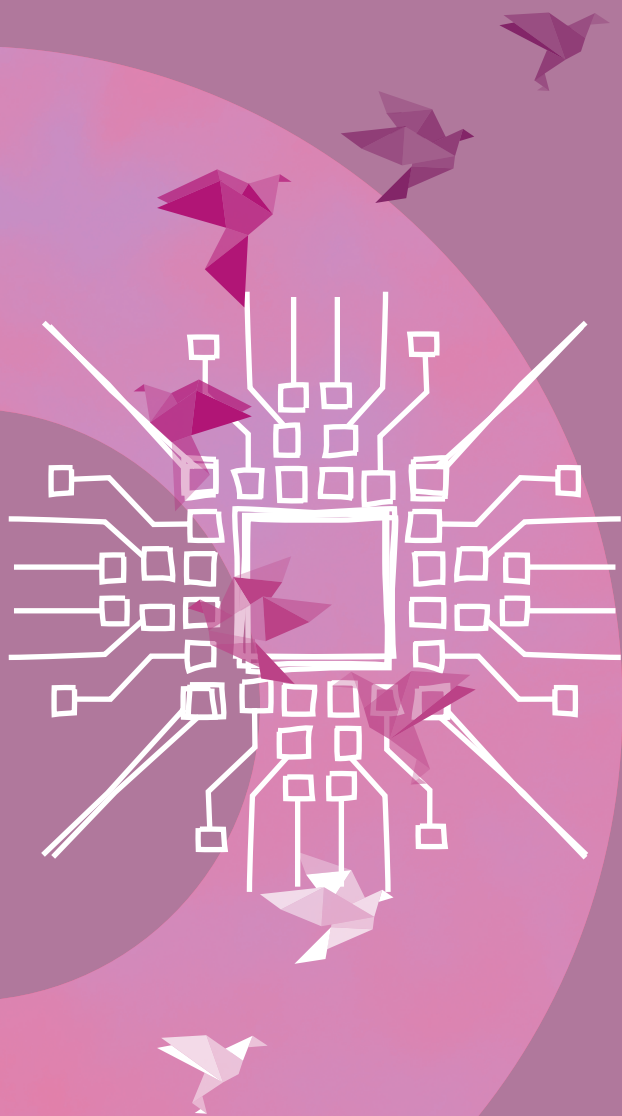




European
Commission



DIGITISATION RESEARCH AND INNOVATION

Transforming
European industry
and services



Research and
Innovation

DIGITISATION RESEARCH AND INNOVATION - Transforming European industry and services

European Commission

Directorate-General for Research and Innovation
Directorate A – Policy Development and Coordination
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FOREWORD



Andrus Ansip Carlos Moedas Mariya Gabriel

Digital technologies have developed tremendously in recent years, helping to improve people's daily lives in a myriad of simple, accessible and affordable ways. They have proved instrumental in stimulating innovation across society and all sectors of the economy, including industry. To support this push to digitisation and make sure Europe continues on the path of technological progress, we need to invest further in scientific research and innovation (R&I).

The EU supports and prioritises top-quality scientific R&I and will continue investing to build a Digital Single Market in Europe and to implement the strategy for Digitising European Industry (DEI).

To keep up with the fast-moving world of technology, especially for strategic cross-cutting areas that can shape the future digital economy, public investment should be matched with investment from the private sector. This is why we set up a series of public-private partnerships (PPPs) in cybersecurity, high-performance computing, 5G infrastructures, photonics, big data, electronic

components and systems, and robotics. These PPPs bring together European industry, researchers, academics and the European Commission to cooperate in R&I.

The European Commission allocated EUR 3 billion for 2016 and 2017 for activities related to information and communication technologies across all parts of the Horizon 2020 R&I programme. This is a solid political and financial commitment to keeping Europe as the home of scientific excellence. More than EUR 6 billion will be earmarked for digital R&I in the programme's last phase (2018-20), of which EUR 1.7 billion will be allocated to the Digitisation Focus Area.

The Digitisation Focus Area will support digitisation in an integrated way, linking the industrial leadership pillar with societal challenges. It intends to provide common technological developments and standards that will support platforms and applications across sectors, making sure that European industries and businesses are well positioned to make the most of the opportunities offered by the digital age. It will be a welcome extra element in the EU's strategy to

cultivate and develop the next generation of companies in the fields of big data, the Internet of Things, content, artificial intelligence and robotics, and to tackle major socio-economic challenges such as the decarbonisation of energy and transport as well as the modernisation of our health and care systems.

Most importantly, it provides the high level of ambition Europe needs to build a real digital society and economy – for the benefit of all.

*Andrus Ansip,
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*Mariya Gabriel,
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INTRODUCTION

Actions to achieve digitisation

Research and innovation ensure that Europe continues to lead in key digital technologies and their use across value chains and industrial platforms. R&I also ensure Europe produces world-class science and technology, removes barriers to innovation and fosters valuable cooperation between the public and private sectors. R&I enable Europe to deliver solutions to the challenges facing society and its future. Digitisation plays a key role in tackling these challenges.

It is estimated that the digitisation of goods and services will contribute EUR 110 billion in annual revenue for European industry for at least the next five years. Digitisation is also expected to stimulate a substantial increase in European productivity growth.

