April 2025. Technological snapshot

Industry 4.0 in Catalonia

ACCIÓ Catalonia Trade & Investment

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Industry 4.0 in Catalonia. Technological snapshot.

ACCIÓ
Government of Catalonia

Carried out by
Strategy and Competitive Intelligence Unit of ACCIÓ

Barcelona, April 2025

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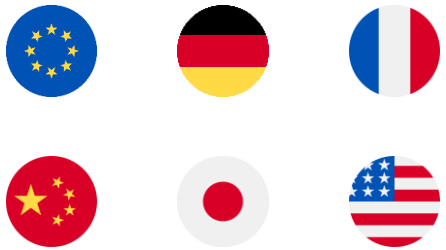
Executive summary: Industry 4.0 in the world

The term **Industry 4.0** refers to the convergence and application of technologies, digital technologies in particular, to transform the design, manufacturing, operation and service of production systems.

Technologies included in Industry 4.0

- Artificial Intelligence/Big Data
- Cybersecurity
- Quantum
- Cloud
- Immersive Technologies
- Chips and Semiconductors
- Simulation
- Internet of Things (IoT)
- DLT/Blockchain
- Supercomputing
- Additive Manufacturing
- Connectivity
- Robotics
- Photonics

Main countries and regions



Opportunities of Industry 4.0

- Increased efficiency, productivity, flexibility and agility
- Customized products and services
- More sustainable and circular industrial processes
- Improved workplace safety
- Increased communication and collaboration

Challenges of Industry 4.0

- Large-scale investment
- Talent, need for new skills and transformation of the way of working
- Data protection and privacy
- Integration, interoperability and standardization
- Cultural change

Executive summary: Industry 4.0 in Catalonia

1,447 companies in the Industry 4.0 ecosystem

30.2% more companies than in 2021.

€7.197 billion (**+29.3%**) in revenue, accounting for **2.6% of GDP** (up from 0.5% in 2019).

37,207 jobs (**+41.0%**).

Major developed technologies:

- Cybersecurity: **35.0%**
- Artificial Intelligence: **34.8%**
- Internet of Things: **23.5%**
- Cloud: **23.2%**
- Semiconductors: **12.9%**

Broad support ecosystem

Technology centers, research centers, support institutions, universities, business associations, professional associations, clusters and fairs and events

Leading technology hubs

106 of the 160 technology hubs are dedicated to Industry 4.0 technologies

Catalonia, industrial territory

National Pact for Industry to transform the Catalan industrial model

Industrial **revenue** amounting to €163.2 billion, 23.4% of Spain's total

90.4% of **exports** come from the manufacturing industry

Attracting leading industrial **investments**:

ACCIÓ promotes Industry 4.0

Projects incorporating 4.0 technologies:

1,399	Projects
€64.9 M	Funding
68.0%	Of the total ACCIÓ projects

2020-2024 Data

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1. Definition and applications of Industry 4.0

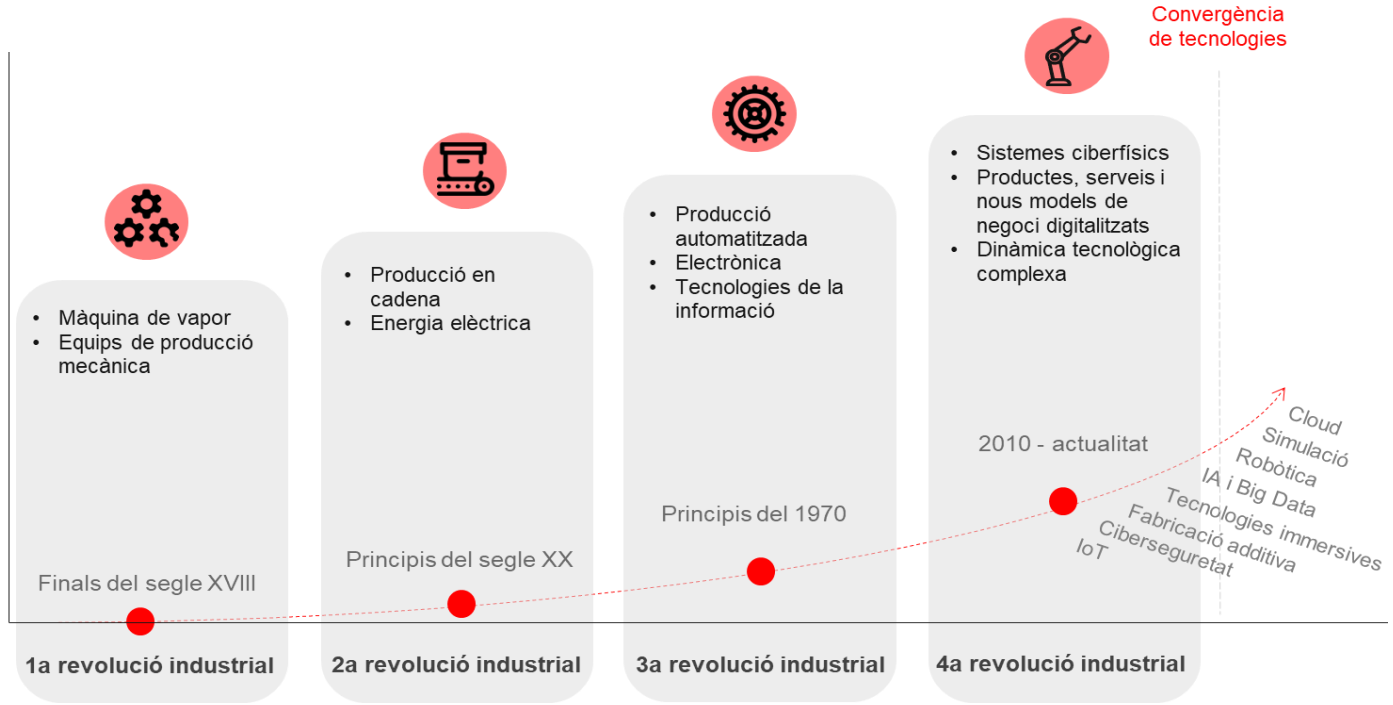
Definition of Industry 4.0

The term **Industry 4.0** refers to the convergence and application of technologies, digital technologies in particular, to transform the design, manufacturing, operation and service of production systems.

- The term was coined in 2011 by economist Klaus Schwab, founder of the World Economic Forum.
- The designation 4.0 means that this is the world's fourth industrial revolution, the successor to three previous industrial revolutions that brought about major changes in the productivity of the manufacturing industry.

"This Fourth Industrial Revolution is fundamentally different. It is characterized by a series of new technologies that are merging the physical, digital and biological worlds, impacting all disciplines, economies and industries, and even challenging ideas about what it means to be human."

Klaus Schwab



Source: own elaboration based on European Parliament, 2015 and WEF

Technologies included in Industry 4.0

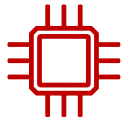
Artificial Intelligence/Big Data

Cybersecurity

Quantum

Cloud

Immersive technologies



Chips and Semiconductors

Simulation

Internet of Things (IoT)

DLT/Blockchain

Supercomputing

Additive Manufacturing

Connectivity

Robotics

Photonics

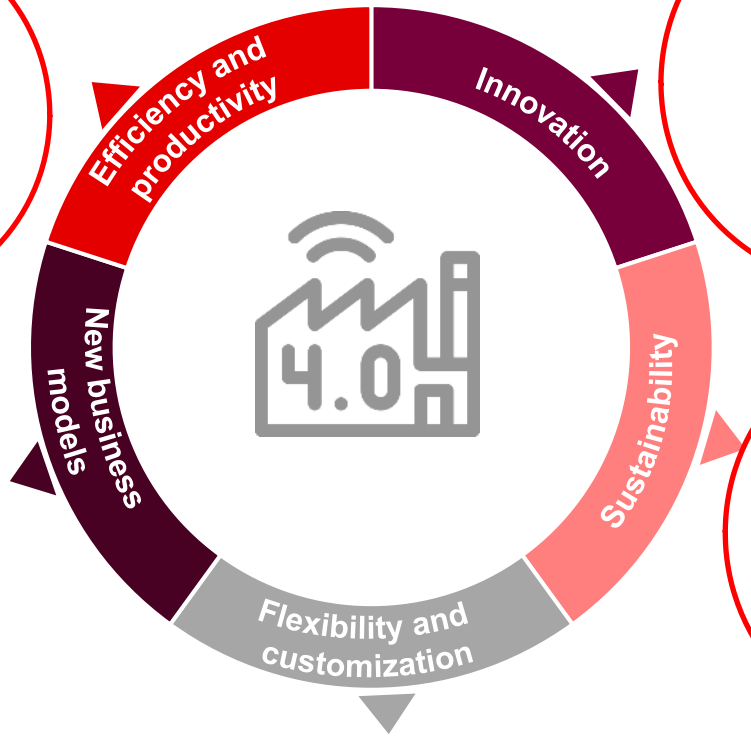
Note: Given their growing importance to the industry, chips and semiconductors, and supercomputing have been added since the last report.

Source: the authors

Importance of Industry 4.0

Process automation and optimization driven by Industry 4.0 technologies can help companies boost their efficiency and productivity.

Repetitive tasks or labor-intensive processes can be automated, minimizing errors and production stoppages.



Emerging and advanced technologies are driving innovation and research, allowing for the improvement of products and processes.

Industry 4.0 technologies are transcending the industrial framework and are being applied to other sectors such as health, agri-food, etc.

Industry 4.0 is creating new innovative business models. Companies can use data and analytics to create new services and new customer experiences, such as MaaS. New forms of partner and supplier collaboration are also being explored, such as the integration of supply chains and collaborative platforms.

More efficient and precise production reduces waste generation and optimizes the use of resources.

Technologies can more efficiently manage energy consumption and water, and in this way contribute to environmental sustainability.

Industry 4.0 makes production easier by tailoring to products and allowing companies to quickly adapt to specific customer demands. Production lines can be reconfigured to manufacture different products, thus improving market responsiveness.

Source: ACCIÓ based on McKinsey, Deloitte and IBM

2. Global market for Industry 4.0 technologies

Industry 4.0 technologies: Artificial Intelligence/Big Data

Artificial Intelligence (AI) is a machine's ability to exhibit abilities similar to human intelligence. AI combines computing, data processing and automatic knowledge management to solve complex problems, which make for very useful applications for predictions, optimization and automation.

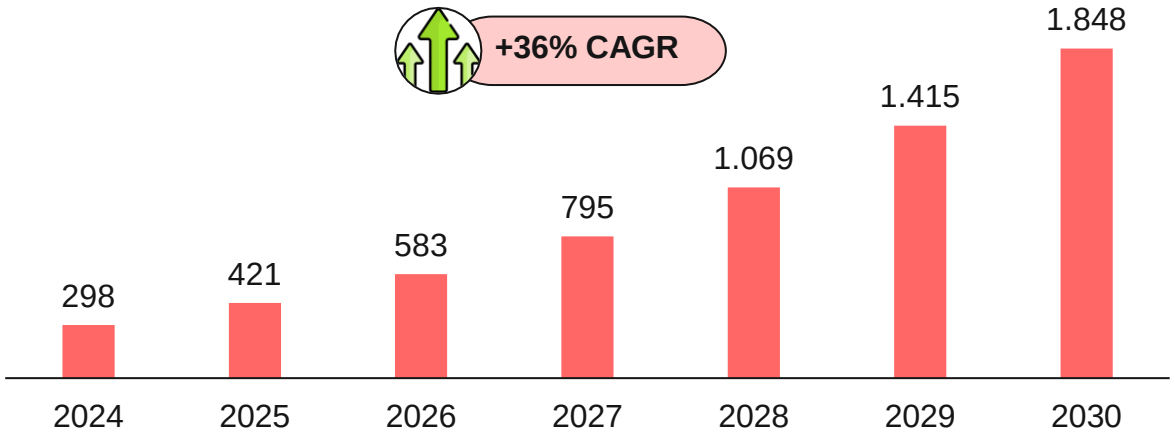
Big Data, the digital "fuel" of Industry 4.0: large databases to power AI.

