Digitalisation and organisational innovation

Lesson 1. Introduction

General information

- **Language**: English
- **Office Hours**: At the end of the Wednesday lesson
- **Exam**: Written examination
- **Materials**: Readings and lecture slides available on the course platform
- **Structure of the Course**: Overview of key topics, lectures, and discussions organized into thematic modules

Tuesday, November 11	Introduction (Introduction)
Wednesday, November 12	From liberal capitalism to fordism and post-Fordism (Cap. 1, par. 1,5)
Thursday, November 13	Varieties of capitalism (Cap. 1, par. 1,6)
Tuesday, November 18	Growth models (Hassel, Palier and Avlijas, 2020)
Wednesday, November 19	Innovative networks (Cap. 1, par. 1,7)
Thursday, November 20	Inventors and creativity (Cap. 2)
Tuesday, November 25	**Convegno Salute (lezione anticipata)**
Wednesday, November 26	The small worlds of creativity and innovation (Cap. 4)
Thursday, November 27	Innovation systems (Cap. 5)
Tuesday, December 2	The geograhy of innovation (Cap. 6)
Wednesday, December 3	Innovation and local development (Cap. 7)
Thursday, December 4	**Ladi**
Tuesday, December 9	Big data (Salganik 2020, par. 2.2)
Wednesday, December 10	Principles of Algorithmic Management (Stark and Vanden Broeck, 2024)
Thursday, December 11	**Ripasso (lezione anticipata)**

General information

Course Features

- **Multidisciplinary approach**:
- We will draw on contributions from economics, sociology, political science, and psychology. Each discipline has developed its own debates over time, which can sometimes create confusion and a “patchwork” of perspectives.
- However, because innovation and its impact on organizations are complex topics, it is essential to move beyond static, single-cause, or deterministic approaches.

- **Multilevel approach**:
- We will examine innovation at different levels — within firms and organizations (micro), across sectors and local systems (meso), and at the level of national contexts and global value chains (macro).

- **Integrated approach**:
- The course combines different perspectives: the individual level (rationality from economics and personality from psychology), the role of social networks (sociology and complex networks), culture (cognitive frameworks and legitimisation), and institutions (comparative political economy).

- **Sociological perspective**:
- Innovation and organizational change are analyzed within the broader transformations of **capitalism** and its relationship with **society**.
- We will explore how this relationship has evolved across different historical phases: liberal capitalism, Fordism, post-Fordism, globalization, the ICT revolution, big data, and artificial intelligence.

- **Innovation and Financial Bubbles**
- Innovation is often linked to periods of **rapid economic growth** and to the creation of **new markets and technologies.**
- However, history shows that waves of innovation can also trigger **financial bubbles** — phases in which expectations and investments grow much faster than real economic value.
- These bubbles emerge when financial markets **overestimate** the potential returns of new technologies, leading to speculative behaviour and inflated asset prices.
- When expectations are not met, the bubble bursts, producing economic crises but also leaving behind **new infrastructures**, institutions and technologies that may support future growth.
- Classic examples include the **railway** boom of the nineteenth century, the **dot-com bubble** of the late 1990s, and the more recent artificial intelligence hype cycles.

- **Analytical approach**:
- to study institutional and organizational change, we will use middle-range theories and ideal types, empirically grounded and historically sensitive.
- The goal is not to search for general laws (as in the natural sciences) or to build abstract causal models. Instead, we will present a set of analytical instruments that can be applied to different cases, in specific historical and geographical contexts.
- This approach enriches the “toolbox” we can use to interpret socio-economic transformations.

