

STUDY

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# Research for REGI Committee - Digital Agenda and Cohesion Policy

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Volume I



Policy Department for Structural and Cohesion Policies  
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# Research for REGI Committee - Digital Agenda and Cohesion Policy

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## Volume I

### **Abstract**

This study provides a critical analysis of the contribution of Cohesion Policy and the European Structural Investment Funds to the Digital Agenda for Europe and the Digital Single Market. Based on the analysis of past and current patterns of ESIF digital investments and selected case studies, this study shows that Cohesion Policy should concentrate where its added value is highest, i.e., on support to the formulation of effective regional digital strategies and on the promotion of partnerships between relevant stakeholders, at regional level and beyond.

This document was requested by the European Parliament's Committee on REGI.

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## LIST OF ABBREVIATIONS

<b>CEF</b>	Connecting Europe Facility
<b>CF</b>	Cohesion Fund
<b>CIP</b>	Competitiveness and Innovation Framework Programme
<b>CP</b>	Cohesion Policy
<b>COSME</b>	EU programme for the Competitiveness of Enterprises and Small and Medium-sized Enterprises
<b>ICT</b>	Information and communication technology
<b>DAE</b>	Digital Agenda for Europe
<b>DEI</b>	Digitising European Industry
<b>DESI</b>	Digital Economy and Society Index
<b>DG</b>	Directorate-General of the European Commission
<b>DG CLIMA</b>	Directorate-General for Climate Action
<b>DG CNECT / DG CONNECT</b>	Directorate-General for Communications Networks, Content and Technology
<b>DG DEVCO</b>	Directorate-General for International Cooperation and Development
<b>DG EMPL</b>	Directorate-General for Employment, Social Affairs and Inclusion
<b>DG ENER</b>	Directorate-General for Energy
<b>DG MARE</b>	Directorate-General for Maritime Affairs and Fisheries
<b>DG MOVE</b>	Directorate-General for Mobility and Transport
<b>DG REGIO</b>	European Commission's Directorate-General for Regional and Urban Policy
<b>DG RTD</b>	Directorate-General for Research and Innovation (European Commission)
<b>DIH</b>	Digital Innovation Hubs
<b>DSM</b>	Digital Single Market
<b>EAFRD</b>	European Agricultural Fund for Rural Development
<b>EASME</b>	Executive Agency for Small and Medium-sized Enterprises
<b>EC</b>	European Commission
<b>ECA</b>	European Court of Auditors
<b>EMFF</b>	European Maritime and Fisheries Fund

<b>ERDF</b>	European Regional Development Fund
<b>EFSI</b>	European Fund for Strategic Investments
<b>EIB</b>	European Investment Bank
<b>EIF</b>	European Investment Fund
<b>ESIF</b>	European Structural and Investment Funds
<b>ESF</b>	European Social Fund
<b>eTEN</b>	Programme that supported the deployment of trans-European e-services in the public interest.
<b>EU</b>	European Union
<b>EUR</b>	Euro
<b>EXAC</b>	Ex Ante Conditionality
<b>FP(X)</b>	X <sup>th</sup> Framework Program for Research
<b>GPT</b>	General Purpose Technology
<b>H2020</b>	Horizon 2020
<b>IRISI</b>	Inter Regional Information Society Initiative
<b>IS</b>	Information Society
<b>ISPA</b>	Instrument for Structural Policies for Pre-Accession
<b>JRC</b>	Joint Research Centre
<b>KBE</b>	Knowledge-Based Economy
<b>LSE</b>	London School of Economics
<b>Mbps</b>	Mega Bytes per second
<b>MGI</b>	McKinsey Global Institute
<b>MS</b>	Member State
<b>NACE</b>	<i>Nomenclature Statistique des Activités Economiques dans la Communauté Européenne</i>
<b>NGA</b>	Next Generation Access
<b>NGO</b>	Non-Governmental Organisation
<b>NUTS (1-2-3)</b>	Nomenclature of Territorial Units for Statistics (level 1-2-3)
<b>OECD</b>	Organisation for Economic Co-operation and Development
<b>PPP</b>	Purchasing Power Parity
<b>R&amp;D</b>	Research and Development



<b>RISI</b>	Regional Information Society Initiative
<b>S3</b>	Smart Specialisation Strategy
<b>SESAR</b>	Single European Sky ATM Research
<b>SME</b>	Small and Medium-sized Enterprise
<b>SPD</b>	Single Programme Document
<b>SSL</b>	Solid State Lighting
<b>STAR</b>	Special Telecommunication Action for Regional Development
<b>TELEMATIQUE</b>	Community initiative for regional development concerning services and networks related to data communication, 1991-1993
<b>TEN-ICT</b>	Trans-European Network – ICT
<b>TO</b>	Thematic Objective
<b>US</b>	United States
<b>USD</b>	US Dollar
<b>YEI</b>	Youth Employment Initiative

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## EXECUTIVE SUMMARY

### Objectives and background

The objective of this study is to provide the European Parliament with a critical analysis of the contribution of the European Structural and Investment Funds (ESIF) to the Digital Agenda for Europe and the Digital Single Market (DAE/DSM). This study identifies and assesses specific challenges encountered/lessons learned during policy implementation, and addresses potential policy evolution post 2020. It is based on an analysis of past and current patterns of ESIF digital investments, complemented by six case studies of digital projects funded by ESIF in 2014-2020.

### Main findings

This study shows that, at the root of the EU ICT policy, are **weaknesses in EU digital performance** despite some assets. While it boasts a strong research basis and a rather dynamic start-up ecosystem, the continent as a whole tends to underperform, compared to competitors such as the USA, Japan and South Korea, in terms of advanced ICT infrastructures and uptake of ICT products and services by citizens and enterprises (in particular SMEs). Moreover, **there are different 'digital divides' at play between and within Member States** that yield a fragmented European digital market.

The EC adopted **early measures to deal with this situation** and developed a conceptual framework that remained stable across programming periods despite the fast pace of technological advance. It culminated in the adoption of the DAE and the DSM in 2010 and 2015, respectively. This policy paradigm relies on a **virtuous circle of investments in and usage of digital technologies**, involving stakeholders on both the supply (e.g. ICT infrastructure) and demand sides (e.g. ICT uptake and digital skills), and combining concerns for efficiency and inclusion. Since the very beginning, **Cohesion Policy has been expected to make a substantial contribution to EU digital policy**, because of both its important budgetary envelope and adequate territorial approach to address issues such as the digital divide(s).

In aggregate terms, patterns of ESIF digital investments reflect the holistic approach adopted by the European Commission (EC), i.e. they are diversified across a large range of areas. **Overall, ESIF digital investments in 2014-2020 represent around EUR 21.4 billion.** ESIF investments in ICT infrastructures are one of the leading areas of intervention with EUR 6 billion, followed by digital investments in a number of areas targeting people, such as e-government, digital skills or e-inclusion (around 40% of ESIF investments in the digital economy). Other forms of ICT support such as Smart Cities and Smart Grids have acquired greater importance since the 2007-2013 programming period and represent around 20% of total planned ESIF digital investments in 2014-2020. The share of ESIF addressed to SMEs is relatively low (EUR 2 billion, less than 10%), a feature that may be explained by the existence of alternative sources of funding. In geographical terms, regions in Southern and Eastern Europe allocated the most to digital investments, in line with the overall ESIF distribution.

A complex governance arrangement underlies the contribution of ESIF to the DAE/DSM's objectives. Issues in the governance and delivery system account for possible **missed opportunities hindering ESIF support for the diffusion of digital technologies in some sectors**. For example, the level of priority for ICT infrastructures raises some controversy and the demarcation between ERDF and EAFRD is unclear in this area. There is some uncertainty about who has responsibility for digital skills, and insufficient coordination regarding the use of

ICT to address climate change. Reaping the benefits of synergies with other EU funding instruments, in particular H2020, also remains a challenge.

At local levels, regional authorities often prefer to concentrate ESIF resources for digital investments on a few priorities rather than spreading interventions thin. Field research shows that **the quality of strategic planning is a decisive success factor** for regional digital strategies. The existence and quality of **regional and local partnerships is another critical factor**, which can help deal with the possible shortage of administrative capacity at regional level, among other things. For these reasons, **Smart Specialisation Strategies appear to be a privileged locus where successful digital strategies can be implemented** as they extend the regional and local partnerships and allow for a better alignment of digital priorities with overall regional ones. They are also a way of promoting synergies with H2020 and of engaging SMEs.

Overall, ESIF have specific value added in stimulating partnerships and helping regions to devise good quality strategies. The role of the EC is central in this respect. In particular, the **strength of the contribution of the EC resides in its interactions with regional authorities**. The EC also acts as a 'knowledge broker', establishing exchange platforms with possible partners in other Member States and diffusing information on good practices. The establishment of Digital Innovation Hubs is a promising development in this respect, but some other comparable initiatives sometimes lack visibility and critical mass.

As a final remark, it should be noted that the above findings are based on a specific combination of desk and field research, but that there is no comprehensive evaluation of the contribution of ESIF digital investments to the DAE/DSM's objectives. There are a few sectoral analyses highlighting mixed performances of ICT infrastructures, for example, or the difficulty in reaching SMEs. In general, this study shows how **difficult it is to gather comprehensive updated and reliable evidence on EU interventions in the digital economy and ICT**.

## Recommendations

The findings of the study offer a clear endorsement of the system of shared management and of the territorial approach it enables. In the context of the high priority placed on digitalisation planned in the next Multi Annual Financial Framework, and considering the probable decrease in ESIF budget following Brexit, it is crucial **that Cohesion Policy concentrates its support where it is most effective i.e. in encouraging the adoption of regional digital strategies and steering effective partnerships at regional level – and beyond**. In this respect, relevant regulations should ensure that a large proportion of funding be allocated to digital projects while funding supporting administrative capacity or exchange platforms remains complementary. The European Parliament should ensure this principle is applied.

Smart Specialisation Strategies should become the main reference for regional authorities willing to engage in sound digital strategies. For this, **the system of Ex Ante Conditionalities connected to digital investments could be streamlined**. The current EXAC dealing specifically with digital growth strategies could be replaced by the existing EXAC dealing with the adoption of Smart Specialisation Strategies, on condition that the latter integrate digital priorities. The EXAC dealing with the deployment of broadband would be maintained but it should refer and be strongly linked to the EXAC dealing with Smart Specialisation Strategies.

Smart Specialisation Strategies are also potentially effective in fostering synergies with other EU funding instruments and H2020 in particular. Digital Innovation Hubs are useful instruments in this respect and they could be consolidated or extended, following their assessment.



ESIF should be mobilised to promote digital strategies in areas where the full potential of ESIF contribution has yet to be tapped, e.g., in the area of climate change, rural economy and in sectors covered by the EMFF. For this reason, the **structure of Thematic Objectives could be reviewed to account for the horizontal specificity of digital investments**. TO2 could cover only broadband investments, while 'digitalisation' could become a horizontal priority valid across Thematic Objectives. A system of earmarking could ensure that a minimum proportion of each ESIF takes digitisation objectives into account.

**A sound knowledge basis should underlie policy development in support of digital investments**. Monitoring systems could be improved by including more (specific and core) indicators dedicated to digital performance (e.g. digital skills). Also, expenditures that fall under other categories of expenditure, but which have a digital component, should be 'tagged' correspondingly (on the model of the 'secondary theme' currently used by the ESF).

Finally, there is room to **improve the governance and delivery of ESIF dedicated to the DAE/DSM**. The division of responsibility between DGs and the overall coordination under the supervision of the Vice President in charge of the DSM in the European Commission should be made clearer. A specific demarcation of the competences of ERDF and EAFRD is also necessary with regard to digital infrastructures.



## 1. INTRODUCTION

### 1.1 Study background

The development of digital technologies and of the data economy is seen as a major driver of innovation and growth, capable of triggering radical and deep transformations in both business models and people's lives. It is increasingly considered that such developments have the potential to disrupt current growth trajectories and welfare patterns.

There is wide consensus to underline the fact that despite undeniable strengths in terms of research and manufacturing bases, as well as a skilled workforce, the **levels of digitalisation in Europe are well below their potential**. What is more, ICT-related growth and its potential seem to be unequally distributed throughout the EU, with some countries and regions being particularly efficient at collecting the economic benefits of the digital transformation, while others are having more difficulties. In other words, the EU is characterized by different digital divides within and between Member States yielding a fragmented digital market. This, together with other inherent structural factors, prevents EU Member States from reaping the full potential of the ongoing digital developments.

The EU is a precursor in fostering a fully-fledged digital strategy aimed at helping European countries and regions to catch up with trends in digital technologies. Indeed, the first initiatives in this direction date back to the 1980s and were progressively scaled up to culminate with the **adoption of the Digital Agenda for Europe (DEA) in 2010 and the Digital Single Market (DSM) as of May 2015**. Their aim was to deliver sustainable economic and social benefits stemming from the digital economy.

Since the beginning of the development of an EU digital policy, the expectations placed on the contribution of Cohesion Policy are high. Of course, this is because European Structural and Investment Funds (ESIF) that co-finance Cohesion Policy are a primary funding mechanism in many regions and can reach remote regions or regions particularly at risk of digital exclusion. Also of fundamental importance is the **territorial approach underlying ESIF developments**, which appears to be specifically pertinent in tackling digital evolution.

As a matter of fact, the EU approach to digital policy has always emphasised the holistic dimension of digital development. This is encapsulated in the expressions 'Information Society' and the more recent 'digital transformation': they testify to the intention to go beyond a mere techno-centred approach and address all the different aspects of the 'digitalisation' of the economy and of society. This requires **treating the supply and the demand sides (e.g. digital skills) on a par**, without neglecting social, cultural and other effects – and overall to foster a virtuous circle in which social demand for new technologies stimulates supply and *vice versa*, in a dynamic of growth.

In this context, Cohesion Policy – and ESIF more generally - are natural candidates to push forward the Digital Agenda, and its corollary the Digital Single Market. Their place-based approach makes it possible to tailor strategies to territorial specificities and needs, which represents a clear added value capable of tackling the different dimensions of the digital transformation while fostering commitment to digital development. At the same time, there are specific challenges in terms of local administrative capacity, coordination of regional strategies and knowledge base – and specific issues, such as the question as to whether some investment areas should be prioritised and if yes, on what grounds, where and under what conditions.

### 1.2 Objectives and research questions

In this context, the objective of the present study is to provide the European Parliament with a study offering a critical analysis of the contribution of the ESIF to the DAE/DSM during the

current programming period. This is to follow from a synthetic overview of past interventions of Cohesion Policy in favour of innovation and the Information Society and to pave the way for a critical assessment of the prospects and options for the next programming period post-2020. To achieve this triple objective, the study addresses a number of research questions, as follows.

- Overview of Cohesion Policy's past role and achievements

What contribution have the early schemes in support of the Information Society/ICT made?

What were the patterns and the evolution of ESIF investments in the Information Society/ICT?

What regions and types of investment were involved?

What are the main achievements and lessons learnt from past programming periods?

- Critical analysis of state of play 2014-2020

What are the patterns of ESIF investments – how have they evolved and how do they relate to levels and disparity in digital performances across regions and countries?

What are the implications and impact of the new regulatory arrangements adopted in the current strategic framework (i.e., thematic concentration, ex ante conditionalities, community-led local development, integrated territorial initiatives, sustainable urban development and coordination between ESIF and synergies with other EU instruments)?

Can different types of digitalisation strategies be detected?

Are there mechanisms or factors that account for the success or failure of specific types of intervention?

Is there synergy between ESIF and other policies/funding?

- Critical assessment of possible prospects

What are the prospects related to challenges inherent to the past and current programming periods? And related to contextual opportunities/challenges (e.g. new technological developments, Brexit, new environmental constraints and opportunities related to climate change)?

Finally, specific horizontal issues are addressed such as territorial needs, the role of local and regional authorities, an urban-rural linkages.

### 1.3 Research design and methodology

The topic under investigation poses a number of specific methodological challenges. In particular, the pervasive nature and ubiquity of digital technologies makes it difficult to comprehensively track the many different areas potentially affected by the DAE/DSM and to provide an overall unified (although not uniform) assessment of the specific contribution of ESIF. Other methodological challenges – more traditional in the context of the analysis of Cohesion Policy – stem from the variety of socio-economic and policy contexts throughout Member States and regions making it difficult to generalise the findings, and the imperfect availability of data at regional level. A mix of methodological approaches and tools were combined to deal with these methodological challenges: mobilising documentary review, interviews with selected stakeholders, data analysis and case studies (see methodological Annex for more details).

The report is structured as follows. In this Volume (Volume 1), Chapter 2 lays out the conceptual and strategic framework of the study: it clarifies notions, analyses gaps in ICT performance in the EU, and the intended policy response. Chapter 3 describes first measures and the contribution of ESIF to the DEA / DSM in the past programming periods; it identifies the policy lessons that were inferred from this experience. Chapter 4 accounts for current patterns of ESIF digital investments, while Chapter 5 provides a more qualitative assessment based on case studies and interviews with stakeholders. Chapter 6 concludes and explore prospects in the post-2020 era. Volume 2 presents the six case studies reports.

## 2. THE DIGITAL AGENDA FOR EUROPE AND THE EU ECONOMY – ISSUES AT STAKE

### KEY FINDINGS

- There are **considerable expectations** placed on digital technologies, but also considerable risks. Their rapid development makes it difficult to refer to a clear analytical framework identifying their net effects on employment, and beyond, or their wider impact on the economy and society. This is reflected in a series of terms that tend to be used interchangeably (e.g. ICT, digitalisation/digitisation, data economy, etc.).
- The EU has many assets in order to harness the potential of digital technologies in terms of research basis, but also to identify weaknesses generally related to the uptake of digital technologies. Overall, there is a **persistent gap with the USA**, and the EU economy as a whole is characterised by irregular digital performances – or **digital divides – between and within Member States**.
- The EU started to tackle the issues posed by the development of digital technologies in the 1990s, i.e., relatively early. On this basis it has developed an **articulated policy framework**, culminating with the Digital Agenda for Europe (DAE) and the Digital Single Market (DSM), in which Cohesion Policy figures prominently.
- The advantage of the contribution of Cohesion Policy (and more generally of ESIF) to DAE/DSM is its **territorial dimension**. The regional level is considered to be pertinent to address **local specificities**, establish a **link between top-down and bottom-up initiatives** in the field, and stimulate a **local dynamic of commitment** favouring the adoption of digital technologies.

This chapter lays out the conceptual and strategic framework of the study. It clarifies the notions and expectations placed on ICT and their economic implications. It shows levels and disparities in digital performances at national and regional levels across the EU, and it explains how EU policies (ESIF and DAE/DSM) intend to respond to the identified challenges.

### 2.1 The pervasive role of digital technologies and the ‘digital transformation’: expectations and conditions

The contribution of technological developments – and of digital technologies in particular – to economic growth is a traditionally debated issue.<sup>1</sup> Benefits are expected to be grasped at different levels:

- Macroeconomic (growth, productivity, employment);
- Industry-level (local and regional growth and employment);
- Firm-level (productivity, industrial organisation, process and product innovation);
- Social changes (working, learning, participation in public life, etc.).

These potential benefits come with associated risks and require policy-makers to be cautious about the conditions for minimising them while harnessing their potential. Deep effects are expected in terms of reshaping of business models, the impact on the labour force and the future of work (e.g. net effect on employment, social security and pension schemes etc.).<sup>2</sup>

<sup>1</sup> Following the contributions of economists such as Romer, Lucas, Grossman and Helpman and Aghion and Howitt in the 1990s, numerous studies of economic growth place technological change at the heart of the growth process. For a review, see European Parliament, CSIL, and PPMI (2013), *Internet, Digital Agenda and economic development of European regions*.

<sup>2</sup> Loebbecke and Picot (2015), *Reflections on societal and business model transformation arising from digitization and big data analytics: A research agenda*.

While technologies such as robotics and machine learning may pose a threat to the current levels of employment, other digital technologies may help to create new opportunities and more flexible jobs allowing displaced workers to recoup income as independent workers. This, in turn, raises questions such as dissatisfaction with income variability, lack of benefits associated with traditional work, etc.

A fundamental feature of digital technologies is that **their rate of development is extremely fast, both quantitatively and qualitatively**. Indeed, the evolution of the cost-performance of the three 'core digital technology building blocks' (computing power, storage and bandwidth) follows exponential laws<sup>3</sup> and show no sign of slowing down unlike some past technological breakthrough (e.g. the introduction of electricity). This pace of change has been accompanied by the sequential emergence of several terms and notions that reflect both technological development and the perception of their impacts on the economy and society as a whole. Even though these terms are often used interchangeably in practice (e.g. in business or policy-making), the perspectives they convey provide insights into the evolution of policies. A clear understanding of these terms and notions is, therefore, a requisite for analysing the issues they pose and envisaging the possible policy responses. It is worth taking a chronological perspective and tracing their emergence<sup>4</sup> in order to infer a sense of the importance and the nature of the mutations at work.

### Information and Communication Technologies

Information and Communication Technologies (ICT) are a set of technologies and applications enabling the electronic storage, retrieval, processing and transfer of data to a wide variety of users.<sup>5</sup> Existing definitions of ICT vary; however, they all imply information generation, transmission and the use of an electronic format. The concept of ICT emerged under its modern meaning in academic literature in the 1980s.<sup>6</sup> This concept is thus strongly linked to a **technological approach that can be translated into diverse policy interventions**, such as infrastructure development or the use of these technologies in a particular area (e.g. health, e-skills etc.). This perspective can be explained by the fact that ICT are considered as General Purpose Technologies (GPT), i.e. technologies that can potentially be used and adapted to all phases of the production process in several sectors, while yielding important changes in operations, products and relationships between stakeholders and sectors.<sup>7</sup>

ICT also refers to a specific sector, regrouping a wide range of different economic activities such as ICT manufacturing, provision of ICT network services, wholesale or retail of ICT, and other ICT services. The debate on the statistical definition of the ICT sector has been wide, resulting in a list of NACE codes proposed by the OECD in 2007.<sup>8</sup> This work allows us to measure the ICT sector's core indicators. However, in face of new technological developments,

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<sup>3</sup> John Hagel, John Seely Brown, Tamara Samoylova, and Michael Lui (2013), *From exponential technologies to exponential innovation*.

<sup>4</sup> Google Ngram can be used to track the emergence of these terms and notions over time. This tool compiles several books and documents up to 2008. In spite of its limits (lack of distinction between types of document and countries, no data after 2008), it clearly shows the sequential rise of the use of different terms and notions. For instance, the number of occurrences of 'Information Society' increased nine fold between 1980 and 2008. An overview can be accessed through these links: <http://bit.ly/2DPfSgU>, <http://bit.ly/2ufwDIO>

<sup>5</sup> European Parliament, CSIL, and PPMI (2013), *Internet, Digital Agenda and economic development of European regions*.

<sup>6</sup> Melody, Mansell, and Richards (1986), *Information and communication technologies: social science research and training*.

<sup>7</sup> Turlea, Nepelski, Prato, and Institute for Prospective Technological Studies (2010), *The 2010 report on R & D in ICT in the European Union*.

<sup>8</sup> OECD (2011), *OECD guide to measuring the information society 2011*.

measuring ICT remains a major issue requiring new methodological and statistical approaches.<sup>9</sup>

In policy terms, the concept of ICT (or notions closely related, such as telecommunication technologies) is mostly related to research and development, infrastructures and sectoral applications of technologies.

### Information Society

Since the beginning of the 1990s the concept of Information and Communication Technologies has been studied and debated in relation to the impact that ICT can exert on the economy and on society as a whole, rather than by looking merely at the technical and technological aspects of ICT. This shift in focus has given rise to the idea of the Information Society - a society where all social and economic aspects of ICT are embedded and analysed. This expanded approach opened up new perspectives in policy terms as it **broadened the scope of policy intervention beyond the traditional fields of technological support and business and operational support** to encompass areas such as investments in ICT-related skills, attention to universal access to ICT, access to knowledge and new learning methods through the use of ICT, etc.

The Information Society was a widely used concept in EU policy from the 1990s to the 2000s. The concept was adopted and adapted through the actions of the European Commission in the early 1990s, mainly with the 1994 Bangemann Report and a related Action Plan 'Europe's way to Information Society' (see below).<sup>10</sup> Between the late 2000s and the early 2010s, the term was less frequent (but still present) in EU policy documents.

### Digitisation, Digitalisation, Digital Economy and Digital Transformation

As ICT moved from the technical/technological realm to include the economy and society as a whole, so did the concept of digitisation. Initially conceived as a technical process converting analogical information into digital (based on sequences of 0s and 1s) information, the meaning of digitisation has shifted to encompass a wider domain of social life through the use of digital communication and media infrastructures. In this respect, the process has lost its specific core of converting analogue data streams into digital bits to extend its influence to digital media and acquire a new, societal role. This transformation is often referred to as 'digitalisation'. In this sense, **digitalisation has come to refer to the structuring of many and diverse domains of social life around digital communication and media infrastructures.**<sup>11</sup>

Today the term 'digital transformation' is used extensively in the public sector, in business and in the media. It generally has a business-oriented connotation,<sup>12</sup> but it also refers to the wider societal effects of digitalisation. Interestingly, the Digital Transformation Scoreboard published by the European Commission does not propose any definition, but tends to adopt a business approach with the aim of deriving useful evidence from a policy perspective.<sup>13</sup> Whether it is defined at business or societal levels, what is specific about this notion is that it is not

<sup>9</sup> Colecchia, Panizza, Köksal-Oudot, Spiezia, Montagnier, Herrera-Gimenez, Serra-Vallejo, and Bourassa (2014), *Measuring the digital economy: a new perspective*.

<sup>10</sup> See Ducatel, Webster, and Herrmann (2000), *The Information Society in Europe: Work and Life in an Age of Globalization*. They argue that the European vision broadly takes on the US approach, but with more emphasis on social/cohesion aspects even if adjustments are minimal.

<sup>11</sup> Scott Brennen and Daniel Kreiss (2014), *Digitalization and Digitization*.

<sup>12</sup> For example: 'Digital transformation is the continuous process by which enterprises adapt to or drive disruptive changes in their customers and markets (internal and external ecosystems) by leveraging digital competencies to innovate new business models, products and services that seamlessly blend digital and physical business and customer experiences while improving operational efficiency and organizational performance'. See IDC (2018), *Digital Transformation*.

<sup>13</sup> European Commission (2017), *Digital Transformation Scoreboard*.