Key to the Industry 4.0 and 5.0 revolutions.

North America is the leading region in the global AI market through 2030.

Cross-industry technology that impacts all sectors of economic activity with great short-term projection.

Global AI market size (billions of dollars)



Areas of technological specialization in AI/Big Data

- Computer Vision
- Green Algorithms
- Advanced Analytics
- Data Mining
- Data Centers
- Machine Learning
- Large Language Models
- Chatbots
- Natural Language Processing

Sources: Technological report "Artificial intelligence in Catalonia" (2024) and Statista

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Industry 4.0 technologies: Robotics

An **Industrial Robot** is a multi-purpose, reprogrammable, automatically controlled handler, programmable in three or more axes, which can be fixed in place or attached to a mobile platform for use in automation applications in an industrial environment. A **Service Robot** is one for personal or professional use that performs useful everyday tasks for people.

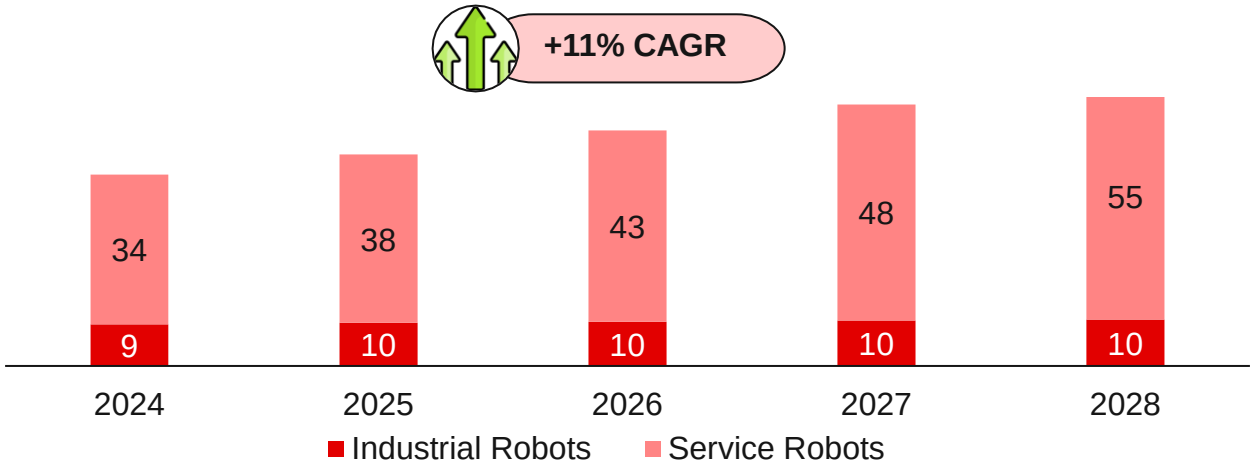
Global investment for better production and efficiency in multiple sectors.

Asia-Pacific is the world's leading region for industrial robots with China, Japan, South Korea and India at the forefront.

Implemented in industries that had not traditionally applied its benefits.

China is the leading country in industrial robots, with more than 276,000 installed, 51% of the world total.

Global Robotics market size, per business segment (billions of dollars)



Areas of technological specialization in Robotics

- Cyber Physical Systems
- Human Augmentation
- Hyperautomation-RPA
- Nanorobotics and Microrobotics
- Cobots
- Articulated Robots
- Cartesian Robots
- Protocol Robots
- Drones
- Service Robots

Sources: International Federation of Robotics, ISO, Tech Report "Robotics in Catalonia" (2020) and Statista

Industry 4.0 technologies: DLT/Blockchain

Blockchain was the first functional Distributed Ledger Technology (**DLT**) and is a distributed and decentralized database, formed by chains of blocks designed to remain unchanged once a piece of data has been published, through the use of digital time stamp and a link between one block and the previous one.

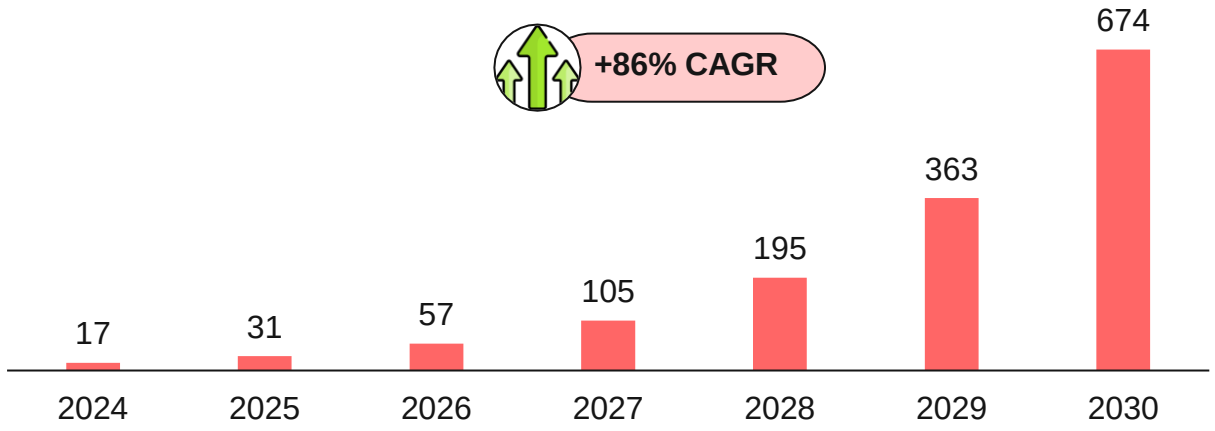
Increased venture capital and investment will mature the technology.

North America is the main region due to the large number of startups. It is followed by Europe and Asia-Pacific.

Applications in sectors such as banking, cybersecurity, government, health, communications, etc.

The infrastructure and protocol and public cloud segments dominate the market with over 60% share.

Global Blockchain market size (billions of dollars)



Areas of technological specialization in DLT/Blockchain

- Cryptocurrencies
- Smart Contracts
- Encryption Technology
- Encryption
- Asset Tokenization
- Non-fungible Token
- Distributed Ledger Technology
- Shared Notebooks

Sources: Tech Report "Blockchain in Catalonia" (2020) and Precedence Research

Industry 4.0 technologies: Supercomputing

Supercomputers, unlike conventional computers, use many central processing units (CPUs) which are organized into computing nodes. A scale-out supercomputer can have tens of thousands of nodes. The vast majority of modern installed computer systems cannot match the performance of supercomputers.

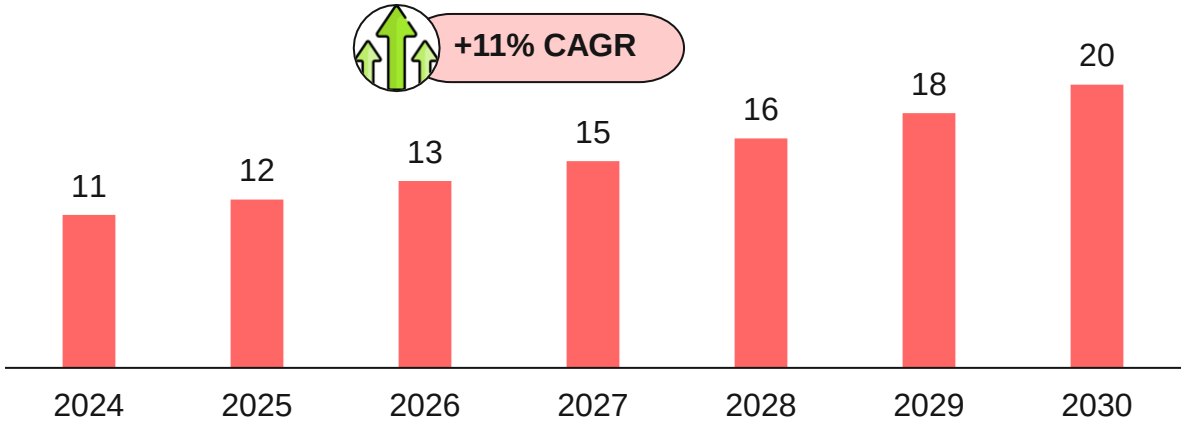
New digital technologies and the massive use of data are spurring the growth of supercomputing.

Asia-Pacific is the leading region in installed supercomputers and revenue, followed by North America and Europe.

Impact on strategic sectors such as defense and space, or in sectors such as health or mobility.

The global market is segmented into data centers, space and research centers, hospitals and laboratories, and government entities.

Global Supercomputing market size (billions of dollars)



Areas of technological specialization in Supercomputing

- High Performance Computing (HPC)
- Vector Processing Supercomputers
- Tightly Connected Cluster Computers
- Commodity Computers

Sources: ACCIÓ Technology Trends Target 2022-2025, Young Wonks and Precedence Research

Industry 4.0 technologies: Chips and Semiconductors

Semiconductors are materials that can control electric currents very precisely to provide **Chips** with the ability to process, store and transmit data.

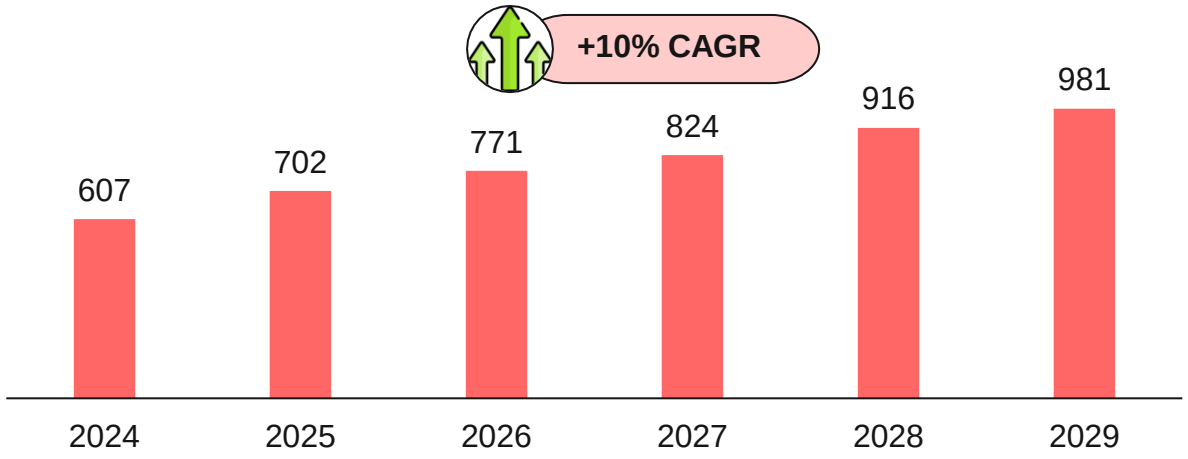
Essential to make the wave of transformational technologies possible in all areas: AI, 5G, IoT, etc.

