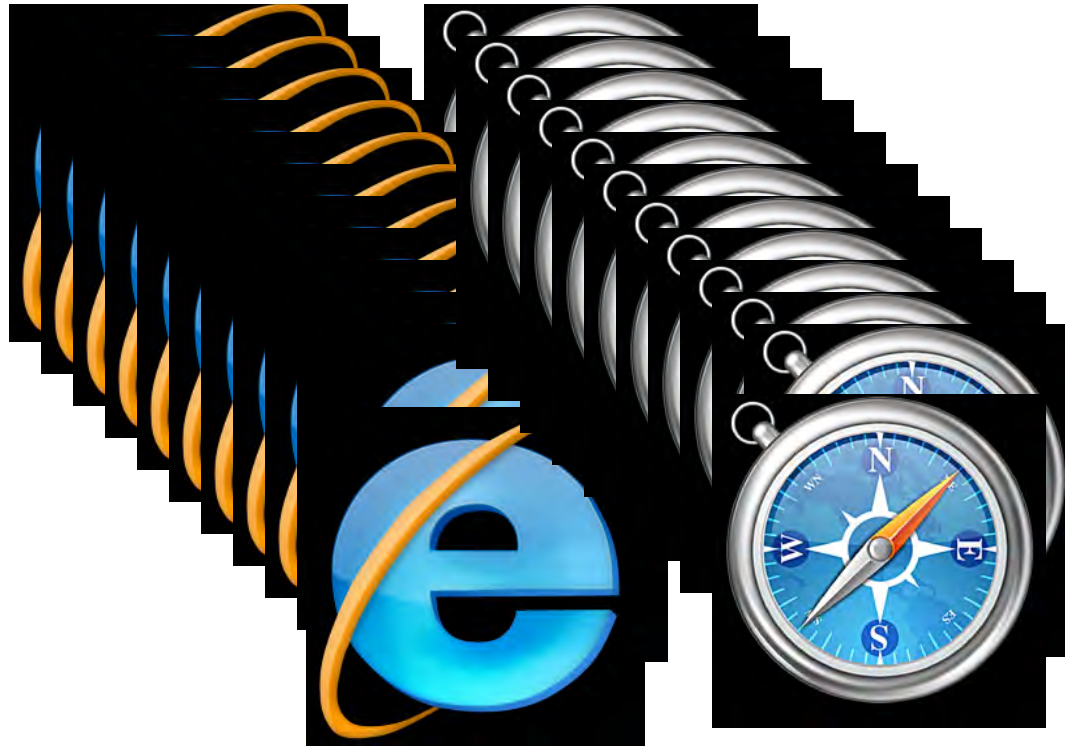


Yet substantive research (>30,000 cases) showed that customer service agents using Firefox and Chrome (right) performed significantly better than those using Internet Explorer and Safari (left):

- higher sales
- customers happier
- call times shorter
- less likely to miss the work

Why?





Internet Explorer is built into Windows for PC users.

Safari is pre-installed in the Mac.

Almost 2/3 of the customer service agents used the default browser, without asking whether a better browser was available.

In order to use Firefox or Chrome you have to take some initiative and search for a better solution.

These people approached the work in the same way, looking for novel ways of addressing the problems of their customers.

They were able to overcome the «system of justification».

Children are not subject to
functional fixedness

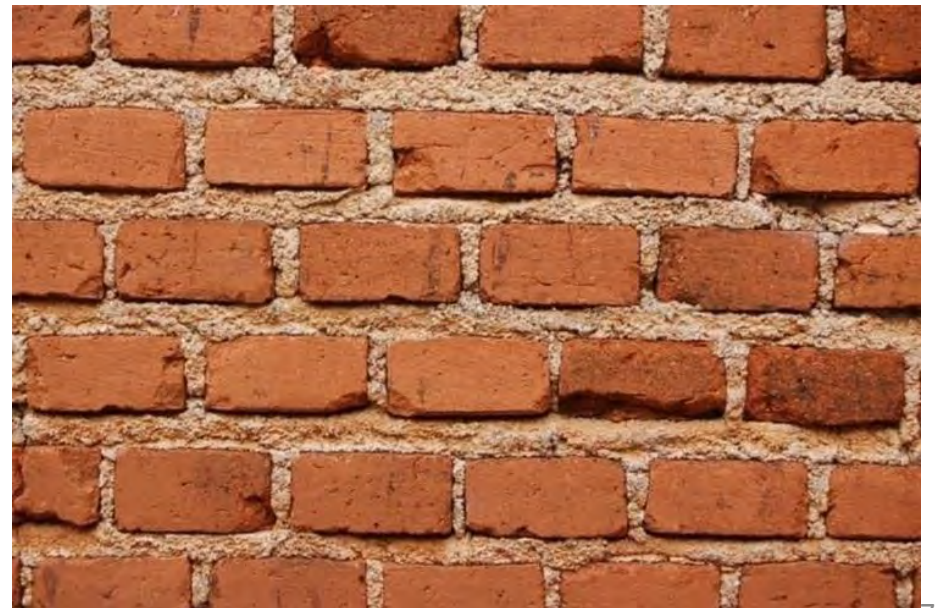






What can we do with a brick (other than walls)?

Can we build a wall without using bricks?



How to generate many good (novel + useful) ideas?

(without necessarily get mood disorder)

Main patterns of creation

- Recombination
- Analogy
- Negation
- Abstraction

Recombination

Recombination involves the use and re-use of existing components for the creation of a new solution.

«Putting new things in old combinations or old things in new combinations» (Karl Weick)

Existing components are often available to everybody.
Yet only the innovator is able to identify the potential for their novel recombination.

Innovators watch what everybody else watches, but see what nobody sees.

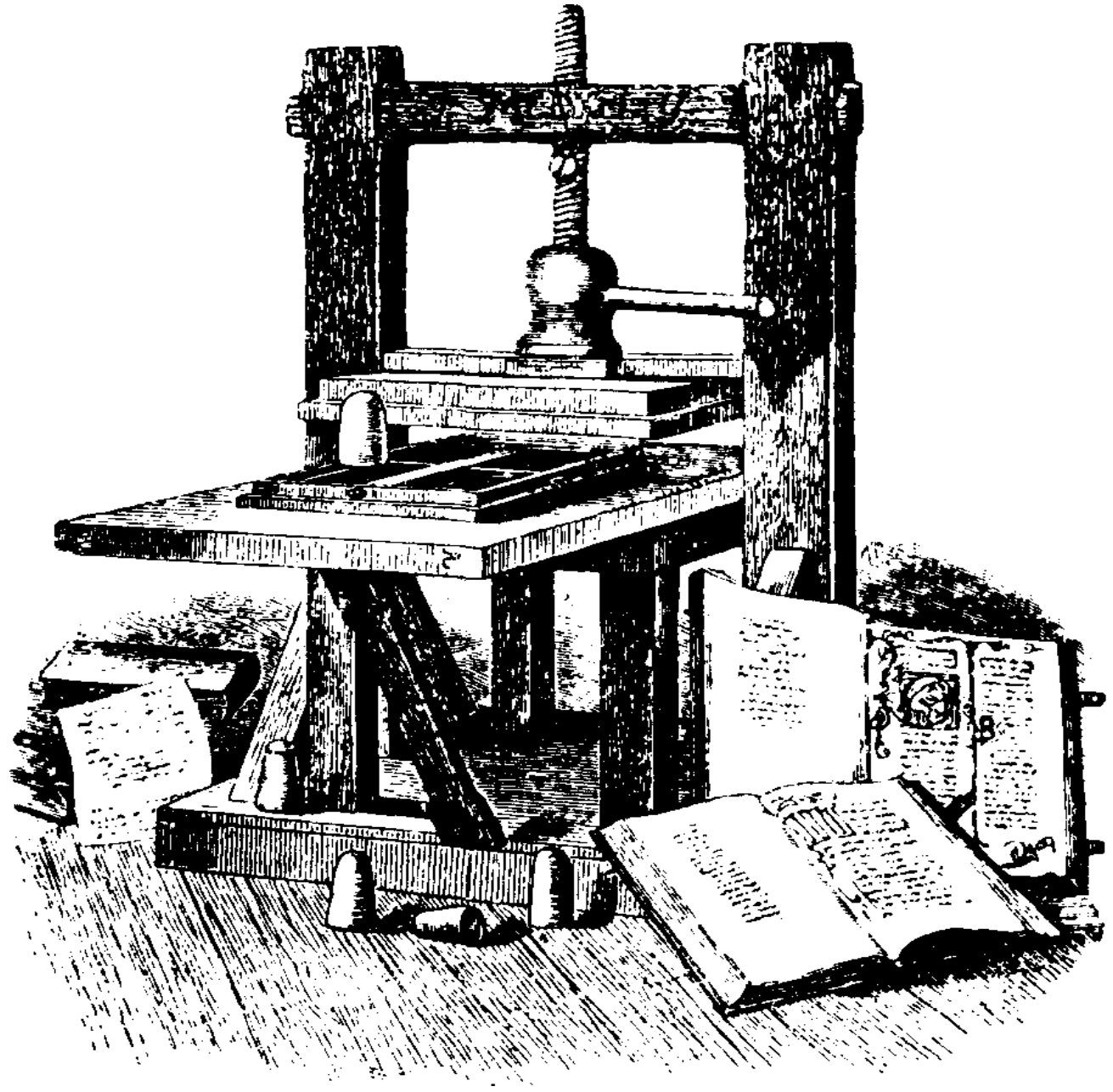


Johannes Gutenberg

Printing press (1436-1450)

Gutenberg was a goldsmith familiar with techniques of cutting punches for making coins from moulds.

He then invented a way to cast letters from matrices. With this technique he opened the way to movable type printing.

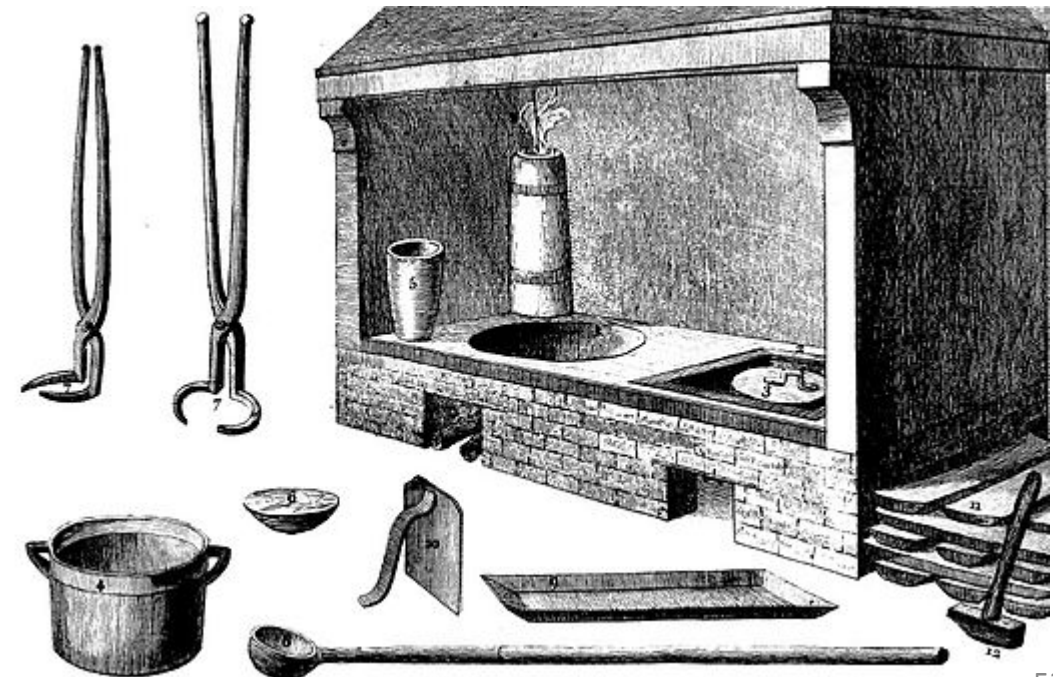




Hand mould

A technique to cast letters from a matrix, in order to obtain single letters to be placed in a movable type press.

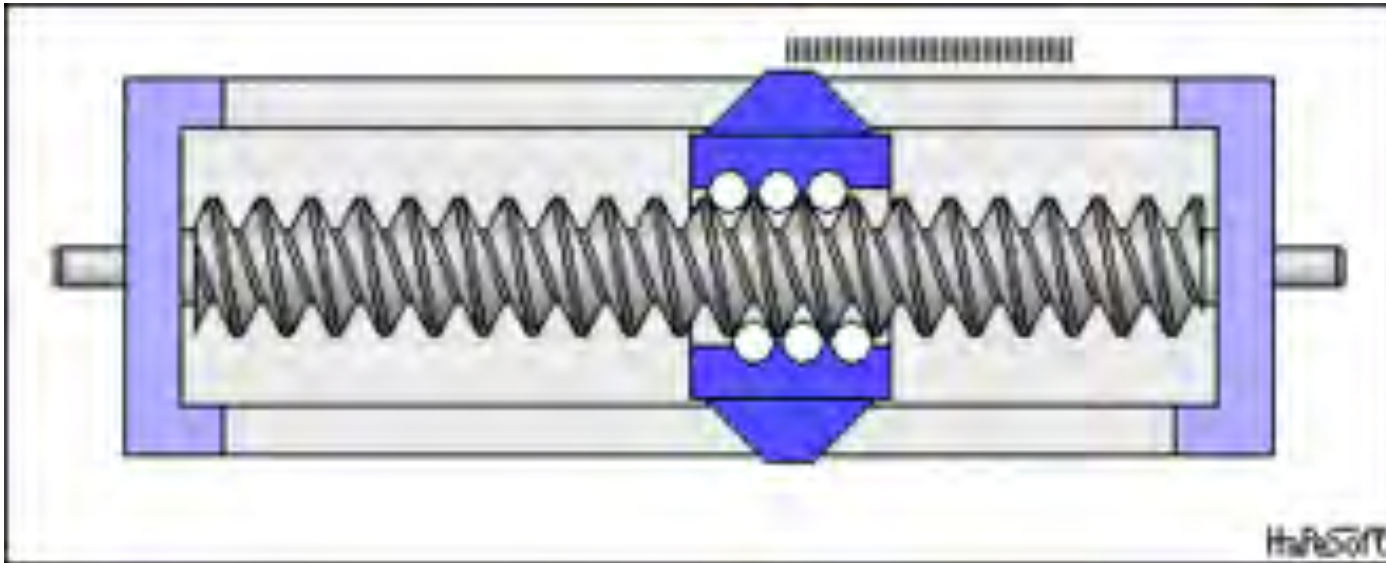
Types were created out of lead, tin and antimony.



Screw press

Gutenberg adapted a screw press machine in order to place pressure on the sheets of paper in a homogeneous way.

The screw press process was largely used in agriculture, e.e. winepress.



Industry 4.0 is not a new technology but

A **recombination**
driven by the **applications**
of **existing** technologies
whose **cost** has been falling significantly
while **usability** greatly improved over time

Enabling factors

- Fall in cost of sensors (e.g. RFID)
- Machine-to-machine communication
- Last generation mobile networks (4G, 5G)
- Increase in computation power (*cloud computing, fog computing*)
- Cyber-security
- Recent developments in Artificial Intelligence (*deep learning, machine learning*)

TECNOLOGIE PER L'INDUSTRIA 4.0

 PRODUZIONE	 LOGISTICA INTERNA	 ACQUISTI	 MANUTENZIONE	 LOGISTICA ESTERNA	 DISTRIBUZIONE E VENDITE	 SERVIZI POST-VENDITA	
robot cobot rfid/nfc microcontrollori sensori cloud processori plc	droni agv gps indoor rfid dispositivi di visualizzazione cloud auto-unloading	rfid sensori block chain auto-unloading	wearable devices sensori realtà aumentata tablet cloud	droni block chain rfid sensori cloud gps	sensori cloud microcontrollori data minig microprocessori	piattaforme web sistemi di diagnostica automatica	
 RISORSE	sensori		microprocessori		microcontrollori		attuatori
 RETE	wi-fi		3G	4G	5G		zigbee
	bluetooth				rfid/nfc		lpwan
 CYBER SECURITY	firewall		sistemi di crittografia		block chain		
 BIG DATA & ANALITICS	fog		data mining		intelligenza artificiale		cloud
 SIMULAZIONE	agent based		system dynamics		discrete events		

Analogy

With the analogy we bring a solution found in a given context into a completely different one. In the new context the solution will be original, often radically new.

The arrival of patients in the surgery room in a hospital may be seen as the arrival of containers in a harbour-
then principles from logistics can be applied to reduce waiting times and to increase the utilization rate of the infrastructure.

Analogical thinking requires the identification of a deep pattern underlying the surface differences.

Finding a right analogy is a surprisingly difficult cognitive task.



What do they have
in common?





The Japanese engineer Eiji Nakatsu had to study in the 1990s how to reduce the acoustic pollution produced by high speed trains.

In entering the narrow tunnels between Osaka and Hakata the trains produced vibrations and noise.

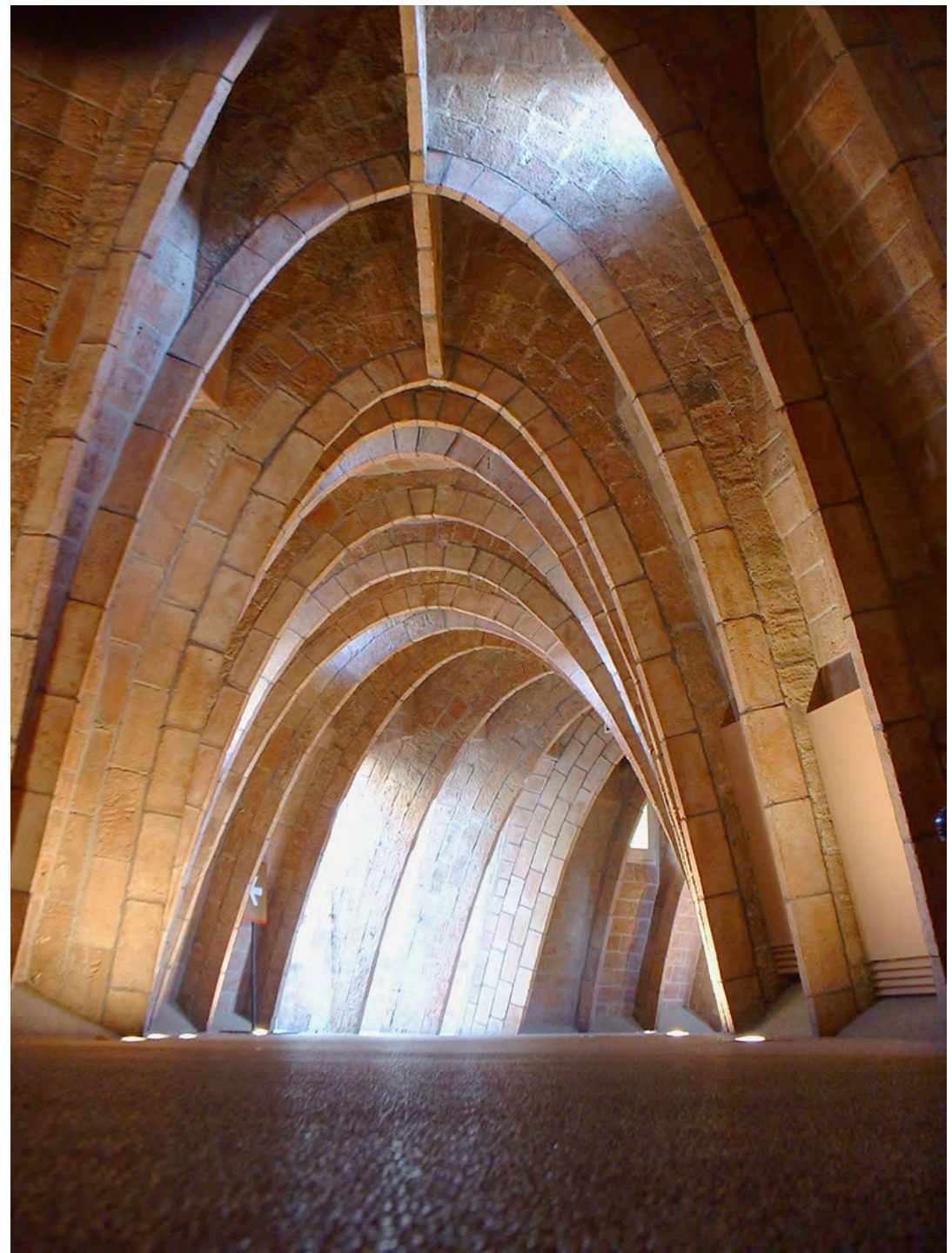
He realized the noise was produced by a sudden change in the resistance of the air.

Nakatsu had previously studied the aerodynamics of birds. He asked whether there were birds that experienced a sudden change in the resistance.

It turned out that the kingfisher moved from low resistance (air) to high resistance (water) without producing a splash.

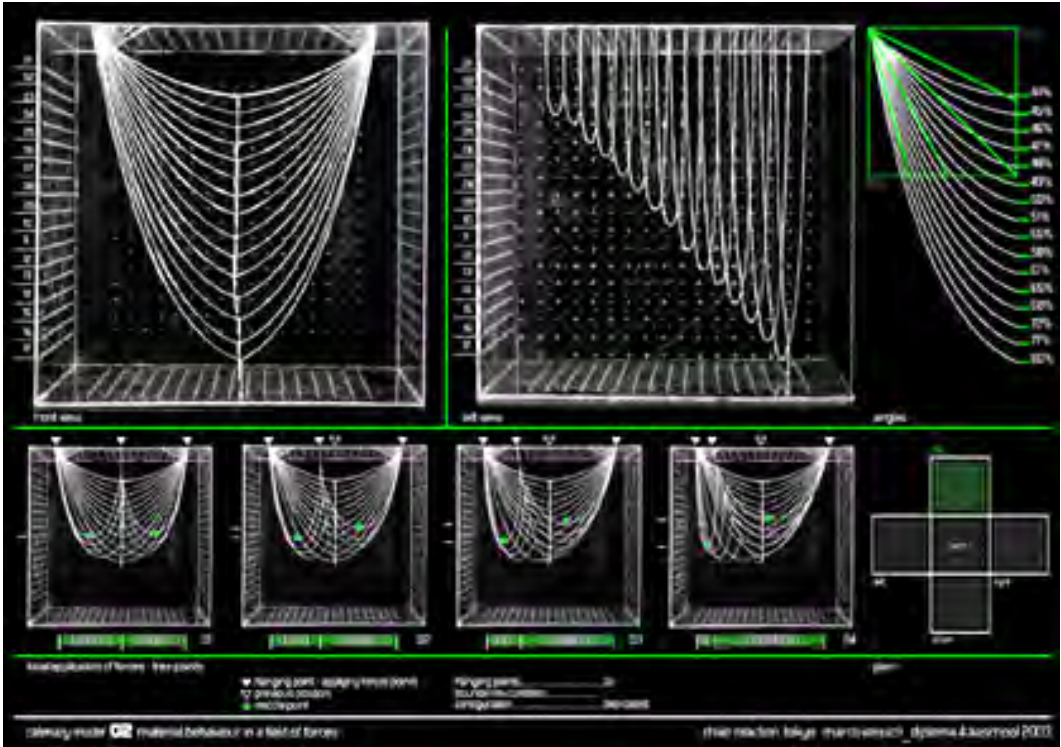
The Shinkansen trains were equipped with a 15mt beak, which reduced air pressure by 30%.

Antoni Gaudí, *Casa Mila (La Pedrera)*,
Barcelona



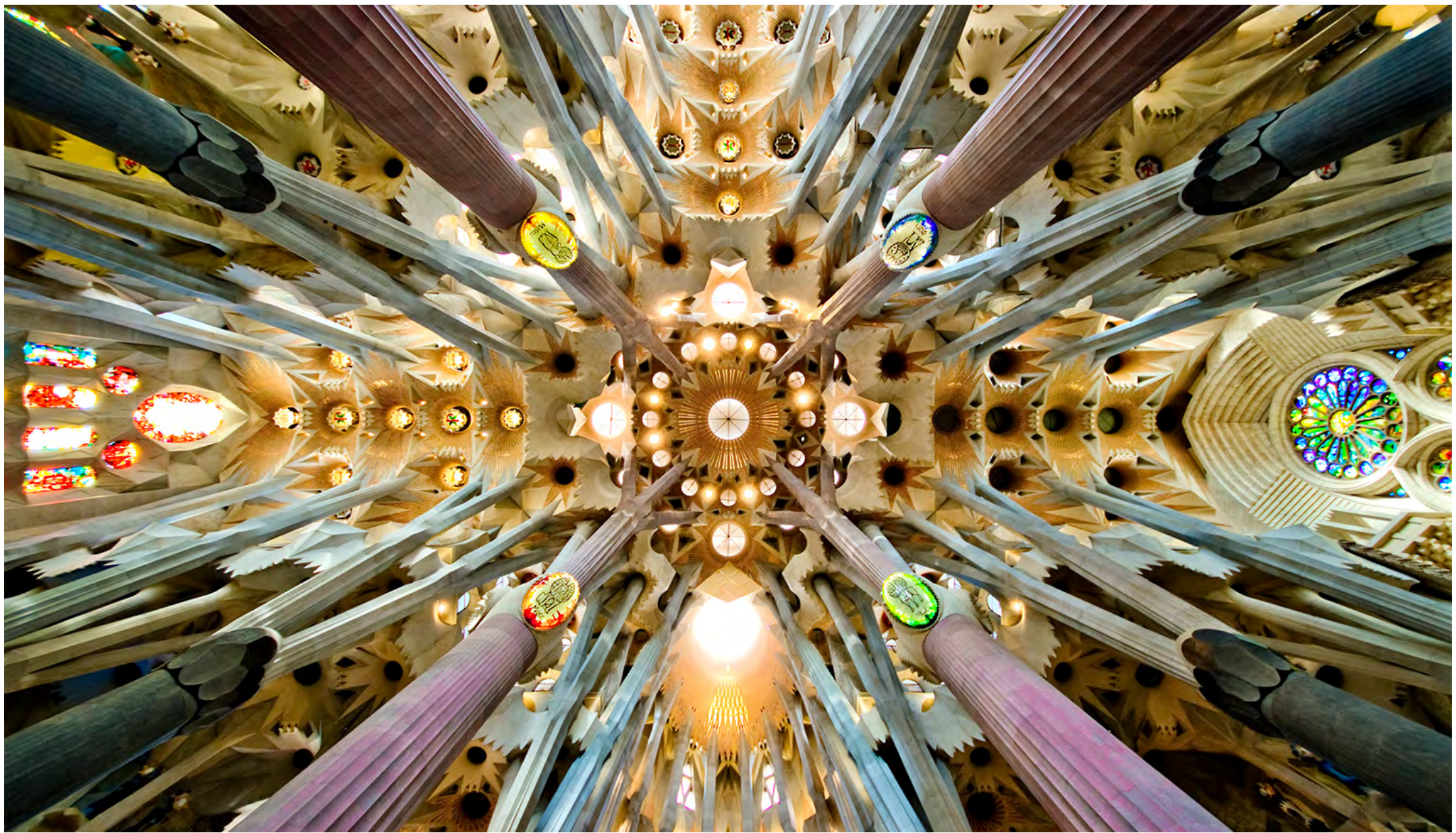


Geometric properties of the catenaria arch



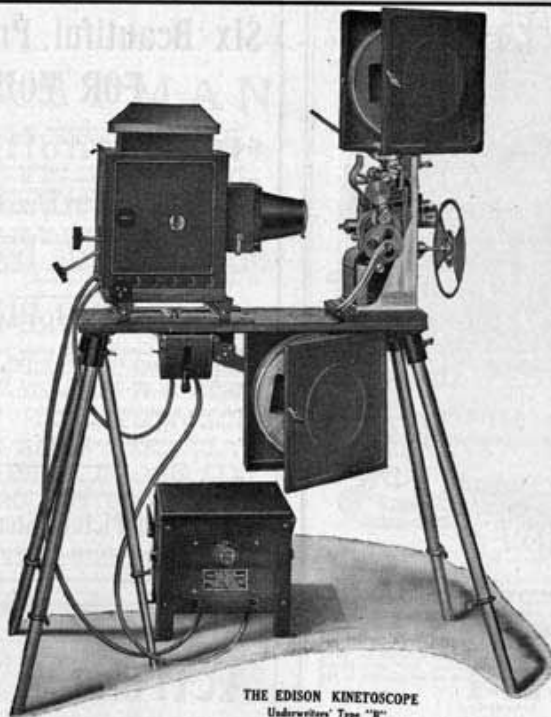
Source: Architettura.it

La Pedrera, Espai Gaudì



Antoni Gaudí, Archivault of the *Sagrada Família*, Barcelona.





THE EDISON KINETOSCOPE
Underwriter's Type "K"

WHY isn't your motion picture show making you the great big money you read about? How is it that the man in the next block can show the same pictures you do—and take the crowds away from you? We'll tell you. It's all in the machine—you need an

EDISON KINETOSCOPE

The Edison wins the crowd because it projects clear, flickerless pictures that don't tire the eyes and are a real pleasure to look at. There are no discouraging "intermissions for repairs". And the Edison Kinetoscope saves the extra money it makes, because it runs the longest time with the least upkeep expense. Get Posted. Send for Catalog 500 and a copy of the Edison Kinetogram.

Price, with Rheostat, 110 volts, 24-40 amperes - \$225.00
Price, " 110 volt, 60 Cycle Transformer - 245.00

THOMAS A. EDISON, Inc., 274 Lakeside Avenue, Orange, N. J.

In writing to advertisers please mention "MOVING PICTURE NEWS"

Thomas Edison invented the kinetoscope after the phonograph.

He thought that it would be possible to record motion as it was possible to record sound- he had a mental model of recording that allowed him to find the appropriate analogy.



CLASS A FILMS
15 Cents per foot
Exhibition Model
Kinetoscope \$115.00

EDISON

FILMS AND PROJECTING KINETOSCOPES

THE RECOGNIZED STANDARDS THROUGHOUT THE WORLD

EDISON RHEOSTAT
UNDERWRITER'S MODEL

Approved by The New York Board of Fire Underwriters and the Department of

CLASS B FILMS
12 Cents per foot
Universal Model
Kinetoscope \$75.00

FRONT VIEW
SWITCH AND COVER

REAR VIEW
CASING REMOVED

EDISON MANUFACTURING CO.,

MAIN OFFICE AND FACTORY, ORANGE, N. J.
Chicago Office, 304 Wabash Avenue,
New York Office, 21 Union Square. Cable Address, Zymoon, New York.

OFFICE FOR UNITED KINGDOM:
23, CLERKENWELL ROAD, LONDON, E. C., ENGLAND.

SELLING AGENTS:

THE KINETOGRAPH CO., 48 East 20th Street, New York.
PETER BACIGALUPI, 1102 Fillmore Street, San Francisco, Cal.
GEORGE BRECK, 250-254 Grove Street, San Francisco, Cal.

DEALERS IN ALL PRINCIPAL CITIES.



Napoletana
machine coffee
XIX century (still
in use)

Two main issues

- Risk of burning the skin in the turning of the machine upside down
- Excess consumption of coffee powder

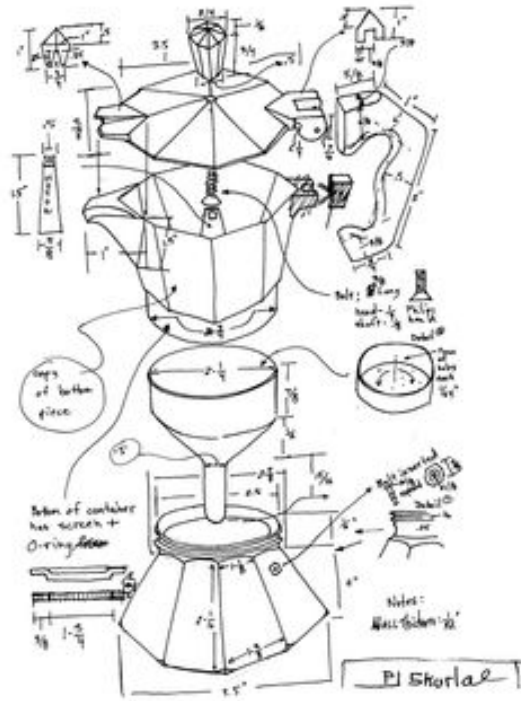


Alfonso Bialetti

Owner of a foundry in Piedmont, after a worker experience in France.

He observed women washing the clothes in the Orta Lake, using a washtub with a hole in the bottom. Below the washtub a container included ash and soap.

After the contact with water, the mix of ash and soap boiled, producing foam and moving upward in the washtub.



Bialetti asked whether the same principle could be applied to the percolation of coffee.

He adopted an aluminium casting, with an appearance close to silver.

Aluminium porosity allowed the machine to absorb the flavour of the coffee powder.





Maltese Falcon

Sailing Yacht by
Perini Navi
(2006)







... where did sailings disappear?



Before entering the yacht production, Fabio Perini was a world leader in paper converting equipment. Fast and reliable rolling is a crucial performance of equipment.

From rolling paper coils to rolling sailings.

Negation

Negation is an innovation pattern in which a crucial component of a solution is reversed or suppressed. In this way the novel solution is distant from the existing ones.

Facing the dramatic crisis of the circus show, the Cirque du Soleil eliminated the single most important asset of circus companies- living animals.
Cirque du Soleil is a circus without the circus.

Not all negations are innovations.

The successful innovator is able to **identify exactly those dimensions of the existing solutions whose negation is the most productive.**

The identification of this dimension turns out to be extremely difficult.

How can we design a table that could be made and sold, at a profit, for five euros?





Audi R10 TDI

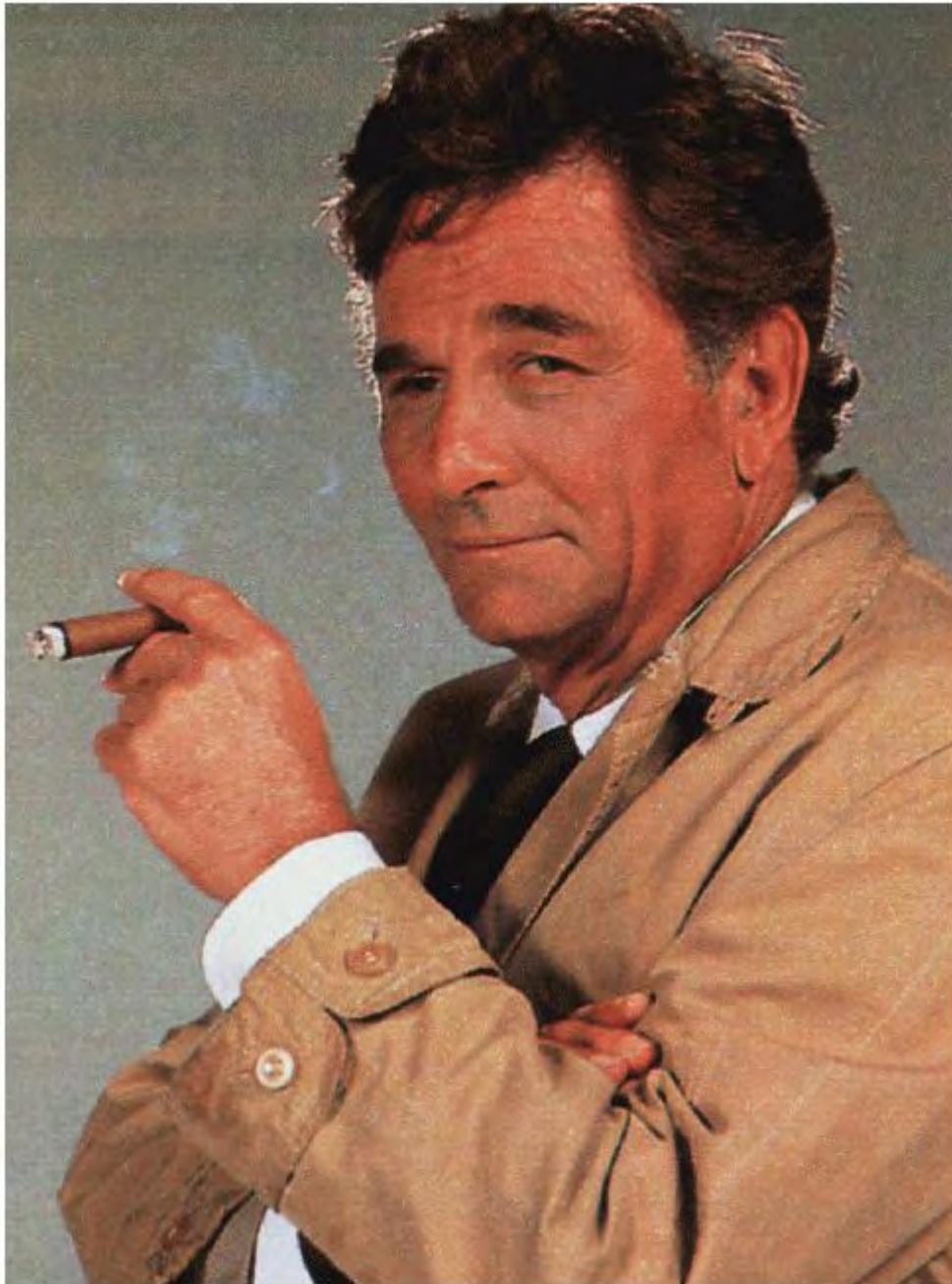
How we could win Le Mans if our car could go no faster than anyone else's ?