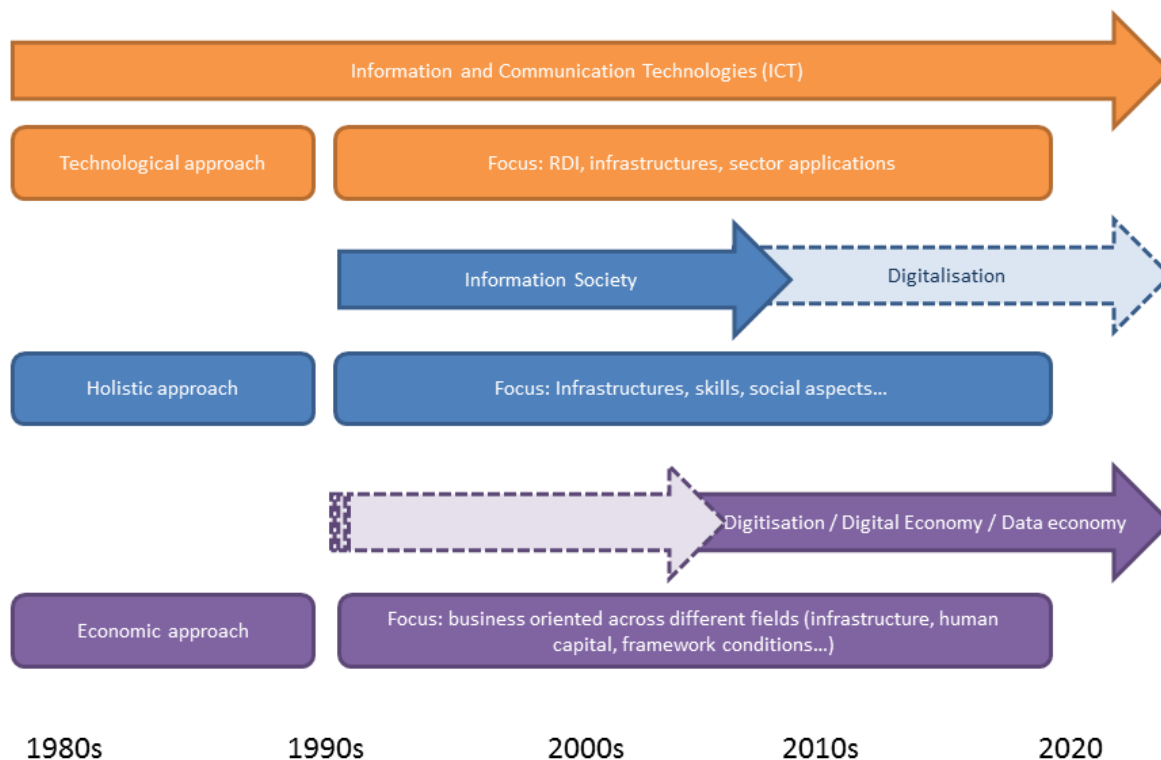
restricted to technological change, but encompasses all other types of change (organisational, cultural etc.) that are necessary to take advantage of technological advances.

### Data economy

The data economy refers to the overall impact of the data market on the economy as a whole. It involves the generation, collection, storage, processing, distribution, analysis, elaboration, delivery and exploitation of data enabled by digital technologies. The data market is the marketplace where digital data or data-enabled services are exchanged as ‘products’ or ‘services’ as a result of the elaboration of raw data; the data market is, therefore, a business-oriented concept.<sup>14</sup> The data economy represents a wider concept than the data market, as it apprehends the value and wealth generated by data in the economy as a whole (not just across businesses) by the exploitation of data.

This reflects a new qualitative and quantitative feature characterising the evolution of digital technologies, i.e. the **emergence of large amounts of data as a new economic resource**. It is accompanied by the emergence of a new generation of technologies designed to extract economic value from very large volumes of data by enabling their capture and/or analysis at very high speed: big data analytics, but also cloud computing, artificial intelligence, blockchain, etc. (see Annex I for a highlight on three such technologies: artificial intelligence, cloud computing and big data analytics).

**Figure 1. Evolution of notions pertaining to digital technologies and their focus**



Source: Authors.

For convenience, and unless otherwise specified, the rest of this study will generally refer to ‘ICT’, ‘digital policy’ and ‘digital investments’ as generic notions valid across time and approaches. On the other hand, notions such as ‘Information Society’ or ‘data economy’ should be considered as chronologically connoted.

<sup>14</sup> IDC and Open evidence (2017), *European Data Market Study (SMART 2013/0063)*.



## 2.2 Digital performance in Europe: state of play

Digital performance can be defined as the ability of a country, region, economic sector, individual firm or citizen, to exploit the benefits linked to Information and Communication Technologies. Therefore, it encapsulates:<sup>15</sup>

- The level of development of the ICT infrastructure/equipment available;
- The knowledge, digital literacy and digital skills present;
- The usage and uptake of digital products, services and technologies by citizens, firms and the public sector;
- Others.

Digital performance conditions several social and economic dynamics and their translation into potential economic and social benefits.

### 2.2.1 The perceived EU-US digital gap

Since the 1990s it has commonly been considered that **the EU is lagging-behind the United States in collecting digital benefits** (e.g. contribution of ICT to total output growth).<sup>16</sup> For instance, a recent McKinsey study estimated that Europe was operating at only 12% of its digital potential<sup>17</sup> in 2016. Accordingly, additional digitisation efforts could significantly boost European growth, for instance if laggard sectors were to double their digital intensity, it would add EUR 2.5 trillion to Europe's GDP in 2025.<sup>18</sup>

This situation does not prevent Europe from **representing a growing and dynamic ICT market**. According to IDC, the total value of ICT spending<sup>19</sup> in the EU28 amounted to more than EUR 624 billion in 2017 and was projected to reach EUR 636.3 billion in 2020. By comparison, the US would generate more than EUR 990 billion in 2017 and comfortably exceed the threshold of EUR 1 000 billion in 2020.<sup>20</sup> More interestingly, the value of Europe's Data Market<sup>21</sup> is second only to the USA. The impact that this market generates on the economy as a whole (the 'Data Economy') has become more and more visible over the past few years (from 2014 to 2017), thus rapidly closing the gap with the American economy.

However, compared to the USA, the EU continues to suffer from **higher levels of fragmentation**. Europe is more divergent than the US when it comes to the usage of digital technologies across companies, including those in the same sector. This is partly due to structural factors (such as the greater presence of SMEs in Europe than in the USA), to cultural and educational factors (such as Europe's relatively weaker position in creating and keeping the necessary digital skills to support the digital transformation process). Indeed, Europe lacks large-scale digital champions such as Amazon, Apple, Facebook and Google-Alphabet. EU companies appear to be less capable than their American counterparts of capitalising on and exploiting the increasing amount of data at their disposal. Nevertheless, the EU remains a protagonist in many areas of the data economy. It is commonly held that it has a lively digital start-up scene and considerable innovation capacity, but it is still unable to translate this

<sup>15</sup> European Parliament, CSIL, and PPMI (2013), *Internet, Digital Agenda and economic development of European regions*.

<sup>16</sup> McKinsey Global Institute (2016), *Digital Europe: Pushing the Frontier, Capturing the Benefits*.

<sup>17</sup> Digital potential is the difference between the maximum and actual value of the McKinsey Global Institute's Industry Digitization Index. This index 'uses dozens of indicators to provide a snapshot of digital assets, usages, and workers'.

<sup>18</sup> McKinsey Global Institute (2016), *Digital Europe: Pushing the frontier, capturing the benefits*.

<sup>19</sup> ICT spending is defined as the total expenditure in ICT technologies in a given market (country, or vertical industry: Manufacturing, Retail, Finance, etc.). ICT spending includes expenditure for: Hardware, Software, IT services, and telecom.

<sup>20</sup> IDC (2017), *Worldwide Black Book Standard Edition*; IDC and Open evidence, *European Data Market Study (SMART 2013/0063)*.

<sup>21</sup> The Data Market is defined as the total value of data-based products and services produced and exchanged, see IDC and Open evidence (2017), *European Data Market Study (SMART 2013/0063)*.

potential into global digital platforms as happens in the USA.<sup>22</sup> It seems that in terms of Research and Innovation, and of the subsequent innovative technologies, **Europe is slower than the US in building an effective ecosystem to turn these technologies in commercially exploitable applications.** In areas such as robotics, augmented reality/virtual reality and machine learning, for instance, – all future engines of the digital transformation – large European companies are investing significantly,<sup>23</sup> but this may not provide sufficient critical mass to compete with American manufacturers.

Europe's relative delay in keeping up with the US in these strategic areas may have undesired consequences on employment and the future of work in the EU. These problems are aggravated by further internal disparities within the EU itself.

## 2.2.2 Disparities in digital performance within Europe

Several disparities in terms of digital performance can be observed across the European Union, both in static (2017) and dynamic terms. These disparities are of different types: sectoral, social and geographical. They lead to an **uneven distribution of digital-related benefits and can also threaten the cohesion objective of the EU.** Even if there are several issues regarding data availability (especially at the regional level and for SMEs),<sup>24</sup> an analysis of the current and past digital disparities in Europe is essential, as it has been a major rationale for policy intervention since the 1990s.<sup>25</sup>

Firstly, **across economic sectors, the levels of uptake and usage of digital technologies differed considerably as of 2016.** According to the MGI Industry Digitisation Index for Europe, while sectors such as ICT, Media, Finance and Insurance were already very highly digitised, Entertainment, Hospitality, Agriculture and Construction were lagging behind.<sup>26</sup> Additionally, there were major differences in digitisation across individual firms, with the leading ones taking the opportunity to transform their processes thanks to new technologies (e.g. additive manufacturing, Internet of Things).

Then, the concept of digital divide is central in order to grasp the **existing disparities in digital performances across Europe.** It is defined by the OECD as 'the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard both to their opportunities to access information and communication technologies (ICT) and to their use of the Internet for a wide variety of activities'.<sup>27</sup> Concretely, it is linked to two major (interconnected) aspects:<sup>28</sup>

- Social divide, depending on economic situation, levels of skills and education, age;
- Geographical divide, especially following an urban-rural dichotomy; with rural areas often experiencing slower internet speeds, fewer technological choices and higher prices.

At the national level, disparities can be observed in terms of overall digital performance as well as for several distinct areas. The Digital Economy and Society Index (DESI) provides a comprehensive overview based on:<sup>29</sup>

<sup>22</sup> There are a few notable exceptions, e.g. Spotify in Sweden, Deezer in France, Shazam in the UK, Gemalto in the Netherlands, etc.

<sup>23</sup> European Commission (2018), *Digital Transformation Scoreboard*.

<sup>24</sup> Datasets on digital performance that are comparable across the EU Member States are available on Eurostat. However, they mostly focus on households and individuals, especially at the regional level.

<sup>25</sup> European Commission (1997), *Cohesion and the Information Society*.

<sup>26</sup> McKinsey Global Institute (2016), *Digital Europe: Pushing the Frontier, Capturing the Benefits*.

<sup>27</sup> OECD (2001), *Understanding the Digital Divide*.

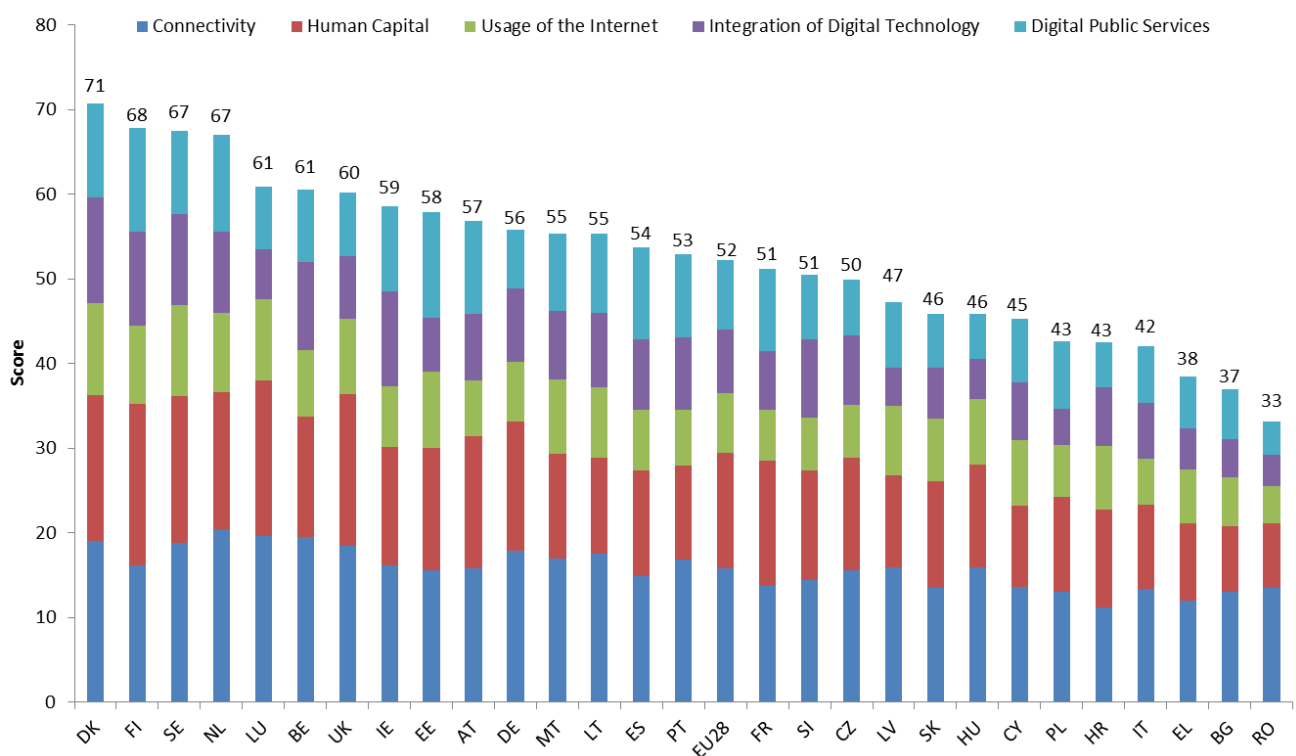
<sup>28</sup> Negreiro (2015), *Briefing Bridging the Digital Divide in the EU*.

<sup>29</sup> European Commission (2018), *DESI — Digital Scoreboard - Data & Indicators*.

- Connectivity (infrastructure, broadband and internet access);
- Human Capital (digital skills and inclusion);
- Use of Internet;
- Integration of Digital Technology (business digitisation, use of e-commerce);
- Digital Public Services (e-government services).

The scores of the DESI range from 0 to 100. In 2017 the EU average score was about 52, with important discrepancies among the Member States. Denmark topped this ranking with a score of 70, closely followed by Finland and Sweden. In contrast, Romania achieved a score of 33, close to Bulgaria and Greece. The different scores were highly correlated with each other, suggesting that high performance in one specific area is usually linked to high performance in others.

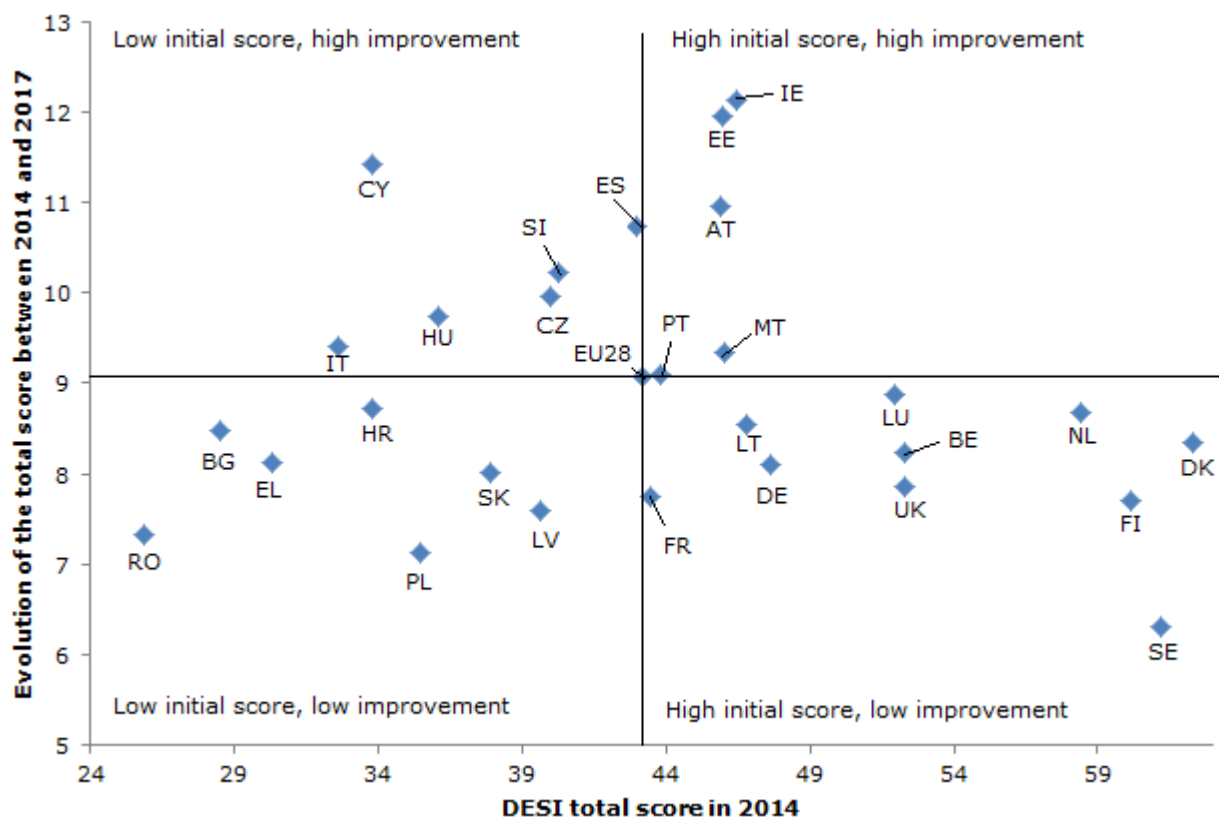
**Figure 2. Digital Economy and Society Index in 2017 by Member State**



**Source:** Authors based on European Commission (2018), DESI — Digital Scoreboard - Data & Indicators.

Moreover, the improvement in the total DESI score between 2014 and 2017 does not seem to be linked to the initial total score in 2014. It suggests that there is no unconditional catching-up in terms of digital performance, and that the differences in improvement could stem from several factors (such as demographic evolution, technologies deployed, quality of government).

**Figure 3. Total DESI score in 2014 and improvement between 2014 and 2017**



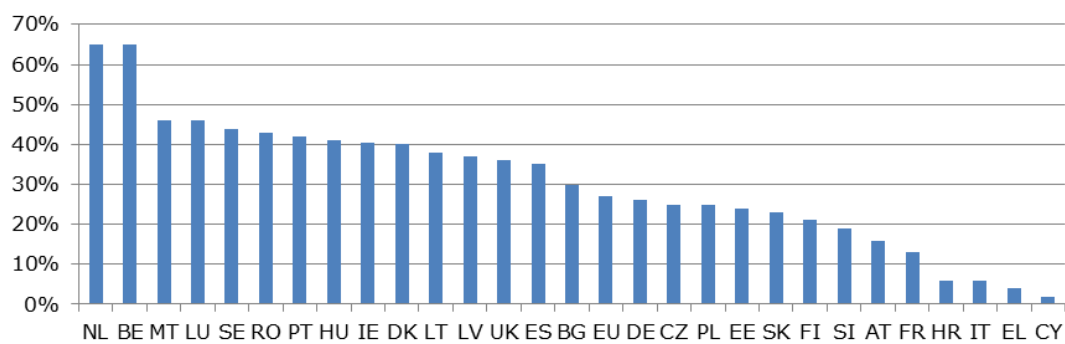
Source: Authors based on European Commission (2018), *DESI — Digital Scoreboard - Data & Indicators*.

The overall patterns of national disparities are largely confirmed by focusing on specific indicators (that are often included in the computation of the DESI itself), such as broadband coverage, prices and actual access, digital skills, usage of the internet, digitisation of enterprises and government services.

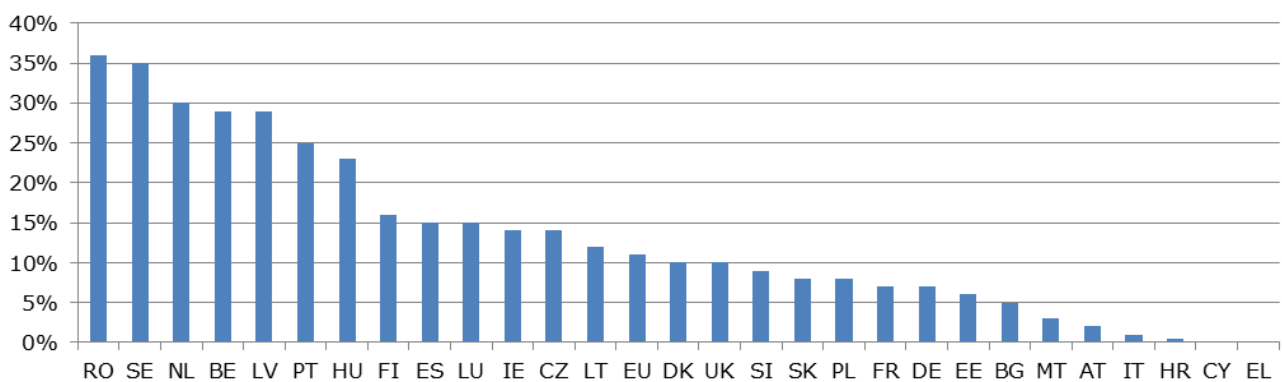
Broadband can be defined as ‘a data transmission capacity associated with a particular speed of transmission and the provision of high-speed internet access’.<sup>30</sup> The European Union has defined different categories of broadband, depending on the data transmission rates. **Basic broadband (256 Kbps) coverage is almost universal in the EU**, with fixed technologies covering 98% of homes in 2017.<sup>31</sup> However, some Member States (Poland, Slovakia and Romania) are lagging behind with fewer than 90% of homes covered. In terms of **fast and ultrafast broadband access, a different picture is observable:**

<sup>30</sup> Garcia Calvo (2012), *Universal Service Policies in the Context of National Broadband Plans*

<sup>31</sup> European Commission (2017), *Europe’s Digital Progress Report 2017*

**Figure 4. Fast broadband (at least 30 Mbps) household penetration rate in 2016**

Source: European Commission (2017), *Europe's Digital Progress Report 2017*.

**Figure 5. Ultrafast broadband (at least 1000Mbps) household penetration rate in 2016.**

Source: European Commission (2017), *Europe's Digital Progress Report 2017*

The household penetration rate for these high-speed broadband networks (at least 1,000 Mbps) is high in the usual top performing Member States (e.g. the Netherlands and Belgium), but also in some that are lagging behind by most metrics (e.g. Romania, topping the ranking in terms of ultrafast broadband household penetration). It should be noted that there is an **important urban-rural gap for high-speed broadband coverage**.<sup>32</sup> According to the 2016 report on EU broadband coverage, only 39.2% of households in EU rural areas are covered by Next Generation Access networks, compared to 75.9% of all EU households<sup>33</sup>. This situation puts rural areas at risk of digital exclusion.

Retail prices also vary substantially across the EU Member States, by a factor of about three between the Member States with the most affordable prices and those with the most expensive ones. Differences in geography (population density, areas covered) and market structure (competition among operators, demand) could explain part of these differences.

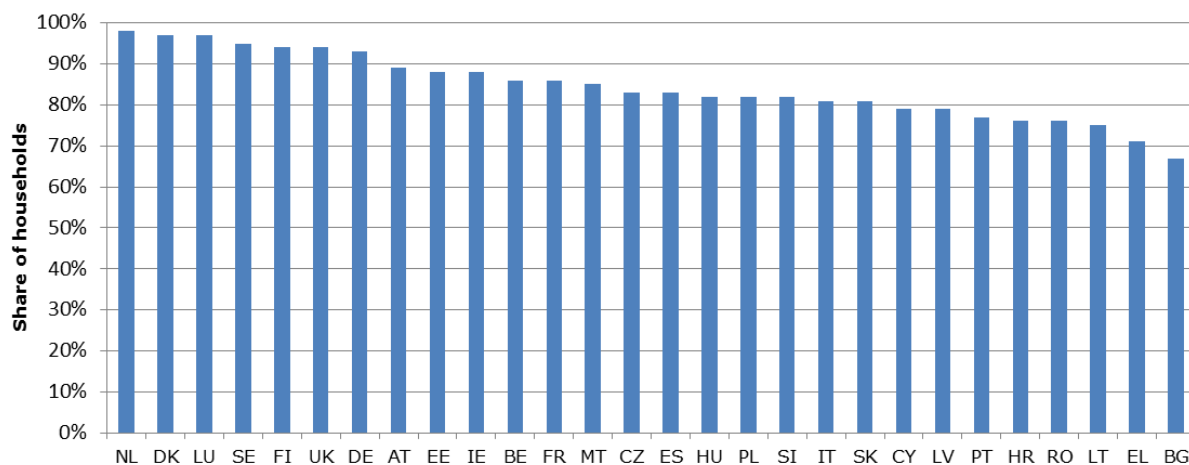
Coverage, technologies and retail prices are key determinants of the uptake and usage of the internet by both households and companies. However, other factors<sup>34</sup> (such as perceived utility of the internet, skills, demographics or openness to innovation) affect the actual access and usage. Indeed, in spite of quasi-universal basic broadband coverage in the EU, in 2017 the percentage of households actually accessing the internet at home was the following:

<sup>32</sup> Negreiro (2015), *Briefing Bridging the digital divide in the EU*.

<sup>33</sup> European Commission, IHS Markit, and Point topic (2017), *Broadband Coverage in Europe 2016: Mapping progress towards the coverage objectives of the Digital Agenda*.

<sup>34</sup> Negreiro (2016), *Briefing Bridging the Digital Divide in the EU*.

**Figure 6. Share of households actually accessing the internet in 2017**

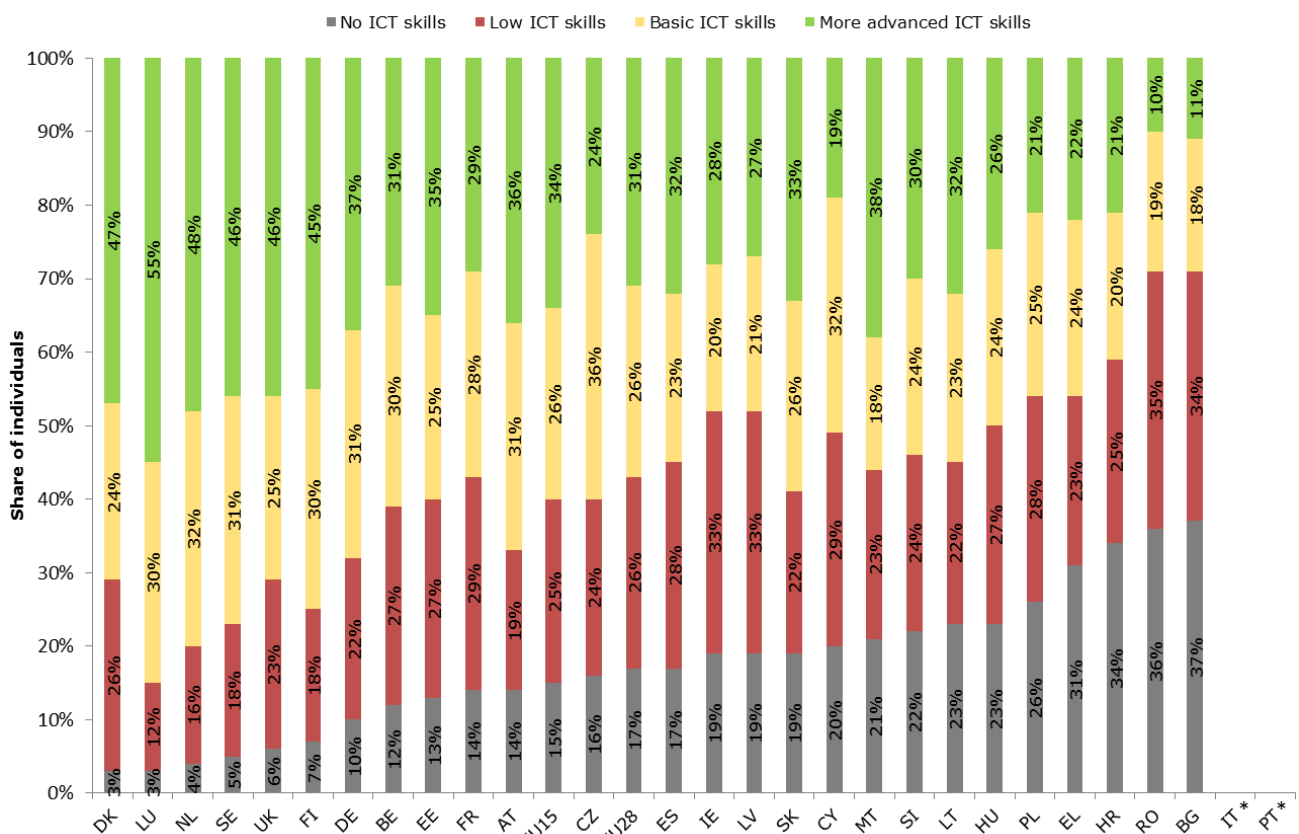


**Source:** Authors based on Eurostat (2017), *Database (regional and national statistics on digitisation)*.

In turn, actual internet access in households is strongly linked to individual digital skills and usage behaviour.