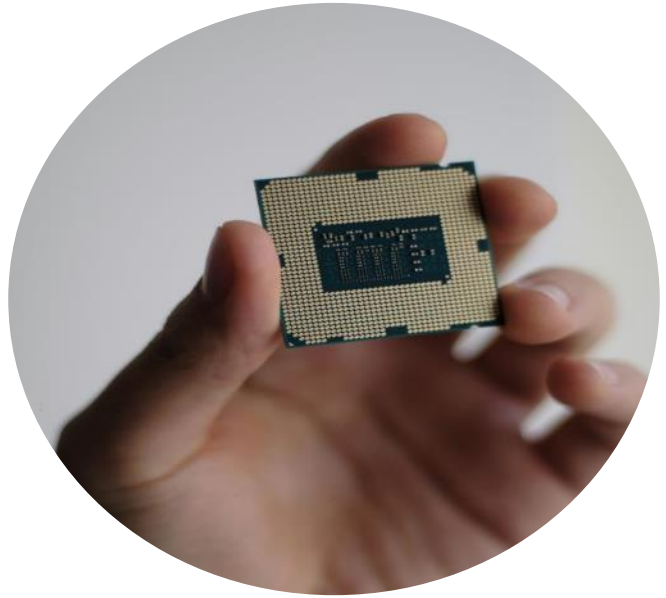
Asia leads the world in semiconductor manufacturing, with China-Taiwan, China and South Korea at the forefront.

Market sensitive to geopolitical conflicts. Complex supply chains and concentrated supply.

R&D+I and local production by the USA and Europe. Innovation in sustainability and efficiency.

Global Semiconductor market size (billions of dollars)





Areas of technological specialization in Chips and Semiconductors

- Logic Chips
- Memory Chips
- DAO Chips
- Photonic and Quantum Chips
- Inference Chips
- AI Chips
- Transistors
- Advanced Assembly

Sources: Tech Report "Semiconductors in Catalonia" (2024), Encyclopedia Britannica and Statista

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Industry 4.0 technologies: Photonics

Photonics is the branch of physics that studies the use of photons, which are the fundamental elements of light. It analyzes its generation, transmission, manipulation and interaction with matter.

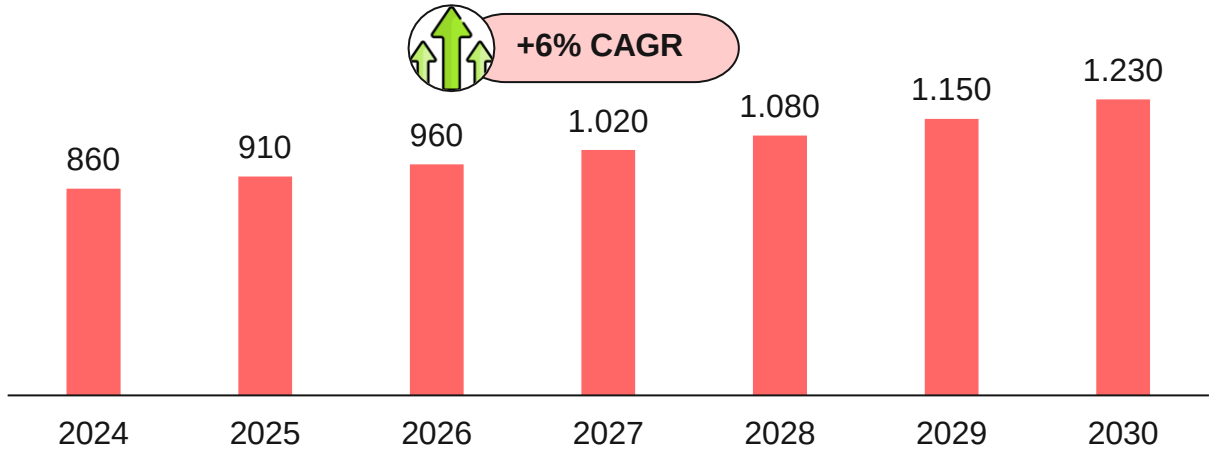
Its growth is thanks to its versatility and application in various fields. New applications and photonic chips.

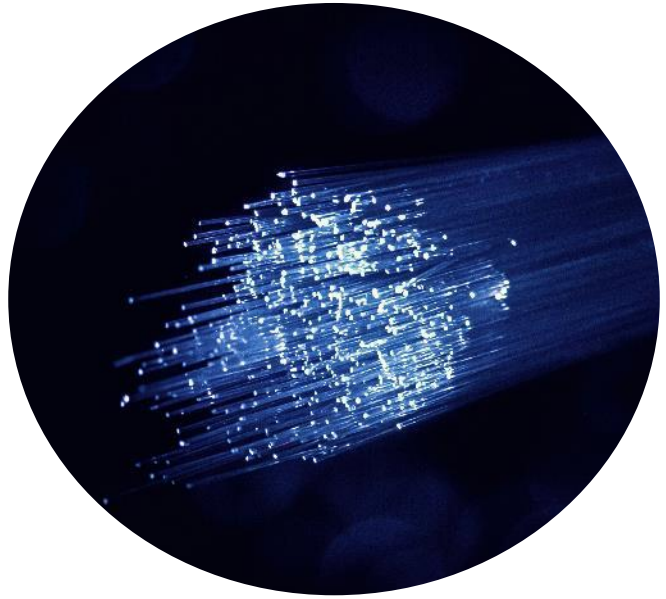
Market growth due to the high demand for data communication. Photonics promotes fast and reliable data exchange.

Growth in the use of photonic devices such as fiber optics, laser printers or metrology devices.

Asia-Pacific is the main growth region. China leads development and innovation.

Global Photonics market size (billions of dollars)





Areas of technological specialization in Photonics

- Fiber Optics
- Laser Diodes
- LED/OLED
- Ultraviolet Radiation
- X-Rays
- Biophotonics
- Reflexography
- Optical Computer

Sources: Tech Report "Photonics in Catalonia" (2022); Precedence Research

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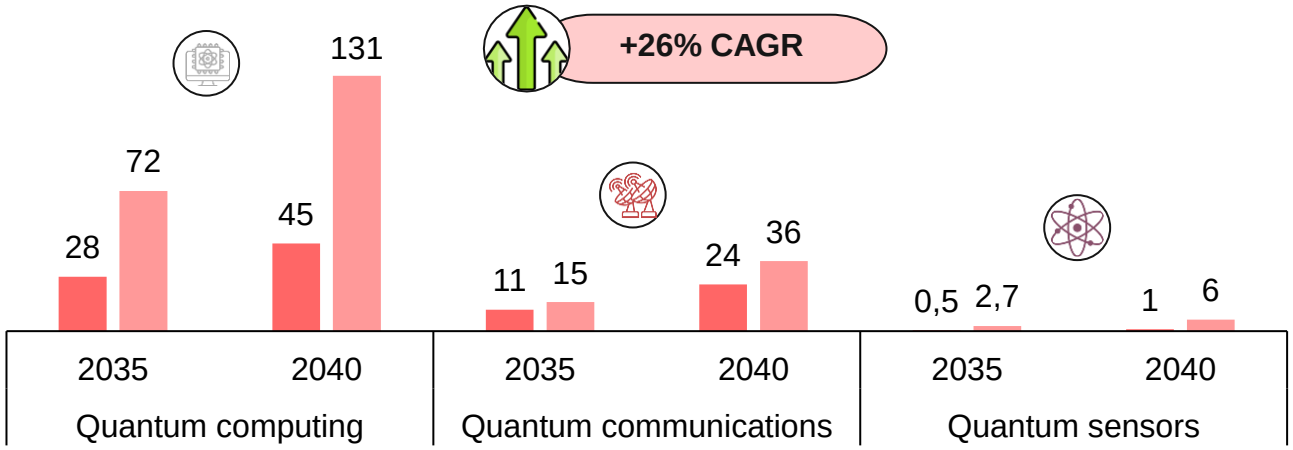
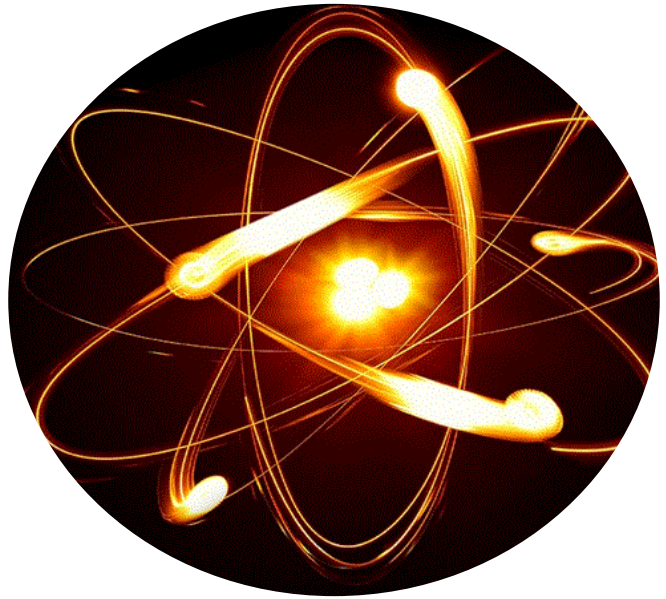
Industry 4.0 technologies: Quantum

Quantum Technologies (QT) are an emerging field of physics and engineering that encompasses technologies that are based on the properties of quantum mechanics, entanglement, superposition, and tunneling. Computing, sensors, cryptography, simulation, measurement and image generation are the applications with the most potential.

- Application in a wide variety of industries (mobility, chemical, pharmaceuticals, etc.) due to its high performance.
- Outstanding growth of quantum computing. Growing convergence with technologies such as AI.
- Europe stands out in QT research, Asia in patents and public funding and the US in startups and venture capital rounds.
- Widespread public investment in QTs due to their disruptive and innovative potential.

Global quantum technologies market size (billions of dollars)





Areas of technological specialization in Quantum

- Quantum Computing
- Quantum Algorithms
- Quantum Key Distribution (QKD)
- Quantum Sensors
- Quantum Random Number Generation (QRNG)
- Superconducting Quantum Computers

Sources: Tech Report "Quantum technologies in Catalonia" (2019), AWS Marketplace, Zion Market Research and McKinsey

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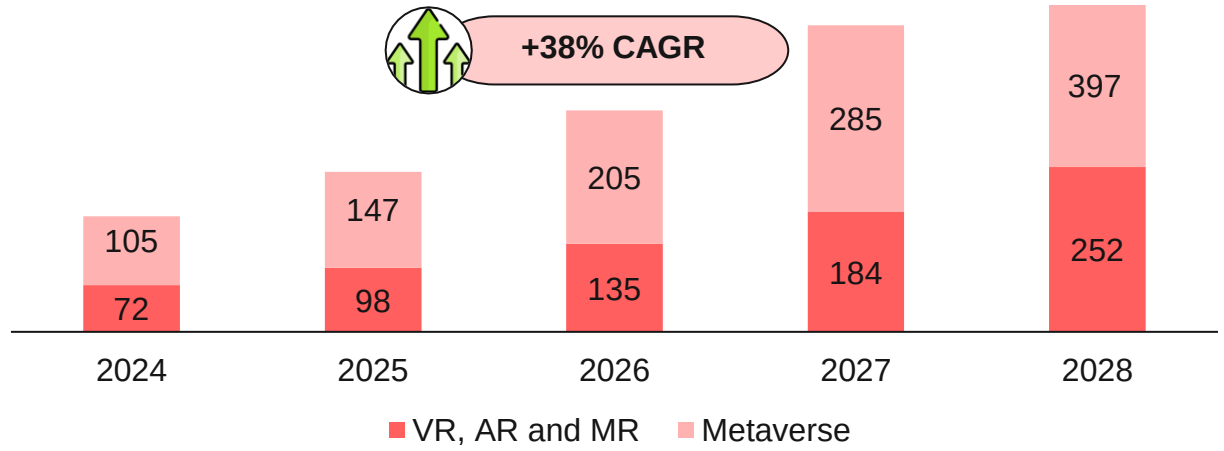
Industry 4.0 technologies: Immersive Technologies

Immersive Technologies build environments by merging the physical and virtual worlds to create a digital or simulated reality with a realistic setting that allows users to explore and interact in a new dimension. Highlighted technologies include **Virtual Reality** (digital environment that replaces the physical environment) and **Augmented Reality** (digital overlaid onto a real-time view of the physical environment).