This in turn is expected to boost economic growth, competitiveness and employment. The information and communication technologies (ICT) sector already represents almost 5 % of the European economy. About 16 % of the total business expenditure in research and development originates from Europe's information and technologies sector. Investments in ICT account for a half of all European productivity growth.

Looking at a breakdown of digitisation by sector, its potential becomes even clearer – not only in terms of growth, but in improving the lives of EU citizens. More than a quarter of the increase in value added in the automotive sector already comes from digital innovations in design, improving safety and efficiency.

Over the next five years it has been estimated that around EUR 500 billion could be saved by more extensive big data use in healthcare systems. This would help to prevent the spread of disease and save more lives on a global scale.

Beyond healthcare and cars, there are many other areas where the potential value added, cost-savings, and efficiency improvements resulting from digitisation are evident. Sustainable transport networks are already benefitting from smarter digital systems, while digitalisation is already providing radically improving resource and energy efficiency in our energy and agriculture sectors.

Digitisation, when driven by demand, has a strong transformative potential which could be of benefit to society as a whole. However, digitisation will also change how our working environments and societies function. We have a responsibility to ensure that the digital revolution takes place in a synergetic way.

With this in mind, the Commission issued a Communication in April 2016 complementing the EU's Digital Single Market Strategy adopted a year earlier. It identifies key technological areas for support. It also identifies the need to foster the uptake of digital technology and innovations while simultaneously ensuring synergies with other key enabling technologies (KETs).

This has become the focus of the 2018-20 which groups digitisation and related transformation by promoting reinforced digital coordination, knowledge transfer and common standards. These will support cross-sectoral platforms and applications. The Work Programme aims to reach out to EU countries and regions to enable economies of scale and foster the emergence of user-driven innovative solutions, products and services.

By proposing concrete actions on digital innovation hubs and large-scale pilots for experimentation, the Commission is aiming to ensure Europe's leadership in a competitive world with a rapid pace of change in digital technologies.

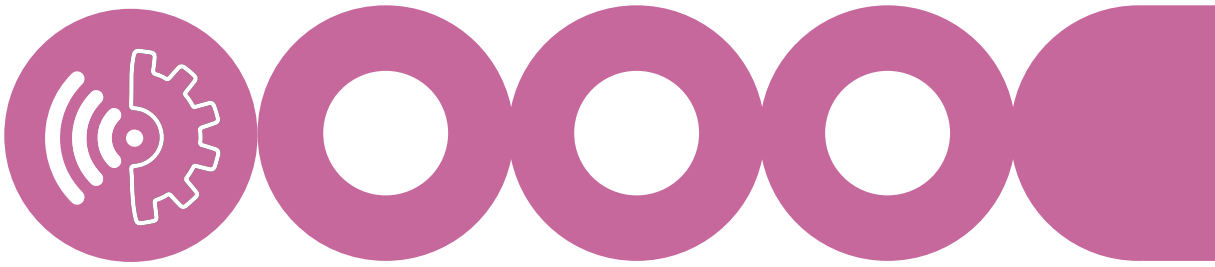
Innovation hubs will deliver facilities to industrial stakeholders, and SMEs in particular, to experiment with and test new and innovative ideas and key digital technologies before investing. They will facilitate access to the latest digital technology and accompanying materials, contributing to upscaling and widespread technology transfer. In turn, pilots and demonstrators could help to foster digital transformations in service sectors such as health and care, agriculture and transport, as well as pioneering sectors like satellite and space data.

To ensure all this potential is exploited across all sectors and society as a whole, Horizon 2020 started funding as of 2014, research and innovation projects spanning key digital technologies to their integration in value chains across the whole economy.

These include manufacturing and micro and nano-electronics, health and care, and transport. In the Work Programme 2018-2020, the EU has earmarked its R&I investments. The Digitising European Industry initiative has featured as a key priority in the Horizon 2020 Work Programmes since 2016 and in 2018-20.

As mentioned in the Digital Single Market mid-term review Communication, EUR 500 million has now been allocated for digital innovation hubs at EU level through the last two Horizon 2020 Work Programmes. Digital innovation hubs are essential to support local start-ups and innovation, and for investment in key technologies and their integration along the value chains with pilot lines and test beds. By acting as the linchpin for national initiatives, the Commission's approach is focused on activities that offer clear added value for Member States and regions.

This focus area builds on the results of previously funded projects, including those mentioned in this booklet.



In recent years, Europe's manufacturing industry has been central to its economic recovery, creating growth and jobs and boosting competitiveness. This is largely due to advances in the field of micro- and nano-electronics, which are responsible for the majority of innovations and productivity improvements in manufacturing.

The digital content of many new and innovative products is growing. This in turn is impacting their design and manufacturing. The manufacturing process benefits from digitisation, thanks to greater automation and flexibility. By 'going digital', industry can also increase productivity and efficiency across all sectors, reduce energy and resource use and waste generation, and facilitate more customised and diversified product portfolios.

Micro- and nano-electronics are KETs. These technologies promote innovation, higher productivity and add smartness in products, services and manufacturing processes. EU investments in micro- and nano-electronics research projects have contributed to progress in miniaturisation and improved functionality at affordable costs. This has led to the production of more efficient electrical cars, smart textiles, revolutionary health devices and many more successes in the field.