Answer: **fuel efficiency.**

By reducing the number of pit stops the Audi R10 TDI won Le Mans in 2006 and in the subsequent three years.

Paradoxical frames

- Create a sense of conflict and discomfort
- This tension can be a valuable trigger to getting people to think in new ways
- Reduce the likelihood that people will fall back with conservative lines of thought
- Force participants to re-interrogate the relationships between key elements
- Suggest «and» thinking rather than «either/or» thinking
- Support the ability to be open to ambiguity and contradictions



Detective Colombo

- He enters the scene of the movie quite late (in some cases 20 minutes after the start)
- The murder is shown at the very beginning
- The murderer is immediately evident to the public, since the scene in which he/she is acting is place at the beginning
- The suspense of the movie is entirely shifted on the intellectual ability of Colombo to place the murderer in contradiction
- Colombo looks shabby, absent-minded
- He wears an old raincoat and drives an old European car
- He speaks of his wife, but she never appears
- He takes notes in a creased notebook

Negation has been a powerful pattern of innovation in contemporary art.

Starting with the Impressionist revolution in France, and with the fin-de-siècle creative environment of Wien, artists have explored the consequences of *negating* some of the most entrenched conventions of art.

Albrecht Dürer
Leprotto (1502)
Wien, Albertina Museum



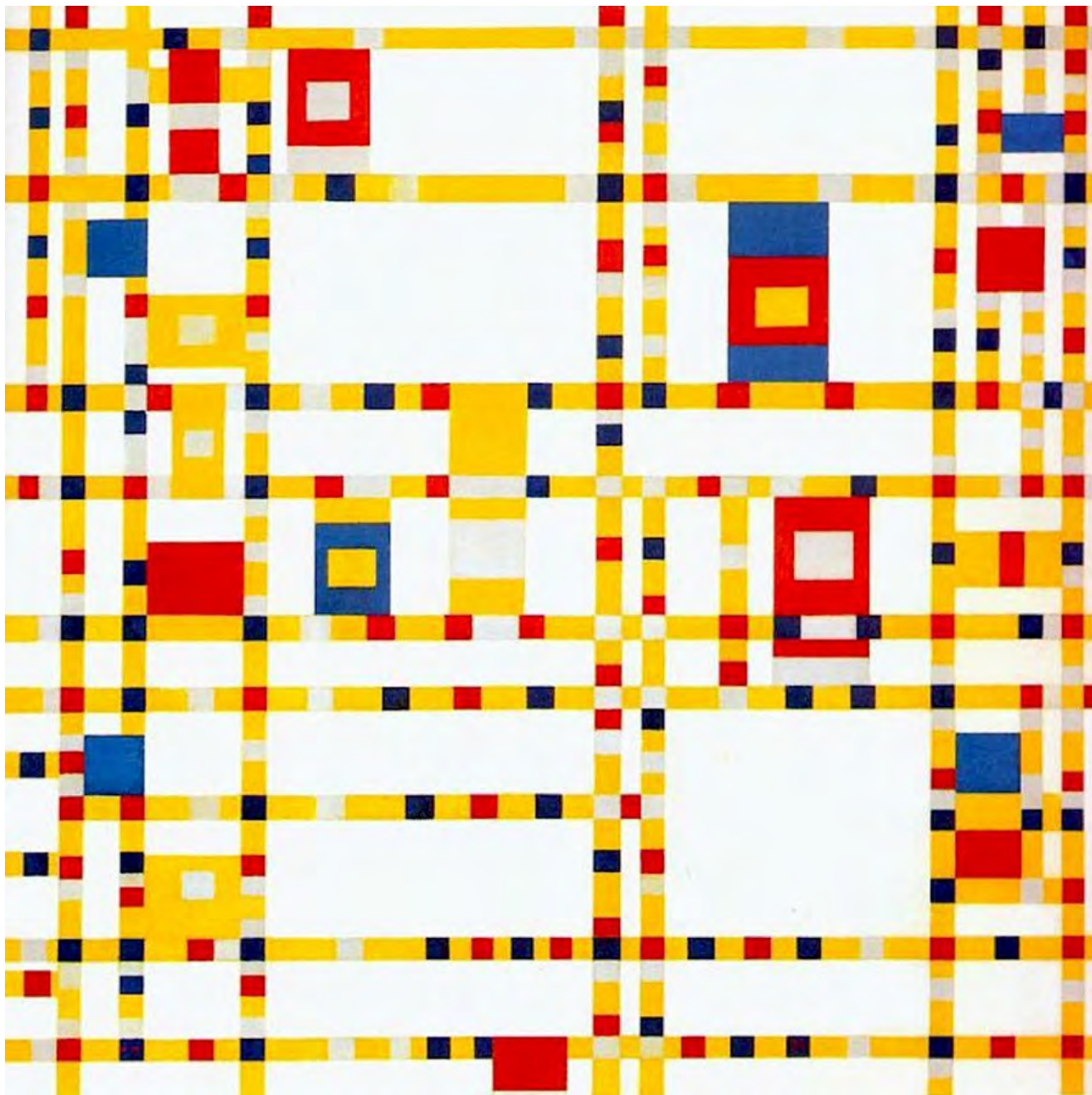
Realism of the image

I asked myself... whether one might not simply reduce or 'distort' objects, but do away with them altogether.

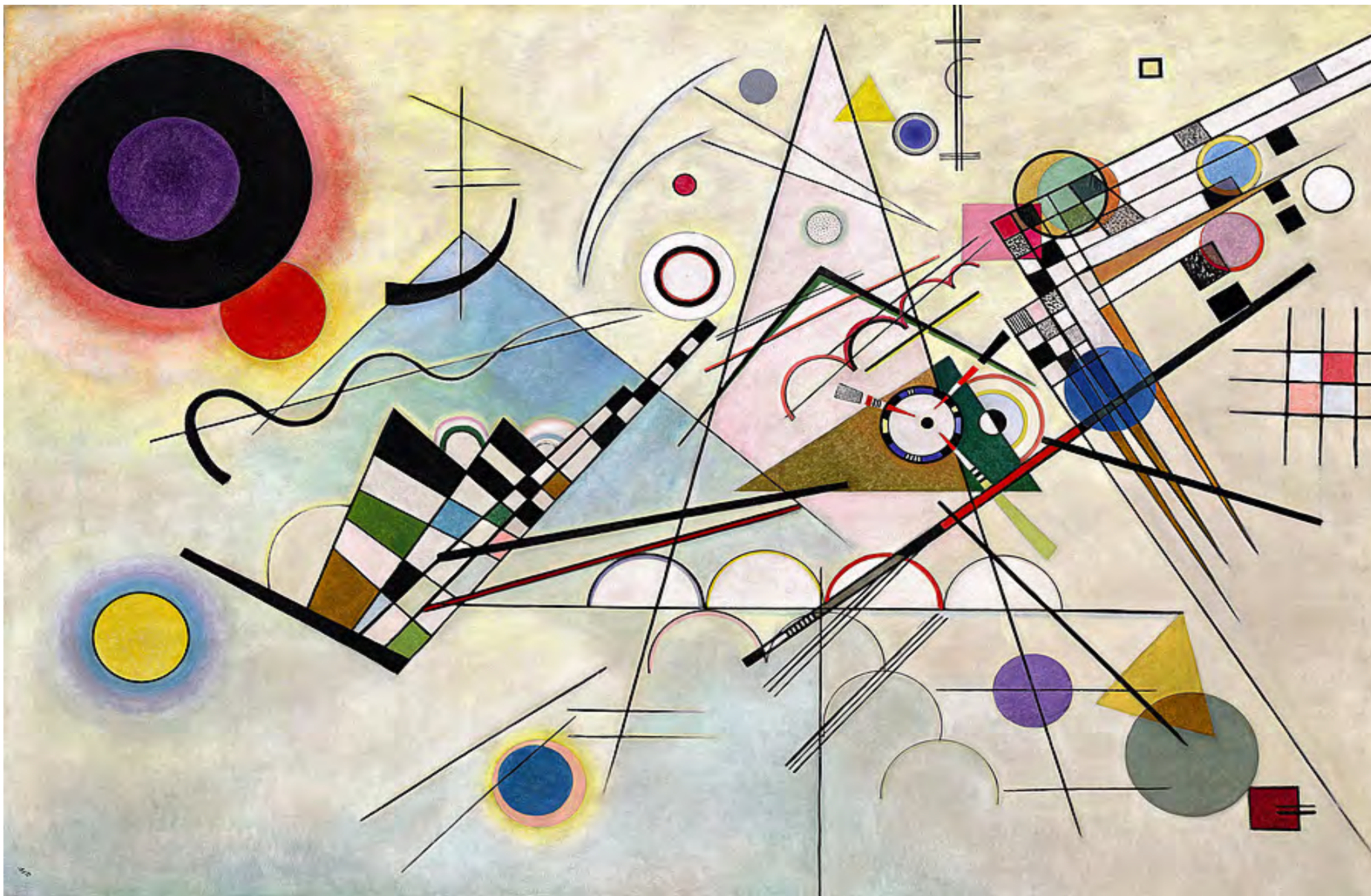
Vassily Kandinsky

Suprematism would create symbols directly from abstract elements, «the formation of signs instead of the repetition of nature, flowing from our creative brain».

Kazimir Malevich



Piet Mondrian
Broadway Boogie-Woogie
(1942-1943)
New York, Museum of Modern
Art



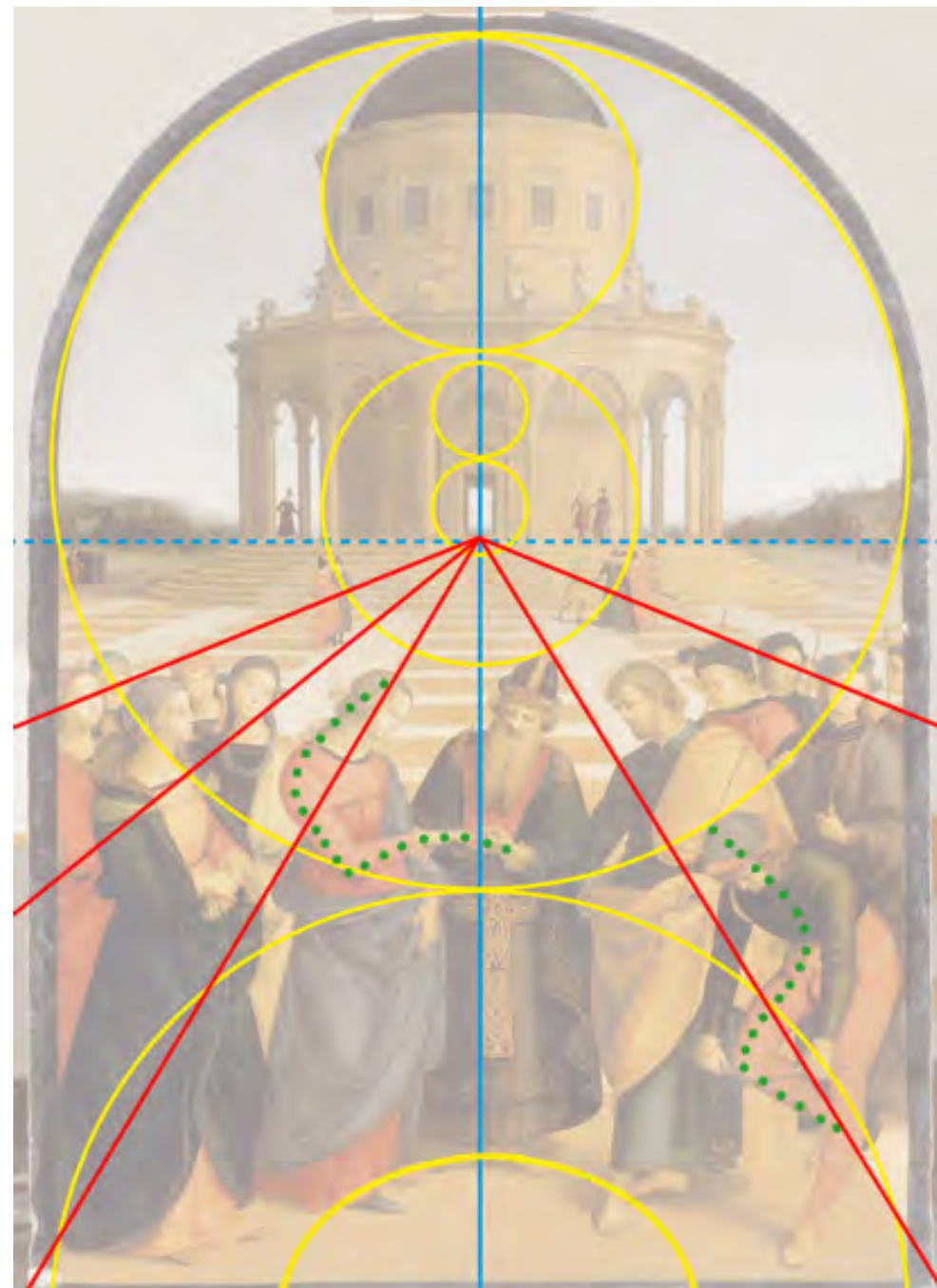
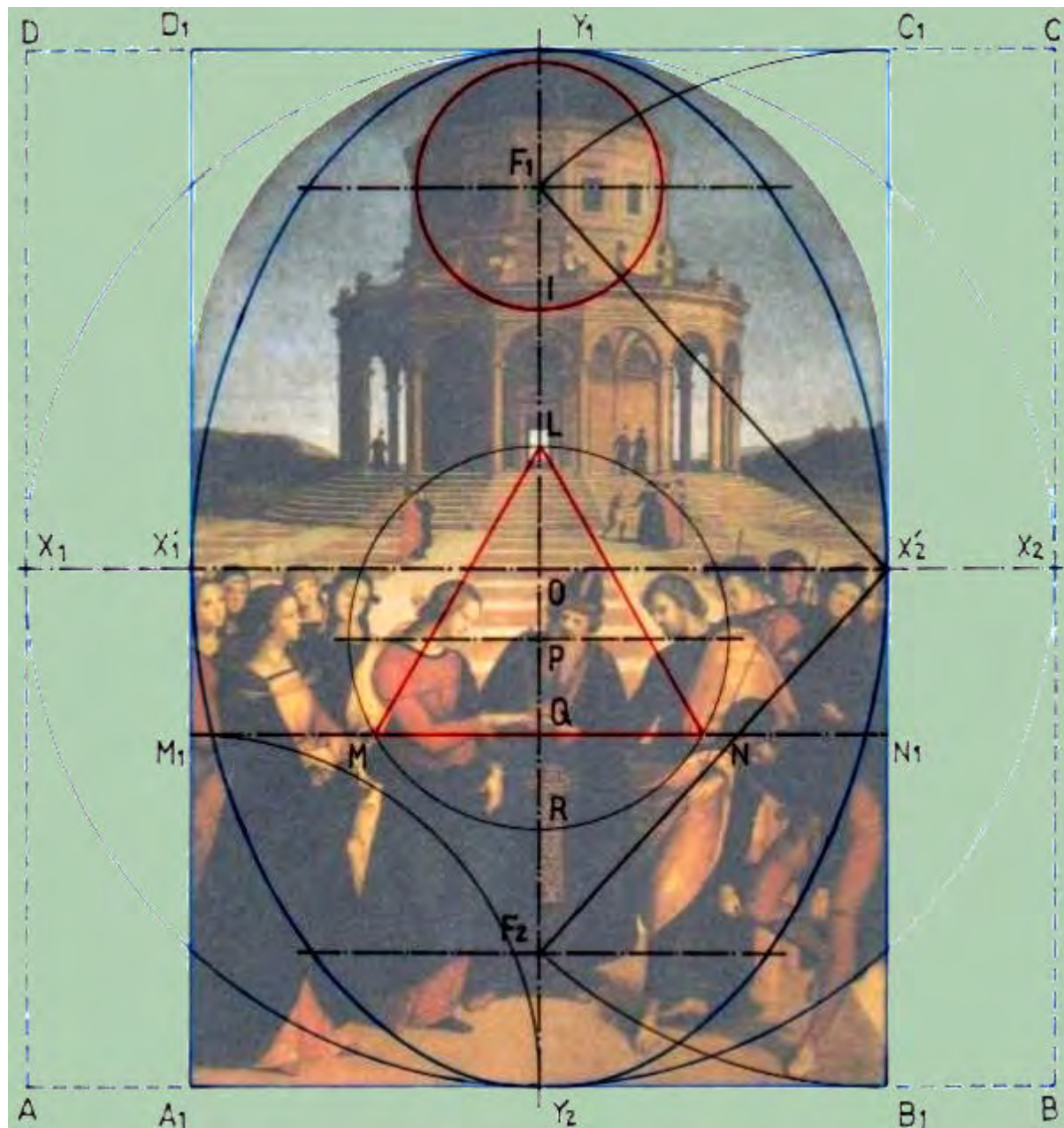
Vassily Kandinsky
Composition VIII
(1923)
New York,
Guggenheim
Museum

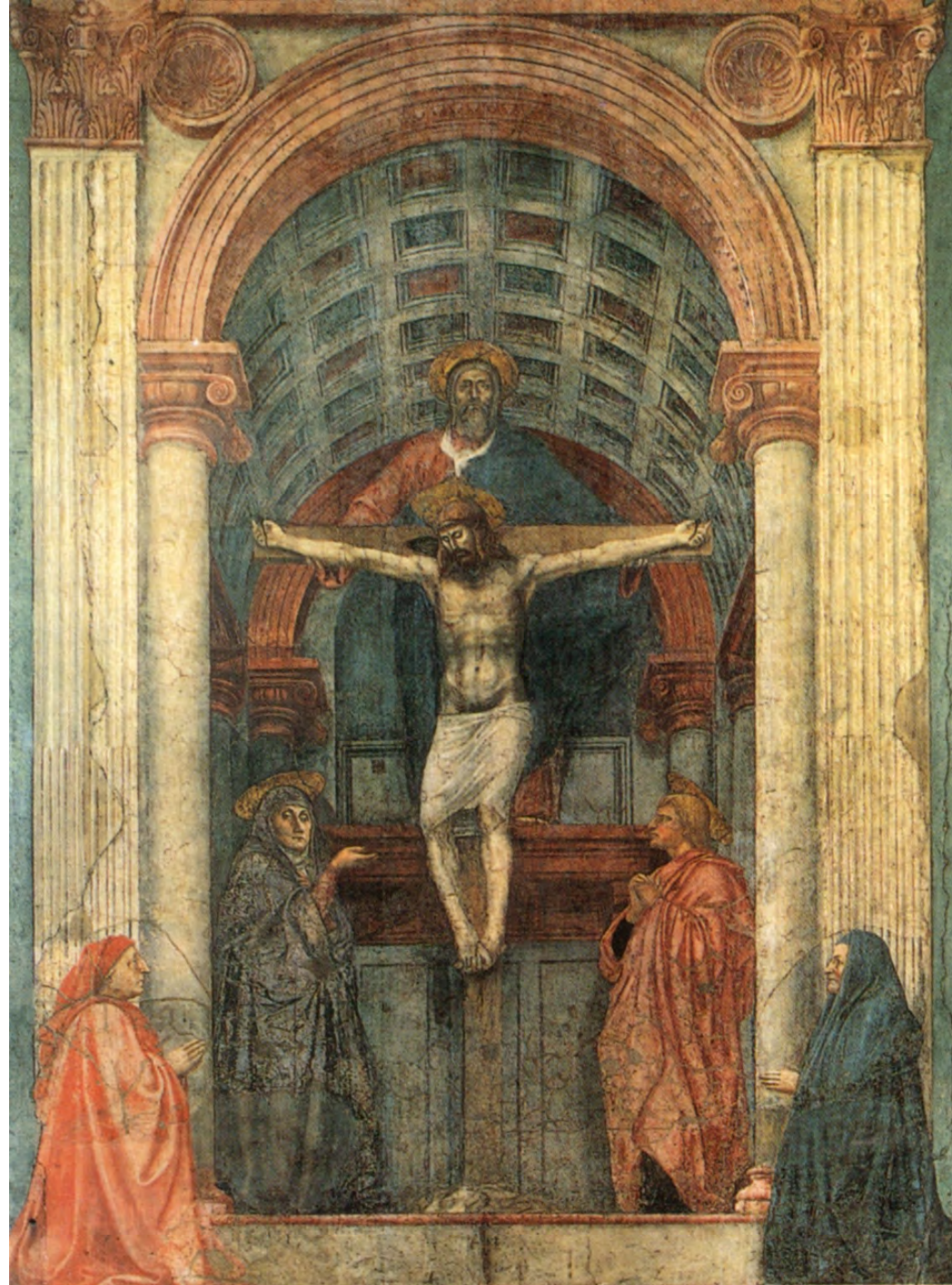


Anonymous. *Perspective on a city* (1475-1480). Urbino, Galleria Nazionale delle Marche.

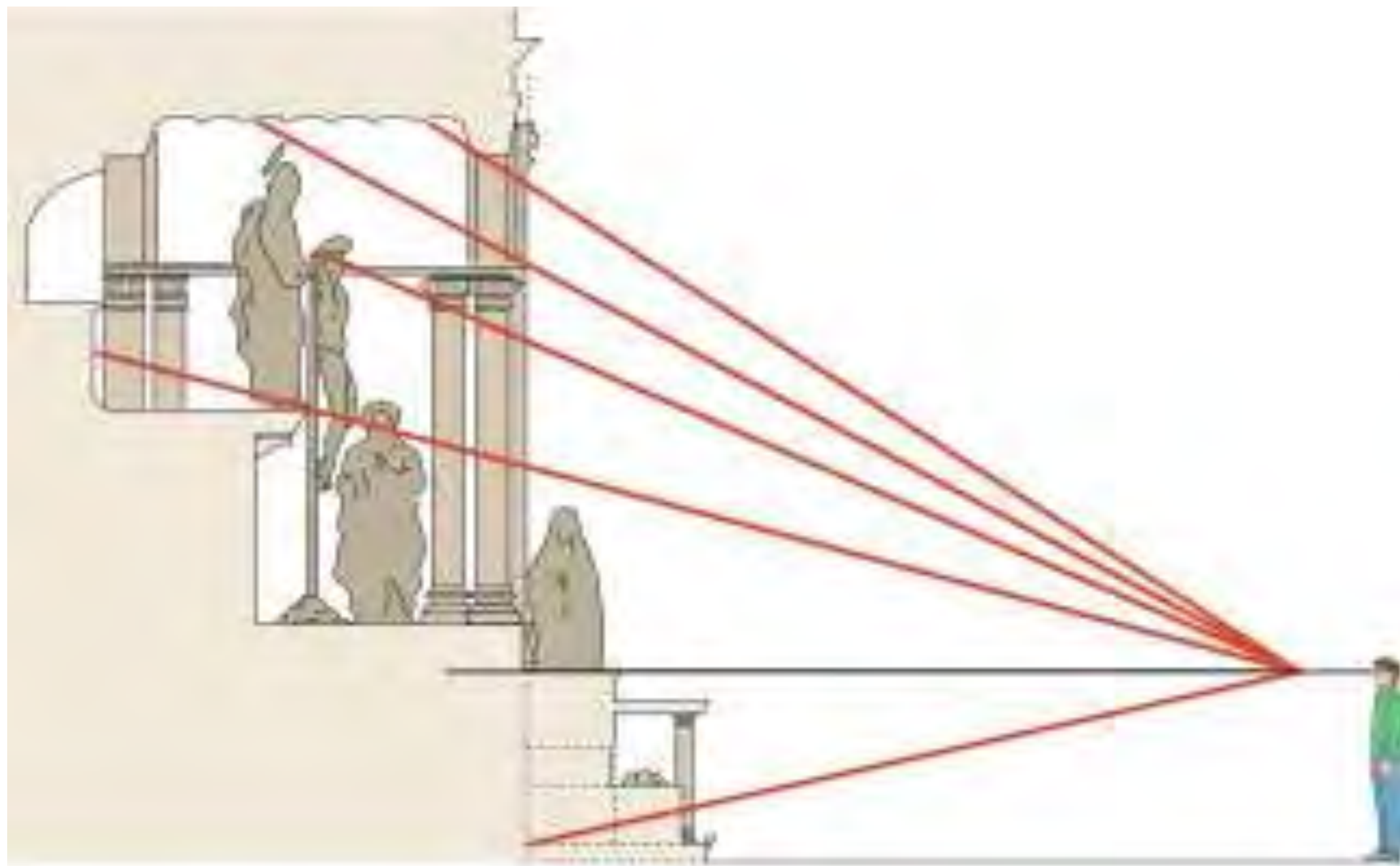


Raffaello Sanzio
Lo sposalizio della Vergine (1504)
Milano, Pinacoteca di Brera





Masaccio
Trinità (1427-1428)
Firenze, Santa Maria Novella



Central perspective

It is as if someone spent his life drawing profiles and believed that man was one-eyed.

George Braque



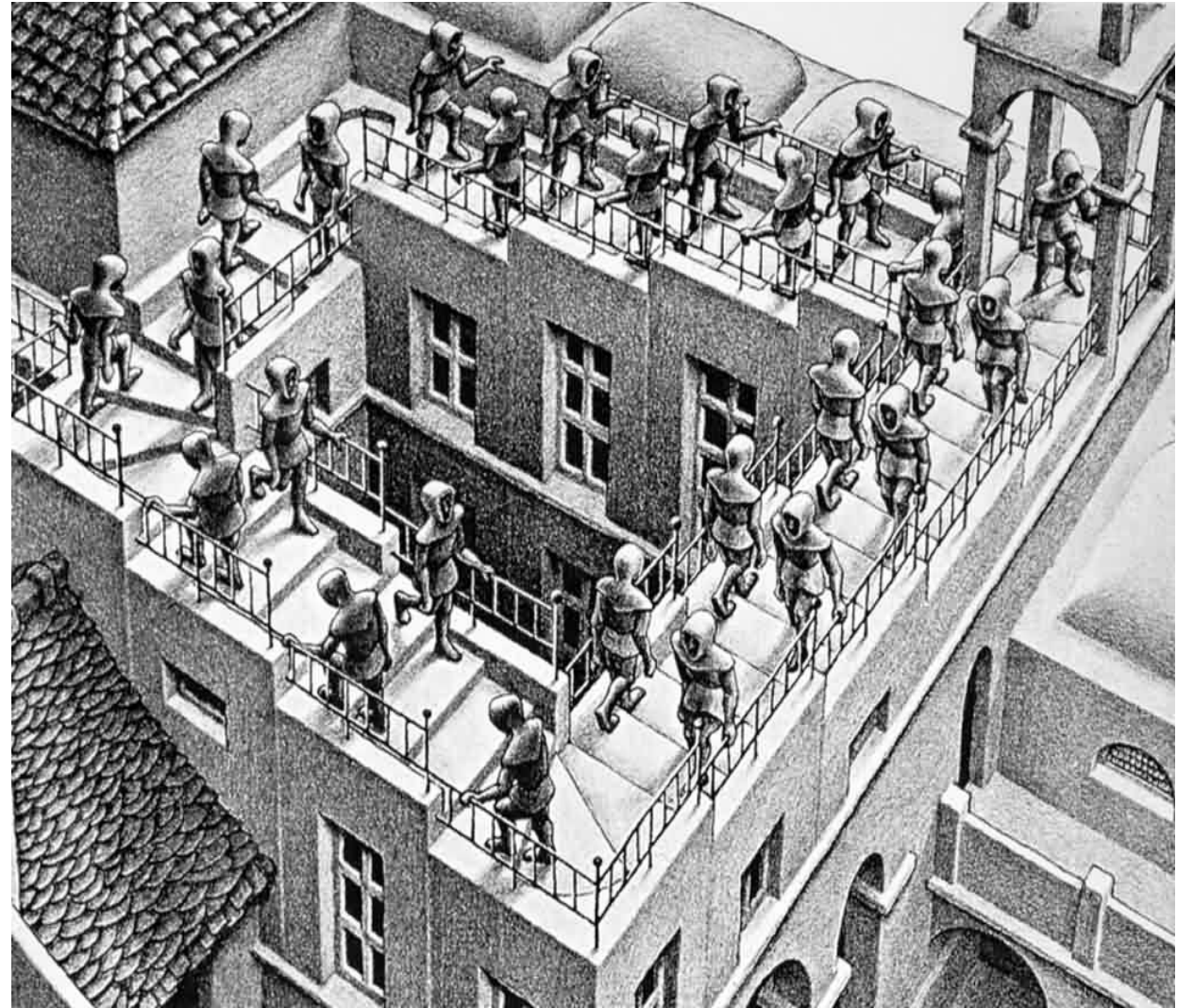
George Braque
Violino e candela (1910)
New York, Museum of Modern Art



Picasso
*Les
demoiselles
d'Avignon*
(1907)
New York,
Museum of
Modern Art



M.C. Escher
Waterfall (1961)





Giotto, *Ascensione al cielo* (particolare) (1303-1304). Padova, Cappella degli Scrovegni

Representational nature of color

Here are the ideas of that time: Construction by colored surfaces.
Search for intensity of color, subject matter being unimportant.
Reaction against the diffusion of local tone in light. Light is not suppressed, but is expressed by a harmony of intensely colored surfaces.

By removing oneself from the literal representation of movement one attains greater beauty and grandeur.

Henri Matisse

Matisse realized «that one could work with expressive colors that are not necessarily descriptive colors» (Jack Flam)



Henri Matisse, *La Gerbe* (1953). Los Angeles, Hemmer Museum.



Henri Matisse, *Icaro (Figure VIII da «Jazz»)* (1946). Paris, Centre Pompidou



Michelangelo
Schiavo barbuto (Prigione)
(1523-1534)
Firenze, Galleria
dell'Accademia

Michelangelo
Atlante (Prigione) (1523-1534). Firenze, Galleria dell'Accademia

Work of art

Can one make works which are not works of 'art'?

The readymade can be seen as a sort of irony, because it says here it is, a thing that I call art, I didn't even make it myself. As we know art etymologically speaking means to 'make', 'hand make', and there, instead of making, I take it readymade. So it was a form of denying the possibility of defining art.

Marcel Duchamp



Georges Duchamp, *Roue de bicyclette* (1913). New York, The Museum of Modern Art

Man Ray
Cadeau (1921)
The Vera and Arturo Schwarz Collection of Dada
and Surrealist Art



George Duchamp
Fountain (1917)
The Vera and Arturo Schwarz Collection
of Dada and Surrealist Art





Piero della Francesca
Federico da Montefeltro (1465)
Firenze, Uffizi

Shape of the painting and orientation in space

My paintings do not have a center.

When I am in my painting, I am not aware of what I'm doing.

The easel picture is a dying form, and the tendency of modern feeling is towards the wall picture or mural.

Jackson Pollock



Jackson Pollock, *Convergence* (1952). New York, The Pollock-Krasner Foundation/Artists Rights Society (ARS).



Jackson Pollock and the dripping technique



Sandro Botticelli
Nascita di Venere (particolare) (1484)
Firenze, Uffizi

Reproduction

The reason I am painting this way is that I want to be a machine.

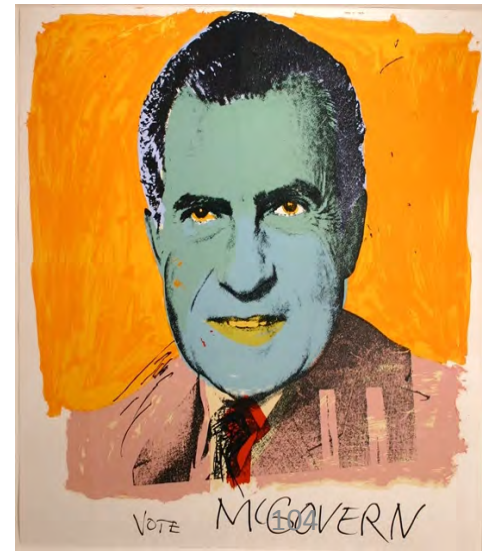
I think somebody should be able to do all my paintings for me.

Why do people think artists are special? It's just another job.

Andy Warhol

Andy Warhol
Marilyn (1967)
New York, The Andy Warhol
Foundation





Negation heuristics in XX century art

Image	Realism	Abstraction
Perspective	Central	Multiple
Colour	Descriptive	Expressive
Work of art	Manual work of the artist	Ready-made
Shape	Table	Mural Dripping
Reproduction	Original or unique work	Mechanical reproduction

Other examples of negation heuristics in contemporary art

Theater

- Unity of action, of time and space (Aristotle, *Poetics*)
- After the translation of *Poetics* in latin in XVI century, the three aristotelian units were assumed as a canon of beauty
- Ibsen (*Peer Gynt*)
- Beckett (*Waiting for Godot*), Ionesco (*La cantatrice chauve*)



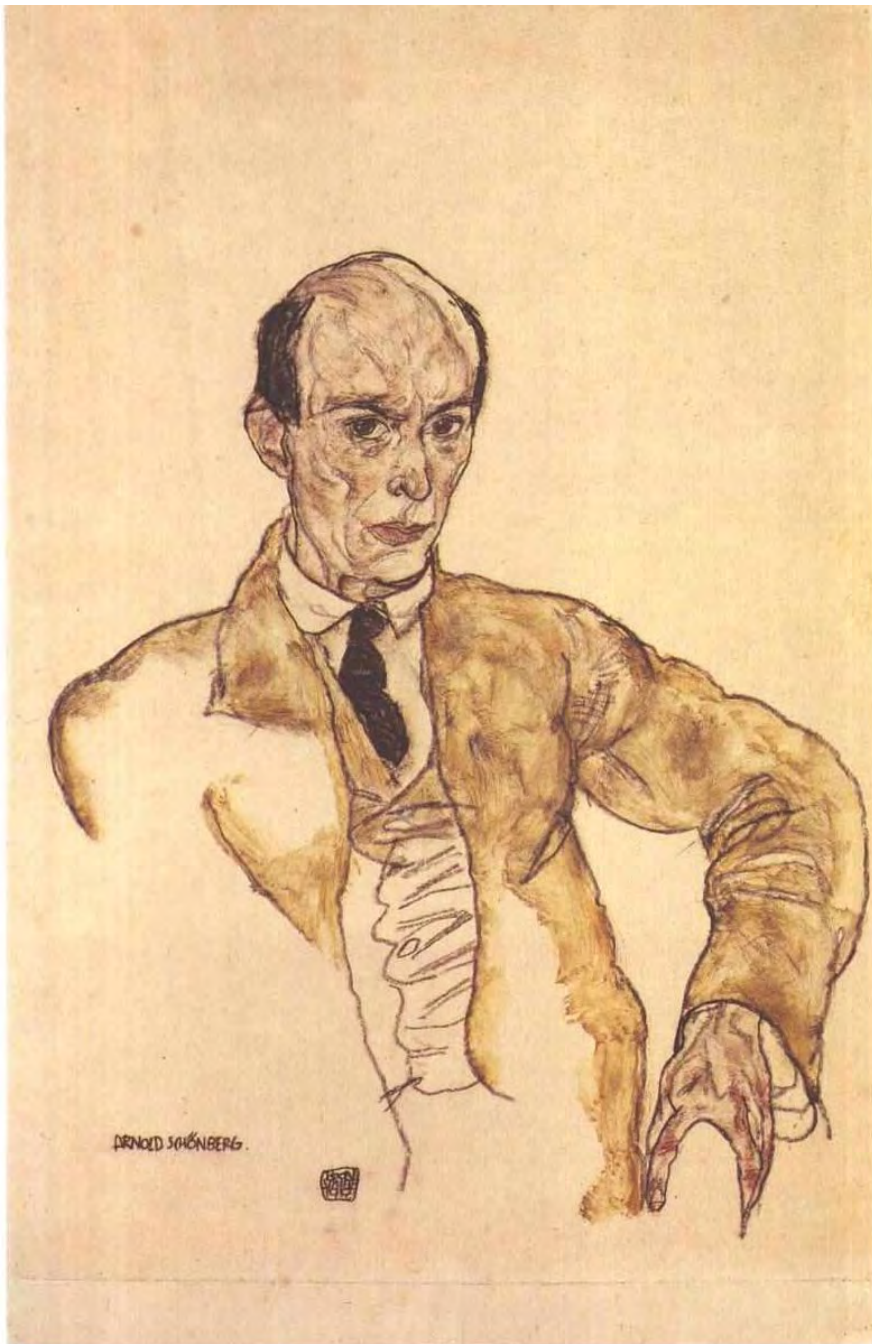
La cantatrice chauve (1950)



En attendant Godot (1952)



Peer Gynt (1867)

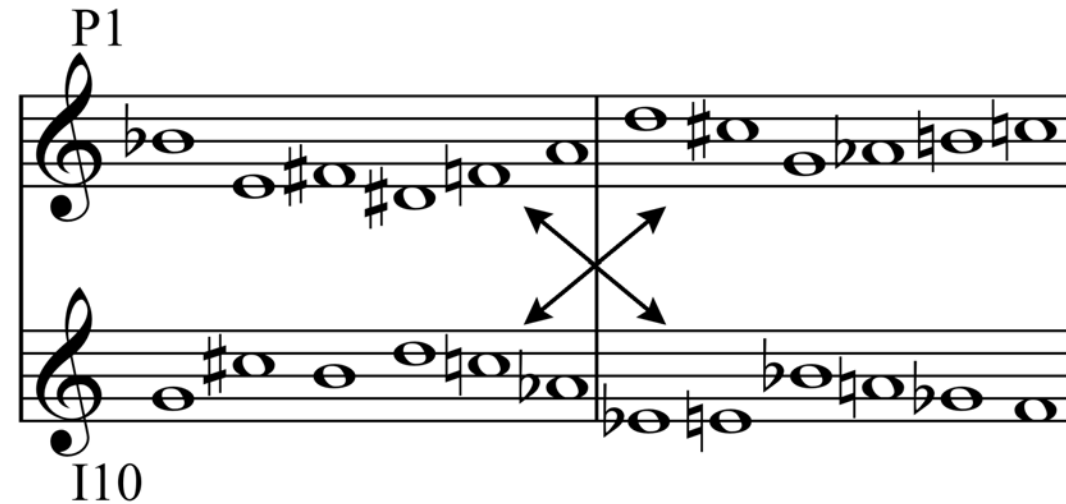


"I have made a discovery which will ensure the supremacy of German music for the next hundred years" (Arnold Schönberg)

A-tonality

Twelve tone composition:

"the twelve pitches of the octave are regarded as equal, and no one note or tonality is given the emphasis it occupied in classical harmony".



