European Commission
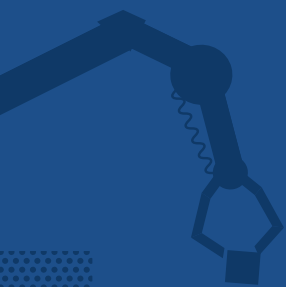
DIGITISING EUROPEAN INDUSTRY

PROGRESS SO FAR,
2 YEARS AFTER THE LAUNCH

MARCH 2018

5G

Digital Single Market

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FOREWORD

Mariya Gabriel

**European Commissioner
for Digital Economy and Society**

The 4th industrial revolution is unfolding worldwide, opening up new horizons driven by new-generation digital technologies. This change of paradigm has a profound impact in our economy and society, transforming products, processes and business models in every industry from construction, health and agri-food to the tourism and audiovisual sector.

Europe has a tremendous opportunity to benefit from these digital innovations, as digitalisation of products and services can add more than €110 billion of annual revenue for our industry until 2020.

Embracing these opportunities requires mobilising all active forces across the EU. This is the objective of the Digitising European Industry initiative adopted in 2016. Just two years after its adoption, we are already delivering along key actions for the digital future of Europe. Member States are benefiting from a coherent European approach, co-investing into further development of digital innovations, and their broad adoption by businesses for a reinforced EU competitiveness.

EU investments in Public-Private Partnerships for Research and Innovation are contributing to build key digital technologies and their integration in future digital industrial platforms. The EU supports a network of Digital Innovation Hubs covering all regions, widening notably towards Central and Eastern Europe and future accession countries. This is helping companies –especially SMEs- to develop the necessary digital competences and make the most of the digital revolution. We are also reviewing regulations to make them fit for the digital age and supporting actions to ensure that all Europeans count with the digital skills to live and work in an increasingly digital society.

Therefore, with the support from Member States, regions and industry, it is my ambition to ensure that every business in Europe - whichever the sector, wherever the location, whatever the size - can draw the full benefits from digital innovations.

It is for this reason that the Commission reaffirmed that digitalisation is at the heart of the renewed Industrial Strategy which was adopted in September. European leaders at the Tallinn Digital Summit of September 2017 stressed in a united and very strong message the need for Europe to invest in digitising our economies and enhance European competitiveness, our quality of life and social fabric.

Together, our steer and mobilisation is critical to continue making progress, fast and at scale. In line with the conclusions of the Digital Summit in Tallinn, let us *«make the EU the home for enterprises and innovators in the digital age»*.

A EUROPEAN STRATEGY FOR THE DIGITALISATION OF INDUSTRY

The Digitising European Industry Initiative is a key element of the Digital Single Market strategy, which aims to make the EU's single market fit for the digital age.

Building on and complementing the various national initiatives for digitising industry, the DEI strategy is structured around five main pillars:

Digital innovations for all: Digital Innovation Hubs

Strengthening leadership through partnerships & industrial platforms

European platform of national initiatives on digitising industry

A regulatory framework fit for the digital age

Preparing Europeans for the digital future

1.0

EUROPEAN PLATFORM OF NATIONAL INITIATIVES ON DIGITISING INDUSTRY
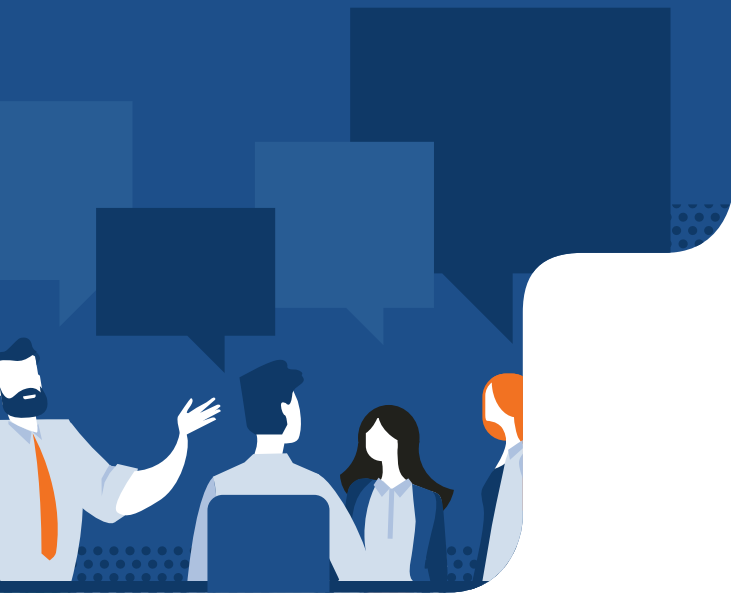
The state of the digitalisation of industry varies across sectors, particularly between high tech areas and more traditional ones, and between Member States and regions. There are also large disparities between large companies and SMEs.

Industrial value chains are connected across borders and the digital revolution brings challenges that can only be addressed through a coordinated EU-wide effort. The European platform of national initiatives on digitising industry offers the coordination framework needed to bring together all Member States and ensure coherence and collective steer.

ADDING VALUE AT EU LEVEL

Launched by the European Commission in March 2017, this forum aims to build a critical mass of initiatives and investments for digitising industry, and to ensure the commitment of Member States, regions and private sector to achieve the Digitising European Industry goals. The focus is on adding value at European scale and not duplicating actions and efforts already done by Member States and regions.

The platform builds on and complements the 15 national initiatives that already exist across the EU and it will expand to welcome new initiatives as they are launched – at least 5 Member States are preparing a national initiative. This coordination is at the core of the Digitising European Industry strategy and it provides a forum to:

- Identify challenges that need to be addressed at EU level.

- Share experiences and best practices

- Trigger collaboration and boost co-investments

- Explore common approaches to regulation, skills and jobs

Existing National Initiatives for digitising industry across the European Union

The ultimate goal is to make sure that actions taken by Member States can complement and reinforce each other. It is only at EU level that the combination of public resources and private investments can reach the critical mass needed for Europe's industry to compete worldwide.

In this respect, the strong leadership of the European Commission has led to the commitment from several groups of Member States towards important co-investments in EU-wide projects strategic for Europe's competitiveness, such as High Performance Computing and micro- and nano-electronics.

During the Digital Day in Rome (March 2017) several Member States committed to concrete progress in high performance computing and connected and automated mobility and to the launch of the European platform of national initiatives on digitising industry.

The Digitising European Industry strategy is mobilising €5 billion of EU investment from Horizon 2020 between 2016 and 2020, expecting to attract a tenfold investment by Member States, regions and industry. The level of investment already committed by Member States since 2016 or foreseen until 2020 gives confidence that this target will be successfully reached.

ENGAGEMENT WITH STAKEHOLDERS

The DEI strategy includes strong stakeholder engagement. High level governance meetings of the European Platform are held twice per year. They offer a forum for representatives of the national governments and initiatives to meet with European Public Private Partnerships, European federations of business, and social associations to take stock of progress and identify areas of actions where the EU can add value.

To support the high level governance meetings, three specific mission-oriented working groups were launched in autumn 2017 on Digital Innovation Hubs, investments & skills, Public-Private Partnerships, and Digital industrial platforms & standardisation. There is also a working group on digital skills. They are a key part of the DEI strategy. Working groups regularly present their findings and recommendations to the high level governance meetings and they help ensure deeper involvement of the Member States, regions and industry.

Last year, together with the German hosts, the European Commission initiated the first yearly European stakeholder forum for Digitising European Industry. The event brought together 500 participants from all over Europe to raise awareness about the importance of the Digitising European Industry strategy, to discuss its action lines in a pragmatic and delivery-oriented way, and to share experiences and exchange best practices.

Industry 2.0 meets Industry 4.0 at the Stakeholder Forum 2017

What is the European Commission doing?

- Maintaining political mobilisation through regular meetings of the European Platform of National Initiatives and ensuring that this multilateral collaboration benefits the whole EU

- Encouraging national initiatives for digitising industry by outlining policy approaches to digitalisation and by sharing experiences

- Monitoring implementation of actions within the Digitising European Industry strategy

- Supporting Member States to launch and maintain digitalisation strategies and commit for collective actions and investments

- Reinforcing the broader involvement of stakeholders across the EU

NATIONAL INITIATIVES ON DIGITISING INDUSTRY

The European Commission monitors the state of digitalisation across the EU through different indexes and indicators.

The Digital Economy and Society Index (DESI) shows that the EU is making progress in digital.

However, more efforts and investments are needed to close the gap between top digital players and lower-performing countries and to make the most of the digital opportunities.