“By ‘going digital’, industry can increase productivity and efficiency, reduce energy and resource use as well as waste, and enable more customised and diversified product portfolios.”

To safeguard and promote Europe's leading position in this sector, the EU has proposed a number of short- and mid-term actions. These are being implemented in close cooperation with the Electronic Components and Systems for European Leadership joint undertaking (ECSEL JU).

Objectives include boosting innovation capacities; supporting industry-driven initiatives in nanotechnologies and new materials; promoting private investment to digitise industry; and strengthening ties between KETs and societal challenges.

Micro- and nano-electronics technologies innovating European manufacturing



LOCOBOT

LOCOBOT has developed a toolkit for low-cost robots to help industry make the expected transition to electric cars. The project's reconfigurable robotic assistants aim to increase productivity on the assembly line, thereby reducing costs and resources. These robots are able to adapt to the new and varied production processes demanded by electric-car manufacturing.

WEB: www.locobot.eu

COORDINATOR: PROFACTOR, Austria

TOTAL COST: EUR 5 323 426

EC CONTRIBUTION: EUR 3 740 000

START/END: August 2010 to July 2013

OTHER COUNTRIES: United Kingdom, Germany, Italy, Finland

CAPP-4-SMEs

CAPP-4-SMEs matches business planning and product design with an innovative method of machining – the process of cutting raw materials into a shape. This is accompanied by an online planning system that collects real-time information on the availability of machines, available cutters and tools, as well as giving guidance on design.

WEB: www.capp-4-smes.eu

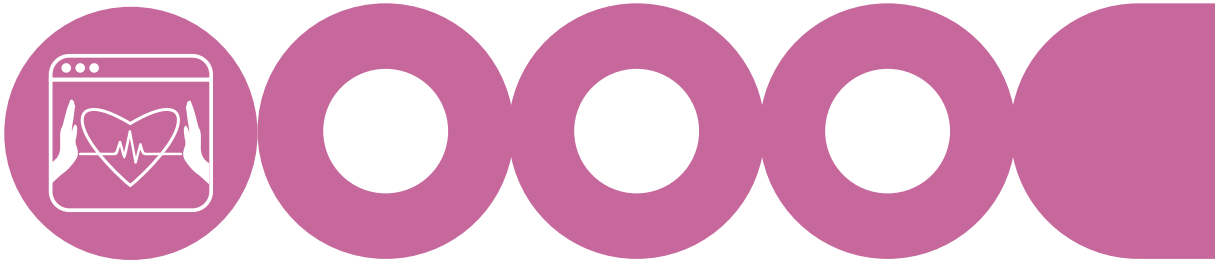
COORDINATOR: Kungliga Tekniska Hoegskolan, Sweden

TOTAL COST: EUR 4 969 112

EC CONTRIBUTION: EUR 3 497 957

START/END: December 2012 to November 2015

OTHER COUNTRIES: Germany, Greece, Spain, United Kingdom



The increasing cost of public health systems in Europe denotes an urgent need for new health-care models. Health and care systems must shift the focus from treatment and cure to prediction and prevention with the support of big data. However, to ensure adequate uptake and use of advanced medical data sets in health-care systems, digital technology is necessary to make a bridge between data and scientific theory.

More support is required for developing such digital tools to fully address end-user needs – whether they are citizens, patients or clinicians. In this context, the EU is planning several short- and mid-term actions to integrate data and KETs into current health-care systems.

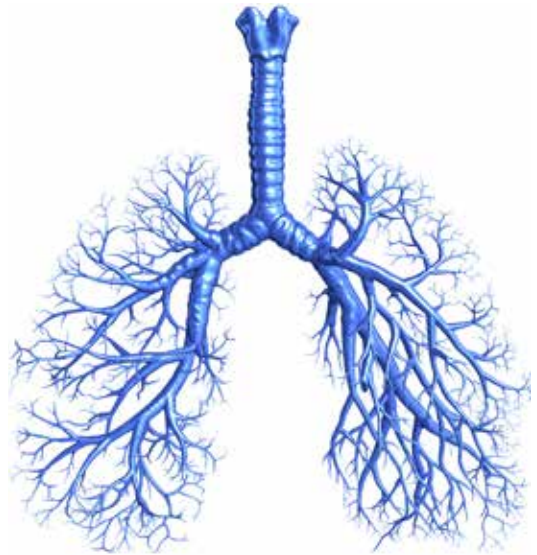
“Health and care systems must shift their focus from treatment and cure to prediction and prevention with the support of big data.”

Such actions include setting up the Consortium on Personalised Medicine to tackle challenges relating to this integration; supporting the Innovative Medicine Initiative in collaboration with the pharma and diagnostics industries; creating an inventory of Smart Specialisation Strategies in medicine/health; and strengthening collaboration between health-related research infrastructures.

