

# A 21st Century *Industrial* Policy: towards a European competitiveness based on technology

Digital Public Policy, Regulation and Competition

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Telefónica

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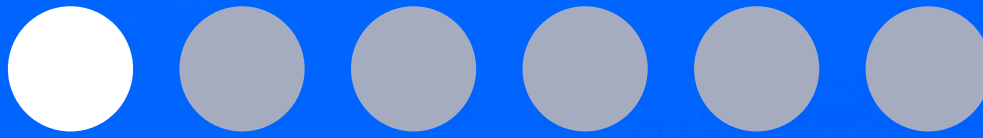
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### Recommendations: towards an Industrial Policy for the 21st century



# 1. *Executive* Summary

## Open Strategic Autonomy, at the heart of industrial policy

Geopolitical tensions, economic growth uncertainties and the polarisation of leadership between the United States and China are calling into question relations of economic interdependence. Europe is losing global economic relevance. Strategic Autonomy becomes a central objective of industrial policies in Europe, in a context of concern about the possible migration of industrial capacity to other regions with greater incentives. Europe aims to design an industrial policy adapted to a 21st century economy shaped by digital innovation and the twin transition, digital and green, in which the autonomy of strategic sectors is achieved, while cooperation with third parties, based on European standards and values, is maintained.

## A digital industrial policy for a more innovative, competitive, and resilient Europe

The global technology race is leading to crucial and sometimes decisive breakthroughs for economies. The development of 5G, quantum computing and the cloud is part of a competition between countries to occupy global leadership positions and become the economic hub of the 21st century.

Europe is lagging behind and this has raised alarms in both the public and private sectors. Connectivity infrastructures are key to boosting solid technological and industrial ecosystems and fostering innovation. However, their build out is progressing more slowly than in other regions. The widening technology gap has strategic implications for the competitiveness of industries. Industrial policy should therefore focus on strengthening cross-cutting technological sectors that leverage industrial sectors.

## The telecoms sector is a key partner: it provides future-proof connectivity

The objectives of the European Digital Decade 2030 are a clear indication of the strategic importance of the telecoms sector in shaping industrial policy. A competitive digital economy is increasingly linked to the availability of connectivity networks that drive technological and digital development. This constantly innovating sector is transforming its connectivity networks to support industrial growth at the pace of the digital economy: Open Gateway, the next step in this evolution, will enable the integration of network capabilities into applications, creating an innovation-friendly environment for developers. Operators thus become technology platforms and active co-creators of a new era of digital innovation.

### The telecoms sector is a key partner: beyond connectivity

Telecom operators offer digital solutions that contribute to the digital transition and to reducing CO<sub>2</sub> emissions and the environmental impact of industries. 5G, in particular, enables innovations such as industrial automation, high precision manufacturing or connected vehicles. This sector also supports R&D and interacts with different actors in the innovation ecosystem, helping to reduce the time to market for innovations. In addition, it participates in multiple initiatives with other industries to improve the employability of people at a time of transformation of the business fabric and the need to adapt skills for a 21st century industry.

### Towards a 21st century digital industrial policy

Public policies need to strengthen key sectors such as telecommunications. To this end, it is essential to put investment and innovation at the heart, aligning them with industrial policy objectives. Specifically, incentives for private investment in connectivity infrastructure should be generated and promote a more balanced development of the digital ecosystem. This requires fostering market structures that allow an adequate return on investment and promoting mechanisms that ensure the fair contribution of ecosystem players to the sustainability of network investments. Similarly, the key role of connectivity in driving the green transition must be recognised. And finally, the competitiveness of European industry must be promoted on the basis of a holistic approach: ensuring growth throughout the entire process: from research and development to scaling up; through policies that stimulate digital adoption, digital trust, and employability. All this without forgetting international cooperation for a harmonised development of technologies such as AI, cybersecurity or data.



## 2. *Open* Strategic Autonomy, at the heart of industrial policy

Strategic Autonomy is becoming more prominent in national and regional policies and has become the central issue in any strategic, political, or legislative debate in Europe.

Europe is losing its global relevance<sup>1</sup> and its relations of economic interdependencies are being disrupted in an environment of rising geopolitical tensions, uncertainty, and polarisation of global leadership between the United States and China. Policymakers are focusing their efforts on defining the right long-term strategy to reduce the potential risks stemming from asymmetries in economic interdependencies.

In the concept of Open Strategic Autonomy, the term “open” underlines that it is about finding a balance between operating more autonomously in strategic areas and cooperating with third parties, always based on European standards, rules and values.



**Open Strategic Autonomy is  
based on achieving a balance  
between operating more autonomously  
in strategic areas and cooperating with  
third parties**

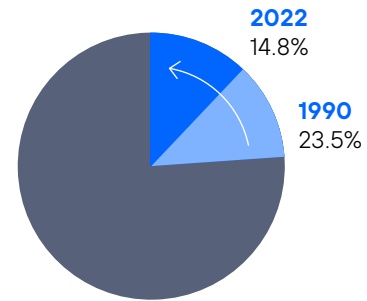
Hence, the goal of achieving greater influence in the design of initiatives to foster economic growth and competitiveness has given rise to policies that seek to incentivise investment and innovation in strategic sectors. As a result, industrial policies are being reoriented to implement policies that enhance, beyond resilience, the autonomy and industrial capacity of strategic sectors such as defence, trade, technology and digital, health and energy, among others.

In this sense, we are observing new public policy proposals in the industrial field on a global scale. In a context of rising energy prices and with the aim of increasing future competitiveness in environmentally oriented technologies, the Inflation Reduction Act (IRA) in the United States<sup>2</sup> and the Green Deal Industrial Plan in the European Union<sup>3</sup> have been proposed. Although with different approaches, both aim to create an enabling environment for investment and innovation to increase domestic energy production and “clean” or emission-reducing technologies for sustainable growth for the future.

