ERT

Mapping a New World with the EU Digital Compass

Priorities for Economic Recovery

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Executive Summary

One of the effects of the extraordinary coronavirus pandemic has been to change our perspective about the challenges of our time. If the transition to a digital and greener economy was not clear before COVID-19, it certainly is now. Our communities and our economies need to be both more sustainable and more digitally adept as we pave the way to a post-pandemic world.

Even before the coronavirus, we could already describe this as a critical moment in history: we have reached a tipping point in our approach towards the environment. The extreme events of 2020 have also shown how we need to innovate faster.

The events of the past year have disrupted long-established systems that were previously resistant to change. There is a growing acknowledgment that innovation and digitalisation are undeniable elements for the future and for the EU's blueprint to reach carbon neutrality by 2050.

ERT supports this goal, and the more recent plans to build back better after the pandemic. This paper is ERT's contribution to the discussions about the path to digitalisation.

We suggest focusing on fundamental digital enablers or technology levers, including the data economy, artificial intelligence (AI), cloud computing, connectivity and cybersecurity. ERT welcomes the EU's commitment to allocate at least 20% of the Recovery and Resilience Facility under the Next Generation EU (NGEU) package to the digital transition. In addition, ERT has recommendations for a critical focus on jobs, skills and education in digital domains.

We also need to consider the EU's position in a global digital economy. While Europe has been falling behind the US and China in its digital transformation, it still has significant potential to lead, especially in Industry 4.0 and B2B data-driven business models.

Finally, we need to track progress against the ambitions set out for Europe's digital transformation. ERT has proposed a set of key performance indicators (KPIs) to measure success in delivering industrial competitiveness. We welcome the 2030 goals outlined by the European Commission in its Digital Decade Communication.

ERT Members are committed to a strong, inclusive and united Europe where innovative industrial players, large and small, play a decisive role. In 2019, we made some broad pledges: to grow investment in Europe, to champion diversity and inclusion, to embrace the digital revolution, to invest in our workforce's skills, to contribute to tackling climate change and to support a level playing field for global trade.[1]

ERT will continue to engage constructively with EU leaders, national governments and civil society to secure a prosperous, stable economic future for our stakeholders and citizens. We believe in a future where a technologically sovereign EU delivers on the twin digital and green transitions.

1 ERT Paper *"Strengthening Europe's Place in the World"*, (April 2019)
https://ert.eu/wp-content/uploads/2019/04/ERT-Position-Paper-Strengthening-Europes-Place-in-the-World-April-2019_V2.pdf

Summary of key recommendations for action

Investment

- Speed up initiatives supporting the digitalisation of business, government and national healthcare systems.
- Provide ambitious, modern and future-oriented funding for Europe's digital transformation through Next Generation EU and Multiannual Financial Framework (MFF), Horizon Europe, Digital Europe Programme and Connecting Europe Facility.
- Implement the decision to allocate at least 20% of the Recovery and Resilience Facility to digital.
- Ensure an overall EU R&D funding of 2% to 3% of EU GDP.
- Focus R&D funding on improving integration between European and national R&D activities as well as to support SMEs and start-ups and to break the silos between sectors.
- Drive coordinated investments in key digital strategic value chains and Important Projects of Common European Interest (IPCEIs) including on cloud, edge cloud and innovative digital projects.
- Introduce tax incentives for investments in R&D, digitalisation and related professional education.
- Improve access to capital, especially for start-ups, by completing the Banking Union and Capital Markets Union.
- Adapt EU competition policy to the digital era and enable European companies to compete at scale globally.

Digital jobs and education

- Develop effective upskilling and reskilling programmes through joint action with the Member States, public employment services, the European Commission and the private sector.
- Roll out the Digital Education Action plan by futureproofing Europe's education system, aligning skills supply and demand, promoting lifelong learning, addressing immediate skills shortages, attracting more women to digital and STEM (Science, Technology, Engineering, and Mathematics) training and jobs, and promoting dual learning.

Europe as a global player

- Build a coherent international digital strategy that aligns efforts in trade, development and digital policies.
- Deliver a level playing field in digital trade by addressing digital trade barriers in third countries.
- Facilitate cross-border data flows in plurilateral and bilateral contexts in compliance with EU rules and standards.
- Follow a risk-based approach towards Standard Contractual Clauses (SCCs).
- Finalise the WTO e-commerce negotiations and expand global participation in the Information Technology Agreement (ITA).
- Drive regulatory cooperation with strategic partners, especially the US.

Data

- Facilitate the data economy, innovative use of data and the Single Market for data, focusing on voluntary business-to-business (B2B) and business-to-government (B2G) data-sharing.'
- Deliver on the European Data Strategy and set up European Data Spaces, while avoiding premature regulatory action that would jeopardise innovation in big data.
- Ensure that standards for B2B data sharing are driven by industry.
- Ensure the public sector becomes a pioneer in making non-personal data available.
- Ensure a more consistent, harmonised and innovation-friendly application of data protection rules throughout the EU.

Artificial intelligence

- Set up new public-private-partnerships in AI and support the establishment of European AI research and innovation superclusters.
- Boost public and private investment for AI research, innovation and adoption through Next Generation EU and MFF.
- Make use of regulatory 'sandboxing' to achieve the right balance of promoting innovation and mitigating risks.
- Avoid rushing into regulation of AI. An onerous regulatory environment and over-prescriptive rules will hinder investments in AI and the use of innovative AI solutions.
- Review existing EU legislation potentially applicable to AI and adapt it to AI as needed.
- Take a risk-based approach to determine which AI applications may be covered by ad-hoc legislation and include the risk of non-adoption of AI in any risk assessment.

Cloud/Edge Cloud

- Set up trustworthy and cost-efficient European cloud and edge infrastructure
- Ensure the European Alliance for Industrial Data, Cloud and Edge and the EU Cloud Rulebook leverage the deliverables of GAIA-X and other related initiatives like the AI, Data and Robotics Partnership.
- Provide initial demand for the European Cloud Federation via the public sector.
- Create EU Cloud Marketplaces, both for the public sector and industrial ecosystems.

Connectivity

- Provide regulatory incentives for private investment, cut the cost of spectrum, support voluntary network sharing and promote competition without artificial interventions.
- Create a revised 5G Action Plan to close the investment gap while maintaining sustainable competition, supported with adequate financing through the MFF and NGEU in areas of market failure, like rural areas.
- Implement the European Commission recommendation on a common toolbox to cut the cost of deploying very high-capacity networks and ensuring timely and investment-friendly access to 5G radio spectrum.
- Promote harmonised and science-based electromagnetic field (EMF) limits.
- Develop an EU strategy on international connectivity and submarine cables.

Cybersecurity

- Push for a harmonised European framework for cybersecurity, including Cybersecurity Act certification schemes in close cooperation with industry.
- Revise the Directive on security of network and information systems (NIS Directive) to address today's fragmented regulatory framework and harmonise cybersecurity measures across EU Member States.
- Foster and finance the deployment of more ambitious cybersecurity tools through initiatives like the Digital Europe Programme (DEP) and the Cybersecurity Competence Centre and Network.
- Implement and apply the 5G Risk Mitigation Toolbox in a timely and coordinated manner across the EU.
- Improve collaboration between national administrations, relevant structures such as the Computer Emergency Response Team for the EU Institutions, bodies and agencies (CERT–EU) and national Computer Security Incident Response Teams (CSIRTs), and industry.

Foreword

The time we live in is characterised by digital transformation. The opportunities are fantastic, and the basic idea is simple. At its core digital transformation is about leveraging technology to develop society.

Companies use data to create more value for their customers. Governments introduce digital tools that change the way citizens interact with authorities and access services. And thanks to digital transformation, we as individuals have drastically changed the way we stay connected with friends, how we work together with our colleagues, not to mention how we buy and consume products and services. The pandemic has accelerated this development even further.

Digital transformation is also key for the transition to a more sustainable society. The automotive industry is the perfect example: electrification of vehicles has delivered a complete transformation of the sector. Connectivity and broadband capacity, as well as the availability of high-performance batteries, are pre-requisites for producing electric vehicles and for operating them in an optimal and resource-efficient way. The software transition that accompanies electrification is just as significant. In addition, digital transformation has changed the way we develop, build and test new concepts, how we manufacture products in our plants and how we serve our customers and the user experience we provide them.

With the green & digital transitions being driven by the European Union's Green Deal and Digital Compass, we have the potential to futureproof prosperity in Europe for the next generations. To capture this opportunity, it is important that Europe´s industrial strategy, competition policy and regulatory environment are aligned so that together we can create a climate where innovation and entrepreneurship thrive.

It is equally important that we ensure that the necessary digital enablers are in place, including the data economy, artificial intelligence (AI), cloud computing, connectivity and cybersecurity. Today, Europe is being outpaced in many areas of digitalisation. If this gap continues to grow, European companies – and citizens – risk being left behind.

In the pages that follow, you will find consensus on many of the components that we - the Members of ERT - believe will be critical to the successful digital transformation of European industry, both the big players and the small & medium sized companies in each ecosystem.

Europe has so much to gain from digital transformation – let's make the very most of this extraordinary moment.

Martin Lundstedt

Chair of the ERT Committee on Digital Transformation
President & CEO of AB Volvo

1. Introduction

It is hard to overstate the disruption caused by the coronavirus pandemic. Our lives, our economies and our communities have been shattered. Even though we are now into the second year of the COVID-19 crisis, we are still fighting the disease while working on a fast and strong recovery.

As we tackle this extraordinary pandemic, we are also battling a chronic climate change crisis. Europe urgently needs a greener economy. We can achieve it through innovations in environmentally friendly technologies. They can drive greener industrial processes, and cleaner energy and transport solutions.

Digitalisation has accelerated throughout the COVID-19 pandemic. Remote solutions and platforms, backed by resilient telecommunications, have been instrumental in ensuring the continuity of businesses and public services, including healthcare.

"Modern technologies have allowed young people to learn remotely and millions to work from home", European Commission President Ursula von der Leyen said in her September 2020 State of the Union speech. *"They enabled companies to sell their products, factories to keep running and governments to deliver crucial public services from afar. We saw years' worth of digital innovation and transformation in the space of a few weeks."* [2]

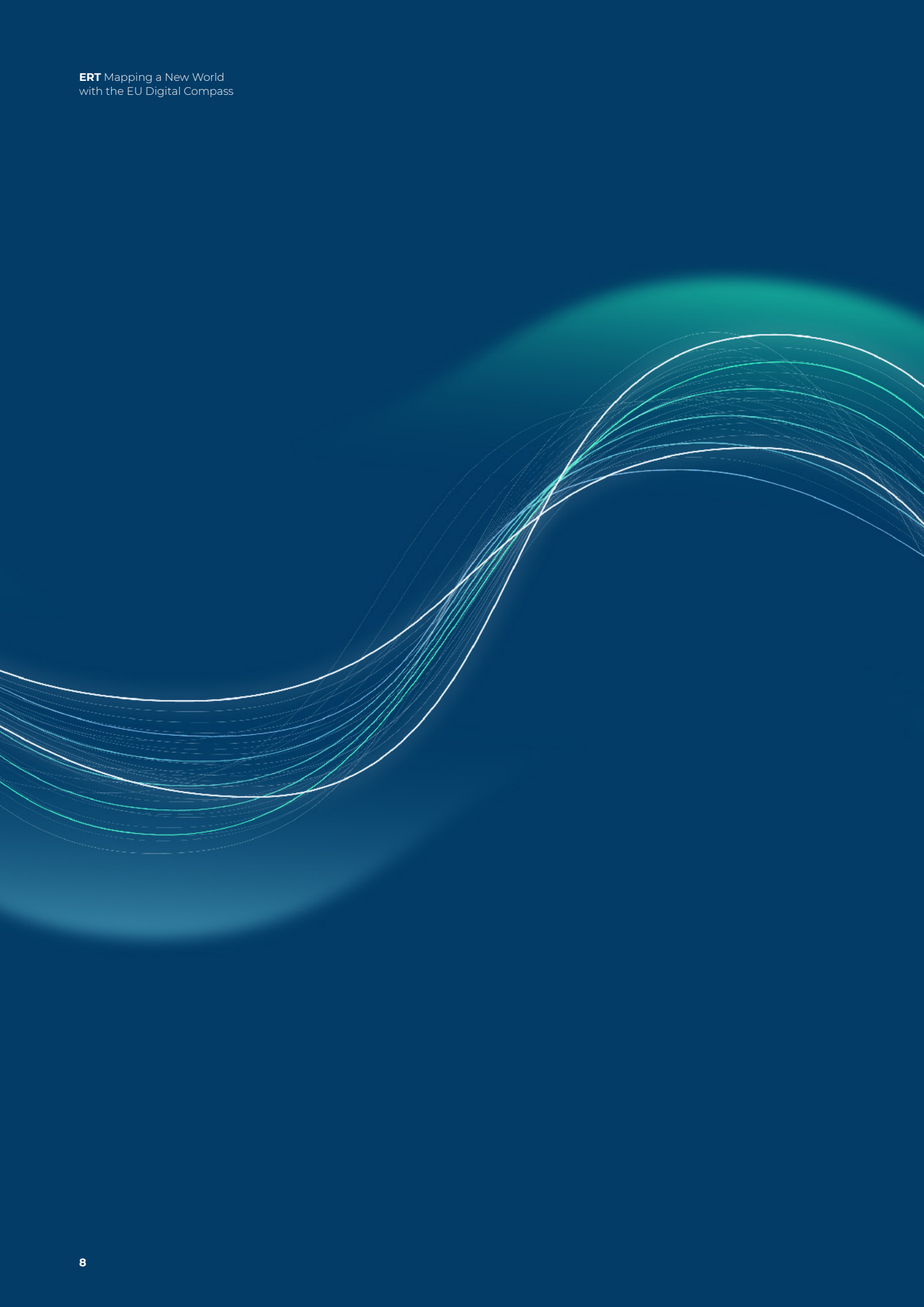
We need a digital transformation of industry and government to tackle today's challenges and deliver a robust recovery. It is essential to fight the current pandemic and to build more resilient healthcare systems. A digital transformation will also drive productivity, new business models and stronger global value chains. And it is a key enabler for the green transition. Digital infrastructure and solutions can advance the circular economy, support decarbonisation and cut the environmental and social footprint of products placed on the EU market.

We need much more investment in digital for both short-term relief to the economy and to drive sustainable, long-term economic growth. The new Recovery and Resilience Facility financed with bonds issued directly by the EU is a bold and welcome response to the massive investment needs that Europe faces.

Money is not the only issue. Public investment must be supported by a modern and future-proof digital policy agenda that creates a regulatory framework that fosters private investment and accelerates the digital transformation. We need to ensure the right skills at all levels for a workforce that can drive the adoption of digital technologies.

This paper is the synthesised recommendation from ERT Members on policy and investment actions required, along with the respective digital enablers. We believe these actions are key to deliver the goals of the 'Digital Compass' that the European Commission set out in its Digital Decade Communication from March 2021.

2 Speech of EC President von der Leyen https://ec.europa.eu/commission/presscorner/detail/en/SPEECH_20_1655



2. A case for change – why digital transformation is essential for Europe's recovery

2.a. Digitalising business

Business recovery will be essential to Europe's exit from this crisis. A robust and sustainable recovery is especially important for SMEs who represented 60% of value creation and 70% of employment in the Euro area from 2008 to 2013.[3]

The digitalisation of businesses will be fundamental for growth and competitiveness. Digital solutions such as artificial intelligence (AI), cloud computing, IoT and Industry 4.0 drive the development of new data-driven business models as well as companies' productivity and the resilience of their global value chains.[4]

Digital technologies and services will be essential tools for the EU to meet its Green Deal aim of becoming the world's first carbon neutral economy by 2050. They are key enablers for the green transition, advancing the circular economy, supporting decarbonisation and cutting environmental and social footprints. Digital solutions contribute to smart energy distribution, advanced mobility solutions, and enable carbon tracking and monitoring.

The COVID-19 crisis has made businesses digitalise fast. Businesses that had already digitalised have an advantage.

Large enterprises were already becoming more and more digitalised, with 38.5% of large companies relying on advanced cloud services and 32.7% using big data analytics.[5] SMEs, however, were already falling behind the innovation curve and have been most at risk of bankruptcy during the pandemic. Even before the crisis, most SMEs were not exploiting new technologies, with only 17% of them using cloud services and 12% using big data analytics.[6]

Only 56% of all companies with 50 or fewer employees provided remote access to email, applications and documents for their staff, according to one survey, compared with 93% of all companies with more than 250 employees.[7] In e-commerce, only 17.5% of SMEs sold online in 2019.[8]

There are still 1.2 million businesses (with 10 to 249 employees) across Europe that have yet to adopt digital technologies. Europe's overall DESI score for the integration of technology in businesses shows that SMEs are fast falling behind large enterprises.[9] If just 100,000 of these businesses digitalised, it could create extra revenue of up to €148 billion, according to one estimate.[10]

3 ECB publication on Small & Medium-Sized Enterprises in the Euro area: Economic Importance & Financing: https://www.ecb.europa.eu/pub/pdf/other/mb201307_focus06.en.pdf?6562a3cee3bd916eed1651c57dd5d2d2

4 See also the case studies in the annex.

5 EC Digital Economy and Society Index Report 2020 - Integration of Digital Technology https://ec.europa.eu/digital-single-market/en/integration-digital-technology-enterprises

6 EC Press Release: New Commission report shows the importance of digital resilience in times of crisis https://ec.europa.eu/commission/presscorner/detail/en/IP_20_1025

7 McKinsey article Safeguarding Europe's livelihoods: Mitigating the employment impact of COVID-19 https://www.mckinsey.com/industries/public-and-social-sector/our-insights/safeguarding-europes-livelihoods-mitigating-the-employment-impact-of-covid-19

8 EC Press Release: New Commission report shows the importance of digital resilience in times of crisis https://ec.europa.eu/commission/presscorner/detail/en/IP_20_1025

9 The Digital Economy and Society Index (DESI) is a composite index that summarises relevant indicators on Europe's digital performance and tracks the evolution of EU Member States in digital competitiveness.

10 Vodafone publication *Europe Connected* https://www.vodafone.com/sites/default/files/2020-10/EuropeConnected_IRELAND_FINAL.pdf

In the global marketplace, Europe is falling behind its main competitors on digitalisation. The European Investment Bank found that digital adoption rates are lower for EU companies than US firms. Some 37% of companies in the EU had not implemented any digital technology in 2020, compared to only 27% of firms in the US.[11]

Europe has to catch up with the US and China in relation to the digital economy. It still has significant potential to lead, especially in the digital transformation of industry and B2B data-driven business models, but time is of the essence.

We must encourage and support European companies though their digital transformation. EU businesses struggle with fragmented regulations, administrative burdens, lack of access to risk capital, and limited incentives for R&D and innovation. We must strengthen the Digital Single Market, invest in digitalisation, innovation and entrepreneurship, and provide access to capital. Europe can then emerge from the crisis stronger and more resilient.

2.b. Digitalising government

The current crisis has shown how we need to foster digitalised public administrations and build more resilient government services. E-government and other digital technologies can support public administrations and European societies, enhancing their ability to respond effectively in times of crises. The COVID-19 crisis has accelerated the transition toward web-based technologies in government, helping to ensure the continuity of public services. But we need more progress to reach the full potential of an EU-wide government digitalisation. The COVID-19 crisis has shown the significant benefits to be reaped from big data, artificial intelligence and cloud computing applications.[12]

Systems and processes need to be digitalised and updated in areas such as health, justice, education and social services. This will ensure a high level of inclusion, including elderly people in remote areas. Public servants and employees need to improve their digital skills and knowledge.