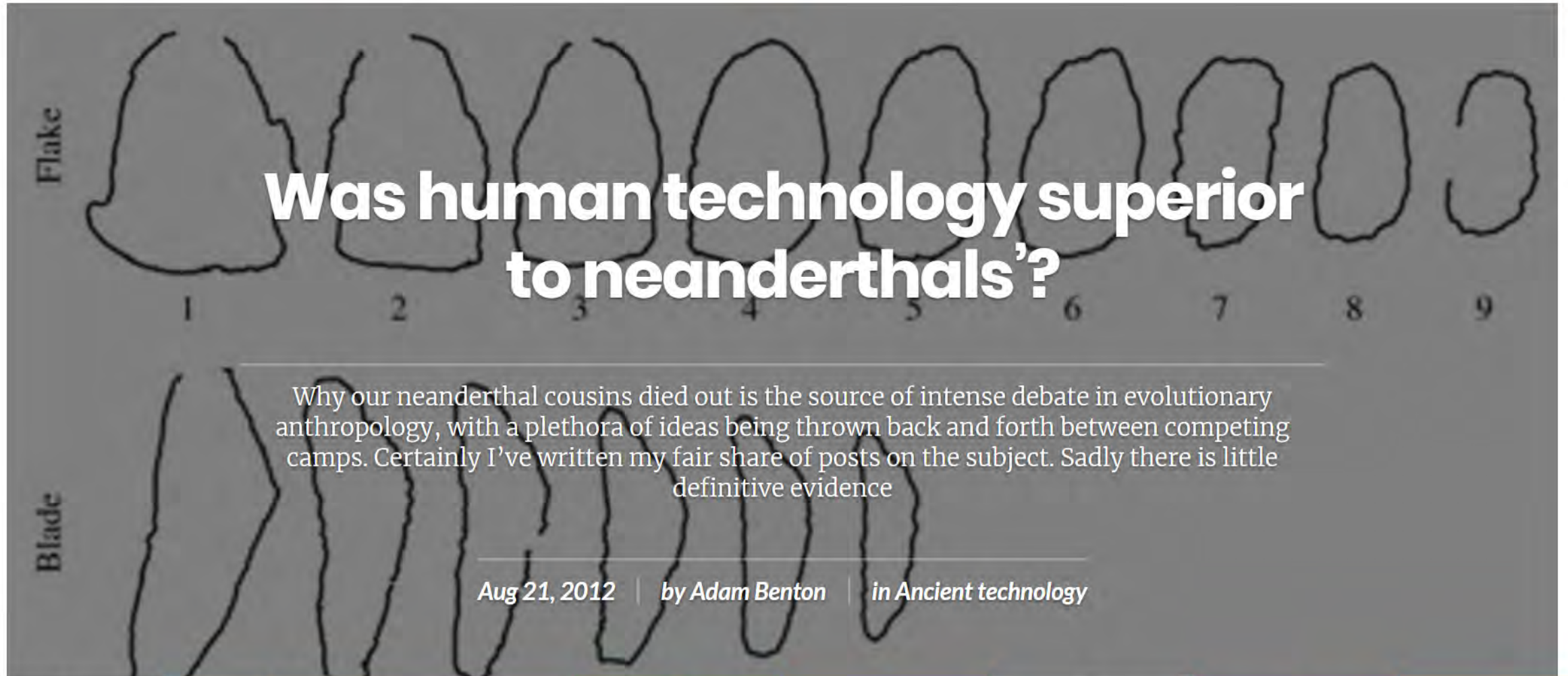
Egon Schiele, *Arnold Schönberg* (1917)

Abstraction

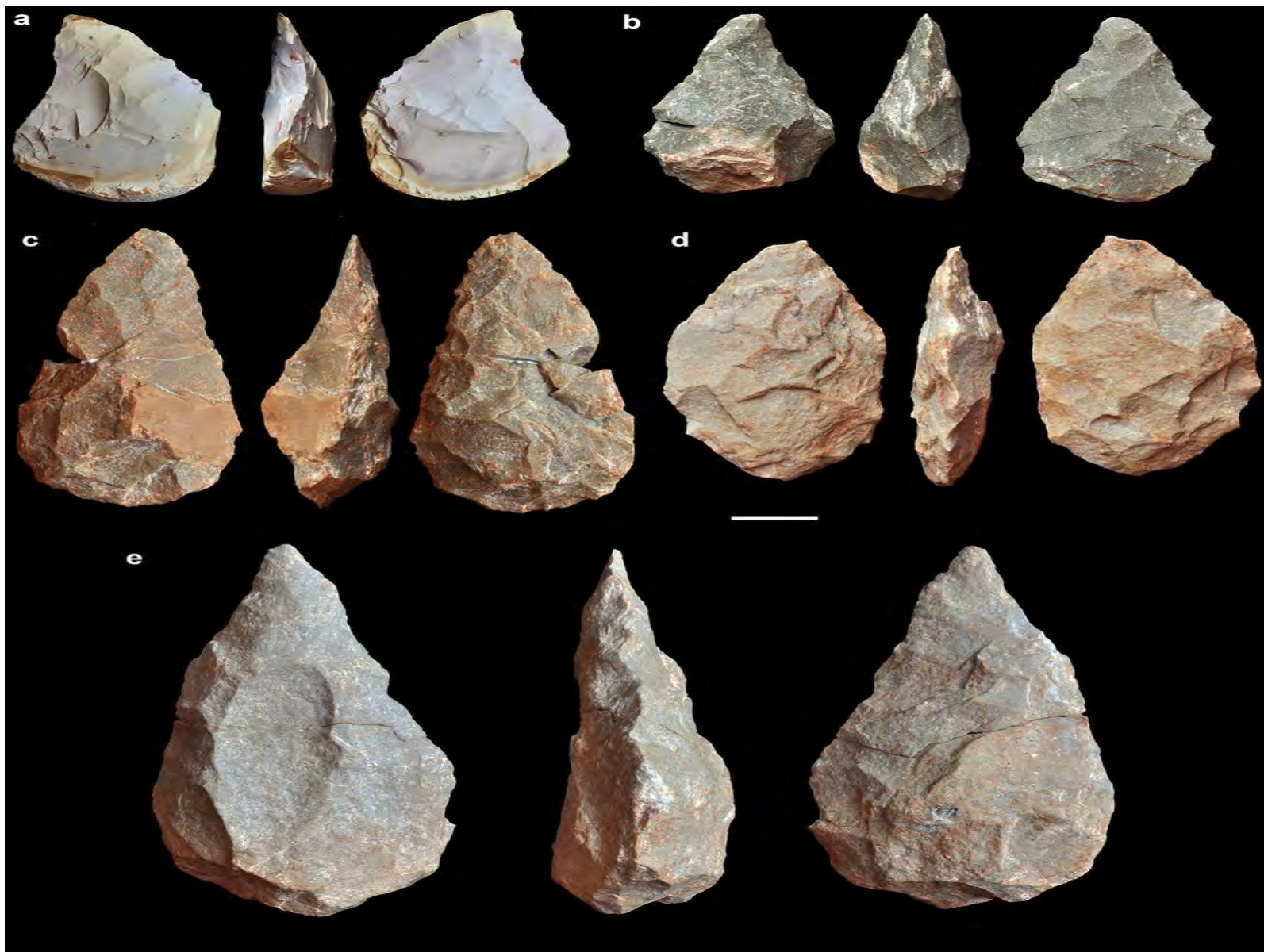
Abstraction involves the search for the general conditions for a solution to take place

It does not search solutions close to existing ones.

It forces the innovator to build up a general and abstract representation of the problem, investigating the conditions for any possible solution to come to life.



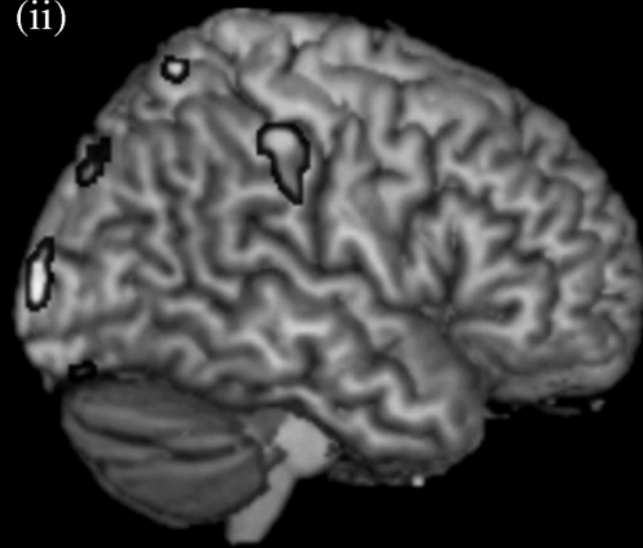




(a) (i)



(ii)

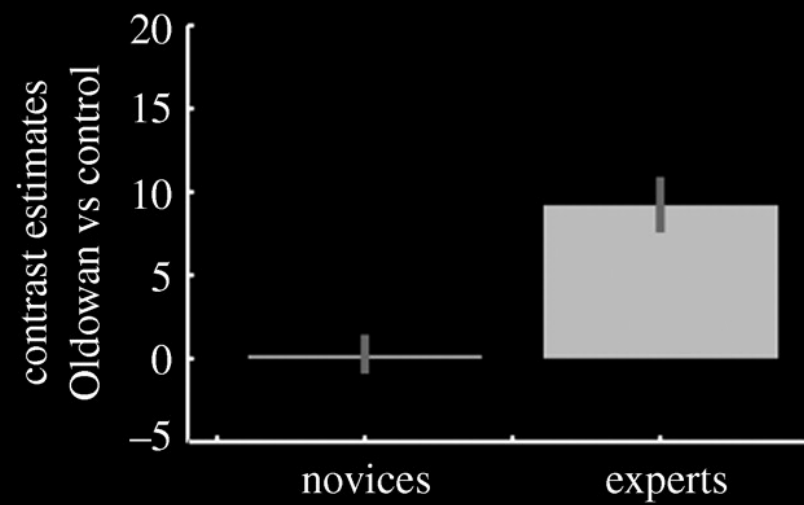


t -score

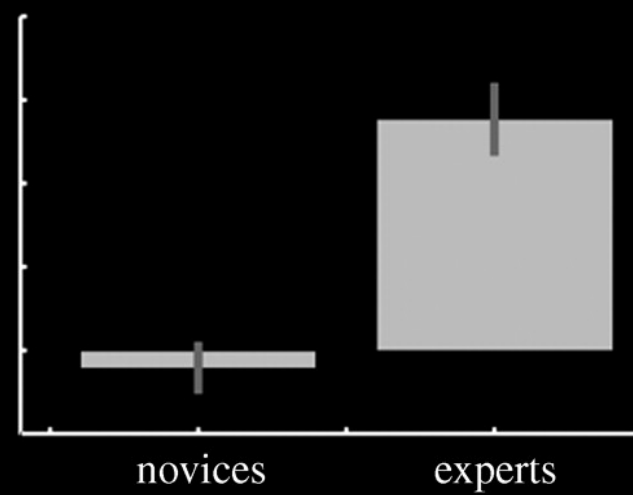
0

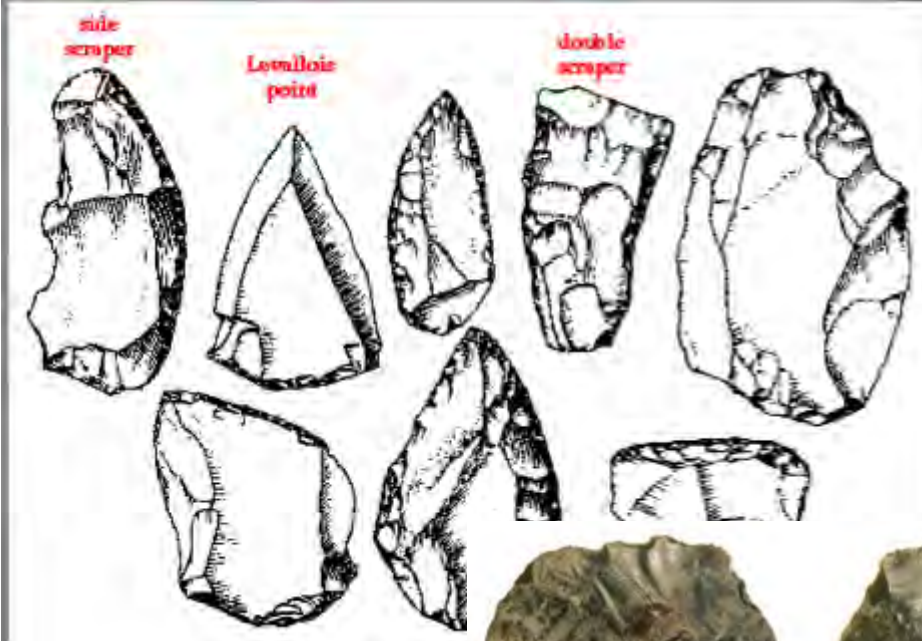
10

(b) (i)

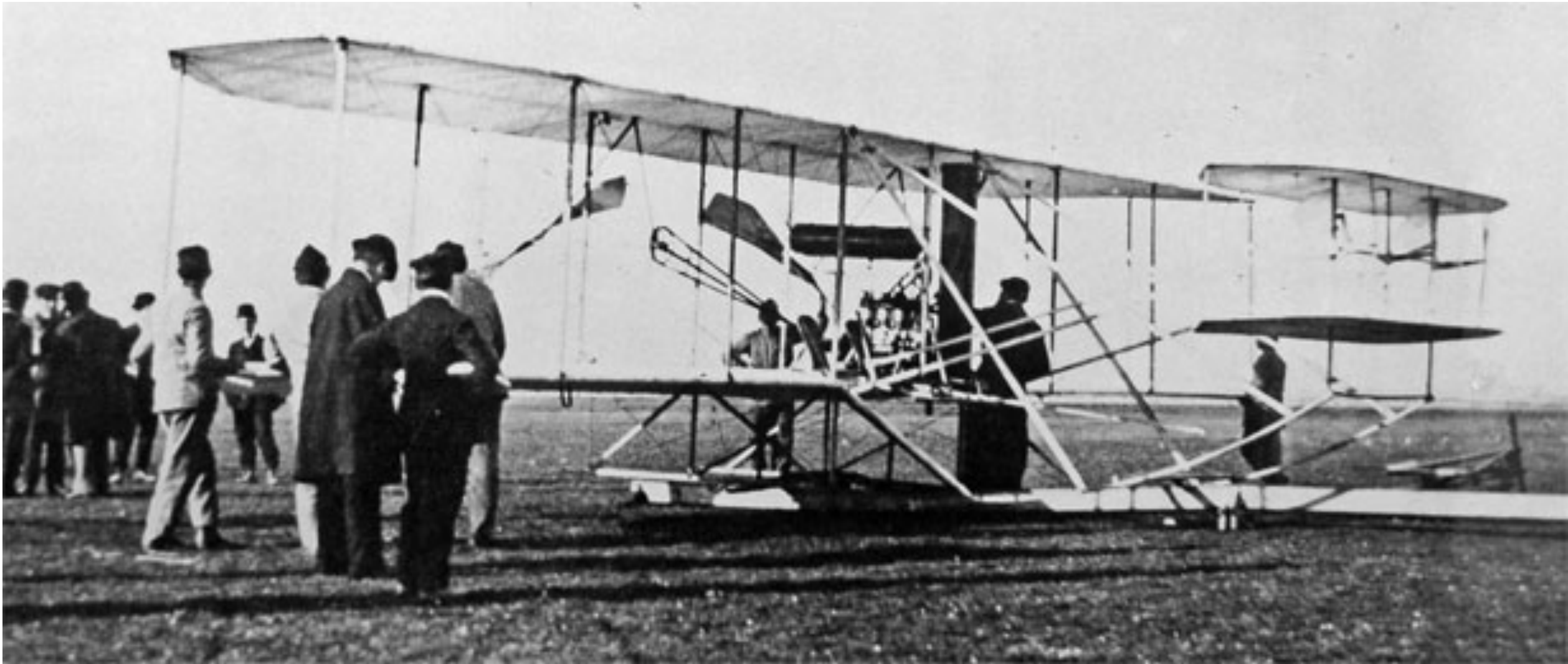


(ii)

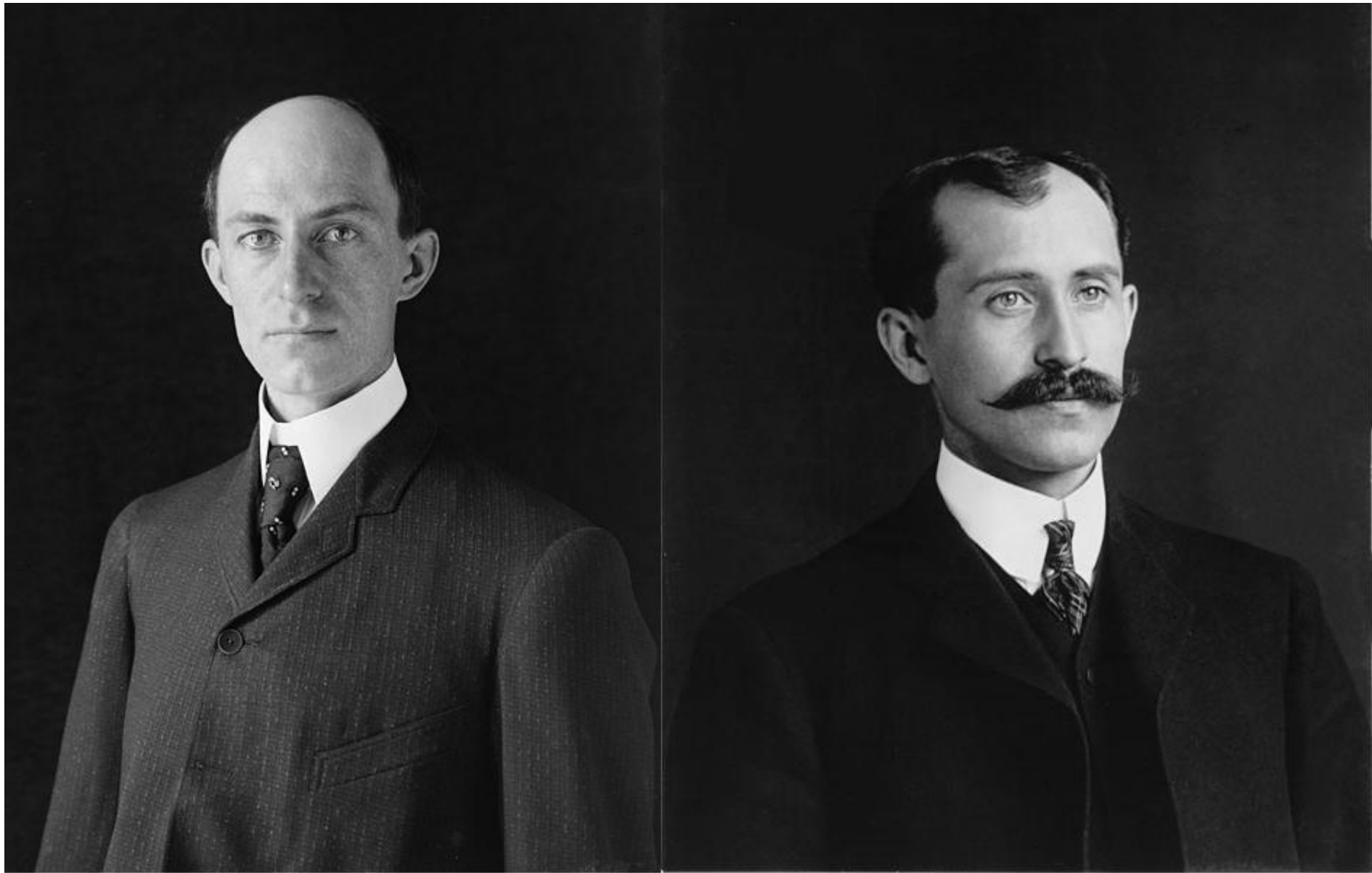




5 cm



First flight of Wright Brothers, Kitty Hawk, North Carolina, 17 December 1903



Wilbur and Orville Wright



The glider produced in 1902.

The shape of the wings was modified repeatedly after tests in a newly created small wind tunnel.

In this year the Wright Brothers carried out between 700 and 1000 flights.

The Flyer was a modified glider

The modifications were

- a petrol engine for the propulsion
- a system to control the flight by manoeuvring a tail

The Wright Brothers were the first to build up an abstract representation of the conditions for controlled flight, by decomposing the problem into

- structure
- propulsion
- control



Putting several patterns together



This is the product that will satisfy those young people who want to listen to music all day. They'll take it everywhere with them, and then they won't care about record functions.

Akio Morita, 1979

Abstraction- what is the abstract configuration of a product that will allow «to listen to music all day»?

Negation- no recording function

Recombination- a playback function (disc player) to be combined with a portability function (battery) and to a hearing function (headphone)

What do artists and innovators have in common?
Are there common bases for creativity in art, science, and technology?

My answer is as follows.

Artists and innovators are similar in that they «see» something others do not see.

- Artists see in the multidimensional space of **forms**
- Innovators see in the multidimensional space of **functions**

The function space describes

- **possibility conditions** (what cannot be done)
- **design principles** (what can be done)
- **system of use** (why it should be done)

Creative patterns
Bending



Around 1980 the French painter Claude Monet rented a room in front of the Rouen Cathedral.

In a period of two years, he painted over 30 views of the main entrance of the Cathedral.







Katsushika Hokusai
Il monte Fuji al tramonto (1843)

36 views of Mount Fuji (46 stampe, 1831-1833)



Katsushika Hokusai
L'orage sous le sommet

Bending the shape

Frank Gehry (1929- today)



Stata Center (2004)
MIT, Cambridge, Mass.

Walt Disney Concert Hall (2003)
Los Angeles



Nationale-Nederlanden Building, 1992–96
(Fred and Ginger, or Dancing House)
Prague, Czech Republic

Bending the size

Fernando Botero (1932- today)



The wedding (2015)



Picnic (1999)

Bending the face
Francis Bacon (1909-1992)



Study of Velasquez Pope Paul II (1961)



Bending the body
Martha Graham (1894-1991)



Creative patterns
Breaking



Londra, British Museum

Igor Mitoraj (1944- 2014)



Agrigento, Tempio della Concordia
e Icaro caduto



Agrigento, Valle dei Templi

Angelo caduto
Pisa, Piazza dei Miracoli



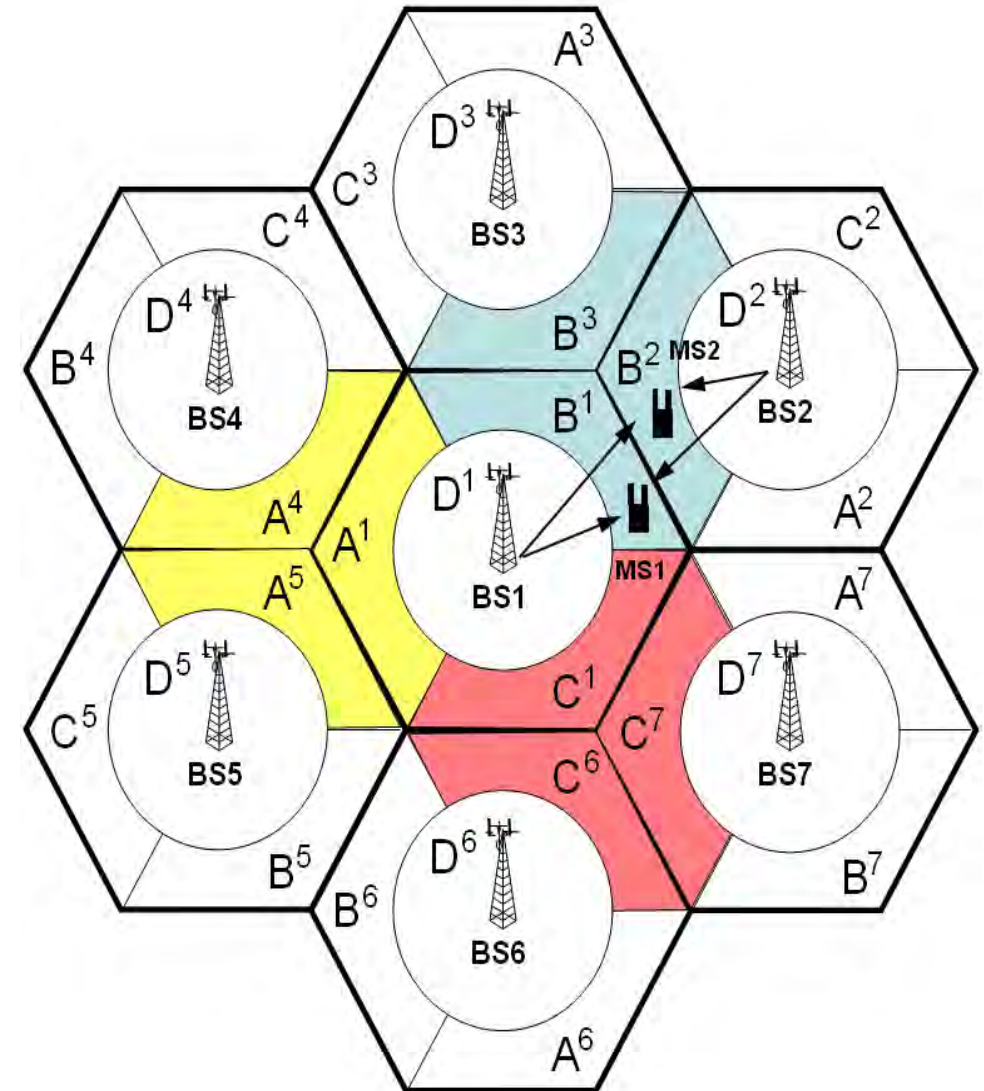
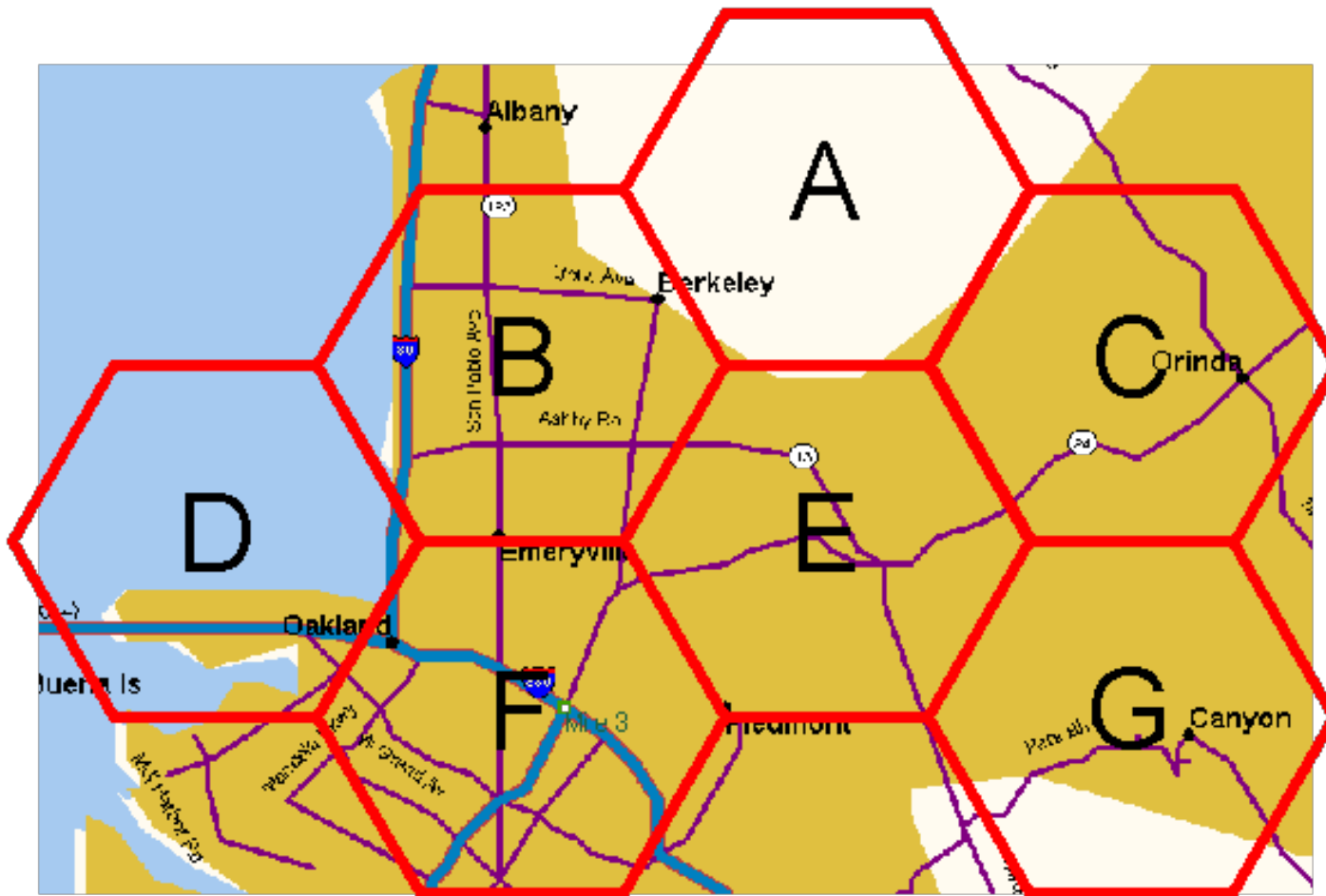
Breaking in invention: mobile communication

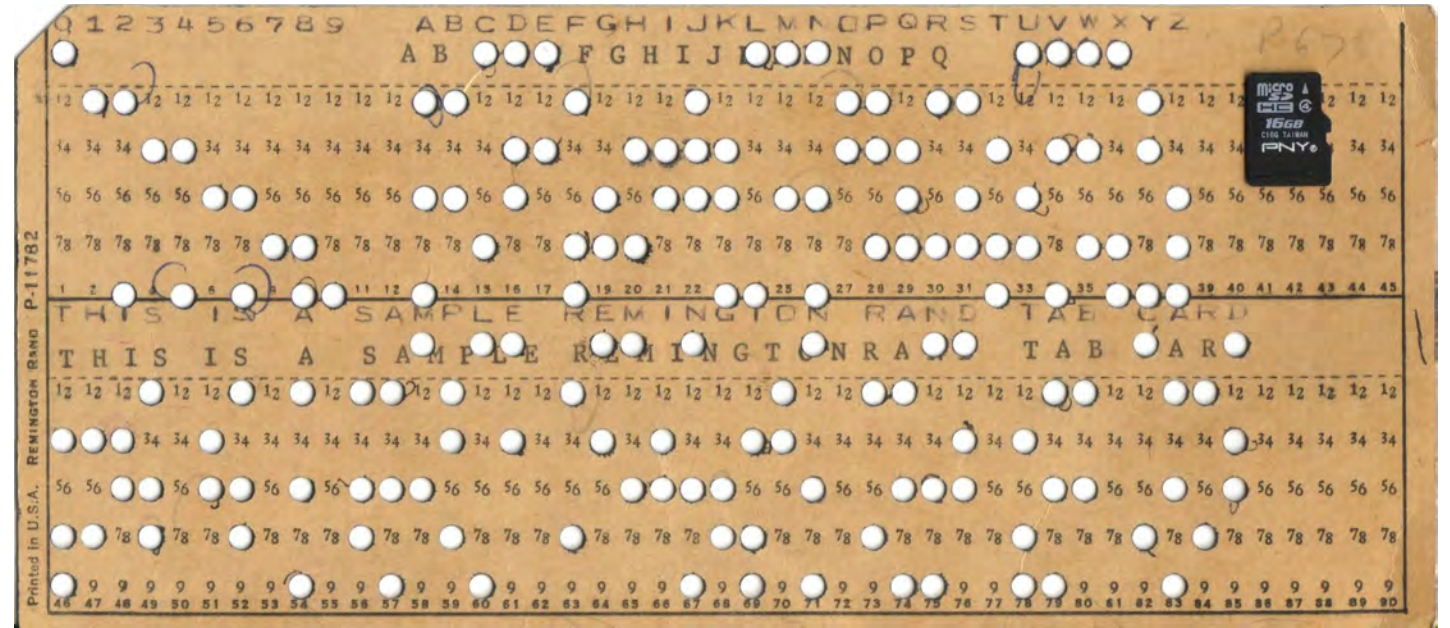
Beginning of mobile phone:
single tower
transmitting widely
in all directions,
as in TV broadcasting.

Problem: only few people
could do telephone calls
simultaneously,
before the congestion
of the tower,
which produced
noisy signals.



Solution: breaking the telephone network into small cells
(first concept at Bell Laboratories, 1947)





Breaking in invention: time sharing in computers

Beginning of computer technology: manframes could process one problem at a time.

Users created punch cards, inserted punch cards in the mainframe and waited for the results.

Time sharing

John Mc Carthy (MIT)

Computer switching between multiple algorithms, instead of running one algorithm at a time.

Dididing up the computer's computations into short micro-segments.

Possibility for users to work on the mainframe simultaneously.

Preliminary testing were a disaster: the mainframe started to run out of memory and produced error messages.