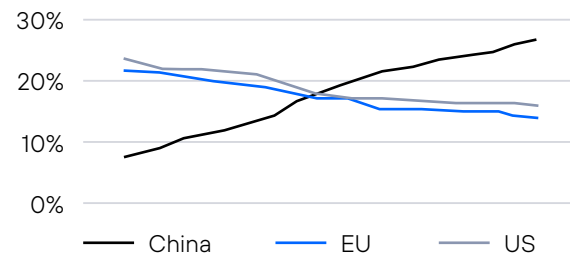
Beyond energy autonomy, Europe should also continue to prioritise digital autonomy in its policies and budget packages. Digitalisation becomes a key component of competitiveness and geopolitics.

## The need to boost European competitiveness

### European Union global share of GDP (ppp)<sup>1</sup>



### Industry value added (Global share, 2000-2021)<sup>2</sup>



#### Sources

1. In parity purchasing power (ppp). Telefónica based on the International Monetary Fund (IMF), 2023
2. Telefónica based on World Bank data (data retrieved April 2023)



## A. Europe's position in technological geopolitics

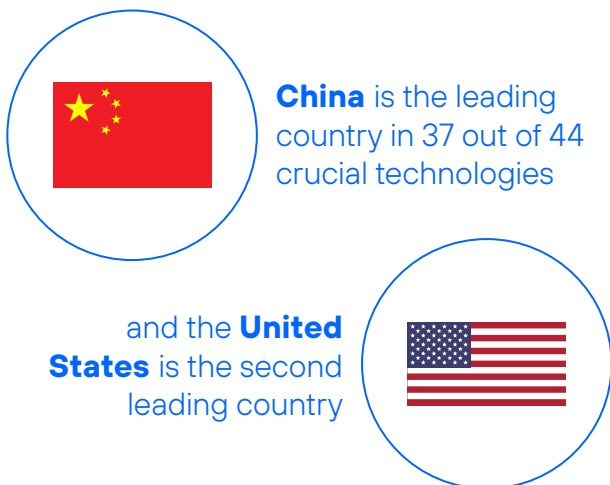
In today's landscape, leading the world means leading the industries and technologies of the future. Micro-chips, the deployment of 5G, artificial intelligence (AI), industrial robotics or *deep tech*, such as quantum computing, are becoming central to major international geopolitical balances<sup>4</sup> and triggering new paradigms of industrial competitiveness.

The United States and China are engaged in a global competition to lead in these industries and become the main supplier of future technologies. According to the Australian Strategic Policy Institute (ASPI), China leads 37 out of 44 technologies in crucial technology fields such as defence, space, robotics, energy, environment, biotechnology, AI, advanced materials, and quantum computing, followed by the United States. And there is a big gap between China and the United States and the rest of the countries<sup>5</sup>.

Europe is losing its leadership in cross-cutting technologies such as 5G, AI, quantum computing and the cloud. For example, in 5G innovation, a key element for future industrial competitiveness, China captures nearly 60% of external funding, the United States 27% and Europe 11%. None of the top 10 technology companies investing in quantum computing are in Europe but are split between the United States and China<sup>6</sup>.

Moreover, progress in building key digital infrastructures to foster strong and innovative technological and industrial ecosystems is still too slow in Europe compared to peer countries<sup>7</sup>. Despite an investment effort of around 50 billion euros per year<sup>8</sup>, in per capita terms, the European telecoms sector invests half as much as its US counterpart: 104.4 euros per capita per year compared to 210.7 euros respectively in 2021<sup>9</sup>. The pressure of investment on declining revenues over the last decade has pushed the investment intensity of European operators to a record high of around 20%<sup>10</sup>, calling into question the sustainability of the pace of investment.

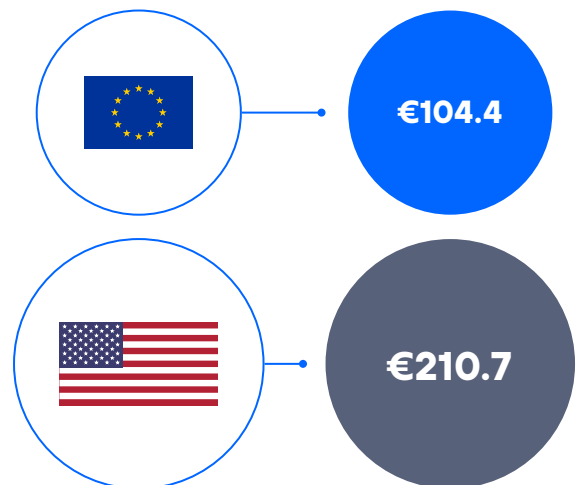
### The need to boost Europe's technological leadership



#### Source

In crucial technology fields such as defence, space, robotics, energy, environment, biotechnology, AI, advanced materials, and quantum computing. Australian Strategic Policy Institute, Critical Technology Tracker. 2023. <https://www.aspi.org.au/report/critical-technology-tracker>