CATEGORIA: SISTEMA SOLARE

Con l'AI la bolla è diventata sistema

scritto da **Alessandro Magnoli Bocchi** il 24 Ottobre 2025

Le bolle, è noto, si riconoscono dopo. Nel Seicento olandese, durante la "*tulipmania*", i bulbi più rari toccarono prezzi ben superiori al reddito annuo di un artigiano. Durò pochi mesi (1636–1637), poi il mercato crollò in pochi giorni. Nell'Ottocento, le ferrovie britanniche si espansero finanziandosi a debito finché fallirono banche e risparmiatori. Nel 2000, bastava aggiungere *".com"* al nome per pretendere valutazioni milionarie. Oggi tocca all'intelligenza artificiale. Cambia la tecnologia, non il copione: l'innovazione diventa aspettativa, e

The Compass Checkpoint

31 Ottobre 2025

Il boom dell'intelligenza artificiale

Nel 1987, il premio Nobel Robert Solow osservò con ironia: "Si può vedere l'era dei computer ovunque, tranne che nelle statistiche sulla produttività." L'adozione di una nuova tecnologia di portata generale richiede infatti tempo: le imprese devono adattare i propri processi per poterne sfruttare appieno il potenziale. Allo stesso modo, mentre l'intelligenza artificiale (IA) sta rapidamente diventando un assistente di fiducia nella vita quotidiana, è ancora troppo presto per coglierne gli effetti concreti nei dati sulla produttività.

Tuttavia, i massicci investimenti in data center necessari per supportare questa tecnologia stanno già emergendo nei numeri di crescita del PIL. Quest'anno, le principali Big Tech statunitensi hanno stanziato circa 400 miliardi di dollari per la costruzione di nuovi data center. Senza questo impulso, l'economia americana avrebbe registrato una crescita minima negli ultimi trimestri. Secondo le nostre stime, gli investimenti legati all'IA hanno contribuito per quasi il 70% alla crescita del PIL degli Stati Uniti nella prima metà del 2025.

Questa fase, tuttavia, non è una nuova bolla dot-com. All'epoca, molte società erano semplici start-up con buone idee di business ma senza prodotti concreti. Oggi, le cosiddette "Magnifiche 7" sono aziende mature, con ampie riserve di liquidità e solide capacità di generazione di utili. Anche se le valutazioni del settore tecnologico restano elevate, non appaiono eccessive: al picco della bolla internet, nel marzo 2000, il rapporto P/E prospettico a 12 mesi del Nasdaq 100 superava quota 60x, mentre oggi si attesta intorno a 27x.

Ciò detto, è opportuno mantenere un approccio prudente, poiché non mancano potenziali rischi. Accordi circolari tra sviluppatori di modelli di IA, fornitori di capacità computazionale e produttori di chip stanno sostenendo i prezzi dei titoli tecnologici, aumentando il rischio sistemico legato all'IA. Al contempo, le imprese statunitensi sono impegnate in una corsa verso l'intelligenza artificiale generale (AGI) – una forma di IA dotata di capacità cognitive paragonabili a quelle umane – senza alcuna garanzia di successo.

Esiste inoltre il rischio concreto che l'approccio attuale non sia quello vincente. La Cina, ad esempio, sta sviluppando modelli di IA – come DeepSeek – che richiedono molta meno potenza di calcolo (e quindi meno data center) rispetto a quelli statunitensi. Inoltre, Pechino è più concentrata sulle applicazioni pratiche dell'IA che sul raggiungimento dell'AGI. Questa strategia potrebbe tradursi in un incremento più immediato della produttività, capace di offrire un vantaggio competitivo duraturo, soprattutto se l'AGI dovesse rivelarsi irraggiungibile o di breve durata.

Introduction: Innovation Studies (IS)

- This course gives an overview of theories and research, in sociology and related fields, about **economic innovation**.

- In economics, this topic has been widely studied. Over recent decades, the **economics of innovation** has produced extensive research, gradually consolidating this area of study.

- In **economic sociology**, the situation is different and research is more fragmented. Moreover, since the **classical authors**, many have examined economic innovation and linked it to the **dynamics of capitalism**.

- In this course, we study economic innovation from a **sociological perspective**.

- The aim is to support the idea that the study of innovation requires an **integrated approach**, with dialogue between disciplines and explanations on different geographical and analytical (micro, meso and macro) **levels**.

- In order to understand the processes of innovation, we must look at the **actors**, their **relations**, the **sector** where they operate and the **institutional contexts**.