Digital Economy and Society Index, by Main Dimensions of the DESI

Legend
- Connectivity
- Human Capital
- Use of Internet
- Integration of Digital Technology
- Digital Public Services

European Commission, Digital Scoreboard 2017
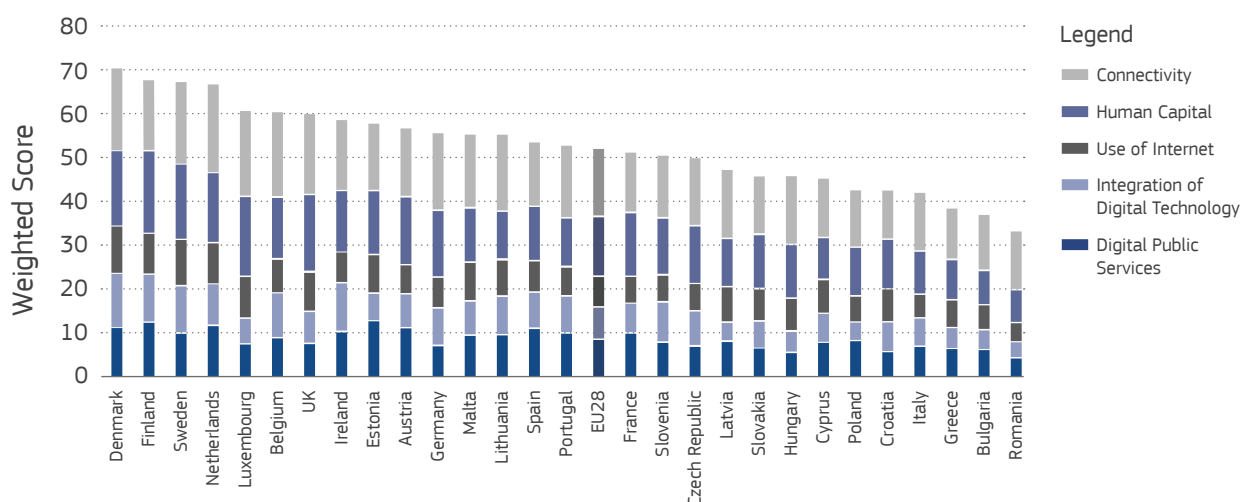
The Digital Transformation Monitor takes stock of Industry 4.0 policy initiatives across several EU Member States. The results identified the need for systematic cooperation and exchange of good practices at EU level.

More detailed analysis of the existing **15 national initiatives for digitising industry** and relevant national measures along the action lines of the DEI strategy concluded that:

- Digitalisation is a key element of national industrial policies. Some are among the 'trend-setters' and many are 'fast followers' in absorbing the emerging trends.

- EU-collaboration is necessary to face worldwide competition. Europe brings added value, prepares for legal certainties and encourages essential co-investments to successfully reach leadership positions across the EU.

- Specific measures employed by Member States to encourage investments in research, development and innovation (R&D&I) include incentives and access to finance.

- The Digitising European Industry strategy makes significant progress towards the mobilisation of close to €50 billion of public and private investment until 2020. The analysis of national initiatives has provided reliable - although non-exhaustive- financing information in this respect.

- Member States recognise the need for digital skills and have set up actions related to education and training.

- No one-size-fits-all: addressing the needs of national industrial fabrics led to different national measures, providing a coherent and coordinated national vision.

In summary, clear alignment of national initiatives along the action lines of the DEI strategy is gradually taking place.

Fiscal measures

Investment funds

Regional funds

National funds

EU level investments in DEI

Digital innovations for all

R&D&I programmes

Digital skills
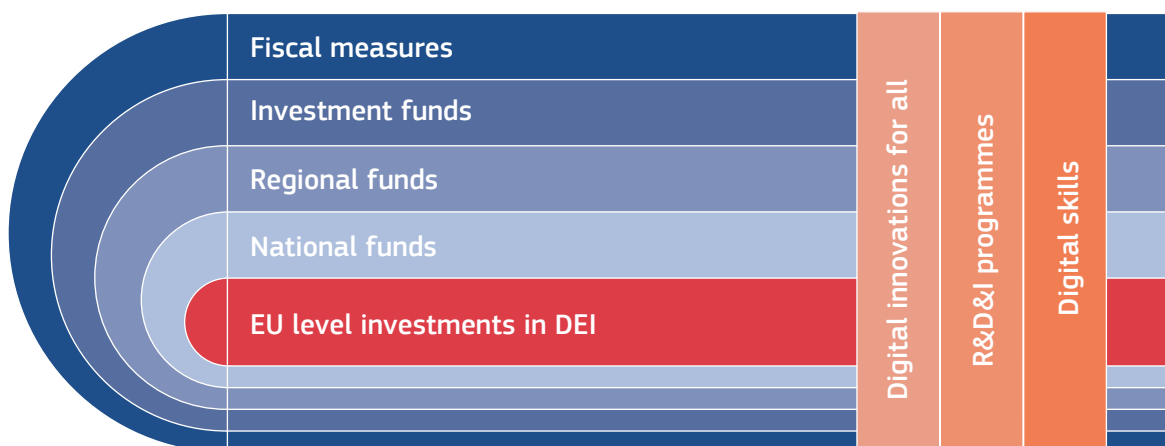
National measures to multiply EU investments on digitalisation of industry

		AT	BE	CZ	DE	DK	ES	FR	HU	IT	LT	LU	NL	PL	PT	SE
INCENTIVES TO INVEST IN R&D&I	Innovation vouchers		●	●	●			●	●		●			●	●	
	Amortisation schemes				●			●		●						
	Foreign direct investments measures	●		●											●	●
	Tax relief	●	●			●	●	●		●	●		●	●		●
ACCESS TO FINANCE	Guarantee/Loan fund						●	●	●	●			●	●	●	
	National innovation fund		●	●	●	●		●				●	●	●		●
	Venture capital Start-ups support	●			●	●	●	●		●			●	●		●
PATENTS & IPR INCENTIVES		●	●		●					●	●	●		●		

National financial measures

		AT	BE	CZ	DE	DK	ES	FR	HU	IT	LT	LU	NL	PL	PT	SE
DIGITAL INNOVATIONS FOR ALL	Test-beds				●			●	●		●		●	●	●	●
	R&I infrastructure	●	●		●		●	●	●	●		●	●	●	●	●
	DIH	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Clusters		●		●	●	●	●		●	●	●	●		●	
R&D&I PROGRAMMES	Basic technology research	●	●		●			●	●	●			●	●	●	
	Industrial/Applied research	●	●	●	●	●	●	●				●	●	●		●
	Pilot & Demonstrators	●	●		●	●			●			●		●	●	●
	Standardisation	●			●		●			●	●	●	●	●		
	International cooperation	●	●	●	●			●	●	●	●					●
	R&I PPPs					●						●	●			●
	Regional level		●		●	●	●	●					●			●
REGULATION			●	●	●	●	●	●	●		●	●	●	●	●	●
DIGITAL SKILLS		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

National actions along the DEI strategy

2.0

DIGITAL INNOVATIONS FOR ALL: DIGITAL INNOVATION HUBS

Only about 1 out of 5 companies across the EU are highly digitised. Similarly, around 60% of large industries and more than 90% of SMEs feel lagging behind in digital innovation. The digital revolution brings opportunities for big and small companies, but many of them still find it difficult to know in which technologies to invest and how to secure financing for their digital transformation.

Within this context, Digital Innovation Hubs (DIHs) can help ensure that every company, small or large, high-tech or not, can take advantage of digital opportunities. A Digital Innovation Hub is a place where companies –especially SMEs, startups and mid-caps– can get help to improve their business, production processes, products and services by means of digital innovations. At the core of the DIH there is normally a competence centre such as a research and technology centre or an innovation-oriented university department. Digital Innovation Hubs offer the following services:

- Access to digital technologies and competences

- Infrastructure and training to test digital innovations

- Financing advice

- Market intelligence

- Networking opportunities

Member States and regions play a key role in establish DIHs that support the digital transformation of the industry in their regions. This can be financed through European Structural and Investment Funds (ESIF) or other national or regional funds. The role of the European Commission is to network the DIHs. For this, **the European Commission is investing €100 million per year on DIHs from 2016 to 2020**.

Key elements and services of a Digital Innovation Hub

NETWORKING DIGITAL INNOVATION HUBS THROUGH HORIZON 2020

Digital Innovation Hubs need to focus on the main needs of the industry and build on the technological strengths available in their region. They must also collaborate to offer all necessary expertise to companies across Europe. For instance, an SME from a region has a good idea for a new product, but the facilities to produce it are only available in a DIH of another region. In that case, collaboration between the two DIHs should ensure that the company receives the support to realise its idea. This is the aim of the pan-European network of DIHs.

