



# Economic Geography

## 5 – Location of industrial activities

121EC

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# Learning Objectives

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- ◆ In this lesson we will:
  - Introduce the industrial location's factors;
  - Examine the spatiality of production factors;
  - Focus on: industry clusters (industrial districts);
  - Circular Economy
  - Present Weber's theory of industry location

# Topics

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1. Industry: characteristics
2. Factors of industrial location
3. Insight: diffusion processes
4. 'Geographical' production factors
  1. Industry clusters
  2. The Silicon Valley case
5. Circular vs Linear Economy – Geographic perspectives
6. Industrial location theory

# Industry: characteristics

- ◆ Industrialization is an essential aspect of World Economic Growth
- ◆ Dimensions, transformation of spaces, impact on economies, effects on development and lifestyles.
- ◆ Industry: from manufacturing to 'trivialization': from the secondary sector to (almost) every production type

# Industry. Production systems

## Vertical

- Production processes linked together in line
- Transformation of raw materials in a final product (i.e., steel industry)

## Horizontal – lateral

- Differentiate productive processes
- To converge in an assembly industry (i.e., automotive)

## Services

- Production processes of services, organized by other operators (i.e., energy supply, transport infrastructure)

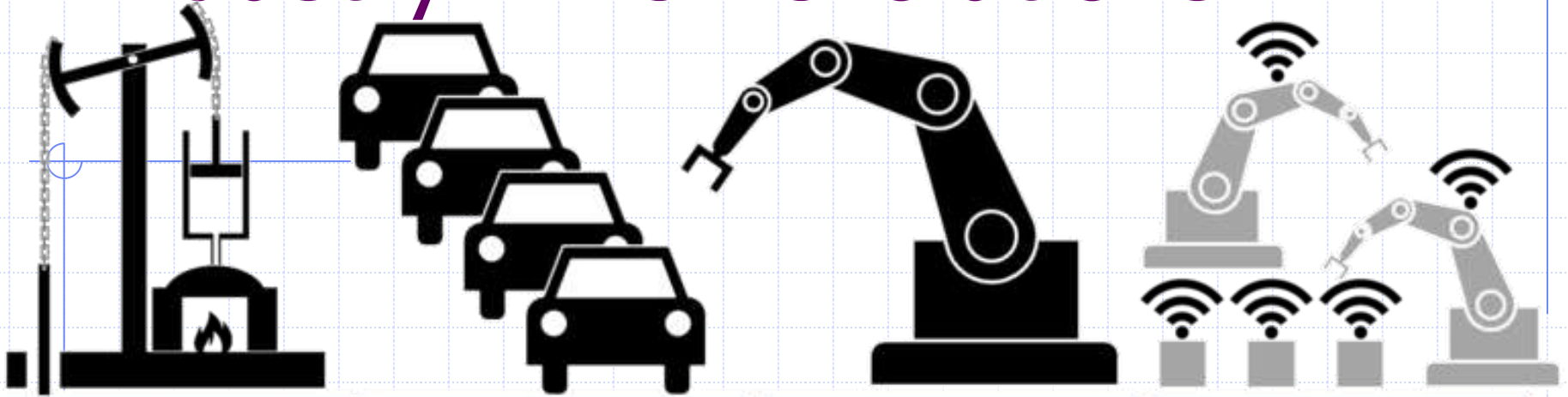
# Industry. Main categories

- ◆ Mining industry
  - (basic)
- ◆ Manufacturing
  - (processing)
- ◆ Construction
- ◆ Energy





# Industry. The 'revolutions'



1st

2nd

3rd

4th

Mechanization,  
water power, steam  
power

Mass production,  
assembly line,  
electricity

Computer and  
automation

Cyber Physical  
Systems





# Industry. The 'revolutions'

## I industrial revolution

- England (XVIII – start XIX Century ).
- Steam machine (James Watt, 1783).
- Coal; iron; textiles
- New organization of labour (it substitute the 'makers' model)
- Countryside – City movements and migrations

## II industrial revolution

- End XIX Century - Beginning of XX century
- Coal -> Oil, hydroelectric energy
- New industries, new locations, new markets, new products. Series production. Fordism

## III industrial revolution

- End of XX century – To-date
- Hi tech: electronics, robotics, telecommunication, bio-tech

## IV industrial revolution

- Cyber-physical systems
- Makers
- Circular economy
- 3D Printing



Diffusion  
process

**Figure 2.12 The spread of industrialization in Europe**

European industrialization began with the emergence of small industrial regions in several different parts of Britain, where early industrialization drew on local mineral resources, water power, and early industrial technologies. As new rounds of industrial and transportation technologies emerged, industrialization spread to other regions with the right locational attributes: access to raw materials and energy sources, good communications, and large labour markets.

# Robotics & Industry

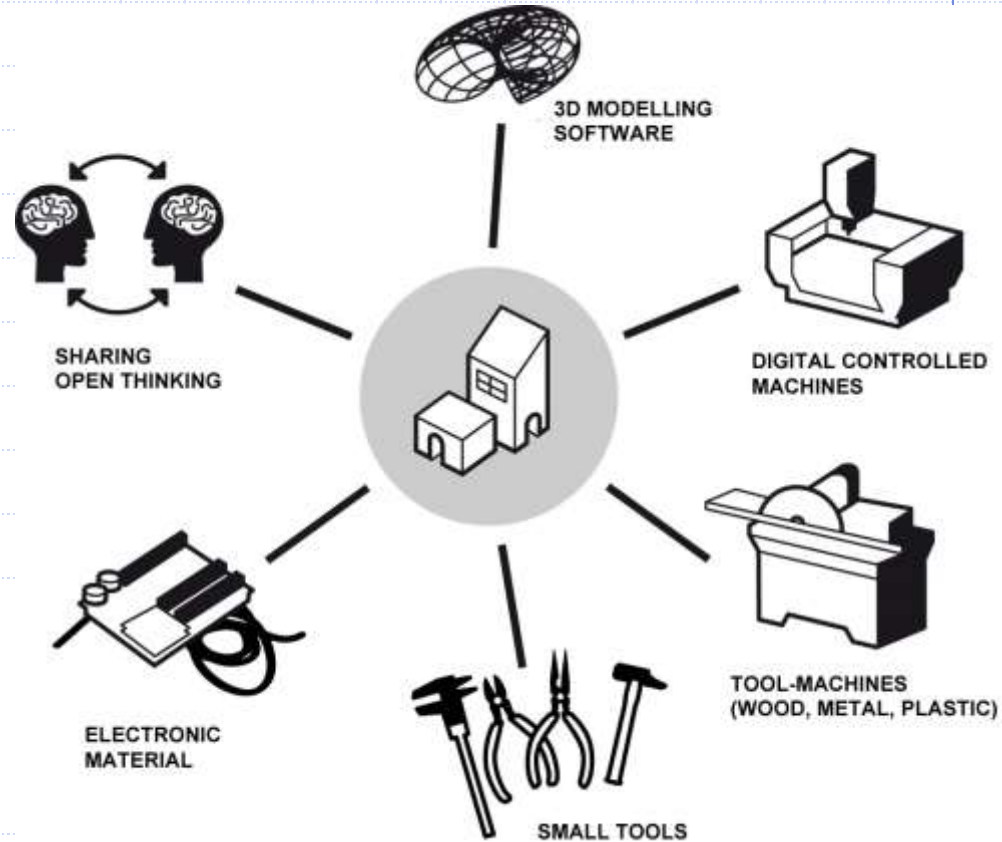
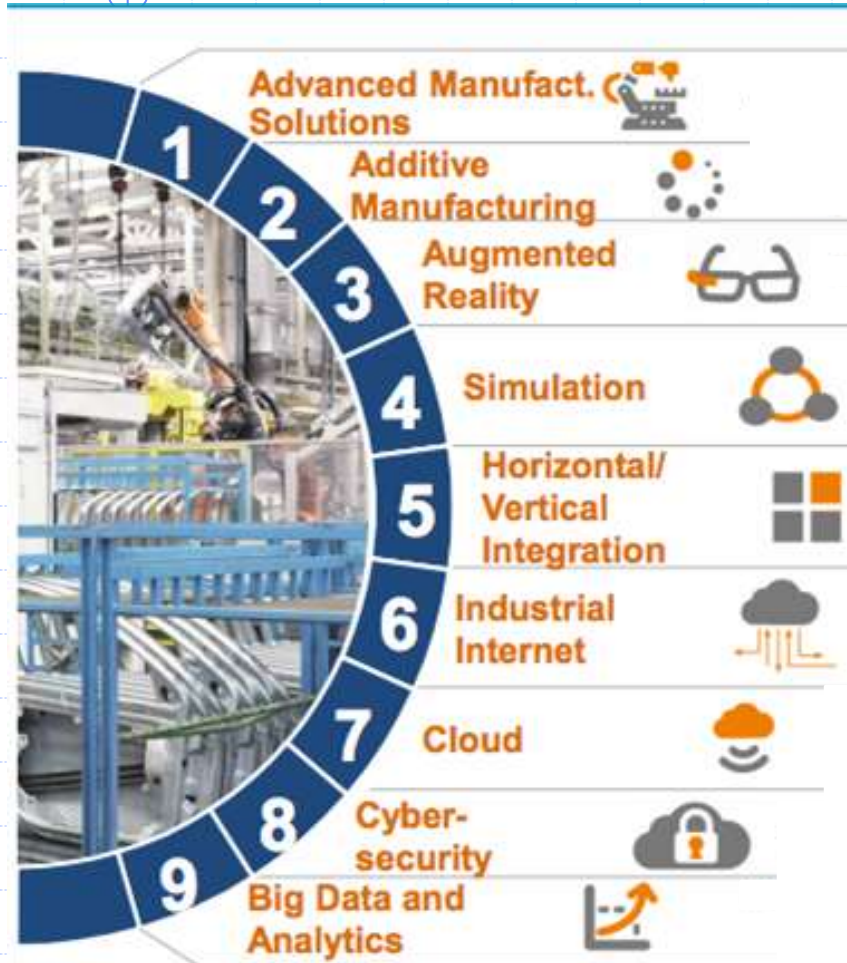


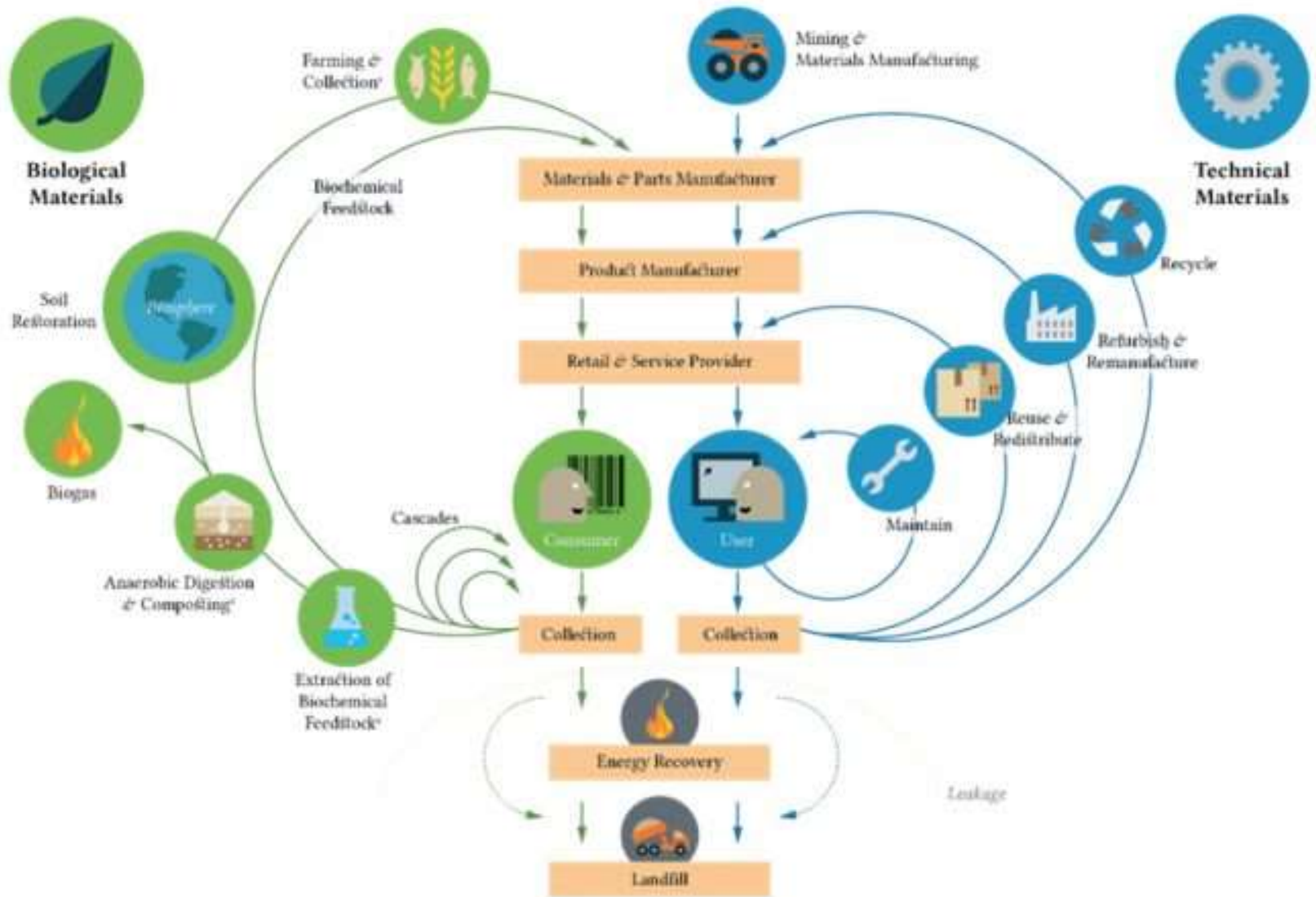
<https://www.britannica.com/topic/Fordism>





# IV Industrial revolution





# Industrial location

- ◆ Spatial distribution and location of industries:
  - Inserting a manufacturing firm in a given territory is important in terms of the spatial reorganization of:
    - ◆ Demographic component;
    - ◆ Urban structure;
    - ◆ Other economic activities;
    - ◆ Network of flows and traffic;
    - ◆ Political- social rules.
- ◆ Industrial geography: where and why industries in a given territory
  - => location as a process of setting an industry. It is important to examine:
  - The factors of industrial location;
  - The 'geography' of production factors;
  - Location theories



# Industrial location

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- ◆ Geographical studies on the spatial distribution and location of manufacturing activities;

## **Factors of industrial location;**

### **'Geographical' production factors;**

- Land
- Capital
- Labor
- Information

### **Scale, manufacturing relocation and spatial concentration**

## **Industrial location theory**

- Weber, Smith
- Hoover, Palander

# Industrial location's factors

## ▶ Natural elements

- Environment influences location
- Industries influence environment moving resources and technologies (i.e., water)
- Industry-nature relationship (externalities)

## ▶ Technical factors

- Energy supply;
- Organization of transport systems;
- (technological changes make the location issue a more elastic one)

## ▶ Demographic factors

- Population-industry relationship
- Population = demand of products; = workforce supply
- Expected demographic dynamics and socio-economical qualities (gender, age, education, etc.)

