

5G in the Manufacturing Industry

How can 5G be a game changer for manufacturers?



5G as a key technology enabler



5G is considered as a key enabler for digital transformation across many sectors and several companies are already planning to make a shift towards digitalization through implementing 5G.

5G provides a big step ahead for connectivity across three main dimensions:



Mobile broadband speed:

5G recorded a 100-fold improvement when compared to 4G, supporting new bandwidth-hungry applications.



Ultra-reliability and low latency:

The time required for a packet of data to travel back and forth between two points is 10 times lower compared to previous cellular technologies, less than or equals to 1 millisecond with 99,99% assurance of delivery. This means it can support outright data transmission, in-depth coverage and reliable communication.



Extensive connection density:

5G supports massive machine-type communications, up to million devices per square meter, allowing an extensive IoT adoption and real time interaction within the production site.

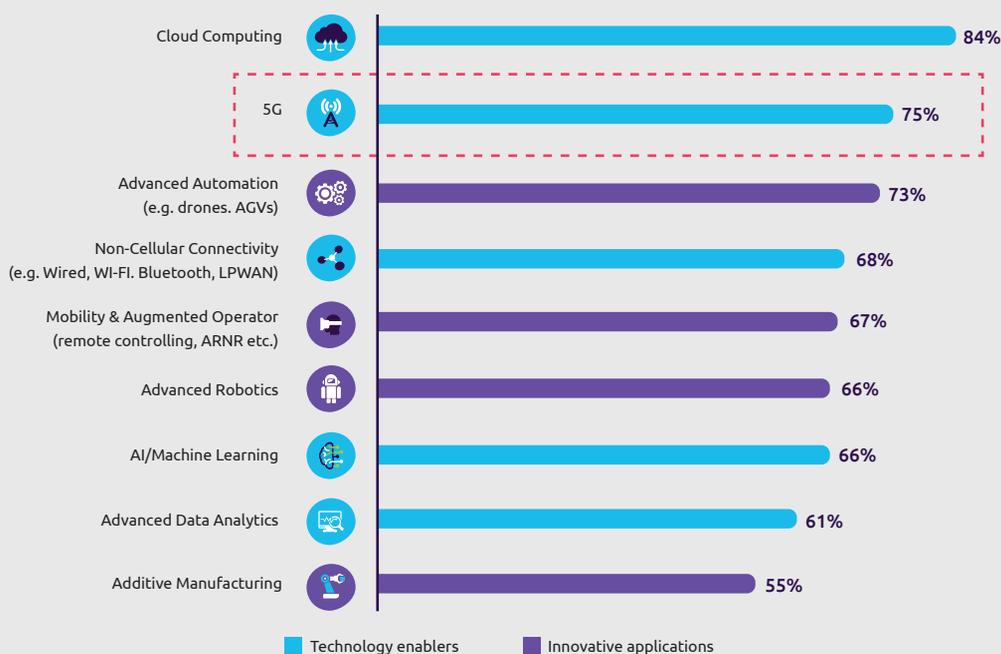
Another relevant feature carried by 5G is network slicing, which consists in the same physical network partitioned into multiple virtual network, each one optimized for its specific requirements. Thus, 5G brings the capability to allocate slices of the network in order to guarantee adequate speed and latency for every application. This hallmark allows to scale up or scale down the network in order to meet dynamic needs.

In the end, the new 5G architecture offers more distributed intelligence capabilities at the edge of the network, a native software driven platform, which can adapt to real-time demand, and full virtualization of its core component, enabling a higher level of versatility that can accelerate the reconfiguration or the deployment of assembly lines.

5G is a key enabler for Industry 4.0

Industry 4.0 (the fourth industrial revolution) is generating significant changes across the Manufacturing industry through uptake of digital advanced technologies such as Internet of Things (IoT), edge computing, cloud, artificial intelligence (AI) and big data to help manufacturers advance towards a higher degree of automation and apply digital functions to physical processes. Such a shift towards digital manufacturing and Industry 4.0 could significantly impact the efficiency and productivity of manufacturers and make them more resilient for a digital future. To make this shift happen, a reliable connectivity technology is a must have. Accordingly, 5G plays a key role to accelerate the digital journey in the Manufacturing industry, since its technical features are also born based on the direct requirements of this business. Indeed, industrial companies identify 5G as one of the biggest enablers for the digital transformation of their industry.¹

