

Digital transformation

SUMMARY

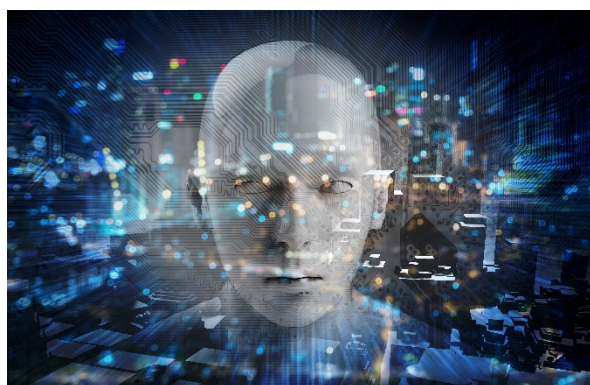
A digital revolution is transforming the world as we know it at unprecedented speed. Digital technologies have changed the way businesses operate, how people connect and exchange information, and how they interact with the public and private sectors. European businesses and citizens alike need an adequate policy framework and appropriate skills and infrastructures to capture the enormous value created by the digital economy and make a success of digital transformation.

The European Union plays an active role in shaping the digital economy, with cross-policy initiatives that range from boosting investment to reforming EU laws, to non-legislative actions to improve Member States' coordination and exchange of best practices. The 2014-2019 parliamentary term has seen a number of initiatives in the areas of digitalisation of industry and public services, investment in digital infrastructure and services, research programmes, cybersecurity, e-commerce, copyright and data protection legislation.

There is a growing awareness among EU citizens that digital technologies play an important role in their everyday lives. In a 2017 survey, two-thirds of Europeans said that these technologies have a positive impact on society, the economy and their own lives. However, they also bring new challenges. A majority of respondents felt that the EU, Member States' authorities and companies need to take action to address the impacts of these technologies.

The European Union will increase its support for digital transformation in the coming years, as illustrated by the recent proposal for the Digital Europe programme (for 2021-2027) – which would be the first ever funding programme dedicated solely to supporting digital transformation in the EU. Further EU action will doubtless be needed, notably to increase infrastructure investment, boost innovation, foster digital champions and businesses digitalisation, reduce existing digital divides, remove remaining barriers in the digital single market and ensure an adequate legal and regulatory framework in the areas of advanced computing and data, artificial intelligence, and cybersecurity.

The European Parliament, as co-legislator, is closely involved in shaping the policy framework that will help citizens and businesses fully exploit the potential of digital technologies.



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State of play

The internet and digital technologies are transforming our world. For decades, Europe's societies and economies have been experiencing a radical digital transformation, fostered by 'digitalisation' and the speeding up of many kinds of interaction through the increasing number of [connected devices](#) and data flows.¹ Digital transformation covers both the integration of digital technologies by European enterprises and the impact on society of new technologies, such as the Internet of Things (IoT), cloud computing, innovative digital platforms and blockchain technologies. It is becoming an increasingly important condition for modern economies to thrive and has the potential to affect many sectors of the economy (including transport, energy, agri-food, telecommunications, financial services, factory production and health care) and to transform people's lives. According to the [OECD](#), the greater computing power of consumer devices, which are available at ever more affordable prices, is accelerating this transformation. Furthermore, [artificial intelligence](#) (AI) and advanced robotics are viewed as an important manifestation of the digital transformation, with a profound impact throughout society – including on productivity, employment, business models and public services – which requires coherent public policies.

Digital technologies have the potential to improve our living standards, life expectancy and quality of life. It is widely agreed that such technologies contribute positively to productivity and economic growth. The [World Economic Forum](#) estimates that the combined global value of digital transformation to society and industry will exceed US\$100 trillion by 2025. For instance, the market for robots and artificial intelligence solutions is expected to grow by up to €142 billion by 2020. The combined economic impact of the automation of knowledge, work, robots and autonomous vehicles is estimated to reach between €6.5 trillion and €12 trillion annually by 2025, including gains in productivity and benefits in areas such as healthcare and security. Nevertheless, such changes, and their speed, can disrupt existing industries, with new business models, and also governments, which are obliged to review existing frameworks to embrace digital transformation.