The EU also funds the Human Brain Project (HBP). HBP aims to build a world-class IT research infrastructure for neurosciences, brain medicine and future computing. It will allow scientific and industrial researchers to advance our knowledge in the fields of neuroscience, computing and brain-related medicine. The HBP Medical Informatics Platform focuses in particular on the medical field, defining the biological signatures of diseases and developing infrastructure and tools to enable the data on brain diseases to be shared. This Platform will act as a bridge between researchers, epidemiologists and clinicians, adding fundamental knowledge about brain activity and brain diseases with the aim of improving clinical outcomes in parallel with therapeutic advances. This could potentially deliver huge benefits for the European citizens.

Looking further ahead, the EU is considering a potential global agreement on the standardisation, sharing and harmonisation of health-related data. EU leadership in the use of such data to ensure better outcomes could improve care and medicine not just in Europe, but worldwide.

INTEGRATING HEALTH-RELATED DATA INTO PATIENT TREATMENT AND CARE



INSULCLOCK

INSULCLOCK offers a solution to help diabetics and their caregivers to self-manage their disease by integrating smart electronic devices and wearable technologies within their treatments. The project has created new demand both from patients already using insulin pens, as well as from those who were avoiding using them because of reliability concerns.

WEB: www.insulclock.com

COORDINATOR: INSULCLOUD, Spain

TOTAL COST: EUR 71 429

EC CONTRIBUTION: EUR 50 000

START/END: June 2015 to October 2015

OTHER COUNTRIES: N/A

MYAIRCOACH

MyAirCoach is using new approaches, including analysis, modelling and sensing of both physiological and environmental factors, to the customised and predictive self-management of asthma. It will provide patients suffering from the lifelong, chronic and inflammatory disease with a greater understanding and better control of their illness.

WEB: www.myaircoach.eu

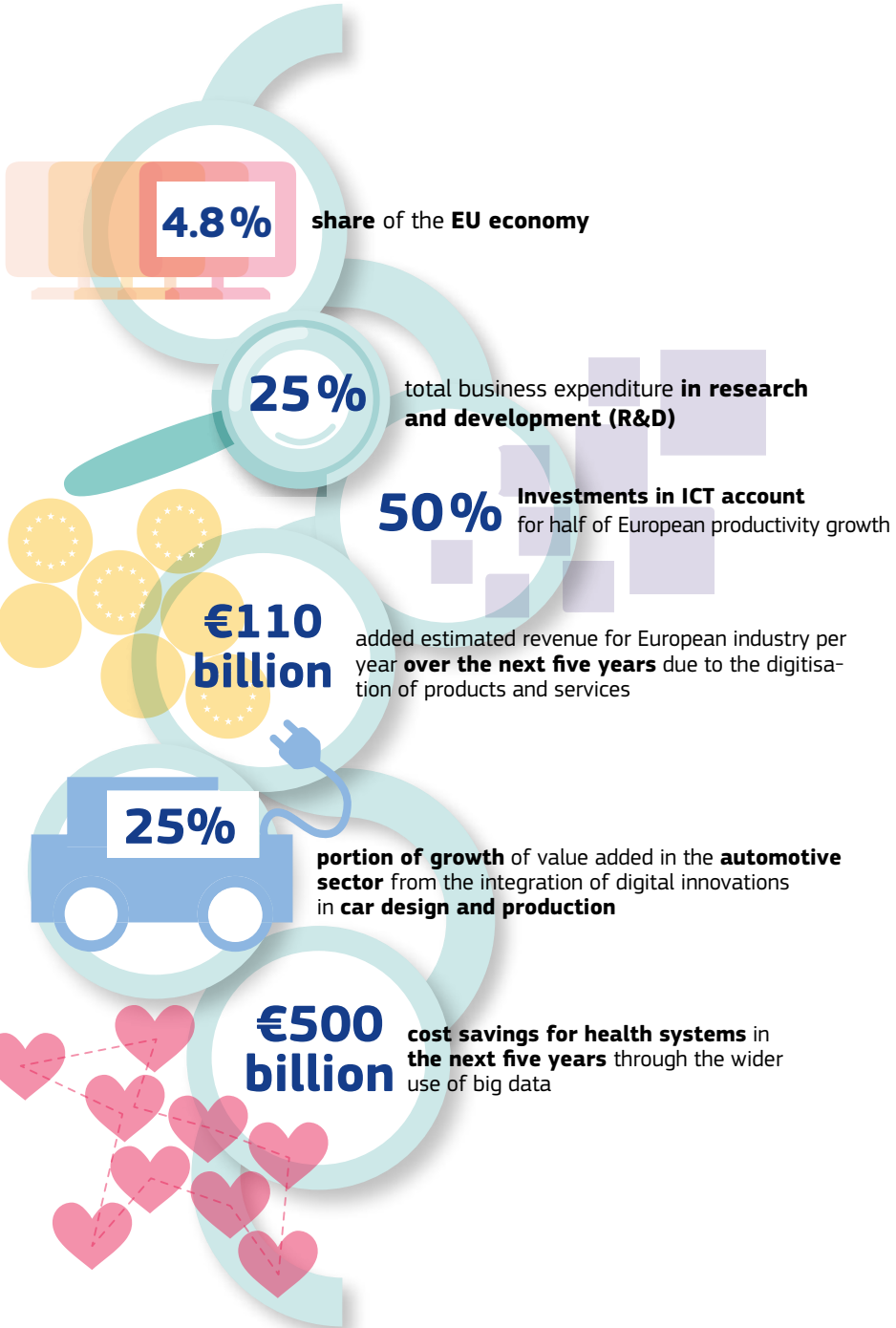
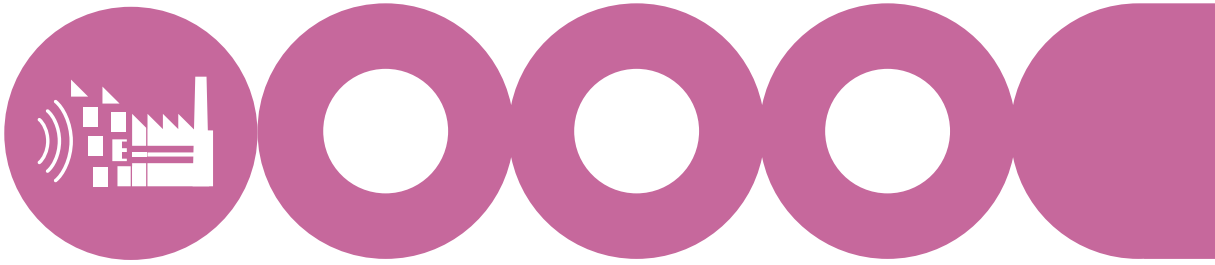
COORDINATOR: Ethniko Kentro Erevnas Kai Technologikis Anaptyxis, Greece