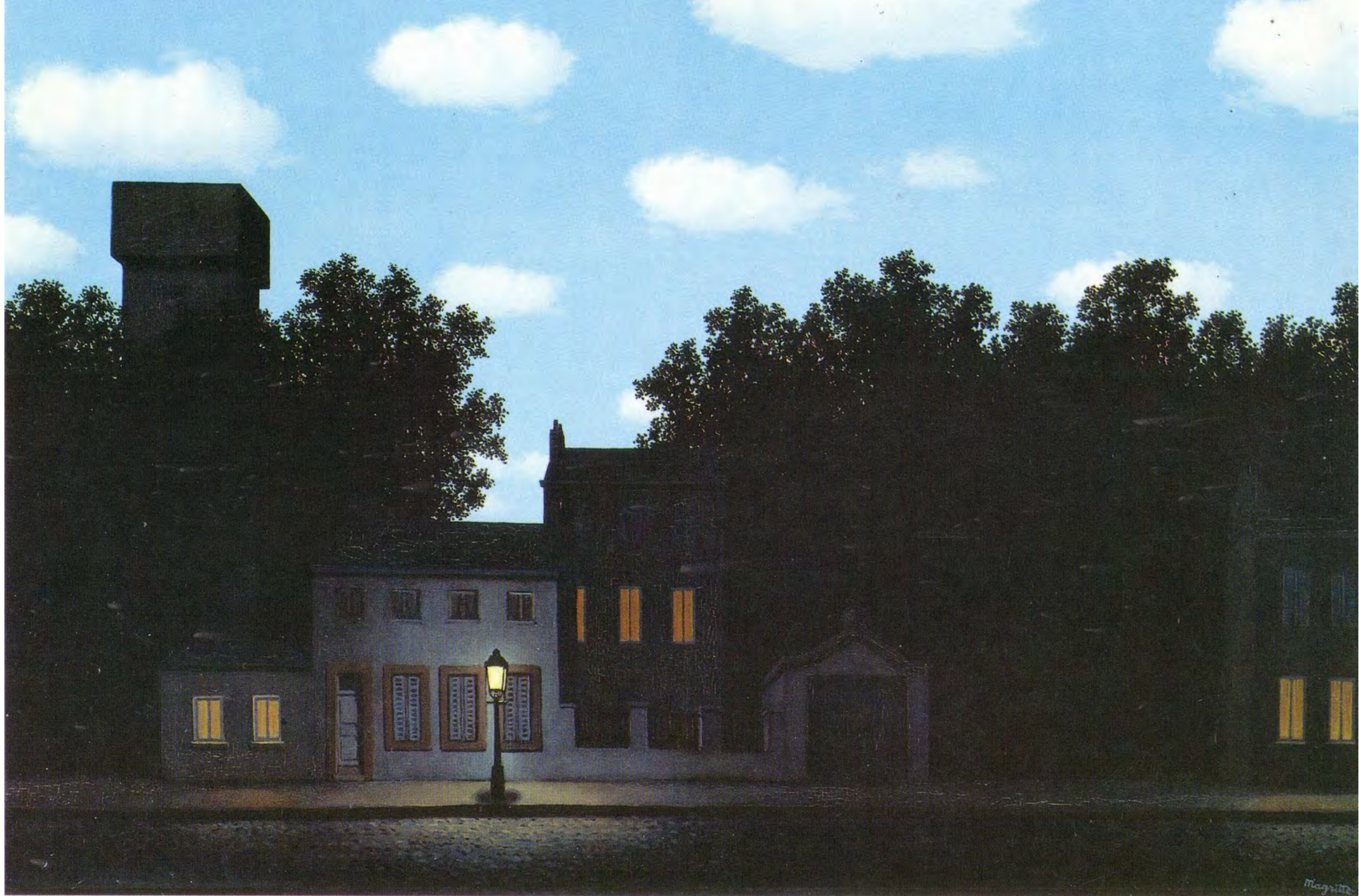
Creative patterns

Blending

René Magritte
Lovers (1928)







René
Magritte

*Empire of
light*
(1950)



Maurizio Cattelan, *America*
New York, Guggenheim Museum



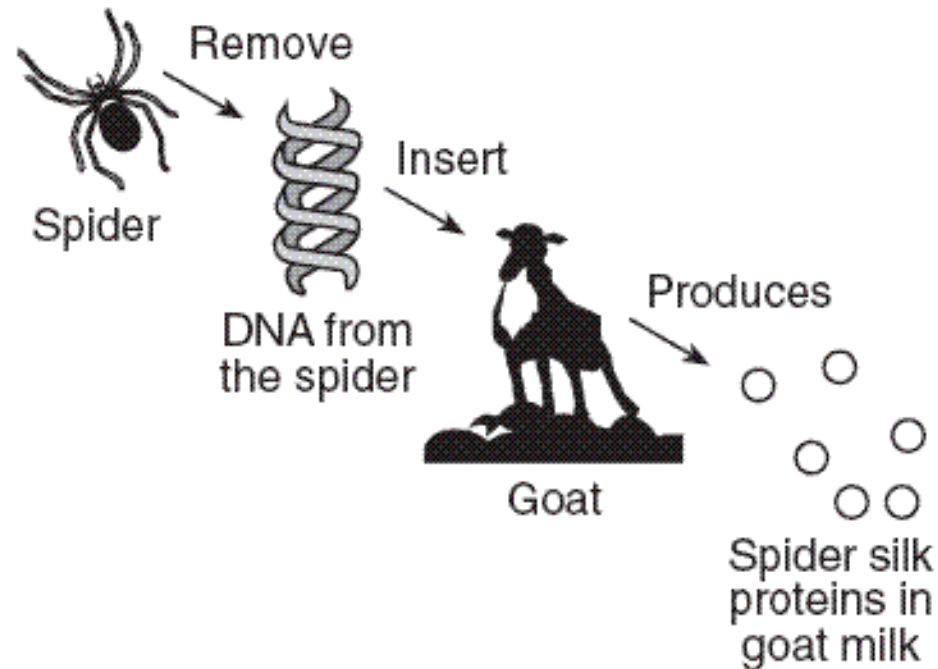
Maurizio Cattelan, *Kaputt*
Fondazione Beyeler, Basilea



Spider goat

Silk stronger than steel- but difficult to produce

Splicing the DNA responsible for silk production in spiders into a goat



Genetics professor Randy Lewis

INTRODUCTION



- ▶ Cracking of concrete is an inevitable phenomenon related to durability.
- ▶ repairing of existing cracks has been a subject of research for many years.
- ▶ In recent years, a bacteria based self healing concrete is being developed to extend the service life.
- ▶ Synthetic polymers such as epoxy treatment etc. are currently being used as filling agents.
- ▶ They are neither eco-friendly nor safe for human health.
- ▶ Hence the use of a *biological repair technique* or *micro-biologically induced calcite precipitation technique* [MICP] in concrete is focused,

2/28



TYPES OF BACTERIA USED

They are classified as the following ;

- ▶ *Bacillus pasturii*.
- ▶ *Bacillus Subtiles*.
- ▶ *Bacillus Sphaericus*.
- ▶ *Bacillus Cohnii*.

These can lie dormant within the concrete for several years.



B.Cohnii.



B.pasturii.



B.Sphaericus



B.Subtiles.

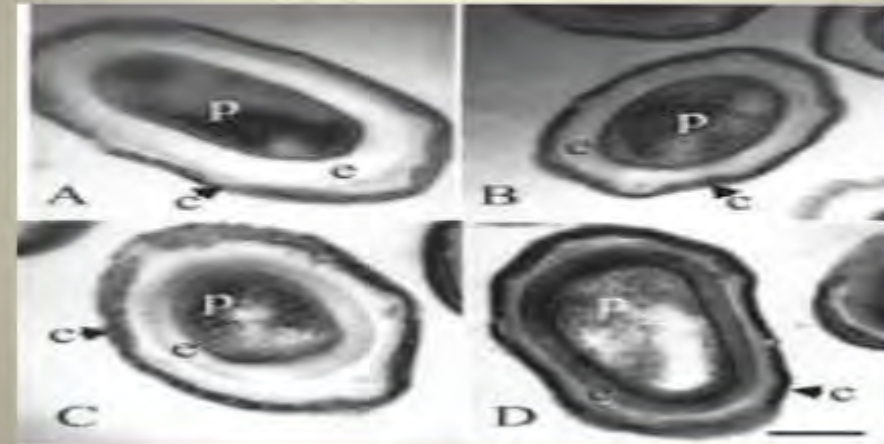
13/28

Dormant bacteria in concrete

WHAT SPECIAL PRESENT IN BIO CONCRETE

There are two thing present in bio concrete.

- 1) The special bacteria that has to resist the alkalinity and the mechanical stress of concrete.

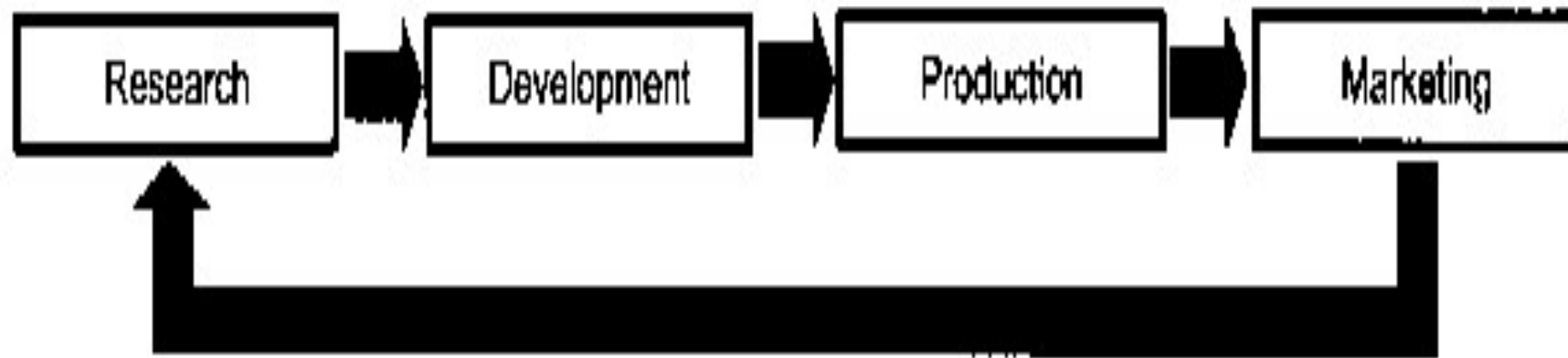


- 2) The chemical precursor to activate the bacteria.

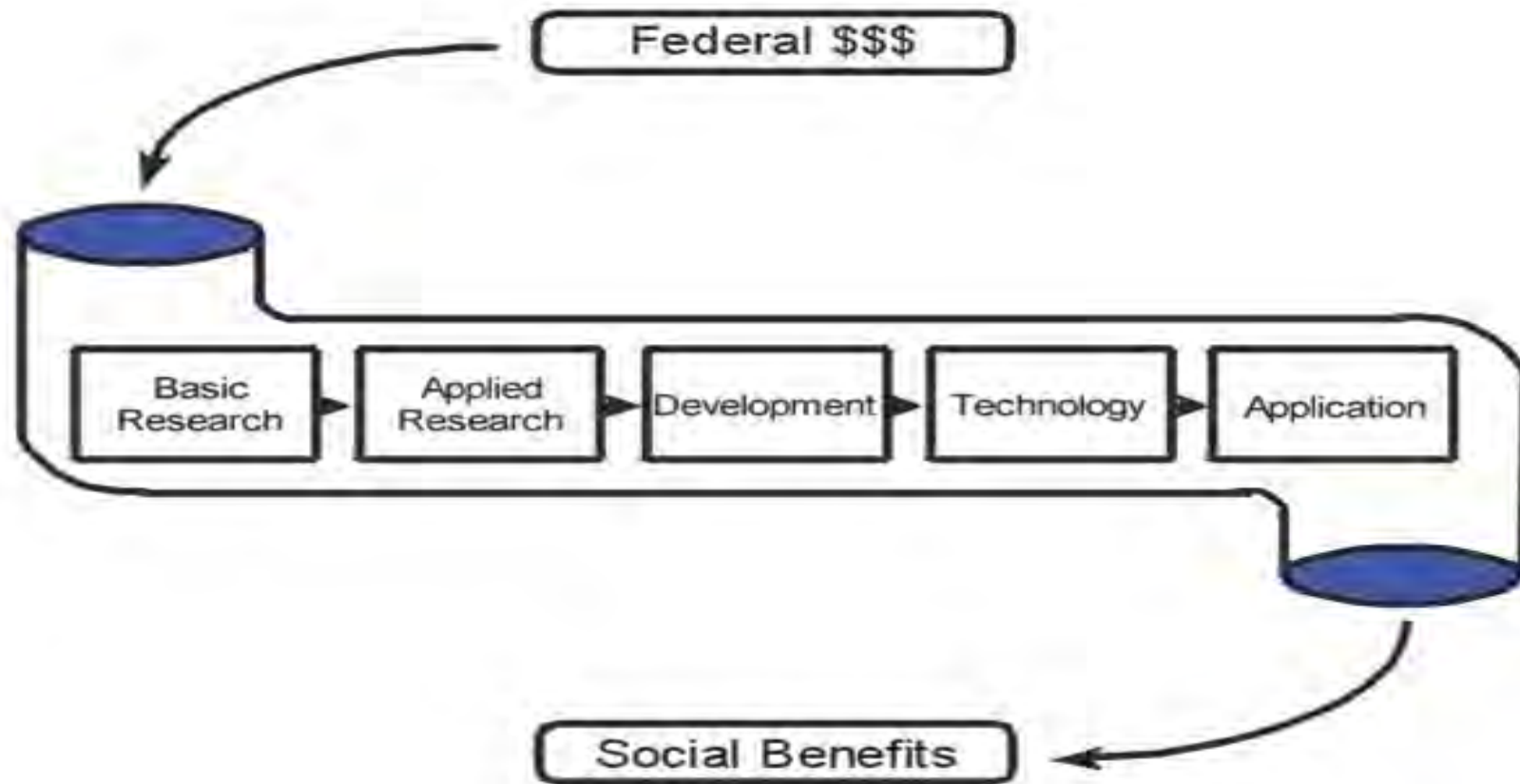
John Woodehouse (1773)



Simple Linear Model of innovation (SLIM)



La tesi del rapporto di Vannevar Bush (1945) *Endless frontier*



Research

Knowledge

Potential
Market

Invent and/or
Produce
Analytical
Design

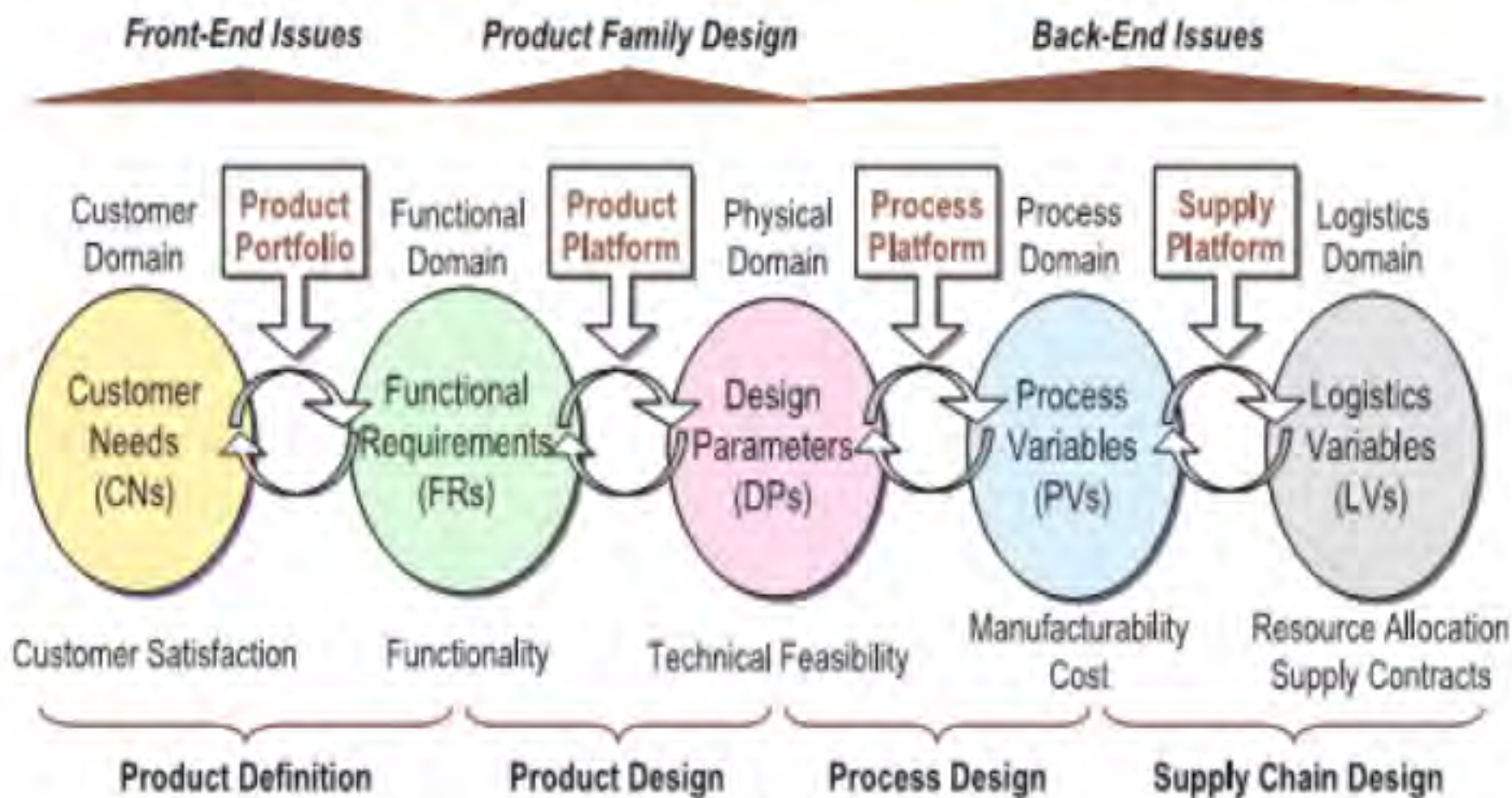
Detailed
Design and
Test

Redesign
and
Produce

Distribute
and
Market

The Chain-Link Model

Fundamental Issues

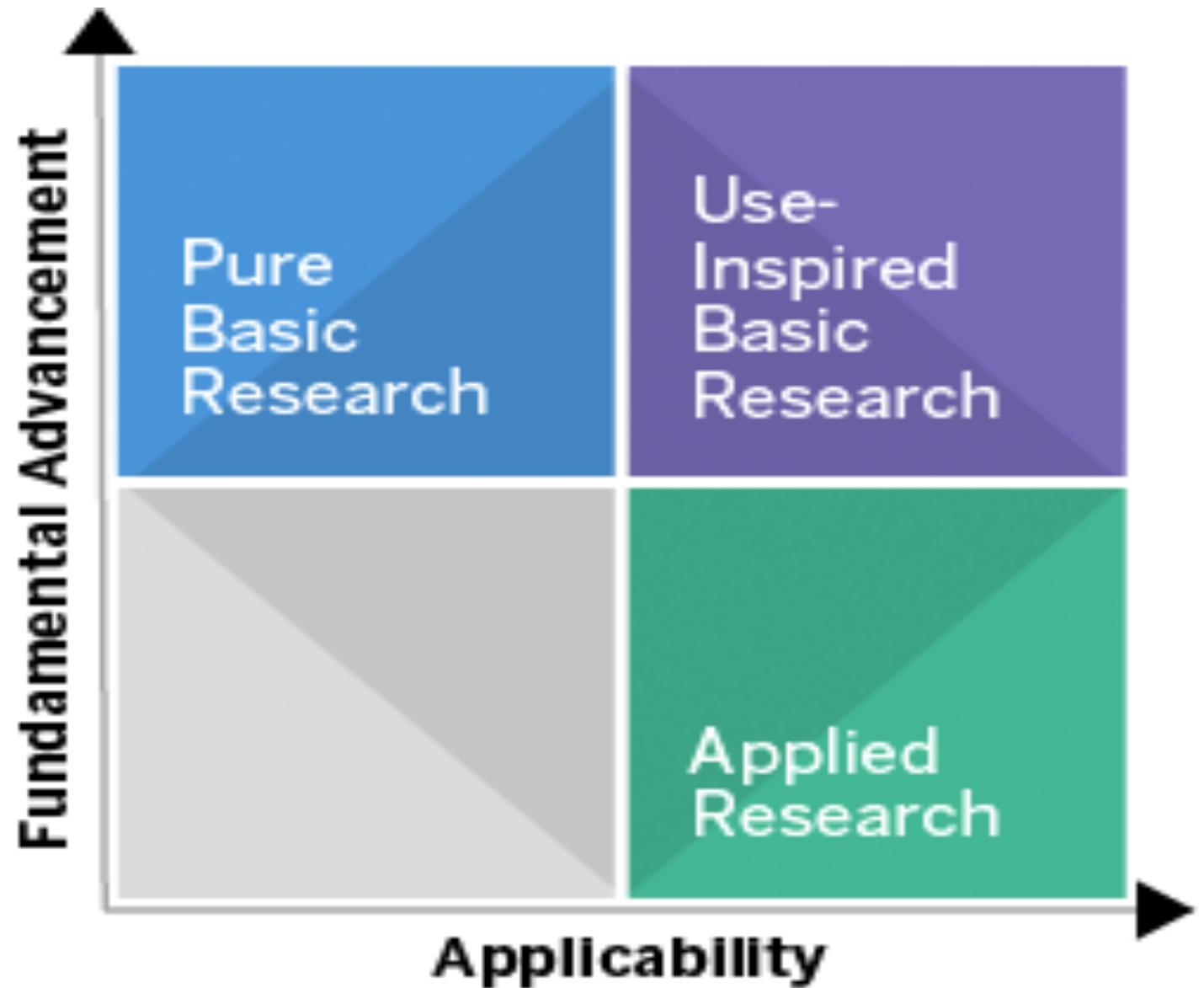


Fonte: Jiao *et al.* (2007), Fig.1

Una alternativa al modello lineare semplice: Il «quadrante di Pasteur»



Stokes (1997)



Quest for fundamental
understanding?

High



Pure basic
research

BOHR QUADRANT



Use-inspired
basic research

PASTEUR QUADRANT

Low



Applied
research

EDISON QUADRANT

Low

High

Consideration of use?

Technology push vs. Market pull

Technology push

Research &
Development



Production



Marketing



Need?

Market pull (demand pull)

Research &
Development



Production



Marketing



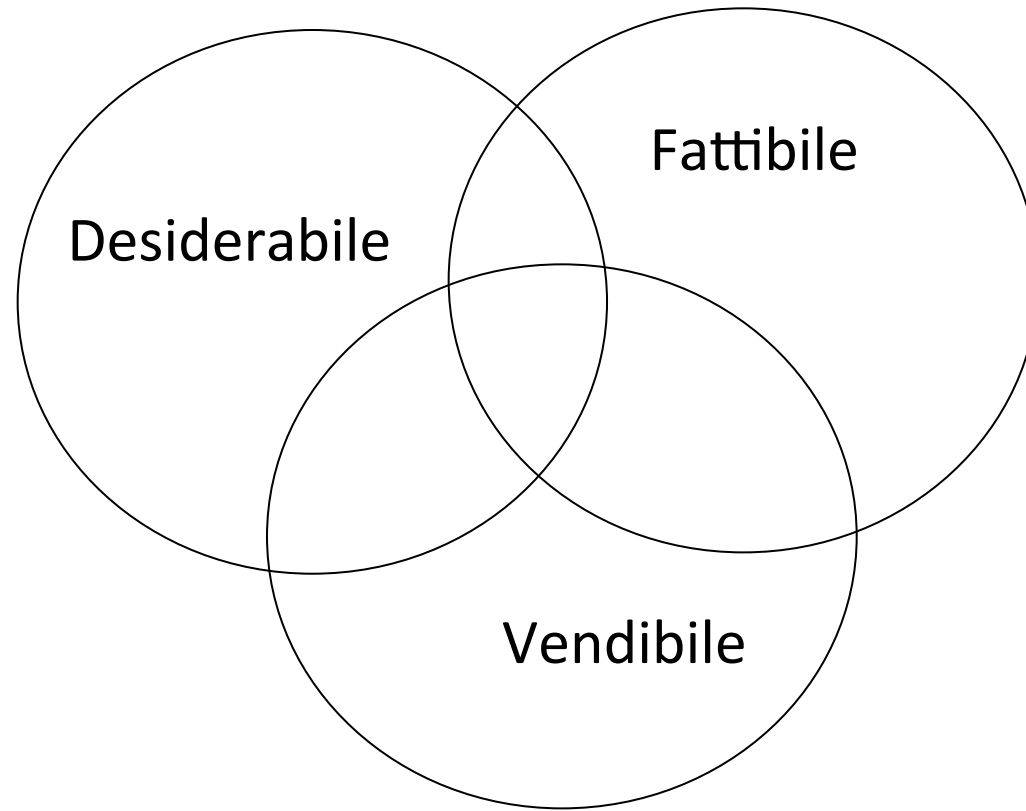
Expressed
Market
Need



Selezione

Metodi di identificazione dei bisogni dei clienti

Metodi di identificazione dei bisogni dei clienti



Bisogni dei clienti- richiami di teoria

Bisogni dei clienti (*needs*) = descrizione dei benefici desiderati dai clienti, ciò che i clienti cercano. I bisogni sono per natura di lungo termine e non sempre possono essere riconosciuti o descritti verbalmente da un cliente. I bisogni possono essere utilitaristici come pure edonistici.

I **desideri** (*wants*) sono invece di breve pertime e temporanei, e possono essere influenzati dalla comunicazione pubblicitaria, dal word-of-mouth e dalle norme sociali. I desideri riguardano oggetti che i clienti ritengono possano soddisfare un dato bisogno.

Le **caratteristiche** (*characteristics*) sono le proprietà di un prodotto che sono rilevanti per i clienti- quantitativi, misurabili in modo oggettivo e universali. Gli **attributi** (*attributes*) descrivono i prodotti secondo le dimensioni percettive che i clienti usano per compiere le decisioni.

I **requisiti** sono le soluzioni ingegneristiche e tecniche per soddisfare un bisogno dei clienti. Le **specifiche** rappresentano la metrica specifica associata ai requisiti.

Bisogni dei clienti- richiami di teoria

Gerarchia dei bisogni di Maslow (1954): bisogni biologici/fisiologici, di sicurezza, di appartenenza e cura, di stima e di auto-realizzazione

Modello delle catene mezzi-fini (*means-ends chains*)

Livelli dei bisogni in ordine di astrazione crescente

- aspetti del prodotto (*feature*)
- conseguenze degli attributi per il cliente
- stati finali desiderati

Gli **aspetti** sono concreti, di breve termine e facili da influenzare. Corrispondono alle parole con le quali i clienti descrivono i prodotti.

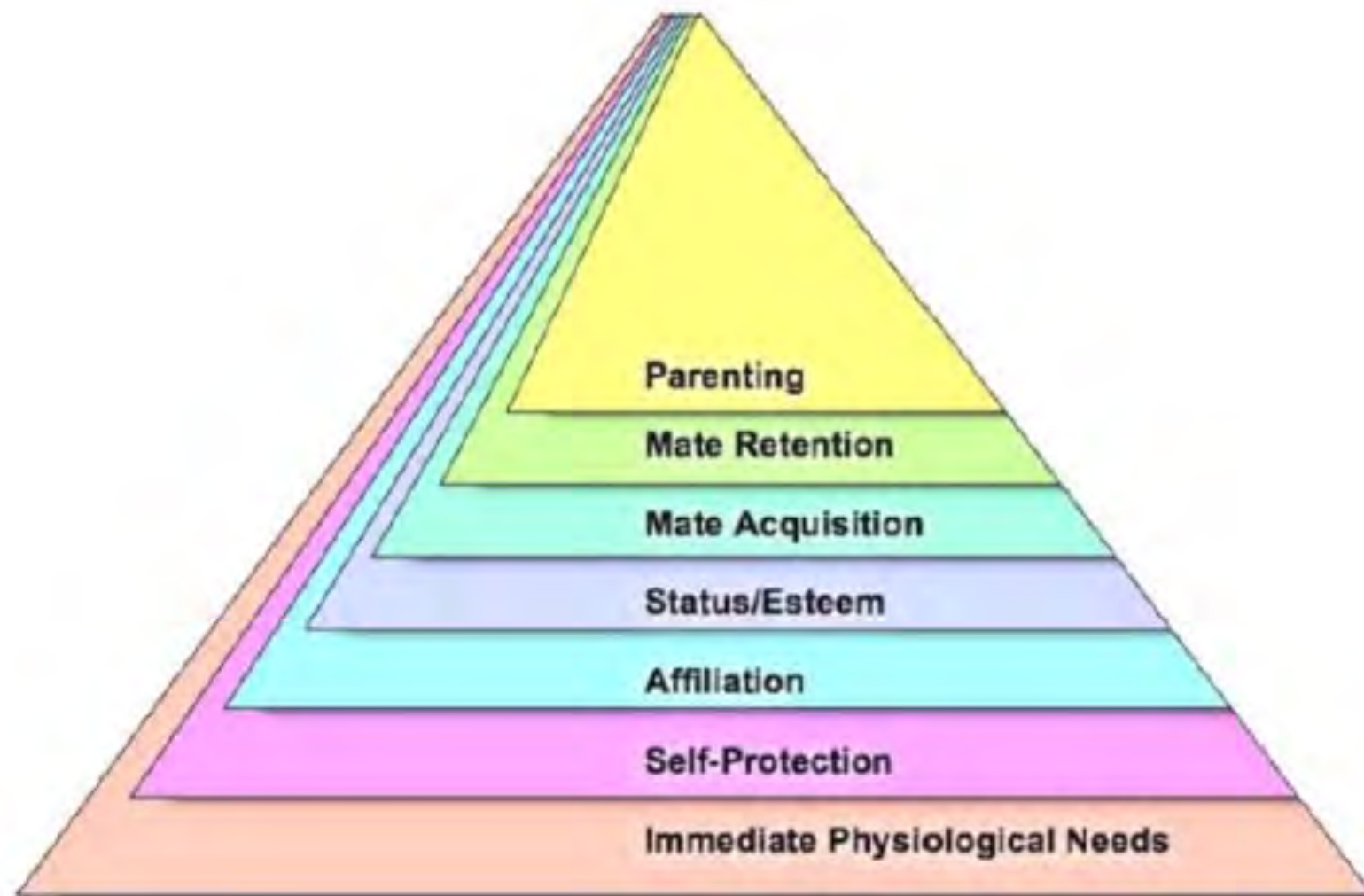
Le **conseguenze** derivano dal possesso o uso del prodotto.

Gli **stati finali** desiderati riflettono i fini e gli obiettivi del cliente. Sono di lungo termine e astratti.

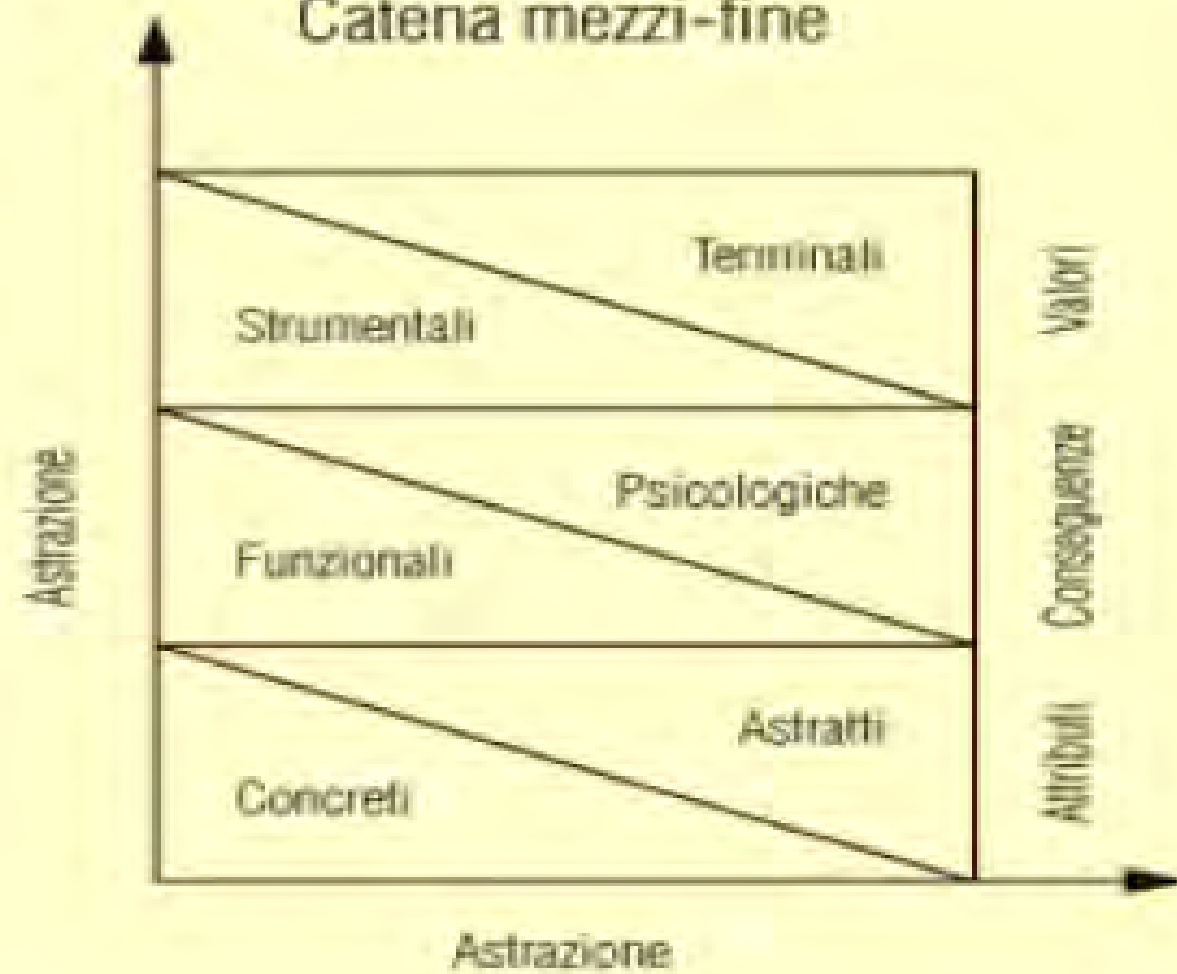
I clienti non sempre riescono a riconoscere o descrivere i propri bisogni in termini di conseguenze o stati finali. Le informazioni che essi forniscono devono essere «interpretate».



Fig. 1. Maslow's classic hierarchy of needs.