- Growth of demand is paired to the development of the technology.
- The hybridization with other technologies, the rise of the digital economy or changes in social behavior are fostering the boom in immersive technologies.
- The United States, Europe and East Asia stand out as key technology hubs.
- They will represent a transformation in the way of training and working in industrial areas.

Global Immersive Technologies market size (billions of dollars)



Areas of technological specialization in Immersive Technologies

- Virtual Reality
- Augmented Reality
- Mixed Reality
- Extended Reality
- Metaverse
- Holography

Source: Tech Report "Immersive technologies in Catalonia" (2023)

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Industry 4.0 technologies: Additive Manufacturing

3D printing, also known as **Additive Manufacturing**, refers to a set of technologies that can create volumetric objects using digital models. Manufacturing is carried out with 3D printers which deposit the material, usually in layers, and consolidate it with different technologies until the end part is obtained.

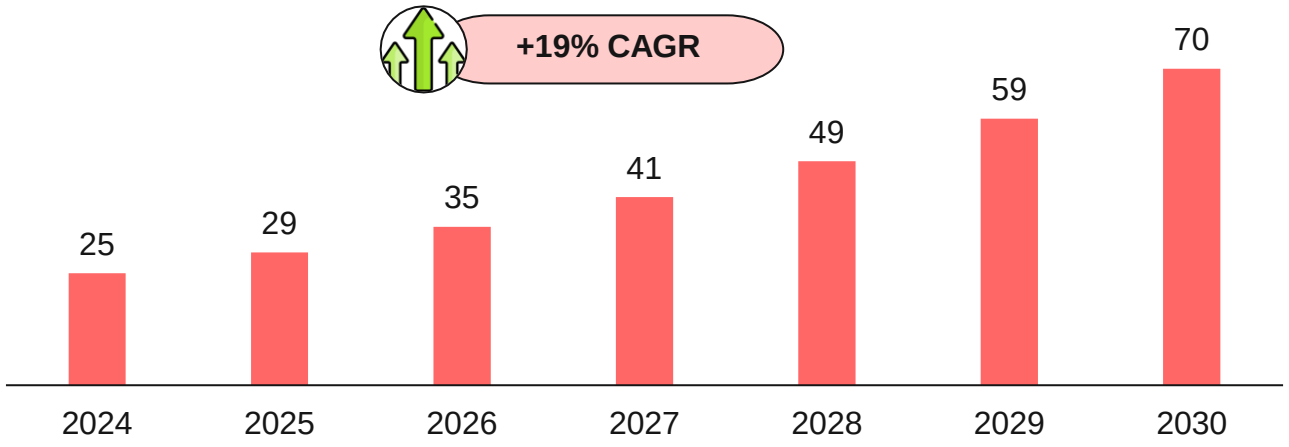
Technology with multiple applications in industry thanks to its versatility in areas such as prototyping.

North America is the world's leading region thanks to the rapid adoption of this technology.

It allows sustainable and local production with recycled materials and new properties.

It will contribute to GDP growth thanks to its ability to streamline production and reduce dependence on international supply chains.

Global Additive Manufacturing market size (billions of dollars)



Areas of technological specialization in Additive Manufacturing

- 4D printing
- Bioprinting
- Material Extrusion
- Binder Jetting
- VAT Photopolymerisation
- Material Jetting
- Powder Bed Fusion
- Sheet Lamination

Source: Tech report "3D printing in Catalonia" (2024)

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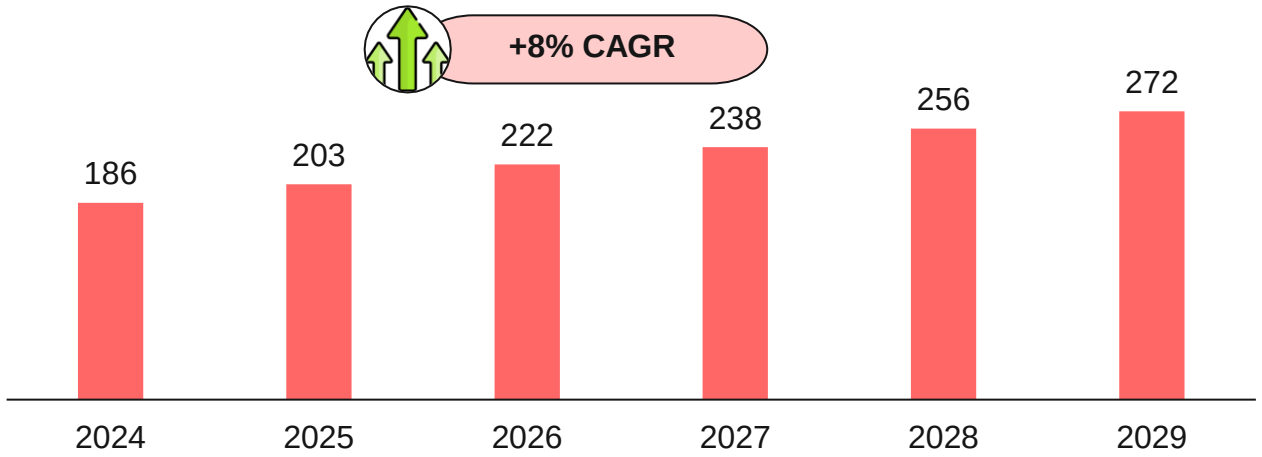
Industry 4.0 technologies: Cybersecurity

Cybersecurity is the set of physical, logical and governance measures that protect data properties and information systems. It consists of comprehensive and holistic threat management, spanning from identification to protective measures, detection of cyber-attacks, cyber-incident response and recovery.

- Increased demand due to the growth of digital technologies to deal with possible threats.
- It contributes to the full development of other innovative technologies, such as IoT, the connected vehicles, or e-commerce.
- Asia will be the region with the largest increase in revenue in cybersecurity, followed by Europe and North America.
- Cyber-securing AI and using AI in cybersecurity are fundamental actions for a secure cyber-future.

Global Cybersecurity market size (billions of dollars)



Areas of technological specialization in Cybersecurity

- Backup
- Firewall
- Data Analytics
- Identity Management
- Zero Trust
- Cybersecurity Mesh
- Anti-Malware
- Tokens
- One-Time Passwords (OTPs)

Source: Tech report "Cybersecurity in Catalonia" (2024)

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Industry 4.0 technologies: Cloud

Computer science in the **Cloud** is the provision of computing services (including servers, storage, databases, networks, software, analytics and intelligence) over the Internet ("the cloud") to offer faster innovation, flexible resources and economies of scale.

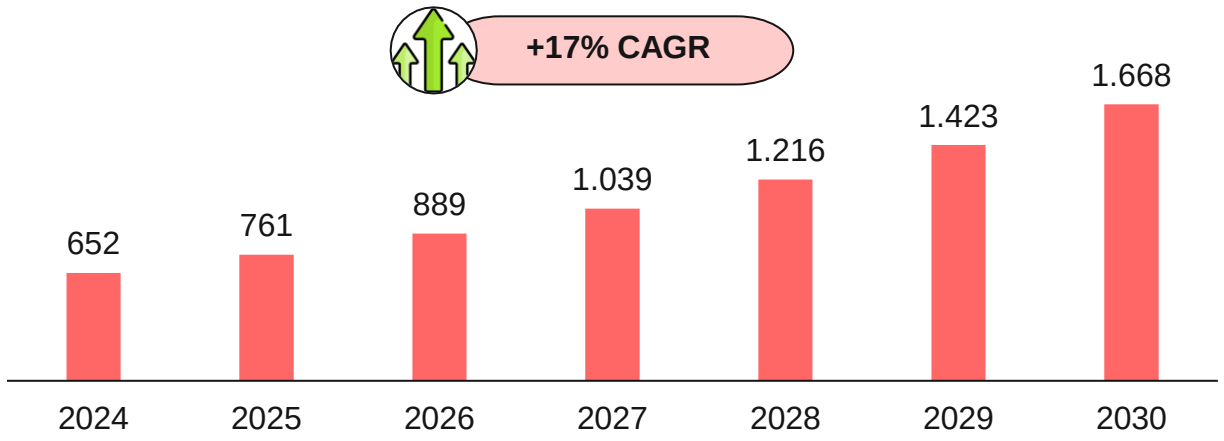
It allows the storage, location, availability, recovery and protection of data.

It helps optimize IT costs, eliminating spending on hardware and software, energy, infrastructure, maintenance, etc.

North America is the leading region in terms of revenue due to the rapid adoption of advanced technologies by different industrial sectors.

The growth of artificial intelligence and its rapid adoption in the cloud are spurring its growth globally.

Global Cloud Computing market size (billions of dollars)



Areas of technology specialization in Cloud

- Customer Relationship Management (CRM)
- Enterprise Resource Management (ERM)
- Online Archiving
- Cloud Connectivity
- Business Intelligence (BI) & Analytics
- Public Cloud
- Private Cloud
- Hybrid Cloud

Sources: Microsoft and Precedence Research

Industry 4.0 technologies: Internet of Things (IoT)

The **Internet of Things** (IoT) is the digital interconnection of objects in different areas that allows for comprehensive control over the status of the object based on the analysis of data they have collected. Integrated computing enriches the different devices that are interconnected with each other.

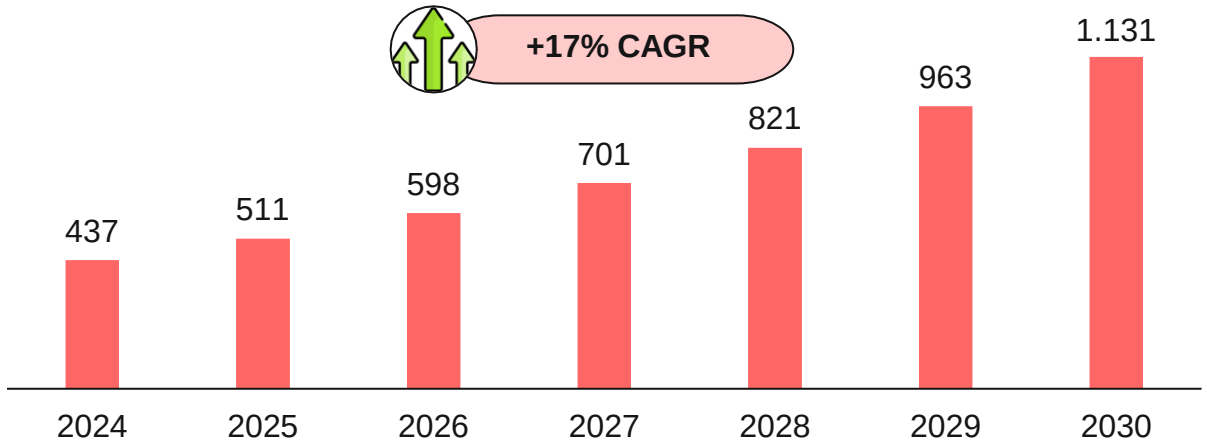
Industrial Internet of Things (IIoT) encompasses the use of smart sensors, actuators, and other devices to improve manufacturing and industrial processes.