I4MS (ICT Innovation for Manufacturing SMEs) and SAE (Smart Anything Everywhere) are two of the key European initiatives helping to build this network and boost innovation. They foster the collaboration of SMEs, startups and mid-caps across their value chains with the European DIHs. Companies can run small scale experiments to implement and test digital innovations.

Several hundreds of these innovation experiments are funded every year within EU projects, where at least one SME and one Digital Innovation Hub implement and test digital innovations.

Other EU research & innovation initiatives are also contributing to the development of the DIHs network: the European Coordination Hub for Open Robotics Development (ECHORD++), the Open Data Incubator Europe (ODINE), the Network for Supercomputing Expertise for SMEs (SESAME NET) and the Access Center for Photonics Innovation Solutions and Technology Support (ACTPHAST).

More initiatives on Digital Innovation Hubs will be supported from 2018 to 2020, with a total investment of €300 million within the Horizon 2020 programme.

SMEs currently face difficulties to access finance for their digital transformation because financial intermediaries have the perception of a relatively high credit risk. Therefore, the European Commission is exploring with Member States and the European Investment Bank whether and how a European Digitalisation Investment Fund could help bridge this gap.

Success Story

A 3D Scanner to design made-to-measure shoe insoles using cloud-based HPC

Podoactiva, a Spanish traditional podiatrist company, saw the potential of digitalisation to create a unique method to scan feet in order to produce made-to-measure medical insoles. Through their participation in the European initiative I4MS, they partnered with the Spanish IT company Inycom, which provided them with the necessary specific software. The Spanish Institute for Biocomputation and Physics of Complex Systems (BIFI), acting as a DIH, provided them with the necessary **High Performance Computing (HPC) infrastructure** and know-how to run this **software on the cloud on a pay-per-use basis**, helping them to develop a fully working 3D Scan Insole Designer.

Thanks to this innovative solution, Podoactiva and Inycon have now private clinics that use this technology in Spain, Portugal, Italy and Mexico, selling made-to measure products to customers worldwide.

Apart from Podoactiva, the Italian SME Base Production also benefited from this cloud-based solution. Thanks to it, they expect in the next 3 years to multiply their turnover by 3 up to €750.000, gain an additional 3% in their market share and reduce their time-to-market by 40%.

The EU made this innovation possible with an initial €321.000 investment.

Success Story

An autonomous robot to make agriculture more digital

Fendt is a German company that manufacturers agricultural tractors and machines. Although for long this has been seen as a quite traditional sector, Fendt wanted to exploit the benefits of bringing robots to agriculture.

Through their participation in the EU Robotics Research Project ECHORD++, they partnered with the DIH in the Service Robotics Research Centre at the University of Applied Sciences in Ulm. The result of this collaboration is MARS, an **innovative mobile robot that autonomously plants seeds** while the workers can monitor the process from any location. The robot also takes care of every plant, reduces the use of fertilisers and pesticides, and contributes to sustainability and savings in energy, time and costs.

With this innovative solution, Fendt fuels a paradigm shift in farming practices and it could help to solve challenges arising from climate change as well as shortage of skilled labour. With this new product, Fendt also opens new market opportunities for its own business and helps other companies in the agricultural sector to be more competitive.

At the AGRITECHNICA 2017 trade fair, the world's biggest trade fair for agricultural machinery, MARS won a silver medal in the innovation award category.

Success Story

A photonic gyroscope for safer transportation systems

AEROSPAZIO Tecnologie s.r.l. is an Italian SME established in March 2000 specialising in the fields of electric propulsion, thermovacuum and space simulation. They provide high qualified test services for space applications to some of the main European players such as Electric Rocket Propulsion.

Aerospazio recognised a need in the marketplace for all moving vehicles – manned and unmanned – to be equipped with a more reliable and precise gyroscopic solution which is essential for the navigation and attitude control system of vehicles for safer transportation systems.

Through the EU initiative ActPhast, Aerospazio engaged with the COBRA Research Institute of the Technische Universiteit Eindhoven, who helped them to develop an **integrated photonics-based gyroscopic solution**. Photonic integration technology will allow for dramatic reduction in the size of such a gyroscope in comparison to the existing fiber-based ones. In particular such a gyro could be valuable in applications in space satellites, where relatively low power and low volume are required.

The ACTPHAST project involved the innovative combination of different integrated photonic technologies into a single system, commencing with a rapid 3-month feasibility study of less than €20K which was fully subsidised by ACTPHAST, allowing for the next phase development of a working prototype.

Success Story
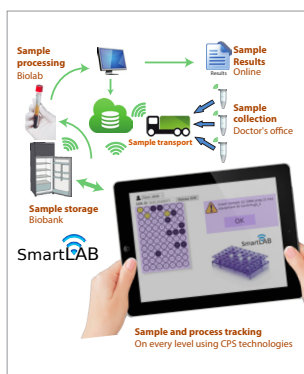
A smart laboratory with cyber-physical systems to improve the diagnose of cancer

The Hungarian company NEUMANN offers advanced screening technology to diagnose cervical cancer in women. However, they were facing the challenge of how to optimise the processing, transportation and storage of the thousands of biomedical samples they received in their laboratories. Thanks to their participation in the EU initiative SAE they teamed up with the Budapest University of Technology and Economics in Hungary as a DIH and with Intel Ireland and ST Microelectronics in France as technology providers. Through this collaboration they developed a smart laboratory equipped with **chips and sensors** that track the medical samples at all times. This allows keeping the samples stored in the right conditions and correctly identified to avoid loss or confusion between different patients.

Thanks to this solution, NEUMANN expects to augment their revenues by up to €2 million in the coming 5 years. INTEL and ST Management will also profit from NEUMANN's success with higher sales of their components.

TRAINING AND DEVELOPMENT OF SKILLS

Helping companies to accomplish their digital transformation also means advising and training them on those digital technologies that are relevant for their business, and to make sure that everybody in the company has sufficient digital skills. This is a crucial role played by Digital Innovation Hubs, which dedicate around 15% of their efforts to training and skills development.

The European network of Digital Innovation Hubs aims at reinforcing this aspect. Through the leading involvement of the EIT Digital in one of the recently selected network of DIHs, the skills dimension will be further strengthened.

THE EUROPEAN CATALOGUE OF DIGITAL INNOVATION HUBS

In order to create a strong network of Digital Innovation Hubs it is crucial to link together the infrastructures and facilities that are already in place across Europe. With this goal, the European Commission launched the European catalogue of DIHs, a repository that includes more than 200 already existing operational hubs and that will keep growing with new additions in the future. The catalogue is a practical tool for DIHs to collaborate and network effectively. In the future it will also be a key place to share best practices and gather information about the expertise and support facilities offered across Europe. Policy makers can use it to further develop their digitalisation programmes.

WIDENING TOWARDS REGIONS NOT WELL COVERED BY DIGITAL INNOVATION HUBS

One of the goals of the Digitising European Industry strategy (DEI) is to have a Digital Innovation Hub in every region by 2020. However, many regions are not yet well covered by DIHs. In order to help them, the European Commission has launched **coaching and training programmes for new DIHs**.

Under the I4MS initiative, 29 new DIHs received support from the existing network of hubs on how to develop a business plan, identify the needs of industry in their regions and operate their services. With €2 million support by the European Parliament, the European Commission has also started a similar programme that will give training to 34 new DIHs across 13 countries in Central and Eastern Europe. In addition, possible collaborations between these 34 hubs and 31 other applicants which had similarities in terms of geography or topic are heavily stimulated to build local ecosystems.

These efforts will be reinforced in 2019 with **€8 million under Horizon 2020** in order to support new DIHs in underrepresented regions with strong industrial activity. This will allow them to link with strong DIHs from other regions to support innovative local SMEs in their region to master their digital transformation.

European Catalogue of Digital Innovation Hubs
Operational hubs, January 2018

3.0

STRENGTHENING LEADERSHIP THROUGH PARTNERSHIPS AND DIGITAL INDUSTRIAL PLATFORMS

With the advent of the digital revolution, products and services increasingly combine different digital technologies. For instance connected and automated cars integrate vision systems, robotics, artificial intelligence, mobile communication, and more. To build such products, one needs both the digital technology building blocks like smart sensors, robotics components, artificial intelligence modules and mobile communication systems, and at the same time the means to integrate those building blocks into applications.

Digital industrial platforms integrate the different digital technologies into real-world applications, processes, products, and services; while new business models re-shuffle value chains and blur boundaries between products and services.

To reinforce the EU's competitiveness in digital technologies, the Digitising European Industry strategy (DEI) supports Public-Private Partnerships (PPPs) that develop future digital technology building blocks.

