

Industry 4.0 & 5G

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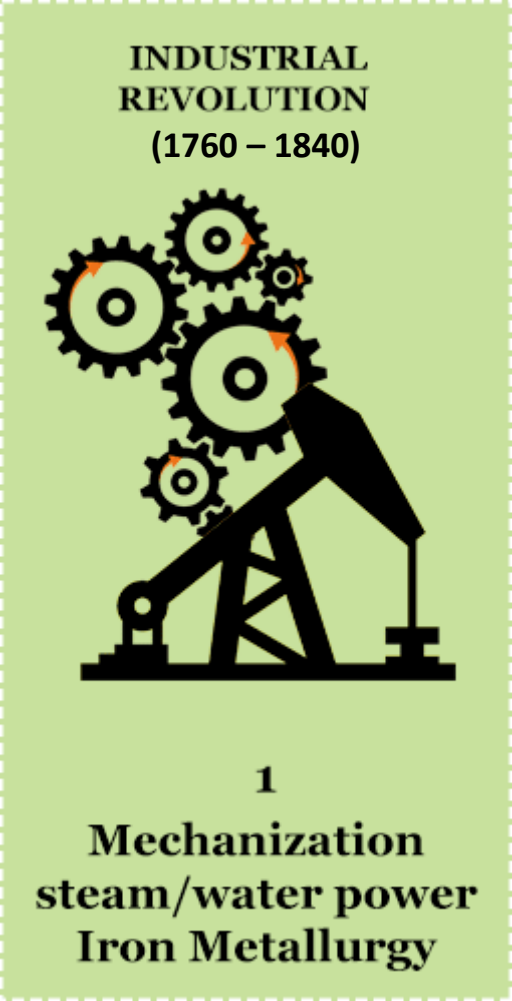
Industry 1.0: The first industrial revolution



Picture Source: Lanner

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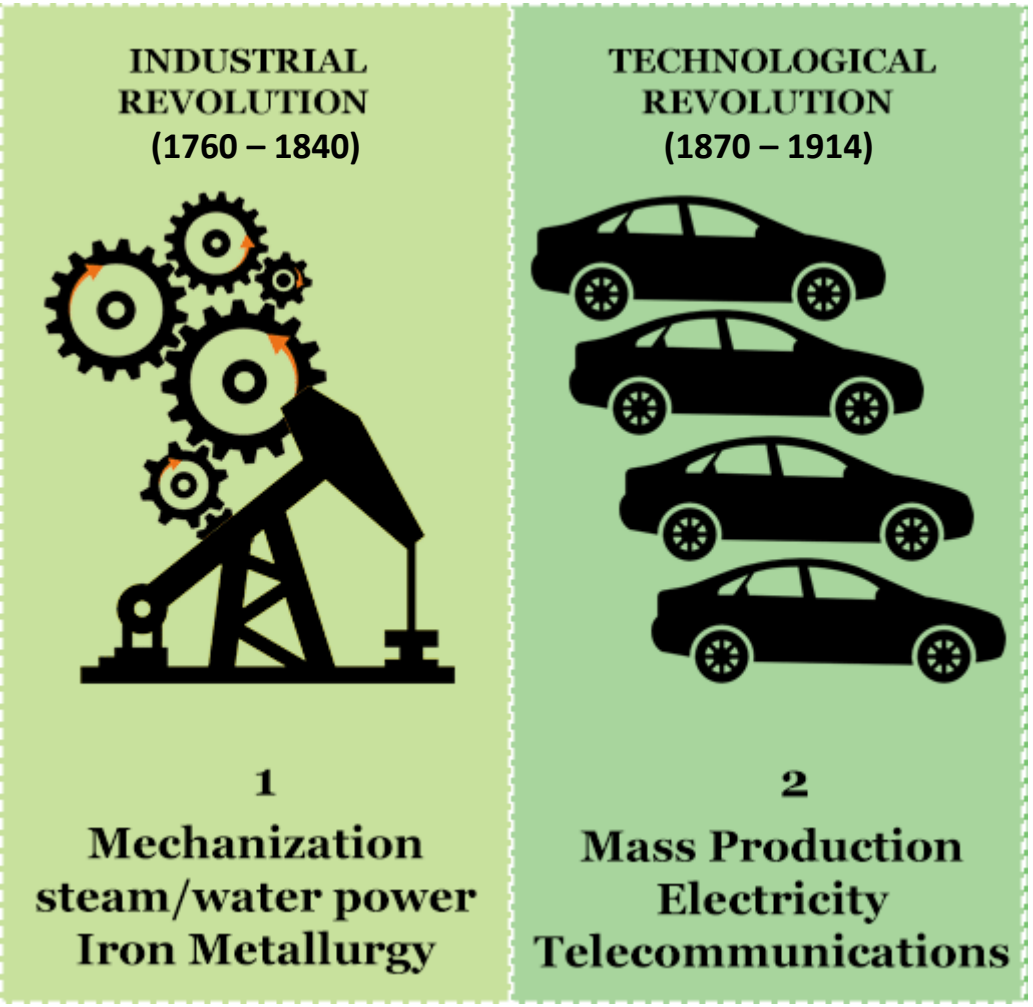
Industry 2.0: The Technological Revolution