The contribution of economy

- In economics the topic of innovation was controversial and only recently became a research topic.
- At the start of the 20th century, the heterodox economist **Joseph Schumpeter** studied innovation in a systematic way and linked it to economic development.
- However, Innovation Studies (IS) grew in the **eighties** with the publication of *An Evolutionary Theory of Economic Change* (1982) by Richard **Nelson** and Sidney **Winter**.

- The book puts **technological innovation** at the center of the debate about **economic change**, marks the foundation of an **evolutionary approach** to economics, and provides an alternative to **neoclassical theories** of growth.

- The contribution of economists to Innovation Studies then progressively becomes prevalent.

- These economic approaches, however, are '**heterodox**' in nature and remain outside the mainstream theories.

- This is not accidental. Innovation is hard to understand and explain using the conventional analytical categories.

- **Neoclassical economics**, for example, studies actors who maximise choices, have a well-defined preferences and utility functions, and compete with one another for scarce resources.

- However, **innovative behavior** depends on insights and decision made in conditions of **deep uncertainty**, which contrast with the probabilistic and predictable calculations of rational actors.

- **Innovative behaviour** is then shaped not only by economic or utilitarian motivations but also by **social dynamics** based on **trust**, **cooperation**, and **interaction**.

- For these reasons Innovation Studies (IS) represent a **borderline area**, open to contributions from a number of different disciplines.

The contribution of sociology

- In 1954 James Coleman, Elihu Katz and Herbert Menzel published a research on the **process of diffusion of new drugs in the medical field**.
- The study concerns the adoption by doctors of a new broad-spectrum antibiotic (tetracycline) in four small Illinois towns, and it highlights the importance of **networks of interpersonal communication** and the role of **opinion leaders** in the **transmission of innovation**.
- The research show:

- how the diffusion of innovation takes place according to processes of '**social contagion**', arising from informal discussions within the medical profession;
- and how the **dynamics of contagion** (the timing of the adoption rate) depend on the **formal properties** of the network of relationships.

- In the 1962 Everett Rogers published "*Diffusion of Innovations*", which is still the benchmark for 'diffusionist studies'.

- This work systematically reconstructs innovation adoption processes, demonstrating how these have **well-defined actors** and **roles** and follow a recurring pattern of diffusion: the logistic curve of adoption rates (**S-curve**).

- Other pioneering contributions hail from the world of **industrial and organisational sociology**:

- Joan Woodward (1965), highlights the close relationship between the type of technologies employed, the organisation of work and the economic performance of companies.

- Burns and Stalker (1961), in a study of electornic companies, developed two ideal-typical models: a ‘mechanistic’ organisation of work (hierarchical and centralised), and an ‘organic’ one (decentralised, horizontal and complex model).

- In 1987, Ronald Burt reappraised the study by Coleman, Katz and Menzel on medical breakthroughs, criticizing the idea of social contagion. Later, in 1985, Mark Granovetter wrote an essay on '*Economic Action and Social Structure: The Problem of Embeddedness*'.

- This deals with the importance of **social networks** for the circulation of information, and has come to be considered as a kind of manifesto for the '**new economic sociology**', an approach that gives preferential attention to social networks.

- This attention devoted by IS to social networks (even when it is not explicitly addressing the theme of innovation) should not surprise us.
- **First** one, starting from the **mid-nineties**, IS showed growing interest in **inter-organisational relations** due to the exponential growth of **collaborative relationships** between companies.
- In particular, **research and development** (R&D) partnerships around world rose from a few dozen in the **sixties and seventies**, to several hundred in the **eighties**.
- From the early eighties, moreover, these partnerships were concentrated in the **high technology sectors** (pharmaceuticals, IT and telecommunications, aerospace, etc.).

- A **second** reason of attention, is linked to the development of the literature concerning **high technology innovation systems**, which gives a prominent place to networks of collaboration.

- Powell, Koput and Smith-Doerr study on **biotechnology** shows that in an industry characterised by rapid scientific and technological change, one in which the knowledge base and required skills are complex and dispersed amongst a variety of subjects, **networks of learning** become the '***locus of innovation***' par excellence.