ICT skills are assessed every year by Eurostat in its Community Survey on ICT usage. Based on this data, in 2017 83% of Europeans had some digital skills (low, basic or more advanced), compared to 75% in 2011.<sup>35</sup> In particular, no country had a majority of people without any digital skills in 2017. However, **severe national disparities were still observed in terms of ICT skills**. For instance, in Luxembourg 55% of people had more advanced digital skills, compared to only 10% in Romania.

<sup>35</sup> European Parliament, CSIL, and PPMI (2013), *Internet, Digital Agenda and economic development of European regions*.

**Figure 7. Distribution of digital skills among individuals in Member States in 2017**


**Source:** Authors based on Eurostat (2017), *Database (regional and national statistics on digitisation)*.

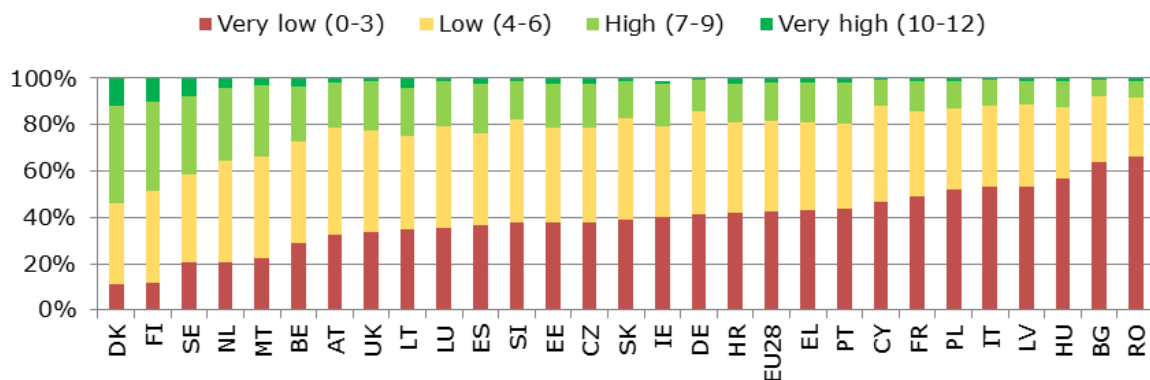
**Note:** \*no data for IT and PT

This distribution of skills strongly mirrors the regular use of the internet by individuals. National disparities are also encountered in the area of enterprises' digitisation. The Digital Intensity Index measures the availability of 12 different digital technologies at the firm level<sup>36</sup> (e.g. internet for at least 50% of employees, recourse to ICT specialists, fast broadband, website with advanced functions, eCommerce turnover etc). **According to this index, only 20% of EU28 companies could be considered as 'highly digitised' (7-9 technologies) in 2016.** In some countries such as Poland, Italy, Latvia, Hungary, Bulgaria and Romania, more than 50% of companies had very low levels of digitisation. By contrast, more than 50% of companies were highly or very highly digitised in Denmark. The size of companies seems to be a major determinant of the digitisation level, with SMEs lagging behind large companies, generating a gap in the opportunities to be exploited.<sup>37</sup>

<sup>36</sup> European Commission (2017), *Europe's Digital Progress Report 2017*.

<sup>37</sup> European Commission (2017), *Europe's Digital Progress Report 2017*.

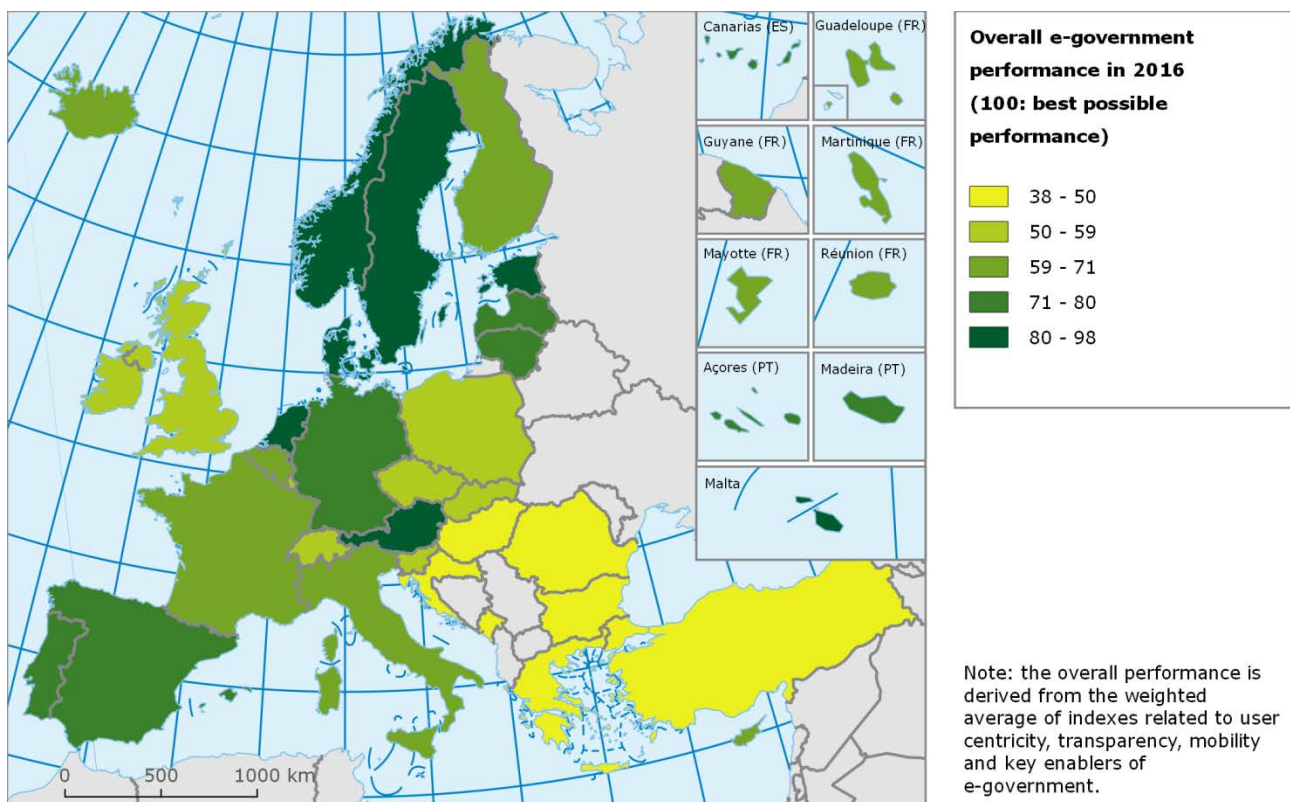
**Figure 8. Digital Intensity Index (share of enterprises by level) in 2016**



Source: European Commission (2017), *Europe's Digital Progress Report 2017*.

Finally, **e-government performance is also experiencing important variations across Member States**, though the patterns are slightly different from most other indicators. Using data from the e-government benchmark of 2017,<sup>38</sup> it is possible to assess the overall performance based on user-centricity (availability and usability of public e-services), transparency (government transparency on the process of service delivery, own responsibilities and performance and personal data involved), mobility (cross-border availability and usability of a service for foreign citizens and businesses) and key enablers (availability of five functionalities, such as electronic ID):

**Map 1: Overall e-government performance in 2016**



Source: Authors based on European Commission (2017), *eGovernment Benchmark 2017*.

<sup>38</sup> European Commission, Capgemini, Sogeti, IDC, and Politecnico di Milano (2017), *eGovernment Benchmark 2017*.



In particular, the Baltic States, Portugal and Spain score high for eGovernment, alongside the usual forerunners in digital performance (Scandinavia, the Netherlands). In contrast, some countries seem to underperform for these aspects, e.g. the United Kingdom.

Thanks to these datasets and the existing literature, it is, therefore, possible to distinguish **clusters of countries that differ in terms of digital performance**. For instance, using data on the different dimensions of the digital divide, researchers were able to identify patterns of performance among Member States, based on the use of e-business, internet access costs, ICT infrastructures and ICT adoption by the population.<sup>39</sup> However, these approaches at the national level fail to account for important within-country disparities and can lead to inconsistent results.

### Digital performance at regional level

At the regional level, previous research showed the existence of **wide gaps within and between Member States**.<sup>40</sup> The most recent data reveal the persistence of such disparities in digital performance as of 2017. Unfortunately, refined data is often unavailable at the NUTS 2 level, resulting in an analysis of a few core indicators developed by Eurostat:

- Internet access (share of households);
- Broadband access (share of households);
- Regular use of the internet (share of individuals);
- E-commerce use during the last year (share of individuals).

Even though the lack of more precise data leaves gaps in the analysis, especially for the regional patterns for enterprises, these indicators provide a snapshot of several key dimensions of digital performance (infrastructure, skills, usage and uptake, business).

In general, **important regional differences can be observed for all the selected indicators in 2017**. Northern and Western regions of Europe tend to perform better than Southern and Eastern ones for all the studied metrics. In particular, regions in Scandinavia, the United Kingdom, the Netherlands and Western Germany rank the highest. Conversely, most regions in Bulgaria and Romania tend to lag behind. Finally, all the tested indicators are highly intercorrelated.<sup>41</sup> However, in some cases, performance gaps occur between the different indicators in a single region. For instance, in some Romanian regions, broadband access is relatively high, while the use of e-commerce is low.

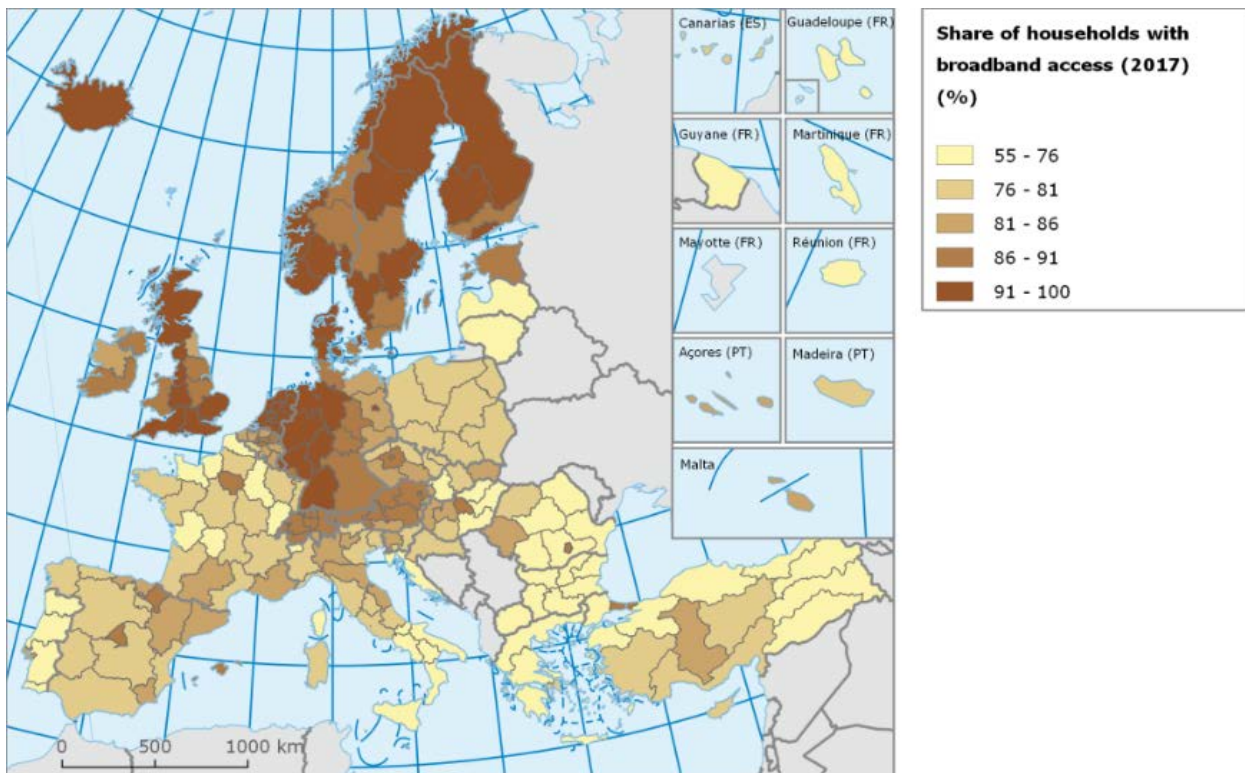
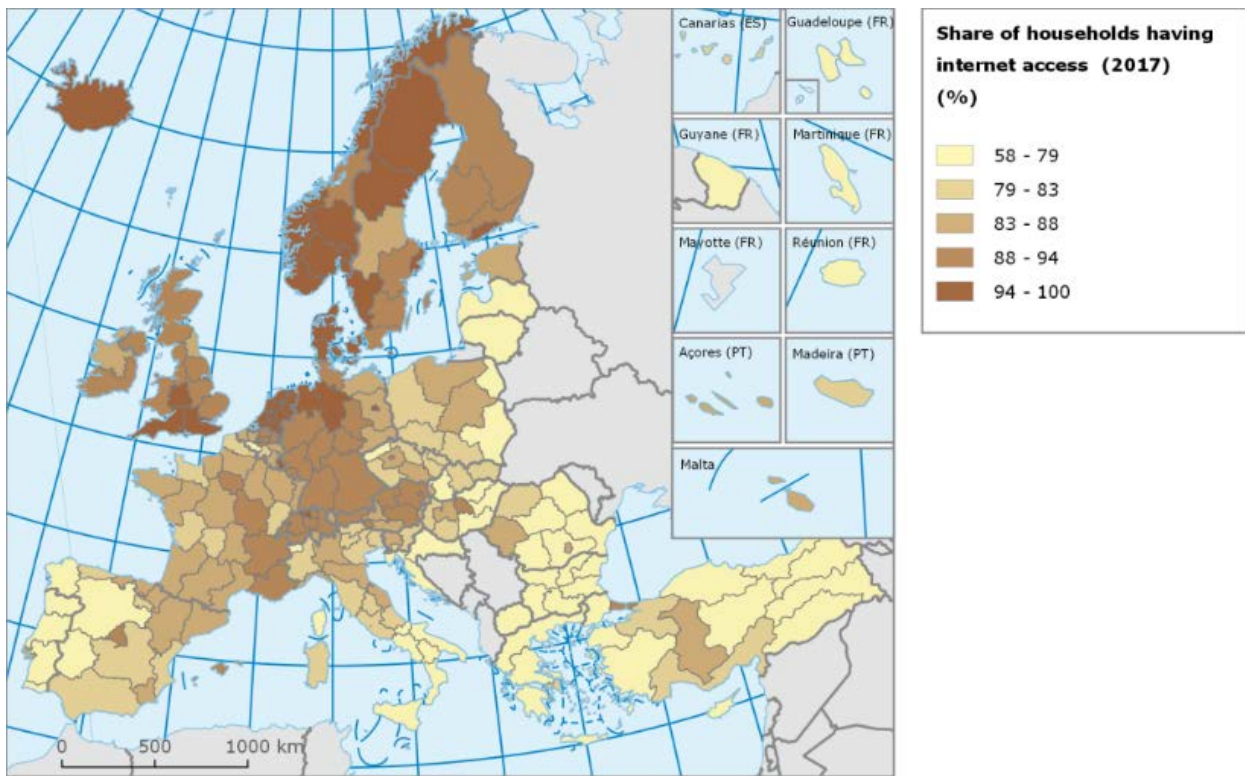
However, there are some key nuances of this general picture. Regardless of the country, **capital regions tend to achieve higher performances**. This is especially true in the New Member States, where the performance of the capital region often matches the level of regions in the more digitally advanced Member States. In some countries, important regional divides are at play, notably in Italy or Spain, where gaps in digital performance closely follow disparities in regional economic development.

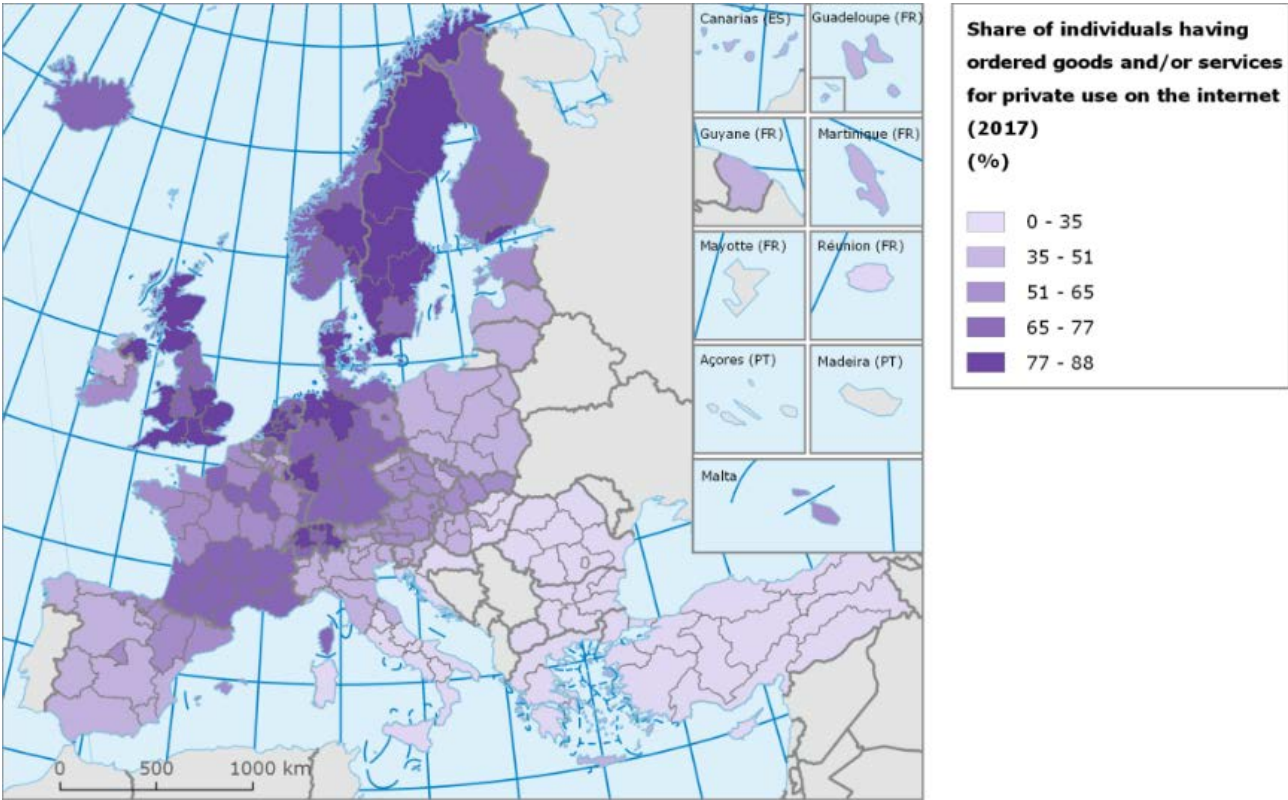
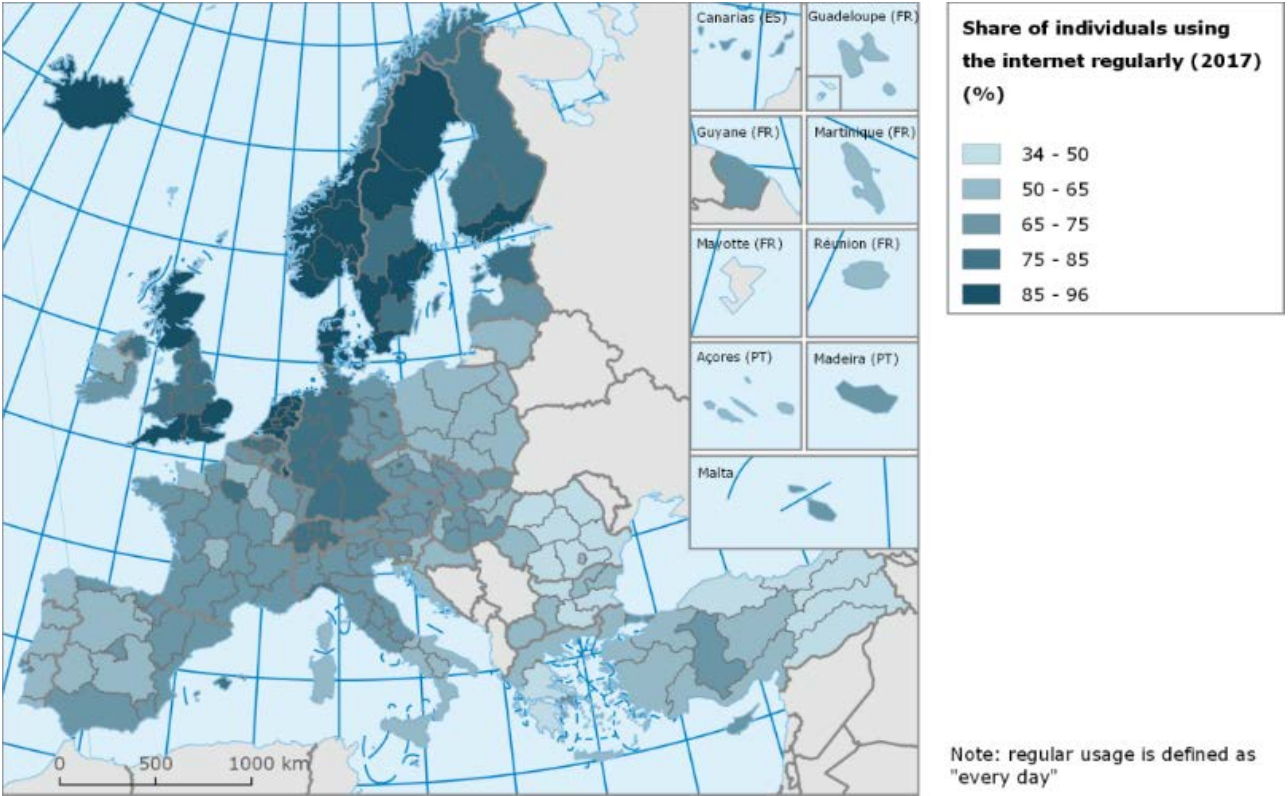
<sup>39</sup> Cruz-Jesus, Oliveira, and Bacao (2012), *Digital divide across the European Union*.

<sup>40</sup> Vicente and López (2011), *Assessing the regional digital divide across the European Union-27*.

<sup>41</sup> With all the coefficients of correlation above 0.8 (absolute value).

**Map 2: Overview of regional digital performance indicators.**





Source: Authors based on Eurostat (2017), Database (regional and national statistics on digitisation).

It is possible to identify clusters of countries and regions sharing similar digital performance, by using some indicators available at the regional level:<sup>42</sup>

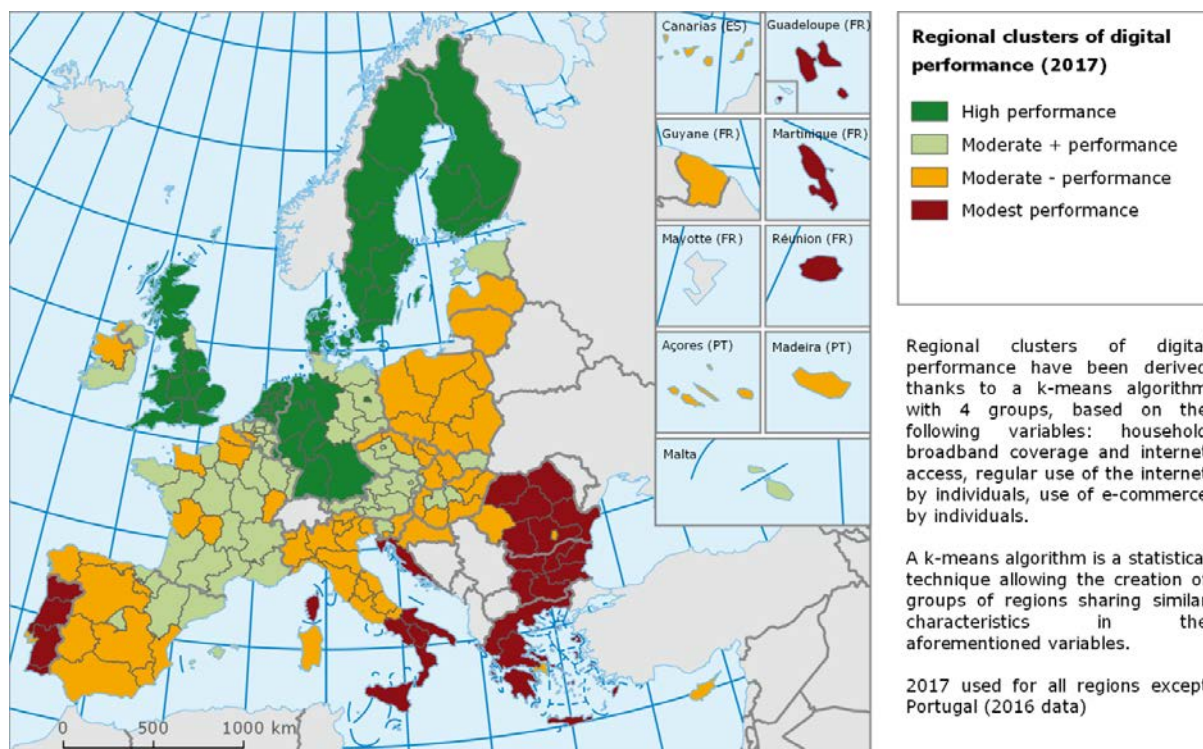
**Table 1. Clusters of countries and regions sharing similar digital performance**

CLUSTER	CLUSTER CHARACTERISTICS	BROAD AREAS WITHIN THE CLUSTER
<b>High digital performance</b>	Very high levels of broadband coverage, internet access, regular use of the internet and use of e-commerce	Luxembourg, the Netherlands, Scandinavia, most of the United Kingdom, West Germany
<b>Moderate + digital performance</b>	Moderate-High levels of broadband coverage, internet access, regular use of the internet and use of e-commerce	Austria, Estonia, Malta, some regions in the Czech Republic, Hungary, Slovakia and Slovenia, several regions in Western Europe
<b>Moderate – digital performance</b>	Moderate-Low levels of broadband coverage, internet access, regular use of the internet and use of e-commerce	Cyprus, Latvia, Lithuania, Poland, several regions in Croatia, the Czech Republic, Hungary, Slovakia, Slovenia, Spain, Northern Italy, some regions in France, Greece, Ireland, Portugal
<b>Modest digital performance</b>	Modest levels of broadband coverage, internet access, regular use of the internet and use of e-commerce	Bulgaria, Greece, several regions in Portugal, Romania, Southern Croatia and Southern Italy, several French overseas territories/Corsica

Source: Authors based on Eurostat (2017), *Database (regional and national statistics on digitisation)*.