### Annual per capita investment in the telecommunications sector (2021)



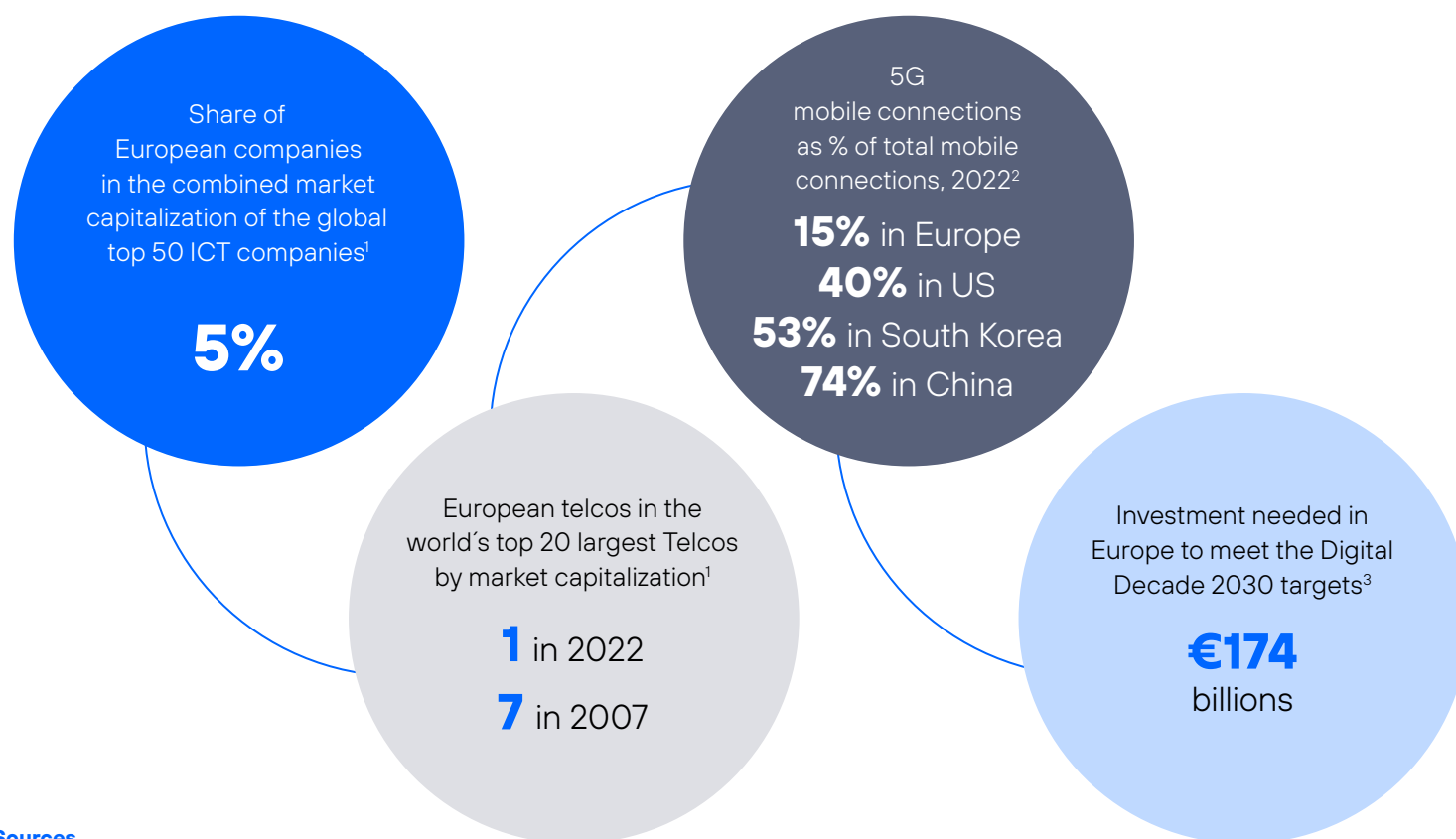
#### Source

ETNO, The State of Digital Communications, 2023. <https://etno.eu/library/reports/112-the-state-of-digital-communications-2023.html>

All this in a context where, according to the European Commission, 174 billion euros are needed to meet the connectivity objectives of the Digital Decade 2030, i.e., to deploy fixed and mobile gigabit networks (5G)<sup>11</sup>. This investment gap is hampering technology deployment in communications networks across the region, as well as its ability to innovate. In 2022, 15% of mobile subscriptions in Europe are 5G, while in the United States this figure reaches 40%, in Japan 24%, in South Korea 53% and in China 74%<sup>12</sup>. By 2022, 73% of the European population was covered by 5G networks, compared to 96% in the US<sup>13</sup>.

These data highlight the risk that the weakening of Europe's technology and digital ecosystem will intensify if rapid action is not taken to strengthen its capacity. Currently, only five European companies in the ICT sector, which includes technology, internet, and telecommunications companies, are among the top 50 global leaders of ICT companies by market cap. They account for almost 5% of the total market value, while US companies account for more than 80%<sup>14</sup>. European telecoms operators are disappearing from the global leadership *ranking*<sup>15</sup>, while the success of a few technology companies, none of them European, has occurred at breakneck speed, with market capitalisation exceeding the GDP of several G7 countries<sup>16</sup>.

### The need to boost Europe's Digital Autonomy



#### Sources

1. Telefónica based on Bloomberg. June 2023.

2. Europe considering UE24 and United Kingdom. EU24 excluding Luxembourg, Malta and Cyprus due to lack of data availability. Total connections excluding IoT. Analysys Mason Datahub. Data retrieved June 2023.

3. European Commission, 2023. <https://digital-strategy.ec.europa.eu/en/consultations/future-electronic-communications-sector-and-its-infrastructure>

## B. A digital industrial policy for a more innovative, competitive, and resilient Europe

The technology and leadership gap in Europe has strategic implications for the competitiveness of industries, as technological weakness permeates all sectors. As a result, large European companies are 20% less profitable, grow revenues 40% more slowly and spend 40% less on R&D than their US counterparts<sup>17</sup>. This makes it difficult for them to maintain leadership positions, innovating, and creating new world leaders in all sectors, being displaced by players from other regions such as Asia, in particular China<sup>18</sup>.

The gap goes beyond competitiveness. It is leading to a loss of digital autonomy, especially important in the age of industrial data. Today, 92% of the Western world's data is stored in the United States<sup>19</sup>, around 80% of data in the cloud is stored by five large technology companies<sup>20</sup>, of which none is European, and almost 60% of internet data traffic flowing over

global networks originates from a small number of large platforms, none of them European<sup>21</sup>. This situation increases Europe's vulnerability to decision-making by non-European market players, which may be subject to different values, rules and standards.