At the same time, the European Commission supports partnerships and EU-wide collaborations that foster digital innovation in specific sectors. To accomplish all this, the EU, Member States, and regions need to cooperate and co-invest under common priorities. For the period 2018-20, the EU alone is investing more than €3 billion in these areas, roughly 2/3 on the development of digital building blocks and 1/3 on platform building, large-scale piloting, pilot lines and related actions.

PPPs and other pan-European collaboration

Collaboration fostering digital innovation in specific sectors

ECSEL Electronic Components & Systems

Big Data Value

High Performance Computing

Robotics

Photonics

Cybersecurity

5G

Digitising Industry Focus Area

IoT Focus Area

Connected automated driving collaboration

FoF Factories of the Future

SPIRE Sustainable Process Industry

ECSEL Lighthouse Initiatives
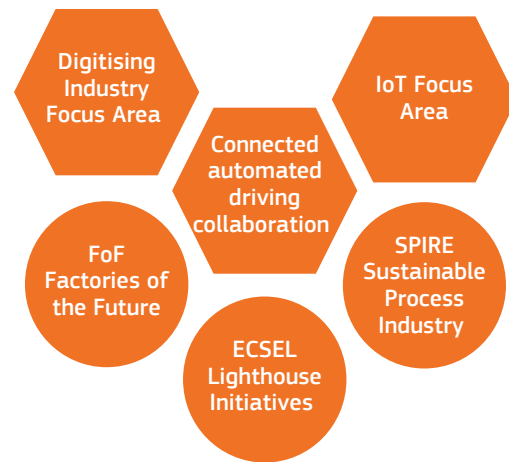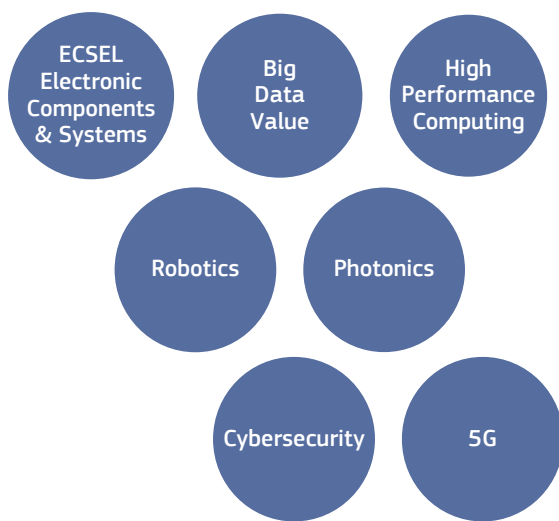
Digital PPPs: providing the building blocks

Public-Private Partnership (PPP)   EU collaboration

# DEVELOPING THE DIGITAL BUILDING BLOCKS

To make Europe a leader in digital technologies it is important to develop strategic research and innovation agendas at EU level and to provide a critical mass of resources to address them. For this purpose the European Commission has established Public-Private Partnerships (PPPs) and a Joint Undertaking under the EU's Horizon 2020 programme in key digital technologies such as 5G, data value, High Performance Computing (HPC), cybersecurity, photonics, robotics and electronic components & systems.

The PPPs have proven to be effective in developing the technology building blocks which underpin the digital revolution. They are successful in joining efforts at the European level for digital industrial innovations in different fields and in attracting investments by industry.

Together with Member states, PPPs, and external experts, the European Commission is further looking into the roles that Member states may play in PPPs and, vice versa, how future partnerships may contribute to the coordination of national programmes.
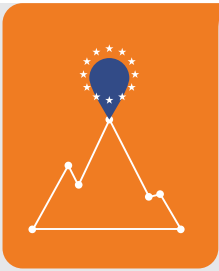
Co-investing for European Leadership

The example of the **ECSEL Joint Undertaking**, a special type of PPP, shows that alignment of regional, national and EU strategies is feasible and that they can draw considerable private investments and achieve ground-breaking impact on competitiveness. ECSEL has aligned national and EU industrial strategies beyond research and innovation and reversed the decline in production of digital components and embedded software in Europe. The €500 million invested by the EU in 2014-16 have drawn in 4 times that amount in additional investments from public & private sectors and secured leading positions in micro- and nano-electronic equipment, sensor technology and low power electronics; all essential for the data infrastructure, the Internet of Things and the next generation of mobility.
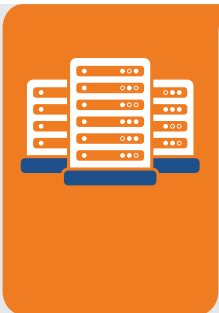
The European High-Performance Computing Joint Undertaking

High-performance computing (HPC) uses super powerful and efficient machines, able to perform calculations thousands of times faster than a normal computer. HPC can bring benefits to science and society in many areas and allow industry and SMEs to find new solutions, reduce costs and decrease time to market for products and services.

Recognising the need for Europe to be in the driving seat in this area, the European Commission proposed in January 2018 the European High-Performance Computing Joint Undertaking (**EuroHPC JU**). This legal and funding entity will enable to pool European and national resources to acquire, build and deploy across Europe a world-class HPC infrastructure. It will also support the development of exascale supercomputers based on European technology which would rank among the world's top three.

Overall, around €1 billion of public funding would be invested by 2020 in EuroHPC. EU contribution will be around €486 million, matched by a similar amount from the Member States and associated countries. Private members of the initiative would also add in kind contributions. Financial support will be provided in the form of procurement or research grants following open and competitive calls.

The EuroHPC JU builds on the declaration launched in Rome in March 2017 and signed by several EU countries that are committed to upgrading European computing power.

FOSTERING INNOVATION IN SECTOR-SPECIFIC DIGITAL INDUSTRIAL PLATFORMS

In addition to the technology-oriented PPPs, other partnerships and collaborations focus on the application of different technologies in specific industrial sectors. That is the case for the PPPs on Factories of the Future (FoF) and Sustainable Process Industry (SPIRE) and also for the EU collaboration around connected & automated driving. Specific Focus Areas in the EU's Horizon 2020 programme support actions across several industrial sectors, such as IoT and Digitising Industry.

They emphasise the importance of the integration of key technologies into future sector-specific digital industrial platforms covering full value chains across the EU, and of large-scale piloting and experimentation to gradually develop and mature such platforms.

Similar in importance as online platforms in the consumer market, digital industrial platforms are key to place Europe in the lead of digital transformation. Digital industrial platforms combine various functions implemented by different technologies via clearly specified interfaces, and make data available for use by applications. For instance, in a smart factory, a platform could take data from the machines on a shop floor, make it accessible to monitoring and control applications, allow third-parties to develop applications based on that data, and also connect different stakeholders such as users and application developers. Equipped with appropriate business models, digital industrial platforms ultimately create ecosystems of different groups of market actors in a multi-sided marketplace.

These ecosystems are very important because in order to create new innovative products and services, industries need to agree on how technologies can be integrated. Nowadays, few individual companies are able to cover the whole value chain themselves; they need the products and services of other companies and vice versa. Therefore, companies in a certain industrial sector need to agree on how their technologies and systems can be integrated, what the interfaces are and how specified functions can be implemented. These industry agreements or platforms are crucial to create new markets and opportunities for Europe.

The partnerships and PPPs are increasingly cooperating in the development of digital industrial platforms. For instance, the Big Data Value PPP, the Alliance for Internet of Things Innovation, and the High Performance Computing PPP agree to join forces in the development of next-generation digital industrial platforms, including AI platforms.

Promising digital industrial platforms building on European strengths:

- **Digital industrial platforms for the connected smart factory** will support much higher levels of distribution and customisation of manufacturing processes across the value chains, with businesses being able to cater to the needs of individual consumers. Interoperability will be supported by following widely accepted reference architectures, such as RAMI 4.0 (Reference Architecture Model Industry 4.0). RAMI gives a framework to position different applications, specifications and standards with respect to each other, promoting common understanding. In addition, the RAMI Administration Shell stores data associated to a production resource (e.g. a machine or a software application) and makes this available to other resources. Its specifications are being developed by the Trilateral cooperation between Germany, France, and Italy.