These clusters tend to confirm the general findings of individual indicators and allow a refined identification of regional divides within countries (e.g. Spain, Italy, France, Czech Republic).

**Map 3: Regional clusters of digital performance in 2017**



Source: Authors based on Eurostat (2017), *Database (regional and national statistics on digitisation)*.

<sup>42</sup> Namely: household broadband coverage, internet access by households, frequent use of the internet by individuals, use of e-commerce by individuals; in order to cover the different dimensions with data available at the regional level without redundancy. Datasets on firms are not available at the regional level.

Available theoretical and empirical evidence thus suggests that the digital performance of Europe should be improved in order to fully reap the benefits related to Information and Communication Technologies. Moreover, the question of disparities (especially regional ones) ought to be addressed should this goal be attained. These strong rationales for policy led to several initiatives, culminating in the Digital Agenda for Europe and Digital Single Market. As a consequence, an in-depth analysis of the evolution of such policies will be presented, with an emphasis on elements that are relevant for the current period and beyond.

## 2.3 EU Policy response: conceptual framework and underlying logics of intervention

Against this background, the EU has gradually deployed a policy framework to ensure that the benefits related to ICT are fully exploited and to catch-up with international competitors in areas where delays are perceived to be acute. EU policies related to digital aspects have been designed and implemented since the early 1990s, with forerunners going back as early as the late 1980s. These policies were strongly consolidated in 2010 and in 2015, culminating in the Digital Agenda for Europe and the Digital Single Market. Cohesion Policy figures prominently in this framework. Taking a historical perspective, this section describes the rationale underlying the establishment of this policy framework and the expected contribution of Cohesion Policy.

### 2.3.1 From individual concepts to frameworks: the emergence of the EU digital policy

#### The 1990s and the conceptualisation of an EU Information Society

As explained above, a major concern backed by evidence in the early 1990s was that the EU was lagging behind the USA (and other developed economies such as Japan) when it came to ICT development, diffusion and uptake. That situation was perceived as a threat; in the **1993 Delors Report** on the challenges of the 21<sup>st</sup> century, ICT was identified as a lever to ensure both competitiveness and the transition towards an 'Information Society', where 'services provided by information and communication technologies underpin human activities'.<sup>43</sup> Although this report already contained several features of the emerging EU digital policy, the **1994 Bangemann Report** is widely considered as its true beginning.<sup>44</sup> It developed the idea of an 'Information Society' in the European context, sharing many elements of the US approach,<sup>45</sup> in particular the preference for and confidence in market mechanisms to finance the supply-side dimension of ICT (network infrastructures), while ensuring universal access. It also emphasised the importance of demand-side support, with a strong role for the EU and its Member States in that sphere.<sup>46</sup> The report, therefore, induced a first (limited) shift away from a solely technological and infrastructural approach (contrary to the USA, where infrastructures were highlighted with the Information Superhighway).<sup>47</sup> This led to an action plan called '**Europe's way to the Information Society**' in 1994, with four major fields of intervention:<sup>48</sup>

- Regulatory and legal framework (emphasis on liberalisation and privacy);

<sup>43</sup> European Commission (1993), *Growth, competitiveness, employment: the challenges and ways forward into the 21st century: white paper*.

<sup>44</sup> Because it led to specific policy action plans, see Taylor and Downes (2001), *The Structural Funds Facilitating the Information Society*.

<sup>45</sup> European Commission (1994), *Report on Europe and the global information society*; Ducatel, Webster, and Herrmann (2000), *The Information Society in Europe: Work and Life in an Age of Globalization*; Taylor and Downes (2001), *The Structural Funds Facilitating the Information Society*.

<sup>46</sup> Taylor and Downes (2001), *The Structural Funds Facilitating the Information Society*.

<sup>47</sup> Ducatel, Webster, and Herrmann (2000), *The Information Society in Europe: Work and Life in an Age of Globalization*.

<sup>48</sup> European Commission (1994), *EUROPE'S WAY TO THE INFORMATION SOCIETY. AN ACTION PLAN*.

- Networks, basic services, applications and content (including funding schemes, such as the Framework Programme for Research 4 and the Structural Funds);
- Social and cultural aspects;
- Promotion of the Information Society (creation of the Information Society Project Office).

This action plan was updated in **1996 by the Dublin summit** in order to account for emerging priorities (business environment, investments in the future e.g. skills, people at the centre and social issues, meeting the global challenge, i.e. trade negotiations).<sup>49</sup> It was at this time that European strategy began to fully incorporate the concerns related to the social and territorial consequences of the transition towards a digital-based society. Indeed, a green paper on '**Living and Working in the Information Society: People First**' emphasised the adaptation of skills, training and the labour market to the changes induced by ICT.<sup>50</sup>

### The 2000s and the emergence of overarching digital strategies

In the early 2000s the potential and challenges of ICT were increasingly acknowledged by enterprises, citizens, academics and policy-makers. In Europe it led to a greater coordination of Information Society policies between the different levels of government<sup>51</sup> and to a higher degree of prioritisation and funding. This period is critical because it gave birth to highly formalised policies and strategies at the EU, Member State and, to some extent, regional level. Indeed, the **e-Europe** initiative of 1999-2000 is considered to be one of the key milestones in building an overarching strategic and policy framework for the Information Society. It was conceived as a way of improving EU competitiveness in the framework of the Lisbon Strategy<sup>52</sup> and it has far-reaching ambitions: 'bringing every citizen, home and school, every business and administration, into the digital age and online' while guaranteeing that 'the whole process is socially inclusive, builds consumer trust and strengthens social cohesion'.<sup>53</sup> Accordingly, e-Europe virtually covered all the policy areas that can be affected by the Information Society:<sup>54</sup>

- Access and use of ICT (citizens, SMEs): broadband, security, e-government, e-health, e-business;
- Digital literacy and entrepreneurial culture: e-learning;
- Social inclusion: e-inclusion.

With e-Europe, the Information Society was thus emerging as a policy area in its own right and as a horizontal area of activity addressed via different instruments, such as the Structural Funds (see below).<sup>55</sup> Concretely, e-Europe was operationalised through two action plans, one in 2002 and one in 2005.

Following the e-Europe initiative, a new EU policy framework for the Information Society was released in 2005 to cover the 2005-2009 period: **i2010 – a European Information Society for Growth and Employment**. It was still aligned with the Lisbon Agenda and emphasised an integrated approach to the Information Society and audio-visual media policies in the EU. As such, it set three political priorities:<sup>56</sup>

- Single European Information Space (consistent rules for ICT and the media);

<sup>49</sup> Taylor and Downes (2001), *The Structural Funds Facilitating the Information Society*.

<sup>50</sup> European Commission (1996), *Green Paper: Living and Working in the Information Society, People First*

<sup>51</sup> Technopolis (2002), *Final Report for the Thematic Evaluation of the Information Society*.

<sup>52</sup> E SPON (2005), *The Territorial Effects of the Structural Funds*.

<sup>53</sup> Feijóo, Gómez-Barroso, and Karnitis (2007), *More than Twenty Years of European Policy for the Development of the Information Society*.

<sup>54</sup> Technopolis (2002), *Final Report for the Thematic Evaluation of the Information Society*.

<sup>55</sup> ESPON (2005), *The Territorial Effects of the Structural Funds*.

<sup>56</sup> European Commission (2009), *i2010: Information Society and the media working towards growth and jobs*.

- Innovation and investments in ICT;
- Inclusive European Society.

Critics of the previous periods argued that the EU Information Society was too focussed on the economic and technological dimensions, in spite of claiming a holistic approach.<sup>57</sup> With e-Europe i2010 the EU had strong ambitions for the social aspects of the Information Society<sup>58</sup> (e.g. employment, skills, disparities and inclusion). For instance, the 2000 communication on 'Job Strategies in the Information Society' analysed the situation related to employment and ICT and provided specific recommendations and best practices.<sup>59</sup> More specifically, the **Riga Declaration of 2006** promoted the concept of e-inclusion, meaning 'both inclusive ICT and the use of ICT to achieve wider inclusion objectives. It focuses on the participation of all individuals and communities in all aspects of the Information Society. E-inclusion policy, therefore, aims to reduce gaps in ICT usage and promote the use of ICT to overcome exclusion and improve economic performance, employment opportunities, quality of life, social participation and cohesion'.<sup>60</sup> It notably highlighted the ageing and the regional aspects.<sup>61</sup>

### 2.3.2 A major priority: Digital policy at the core of EU ambitions

#### From the overarching digital frameworks to the flagship initiative: the Digital Agenda for Europe

The Digital Agenda for Europe is a long-term initiative launched by the European Commission in May 2010,<sup>62</sup> directly following the previous i2010 framework. Its main aim is to deliver sustainable economic and social benefits stemming from the completion of a digital single market. As with several of the past strategies, the Commission put strong emphasis on the fact that the EU is lagging behind in terms of access to and usage of ICT.

A key change compared to the previous strategic frameworks is that **the Digital Agenda for Europe is itself considered a flagship initiative, contributing to the Europe 2020 strategy for smarter, sustainable and more inclusive growth**.<sup>63</sup> Digital aspects were thus put on a par with other key policy areas, such as industrial policy, innovation or youth. The policy rationale is that the use of ICT and the completion of the digital single market would help (directly and/or indirectly) to achieve these goals.<sup>64</sup> In this context, the DAE ranks high in terms of policy priority and it benefits from significant financial resources available through ESIF (see chapters 3 and 4 for details on related expenditure).

The intervention logic underpinning the Digital Agenda for Europe is that **a virtuous circle should be created**. With an interoperable and borderless internet, the creation of valuable and attractive services and products would be facilitated, in turn stimulating demand for

<sup>57</sup> Feijóo, Gómez-Barroso, and Karnitis (2007), *More than Twenty Years of European Policy for the Development of the Information Society*.

<sup>58</sup> Mikel Landabaso (2010), *European Regional Policy: Reflections on 20 Years of Innovation Support*.

<sup>59</sup> European Commission (2000), *Jobs Strategies in the Information Society*.

<sup>60</sup> EU Ministers (2006), *Riga Declaration: ICT for an inclusive society*.

<sup>61</sup> Benedek, Bauer, and Kettemann (2008), *Internet Governance and the Information Society: Global Perspectives and European Dimensions*.

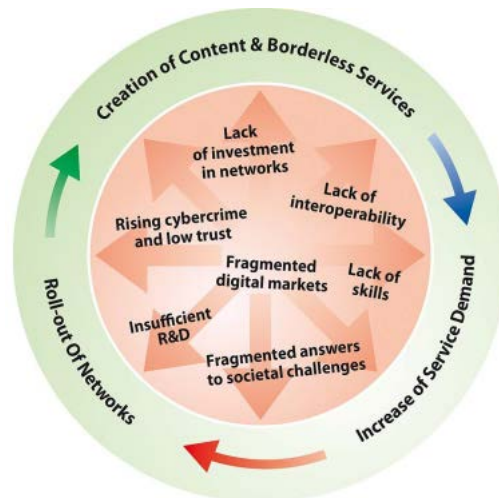
<sup>62</sup> European Commission (2010), *COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS A Digital Agenda for Europe*.

<sup>63</sup> European Parliament, CSIL, and PPMI (2013), *Internet, Digital Agenda and economic development of European regions*.

<sup>64</sup> European Parliament, CSIL, and PPMI (2013), *Internet, Digital Agenda and economic development of European regions*.

further investments in digital projects and infrastructures, which would strengthen the creation and delivery of further innovative products and services etc.<sup>65</sup>

**Figure 9. Intervention logic of the Digital Agenda for Europe**



Source: European Commission (2012), *A Digital Agenda for Europe*.

With the DAE, a shift can be observed in the concepts mobilised in EU digital policies. Indeed, the term ‘Information Society’ that was prominent during the 2000s, is almost absent from the DAE. Instead, the emphasis is on economic issues with terms such as ‘digital economy’ and ‘digital single market’. However, it does not imply an abandonment of the social or holistic approach in EU policies. These dimensions are present in the **seven weaknesses identified by the European Commission that the DAE should tackle**:

- Fragmentation of the digital market;
- Lack of interoperability;
- Rising cybercrime, risk of low trust;
- Lack of investment in networks;
- Insufficient research and innovation;
- Lack of digital literacy and digital skills;
- Missed opportunities in addressing social challenges.

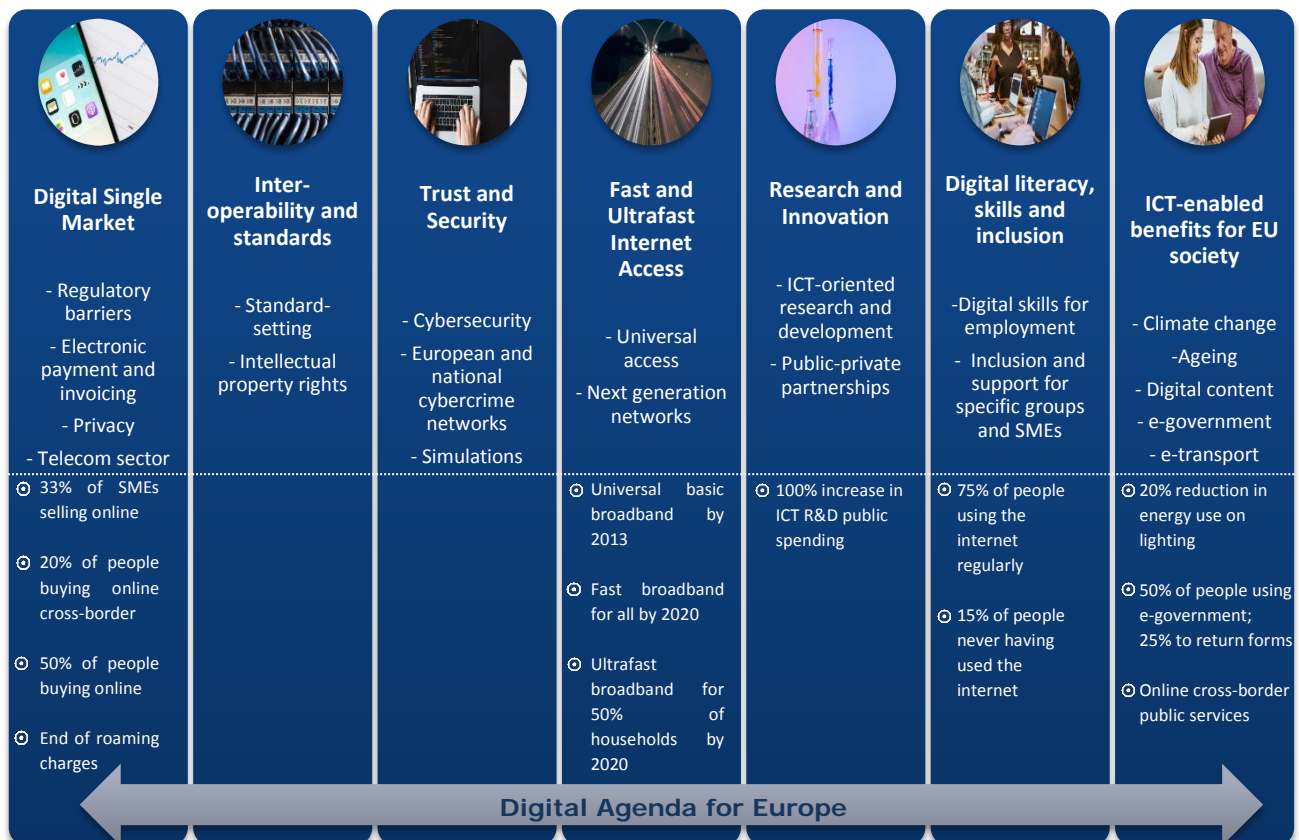
Hence, the DAE is articulated across **seven pillars** to deal with these challenges, with major areas of intervention and specific measurable targets to translate the pillars into concrete objectives<sup>66</sup>.

<sup>65</sup> European Parliament, CSIL, and PPMI (2013), *Internet, Digital Agenda and economic development of European regions*.

<sup>66</sup> European Commission (2010), *COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS A Digital Agenda for Europe*.



**Figure 10. Seven pillars, main areas of intervention and measurable targets of the EU Digital Agenda**



**Source:** Authors based on European Commission (2018), *The Digital Single Market – Our Goals*; images from Burst.

A collection of actions has been planned for each pillar, in terms of both supply and demand-side intervention logics. A total of about 100 specific policy actions were designed by the Commission in the framework of the DAE.

Such a variety of measures implies a sharing of management, funding and responsibilities among the European institutions, the Member States and local stakeholders. Some 78 actions are the responsibility of the European Commission, while 23 are directly managed by the Member States.<sup>67</sup>

The achievements of the Digital Agenda are tracked by the European Commission, thanks especially to an annual scoreboard.<sup>68</sup> In 2012 the European Commission comprehensively assessed the progress made. It concluded that even though the DAE was broadly on target, **several gaps and disparities remained in order to generate a virtuous circle dynamic at the basis of the strategy.**<sup>69</sup> As a result, the European Commission decided to further concentrate its efforts and to prepare complementary measures on:

- Digital economy, single market and consolidation of consumers' and creators' rights;
- Public sector innovation and interoperable ICT;
- High-speed fixed and mobile broadband networks, especially through the stimulation of the private sector;

<sup>67</sup> European Parliament, CSIL, and PPMI (2013), *Internet, Digital Agenda and economic development of European regions*.

<sup>68</sup> Accessible at: <https://ec.europa.eu/digital-single-market/scoreboard> (now merged with the more recent Digital Single Market initiative).

<sup>69</sup> European Commission (2012), COM (2012) 784 Final - The Digital Agenda for Europe - Driving European Growth Digitally.

- Secure and trustworthy internet environment against global risks;
- Adapted framework conditions for cloud computing;
- Adapted framework conditions for the digital transformation of businesses, digital skills and employment;
- Industrial, innovation and research strategy based on Key Enabling Technologies (e.g. advanced manufacturing, photonics).

The Digital Agenda for Europe was then strengthened with a specific focus on the Digital Single Market starting in 2015.

### **Consolidation of the strategic framework: the Digital Single Market**

The early 2010s are a key phase in consolidating and prioritising digital policies in Europe, especially with the establishment of the Digital Agenda for Europe. As mentioned earlier, the Digital Single Market was launched in 2015 to complement this approach, also resulting in further developments for Cohesion Policy.

In the 2014 political guidelines of the European Commission led by Jean-Claude Juncker, digital policies were given high priority. In particular, priority number 2 was to achieve 'A Connected Digital Single Market'.<sup>70</sup> This **focus on the completion of the Digital Single Market**, in line with the initial goals of the Digital Agenda launched in 2010, was motivated by several elements: fair unification of rules for businesses and citizens, potential for growth (estimated to up to EUR 250 billion for 2014-2019), employment and development of the knowledge-based economy where ICT is thought to be cross-cutting rather than a sector.<sup>71</sup>

In terms of concepts, the Digital Single Market was by definition highly focused on the economic aspects of digital policies. Therefore, it was strongly linked to the idea of the 'digital economy' (cited 15 times in the original communication), rather than the 'Information Society' (cited only once). Accordingly, attention was centred on **legislative aspects** in order to abolish barriers in the Single Market. However, the **need for substantial investments** was also highlighted to create a favourable environment, especially through the ESIF and the European Investment Bank (EIB)/ European Investment Fund (EIF).<sup>72</sup>

The strategy retained a **comprehensive approach**, addressing several issues through the lens of the single market (including inclusion in the digital economy and society). As such, three main pillars were identified, with core topics and several related policy initiatives.<sup>73</sup> By mid-September 2017, the European Commission had proposed a total of 38 policy initiatives, including 23 involving legislative changes. Examples include the end of roaming charges and the Digitising European Industry initiative (see Chapter 4).

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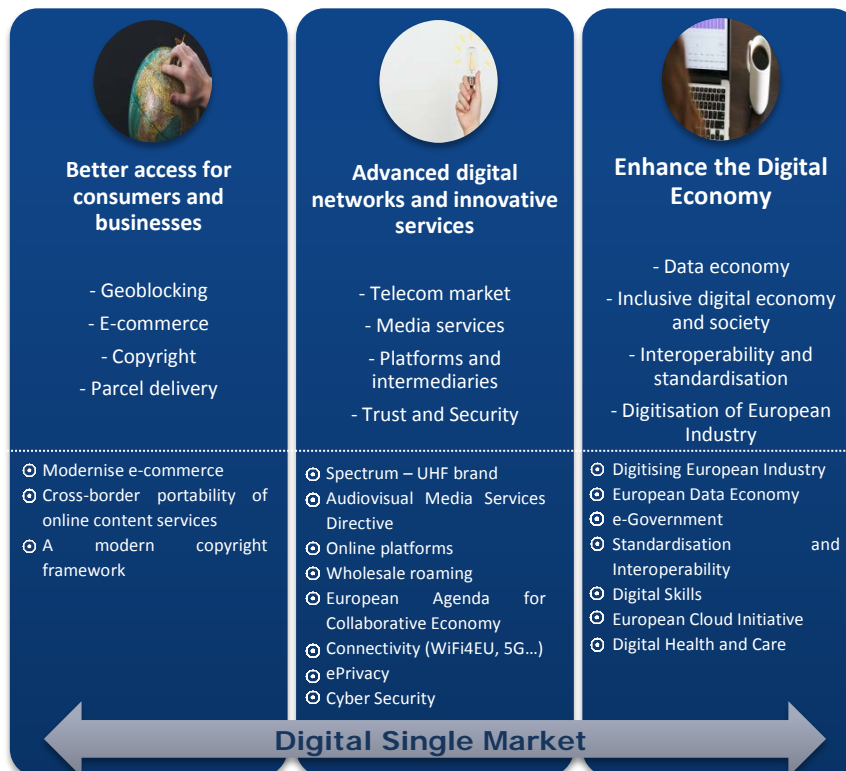
<sup>70</sup> European Commission (2015), *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: A Digital Single Market Strategy for Europe*.

<sup>71</sup> European Commission (2015), *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: A Digital Single Market Strategy for Europe*.

<sup>72</sup> European Commission (2015), *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: A Digital Single Market Strategy for Europe*.

<sup>73</sup> European Commission (2017), *The Digital Single Market: State of Play Prepared for the Digital Summit*.

**Figure 11. Three pillars of the Digital Single Market, with core topics and related policy initiatives**



**Source:** Authors based on European Commission (2017), *The Digital Single Market State of Play*; images from Burst.

In 2017 the Mid-Term review of the Digital Single Market assessed the progress made since 2015.<sup>74</sup> It called for a **continuation of legislative, financial and organisational efforts to deliver the Digital Single Market in an efficient and timely manner**. Regarding funding, the different sources and amounts were precisely identified in the Mid-Term review,<sup>75</sup> with an annex dedicated to them. In particular, the contribution of the ESIF was estimated to be around EUR 21.4 billion (4.8% of the total), including EUR 6 billion for broadband (see Chapter 3).

### 2.3.3 The expected contribution of Cohesion Policy

Cohesion Policy has a key role to play in the digital policy of the EU, because of the territorial dimension of the issues at stake. Different rationales have been used to justify the mobilisation of Cohesion Policy. To begin with, the **regional level is considered to be an appropriate level of action to deal with enabling conditions and adapt intervention to the local context**. In particular, it is adequate to address challenges such as bridging top-down and bottom-up initiatives.<sup>76</sup> European regions can play a pivotal role as an intermediate agent between national and EU top-down initiatives (e.g. on interoperability, standard setting, e-ID, etc.) and the bottom-up efforts of local administrations. Also, disparities (the ‘digital divides’) between and within regions (e.g. in terms of levels of infrastructure endowment, e-skills, openness to innovation) prevent them from reaping the benefits of the DAE (and of the DSM in

<sup>74</sup> European Commission (2017), *Commission staff working document on the Mid-Term Review on the implementation of the Digital Single Market Strategy: A Connected Digital Single Market for All*.

<sup>75</sup> European Commission (2017), *Commission staff working document on the Mid-Term Review on the implementation of the Digital Single Market Strategy: A Connected Digital Single Market for All*.

<sup>76</sup> Committee of the Regions (2013), *Digital Agenda for Europe: The Role of Regions and Cities*.

particular). Conversely, it was recognised that innovation, including the Information Society is the main driver for regional development.

These rationales have progressively unfolded as EU policies have increasingly focussed on the digital economy. The 1994 action plan '**Europe's Way to the Information Society**'<sup>77</sup> argued in favour of a combination of different policy interventions, including Structural Funds. In 1997 the European Commission released a Communication entitled '**Cohesion and the Information Society**', which highlighted the opportunities of ICT for all regions while explicitly identifying the risk of territorial and social digital divides (i.e. disparities in use, access and related benefits).<sup>78</sup> It was argued that liberalisation and harmonisation measures might delay investments in regions with disadvantageous characteristics<sup>79</sup> and deny them access to the benefits of ICT (attractiveness, new forms of labour, new employment positions).

Public intervention (regulatory and financial) was thus called for to ensure that the development of the Information Society happened at the desired rate throughout the entire Union, especially in areas where private involvement was unlikely. Indeed, economic studies in the late 1990s and early 2000s demonstrated that **ICT could have ambiguous effects on territorial cohesion**, potentially leading to both greater economic concentration and a more even distribution of economic activities, depending on the balance of centripetal and centrifugal effects.<sup>80</sup> In the EU ICT tended to favour greater concentration (with some nuances and niche opportunities for peripheral regions),<sup>81</sup> thus confirming the relevance of a cohesion objective for public policies related to ICT.

Additionally, the Communication considers that the regional level is the most appropriate for identifying the opportunities offered to it by the Information Society. It was stressed that '*only an **approach based on consensus, partnership and dialogue** among users and ICT providers within the regional context can make the Information Society a reality adapted to the needs of people and firms rather than a celebration of technology*'.<sup>82</sup> As such, this Communication paved the way for the contribution of Cohesion Policy to the Information Society.

Since the beginning of the 21st century, there has been further recognition that **a region's competitiveness lies in its potential for innovation and that new technologies can be an instrument for social integration**. As a result, the Structural Funds have been perceived as crucial not only to encourage the supply side of the Information Society, but also, and especially, to catalyse latent demand, which, although potentially substantial, is still currently relatively weak in some regions.<sup>83</sup>

More recently, the DAE established that the regional level would be pertinent for carrying out plans and programmes to achieve its goals. The idea was developed that if it did not 'go local' then the Digital Agenda would fail.<sup>84</sup> In a June 2017 resolution, the European Parliament reaffirmed that the Digital Agenda should be a priority for the Cohesion Policy, in all of its dimensions (funding of infrastructures, but also attention to services and training).<sup>85</sup>

<sup>77</sup> Taylor and Downes (2001), *The Structural Funds Facilitating the Information Society*.

<sup>78</sup> European Commission (1997), *Cohesion and the Information Society*.

<sup>79</sup> E.g. with low (potential) demand, territorial fragmentation etc.