TOTAL COST: EUR 4 581 378

EC CONTRIBUTION: EUR 4 581 378

START/END: January 2015 to December 2017

OTHER COUNTRIES: Belgium, Netherlands, Germany, Sweden, United Kingdom



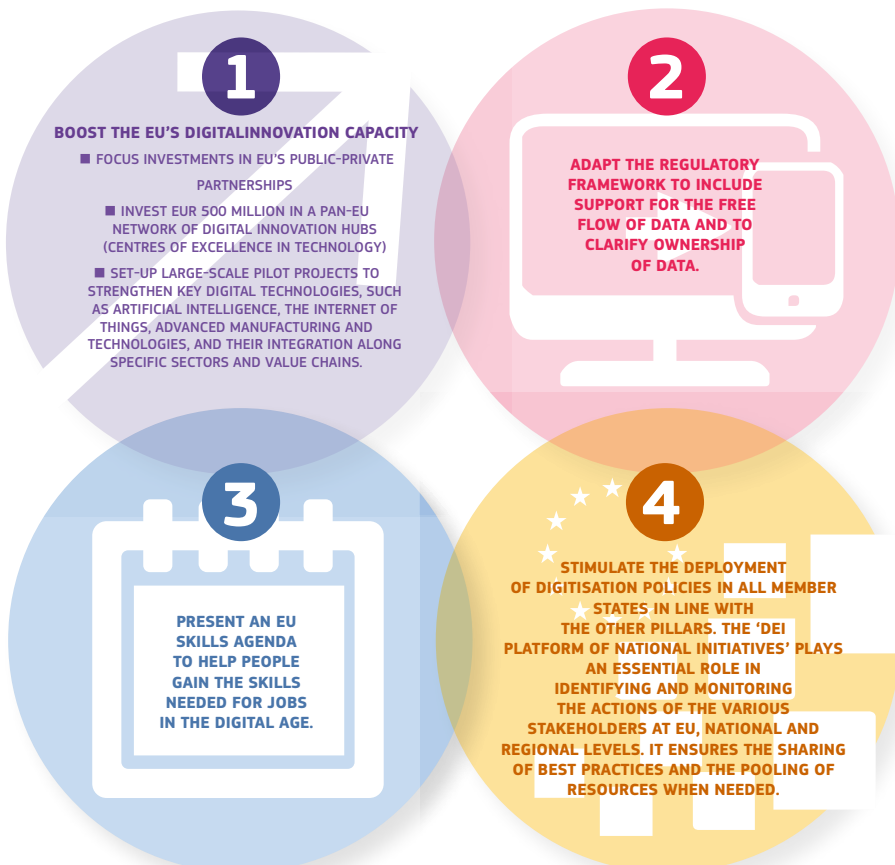
THE DIGITISATION OF INDUSTRY

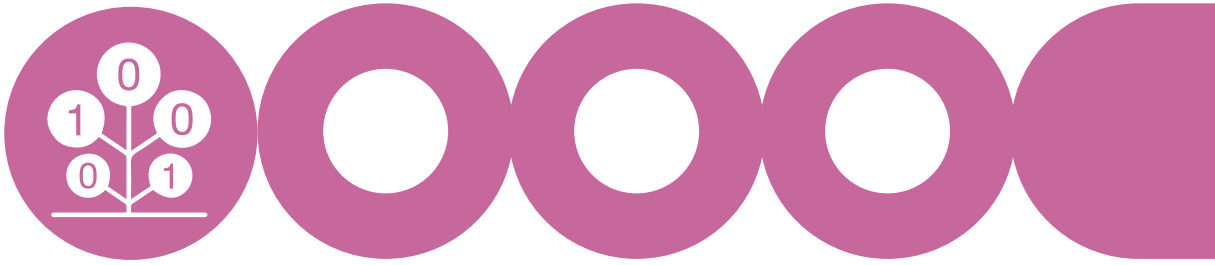
INFORMATION AND COMMUNICATION TECHNOLOGIES SECTOR

Blueprint for digitisation

The Digitising European Industry (DEI) initiative aims to reinforce the EU's competitiveness in digital technologies and ensure that every business in Europe of any size, in any sector, and wherever situated, can fully benefit from digital innovations to create higher-value products, improve its processes and adapt its business models.