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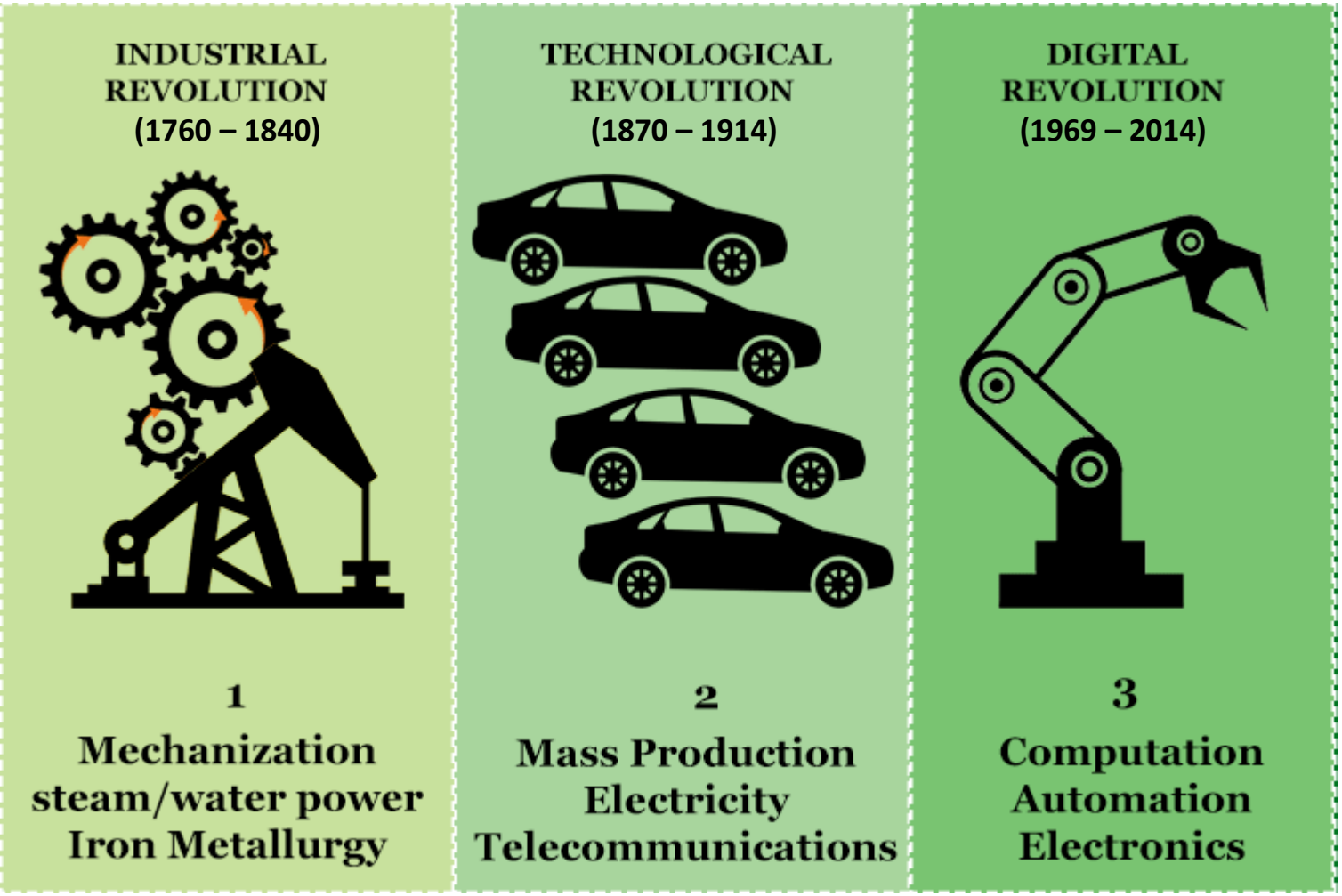
Industry 3.0: The Digital Revolution