<sup>80</sup> See for instance Maignan, Pinelli, Mattei, and Ottaviano (2003), *ICT, Clusters and Regional Cohesion: A Summary of Theoretical and Empirical Research* the tendency to favour concentration of economic activities was widely seen as the dominant empirical consequence of ICT.

<sup>81</sup> Bellone (2006), *Géographie Des TIC et Dynamiques Régionales En Europe*.

<sup>82</sup> European Commission (1997), *Cohesion and the Information Society*.

<sup>83</sup> Technopolis (2002), *Final Report for the Thematic Evaluation of the Information Society*; European Parliament, CSIL, and PPMI (2013), *Internet, Digital Agenda and Economic Development of European Regions*.

<sup>84</sup> Digital Agenda Assembly (2011), *First Digital Agenda Assembly (Brussels, 16-17 June 2011) – Report of activity*.

<sup>85</sup> European Parliament (2017), *Resolution of 13 June 2017 on building blocks for a post-2020 EU cohesion policy (2016/2326(INI))*.

Based on these rationales, the actual support of Cohesion Policy to digital projects increased substantially over time, following different patterns in terms of types of investment and geographical targeting. This is the subject of the next Chapter.



### 3. EARLY ESIF SUPPORT FOR ICT AND THE INFORMATION SOCIETY: FIRST DEVELOPMENTS AND ACHIEVEMENTS

#### KEY FINDINGS

- There was **early awareness** about the importance of promoting ICT and the Information Society at the EU level, especially through Structural Funds and Framework Programmes for Research. Indeed, the first relevant initiatives date back to the 1980s.
- Following a period of **regional experimentation and conceptual consolidation** in the 1990s, programming periods in the 2000s (2000-06, and especially 2007-13) saw **steady growth of their overall budget** dedicated to ICT and the Information Society (**in current prices**). Cohesion Policy was expected to become the **primary contributor to the Digital Agenda for Europe** adopted in 2010.
- The range of intervention areas where regions can invest to promote ICT and the Information Society is very broad. This testifies to the ‘holistic’ approach adopted by the European Commission according to which **the different dimensions of the Information Society should be addressed** (uptake, skills and not only infrastructure or ICT development *sensu stricto*) for overall effectiveness.
- Despite the recommendation to adopt specific ICT/IS strategies relying on the principle of investment diversification, regions often **concentrated resources on a few priorities, and in areas of relative strength**, according to their specific local contexts. They generally focused on ICT infrastructures and the supply side, but also e-government.
- There remains uncertainty about the **exact magnitude of ESF engaged in favour of Information Society priorities in 2000-06** – and to some extent in 2007-13. But ESF investments formed a fully-fledged component of regional digital strategies.
- There is **little aggregate evidence about the overall contribution of Cohesion Policy** to improved digital performance at regional level due to data and methodological limitations. Targeted evidence raises some doubts about the effectiveness of the investments in ICT infrastructure.
- A number of lessons have been learnt from the experience of programming periods in the 2000s. They concern the **important role of the underlying strategies and of partnership**, requiring adequate administrative capacity.
- There is **little evidence of synergies** between Cohesion Policy and other EU instruments over the period considered.

This Chapter examines the contribution of Cohesion Policy to ICT developments and the Digital Agenda, from its early measures in the 80s up until 2013.<sup>86</sup> Since the first integration of ICT-related priorities into Cohesion Policy in the 1980s, different notions have been referred to, *a priori* reflecting different intervention rationales and different types of projects funded. In fact, even if different notions are mobilised in policy documents (e.g. ICT, Information Society, Digital Agenda), the EU tends to consistently follow a rather holistic approach combining digital infrastructures with other economic and social aspects.

<sup>86</sup> In this Chapter, all expenditures are expressed in current prices.

### 3.1 First Cohesion Policy support for ICT (1980s – early 1990s)

Several forerunner initiatives and *ad hoc* support for ICT can be found as early as the 1980s. Structural Funds dedicated funding to ICT during the 1987-1993 programming period, without referring to a formalised EU strategy in the field. In particular, the European Commission developed two relevant Community Initiatives<sup>87</sup> (see Box 1).

#### Box 1: STAR and TELEMATIQUE

The STAR initiative (Special Telecommunications Action for Regional Development) aimed to promote the economic development of the Less Favoured Regions (Objective 1, with a GDP per capita below 75% of the Community average<sup>88</sup>) by providing funding for the development of telecommunication services (mainly network infrastructures, databases, automation support).<sup>89</sup> It was allocated EUR 760 million from the ERDF (current prices). The main rationale was to invest in telecommunication infrastructures ‘ahead of demand’ to stimulate development. Evaluations did show the important contribution of this initiative to the speed of deployment of digital infrastructures, but the effects on regional development itself were considered more mixed.<sup>90</sup> TELEMATIQUE was a follow-up of STAR in 1991-1993, focusing on providing incentives to SMEs to use advanced telecommunication services. It also targeted the Less Favoured Regions (Objective 1), with a financial envelope of EUR 200 million.<sup>91</sup>

**Source:** Authors based on CORDIS (1993), *Final Phase of the STAR Programme*; CORDIS (2014), *Community Initiative for Regional Development concerning Services and Networks related to Data Communication (TELEMATIQUE), 1991-1993*.

Data availability does not allow the precise quantification of the financial resources dedicated to ICT by the Structural Funds, but a rough estimate of EUR 1.2 billion can be provided for the 1987-1993 programming period (current prices), based on a share of 1.5% of the Structural Funds dedicated to Physical Infrastructures and the relevant Community Initiatives.

Consistently with the 1988 reform of the Structural Funds,<sup>92</sup> the first Cohesion Policy support for ICT appears to target regions lagging behind in terms of economic and digital performance, mainly through **infrastructure development and business up-take**. This approach was adopted during the first academic and policy debates on the effects of ICT for regional disparities, with great uncertainties. Indeed, theoretical economic arguments suggest that ICT might aggravate or alleviate regional disparities.<sup>93</sup>

In parallel, other European support for ICT focused on the liberalisation of telephony, standardisation and Research and Development. The Second Framework Programme for Research dedicated significant resources to ICT (both hardware and software), namely EUR 2.15 billion (40% of the 1987-1991 Second FP).<sup>94</sup> Goals included the ambition to contribute to a transition ‘Towards a large market and an information and communications society’,

<sup>87</sup> Community Initiatives are spending programmes co-financed by the Structural Funds that are not part of the standard framework, as they are based on Commission guidelines. They aim to address emerging regional challenges beyond national borders and are a tool for experimenting innovative measures.

<sup>88</sup> Bachtler, Jossierand, and Michie (2003), *EU enlargement and the reform of the structural funds: the implications for Scotland*.

<sup>89</sup> CORDIS (1993), *Final Phase of STAR Programme*.

<sup>90</sup> Ducatel, Webster, and Herrmann (2000), *The Information Society in Europe: Work and Life in an Age of Globalization*.

<sup>91</sup> CORDIS (2014), *Community Initiative for Regional Development Concerning Services and Networks Related to Data Communication (TELEMATIQUE), 1991-1993*.

<sup>92</sup> Which concentrated resources towards the less developed regions.

<sup>93</sup> Bellone (2006), *Géographie Des TIC et Dynamiques Régionales En Europe*.

<sup>94</sup> CORDIS (2014), *Framework programme for Community activities in the field of research and technological development, 1987-1991*.



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anticipating the formal definition of these concepts at the EU level. These first initiatives paved the way for increasingly prioritised policy support for ICT and the Information Society.

### 3.2 Emergence and consolidation of ICT and the Information Society as a priority of Cohesion Policy (1990s)

During the 1990s important advances were made in the conceptual framework underlying policy developments (with the Delors Report in 1993 and more critically, the Bangemann Report in 1994 – see Chapter 2). Structural Funds were explicitly expected to contribute to the transition towards an Information Society. However, this objective did not *de facto* lead to substantial funding for the 1994-1999 programming period of Cohesion Policy. Indeed, only a **small share of resources was allocated to the Information Society** (about 2% of Structural Funds, i.e. EUR 2.1 billion for telecoms, telematics and the related Community Initiatives).<sup>95</sup> This period was seen rather as an **experimentation field** to favour the development of the Information Society at a regional level. This took place in parallel with the increasing focus of regional public policies on innovation.<sup>96</sup>

Accordingly, several initiatives and pilot actions were conceived around two objectives: regional strategy-building and applications. With the Inter Regional Information Society Initiative (IRISI) and the Regional Information Society Initiative (RISI), a sample of Less Favoured Regions (Objective 1 regions, with a GDP per capita below 75% of the Community average<sup>97</sup>) were given support to design strategies and action plans related to the Information Society (see Box 2).

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<sup>95</sup> European Commission (1997), *Cohesion and the Information Society*.

<sup>96</sup> Mikel Landabaso (2010), *European Regional Policy: Reflections on 20 Years of Innovation Support*.

<sup>97</sup> Manzella and Mendez (2009), *The turning points of EU Cohesion policy*. See <https://bit.ly/2kwDYFW> for details.

**Box 2: IRISI and RISI**

The IRISI involved six (Less Favoured) Regions from 1994 to 1996 in order to develop regional strategies and action plans to address the challenges of the emerging Information Society. These regions benefited from support of EUR 2 million,<sup>98</sup> concretely leading to international networking of the regions, feasibility studies, regional committees of actors to deliver a strategy, etc. The focus was on the priorities identified in the Bangemann report. According to the evaluation, IRISI led to valuable improvements in terms of the emergence of stakeholders' networks in the Information Society in the targeted regions, developed the bottom-up and user-driven approach and favoured the Information Society's (emerging) influence on regional planning.<sup>99</sup> However, problems remained in terms of awareness raising, inclusiveness and in strategy development and guidance from the Commission.

The RISI (1, 2, +) built upon the first IRISI findings. It was implemented in 22 regions between 1996 and 1999 with a support of EUR 20 million.<sup>100</sup> It shared major features with the IRISI, and specifically aimed to make the Information Society a key part of regional development and employment policies, and to implement pilot actions.<sup>101</sup> It promoted the development of regional Information Society strategies with networking and best practice exchanges. In terms of methods, the RISI combined top-down, bottom-up, market and consensus-building (e.g. public-private partnerships) approaches.<sup>102</sup> Moreover, RISI was linked to subsequent EU funding (Structural Funds), allowing a smoother transition to concrete projects. RISI results were variable (because of the wide differences between the regions involved).

**Source:** Authors based on Mikel Landabaso (2010), *European Regional Policy: Reflections on 20 Years of Innovation Support*.

Several findings on regional digital strategies were identified by different evaluations for the 1994-1999 period (especially based on the experience of IRISI/RISI)<sup>103</sup>.

- **Awareness raising** and networking on the importance of the Information Society seemed to have been a success factor among the IRISI/RISI regions. Indeed, as the context of the Information Society was in its infancy during the period, the IRISI/RISI approach allowed for the development of relevant strategies and funding.
- Emphasis on **consensus building**, public-private partnerships and information sharing favoured the outputs of the IRISI/RISI (strategies and funding). Yet issues stemming from regional differences (cultural, administrative and technical capacities) remained and there could have been more emphasis on the mobilisation of the private sector.
- Overall, the total funding dedicated to the Information Society increased for the regions that benefited from the IRISI/RISI, even though the causality link is difficult to assess. Involvement in strategy-building around the Information Society seemed to be closely linked to the availability of further financial support.
- Regions of the IRISI/RISI often based their strategies on **local needs** (a key condition for success); however, Information Society priorities **remained very generic** across the spectrum of local situations.
- There was a trade-off regarding the involvement of the central government in regional digital strategies. Indeed, the flexibility required to adapt freely to local conditions was

<sup>98</sup> Mikel Landabaso (2010), *European regional policy: reflections on 20 years of innovation support*.

<sup>99</sup> Tsipouri, *Europe and the Information Society*.

<sup>100</sup> Mikel Landabaso, *European Regional Policy: Reflections on 20 Years of Innovation Support*.

<sup>101</sup> Tsipouri (2000), *Europe and the Information Society: Problems and challenges for supranational intervention*.

<sup>102</sup> Tsipouri (2000), *Europe and the information society: Problems and challenges for supranational intervention*.

<sup>103</sup> Technopolis (2002), *Final Report for the Thematic Evaluation of the Information Society*; Taylor and Downes (2001), *The Structural Funds Facilitating the Information Society*; European Commission, Socintec, and Inno-TSD (2005), *Ex-Post Evaluation of the RIS, RTTs and RISI ERDF Innovative Actions for the Period 1994-99: Final Synthesis Report*.

contrasted by the **demand from the regional authorities for technical and administrative support related to ICT.**

- IRISI/RISI had an ambiguous impact on the overall regional innovation systems. Regions with relatively **low previous experience with the Information Society benefited from improvements in their regional innovation system** after IRISI/RISI (e.g. greater expert skills, better identification of the different sources of expertise, greater ability to operate at the international level, etc.). However, this was not observed for regions that were initially more advanced in terms of the Information Society experience.

Generally speaking, these insights contributed to the reflections paving the way for the subsequent programming periods.

In addition to support through Cohesion Policy and its initiatives, the EU continued to support ICT research programmes, for instance ESPRIT since Framework Programme 4. ESPRIT supported research into Information Technologies, with an envelope of EUR 2 billion. In total, the Research and Development funding for ICT/the Information Society amounted to EUR 3.6 billion, that is to say 27%, for 1994-1998.<sup>104</sup> Still synergies with the Structural Funds remained low.<sup>105</sup>

After this period of awareness-raising and experimentation, the **consensus on the importance of the Information Society was increasing among the stakeholders at different levels.** It led to the first substantial commitments to move towards the Information Society in the early 2000s, especially in Cohesion Policy.<sup>106</sup>

### 3.3 Cohesion Policy's first substantial efforts in favour of the Information Society (2000-2006)

During the 2000-2006 programming period, Cohesion Policy was much more geared to the objectives of the Information Society. It explicitly referred to the e-Europe strategy<sup>107</sup>, and developed on the basis of two main rationales:<sup>108</sup>

- The role of innovation and new technologies for regional competitiveness;
- The inclusion aspects related to the access (or lack thereof) to the Information Society.

Information Society measures were financed as part of mainstream funding rather than through innovative initiatives such as IRISI.<sup>109</sup> The relevant Cohesion Policy regulations for both the ERDF and the ESF explicitly identified priorities for funding related to the development of the Information Society.<sup>110</sup>

#### 3.3.1 Patterns of expenditure

This prioritisation was accompanied by a **significant rise of the amount of Structural Funds for the Information Society**, with an envelope of at least EUR 5,3 billion from the ERDF, CF and ISPA (about 3%).<sup>111</sup> It was estimated that Objective 1 and 2 regions<sup>112</sup> would

<sup>104</sup> CORDIS (2015), *Fourth Framework Programme of European Community activities in the field of research and technological development and demonstration from 1994 until 1998.*

<sup>105</sup> European Commission, Socintec, and Inno-TSD (2005), *Ex-Post Evaluation of the RIS, RTTs and RISI ERDF Innovative Actions for the Period 1994-99: Final Synthesis Report.*

<sup>106</sup> Technopolis (2002), *Final Report for the Thematic Evaluation of the Information Society.*

<sup>107</sup> European Commission (1999), *eEurope - An Information Society for All.*

<sup>108</sup> Technopolis (2002), *Final Report for the Thematic Evaluation of the Information Society.*

<sup>109</sup> Technopolis (2002), *Final Report for the Thematic Evaluation of the Information Society.*

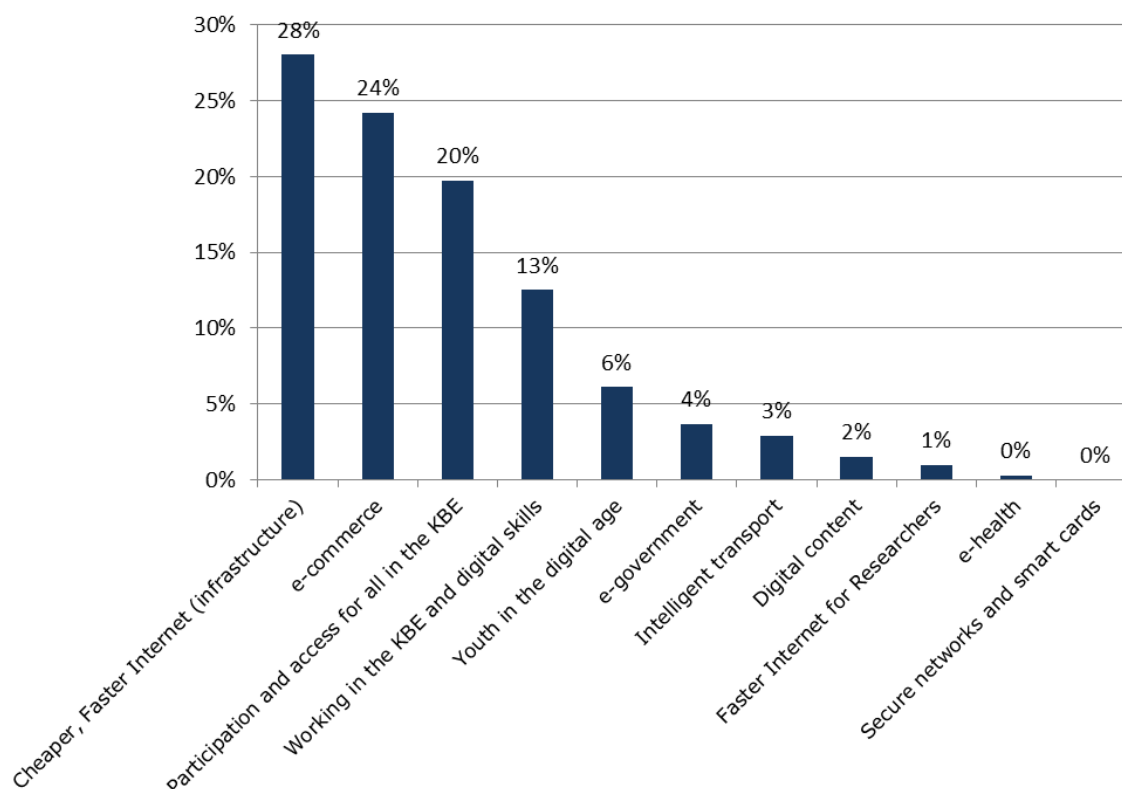
<sup>110</sup> European Commission (2004), *Structural Funds Regulations 2000-2006.*

<sup>111</sup> Authors, based on DG REGIO (2008), *Regional expenditure study 2000-2006: Breakdown of ERDF, Cohesion Fund and ISPA expenditures by regions, by sectors and by Objectives.* It only includes expenditure recorded under the 'Telecommunications infrastructure and Information Society' category, while other relevant

dedicate EUR 9.6 billion to the Information Society (ERDF, CF and ESF, excluding ESF in objective 3 regions).<sup>113</sup> There are uncertainties about the extent of the total ESF funding targeting ICT competence, however, it was estimated at roughly EUR 7.1 billion (12%) for 2000-2006.<sup>114</sup>

Regional investments for the Information Society were broadly consistent with the e-Europe objectives,<sup>115</sup> as they covered different types of intervention in a holistic approach. This can be observed in the following graph.

**Figure 12. Share of Structural Funds dedicated to the Information Society in Objective 1 and 2 regions by e-Europe priority for the 2000-2006 period**



Source: Authors based on Technopolis (2002), *Final Report for the Thematic Evaluation of the Information Society*.

The main e-Europe regional priorities<sup>116</sup> for that period were **Infrastructure development (especially in peripheral/lagging-behind regions), e-commerce, Participation and access for all in the Knowledge-Based Economy, and Working in the Knowledge-Based Economy/Digital skills**. These four priorities amounted to 85% of the Structural Funds dedicated to the Information Society in Objective 1 and 2 regions during the 2000-2006 period. Infrastructure development was not a major e-Europe priority, yet it was considered as a key intervention for a substantial number of regions. Regions still largely focused on supply-

investments might have been financed under different categories and funds (especially regarding digital skills, e-inclusion etc.)

<sup>112</sup> Objective 1 regions were considered as 'lagging behind', Objective 2 regions as in 'structural difficulties'. Most of the Structural Funds were dedicated to these 2 objectives. Objective 3 regions were the ones not covered by objective 1 or 2, and benefited solely from ESF funding.

<sup>113</sup> Technopolis (2002), *Final Report for the Thematic Evaluation of the Information Society*.

<sup>114</sup> LSE Enterprise Ltd et al. (2010), *Final Report for the Ex-Post Evaluation of the European Social Fund (2000 - 2006)*. For more details, see the Methodological Annex.

<sup>115</sup> Technopolis (2002), *Final Report for the Thematic Evaluation of the Information Society*.

<sup>116</sup> This nomenclature was used in the framework of e-Europe and served as a basis for the Technopolis study of 2002.

side investments rather than on demand stimulation.<sup>117</sup> Nevertheless, a greater emphasis on digital business development (e.g. e-commerce) and employment/skills could be observed.<sup>118</sup>

**Box 3: The contribution of the ESF to the Information Society (2000-2006)**

As a key priority emerging during the early 2000s, the social and labour market dimensions of the Information Society were strongly supported by the ESF during the 2000-2006 programming period. Indeed, based on keywords found in Operational Programmes,<sup>119</sup> the ESF dedicated EUR 7.1 billion to ICT/IS-related training projects, targeting both ICT skills *per se* and using ICT for learning. The evaluation of these projects revealed several insights for future policy-making. Major success factors for Information Society training included:

- Certification of the training;
- Motivation and selection of the trainees;
- ICT as Soft/basic skills (non-directly marketable; required for other types of training).

The impact of such training was considered as potentially highly influential, as it was connected to changing long-term attitudes of beneficiaries towards training itself. However, many challenges were identified for Information Society training:

- Ageing of the workforce;
- Obsolescence of skills;
- Digital divide linked to ICT skills;
- Identification of target groups.

**Source:** Authors, based on LSE Enterprise Ltd et al. (2010), Final Report for the Ex-Post Evaluation of the European Social Fund (2000-2006).

Geographically, there was a pattern of **greater allocation of ERDF and CF to the Information Society in Southern Europe**, with Portuguese, Spanish, Italian and Greek regions recording the highest levels of expenditure. However, this finding is probably linked to the fact that this part of Europe was over-represented among Objective 1 (less developed) regions.<sup>120</sup> Smaller regions (fewer than 1 million inhabitants) also dedicated more Cohesion Policy funding *per capita* to the Information Society.<sup>121</sup> It probably stems from the greater confidence of public authorities to manage Information Society issues on a smaller scale (reduced perceived complexity, fewer competing interests, etc.). Similarly, sparsely populated and peripheral regions had higher levels of Information Society spending *per capita* via ERDF/CF during the 2000-2006 period. This might be explained by the greater investment requirements in these regions,<sup>122</sup> stemming from their physical peculiarities (e.g. infrastructure costs tend to be higher when population density is low).

<sup>117</sup> Technopolis (2002), *Final Report for the Thematic Evaluation of the Information Society*.

<sup>118</sup> ESPON (2005), *The Territorial Effects of the Structural Funds*.

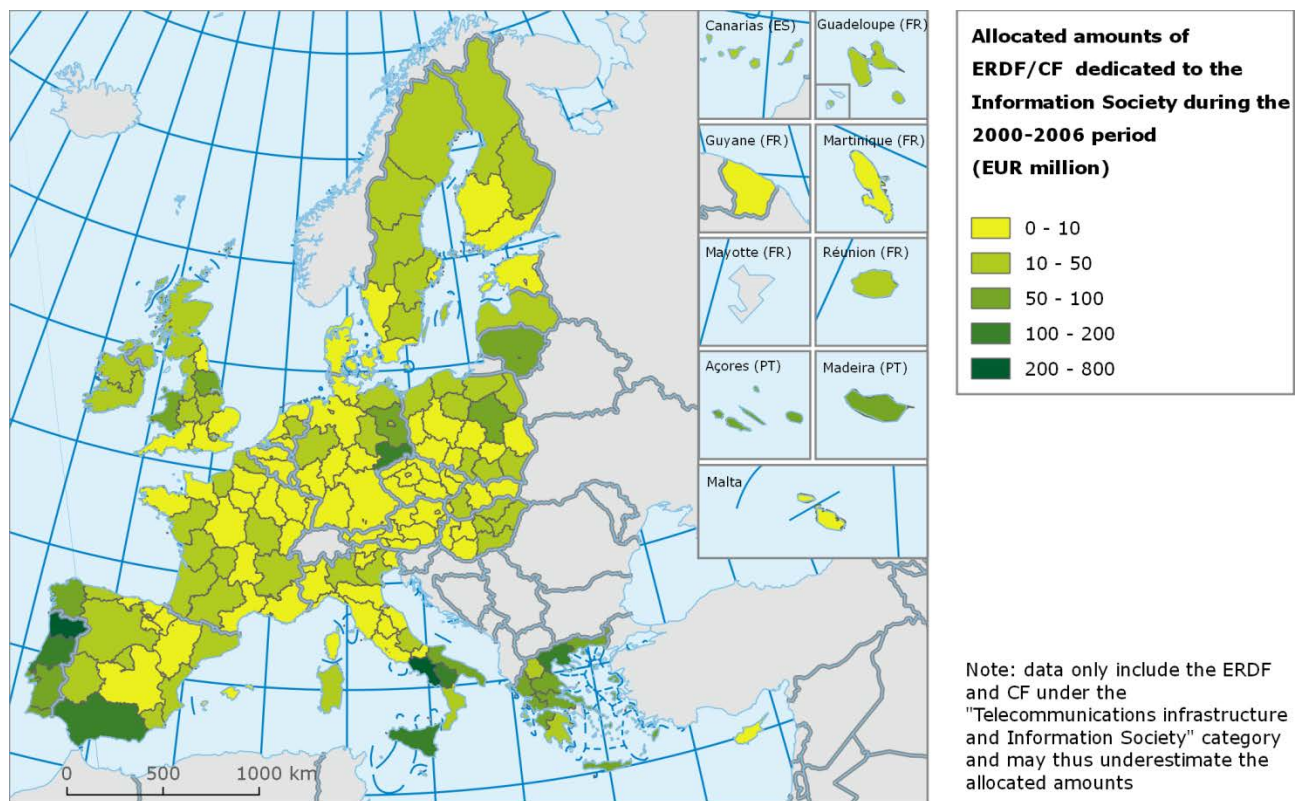
<sup>119</sup> The text of OPs was analysed to find measures containing the following expressions: 'distance learning, e-health, e-learning, ICT, Information and Communication Technology, Information Society, Knowledge-Based Society, skills for innovation and technology'. These measures were considered as contributing to the Information Society, allowing the computation of the financial estimate.

<sup>120</sup> Technopolis (2002), *Final Report for the Thematic Evaluation of the Information Society*.

<sup>121</sup> Technopolis (2002), *Final Report for the Thematic Evaluation of the Information Society*.

<sup>122</sup> Technopolis (2002), *Final Report for the Thematic Evaluation of the Information Society*.

**Map 4: Allocated amounts of ERDF/CF dedicated to ICT/the Information Society during the 2000-2006 programming period**



**Source:** Authors based on DG REGIO (2008), Regional expenditure study 2000-2006: Breakdown of ERDF, Cohesion Fund and ISPA expenditures by regions, by sectors and by Objectives.