In addition, Europe is facing a mismatch between the supply and demand of digitally skilled professionals. Data from the DESI 2022 report<sup>22</sup> shows that 54% of Europeans aged 16-74 have basic digital skills. Companies are struggling to find a skilled workforce with knowledge and skills related to new technologies, to advance digital transformation, AI, the *Internet of Things* (IoT), cloud projects and cybersecurity. According to IoT Analytics, the number of job advertisements that included IoT, AI, edge computing and 5G grew by an average of over 45% between July 2021 and April 2022, with 5G in even greater demand<sup>23</sup>.



A sustained *gap* over time in competitiveness, skills and leadership in technology sectors would lead to lower efficiency of industries, a decrease in their capacity to innovate, export and create jobs. The competitive edge of products, services or technologies from non-European companies would intensify the region's strategic dependencies, widening the gap.

Without addressing this situation, other regions would have a significant advantage, for example in 5G applications that determine future competitiveness in many key industrial sectors. Europe must act to avoid a future where one or two countries dominate emerging industries and to ensure that the region has continued access to critical technologies and reliable and secure digital supply chains.

Europe realises that its future competitiveness will depend on its industrial capacity to produce services and products that contribute to the successful digital and green transitions. And the speed at which economic transformation is driven will make the difference between positioning Europe as a leading region or a strategically dependent one.

In this context, a digital industrial policy becomes a matter of Strategic Autonomy. It is about boosting the competitiveness of the digital ecosystem and key industrial sectors to achieve industrial policy objectives.

**Europe needs an industrial policy  
to address the technological  
and competitiveness gap to  
boost European industries  
efficiency, capacity of  
innovation, exports, job creation  
and Strategic Autonomy.**



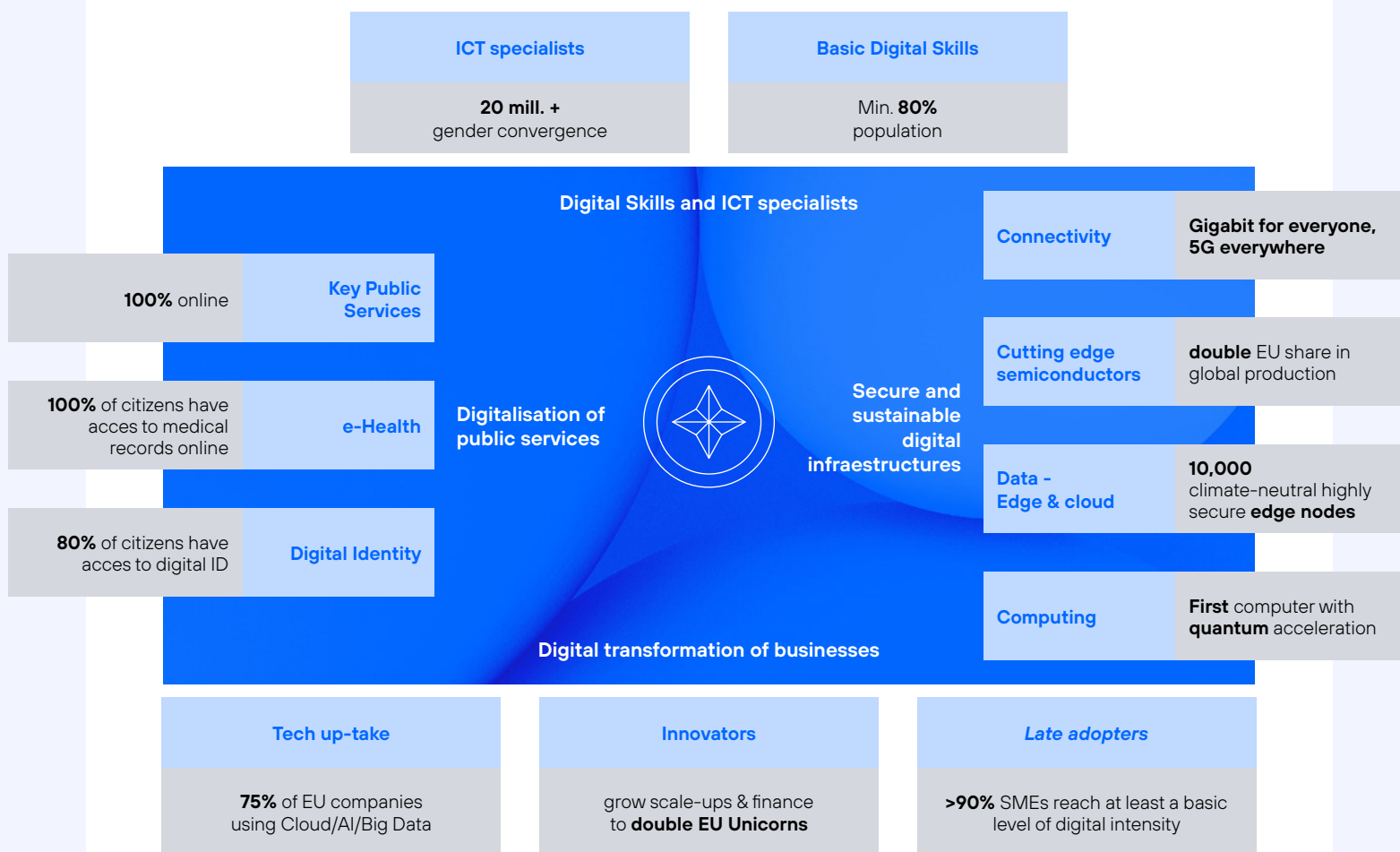
### 3. The *telecommunications* sector: a key partner

Europe's loss of competitiveness and Strategic Autonomy has heightened the sensitivity of European governments to the need to strengthen industries and companies in sectors considered strategic for resilience and economic growth now and in the future. The European Commission is committed to strengthening the region's competitiveness by updating industrial policy to drive the digital and green transitions, reinforcing the European single market and reducing strategic dependencies<sup>24</sup>.

