European Commission

Advanced Technologies for Industry

Providing useful guidance to industries, policy makers and academics

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EUROPEAN COMMISSION

Executive Agency for Small and Medium-sized Enterprises (EASME)
Unit A.1.2 — COSME

E-mail: EASME-COSME-ENQUIRIES@ec.europa.eu

Directorate General for Internal Market, Industry, Entrepreneurship and SMEs
Unit F.1 — Industrial Strategy and Value Chains
Unit F.2 — Social Economy

E-mail: GROW-ATI@ec.europa.eu

European Commission
B-1049 Brussels

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Advanced technologies: a new industrial revolution

Industry is an essential part of the European economy, central to Europe's future progress and prosperity. It now faces a new industrial revolution, brought on by new-generation technologies. These technologies offer opportunities to innovate, become more efficient and reduce carbon footprints. To remain competitive, it is essential that advanced technologies are applied not only in the more traditional sectors but also in the service sectors within the European Union (EU). Also, advanced technologies will be essential for the recovery of the European economy from the economic impact of the COVID-19 pandemic. The EU must build on its strengths, including a robust industrial base, high quality research, skilled workers, a vibrant start-up ecosystem, mature infrastructure and a leading position in the use of industrial data.[1]

With its Green Deal strategy, Europe aims to become the world's first climate-neutral continent by 2050. Advanced technologies and industrial value chains play a key role in this strategy by reducing their own carbon footprints and by accelerating the transition towards clean technology solutions and new business models. Industries, regions, Member States and EU institutions should work together to create lead markets in clean technologies. Regulatory policies and the full involvement of SMEs will be essential to make this happen.

Advanced technologies create such new business models, enable industry to be more productive, provide workers with new skills and support the decarbonisation of the European economy. Being a source of clean technology solutions -and also by reducing its own carbon footprint- the digital sector contributes to the European Green Deal. With its Strategy on Shaping Europe's Digital Future[2], the European Commission set out its vision for how Europe can retain its technological and digital sovereignty and be the global digital leader.

[1] https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1590652681448&uri=CELEX:52020DC0102

[2] https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/shaping-europe-digital-future

Advanced Technologies for Industry (ATI) project

In order to properly support the implementation of the new growth strategy, a systematic monitoring of technological trends and reliable, up-to-date data on advanced technologies is needed. To this end, the **Advanced Technologies for Industry (ATI)** project has been set up. It provides policymakers, industry representatives and academia with:

- Statistical data on the **production and use of advanced technologies** including enabling conditions such as skills, investment or entrepreneurship;
- Analytical reports such as on **technological trends, sectoral insights and products**;
- Analyses of **policy measures and policy tools** related to the uptake of advanced technologies.
- Analysis of technological trends in **competing economies** such as in the US, China or Japan;
- Access to **technology centres** and innovation hubs across EU countries.

The ATI project focuses on the following **advanced technologies** that enable and help industries to successfully manage a shift towards a low-carbon and knowledge-based economy:

1. Advanced Manufacturing Technology
2. Advanced Materials
3. Artificial Intelligence
4. Augmented and Virtual Reality
5. Big Data
6. Blockchain
7. Cloud computing
8. Connectivity
9. Industrial Biotechnology
10. Internet of Things
11. Micro- and Nanoelectronics
12. Mobility
13. Nanotechnology
14. Photonics
15. Robotics
16. Security

The insights provided by the project are available at the Advanced Technologies for Industry website (https://ati.ec.europa.eu) and include the following information:

Data dashboard

This dashboard provides statistics and data on the level of technology production and uptake, their impact across sectors and countries, supporting policymakers and businesses in their decision making. The data dashboard helps to answer questions like:

- What are the maturity levels and adoption rates of advanced technologies?
- What are the trends in key enabling factors such as skills, investment or entrepreneurship?
- How do key competing economies perform compared to the EU?

Furthermore, the data dashboard allows the users to select and download the relevant information.

Mapping of technology centres

The Technology Centre Mapping presents an overview of the technology centres with expertise in advanced technologies in the EU. It contains information about their type of expertise and services, the exact location and contact details for each registered technology centre. Technology centres perform applied research and develop close-to-market innovations and can be both public and private organisations. The mapping is primarily meant for Small and Medium Enterprises (SMEs), technology centres, innovation intermediaries working with SMEs, and policymakers.

