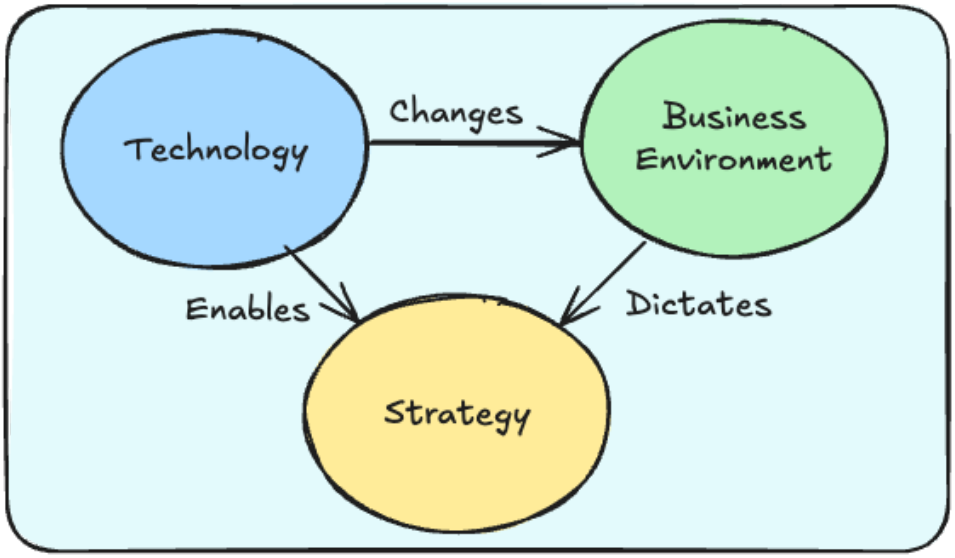
Espen Andersen - Introduction to technology evolution and disruptive innovations

https://www.youtube.com/watch?v=IIam_24p5WQ



1. **Technology** changes the **Business Environment**, *what businesses can do*.
2. When the **Business Environment** changes, you need to change your **Strategy**, *what you do*.
3. **Technology** also enables you to change your **Strategy** *before* you *need* to change it due to forced or sudden changes in the **Business environment**.

Technology evolution over time

> Based on W. Brian Arthur's The Nature of Technology

1. Technology is a combination of components
2. Each component is itself a technology
3. Each Technology exploits an effect or phenomenon (and usually several)

> Espen's take: Technology is just ways of doing something, that are repeatable and discussable.

Innovation in four processes:

- **Standard engineering** (problem solving)
- **Invention** (requires deep knowledge)
- **Structural deepening** (bells, whistles, and reliability)
- **Bodies of** (General)**technology emerging** (new technologies, changing the economy)

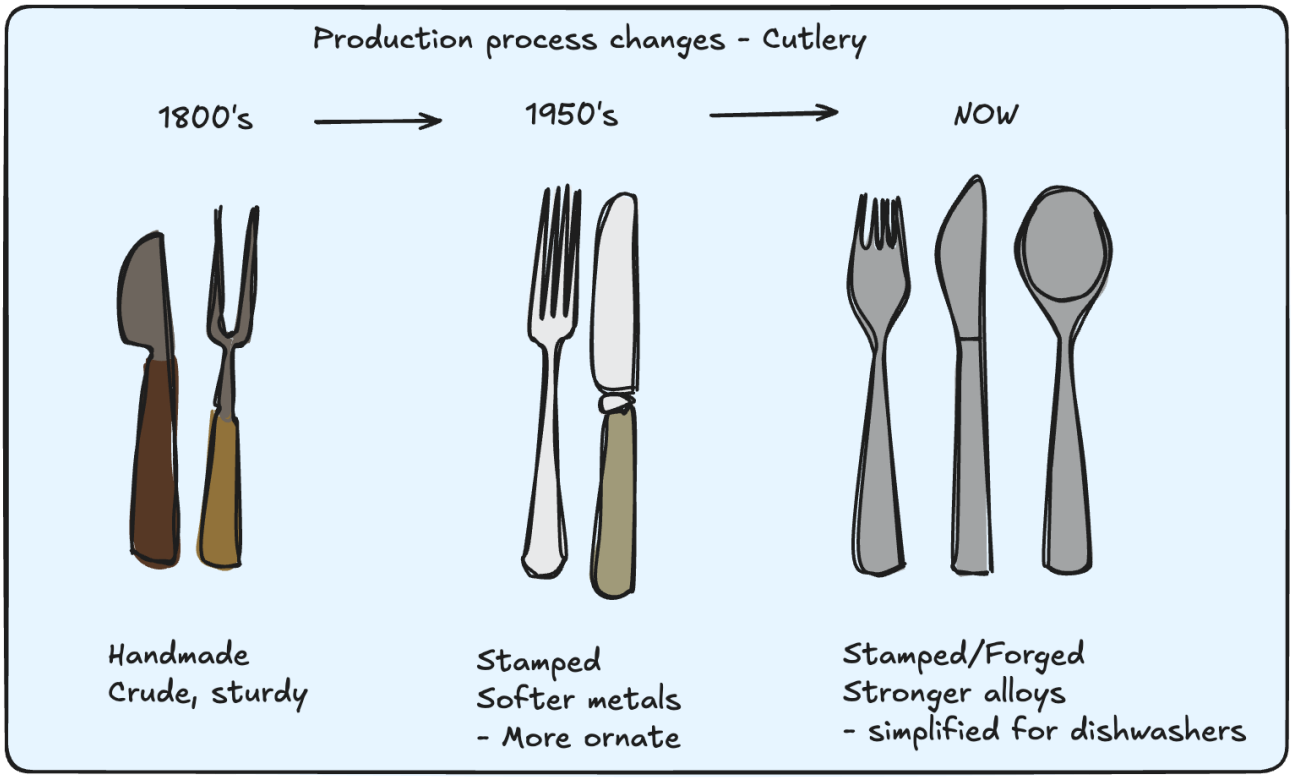
> *"Innovation is not mysterious, does not involve "creativity"*