Public administrations are already transitioning culturally and technologically towards more digitalised processes. They are shifting from physical asset acquisitions to service delivery and learning new ways of procurement from industry and utility providers. The digitalisation of public administration services is already advanced adoption in the EU's more innovative Member States, specifically in northern Europe where the general 'digital knowledge' is higher.

Digital initiatives will be essential in ensuring Europe can recover faster and be more resilient in the future. We need to put in place the right conditions to develop new government-to-business (G2B) business models. That means increased digitalisation of governmental processes (justice, learning, mobility, city administration, sport, culture, etc.), and a better and more harmonised ability to access and re-use open data.

11 EIB publication *"Building a smart and green Europe in the COVID-19 era"* https://www.eib.org/attachments/efs/economic_investment_report_2020_2021_en.pdf

12 OPSI Call for Innovative Government Responses https://oecd-opsi.org/projects/covid-19innovation/

2.c. Digitalising healthcare

Governments are rethinking national healthcare systems as the global COVID-19 pandemic continues to unfold. We need more investment to digitalise healthcare systems. It should go hand-in-hand with public policies facilitating cross-border exchange of healthcare data freely, securely and in line with Europe's privacy provisions and values.

Many new innovative healthcare use cases have been introduced over the past year. These include tracing and tracking apps, drones purposed for healthcare missions, as well as remote patient monitoring (including remote mammography exams using 5G), all helping to tackle the challenges posed by the pandemic. Remote medical consultations increased in Spain by 153% during the crisis, and digital health services are becoming the new normal.[13]

COVID apps, developed jointly by Member States and industry, have offered better monitoring and tracing of infection chains in real-time to enable faster responses, including the notification of at-risk individuals. Data sharing and assessment, as well as digital solutions, can help epidemiologists and public health practitioners involved in the development and implementation of prediction systems for infectious diseases and environmental hazards, and in assessing the most appropriate interventions.

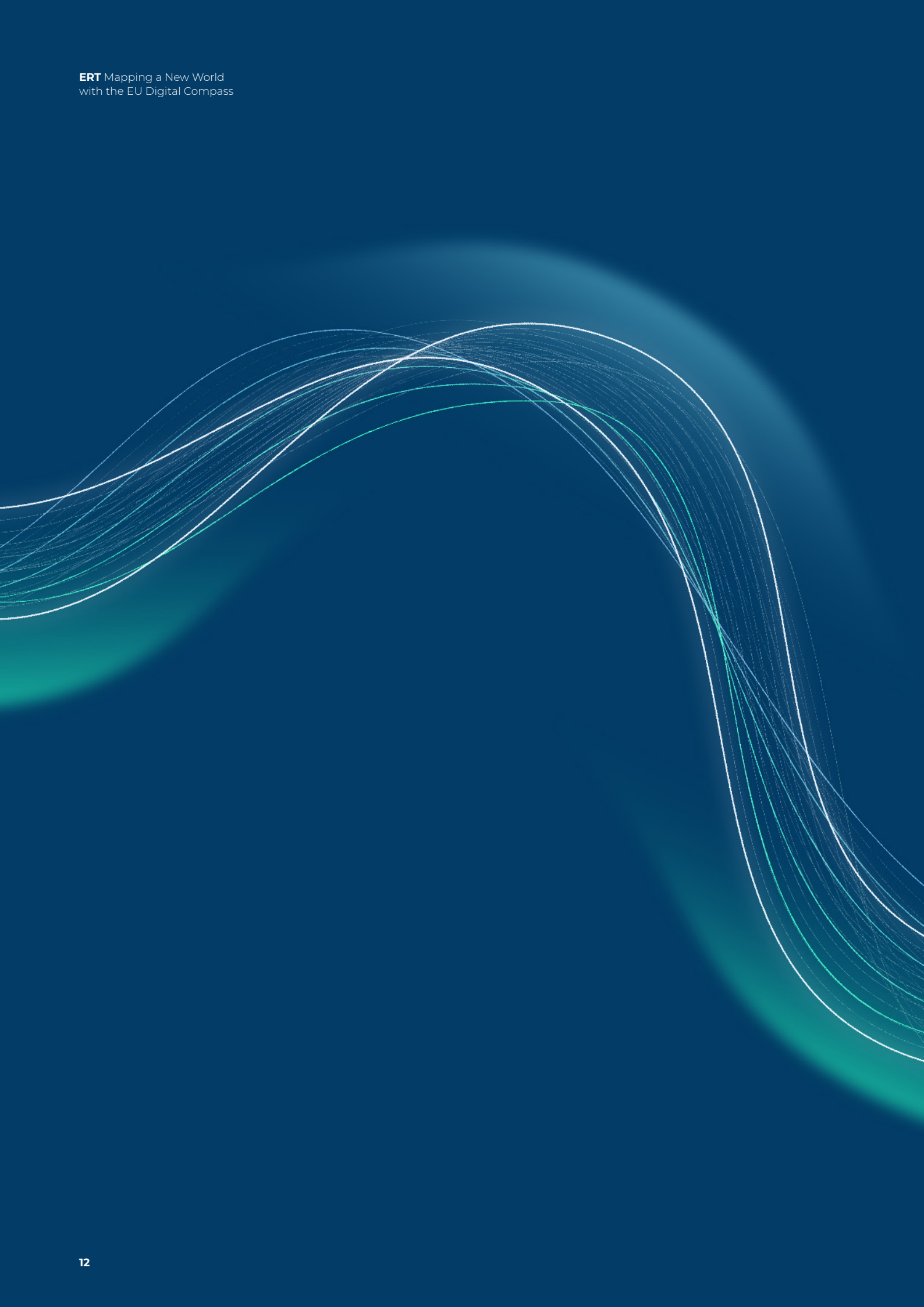
The pandemic has however also exposed fragilities in healthcare systems. Even before the pandemic, there were daunting challenges managing the chronic disease burden and caring for an ageing population. Most patient data remain stored in disparate systems, which are not integrated and cannot interoperate. It means practitioners have difficulty exchanging information. Medical decisions cannot focus on patients, take a longitudinal view, and are not optimised on a regional, national or European scale.

Member States should work with the European Commission to create Health Data Spaces to transform healthcare systems. Interoperable healthcare systems are critical for clinical care as well as clinical research and policy-making. The EU Health Data Space also needs to protect Member States sovereignty in the healthcare domain and allow data elements to be exchanged with the other Member States and/or their citizens.

The EU Health Data Space will help future-proof healthcare systems that are resilient in absorbing shocks (including infectious disease pandemics) as well as dealing with an increasing chronic disease burden of an ageing population. Additionally, the EU Health Data Space can give every citizen in the EU (remote) access to essential, high quality, affordable healthcare services, in line with the United Nation's Sustainable Development Goals. GAIA-X is a credible basis for the EU Health Data Spaces, incorporating as a foundation a federated and open data infrastructure based on European values.[14]

13 Eurohealth - Vol.2, No.2, 2020, *Keeping what works: Remote consultations during the Covid-19 pandemic* https://analysis.covid19healthsystem.org/index.php/2020/11/18/keeping-what-works-remote-consultations-during-the-covid-19-pandemic/

14 Information on GAIA-X : A Federated Data Infrastructure for Europe https://www.data-infrastructure.eu/GAIAX/Navigation/EN/Home/home.html



3. ERT recommendations – boost recovery, build resilience and strengthen technological sovereignty

3.a. The modern digital ecosystem – key areas for EU focus

There is a vast landscape of digital use cases that promote economic growth and a greener economy. We cannot exhaustively mention them all in a single paper, and it would be of limited value anyway. We do however want to recognise the current top digital use cases and dive deeper into a few of the most promising avenues for investment and renewed policy considerations.

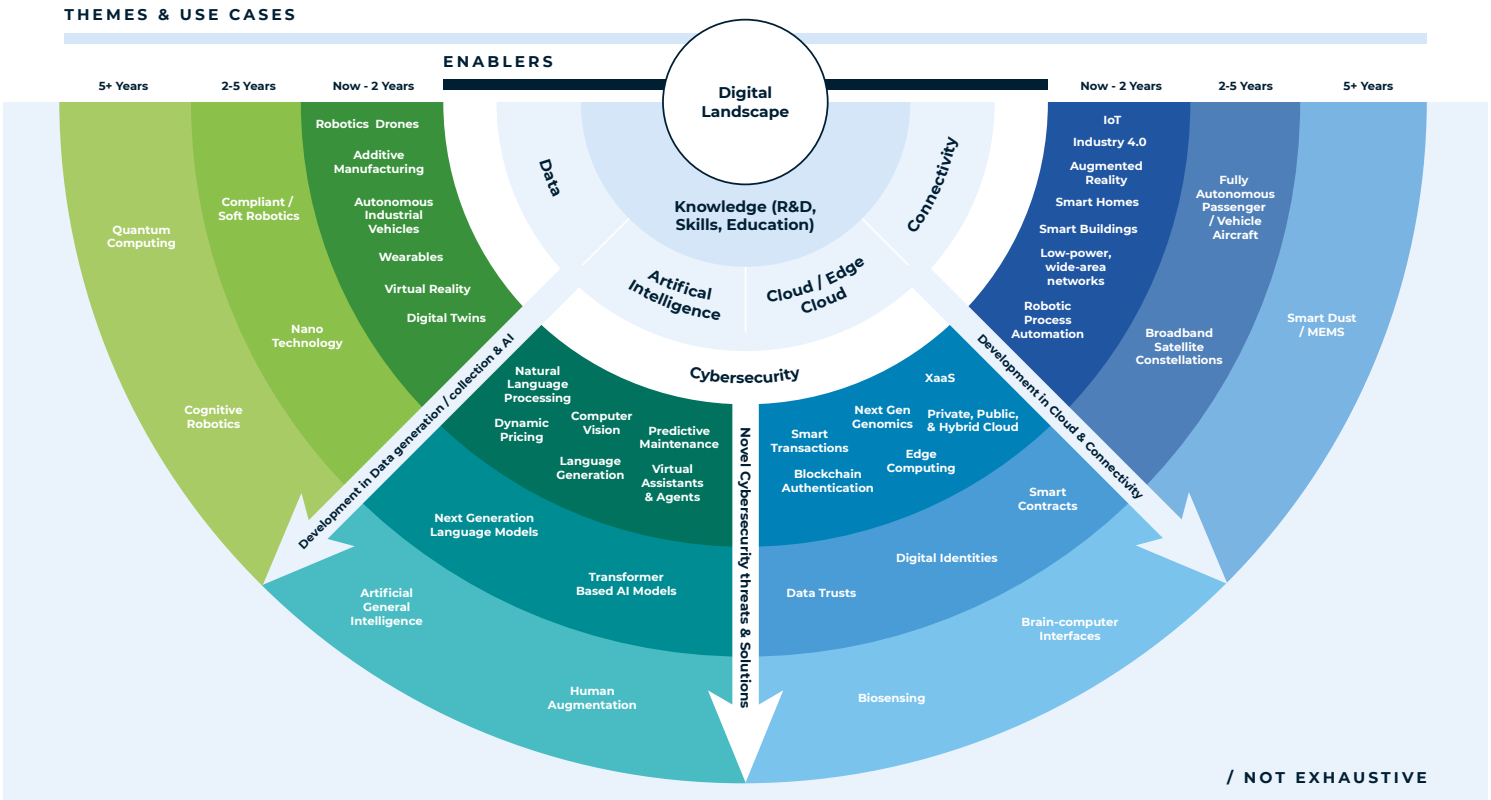


Figure 1: Digital Transformation landscape

Figure 1 gives an overview of the key enablers, themes and use cases in the modern digital landscape. Key enablers are ultimately driven by progress in our collective knowledge, through R&D, skills development and education. The five primary enablers – data, artificial intelligence (AI), cloud/edge cloud, connectivity and cybersecurity – represent a multitude of use cases.

Many interdependent use cases can be identified from the ecosystem, but it is also important to recognise that we do not know what exactly lies ahead. We should also note that this landscape is very fluid and we expect considerable advancements in themes and use cases over time. Even key enablers are likely to advance, become obsolete or be accompanied by others over time. If we were to draw this picture in

the late 1980s, connectivity might not yet be recognised as a key enabler, but hard disk drive storage capacity might. If you drew this picture at the start of the new millennium, the cloud certainly would not have been recognised yet as a key enabler, but the internet would have.

The enablers and use cases in the modern digital transformation landscape are complex, highly interdependent, and often overwhelming for policy-makers and business leaders alike. Indeed, in a 2015 survey by MIT Technology Review and Deloitte, the top barrier cited as impeding public organisations from taking advantage of digital trends was "Too many competing priorities".[15]

ERT therefore believes that the EU should focus on two main tasks. The first focus should be to boost investment in areas that can help governments and companies, and in particular SMEs, to recover from the crisis and overcome the challenges described in section 2, especially through Next Generation EU.

The second focus should be enacting measures to support a favourable policy and regulatory framework to develop an inclusive, digital and green transformation of Europe.

Critical enabling technologies and catalysts play an important role in the digital transformation, driving areas of European strength such as Industry 4.0 and IoT. These technologies are inherently and intricately interlinked. ERT believes that achieving full potential in a single technology is also, to a greater or lesser extent, dependent on the successful development of the others in this list:

- Data
- Artificial intelligence
- Cloud/edge cloud
- Connectivity
- Cybersecurity

Before we look at each of these key enablers in section 4, we would like to address the concept of technological sovereignty in section 3.b. and also remind readers of the importance of the investment ambitions outlined in Next Generation EU and the Recovery and Resilience Facility in section 3.c.

Furthermore, and underlying to the successful development of the digital enablers is the development of skills. We devote a separate section in 3.e. to ERT's observations and recommendations on Digital Jobs, Skills and Education. Finally, we consider the international dimension for Europe's digital success in section 3.f.

3.b. Strengthening Europe's technological sovereignty

The disruptions caused by the COVID-19 pandemic have accelerated the debate on how to strengthen resilience in global supply/value chains, decrease dependence on foreign technologies and trade, and strengthen Europe's technological sovereignty.

Technological sovereignty should mean that Europe has a choice over its technological development. This is not an autarchic Europe with all technology produced locally, but a Europe that can make strategic decisions about technologies it depends on. Technological sovereignty must not be interpreted in a protectionist manner.

A forward-looking focus on technological sovereignty can moreover help to strengthen this resilience. The main goal of technological sovereignty must be to address the economic challenges ahead by creating a positive vision for a technologically innovative Europe. It should aim at developing and strengthening the European business base, geo-economic leadership, and enhancing European competitiveness in a global market.

Technological sovereignty must reinforce European technological capabilities, especially those supporting the European industrial growth engine, while remaining open for trade and investment. While Europe might have lost ground in the global race for consumer

15 Deloitte: *The journey to government's digital transformation (2015)*
https://www2.deloitte.com/content/dam/insights/us/articles/digital-transformation-in-government/DUP_1081_Journey-to-govt-digital-future_MASTER.pdf

platforms, thanks to its strong industrial base it is well-positioned to become the world leader in B2B data-driven business models.

Because of the inherent difficulty in predicting future external shocks to the global trade system, the main guiding principle for building more resilience in global value chains is not reshoring but flexibility and diversification. ERT believes every individual company must determine its own supply chain architecture. Digitalisation is a key factor in increasing the resilience of companies' supply chains.

Above all, this means leveraging the EU's biggest asset, its Single Market. It is vital we develop a stricter culture of compliance and enforcement in the Member States as well as more political commitment to the Single Market by proposing new avenues of integration, especially in the areas of services, digital and energy and further tax harmonisation. We also need to empower innovation and entrepreneurship in Europe, with vibrant ecosystems of start-ups, SMEs and large companies. The EU needs to apply the 'innovation principle' across all policy proposals and systematically conduct a cost-benefit analysis of regulations.

Technological sovereignty also means strengthening Europe's key strategic value chains by boosting investment, creating an innovation-friendly environment and delivering digital and green transformations. The EU needs to identify key future technologies and create clusters of excellence to strengthen R&D as well as expertise.

Strategically relevant industrial ecosystems should be fostered, building on existing globally leading industries like electronic communication networks and manufacturing. Investments in data-driven technologies like micro/nanoelectronics (semiconductors, processors), high-performance computing, quantum computing, AI, cloud/edge cloud computing as well as cybersecurity should get specific attention.

Europe should also develop a comprehensive strategy for a thriving space downstream sector, particularly satellite navigation and earth observation systems, which are key for reaching public interest goals (i.e., the observation of causes and effects of climate change, environmental monitoring, territory monitoring, critical infrastructure management, precision farming and connectivity).

Data sovereignty is an important element of technological sovereignty. Citizens, governments and companies need to keep control over their data. Concerns over data sovereignty contribute to the current hesitation to adopt cloud computing in Europe. Dependency on non-European cloud infrastructure providers has increased these concerns.

We need a trustworthy, secure and cost-efficient infrastructure to address these concerns. The creation of a European Cloud Federation and an EU Cloud Rulebook based on European standards, laws and values can help address this issue.

3.c. Driving investment

To drive digitalisation, we need to invest in strategic digital technologies and the digitalisation of business, government and national healthcare systems, as well as R&D and innovation. Europe moreover needs to increase access to capital for companies. Short-term liquidity measures must be complemented by long term investments in technological sovereignty and measures to support the twin green and digital transitions.

Next Generation EU and MFF (Horizon Europe, Digital Europe Programme, Connecting Europe Facility) must provide ambitious, modern and future-oriented funding. Funding should focus on integrating European and national R&D activities, supporting SMEs and start-ups and breaking silos between sectors. Overall EU R&D funding should be at 2% to 3% of EU GDP.

Next Generation EU includes €390 billion in grants and €360 billion in loans to the Member States. Commission President Ursula von der Leyen says grants should be considered as "common investments in the EU's future" and will be allocated via the Member States in their

Recovery and Resilience Plans. They are labelled as investments in the Single Market, the resilience of the EU, as well as the twin green and digital agenda.

The twin digital and green transitions are the two main targets: public investment in the recovery should live up to the green commitment to 'do no harm', whilst investment in digital recovery would help to stimulate competitive innovation and give users greater choice.

ERT welcomes the EU's decision to allocate at least 20% of the recovery package to the digital transformation and 37% to the green transition. The national recovery and resilience plans must be built based on a cooperative approach between the public and private sectors as well as on synergies between the use of EU and national funds – for instance, Multi-Country Projects, as proposed in the Commission's Digital Decade Communication. Coordinated investments in key digital strategic value chains should be encouraged through Important Projects of Common European Interest (IPCEIs). EU State Aid rules should be reviewed to allow for temporary aid for research and demonstration projects for the deployment of breakthrough innovations.

One example of how digital solutions can enable the green transition is through a massive digital renovation wave of buildings and infrastructure and adoption of state-of-the-art digital technologies when constructing new buildings, e.g. Building Information Modelling (BIM). The public sector has an important role to play in speeding up initiatives that support the digitalisation of public assets like transport, the energy efficiency of public buildings, digitalisation of the building sector, remote (security) monitoring.

These measures should be complemented by tax incentives for private investments in digitalisation, R&D and related professional education. Access to capital, especially for start-ups, can be improved by completing the Banking Union and Capital Markets Union. As the global economy changes, and in particular as it digitalises, we must strive to deliver the optimal competition policy for Europe: one that benefits consumers, while also allowing European firms to compete at scale globally. EU competition policy needs to be modernised, with a broader focus towards innovation, investment and job creation.