Industrial companies consider 5G a key enabler of their digital transformation



Part of this attraction can be explained by 5G's ability to solve some of the latest organizations' challenges. Industrial companies are willing to implement 5G primarily in order to achieve more secured operations and to obtain higher efficiency and cost savings. During a serious economic downturn these aspects become even more significant and this speed up the need to strengthen them. Results of a recent study show that Manufacturing will be one of the industries most affected by the 5G revolution, with \$605 billion of estimated revenue unlocked in a time horizon between 6 and 18 months.

In the near future, we will witness several other changes that will take place within the industry. Enhanced **Internet of Things** accelerates the communication between all the connected devices in all the areas of a factory, from the shop floor to the warehouse and assembly line, enabling real time control to adjust the process in motion. While Massive IoT and Broadband IoT are already supported by 4G networks, 5G can enable even Critical IoT which is intended for real-time applications, allowing manufacturers to obtain maximum data rate with extremely low latency. Thus, 5G can support all types of IoT devices on the same network whilst respecting the different peculiarities of each type.

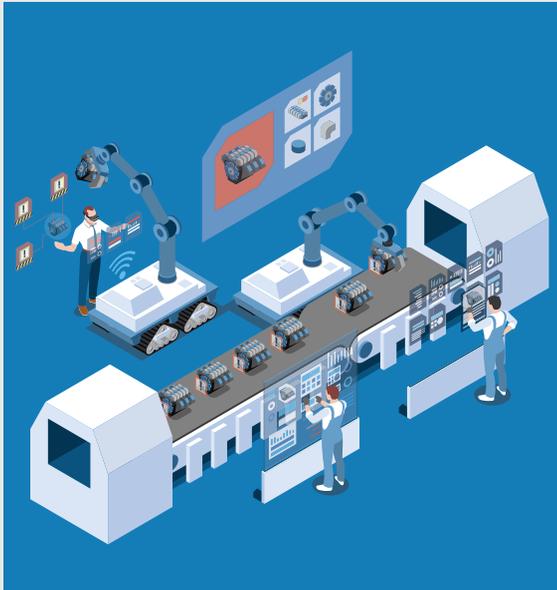
Artificial Intelligence will allow to exploit the massive amount of data collected from operations and use it for predictive maintenance and monitoring and **augmented reality** will provide key insights and visual training tools to technicians. Along with other 5G-enabled applications such as Robotization and AR/VR, these applications will unlock a huge amount of value and opportunity for the Manufacturing sector.

In order to go on with these digital technologies, the necessity to manage and sustain the enormous data volume will arise. 5G is a game changer for industrial companies not only to facilitate the effective connection thanks to its higher capacity but also to manage the enormous volume of data, accelerate the data analytics and obtain a significant industrial management simplification.

¹ Capgemini Research Institute, "5G in industrial operations: How telcos and industrial companies stand to benefit", May 29, 2019, <https://www.capgemini.com/research/5g-in-industrial-operations/>

5G applications in Manufacturing

The applications of 5G in Manufacturing are extensive and broad, varying from real-time production monitoring to predictive maintenance and production security. We summarize these applications into five core categories:

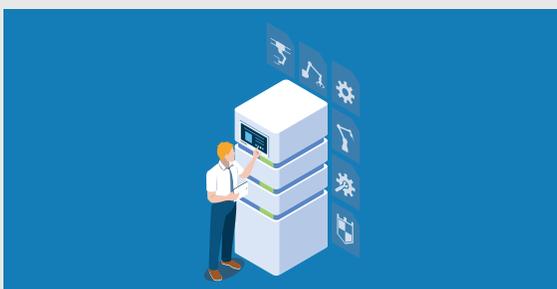
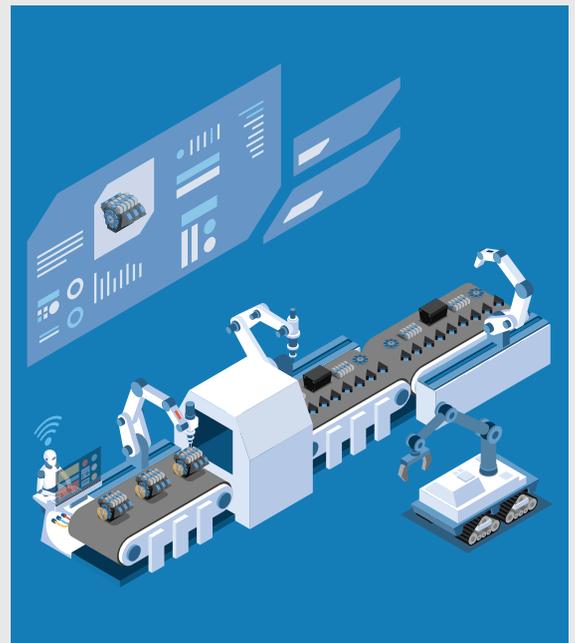