Layers

Life Cycle Value Stream
IEC 62890

Hierarchy Levels
IEC 62264//IEC 61512

Business
Functional
Information
Communication
Integration
Asset

Development Maintenance Usage
Type
Production Maintenance Usage
Instance
Product
Field Device
Control Device
Station
Work Centers
Enterprise
Connected World
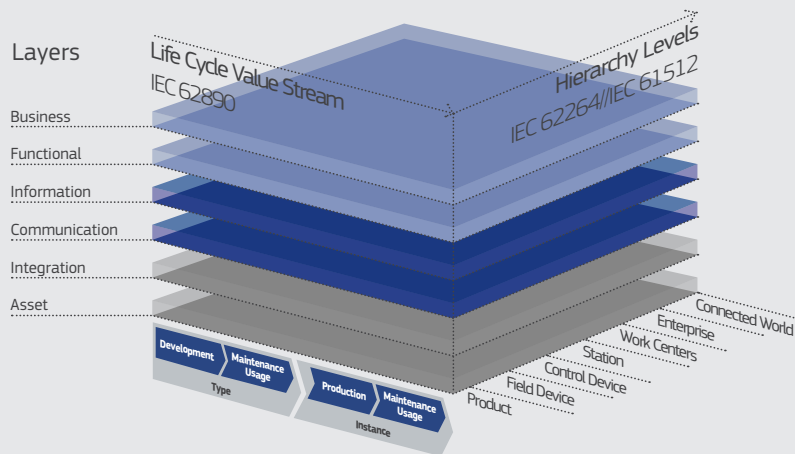
Source: Plattform Industrie 4.0 and ZVEI

- **Industrial data platforms** offer virtual environments that facilitate the exchange and connection of data between different companies within a secure business ecosystem. This also requires shared standards and common governance rules such as the Industrial Data Space (IDS). This initiative was launched in Germany in 2014 and has led to a consensus among a large number of research & technology centres and industrial actors across the EU, paving the way for an internationally accepted standard.

- **FIWARE** is an open platform that consists of a set of high-level software components available to anyone today. All components come with public specifications and an open source reference implementation that can be used freely. FIWARE components (or 'enablers') are used by startups, SMEs and large enterprises in a wide range of industrial sectors, such as manufacturing, agriculture and smart cities. FIWARE has been initially developed by the Future Internet Public-Private Partnership.

INVESTING IN PLATFORMS AND PILOTING IN HORIZON 2020

In 2016 and 2017, the European Commission invested €100 million in Large Scale Pilots to foster the deployment of IoT solutions in Europe in smart living, smart farming & food security, smart cities, wearables, and autonomous driving. In the Factories of the Future PPP, €70 million are invested in reference implementations and pilots of platforms for the shop floor and for collaborative manufacturing. In 2016, in the ECSEL Joint Undertaking, Member States and the EU invested around €100 million with equal share in Lighthouse Initiatives fostering the adoption of microelectronics components and cyberphysical systems across full value chains in production and mobility. Further investments in these Lighthouses and in new ones are envisaged for 2018 to 2020.

Mapping EU platform projects on the RAMI 4.0 reference architecture model
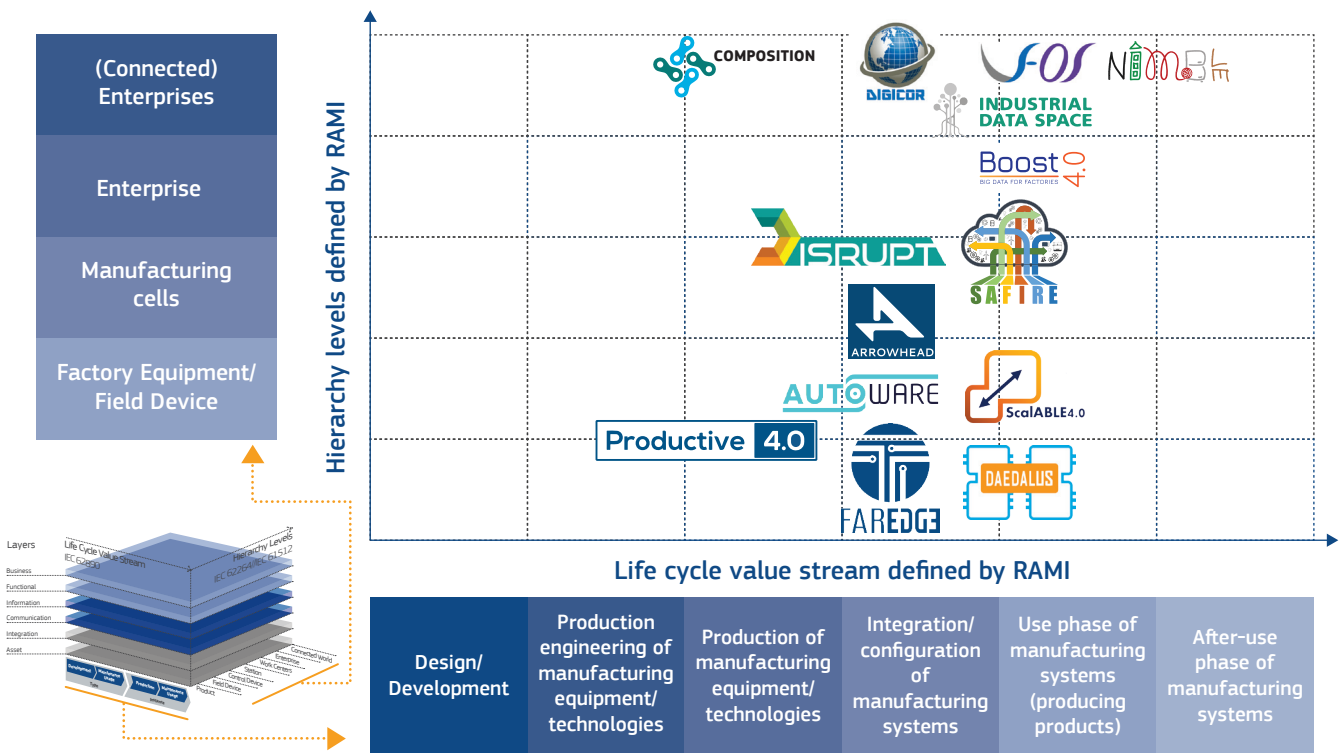
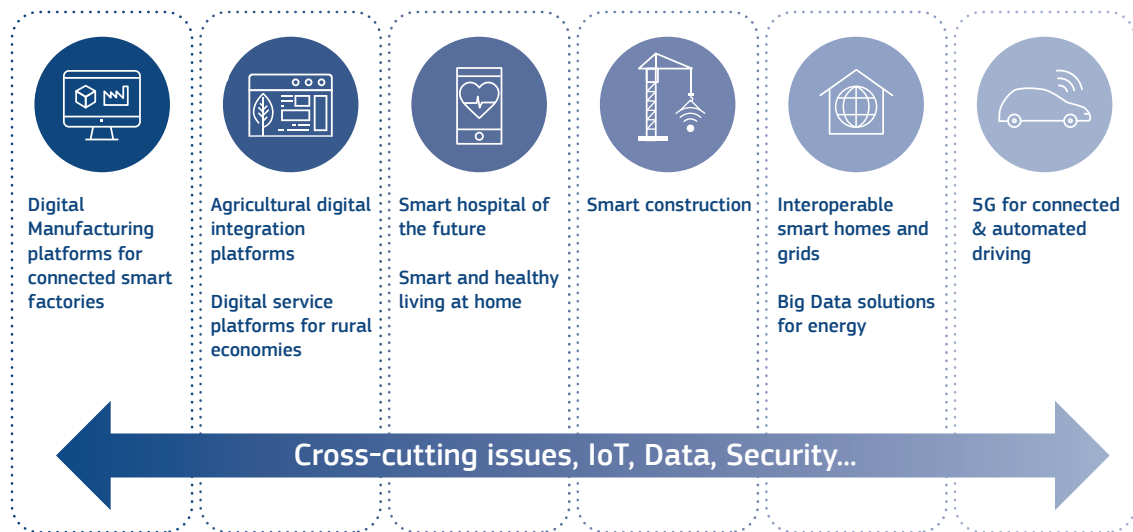Note: This includes a portfolio of more than €100 million EU investment across different projects

For the period 2018-20, with an investment of around €300 million, the EU is reinforcing its support to strategic next-generation platform building and piloting through large scale federating projects. The aim is to foster user-supply cooperation and link Member States and industrial investments under common EU-wide strategies:

Digital Manufacturing platforms for connected smart factories

Agricultural digital integration platforms

Digital service platforms for rural economies

Smart hospital of the future

Smart and healthy living at home

Smart construction

Interoperable smart homes and grids

Big Data solutions for energy

5G for connected & automated driving

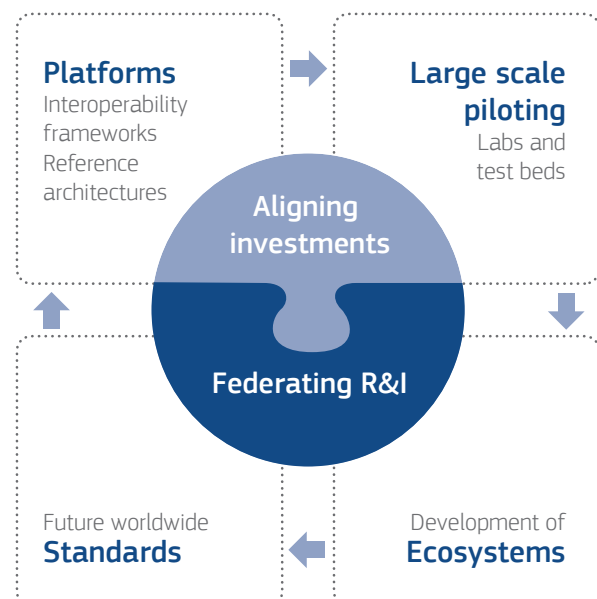**Cross-cutting issues, IoT, Data, Security...**

In order to increase the chances of wide deployment of industrial platforms, any of the 10 – 20 projects to be supported must address the full cycle from platform development and piloting to ecosystem building and standardisation:

- **Platform building:** digital industrial platforms need to be designed and implemented via open specifications and reference implementations, preventing dominant positions of individual players and allowing all the actors to take part.