Public and private investments in the following areas are key:

1. The digitalisation of companies, governments and national healthcare systems
2. R&D and innovation
3. Industry 4.0, IoT and advanced manufacturing
4. Digital renovation wave
5. Micro / nano electronics
    a. Semiconductor manufacturing
    b. Semiconductor design technology
    c. Data-centre processing technology
        i. General-purpose processors
        ii. Switching, routing and packet processing
        iii. Field Programmable Gate Array (FPGA)
        iv. Graphics processors
6. Data sharing
7. Artificial intelligence
8. High-performance computing and quantum computing
9. Cloud and edge cloud computing
10. Connectivity (Fibre and 5G)
11. Cybersecurity
12. Space economy
13. Reskilling and upskilling

Investments should go hand-in-hand with a modern and future-proof digital policy agenda with a regulatory framework that speeds the digital transformation and energy transition of the European economy. We welcome the aims of the European Commission's Digital Decade Communication, including the targets for Europe's digital transformation by 2030. To deliver these goals, we should focus on the key enablers set out in the following chapter.

3.d. Digital jobs, skills and education

The Challenge

The digital transformation and the green transition will lead to changing skills requirements. In the next 10 years, about 100 million workers in Europe will need some form of training, as over 20% of their tasks will be automated or digitalised. Of these, about 20 million people could be displaced soon and will need significant reskilling to a new occupation.[16] Moreover, the economic crisis has impacted nearly 60 million jobs and increased the risk of more young people in neither employment, education nor training (NEETs).[17]

At the same time, there is a persistent (digital) skills gap, with hard-to-fill vacancies (e.g. in ICT) remaining open at times when unemployment rates soar. As the DESI index noted: "In 2018, some 9.1 million people worked as ICT specialists across the EU, 1.6 million more than 4 years earlier. Nevertheless, there remains a shortage of ICT specialists in the labour market: 64% of large enterprises and 56% of SMEs that recruited ICT specialists during 2018, reported that vacancies for ICT specialists are hard to fill. The problem is even more widespread in Romania and Czechia, where at least 80% of enterprises that either recruited or tried to recruit ICT specialists reported such difficulties. There is also a gender balance issue as only one in six ICT specialists are female."[18]

A particular challenge is attracting sufficient female representation, which leads to gender imbalance. As digitalisation continues, the size of this already significant challenge may even further exacerbate, thus widening any gender-based pay or employment gap across the EU.

The importance of digital skills can hardly be overstated: they are key for 90% of jobs[19] and they are increasingly required for a well-functioning society and daily life. However, digital capabilities vary a lot across the Member States. The Netherlands and Finland have the largest share of the population proficient in using the internet, computers and software, while Bulgaria and Romania are lagging far behind.[20]

The current offer of reskilling programmes is inadequate.

Reskilling the unemployed, or people at risk of losing their job, requires more than training. ERT has benchmarked more than 200 training, upskilling and reskilling initiatives. Those achieving high job-placement rates take an end-to-end approach with seven steps in the reskilling value chain:

1. Monitoring (local) job demand, including skills and activities required for the job;
2. Training design, of multiple tailored programmes to teach all activities and skills needed to perform in the target occupation;
3. Candidate mobilisation, counselling and assessment, mobilising candidates and counselling on whether they need reskilling and for what target occupation;
4. Training delivery and recognition;
5. Job placement, including training and mentoring on how to look for a job;
6. Monitoring and evaluation, measuring employment outcomes (e.g. job-placement at 3 and 12 months), gathering feedback from hiring employers, and updating the training design as the target occupation changes;
7. Funding scheme, which enables affordability for the candidate while ensuring that candidates, providers and hiring employers have aligned incentives.

16 McKinsey article *"Future of Work"*, p31 (2020) https://www.mckinsey.com/featured-insights/future-of-work

17 McKinsey article, *"Safeguarding Europe's livelihoods: Mitigating the employment impact of COVID-19"* (2020) https://www.mckinsey.com/industries/public-and-social-sector/our-insights/safeguarding-europes-livelihoods-mitigating-the-employment-impact-of-covid-19

18 DESI Index 2020

19 European Commission on Digital Skills, https://digital-strategy.ec.europa.eu/en/policies/digital-skills

20 Statistics Netherlands (CBS), https://www.cbs.nl/en-gb/news/2020/07/the-netherlands-ranks-among-the-eu-top-in-digital-skills

We found that very few initiatives follow this end-to-end approach and only on a small scale. The barrier to reskilling at-scale is essentially a market failure – a lack of incentives and fragmented information. Those who need to be reskilled cannot afford to pay for it, while public funding schemes are oriented towards training (activity) and not employment outcomes (results). The result is a fragmented system with thousands of training programmes, less than one per cent of which publish employment outcomes.

Towards a pan-European, cross-sectoral, end-to-end reskilling programme

ERT has partnered with McKinsey (and potentially with other interested companies) to launch a reskilling programme across three to four country pilots. These would mark the start of a pan-European initiative, provisionally called Reskilling 4 Employment (R4E).

This major social initiative would aim to unlock the reskilling ecosystem at scale while directly reskilling one million people in Europe by 2025, potentially reaching between 2.5 and 5 million by 2030 (up to 25% of around 20 million people needing re-skilling by 2030).

We have established our core value proposition in four key actions that we believe can unlock the creation and scale-up of re-skilling ecosystems across Europe:

1. Create the gold standard for an online reskilling platform with a seamless and simple end-to-end experience to unemployed people (and those at risk of losing their job), offering selected tech-components to national employment agencies;
2. Create a repository of 100+ reskilling programmes that lead to high placement rates in 100+ occupations, supporting providers to improve and scale their programmes across Europe;
3. Develop and scale local employment ecosystems, mobilising players (e.g. suppliers and customers including SMEs) to share their vacancies and offer interviews to graduates from certified reskilling programmes;
4. Co-design with the EU and national authorities effective and sustainable funding mechanisms to unlock reskilling at scale in Europe.

Boosting digital skills throughout society

Cooperation between the public and private sector at both the European and national level is needed to tackle the challenge and make this transition a success.

The European Skills Agenda is a tool to boost the employability of both the current and future workforce, promote lifelong learning, enable upskilling and reskilling, and address urgent skills shortages in specific areas such as AI, big data, cybersecurity, etc.

National governments must invest in their education system and make all necessary digital tools (laptops, training, etc.) available. They should make digital education and training not only possible but also affordable for everyone including those from less advantaged socio-economic backgrounds.

Together, we must ensure the availability of those skills that underpin a successful deployment of digital solutions, with a focus on equal opportunities and inclusion. Europe's successful adoption of new technologies depends on talented and prepared individuals who develop innovative solutions and new business models. They must be at the heart of the transitions we are facing to lead Europe through the recovery.

ERT recommends the following actions:

1. **ERT calls on all stakeholders, in particular the Member States, public employment services, and the European Commission to join forces with the private sector** to make upskilling and reskilling programmes as effective as possible. This requires:
   - An end-to-end approach: reskilling based on an individual's current skills set and directed towards a defined new occupation or job opportunity.
   - Allowing mobility across all sectors: industry, banking, health, services, etc.
   - A pan-European view to identify and leverage economies of scale.
   - A one-stop-shop with easy access for any candidate.
   - Dedicated funding, based on success in terms of jobs placement.
   - A public and private partnership – to which ERT Member companies are ready to contribute.
2. **Roll out the Digital Education Action plan** with a particular focus on:
   - Making Europe's education system future-proof.
   - Aligning skills supply and demand at a relevant level (e.g. strategic workforce planning, using data analytics) and updating curricula.
   - Promoting lifelong learning, targeted up- and reskilling leading to job placement.
   - Addressing immediate skills shortages (e.g. data analytics, artificial intelligence, cybersecurity).
   - Attracting more women to digital and STEM training and jobs.
   - Promoting dual learning (e.g. in vocational training) – also for adults.

3.e. Europe as a global player

Open and fair global markets with strong competition are critical to the European Union meeting the challenges of the next generation. The emerging global markets for digital products and services provide tremendous business opportunities for the European industry. Moreover, digital technologies can be instrumental in strengthening economies and addressing societal challenges in developing countries and integrating them into global value chains.

Digital trade is increasingly important for strengthening Europe's economic recovery but also competitiveness and its position as a global player. Digitalisation also boosts opportunities for all players to participate in global trade, including SMEs, thanks to e-commerce, remote delivery of services, reduced costs of reaching global audiences through new technologies, digital facilitation of trade in the form of digital customs declarations, new means to build verifiable online transaction records with blockchain, and more efficient logistics. Cross-border data flows, in particular, are critical for the smooth operation of today's economy and fundamental to competitive business models and all sectors. The ability of companies to locate data storage and processing centres where it makes the most technical and commercial sense has been an enabling factor in the growth of digital trade and technologies and will only increase in importance in the future.

Unfortunately, digital protectionism is on the rise globally and creates market-entry barriers for many European service providers and product suppliers. According to the Commission's Trade Barriers Report published in June 2020, EU companies faced a multiplication of new unlawful barriers in sectors of strategic importance for the EU in 2019, notably in information and communication technology, electronics, auto and other high-tech industries.[21]

The Commission said new barriers in 2019 affected EU trade in 17 sectors of economic activity, including ICT, automotive and electronics sectors. As it relates to its direct impact on European trade flows, industrial sectors accounted for more than 85% of trade flows affected. Specifically, barriers in the sectors of ICT (€15 billion), automotive (€5.7 billion) and electronics (€2.6 billion) make two-thirds of all EU-27 exports affected by new reported barriers. These are sectors that are directly linked to the EU's technological sovereignty. The concerns raised relate to, among others, forced data localisation, buy-local policies, licensing restrictions, and forced technology transfers.

Protectionist trends affecting European high-tech sectors were already spotted in 2018 and continued unabated in 2019. If not effectively addressed, these barriers will be an objective threat not only to the competitiveness of EU firms but to the EU's position as a global technological leader. The European Commission must engage with its partners bilaterally and multilaterally to defend open, fair and rules-based global trade.

The EU has to secure Europe's leadership in technology and avoid a weakening of European players due to unfair competitive conditions globally. Given the openness of the European Single Market, EU trade policy should ensure that European businesses engaging in digital trade outside the EU can benefit from the same level of openness that the partner countries enjoy when their companies sell products and services in the European Union.

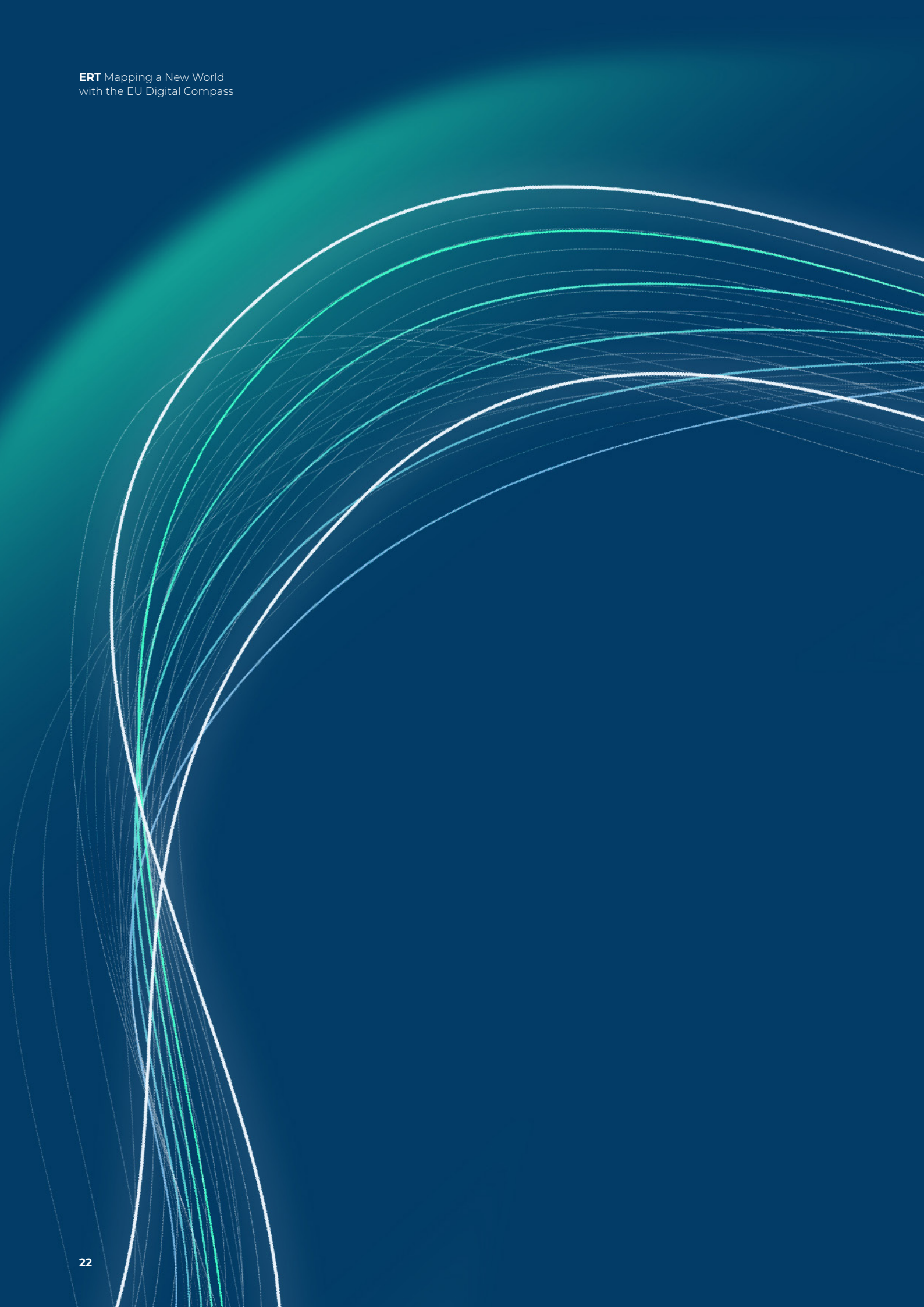
A level playing field needs reciprocity and open markets for digital trade. Having transparent, non-discriminatory and competitively neutral rules is vital to boosting legal certainty and benchmarking high standards in the conduct of digital trade at a global level. Digital developments have to serve societies as a whole, and rules governing them have to ensure fairness and be human-centric. These efforts should be pursued at the multilateral, plurilateral and bilateral level.

The EU must lead in setting standards globally and foster collaboration to boost technological capacity, notably by seeking geopolitical alliances with like-minded partners at the WTO and through trade and investment agreements and regulatory cooperation.

21 EC Report on Trade & Investment Barriers (2019) https://trade.ec.europa.eu/doclib/docs/2020/june/tradoc_158789.pdf

ERT recommends the following actions:

- **Develop a coherent international digital strategy** to align efforts in trade, development, and digital policies, including on standardisation, as indicated by the European Commission's Communications on "Shaping Europe's Digital Future" and "2030 Digital Compass: the European way for the Digital Decade".
- **Deliver a level playing field in digital trade:** Address digital trade barriers effectively in bilateral and global trade negotiations and bilateral digital policy dialogues.
- **Facilitate cross-border data flows:**
  - Ensure that both plurilateral and bilateral trade agreements acknowledge and enhance the free, cross-border flow of non-personal data, and that the EU is equipped with the means to address unjustified restrictions.
  - Follow a risk-based approach to Standard Contractual Clauses (SCCs) to enable a practical and safe path for businesses to continue transferring data across borders.
  - Conclude a new sustainable agreement with the US for the transfer of personal data.
- **Promote multilateral and plurilateral negotiations:**
  - Finalise the WTO e-commerce negotiations to ensure the free flow of data across borders, open markets, and level the playing field in digital services within a rules-based, multilateral trading system.
  - Expand the global participation in the Information Technology Agreement (ITA).
- **Drive regulatory cooperation with strategic partners, especially the US, to set global standards:** Establish the proposed EU-US Trade and Technology Council (TTC) and leverage it to address key areas such as data flows, digital taxation, IoT, AI, platforms, cybersecurity, 5G.
- **Make digital transformation a core priority for EU development policy,** which would further strengthen the strategic partnership of the EU with developing countries. ERT welcomes the initiative of the European Commission to establish a Global Digital Cooperation Strategy that requires effective coordination of departments within the European Commission and closer alignment with the Member States.



4. ERT recommendations II – Key enablers of Europe's digital transformation

4.a. Data

Business data is increasingly seen as both a strategic resource and an essential utility. In the data-driven economy, companies completely rethink their data value chain, moving from data silos and a traditional transactional approach to a new concept of a 'data ecosystem' representing the myriad of interactions between suppliers, partners, customers and other actors such as the public institutions and academia. New digital business models are shifting from closed, linear value chains to open, integrated ecosystems, with the ability to easily exchange data securely.

The industrial data ecosystems formed today will be tomorrow's innovation platforms. Success or failure in the data economy will impact economic leadership and competitiveness in the coming decades. While Europe might have lost ground in the race for consumer platforms, thanks to its strong industrial base it is well positioned to become the world leader in B2B data-driven business models. Europe must seize the opportunity to lead the world in B2B data sharing by rapidly developing practical business use cases based on voluntary data sharing and the use and re-use of that data, drawing on its existing industrial strengths.

Unfortunately, Europe has not yet seized the massive potential of data sharing. The challenges standing in the way of Europe's success include concerns over legal certainty, data privacy and interoperability issues, as well as the absence of common standards for B2B data sharing. Data protection authorities in the EU Member States interpret various provisions of the General Data Protection Regulation (GDPR) differently, undermining the Single Market, hampering innovation and creating difficulties for companies operating in more than one Member State. The proposed ePrivacy Regulation departs from the GDPR by imposing stricter requirements to data processing provisions and maintaining outdated sectoral rules.

Furthermore, poor quality data and a lack of data interoperability limit the capacity of businesses to use technology and algorithms to process and extract value from datasets. One key reason for this is the lack of common standards and compatible formats. A hesitation to adopt cloud computing is a substantial obstacle as well and we dedicate a full section to the issue in 4.c.

European policy-makers and industry should join forces to remove bottlenecks and make the most of B2B data sharing. The EU should facilitate the voluntary sharing of B2B data while avoiding hasty regulatory action. Europe must strike the right balance between protecting privacy and stimulating innovation by making more data available for access and re-use. Contractual freedom must underpin data sharing as a guiding principle.

The huge quantity of public data held by the EU and its Member States could unlock substantial benefits in growth and innovation if mechanisms are introduced to enable safe and secure sharing with industry. The potential benefits of government-to-business (G2B) and business-to-government (B2G) data sharing could be significant for Europe. The public sector should become a leading pioneer and trendsetter in making non-personal data available.

In the context of digital platforms, the European Commission should take a more dynamic and pragmatic approach to assess digital markets and market power, notably taking into account the important role of data as a competitive asset and innovation while ensuring a level playing field throughout the whole Internet value chain.

The European Data Spaces outlined in the EU Data Strategy from February 2020 can make an important contribution to a strong data economy. These data spaces can leverage the data of relevant stakeholders in a particular industry or domain, test new data business models and scale them across Europe.
While data-driven innovation is critical, each domain has its specificities and not all sectors move at the same speed. ERT welcomes the Commission's plans to set up separate data spaces for specific industries and domains. At the same time, silos should be avoided: cross-sector data sharing should be encouraged instead so interested third parties can contribute and access these data spaces.

The creation of a European Health Data Space would foster a common market for healthcare and prevention. This would give patients control of their personal data and access (to anonymised data) by healthcare providers and companies developing health services. It would spur the development of AI applications to accelerate R&D, improve diagnostics and benefit patient outcomes.