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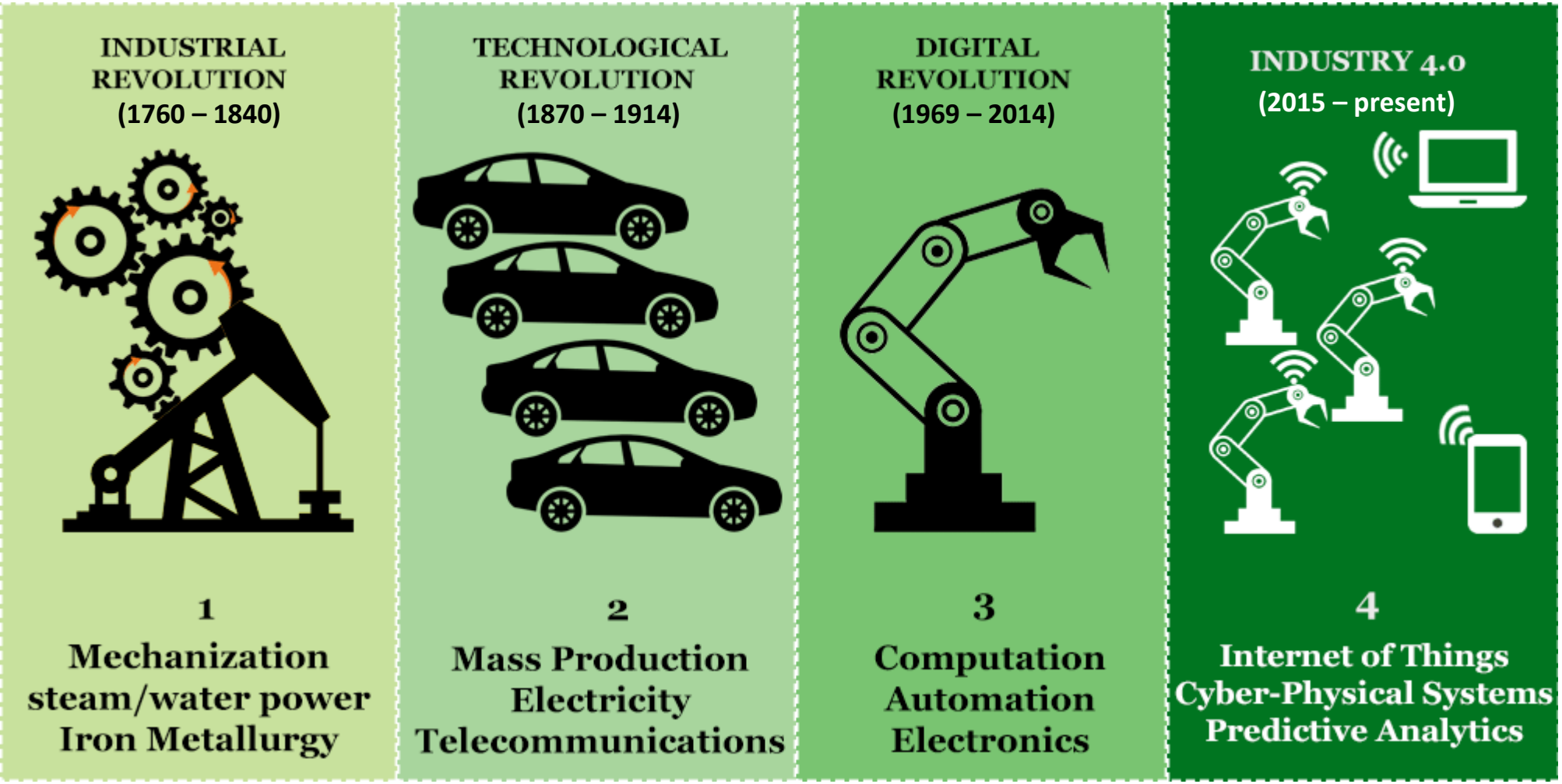
Industry 4.0: Transformative Technologies