Against this background, the European Union (EU) has been making efforts to help enterprises and citizens embrace these changes, and benefit from the creation and deepening of the digital single market (DSM), which dates back to the [mid-1990s](#), when the liberalisation of the telecoms market started in Europe.

In recent years, EU policy-makers have strongly expressed their support for the achievement of the DSM. The European Parliamentary Research Service has [identified](#) that an efficiently functioning DSM could contribute €415 billion per year to our economy and create hundreds of thousands of new jobs. In its [mid-term review](#) of the DSM (in 2017), the European Commission called for new action at EU level. Fresh initiatives have already been launched, including the Commission's proposal for [three new connectivity targets](#) and policy measures to accelerate the roll-out of the next generation of broadband infrastructure (5G). According to the Commission, the benefits of the industrial internet are expected to boom, with the implementation of 5G enabling an array of new innovative services that will transform sectors such as manufacturing, energy, vehicle manufacturing and health.

A number of challenges arise from digital transformation, including the following:

- **Digitalisation of industry is lagging behind:** According to the OECD, use of information and communications technology (ICT) by businesses has grown slowly in the EU, and the use of advanced e-business applications is particularly low. Traditional sectors (like construction, agro-food, textiles or steel) and small and medium-sized enterprises (SMEs) are particularly lagging behind in their digital transformation.²
- **Incomplete DSM:** Despite efforts and good progress, the single market [is not yet a reality](#). Many barriers still exist to services such as [e-commerce](#), preventing full access to the goods and services being offered by businesses in the EU.

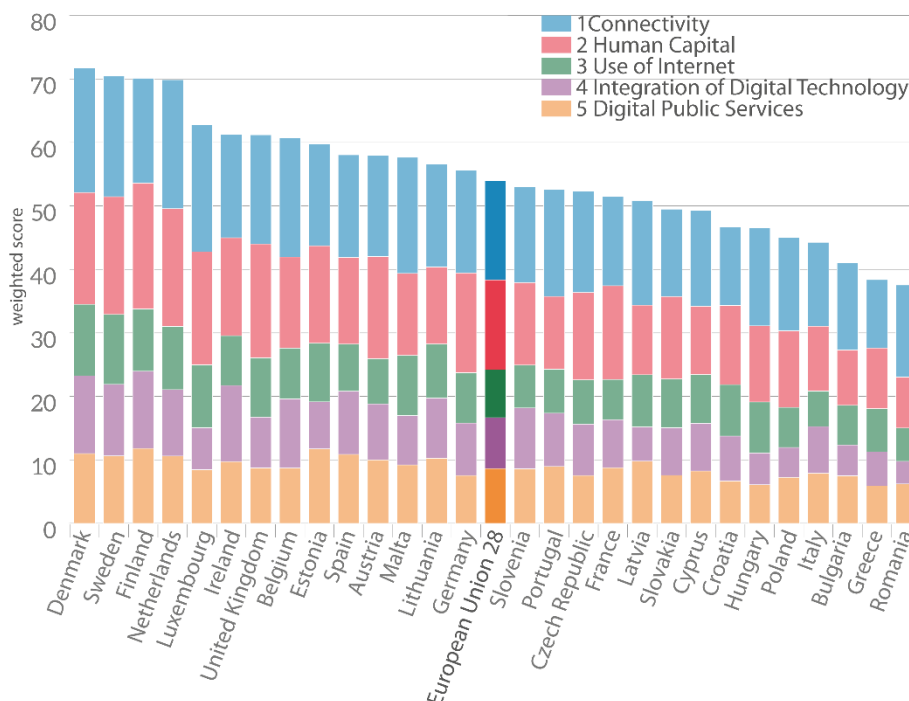
- **Digital divide:** There is some concern that not all consumers and businesses in Europe will benefit from digital transformation, given the current and future digital divide between urban and rural areas and across EU countries. The digital divide has been substantially reduced over the past decade in Europe, but the gap remains far from closed.³ For instance, the price and quality of telecoms services for consumers varies considerably.
- **Lack of a digitally competent workforce:** Already 90 % of all jobs require at least a minimum level of digital skills, and demand is growing for digital specialists. However, according to the [Commission](#), 44 % of the EU population and 37 % of the labour force have insufficient levels of such skills. In addition, nearly half of EU businesses are still not implementing strategies to re-skill their workforce.
- **Low number of digital champions:** Of the world's top 200 digital firms, only 8 are European.⁴ The top 15 are from either the United States or China. Similarly, the top super-computers with high-performance computing capabilities are not based in the EU. According to a 2018 [study](#) by PwC, Asia is in the lead as the digital champion.
- **Lack of cybersecurity readiness:** Digital transformation demands robust, secure and resilient digital network infrastructure. With cybersecurity incidents on the rise worldwide, critical infrastructure and democratic processes are under threat. Currently, Europe is not adequately prepared to address cybersecurity threats. Industry and the public sector struggle to secure the equipment and tools needed (such as quantum technologies) due to the fragmentation of resources and know-how across the EU.⁵
- **Building trust in digital transformation:** New challenges are also emerging in terms of the safety of connected systems, products and services, as well as for businesses' liability. Industrial supply chains are becoming increasingly complex, and involve a growing number of players from different sectors. Faulty sensors, vulnerable software or unstable connectivity may make it difficult to determine who is technically and legally responsible for damages.
- **Lack of investment:** Current estimates suggest a shortfall of €155 billion, compared to the total €500 billion investment needed to meet the Commission's 2025 internet connectivity objectives for ensuring that Europe takes a leading global role in the deployment of 5G services. Furthermore, the lack of advanced computing systems impedes Europe's success in the data economy. Also, as underlined by the Commission's [communication on artificial intelligence for Europe](#), there is currently a gap in investment in AI between the EU and competing economies of more than €10 billion per year.