ERT welcomes the EU's overall ambition to mobilise up to €10 billion public and private funds for the creation of European Data Spaces and a European Cloud Federation. We need political and budgetary support - from Horizon Europe, Digital Europe Programme - for the AI, Data and Robotics Partnership as a necessary add-on to European Data Spaces and the European Alliance for Industrial Data, Cloud and Edge.

The European Commission's Data Strategy provides a solid foundation for fostering data sharing. Swift execution of this strategy should be the priority.

ERT recommends the following actions:

1. **Create a European Single Market for Data:**
   - Eliminate all disproportionate data-localisation requirements to allow the free flow of data within the EU, in line with the EU Free Flow of Data Regulation.
   - Ensure a more consistent, harmonised and innovation-friendly application of data protection rules throughout the EU.
   - Align the pending ePrivacy reform with the GDPR's risk-based, harmonised and horizontal approach to data protection.
   - Enable better access to public sector data through effective implementation of the EU Open Data Directive and ensure a harmonised approach to opening up sensitive public sector data under the proposed Data Governance Act.
   - Consider a general obligation to grant access to public sector data through a revision of the Open Data Directive and/or the proposed Data Governance Act, with due consideration for existing intellectual property rights, investments and business agreements.
2. **Establish European Data Spaces:**
   - Implement the proposal for a framework to govern common European (B2B and B2G) Data Spaces while avoiding premature regulatory action that would jeopardise innovation in big data.
   - Develop the systems, tools, standards, frameworks and platforms needed to operate data spaces. GAIA-X and various existing European partnerships (e.g. AI, Data...) can provide blueprints.
   - Involve industry in setting the operating and governance model of the data spaces to ensure these reflect the practical needs of businesses.
   - Ensure data spaces attract both large and small companies and both providers and users, so that their benefits are widespread.
   - Ensure that each data space has a set of specific business cases with clear value creation.
   - Implement European Health Data Space swiftly, including a clear framework on data sharing and access to unlock the full value of health data while respecting the protection

of patients' data. Encourage the Member States through the EU4Health programme in the set-up of digital health infrastructure that is fit for purpose.

3. **Encourage industry-driven standardisation:**
   - Ensure that standards for B2B data sharing are industry-driven and enshrined in international standardisation organisations.
   - Encourage European companies, in particular SMEs, to play an active role in industry-driven standardisation.
   - Help European Data Spaces play a role in defining requirements for common standards.
4. **Address horizontal barriers:**
   - Improve data quality and define common and harmonised cybersecurity rules to ensure a consistent level of protection.
   - Uphold the fundamental principle that data sharing by companies is conducted on a voluntary and contractual basis. Only impose mandatory data access on businesses if there is a proven market failure or clear misuse of a dominant market position.
   - Consider a voluntary scheme and certification mechanism for data intermediaries under the Data Governance Act rather than a compulsory notification framework to make their services more transparent and attractive for B2B and B2C data exchange.
   - Use the review of the EU antitrust guidelines on horizontal cooperation between companies to provide greater legal certainty on voluntary B2B data sharing.
   - Use the Digital Markets Act to ensure that markets with large platforms acting as gatekeepers remain fair and open for innovators, businesses and new market entrants.

4.b. Artificial intelligence

Artificial intelligence (AI) and data-driven tools will be core drivers of productivity and economic growth in Europe over the coming years – and essential for a resilient European digital society. These tools will also address some of the societal challenges brought to the fore in the context of the COVID-19 pandemic.

ERT supports the objectives of the European Commission outlined in the February 2020 White Paper on AI to encourage the creation of an ecosystem of excellence and an ecosystem of trust for AI development and adoption in Europe. We very much welcome measures to boost the development and usage of AI, giving equal attention to the competitive promise as to the ethical dimension.

However, Europe currently lags behind its main competitors in AI investments (around €3.2 billion AI invested in Europe in 2016, €12.1 billion in North America, €6.5 billion in Asia).[22]

Europe can become a global leader in AI and data-driven innovation by leveraging its technological capacity and strong industrial base with high-quality digital infrastructure and a regulatory framework based on its fundamental values. It can develop an AI ecosystem that shares its benefits across the economy and society:

- For business (including ERT Member companies) AI can be used to boost efficiency and output in areas where Europe is particularly strong (machinery, transport, cybersecurity, farming, energy management and transition, the green and circular economy, healthcare and high-value-added sectors like fashion and tourism).
- Citizens (served by ERT Member companies) can reap new benefits like improved health care and prevention, the longevity of digital products and services, safer and cleaner transport systems and better public services.
- The wider public interest can be served with AI being used to tighten cybersecurity, reduce the

22 McKinsey article *"10 imperatives for Europe in the age of AI and automation"* (2017)
https://www.mckinsey.com/featured-insights/europe/ten-imperatives-for-europe-in-the-age-of-ai-and-automation

costs of public services and utilities (transport, education, energy and waste management) and contribute to enhanced sustainability.

McKinsey states that, "If Europe on average develops and diffuses AI according to its current assets and digital position relative to the world, it could add some €2.7 trillion, or 20%, to its combined economic output by 2030. If Europe were to catch up with the US AI frontier, a total of €3.6 trillion could be added to collective GDP in this period".[23] Europe must take a global leadership role in the development and deployment of values-based AI as a core driver of economic growth, inter alia through a surge in AI investment. Importantly, setting up new public-private-partnerships will be key for achieving an acceptable degree of European technological sovereignty in the domain of AI.

ERT recommends the following actions:

ERT has several recommendations for guidelines and policies on AI.[24] ERT makes the following requests and observations on the main actions outlined in the European Commission's AI White Paper.

1. **Create an Ecosystem of Excellence for AI**:
   - Collaborate with Member States and EU stakeholders to define a shared European vision on the 2030 horizon and set up new public-private-partnerships in AI.
   - Ensure consistent implementation of the recommendations in the European Commission's Coordinated Plan on AI to facilitate the application of AI in Europe coherently.
   - Provide ambitious funding for AI research, innovation and adoption through Next Generation EU and MFF (Horizon Europe, Digital Europe Programme, Connecting Europe Facility-2 (CEF-2) programme) and for the planned co-programmed Partnership on AI, Data and Robotics.
   - Establish European AI research and innovation superclusters that can compete with those in the US and China, with strong industry engagement from start-ups, SMEs and large companies.
   - Facilitate private investments in AI and fast transfer from basic research to applied science, from lab to practice, including by facilitating spin-offs from AI research institutions, and include SMEs and start-ups via the Digital Innovation Hubs (DIHs), where large companies can play a key advisory role on the industrial use of AI technologies.
   - Use of 'sandboxing' to achieve the right balance of promoting innovation and mitigating risks in a safely delimited, co-regulatory space at the EU level, for example, to test new concepts such as digital twins for manufacturing, guidelines on ethical AI or full autonomous driving.
   - Facilitate the innovative use of data and a Single Market for data by swiftly implementing the European Data Strategy, focusing on voluntary B2B and B2G data sharing and health data (see the section above).
   - Close the digital skills gap and invest in education and upskilling programmes for AI. Increase cooperation and coordination between the public and private sector.
2. **Create trustworthy AI systems** for Europe built around a human-centric approach:

   Building trust:
   - Focus on the potential benefits that might come through the application of AI technologies and consider the opportunity cost of failing to deploy AI.
   - Give specific attention to the risk of racial, gender or social bias in machine learning algorithms in AI applications, especially those involving B2C and the relationship between government institutions and citizens.

23 McKinsey Global Institute discussion paper "Tackling Europe's gap in digital and AI", (February 2019) https://www.mckinsey.com/featured-insights/artificial-intelligence/tackling-europes-gap-in-digital-and-ai#

24 ERT Expert Paper on Artificial Intelligence (March 2021) https://ert.eu/documents/ert-expert-paper-on-artificial-intelligence/

Regulatory aspects:

- Avoid rushing into regulation of AI: an onerous regulatory environment and over-prescriptive rules will hinder investment and innovation.
- Review existing EU legislation with potential implications for AI: make it fit only as needed and embed it in the broader regulatory framework. Focus on safety, liability, data protection, privacy, employment, anti-discrimination and relevant sector-specific legislation. Address White Paper concerns about AI applications with guidelines and targeted amendments to existing horizontal and sector-specific EU legislation – and by reviewing and empowering existing enforcement mechanisms and oversight bodies. Avoid a one-size-fits-all approach to regulation for AI's wide range of applications.
- Consider keeping B2B applications out of the scope of a future AI regulatory framework. Associated risks can generally be addressed through contracts between business partners. Regulatory obligations for providers of B2C high-risk applications will cascade down the entire supply chain through private contracts.
- Consider whether most industrial applications even need new regulation, as they are already covered by existing rules, both horizontal (e.g. GDPR, Machinery Directive) and sector-specific (e.g. the European Electronic Communications Code). Similarly, AI in healthcare is already strictly regulated through the EU Medical Devices Regulation and GDPR, which offer an appropriate framework.

Risk-based approach and assessment:

- Take a risk-based approach to determine which AI applications may be covered by ad-hoc legislation and include the risk of non-adoption of AI applications in any risk assessment. Any new or adapted legislation/ rules/guidelines for AI will require a clear definition of AI.
- Apply the technology neutrality principle when assessing the need for regulatory intervention.
- Set up clear and precise criteria for high-risk AI systems based on the occurrence and consequences of the expected risk. It should distinguish between purely technical or commercial (B2B) applications of AI (such as remote network management and diagnostics) and AI that has a direct impact on citizens/consumers (B2C).
- Refrain from new ex-ante conformity assessments for new AI products and services that could significantly delay the release of AI products and services to the European market. Instead, apply existing self-assessment tools for Trustworthy AI systems such as the Data Protection Impact Assessment (DPIA) under the GDPR.
- Use process-based certifications for high-risk AI systems instead of individual product or algorithm-based certifications to avoid repeated assessments over the lifetime of AI systems, as suggested in the White Paper.
- Steer clear of new risk assessment obligations for products 'subject to important changes during their lifetime'. Instead, the existing New Legislative Framework (NLF) procedures that take place before placing products on the market could be broadened through the adoption of new standards.

Security:

- Consider that AI development should be by design intertwined with cybersecurity.

Voluntary labelling scheme:

- Involve businesses in defining a possible voluntary labelling scheme for no-high risk AI applications: they can advise on an implementable, not overly burdensome framework.
- Use the AI Ethical Guidelines created by the AI High-Level Expert Group as a foundation to develop two sets of requirements addressed to AI developers and users.

- Provide more details about the industrial B2B area (e.g. how it would work and potential incentives) to better understand how such voluntary labelling could bring benefits and not only impose an additional administrative burden on companies (especially for SMEs and start-ups).

3. **Liability framework for AI:**

- Target new requirements at providers of high-risk AI applications and avoid imposing excessively high burdens on businesses using AI that is a low risk to citizens.
- Identify gaps first in the current legal framework before assuming that existing insurance schemes, civil liability rules and tort law, as well as contractual arrangements are not fit for purpose.
- Determine in the context of 'strict liability' who has the economic or social benefit from deploying the technology and for what use the technology was foreseen (as is typically the case today for instance in the context of a car accident where the victim has a 'strict liability' claim against the owner of the vehicle).
- Consider that the current national liability rules in most Member States are already implementing 'strict liability'. For specific AI applications, it may be required to adapt the current national liability rules for the operation of AI to better ensure proper compensation for damage and a fair allocation of liability.
- Consider a reversed burden of proof only in limited cases and apply only to very high-level risk AI applications.

4.c. Cloud/Edge Cloud

A well-functioning European data economy and a successful digitalisation of industry and government depend on a trustworthy, secured and cost-efficient cloud and edge computing infrastructure. B2B data sharing will increasingly be in the cloud, and there is an increasing shift to edge clouds.

European companies still hesitate to adopt cloud computing. Their concerns may relate to data security, GDPR compliance, data portability, and data sovereignty (the extent to which business users can control who will access 'their' sensitive data in the cloud). Dependency on non-European cloud infrastructure providers has increased these concerns.

Cloud development in Europe currently lags behind the US. We need a stronger EU in terms of capacity for data storage and processing as an alternative to existing hyper-scaler offerings. It should be aligned with our EU values, focusing on security, privacy and competition. A Single Market for cloud computing will make the EU more competitive globally and will enable innovative processes, products and services.

Several Member States have developed cloud-computing initiatives to address these challenges. Coordination of these policies at the EU level can prevent market fragmentation of Europe's cloud computing services.

ERT calls for clear policy direction by the European Commission to bring together the currently fragmented and overlapping national initiatives in this space. ERT welcomes the European Commission's plans to create a European Cloud Federation to coordinate existing cloud capacities and investment, including in edge and telco edge cloud, based on open standards and aiming at the creation of a secure, trustworthy and cost-efficient European cloud and edge infrastructure.

ERT supports the launch of the European Alliance for Industrial Data, Cloud and Edge and the creation of a related Important Project of Common European Interest (IPCEI) to mobilise both public and private funds for the development of such a European Cloud Federation. Initiatives such as GAIA-X could help create a European Cloud Federation by providing a European reference architecture for an interoperable and trusted cloud infrastructure. Such a reference architecture with common standards will serve as an essential technology backbone for B2B data sharing and realise the objective of data sovereignty. It should also address the EU's needs in terms of edge and telco edge cloud.

ERT welcomes the European Commission's plans to create an EU Cloud Rulebook to harmonise national regulations for cloud computing, based on European standards, laws and values. This Rulebook should deliver a framework for a secure and trusted cloud and edge computing that addresses user concerns and facilitates a common and scalable market for cloud providers in Europe.

ERT recommends the following actions:

1. **Deliver on the EU's overall ambition to mobilise up to €10 billion public and private funds for the creation of a European Cloud Federation and European Data Spaces.**
2. **Ensure that the European Alliance for Industrial Data, Cloud and Edge leverages as much as possible the deliverables of GAIA-X and other related initiatives** like the AI, Data and Robotics Partnership. It should make use of synergies between national cloud initiatives and related activities at the European level, leveraging the computing capabilities within the Member States, including High-Performance Computing (HPC). Duplication of activities must be avoided.
3. **Ensure that the EU Cloud Rulebook builds on the policies, rules and standards developed within the GAIA-X initiative.**
4. **Include the following aspects in the Cloud Rulebook:** horizontal and sectoral certification schemes to ensure compliance with security standards; interoperability specifications and additional requirements that can be applied as necessary (like rules for cloud service providers to prevent unauthorised data access based on foreign jurisdiction legislation that would violate EU law).
5. **Provide initial demand for the European Cloud Federation via the public sector,** as industry alone cannot provide the scale needed to get the project off the ground. The EU Cloud Rulebook should be the basis of public procurement of cloud services.
6. Create EU Cloud Marketplaces, both for the public sector and industrial ecosystems. Bringing the private sector in the lead, marketplaces should foster the adoption of cloud services that comply with the requirements of the EU Cloud Rulebook.

4.d. Connectivity

European very high capacity (VHC) networks, 5G and fibre, are enablers for strategic digital technologies such as IoT, AI and Industry 4.0, delivering growth opportunities for European companies. They will support Europe's economic recovery in the midterm and provide a basis for environmentally sustainable economic prosperity in the long term.

Technology and connectivity play a significant role in keeping people connected to their work and social activities, as well as in managing health-related issues during the crisis through planning, monitoring, testing, contact tracing, quarantine and remote healthcare. Telemedicine consultations grew more in one month than in the past decade, playing a key role in keeping lines down at hospitals and maintaining patients' health at home. Internet use has also soared during the pandemic, putting network capacity to the test. European network providers have ultimately proved very successful in managing the major traffic increases observed during the pandemic.

This trend was already clear before the pandemic, along with rising online activity. As EU economies gear up for recovery, we must continue to build and invest in resilient and flexible connectivity. 5G and fibre infrastructures across the EU are essential – which means public nationwide and private local industrial 5G networks. We need local 5G networks for European industry, enabling communication among machines, systems and plants at production sites.

However, the current European context does not support private investment in networks, with the cost of capital often higher than its return. Telecom service revenues in Europe are half of those in the US.

The EU also faces a major investment gap compared to other parts of the world. According to a 2019 IDATE report, investment is still far higher in the US (x1.6).[25] The EIB estimates the EU digital infrastructure investment gap at €42 billion per year between 2020 and 2025.[26]

Despite the enormous potential of 5G and VHC networks, Europe lags behind the US and Asia in rolling out 5G and to some extent also fibre. Europe's ability to roll out 5G is weakened by a regulatory environment that results in fragmentation, high costs and low return on capital employed. The 5G spectrum awards have added to uncertainty, fragmentation and costs, emphasising raising auction receipts at the expense of network investment.[27]

For example, the auction rules for the Portuguese and Czech markets encourage new players to enter the already competitive mobile market, while avoiding any material obligation to contribute to the overall substantial investment burden of rolling out 5G networks. Nonetheless, new players enjoy preferential wholesale access to the network thanks to investments made by established competitors. These conditions violate EU law and State Aid Rules and artificially introduce competitive distortions, creating significant uncertainty for long term network investment. Additionally, mandatory national roaming agreements for new entrants further suffocate infrastructure investment and competition. The Commission must engage with the Member States in such cases to protect the Single Market and rule of law.

A more favourable economic and regulatory framework supporting private investments in networks is urgently required. This means ensuring that operators are granted 5G spectrum under reasonable, fair and investment-friendly conditions and can benefit from a fair return on capital employed.

The recovery funds should support the demand side where connection costs are very high and extend very high-capacity connectivity in case of market failure. Public investment should remain a complement, for instance to connect rural areas where needed, rather than a replacement for private investment.

Concrete measures need to streamline the rollout of infrastructure, from simplifying planning permissions and permits to clearer principles and guidelines from competition authorities. That also means supporting and giving legal certainty to voluntary network sharing, which is fundamental to a more efficient, quicker and greener rollout of networks.

Completing network sharing agreements across Europe under a legally safe framework is essential, along with smart spectrum policy, such as the French New Deal on mobile or the UK Shared Rural Network initiative bringing connectivity to rural areas.