For SMEs and intermediaries, the mapping is of great value as it offers a comprehensive overview of the technology centres working on advanced technologies in Europe. SMEs can easily identify and get access to expertise, technology services and facilities that can enable them to improve existing processes, develop new products and services, and reduce the time-to-market.

For technology centres this mapping is an enabler to get access to potential customers, identify potential technology partners and build industry relevant collaborations. Technology centres working on advanced technologies and with experience in the provision of services to SMEs are encouraged to register themselves and be part of the Technology Centre Mapping by selecting the relevant banner on the homepage of the ATI project. More information on the criteria for inclusion in the mapping is available on the webpage of the mapping.

Analytical reports

The **ATI technology watch** explores the futuristic, upcoming technologies that are on the horizon of technology development today and that are characterised by high speed of evolution and a significant disruptive potential. Advanced Technology Watch is addressed to policy-makers, enterprises (large and SMEs) and business intermediaries. It allows them to better assess the maturity of technologies, the potential market applications and the technical adaptation required to bring advanced technologies to the market.

The **ATI Sectoral watch** analyses trends in the generation and uptake of advanced technologies, related entrepreneurial activities and skills needs in a number of selected sectors. It interprets data from a list of data sources compiled to monitor advanced technologies and their applications in industry across Europe and key competitor economies. It allows policy makers, industries and intermediaries to contextualise the collected data on advanced technologies specific for the industries in focus.

The **EU and international reports** explore the technology and policy landscape of EU and non-European countries including USA, China, Canada, Japan, South Korea and Russia. These reports provide European policymakers insights into the most recent developments from overseas. Country performance regarding advanced technologies is presented based on patents, trade and investment data. A concise and informative review of policies relevant for advanced technology development and deployment is also part of the reports.

The **Policy briefs** analyse national and regional policy measures focused on a specific policy challenge, technological area or mode of implementation and explore policy tools that have been designed and implemented with the aim of fostering the generation and uptake of advanced technologies. The reports provide a comparative analysis of some of the most relevant national and regional examples on the policy landscape in the EU. They highlight the lessons learnt based on existing policy evaluations, monitoring or any other learning process and present both good practices and potentially the bad ones. In the case of novel policy initiatives, they focus on the key challenges in the design process.

The **ATI Product watch** analyses novel products that are based on advanced technologies for the development of goods and services - enhancing their overall commercial and social value. It analyses the value chain of the selected ATI-based products, their link to the Important Projects of Common European Interest (IPCEI) and the strengths and weaknesses of the EU competitive positioning. This report specifically supports cluster organisations and Smart Specialisation Strategy (S3) partnerships, providing intelligence on innovation areas where European regions could team up and invest together.

Events, news and trends in the field of advanced technologies

News items covering events and trends in the field of advanced technologies are available on the website.

Advanced Technologies definitions:

Advanced Manufacturing Technology: Advanced manufacturing technology encompasses the use of innovative technology to improve products or processes that drive innovation. It covers two types of technologies: process technology that is used to produce any of the other advanced technologies, and process technology that is based on robotics, automation technology or computer-integrated manufacturing. For the former, such process technology typically relates to production apparatus, equipment and procedures for the manufacture of specific materials and components. For the latter, process technology includes measuring, control and testing devices for machines, machine tools and various areas of automated or IT-based manufacturing technology.

Advanced Materials: Advanced materials lead not only to new reduced cost substitutes to existing materials but also to new higher value-added products and services. Advanced Materials offer major improvements in a wide variety of different fields, e.g. in aerospace, transport, building and health care. They facilitate recycling, lowering the carbon footprint and energy demand as well as limiting the need for raw materials that are scarce in Europe.

Artificial Intelligence: Artificial Intelligence (AI) is a term used to describe machines performing humanlike cognitive functions (e.g. learning, understanding, reasoning or interacting). It comprises different forms of cognition and comprehension (e.g. speech recognition, natural language processing) and human interaction (e.g. signal sensing, smart control, simulators). In terms of its technology base, AI is a very heterogeneous field. Although some of its aspects like sensors, chips, robots as well as certain applications like autonomous driving, logistics or medical instruments refer to hardware components, a relevant part of AI is rooted in algorithms and software.