Problem solving

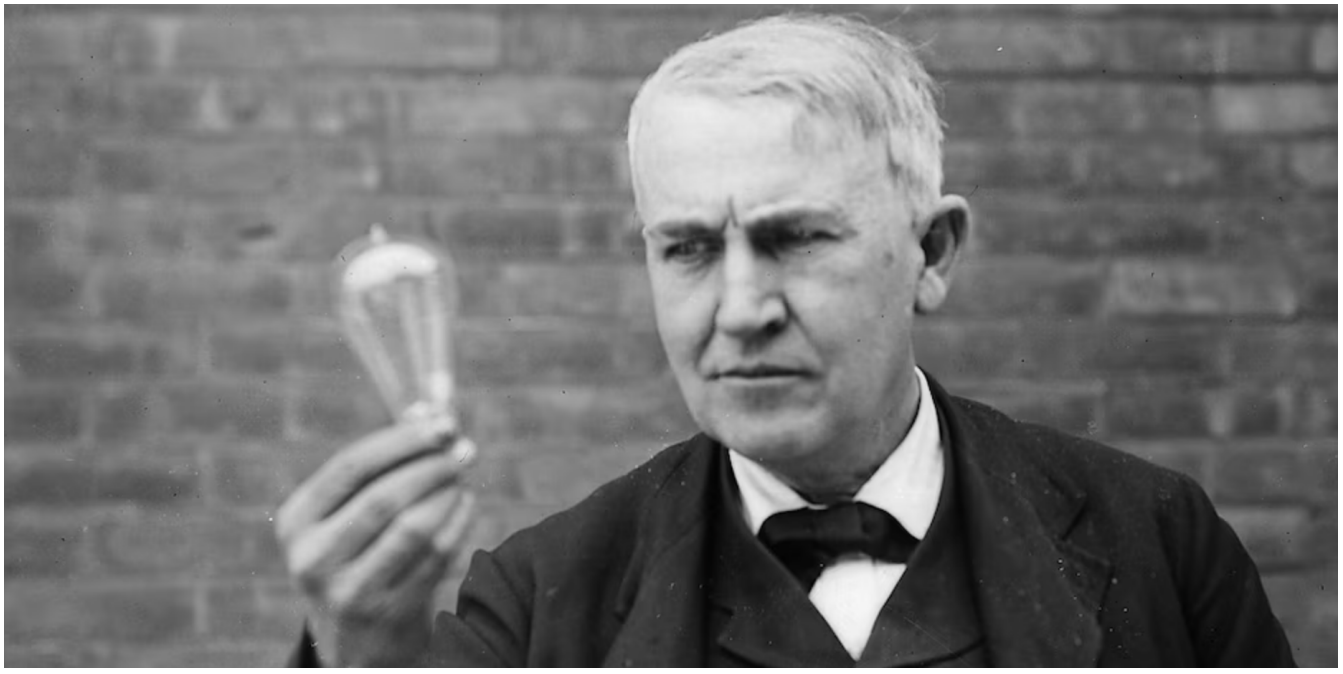
Technologies change over time:
Cutlery example:

- What has changed? - **The manufacturing process**
  - Moved from handmaking cutlery and tools, to production line

- Engineering - Use something, uncover errors, address error.