The objectives of the European Digital Decade 2030<sup>25</sup> are a clear indication of the strategic importance of the telecommunications sector in shaping industrial policy. This sector contributes, directly and transversally, to the achievement of Europe's objectives for its digital transformation, defined around four pillars: developing the digital skills of the population, fostering the deployment of high-capacity digital infrastructures, promoting the digital transformation of businesses and fostering the digitisation of public services.



## European Digital Decade: digital targets for 2030



### Resource

European Commission. [https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/europes-digital-decade-digital-targets-2030\\_en](https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/europes-digital-decade-digital-targets-2030_en)

The European Union is clear about its digital ambition. Recognising the critical importance of connectivity for competitiveness, in February 2023 the Commission launched the “Connectivity Package”. This includes initiatives to promote faster and less expensive deployment of high-capacity networks. It also includes a consultation on the future of connectivity. This consultation highlights the Commission’s concern to achieve the connectivity objectives and, with it, the Commission wants to explore new instruments to ensure the sustainability of network investments, including the debate of *fair share*<sup>26</sup>.

In this context, the telecommunications sector is a crucial partner for any 21st century industrial policy. It provides connectivity networks and digital solutions that accelerate digital and green transition, positively impacting economic growth, productivity, job creation and competitiveness.

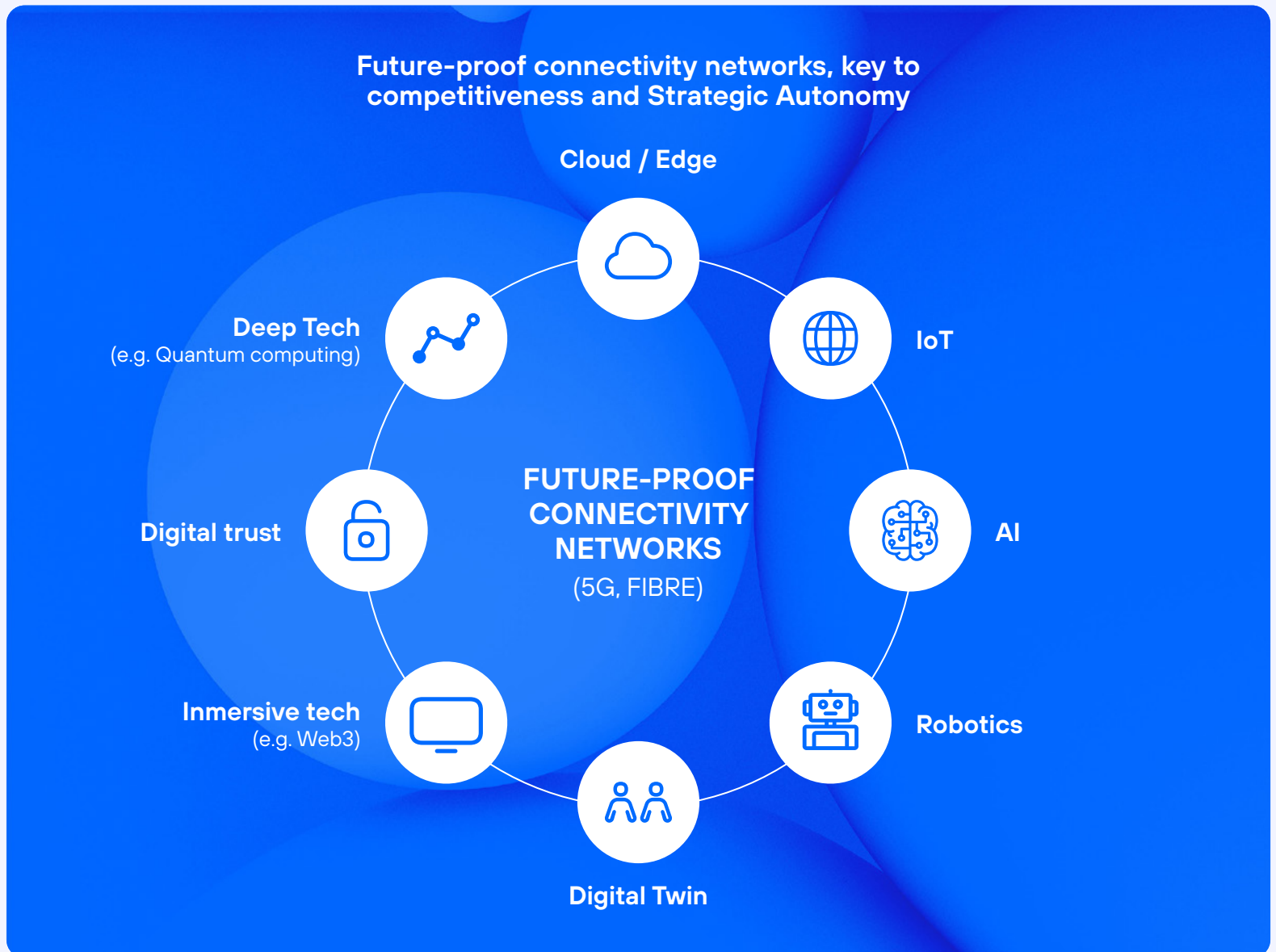
But despite Europe’s ambitions, this sector has lagged behind its economic peers in terms of investment, deployment, and take-up of new networks. It is time to open the debate on how to finance the billions of euros of infrastructure investment needed and how to adapt regulation and competition policy to the new times.