Augmented/Virtual Reality: Augmented reality (AR) devices overlay digital information or objects with a person's current view of reality. As such, the user is able to see his or her surroundings while also seeing the AR content. Virtual reality devices place end users into a completely new reality, obscuring the view of their existing reality. Augmented reality is enhanced by computer-generated perceptual information across multiple sensory, visual or auditory modalities. The user experience is closely interwoven with the physical world and is perceived as an immersive aspect of the real environment.

Big Data: Big Data is a term describing the continuous increase in data, and the technologies needed to collect, store, manage, and analyse it. It is a complex and multidimensional phenomenon, impacting people, processes and technology. From a technology point of view, Big Data encompasses hardware and software that integrate, organise, manage, analyse, and present data which is characterized by 'four Vs': volume (size of the data sets), velocity (high speed of data processing), variety (different types and sources of data used), and velocity (high quality of analysed data).

Blockchain: Blockchain is a digital, distributed ledger of transactions or records, in which the ledger stores the information or data and exists across multiple participants in a peer-to-peer network. Distributed ledgers technology allows new transactions to be added to an existing chain of transactions using a secure, digital or cryptographic signature. Blockchain protocols aggregate, validate, and relay transactions within the blockchain network. Blockchain technology allows the data to exist on a network of instances or "nodes," allowing for copies of the ledger to exist rather than being managed in one centralised instance.

Cloud computing: Cloud computing includes the delivery of tools and applications like data storage, servers, databases and software based on a network of remote servers through the Internet. Cloud computing services enable users to store files and applications in a virtual place or on the cloud and access all the data via the Internet. Public cloud services are available on public networks and are open to a largely unrestricted universe of potential users. They are designed for a market, not a single enterprise.

Connectivity: Connectivity refers to all those technologies and services that allow end-users to connect to a communication network. It encompasses an increasing volume of data, wireless and wired protocols and standards, and combinations within a single use case or location.

Standard connectivity includes Fixed Voice and Mobile Voice telecom services to allow fixed or mobile voice communications, but also Fixed Data and Mobile Data services to have access and transfer data via
a network.

Advanced connectivity that is in the focus of the ATI project refers to the rise of Internet of Things scenarios, where connectivity technology boundaries expand beyond wired and cellular (e.g. 4G, 5G) services to Low Power Wide Area Network (LPWAN), Satellite, and Short Range Wireless technologies (e.g. Bluetooth, ZigBee).

Industrial Biotechnology: Industrial Biotechnology or white biotechnology is the application of biotechnology for the industrial processing and production of chemicals, materials and fuels. It includesthe practice of using microorganisms or components of micro-organisms like enzymes to generate industrially useful products in a more efficient way (e.g. less energy use, or less by-products), or generate

substances and chemical building blocks with specific capabilities that conventional petrochemical processes cannot provide.

Internet of Things (IoT): The Internet of Things (IoT) refers to the network of smart, interconnected devices and services that are capable of sensing or even listening to requests. IoT is an aggregation of endpoints that are uniquely identifiable and that communicate bi-directionally over a network using some form of automated connectivity. The Internet of Things relies on networked sensors to remotely connect, track and manage products, systems and grids. The Industrial Internet of Things (IIoT) – a subset of the larger Internet of Things – focuses on the specialised requirements of industrial applications, such as manufacturing, oil and gas, and utilities.

Micro - and Nanoelectronics: Micro and nanoelectronics deal with semiconductor components and/or highly miniaturised electronic subsystems and their integration in larger products and systems. They include the fabrication, the design, the packaging and testing from nano-scale transistors to micro-scale systems integrating multiple functions on a chip.

Mobility: Mobility refers to both IT for Mobility and Enterprise mobility.

IT for Mobility covers a large number of different technology areas and markets, which does not only encompass vehicles that take people from point A to point B, but also includes all kinds of technologies that make people more mobile (like for example mobile phones etc.). These, however, consist of a large set of sub-technologies that are hard to capture at the same time. In this project, the patent, trade, Procom, investment and skills analysis focus on a sub-section of mobility, which is related to vehicles only, e.g. satellite navigation and radio-location, which are also the core technologies that are necessary to make autonomous driving work.