DEI is part of the pillar on "maximising the growth potential of the digital economy" of the Digital Single Market strategy. This provides a coherent framework of actions for taking the digitisation of Europe's economy forward. The initiative, endorsed by the European Council and the European Parliament, is structured around four main pillars.





By 2030, the world will need to produce an estimated 50 % more food and energy and 30 % more fresh water. This will require a radical shift towards more sustainable production in industry, agriculture and fisheries.

Digitisation can enable the sustainable production, use and recycling of food and biomass. Digital tools can achieve a more optimal use of raw materials and waste streams. Integrated data systems can also help industry substitute fossil-based energy and products with renewable energy and bio-based products.

Sensor and data technology and observation services in agriculture and forestry can improve resource efficiency, lower the risk of production losses, increase output and reduce price volatility.

In addition, smart manufacturing and logistics in food processing and retail are helping to cut food waste while improving food safety. Similarly, enhanced ocean-observation systems can help us to monitor, understand and manage our marine resources better.

Digitisation is also helping to integrate data on consumer behaviour and citizens' needs with research on nutrition, health and well-being. This integra-

tion is delivering smart tools for personalised and tailored advice on nutrition and health, leading to sustainable and healthy diets.

EU actions to promote digitisation in the bioeconomy include Horizon 2020 investments in digital-physical infrastructures. These include a large-scale 'Smart Farming and Food Security' pilot and the Earth Observation Services monitoring farming across Africa. Earth Observation technologies also focus on monitoring oceans and climate change, including mapping marine resources, pollution and potential threats to food security.

“Digitisation can enable the sustainable production, use and recycling of food and biomass.”

These actions, among others, aim to support improved performance and cross-linkages in bio-economy value chains, leading to more sustainable food and energy production systems in Europe.

SENSOR, DATA AND OBSERVATION TECHNOLOGY FOR BETTER RESOURCE EFFICIENCY



CO-RESYF

The Co-ReSyF project aims to facilitate the research community's access to Earth Observation data and pre-processing tools. This will be an important step towards supporting and monitoring economic and social activities in coastal waters. Such activities include fisheries, harbour operations, ship-traffic monitoring and oil-spill detection.

WEB: www.co-resyf.eu

COORDINATOR: Deimos Engenharia S.A.

TOTAL COST: EUR 2 999 901

EC CONTRIBUTION: EUR 2 999 901

START/END: January 2016 to December 2018

OTHER COUNTRIES: Portugal, Ireland, Italy, United Kingdom

IOF2020

IoF2020 aims to accelerate the adoption of the Internet of Things (IoT) for securing sufficient, safe and healthy food. It also aims to strengthen the competitiveness and sustainability of farming and food chains in Europe. It will consolidate Europe's leading position in the global IoT industry by fostering a symbiotic ecosystem of farmers, food industry, technology providers and research institutes.

WEB: www.iof2020.eu

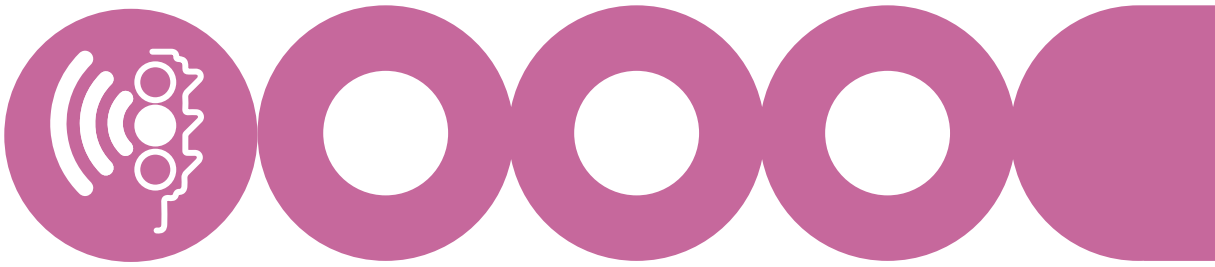
COORDINATOR: Wageningen UR, Netherlands

TOTAL COST: EUR 34 713 063

EC CONTRIBUTION: EUR 29 999 528

START/END: January 2017 to December 2020

OTHER COUNTRIES: Germany, Serbia, Belgium, Spain, Sweden, Greece, Italy, Portugal, Czech Republic, United Kingdom, France, Austria, Denmark, Norway, South Korea



Human error is implicated in 95 % of all traffic accidents on Europe's roads each year, causing over 30 000 deaths and 1.5 million casualties. In addition, road transport is responsible for a quarter of all EU energy consumption and a fifth of its CO₂ emissions. Solutions are needed to create a safer, more efficient, and less-congested road transport network.

eSafety 'smart' technologies based on the powers of computing and telecoms can make a major contribution.