## A. Future-proof connectivity infrastructures

The deployment of very high-capacity networks is the first step towards full Strategic Autonomy. Connectivity is the foundation of a sustainable and digitally advanced economy.

High-speed connectivity networks, such as fibre and 5G, are at the heart of the development of emerging technologies, such as artificial intelligence (AI), *cloud* and *edge cloud* computing, and IoT, helping industries

to transform processes, drive efficiency, innovation, and competitiveness. 5G-enabled applications such as automated driving, smart factories, smart cities, and immersive technologies, among others, open the door to an unprecedented era of innovation in digital services that will drive industrial transformation. Their strategic value raises the need for new approaches to financing and regulation to ensure network readiness and sustainability over time.



To cope with the speed of change and new digital demands, telecom operators have not stopped evolving their networks. The arrival of a new wave of digital innovation triggered by 5G or immersive technologies, such as the metaverse or web3, again requires a rethink of the connectivity model.

Present and future experiences depend more than ever on connectivity. The new digital era will require a radical transformation and a platform that offers simplicity over business complexity. A platform that makes the high capabilities of operators' digital infrastructure available to any developer and allows the required network capabilities to be tailored for each service.

Therefore, a step in the evolution of networks has been taken with the launch of Open Gateway. Open Gateway is a GSMA-led initiative that aims to transform communications networks into platforms, for the benefit of the entire digital ecosystem. The capabilities of telecommunication networks are opened to developers in an interoperable, intuitive, and programmable way through APIs.



**The new digital era will require a transformation of connectivity infrastructures into platforms to accelerate the development of new digital services**

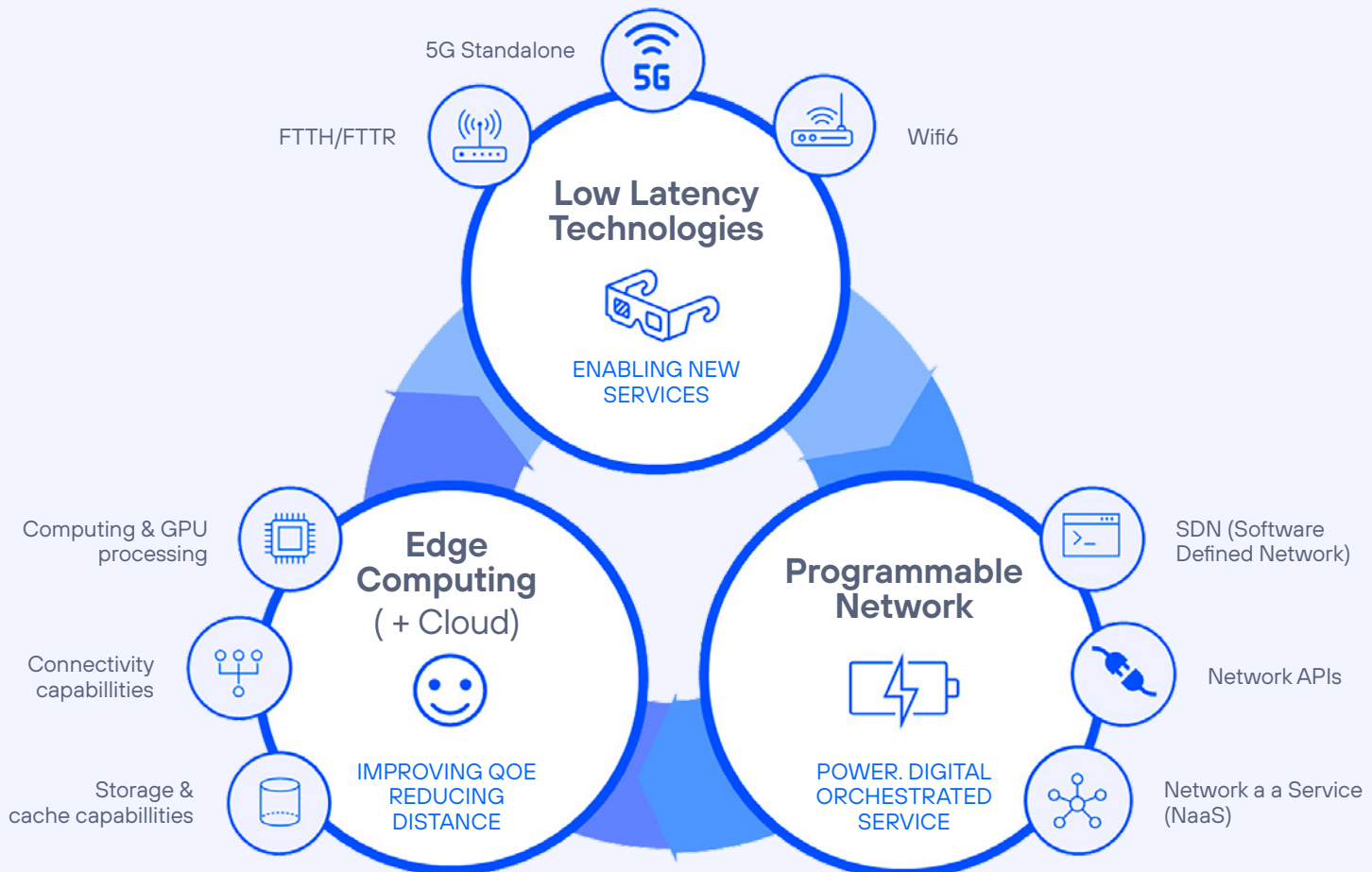
Network APIs, available in the developer marketplaces, will enable network capabilities, such as connectivity (e.g., speed), *edge* or communication services, to be incorporated into applications. This will drive the enhancement and creation of new services that incorporate the network capabilities that each application requires, broadening the spectrum of distinctive value propositions for developers, *start-ups*, application providers, and users.