Invention - *is less inspiration than transpiration*



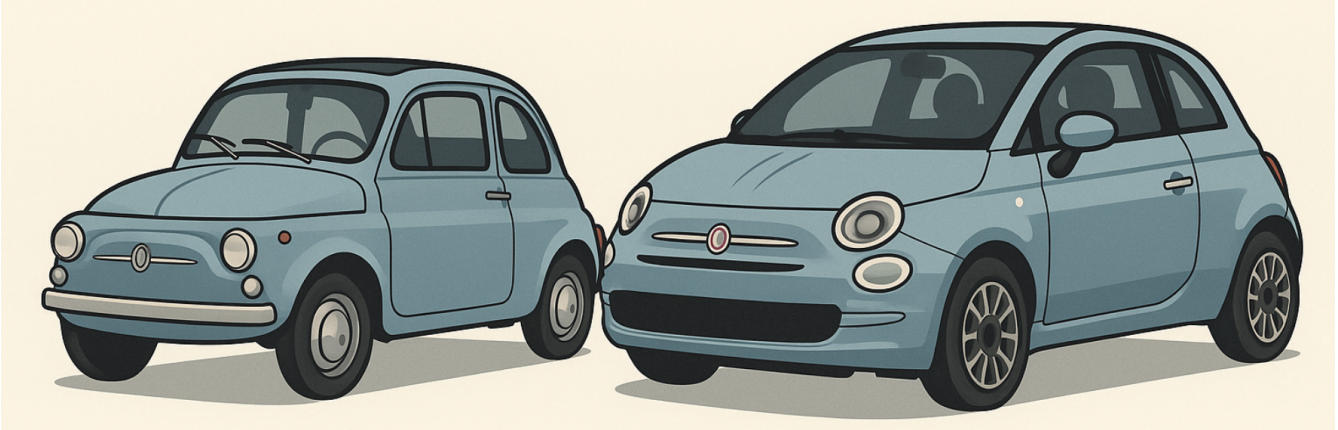
Thomas Edison did not simply stumble upon the invention of the light bulb, nor did he create it alone out of thin air.

- Edison led a large organization with multiple research teams working in laboratories.
- These teams conducted countless experiments, tested prototypes, and refined designs through trial and error.
- In developing the **light bulb**, they faced two main challenges:
  1. **Removing oxygen** from the bulb, since burning oxygen produced soot.
  2. **Finding a durable filament material** that could withstand electric current without breaking.
     - It is estimated that over 10,000 material combinations were tested before finding a viable solution.

This shows that invention is not a matter of sudden inspiration, but of systematic experimentation and perseverance. Edison's version of the electric light became the most **commercially practical solution**, which is why he is often credited as the inventor, even though the process was far more collective.

A similar parallel can be drawn with **Steve Jobs**, who is frequently credited with creating the first personal computer, despite the reality being the result of collaborative innovation.

Structural deepening



These two cars are both **Fiat 500s**:

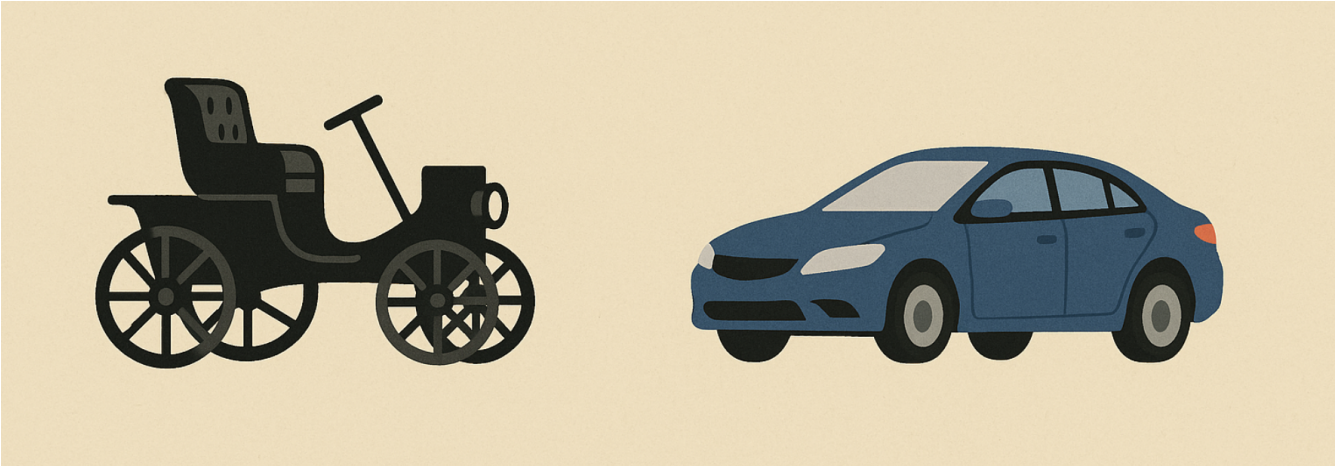
- **Left: 1964 model**
  - 500 cc engine
  - 4 wheels, seats for 4 people
  - Basic steering wheel, minimal safety features
  - Affordable and simple
- **Right: 2009 model**
  - Modernized with seatbelts, airbags, traction control, and hundreds of other safety innovations
  - More powerful and comfortable, with advanced engineering

  The concept *car* has changed drastically since the 60s, but they are both regarded as cars. Despite their dramatic differences in complexity and safety, **both count as just "one car" in Italy's export statistics.**

Emerging bodies of technology - *come in three stages*

> Sidenote: A general technology is a technology that can be applied in many settings. Computers, Telephones, electricity etc..

Substitution



Take a new technology and use it instead of what's there. The function stays the same, but the tool changes.

- **Horseless carriage → Cars**
  Early cars were literally called "horseless carriages." The car **substituted** the horse, but still fulfilled the same role: personal transportation.
- **Self-driving cars → Cars**
  Once self-driving cars become widespread, they'll just be considered "cars." The current model will likely be renamed "human-driven cars." The core function (getting from A to B) stays the same, only the technology shifts.
- **Virtual airport tower control → Airport control towers**
  Instead of physical towers at every airport, controllers can operate remotely using cameras, sensors, and data feeds. It's still air traffic control, but the **infrastructure is substituted**.
  You know you're in the substitution phase when the new technology looks like old technology.

Expansion

Technology gets better and cheaper, and is adopted by more people.

- **How?** By scaling production.
- **Ford Model T** → The first mass-produced car. Price dropped from **$800 to $260** over 15 years as production improved.
- **Chrysler Airflow (1934)** → Often seen as the first “modern car.”
- **Dominant design** → Over time, cars start to look and function alike; competition shifts from being “different” to being “the same, but better.”
- **Ecosystem development** → Cars need supporting infrastructure (roads, gas stations, repair shops), and even cultural elements like the Michelin Guide to help people travel.
    - Not cars, but transportation.

Structuration

Societies, organizations, and processes become dependent on the existence of a technology.

- **Sociological concept** → The availability of technology reshapes society, businesses, and how we think about things.
- **IKEA example**:
  - 1950s: IKEA pioneered the flat-pack model. Furniture was cheap, easy to transport, and customers assembled it themselves.
  - This logic worked for decades, relying on customers owning cars to transport flat-packs.
  - **Modern shift**: Many young people don't have cars. IKEA adapts by offering mail order, delivery, or alternative solutions.
- **Key point**: Businesses and cultures evolve around technology, and when the tech landscape changes, society must adapt.