Catena mezzi-fine





Voice of the customer

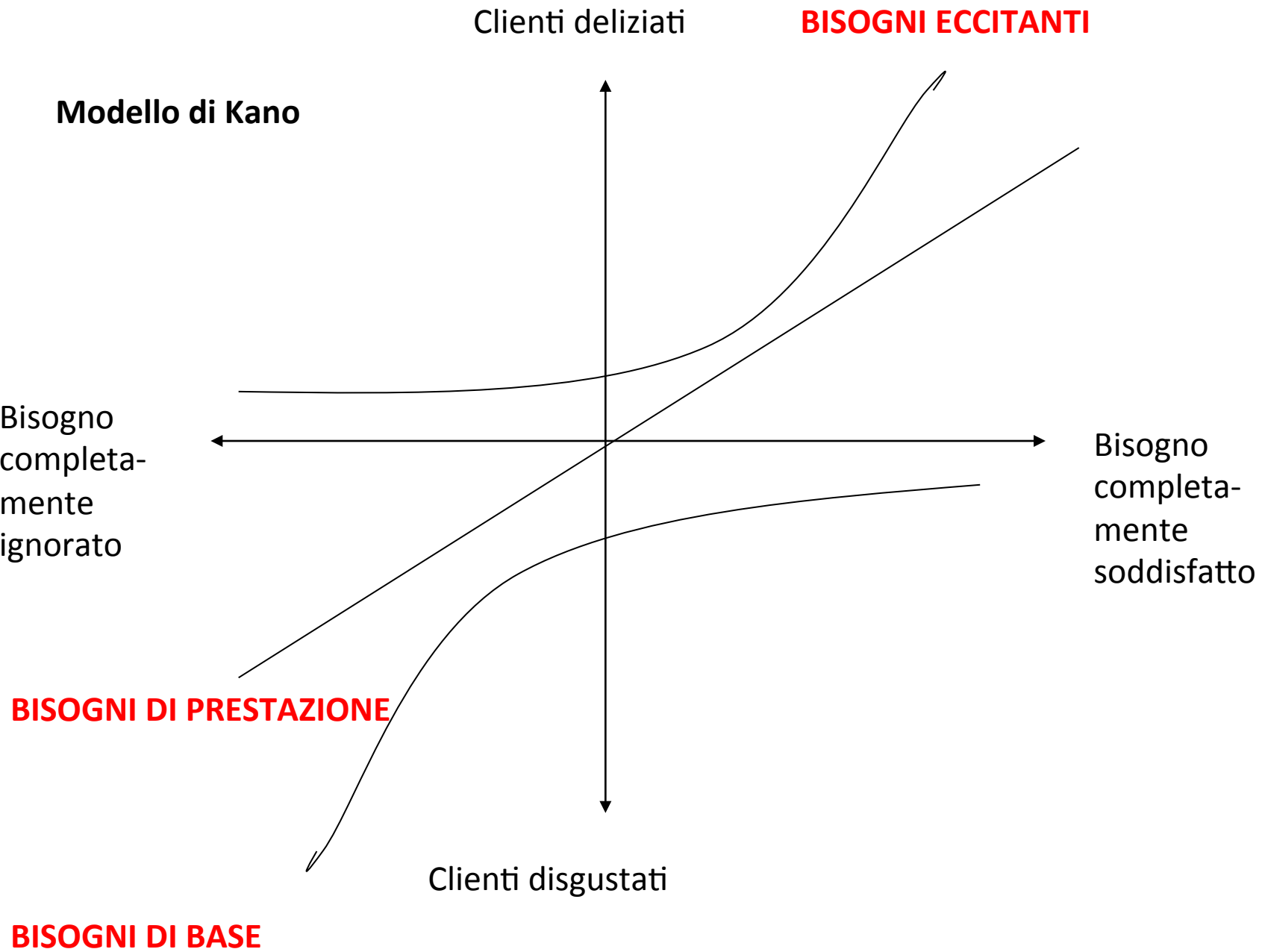
- Identificare i bisogni dei clienti
 - Metodi di progettazione empatica
 - User-centered design
 - Ricerca contestuale
 - Metodi etnografici
 - Customer experience
- Stabilire gerarchie strutturate di bisogni dei clienti
 - Costruzione di scale (direct rating scales) da parte del team di progetto
 - AHP (Analytic Hierarchy Process)
 - Conjoint analysis
 - Borda counts
 - Metodi fuzzy

Voice of the customer/2

- Stabilire obiettivi di requisiti e specifiche
 - Metodi di definizione analitica degli obiettivi (cascading)
- Generazione di concetti di prodotto
- Screening
- Testing
- Selezione

Limiti dei modelli di marketing (conjoint analysis, analisi di posizionamento)

- assumono attributi come un dato del problema
- trascurano la fattibilità tecnica dei prodotti
- sovrastimano la affidabilità delle informazioni ottenibili dalle ricerche di mercato



Natura dei bisogni e metodi di indagine

Bisogni interpretati

- di base (*basic needs*)
- di prestazione (*performance needs*)
- eccitanti (*exciting needs*)

Bisogni

- *articolati* (cosa dicono i consumatori)
 - ricerche di mercato
- *non articolati* (cosa fanno i consumatori)
 - osservazione partecipata
 - etnografia applicata
 - ricerca ergonomica
- *non articolati* (cosa producono i consumatori)
 - progettazione collaborativa
 - co-makership

Tecniche per la analisi di bisogni articolati

Focus group
Interviste personali in profondità
Questionario
Questionario via mail
Conjoint analysis
Mappatura percettiva
Segmentazione
Modellazione delle preferenze
Test di mercato simulati
Analisi delle categorie di problemi
Repertory grids
Echo procedure
Protocolli verbali
Stratificazione e Analisi mezzi-fini
Profilazione della personalità
Disegno del prodotto ideale
Analisi degli archetipi

Tecniche per la analisi di bisogni non articolati («cosa i consumatori fanno»)

Osservazione partecipata

Etnografia

Analisi contestuale

Self-reporting (diari, log quotidiani, videocamere portatili, self-video, webcam)

Analisi artifattuale

Fattori umani

Ergonomia e ergonomia cognitiva

Tecniche per la analisi di bisogni non articolati («cosa i consumatori producono»)

Lead user analysis

Customer toolkits

Elicitazione delle metafore

Serious play

Collages

Mappatura delle immagini mentali



L'esperienza IDEO

Ritenzione

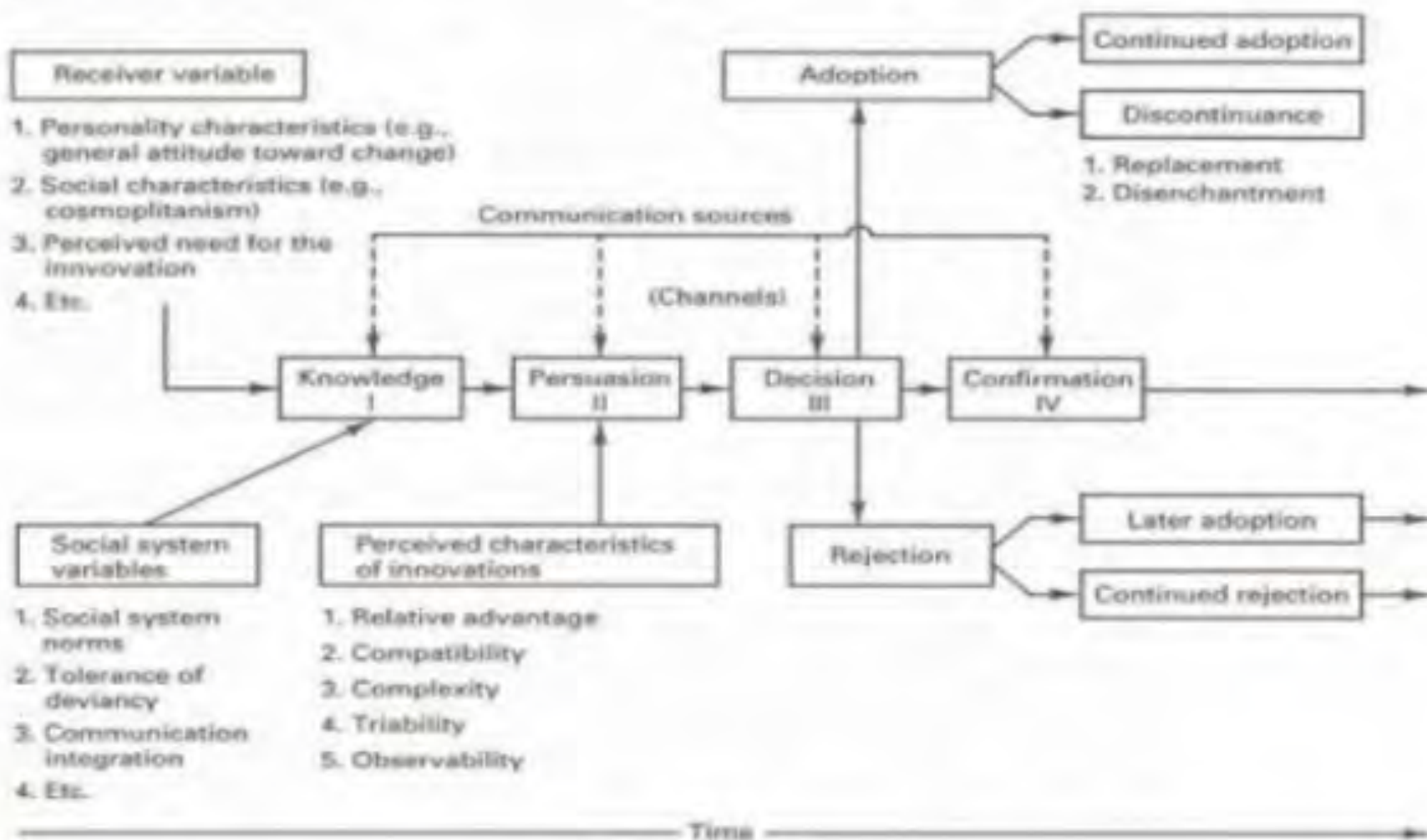
Modelli di diffusione



Antecedents

Process

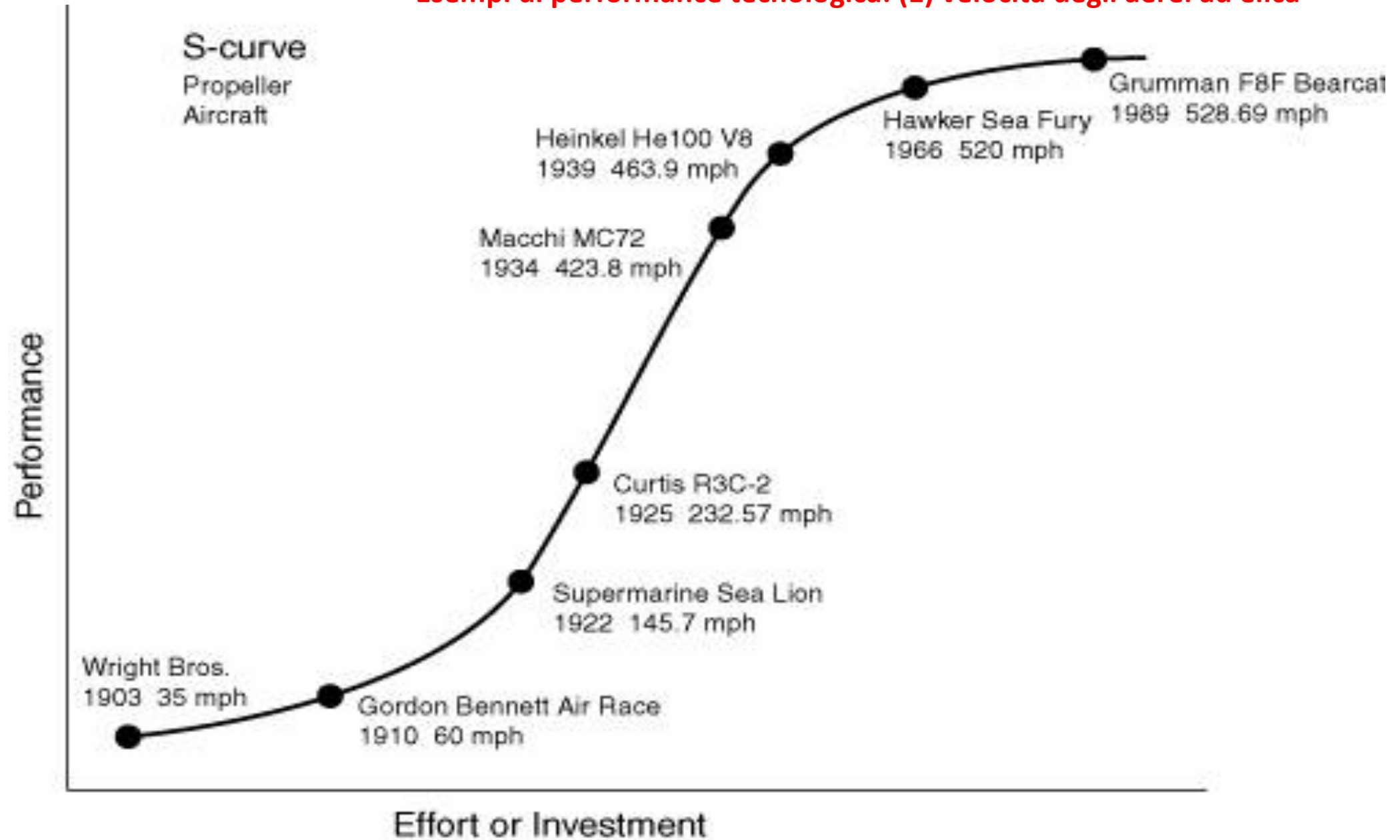
Consequences



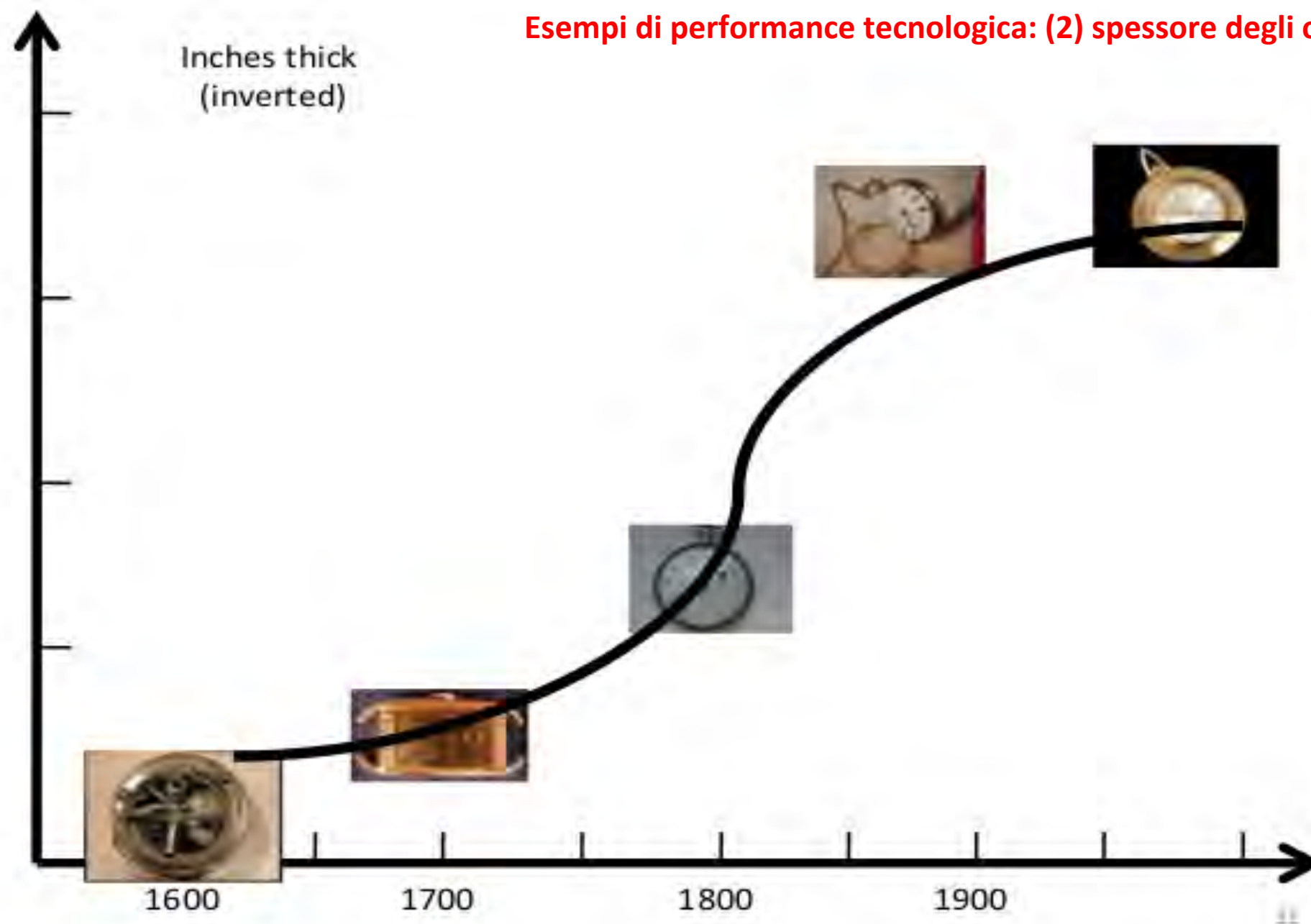
Ritenzione

Regolarità empiriche del progresso
tecnologico

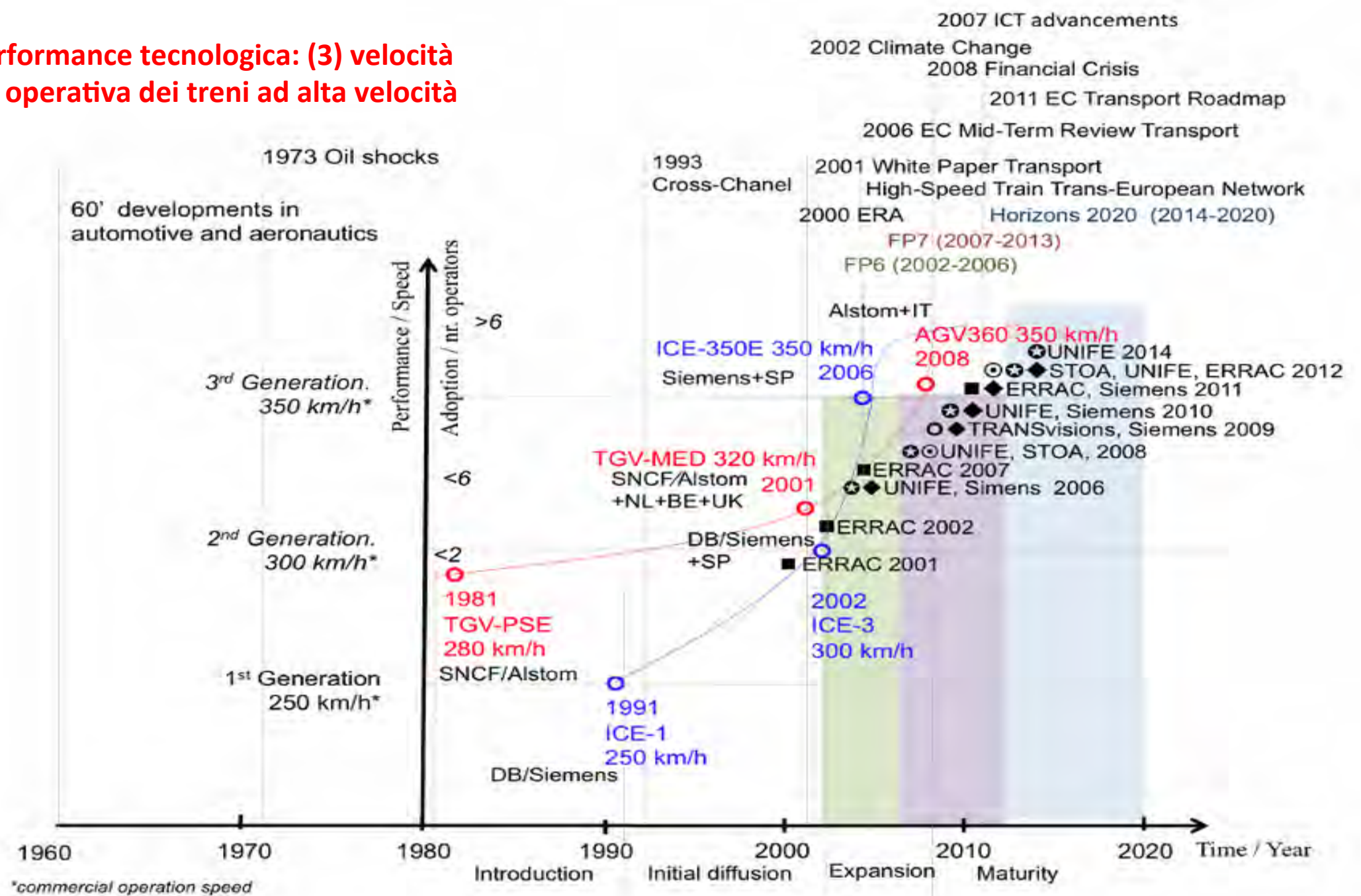
Esempi di performance tecnologica: (1) velocità degli aerei ad elica



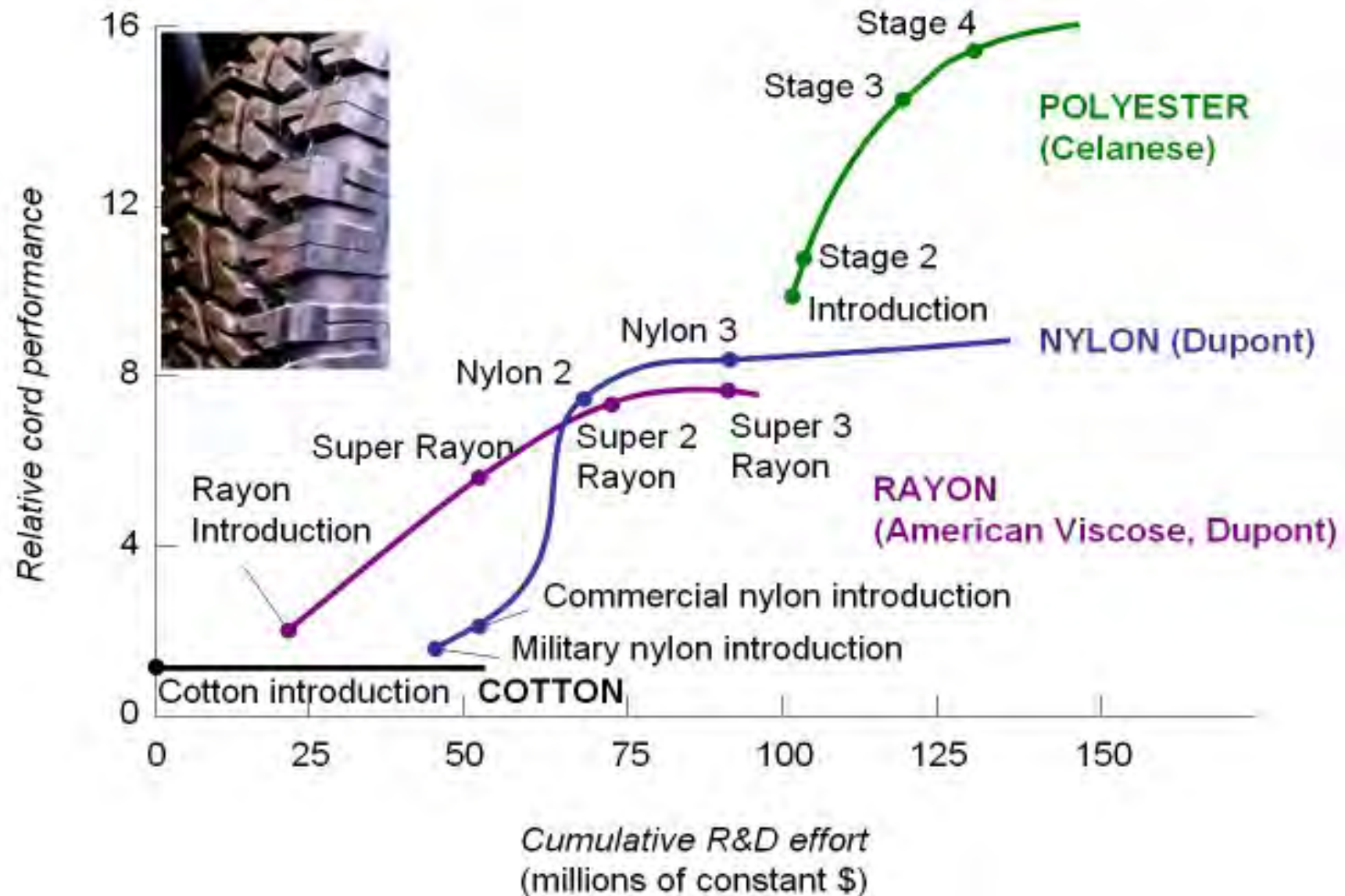
Esempi di performance tecnologica: (2) spessore degli orologi



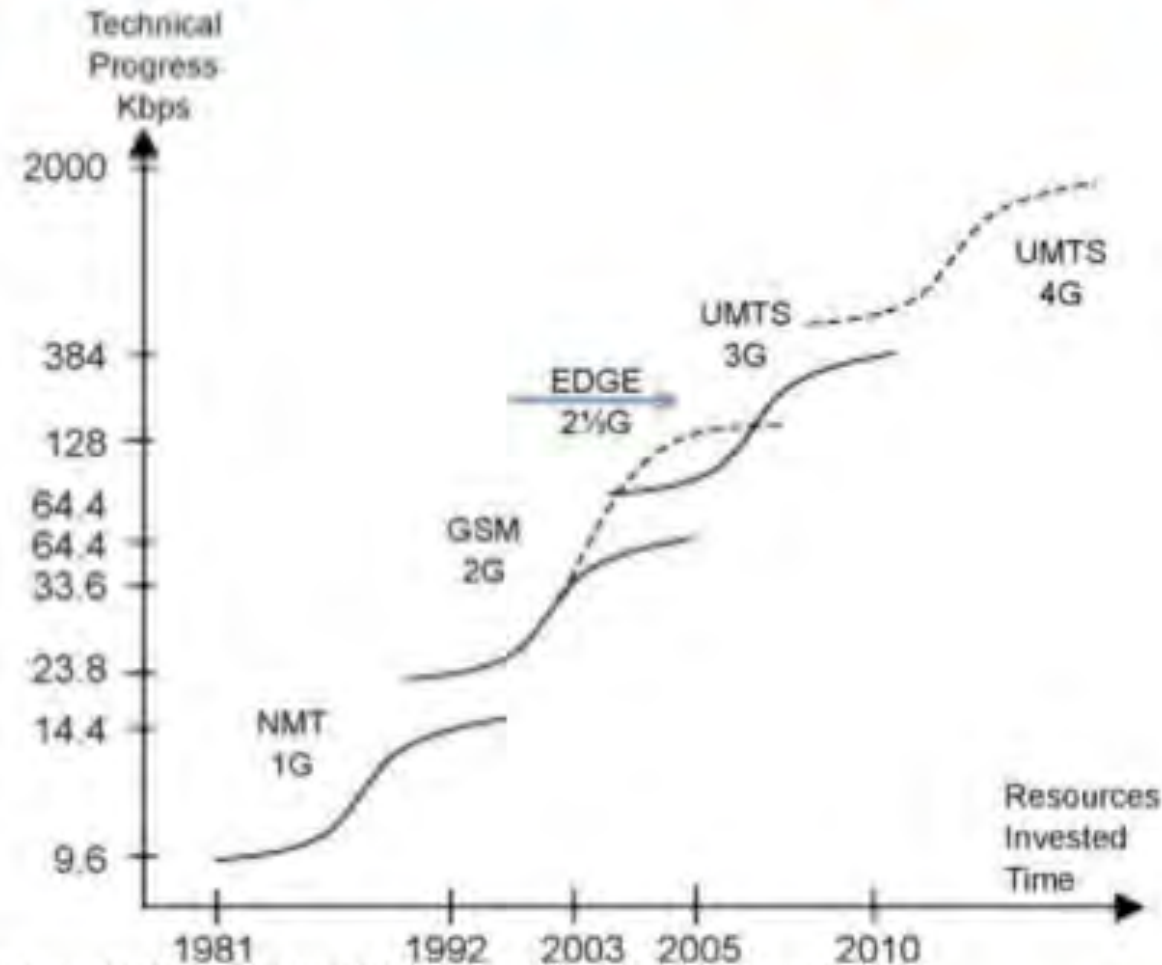
Esempi di performance tecnologica: (3) velocità commerciale operativa dei treni ad alta velocità



Esempi di performance tecnologica: (4) resistenza della fibra tessile

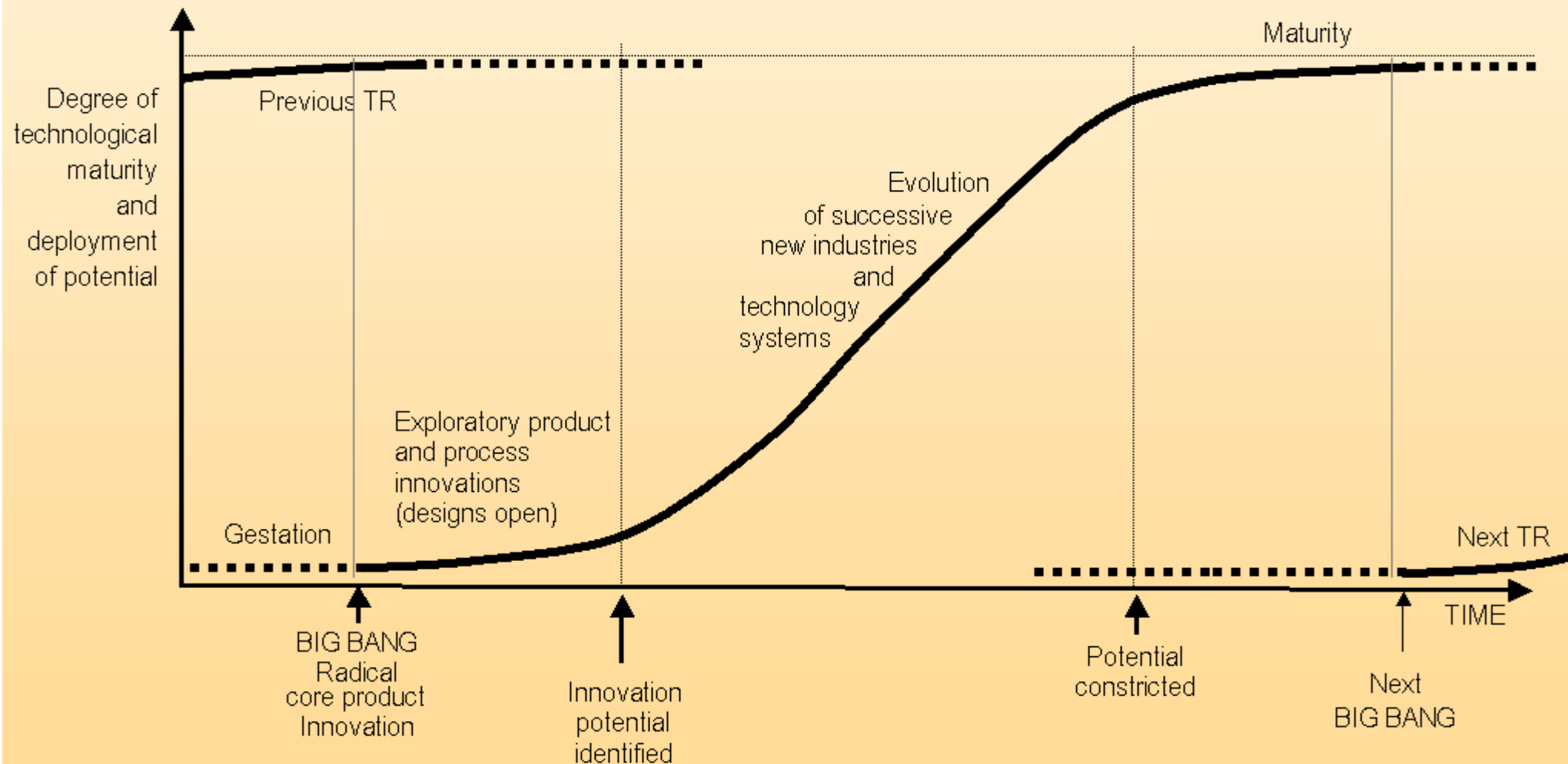


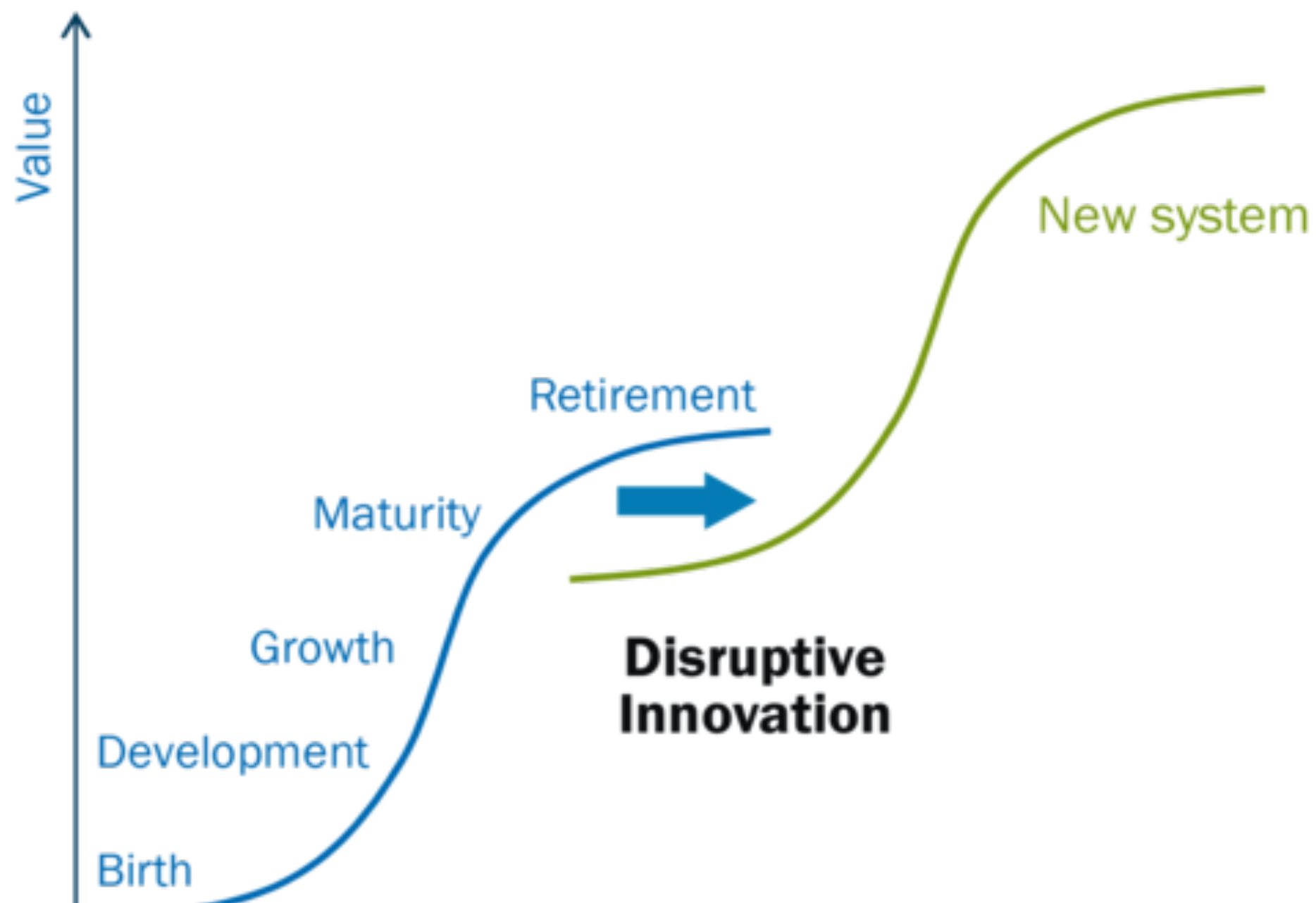
Technical Innovation in an Industry

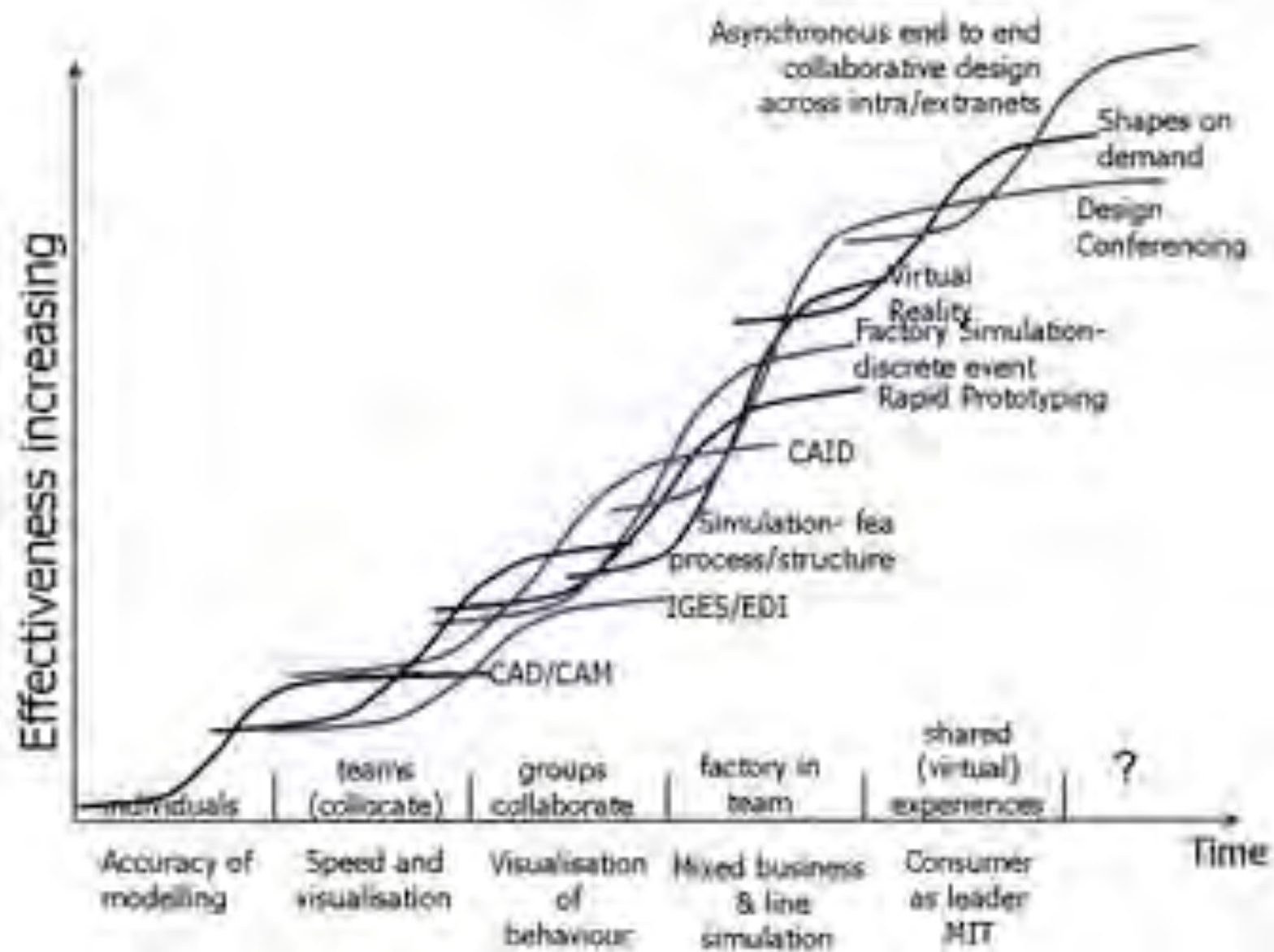


Source: Inter-generational transitions in socio-technical systems: The case of mobile communications