Technology that facilitates the obtaining of real-time data and the implementation of predictive maintenance systems.

North America leads in market share, but Asia-Pacific is expected to grow at a faster rate.

Application in many sectors such as in the field of production (smart factory), mobility (smart city), the habitat (smart home), etc.

Global IoT market size (billions of dollars)



Areas of technological specialization in IoT

- Smart Thermostats
- Radio Frequency Identification Tags
- Connected Sensors and Actuators
- Predictive Maintenance Monitors
- Biometric Sensors
- Stock Monitoring Systems

Sources: Tech Report "The Internet of Things in Catalonia" (2023), Precedence Research and TechTarget

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Industry 4.0 technologies: Connectivity

Connectivity encompasses digital networks, from mobile and fixed structures to the Internet, including cables and satellites. Network connectivity allows various parts of a specific network to connect to each other through switches, gateways, and routers. This connectivity is crucial because it facilitates the connection between computers or devices.

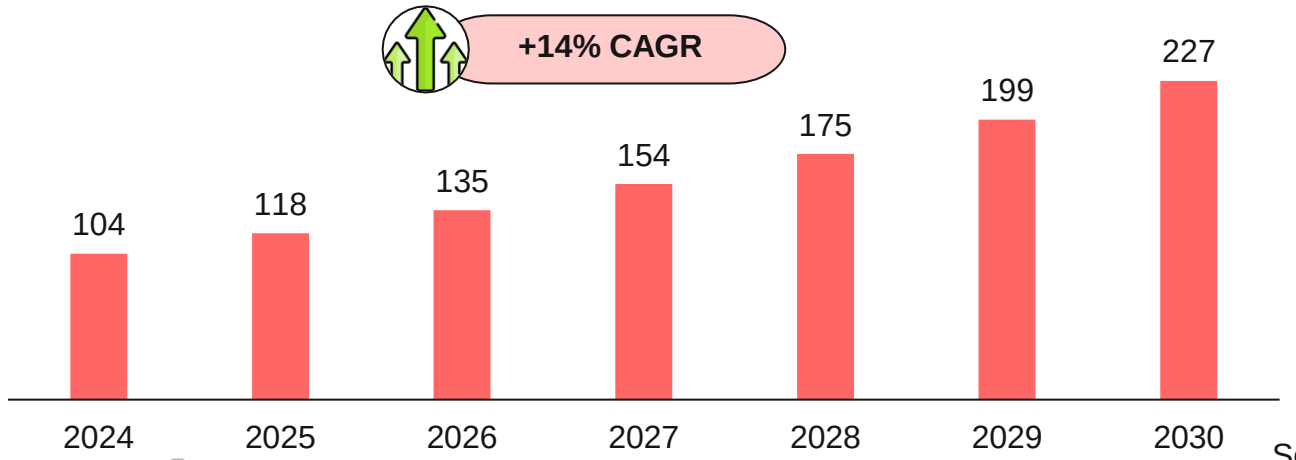
Cross-industry technology that impacts all sectors of the economy and enables the full deployment and potential of other digital technologies.

Asia-Pacific is the world's leading region in wireless connectivity, and North America will have the fastest growth in the coming years.

Connectivity, especially wireless, is becoming increasingly important due to the rapid adoption of 5G and IoT.

Demand from consumer electronics and automotive, among other industries, is driving growth.

Global Connectivity market size (billions of dollars)



Areas of technological specialization in Connectivity

- 5G and 6G Networks
- Fixed LAN/WLAN Networks
- Routing Information Protocol (RIP)
- Internet Protocol (IP)
- Interior Gateway Protocol (IGP)
- Wi-Fi Network

Sources: European Commission, Precedence Research and NordVPN

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Industry 4.0 technologies: Simulation

Digital simulation consists of the digitized representation of an object or system designed to accurately reflect a physical object. Although it is assimilated to a **Digital Twin**, the latter is a more precise digital ecosystem (it can simulate more than one system at a time) that is updated based on real-time data obtained through sensors installed in the object (there is a constant data flow between the physical object and the digital twin).

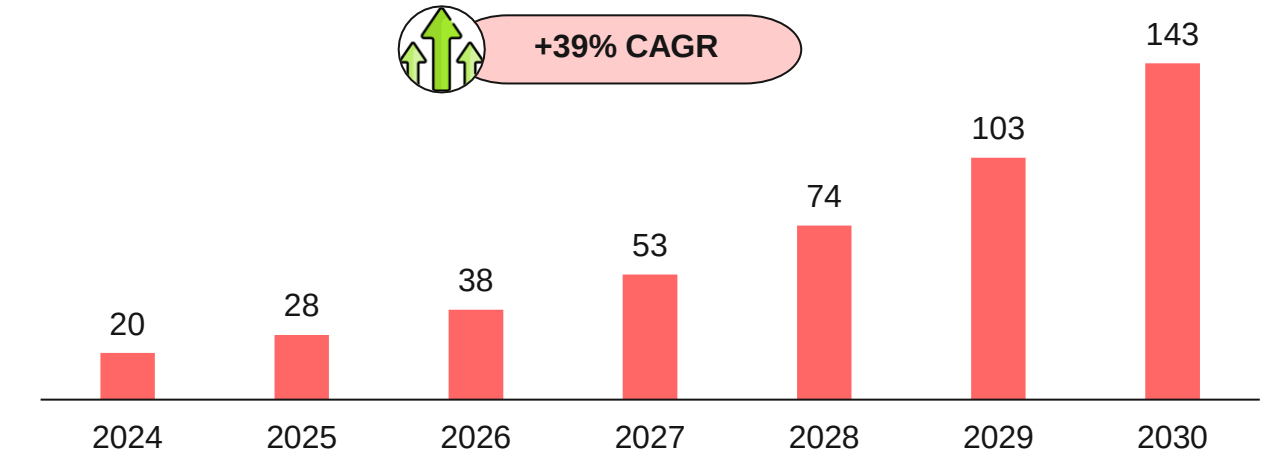
Technology with great potential in industrial processes to design products and simulate systems and situations.

Asia-Pacific is positioned as the leading region with the largest share of the digital twin's market.

Technologies such as AI, IoT or Cloud Computing are driving the growth of Digital Simulation.

The automotive and transportation industry is the main industry spending on digital twins.

Global Digital Twins market size (billions of dollars)



Areas of technological specialization in Simulation

- Component Twinning
- Asset Twinning
- System Twinning
- Process Twinning
- Virtual Industrialization

Sources: IBM and Precedence Research

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3. Policies and strategies to support Industry 4.0

Countries with policies on industry 4.0

The world's major manufacturing powers have launched initiatives to promote the digital transformation of manufacturing processes.

Germany – Industry 4.0 (2013)

This program aims to create smart factories and innovative manufacturing centers across the country. The strategy represents a paradigm shift from centralized manufacturing to decentralized smart manufacturing and production.

France – New Industrial France (2013)

This policy outlines plans for 34 new industrial projects in a variety of industries such as factories of the future, smart textiles, green chemistry and biofuels, cloud computing, nanoelectronics, augmented reality, robotics and connected devices, among others.

China – Made in China 2025 (2015)

The aim is to create 40 manufacturing innovation centers by 2025. Priority areas include automated and robotic machinery, advanced information technology, vehicles powered by alternative energies and new materials, among others.

Japan – Society 5.0 (2016)

This social transformation plan focuses on developing solutions in the areas of IoT, artificial intelligence, cyber-physical systems, additive manufacturing, vehicles powered by alternative energies, robots, virtual and augmented reality, and data analysis.

United States – Manufacturing USA (2016)

The strategy is expected to result in 45 innovation centers across the country to develop smart manufacturing technologies. Some of the prioritized areas include additive manufacturing, lightweight materials manufacturing, and the development of integrated photonics.

Source: Statista

EU programs and policies driving Industry 4.0

Programs

Horizon Europe

Research and innovation framework program for the 2021-2027 period with three pillars, the second of which seeks to enhance European industrial technological capabilities.

Next Generation

Post-pandemic recovery package aimed at making EU economies greener, more digital and more resilient.

European Digital Programme

The aim is to accelerate the digitalization of industries and SMEs, contributing to the development of Industry 4.0.

Policies

EU Digital Strategy

Promotes a digital economy based on privacy, transparency and security. The strategy encompasses the creation of digital infrastructures, such as 5G networks and cloud computing, which are essential for Industry 4.0.

Net-Zero Industry Act

Initiative derived from the European Green Deal that aims to increase the manufacturing of clean technologies in the EU to 40% of deployment needs by 2030.

AI Act

Regulatory framework to guarantee ethical and safe use of artificial intelligence. This includes regulations that directly impact industrial sectors that use AI and that encourage responsible innovation within Industry 4.0.

Cluster policy

The EU promotes industrial clusters to encourage collaboration between companies, universities and research centers. This is key for collaborative innovation and for the implementation of Industry 4.0 technologies.

Other relevant initiatives

Digital Compass | **European Chips Act** | **Critical Raw Materials Act** | **IPCEI** | **InvestAI**

Source: the authors

Support programs for industrial companies in Spain

The “Industria Conectada 4.0 [Connected Industry 4.0]” strategy establishes programs to promote the digital transformation of industry.

HADA - Herramienta de Autodiagnóstico Digital Avanzada

Advanced Digital Self-Diagnostics Tool, an online application which allows companies to evaluate their **digital maturity** and the **impact of Industry 4.0 enablers**.

ACTIVA Startups

Support for the **collaboration between emerging companies and established companies** to promote innovation and business growth.

DIH – Digital Innovation Hubs

Financing to SMEs to receive advice and support in innovation for the **implementation of disruptive digital technologies**.

ACTIVA Industria 4.0

Program that offers **advice** to industrial SMEs for their **digital transformation**.

ACTIVA Ciberseguridad

Consulting program that offers an **analysis of the company's current cybersecurity situation**.

ACTIVA Financiación

Grants for financing **digital transformation projects and environmental sustainability** of industrial companies.

ACTIVA Crecimiento

Consulting focused on one of the areas of **company growth**: innovation, human resources, operations, digitalization, marketing and commercialization and finance.