## ▶ Historical-cultural factors

- 'endogenous culture' of a territory: pre-industrial organizational production often put the basis for future industrial setting.
- (industry not always an element of break with territory)

## ▶ Economical factors

- More complex ones and directly related to the nature of the production activity
- Capital, work, land+ knowledge (entrepreneurship and managerial education)

## ▶ Psycho-social factors

- Non-objective elements of territory;
- Actors and strategic choices: relocation; delocalization, multi-localization
- The cognitive and perceptive behavior of the company's decision maker is relevant
- Relevant the environmental amenities
- Knowledge or 'perception' of the competitors' spatial structure

## ▶ Political factors

- Regional economical development
- Political target = avoid interregional imbalances deriving from a high industrial concentration (**spatial planning** => capacity of intervention over different aspects concerning a territory's organization)

# Spatiality of production factors

- ◆ Economics analyzes scarcity, remuneration, accumulation of production factors;
- ◆ Spatiality (spatial dimension)
  - ◆ Land
  - ◆ Capital
  - ◆ Labor
  - ◆ Information
    - Entrepreneurial and managerial culture, innovation capacity

→ INDUSTRY

# Spatiality of production factors

## ◆ Land:

- Location (space)
- Physical support to the social organization (territory)
- Container of renewable and non-renewable resources (environment)
- Accessibility (transport)

## ■ **Physical location of industry**

- ◆ Competition with other human activities;
- ◆ Preference for flat lands; water; waste disposal
- ◆ Land <> climate (advantages of setting in certain climate zones)
- ◆ Land vs territory (space transformed by work: cities and communication networks)
- ◆ Land as set of renewable resources

# Spatiality of production factors

## ◆ Capital:

- Usually considered **mobile and non spatial**
- **Technical component of capital is** located in the existing production places => places where investments for innovation and modernization will be directed (**capital intensive structures**)
- **Financial capital** in a free market *chooses* the areas in which a stable development is present (reduction of uncertainty)
- Consequences on the capital's costs (interests)
- => **financial instrument** used as regional development policy
- Bank system and location of credit management structures

# Spatiality of production factors

## ◆ Labor:

- Production factor whose supply is more uniformly distributed in space
- Historical empirical evidence: long range migrations towards places of high workforce demand
- From a qualitative point of view, work is not mobile in space (related to a given territory)
- Labor is not related to the regulation of markets as it is an element of spatial organization and at the same time oriented and qualified by place.
- Economic neoclassic theory:
- Labor = undifferentiated set and production factor expressed by its price (without considering the social context)
- => 'a-spatial hypothesis':
  1. Employers and employee hold a satisfactory knowledge of employment and wages thanks to the market;
  2. Individuals are rational (maximization of profits and wages)
  3. Individual decisions are not influent over the general level of wages
  4. There are no obstacles to the mobility of labor
  5. Labor = exchangeable and homogenous in every particular market



# Spatiality of production factors

## ◆ Labor:

- It's a 'living' production factor, not just a SIMPLE input
- Worker = carrier of a cultural process deriving from the environment
- Labor = pseudo-commodity
- Labor is crucial in location. The cost of a unit of labor increases more than the average of the production costs.
- Location processes and production conversion:
  1. Industrialization in 'new countries' (NIC – *new industrialized countries*) having a low cost of the workforce
  2. Specialization of the countries of 'old' industrialization in sectors producing capital-goods and non standard consumption goods and dedicated to selected and non-fragmented market shares.

# Spatiality of production factors

## ◆ Information:

### ■ Technical knowledge (*know how*)

- ◆ Network of centres
- ◆ Network of the existing industrial development
- ◆ Entrepreneurial innovation
- ◆ Research and development
- ◆ Innovation diffusion
  - *Filtering down*
  - *Learning by doing*
  - *Learning by seeing*

### ◆ Telematics - ICT

### ■ Political – economical information

- ◆ Role of 'capital cities' in industrial location (es. Rome after Milan and Turin)



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# Industry: Scale, production decentralization, spatial concentration

- ◆ Location choices and production scales
- ◆ Optimal dimension: production techniques in the different industry branches
  - Steel industry integrated cycle; automotive;
  - Production place  $\leq$  external to industry environment (physical and human resources)
  - Emphasis on the market: large vs small (residual) enterprises;
  - Objection = existence of spatial systems of small and medium enterprises:
    - ◆ High competition;
    - ◆ Economies of agglomeration;
    - ◆ Specialization of the different phases and stages;
    - ◆ "spread manufacturing" (see industry clusters)



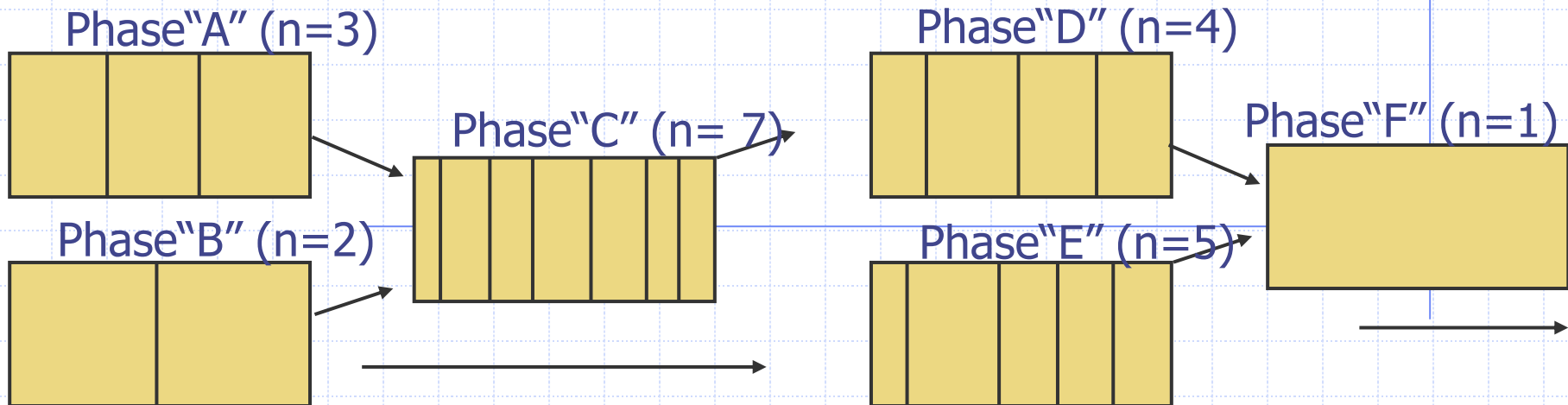
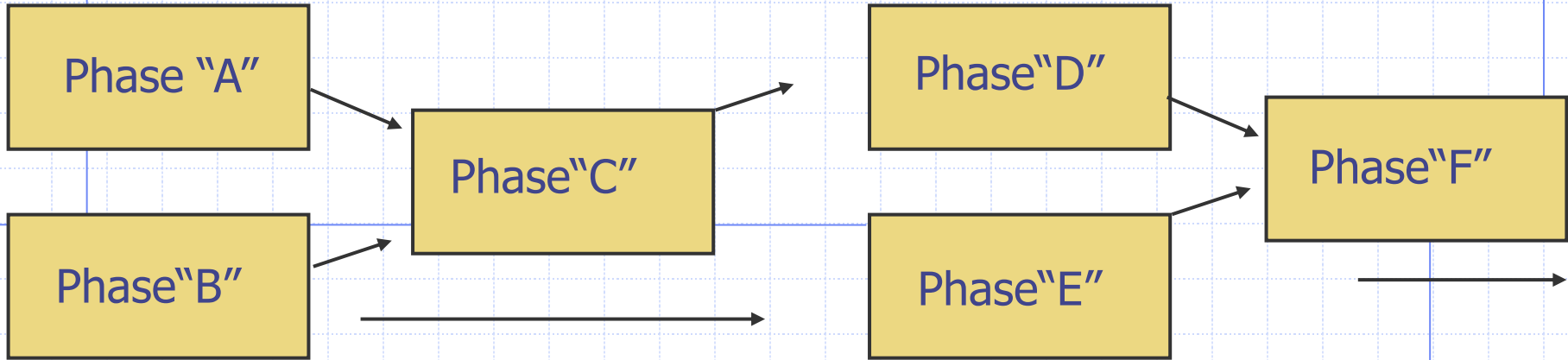
# Industry: Scale, production decentralization, spatial concentration

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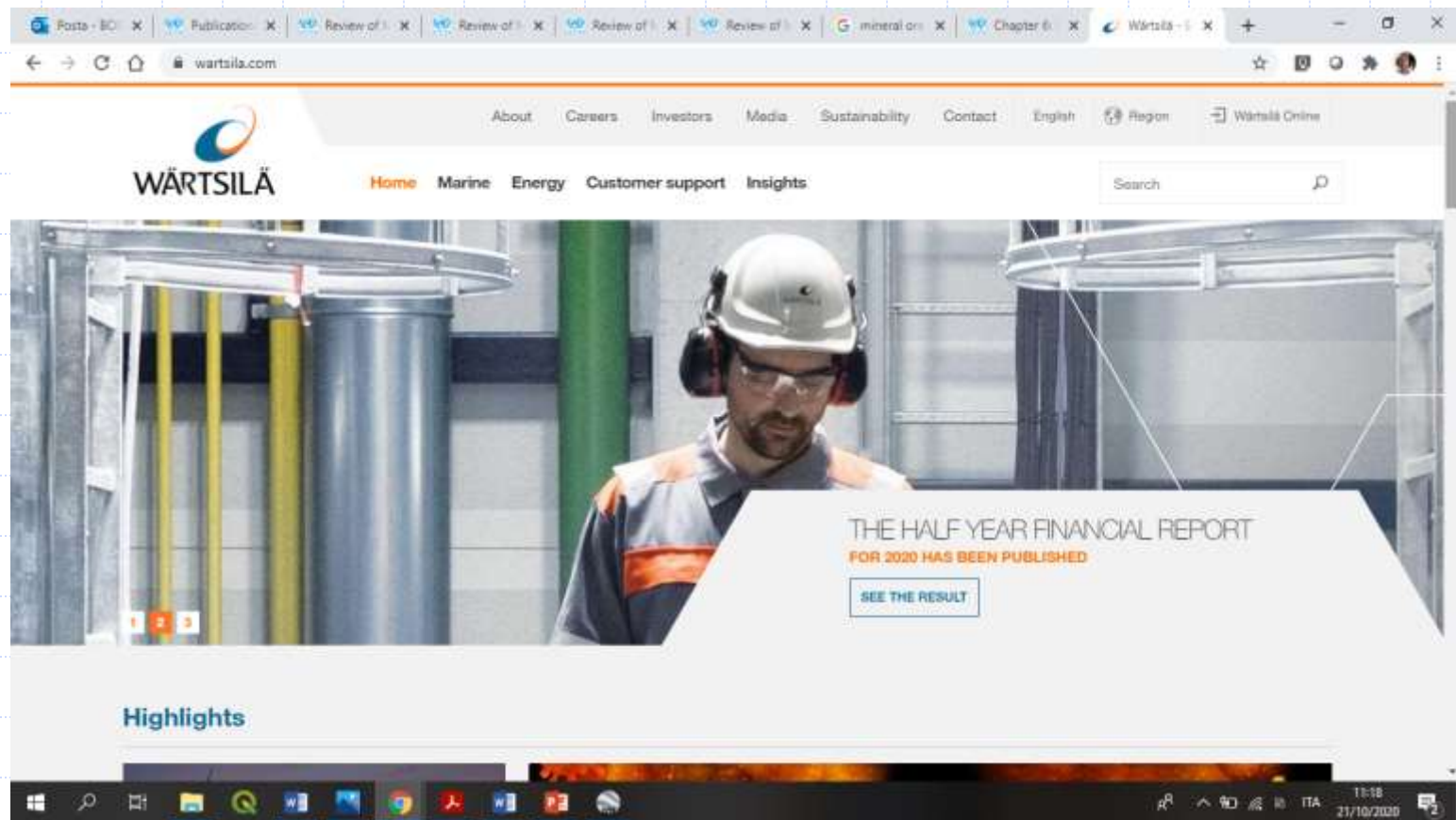
- ◆ Tani (1987):

- Relationship between technological development, market dimension and economic production scale does not necessarily imply bigger dimensions of single production units:
- Technical de-construction of the production process:
  1. By means of the organization of the same firm in parallel lines;
  2. Decentralization of some of the production stages outside the company / firm (productive decentralization);
  3. Organization of a system of firms / enterprises geographically contiguous and functionally integrated in small and medium enterprises (industry cluster).