Remote and real-time control – 5G's guaranteed quality of service and ultra-reliable and low-latency network can support the time-critical operations in remote plans from a central command centre. By applying smart sensors, companies will be able to remotely monitor and control production processes in real-time in order to discover manufacturing failures more promptly, identify issues and adjust the process in motion. The broader spectrum 5G network provides is very relevant for remote control because it overcomes Wi-Fi problems of passing through walls and glasses, providing more diffused connectivity to the production site.

Remote control comprehends also remote security surveillance of production lines. Cameras powered by Artificial Intelligence can be particularly effective at addressing specific business challenges such as real-time surveillance of remote sites, production quality and manufacturing safety.

Smart Automation – The growing use of AGVs and wireless robotics are fundamental to increase efficiency and flexibility but are demanding ultra-low latency and service continuity; companies must face the challenge of a potentially high density of Internet of Things machines. These requirements can hardly be fulfilled by the current connectivity technologies in the case of numerous devices, whilst 5G provides both ultra-low latency and a potentially high density of connected devices (up to 1 million per square kilometre) simultaneously controlled. Moreover, 5G radically improves UWB for asset positioning and tracking, with an accuracy of 1 centimetre from the 4G's accuracy of 20 centimetres.

A broad employment of connected automated machines that independently execute requests and coordinate themselves automatically will allow companies to reap rewards in terms of more flexible production processes, greater efficiency of material and reduction of complexity and downtime.



Predictive maintenance – Next generation, integrated predictive maintenance solutions demands a massive machine-type communication using a single platform. Real-time data collection from many more devices supported by Artificial Intelligence and analytics enhances the quality of predictive maintenance enormously. Furthermore, 5G will also enable remote maintenance thanks to its low latency and high reliability.