However, fostering digital transformation in the EU is considered to bring a number of opportunities and benefits, including the following:

- **Increased productivity and jobs:** Investments in ICT account for 50 % of European productivity growth. Supporting high-growth start-ups and firms scaling up brings innovation and employment benefits, as these companies typically create new jobs. Likewise, in recent years, new markets, such as the [app economy](#), have brought with them new work opportunities. Many more jobs could be created: there are currently more than [350 000 vacancies](#) in Europe for highly skilled technical experts in areas such as artificial intelligence, data analytics and cybersecurity.
- **Increased efficiencies:** According to the Commission, digital transformation helps traditional industries to produce new goods in a more resource-efficient way, and allows public authorities to deliver better, faster and cheaper services. The use of artificial intelligence in different technological solutions and sectors can lead, for example, to fewer fatalities on roads, smarter use of resources such as energy and water, less pesticide use on farms, and a more competitive manufacturing sector.⁶ [Blockchain](#) is also one of the emerging technologies which could have a huge potential impact in many sectors.

➤ **Empowerment:** Digital technologies are empowering us with increasing amounts of data and information that are transforming the way we shop, travel, work, learn, communicate and deal with anyone. In a 2017 special [Eurobarometer](#) survey, two-thirds of Europeans said that digital technologies have a positive impact on society, the economy and their own lives.

Figure 1 – Digital economy and society index (DESI) 2018



Source: European Commission, [Digital economy and society index](#), 2018.

EU Framework

Legal framework

The EU may take action related to digital transformation under a range of sectoral and horizontal policies and on the basis of a number of provisions of the Treaty on the Functioning of the European Union (TFEU).⁷ The Treaty provisions generally used as a basis for harmonising the digital single market are Articles 4(2)(a), 26, 27, 114 and 115 TFEU. Furthermore, Article 173 TFEU with its focus on improving the EU's industrial competitiveness can be used to advance digital transformation. Based on this provision, the Union and the Member States must take action to help industry adjust to structural changes, encourage an environment favourable to initiative and to the development of businesses (particularly SMEs) throughout the Union, favour cooperation between undertakings and foster better exploitation of the industrial potential of policies of innovation, research and technological development. In addition, Articles 179 and 180 TFEU, which are the legal bases for EU and Member State action in the fields of research and technological development, can be used.⁸

The EU is competent to act in various areas of digital policies, although its action is limited by the principle of subsidiarity in sectors such as education and health, and by the requirement for unanimity in the Council on certain topics (such as tax and security policy). Harmonising legislation has been adopted in some areas, including the EU telecoms framework, e-commerce and consumer protection-related legislation. In addition, there are many non-legislative initiatives in areas such as e-skills and e-government, where the competence remains at national level but the Member States coordinate their action in liaison with the Commission.