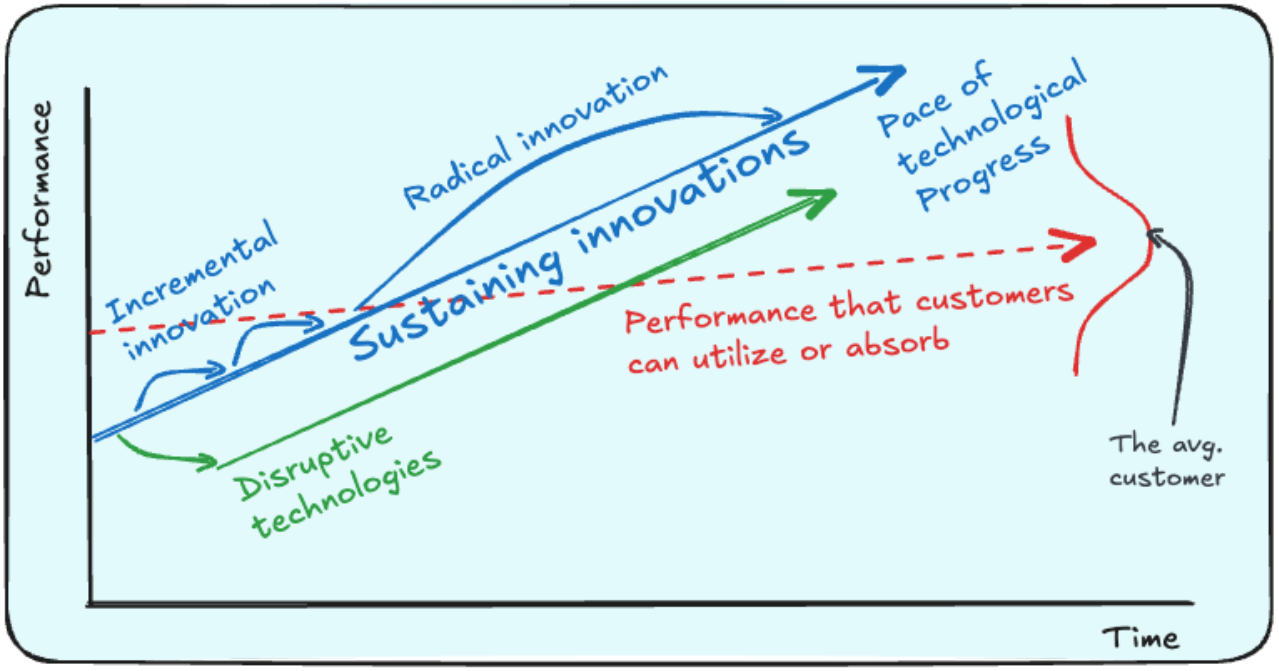
Architectural innovation

Phases of Technology

1. **Proprietary** – Controlled entirely by one company.
   - *Example: Apple* → Builds a closed ecosystem where hardware, software, and services are tightly integrated. Great user experience, but often at a premium price.
2. **Modularized** – Flexible systems where components can be mixed and matched.
   - *Example: Dell* → Popularized the model of customizing PCs with interchangeable parts.
3. **Commoditized** – Technology becomes standardized and so good that differences matter less.
   - *Example: Acer* → Consumers care less about brand or minor performance differences; cost and availability dominate.
4. **Ubiquitous** – Technology becomes a platform, available everywhere and used by everyone.
   - *Example: The internet, Wi-Fi, or smartphones.*
5. **Unnoticed** – The technology becomes invisible, taken for granted as part of everyday life.
   - *Example: Otis Elevators* → Elevators are everywhere, essential to modern buildings, but rarely thought about.

Disruptive innovation

- Clayton M. Christensen



- **Normal curve on the side** → Represents the normal distribution of customers. Most fall in the middle, wanting products that are "good enough," while only a few are at the extremes (demanding cutting-edge or satisfied with the very basic).
- **Pace of technological innovation** → Performance improves over time, moving from poor to excellent in steps:
  - **Incremental innovation** → Small, steady improvements.
  - **Radical innovation** → Large leaps forward.
  - Together, these are called **sustaining innovations**, since they build on and extend existing technologies.
- **Disruptive technologies** → Start as "worse" products in terms of raw performance, but are simpler, more accessible, and often cheaper.
  - They are not designed for the top-tier customer but for the **average consumer** (or entirely new users).
  - Most people don't need or use all the advanced functionality in high-end products.
  - Once the **pace of technological progress surpasses what the average customer demands**, the extra features become irrelevant, creating space for disruption.

Disruptive technologies come in, generally cheaper, at a worse stage, but gradually improves at the same pace of technological progress, and that technology can in time become the new standard.

Examples:

- Hydraulic excavators
- Cutters - Hairdresser
- https://www.youtube.com/watch?v=llam_24p5WQ

How to recognize a disruptive technology

- **Your best customers don't want it** → It starts in markets that established customers ignore.
- **It offers poorer performance** → At first, it's technically inferior compared to mainstream products.
- **If you did it, you would lose money** → It threatens existing profit models, so incumbents avoid it.

How to deal with disruptive innovations

- **Cannibalization** → Be willing to compete with and replace your own products before others do.
- **Value chain evolution** → Adapt your business processes and partnerships to fit the new technology.
- **Let the customer hire you** → Focus on the job customers actually need done, not just product features.
- **"Cheat"** → Success often comes from breaking old rules and finding unconventional solutions.