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Let’s look at some basics

- The term "Industrie 4.0", shortened to I4.0 or simply I4, originated in 2011 from a project in the high-tech strategy of the German government, which promotes the computerization of manufacturing.
- There are four design principles in I4.0 as shown

Pic source: Seebo Blog

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IoT, IIoT and I4.0

Internet of Things (IoT)

- Pertains to consumer and commercial sector
- It can include everything from pet tracker to bin monitor to building temperature control systems to sensor enabled trucks to digital manufacturing control systems.

Industrial IoT

- Pertains to Industrial sector
- Enabling force for Industry 4.0: connecting our devices, our data, our machines, and our people to benefit our company and customers and manufacture the best possible product.

Industry 4.0

- Focuses primarily on the manufacturing sector
- Represents an integration of IoT and relevant physical technologies, including analytics, additive manufacturing, robotics, artificial, and cognitive intelligence.

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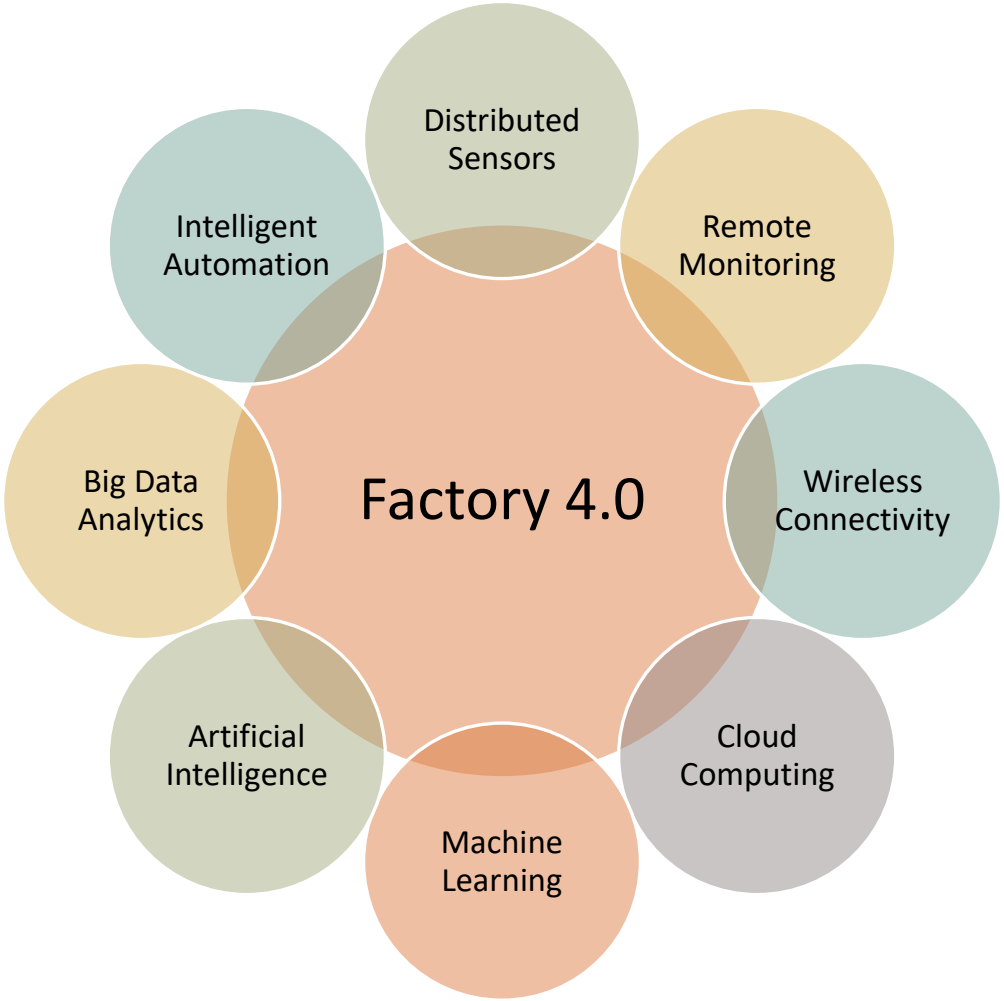
Factory 4.0