- **Innovative processes**, in other words, pass beyond the boundaries of individual companies and put down roots in **inter-organisational networks**.

- Other relevant contributions came from studies with an **organisational approach** and from **neo-institutionalism** (the second branch of NES).

- A great deal of attention was paid to Piore and Sabel's work (1984) on the issue of **flexible specialisation**, which shows the changes in the models of competition and organisation of companies in the **post-Fordist scenarios**, with the shift from the production of mass standardised goods to diversified quality goods.

- From neo-institutional perspective, the work of DiMaggio and Powell describe the mechanisms of **institutional isomorphism** that condition the processes of diffusion and adoption of organisational innovation.

- We will study these topics in detail during the course. However, we can already see some **common elements**:
- The sociological perspective sees **innovation** as closely connected to **changes in the capitalist system:** from Fordism (1945–1970) to post-Fordism (1970–1980), to flexible specialisation and industrial or high-tech districts (1980–2000), to globalization (2001) and finally on digital platforms, algorithms, and big data (after 2010).
- This approach links the **economic perspective** with the **social dimension** (networks and culture) and the **political context** (institutions, public policies, and the welfare state).

- In other words, innovation affects not only **companies** but also **society** as a whole. Society, in turn, reacts by changing **institutions** and shaping new **paths of innovation**.

- To study these processes, we can use different **perspectives** (network analysis, neo-institutionalism, Varieties of Capitalism, and Growth models) and different **levels** of analysis (sectoral, national, local and global value chains). These approaches also combine ideas from several **disciplines**, including economics, sociology, politics, psychology, and engineering.

- The first step is then to provide some **conceptual coordinates** to delineate the topic at hand.

A first definition

- What do we mean by “**innovation**”?
- The verb ***to innovate*** and the noun ***innovation*** describe the transformation of an existing state of things, to create something new.
- This idea refers both to the **action of change** and to its **outcome**. It also suggests that innovation implying a **contextualisation** and a **diachronic comparison**.
- Innovation needs to be collocated within the context in which it occurs, and its results can be understood only by making a comparison between before and after: by comparing what existed previously with what follows its introduction.
- These simple considerations give us a **process-oriented** and **relational idea** of the concept.

The **five characteristics** of innovation

1. Innovation is **processual**
2. Innovation is **relational**
3. Innovation is **different from change**
4. Innovation should be **distinguished from invention**
5. Innovation does **not always bring positive results**

1. Innovation is processual

- Innovation is a **complex activity** made up of a series of **interconnected phenomena**. It includes many activities and transitions that scholars have often combined into phases.
- Rogers, for example, indicates **six phases**:

1. The identification of a need or a problem that requires a solution;
2. The decision to conduct research (basic and/or applied) to find this solution;
3. The development of innovation by giving it a form and content that meet users' needs;
4. The marketing, which is the production and distribution of the product/service that contains the innovation;
5. Its adoption and diffusion;
6. The consequences of innovation, which relate to the changes associated with its adoption.

- In recent years, a procedural approach and a division into stages has also been developed to describe **company innovations**.
- The European survey regarding company innovation (CIS) follows this pattern and collects data for three main stage (input, transformation and output).
- https://ec.europa.eu/eurostat/web/microdata/community-innovation-survey

- The division of the innovation process into different stages has only an **analytical purpose**: it is useful to define the **ideal-typical categories** and reference points for the analysis of specific cases.
- This division does not mean that innovation always follows a **linear order**, with each stage clearly separated from the others.
- It also does not mean that innovation must always involve **formal scientific research**.
- Although innovation always includes the creation, diffusion, and use of new knowledge, this knowledge does not always come from formal research. It often develops from the **practical experience** of suppliers, producers, and users of certain goods and services.

- Despite that, for many years, research on economic innovation was based on the so-called **linear model of innovation**, which describes a fixed and ordered sequence of stages.