Policy developments and challenges

In 2000, at the time of the [Lisbon Agenda](#), the European Council set the goal of making the EU the most competitive and dynamic knowledge-based economy in the world by 2010. Thus, the Commission put forward three consecutive strategies ([eEurope 2002 plans](#), [eEurope 2005](#) and the [i2010 strategy](#)) to improve the deployment of internet infrastructure and services, such as e-government and e-business, and to increase innovation and research spending in ICT. Digital policies were identified as a key part of the flagship initiatives of the [Europe 2020](#) strategy, and the [digital agenda for Europe](#) was established in 2010 to boost the EU's digitalisation.

Today, under the Juncker Commission, digital policies have been placed even higher on the agenda, coming under the second of the [ten priorities](#) of the Juncker plan – implementation of the DSM. To that end, the Commission proposed the [DSM strategy](#) in May 2015, with 16 key measures for action.

Its May 2017 [mid-term review](#) showed that good progress had been made since the approval of the strategy, with many proposals already adopted (see next section). However, more work was identified in areas such as the data economy, online platforms, product liability and cybersecurity.

At the international level, the EU has entered into dialogue with partners worldwide to maintain support in areas such as internet governance, intellectual property rights and common standards for future technologies, such as 5G, and to seek agreements on convergence towards harmonisation of spectrum management. The EU is also increasingly seeking to achieve global improvements in cybersecurity resilience and deterrence.

Financial framework

At present, there is no single programme dedicated to digital transformation. Under the current multiannual financial framework (MFF) for the 2014-2020 period, several EU programmes contribute to investment in digital infrastructures and services throughout the different stages of technological development.⁹ The digital component in the current MFF amounts to €37.4 billion of the total MFF commitment of €1 082 billion (that is, only 3.9 % of the total). In order to maximise the impact of those investments, the EU leverages additional public and private funding through public-private partnerships (PPP), thematic and/or regional platforms and hubs, and through different intermediaries such as banks.

- Under the [European structural and investment funds \(ESIF\)](#), roughly €21.4 billion has been allocated to finance the digital sector for the 2014-2020 period, of which more than €6 billion is for high-speed broadband roll-out in both urban and rural areas. For instance, the European Regional Development Fund (ERDF) will help more than 14.5 million households across the EU to enjoy high-speed broadband access of at least 30 Mbps by 2020. In addition, the European Agriculture Fund for Rural Development (EAFRD) aims to provide broadband to 18 million people in rural areas by 2020.
- As of September 2018, investments in the digital sector related to the [European Fund for Strategic Investments \(EFSI\)](#) account for around €37.8 billion (11 % of the overall amount of investment mobilised at that date).
- Under the [Connecting Europe Facility](#) (CEF), designed to promote and part-finance the construction of cross-border transport, energy and telecommunications infrastructure between the EU's Member States, the budget for ICT infrastructure amounts to roughly €1 billion over the 2014-2020 MFF.
- Under [Horizon 2020](#), the EU research programme, a targeted €5.5 billion of EU research and innovation investment is planned for key digital technologies over the 2016-2020 period. For instance, an investment of close to €3.2 billion is allocated to nano-electronics, photonics, robotics, 5G, high-performance computing, big data, cloud computing, and artificial intelligence. As an example, the [5G-PPP](#) is a major initiative with €700 million in EU funding, to be topped up with private financing to reach a total budget of €3.5 billion by 2025. Furthermore, [the quantum technologies flagship](#)

large-scale research initiative, which aims at fostering the development of a competitive quantum industry in Europe, has been allocated a budget of €132 million for the period 2018-2021 and a total budget of roughly €1 billion.

- Likewise, to help European businesses reap the full benefits of digital transformation, in April 2016 the Commission adopted a comprehensive strategy on [digitising European industry](#). This included measures to encourage cooperation between national initiatives on digitalising industry, supported by up to €50 billion¹⁰ in funding.