- The traditional manufacturing model is evolving into what is referred to as a "**Smart Factory**" or "**Factory 4.0**" – a connected system that links machinery, personnel, maintenance activity, and analytics for a completely integrated approach to factory management.
- Factory 4.0 leverages technologies and industry 4.0 components such as non-intrusive sensors, wireless connectivity, cloud computing, artificial intelligence, machine learning and others, to affect all phases of manufacturing business from raw materials processing, safety, and production, to quality assurance, packaging, and distribution.



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Port 4.0

Drones in Port Operation

Enabler for highly automated maintenance and operations

Hamburg Port Authority

Port operations „4.0“

- Real time status required
  - Fixed assets: buildings, quay walls, etc.
  - Mobile assets: buoys, ships, etc.
  - Traffic on land, water and rail
- Enabler for automation
- Enabler for predictive maintenance
- Enabler for new business models

Drone-Roadmap in port operations

Echo-sounding drones on water

- Real-time echo sounding of waterways
- AI to analyse raw data
- 5G-URLLC and 5G-eMBB

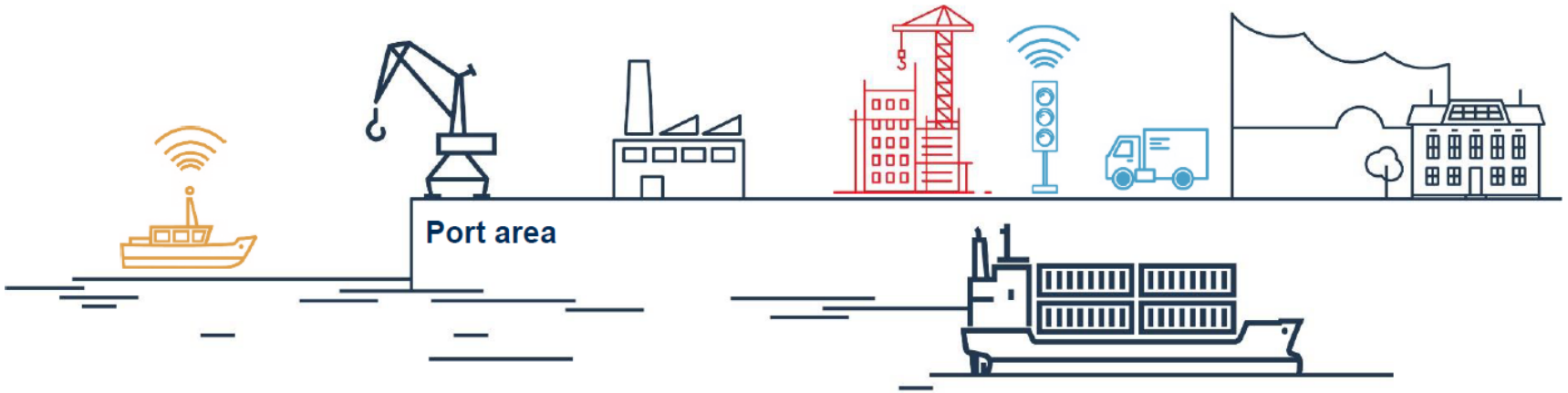
→ End-to-end process automation
→ Today: 3-5 days
→ 5G & Drones & AI: Minutes

Vision: Broaden use-case

Demand for similar use cases

- Bridges
- Quay walls
- Railways

→ Flying drones (Prototype today)
→ AI crucial to process data (Prototype today)
→ AI crucial to orchestrate „clouds of drones“
→ 5G eMBB & URLLC is foundation!



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Technologies of Industry 4.0

- Fundamental to Industry 4.0 are the sensors, devices and computers that are connected and communicate with one another to ultimately make decisions without human involvement.
- These are also referred to as Cyber-Physical Systems (CPS) and are integrations of computation, networking, and physical processes.