Finally, the European Commission's digital strategy should include an assessment of the international connectivity aspects and the roles of submarine cables to connect the EU to the global Internet and other regions, especially Africa. A clear strategy on EU needs will be critical to supporting technological sovereignty. ERT welcomes the Ministerial Declaration on international connectivity signed by 25 Member States as well as Iceland and Norway on 19 March 2021.[28]

25 DATE report *"USA vs Europe: network investment at stake"* (2019) https://www.orange.com/sites/orangecom/files/documents/2020-10/Benchmark%20Capex%20T%C3%A9l%C3%A9coms%20USA%20vs%20Europe%202019%20-%20ve.pdf

26 EC communication *"Identifying Europe's recovery needs"* https://ec.europa.eu/info/sites/info/files/economy-finance/assessment_of_economic_and_investment_needs.pdf

27 See also ERT publication *"Assessment Report of 5G Deployment Status in Europe"*, September 2020 https://ert.eu/documents/5g-assessment/ and ERT's paper on the Regulatory Framework for 5G, March 2020 https://ert.eu/documents/ert-position-on-the-regulatory-framework-for-5g/

28 Ministerial Declaration: *European Data Gateways as a key element of the EU's Digital Decade*, 19 March 2021 https://ec.europa.eu/digital-single-market/en/news/digital-day-2021-europe-reinforce-internet-connectivity-global-partners

ERT recommends the following actions:

1. **Provide regulatory incentives for private investment in networks, including by issuing a revised 5G Action Plan** to close investment gaps while maintaining sustainable competition, supported with adequate financing through MFF and NGEU in areas of market failure (e.g. rural areas). Ensure close coordination with existing funding programmes at a national level as well as with industry.
2. **Implement the European Commission recommendation on a common toolbox** for cutting the cost of deploying very high-capacity networks and ensuring timely and investment-friendly access to 5G radio spectrum.
3. **Establish a harmonised framework for 5G spectrum, deployment and operation, avoiding fragmentation.**
   - Long-term spectrum licenses with clear renewal rules should be provided.
   - Ensure an implementation of the European Electronic Communications Code (EECC) that supports private investment while avoiding counterproductive measures in certain Member States on spectrum auctions. Refrain from discriminatory set-asides or discriminatory obligations (e.g. mandatory national roaming) that disincentivise private investments in 5G infrastructure.
   - Design a smart policy for coverage obligations that is reasonable in terms of the timeframe and priority given to the most imminent demand, including that of industry.
   - Allocation of spectrum resources should enable public nationwide and private local industrial 5G networks in the most efficient way to maximise usage of scarce spectrum resources. Collaboration across sectors and with regulators should be facilitated to improve the understanding of various business cases and enable co-innovation. Solutions offered by operators and a well-functioning secondary market for spectrum (spectrum sharing, leasing, trading) should also be possible.
   - Provide measures to streamline the roll-out of infrastructure.
   - Create legal certainty for voluntary infrastructure sharing by providing more detailed general guidance and a block exemption for certain sharing agreements.
   - Create faster approval processes for antenna deployments and promote light deployment regime, e.g. increases in the maximum permitted tower heights and access to relevant public facilities.
4. **Promote harmonised and science-based electromagnetic field (EMF) limits:**
   - Science-based exposure limits should be harmonised across Europe for the efficient and timely development of new technology for 5G services as well as for preserving the Single Market.
   - Given the escalation of misinformation related to 5G and the attacks on telecoms workers and infrastructure, national and European public authorities should work together with scientists, NGOs and users to tackle disinformation about health consequences with clear educative 5G networks communication programmes.
   - Create a communication strategy at European and national level that provides reliable information related to EMF, radio equipment and 5G to the Member States and European citizens.
5. **Develop a strategy for international connectivity and submarine cables.**

4.e. Cybersecurity

A powerful and sovereign digitalised EU needs a high level of resilience and cybersecurity. As the economy becomes increasingly digitalised, reliance on the digital domain has been a double-edged sword – and the COVID-19 pandemic has made this more apparent.

Remote solutions and resilient telecommunications have been instrumental in ensuring continuity of businesses and public services, yet the extensive use of those very same tools has considerably widened the attack surface for both state and private actors. Neither governments nor companies have been immune from the spike of cyber-attacks, hacking and sophisticated disinformation campaigns. Globally, malicious actors have fielded cyber-attacks against industrial systems, online platforms and critical infrastructures – which in the light of the current crisis include previously neglected targets such as the food supply chain and medical labs.[29] These attacks have been a powerful reminder of the potential security spill-overs affecting a strongly interconnected society and of the lack of an all-encompassing response and recovery strategy. However, they also prove an invaluable opportunity to address key vulnerabilities of the current system and reassess Europe's common approach to crisis management, as well as the role industry can play in its overhaul.

A very important and often overlooked concern is the use of AI by malevolent actors. European AI systems need to counter these threats and any legislative framework needs to consider cybersecurity. Safety and security are a technological continuum and should be considered when assessing compliance requirements that do not to unnecessarily stifle innovation. A new public-private-partnership in AI is also a key for European technological sovereignty. This is especially so when it comes to safety and security applications.

This technology-enabled approach should be holistic, dynamic and data-driven. Above all, it should be 'resilient-by-design' and be built upon the application of disruptive enablers like AI and cloud to analyse and fully exhaust data, improving situational awareness, predictions, and speeding up both response and recovery procedures. The deployment of those innovative tools will be instrumental in this process. It will also require new forms of engagement between industry and institutions, an inescapable precondition to steer joint research priorities and channel substantial investments – both public and private – which are needed to implement those initiatives. And while Europe has no shortage of inventiveness, capabilities and best practices, timely action and commitment will be crucial to turn temporary ad-hoc solutions deployed during the current pandemic into a resilient architecture.

Governments, citizens and industry all have a role to play in managing risks and building the required cybersecurity capabilities for the Digital Single Market, thereby providing a framework of trust. To strengthen cybersecurity, governments, as well as EU institutions and ENISA, will need to work with industry and all relevant stakeholders to develop baseline security and coordination requirements. There is an important link to social acceptance of digital transformation: we need a straightforward and open conversation with the public about the cultural and behavioural changes ahead. International, cross-industry and public-private collaboration are paramount to ensure system resilience. Several ERT Member companies lead by example by driving the cybersecurity initiative Charter of Trust, launched in February 2019 at the Munich Security Conference.

Even if the issue falls mainly in the remit of the Member States' competencies, ensuring the highest level of harmonisation of security levels and regulation within the Digital Single Market is essential for EU players. Varying and differing security obligations across the EU countries are currently an obstacle to a level playing field between all market players but also a common security policy approach. Working on common certification schemes, as foreseen by the recent Cybersecurity Act, can also increase security across the EU. At the same time, security is dependent on the various actors of the digital value chain.

Stronger security for network functions means all the stakeholders abiding by relevant security rules, including software and hardware manufacturers and service providers. This would help identify ownership of vulnerability risks associated with the virtualisation of

29 Europol (2020), *"Internet Organised Crime Threat Assessment 2020"* https://www.europol.europa.eu/activities-services/main-reports/internet-organised-crime-threat-assessment-iocta-2020; Interpol (2020, August), *"INTERPOL report shows alarming rate of cyberattacks during COVID-19"* https://www.interpol.int/en/News-and-Events/News/2020/INTERPOL-report-shows-alarming-rate-of-cyberattacks-during-COVID-19

network functions and create a Single Market for cybersecurity products. It could thus ensure a higher level of security and resilience all along the product or service lifecycle and the value chain.

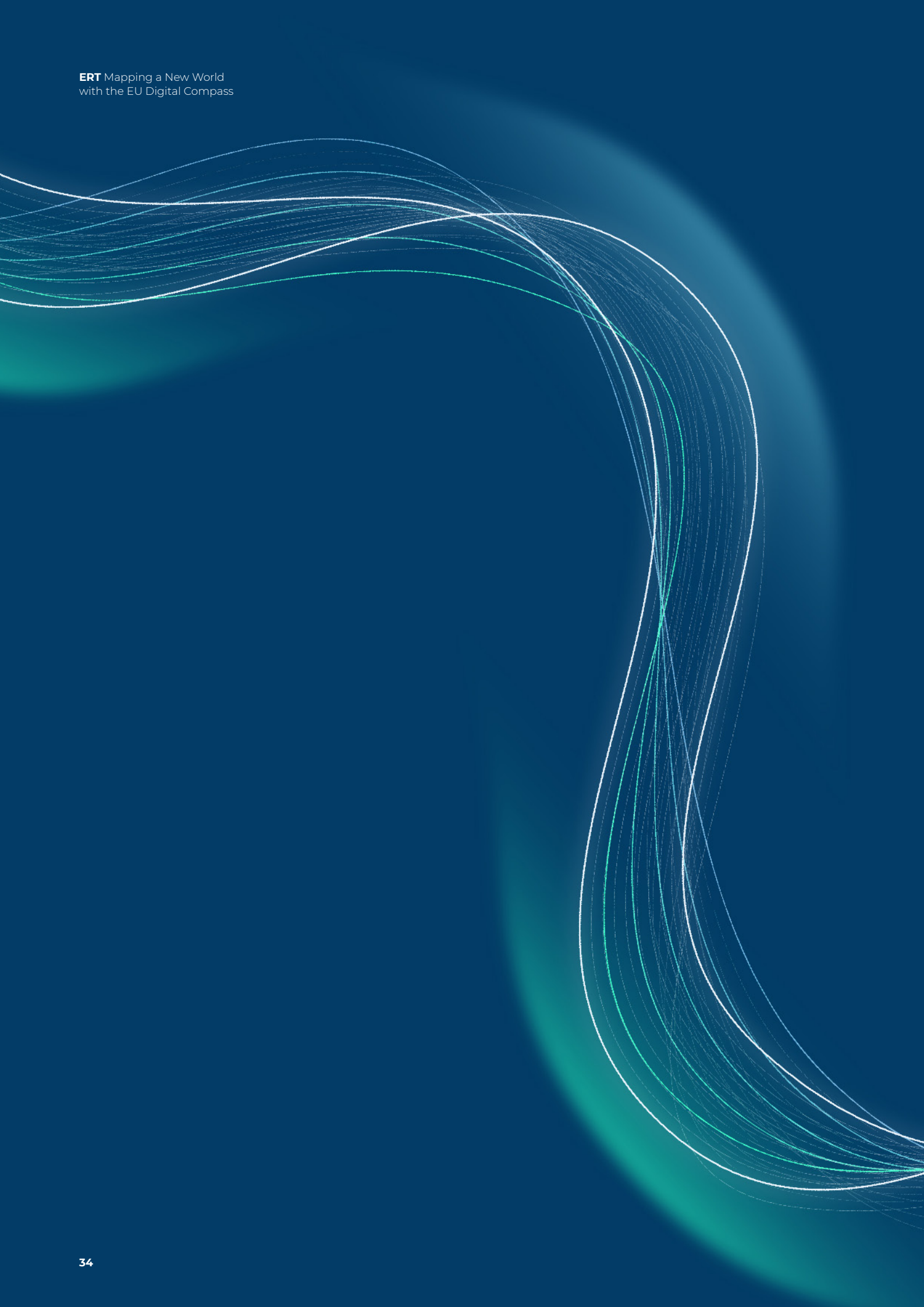
ERT welcomes the ongoing work by the European Commission together with the European Union Agency for Cybersecurity (ENISA), the Member States and industry stakeholders to develop a common coordinated approach to avoid fragmentation and hence strengthen the EU's principles of trust and resilience in the Digital Single Market.

ERT recommends the following actions:

Priorities for an ambitious harmonised framework for cybersecurity[30]:

- **Swift development and implementation of relevant Cybersecurity Act certification schemes** in close collaboration with industrial stakeholders.
- **A harmonised EU approach to 5G security** (via 5G cybersecurity toolbox) preventing national governments from disproportionate or fragmented actions that could, in turn, harm Europe's competitiveness, its strategic position in 5G, and create the risk of market distortion within the EU's Digital Single Market
- **Swift revision of the NIS Directive** to address today's fragmented regulatory framework and harmonise cybersecurity measures across EU Member States.
- **More coordination between European Commission's Directorates-General** in the development of security requirements for the proposed changes to the Radio Equipment Directive, the General Product Safety Directive and the Machinery Directive and an aligned approach towards harmonised standards for the implementation of security requirements.
- **Improved collaboration between national administrations, relevant structures within EU institutions/agencies like CERT EU and national CSIRTs and the industry.**

30 For further details, see *"ERT position on Cybersecurity"*, April 2020 https://ert.eu/documents/ert-position-on-cybersecurity/



5. Tracking progress – KPIs to measure success

To put strategies into practice, ERT believes that decision-makers need more data-driven and comprehensive evidence to devise and implement the right policies.

The twin transitions to a climate-neutral and digitally advanced industrial model can only succeed with a strong EU industry at its core. Industry plays a key role in the green transition to tackle climate change by developing low-carbon technologies and sustainable products and solutions. The digital transition will ensure that European products and services can compete globally and is a prerequisite for green success. These transitions require the mobilisation of significant investment, for Europe to become a place where companies can innovate more and scale up to become true leaders in their new product segments at the global level. Our goals on these issues should be quantified and progress measured meticulously.

In a paper entitled *"Putting EU Industrial Strategy into action: KPIs for tracking progress and benchmarking competitiveness"*, ERT developed a scorecard on industrial competitiveness which also speak specifically to Digital Transformation.[31] For this document, we reference the KPIs contained in that document related to "Digital Transformation".

Table 1: Digital Transformation indicators

#	Indicator	2030 target	#	Indicator	2030 target
1	Graduates in STEM and related fields	Increase rate from 17 to 25 graduates per 1000 inhabitants	4	DESI business digitisation index	Increase index score from 42 to 90
2	5G adoption rate	On par with the US and China	5	Number of industrial robots	Narrow the gap with current leaders
3	Artificial intelligence investment	€20 billion per year in 2021-30			

ERT welcomes the objectives of the European Commission's Digital Decade Communication. These objectives echo ERT's proposals, both as they relate to the focus areas of the chosen indicators and targets and in the approach taken to track progress, e.g. through annual reports. Diligent implementation through the planned Policy Programme for the Digital Compass will be crucial to reach the ambitious goals of a digitally competitive Europe.

31 ERT publication *"Putting EU Industrial Strategy into action: KPIs for tracking progress and benchmarking competitiveness"* https://ert.eu/documents/kpis4industrialstrategy/

ERT commitment

ERT Members are committed to a strong, inclusive and united Europe in which innovative industrial players, large and small, have a decisive role to play.

As Europeans, we want to leverage the power of industry for the benefit of Europe. As business leaders, we recognise that a successful Europe and successful European companies are interdependent. We need and want to be part of the solution.

What we will do

The companies led by Members of ERT have pledged to take a range of unilateral actions that we believe are good for Europe and good for European industry:

1. **Invest more:** The companies led by Members of ERT are investing over €50 billion per year in R&D and are ready to invest even more in conjunction with the right policy actions.
2. **Open up:** The companies led by Members of ERT have pledged to promote inclusion and diversity in businesses throughout Europe. ERT will strengthen its interactions with society and develop new best practice policies. This will also ensure that innovation follows a human-centric approach.
3. **Further digital transformation:** The companies led by Members of ERT will accelerate their own digitalisation, data and artificial intelligence strategies.
4. **Develop skills:** The companies led by Members of ERT will significantly increase the number of quality business-education partnerships including lifelong learning traineeships, apprenticeships and first employment opportunities. They will train both the current and future workforce with the required skills in the areas of digitalisation, automation and artificial intelligence.
5. **Support trade:** The companies led by Members of ERT will actively support the EU's efforts to deliver fair and free trade and inclusive global growth.
6. **Tackle climate change:** The companies led by Members of ERT are taking the lead in reducing greenhouse gas emissions along the value chain and develop low-carbon solutions. They will collaborate with policymakers at EU and national levels to ensure Europe sets the right policies required to enable an energy transition aligned with the goals of the Paris Climate Agreement.

ANNEX: Use Cases and Case Studies

In this Annex you can find useful examples of use cases & case studies, categorised by theme.

Edge Computing Ecosystem

In the age of digitisation, 5G plays a key role in increasing the independence and intelligence of things. 5G's enhanced mobile broadband, massive IoT and low latency capabilities enable dynamic and flexible value chains with the inclination to increased autonomy of production lines. This trend is accompanied by the exponential growth in produced data. To turn 5G into a competitive investment, companies need to consider accelerating data condensation, data processing and decision derivation to improve their business with the accruing information. T-Systems supports its customers to shape their digital roadmap by combining connectivity, edge computing and solutions based on leading digital technologies.

This objective sparked the deployment of an integrated platform at OSRAM that were seeking a solution to increase the autonomy and intelligence of their production processes. The integrated platform at OSRAM is an ecosystem provided by Deutsche Telekom and T-Systems, consisting of a 4G/5G campus network provided by Telekom for high-performance wireless connectivity in combination with a local T-Systems edge, the EdgAir.

The edge was used to operate autonomous guided vehicles (AGV) using T-Systems' central AGV steering solution which is capable of managing fleets of diverse AGV models. While classical AGV integration results in a strong dependency from a specific vendor's solution and software releases, the independent AGV steering solution allows customers like OSRAM to integrate various models and makes into a unified steering logic, retro-fit existing AGV fleets, and upgrade with further digital solutions of T-Systems and their partners, such as computer vision or precise campus positioning.

T-Systems' EdgAir provides the required minimal latencies and high computing power, smooth operation is ensured, and the way is paved for a reliable smart factory. This is an example of how T-Systems secures past investments by retrofitting and simultaneously ensures compatibility with digital innovation in the future.

As part of the T-Systems Campus Edge[32] ecosystem, the integrator allows their customers to easily combine and integrate further solutions into their value chain to cover further use cases. In the case of AGV, this includes a precise positioning solution that supports multiple positioning technologies to always provide the highest possible positioning accuracy. The precise positioning solution not only benefits the operation of AGVs but provides additional use cases like asset tracking or collision avoidance by computer vision to enhance the management of warehouses. A further example of an innovative use case is the application of T-Systems' augmented and virtual reality solution (AR/VR) in work environments. The AR/VR solution supports visual orchestration of data and processes and greatly reduces the complexity of human-to-machine-interaction through gesture interactions and voice control.

The Edge Computing ecosystem of T-Systems also forms the foundation to incorporate new emerging innovations and solutions of partners to provide customers at any time to benefit from the newest technology and digital solutions. This allows the simplified integration of additional uses cases to further increase productivity, automation and flexibility of companies.

32 T-System's Campus Edge video: https://www.youtube.com/watch?v=uQZEW3EYwYE

Enhanced Cellular Connectivity in Manufacturing

The COVID-19 crisis has shown the value of transforming manufacturing to 'Conscious Factories' which are agile, highly automated and flexible for change. Nokia's 5G radio factory in Oulu, Finland, which is recognised by the World Economic Forum as an 'Advanced 4th Industrial Revolution Lighthouse', was able to transfer its knowledge and technology around complex manufacturing processes to other factories during the COVID-19 lockdown conditions in March/April 2020 in record time without any international travel of engineers and only 10% of our people on-site at the receiving end. This enabled Nokia to ramp up and maintain pre-COVID production schedules and avoid supply disruptions. A variety of digitalisation tools, such as Digital Twins, automated data warehouse tools, Private Wireless for guaranteed low latency connectivity of mobile production assets, High Accuracy Indoor Positioning for locating critical assets and movement on the shop floor, wireless telepresence robots, remote access solutions to access and programme machines and deep-dive remotely into the process performance data and ensure quality control, virtual reality training to teach factory personnel some manual assembly steps, was used among others.

Such a quantum step in connectivity and digitalisation has also been performed by Bosch Rexroth. With Nokia's support, Bosch Rexroth has digitalised their IT and OT, creating a 'digital twin' production line where everything is optimised through data. Robots, mobile machines, intelligent spaces, AI and virtual operations are all connected without cables, powered by software to aggregate, correlate and analyse data.

USE CASE

The digital plant and the road to melamine autonomous production

Sonae Arauco plants can produce up to 5,000 different melamine surfaced boards SKUs per year. Such a high number of SKUs results from the combination of different board types and dimensions, paper references and finishing types. Each different SKU might require a different production line setup (recipe). This complexity has a high impact on productivity, quality and lines uptime resulting in higher production costs, quality downgrading, and potential client claims and poor service.

Not being able to automatically define in real-time the optimal recipe for each SKU, taking into consideration the production conditions (environment, raw materials, equipment), Sonae Arauco has set up a digital platform in the cloud where the production line is mapped as a digital twin. The platform includes the real-time capture of all the production lines' data from different sources (MES, ERP, PLCs or IoT Devices). The available data is monitored and feeds a data lake used afterwards to train AI models to predict quality failures, machine failures and optimal SKUs' recipes. After a successful pilot, the solution is being rolled out to other plants.

Sonae Arauco expects business benefits from the improvement of lines uptime and the elimination of quality defects resulting in lower production costs and better service to the customers.

Supporting SMEs

Vodafone is rolling out new services to support businesses – especially SMEs – to rebuild post-crisis

Europe is home to more than 25 million SMEs, representing over 99% of Europe's businesses. SMEs are a critical part of Europe's economy, providing jobs and driving economic growth. They also provide opportunities for socio-economic participation and mobility for women, young people and ethnic minorities. SMEs employ almost 98 million people across Europe and account for more than two-thirds of new jobs. SMEs contribute over €4 trillion to the total added value of the EU, accounting for more than half of Europe's GDP.