Deliveries of the current parliamentary term

Since mid-2015, when the DSM strategy was first proposed, a number of results have been achieved in a range of digital policies, concerning industry as well as citizens, notably in the following areas:

- **Digitalising European industry:** following its [communication on 'digitising European industry'](#), adopted in April 2016, the Commission has been seeking to implement a set of [measures](#) to coordinate European, regional and national initiatives for the digitalisation of industry. These include [public-private partnerships](#) pooling resources for developments in digital technologies and digital industrial platforms (e.g. European [high-performance computing \(HPC\) joint undertakings](#) and a [pan-European network of digital innovation hubs \(DIHs\)](#)), as well as sharing of best practices.
- **Digitalisation of the public sector:** on the basis of the eGovernment action plan for 2016-2020, several initiatives have been adopted or are on-going to modernise digital public services. The [eIDAS Regulation](#), on cross-border recognition of electronic identification means, entered into force in September 2018. Furthermore, the [Single Digital Gateway Regulation](#), applicable since October 2018, offers to businesses and citizens a single online point of access to gather information about national laws, administrative requirements and procedures such as company registration.
- **European electronic communications code review:** the [new package](#) of measures adopted by the co-legislators in 2018 will give citizens more rights, such as the right to switch telecoms providers in a simpler way and the right to receive public alerts on mobile phones in case of an emergency. The new rules will also guarantee better and more affordable connectivity across the EU. It is expected to bring higher levels of investment in network infrastructure and increased policy coordination across Member States, for instance through increasing spectrum harmonisation for 5G and co-investment in deployments. It will also cap the cost of international phone calls.
- **New broadband funds:** the [Connecting Europe Broadband Fund](#) will help private investors join up efforts to support digital network infrastructure in under-served areas, and trigger up to €1.7 billion in additional investment up to 2021. In addition, the implementation of the new [WiFi4EU initiative](#) will support internet connectivity free to users in local communities. This would enable up to 8 000 local communities to benefit from total funding of €120 million up to 2020.
- **End of roaming charges:** since [June 2017](#), thanks largely to pressure from the European Parliament, citizens can now use their mobile phones while travelling in the EU just like they would at home, without paying extra charges. Since then, people have been using their phones abroad more – with more than five times the amount of data consumed and almost two and a half times more phone calls made in the EU.
- **Open internet:** with the [net neutrality rules](#) in force since the spring of 2016, every European has access to open internet, guaranteeing their freedom without discrimination when choosing content and services of their choice.
- **Cybersecurity:** the Directive on high common level of network and information security ([NIS Directive](#)) adopted by the co-legislators in 2016 (with a transposition deadline of May 2018) improves Member States' cybersecurity capabilities and cooperation and imposes measures on companies to prevent security incidents and cyber-attacks. Furthermore, in September 2017, the Commission adopted a

[cybersecurity package](#) with new initiatives to further improve EU cyber-resilience, deterrence and defence. In particular, a [legislative proposal](#) to strengthen the European Union Agency for Network Information Security (ENISA) and to create a voluntary EU cybersecurity certification framework for ICT products has been [agreed](#) by the co-legislators.

- **Free flow of non-personal data:** thanks to a [new EU law](#) adopted in November 2018, everyone will have access to better and more competitive data storage and processing services in the EU, thus complementing the free movement of people, goods, services and capital.
- **Cross-border online content:** since April 2018, new EU rules on [cross-border online content](#) have allowed citizens travelling across the EU to access online content services they have subscribed to in their home country, including films, TV series and sports broadcasts.
- **Protection of personal data online:** under the [new data protection rules](#), which have been in place across the EU since 25 May 2018, Europeans can safely transfer personal data between online service providers and have the right to know how their personal data are being collected. Furthermore, with the 'right to be forgotten', personal data must be deleted on request, if there is no legitimate reason for a company to keep it.
- **End to geo-blocking:** since 3 December 2018, Europeans have been able to shop online without worrying about [geo-blocking](#), as website can no longer block or re-route them just because they are in another EU country. However, the ban does not apply initially to content and services protected under copyright (for instance, e-books and downloads of music and audiovisual content). At the insistence of the Parliament, a review clause was introduced in the legislation, requiring the Commission to re-examine the situation after two years.

Several other pieces of legislation, on the [re-use of public sector information](#), [e-privacy](#) and the [modernisation of the EU copyright rules](#), are still being discussed by the co-legislators.