- **Large-scale piloting:** large scale testing and experimentation pilots are necessary to validate digital industrial platforms in both controlled environments and in real-life use cases across application fields.

- **Ecosystem building:** the take-up of digital platforms is fostered by enlarging the ecosystem of actors involved – in particular SMEs – in the development, validation, and deployment of these platforms in applications. This incudes devising appropriate business models involving platforms.

- **Standardisation:** setting up common rules on compatibility, interoperability, quality and safety of platform components and

interfaces is essential to make platforms work in real markets.

As far as appropriate, projects shall federate and extend on-going initiatives and deploy testing facilities across the EU. This is key to achieve a significant multiplier effect for EU investments under common EU-wide strategies, leading to alignment of national programmes and ultimately to strengthening competitiveness of EU actors.

Platforms
Interoperability frameworks
Reference architectures

Large scale piloting
Labs and test beds

Aligning investments

Federating R&I

Future worldwide
Standards

Development of
Ecosystems

STANDARDISATION

In the digital world, billions of connected devices – including smartphones, cars, household appliances, and sensors – should communicate safely and seamlessly, regardless of their manufacturer, technical details or country of origin. For this they need a common language: standards.

However, the rapid change and increased convergence of digital technology means that the traditional standard setting process falls short. This prevents European companies from scaling up in the face of fierce global competition. Moreover, digital businesses increasingly define standards outside traditional standards developing organisations, and often outside Europe.

Whereas standardisation primarily is industry business, EU-level strategies and actions help to coordinate and strengthen EU positions:

- Synchronisation and coordination at European level of scattered standardisation efforts related to the digital transformation of industry helps consolidating EU positions and strengthening EU actors in international fora. This is an area where standardisation working groups in Member States and in PPPs, Europe's Multi Stakeholder Platform on ICT Standardisation as well as the European standardisation organisations ETSI, CEN and CENELEC play a crucial role.

- Industrial platform building and large-scale piloting are bottom-up processes that enable European industry to accelerate and lead the development of worldwide standards.

The European Commission is facilitating the acceleration of standardisation by putting in place collaboration and synchronisation fora which aim at strengthening the European interests in worldwide standardisation efforts.

ICT Standards

They are a ~ to make things **work together**

Devices

Technology
4G 3G
5G

Applications
eHealth

5G

4.0

A REGULATORY FRAMEWORK FIT FOR THE DIGITAL AGE

A digital-friendly regulatory framework is important for EU's industry and economy to strive. The **Digital Single Market strategy** adopted in May 2015 paves the way in this direction with the goal of opening up new opportunities and enhancing Europe's position as a world leader in the digital economy.

The European Commission has already put forward 45 initiatives to complete the Digital Single Market, of which 25 are legislative proposals. 11 of these have already been completed and 14 are with the European Parliament and the Council for approval.

In May 2017, the European Commission took stock of the progress made in the Digital Single Market's mid-term review, called on co-legislators to swiftly act on all proposals already presented, and identified main areas where further EU action is needed.

Many of the measures already presented under the Digital Single Market can have a key impact on European industries, companies and SMEs. Some of the most relevant for the digitalisation of industry are the proposals on cybersecurity and free flow of non-personal data.

In the near future, the European Commission will also address other issues such as the relations between online platforms and the businesses that use them and the liability challenges emerging from the Internet of Things and artificial intelligence.

Completing the Digital Single Market could contribute **€415 billion per year to the EU's economy**, create new jobs and help sectors such as industry to fully benefit from digital opportunities.

Cybersecurity

While digital technologies open up new opportunities, they have also brought about new risks. Last year, 80% of European companies experienced at least one cybersecurity incident. This is particularly relevant for industry and for those companies working in digital sectors. For example a 3D printing company has all its assets and value on the cloud, so a cyberattack can put at risk their whole business.

To equip European industry and society with the right tools to deal with cyber-threats, the European Commission has proposed a full set of new measures. These include a proposal for an **EU Cybersecurity Agency** to assist Member States in dealing with cyber-attacks, a new **European certification scheme** for products and services, and further actions to step up the EU's cybersecurity capacity, such as a network of **European Cybersecurity Competence and Research Centres**.

European Commission's proposals to increase cyber resilience

A European Union Cybersecurity Agency to **assist Member States in dealing with cyber-attacks**.

An EU-wide certification framework to **ensure that products and services are cyber secure**.

A Blueprint for how to **respond quickly, operationally and in unison when a large scale cyber-attack strikes**.

A network of competence centres in the Member States and a European Cybersecurity Research and Competence Centre to **help develop and roll out the tools and technology needed to keep up with an ever-changing threat**.

A new Directive to **combat fraud and counterfeiting of non-cash means of payment**.

Measures to **strengthen international cooperation on cybersecurity, including deepening of the cooperation between the EU and NATO**.
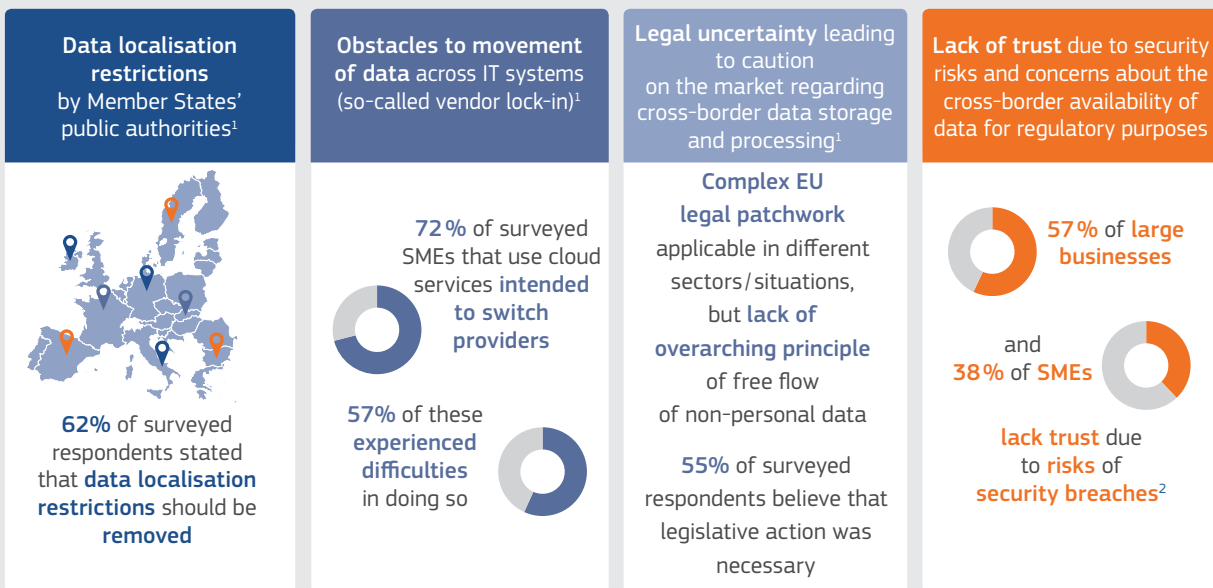
Free flow of non-personal data

Data has become the most valuable resource of the global economy. This asset brings new opportunities to all sectors. Removing localisation restrictions is key to unlock its full potential. The European Commission has proposed a regulation on free flow of non-personal data to address this challenge.