# The recombination of the production process



# Case Study: Wartsila company





# Case Study: Wartsila company

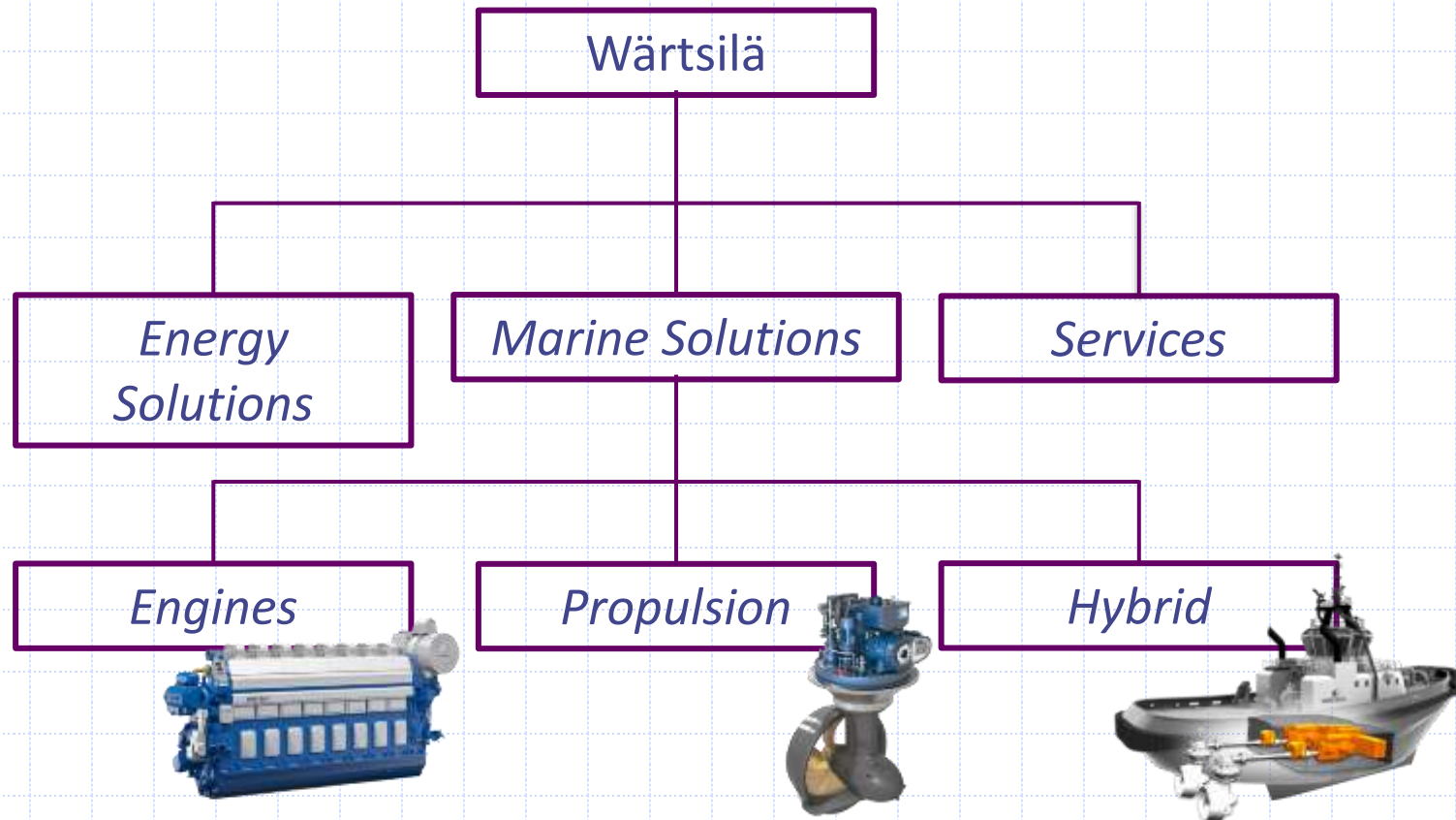




# Case Study: Wartsila company



# Case Study: Wärtsilä company





# Wärtsilä and *joint ventures*



Wärtsilä Hyundai *Engine Company*: Mokpo

Wärtsilä Qiyao Diesel *Company*: Shanghai

Wärtsilä Yuchai *Engine Co.*: Zhuhai

CSS Wärtsilä *Engine Company Ltd.*: Shanghai

# *Outsourcing of services and processes*

16 local  
companies

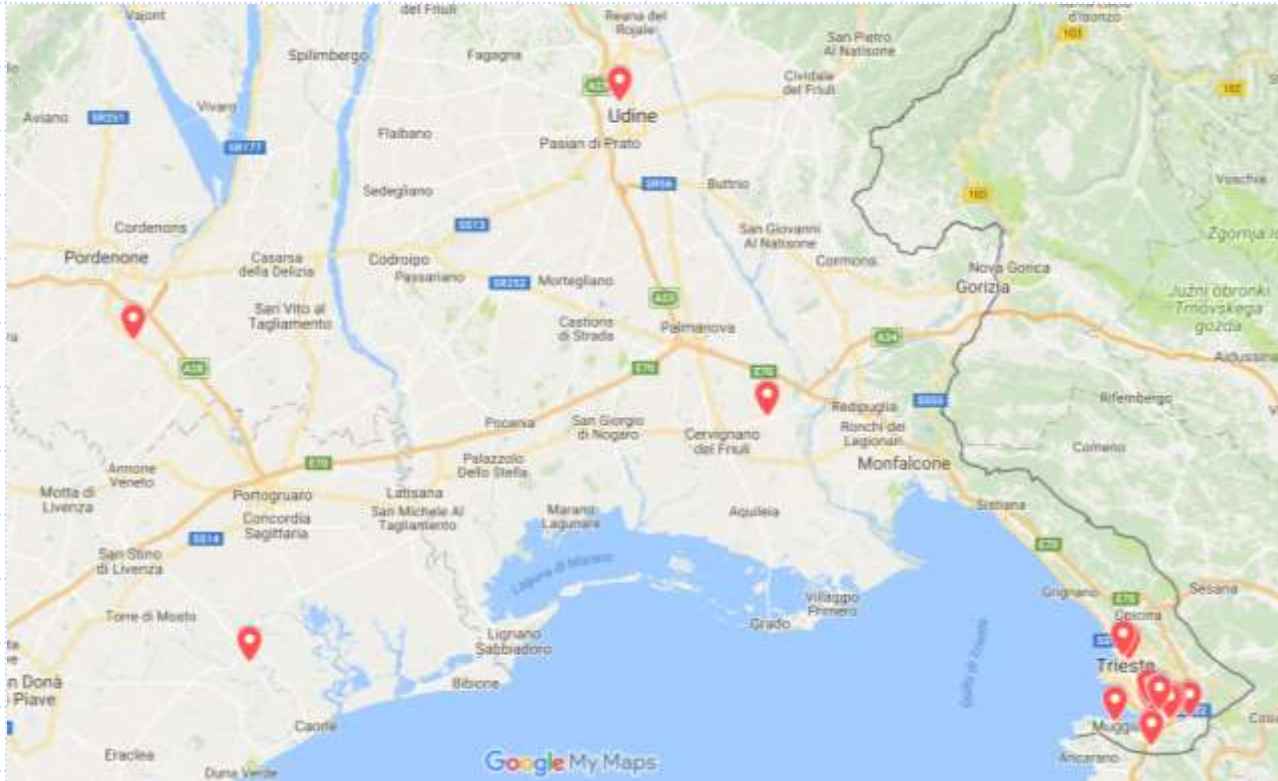


100 workers

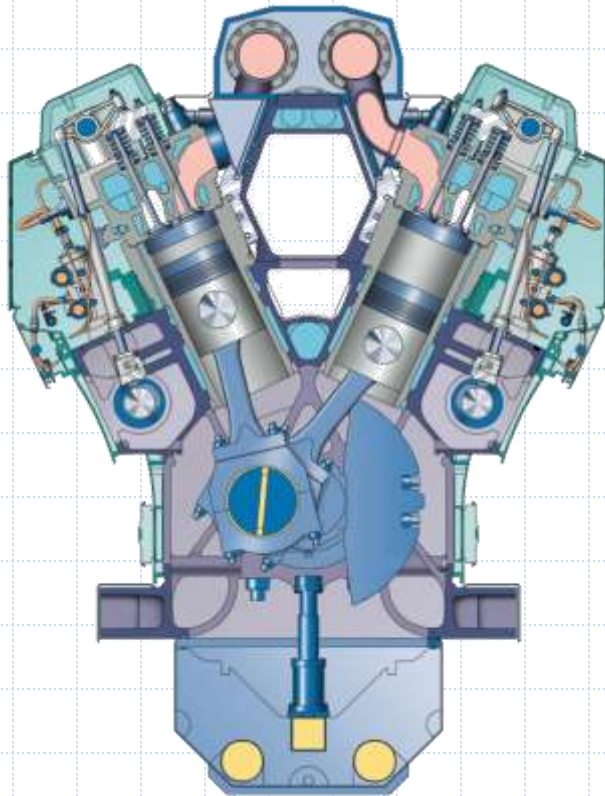
9 services and  
processes



# Localization of services providers

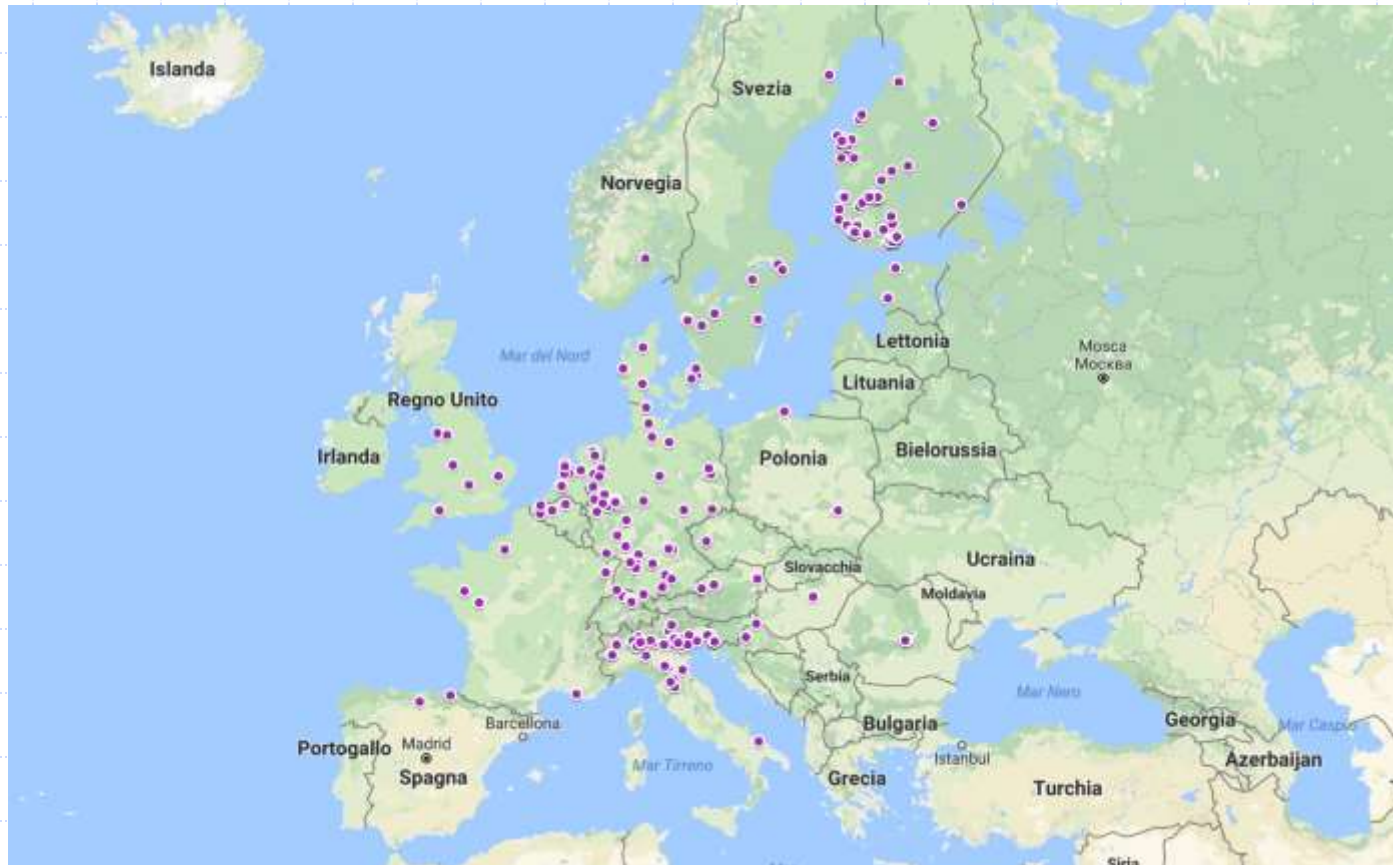


# Providers of direct materials



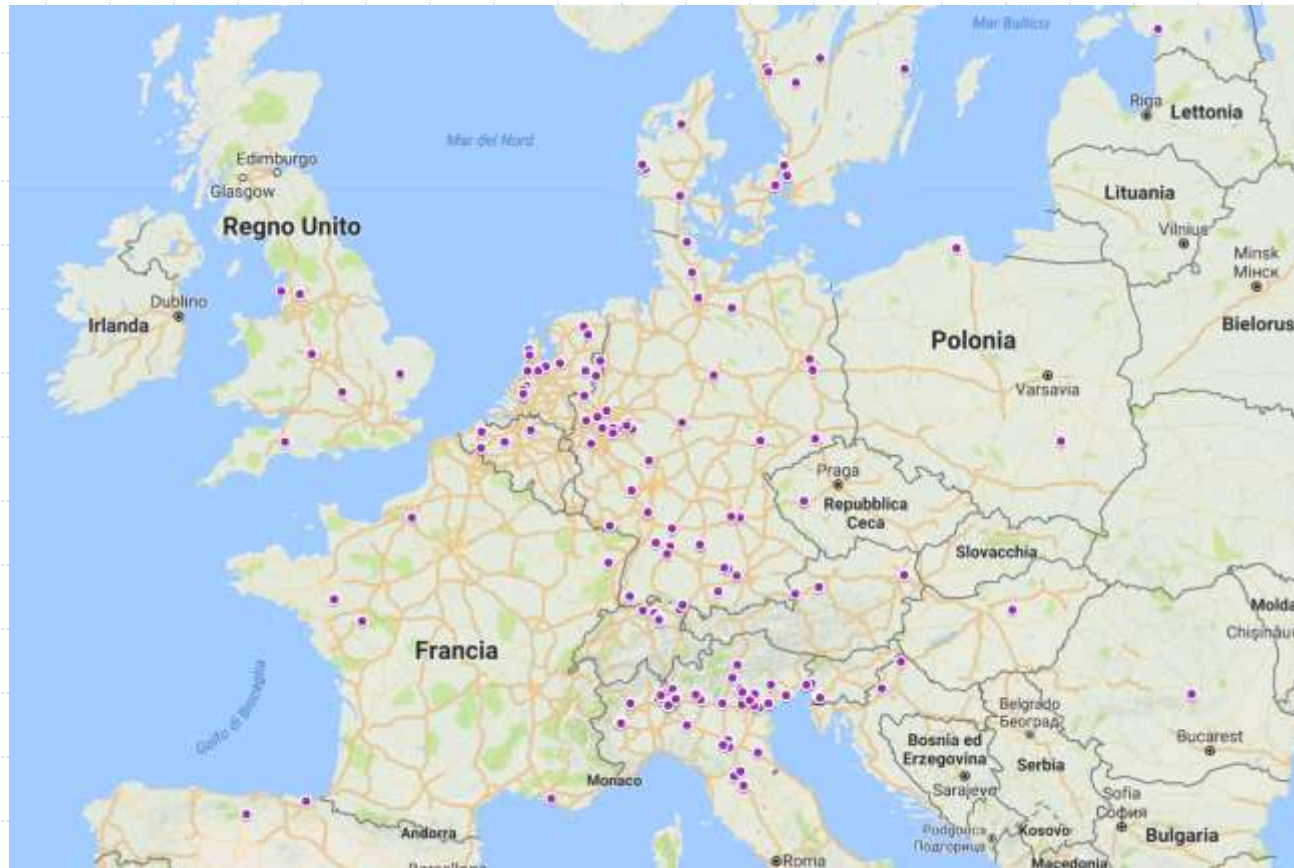
- 294 contractors
- 25 countries
- 25,000 items
- 18 categories

# Globale localization of suppliers: Europe (1)





# Globale localization of suppliers: Europe (2)



# Globale localization of suppliers: Europe (3)



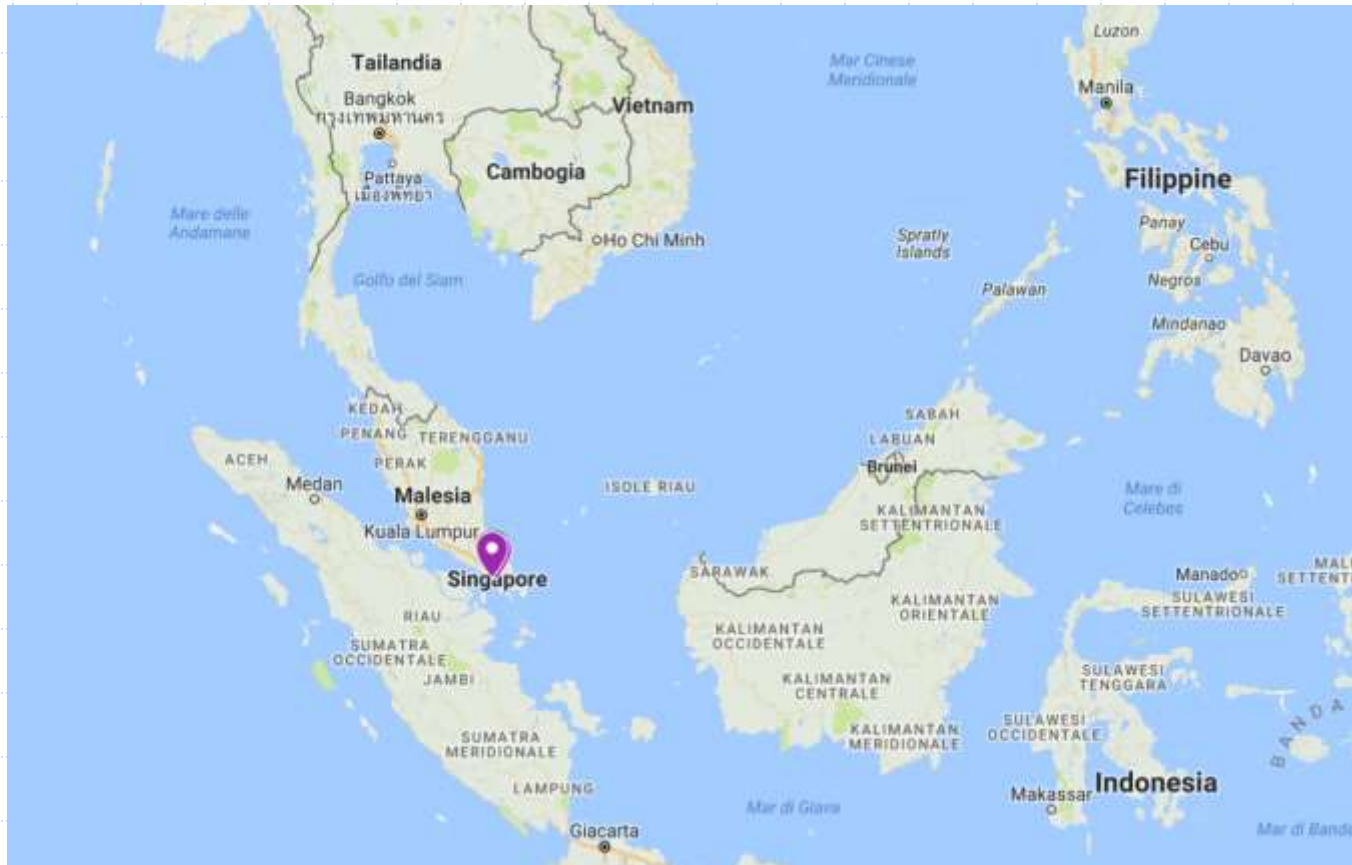
# Globale localization of suppliers:

## India



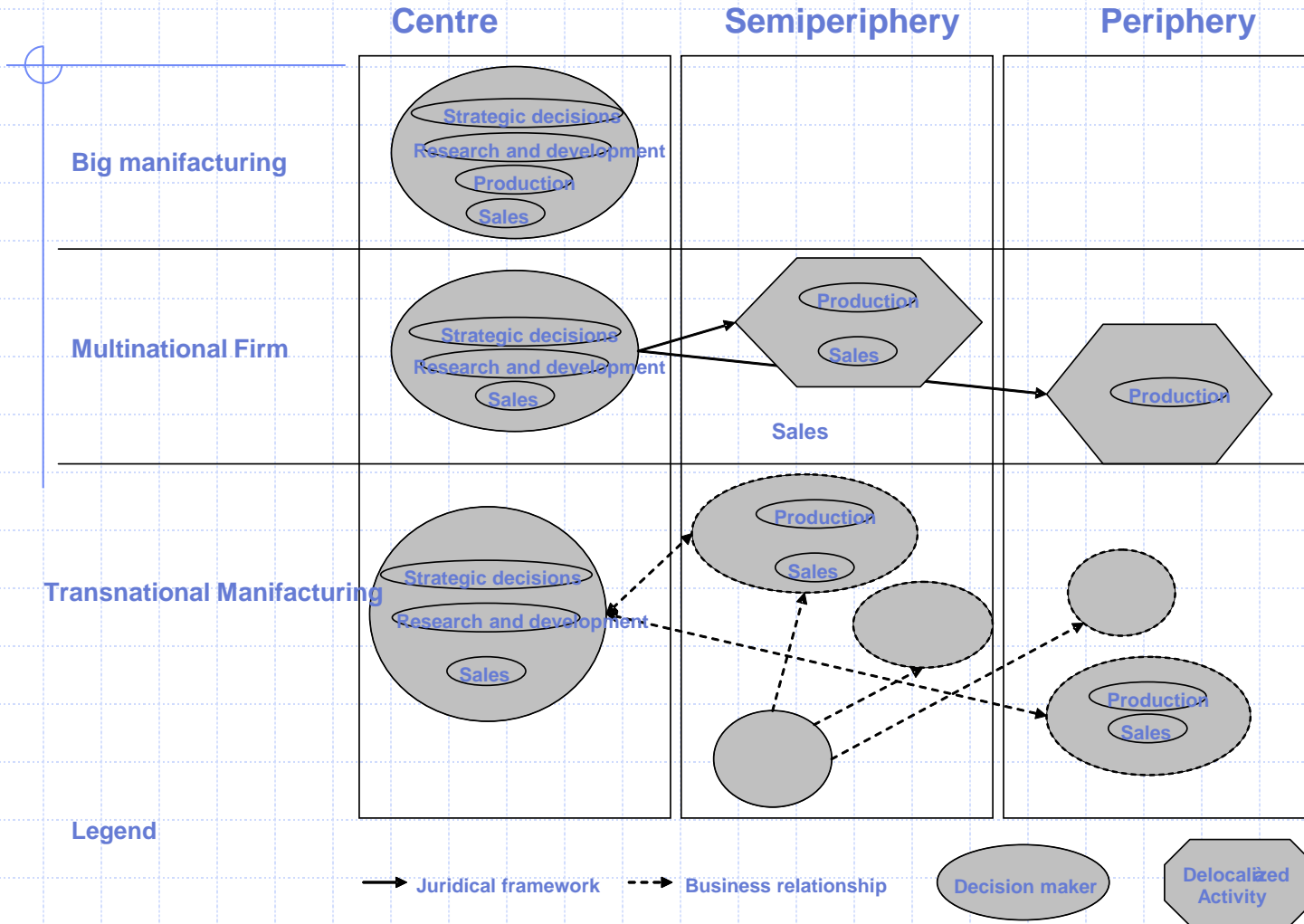


# Globale localization of suppliers: Singapore

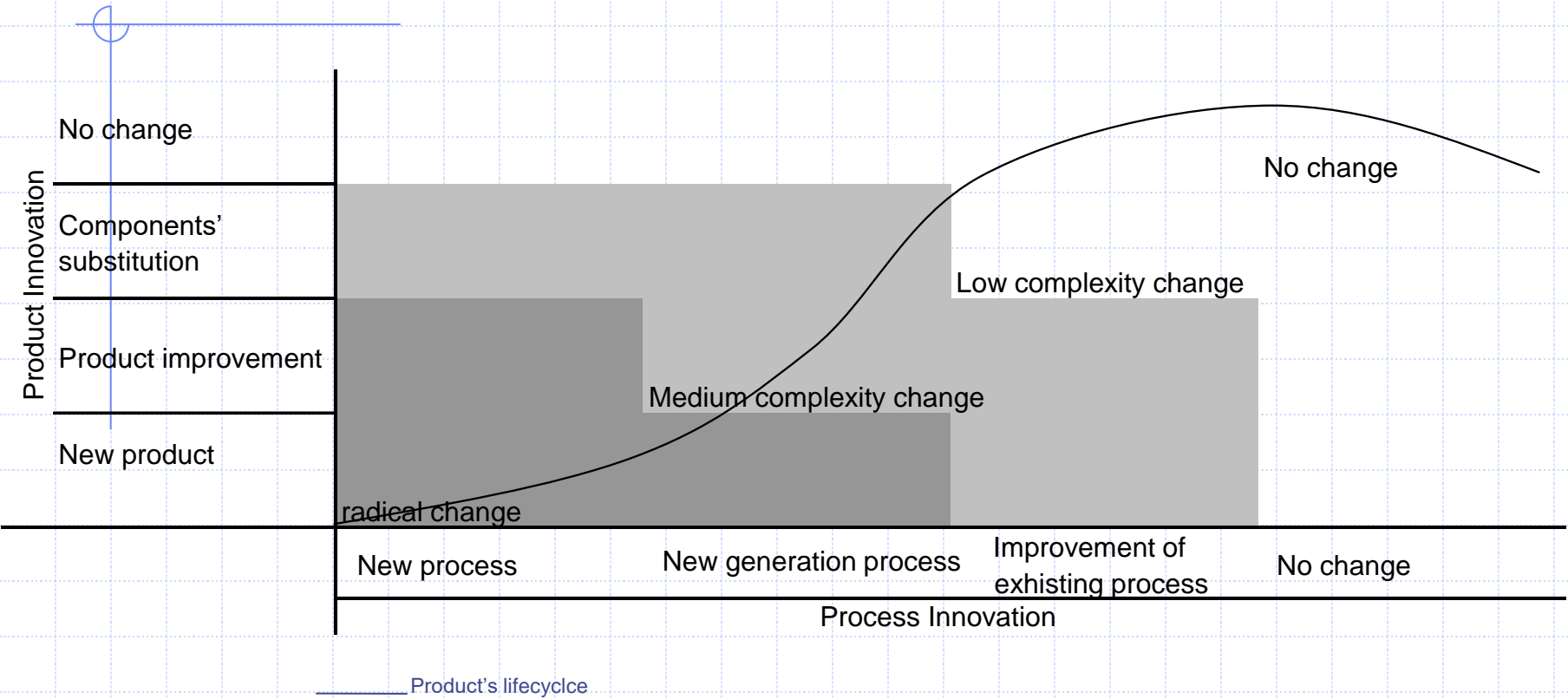




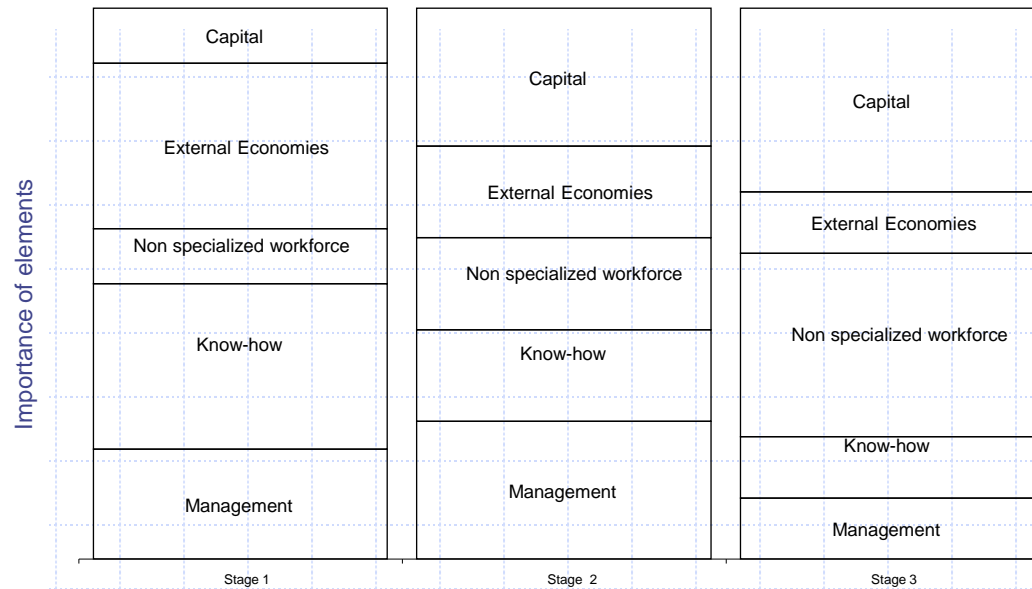
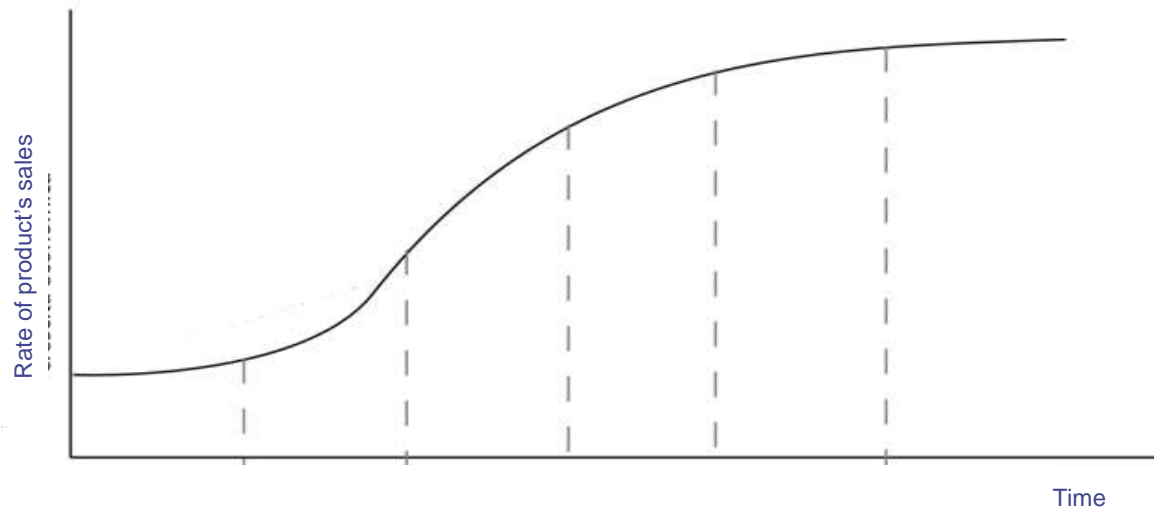
# The new model of industrial production



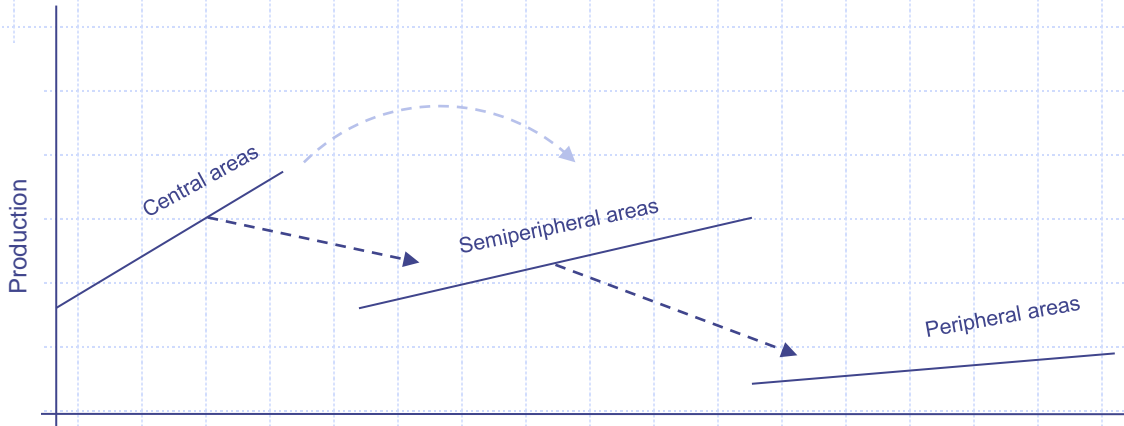
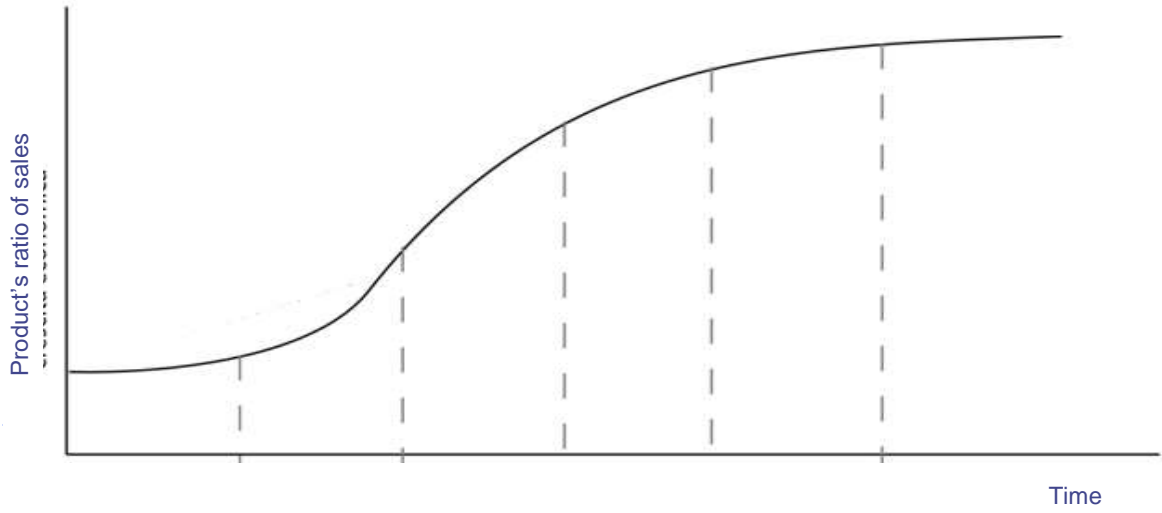
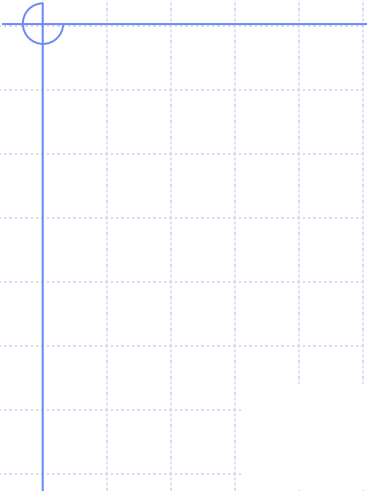
# The product lifecycle



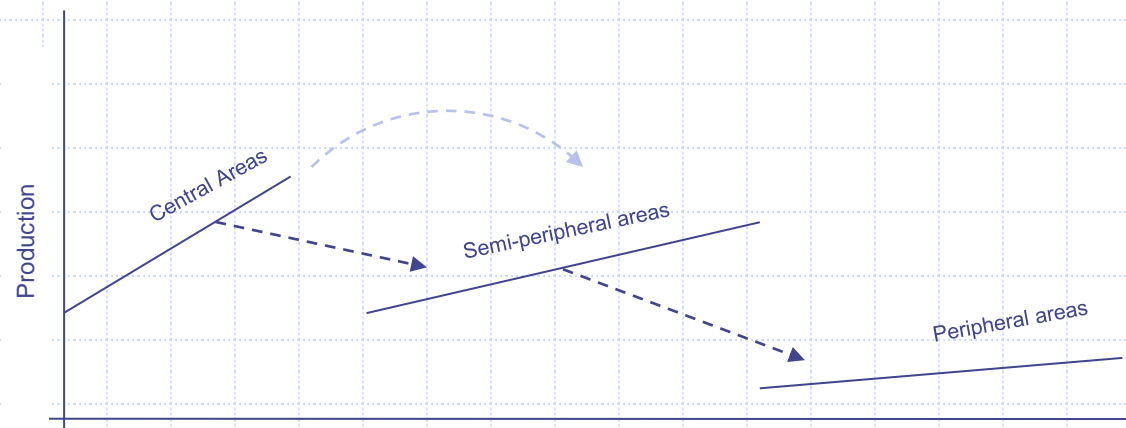
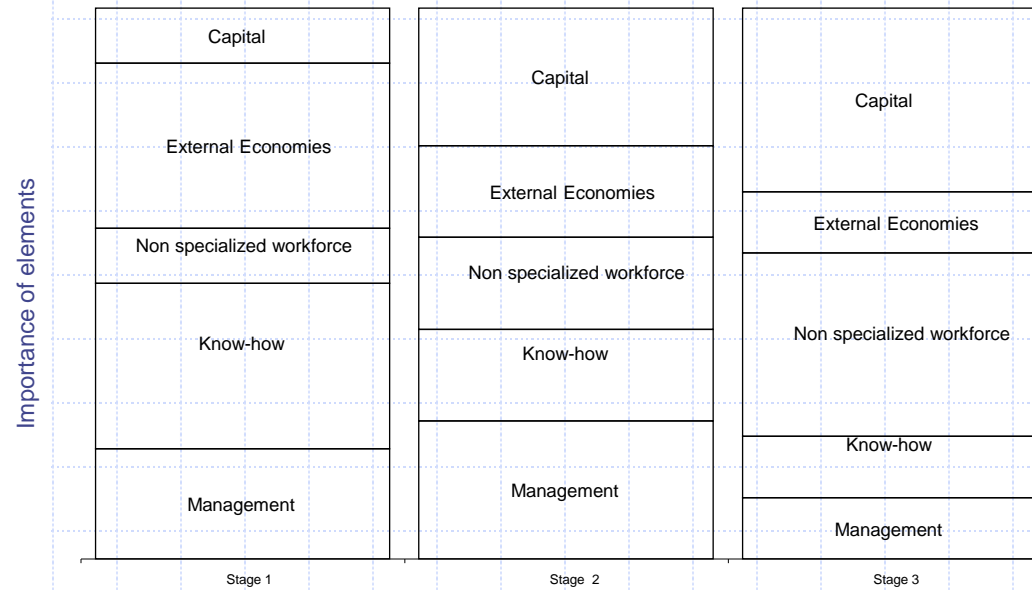
# Factors influencing the product's lifecycle