Potential for the future

Fostering digital transformation is higher than ever on the EU's political agenda, and has been identified as a **priority for unlocking future growth** in Europe. The European Commission's white paper on the [future of Europe](#) underlines the challenges posed by the increased use of technology and automation that will affect all jobs and industries. In one of the scenarios discussed, it calls for the launch of new EU-wide projects to support digitalisation. In its reflection paper on [globalisation](#), the Commission also underlined that, while still in the early phases of transformation, the challenge for Europe will be to innovate in strategic technologies and help workers to gain the right skills to avoid widening the gap in the labour market. The Commission is also currently assessing the impact of digital transformation in various areas, including [EU labour markets](#), [artificial intelligence and robotics](#), and [standardisation](#), with a view to developing appropriate responses.

The European Parliament, for its part, has been calling for strong EU action to foster digital transformation of the economy and society. In its resolution of March 2018 on [guidelines for the 2019 budget](#), the Parliament stressed the potential for economic growth stemming from technological transformation and called for the EU budget to have an appropriate role in supporting the **digitalisation of European industry** and the **promotion of digital skills and entrepreneurship**. The Parliament has also [called](#) for the promotion of and support to women entrepreneurs in the framework of the digital transformation of industry in particular. Already in January 2017, leading the debate at EU level, the Parliament had [called](#) on the European Commission to **assess the impact of artificial intelligence**, and made wide-ranging recommendations for setting a legal and ethical EU framework for robotics and AI. The Parliament is currently working on adopting a position on how to foster a [comprehensive European industrial policy on artificial intelligence and robotics](#).

The focus is increasingly on actions where the EU can bring specific added value, concentrating on **European digital projects** whose scope and scale cannot be realised by individual countries alone. That is the case, for instance, in the areas identified under the future [Digital Europe](#) programme – the first ever EU programme solely dedicated to digital transformation, which is part of the 2021-2027 MFF proposals currently under consideration. This funding programme has a proposed overall budget of €9.2 billion aimed at boosting investments (mainly in the five broad areas of supercomputing, artificial intelligence, cybersecurity, digital public services and advanced digital skills)¹¹ and at ensuring the wide use of digital technologies across economy and society. The expectation is that such extensive funding at EU level will reach the critical mass needed to attract large private investments.

The Commission expects that the Digital Europe programme will complement and create synergies with other related MFF proposals, in particular the [Connecting Europe Facility \(CEF\)](#) and the Horizon Europe programmes. An estimated €3 billion of the CEF will be dedicated to digital infrastructure deployment, while [Horizon Europe](#) will fund research and development activities. Furthermore, additional funding for cybersecurity is planned within the [European Defence Fund](#).

Similarly, the [Regional Development and Cohesion Funds](#) will continue their support for the digital transformation of the economy at regional level, and create regional networks and systems to promote sustainable transport, smart energy grids, smart cities and high-speed digital access. In addition, investments in digital matters will be possible under the four strands of the future [InvestEU Fund](#), particularly in digital infrastructure, digital transformation of small businesses, research on digital technologies and helping the social economy to benefit from digital transformation.

As far as the **policy outlook** is concerned, under the current Treaties, the Commission plans to use a mix of policy instruments, including financial support, coordination and legislation, to address the legal and regulatory gaps identified and to trigger further digital investment in the EU in the years to come. Policy initiatives are based on legislative (mostly approximation of national laws) and non-legislative tools, including Member States' coordination mechanisms and sharing of good practices.

New or updated legislation or guidelines have been announced in the following areas:

- In the field of **robotics and artificial intelligence**, questions revolving around how technologies challenge [ethical norms](#) and [ethical standards](#) have been a focal point of the policy discussion for some time now. On the premise that the EU must become the world leader in ethically responsible AI, the Commission has been consulting throughout 2018 with all relevant stakeholders and the [High-Level Expert Group on Artificial Intelligence](#). The publication of a set of [EU ethical guidelines on AI](#), covering issues such as fairness, safety, transparency, privacy and personal data protection and non-discrimination, is due in 2019.
- The emergence of digital technologies (such as IoT, robotics and AI) has also prompted a [reflection](#) about the suitability of current rules on **safety and liability**, in particular for autonomous vehicles and IoT products. The European Parliament has [called](#) for updated civil liability rules to take into account the development of autonomous and cognitive features in cars and robots. The Commission has announced a guidance document on the interpretation of the [Product Liability Directive](#) for 2019, and will assess whether certain aspects of the directive should be updated to ensure legal clarity for consumers and producers in case of defective products.