5G and Industry 4.0 | A Perfect Match

5G ACIA
5G Alliance for Connected Industries and Automation

5G will lift Industry 4.0 to the next level

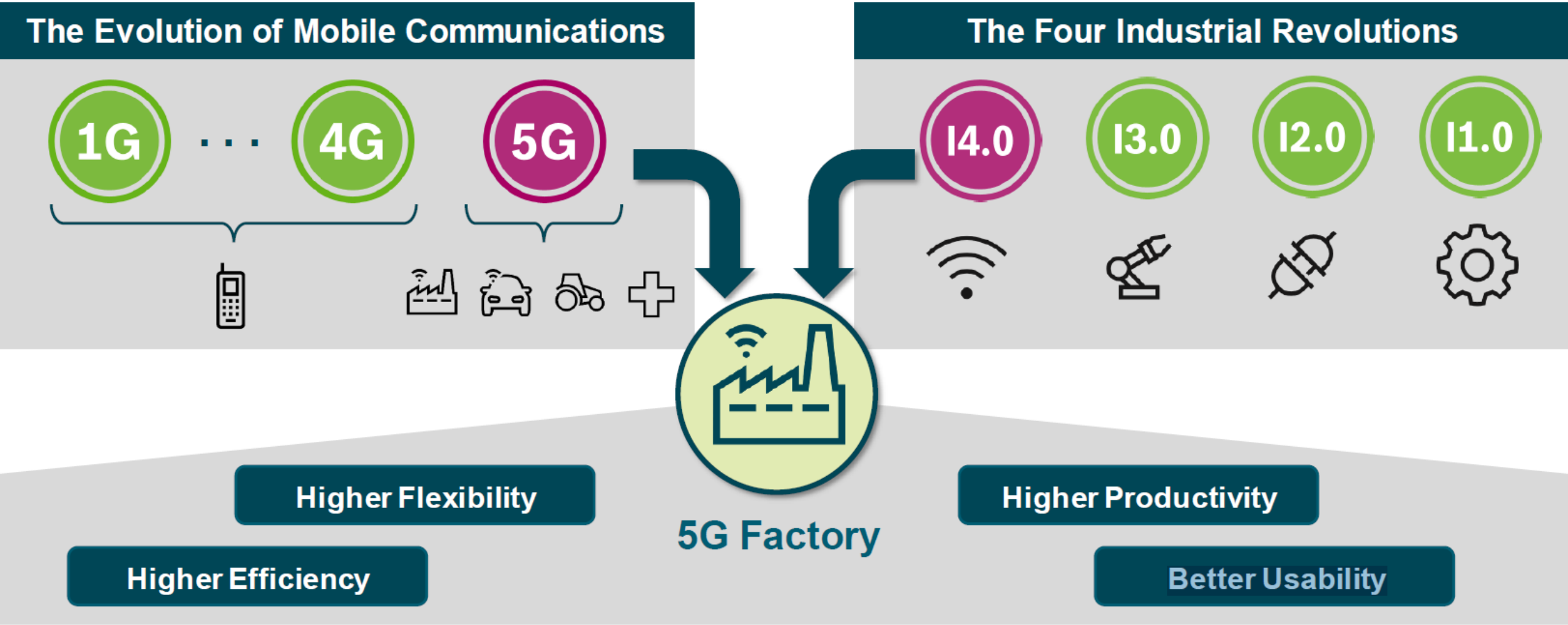
Industry 4.0 may become the killer application for 5G ☺!

Crucial factor for our economy & society!

Image: BOSCH

5G Alliance for Connected Industries and Automation

The Role of 5G for Industry 4.0



Further Reading and References

- Wikipedia: Industry 4.0 (link)
- Forbes: What is Industry 4.0? Here's A Super Easy Explanation For Anyone – Bernard Marr (link)
- Lanner: Industrial Automation (link)
- uBlox: The Role of 5G for Industry IoT, Trends & Use Cases – Sylvia Lu, 5G Techritory (link)
- Seebo Blog: IoT Design: Making Connected Products for Smart Manufacturing (link)
- Seebo: How Factory 4.0 is transforming production (link)
- 5G ACIA: 5G-ACIA brings 5G to Hannover Messe 2019 - Dr. Andreas Mueller, Bosch (link)
- 5G ACIA: 5G for Automation in Industry White Paper (link)
- 5G ACIA: 5G for Connected Industries and Automation, White Paper, 2nd Edition (link)

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