It establishes a paradigm shift: telecom operators evolve from providing connectivity infrastructures to providing *Network as a Service* (NaaS). Operators thus become active co-creators of the new era of digital innovation and key assets for the services of the future.

To do so, operators need to invest in 3 pillars whose convergence will allow digital disruptions, such as web3 or metaverse, to become a reality in Europe as well.

1. Firstly, *edge computing*: which allows data to be processed closer and more securely to end-users, making more efficient use of network resources;
2. Secondly, low latency technologies: such as 5G, fibre deployment and next generation wireless networks;
3. Thirdly, programmable networks: through APIs, global and standardised, so that a single development is interoperable and compatible with all telecom operators' networks.

## Investments to evolve networks and unleash a new era of digital innovation



### B. Beyond connectivity: the integral role of the telecoms sector

Beyond connectivity, the adoption of digital services and solutions promotes competitiveness by enabling businesses to drive strategic differentiation and innovation, increase efficiency, expand the market, improve customer experience, and provide real-time information, allowing companies to make informed decisions and adapt quickly to market changes.

Telecommunication operators are crucial to achieving the digital transition because of its expertise, technological capabilities and reach across all types of businesses and sectors. It offers a wide range of digital services, from connectivity to cybersecurity and AI, providing tailored solutions for businesses of all sizes and public administrations that accelerate their transformation.

And the digital transition goes hand in hand with the green transition. As the European Commission states, “digital and green are twin challenges, as neither can succeed without the other”<sup>27</sup>. The telecoms sector offers digital solutions based on connectivity, IoT technologies, cloud, *big data* and AI, which contribute to reducing the CO<sub>2</sub> emissions of its customers.

According to Ericsson, although ICT’s carbon footprint is around 1.4% of global emissions, ICT has the potential to reduce global greenhouse gas emissions by 15-30% by 2030. In addition, the industry itself is reducing its environmental impact as it deploys next generation networks (fibre, 5G).



## ICTs have the potential to reduce global greenhouse gas emissions by 15-30% by 2030

Thanks to lower energy consumption and more efficient management during data transport and processing in the network system, these networks reduce the environmental impact compared to previous generations. As analysed by Telefónica, the environmental impact per petabyte of its fibre network has been shown to be 18 times lower than that of the copper network, while the impact of 4G/5G has been shown to be 7 times lower than that of 2G/3G<sup>28</sup>.





Beyond the digital and green transition, the telecommunications sector is a key player in driving industrial capacity for building strong industrial ecosystems. The integration of industrial data with emerging technologies makes the sector a key enabler of technological innovation and a driver of competitiveness. By 2025, smart sensors – in cities, hospitals, factories or connected vehicles – will create almost 90% of humanity's data<sup>29</sup> and will play a vital role in the future competitiveness of sectors ranging from manufacturing to healthcare, driving innovative use cases.

In particular, 5G is the driver of Industry 4.0. 5G represents a platform for innovation with differential advanced capabilities, such as increased reliability and security.

The ability to connect a large number of elements securely, *edge computing* and lower latencies will make it easier to meet the specific demands of each use

case. This will allow the development of applications adapted to each industry, which when implemented in their processes, products and services will result in greater efficiency, flexibility, and competitiveness. It will also enable innovations such as industrial automation, high-precision manufacturing, and connected vehicles. In this way, the robustness and security of industrial value chains, reinforced by reliable cybersecurity solutions offered by operators, will boost digital trust and adoption, which is essential to accelerate the digital transformation of industries.

Moreover, the telecommunications sector's investment in R&D and cooperation with other players in the innovation ecosystem generates virtuous circles. Cross-sector collaboration with a variety of companies and innovation centres reduces the time to market for new products, services or technologies, which translates into competitive advantages.



## 4. Recommendations: towards an *industrial* policy for the 21st century

The loss of leadership in the digital world translates into a widening of Europe's technology and connectivity gap with other regions. Promoting investment and innovation must be the priority objective. In particular, strengthening the investment capacity of the European telecoms sector is crucial.



### Boosting leadership in the digital world

would translate into a reduction  
of Europe's technology and  
connectivity gap with other  
regions and, to this end, the  
promotion of investment is key

However, we live in a contradictory landscape with a difficult balance between investment, regulation, and competition policy. Recent trends show that the European telecommunications sector is losing size and global competitiveness. The declining path of the sector's revenue market over the last decade, with average revenue per user (ARPU) up to 60% lower than in the United States<sup>31</sup> together with investment pressure, is substantially reducing the availability of financial resources for investment. As an example, the free cash flow of European incumbents has more than halved in the last decade<sup>32</sup>.

This is partly due to an approach to sectoral regulation and competition policy focused on short-term price reductions. This has led to the development of highly competitive, but also highly fragmented markets at national level, leading to artificial competition, which hampers the return on investment. It is important to note that operators achieve a higher return on investment the more customers they have on the deployed infrastructure, which is national. Insufficient profitability discourages investment.

Moreover, the complementarity of the different players in the ecosystem, such as telecoms and digital platforms, is unquestionable for users to benefit from innovative digital services. However, an unbalanced distribution of value<sup>33</sup> and bargaining power is jeopardising this virtuous circle of investment and innovation, and the sustainability of the digital ecosystem.

### Recommendations for a 21st century industrial policy

A competitive digital economy is closely linked to the availability of connectivity networks that drive technological and digital development. To this end, policies must put investment and innovation at the centre. Specifically, any industrial policy in the digital era should take into account the following recommendations to boost the competitiveness of the European telecommunications sector:

#### 1. Investment-friendly policies: an enabling framework that creates incentives for investment and innovation for future-proof connectivity networks.