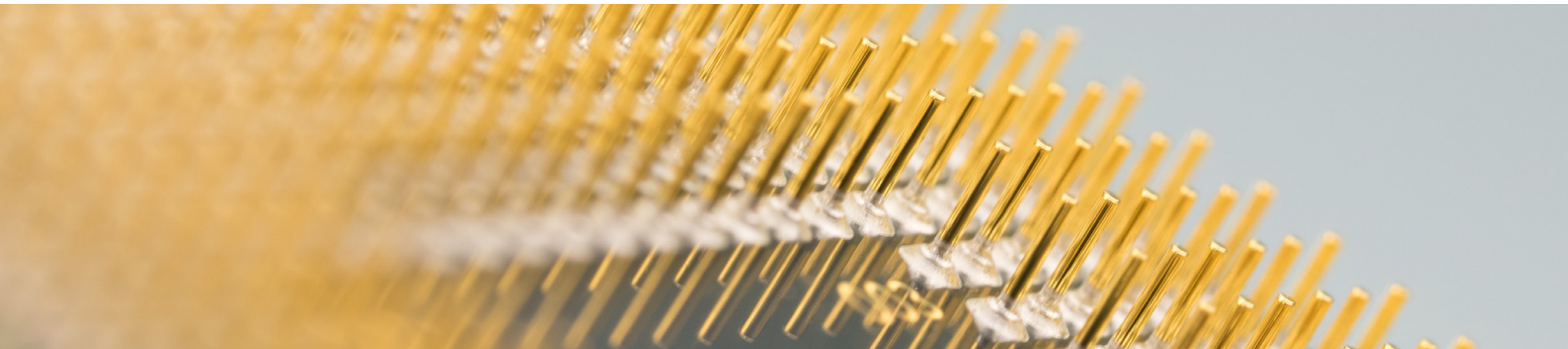
Enterprise mobility: the survey analysis captures mobility in terms of the workforce. The enterprise mobility market is made up of a conglomeration of mobile solutions and technologies, including hardware, software and services, empowering a borderless workforce to securely work anywhere, at any time and from any device. It does not include only the provision of smartphones or tablets to the workforce but also all the tools and applications for transforming key processes, from internal operations to operations with customers and suppliers, all the way from the shop floor to the top floor and from the back office to the end customers.

Nanotechnology: Nanotechnology is an umbrella term that covers the design, characterisation, production and application of structures, devices and systems by controlling shape and size at nanometre scale. Nanotechnology holds the promise of leading to the development of smart nano and micro devices and systems and to radical breakthroughs in vital fields such as healthcare, energy, environment and manufacturing.

Photonics: Photonics is a multidisciplinary domain dealing with light and encompassing its generation, detection and management. Among other things, it provides the technological basis for the economic conversion of sunlight into electricity which is important in the production of renewable energy, and a variety of electronic components and equipment such as photodiodes, light emitting diodes (LEDs) and lasers.

Robotics: Robotics is a technology that encompasses the design, building, implementation, and operation of robots. Robotics includes applications designed to conduct a specific task or series of tasks for commercial purposes. These robots may be stationary or mobile but are limited in function as defined by the intended application. Multipurpose robots can perform a variety of functions and movements determined by a user that programs the robot for tasks, movement, range, and other functions and that may change the effector based on the required task. These robots function autonomously within the parameters of their programming to conduct tasks for commercial applications and may be fixed, moveable, or mobile. Cognitive robots are capable of decision making and reasoning, which allows them to function within a complex environment.

Security: Security products are tools designed using a wide variety of technologies to enhance the security of an organisation's networking infrastructure — including computers, information systems, internet communications, networks, transactions, personal devices, mainframes, and the cloud. They also help provide advanced value-added services and capabilities. Cybersecurity products are utilised to provide confidentiality, integrity, privacy, and assurance. Through the use of security applications, organisations are able to provide security management, access control, authentication, malware protection, encryption, data loss prevention (DLP), intrusion detection and prevention (IDP), vulnerability assessment (VA), and perimeter defense, among other capabilities.



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