THE LIFE TRAJECTORY OF A TECHNOLOGICAL REVOLUTION

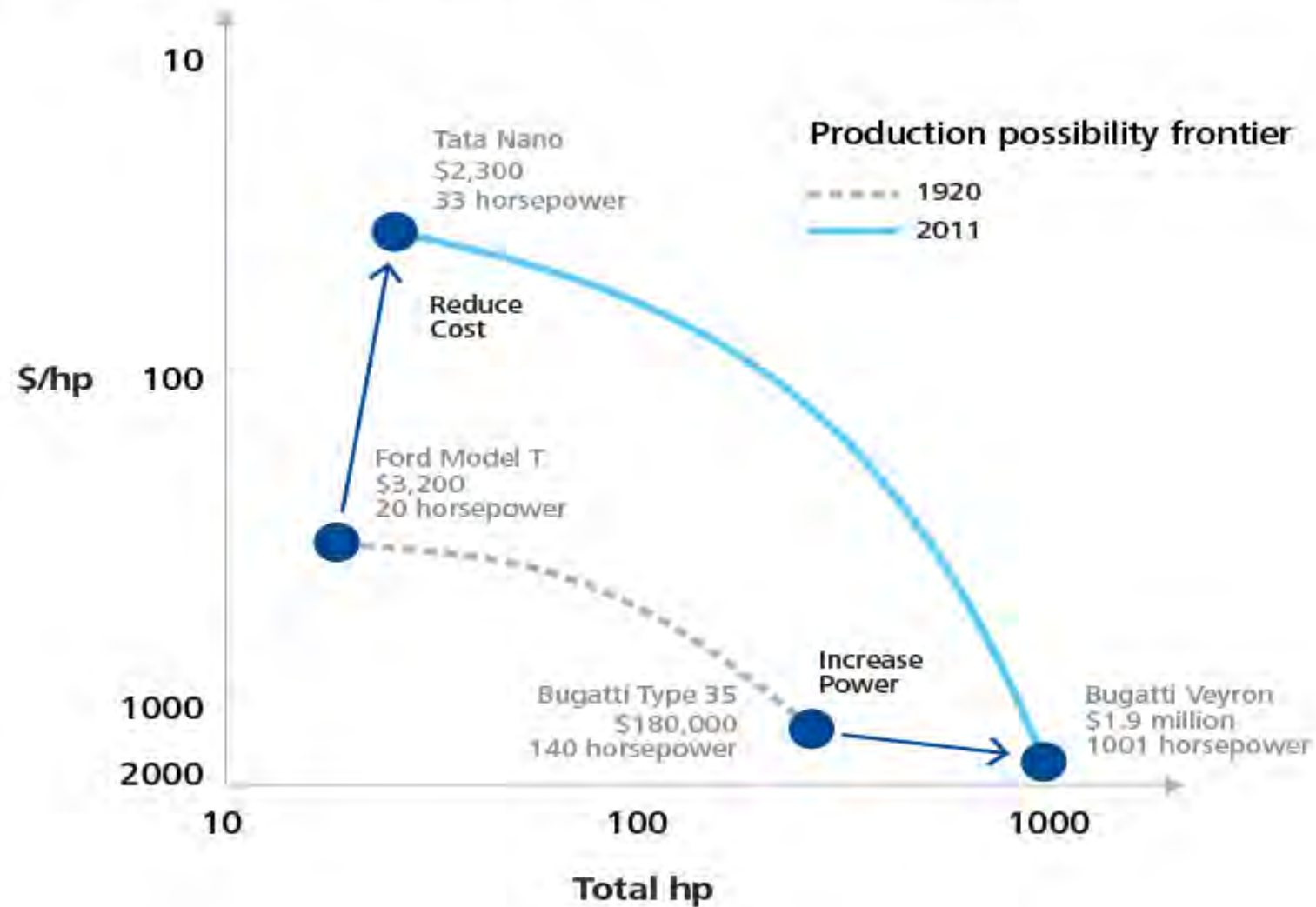






Esempi di performance tecnologica

Figure 2. A production frontier in the automotive industry



Curva logistica (Basalla)

Una regolarità osservata ripetutamente nell'evoluzione del progresso tecnologico è riassunta nella «curva ad S»

Definendo in ordinata una misura di performance tecnologica e in ascissa il tempo (o in alternativa l'investimento cumulato in R&S o in sforzi innovativi)

- la curva mostra una fase (più o meno lunga) di impatto modesto
- dopo questa fase di latenza si osserva un rapido aumento della performance
- dopo la fase di accelerazione si giunge ad un punto di flesso
- la curva successivamente converge verso un livello massimo di performance, oltre il quale non si osservano ulteriori miglioramenti

Necessità di gestire in modo strategico la curva logistica:

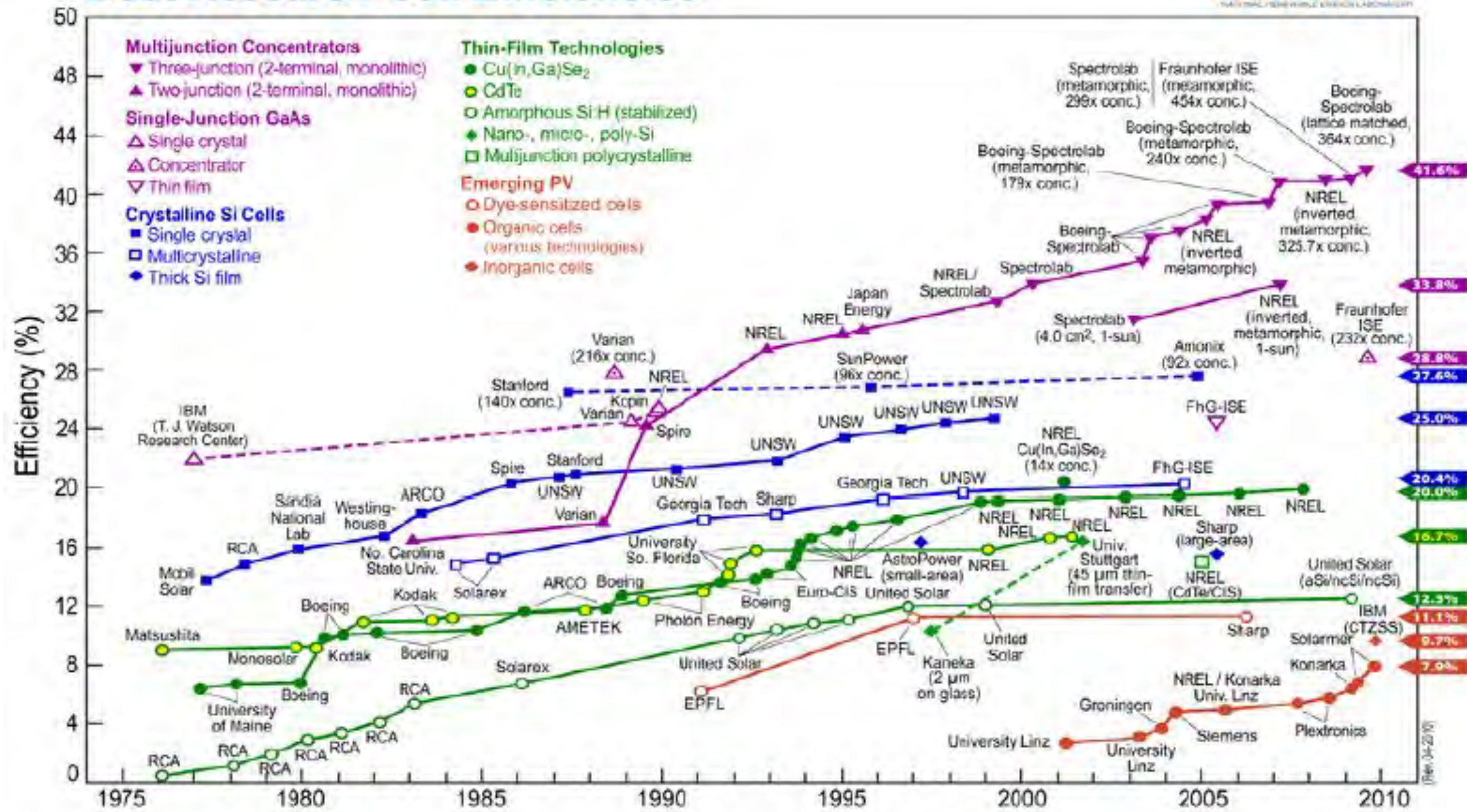
- saturazione
- esaurimento delle opportunità tecnologiche
- convergenza progressiva di tutte le imprese verso il livello di saturazione- difficoltà di differenziare rispetto alla concorrenza
- nascita di una nuova curva ad S

Traiettorie tecnologiche (Dosi, 1982)

Nozione di paradigma tecnologico

- Concetto di paradigma tratto da *The structure of scientific revolutions* di Thomas Kuhn (1962)
- Si può dire che esista un *paradigma tecnologico* quando in una certa comunità sono condivisi
 - I **problemi** tecnici da risolvere
 - Le definizioni con le quali viene misurata la **performance**
 - I **procedimenti** tecnici seguiti
 - Gli esempi realizzati di **soluzione**
- La esistenza di un paradigma comune assicura che tutte le imprese (e tutti gli inventori) convergono negli sforzi innovativi
- La conseguenza è che il progresso tecnologico tende a seguire una vera e propria traiettoria, come se fosse un fenomeno fisico prevedibile
- Esempi di *traiettoria tecnologica*
 - miniaturizzazione nel «paradigma del silicio» (es. legge di Moore)
 - ricerca dei geni responsabili dei meccanismi molecolari delle proteine nel «paradigma della biologia molecolare»

Best Research-Cell Efficiencies



Microprocessor Transistor Counts 1971-2011 & Moore's Law

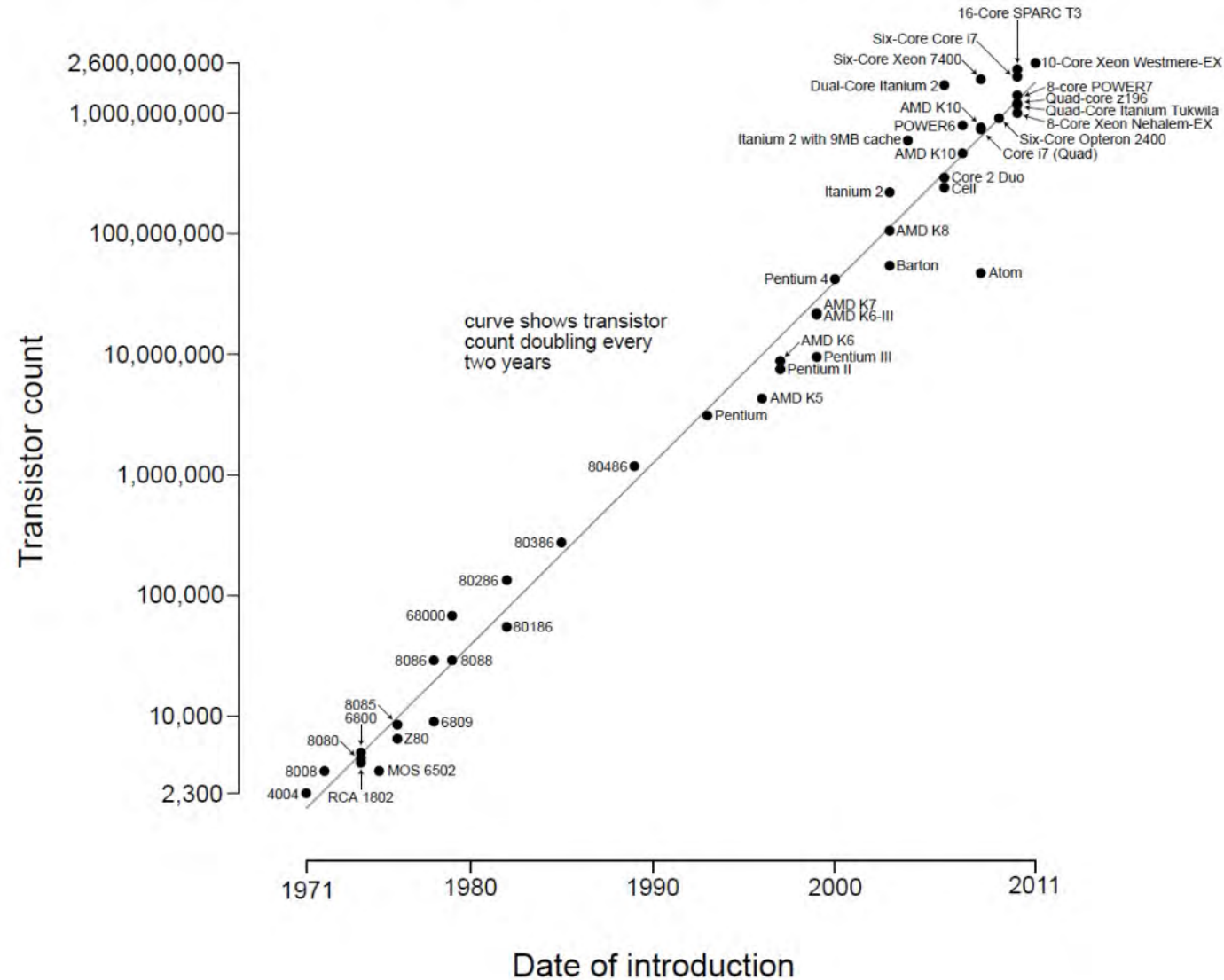
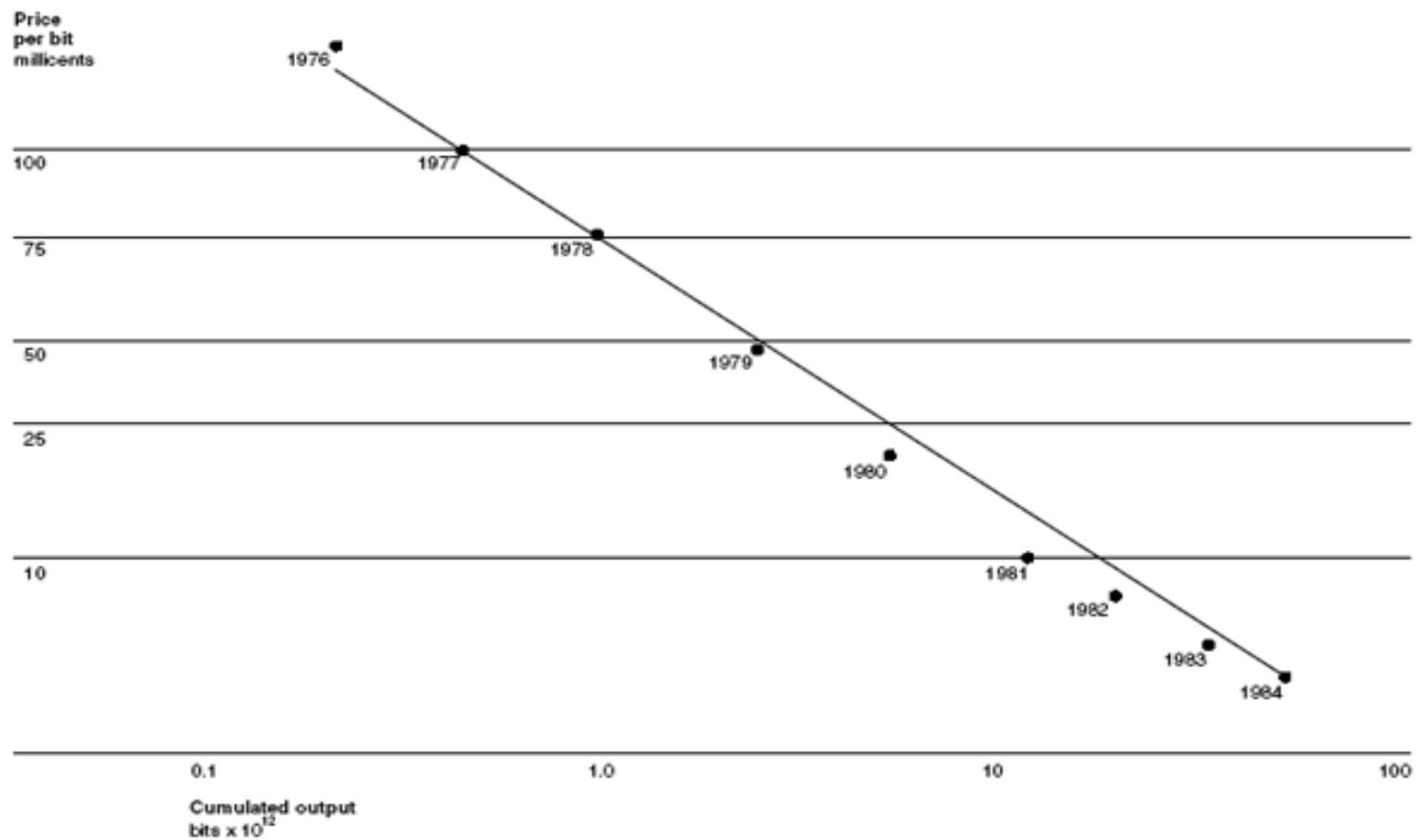


EXHIBIT I

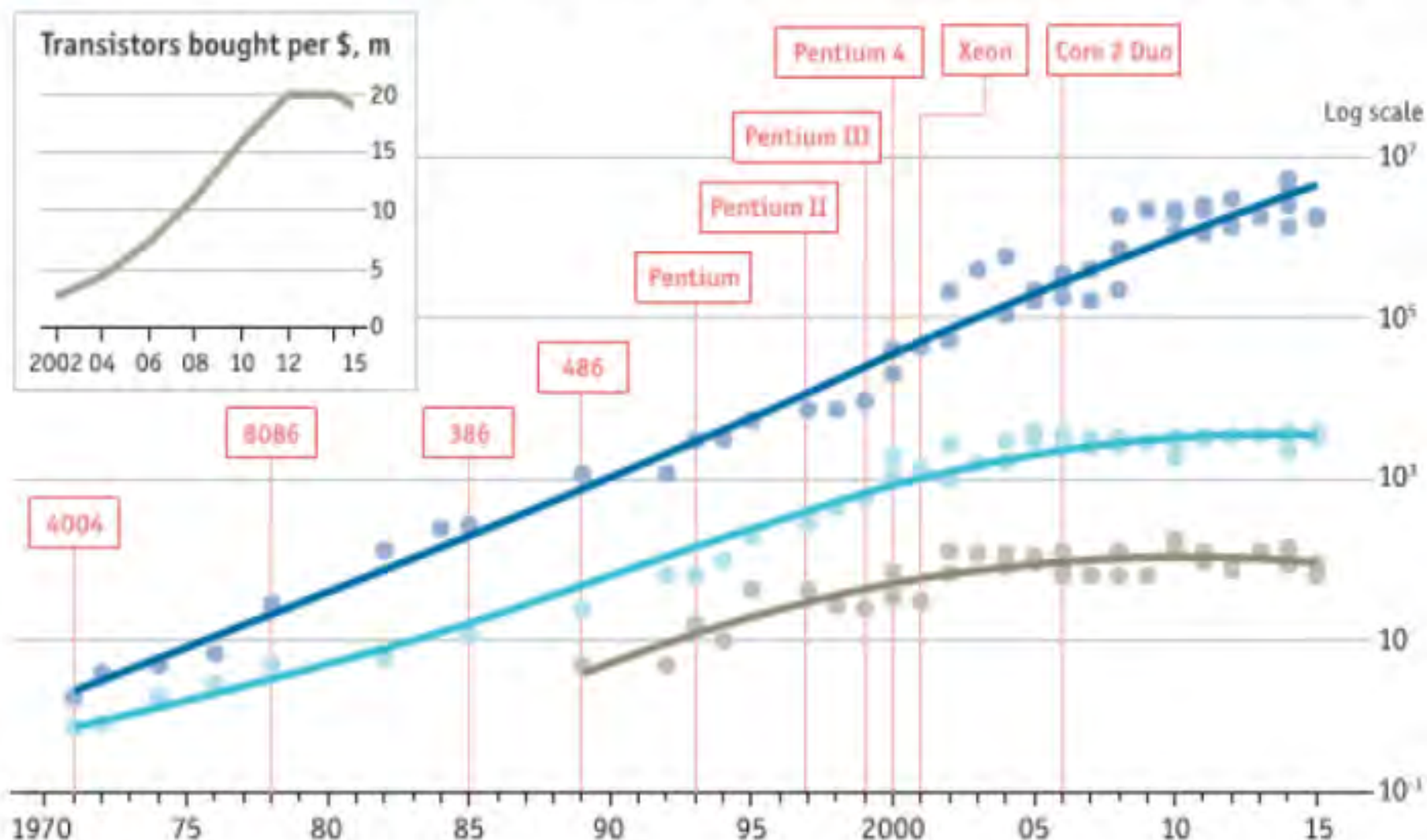
70% experience curve for dynamic RAMs



Source: Integrated Circuit Engineering Corporation

Stuttering

● Transistors per chip, '000 ● Clock speed (max), MHz ● Thermal design power*, w □ Chip introduction dates, selected

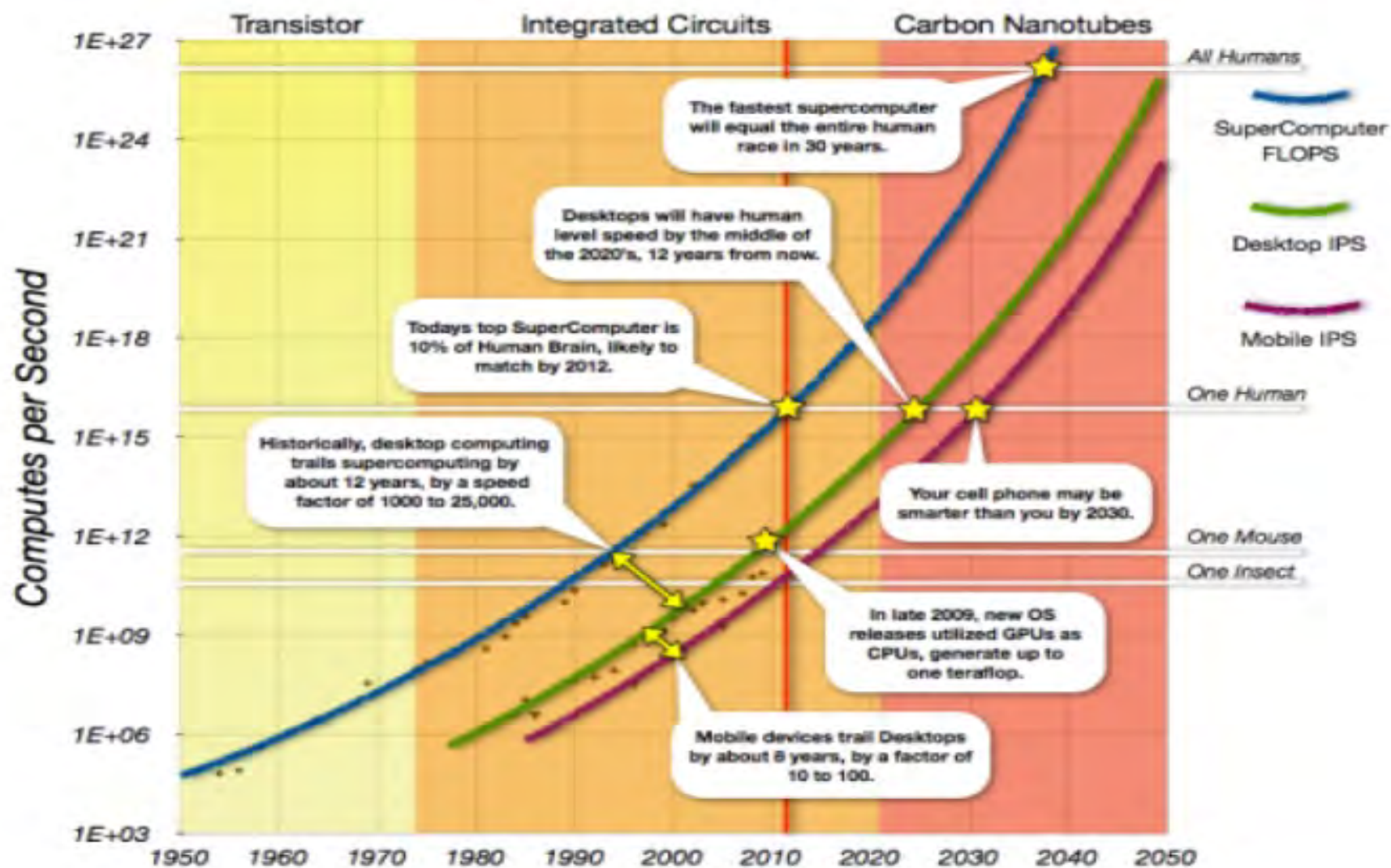


Sources: Intel; press reports; Bob Colwell; Linley Group; IB Consulting; *The Economist*

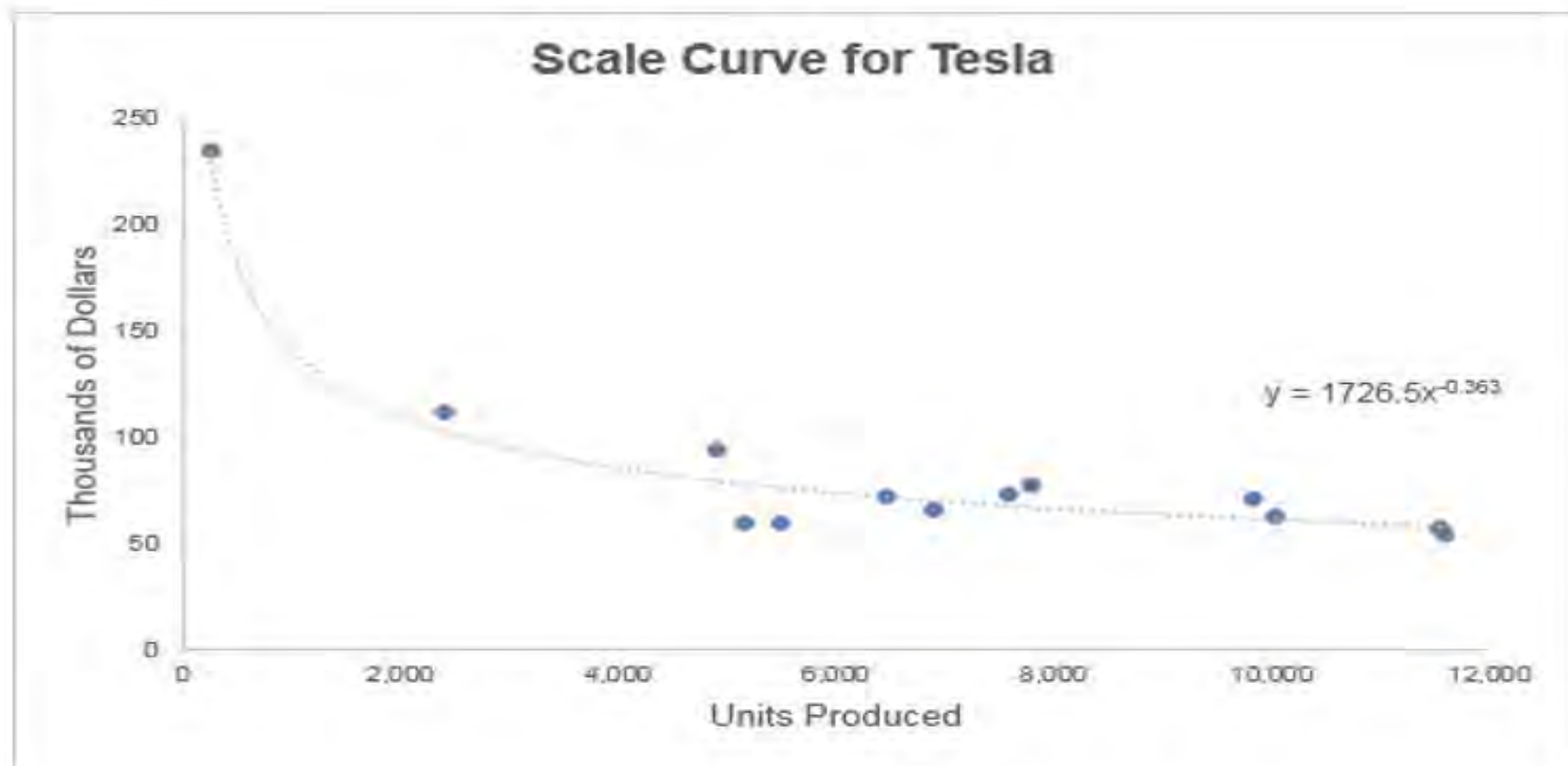
*Maximum safe power consumption

Fonte: *The Economist*, *Technology quarterly*, *After the Moore's Law*

Compute Power



**Figure 1: Scale Curve for Tesla's Model S
(2012-2014)**



Scale Curve Slope = 80%
Costs drop 20% with each doubling of unit volume

Tassonomia di Pavitt (1984)

- Tassonomia di Pavitt (1984) basata sulla analisi della fonte dell'innovazione e delle caratteristiche dominanti dei settori industriali
- Classificazione dei settori industriali in
 - Dominati dai fornitori
 - Ad alta intensità di scala
 - Fornitori specializzati
 - Basati sulla scienza

Fonti di innovazione e specificità settoriali

(segue)

	Settori	Scopo innovaz.	Principale fonte innovaz.	Dimensione imprese
Dominati dai fornitori	Tessile, calzature, alimentari, non manifatturiero	Riduzione dei costi	Esterna (learning by doing/using)	Medio-piccola
Ad intensità di scala	Siderurgia, auto, beni durevoli	Riduzione costi Modifica processi	Esterna (suppliers) Interna (R&S)	Medio-grande Integraz. Vert.
Fornitori specializzati	Meccanica strumentale, macchinari	Miglioramento performance e customizzazione prodotti	Esterna (users) Interna (learning, non R&D based)	Piccole e specializzate
Basati sulla scienza	Elettronica, farmaceutica	Modifica e creazione di nuovi prodotti	Interna (R&S) Esterna (Univ. e centri di ricerca)	Grandi e diversificate Medie e piccole

Pattern settoriali di innovazione

- Specificità settoriali nell'organizzazione dell'attività innovativa:
 - **Schumpeter Mark I** (*distruzione creativa*, regime *entrepreneurial*)
Schumpeter (1912), *Teoria dello sviluppo economico*
 - **Schumpeter Mark II** (*accumulazione creativa*, regime *routinized*)
Schumpeter (1942), *Capitalismo, socialismo e democrazia*

Pattern settoriali di innovazione (segue)

- Caratteristiche che definiscono i pattern di innovazione
 - **Concentrazione** delle attività innovative (innovazione diffusa vs. concentrata)
 - **Dimensione** delle imprese innovative (innovazione da parte di piccole vs. grandi imprese)
 - **Stabilità** nella gerarchia degli innovatori (persistenza vs. ricambio nella *leadership* tecnologica)
 - **Entrata** tecnologica (innovazioni introdotte dai *new comers* vs. *incumbents*)

Pattern settoriali di innovazione (segue)

Nelson e Winter (1982); Winter (1984)

	Schumpeter Mark I	Schumpeter Mark II
Grado di concentrazione	Basso	Alto
Dimensione delle imprese innovatrici	Piccole	Medio-grandi
Grado di stabilità nella gerarchia degli innovatori	Basso	Alto
Entrata tecnologica	Alta (innovation by new-comers)	Bassa (innovation by incumbents)

Pattern settoriali di innovazione (segue)

- Perché l'attività innovativa ha definite specificità industriali/settoriali? Breschi, Malerba, Orsenigo (2000)
 - Caratteristiche delle **conoscenza** e della **tecnologia**, e dei loro meccanismi di **trasmissione**
 - Condizioni di **opportunità**
 - Condizioni di **appropriabilità**
 - Condizioni di **cumulatività**
 - **Conoscenza** di base

Pattern settoriali di innovazione (segue)

- Condizioni di ***opportunità***: facilità di innovare per ogni dato ammontare di risorse investito
 - *Fonte* delle opportunità tecnologiche: scoperte scientifiche, R&S, *learning*, fonti esterne
 - Le opportunità sono più elevate in seguito a scoperte scientifiche
 - Sono più contenute nei settori non R&D-based
 - *Livello/Varietà*: stadio di evoluzione dell'industria (pre-paradigmatico/ paradigmatico)
 - Le opportunità sono elevate nella fase pre-paradigmatica ma sono soggette a processi di selezione
 - Nella fase paradigmatica diminuiscono le innovazioni radicali, aumentano le innovazioni incrementali e di processo
 - *Pervasività: GPT*
 - Le opportunità connesse alle GPT sono elevatissime

Pattern settoriali di innovazione (segue)

- Condizioni di ***appropriabilità***: *possibilità di proteggere le innovazioni dall'imitazione e di estrarre profitto dalle attività innovative*
 - *Livello di appropriabilità*
 - Elevati livelli di appropriabilità attribuiscono vantaggi agli incumbenti e costituiscono barriere all'entrata per i nuovi entranti
 - *Metodi di appropriabilità*: segreto industriale, *lead time*, innovazione continua, curva di apprendimento (learning curve), brevetti

Pattern settoriali di innovazione (segue)

- Condizioni di *cumulatività*: si riferisce al fatto che le innovazioni e l'attività innovativa di oggi sono il punto di partenza per le attività di domani (la probabilità di innovare a t_0 è funzione dell'aver innovato a t_{-1})
 - La cumulatività può essere definita a livello di tecnologia, settore industriale, singola impresa
 - Cumulatività a livello di territorio a causa di spillovers di conoscenza

Pattern settoriali di innovazione (segue)

- La **conoscenza** di base: si riferisce alle proprietà della conoscenza su cui si basano le attività innovative delle imprese
 - **Natura** della conoscenza:
 - tacita vs. codificata
 - complessa
 - indipendente/isolabile
 - generica vs. specifica
 - **Mezzi di trasmissione** della conoscenza:
 - mezzi formali (comunità scientifica, università, pubblicazioni di settore, brevetti)
 - vs. mezzi informali (*face-to-face*, conversazioni informali)
 - ruolo della distanza geografica.