- Generate incentives for investment by promoting pro-investment market structures, i.e. less fragmented markets at the national level. This would create incentives to increase private sector investment and innovation capacity.
- Free up resources for investment by simplifying regulation, reducing deployment costs, eliminating telecom sector-specific taxes and ensuring spectrum availability on reasonable terms.

#### 2. Technology regulation: fair conditions for a well-functioning digital ecosystem.

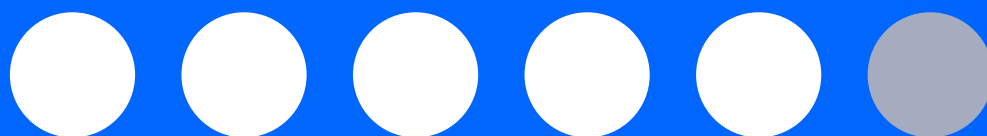
- Enable legislation that encourages digital ecosystem actors to contribute in a fair and proportionate manner to the sustainability of network investments.
- Promote a level playing field through horizontal regulatory frameworks covering aspects such as privacy, consumer rights and security, while eliminating telecommunications sector-specific regulations.

#### 3. Digitisation for a green transition: policies that recognise telecommunications infrastructures as enablers of the green transition.

- Include telecommunications infrastructure in the European taxonomy of sustainable activities to attract sustainable investment.
- Build a coherent and consistent framework to foster the dual digital and green transition. In this regard, the EU's sustainable financing policy should be a driver to support European priorities to foster the dual digital and green transition, as set out in the Green Deal and the EU's Next Generation Funds.

#### 4. A holistic approach to industrial policy: promoting the capacity of European industry and its competitiveness from R&D to commercialization.

- Align competition policy, state aid and regulatory frameworks to promote investment and innovation and ensure a level playing field between Member States.
- Stimulate demand for connectivity and digital adoption, boosting digital trust, and encouraging digital skills and employability initiatives.
- Promote international cooperation to foster convergence in data governance, AI and cybersecurity, among others.



## 5. References

1. In 2022, the EU's share of GDP (based on PPP) in the world was 14.8%, compared to 23.5% in 1990 and 25% in 1980. That of the United States was 15.8% (compared to 21.6% in 1990) and that of China 18.5% (compared to 4% in 1990). IMF (data retrieved 1 June 2023) <https://www.imf.org/external/datamapper/PPPSH@WEO/ADVEC/WEOWORLD/EU/CHN/USA/DA> See also ERT Benchmarking Report, 2022 <https://ert.eu/wp-content/uploads/2022/06/ERT-Benchmarking-Report-2022-LR.pdf>
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12. Analysys Mason Datahub. Data retrieved June 2023.
13. ETNO, The State of Digital Communications, 2023. 2022. <https://etno.eu/library/reports/112-the-state-of-digital-communications-2023.html>
14. Telefónica based on Bloomberg, June 2023.
15. In June 2007, seven European telecommunications operators were among the world's top 20 (Vodafone, Telefónica, Deutsche Telekom, France Telecom, BT, Telia Sonera) by market capitalisation. In December 2022, only Deutsche Telekom remained in the top 20. Telefónica based on Bloomberg.
16. The combined market capitalisation of Apple (\$2.1 trillion), Microsoft (\$1.7 trillion), Alphabet (\$1.2 trillion) and Amazon (\$1 trillion) (all US companies) exceeded \$6 trillion in April. This figure is equivalent to more than the GDP in 2023 of some of the G7 countries (in USD): United Kingdom (3.1Tr.), Germany (4.3Tr.), France (2.9Tr.), Italy (2.2Tr.) or Canada (2.1Tr.). Telefónica based on Bloomberg (market capitalisation in April 2023) and IMF (data accessed on 10 April 2023).
17. Most of the differences are observed in technology creation industries, namely ICT and pharmaceuticals, which account for 90% of the total ROIC gap, 80% of the investment gap, 60% of the growth gap and 75% of the R&D gap. McKinsey, 2022 <https://www.mckinsey.com/capabilities/strategy-and-corporate-finance/our-insights/securing-europes-competitiveness-addressing-its-technology-gap?hlkid=09658ec6952849dfb50fa1e31a38d5ae&hctky=10130448&hdpid=24c12759-3e04-4a06-ac4e-ace9137a1c51>
18. According to the Fortune Global 500, China-based companies have surpassed in revenue many European companies, whose numbers have remained flat since 2017. Chinese companies have even surpassed US companies' revenues for the first time in 2022, with 31% of the total. <https://www.europapress.es/comunicados/internacional-00907/noticia-comunicado-fortune-publica-listaanual-fortune-global-500-20220805142754.html>; <https://fortune.com/ranking/global500/>
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**29.** Internal Market Commissioner Thierry Breton: "Europe has everything to lead the technology race" <https://www.linkedin.com/pulse/europe-has-everything-takes-lead-technology-race-thierry-breton>

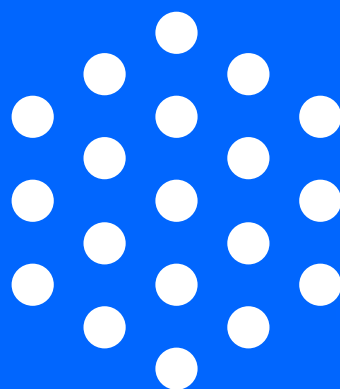
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**31.** The industry invests half as much as its US peers because ARPU levels are ca. 60% lower than in the US: both in fixed broadband: EUR 21.8 in Europe vs. EUR 50.6 in the US, and in mobile: EUR 14.71 in Europe vs. EUR 37.37 in the US in 2021. ETNO. The state of digital communications, 2023. 2022. <https://etno.eu/library/reports/112-the-state-of-digital-communications-2023.html>

**32.** Free cash flow: -57 % 2011-2021, according to J.P. Morgan 2022.

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