# Product's lifecycle and spatial diffusion



# Factors and spatial diffusion



# Spatial diffusion

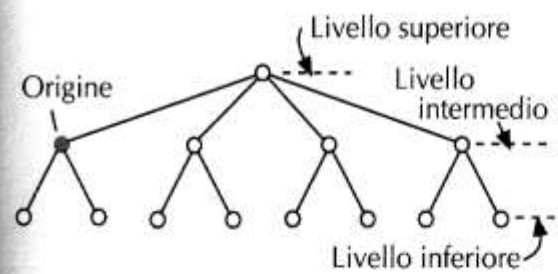
In geography we highlight two macro types of diffusion:

- ◆ **Diffusion as relocation** (original location is abandoned: migrations; industrial re-location);
- ◆ **Diffusion as expansion** (sprading from one place to another one):
  - **Contagion** (direct contact: epidemics; economic crisis);
  - **Hierarchical or 'waterfall'** (diffusion follows different steps or stages: example - innovation).
    - ◆ Bottom up
    - ◆ Top down

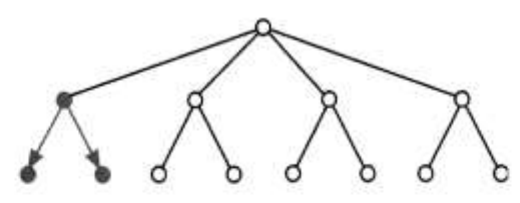




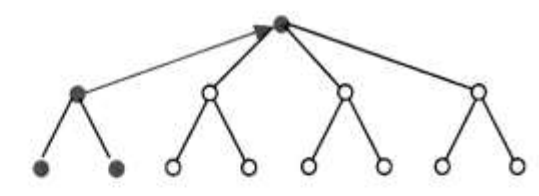
# Hierarchical spatial diffusion



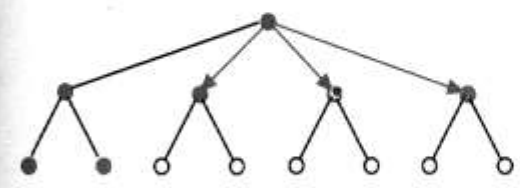
(a)



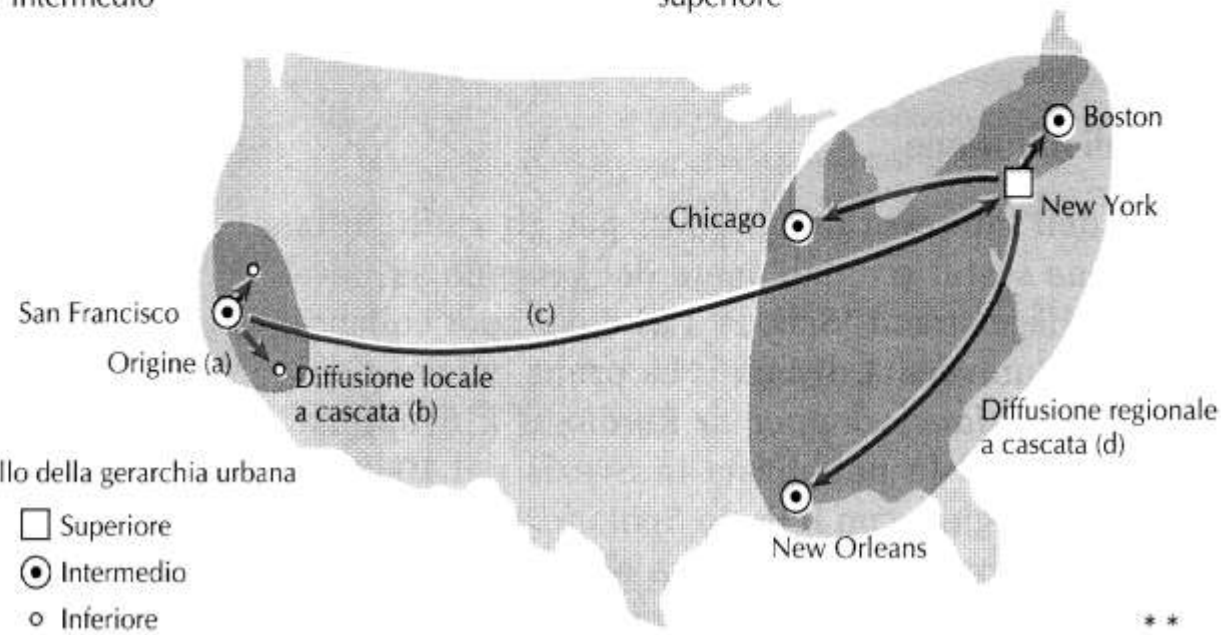
(b) Diffusione rapida all'ingiù dal livello intermedio



(c) Diffusione lenta all'insù verso il livello superiore



(d) Diffusione rapida all'ingiù dal livello superiore



Livello della gerarchia urbana

- Superiore
- Intermedio
- Inferiore

(e) ○ Inferiore

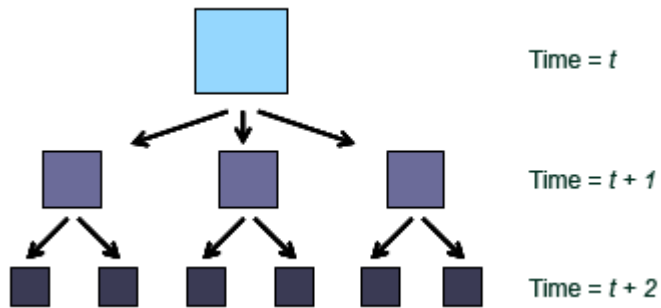


**Figure 2.12 The spread of industrialization in Europe**

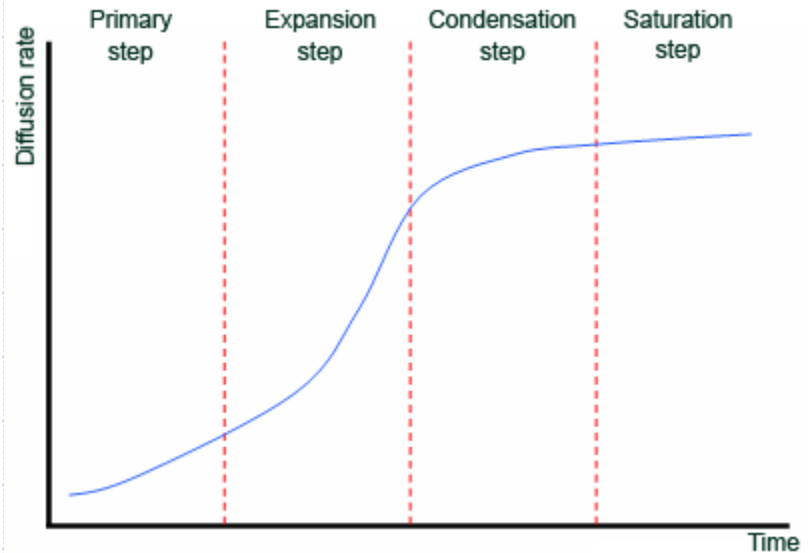
European industrialization began with the emergence of small industrial regions in several different parts of Britain, where early industrialization drew on local mineral resources, water power, and early industrial technologies. As new rounds of industrial and transportation technologies emerged, industrialization spread to other regions with the right locational attributes: access to raw materials and energy sources, good communications, and large labour markets.

# Spatial diffusion: modes

Principle of non-spatially dependant Hierarchical diffusion at successive moments of time



Typical successive stages of diffusion rate during the diffusion process. For an innovation, they are called Innovators, Early majority, Late majority and Laggards



Case study: Spatial diffusion in music

[https://www.youtube.com/watch?v=\\_euGMuX8EG8](https://www.youtube.com/watch?v=_euGMuX8EG8)

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# Industry Clusters

- ◆ 1st law of Geography (Tobler, 1970):  
*"Everything is related to everything else, but near things are more related than those far apart"* (distance decay effect)
- ◆ => very few of us live in complete isolation from the rest of society.  
It is likely that many of our behaviours, choices, aspirations and ideals are influenced by those with whom we interact in our everyday lives.

# Industry clusters

- Clusters illustrate why place still matters in the global economy.
- **Michael Porter** defines clusters as groups of similar and related firms concentrated in a small geographic area (Porter, 1998).
  - ◆ interconnected firms in the same fields,
  - ◆ specialized suppliers,
  - ◆ service providers,
  - ◆ firms in related industries,
  - ◆ associated institutions (such as trade associations, universities, technology transfer centers, etc.).

# Industry clusters (Industrial districts)

- ◆ Industry clusters are geographic concentrations of competing, complementary, or interdependent firms and industries that do business with each other and/or have common needs for talent, technology, and infrastructure.
- ◆ The firms included in the cluster may be both competitive and cooperative. They may compete directly with some members of the cluster, purchase inputs from other cluster members, and rely on the services of other cluster firms in the operation of their business.
- ◆ Industry clusters are dynamic entities. They may change as the industries within them change or as external conditions change
- ◆ An important characteristic of clusters is that they are centered on firms that sell outside the local, state, or even national market
- ◆ Clusters may include government, nonprofit organizations, educational institutions, and other infrastructure and service providers whose presence is key to the strength of the cluster.
- ◆ An industry cluster is an interconnected group of industries and firms. It differs from trade associations, which may have a narrower membership and focus.
  - A trade association, for example, may include the members of a single industry and focus entirely on lobbying. By contrast clusters are agglomerations of regional industries and interdependent firms that are key to the success of the industry in the state.
  - Organized industry clusters contribute broadly to the well-being of the region by addressing workforce recruitment and training issues, developing needed infrastructure, and establishing research and training programs at universities and technical colleges, to name a few.

# Industry clusters (Porter's definitions)

- ◆ “[...clusters are] a geographical concentration of firms interconnected by being part of the **same industry** or the **same supply chain**, by a **common resource** or market, by similar philosophy, by facing similar opportunities and challenges or by collaborating with the same **university or research institution**”<sup>1</sup>
- ◆ Michael Porter “Diamond of Advantage”, a model that offers insights into industry clusters and competitiveness:
  - regions develop a competitive advantage based on their firms' ability to continually innovate, and that economic vitality is a direct product of the competitiveness of local industries.



[1] Michael E. Porter, “Clusters and the new economics of competition, *Harvard Business Review*, 1998

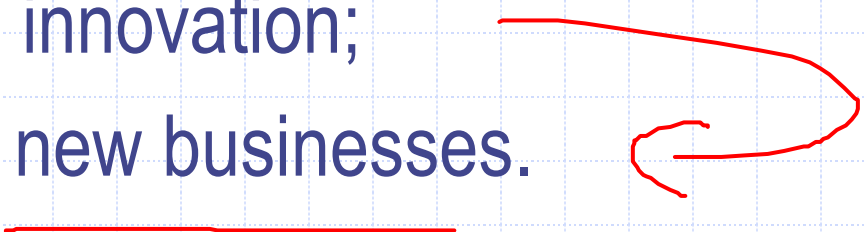
# DEFINITION AND ADVANTAGES

Set of enterprises  
→ competitive or  
→ cooperative, which  
produce and sell related  
products, facing  
common challenges and  
opportunities.

- ◆ Lower inputs and transaction costs;
- ◆ High quality information at lower cost;
- ◆ Higher level of trust;
- ◆ Skilled labour force.



# EFFECTS ON ENVIRONMENT

1. Increase productivity → way in which companies compete;
  2. Benefits on innovation;
  3. Creation of new businesses.
- 

# Industry clusters: factors innovation and growth

- ◆ The factors that drive innovation and a cluster's growth include:
  - FACTOR CONDITIONS: such as a specialized labor pool, specialized infrastructure, and sometimes selective disadvantages;
  - HOME DEMAND: or local customers who push companies to innovate, especially if their needs or tastes anticipate global or local demand;
  - RELATED AND SUPPORTING INDUSTRIES: nationally competitive local supplier industries that create business infrastructure and spur innovation and spin off industries;
  - INDUSTRY STRATEGY, STRUCTURE AND RIVALRY: intense rivalry among local industries that is more motivating than foreign competition, and a local "culture" that influences individual industries' attitudes toward innovation and competition
  - government and chance. Historical accident and/or government actions tend to play significant roles in the development or location of industry clusters.

# Industry clusters (Marshall definitions)

- ◆ ~~Location variables (Marshall):~~
  - Decreasing transport costs (not relevant in location) and spatial specialisation processes;
  - Geographical, historical – political, psychological factors;
  - Localized economies:
    - ◆ *know how* diffusion and capacity;
    - ◆ Innovations and findings continuous through time;
    - ◆ Trade and transport system development;
    - ◆ Face to face agreement;
    - ◆ Complementarity between industries specialized in terms of stages / phases (process) or types (of product);
    - ◆ Enlarging specialized labor market (immigrant)
    - ◆ Attracting entrepreneurial capacities.
  - Marshall's analysis considers firm as homogeneous or specialized BUT capable of being extended to different industries - external economies, and complementarity of the job market and consolidated on the demand of goods)
  - Marshall does not analyse the work in means of developing activities
  - Marshall admits the possibility of congestion diseconomies.

# Industry clusters (Industrial districts)

- ◆ Marshall (1920) identified the firm's external economies, although internal to the district, the basic foundations' of the districts' (or local labor systems) competitiveness..
- ◆ The spatial aggregation of several firms, each one operating in full technical and organizational efficiency, related in terms of production and distribution processes, determines a particular efficiency condition for the overall economic system.
- ◆ Economical advantages:
  - Reduction of production costs;
  - Reduction of transaction costs;
  - Innovative and incremental dynamics settings.
- ◆ The environment allows an organization based on a non-hierarchical order. The spontaneous and self propelling character in producing external economies seems to originate from evolutionary stability and by the convergence of a set of socio-economical, institutional and manufacturing.

# Industry clusters (Industrial districts)

## ◆ Technological conditions:

- Economies of scale relevant at plant level and not firm's one;
- Technologies having minimal efficient dimensions at local, limited-production scales;
- Spatial concentration of the manufacturing relations among specialized companies.

## ◆ Market conditions

- A growing market
- Standardized growth of the market and of the related specific manufacturing techniques
- Lack of substantial changes within the market relationships

## ◆ Firm's external economies:

- Economies external to firms but internal to local community; spread, as not appropriable individually by a single player;
- Localized, as belonging to firms rooted there;
- Localizing, as few and maintaining relations between neighbouring companies;
- Influenced by technological, market, socio-economical and geographical aspects;
- External economies are generated 'unocunsciously' through the operation of other different local actors payers within the district.

# Industrial District vs. Cluster

## Industrial District

- ◆ Alfred Marshall 1890: area where concentrations of competing, complementary, or independent firms and industries do business together or have common needs;
- ◆ Efficient and flexible companies, usually small and medium sized;
- ◆ Cooperation and/or competition

◆ Giacomo Beccantini: "*socio-territorial entities characterized by the active presence of both a community of people and a population of firms in a bounded area with a dominant industrial activity*";

- ◆ Local outsourcing;
- ◆ Economies of scale and scope.