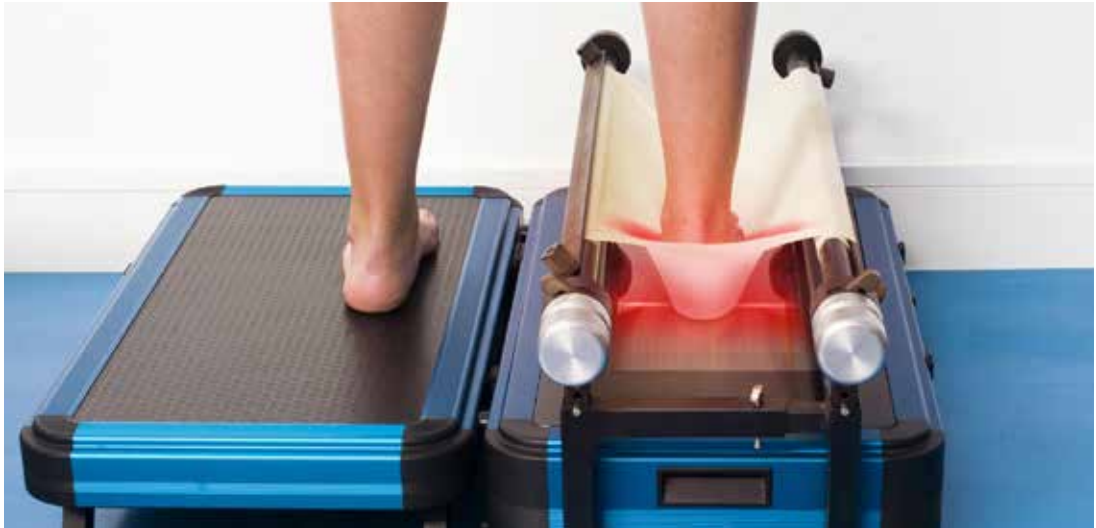
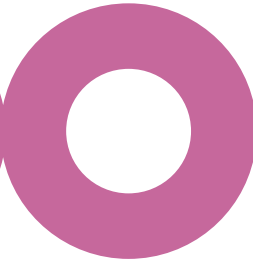
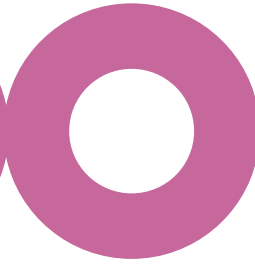
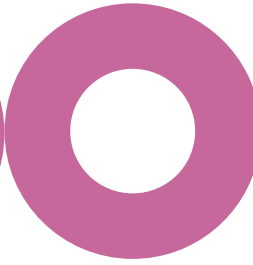
Fortunately, digital technologies are making a considerable contribution to producing vehicles, aircraft and infrastructure which are safer, more efficient and easier to operate. Internet-based digital applications are transforming business models, moving towards shared travel solutions and 'mobility as a service'.

Connected and automated cars provide an exemplary case of the transformative potential of digitisation. They are making drivers and pedestrians safer while enabling innovative services in brand new areas of mobility on demand, entertainment

“Digital technologies are making a considerable contribution to producing vehicles, aircraft and infrastructure which are safer, more efficient and easier to operate.”

and commerce. The integration of future digital developments – such as progress in artificial intelligence and big data – are expected to achieve even higher levels of safety and performance from highly automated vehicles.

The EU has allocated a budget of over EUR 6 billion to the 'Transport Challenge' initiative (2014-2020). Part of this budget will be used to develop digital tools for a transport system that is resource-efficient, climate- and environmentally friendly, safe and seamless. These changes will boost the competitiveness of European transport industries for the benefit of citizens, the economy and society.



Only one in five companies in the EU is highly digitised today. This suggests that the other 80% require more help, incentives and support to undergo the digital transformation that is available to them. In particular, many companies need help with identifying and accessing innovative digital technologies, as well as securing financing for digitisation.

Digital Innovation Hubs (DIHs) have been conceived to help SMEs to achieve their digital transformation potential. DIHs aim to foster faster adoption by companies of the latest digital technologies in a number of ways. They provide businesses – whether start-ups, SMEs or mid-caps – with access to digital technology and competences, as well as facilities to experiment and test digital innovations with.

DIHs also provide targeted innovation support and tailored financing advice to SMEs. They connect industry with research centres, bridging the gap

between research and theory and industrial practice and implementation. DIH networks also offer SMEs and other businesses opportunities for collaboration.

The European Commission has made a strong commitment to establishing more DIHs through a EUR 500 million budget from 2016 to 2020.

Funding aims to reinforce the capacities of and networks between digital competences centres to ensure that the latest technologies are available to SMEs in all sectors and regions. The target is to ensure hubs are available in all regions by 2020 and are accessible at a reasonable distance to any company.

The EU's investment will also be used to leverage an additional EUR 5 billion in investments from Member States, regions and industry based on the encouraging results that DIHs have produced so far. Member States and regions can provide significant bottom-up investments to innovation hubs through

BOOSTING EU INNOVATION CAPACITY: DIGITAL INNOVATION HUBS (DIHs)

national or regional funding channels or the European Structural and Investment Funds (ESIF).