Connected Industry 4.0 - Support programs

(industriaconectada40.gob.es)

Source: Ministry of Industry and Tourism of Spain

4. Impact of Industry 4.0 on SDGs

Industry 4.0 and Sustainable Development Goals

17. Partnership for the goals
16. Peace, justice and strong institutions
15. Terrestrial life
14. Marine life
13. Climate action
12. Responsible consumption and production
11. Sustainable cities and communities
10. Reduction of inequalities
9. Industry, innovation, and infrastructures
8. Decent work and economic growth
7. Clean and affordable energy
6. Clean water and sanitation
5. Gender equality
4. Quality education
3. Health and wellness
2. Zero hunger
1. End of poverty

Source: the authors

5. Opportunities, challenges and trends in Industry 4.0

Opportunities and challenges of Industry 4.0

Opportunities

- Increased efficiency, productivity, flexibility and agility
- Customized products and services
- More sustainable and circular industrial processes
- Improved workplace safety
- Increased communication and collaboration

Challenges

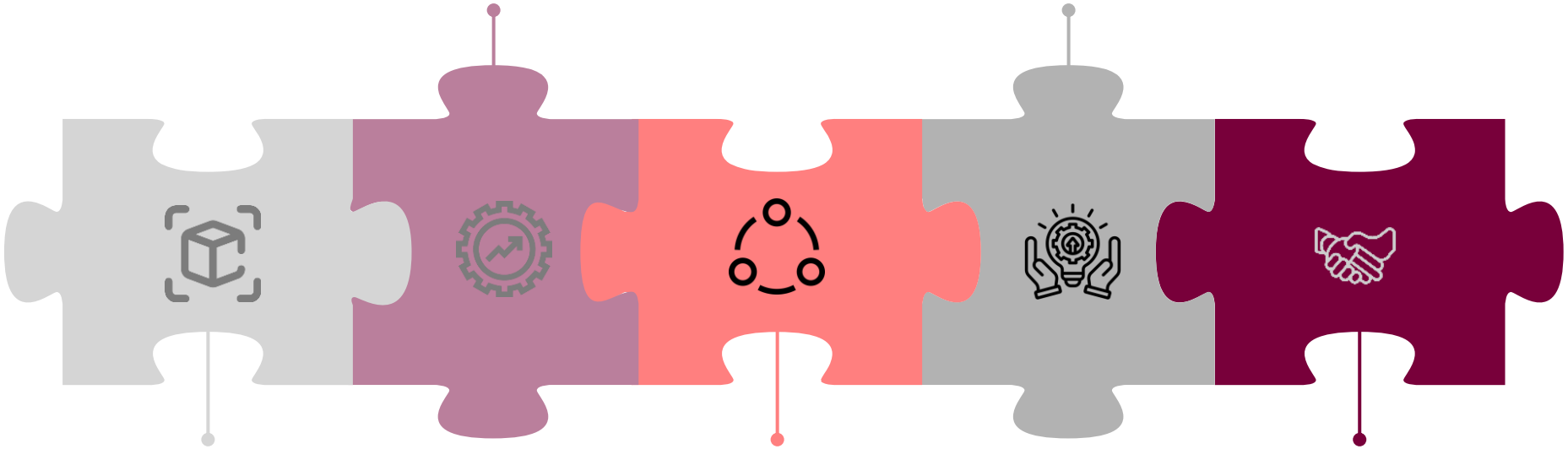
- Large-scale investment
- Talent, need for new skills and transformation of the way of working
- Data protection and privacy
- Integration, interoperability and standardization
- Cultural change

Source: the authors based on OECD, SAP, Sciencedirect and the World Manufacturing Foundation

Trends in Industry 4.0

From efficiency to optimization

From elitist technology to democratization



From automation to augmentation

From individual factories to connected ecosystems

From manual handling to human-machine collaboration

Source: the authors based on Oracle, PwC Report on Industry 4.0, McKinsey and JRC

6. Industry 4.0 in Catalonia

Business mapping of Industry 4.0 in Catalonia

1,447 companies

+30.2%[1]

7.197 billion euros

+29.3%[1]

37,203 jobs

+41.0%[1]

90.1% are SMEs.

56.5% bill over one million euros and **22.6%** bill over 10 million euros.

27.5% are less than 10 years old.

14.0% are startups.

36.8% are exporters.

16.9% are foreign subsidiaries.

By **technologies**, the key ones are:

Cybersecurity	**35.0%**	
Artificial intelligence	**34.8%**	
Internet of Things	**23.5%**	
Cloud	**23.2%**	
Semiconductors	**12.9%**	

[1] growth in comparison to mapping data from 2021.

Note: the companies in the mapping are part of the offer of Industry 4.0 technologies and can be classified into more than one technology. The company data refers to 2025; the revenue and number of employees data, to 2023 (or latest available).

Source: ACCIÓ

ACCIÓ Catalonia Trade & Investment

Generalitat de Catalunya
Government of Catalonia

CataloniaConnects

Business mapping of Industry 4.0 in Catalonia, by technologies

Cybersecurity

esprinet · Grupo Eulen · Ingram · inetum · DELL Technologies · ayesa · Logicalis · oesia · akcent · sopra steria · V-Valley · redtrust

AI/Big Data

NTT DATA · Schneider Electric · Mecalux · IBM · SAP · Minsait · gmv · AIS Group · Microsoft · Seidor · Dribia · stratesys

Internet of Things

cellnex · TD Synnex · Schaeffler · simon · Circutor · Bosch · idneo · elektra catalunya · Weidmüller · Worldline · World Sensing · Fractus

Cloud

Microsoft · amazon · Google · it now · Oracle · Atos · T-Systems · Equinix · evolutio · TEN Technip Energies · CGI · Beyondsoft

Chips and Semiconductors

Lear Corporation · Arrow · Johnson Controls · Giesecke+Devrient Creating Confidence · Avnet Silica · JBC · E·G·O · EBV Elektronik · eurocir · TEF · DigiProces · draco systems

Robotics

ABB · Siemens · Tavil · Fanuc · Salto · Festo · Kuka · Stäubli · Yaskawa · PAL · Theker · Universal Robots

Connectivity

Telefónica · orange · cellnex · vodafone · MASMOVIL · Huawei · parlem telecom · DIGI · ADTEL · Ericsson · neutroon · Saima Systems

Photonics

Recam Laser · Sensofar · monocrom · SICK · Optral · IPG Photonics · Inoxlaser S.L. · IRIS · fablaser · Bitmakers · Laser Goded · Motocono

Additive Manufacturing

HP · Jabil Packaging Solutions · EPSON · Renishaw apply innovation · Hyperion Materials & Technologies · BCN3D · stratasys · intermaher · AMES Sintered Metallic Components · CAF Projectes, S.L. · Ineo · Xcelencia Tech

Simulation

SEAT S.A. · HEXAGON · Dassault Systèmes · inprocess · ABGAM · Autodesk · ARKANCE · ESSS · Holo-Factory · Construsoft · Avantek · intemic

Immersive Technologies

EPSON · PICO · invelon · innovae · Pixel Dreams · Wideum · Yoy · Two Reality · mentor-vr · Aumenta Solutions · Futura VR Studio · Tekniker

DLT/Blockchain

SNGULAR · Signaturit Group · Validated ID · Entorno Digital · FlexVPC · finboot · Blue Room Innovation · Vottun · eersyst · BIGLE · Zertifier · Blocktac

Quantum

ayesa · Kilimanjaro · Arquimea · LuxQuanta · Quside · Infineon · Entanglement Partners_> · IBM · Radiantis · sener · Fujitsu · Keysight

Supercomputing

HPC Now! · Microsoft · intel · IBM · neutroon · beast · Mitiga · NEXTMOL · EAS · Nearby Computing · NVIDIA · UniSCool

Engineering/Integrator

TRIGO · Airplan · TYLin · elmec · ePLAN electric P8 · NGNY Devices · ITALDESIGN · Tectrol · EDAG · ACK Logic · Dominion · Sisteplant

Note: partial illustrative image

Source: ACCIÓ

ACCIÓ Catalonia Trade & Investment

Generalitat de Catalunya Government of Catalonia

CataloniaConnects

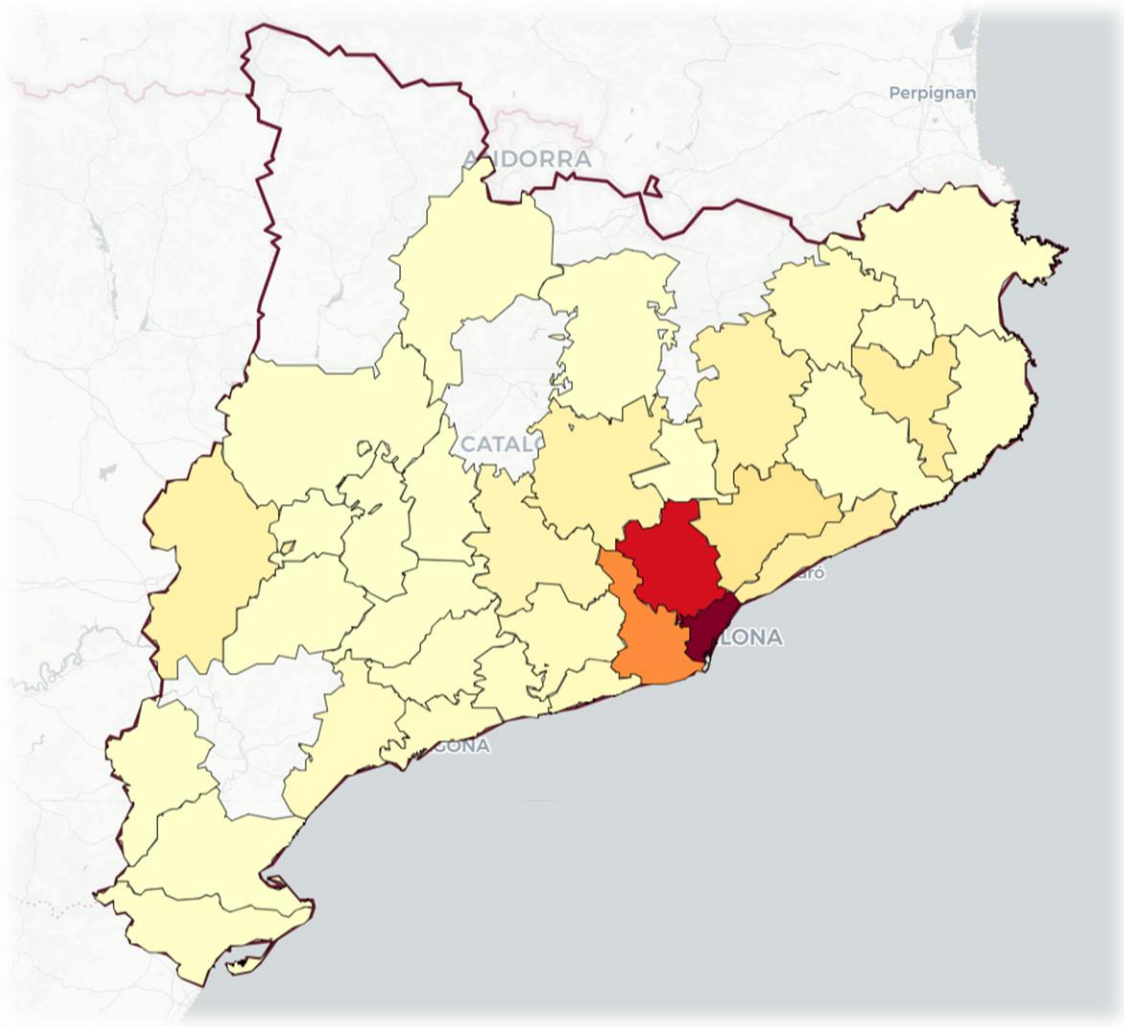
Mapping of Industry 4.0 companies in Catalonia

- Most companies offering Industry 4.0 technological solution in Catalonia are located in the **Barcelona area** and the **Barcelona Metropolitan Area**.

- **By county,** the following stand out: **Barcelonès** (with **49.3%** of the total number of companies), **Vallès Occidental** (**17.0%**), **Baix Llobregat** (**10.5%**), and **Vallès Oriental** (**3.7%**).