## Cluster

- ◆ Porter: "*Geographical proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities of various types*";
- ◆ Small, medium and big enterprises are welcome
- ◆ Cluster's players:
  - Firms
  - Financial Institutions
  - Public Actors
  - Universities and Research Institutes
  - Organizations for collaborations
  - Media



# Clusters Vs Industrial Districts

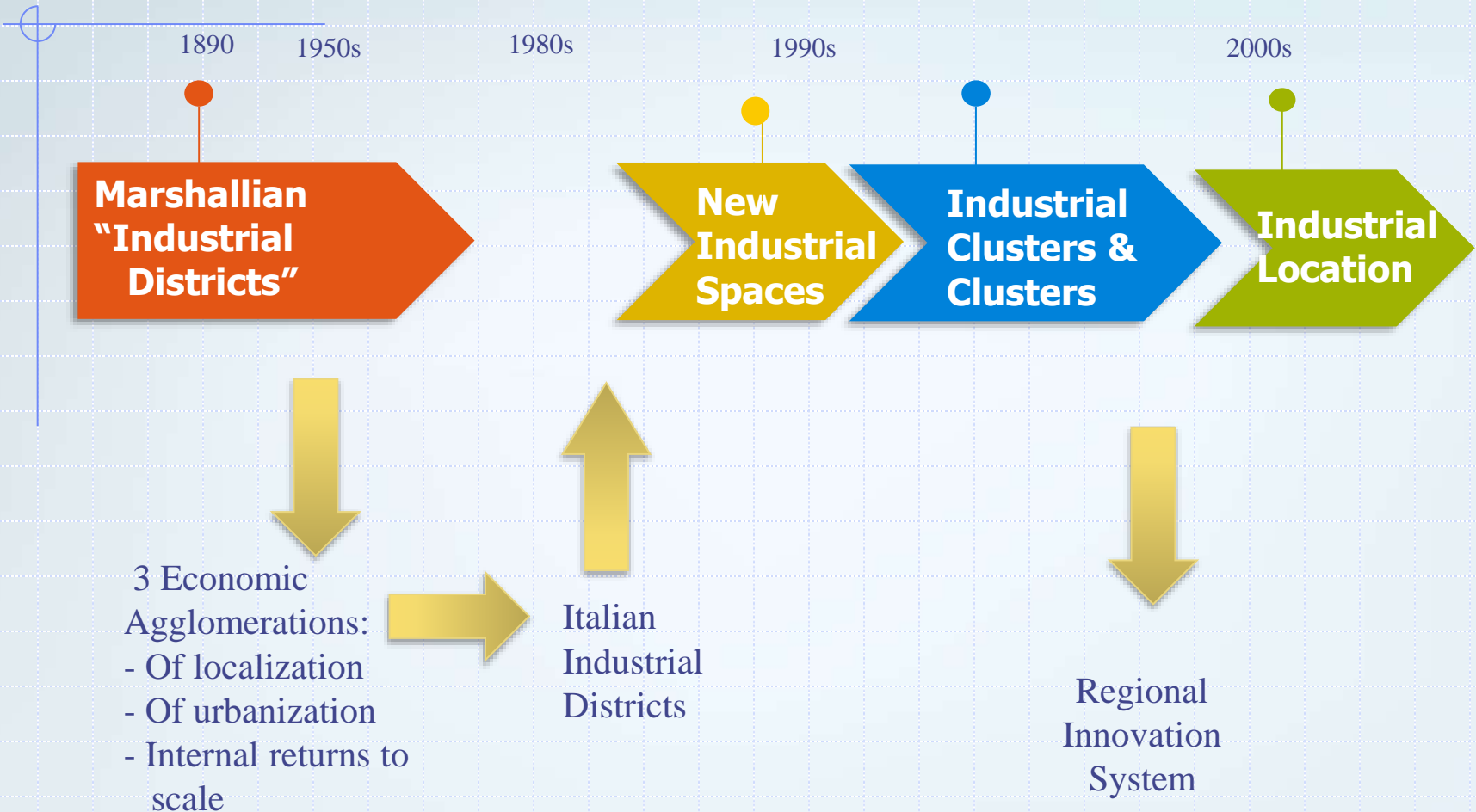
## INDUSTRIAL DISTRICT

- ◆ More defined boundaries
- ◆ Smaller space
- ◆ Homogeneity

## CLUSTER

- ◆ Less defined boundaries
- ◆ Wider space
- ◆ Heterogeneity  
→ In products and sectors

# Evolution of the Concept of cluster



# HOW CLUSTERS EFFECT COMPETITION

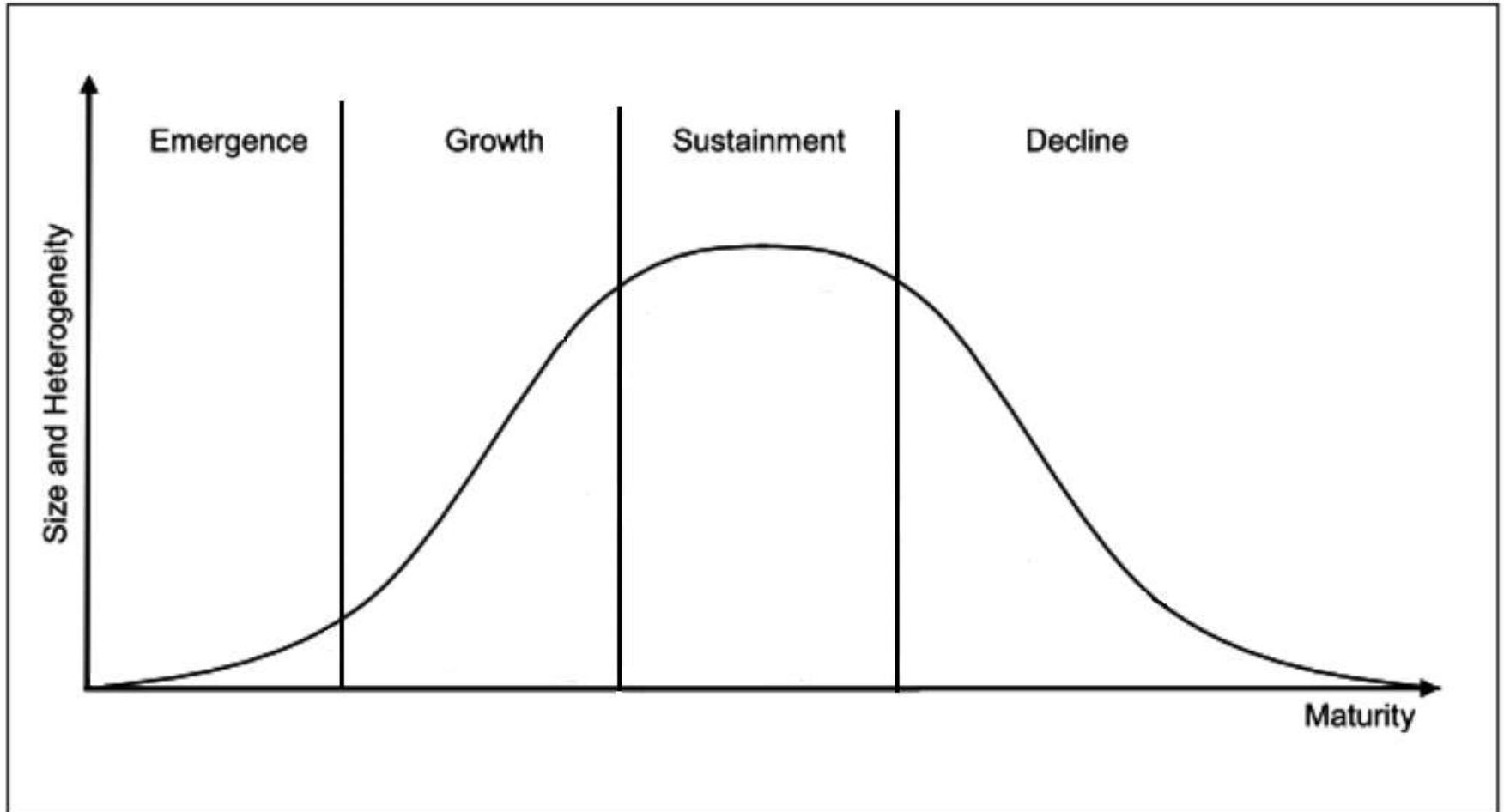
Increasing productivity

Driving the direction and pace of innovation

Stimulating the formations of new business

Add title here

# The Cluster Life Cycle (1)

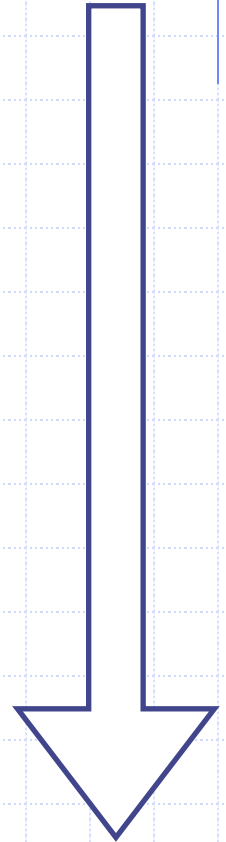


# The Cluster Life Cycle (2)

1. Emergence: there are few firms pioneering a new product, technological path or even a completely new industry and therefore have the push to innovate even though competition is not fierce yet. At this point we **don't have a cluster yet**, as only when the firms start to interconnect and create synergies we can start talking of clusters. This may or may not happen due to several factors, for instance the absence of supporting research institutions or the fact that firm simply develop very different cultures and take different technological approaches.
2. Growth: if technological trajectory homogeneity is achieved and spin-offs from the original firms occur, the cluster becomes more definable, and heterogeneity decreases.
3. Sustainment: the cluster enjoys stability of interconnection and the spread of technology is even among firms. This is a phase of stagnation.
4. Decline: the cluster faces a decline in the number of firms and an increasing number of mergers and acquisitions, capital moves away from the area and start-ups formation is close to zero.

# LIFECYCLE

- ◆ **BEGINNING** → multiple causes;
- ◆ **DEVELOPMENT** → on average 10 years to gain competitive advantage;
  - responses from institutions;
  - rivalry;
- ◆ **DECLINE** → internal or external factors.

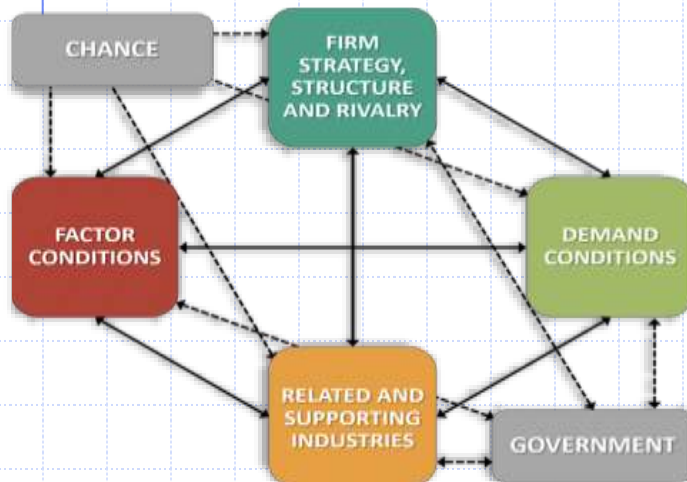




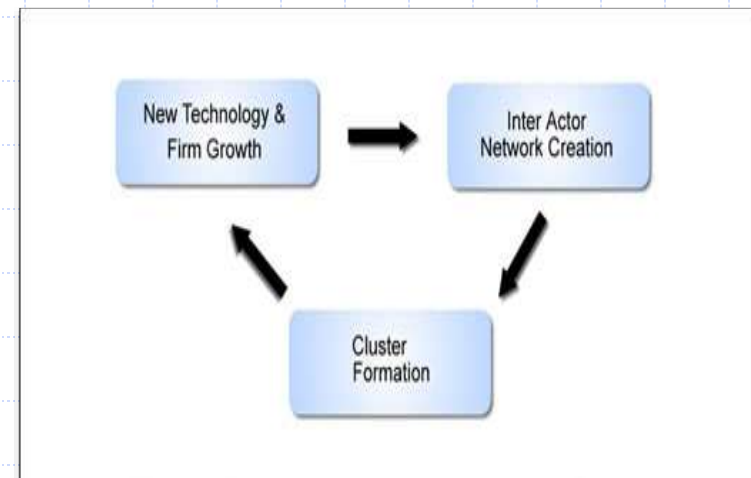


# Innovative Clusters

- ◆ Broersma "*industry groups that have strong innovative links with each other, but weak innovative links with the rest of the industries*"
- ◆ Informal unions of different kinds of organizations in which knowledge and discoveries flow without boundaries



Porter's Diamond of Advantage



The Inner dynamic of an Innovative Cluster

# Cluster's Policies

*”Organized efforts to increase growth and competitiveness of Clusters within a region, involving firms, government and research community”* (The Cluster Initiative Greenbook).

- ◆ Cluster policies are a mean to improve and succeed, rather than an end to reach a goal
- ◆ Sustain Network of SMEs as large companies are less dependent on territory
- ◆ Take advantage of geographical proximity in order to build trust and social norms
- ◆ Let the private sector lead
- ◆ Focus mainly on short-term

## Greenbook's 6 Cluster Initiatives:

1. Research and Networking
2. Policy Action
3. Commercial Cooperation
4. Education and Training
5. Innovation and Technology
6. Cluster Expansion



# Advantages and Disadvantages of Innovative Clusters

## Advantages

- ◆ Innovative ideas arising from Clusters' fertile grounds and Knowledge creation through Universities;
- ◆ Higher employment rates and wage growths bring economic growth, welfare and attract customers and investors;
- ◆ Long-term relationships with suppliers that will deliver high-quality inputs, merge of production processes in order to enjoy lower costs and economies of scale
- ◆ Start-ups can easily find partners

and take advantage of their expertise, presence of SMEs allow closer relationships with customers

## Disadvantages

- ◆ Overspecialization of the Cluster
- ◆ Lock-In effect
- ◆ Cost-reduction most important than the need to innovate
- ◆ Poor relationships and trust among the Cluster's players which are the basis for its existence
- ◆ Mismatch between long and short-term strategies
- ◆ Inability of comparing Clusters



**Focus on:**

**THE SILICON VALLEY CLUSTER**





# HISTORY: 1920/1940

## Electric Engineering and Stanford's entrepreneurial thinking

### THE ROLE OF STANFORD

- Hiring of Frederick Terman(1925)
  - Creation of a start – up incubator
- Diffusion of entrepreneurial thinking and encouragement to students to follow the entrepreneurial path. HP is founded in 1939

### REDISCOVERY OF ELECTRONIC COMPUTING

- Alan Turing theorizes a programmable machine (1937)
- Konrad Zuse builds the first Turing machine (1941)

# HISTORY: THE 1940's

The WW2 and the role of cryptography

## NECESSITY TO DECRYPT THE NAZI MESSAGES

- Strong push to develop automatic decrypting machines;
  - Creation of the first digital programmable machine (1943)
  - Invention of the transistor (1947)
- the foundation to the development of the computer industry are laid down.

# HISTORY: THE 1950's

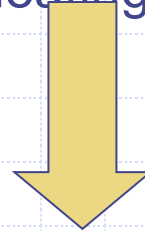
## The birth of the semiconductor industry

- Release of the transistor patent
  - Creation of The Stanford Industrial park with the purpose of creating innovation
  - William Shockley moves to the Santa Clara Valley and hires a lot of young engineers
  - Concentration of venture capital firms in the bay area
- The Bay Area becomes a very business friendly environment.
- 
- Fairchild semiconductors starts innovating the transistor technology
    - Usage of silicon instead of germanium
    - Development of the integrated circuit
- The semiconductor industry starts to flourish

# HISTORY: 1960/1975

○ The inventions and the boom  
NEW WAVE OF INNOVATION BY FAIRCHILD

- Bob Widlar produces the first “chip” (1963)
  - Dave Talbert creates the first analog integrated circuit (1964)
  - Frank Wanlass uses three layers (conducting, isolating, semiconducting) to build chips
- easier manufacturing and increased transistor density on boards.
- Federico Faggin substitutes the aluminum control gates with silicon based ones
- low power consumption and heating, higher density



Boom in the semiconductor industry in the area, with a lot of start-ups and spinoffs from Fairchild, that faced a lot of key employees leaving to open their own company

# HISTORY: 1960/1975 (2)

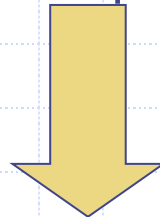
## The inventions and the boom

### MORE DEVELOPMENTS IN THE COMPUTER INDUSTRY

- Foundation of Intel (1968)
  - invention of the dynamic RAM memory
  - Miniaturization of the processor, the first microprocessor is built.
- East Coast firms such as IBM open their labs in the Silicon Valley
  - invention of the floppy disk

### A NEW TYPE OF CUSTOMERS ENTER THE MARKET

- The hobbyists create the market for personal computer



The Silicon Valley is “officially” born. a center of gravity for capital and ideas.