The proposed measures, together with the General Data Protection Regulation (GDPR), will create **a common European data space** without unjustified or disproportionate national rules restricting companies' location choices for data storage and processing. Companies will have greater flexibility, cost efficiency and legal certainty to digitise their data. As a result, Europe's data economy could double its value to 4% of GDP in 2020 and create more than € 1.9 billion additional revenue in the manufacturing sector.

What is the situation today?

The European Commission has identified 4 types of obstacles to data mobility within the EU:

Data localisation restrictions by Member States' public authorities[1]	Obstacles to movement of data across IT systems (so-called vendor lock-in)[1]	Legal uncertainty leading to caution on the market regarding cross-border data storage and processing[1]	Lack of trust due to security risks and concerns about the cross-border availability of data for regulatory purposes
62% of surveyed respondents stated that **data localisation restrictions** should be **removed**	**72 %** of surveyed SMEs that use cloud services **intended to switch providers** / **57%** of these **experienced difficulties** in doing so	**Complex EU legal patchwork** applicable in different sectors / situations, but **lack of overarching principle** of free flow of non-personal data / **55%** of surveyed respondents believe that legislative action was necessary	**57 %** of **large businesses** and **38 %** of **SMEs** **lack trust** due to **risks** of **security breaches**[2]

Examples of predicted additional revenue by sectors (2015-2020) assuming that data localisation restrictions are removed:

Manufacturing	Distribution, retail & hotels	Finance & business services	Government, education & health
+ € 1.9 billion	+ € 4.5 billion	+ € 2.5 billion	+ € 1.5 billion

Artificial Intelligence – the next digital revolution

Making any object and device intelligent is one of the current megatrends. Artificial Intelligence (AI) and robotics will be key drivers of economic and productivity growth in the future, and AI could contribute up to €13.3 trillion to the global economy by 2030. The European Commission has long recognised the importance and potential of robotics and AI. For example, a Public-Private Partnership for Robotics, SPARC, was set up with up to €700 million EU funding and, adding the private investment, an overall investment of €2.8 billion.

The emergence of AI is a key opportunity for our economy but it also poses legal and ethical concerns. While many robots and AI systems are impressive and have greatly progressed recently, they are still very far from exhibiting intelligent, human-like behaviour. Therefore, it needs to be carefully assessed if the current legislation is fit for purpose. The European Commission is currently evaluating some existing legislation, such as the Defective Products Liability Directive and the Machinery Directive and it will publish a wide-ranging strategy on Artificial Intelligence in the first half of 2018. This will include measures to improve Europe's competitiveness, address new ethical, legal and societal issues and to tackle socio-economic challenges.

Business relations to online platforms

Ensuring a fair, predictable and trusted business environment is crucial to fully exploit the potential of the online platform economy. However, nowadays there are frictions in commercial relations between online platforms (such as e-commerce market places, app stores and social media) and their business users. For business users, this is due to a number of potentially harmful trading practices and lack of effective mechanisms to tackle them. For platforms, the challenges lie in the potential loss of business users' trust as well as an emerging fragmentation which threatens to undermine the single market-potential of the online platform economy.

The Commission therefore intends to adopt a proposal in the first half of 2018 to promote fairness and transparency in Platform-to-Business relations. This should also serve to safeguard innovation and prevent regulatory fragmentation. This proposal is foreseen to contain principles-based legislation as part of a co-regulatory approach – leaving important flexibility to industry to find practical solutions to implement legal obligations. EU-level monitoring of the online platform ecosystems will also be enhanced in order to inform a possible future review of the legal framework, which is relevant in light of the complex and constantly evolving online platform ecosystems which also increasingly pervade European and global industrial supply chains.
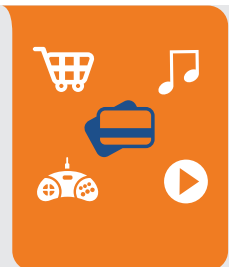
5.0

PREPARING EUROPEANS FOR THE DIGITAL FUTURE

The digital transformation is structurally changing the labour market and the nature of work. These changes may affect employment levels, the types of work available and the distribution of income. To make the most of the digital transformation and ensure all Europeans are ready for these changes, major investments in reskilling citizens are needed.

Share of Europeans who lack basic digital skills
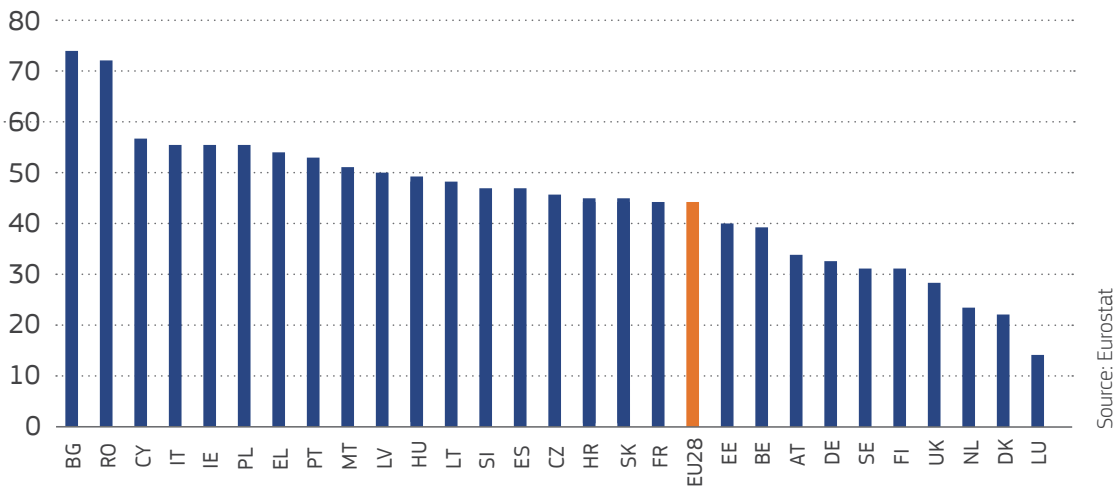
Source: Eurostat

No or low digital skills (% of individuals between 16 and 74 years old) – 2016

Adapting the workforce and our education and learning systems is a key priority of the Digitising European Industry (DEI) strategy and more broadly of the Digital Single Market strategy. While competence for education and skills policy lies mainly in the hands of the Member States, the European Commission has a complementary role where its actions coordinate and support those of Member States. As such, it has launched several initiatives to support actions in this direction. In particular:

DIGITAL SKILLS AND JOBS COALITION

The Digital Skills and Jobs Coalition (DS&JC), launched on 1st December 2016 as one key action of the European Commission's new Skills Agenda for Europe, brings together Member States, companies, social partners, non-profit organisations and education providers to take action to improve digital skills of all types in Europe. More than 320 members have already joined the initiative, with 90 making concrete pledges. Some of the key objectives by 2020 are to train 1 million young unemployed people for vacant digital jobs and support upskilling of the workforce, especially in SMEs. The activities of the Coalition have so far provided 3.7 million trainings in digital skills, over a million digital skills certifications, four thousand events, over nine thousand job placements and around 200 internships.

▶ *Digital Innovation Hubs can play a key role in this respect by broadening the training and skills development they offer – a key target within the DEI strategy. Aligning this offer with the DS&JC will further multiply the results.*

Employment of ICT specialists in the EU in absolute terms and as a share of total employment, 2006–2015

ICT employment, 1000s ▬ share in total, %

Source: Eurostat 2016
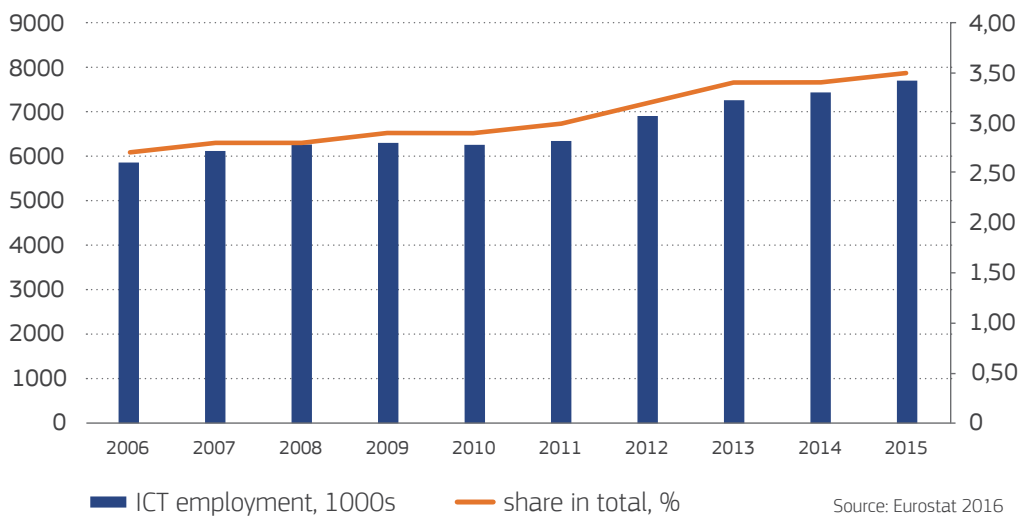
DIGITAL OPPORTUNITY TRAINEESHIPS PILOT

The recently launched «Digital Opportunity» pilot scheme, funded with €10 million from Horizon 2020, offers students and recent graduates the opportunity to carry out a paid cross-border traineeship with the aim of improving their digital skills. The pilot project will be implemented through the mechanisms of Erasmus+ and will provide students with hands-on experience in key fields such as cybersecurity, data analytics, quantum, artificial intelligence, programming and software development. The traineeships will take place over the period 2018-2020. If successful, it is hoped to expand the initiative in the future.