### 3.3.2 Challenges related to the emergence of regional digital strategies

Since 2000, the ambition of the Commission has been to promote integrated strategies for the Information Society at the regional level.<sup>123</sup> This ambition should be understood in the framework of the shared management system, with cooperation between the different levels of government to design and implement Cohesion Policy<sup>124</sup>. In practice, the public authorities mostly restricted their Single Programming Document (SPD) to **particular aspects of the Information Society**<sup>125</sup> and, in most cases, they did not explicitly include ICT/the Information Society in strategic objectives.<sup>126</sup> However, ICT and the Information Society were common at the priority or measure level during that period. This situation has led to different interactions between the SPD of Cohesion Policy and other regional strategies regarding the Information Society:<sup>127</sup>

<sup>123</sup> ESPON (2005), *The Territorial Effects of the Structural Funds*.

<sup>124</sup> Specific arrangements concerning the division of responsibilities between regional and national authorities depended on national frameworks. According to a study for the European Parliament, there is wide consensus that since its 1988 reform, Cohesion Policy requirements have supported and strengthened multi-level governance arrangements, however "national governments have continued to exert a strong grip on key decisions and (...) there has been resistance to EU pressures for sub-national empowerment". See European Parliament, Metz, EPRC (2014), *An assessment of multilevel governance in Cohesion Policy 2007-2013*.

<sup>125</sup> In 2000-2006, SPDs had a comparable role to the current OPs.

<sup>126</sup> ESPON (2005), *The Territorial Effects of the Structural Funds*.

<sup>127</sup> Taylor and Downes (2001), *The Structural Funds Facilitating the Information Society*.

- **Passive:** the Information Society component was minimised in the SPD due to a late imperative by the Commission combined with the absence of existing Information Society initiatives at the regional level. No region was entirely 'passive', but regions such as Catalonia and Saarland had several features of this category.
- **Responsive (majority of SPD):** existing Information Society strategies were integrated into the SPD. Regions such as Steiermark and Lombardy were part of this category.
- **Catalytic:** the Information Society priority had led to the development of new Information Society initiatives within the framework of Structural Funds. Western Scotland can be considered as part of this category.

Because ICT and the Information Society were considered as both a priority area and a cross-cutting theme, the regions could be grouped by the type of approach chosen:<sup>128</sup>

- **Vertical approach:** the Information Society is one of many priorities (e.g. Valencia)
- **Horizontal approach:** the Information Society is a cross-cutting (national) theme (e.g. South Yorkshire)
- **Combined approach:** the Information Society is both one of many priorities and a cross-cutting theme (e.g. Wales)
- **Fragmented approach:** the Information Society is addressed in some or all of the priorities (e.g. several Objective 2 regions).

In just over half of the regions, the **Information Society was a cross-cutting theme testifying to the difficulties in generalising the Information Society approach at the regional level.**<sup>129</sup>

The level of development of regions influenced the IS priorities selected. More developed Objective 2 regions tended to focus on infrastructures, e-commerce and participation/access to the Knowledge-Based Economy (KBE). Instead less developed Objective 1 regions spent more Structural Funds *per capita* for the Information Society than Objective 2 regions and tended to allocate more resources to public sector activities, potentially linked to their weaker private/SME sector.<sup>130</sup> National context and policy backgrounds, dialogue between levels of government, previous experience in the field and planning capacities were decisive for national and regional authorities to select the most relevant priorities adapted to their local context.

During the 2000-2006 period, **the maturity of regional authorities in the sphere of the Information Society improved significantly** (in terms of infrastructure, usage, services, skills).<sup>131</sup> However, regions that had been involved in the IRISI/RISI in the previous programming period had lower levels of investments in the Information Society for 2000-2006. This surprising result could be due to several factors: failure to mainstream their priorities, but also a potential head-start compared to other regions and a greater ability to attract other sources of funding (e.g. private, national, regional etc.).<sup>132</sup>

### 3.3.3 Additional sources of EU funding for ICT/the Information Society

In parallel with Cohesion Policy funding, the EU also contributed to its digital strategies via other financial instruments. In particular, commitments linked to Research, Development and Innovation continued under the 6<sup>th</sup> Framework Programme, which attributed EUR 3.6 billion

<sup>128</sup> Technopolis (2002), *Final Report for the Thematic Evaluation of the Information Society*.

<sup>129</sup> ESPON (2005), *The Territorial Effects of the Structural Funds*.

<sup>130</sup> Technopolis (2002), *Final Report for the Thematic Evaluation of the Information Society*.

<sup>131</sup> Technopolis (2002), *Final Report for the Thematic Evaluation of the Information Society*.

<sup>132</sup> Technopolis (2002), *Final Report for the Thematic Evaluation of the Information Society*.

(21% of FP6) for ICT Research and Development projects in 2002-2006.<sup>133</sup> However, critics noted a persistence of the technology-centric approach, to the detriment of socio-economic and cultural aspects.<sup>134</sup> Moreover, and in line with the holistic approach of the Information Society, resources were attributed to:

- The deployment of trans-European public electronic services with the eTen (TEN-Telecom) programme: EUR 275 million for 2000-2006.<sup>135</sup> For example, this programme financed the MICHAEL project, an 'electronic system to access, manage and update existing digital records of 13 national collections - including museum objects, archaeological and tourist sites, music and audio-visual archives, biographical materials, documents and manuscripts'.<sup>136</sup>
- The development of European digital content (including a focus on linguistic and cultural diversity) with the eContent (EUR 100 million for 2001-2004)<sup>137</sup> and eContent plus programmes (EUR 149 million for 2005-2008).<sup>138</sup>

### 3.4 Cohesion Policy as a main instrument to achieve the Digital Agenda (2007 - 2013)

As the Digital Agenda for Europe was launched in 2010, it did not affect the strategic framework of Cohesion Policy over the 2007-2013 programming period. Reference continued to be made to the notion of the Information Society;<sup>139</sup> however, **Cohesion Policy became recognised as a major contributor to the realisation of the Digital Agenda's objectives**, especially given its important financial resources and the adequacy of the regional level to address the challenges identified (see Chapter 2).

#### 3.4.1 Patterns of expenditure

A significant rise in resources dedicated to the Information Society was observed for the 2007-2013 programming period of Cohesion Policy, with EUR 15.3 billion from the ERDF/CF and EUR 88 million from the ESF directly connected to IS priorities.

#### Sectoral breakdown

A system of categorisation of Cohesion Policy expenditure was established by the European Commission for 2007-2013<sup>140</sup>. Under this system, the Structural Funds' expenditure data were sorted out and coded by 86 priority themes. The priority themes related to the Information Society covered a wide range of types of intervention, in line with a holistic approach:

- 10 Telephone infrastructures (including broadband networks);
- 11 Information and Communication Technologies;
- 12 Information and Communication Technologies – Trans-European Networks;
- 13 Services and applications for citizens;
- 14 Services and applications for SMEs;
- 15 Other measures for improving access to and the efficient use of ICT by SMEs.

It is possible to regroup some of the priority theme codes to form consolidated areas of intervention with greater policy relevance: e-services and applications for citizens (code 13),

<sup>133</sup> European Commission (2002), *The Sixth Framework Programme in brief*.

<sup>134</sup> Servaes (2003), *The European Information Society: A Reality Check*.

<sup>135</sup> European Commission (1999), *eEurope - An Information Society for All*.

<sup>136</sup> CORDIS (2006), *Commission selects 30 new eTEN projects*.

<sup>137</sup> Tarmo Pihl (2002), *Funding possibilities under the eContent Programme*.

<sup>138</sup> Welcomeurope (2012), *E-CONTENT PLUS - Programme from European Commission*.

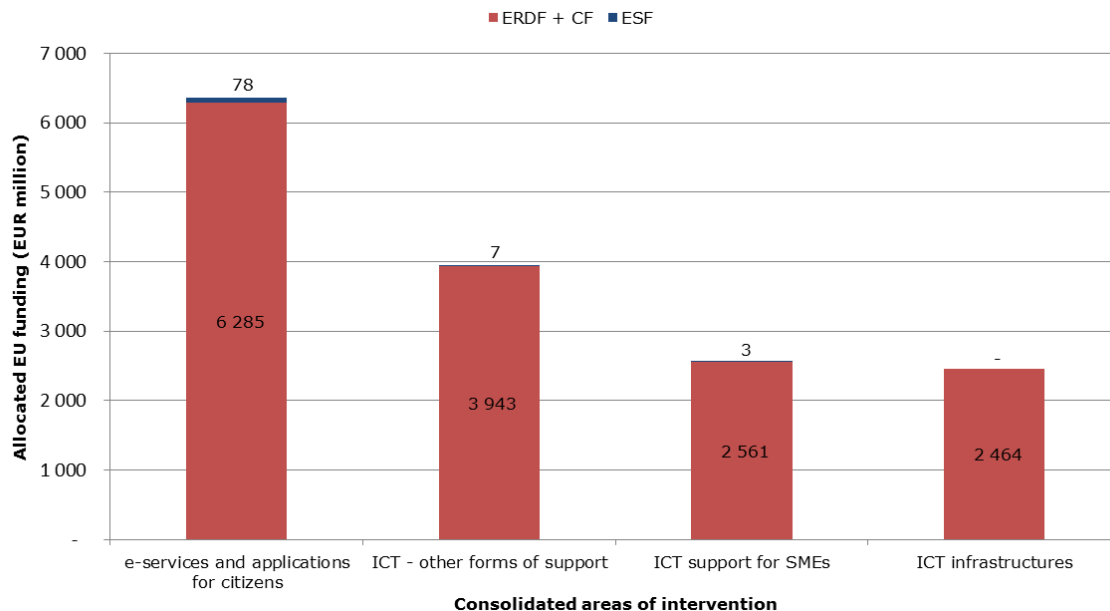
<sup>139</sup> European Commission (2007), *Cohesion Policy 2007-13: Commentaries and Official Texts*.

<sup>140</sup> European Commission (2006), *Commission Regulation (EC) No 1828/2006 of 8 December 2006*.



ICT – other forms of support (merging codes 11 and 12), ICT support for SMEs (merging codes 14 and 15), ICT infrastructures (code 10).

**Figure 13. Consolidated areas of intervention related to the Information Society/Digital Agenda funded by Cohesion Policy in 2007-2013**



**Source:** Authors based on European Commission (2015), *2007-2013 database of Structural Funds (by Member state and priority themes)*.

As Figure 13 illustrates, **the main consolidated area of intervention was e-services and applications for citizens**, with about EUR 6.36 billion, followed by ICT – other forms of support (covering R&D, innovation, interoperability and access, etc.) at EUR 3.95 billion. ICT support for SMEs and ICT infrastructures reached comparable levels at about EUR 2.5 billion. Even though e-services and applications for citizens tended to absorb an important share of resources (41%), these patterns clearly show the continuation of a holistic approach in terms of types of intervention funded, consistently with the Information Society notion.

It should be noted that the marginal amounts of the ESF are probably due to the fact that the data only capture interventions that were coded under priority themes 10 to 15. However, it may be hypothesised that **the ESF contributed to Information Society and Digital Agenda objectives with funding coded under other priority themes**, e.g. 63 'Design and dissemination of innovative and more productive ways of organising work'. Nevertheless, it is impossible to recover the extent of such funding given the nomenclature of data (see Annex II for more details on methodological issues).

More globally, the consolidated areas of intervention directly address all the pillars of the Digital Agenda, as follows:<sup>141</sup>

- E-services and applications for citizens: contribution to 'Trust and Security', 'Digital literacy, skills and inclusion', 'ICT-enabled benefits for EU society';
- ICT – other forms of support: contribution to 'Interoperability and standards', 'Trust and Security', 'Fast and ultrafast Internet access', 'Research and Innovation';
- ICT infrastructures: contribution to 'Fast and ultrafast Internet access';

<sup>141</sup> European Commission (2010), *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions a Digital Agenda for Europe*; European Commission (2012), *COM (2012) 784 Final - The Digital Agenda for Europe - Driving European Growth Digitally*; European Commission (2007), *Cohesion Policy 2007-13*; European Parliament, CSIL, and PPMI (2013), *Internet, Digital Agenda and Economic Development of European Regions*.

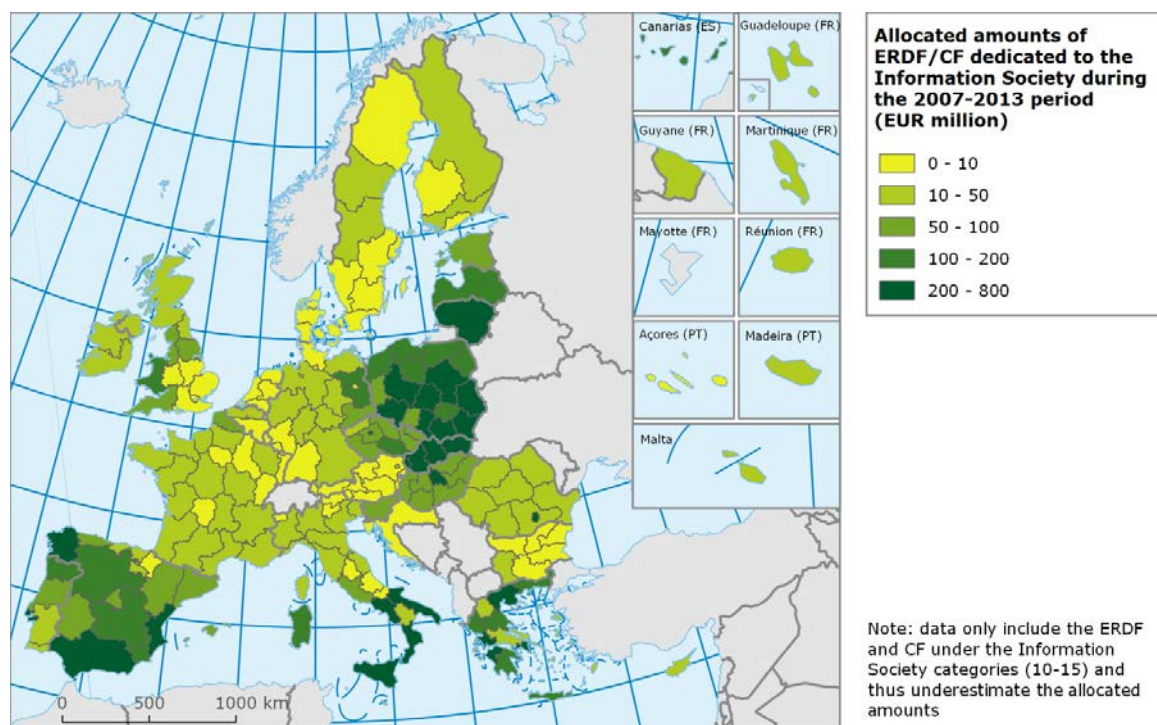
- ICT support for SMEs: contribution to 'Digital Single Market', 'Digital literacy, skills and inclusion'.

### Geographical patterns

On average, the amount spent in NUTS 2 regions for Information Society priority themes (ERDF and CF only<sup>142</sup>) was EUR 57 million during the 2007-2013 period. The **regions spending the highest amounts of ERDF and CF on themes related to the Digital Agenda were located in Southern and Central and Eastern Europe**. This pattern is consistent with both the overall distribution of these Funds in Europe and the countries with the lowest performance in digital indicators.<sup>143</sup> The Mazowieckie region in Poland spent the most, with EUR 750 million, followed by Attiki in Greece (EUR 429 million) and Campania in Italy (EUR 418 million).<sup>144</sup> The relatively low levels of expenditure in Romania, Bulgaria and Croatia, in spite of their limited digital performance, can be explained by the fact that they joined the European Union during the period. On average, the less developed 'Convergence' regions spent EUR 116 million of ERDF and CF on Information Society priority themes; while the more developed 'Competitiveness and Employment' regions spent only EUR 10 million.

For the 2007-2013 period ESF amounts dedicated to the Information Society were not available at the regional level, restricting geographical analysis to the contribution of the ERDF and CF. However, it should not significantly change the patterns given the very limited amounts of ESF coded under the Information Society priority themes (10-15, see previously).

**Map 5: Allocated amounts of the ERDF and CF dedicated to the Information Society during the 2007-2013 period**



**Source:** Authors based on DG REGIO (2015), Database of the cumulative allocations to selected projects and expenditure at NUTS2.

<sup>142</sup> See European Commission, WIIW and Iseri Europa (2015), Geography of Expenditure Final Report Work Package 13: Ex post evaluation of Cohesion Policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF) for details on the creation of the regional database for the ERDF and CF.

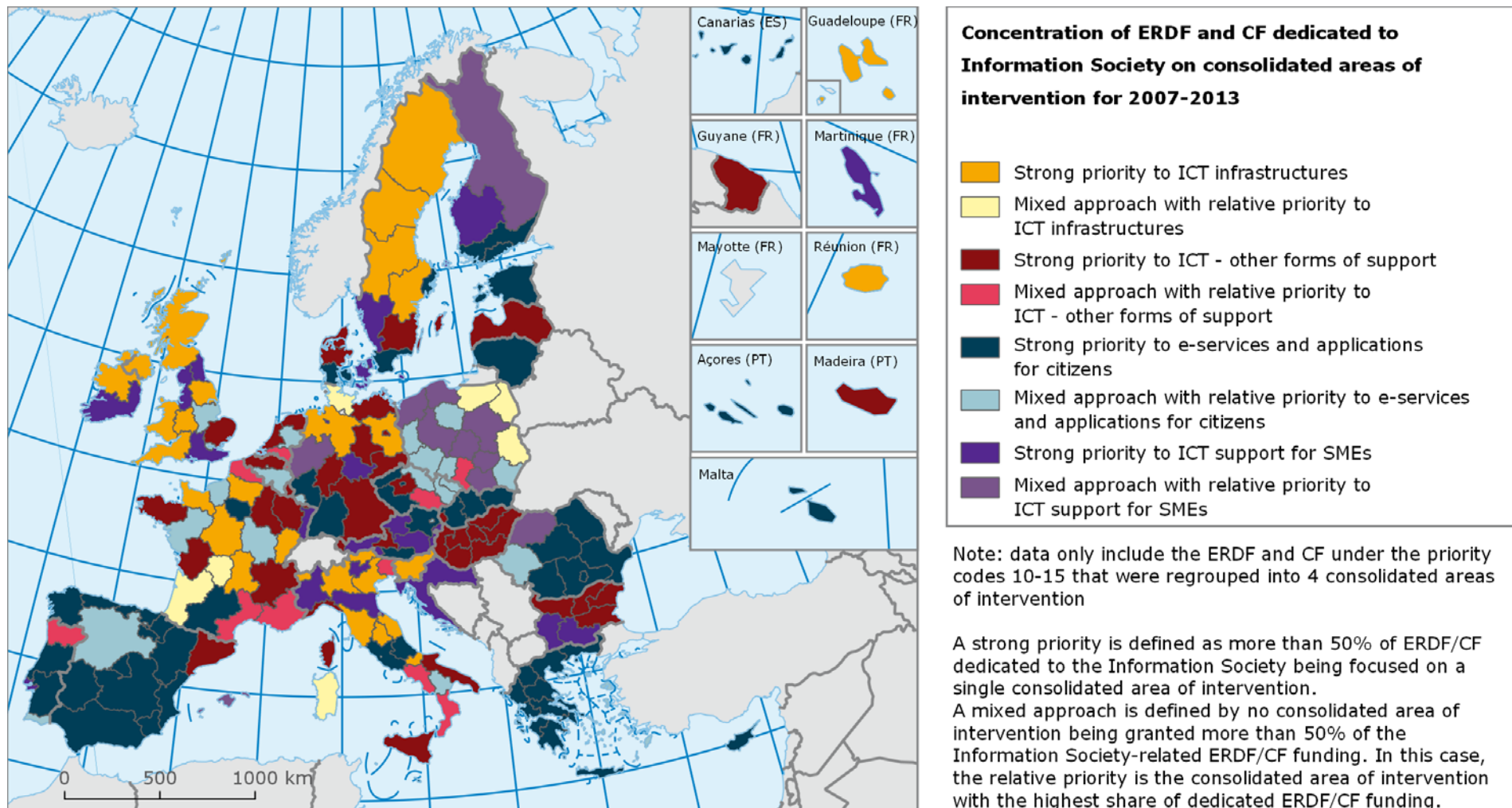
<sup>143</sup> European Commission (2018), *The Digital Economy and Society Index (DESI)*.

<sup>144</sup> Authors, based on DG REGIO (2015), Database of the cumulative allocations to selected projects and expenditure at NUTS2.

As can be seen on the following map, the vast majority of **regional Operational Programmes (75%) allocated more than 50% of their Information Society-related ERDF and CF funding to a single consolidated area of intervention**: ICT infrastructures (14% of the regions), ICT – other forms of support (20%), e-services and applications for citizens (29%) or ICT support for SMEs (12%). This suggests the preference of regional strategies for concentration rather than diversification. However, it does not necessarily imply an unbalanced approach, as local contexts may explain part of this situation. Moreover, this tendency to concentration is mitigated by the presence of other sources of funding (e.g. ESF which is not included in this geographical analysis, national or regional funds etc.). As shown on the same map, there were **no clear geographical patterns for the relative prioritisation of consolidated areas of intervention in total ERDF/CF Information Society funding** (even if the national frameworks seem to play a role, e.g. with ICT a strong priority in Hungary and e-public services in Slovakia).

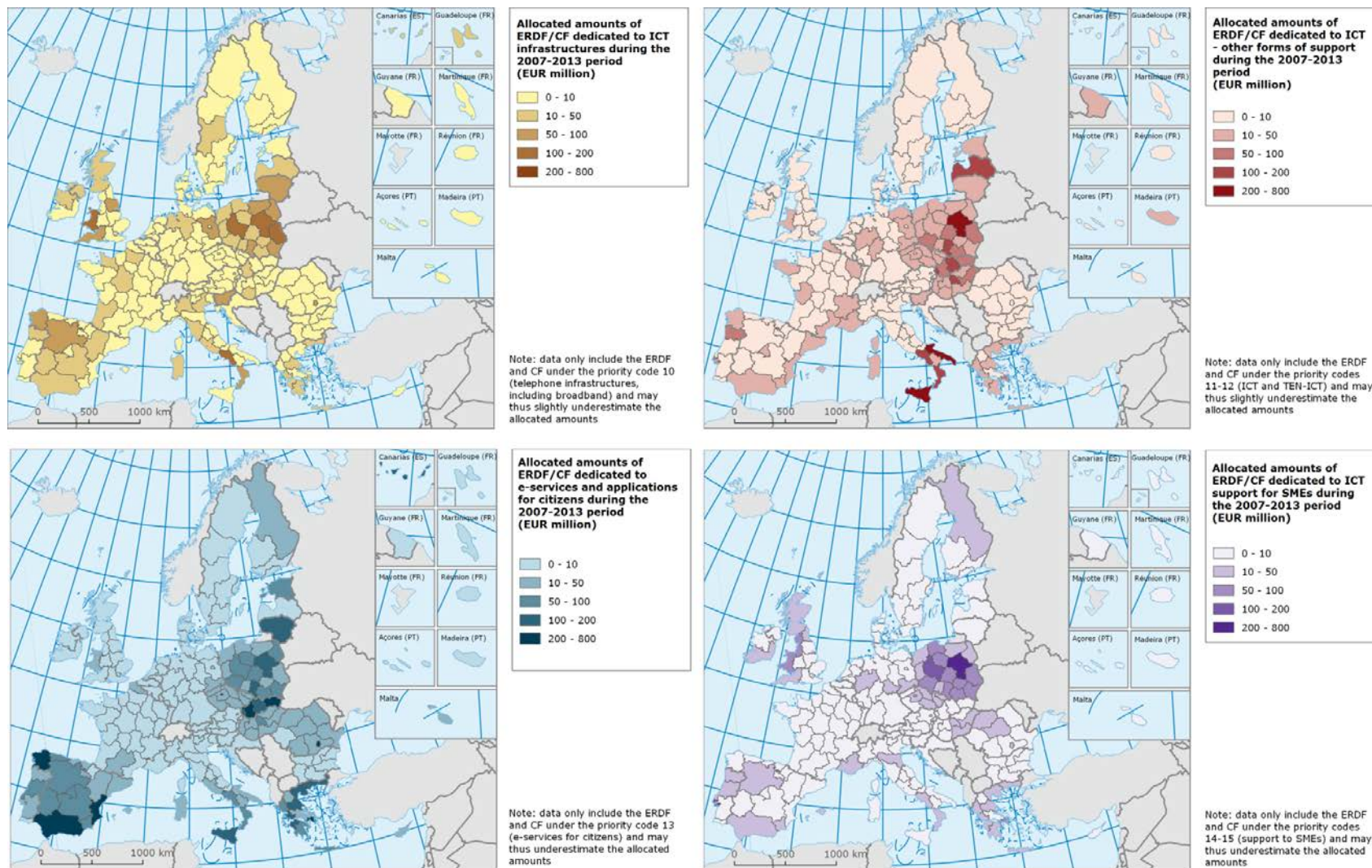
In terms of the total amounts allocated to the different consolidated areas of intervention, the observed patterns are similar to the overall allocation of ERDF/CF to the Information Society. In particular, Polish regions distinguish themselves in all the categories, especially for support to SMEs.

**Map 6: Concentration of ERDF and CF dedicated to the Information Society in consolidated areas of intervention during the 2007-2013 period**



**Source:** Authors based on DG REGIO (2015), Database of the cumulative allocations to selected projects and expenditure at NUTS2.

**Map 7: Allocated Amounts of ERDF and CF dedicated to the different consolidated areas of intervention of the Information Society during the 2007-2013 period**



**Source:** Authors based on DG REGIO (2015), Database of the cumulative allocations to selected projects and expenditure at NUTS2.

### 3.4.2 Additional sources of EU funding for ICT and the Digital Agenda

Other instruments were mobilised alongside Cohesion Policy funding in order to contribute to the DAE's objectives in the 2010s. As during the previous programming periods, the **Framework Programme for Research (FP7)** dedicated substantial resources to ICT Research and Development projects. In particular, ICT was the largest research theme in the **Cooperation Programme**<sup>145</sup> in terms of funding, with EUR 9.1 billion (i.e. 64% of the FP7 budget).<sup>146</sup> The aim was notably to bridge the gap between basic research and industrial/business applications, as well as addressing several challenges such as the low-carbon transition. There is limited evidence of synergies between the Structural Funds and FP7 for ICT-related projects. However, it is likely that these **synergies were limited in terms of number and scope**. Indeed, regulatory barriers, lack of knowledge/habit and mismatches between frameworks (sectoral top-down approach of the FP7 compared to the place-based approach of Cohesion Policy) were serious obstacles to such synergies.<sup>147</sup>

Additionally, a specific **Competitiveness and Innovation Framework Programme (CIP)** was established for 2007-2013, with the ambition of contributing to the DAE by favouring the uptake of ICT services and applications by companies, especially SMEs.<sup>148</sup> It dedicated EUR 730 million to the ICT Policy Support Programme, which had numerous concrete themes (e.g. open innovation, smart cities, e-government services, ICT for low-carbon transition, etc.). This particular programme thus provided support to SMEs for ICT services and applications, in addition to the ERDF. It may partly explain why regions dedicated less Structural Funds to ICT support for SMEs, compared to e-services and applications for citizens.