5G applications in Manufacturing

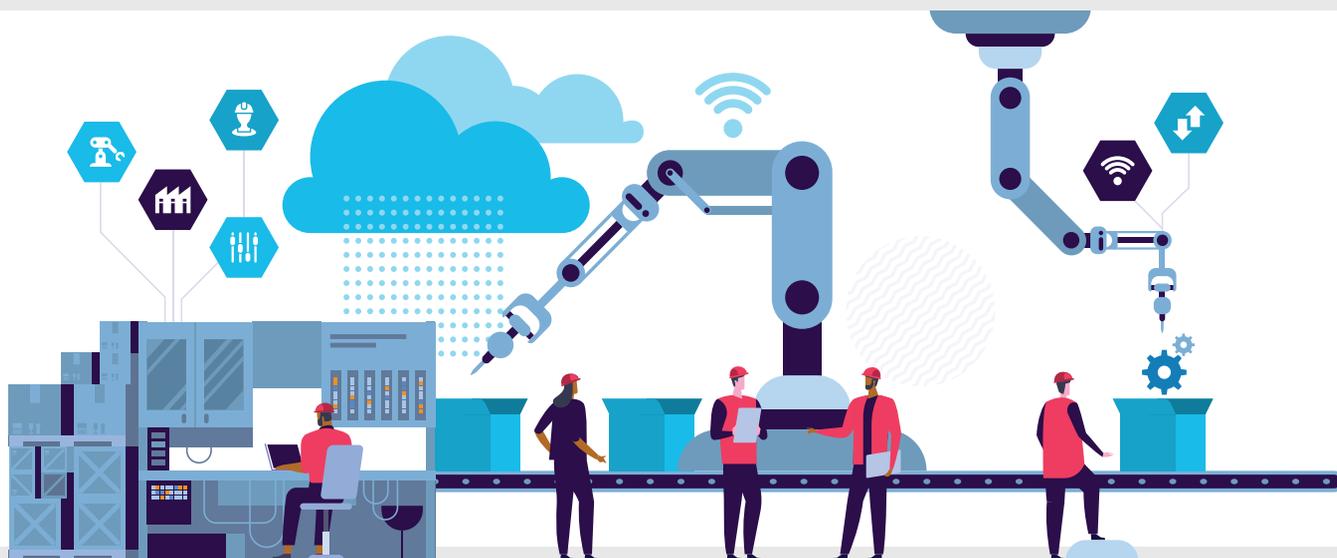
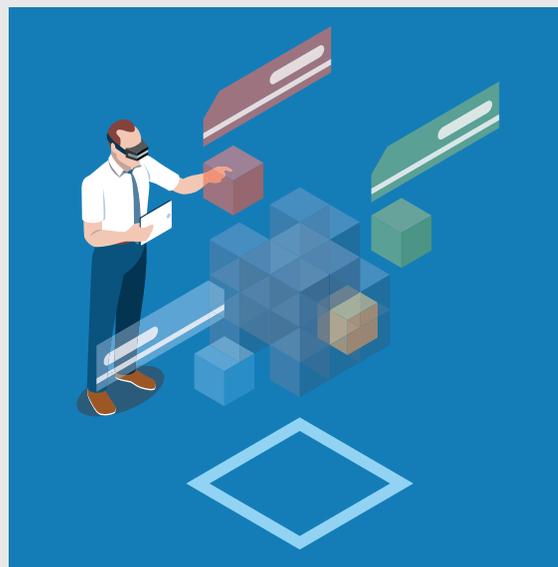


Edge Analytics – 5G's faster communication improved latency and ability to connect to a massive number of devices if compared to previous network generations, providing real-time information from a large set of devices, which can be converted into real-time insights leveraging edge computing. 5G will give operators a quick access to real-time information, such as the production status at one glance of manufacturing data, on different devices providing the ability to rapidly tackle issues or new requirements.

Existing use-cases focusing on Human Machine Interface devices that give humans quick access to real-time information and integrate them into the data and communication stream of the intelligent machine are examples of how 5G can enhance edge analytics. Human-machine interface technologies, such as tablets and augmented reality devices, will be at the centre of the analytics transformation, enabling a truly deep communication in order to integrate humans into the data and communication stream of the intelligent machine.

Virtualization – The aim for the future is to connect the shop floor and entire machine parks, thus outsourcing parts of the control elements usually used in machines to a local production cloud. Therefore, the demand for 5G and its high computing capacity, low latency and high network availability is increasing.