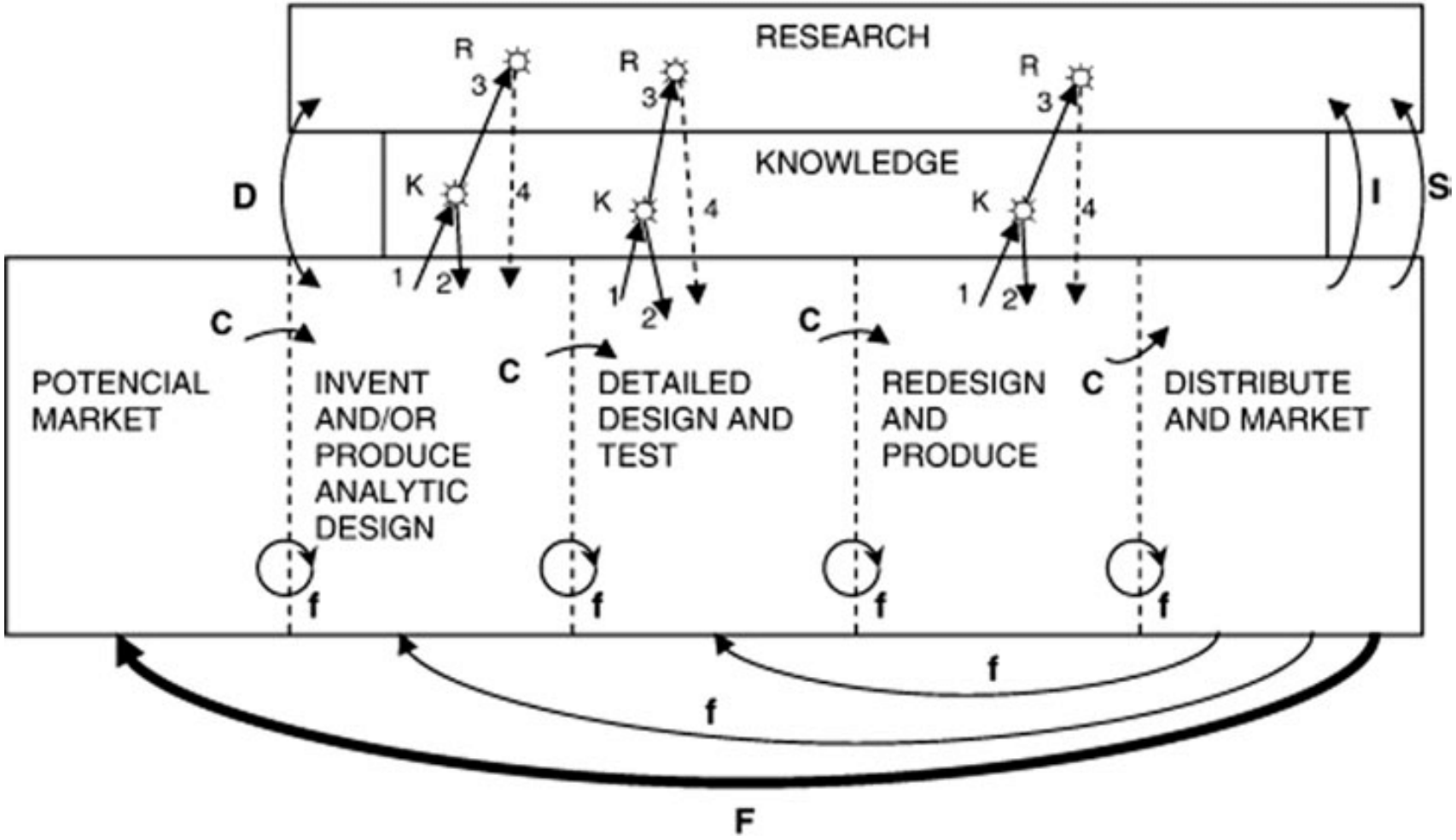
- The process begins with basic research, continues with applied research, moves into the development phase, and ends with production and market diffusion.

- This model shows innovation as a **one-way process** that flows from upstream (basic research) to downstream (the market).