However, SMEs face an uncertain future. The OECD has found that more than half face severe losses in revenues due to COVID-19, with one third fearing for their future without further support.

While COVID-19 has accelerated digital transformation plans for many businesses, smaller companies are being left behind; only 17% of SMEs have successfully integrated digital technologies, compared to 54% of large organisations.

We have identified several adoption challenges specific to SMEs:

- The technical and organisational capability to engage with digitalisation, which can limit the ability or willingness to adopt, particularly when faced with overwhelming challenges such as COVID-19.
- Financial and time restrictions impact the ability to digitise, given the significant resource constraints and conflicting priorities for these resources, especially in light of COVID-19.
- The availability, or ability to identify, suitable digital solutions, leading to either un-started or inefficient digital adoptions.

Vodafone actively supports SME digitalisation through a range of initiatives and solutions as set out below, designed to improve SME performance and resilience, from web design to privacy and security, enhanced by our free V-Hub SME advisory service launched in the UK, Germany, Spain and Italy.

- **Finding and keeping customers** enabling SMEs to sell their products/services via online channels, with website creation and marketing software and improving face to face interaction, including tools to support social distancing.
- **Cost control** providing software to manage internal processes, smart buildings solutions which also limit environmental impact and solutions to optimise stock management.
- **Hybrid working** enabling employees to both work remotely and in the office safely, securely and productively.
- **Improving product quality** with next generation R/VR product design and visualisation tools, project management software and distribution tracking capabilities.
- **Resilience, privacy and security** enabling SMEs to secure and protect their assets and their business by providing advbice, consultancy, playbooks and solutions.
- **Digital transformation and business support** providing a one-stop shop for advice, implementation, training and ongoing support.

More than 1.2 million European SMEs have not digitalised. If just 100,000 did so, it would raise turnover by up to €148 billion (an average of €1.4 million per business, depending on the business model and existing level of digital adoption).

EXSCALATE4CoV

Eni is committed to the EU-funded EXSCALATE4CoV project to find the safest and most promising drugs to fight Covid-19.

Steering the project is the Italian biopharmaceutical company Dompé, at the helm of 18 universities, research centres and private corporations in seven European countries, including Cineca in Bologna.

Eni is offering HPC5's computing power, its custom workflow management software, and its experience in molecular modelling.

The supercomputer infrastructure HPC5 is the best-performing in use in industry anywhere in the world, with peak processing speeds of 51.7 petaflops per second. Combined with its predecessor HPC4, which is still running, the system can reach record speeds of 70 petaflops, meaning 70 million billion mathematical operations per second.

One of its applications is in molecular modelling, the study of molecules using mathematical models that simulate their characteristics.

Eni's shared goal is to run simulations of the molecular dynamics in the proteins on the surface of SARS-CoV-2, which play a key part in the infection mechanism of the virus. This work lays the foundations for the next step, which is Dompé's responsibility: screening 10,000 active ingredients in known pharmaceutical compounds, to find the most efficient for blocking the virus.

Without a powerful supercomputer, it would take years to do all the necessary calculations.

But HPC5 will let scientists study all the thirty or so proteins present in SARS-CoV-2 in just a few months. With HPC4, it would have taken two months to simulate the behaviour of a single protein. HPC5 can do the same in about 10 days.

The first screening of a database of known drugs produced a wide range of potential molecular targets blocking viral activity within the simulation. The aim is to find effective drugs that have already been clinically tested in terms of activity and tolerability and are therefore immediately available.

In June 2020, that is to say just after 2 months of activity, the main result of this screening was the identification of Raloxifene, a known molecule used as osteoporosis drug, which proved effective against the SARS-CoV-2 virus in vitro, counteracting virus replication in cells.

On the 27th of October 2020, the Italian Medicines Agency (AIFA) authorized the clinical trial at the Spallanzani hospital in Rome and in Milan's Humanitas in order to assess Raloxifene as a potential Covid treatment.

Clinical test is on-going involving 150 patients and the first results to assess its efficiency in terms treating SARS-CoV-2 viral infection will be available by the end of May.

Eni and the Exscalate4CoV consortium believe this will only be the first of a range of treatment solutions identified with molecular modelling.

In mid-November 2020, HPC5 enabled the most complex molecular supercomputing experiment to date to be carried out to identify new treatments for the virus.

The goal of the experiment, called the Fast Track phase, was to test the interaction of 71.6 billion molecules on 15 "active sites" of the virus. A total of 1074 billion interactions - equal to 5 million simulations per second - were processed in 60 hours. All these simulations amounted to the execution of almost 30,000 HPC jobs; such workload was managed without interruptions over 60 hours by the custom workflow management software named Beat, originally developed by Eni for its seismic imaging HPC platform. The experiment generated 65 TeraBytes of results.

The experiment simulated "molecular docking", i.e. all possible intermolecular links between virus proteins and other already known molecules among potentially usable drugs, natural products, nutraceuticals and other substances on the market from public databases and those made available by pharmaceutical companies. By processing the results of the screening, it is possible to identify candidate molecules, i.e. those capable of attacking the virus and locking it in and preventing it from unleashing its viral load.

Healthcare

PHILIPS

Exchange of COVID-19 patient data

Royal Philips launches a national portal for the digital exchange of COVID-19 patient data in the Netherlands.

In cooperation with Erasmus Medical Center (Rotterdam, the Netherlands), Jeroen Bosch Hospital ('s-Hertogenbosch, the Netherlands) and the Dutch Ministry of Health, Welfare and Sport (VWS), Royal Philips has created an online portal that allows Dutch hospitals to seamlessly share COVID-19 patient information. When fighting a pandemic like COVID-19, the ability to share patient data between hospitals at the touch of a button is vitally important, as it can optimise the use of healthcare resources. It can, for example, assist in the seamless transfer of infected patients between hospitals to avoid local overload in critical care units. Since its launch on March 28, 95% of Dutch hospitals have already been connected to the portal for the digital exchange of COVID-19 patient data.

The new COVID-19 portal, which is available to all Dutch hospitals, is not linked directly to an individual hospital's EPD (Electronic Patient Dossier), PACS (Picture Archiving and Communication System) or pathology department systems. Instead, specific information, such as a patient's radiology images, reports and patient summary is shared via the portal. The information is instantly available to a receiving hospital provided the originating hospital and the patient have given their explicit consent. The safety of medical data exchange remains of the utmost importance, even in times of crisis. As a result, the portal fully complies with the ISO27001 information security standard and the Dutch NEN7510 standard, which is specifically designed for information handling in the healthcare sector.

eCare Manager

eCareManager is a software platform that enables patient population management, provides actionable insights for clinical decision support and supports care coordination.

AI-enabled function or features

Discharge Readiness Score uses predictive analytics to estimate the probability that patients in the intensive care unit (ICU) risk death or readmission within 48 hours if they were discharged from the ICU, assisting the healthcare professional in the ICU discharge process.

Sentry Score uses predictive analytics to identify patients in the intensive care unit (ICU) who may require intervention within 60 minutes, helping the healthcare professional prepare accordingly.

Validation process

Discharge Readiness Score was retrospectively developed and validated on separate ICU patient cohorts, and it was further validated as a marker of severity of illness throughout the ICU stay on another cohort of ICU patients.

Sentry Score was retrospectively developed and validated on separate ICU patient cohorts, and a prospective validation was performed for another cohort of ICU patients against blinded assessments of need for intervention as adjudicated by ICU clinicians.

Ultimate decision responsibility

Discharge Readiness Score presents healthcare professionals with the probability that a patient in the ICU would die or need to be readmitted to the ICU within 48 hours after a discharge from the ICU. They remain fully in control of the decision of whether to discharge a patient from the ICU.

Sentry Score presents healthcare professionals with the probability that a patient in the ICU will need an intervention within 60 minutes. They remain fully in control of any intervention.

IntelliSpace Discovery

IntelliSpace Discovery is an open platform that offers radiologists comprehensive data analytics capabilities for clinical and translational research in radiology. IntelliSpace Discovery is for research use only and cannot be used for patient diagnosis or treatment selection.

AI-enabled function or feature

The IntelliSpace Discovery platform provides applications and tools for radiologists to aggregate and normalise data, which can be visualised and annotated to train and validate deep learning algorithms.

Validation process

AI-enabled algorithms that are created using IntelliSpace Discovery are validated separately; the platform itself is used for research only.

Ultimate decision responsibility

Healthcare professionals and researchers can use IntelliSpace Discovery platform to create algorithms for research purposes. They remain in control of the validation and deployment of those algorithms.

Concluding recommendation

These examples show that there is a huge amount of progress to be made in healthcare through data sharing. Every citizen in the EU has the right to (remote) access to essential, high quality, and affordable healthcare services.

For continued innovation, stakeholders in the healthcare domain, public and private, should step up efforts to share data and make it available in health data spaces.

Digital technologies help to manage the pandemic safely

The local health department, clinics and hospitals of the Rhine-Neckar region have partnered with SAP to relieve the healthcare system during the pandemic and beyond.

Using data analytics and visualisation technology, they can see capacity levels at a glance and decide which hospital can best care for the patient in question. This information is also shown on an interactive geomap, enabling medical staff to see where each hospital is, pinpoint a facility where beds are available, and coordinate directly with the team there.

Each hospital uses the system to report its capacity. The software then updates the occupancy plan for all hospital beds in the region. Furthermore, built-in analytics capabilities can demonstrate how bed occupancy and the number of hospital beds have changed over time. The analytics function can also analyse past metrics and depict timelines, enabling hospitals to respond to trends.

This example shows how digital technologies can enable the healthcare system to manage the pandemic more safely, but also how it can become more efficient in the long run.

See also: https://news.sap.com/2020/11/vaccine-distribution-road-to-recovery/

Mastering the biggest vaccine distribution projects in history with technology

Governments, healthcare organisations, life sciences companies, medical device manufacturers and distributors are preparing for the biggest vaccine distribution projects in history, as the world is waiting for an effective vaccine against the COVID-19 virus.

Managing the delivery network for safe and efficient vaccine delivery to the communities will be a tremendous challenge, but one that can be met with the intelligent use of digital technologies.

The SAP vaccine collaboration hub covers the end-to-end process from manufacturing to controlled distribution to administration and postvaccine monitoring and thereby helps to:

- Create value chain visibility and tracking to identify bottlenecks, avoid disruptions and prevent counterfeiting and expired batches.
- Enable supply chain planning to integrate and optimise financial and operational network planning and predict demand to maximise vaccine administration.
- Effectively manage a situation room, from where to capture and respond to real-time operational metrics and citizen sentiments.

It uses a digital network built on SAP Cloud Platform and enables partners to exchange large amounts of data, supporting data-driven decision-making and providing the backbone to better mitigate future emergencies.

See also: https://news.sap.com/2020/11/vaccine-distribution-road-to-recovery/

USE CASE

Additive Manufacturing / 3D Printing

Additive Manufacturing (AM), also known as 3D printing, is a modern fabrication process that can use a wide range of materials (metals, polymers, composite, ceramic and more) to create products layer-by-layer from a digital file.

AM proposes a novel paradigm for design, manufacturing, and business models, based on design freedom, localised value chains and reduction in waste production and material consumption.

AM can reduce waste in the production process since they only use the material that is needed to produce a part. AM supports circular design strategies by creating opportunities to extend a product's lifespan, for instance by enabling repair or upgrades, even if these products were not originally designed for ease of repair or upgrading.

Use of recycled materials

Current industrial applications of AM are designed to enable a closed-loop circulation of materials, facilitating a more sustainable production system.

In metal AM, more than 95% of the unused powder can be locally filtered and reused directly, while the remaining 5% can be used to produce a virgin powder, without having negative impacts on material properties.

The use of recycled plastics in 3DP is steadily increasing as different EU projects show. Examples can be found in the results of European projects: Repair3D or BARBARA.

Supporting sustainable design

During the use phase, AM has a minimal shape and geometric constraints, allowing the production of alternative optimised complex parts, which have a lighter weight, enhanced durability and improved functionality.

This can help to reduce the consumption of energy and natural resources during the use phase of the final product, leading to a positive impact on the environment. An example of such functional improvement can be found in lightweight components for transport systems.

Industries like aerospace and automotive face the challenge of optimising fuel consumption efficiency, reducing production costs, and meeting stringent regulatory standards on harmful emissions.

Further benefits obtained by using Additive technologies can be found in the consolidation of the number of components within an assembly and the creation of new material structures.

Fewer components to be assembled can lead to less need for tooling, fewer errors in production and reduction of production and assembly time, resulting in both costs saving and the reduction of environmental impact. Moreover, the nature of the AM process allows the creation of new material structures that can enhance the properties of the components being fabricated, e.g. increased strength, stiffness and corrosion resistance.

Facilitating repairing and remanufacturing

AM makes repairs and remanufacturing easier and more cost-effective. It allows spare parts to be printed on-demand and closer to where they are needed. This helps to reduce inventory waste and product's carbon footprint as well as extending the lifetimes of those products needing spare parts that would otherwise be difficult to obtain.

Furthermore, AM enables access to damaged or obsolete components in different sectors: oil and gas, automotive, aerospace, etc. In this case, the lifetime of a component can be extended, in particular where the faulty part of a critical component can simply be 3D printed and replaced like-for-like, consuming only a fraction of the energy and resources required for new parts.

So, overall, Additive Manufacturing can be a mighty driver for supporting the EU Commission's Green Deal, digitalisation and sovereignty objectives.

Additive Manufacturing Network

SIEMENS

Since March 2020, Siemens opened its Additive Manufacturing Network to enable the efficient execution of design and printing requests by doctors, hospitals and suppliers of medical equipment in response to the COVID-19 pandemic.

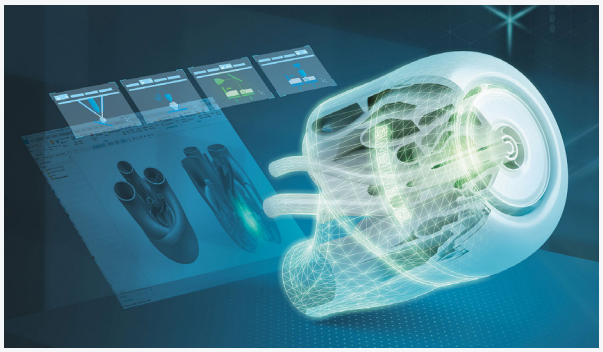
Siemens made its Additive Manufacturing (AM) Network, along with its 3D printers, available to the global medical community to speed the design and production of medical components. The AM Network connects users, designers and 3D-print service providers to enable faster and less complicated production of spare parts for machines like ventilators. The Siemens AM network is available globally and covers the entire value chain – from upload and simulation to checking the design up to the printing process and associated services.

Doctors, hospitals and organisations in need of medical devices, as well as designers and service providers with medically certified printing capacities, can register for free access to the Siemens AM Network.

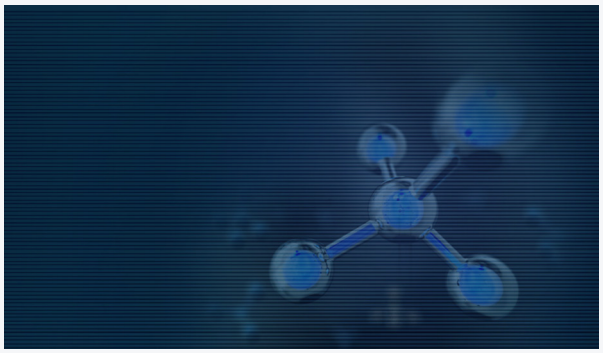
Siemens' designers and engineers are a part of the AM Network so they can answer design requests and help convert designs into printable files. Afterwards, these components can be printed via medically certified 3D printers of partner companies that are also part of the AM Network. In addition to numerous 3D printers from partner companies, Siemens' 3D printing machines are also connected to the network and if suitable, will also be used to locally print components and spare parts for medical devices.

Printing capacities from additional service providers can easily be added to the AM Network.

See also:



https://www.plm.automation.siemens.com/global/en/our-story/newsroom/am-network-open-covid-19/75019



https://additive-manufacturing-network.sws.siemens.com/fight-coronavirus/

USE CASE

Upgrading and renewing Europe's (public) buildings and construction with digital solutions

Investment in Digital tools like BIM (Building Information Modelling) and Digital Building Twin is key when planning to construct or renovate new buildings – so these are designed and built, or renovated, in a much more sustainable way than ever before. With BIM, a building is first built virtually, then physically, with construction only beginning after the virtual building meets all expectations and specifications. Architects and designers must become familiar with design requirements and strategies, the concept of life cycle assessment, the potential to increase the content of recycled materials in products, future reuse potential (product, component and building), (future) recyclability and transformation capacity (reuse potential and reversible building design score).

The public sector must lead by example. Many Member States have not yet presented their long-term renovation strategies under the revised Energy Performance of Buildings Directive. They should use the Recovery Fund to allocate extra spending on retrofitting older publicly owned buildings like schools, hospitals and town halls or for construction new ones. Digital should be a key pillar in such renovation strategies but must now also be applied for new buildings.

Furthermore, for renovations and also for new buildings, all public EU tenders, e.g. by 2025 or 2030, should be made digital and have BIM included with a coordinated overall design. A new way of tendering will be required (no fragmented breakdown in all disciplines anymore); the tender must make simulation testing and data sharing ('building twice') mandatory as part of the handover processes.

While BIM allows us to plan and construct buildings with greater insight, it also creates significant benefits that are realised during the operation phase, even until its end-of-life. All of this will improve profitability over the entire building lifecycle and generate measurable advantages for investors, planners, contractors, tenants and operators. With BIM and the Digital Building Twin, the high goals in reducing the use of raw materials, energy and a sustainable approach to the environment are within reach and enable the achievement of the requirements of the Green Deal initiative of the European Commission.

Beyond the environmental benefits, such a scheme of investments would create jobs at multiple different skill levels, from architects, designers, construction workers to data engineers and other technicians.

See also the case study: New Siemens Smart Infrastructure Headquarters in Zug, Switzerland https://new.siemens.com/global/en/company/about/businesses/real-estate/bim-pilot-project.html

Combining digitalisation and sustainability to green the textile industry

Lenzing
Innovative by nature

Lenzing Group, a leading company in the area of wood-based specialty fibers, launched a digital platform to ensure the traceability of textiles from fiber to production and distribution, and has onboarded some of the most important fashion brands. This platform, powered by the start-up TextileGenesis™, makes the textile and apparel industry more sustainable and transparent. It will help green an industry which is currently one of the biggest polluters of the environment with very high CO_2 emissions. Consumer awareness of this has increased in recent years. 80 percent of consumers want fashion brands to source from transparent supply chains. Numerous NGOs have kept a close eye on the sourcing and production processes of the textile industry.

According to an ISPO survey, transparency is a core aspect of business priorities of the top 100 fashion brands. Their aim is to use 100 percent sustainable and traceable fibers over the next five years. As up to 30 percent of branded ingredients such as organic or sustainable fibers are estimated to be fake, Lenzing's traceability platform helps the brands and all customers and partners across the entire value chain to reduce these compliance and reputational risks. It gives all companies involved in the production process an overview of their supply chain at any time.

This full supply chain traceability is achieved by using blockchain technology. Lenzing and further brand partners are able to issue digital tokens (blockchain assets) in direct proportion to the physical shipments of fibers. These digital tokens provide a unique 'fingerprint' and authentication mechanism, preventing adulteration, ensuring a more secure, trustworthy, digital chain-of custody across the entire supply chain. They also serve as the basis for authenticity and provenance of sustainable textiles against generics.