- **By municipality,** the following stand out: Barcelona (with **648** companies), Sant Cugat del Vallès (**67**), Terrassa (**36**) and Hospitalet de Llobregat (**36**), Sabadell (**30**), Lleida (**27**) and Cerdanyola del Valles (**27**), Girona (**26**), Badalona (**23**), Cornellà de Llobregat (**20**), Castelldefels (**17**), Igualada (**16**) and Rubí (**16**), and Mataró (**15**).

County	Number of companies	% of the total
Barcelonès	713	49.3%
Vallès Occidental	246	17.0%
Baix Llobregat	152	10.5%
Vallès Oriental	53	3.7%
Gironès	41	2.8%
Maresme	37	2.6%
Segrià	28	1.9%
Bages	28	1.9%
Osona	27	1.9%
Others	122	8.4%
Total	**1,447**	**100%**



Source: ACCIÓ

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Generalitat de Catalunya
Government of Catalonia

CataloniaConnects

Research institutes and technology centers of the Industry 4.0 ecosystem in Catalonia

Cybersecurity

AI/Big Data

Internet of Things

Cloud

Chips and Semiconductors

Robotics

Connectivity

Photonics

Additive Manufacturing

Simulation

Immersive Technologies

DLT/Blockchain

Quantum

Supercomputing

Note: partial illustrative image

Source: ACCIÓ

The Industry 4.0 support ecosystem in Catalonia

Support institutions

DIH4CAT Digital Innovation Hub de Catalunya
DCA Digital Catalonia Alliance
Digital Impulse Hub
Barcelona Activa
DFACTORY BARCELONA
IAM3DHUB
Consell General de Cambres de Catalunya
tecnio Associació
CERCA Centres de Recerca de Catalunya
CIDAI Centre of Innovation for Data tech and Artificial Intelligence
avançsa
ICF Institut Català de Finances
ACCIÓ Catalonia Trade & Investment
Generalitat de Catalunya Departament d'Empresa i Treball Secretaria de Polítiques Digitals
Generalitat de Catalunya
Generalitat de Catalunya Centre de Telecomunicacions i Tecnologies de la Informació
AGÈNCIA DE CIBERSEGURETAT DE CATALUNYA

Universities and networks

UAB Universitat Autònoma de Barcelona
Universitat de Barcelona
Universitat de Girona
Universitat de Lleida
UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH
upf. Universitat Pompeu Fabra Barcelona
UOC Universitat Oberta de Catalunya
Universitat Rovira i Virgili
UVIC UNIVERSITAT DE VIC UNIVERSITAT CENTRAL DE CATALUNYA
UNIVERSITAT RAMON LLULL
XARXA RDI·IA
XaRFA
X4HPC
Fablabs.io

Clusters

Clúster Digital
CEEC Clúster de l'Energia Eficient de Catalunya
in-move
CICAT CLÚSTER DE ILUMINACIÓN DE CATALUÑA
Clúster Mav
FEMAC.CAT
LIGHT MOBILITY CLUSTER
PACKAGING CLUSTER
SMARTECH CLUSTER
secpho

Business associations

AER automation
amec
Ametic
cecot reimpulsem l'empresa
aseit Associació TIC catalana
Tech Barcelona
Foment del Treball Nacional
pimec
SINERGIA
Fundació per la Indústria
Secartys
cequip
ASCICAT
CERCLE TECNOLÒGIC

Professional associations

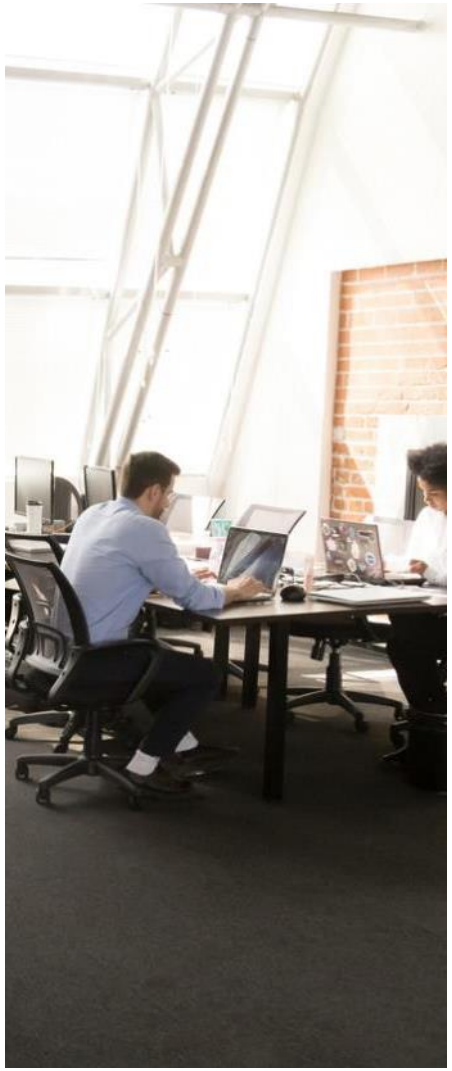
Enginyers Industrials de Catalunya
Telecos.cat enginyers de telecomunicació
informàTICs Enginyers en informàtica de Catalunya
ENGINYERS BCN
ENGINYERS GI
ENGINYERS MANRESA
ENGINYERS Lleida
ENGINYERS TARRAGONA
Agrònoms Col·legi Oficial d'Enginyers Agrònoms de Catalunya
Camins.cat Col·legi d'Enginyers de Camins, Canals i Ports - Catalunya
COETIC Col·legi Oficial d'Enginyeria Tècnica en Informàtica de Catalunya

Fairs and events

ADVANCED FACTORIES EXPO & CONGRESS
MWC GSMA
4YFN
integrated systems europe
SMARTCITY EXPO WORLD CONGRESS
IOT SOLUTIONS WORLD CONGRESS
TECH SPIRIT BARCELONA
BARCELONA DEEPTECH SUMMIT
BARCELONA CYBERSECURITY CONGRESS
AI & BIG DATA CONGRESS BARCELONA

Source: ACCIÓ

Technological hubs in Catalonia focused on Industry 4.0



Currently in Catalonia there are 160 technological hubs of foreign companies

+9% compared with the previous year

6,200 new jobs

Economic impact of **€2.879 billion**

Of these hubs, **106** (**66%**) are dedicated to **Industry 4.0** technologies

Main technologies

AI/Big Data	**56%**	Cloud	**49%**
Cybersecurity	**31%**	Internet of things (IoT)	**17%**
Immersive tech.	**10%**	Connectivity	**10%**

Major hubs

Nestlé, Cisco, PepsiCo, Oracle, Schneider Electric, IBM, Microsoft, hp, Sony AI, ABB

Source: the authors based on Mobile World Capital Barcelona, ACCIÓ, Barcelona City Council: “Tech hubs overview”

ACCIÓ supports Industry 4.0

ACCIÓ makes financial instruments and support available to Catalan companies for **projects incorporating 4.0 technologies**

In Industry 4.0 technologies, **ACCIÓ** has supported:

Projects	Funding	ACCIÓ projects incorporating 4.0 technologies
1,399	€64.9 M	68.0%

Data from 2020 to 2024

Main technologies:

393 projects €23,100,018.09 **Artificial intelligence**	118 projects €5,875,782.47 **Internet of things**	111 projects €3,323,819.54 **Connectivity**
97 projects €8,518,419.60 **Robotics**	80 projects €3,287,063.48 **Simulation**	63 projects €1,504,927.14 **Cloud**

Source: ACCIÓ

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International opportunities of Industry 4.0 technologies

The **Global Map of International Business Opportunities** is an annual report that identifies the main business opportunities for Catalan companies in the countries where ACCIÓ has coverage. International opportunities are categorized according to the associated technology.

TOP 5

Automation

Digital health

Foodtech

Big Data and artificial intelligence

Sustainable materials

Technologies with greater presence	
Automation	**50**
Digital Health	47
Foodtech	32
Big Data and Artificial Intelligence	**28**
Sustainable Materials	28
Medical Devices	28
IoT/Sensors	**26**
Recycling and Recovery	26
Agritech	22
Electric Vehicle	20
E-commerce	19
Clean energy	17
Hydrogen	17
Connectivity	**16**
Smart City	16

Source: Global map of international business opportunities

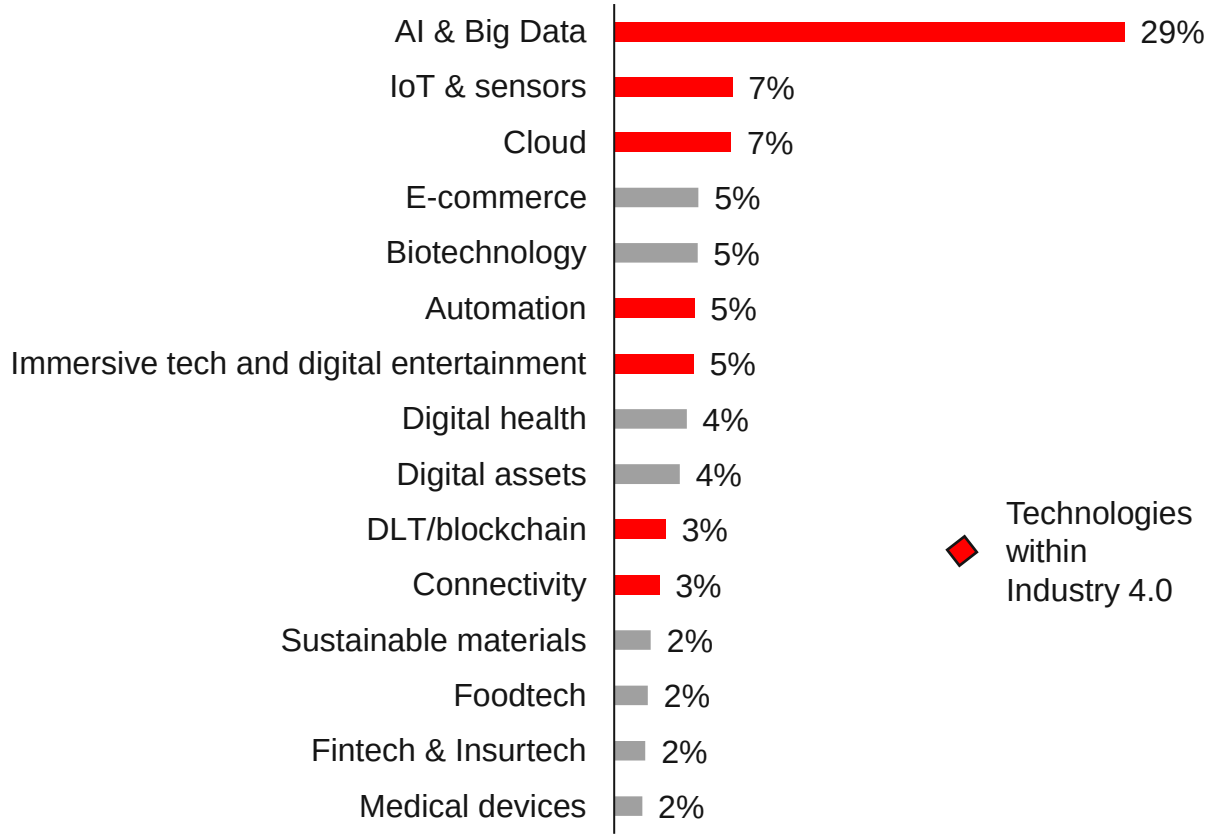
Barcelona, cradle of startups dedicated to Industry 4.0 technologies

62% of the 2,285 startups at the Barcelona & Catalonia Startup Hub work with technologies linked to Industry 4.0.