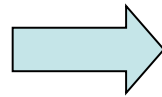
Conoscenza tacita vs codificata

Nelson e Winter (1982)

- Conoscenza codificata: può essere espressa attraverso un linguaggio formale
- Conoscenza tacita: «we know more than we can tell» (Polanyi, *La conoscenza personale*)
- Cause della natura tacita della conoscenza
 - Coordinamento senso-motorio non cosciente
 - Complessità della conoscenza esperta e difficoltà di elicitazione delle regole
 - Linguaggi informali in compiti di coordinamento
- Conseguenze economiche della natura tacita della conoscenza
 - Trasmissione attraverso rapporto maestro-allievo (apprenticeship)
 - Rapporto uno a pochi (costo elevato di trasmissione)
 - Tempi di trasmissione della conoscenza estremamente lunghi (anni)
 - Impossibilità di trasmissione senza la collaborazione attiva del detentore della conoscenza (elevata appropriabilità)
 - Necessità di processi strutturati di trasformazione della conoscenza (cfr. Nonaka e Takeuchi, *The knowledge creating company*)

Pattern settoriali di innovazione (segue)

- L'evidenza empirica internazionale (Breschi, Malerba, Orsenigo 2000) suggerisce che:
 - Elevate opportunità tecnologiche
 - Contenuto grado di appropriabilità e cumulatività
 - Fonti esterne di conoscenza

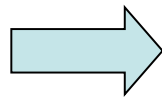


Elevata turbolenza (entrata/uscita)
Elevata mobilità nel ranking degli innovatori
Bassi livelli di concentrazione dell'attività innovativa
Bassa dimensione delle imprese innovatrici

Schumpeter Mark I (regime di tipo "entrepreneurial")

Pattern settoriali di innovazione (segue)

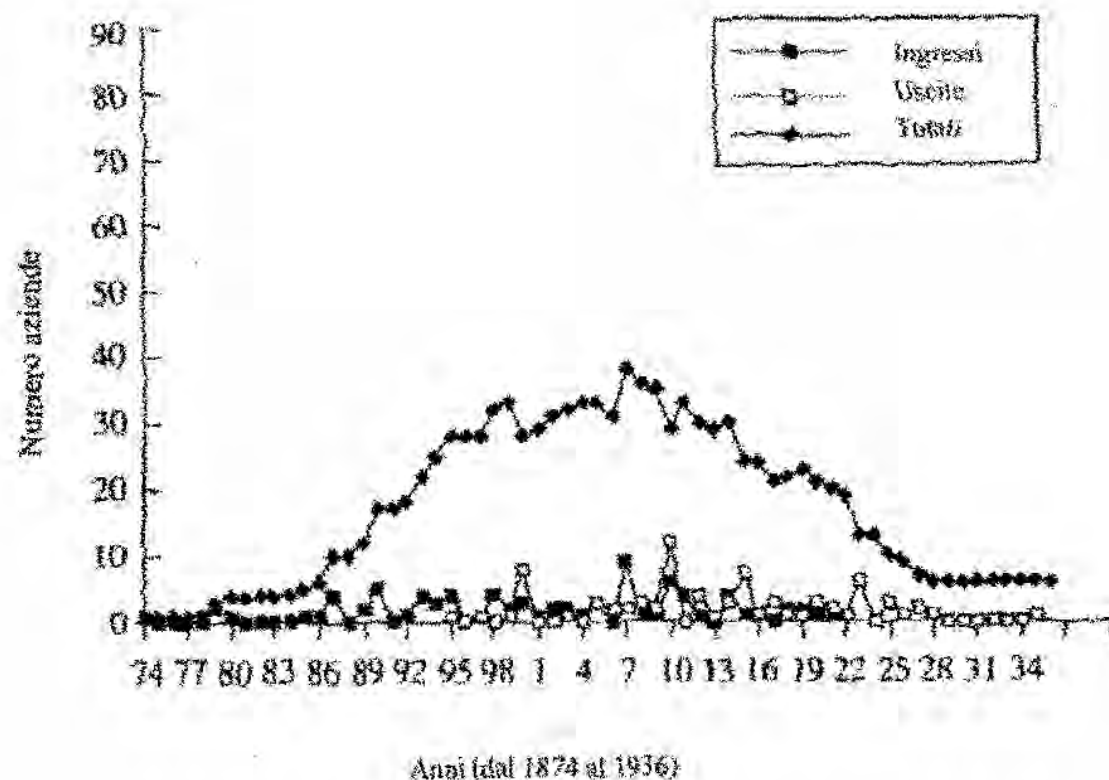
- **Al contrario:**
 - Basse opportunità tecnologiche
 - Elevato grado di appropriabilità e cumulatività
 - R&S come fonte di innovazione



**Bassa turbolenza (entrata/uscita)
Stabilità nel ranking degli innovatori
Elevati livelli di concentrazione dell'attività innovativa
Vantaggio innovativo delle grandi imprese**

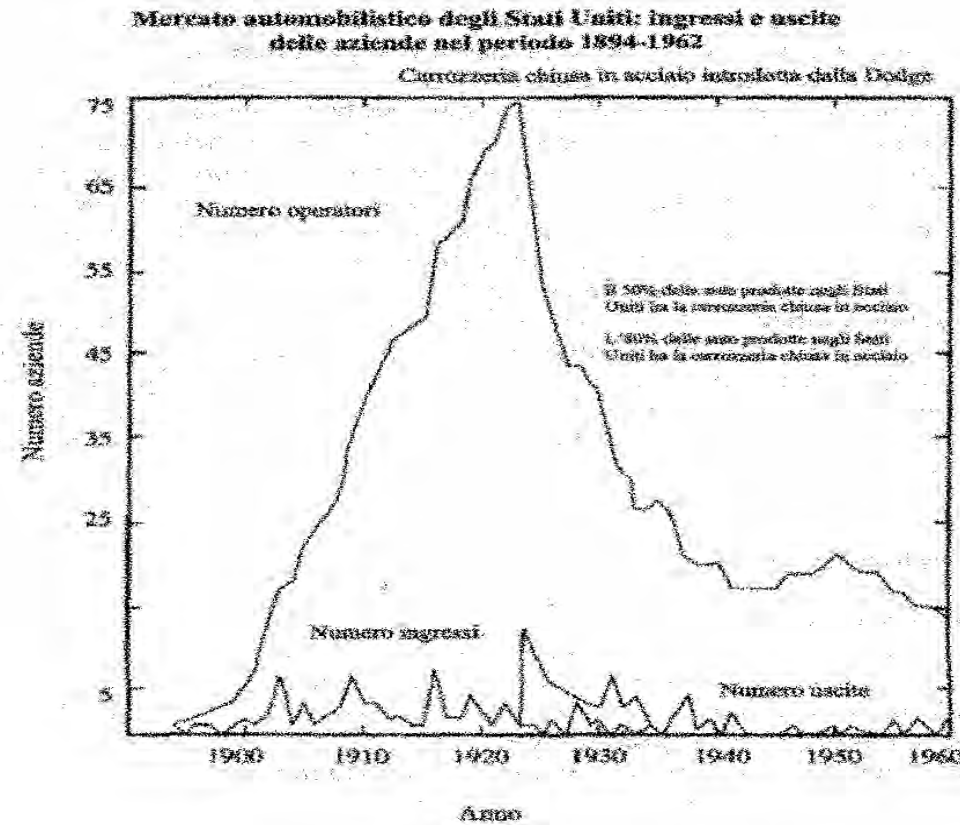
Schumpeter Mark II (regime di tipo “routinized”)

Innovazione e dinamica industriale



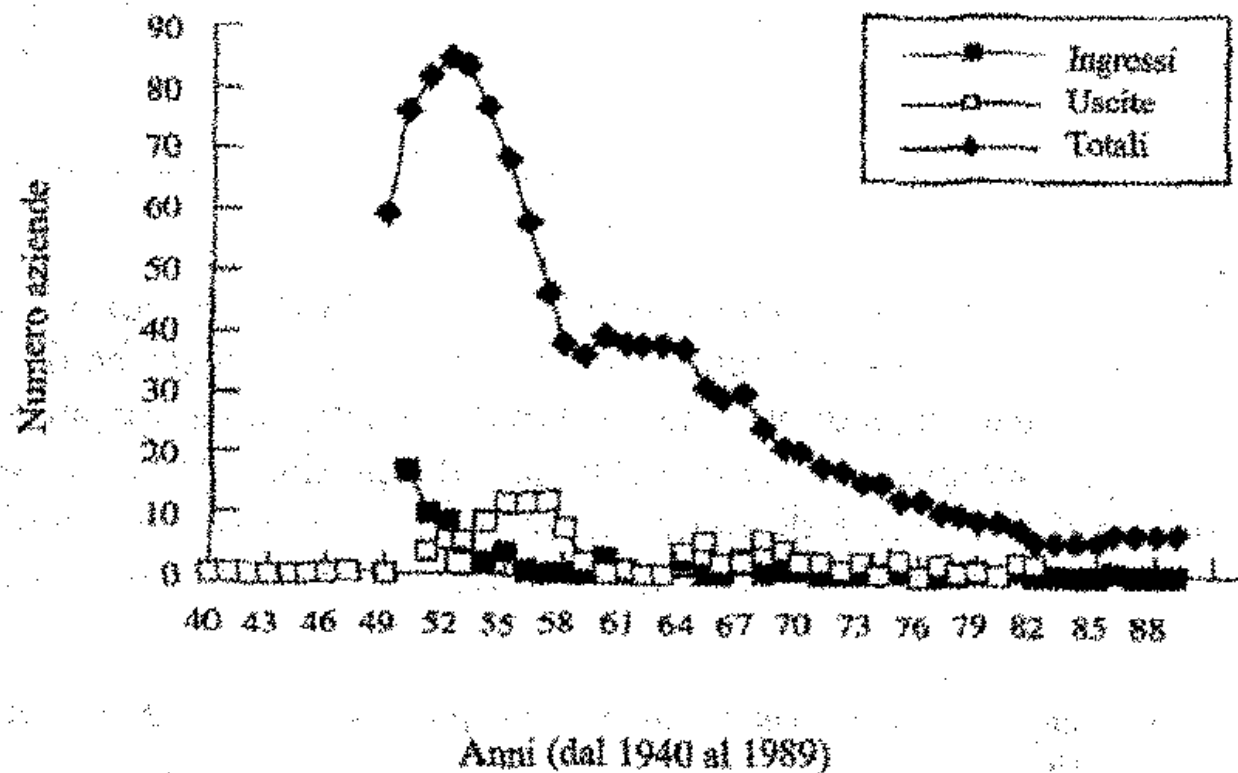
**Numero delle aziende presenti sul mercato americano
delle macchine per scrivere**

Innovazione e dinamica industriale (2)



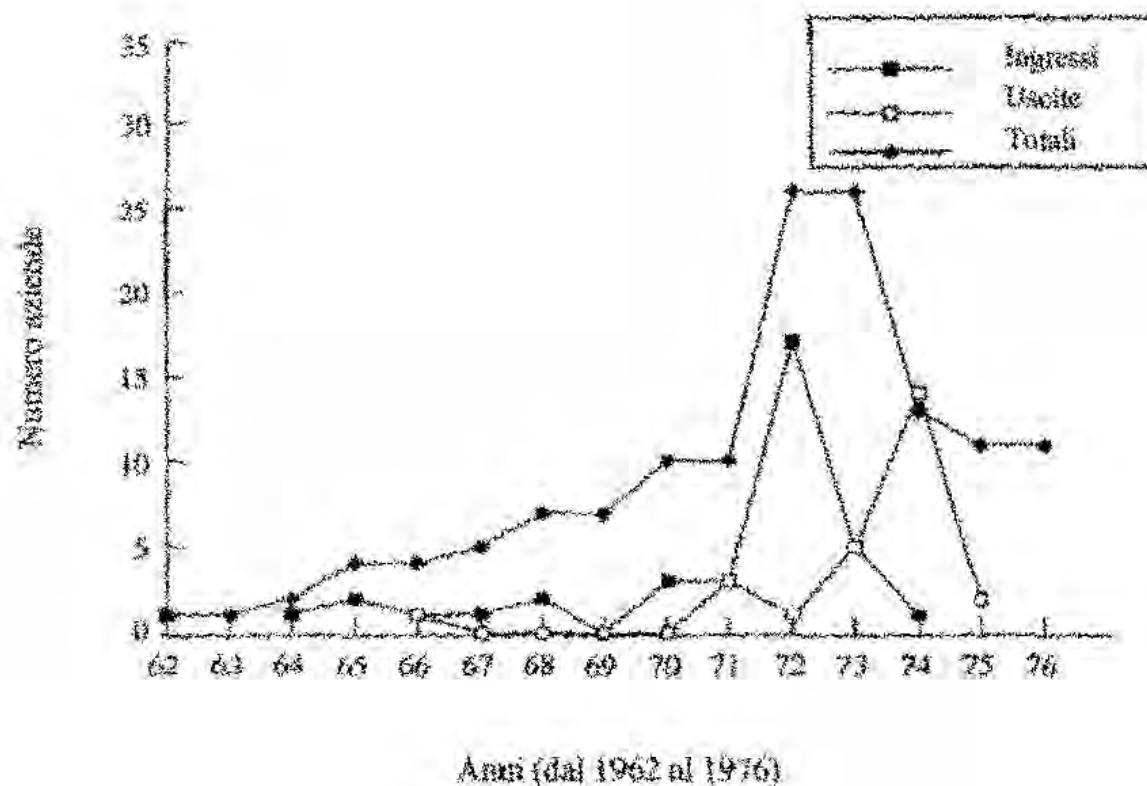
Numero delle aziende presenti sul mercato americano delle automobili

Innovazione e dinamica industriale (3)



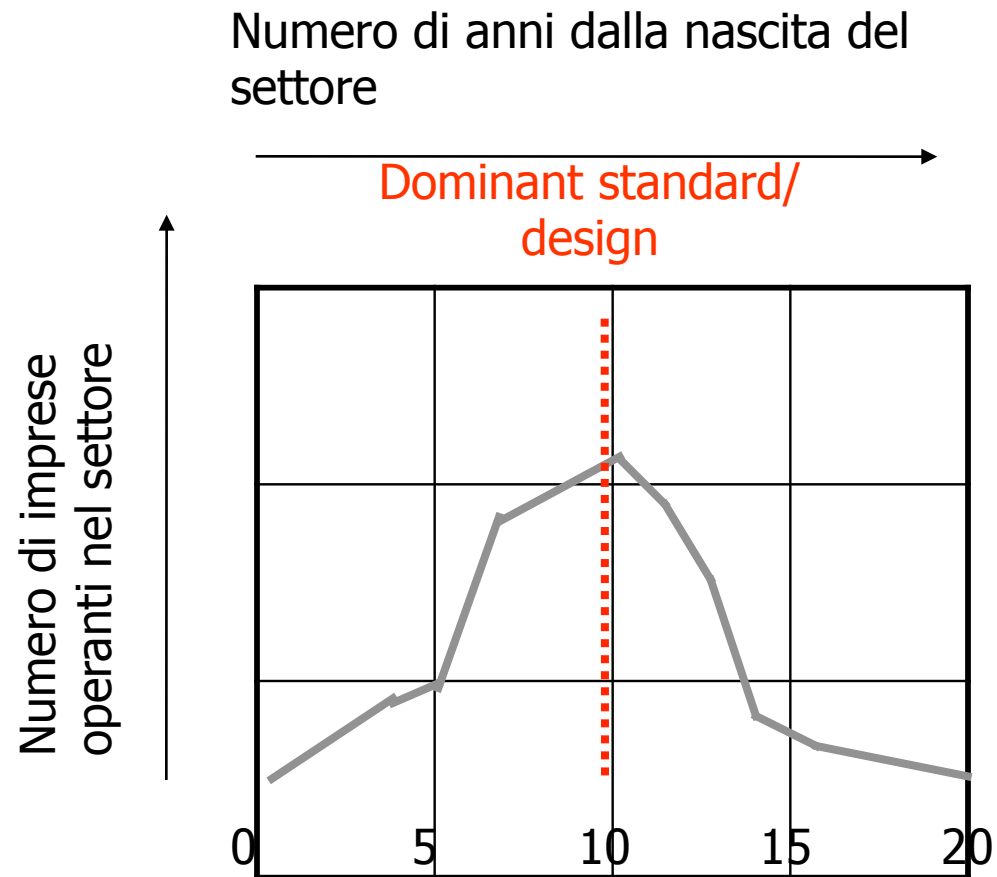
Numero delle aziende presenti sul mercato dei televisori negli U.S.A.

Innovazione e dinamica industriale (4)



Numero delle aziende presenti sul mercato U.S.A. dei calcolatori elettronici

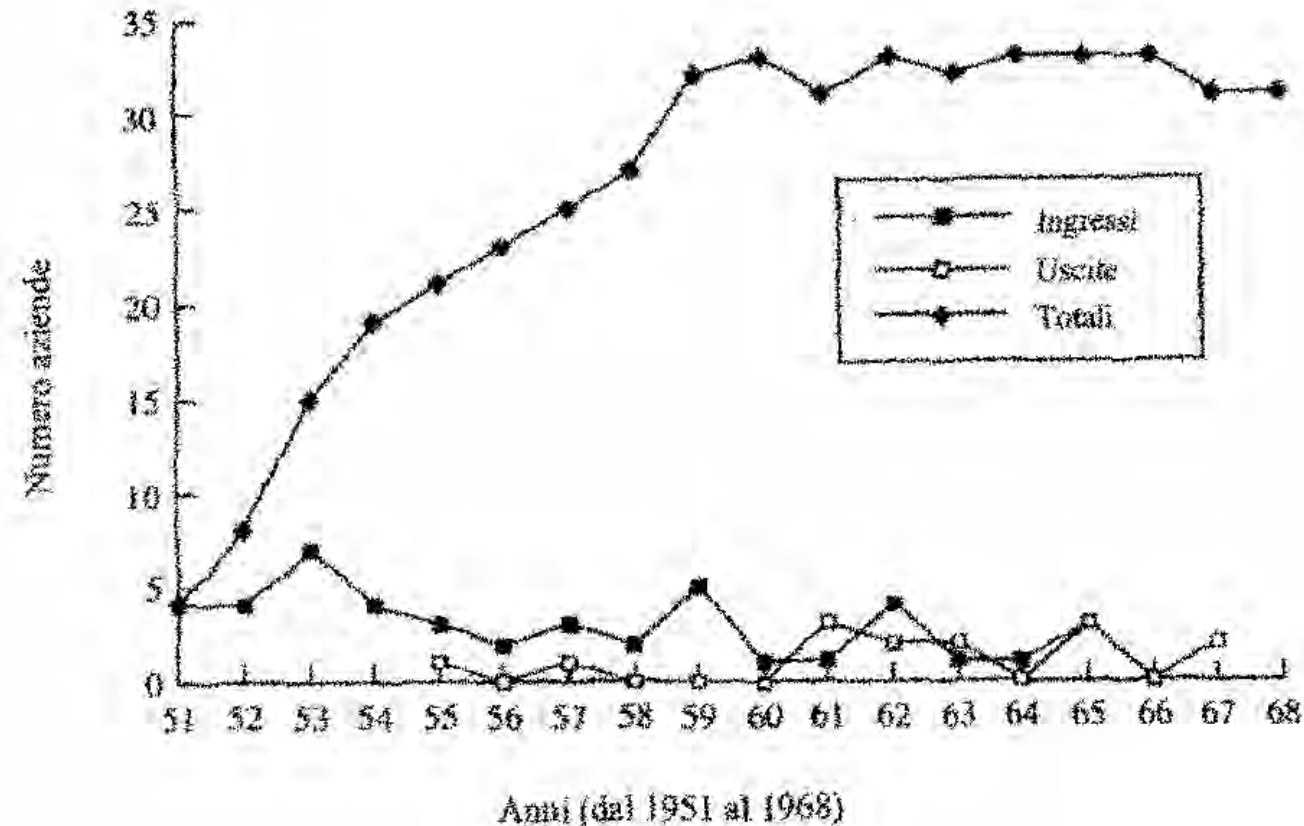
Innovazione e design dominante



Innovazione e design dominante (2)

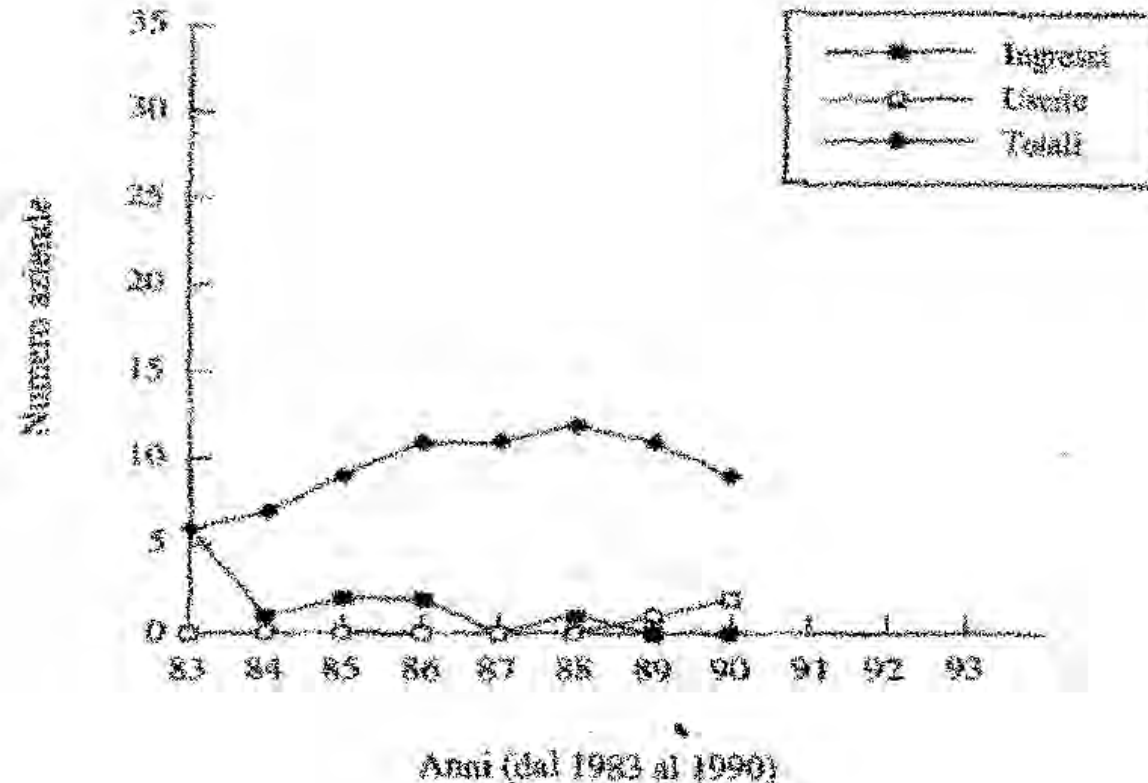
- Design (o standard) dominante: il design che conquista la preferenza del mercato in una determinata classe di prodotti
- Set di caratteristiche che:
 - **Sintetizza/incrementa** su innovazioni introdotte separatamente in versioni precedenti
 - Incorpora le soluzioni richieste da molte categorie di **utilizzatori** di un certo prodotto
 - **Riduce** significativamente il numero dei requisiti di performance che deve soddisfare un certo prodotto

Innovazione e design dominante (7)



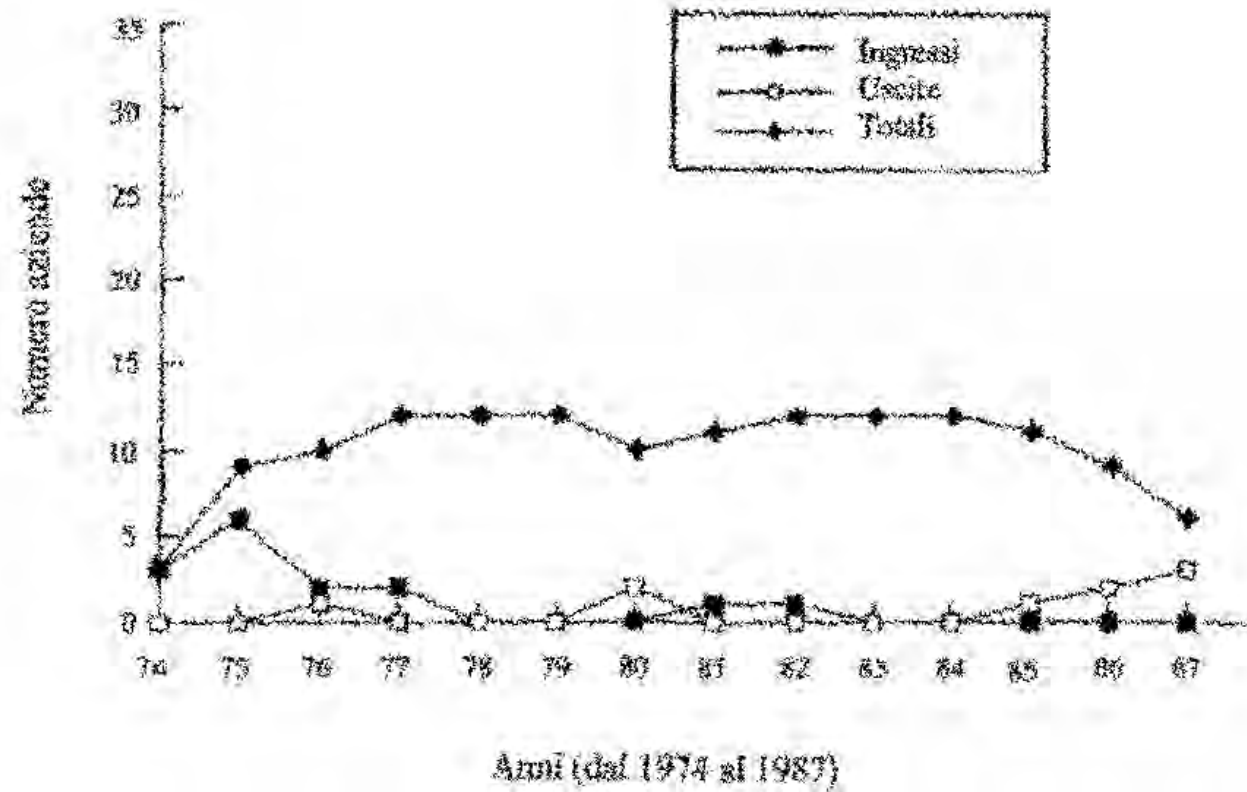
**Numero delle aziende presenti sul mercato americano
nella produzione di transistor**

Innovazione e design dominante (8)



**Numero delle aziende presenti sul mercato americano
nella produzione di supercomputer**

Innovazione e design dominante (9)



**Numero delle aziende presenti sul mercato americano
nella produzione dei circuiti integrati**

General Purpose Technology (GPT)

In alcuni casi le discontinuità tecnologiche sono seguite da massicci processi di diffusione che presentano le seguenti caratteristiche:

- pervasività
- trasversalità settoriale
- sequenza di innovazioni incrementali per l'adattamento dell'innovazione principale a vari contesti applicativi
- perfezionamento progressivo della tecnologia spinto dalle esigenze applicative dei settori utilizzatori
- massiccio aumento della produttività

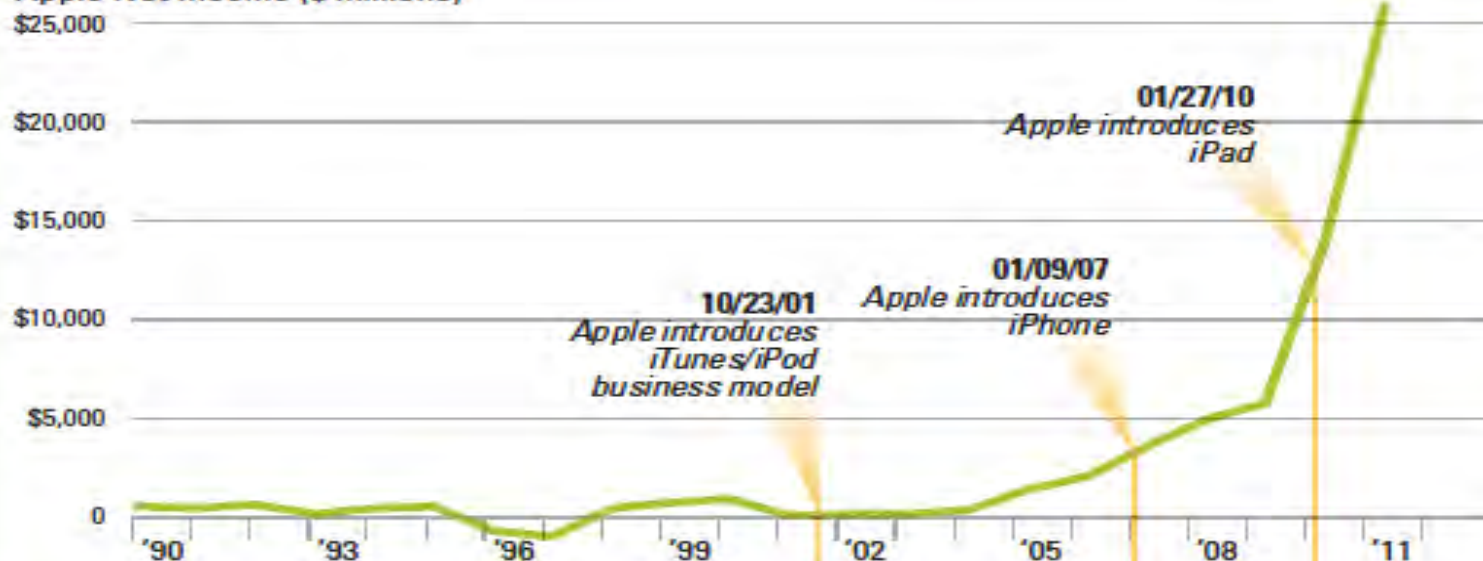
In questi casi si parla di tecnologie generali o GPTs. Esempi:

- energia elettrica (processo di diffusione in seguito alla elettrificazione delle città e al progressivo utilizzo dell'energia nella produzione industriale e nelle abitazioni)
- information technology
- Internet

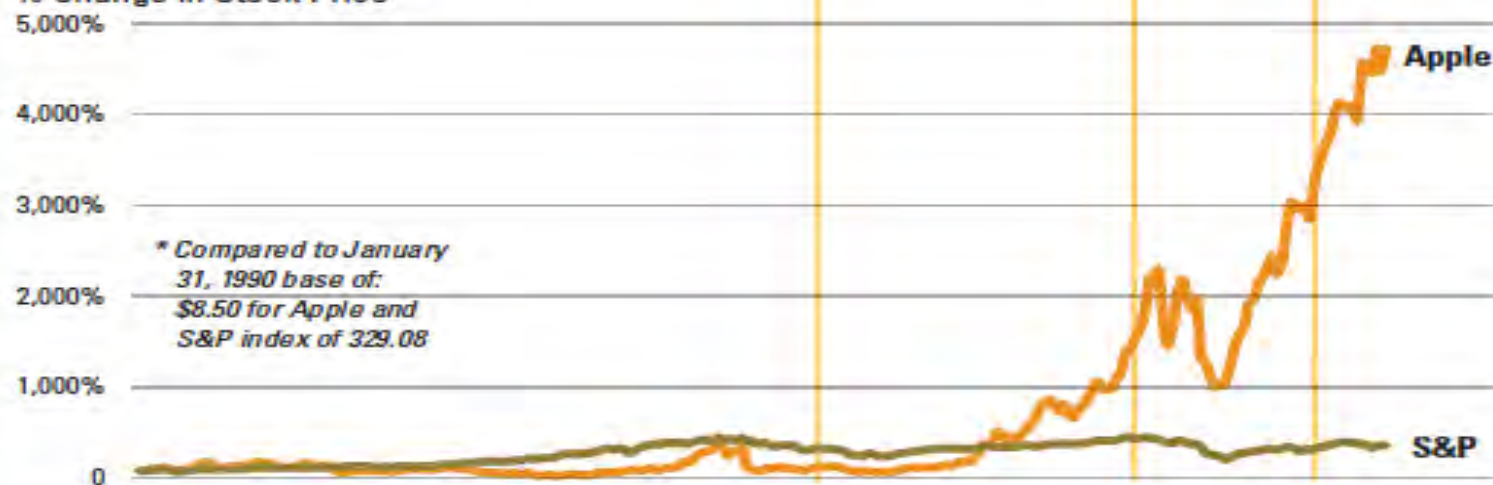
APPLE'S PERFORMANCE, BEFORE AND AFTER BUSINESS MODEL CHANGES

In recent years, Apple's revenues, profit and stock price change have reflected its successful business model innovations.

Apple Net Income (\$ millions)



% Change in Stock Price*

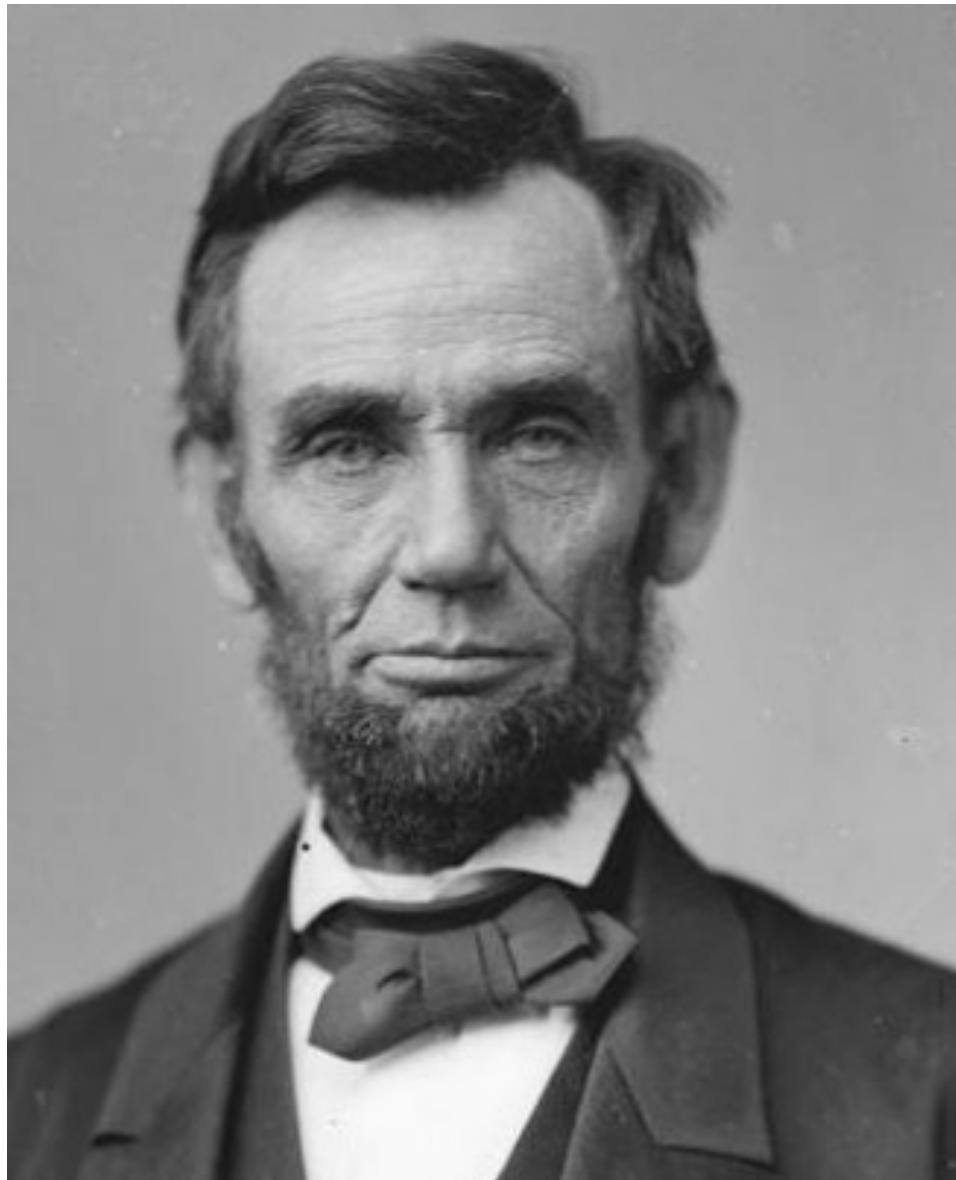


Wait the right time

Innovators run the risk of being ahead of time.

Procrastination might be an appropriate strategy

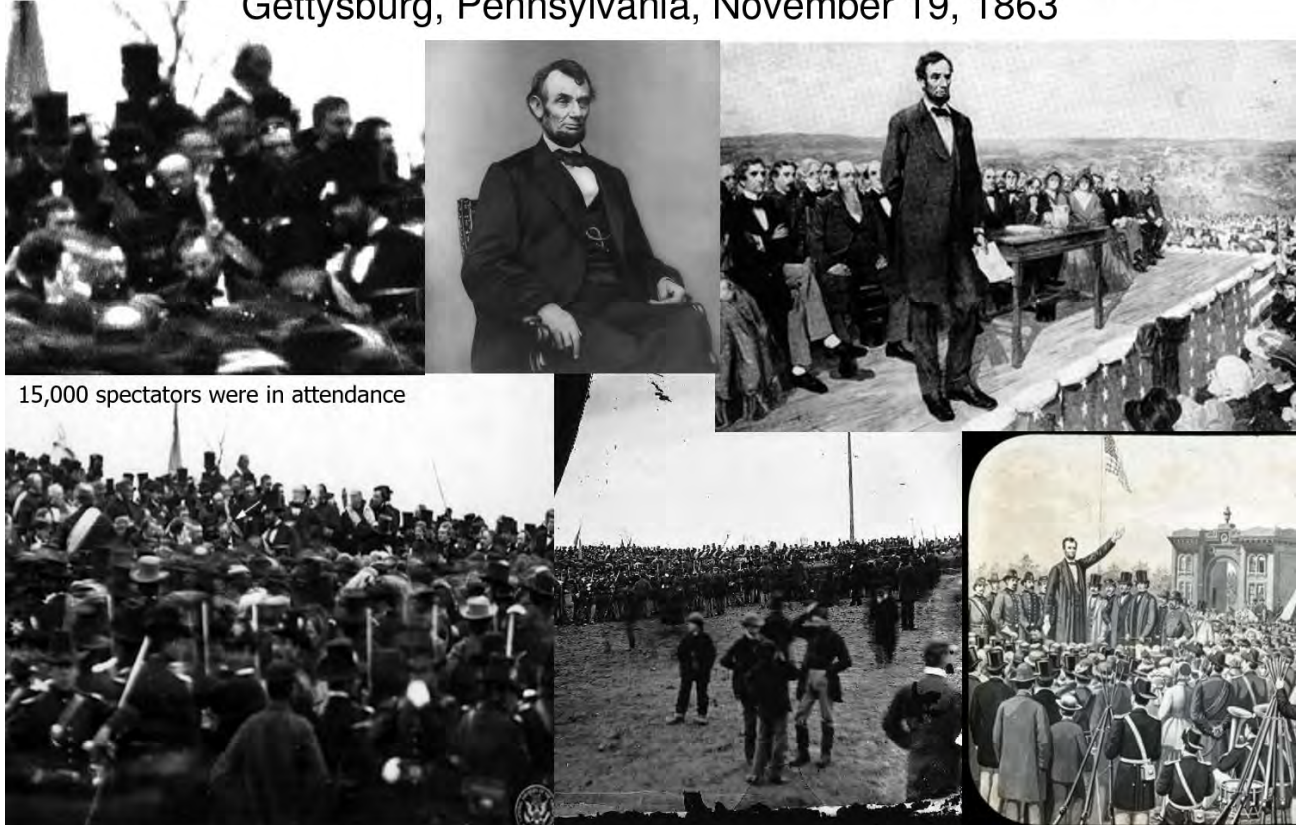
- keep in mind several alternatives until the last minute may help to select
- wait until you have the authority to put in place the innovation you have been thinking for a while



The most famous speech by President Lincoln was written the night before.