The technology used by Lenzing and TextileGenesis™ combines blockchain with the GS1 traceability standard. It is the first fiber-to-retail traceability data standard for the apparel ecosystem based on the GS1 framework. The digital tokens in use are called Fibercoins™ and are not based on any cryptocurrency in order to eliminate financial and legal risks and drive ease of adoption for the B2B users.

This transparency platform provides the opportunity to include various sustainability figures. After one of the next roll-out phases, consumers will be able to scan a barcode and receive information regarding the journey of the garment they want to buy, from the raw material to the store. This will be the basis for informed purchase decisions and will meet the demand of a growing number of conscious customers who want to know more about the ecological footprint, i.e., the CO_2 emissions of the products they use.

Sustainability in the Telecoms sector

Deutsche Telekom will exclusively rely on renewable electricity by 2021. Additionally, and approved by the Science-Based Target Initiative, Deutsche Telekom's emissions will be reduced by 90% by 2030 (compared to 2017) and the firm will become completely carbon neutral by no later than 2050.

At the same time, the digitalisation of our society and economy will be a terrific enabler for less carbon consumption. According to The GSMA study on 'Enablement Effect', mobile networks have contributed to saving 2.1 billion tons of CO_2 in 2018, which is 10 times the carbon print of mobile operators worldwide. We are thus committed to delivering digital solutions to other sectors for a green transition (energy, building, cities, health, etc.).

Ericsson and **Deutsche Telekom** have tested autonomous energy supply for mobile sites aimed at reducing carbon footprint and saving energy costs. The tests, carried out in the second half of 2020, showed that solar energy is able to contribute to more than two-thirds of the site's total power during peak hours. Depending on the solar irradiation and technology configuration, larger shares, including up to fully autonomous power supply, where are also observed. This is thanks to the energy-efficient radio equipment.

The project confirms the potential of solar energy as an alternative power source for mobile sites and opens up for other renewable power sources.

Ericsson has a high focus on the energy efficiency of its portfolio, as detailed end-to-end Life Cycle Analysis reveals that the operational phase of the product is responsible for about 80 percent of CO_2 emission of the total life cycle. A higher energy efficiency of the radio site solutions means that local generated renewable energy will become more feasible. Furthermore, Ericsson has set a goal to become climate neutral by 2030 in its own activities.[33]

Nokia has developed a solution to use liquid cooling for mobile base stations to redistribute heat and reduce CO_2 emissions. This avoids that up to 90% of the energy consumed by mobile base stations is converted to waste heat, but is instead converted and repurposed. Elisa – a leading communication service provider in Finland – has been able to reduce its CO_2 emissions by approximately 80% by implementing liquid-cooling solutions pioneered by Nokia. Liquid-cooled sites are silent, require zero maintenance, and can be 50% smaller and 30% lighter than standard active air conditioning units. They offer operators and owners of base station sites significant savings and potentially longer base station component life. Using a similar approach, Nokia achieved a 20% improvement in energy efficiency and 90% reduction in CO_2 emissions in its Tampere Data Centre, which contains 13,000 square feet of hardware with an output of 4 megawatts of energy. Waste heat from the data centre is routed back to the city's grid line for district heating.

Orange has committed to be carbon neutral for all its operations across the world by 2040, without offset except for the unavoidable part of carbon emissions for which there will be investments in carbon sinks, such as funding the planting of trees or mangroves. As an intermediary step, Orange will have to rely on 50% of renewable energy by 2025 and to reduce their CO_2 emissions by 30% between 2015 and 2025. Orange is also integrating circular economy principles in all its products, services and processes.

Vodafone Group has committed to power its European network with 100% renewable electricity by 2021, creating a Green Gigabit Net for customers across 11 markets that will grow sustainably using only power from wind, solar or hydro sources.

33 Deutsche Telekom and Ericsson partner on renewable energy for mobile sites
https://www.ericsson.com/en/news/2021/2/dt-sustainable-mobile-sites

Sustainability

Deutsche Telekom offers various digital solutions which not only optimise processes and costs but also environmental figures like CO_2 emissions. Some selected solutions from Deutsche Telekom's Smart City activities:

Smart Street Lighting

Cut energy costs, reduce CO_2 emissions and prevent the extinction of insects in cities. Smart Street Lighting makes it possible. Smart Street Lighting ensures efficient resource management by managing the street light infrastructure for the cities. A central, cloud-based light management application and intelligent hardware in or within the proximity of luminaries is the basis of the solution. The core functions of Smart Street Lighting are to regulate light cycles and specify the brightness of the lights according to location and time.

Cities need to become more liveable by providing citizens and tourists with a welcoming, efficient and functioning environment. Smart Street Lighting provides an increased sense of security by creating a safe environment and can also improve driving conditions during the night. Citizens and tourists also look at the sustainability of the cities they live in and visit. Smart Street Lighting reduces CO_2 emissions helping the cities to reduce their carbon footprint. An analysis shows that a city like Munich can save roughly 4,5 metric tons of CO_2 emissions. It can also help decrease light pollution, which is a growing problem because as it disrupts ecosystems and has adverse health effects.

Smart Waste Management

Mountains of rubbish can cause problems to waste management operations, especially during the warm season or when there are big events in cities. Waste bins that are overfilled annoy and upset citizens. How to eliminate piles of rubbish and overfilled waste bins? This is where Smart Waste Management comes in. Deutsche Telekom puts sensors inside the containers to measure fill levels on an hourly basis. A dashboard helps to visualise the operations. Drivers receive a tablet with an integrated application to view the optimised route. Sensor longevity is guaranteed due to low power consumption. With this simple solution, cities or companies can save up to 50% of the costs related to waste logistics and also substantial CO_2 emissions. An analysis of smart waste solutions shows possible savings of roughly 26,500 tons of emissions in Germany.

Smart Air Quality Monitoring

The rapid expansion of our cities leads to more opportunities and economic growth, but it can also lead to greater demand and overutilisation of available and essential resources. Cities are not only the main cause but also the main victims of increased and intensified emissions such as exhaust gases and particulate matter from the burning of fossil fuels. The yearly consequential costs of air pollution in the EU from transportation amounts to around €66.7 billion per year. Hourly measurement of fine particles (PM1, PM2.5 and PM10) and gases like NO_2, O_3 and CO_2 are required to understand the distribution, volumes and changes of the pollutants and identify any hot-spots. Without this continuous monitoring, you cannot measure and implemented changes and their immediate impact on improving air quality. Deutsche Telekom solutions use flexible air quality monitoring stations to determine the hourly average values of the pollutants as specified in the EU Air Quality Index. Reliable and comparable measured values of air quality are important for cities, citizens and tourists alike. Our solutions can be implemented in various and flexible locations that we help you specify at low costs and with minimal effort. The solution also provides data and benefits for both environmental agencies and maintenance teams who look after the stations.

Rural connectivity – driving digital and green benefits for agriculture

Agriculture, which accounts for 10% of total EU greenhouse gas emissions and 44% of total water abstraction in Europe, is a key sector where transition to a smart ecosystem will be integral to promoting and delivering greater sustainability. Connectivity providers such as Vodafone are working with partners across the value chain, including farmers, equipment manufacturers, suppliers and research institutes to introduce new applications and technologies. The availability of connectivity is already enabling a greener approach, with more efficient use of resources via real-time monitoring. However, to realise the full benefit digital technology will need to be deployed at scale. Partnerships between the agricultural industry, governments and connectivity providers are critical to ensuring the digital infrastructure and funding is in place to deliver this and create greener, smart, digital ways of working.

This can be seen in the following two examples:

Sensing4Farming with Emilio Moro in Spain

Emilio Moro, a Spanish wine producer, is aiming to maximise efficiency and minimise the environmental impact of its wine production. Through Vodafone's Sensing4Farming solution, a network of sensors has been installed in Emilio Moro's vineyards which, combined with the high resolution satellite images obtained in real time, allow the measurement of key environmental factors such as humidity, temperature, soil conductivity, water absorption and the health of the grapevines. This data is sent to the winery oenologists and technicians so that the winery can identify the ideal quantity of irrigation and fertiliser needed by the vines, as well as which require pruning and when to harvest.

The key benefits of the project include:

- **Lower environmental impact** due to reduced fertiliser use and water consumption
- **Reduced production costs** through reduced water, fertiliser and energy consumption
- **Increased quantity and quality of production** by permitting a more slection application of treatments

KEENAN and IoT improving sustainability of livestock farming

KEENAN, an Irish manufacturer of diet feeders for livestock, is using Vodafone's IoT solutions to enable farmers to measure, monitor and manage feed efficiency. This leads to a reduction in feed waste and an overall improvement in animal health. KEENAN's diet feeders are used on farms across Europe and globally. Their diet feeders automate the mixing and delivery of feed to livestock, and, with IoT connecting the machines to the cloud, farmers can easily monitor and analyse the resulting data.

By incorporating IoT services into the equipment:

- The efficiency of animal feed **increased by 10%** reducing inpout requirements and waste
- Yields increased: dairy farms saw milk production **increase by 1.74kg per cow per day**
- **Animal health improved** reducing vet bills and enhancing welfare.

IoT-based solutions are increasing the amount of information that farmers have available to them, enabling them to optimise their operations and use of resources. This enables a fall in the use of pesticides and fertiliser, which reduces emissions, water use and resource consumption, as well as improving the protection of biodiversity and increasing yields. For instance, Vodafone IoT technology is being used to deliver real time app and SMS-based information to farmers concerning environmental factors such as insect presence, soil temperature, humidity and crop growth and local weather information. This technology delivers a 20% increase in efficiency, driving a reduction in resource use and environmental impact. Scaling this impact over very large EU farms, with an illustrative adoption rate of 50%, IoT technology could reduce pesticide use by 12,000 tonnes and fertiliser use by over 350,000 tonnes in the EU (3.5% of total pesticide and fertiliser annual consumption) and reduce annual greenhouse gas emissions by 4.5m tonnes CO_2e.

Smart Cities

Europe is highly urbanised, with the majority of citizens living in cities that are evolving in response to changing societal needs. European cities are facing challenges such as pollution, congestion and impaired mobility, personal safety concerns and economic inequality. These pressures accentuate the need for investment in economic and environmental sustainability to become future-ready and to improve citizens' quality of life.

Among the many factors driving urban change, two have become particularly relevant:

- The increasing focus on climate impact and the need to meet ambitious targets; for example, the EU's goal of 100 climate-neutral European cities by 2030 outlined in the Mission Board for climate-neutral and smart cities.
- More recently, the reshaping of work and learning as a result of COVID-19 has brought into sharp focus the need for adaptability and reliable technological solutions, and the need for governments to use data to make decisions that protect and enhance citizens' lives.

In this context, the digitisation of cities, underpinned by emerging technologies such as 5G, IoT, edge computing and the further application of Big Data solutions, will be key to the transformation of cities to meet these challenges.

As the largest economic and urban centre in Andalucía, growth in Sevilla's metro area is inevitably linked to use and pressure on public services in the city proper. The city has invested in new solutions for specific municipal services to meet needs, particularly video surveillance and lighting. However, while these solutions improve the provision of public services, they were not built as part of an integrated 'smart city' strategy and platform, instead of operating to date as discrete systems within their respective value chains.

Vodafone is working with the Sevilla municipal government to integrate the Vodafone Smart Cities Platform, creating a single platform to monitor a wide range of its services. The Platform is designed to provide transparency to public bodies, and by combining analytical capabilities with the integration of multiple data sources, it enables efficiency improvements and higher quality municipal services:

- **Energy:** Using mobility data in different areas to adapt lighting needs, optimising energy usage to demand patterns and improving efficiency
- **Mobility:** Using citizen mobility data to identify required changes to bus frequencies or stops, making the most of limited public transport resources
- **Environment:** Using water consumption data and patterns to predict breakdowns/faults, ensuring efficient and effective continuity of services
- **Security:** Using security cameras to monitor capacities in public areas, allowing cities to better manage social distancing for COVID-19

The Platform has delivered improvements to Sevilla's municipal services through solutions, such as the Security Vertical service, which monitors visitor flows and, by integrating different sources of data with analytical capabilities, allows for the prediction of critical events. The Platform is also deploying several other pilot project verticals, for example in smart management of parking, watering, waste collection, energy and air quality.

Implementing a city data platform, paired with smart energy and mobility solutions across the top 80 EU cities by population could yield:

Annual energy savings of 10.2 terawatt-hours – more than the total annual electricity used by countries such as Cyprus, Latvia and Estonia

10.2 TWh

more than the total annual electricity used by countries such as Cyprus, Latvia and Estonia

A reduced cost to cities of €876 million per year, in addition to further benefits such as maintenance cost efficiencies and time saved and productivity gains for citizens and businesses

A reduced cost to cities of

€876 million per year

Cyber Range / Training Solution

LEONARDO

Leonardo has developed a Cyber Range/Training solution that responds to the need for practices and skills to counter cyberattacks pro-actively and reactively.

To support the cybersecurity needs, both of Large Enterprises and Operators of essential services (OES) falling under the NIS Directive, the Cyber Range/Training solution can be used specifically for:

1. Exercise the ability to respond quickly to an attack in a simulated environment with the following characteristics:
   - Configurable simulations of business assets to be protected as well as the attack technique
   - Reproduction of real-world cyber-attack scenarios and execution of strategies to identify vulnerabilities in infrastructure
   - Study of defensive techniques in realistic and high-pressure situations, led by domain experts
2. Learn in a simulated mode how security solutions interact:
   - Learn how to use multiple tools to investigate a cyber-incident
   - Experiment with innovative capabilities, such as artificial intelligence and automated incident response solutions, and how to apply them to investigations
   - Use defensive techniques and tools to test them in realistic scenarios.
3. Learn to collaborate in a team game:
   - Collaborate with IT analysts, security officers and managers during an incident
   - Structure the learning sessions in defence and attack teams that face each other in gaming mode and evaluate the level of learning and the ability to collaborate
   - Be able to reproduce the attack on the infrastructure in playback mode to learn from the experience and mistakes made in the simulation sessions

Leonardo Learning Academy

Project for the reskilling and employability of resources

The defence and hi-tech sectors are particularly exposed to the introduction of new technologies, digital ones, in particular. Their impact is even more relevant in the aerospace and defence sector, with an emerging theme of resources' ageing, but with some criticalities also on new entrants in the workforce.

- The introduction of new technologies threatens a significant part of accumulated professional skills in this industry. There is consequently the need for an articulated approach to digital up-skilling and re-skilling of all resources, which must be strongly oriented towards lifelong learning and employability.
- The potential disruption introduced by new technologies is anyhow not limited to more senior workers, but may also affect some groups of younger workers, especially as regards their first jobs. In most cases, the less specialised groups would be oriented towards elementary jobs, that is, requiring a lower level of skills and therefore characterised by tasks that can be more easily automated.
- Reskilling must therefore be oriented towards the most relevant emerging needs in terms of technological contents and staffing must be built accordingly, to sustain over time.
- Regarding the first issue discussed, Leonardo has carried out a specific pilot to identify and manage professionals at risk of obsolescence. In particular, Leonardo assessed the available competencies and matched them with scientific staffing needs in various business areas, identifying and prioritising gaps to fill. It has therefore created a series of reskilling paths, based on a flipped learning approach, internally known as the Academy, by leveraging e-learning (e.g. through an agreement with one of the main MOOCs providers), face to face classes supported by external trainers, and on the job training, to guarantee to the resources involved a new professional path within the organisation and therefore their future employability.
- Building on this experience, and leveraging also Big Data and AI tools, Leonardo aims at spreading the learning experience of the Academy and at creating the conditions for effective lifelong employability for the entire company population

Catena-X

To create uniform data and information flows throughout the automotive value chain, BMW AG, Deutsche Telekom AG, Robert Bosch GmbH, SAP SE, Siemens AG and ZF Friedrichshafen AG have joined forces to the Catena-X Automotive Network. Together with other companies, they want to take part in the development of an open, scalable network for cross-company and secure information and data exchange in the automotive industry. Through standardised information and data availability, the participating companies want to increase the competitiveness of the automotive industry, improve efficiency in industry-specific collaboration and accelerate company processes across the board. A particular focus is to be placed on small and medium-sized companies, and existing structures in the European vehicle industry are to be integrated into the network. The basis for trustworthy and secure collaboration will be the European cloud data infrastructure GAIA-X.

Currently, the following use cases are being worked on jointly.

1. **Parts traceability:** Materials and components can be tracked across organisations within the supply chain from n-tier suppliers to the OEM. For example, recalls in case of anomalies can be specified.
2. **Quality management:** Improved visibility for critical parts/components. Complaints and warranty claims are based on common original analysis. Tier N suppliers are included in feedback loops for part quality issues and n-tier suppliers are included in feedback loops for quality issues.
3. **Sustainability:** Consumers request more transparency on sustainability KPIs. Raw material suppliers, manufacturers and logistics providers share their sustainability KPIs as well as certificates on parts, enabling tracking of sustainability-related data within the value chain.
4. **Demand and capacity management:** Individual OEMs share tactical and operational demand for parts/components with their respective suppliers in an industrial network following applicable antitrust rules. These suppliers and their OEMs thus jointly manage fluctuating demand and varying acceptance rates.

The open network to be established will create an ideal foundation for the industry to better meet the challenges of the transformation already in full swing. Continuously connected parts and component suppliers, assembly plants and ultimately the driver of a vehicle will, for example, make it possible to create a digital twin of a vehicle that can form the basis for innovative business processes, digital offerings and new mobility services.

Data and Digital for Safe Mobility

Around 1.3 million people die every year on the world's roads, a number that is still too high. Michelin is addressing the problem by developing data analysis to improve road safety. We created MICHELIN DDI[34] (Driving Data to Intelligence) to use our expertise in driving behaviour and vehicle usage analysis to support smarter and safer mobility. MICHELIN DDI offers three solutions:

- **Better Drivers:** Driving data is collected with the consent of the vehicle user and processed to enable an accurate and continuous analysis of the driver's driving behaviour. We can identify risky behaviour and to correct it through awareness-raising or prevention actions with drivers.
- **Better Roads:** Analysis of aggregated data makes it possible for road operators and indirectly local authorities to identify risky zones on the network, concentrating on atypical or abnormal driving behaviour. It means more efficient road maintenance at the right location.
- **Better Cars:** Usage patterns are analysed allowing the development of smart solutions for predictive maintenance while contributing to sustainable mobility.

MICHELIN DDI is fulfilling its societal commitment by leading a community of drivers in France committed to improving road safety: the **Better Driving Community.**

All these activities are built on data collection instruments (telematics boxes), big data platforms, and digital tools for users (e.g. applications). Throughout the life cycle of the data, appropriate security measures are implemented such as pseudonymisation, encryption and data storage by a trusted third party. MICHELIN DDI's activities are based on the conviction that data sharing benefits society provided that users and third parties have the freedom to choose the data they wish to share, and the service provider(s) who will exploit this data.

34 MICHELIN DDI https://ddi.michelin.com/en/

European Maritime Security

LEONARDO

EUCISE 2020 (European Test Bed for the Maritime Common Information Sharing Environment)

Europe is connected to the wider world largely by the oceans that surround it. European maritime zones bristle with activity 24/7. They are subject to a wide array of threats, including accidents, piracy, illegal fishing, crime, ecological disasters and terrorism.

These threats are not limited to coastal states, but can rapidly expand to mainland Europe. That means effective and efficient monitoring is needed to ensure the environmental health of Europe's seas and the safety and security of its citizens.

