

# Technology definitions

## Advanced Manufacturing Technology

Advanced manufacturing technology encompasses the use of innovative technology to improve products or processes that drive innovation in manufacturing. It covers two types of technologies: process technology that is used to produce any of 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 both to new reduced cost substitutes to existing materials and to new higher added-value 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 is a term used to describe machines performing human-like cognitive functions (e.g. learning, understanding, reasoning or interacting). It comprises different forms of cognition and meaning understanding (e.g. speech recognition, natural language processing) and human interaction (e.g. signal sensing, smart control, simulators). Artificial Intelligence is a heterogeneous field in terms of its technology base. While some 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 devices look to overlay digital information or objects with a person's current view of reality. As such, the user is able to see his/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.

## Big Data

Big Data is a term describing the continuous increase in data, and the technologies needed to collect, store, manage, and analyse them. 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. It is characterised by "four Vs": volume, velocity, variety and value. Big Data technologies are new generation of technologies and architectures, designed to economically extract value from very large volumes of a wide variety of data, by enabling high-velocity capture, discovery, and/or analysis.

## 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.

## 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.

### **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 the cloud and access all the data via the Internet.

*Public Cloud services* that have been explored specifically by the ATI survey are available on public networks and open to a largely unrestricted universe of potential users. Public clouds are designed for a market, not a single enterprise.

### **Industrial Biotechnology**

Industrial Biotechnology is the application of biotechnology for the industrial processing and production of chemicals, materials and fuels. It includes the 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. There are many examples of such bio-based products already on the market. The most mature applications are related to enzymes used in the food, feed and detergents sectors. More recent applications include the production of biochemicals and biopolymers from agricultural or forest wastes.

### **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. Objects become interconnected, make themselves recognisable, and acquire intelligence in the sense that they can communicate information about themselves and access information that has been provided by another source. 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. IIoT systems connect non-consumer devices, used by companies, governments and utility providers in their service delivery.

### **Micro- and Nanoelectronics**

Micro- and nanoelectronics deal with semiconductor components and 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**

#### *IT for Mobility*

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 nanometer 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, encompassing its generation, detection and management. Among other things it provides the technological basis for the economic conversion of sunlight to electricity which is important for the production of renewable energy, and a variety of electronic components and equipment such as photodiodes, LEDs and lasers.

### **Robotics**

Robotics is technology that encompasses the design, building, implementation, and operation of robots. Robotics is often organised into three categories: 1) Application specific. This includes robotics 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. 2) Multipurpose. Multipurpose robots are capable of performing 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. 3) Cognitive. Cognitive robots are capable of decision making and reason, which allows them to function within a complex environment. These robots can learn and make decisions to support optimal function and performance and are designed for commercial applications. When measuring production and uptake of robotics, industrial applications will be taken into account.

### **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, mainframe, and the cloud — as well as 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.