▶ *Digital Innovation Hubs will be involved in this programme, offering traineeships in relevant domains and ultimately helping to make Europe's workers ready for the digital age.*

DIGITAL EDUCATION ACTION PLAN

90% of future jobs
will require digital skills.

44% of Europeans
lack basic digital skills.

Less than 20% of ICT
professionals are female.

More than 48 000 schools
lack broadband connection.

Digital wellbeing is threatened
by misinformation, cyber bullying,
data privacy issues.

Digital competences have become key for citizens to participate in today's social, economic and civic life. Like previous major technological advances, digitalisation is transforming the nature of work, and poses new challenges that Europeans can only address if they have the necessary digital skills.

In this context, in January 2018, the European Commission adopted new initiatives to improve the key competences of European citizens, to promote common values and inclusion and pupils' awareness of the functioning of the European Union.

It included the adoption of the Digital Education Action Plan setting out how education and training systems can make better use of innovation and digital technology and support the development of digital competences needed for life and work in an age of rapid digital change.
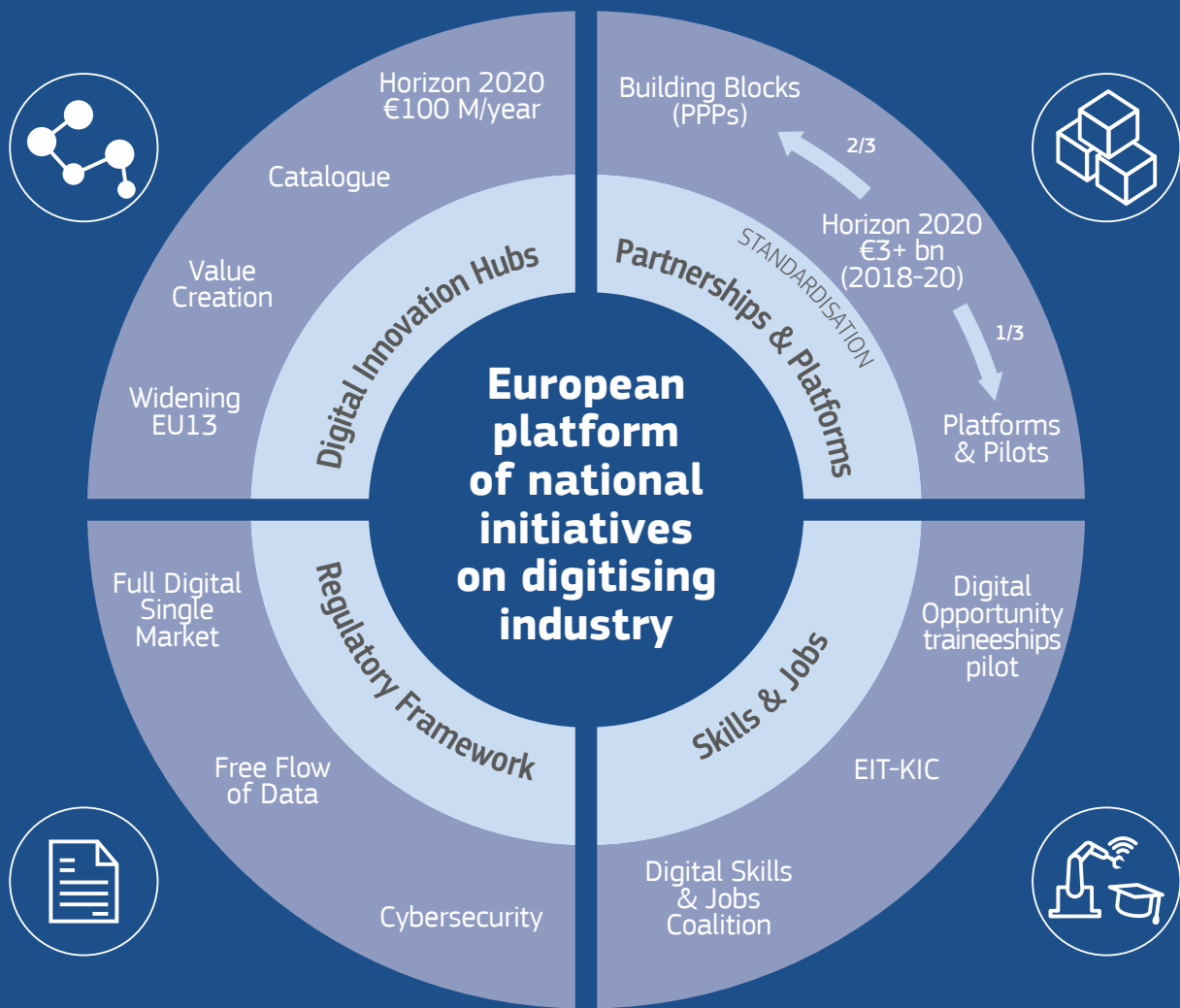
The Action Plan focuses on initial education and training systems (including schools, vocational education and training (VET) and higher education) and has three priorities:

- Making better use of digital technology for teaching and learning;
- Developing the digital competences and skills needed for living and working in an age of digital transformation; and
- Improving education through better data analysis and foresight.

Actions include supporting schools with high-speed broadband connections, scaling up a new self-assessment tool for schools on the use of technology for teaching and learning (SELFIE), bringing coding classes to all schools in Europe, including by increasing participation in EU Code Week, and launching a public awareness campaign on online safety, media literacy and cyber hygiene.

The Action Plan outlines European initiatives that the Commission, in partnership with Member States, stakeholders and society, will implement by the end of 2020.

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THE DIGITISING EUROPEAN INDUSTRY STRATEGY AT A GLANCE

European platform of national initiatives on digitising industry

Digital Innovation Hubs
- Horizon 2020 €100 M/year
- Catalogue
- Value Creation
- Widening EU13

Partnerships & Platforms
- Building Blocks (PPPs)
- 2/3
- STANDARDISATION
- Horizon 2020 €3+ bn (2018-20)
- 1/3
- Platforms & Pilots

Regulatory Framework
- Full Digital Single Market
- Free Flow of Data
- Cybersecurity

Skills & Jobs
- Digital Opportunity traineeships pilot
- EIT-KIC
- Digital Skills & Jobs Coalition

@DigIndEU #DigitiseEU
@DSMeu

bit.ly/DigitiseEUpillars
bit.ly/futuriumdei

FURTHER READING

Digital Innovation Hubs

- Report of the Working Group on Digital Innovation Hubs:

Digital Industrial Platforms

- Report of the Working Group on Digital Industrial Platforms

Partnerships

- Interim Evaluation of the ECSEL Joint Undertaking (2014-2016) Operating under Horizon 2020, June 2017

- Mid-term review of the contractual Public Private Partnerships (cPPPs) under Horizon 2020, September 2017

- Fab-Lab-App report of the high-level group on maximising the impact of EU Research & Innovation Programmes, July 2017

ICT Standardisation

- Report of workshop «Standardisation to support Digitising European Industry», October 2017

Skills and jobs

- Digital Skills and Jobs Coalition

- Digital Opportunity Traineeships Pilot

Regulatory framework and Digital Single Market

- Mid-term review of the Digital Single Market, May 2017

- Cybersecurity package, September 2017

- Free flow of non-personal data, September 2017

Strategies and Initiatives for digitising industry

- Digitising European Industry initiative (COM(2016)180)

- Launch of the European Platform of national initiatives at the Digital Day in Rome, March 2017

- Report of the high-level governance meeting of the European Platform of national initiatives, 21 November 2017

- Report of the preparatory workshop for the high-level meeting, 27 June 2017

- Analysis of national initiatives on digitising industry

- Investing in a smart, innovative and sustainable industry: A renewed EU Industrial Policy Strategy

- Italian-Franco-German action plan