CISE (Common Information Sharing Environment) was originally conceived by the European Commission's Directorate-General for Maritime Affairs (DG Mare) to address the need to increase Maritime Security, providing an environment in which several private and public stakeholders can exchange maritime surveillance data. EUCISE 2020 is a great example of Business to Government (B2G) data sharing.

DG Mare conceived this policy as a part of the EU Maritime Security Strategy with the following goals:

- To generate a situational awareness of activities at sea, impacting on the denominated seven maritime sectors to facilitate sound decision-making.
- To enhance the present sectoral maritime awareness pictures of the sectoral user communities, with additional relevant cross-sectoral and cross-border surveillance data on a responsibility to share basis.
- To increase Member States authorities' efficiency and improve cost-effectiveness.
- To increase the interoperability among the Member States joining the CISE Network, through the use of a common data language (CISE Data Model).

The EUCISE 2020 project was carried out by a Temporary Grouping of industrial companies formed by:

- Leonardo Spa (Group Leader)
- Engineering Ingegneria Informatica S.p.A
- G.M.V AEROSPACE AND DEFENCE, S.A.U
- Inovaworks II Command

Institutions were represented by 37 Partners from 15 EU Member States. Among them, Agenzia Spaziale Italiana (Italian Space Agency) acted as the Technical Coordinator for the Project. The Contracting Authority was the Marina Militare Italiana (Italian Navy).

Greening the Grid through AI

We are facing a new society with more demanding consumers who expect an advanced energy sector based on new customised products and services. Digitalisation along with decarbonisation and electrification are the three key trends driving the transformation of the energy system and catalysing the transition to a sustainable energy model.

Technologies such as AI, IoT, cloud, and Blockchain are being adopted by the energy system and can enable to overcome the challenges of integrating renewable energy sources and the development of smart grids.

However, there are still some very important issues regarding the implementation of these technologies that must be addressed before they can be adopted massively within this industry.

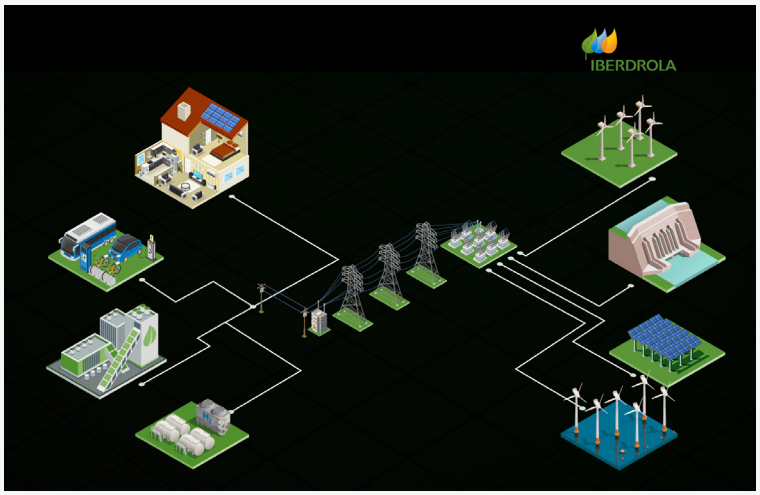
Smart grids have a critical role in the transformation of existing electricity systems, facilitating the fulfilment of the low carbon economy targets and ensuring a high level of security, quality and economic efficiency of electricity supply. Modernising electricity network includes the ability to reduce power consumption at the consumer end during peak hours, enabling grid connection of distributed generation and providing an opportunity to integrate renewable.

Iberdrola began the deployment of smart grids in 2010. Today, Iberdrola has 13 million smart meters in Spain, the US, the U.K. and Brazil. Applying AI, Iberdrola can better forecast and predict when a device is going to fail or the potential damage in the infrastructure after an extreme climate event, allowing Iberdrola to take decisions to increase the reliability of the grid.

Regarding renewables: at the end of 2019, 100% of the assets were covered by predictive maintenance trough AI, which reduces maintenance costs and increases production.

Among the initiatives developed, Iberdrola created four control centres for renewables located in Spain, the UK, the US and Brazil, using IoT technology to monitor and operate 11,000 wind turbines and 16GW real-time.

Iberdrola facilities, smart meters and operations generate a huge amount of useful data. This data together with analytics can lead to better forecast and predictions so Iberdrola can operate accordingly obtaining better prices for its customers and using renewable energy more efficiently. Using AI and machine learning, Iberdrola can get insights to help its customers to make more efficient use of energy.



The Aletheia Framework™ – helping build trust in artificial intelligence

Rolls-Royce has released its breakthrough work on artificial intelligence (AI) ethics and trustworthiness – The Aletheia Framework™ – to help support the future health, wealth and growth of the world. *(Rolls-Royce have called this toolkit after the Greek goddess of trust and disclosure, and believe it will help address one of the biggest barriers to the widespread use of AI – mistrust).*

The comprehensive ethical framework and trustworthiness process is free of access. Once fully implemented, businesses that follow the checks and balances within it can assure themselves that their AI projects are fair, trustworthy and ethical. The Aletheia Framework™ provides the foundations for that to happen, so business leaders, academics, technologists and even philosophers can now move from simply talking about the potential of AI, to unlocking its benefits for the health, wealth and growth of the world. It's with that objective in mind that Rolls-Royce has decided we need to make this free for anyone to access and we will seek to build partnerships with interested organisations to support its widespread application, so that we can all build trust in AI.

The Aletheia Framework™ is a checklist that invites public and private organisations to consider the impacts of using artificial intelligence prior to deciding whether to proceed. It looks across a total of 32 facets of societal impact, governance and trust, and transparency and requires executives and boards to provide evidence that these have been rigorously considered. Once the AI has been applied, the framework includes a five-step continuous automated checking process, which, if comprehensively applied, tracks the decisions the AI is making to detect bias or malfunction and allow human intervention to control and correct it.

Rolls-Royce is a global industrial technology leader and has used artificial intelligence for decades to analyse more than 70 trillion data points across 26 dimensions on jet engines to increase the amount of time they fly and improve their sustainability. We're now developing AI for quality inspections of critical components and it's in the justification of applying artificial intelligence technologies to this activity that we have had to challenge ourselves to ensure it's the right thing to do, and that it's trustworthy. It's that deep safety culture at the heart of our business that has created the mindset to apply safety principles to data. During the peer review process of our work with experts in big tech, healthcare, pharmaceuticals, academia and government, it became clear that no other organisation had progressed as far as we had. It was also clear that the applications for what is now The Aletheia Framework™ went beyond our own area of industrial use and into consumer applications, healthcare, recruitment, security – basically any use of artificial intelligence.

The open-access publication of The Aletheia Framework™ is also intended to invite critique and collaboration from the global AI community to seek improvements. The decision to publish it follows a recent breakthrough in speech software for people living with motor-neurone disease (MND), motivated by a Rolls-Royce colleague who had personal experience with the disease.

The software improves the quality of life of people living with MND who cannot speak, by using AI to learn their voice, idioms, emotional inflections and phrases, so they can interact quickly with those around them. The experience of developing this software was among the AI activities that fed into the development of The Aletheia Framework™.

See also: https://www.rolls-royce.com/sustainability/ethics-and-compliance/the-aletheia-framework.aspx

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USE CASES

5G

Accelerating the availability and uptake of 5G infrastructure for Smart Production is the single most efficient measure from a cost-benefit perspective according to recent studies (conducted by Analysis Mason) with investment costs of €12 billion able to generate €70 billion to the European GDP.

Features of this particular use-case include:

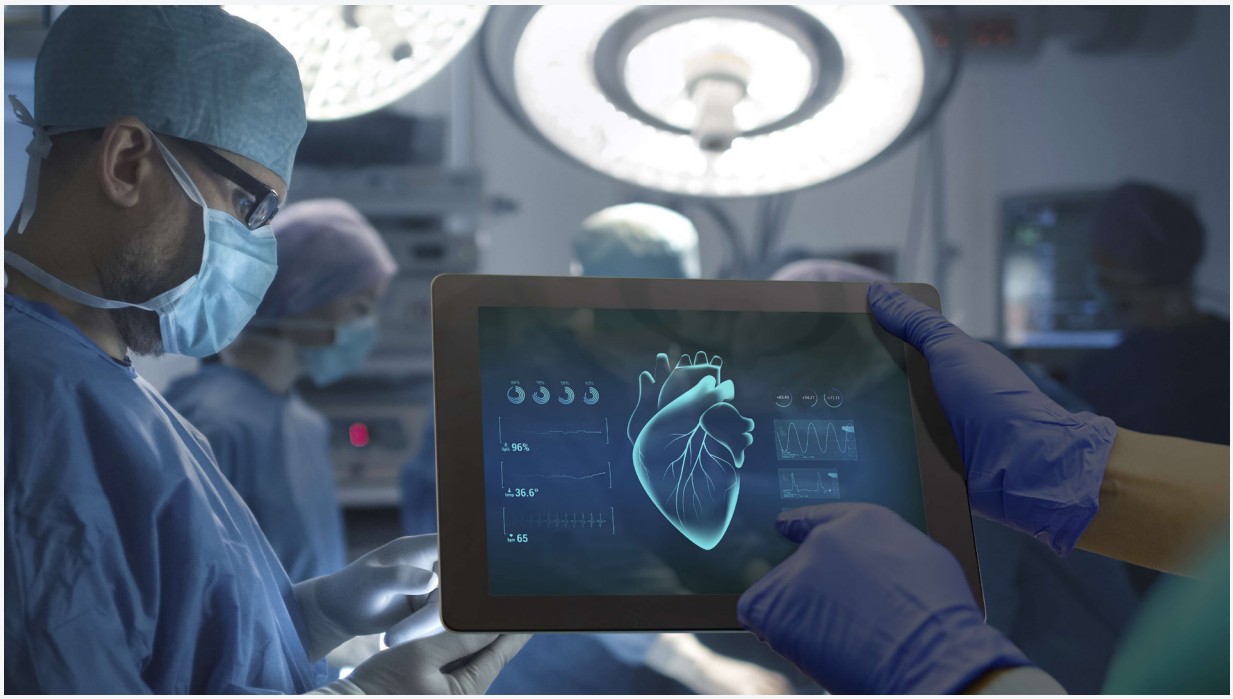
- Machinery monitoring for predictive maintenance and remote-control-reduced downtime
- Real-time supply chain visibility
- X-reality guided procedures and repairs
- Ultra-high-definition (UHD) surveillance, etc.

High-speed 5G connectivity is particularly suitable in smart factories as capacity considerations include: low latency and high reliability for remote control of processes, high-volume video traffic for surveillance and monitoring as well as IoT-type tracking of objects and status of machinery. Also, there are social benefits like increased security/safety, a technologically skilled workforce etc. that need to be taken into account. From an environmental perspective, real-time monitoring of processes can help to significantly reduce energy and materials consumption and diminish equipment replacement.

Also in **education,** 5G roll-out will be of immense importance going forward. All students need to have access to a connected education – encompassing top-class connectivity, cloud productivity tools, the latest devices in the classroom, and excellent online content. Mobile connectivity, including 5G private networks or in-building solutions in all schools, will open up a range of learning opportunities for students, and ensure all children receive the same quality of education. Universities are already at the centre of our technological development. The government should build on this by encouraging higher education institutions to invest in private networks, making them 5G hubs. This would enable them to trial new IoT technology and to use research and innovation to bring smart technology to local public services and civic infrastructure.

As pointed out by President von der Leyen in her State of the Union speech, **40% of people in rural areas still do not have access to fast broadband connections.** A combination of fibre to the premise deployments and Fixed Wireless Access (FWA) based on 5G connectivity, will help Europe to bridge this gap, delivering benefits to people and businesses, helping to sustain rural living and support working remotely. Features of this use case include high-speed broadband connectivity for consumers and business in areas not reached by fibre networks. FWA could also support the implementation of other 5G use cases, such as remote monitoring/remote healthcare.

There are also significant social benefits to be reaped from FTTH, 5G and FWA which include governments' ability to **increase social inclusion and reduce the digital divide.** It could also help slow or reverse declining populations living in rural areas /contribute to maintaining rural communities as well as enable local businesses to access wider markets for their products via e-commerce, supporting rural sustainability. From an environmental point of view, having the possibility to work from home to a larger extent means reduced journeys (e.g. from being able to work remotely). On the economic side, by



connecting much of today's unconnected rural areas, the economic output to European GDP could be as high as €28 billion, with an investment cost of around €10 billion. Here MNO business cases might be challenging thus public subsidies probably will be needed to make mobile networks suitable for 5G rural coverage.

In the domain of Health and Social Care, 5G represents a unique opportunity. According to a study by Arthur D. Little and Ericsson[35], the revenue from digitising the healthcare sector enabled by 5G is estimated to be US$160 billion for all involved ICT players by 2026.

New technology has, and will continue to, revolutionise working methods and transform healthcare and patient care, whilst saving healthcare services billions annually, for example through reduced admin, waiting times and personnel time. Governments should invest in bringing the best connectivity to every hospital, either via 5G private networks or in-building solutions. This would ensure guaranteed capacity and other essential features to open up the ability to undertake remote surgery, as well as the internal transfer of large, confidential files (e.g. MRI scans), and to equip medical instruments, patient beds and other essential items with connectivity for optimised overall management of key resources. Also, investment should be made into 5G healthcare applications, such as video consultations and digitised prescribing.

35 https://www.economiadehoy.es/adjuntos/19430/Ericsson-5G-business-potential-report.pdf

5G-Connected Mobility

ERICSSON

Today, road vehicles hardly use communication while aircraft and trains have their own dedicated air/rail traffic control networks. 5G will break such silos and establish a single technology to serve different domains. Network slicing is intended to separate a physical network into multiple virtual ones. Each transportation mode can get its own mode. Within one transport system also different priorities can be set including a Mobile Broadband slice for passenger infotainment and a mission critical one for rail traffic management. Trials conducted within the 5G-ConnectedMobility test site at Germany Motorway A9 showed how road vehicles, high speed trains and Unmanned Aerial Vehicles (UAVs) each get one or more Network Slices and resources are dynamically shifted from less to more crucial services in times of high network load.

Ericsson provided and operated the network enabling automotive, railway and UAV partners to conduct corresponding trials. By the end of 2020, after 4 years of operation, the trial network was completed successfully, as by then, commercial rollout of 5G network started.

USE CASE

5G for factories

Thanks to its low latency, very high throughput and – over time – network slicing, 5G will be a competitive lever for companies, as it will bring a noticeable improvement in industrial processes and working methods, especially through mixed reality (augmented and virtual). In the industrial sector, 5G will help synchronise in real-time large amounts of data, which are key to boost performance, facilitate remote working, and ensure optimal production efficiencies.

Schneider Electric and Orange announced in September 2020 the first deployment of indoor 5G in the industrial sector in France on experimental frequencies as part of a trial. Five indoor 5G antennas were installed inside a part of the factory, covering close to 2,000 m^2 of production space with download speeds beyond 1 Gbps, on an experimental network architecture allowing local data processing with edge computing technologies.

In the first use case tested, the teams connected tablets to 5G using the Schneider Electric augmented reality application called EcoStruxure Augmented Operator Advisor (AOA). This custom application improves operational efficiency with augmented reality, enabling operators to superimpose real-time data and virtual objects onto a cabinet, machine or entire plant. The objective with 5G is to test future functionality with minimum latency and maximum throughput.

Operators using the AOA application via their 5G-connected tablet film a machine and access information about its status and future maintenance that are hosted in the cloud in real-time. This helps reduce machine downtime and streamline maintenance operations while minimising human error. For example, temperature data from a coil winding machine can signal when it is overheating, and a part needs to be replaced.

The second use case tested concerns driving an AXYN mobile telepresence robot using 5G to eventually arrange remote visits to the site. A remote visit with high-quality video and audio will help minimise travel time and costs and, most importantly, reduce the carbon footprint while providing the end-user with a unique experience.

See also https://www.orange-business.com/en/press/orange-and-schneider-electric-run-industrial-5g-trials-french-factory.

USE CASE

5G in healthcare

PHILIPS

5G will help Philips to address the quadruple aim in healthcare, enabling use cases such as:

- Dealing with trauma or stroke. The right emergency care can be provided once the person is identified and located. The ambulance, rushing a stroke patient to the hospital, could stream vital signs data, as well as transmit images from a portable CT scanner, which could be used to locate the clot, so that at the hospital the patient could be operated on immediately. The risk of death and serious complications rise exponentially with the progression of time, so every second counts.
- Not only would 5G allow more effective handling of vast amounts of medical data, but it would also enable enhanced use of mobile, edge and cloud-based diagnostic tools, such as sharing of high volumes of data from imaging devices, as well as improved bio-connectivity, the continuous, automatic monitoring of vital-signs via wearables, such as patches.
- 5G will make it possible to create new applications in advanced remote care and home-monitoring. The reduction in latency could even enable remotely-assisted diagnosis and intervention, using a 5G telepresence network. Surgeons could examine a patient in real-time and even perform an operation remotely via robotics.
- Though the first wave of these advancements will most likely make their presence felt in Europe and the West, a global rollout of 5G would also advance new levels of access to healthcare in emerging geographies. One example is in Indonesia, where our mobile solutions are already used to improve the detection of high-risk pregnancies, allowing obstetricians and gynaecologists to remotely monitor patients from hospitals or home. These solutions already show their enormous potential today and could be further complemented with new 5G-enabled digital and mobile diagnostic tools and tests.

5G Shipyard

Telefónica

5G will help the shipbuilding industry increase efficiencies in production, reduce maintenance and downtime, increase safety and digitise different industrial processes.

The key points of this project are: 5G coverage in an industrial environment (3.5 GHz and 26 GHz bands), Augmented Reality and Virtual Reality tools applied to remote consultant processes and ship construction process and use of computing environments at the edge to achieve high computing capacity with very low latency.

Telefónica is focused on testing three use cases:

- **Augmented reality for remote support:**
  The machinery and devices used in an assembly line and the industrial processes are becoming increasingly more complex, which entails the need for highly specialised support that very few professionals are capable of providing. The direct consequence is that every time an important component breaks down, it is necessary to wait for a specialist from the supplier company to come in person, which can take days, with the consequent loss of productivity in the assembly line. To avoid this situation, this use case will enable, through 5G supported augmented reality techniques, a non-specialised local operator to perform regular repair or maintenance tasks on certain parts, with the assistance of a remote specialist. In this way, the downtime of the industrial chain will be significantly reduced.
- **Precise visualisation of virtual parts in real environment:**
  Going further in augmented reality scenarios, Telefónica will seek a solution to those situations where it is necessary to verify, within a real scenario, how a designed piece will look like before proceeding to its manufacture. One example is verifying that a pipe will fit perfectly in an already built cabin of a ship, before proceeding to its manufacture. This use case requires the placement, in an augmented reality image, of a piece with millimetre accuracy, something not done so far, and the direct consequence will be the early detection of inconsistency in the design, with the enormous saving of time and resources that this entails.
- **3D Scan Streaming:**
  The construction of ships is approached in a modular way, in elements called ‘blocks’. A critical aspect is the verification that each one of the blocks will fit perfectly with the others. Today, this task is carried out with 3D laser scan tools that generate huge amounts of information that must be analysed locally by high-capacity computers. In this use case, Telefónica is exploring the possibility of taking advantage of the great bandwidth of 5G to send this information in streaming to computers placed at the edge of the mobile network, so that this ‘3D reality survey’ can be carried out without the need of having high-capacity computers at the construction site or of dispatching highly specialised personnel to each site. In this ideal scenario, a single person could verify the correct condition of block fabrication in multiple locations without the need to travel.

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