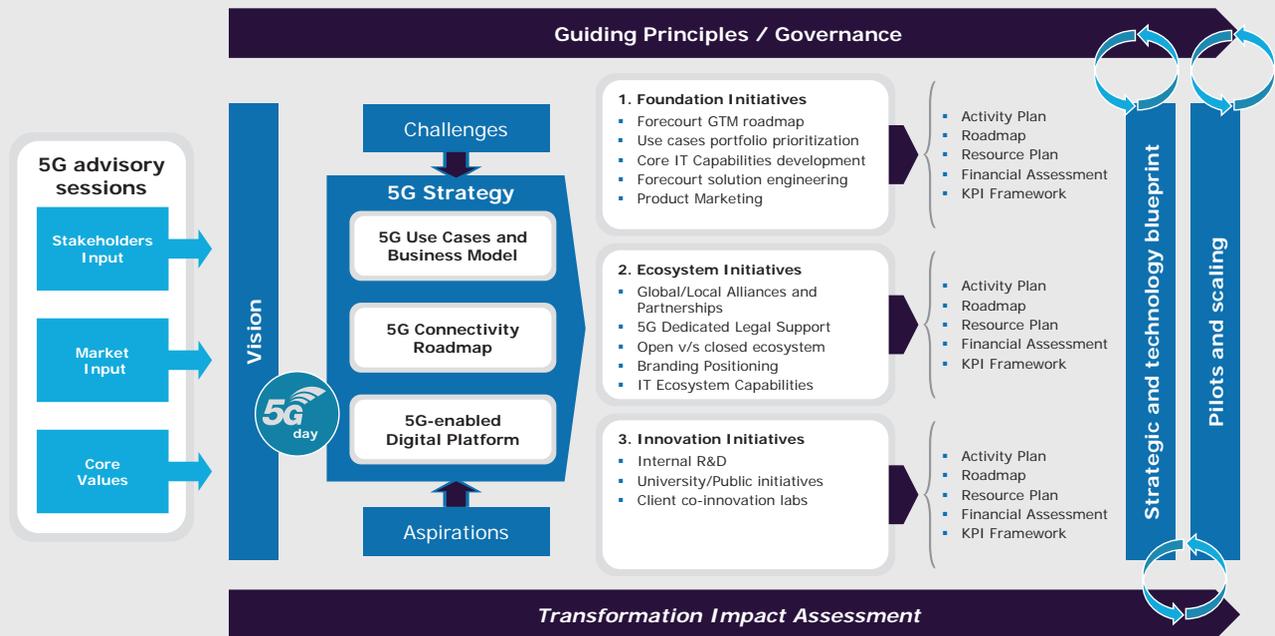
Virtualization and on-demand cloud delivery has broad applications within augmented reality devices and digital twins. AR devices can enhance efficiency by providing visual tools and information to technicians to help them make production adjustments and work hands free. The digital twin is a fully detailed representation of the actual prospective machine or of a value chain. The outcome is the prototype is comprehensively represented, tested, and optimized in digital form. This enables data to be recorded and analysed during subsequent operations and in this way to facilitate actions such as predictive maintenance and power optimization.



Road to 5G implementation

Capgemini has the industry's most comprehensive consulting portfolio, spanning from **Business to Technical Consulting to Operation Outsourcing or Managed Services**, our technology and services help customers around the world make their business more efficient, more productive and more secure.

We offer comprehensive end-to-end methodology and strategy to support companies in their journey towards 5G implementation.



Capgemini's offer for 5G implementation is based on four main steps:

01 Visioning and 5G Innovation Days:

Through an innovative design-thinking oriented workshop the main requirements, challenges and aspirations will be defined to create the vision for the client

5G strategy:

Based on the outcomes of the 5G Innovation Day a 5G strategy will be defined. The strategy is based on three main pillars: 5G use-cases that are relevant and address the challenges of the client and the proper business model to implement them; 5G connectivity roadmap to define the connectivity features and requirements for the defined use-cases; 5G digital platform to define the required technical and business capabilities to implement the pilot of use-cases. The 5G strategy is defined thanks to the rich technological, ecosystem and innovation initiatives that exist in Capgemini.

02

03 Strategic and technology blueprint:

Through its competencies, Capgemini defines a blueprint of the 5G pilots both from strategic and technology perspectives.

Pilots and scaling:

MVP of the 5G use-cases will be developed and delivered through an agile@scale approach. The developed pilots can be later on scaled up.

04



Alessandro Puglia

Alessandro is Future Of Technology Director Italy with 15+ years' of consulting experience in the Telecommunication and Media industry, helping clients improve their performance by addressing strategic and operational issues. In his career, he served top players across Europe and South East Asia, applying advanced subject-matter knowledge in vertical business initiatives, while supporting the definition and execution of their IT strategies.



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Golboo is a Senior Consultant in Future Of Technology with 8+ years' experience in both Industry and Research, in particular within the Manufacturing sector. She has worked extensively on business model innovation, strategic road mapping and digital transformation. She is managing the 5G offering initiative in Capgemini Business Unit Italy, led by Alessandro Puglia.



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About Capgemini

Capgemini is a global leader in consulting, digital transformation, technology and engineering services. The Group is at the forefront of innovation to address the entire breadth of clients' opportunities in the evolving world of cloud, digital and platforms. Building on its strong 50-year+ heritage and deep industry-specific expertise, Capgemini enables organizations to realize their business ambitions through an array of services from strategy to operations. Capgemini is driven by the conviction that the business value of technology comes from and through people. Today, it is a multicultural company of 270,000 team members in almost 50 countries. With Altran, the Group reported 2019 combined revenues of €17billion.

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