# HISTORY: 1975/1980

The semiconductor wars and the coming of Apple

THE MAIN COMPUTER PRODUCERS ENGAGE IN A WAR FOR THE MOST POWERFUL COMPUTER

- Necessity to increase data storage
- Necessity to optimize user interfaces and database management

APPLE IS FOUNDED IN 1976

- Production of the Apple I
  - Boom with the Apple II
  - Implementation in the Apple II of the first spreadsheet program
- Record IPO in 1979

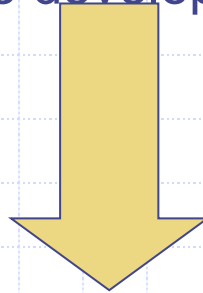


# HISTORY: THE 1980'S

## Apple vs Microsoft

AN INCREASED NUMBER OF INDIVIDUALS AND BUSINESSES REALIZE THE POTENTIAL BENEFITS OF USING COMPUTERS

- There is an incredible demand for more complex software
  - New operative systems are required as the technology evolves
- Microsoft is hired by IBM to develop an OS



There is a shift in the focus of computers, from hardware-based to software based. In this context the battle between Apple operative system and Microsoft operative system takes place. With the former relying on proprietary technology and software, and the latter engaging a more “open” approach.

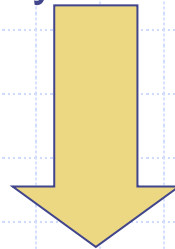
# HISTORY: 1990/2005

## The Internet revolution and the dot-com bubble

### THE INTERNET BECOMES AVAILABLE TO THE PUBLIC

- Creation of the market for browsers (Netscape Altavista and IE)
- Creation of the market for search engines (Google and AOL)
- Rise of the e-commerce and increased importance of websites for companies

→ Incredible amounts of money invested into dot-com companies



The Silicon Valley starts looking like it does now. Basically, a complex cluster of different industries that live in symbiosis, with high capital availability and productivity.

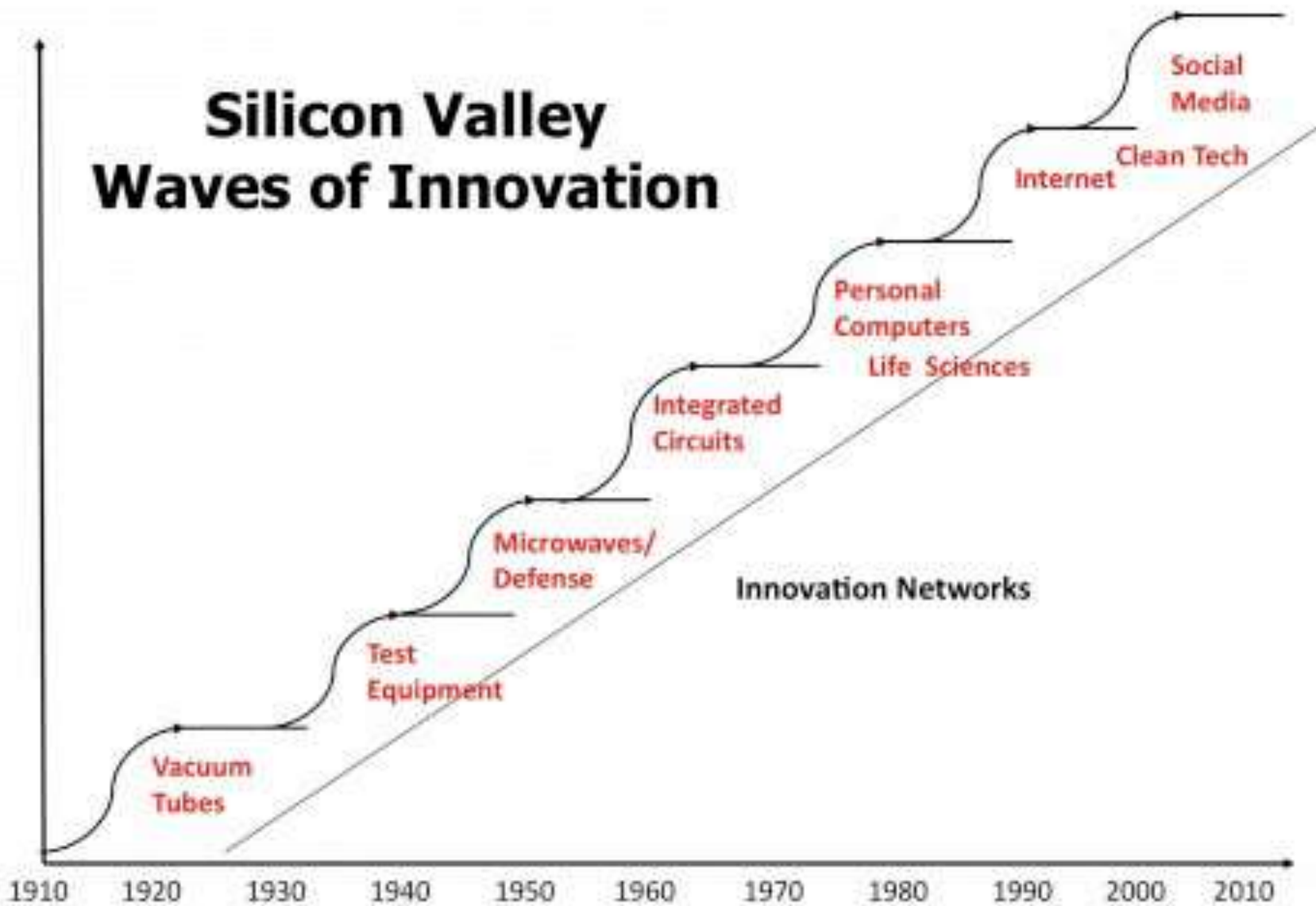
# HISTORY: 1990/2005 (2)

The Internet revolution and the dot-com bubble

THE LAST TWO WAVES OF INNOVATION IN THE SILICON VALLEY ARE SMARTPHONES AND SOCIAL MEDIA

- Apple launches the first iPhone (2007) creating a new market
- Facebook is founded in 2004

# Silicon Valley Waves of Innovation



# PORTER'S DEFINITION

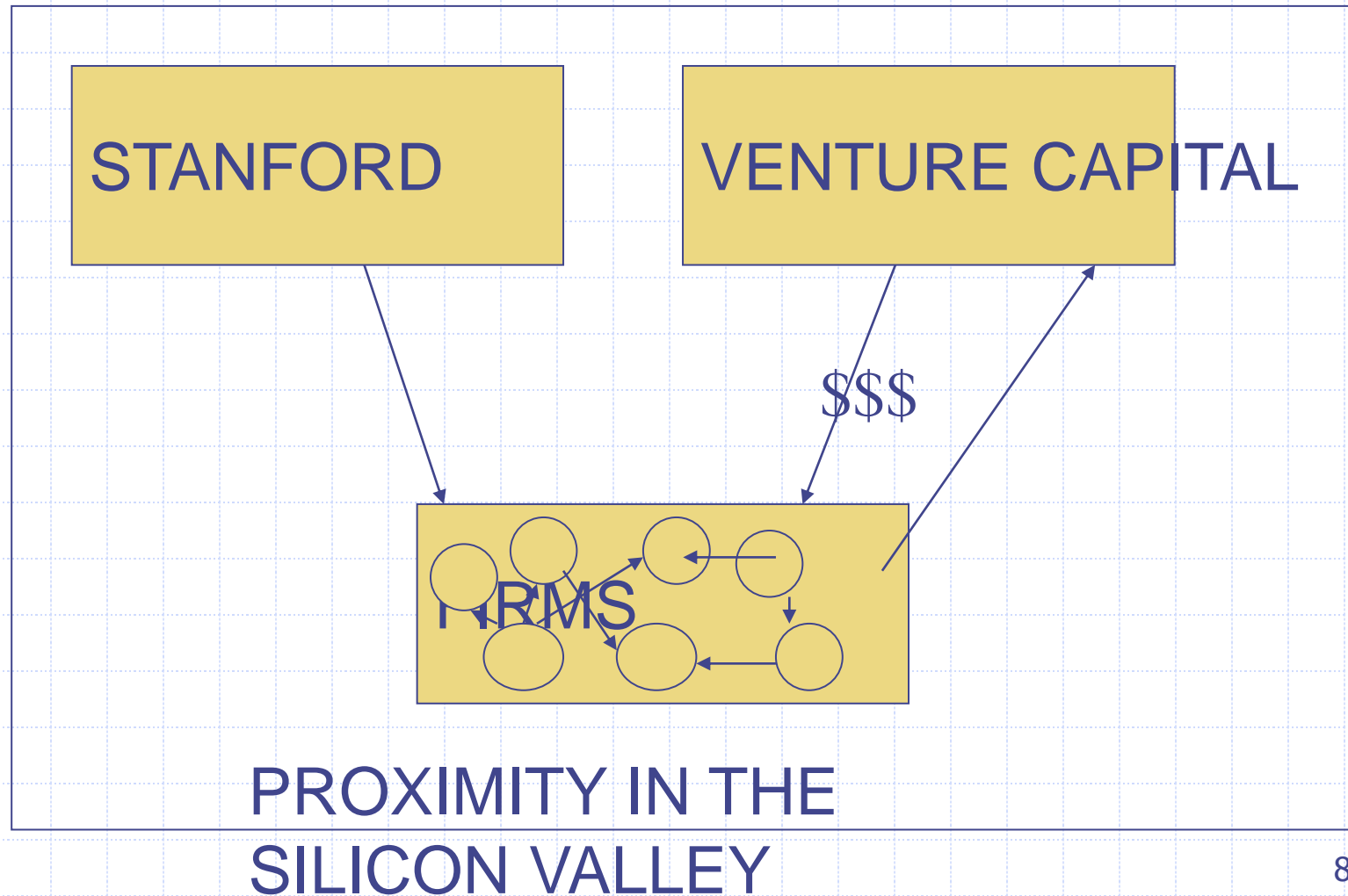
“[...]clusters are] a geographical concentration of firms interconnected by being part of the **same industry** or the **same supply chain**, by a **common resource** or market, by similar philosophy, by facing similar opportunities and challenges or by collaborating with the same **university or research institution**”<sup>1</sup>

IN THE SILICON VALLEY WE HAVE

- ◆ Firms part of the same industry (microprocessors, computers, software etc. taken separately)
- ◆ Firms part of the same supply chain (the same sectors taken together)
- ◆ Fundamental role of Stanford and UC Berkeley throughout the area's history

[1] Michael E. Porter, “Clusters and the new economics of competition, *Harvard Business Review*, 1998

# PORTER'S DEFINITION (2)





# PORTER'S DIAMOND MODEL (2)

## FACTOR INPUTS

- Cheap raw materials in the semiconductor era
- Steady production of talent inside Stanford
- Availability of Capital thanks to VC firms and successful IPO's

## Universities in and near Silicon Valley



# PORTER'S DIAMOND MODEL (3)

## DEMAND CONDITIONS

- Shift from defense-only demand to hobbyists
- Hobbyists create the market for home based computers and provide input for further development
- As miniaturization occurs and software becomes more complex the demand for computers, software and microprocessors skyrockets
- New high demand markets arise with the coming of Internet

# PORTER'S DIAMOND MODEL (4)

## RELATED AND SUPPORTING INDUSTRIES

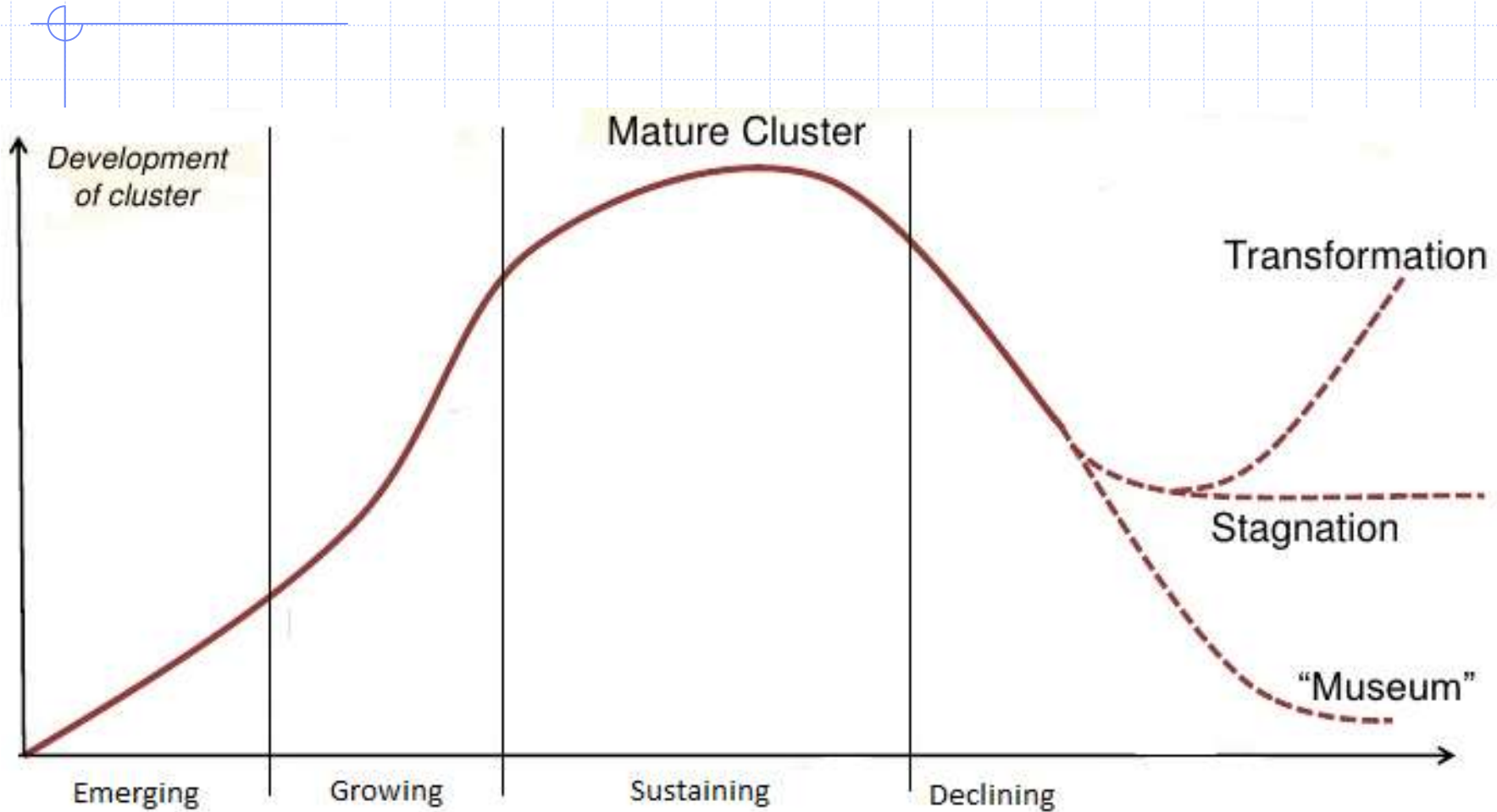
- Many interdependent industries promote the transfer of knowledge and know-how;
- The different industries that coexist in the area support each other and often cooperate (e.g. chip, computers and software firms)

# PORTER'S DIAMOND MODEL (5)

## FIRM STRATEGY, STRUCTURE AND RIVALRY

- Positive effect of close competition in the various industries
- Coexistence of different approaches
- There are not dominant strategies and business models

# THE CLUSTER LIFE CYCLE (2)





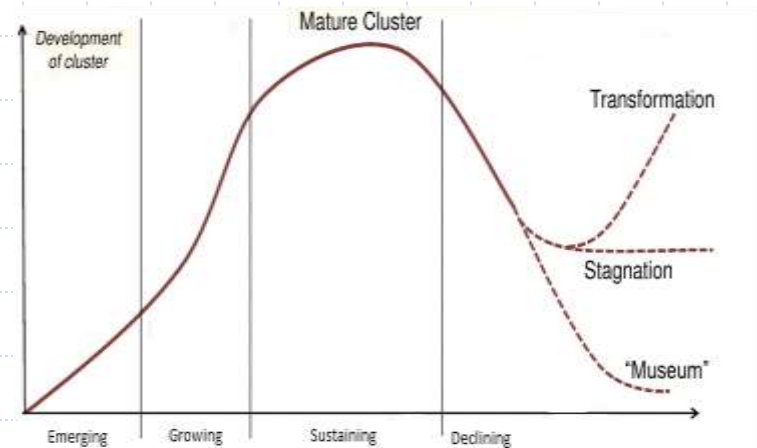
# Cluster Life Cycle

*Emergence:* driven by environmental advantages or market demand

*Growth:* pressure on innovation, competition starts to emerge

*Sustainment:* phase of stability, strategies of cost minimizing, fixed capital requirements