We should highlight, above all, the 29% of startups that use artificial intelligence and big data as their main technologies. Also, the 14% who work in sensory and cloud.

Beyond Industry 4.0, there is important use of technologies linked to the electronic commerce, biotechnology and digital health.

Top 15 technologies (% of startups)



Note: this chart has been assembled using the main technology data from the 2,285 startups at the Barcelona & Catalonia Startup Hub.

Source: Barcelona & Catalonia Startup Hub, 2024, ACCIÓ

Catalonia, a dynamic Industry 4.0 ecosystem

Local business ecosystem

1,447 companies dedicated to Industry 4.0, representing a **30.2%** growth compared to 2021

€7.197 billion (**+29.3%**) in revenue, accounting for **2.6% of GDP** (up from 0.5% in 2019)

Leaders in Industry 4.0 technologies

- Cybersecurity: **35.0%**
- Artificial Intelligence: **34.8%**
- Internet of Things: **23.5%**
- Cloud: **23.2%**
- Semiconductors: **12.9%**

Catalonia, industrial territory

National Pact for Industry to transform the Catalan industrial model

Industrial **revenue** amounting to €163.2 billion, 23.4% of Spain's total

90.4% of **exports** originate from the manufacturing industry

Capture of leading industrial **investments**

LOTTE, CHERY, SEAT, Nestlé, SHINING 3D, PAULIG

Broad support ecosystem

DIH4CAT Digital Innovation Hub de Catalunya, DCA Digital Catalonia Alliance, Clúster Digital, eurecat Centre Tecnològic de Catalunya, tecnio Associació, DFACTORY BARCELONA, IAM3DHUB, ADVANCED FACTORIES, LEITAT managing technologies, CERCA Centres de Recerca de Catalunya, BSC, ICFO, IOT SOLUTIONS WORLD CONGRESS, Enginyers Industrials de Catalunya, amec, CNM Centro Nacional de Microelectrónica, CSIC, Secartys, ALBA, Fundació per la Indústria Gremi de Fabricants Sabadell 1599, ACCIÓ Catalonia Trade & Investment, Generalitat de Catalunya

Leading technology hubs

106 of the 160 technology hubs are dedicated to Industry 4.0 technologies

Nestlé, CISCO, PEPSICO, ORACLE, Schneider Electric, IBM, Microsoft, hp, Sony AI, ABB

ACCIÓ Catalonia Trade & Investment

Generalitat de Catalunya Government of Catalonia

Source: ACCIÓ

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DAFO of Industry 4.0 in Catalonia

Strengths

- Strong and diversified business fabric
- Innovative ecosystem and active entrepreneurship
- Strategic location as part of global value chains
- Venue for major events: MWC, ISE, Smart City, Advanced Factories and IoT SWC

Weaknesses

- Lack of public and private funding
- Lack of talent and specific training
- Lack of connection between technology centers and companies
- Business fragmentation

Opportunities

- Leadership in initiatives and projects
- Growing demand for digitalization and sustainability
- Increasing availability of grants and funding in technology projects
- Creation and development of solutions for different economic sectors

Threats

- High costs of technologies and their implementation
- Cybersecurity issues
- Resistance to change and socioeconomic impact
- International competition

Source: ACCIÓ

7. Demand for solutions for Industry 4.0 in Catalonia

Survey results on digitalized companies: main characteristics of companies implementing 4.0 technologies in Catalonia

Main features of the 203 companies with digitalized plants, detected in the ACCIÓ survey:

Distribution by size

Half the companies bill between **€10 and €50 million** and have between **50 and 250 employees**.

40% bill more than €50 million and the 28% have over 250 employees.

Sectoral distribution

Chemistry and plastics (16.3%), **food** (14.8%), **machinery and capital goods** (11.0%) and **metal transformation** (10.2%) account for more than half of the companies that implement 4.0 technologies.

Technologies implemented

Connectivity, systems automation, cybersecurity and cloud/edge are the most implemented technologies in 4.0 companies, all of them indicated by more than 150 companies.

Artificial intelligence is the technology that most companies plan to implement.

Digitalization profile

Nearly **75%** of these companies is viewed as having a **high or very high level of digitalization compared to its sector**.

Around **25%** of companies have **staff fully dedicated to 4.0 technologies**.

Mapping of Catalonia

The region that concentrates the most companies implementing 4.0 technologies and digitalization is the **Barcelonès** (14.8%), followed by **Vallès Occidental** (13.6%) and **Vallès Oriental** (12.5%).

In any case, the **62%** of companies are located in municipalities **outside the Barcelona Metro Area**.

Source: ACCIÓ

Digitized plants in Catalonia

AMES GROUP: Optimization of quality and production, sensorisation, recording and analysis of work equipment parameters

ARRAY PLASTICS: Production traceability and control

CELO: Small Things Matter

GALFER: Brakes for motorcycles and bicycles. “Performance braking power”

GEDIA: Trusted partner of the automotive industry

GESTAMP: Smart manufacturing ensuring sustainability

HIPRA: Building immunity for a healthier world

KELLOGG’S MANUFACTURING: Digitalization applied to continuous improvement

LINDE+WIEMANN: Steel car parts

NOEL: Pioneers in automated cold meats production

PAGESVALENTI: Leaders in the production of recycled yarns

PAULIG SPAIN: Real-time monitoring system for the optimization of production processes

PIENSOS PICART: Animal feed producers since 1953

QUADPACK WOOD: Machine and equipment monitoring

SEDAL: Global leader in the manufacture of components for the faucet and sanitary industry

8. Transformation of Catalan industry

Catalonia, synonymous with industry

Industry is one of the fundamental pillars of **Catalonia** because it powers the **economy**, generates **quality jobs** and encourages **technological development**, **innovation** and **sustainable growth**. The commitment to **reindustrialization** consolidates Catalonia as a **competitive leader** at a global level.

Main indicators of the contribution of industry to the Catalan economy

- Catalan industrial companies contribute 18.6% of GVA.
- Industrial revenue amounting to €163.2 billion, 23.4% of Spain's total.
- Industrial R&D spending was €1.575 billion, a 15.5% year-on-year increase.
- 90.4% of exports come from the manufacturing industry.
- Capture of leading industrial investments, such as those from Lotte, Chery, SEAT or Nestlé.
- Catalan industrial companies stand out in capturing European funds, in which Catalonia leads Spain as a whole.

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Government of Catalonia

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The National Pact for Industry and the commitment to industrial digitalization

- In 2022, the **National Pact for Industry 2022-2025 (*Pacte Nacional per a la Indústria* or PNI)**. This cross-industry agreement that involves all social and economic stakeholders in Catalonia aims to transform the Catalan industrial model, promoting an industry that generates shared value. The pact must strengthen and structure Catalonia around industrial employment, recover strategic autonomy and accelerate a two-fold transition (climate and digital).

- The actions included in the pact are structured into five thematic areas, one of which is entitled "**Digitalization, Industry 4.0, innovation and internationalization**". The goal in this area is to enhance the competitiveness of the Catalan business fabric through digitalization, innovation and internationalization; the two former, as levers to transform design, production processes and products, as well as business models; the latter, as a tool to open new markets and draw investment, as well as access international technological alliances.

- In terms of **milestones for 2025** that are established within this area, and that the actions of the PNI must succeed in achieving, it is worth highlighting those of **Digitization** and **Innovation**:

Digitization	% total companies
Industrial companies that have incorporated **IoT** in their company	**40%**
Industrial companies that have incorporated the use of **big data** in their company	**20%**

Innovation

- Increase in public-private spending on R&D+I up to **2.25% of GDP**
- Increase in the number of industrial companies that innovate in processes and/or products up to **38%** of the total
- Increase in the Generalitat's spending on innovation up to **€200 million** in 2025

Sources: Government of Catalonia, DGI and Pacte Nacional per a la Indústria 2022-2025

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9. Success stories in Catalonia

Success stories in Catalonia (I)

FRAGOLA IBERIA carries out cybersecurity diagnostics with OWASP and CVSS methodologies to strengthen the protection of the IT network and its systems.

DRIBIA designs algorithms that use advanced analytics and artificial intelligence to understand, predict and optimize business processes.

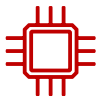
SIVERUS develops IoT solutions that monitor the use of PPE with emergency alerts, geolocation and access control to reinforce occupational safety.

Attendo is the cloud technology software developed by the Iatsae Group for the management and optimization of companies' production processes.

ELECTROLOMAS is specialized in the manufacture of electronic circuits with applications in multiple sectors such as automotive or packaging.

KUKA ROBOTICS participates in the SELF project, the first robotized restaurant with AI in an airport worldwide, inaugurated in El Prat.

CELLNEX offers connectivity solutions and sustainable wireless networks with applications in many sectors, including industry.



AXELIA offers offensive cybersecurity services, vulnerability, incident and risk management, and secure product development for enterprises.

MITSUBISHI ELECTRIC applies AI to its robotic machinery to automate manufacturing, optimize logistics and facilitate predictive maintenance.

AEINNOVA develops battery-free IoT sensors powered by thermal energy, intended for measurement, prediction and data collection in industrial environments.

NEARBY COMPUTING manages cloud and edge computing infrastructures to improve resource efficiency and performance in distributed environments.

NEURON IP designs advanced integrated circuits and chiplet technologies which integrate multiple semiconductor chips for high-performance applications.

PAL ROBOTICS integrates advanced technology in humanoid and service robotics to solve challenges in industrial and domestic environments.

SIMON offers digital and connectivity solutions to transform work environments, offices and production spaces, making them connected and sustainable.

Success stories in Catalonia (II)

IRIS TECHNOLOGY specializes in the development and integration of photonics and artificial intelligence solutions.

AMES GROUP develops high-precision metal components using additive manufacturing and powder metallurgy for industrial applications.

COMFORSA manufactures metal parts and has implemented simulation models to optimize cooling and extend the service life of forging tools.

AUMENTA SOLUTIONS develops virtual and augmented reality software to train operators, simulate processes and improve efficiency in industrial environments.

COLEO FIBERS uses blockchain to certify the sustainable and recycled origin of textile fibers, improving the traceability and transparency of the production process.

QILIMANJARO develops custom quantum computers and offers cloud quantum computing services (QaaS) to optimize advanced solutions.

NEXTMOL uses supercomputing to accelerate the development of new chemicals through molecular simulations in the cloud.

MAPSI PHOTONICS manufactures silicon optical filters for infrared detection, with industrial applications such as thermal vision and gas detection.

COMPIN FAINSA manufactures seats for transportation using additive manufacturing (SLM technology) to reduce weight, optimize costs and offer customized solutions.

JORCAR manufactures titanium frames and applies finite element simulation to optimize fusion processes and validate industrial designs.

SEREV is applying artificial vision systems and volumetry software to automate welding processes and improve industrial efficiency.

VOTTUN offers its platform that makes it easy for companies to use blockchain solutions more advantageously for their use cases and business models.

RADIANT designs high-performance laser systems for quantum technologies, such as computing, cryptography and quantum communications.

SUBMER develops cooling systems for supercomputers using thermally conductive and dielectric liquid.

Interviews with companies and institutions

We would like to sincerely thank all participating institutions for their generosity, both for their time and for sharing their valuable knowledge

DRIBIA KUKA PAL IRIS

More information about the sector and related news:
https://catalonia.com/key-industries-technologies/industrial-systems-digitalization/industry-4-0-in-catalonia

Contact us!

934 767 206
info.accio@gencat.cat
Passeig de Gràcia, 129
08008 Barcelona

accio.gencat.cat
catalonia.com

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