ESIF offers a number of earmarked – but under-used – supports specifically for digital and innovation infrastructure. Private investment is also essential and should go beyond simply funding testing and experimentation to allow the full integration of innovations in products, processes and services.

The development of DIH networks – including communication channels, knowledge transfer and collaboration between them – is also a key priority for the EU. DIH networks support highly innovative digital transformation experiments that require cross-border collaboration, bringing projects to life which would otherwise never have started.

Recently, the European Institute of Innovation and Technology (EIT) Digital has been bolstering the work of DIHs by reinforcing and empowering the networks with additional nodes and co-location centres. These will further improve outreach to

SMEs and academia while strengthening the skill-development dimension of the networks.

In 2016-17, the EU supported 150 DIHs. Half of the hubs were involved for the first time. These 150 hubs are already supporting 600 innovation experiments and 1200 start-ups, SMEs and mid-caps in their digital transformation.

These figures are set to grow, with EUR 300 million earmarked in the Horizon 2020 Work Programme 2018-2020 for the reinforcement of this bottom-up and demand-driven wave of digital innovation across the EU. The resulting digital innovations will benefit EU citizens' by improving the quality of life while also contributing to job creation, growth and competitiveness.

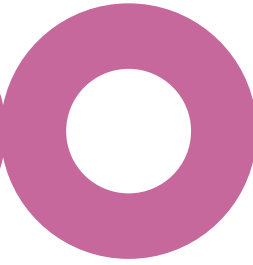
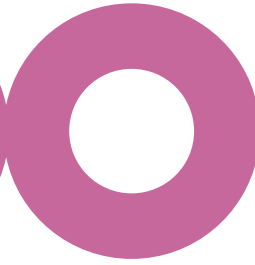
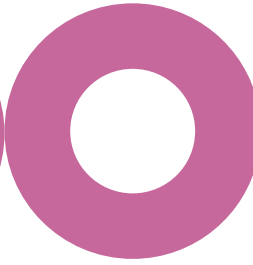
Three SMEs from across Europe have been chosen to showcase the growth potential offered by DIHs and how funding can help. The following companies have all received funding through either the European initiative for Smart Anything Everywhere (SAE) or ICT Innovation for Manufacturing SMEs (I4MS).

How companies benefit from DIHs

PODOACTIVA

Podoactiva is a Spanish biotechnology SME specialised in podiatry and biomechanics. The SME wanted to accomplish the mass customisation of tailored insoles to be inserted into any footwear. With support from the Spanish IT provider INGECON, Podoactiva was able to gain access to pay-per-use high performance computing capabilities to help it achieve its objective.

Thanks to this collaboration, the podiatry SME was able to successfully develop a fully automated '3D Scan Insole Designer' which facilitated the design process of the insole while enabling additional benefits for consumers in the form of a perfectly fitting product.



KOENIGSEGG

KOENIGSEGG, a Swedish SME, is a leading designer and manufacturer of high-performance sports cars. KOENIGSEGG set itself the task of developing the world's first 'megacar' able to reach ground-breaking maximum speeds of 440 km/h. Previously, the aerodynamics involved posed challenges which could not be overcome with only the resources available to a typical SME. However, a DIH network gave KOENIGSEGG the opportunity to use design and simulation software provided by a German company on an Italian company's (CINECA) high-performance computing system.

This collaboration enabled KOENIGSEGG to save 10% of its operational costs, 30% of design costs, 60% in prototyping and 50% in physical testing. The EU made this experiment possible with an initial EUR 120 000 investment. KOENIGSEGG's revenue is estimated to increase by EUR 4 million over the next five years.



BOOSTING EU INNOVATION CAPACITY: DIGITAL INNOVATION HUBS (DIHs)



WEST IT

West IT is a Dutch SME which provides IT solutions in traffic management systems (TMS). It aims to develop collaborative and distributed control architectures to allow these to engage in automated negotiation processes. With support from Newcastle University (UK) and Aarhus University (DK), open source technology and software for modelling and analysing cyber-physical systems were used to synchronise different TMS. West IT was therefore able to produce large amounts of numerical data from traffic simulations to be processed and presented to non-experts.

Having since expanded their existing business beyond the TMS area to the collaborative TMS market, West IT now expects to increase its revenue by EUR 1.5 million over the next five years. Breaking into the new collaborative market also led to new opportunities for West IT involving hubs such as stadiums, harbours and airports which were not previously commonly associated with traffic management.

The EU made this experiment possible with an initial EUR 100 000 investment which has since had a positive spillover effect of such digital innovations, transformation and networking into new areas and markets.

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Digital technologies have proved instrumental in stimulating innovation across society and all sectors of the economy, including industry. To support this push to digitisation and make sure Europe continues on the path of technological progress, we need to invest further in research and innovation. For this reason, around EUR 1.7 billion will be allocated to the Digitisation Focus Area in the next Horizon 2020 Work Programme - the European Union's research and innovation funding programme. The Digitisation Focus Area will support digitisation in an integrated way, linking the industrial leadership pillar with societal challenges. It intends to provide common technological developments and standards that will support platforms and applications across sectors, making sure that European industries and businesses are well positioned to make the most of the opportunities offered by the digital age.

Research and Innovation policy