*Decline:* investments drop due to new incumbent ideas/technologies

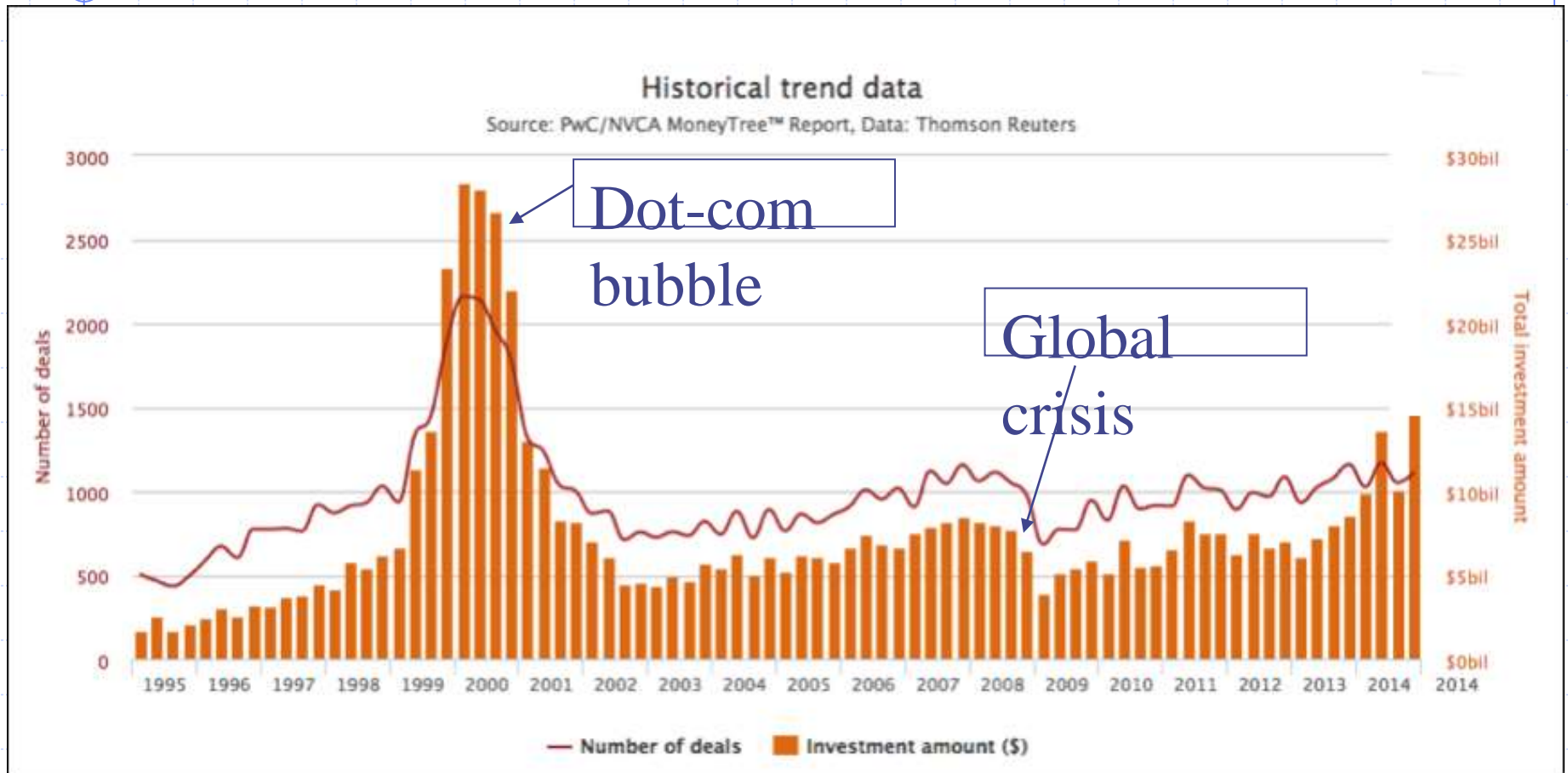


*Transformation:* a new Cluster is formed from the previous one

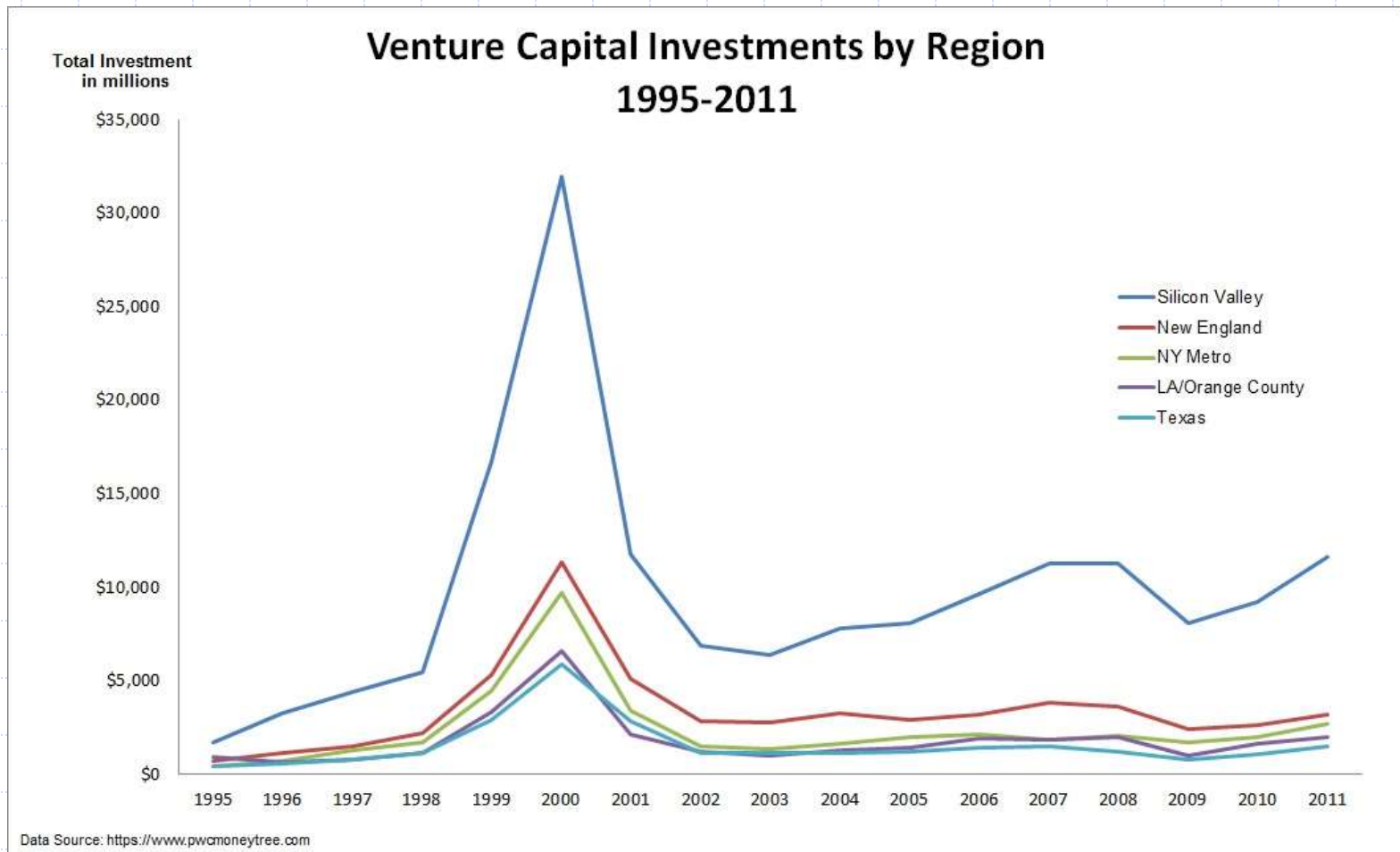
*Stagnation:* symbol Clusters remaining in the market

*Museum:* disappearing Clusters

# THE PRESENT SITUATION



# THE PRESENT SITUATION (1)



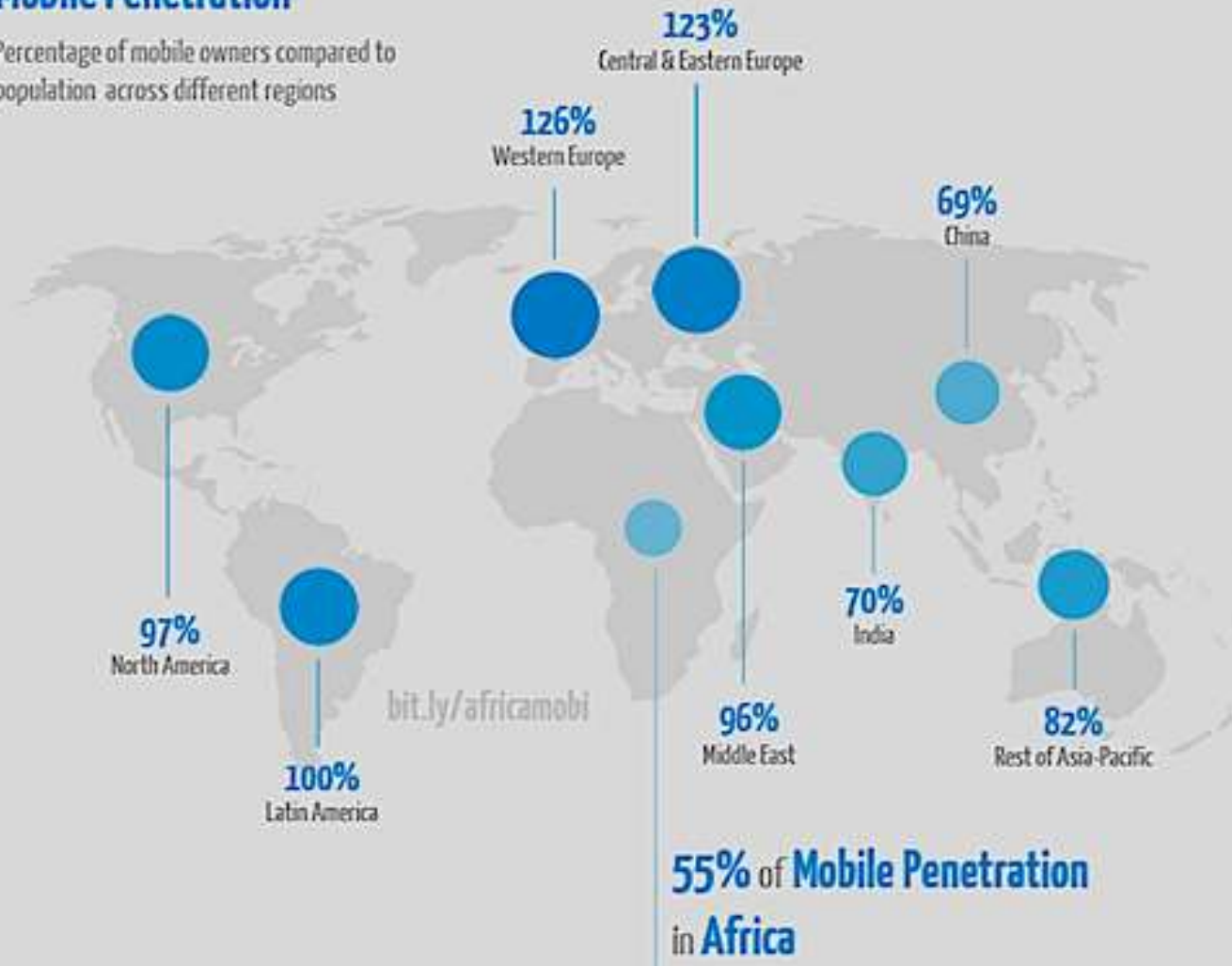
# HETEROGENEITY CREATION

## APPLE

- ◆ Prevents the emergence of a dominant design
- ◆ Created the online music market
- ◆ Created the smartphone market and all the related industries (apps)

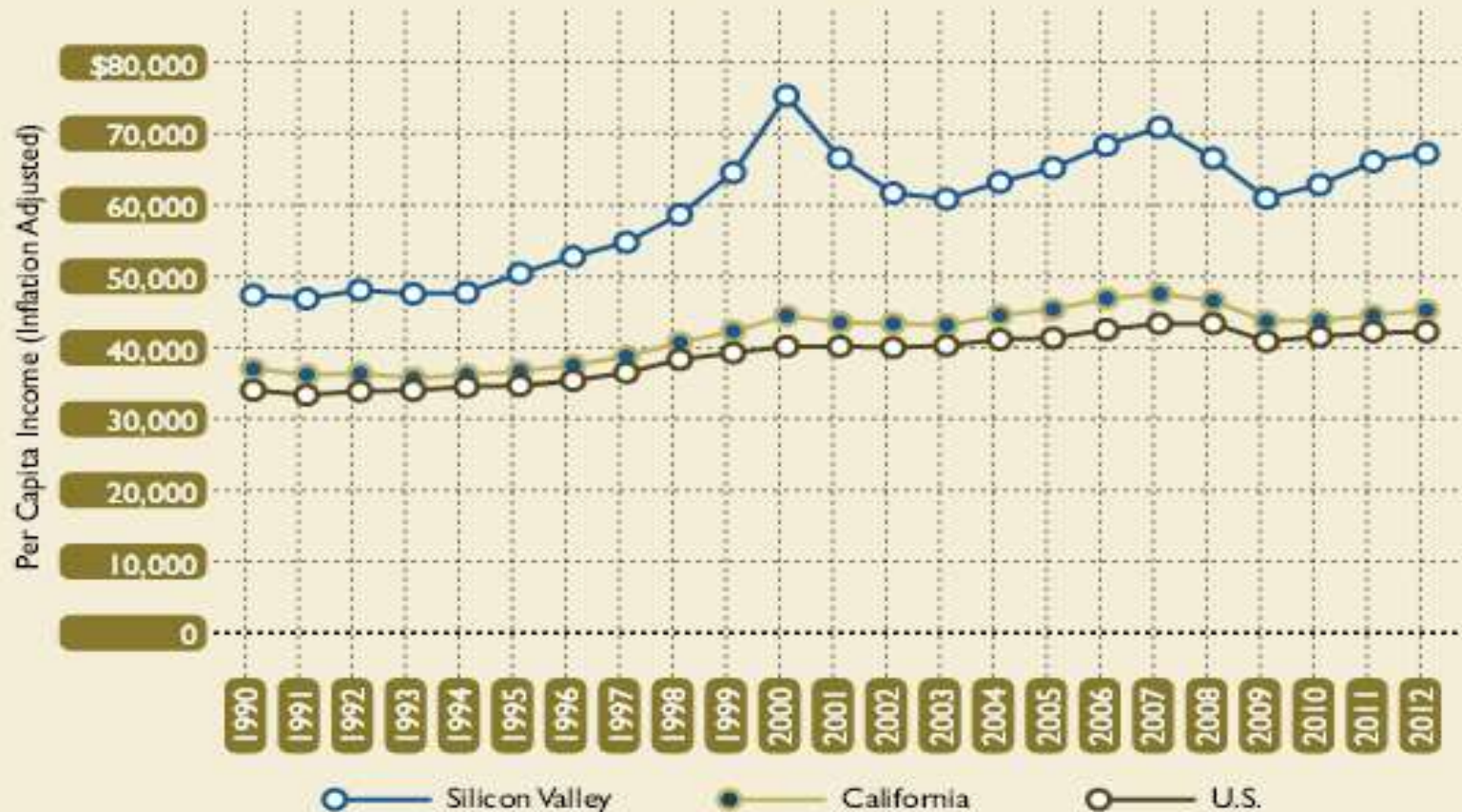
## Mobile Penetration

Percentage of mobile owners compared to population across different regions



## Real per Capita Income

Santa Clara & San Mateo Counties, California and U.S.



Note: Personal income is defined as the sum of wage and salary disbursements (including stock options), supplements to wages and salaries, proprietors' income, dividends, interest, and rent, and personal current transfer receipts, less contributions for government social insurance

Data Source: Moody's Economy.com

Analysis: Collaborative Economics