- Against this backdrop, Kline and Rosenberg (**1986**) developed the so-called **chain model**. They showed that innovation is an uncertain, complex, and non-linear process, which often does not begin with research activity.

- In this model, there is **interaction** and **cross feedback** between the different stages. Important ideas for research often come from later phases, such as development or the market.

- Innovation therefore has a **circular** and **recursive** nature. It would be wrong to limit the ‘creative’ dimension only to the first stage, the input phase.



C: central chain of innovation
f: feed-back loops) to depict the trial and error nature of the process
F: feed-back from testing the idea in the market
K and **R**: knowledge and research

- For example, in companies, the transformation of input into output is not just the moment when the R&D department’s invention is applied.
- This phase often generates new ideas and stimuli that later guide systematic company research. In addition, during implementation, inventions from the laboratories change significantly, as research staff and production staff interact continuously.
- The same dynamic appears in the downstream phase, where innovations gain economic value. Market feedback, together with the needs and suggestions of key customers, makes an essential contribution to creating and improving new products.
- The innovation process, therefore, is not a direct current — a steady, one-way flow of electrons. Instead, it resembles an alternating current, where the flow shifts over time, sometimes moving forward and sometimes moving backward.

The Kayzen method

- The Kaizen method is a Japanese approach to **continuous**, **incremental improvement** that involves all **employees** in identifying and implementing small changes to enhance processes, products, and services.
- Originating from Japan after World War II and popularized by Toyota, this philosophy emphasizes a gradual, step-by-step approach to eliminating waste, improving quality, and increasing efficiency.
- Key principles include the belief that every process can be improved, defects stem from flawed processes, and small changes can have significant long-term impacts.


Kaizen cycle for continuous improvement
Kaizen requires identifying areas for improvement, creating solutions and plans for a rollout—and then cycling through the process again for other issues or issues that were inadequately addressed.
1 Get employees involved.
2 Gather a list of problems.
3 Encourage solutions, then choose an idea.
4 Test the solution.
5 Regularly measure and analyze the results.
6 If successful, adopt the solution.
7 Repeat on an ongoing basis.
TechTarget

2. Innovation is **relational**

- Innovation is a relative concept: it must always be understood in relation to a specific **period** and **context**. We can define it only by comparing two moments — the existing situation in an economic sector, company, or region at time T1, and the new situation that appears at time T2.

- Innovation also depends on the contribution of other **actors**, either **directly** or **indirectly**. Their input matters both in the creation phase — through the exchange of ideas and interpretations — and in the implementation phase.

- In order to have an impact on the context, it must also be **accepted** and **diffused**, and this occurs through the mediation of interpersonal relationships, as sociological studies on diffusion show.

3. Innovation is different from change

- Change is a **broader** and more **general concept**. It refers to transformations that are not necessarily innovative.
- Innovation always includes change, but it aims to introduce something new.
- As Schumpeter explained, it means ***"doing new things or doing things that are already being done in a new way."***

4. Innovation should be distinguished from invention

- Invention means creating a new product or process, while innovation means putting that new idea into practice for the first time. As Schumpeter said, "***the inventor produces ideas, the entrepreneur gets things done.***"
- Schumpeter made this distinction by separating the figure of the **inventor** from that of the **innovative entrepreneur**.
- The inventor's work focuses on the progress of knowledge, while the entrepreneur's activity has direct economic value: "***getting new things done***" ***is not only a distinct process but it is a process which produces consequences that are an essential part of capitalist reality***'.
- However, the line between invention and innovation is **not always clear**. In some industries, such as biotechnology or software, inventive and innovative activities often overlap.


COSA ?! E PERCHE' NON VUOI INVENTARE UN MARCHINGEGNO PIU' AVANZATO DI QUELLO A RAGGI COSMICI ?
PER UNA SEMPLICE RAGIONE ! EH ! EH !
L'HO GIÀ INVENTATO ! ECCO L' ECO-LASER PORTA-TILE. MINIMO INGOMBRO. MASSIMO RENDIMENTO !