New initiatives could also be taken in the following areas:

- **Access to and re-use of digital data** (i.e. especially non-personal data and machine-generated data) is a [key enabler](#) for digital transformation in many sectors of EU industry, such as in health and social care. New initiatives may be taken to further harmonise rules on [data-sharing arrangements](#), especially in business-to-business and business-to-government situations, and to clarify concepts such as data ownership.

- The current lack of **interoperability of electronic health record systems** across the EU has significant drawbacks and limits progress in the field of healthcare research, prevention strategies and personalised medicine. The Commission might put forward proposals to increase [coordination efforts on the digital transformation of health and care](#) in Europe, including initiatives to ensure cross-border interoperability and secure cross-border access to electronic health records by authorised healthcare professionals.
- Regarding the **digitalisation of the public sector** (i.e. e-Government), the focus will be on the implementation of the [eGovernment action plan 2016-2020](#). Further EU action could be taken in line with the 2017 [Tallinn Declaration](#), in particular in the fields of interconnectivity of public services, reusability of public sector data and digital skills for civil servants.
- EU competition authorities are increasingly concerned by the challenges posed to **competition policy** by digitalisation, and will no doubt increase their [scrutiny](#) to avoid data bottlenecks and the abuse of market power by digital platforms.
- EU level coordination is needed to address standardisation. Initiatives may be [taken](#) to foster **standardisation** in emerging technologies (for instance blockchain) in support of digitalising European industry.
- The EU may also consider measures to promote the development of technology and industrial capabilities in **cybersecurity** and to develop a European cybersecurity crisis cooperation on the basis of the [Council conclusions](#) of 26 June 2018.
- Digital transformation is changing the nature of work and labour markets, and there are [concerns](#) about how this may affect employment conditions and employment levels in particular. Some initiatives could be taken in the area of the [digital skills and jobs coalition](#) strategy, for instance to **modernise education and training systems** and support SMEs facing specific challenges in attracting and retaining digital talent in their workforce.

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ENDNOTES

- ¹ 'Digitisation' refers specifically to the conversion of information or data from analogue to digital format. 'Digitalisation', by contrast, refers to the adoption or increase in use of digital or computer technology (by an organisation, an industry, or a country) and therefore describes more generally the way digitisation is affecting economy and society (see OECD, [Going Digital: Making the Transformation Work for Growth and Well-Being](#), 2017, p. 9).
- ² See Commission communication, [Digitising European industry, reaping the full benefits of a digital single market](#), 2016.
- ³ See the Commission's [Europe's digital progress report](#) 2017 and [Digital Economy and Society Index](#) (DESI) 2018.
- ⁴ See Charlemagne, 'Europe's History explains why it will never produce a Google', *The Economist*, 13 October 2018.
- ⁵ See Commission [impact assessment](#) accompanying the proposal for a regulation establishing the Digital Europe programme for the period 2021-2027, pp. 12-13.
- ⁶ See Commission [communication on the mid-term review on the implementation of the digital single market strategy – A connected digital single market for all](#), 2017.
- ⁷ Note that the provisions relating to the creation of a European research and investment policy framework dates back to previous Treaties: Title VI of the Treaty establishing the European Communities (1957); Title VI of the Single European Act (1987). In the Single European Act, the title dedicated to research and technological development (Article 130f - 130q) lays down basic principles and objectives on how the EU should promote research and technological development and how the Commission should support Member States' actions.
- ⁸ Other Treaty provisions, such as in the field of competition policy (Articles 101-109 TFEU), trade policy (Articles 206-207 TFEU), and trans-European networks (Articles 170-172 TFEU), can also be relevant to implementation of digital policies.
- ⁹ Research and innovation, testing, deployment and market up-take.
- ¹⁰ With €37 billion investment to boost digital innovation, €5.5 billion national and regional investments in digital innovation hubs, €6.3 billion for the first production lines of next-generation electronic components and €6.7 billion for the European cloud initiative.
- ¹¹ For instance, through projects in the Member States, the new European Social Fund+ will help to equip citizens with basic skills fit for the digital world. Investments in digital 'upskilling' are also included in the Global Adjustment Fund.

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