## 3.5 Evidence of achievements and lessons learnt up to 2014

The assessment of the achievements of Cohesion Policy in the field of ICT and the Information Society is a topical issue in the context of the high priority given to this subject over the 2000-2006 and 2007-2013 programming periods. Based on different sources of evidence such as documentary analysis, data analysis and interviews with stakeholders, this section focuses on:

- The achievements of the policy up to 2014 in terms of digital performance;
- The key lessons learnt and issues identified that informed the 2014-2020 programming period and beyond.

### 3.5.1 Evidence of the effectiveness of Cohesion Policy in the field of ICT and the Information Society

The European Commission's reports on economic, social and territorial cohesion have highlighted **incremental progress in all the dimensions of digital performance since the 2000s**.<sup>149</sup> However, according to the 6<sup>th</sup> Cohesion Report, disparities in performances persist and some peripheral regions still face the risk of exclusion.<sup>150</sup>

<sup>145</sup> The Cooperation Programme of FP7 represented 2/3 of the FP7 budget and focused on research projects by transnational consortia including industry and academia. See European Commission (2007), *FP7 in Brief*.

<sup>146</sup> CORDIS (2015), *The 7th Framework Programme funded European Research and Technological Development from 2007 until 2013*.

<sup>147</sup> Ferry, Kah and Bachtler (2016), *Maximisation of Synergies between European Structural and Investment Funds and Other EU Instruments to Attain Europe 2020 Goals*.

<sup>148</sup> CORDIS (2012), *ICT Policy Support Programme as part of the Competitiveness and Innovation framework Programme (CIP)*.

<sup>149</sup> European Commission (2010), *Investing in Europe's future: Fifth report on economic, social and territorial cohesion*.

<sup>150</sup> European Commission (2014), *Investment for jobs and growth, Promoting development and good governance in EU regions and cities: Sixth report on economic, social and territorial cohesion*.

How much evidence is there to demonstrate the contribution of Cohesion Policy to the improvement of digital performance in Europe? It is worth noting that there are **few evaluation studies focusing on the aggregate achievements of Cohesion Policy in the field of ICT and the Information Society**, and a lack of studies investigating the causal effect of Cohesion Policy funding on digital performance. This is partly due to an issue of data availability and methodology. As pointed out by evaluation experts for the 2007-2013 period, the wide range of Information Society measures funded by Cohesion Policy does not facilitate general conclusions about the achievements of Cohesion Policy in this field.<sup>151</sup> This calls for the analysis to focus on targeted areas of intervention.

A first indication of performance by area of intervention is given by their respective absorption rates available for the 2007-13 period (see Table 2). These rates show the ability of stakeholders to actually spend the budgetary resources allocated to Information Society. Absorption rates for **Information Society-related expenditure were below the overall absorption rate for Cohesion Policy** (56% and 68% in 2014, respectively)<sup>152</sup>. Reasons for these limited absorption rates, especially for broadband projects (45%) are manifold, and could testify to limited technical and administrative capacities at the regional level.<sup>153</sup>

**Table 2. Absorption rates of ICT-related consolidated areas of intervention for the 2007-2013 programming period**

CONSOLIDATED AREA OF INTERVENTION	ABSORPTION RATE (2014)
ICT Infrastructures	45%
ICT – other forms of support	66%
E-services and applications for citizens	52%
ICT support for SMEs	59%
Overall	56%

**Source:** Authors based on DG REGIO (2015), *Database of the cumulative allocations to selected projects and expenditure at NUTS2*.

**Note:** ERDF and CF expenditure only.

It should be noted that the breakdown of absorption rates by priority theme is not available after 2014 and that the absorption rates of Information Society-related expenditure possibly improved since then. In 2016, the overall EU28 absorption rate of Structural Funds was 96.1%, a figure that can be considered to be final.<sup>154</sup> However, given the underperforming absorption rates for Information Society-related expenditure in 2014 and other collected evidence<sup>155</sup>, it can be assumed that they remained relatively low in 2016 too.

## ICT infrastructures

For example, as far as investments in ICT infrastructures are concerned, existing studies<sup>156</sup> have confirmed their **relevance for economic development and the important share of**

<sup>151</sup> European Commission (2014), *Expert evaluation network on the performance of Cohesion Policy 2007-2013, Synthesis of National Reports 2013*.

<sup>152</sup> Authors based on DG REGIO (2015), *Database of the cumulative allocations to selected projects and expenditure at NUTS2*.

<sup>153</sup> Based on interviews with experts and case studies.

<sup>154</sup> European Commission (2018), *2007-2013 Funds Absorption Rate*.

<sup>155</sup> Interviews with experts, especially on the issue of absorption rate for broadband/ICT infrastructure projects.

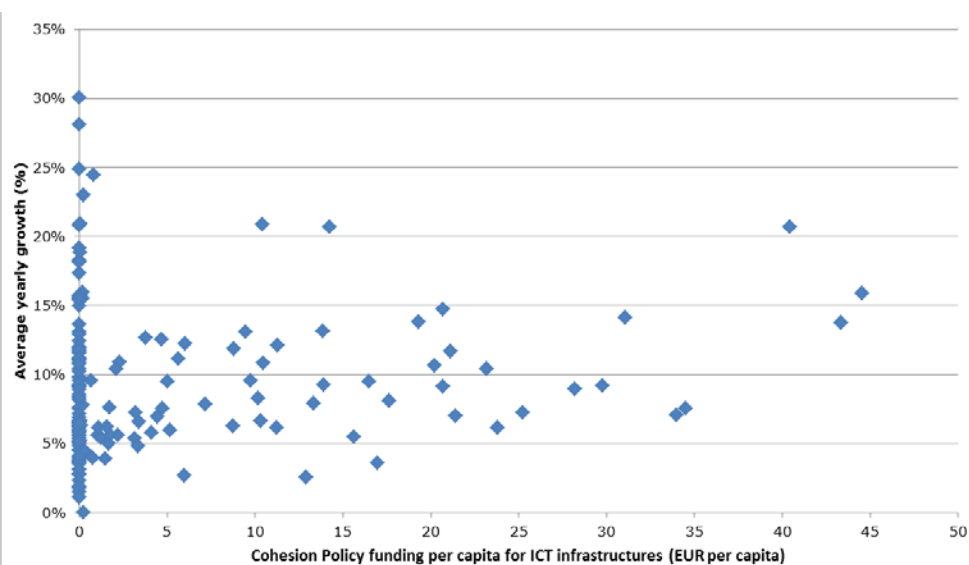
<sup>156</sup> European Parliament, CSIL and PPMI (2013), *Internet, Digital Agenda and Economic Development of European Regions*; Feko, Sass and Nagy (2011), *The Role of Broadband Developments Financed from EU Structural Funds in the Enhancement of Regional Cohesion in the NMS-10*.

## Cohesion Policy funding dedicated to broadband, in particular in the New Member States.

Among the monitoring indicators published by DG REGIO of the achievements of Cohesion Policy, some are related to ICT and the Information Society. In particular, a core indicator was dedicated to broadband for the 2007-2013 programming period. According to the corresponding target, the aim was to connect an extra 12.7 million people to the Internet through the broadband over the 2007-2013 period. However, the actual figure was 5 million, that is to say 39% of the expected target<sup>157</sup>. This shows **difficulties in terms of the achievements of the broadband projects** (low rate of absorption, limited co-financing and limited stimulation of demand).<sup>158</sup>

More critically, the causal impact of Cohesion Policy on broadband development has not been assessed.<sup>159</sup> In this respect, additional evidence can be retrieved by linking regional indicators of broadband development and Cohesion Policy funding in that area of intervention. The results show a **limited correlation between Cohesion Policy funding and improvements in broadband**, as illustrated in the following graph. This suggests that besides Cohesion Policy support, many other factors and conditions (e.g. initial situation, access to other sources of funding, etc.) contribute to improve broadband access. Moreover, regions not benefiting from Cohesion Policy support for ICT infrastructures (0 on the x-axis) feature the widest range of possible situations for household broadband access growth, tending to confirm the relevance of other variables.

**Figure 14. Correlation between Cohesion Policy funding *per capita* for ICT infrastructures (2007-2013) and average yearly growth in household broadband access (2008-2014)**



**Source:** Authors based on DG REGIO (2015), *Database of the cumulative allocations to selected projects and expenditure at NUTS2* and Eurostat (2017), *Database (regional and national statistics on digitisation)*.

There are technical difficulties due to the fact that this approach does not control for other factors that might contribute to the change in broadband access. Another method could be to map categories of regions (distinguishing convergence and competitiveness regions) by levels of funding and improvement. In principle, this makes it possible to explore the regions' relative achievements in more detail. However, the issue of the interference of other factors largely

<sup>157</sup> DG REGIO (2015), *ERDF/CF Output Indicators 2012 and 2013*

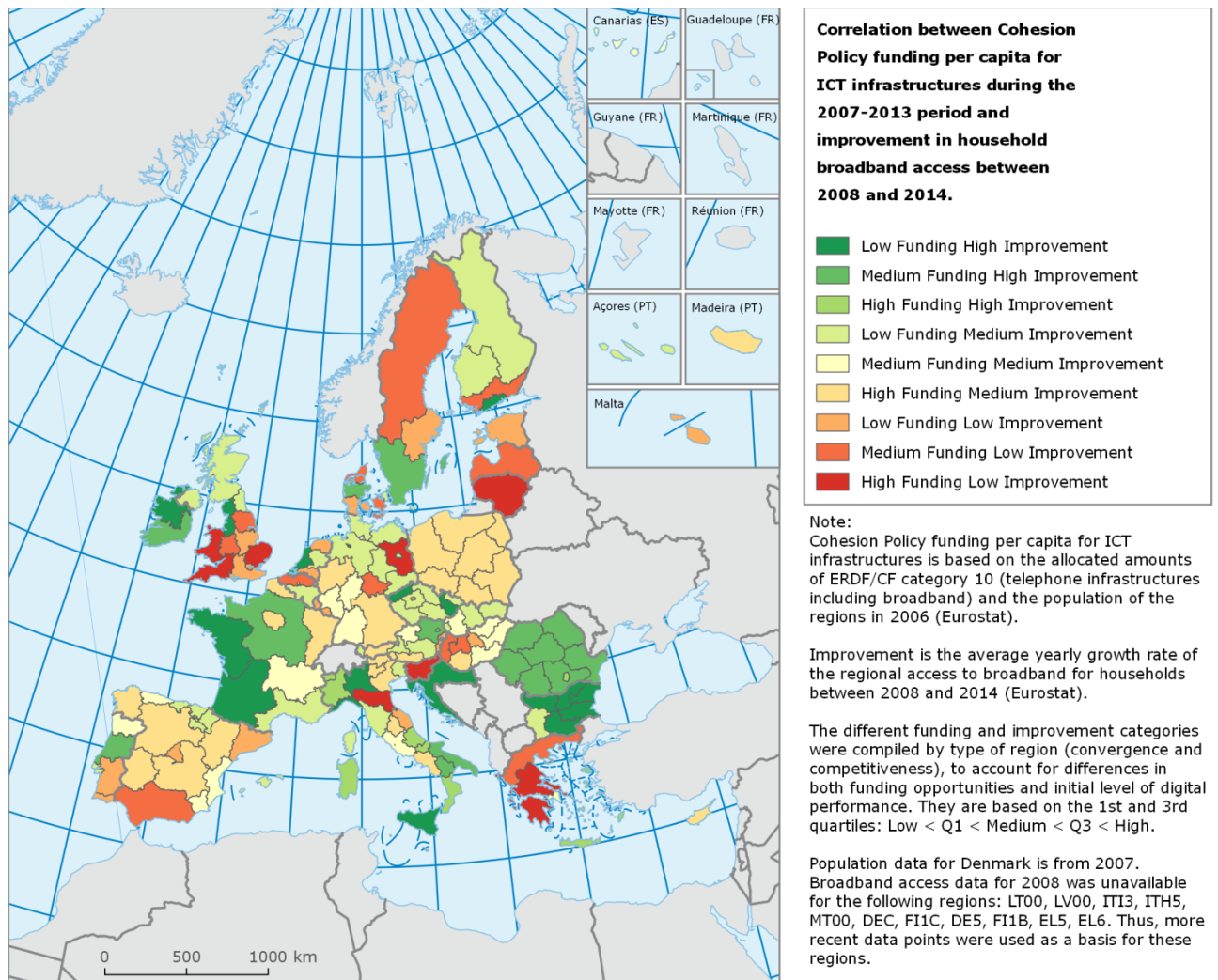
<sup>158</sup> Based on interviews with experts

<sup>159</sup> Feko, Sass, and Nagy (2011), *The Role of Broadband Developments Financed from EU Structural Funds in the Enhancement of Regional Cohesion in the NMS-10*.



remains. Indeed, the following map reveals various situations across regions, often within a single country, suggesting the **importance of additional explanatory factors** (e.g. alternate sources of funding, governance quality, geographical and social/demographic characteristics).

**Map 8: Correlation between Cohesion Policy funding *per capita* for ICT infrastructures during the 2007-2013 period and improvement in household broadband access between 2008 and 2014**



**Source:** Authors based on DG REGIO (2015), *Database of the cumulative allocations to selected projects and expenditure at NUTS2* and Eurostat (2017), *Database (regional and national statistics on digitisation)*.

## E-commerce

It is also possible to provide insights into some core topics that were at the centre of expectations. For example, the European Court of Auditors dedicated a special report to the use of e-commerce by SMEs.<sup>160</sup> Even if this report is based on a small sample of Operational Programmes (5) that does not allow for generalisation of findings, it explores experiences from a wide range of additional evidence and highlight important issues. ERDF Operational Programmes were considered as a good basis to provide support for SMEs to engage in e-commerce. However, the **focus on performance and monitoring was considered too limited to show the contribution of Cohesion Policy to the improvement of EU digital performance in this area**. Linking data on expenditure and regional digital performance

<sup>160</sup> European Court of Auditors (2014), *Has ERDF support to SMEs in the area of e-commerce been effective?*

indicators is not possible for e-commerce and SME support, given the lack of regional performance statistics for that consolidated area of intervention. The main findings of the ECA report are presented in the box below.

**Box 4: E-commerce and Cohesion Policy 2007-2013**

During the 2007-2013 period e-commerce was seen as a way to accelerate growth and SME development. On a more strategic side, it was expected to consolidate the Digital Single Market and contribute to the Digital Agenda.

There is no specific data on the use of e-commerce. However, EUR 3 billion of the ERDF was dedicated to the promotion of ICT uptake by SMEs in 2007-2013 (11% of direct SME support, 21% of direct ICT support).

According to the European Court of Auditors, several insights can be gained from the 2007-2013 e-commerce support by the ERDF:

- Operational Programmes served as a good basis for providing SME e-commerce support, but not for performance measurement. Moreover, alignment of the OPs with the EU objectives (including DAE) was relatively weak;
- Project selection procedures rarely assessed whether the selected projects were the most likely to contribute to SME development and/or EU objectives (including DAE);
- Generally, there was a lack of knowledge of the actual impact of a project on SME development.

**Source:** Authors, based on the ECA (2014), *Has ERDF support to SMEs in the area of e-commerce been effective?*

**Digital skills**

Regarding support by the ESF to digital skills and e-inclusion projects, an evaluation of the 2000-2006 period highlighted their **potential long-term achievements, in terms of changing attitude to lifelong learning itself**.<sup>161</sup> Linking data on expenditure and regional digital performance indicators is not possible for digital skills and e-inclusion, given the wide range of projects covered under the relevant category in the 2007-2013 programmes for ERDF/CF.

**Overall qualitative approaches**

Finally, in the face of the difficulty in establishing strong quantitative correlations between Cohesion Policy investments and performance in the area of the Information Society, some studies have opted for qualitative approaches. For example, using a methodology based on case studies, a study for the European Parliament showed that the types of regional intervention financed under Cohesion Policy tend to affect both economic growth and social wellbeing, but to different extents and through different patterns.<sup>162</sup> Schematically, interventions focusing on equity have significant effects in terms of empowerment and social participation, while interventions focusing on efficiency perform well in improving living conditions. Interventions of all types have transversal outcomes regarding digital literacy and cohesion. This speaks in favour of **strategies that address the different dimensions of the Information Strategy without concentrating on one aspect at the expense of the others** – a finding further confirmed by the thematic studies addressed in the following subsection.

<sup>161</sup> LSE Enterprise Ltd et al. (2010), *Final Report for the Ex-Post Evaluation of the European Social Fund (2000 - 2006)*.

<sup>162</sup> European Parliament, CSIL, and PPMI (2013), *Internet, Digital Agenda and economic development of European regions*.

### 3.5.2 Lessons learnt

Different evaluations were carried out during the 1994-2006 period to identify lessons from the experimental period. More recent studies focused on strategic aspects as illustrated below. Hence, evidence is available allowing for a greater understanding of how policies could influence the complex relationships between the determinants of digital performance.

#### Strategic framework

The importance of the strategic framework in contributing to the Information Society under Cohesion Policy has been investigated since the 1990s<sup>163</sup> and is widely considered as a major condition for success. Digital strategies typically cover:

1. Setup of the appropriate level of funding;
2. Prioritisation of the different types of Information Society measures;
3. Contribution of individual projects to greater objectives.

All these elements are largely related to local characteristics, thus justifying the pertinence of the regional level for building these digital strategies.<sup>164</sup> In practice, several strategic issues can be highlighted.

For a start, research suggests that the regional strategies should aim for a **balanced approach covering the different dimensions of the Information Society and the different types of Information Society measures** (broadband, skills, e-services etc.) in order to maximise benefits.<sup>165</sup> However, actual developments tend to contradict this prescription. Based on data analysis,<sup>166</sup> previous research showed that in 2007-2013 (Convergence) regions adopted the following approaches to determine their Cohesion Policy investments in different consolidated areas of intervention:

- Cluster 1 (29% of regions): focus on ICT infrastructures;
- Cluster 2 (29% of regions): focus on e-services and applications for citizens;
- Cluster 3 (49% of regions): focus on ICT support for SMEs and broadband.

Moreover, **regions should also invest in identified areas of relative weakness**, based on an initial assessment of the situation. In reality, evidence tends to highlight that regions have been prone to overinvest in areas where they have already achieved a relatively good level of performance, in particular broadband, and thus tended to neglect other projects that could potentially trigger greater benefits.<sup>167</sup>

Two potential causes were identified: **inadequate analysis of the initial situation and path-dependency** (i.e., the tendency to replicate past practices and institutional set ups that gives an incentive to continue investments in areas of strength).<sup>168</sup> However, these findings are mitigated by the fact that there are alternative sources of funding for the Information Society that might complement the priorities under Cohesion Policy.

<sup>163</sup> Technopolis (2002), Final Report for the Thematic Evaluation of the Information Society; Taylor and Downes (2001), *The Structural Funds Facilitating the Information Society*; European Commission, Socintec, and Inno-TSD (2005), *Ex-Post Evaluation of the RIS, RTTs and RISI ERDF Innovative Actions for the Period 1994-99: Final Synthesis Report*.

<sup>164</sup> Reggi and Scicchitano (2014), *Are EU Regional Digital Strategies Evidence-Based? An Analysis of the Allocation of 2007–13 Structural Funds*. Committee of the Regions (2013), *Digital Agenda for Europe: The Role of Regions and Cities*.

<sup>165</sup> Reggi and Scicchitano (2014), *Are EU Regional Digital Strategies Evidence-Based? An Analysis of the Allocation of 2007–13 Structural Funds*. European Parliament, CSIL, and PPMI (2013), *Internet, Digital Agenda and economic development of European regions*.

<sup>166</sup> Reggi and Scicchitano (2014), *Are EU Regional Digital Strategies Evidence-Based? An Analysis of the Allocation of 2007–13 Structural Funds*.

<sup>167</sup> Reggi and Scicchitano (2014), *Are EU regional digital strategies evidence-based? An analysis of the allocation of 2007–13 Structural Funds*.

<sup>168</sup> Reggi and Scicchitano (2014), *Are EU regional digital strategies evidence-based? An analysis of the allocation of 2007–13 Structural Funds*.

More globally, it should also be noted that the mere existence of regional digital strategies (in particular if only realised in order to comply with requirements) is not likely to be a sufficient condition for success. Indeed, as shown in the 2007-2013 period, the presence of a regional digital strategy was not linked to greater improvements in digital performance (proxied by household internet access 2008-2012).<sup>169</sup> On the contrary, the amounts invested were decisive. However, this approach did not consider the quality of the digital strategy, which is probably central (in terms of initial assessment, selection of projects, monitoring etc.).

## Partnership

**Building and implementing digital strategies requires in-depth partnerships, in particular between the public and private sectors, and the civil society.**<sup>170</sup> The organisation of these partnerships should be adapted to local conditions, creating and strengthening links between stakeholders. Typically, they are led by regional development agencies or regional authorities, and can bring together the business community, social partners, community actors etc.<sup>171</sup> These partnerships can be stimulated through a wide range of activities: workshops, seminars, shared training etc. The purpose of such partnerships is mainly to reach consensus on the specific goals of a (regional) digital strategy and also to channel joint efforts towards projects that match this consensus. For instance during the RISI initiative, some regions reached consensus on Information Society themes such as opportunities for cross-border economic development or cultural identity.<sup>172</sup> **In the 1990s, efforts to forge partnerships were principally intended to trigger cultural changes** in regions and to take into consideration the importance of ICT in regional planning and development.<sup>173</sup> This goal was largely attained by the 2000s. However, consensus among stakeholders often failed to trigger projects that were specifically adapted to the local context. An additional limit is the potential biases present when building networks of local partners, which could lead to projects disproportionately benefiting some stakeholders (typically incumbents and/or large companies) at the expense of others.<sup>174</sup>

## Administrative capacity and multi-level governance

Fulfilling some of the conditions of success described above requires technical and administrative capacities, as well as familiarity with ICT. **Administrative and technical capacities related to ICT were often lacking among public authorities in the 2007-2013 period**, in spite of the overall progress and greater familiarity with ICT since the 1990s.<sup>175</sup>

The need for coordination in designing and implementing Information Society strategies among the different levels of government is another lesson from the previous programming periods.<sup>176</sup> It makes it possible to share responsibilities and to take advantage of adapted technical and administrative capacities to achieve the Information Society's objectives. For instance during the 2000-2006 programming period, Greek regions received support from their central

<sup>169</sup> Kleibrink et al. (2015), *Regional ICT Innovation in the European Union: Prioritisation and Performance (2008–2012)*.

<sup>170</sup> European Parliament, CSIL and PPMI (2013), *Internet, Digital Agenda and Economic Development of European Regions*.

<sup>171</sup> Patrick Collins (2007), *Policy approaches to developing the region in the Information Age: evidence from Ireland and Europe*.

<sup>172</sup> Patrick Collins (2007), *Policy approaches to developing the region in the Information Age: evidence from Ireland and Europe*.

<sup>173</sup> Tsipouri (2000), *Europe and the information society: Problems and challenges for supranational intervention*.

<sup>174</sup> JRC (2014), *The Digital Agenda Toolbox*.

<sup>175</sup> European Commission (2016), *Support to the Implementation of the ERDF Investment Priority: Enhancing Access to, and the Use and Quality of ICT*. Technopolis (2002), *Final Report for the Thematic Evaluation of the Information Society*; Taylor and Downes (2001), *The Structural Funds Facilitating the Information Society*.

<sup>176</sup> Technopolis (2002), *Final Report for the Thematic Evaluation of the Information Society*.

government to draft adequate Information Society business plans, benefiting from technical experience while retaining regional flexibility (e.g., selection of priorities).<sup>177</sup>

## Synergies

The experience of the previous programming periods suggests that **synergies between Information Society measures funded by Cohesion Policy and other EU programmes have likely been limited**. Indeed, there were significant barriers impeding the emergence of such synergies, such as different cost models between EU programmes.<sup>178</sup> Even if there is little evidence of synergies specifically related to Information Society measures, it can be hypothesised that synergies have largely been limited to connections between Structural Funds and Framework Programmes for Research, and triggered by engaged individuals and groups.<sup>179</sup>

## General success factors

Finally, the analyses from the previous programming periods confirm the relevance of key enabling factors that are valid for other policy interventions. In particular, strong political leadership is essential to secure strategic and financial support. More globally, the **openness of regional and local stakeholders to innovation** is essential, as the Information Society often implies a high degree of habit changes. Other relevant factors of success include the existence of complementary measures for individual projects and adequate levels of digital skills among the population. This is summarised in the following key enabling conditions:<sup>180</sup>

- Political leadership;
- Presence of well-developed ICT infrastructures and skills;
- Involvement of stakeholders;
- Existence of complementary measures (synergies between funded projects, contribution to a more comprehensive plan);
- Positive attitude/culture towards innovation;
- Dynamics of public-private cooperation.

To conclude, programming periods until 2013 have provided valuable lessons regarding the contribution of Cohesion Policy to the Information Society, notably regarding the role of strategies, partnerships and networks, administrative and technical capacities and synergies. Above all, the **absence of a one-size-fits-all approach** should be noted, given the variety in types (and contexts) of Information Society measures. Unfortunately, the limits in terms of data availability restrict the ability to derive additional policy lessons, especially in specific sectors outside physical infrastructures (e.g. digital skills, ICT and climate change, etc.).

<sup>177</sup> Technopolis (2002), *Final Report for the Thematic Evaluation of the Information Society*.

<sup>178</sup> Ferry, Kah and Bachtler (2016), *Maximisation of Synergies between European Structural and Investment Funds and Other EU Instruments to Attain Europe 2020 Goals*.

<sup>179</sup> Ferry, Kah, and Bachtler (2016), *Maximisation of synergies between European structural and investment funds and other EU instruments to attain Europe 2020 goals*.

<sup>180</sup> European Parliament, CSIL, and PPMI (2013), *Internet, Digital Agenda and economic development of European regions*.



## 4. ESIF SUPPORT TO THE DIGITAL AGENDA IN 2014-2020: PATTERNS OF EXPENDITURE AND TRENDS

### KEY FINDINGS

- Overall, **ESIF digital investments in 2014-2020 represent around EUR 21.4 billion.**
- Aiming at rolling out next generation broadband (especially fast and ultrafast broadband benefiting from technologies such as optical fibre), **ESIF investments in ICT infrastructures have followed a recent upsurge in the 2014-2020 programming period.** ICT Infrastructures are indeed one of the **leading areas of intervention** with EUR 6 billion (28% of ESIF digital investments).
- **Digital investments in a range of areas targeting people**, such as e-government, digital skills or e-inclusion have always represented a **sizeable share (around 40%)** of total ESIF digital investments which remained relatively stable across programming periods since 2000-2006.
- Other forms of ICT support such as **smart cities and smart grids have acquired a new importance** since the 2007-2013 programming period and represent around 20% of total planned ESIF digital investments in 2014-2020.
- The **share of ICT support for SMEs has decreased steadily in relative terms across time** – even though the total support remained relatively stable in absolute levels since 2000-2006 (around EUR 2 billion). It is difficult to ascertain whether this decrease is actually compensated by other sources of funding, or whether SMEs benefitted from ESIF support classified under other areas of intervention.
- **Regions in Southern and Central and Eastern Europe allocated the most** to digital investments. Regional authorities often prefer to **concentrate ESIF resources** for digital investments on a few priorities rather than spreading interventions thin. A variety of patterns emerges at regional levels as the result of a combination of regional specificities and territorial needs, as well as national framework and policies.

This Chapter focuses on patterns of ESIF expenditure in the area of digital investments during the 2014-2020 programming period, as well as on their evolution compared to past programming periods. It adopts a quantitative and statistical approach. First, the current programming period is placed in the perspective of its predecessors in overall aggregate terms. A more detailed sectoral and a geographical analysis follows. It is worth noting that such an analysis raises different methodological issues (related to data availability, nomenclature, etc.). These issues were addressed in different ways that are described in details in the Methodological Annex II.