5. Innovation does not always bring positive results

- The word innovation carries a strong **emotional** and **evocative power** and often creates a **bias**. People tend to believe that all changes linked to innovation are always positive.

- As a result, innovation is often seen as a synonym for **progress**.

- This way of thinking is misleading because it mixes two levels that should stay separate: the **intentions and expectations** for improvement, and the **evaluation of the results** produced.

- The introduction of something new is not always positive and does not always lead to the desired results.
- Innovation can fail or produce **unexpected effects** that may not be beneficial for the innovators or for society as a whole — for example, nuclear energy and the atomic bomb.
- In this course, the term innovation will be used in a **neutral way**. This helps us place its economic and social effects within an analytical framework and study both its positive and negative impacts.

- Innovation is a complex and risky activity because it always involves **uncertainty**. Failures can occur at different levels: **technological** (when a technical solution does not work), **social** (when people resist or are threatened by the new solution), or **economic** (relating to the market).

- Small or **marginal innovations** create **risk situations**, where the chances of success can be estimated from past experience. In contrast, major or **radical innovations** create **uncertainty situations**, where it is impossible to calculate probabilities because there are no previous examples to rely on.

Economic innovation

- What do we mean by **economic innovation**? We can provide a first general definition

- Economic innovation is a process of change that introduces new economic and regulatory elements. These changes can affect the needs that are satisfied, the goods and services that are produced, and the ways they are created, distributed, and used.

- The **level of analysis** may vary. The focus can be on a company, on consumers, or on larger systems such as local, regional, or national economies.

- Building on Schumpeter’s ideas, many authors describe innovation as a **problem-solving process** based on new combinations of existing elements.
- This often refers to **technological innovation**, but technical change is only one part of a much broader and more complex phenomenon. ***Economic innovation is not limited to technological change***.
- As Keith Pavitt (2005) observed, innovation involves matching **technological opportunities** with **market needs** and **organizational practices**.
- The role of the innovator—whether an individual or an organization—is to activate and coordinate all the factors needed to achieve this goal.

Types of innovation

- The reference point for defining innovation is the **Oslo Manual**, which guides data collection for surveys conducted across European Union countries.
- According to this definition, "*an innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation, or external relations*" (OECD/Eurostat 2005, 46).

- There are four main types of innovation:

1. **Product innovation**, refers to the creation of new goods or services, or to significant changes made to existing ones.
2. **Process innovation**, involves changes in the way goods or services are produced or delivered.
3. **Organisational innovation**, introduces new ways of structuring and managing business operations.
4. **Marketing innovation**, relates to changes in product design or packaging, in promotion and market placement, or in selling prices methods for goods and services.

- Every change in these activities must include some degree of novelty, although the level of newness can vary greatly. In the literature, two main types of innovation are usually identified:

1. **Incremental innovation**, which introduces small improvements or limited changes in the production or use of a product or service.

2. **Radical innovation**, which brings a much higher level of newness. It reshapes the knowledge and expertise previously used in a specific field and can sometimes even create entirely new markets.

- Examples of the first type of innovation include the constant updates made to cars, televisions, and computers. Manufacturers introduce these changes to improve design or performance, attract new customers, and stay ahead of competitors.

- Examples of the second type include the launch of the first cars, televisions, and personal computers — products that completely changed their markets (i.e. Smartphone).

- However, incremental innovation should not be **underestimated**. In quantitative terms, it makes up most of all economic innovations, and in qualitative terms, many small, cumulative improvements can lead to major transformations over time.

- In addition to single innovations, we must also consider broader **technological changes**. Shifts in technological systems represent large-scale transformations that affect several economic sectors and include many interrelated innovations — radical, incremental, and organisational.
- One example is the development - in the first half of the twentieth century - of new techniques for producing synthetic materials, which came together with innovations in the petrochemical and machinery industries.
- **Technological revolutions**, called techno-economic paradigm shifts, can **reshape the entire process of economic development**. The best-known example is the revolution of the late eighteenth century, marked by the invention of the **steam engine**.

Thanks for the attention

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(Fai clic sulla freccia in modalità Presentazione)