The Gettysburg Address

Delivered at the dedication of the Soldiers' National Cemetery in Gettysburg, Pennsylvania, November 19, 1863

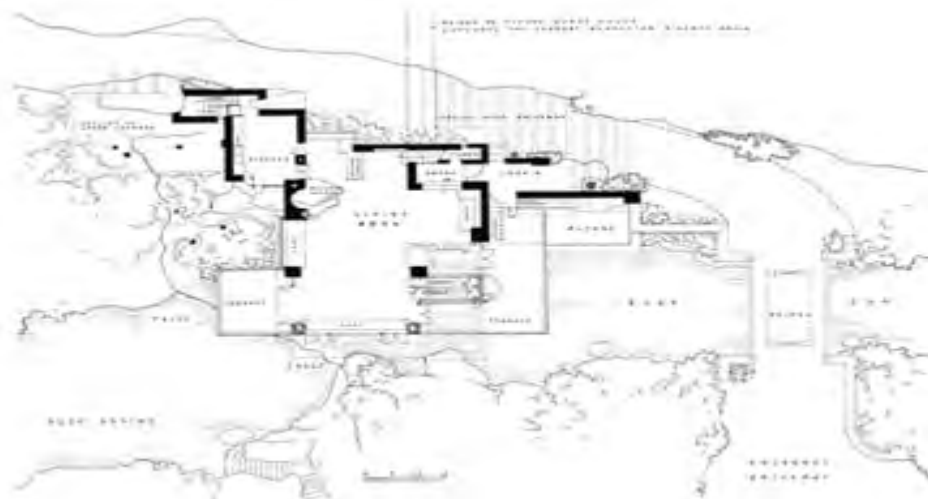
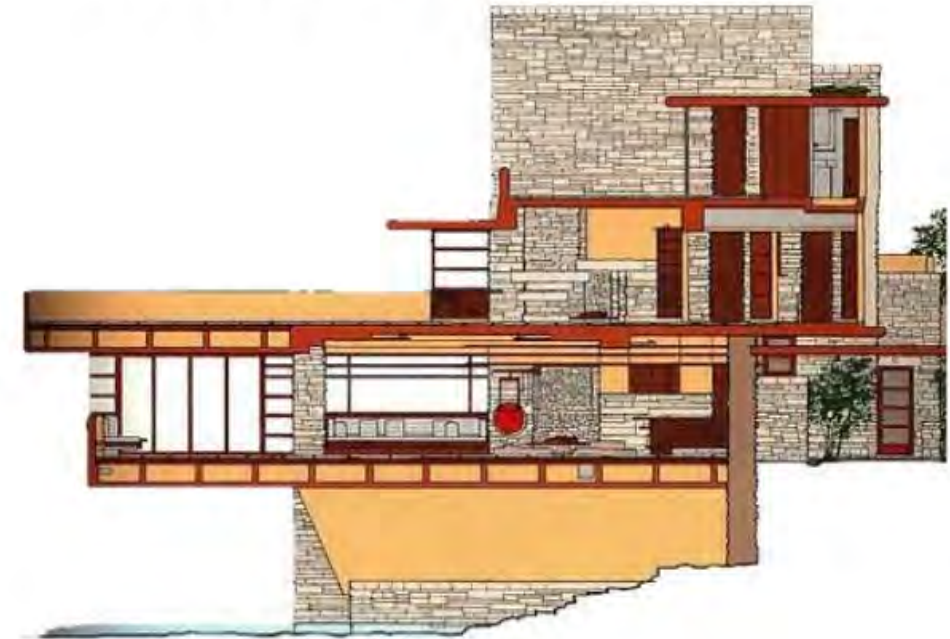


15,000 spectators were in attendance

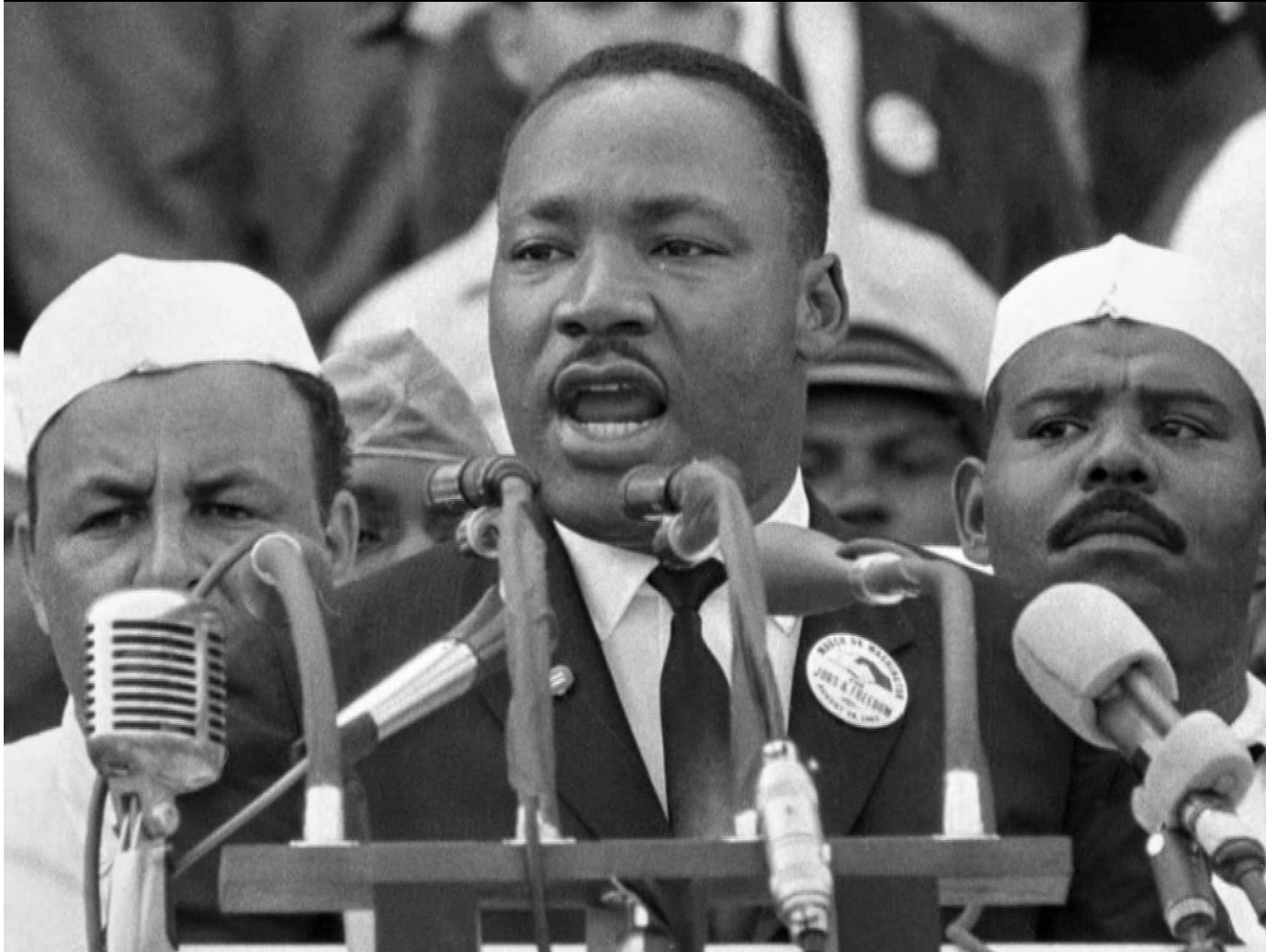


After having received the order for the Fallingwater House, Frank Lloyd Wright procrastinated the work by more than one year.

SECTION OF FALLING WATER:



I have a dream



The most famous speech in XX century was composed the night before the Washington March.

The expression «I have a dream» was not in the written text.



Manage the risk portfolio

People become original in one part of their lives, while remaining quite conventional in others.

Study of > 5,000 US entrepreneurs, 1994-2008.

Entrepreneurs who kept their jobs at the early stage of the startup period were 33% *less likely* to fail.

«No person could possibly be original in one area unless he were possessed of the emotional and social stability that comes from fixed attitudes in all areas other than the one in which he is being original» (Edwin Land, founder of Polaroid).

Connettività, relazioni,
vita buona.

Dove abbiamo sbagliato?

Promesse della innovazione tecnologica digitale

POLITICA

- Democratizzazione
- Aumento della partecipazione

LAVORO

- Miglioramento della qualità del lavoro
- Riduzione della gerarchia aziendale

SOGGETTIVITA'

- Espansione delle opportunità
 - Apprendimento rapido
 - Accesso alle conoscenze

The world is flat

Ottimismo tecnologico anni '90

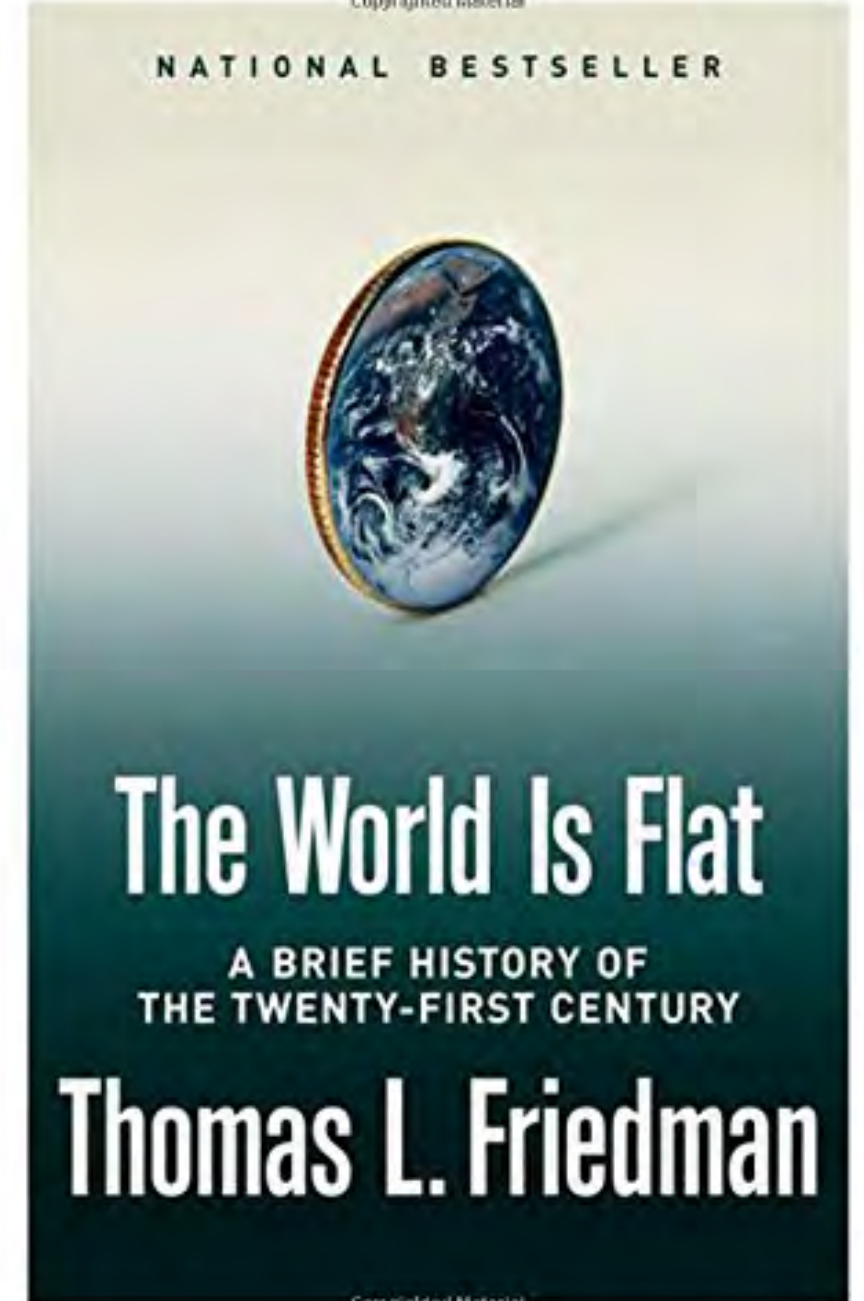
- crescita senza inflazione (Greenspan)
- ciclo di investimenti nelle ICT
- aumento della produttività

Esplosione di Internet e dei social media

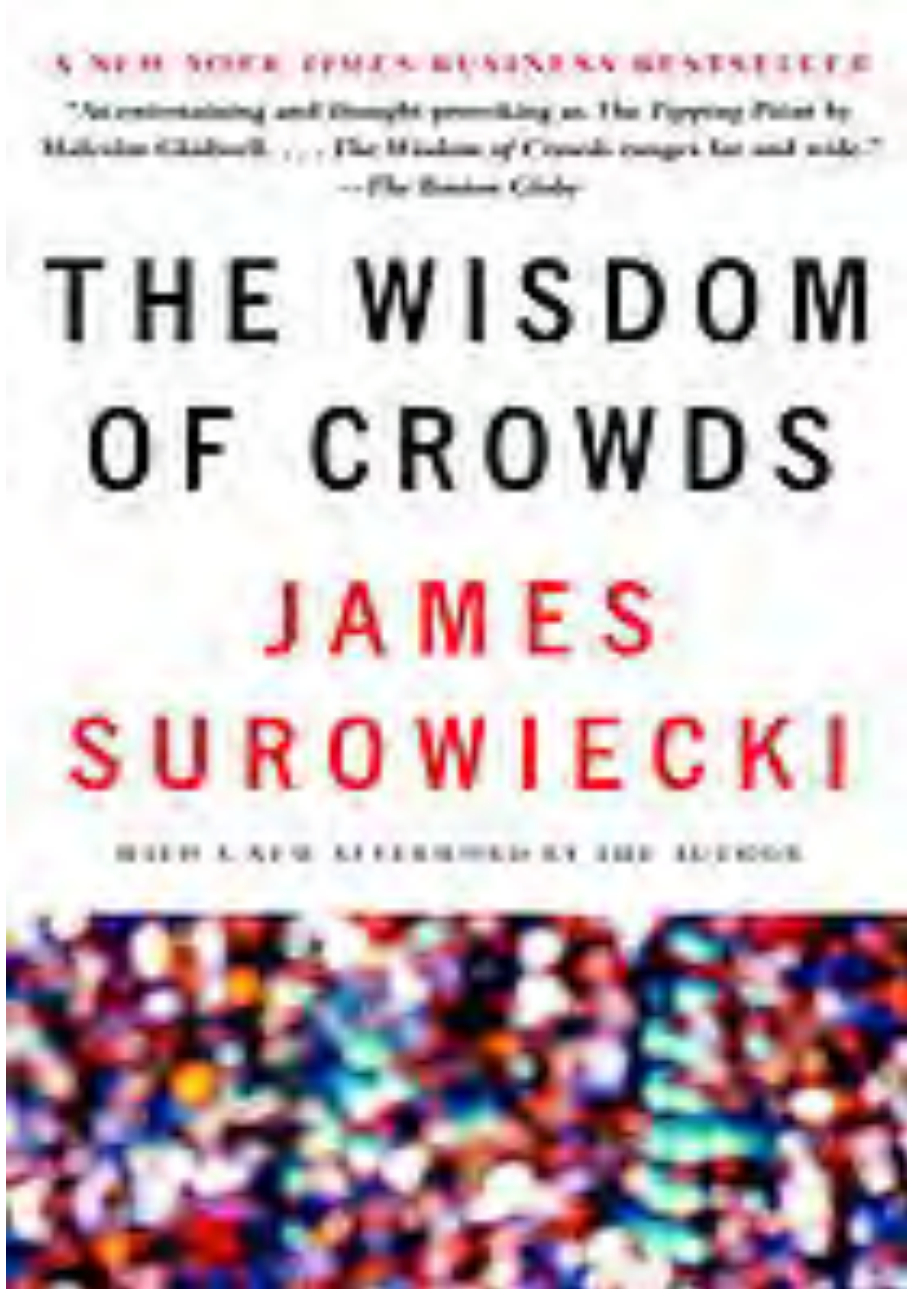
Governi progressisti negli USA (Clinton) e in UK (Blair)

- riformismo
- ottimismo e progettualità

Economia digitale come rivincita generazionale



Farrar, Straus & Giroux (1° edition, 2005)



The wisdom of crowds

Diffusione della conoscenza grazie a Internet e ai social media

Conoscenza diffusa più affidabile della conoscenza di (pochi) esperti

Democrazia deliberativa

Riduzione della delega

Doubleday, Anchor (2004)

Delayering

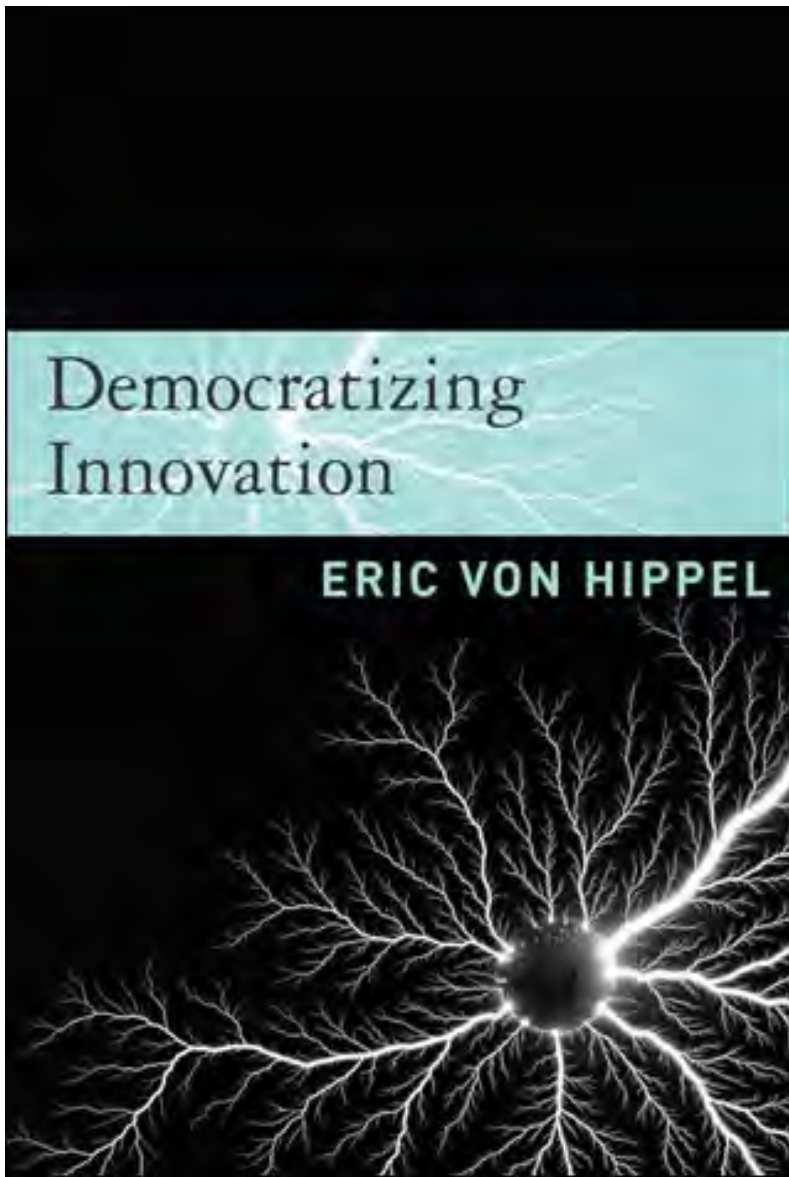
Teoria organizzativa

- esiste un limite alla capacità dei manager di controllare i collaboratori (*span of control*)
- dato un limite costante, all'aumento della dimensione aziendale segue inevitabilmente un aumento del numero dei livelli gerarchici
- l'aumento dei livelli gerarchici genera rigidità e lentezza e deteriora il clima organizzativo

Possibilità di **ridurre il numero di livelli gerarchici delle imprese attraverso l'IT**

- Business Process Reengineering
- Process-driven organizations
- Imprese «piatte» (*flat organization*)
- Diffusione del lavoro di squadra





MIT Press (2006)

Democratizing innovation

Storia di successo: Linux e lo sviluppo della produzione di software Open Source

Sostenibilità di un modello di innovazione collettiva (*collective invention*), con comunità di sviluppatori che si autogovernano

Sfida al monopolio rappresentato da Microsoft nei sistemi operativi

Origine nella cultura alternativa californiana (Free Software Foundation)

Replicabilità del modello in altri settori

The long tail

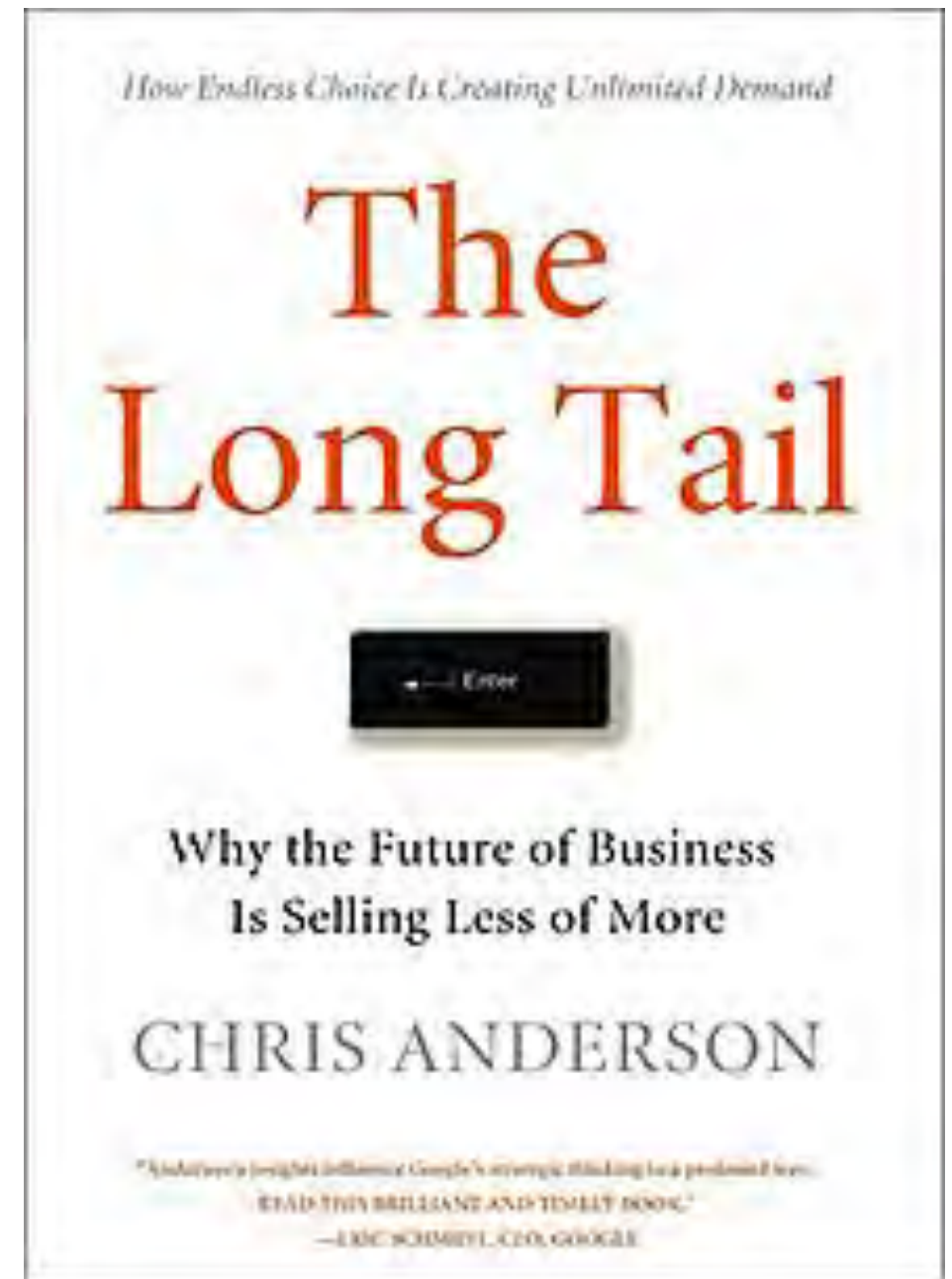
Mercato dei contenuti fortemente concentrato a causa della scarsità di spazio fisico nei punti di vendita (libri, musica, cinema)

Tecnologia consente di abbattere i costi della industria dei contenuti

- costo di produzione
- costo di distribuzione

Prosumer= produttore + consumatore.

Il consumatore diventa produttore.



Hyperion (2006)



The long tail

Entrata di innovatori e creativi prima marginalizzati

Rottura del monopolio delle grandi major e della concentrazione dei produttori di contenuti

Mercato della «coda lunga» (= segmenti di nicchia che non ottengono il successo commerciale dei prodotti blockbuster) di **dimensione complessiva paragonabile al mercato principale**

Modelli di business sostenibili

Cosa è successo?

POLITICA

- Democratizzazione
- Aumento della partecipazione

LAVORO

- Miglioramento della qualità del lavoro
- Riduzione della gerarchia aziendale

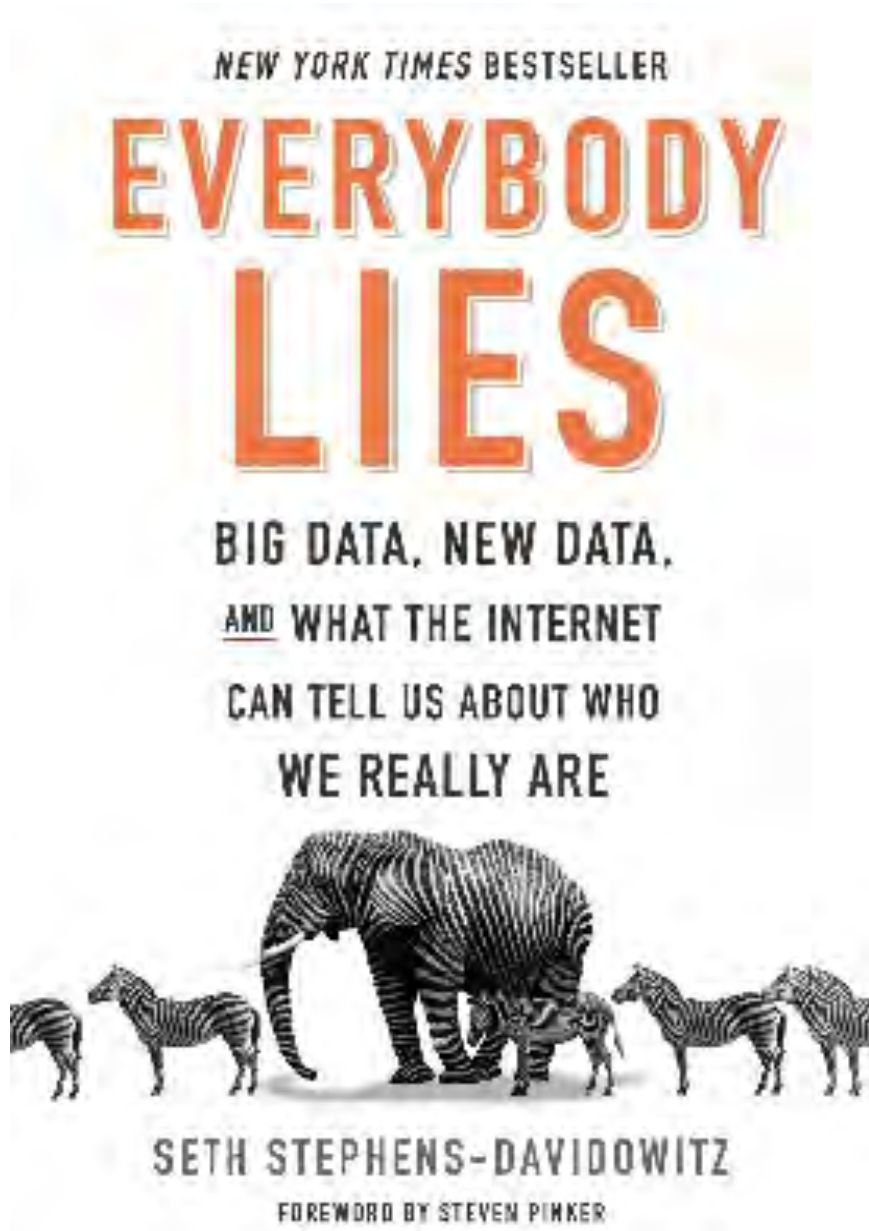
SOGGETTIVITA'

- Espansione delle opportunità
- Apprendimento
- Accesso alle conoscenze

Polarizzazione delle opinioni

Aumento del grado di controllo

Regressione iconica



Princeton University Press (2017)

In rete tutti mentono

Stephens-Davidowitz è un Data scientist a Google con un PhD in economia.

Usando i dati originali delle ricerche su Google ha mostrato l'esistenza di un enorme bacino di comportamenti sociali inattesi, non identificati con gli strumenti usuali della ricerca sociale.

Tra questi, la sopravvivenza di una ampia zona di opinioni razziste.

La rete ha prodotto effetti comportamentali inattesi, esplorati solo di recente (es. **formazione di bolle di opinioni, polarizzazione**).

Steve Bannon



La polarizzazione delle opinioni si presta a distorsioni del processo politico democratico

- la creazione di «bolle informative» implica che gli elettori ascoltino solo le opinioni che confermano la propria posizione
 - il dibattito democratico non si svolge più in una arena discorsiva
 - conta solo la «potenza di fuoco» dei social media
-
- Ossessiva ripetizione del messaggio
 - Saturazione dell'attenzione della opinione pubblica
 - «Scotomizzazione del mittente»

Manipolazione

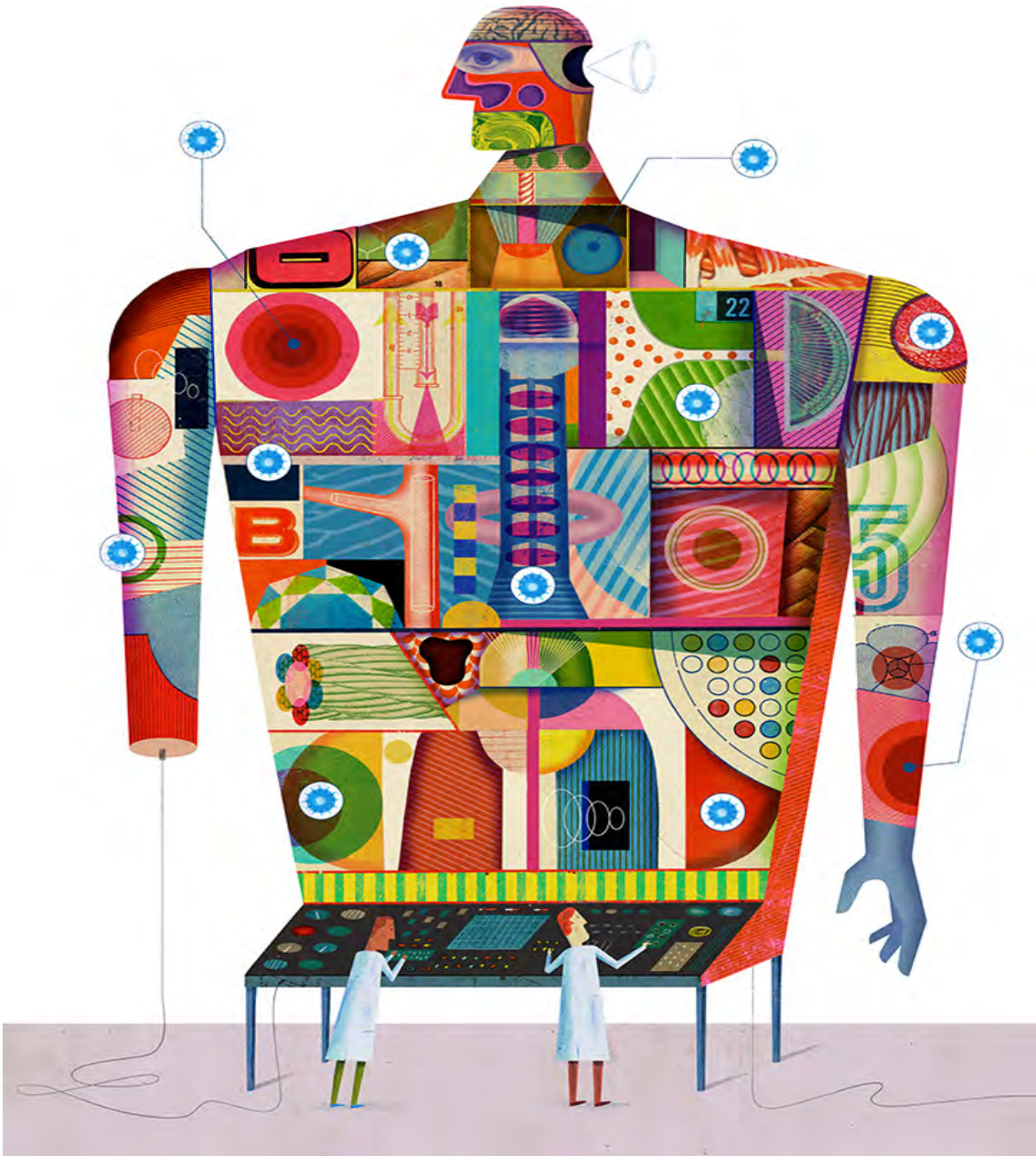
Organizzazione del lavoro

Il numero dei dipendenti nel settore terziario che riceve obiettivi quantitativi giornalieri

è aumentato

- dal 19% nel 1984
- al 43% nel 1998

(Rapport sur les perspectives de la France, 2000).



I dipendenti subiscono una tripla pressione

- superiore gerarchico
- clienti
- subordinati





Obiettivi incompatibili

- Richiesta di autonomia e capacità di problem solving
- Richiesta di risultati quantitativi per unità di tempo



La tecnologia come
strumento di controllo



genera sofferenza
nelle organizzazioni

Percezione del tempo

Processi cognitivi veloci e lenti

Processi veloci

- automatici
- paralleli
- ereditati da comportamenti arcaici e difensivi

Processi lenti

- sequenziali
- strutture gerarchiche (es. grammatica e sintassi della frase)
- acquisizione genetica molto più tarda





Attenzione

Eccesso di stimoli blocca la risposta neuronale.

Diventiamo *protesi della tecnica*- inversione della profezia di McLuhan («il medium è il messaggio»).

Autismo tecnologico (Lucien Sfez).

Memoria

Ipertrofia della fotografia

Delega della memoria

Smettiamo di usare in modo profondo i sensi perché ci illudiamo che possa farlo la tecnologia.

Pensiamo di catalogare, in realtà dimentichiamo.





Pollicina= nipotina che usa i pollici velocemente sulla console dei videogiochi
(Michel Sérres)

Abolizione di tutte le gerarchie cognitive

Accesso immediato alle conoscenze

Vittime immediate

- autorità
- expertise
- scienza

Fear of Missing Out (FoMO) (Przybylski et al. 2013)

- apprensione pervasiva che gli altri possano avere esperienze gratificanti
- bisogno di stare continuamente connessi con ciò che gli altri stanno facendo
- «costo opportunità generalizzato»





Narciso (non più Edipo)
come mito dell'epoca
digitale

Caravaggio
Narciso (1597-1599)



Vedere è diverso da guardare



Vedere è aver già visto- è riconoscere.
Vedere è un processo lento.

E' dolce, il nostro corpo, dolce,
ci procura benessere e gioia
se solo lo trattiamo bene,
se gli prestiamo ascolto,
perché è saggio,
sa sempre prima di noi
cosa vogliamo,
cosa è bene per noi...

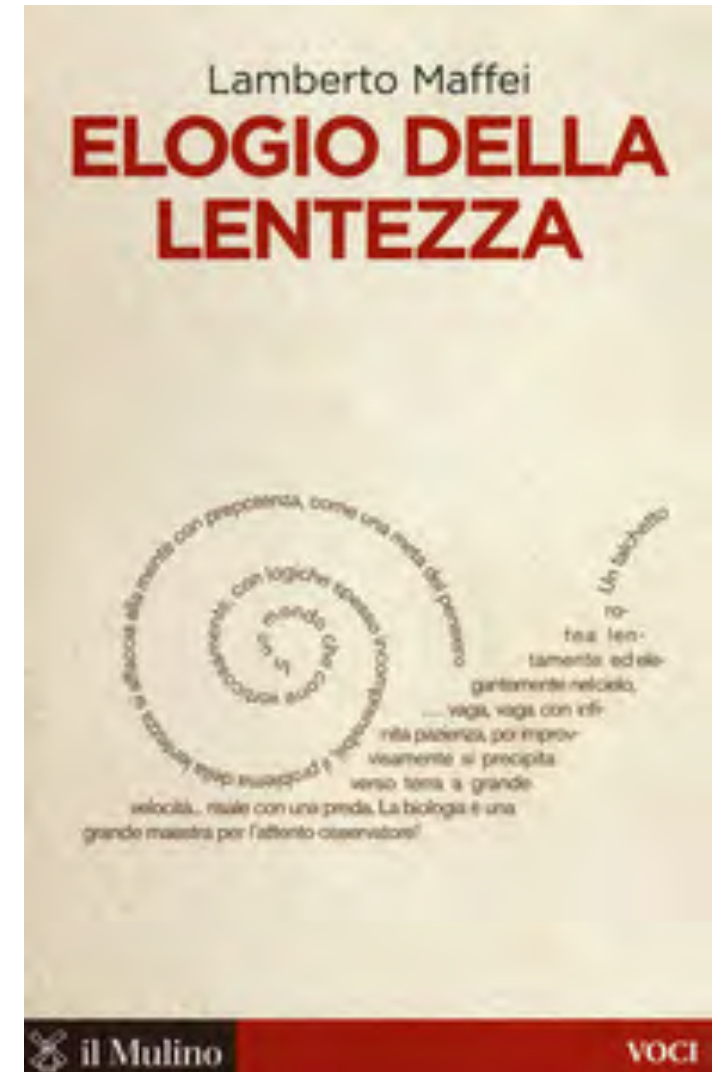
Se solo capissimo
cosa ci vuole dire,
il nostro corpo,
se solo l'amassimo così com'è,
proprio così com'è...

David Grossman, *Col corpo capisco*





Senza sintassi non esiste emozione duratura
F. Pessoa, *Libro dell'inquietudine*



Camminare



Cosa possiamo fare?

Lavorare sui confini

Pubblico-privato

- ripensare i diritti di proprietà
- nuovi modelli di proprietà intellettuale
- nuovi strumenti di partnership pubblico-privato che non creino rendite di posizione

Individuale-collettivo

- spostare la struttura dei consumi verso consumi collettivi di beni intangibili
- nuovi modelli di business nella produzione e distribuzione di beni intangibili a fruizione collettiva
- imprenditorialità umanistica

Capitale-lavoro

- fermare la *salesification* delle organizzazioni e la colpevolizzazione dei dipendenti sui risultati
- studiare l'impatto di Industria 4.0 sui sistemi di lavoro

Centro-periferia

- sperimentare nuovi modelli di partecipazione informata alle decisioni



Caravaggio
Narciso (1597-1599)

Caravaggio
Conversione di Saulo (1600-1601)