### 4.1 Evolution of the prioritisation of Cohesion Policy in the area of digital investments: a snapshot

Distinctive features of the Cohesion Policy programming periods as analysed in the previous Chapter can be summarised as follows:

- **Cohesion Policy 1987-1993**

During this period, there was **no formalised digital strategy connected to Cohesion Policy**. Structural Funds principally intervened by providing some *de facto* support to the development of telecommunication infrastructures, through standard channels and through

specific Community Initiatives (such as STAR). Investments in ICT infrastructure remain an important factor up to the 2014-2020 period.

- **Cohesion Policy 1994-1999**

This programming period was marked by the emergence of **a formalised digital policy** at the EU level. An important aspect was Structural Funds' support for experiments in regional digital strategies, identifying key lessons for policy-making. Therefore, Cohesion Policy did contribute to the conceptualisation of the 'Information Society'.

- **Cohesion Policy 2000-2006**

For the first time, Cohesion Policy was linked to formalised digital strategies at the EU level (namely e-Europe and i2010). This led to the operationalisation of the concept of the **Information Society**, with a holistic approach for Structural Funds (diversification of investments: public e-services, support to businesses, education and lifelong training etc.). Resources dedicated to the Information Society began to increase.

- **Cohesion Policy 2007-2013**

Financial resources dedicated to Information Society under Cohesion Policy rose substantially to EUR 15.4 million during this programming period. Digital policy was given high priority, as the **Digital Agenda for Europe** was a flagship initiative of the EU2020 strategy. In this framework, Cohesion Policy was seen as a major means to deliver the relevant investments.

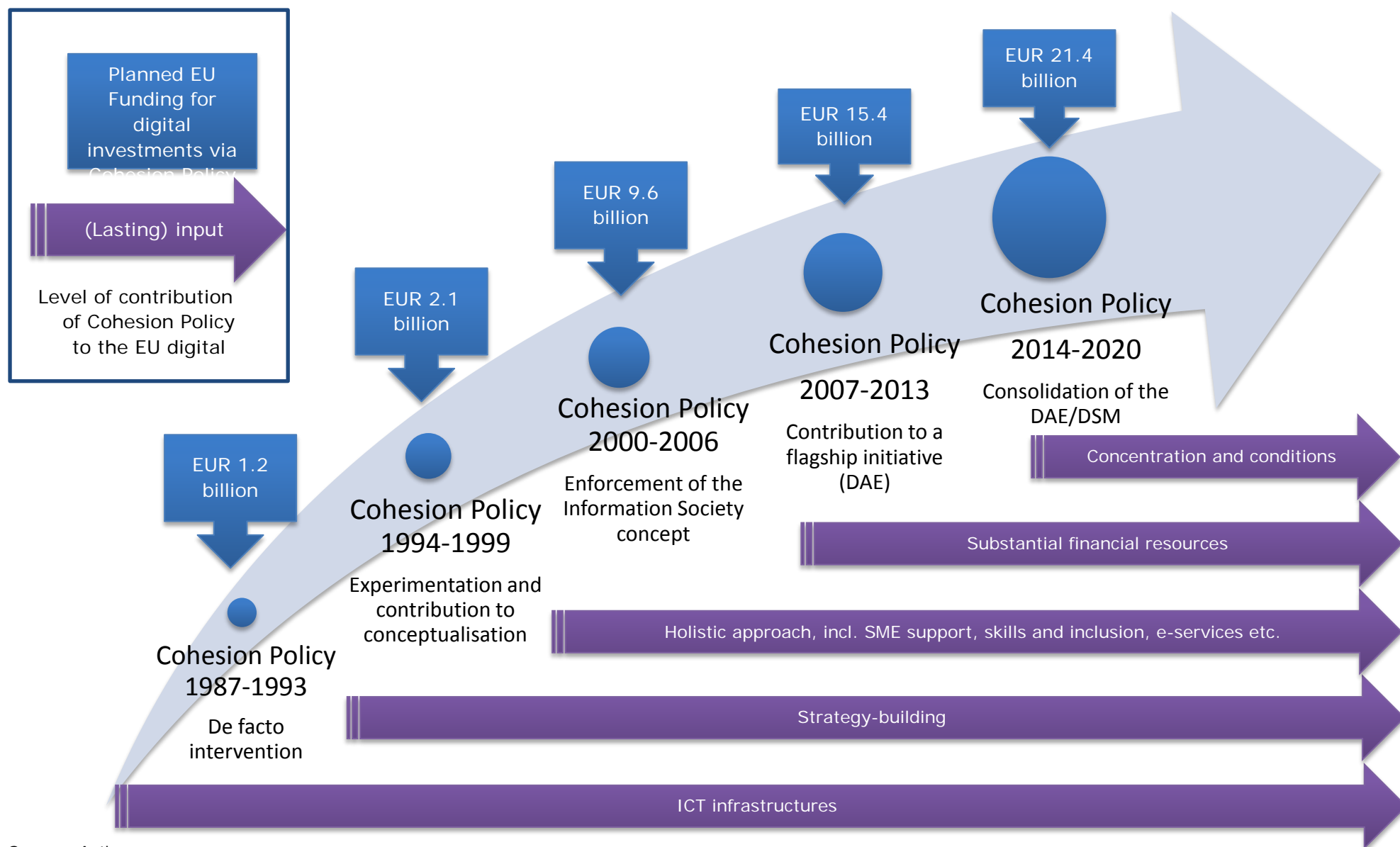
- **Cohesion Policy 2014-2020**

The current programming period is characterised by a confirmation of the role of Cohesion Policy to achieve the Digital Agenda's objectives, consolidated by the **Digital Single Market**. Financial resources continue to rise to reach EUR 21.4 billion.

The main features characterising each programming period are presented in the following figure.



Figure 1. Evolution of the contribution of Cohesion Policy to EU digital objectives by programming period



Source: Authors

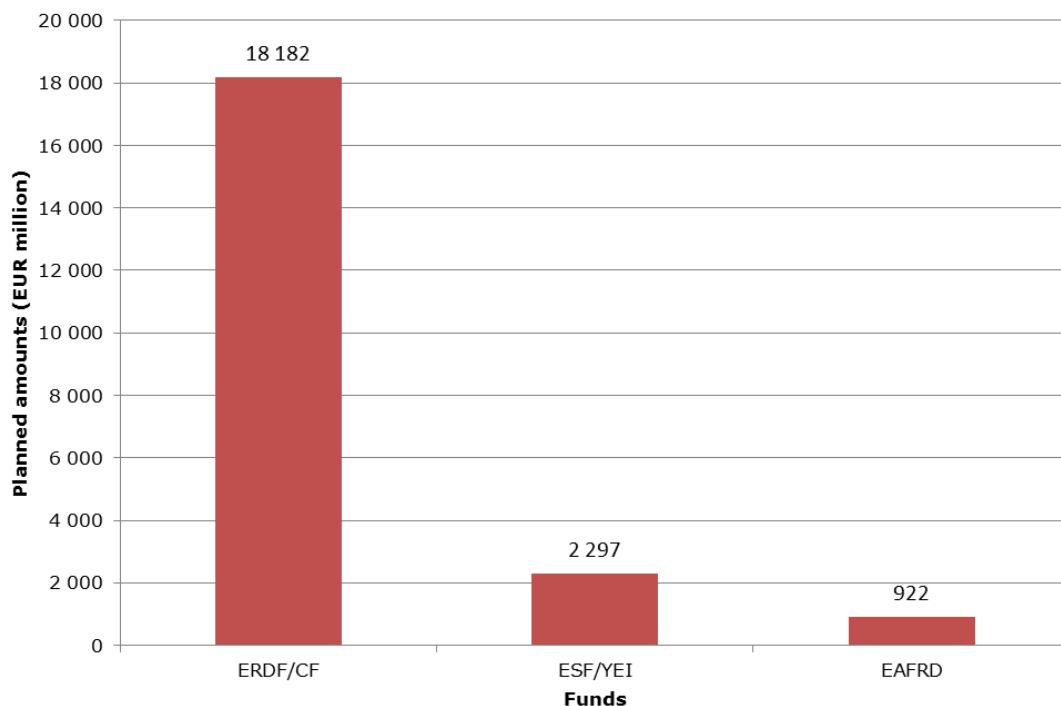
## 4.2 Sectoral patterns

Consistently with the concept of ‘digital economy’, investments that are highlighted for this programming period are the development of the access to online goods and services, e-government services and applications, broadband infrastructure deployment and ICT for SMEs<sup>181</sup>. This focus on the completion of the Digital Single Market is accompanied by a continuity of the holistic approach (e.g. with investments in areas such as human capital under the ESF).

### 4.2.1 Total envelope and sectoral breakdown

Regarding the total envelope dedicated to digital investments during the 2014-2020 period, estimates vary depending on the scope that is considered, ranging from EUR 12.2 billion (narrow estimate) to EUR 35.3 billion (broad estimate<sup>182</sup> – see Annex II for further details). According to the JRC, the best estimate for planned<sup>183</sup> **EU ESIF funding related to digital investments for 2014-2020 is EUR 21.4 billion**. Thus, considering this best estimate as the basis for the analysis, the total envelope has increased compared to the 2007-2013 period by about EUR 6.1 billion. According to the JRC, the breakdown by ESIF shows the overwhelming importance of the ERDF in contributing to the digital economy (see following figure).

**Figure 2. Breakdown of planned ESIF expenditure for digital investments during the 2014-2020 programming period, by fund.**



**Source:** Authors based on JRC (2017), ICT Monitoring – Planned ICT Investments under ESIF (2014-2020).

<sup>181</sup> European Commission (2015), *Contribution of the European Structural and Investment Funds to the 10 Commission Priorities - Digital Single Market*.

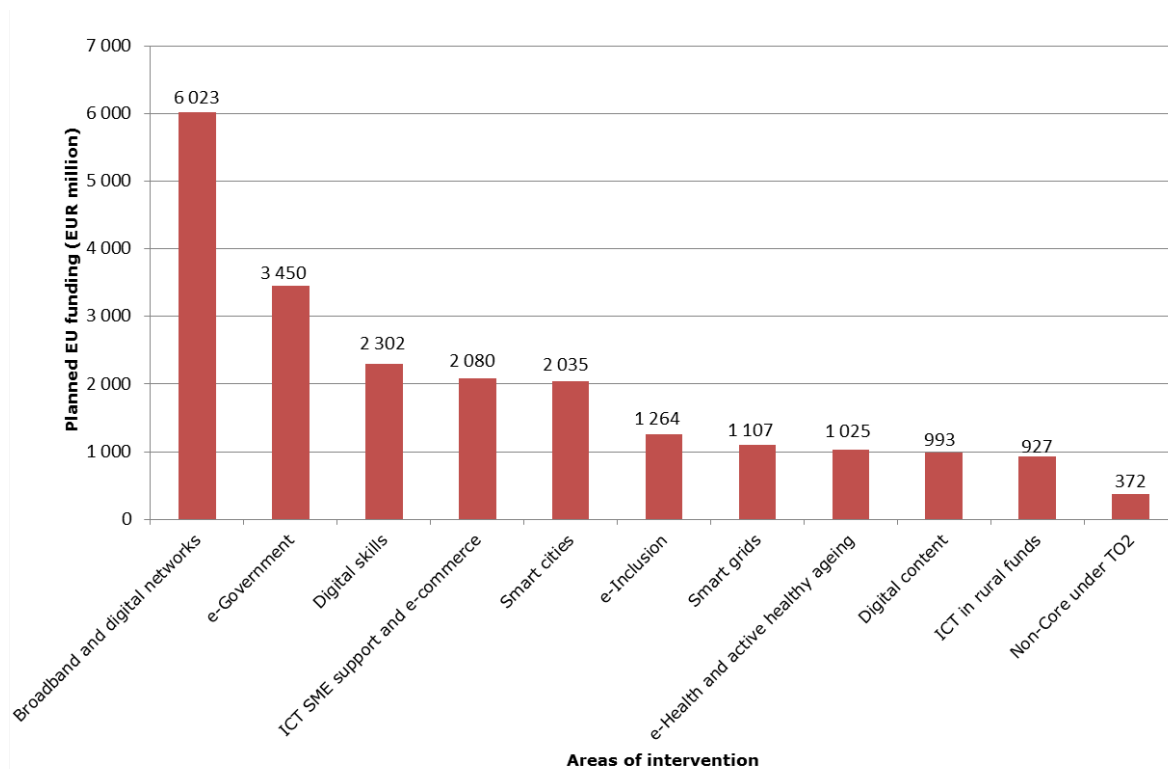
<sup>182</sup> Sörvik and Kleibrink (2016), *Mapping EU Investments in ICT - Description of an Online Tool and Initial Observations*.

<sup>183</sup> For the 2014-2020 programming period, the available expenditure data are only planned and estimated by the JRC, as the actual delivery is still ongoing as of 2018. To ensure consistency, allocated expenditure were used for the previous programming periods.

As will be further detailed in the following Chapter, to favour concentration of resources, eleven Thematic Objectives (TO) have been created (Article 9, CPR).<sup>184</sup> The relevant TO concerning ICT is TO2 'Enhancing access to, and use and quality of information and communication technologies (ICT)'. About **EUR 14 billion from the ERDF and EAFRD are planned under TO2 for 2014-2020**.<sup>185</sup> However, several interventions supporting ICT and the digital economy are **also funded under other Thematic Objectives**, in particular digital literacy under TO10 ('Educational and vocational training').<sup>186</sup>

Additionally, all the ESIF share a refined classification system of expenditure using 123 'Categories of Intervention'.<sup>187</sup> The classification system of expenditure for 2014-2020 allows for more in-depth analyses compared to the previous programming periods, because the number of categories has increased substantially (from 86 in 2007-2013). For practical analyses the JRC has regrouped these categories to form areas of intervention that are meaningful in policy-making. They are reflected in the Figure below.<sup>188</sup>

**Figure 3. Areas of intervention related to the Digital Agenda/the Digital Single Market funded by Cohesion Policy in 2014-2020 (ERDF, CF, ESF, EAFRD and YEI)**



**Source:** Authors based on JRC (2017), ICT Monitoring – Planned ICT Investments under ESIF (2014-2020).

<sup>184</sup> European Parliament and European Council (2013), *Regulation (EU) No. 1303/2013 laying down common provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund, the European Agricultural Fund for Rural Development and the European Maritime and Fisheries Fund and laying down general provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund and the European Maritime and Fisheries Fund and repealing Council Regulation (EC) No. 1083/2006*.

<sup>185</sup> European Commission (2017), *Open Data Portal for the European Structural Investment Funds - Information and Communication Technology*.

<sup>186</sup> Cohesion Data Portal (2018), *Information & Communication Technology*.

<sup>187</sup> See the methodological annex for more details.

<sup>188</sup> The category 'non-core ICT categories of intervention in TO2' regroups interventions not directly connected to ICT the Information Society or the digital economy in general, but coded as contributing to the Thematic Objective 2 (ICT). In this context, it is therefore assumed that they support DAE/DSM objectives (e.g. support to digital skills).

According to the JRC data, **ICT infrastructures benefit from the highest levels of funding**, with EUR 6 billion for broadband and digital networks (28% of the ESIF for digital investments), and EUR 927 million for ICT in rural funds (4%), which is overwhelmingly broadband as well<sup>189</sup>. Investments for **e-services and applications for citizens** are mainly focused on e-government initiatives, with EUR 3.45 billion (16%). Resources dedicated to **training, upskilling and inclusion in the digital economy** are relevant, with EUR 2.3 billion from the ESF for digital skills (11%) and EUR 1.26 billion from the ERDF for e-inclusion (6%). Resources dedicated to **ICT support for SMEs** only account for EUR 2.08 billion (10%), less than during the previous programming period. Finally, **smart cities and smart grids** benefit from substantial ESIF funding in 2014-2020: EUR 2.04 billion (9%) and EUR 1.11 billion (5%), respectively.<sup>190</sup> Cohesion Policy can thus be considered as a key contributor in addressing climate-change, energy-related and broader social-economic issues, using ICT.<sup>191</sup> Even if the exact funding attributed to smart cities or smart grids through other EU instruments is unclear (mainly because of data issues to isolate funding connected to these themes), it is likely well below the level of Structural Funds.<sup>192</sup>

#### 4.2.2 Sectoral trends

By combining some categories of expenditure used above, it is possible to infer ‘consolidated areas of intervention’ that can be compared over time (see the table below and the Methodological annex II for further details).

**Table 3. Consolidated areas of intervention**

CONSOLIDATED AREAS OF INTERVENTION	BASIC DESCRIPTION
<b>ICT Infrastructures</b>	ICT infrastructures are typically investments for broadband development (rural or urban).
<b>ICT – other forms of support</b>	The ICT – other forms of support: this category groups together a wide range of investments, from interoperability, R&D and innovation, smart grids and smart cities to the promotion of digital content (media oriented).
<b>E-services and applications for citizens</b>	E-services and applications for citizens cover the different interventions targeting people and their links with ICT, such as e-government services, e-learning, digital skills, e-inclusion etc.
<b>ICT support for SMEs</b>	ICT support for SMEs encapsulates the interventions aiming to foster the digitalisation of SMEs, notably the use of e-commerce but also cyber security.

Source: Authors.

#### ICT Infrastructures

Cohesion Policy has contributed to the funding of ICT infrastructures since the late 1980s. The data show that Cohesion Policy funding for this type of intervention **has continuously**

<sup>189</sup> The ‘ICT in rural funds’ category comprised 98% rural broadband investments according to the JRC (based on information provided by DG AGRI).

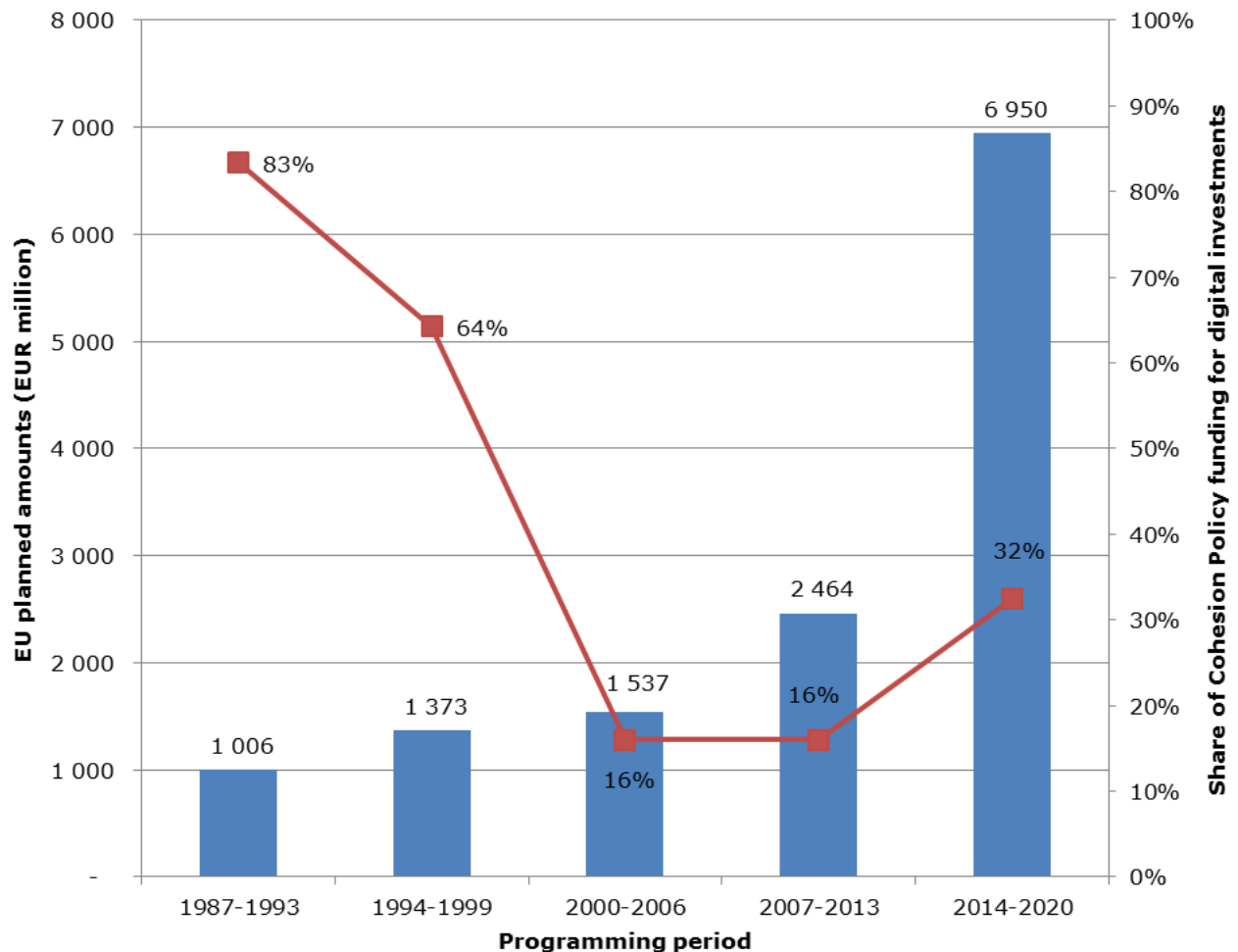
<sup>190</sup> Smart cities can be defined as ‘multi-stakeholder municipally based partnerships aimed at addressing problems of common interest with the aid of ICTs, which underpin ‘Smart’ classification’ (See Section 5.3.3). Smart grids are ‘electricity networks that can intelligently integrate the behaviour and actions of all users connected to it – generators, consumers and those that do both – in order to efficiently deliver sustainable, economic and secure electricity supplies’. See European Parliament, RAND Europe, Danish Technological Institute, WIK, and TNO (2014), *Mapping Smart cities in the EU*, and Clastres (2011), *Smart grids: Another step towards competition, energy security and climate change objectives*.

<sup>191</sup> Skaringer (2015), *EU Cohesion Policy - Investments in Smart Grids*

<sup>192</sup> For instance, the contribution of Horizon 2020 to projects directly connected to Smart Cities probably amounts to tens of EUR million. See European Commission (2017), *Horizon 2020: Work Programme 2018-2020*. Public Private Partnerships are also expected to contribute substantially to these objectives.

increased since the 1980s.<sup>193</sup> Indeed, it has risen from about EUR 1 billion for 1987-1993 to EUR 6.95 billion for 2014-2020. The increase has been particularly marked between 2007-2013 and 2014-2020, jumping by 182%. More qualitatively, support has shifted towards more advanced technologies, especially with the ambition of rolling out broadband in 2014-2020.<sup>194</sup>

**Figure 4. Evolution of Cohesion Policy funding dedicated to ICT infrastructures, by programming period**



**Source:** Authors based on European Commission, JRC and Technopolis (see methodological annex II for details).

ICT infrastructures have by far been the most funded consolidated area of intervention under Cohesion Policy during the 1987-1993 and 1994-1999 periods, with 83% and 64%, respectively, of total Cohesion Policy support for digital investments. This relative share has dramatically dropped to 16% during the 2000-2006 programming (excluding ESF in Objective 3 regions), consistently with the shift towards a more holistic approach in the framework of e-Europe and i2010. However, the relative importance of ICT infrastructures (especially broadband as a precondition for benefitting from the Digital Single Market) has risen again during the 2014-2020 period to 32%. Even when the evolution of the EU population is taken into account, it is found that Cohesion Policy support to **the development of ICT infrastructures has skyrocketed during the 2014-2020 period**. Indeed, per capita funding for ICT infrastructures has gradually increased from EUR 3.1 per capita in 1987-1993 to EUR 5 per capita in 2007-2013, and has then jumped to EUR 13.7 per capita for 2014-2020.

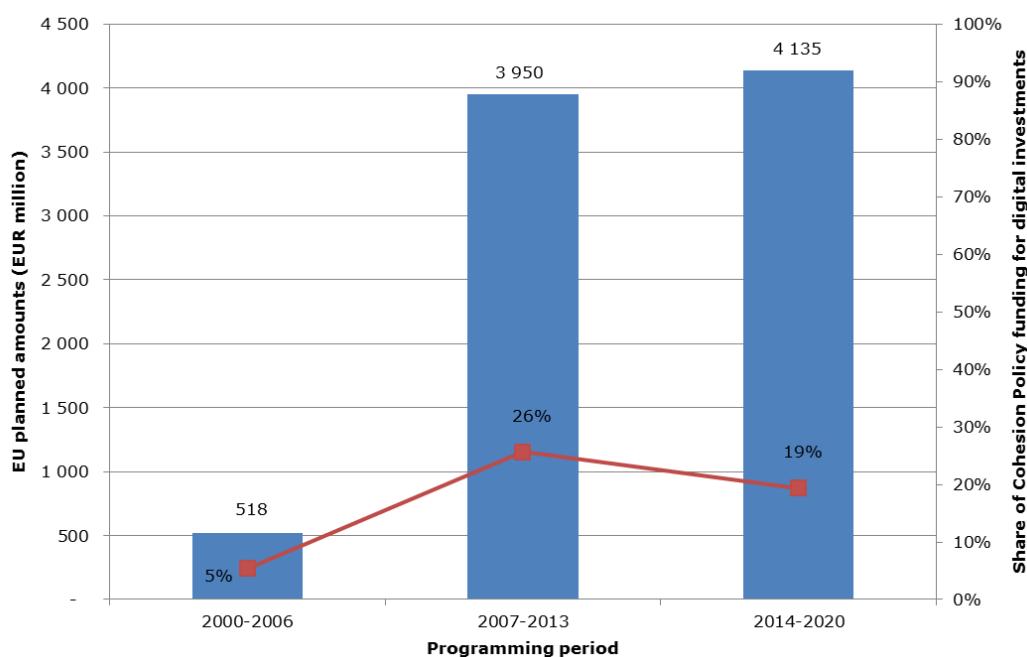
<sup>193</sup> Please, see the methodological annex for computation details.

<sup>194</sup> European Commission (2015), *Contribution of the European Structural and Investment Funds to the 10 Commission Priorities - Digital Single Market*.

## ICT – other forms of support

The ICT – other forms of support category groups together different kinds of investments, ranging from interoperability, smart grids and smart cities to the promotion of digital content (media oriented).<sup>195</sup> As such, the evolution should be interpreted with extra caution. Cohesion Policy Investments in ICT – other forms of support seemed to have increased greatly from 2000-2006 to 2007-2013, from EUR 518 million to EUR 3.95 billion. It has led to the greater relative importance of this type of investment, from 5% of Cohesion Policy funding for digital investments to 26%. Between 2007-2013 and 2014-2020, this type of investment has been relatively stable in the framework of Cohesion Policy, slightly increasing to EUR 4.1 billion, yet declining in relative share to 19%. Evolution of the expenditure per capita closely follows the pattern of absolute amounts, increasing from EUR 1.4 per capita in 2000-2006 to EUR 8 per capita in 2007-2013, then remaining quite stable in 2014-2020. In terms of content of the ICT – other forms of support category, **the 2014-2020 programming period is marked by an important focus on smart cities (EUR 2 billion) and smart grids (EUR 1,1 billion).**

**Figure 5. Evolution of Cohesion Policy funding dedicated to ICT – other forms of support, by programming period**



**Source:** Authors based on European Commission, JRC and Technopolis (see methodological annex II for details).

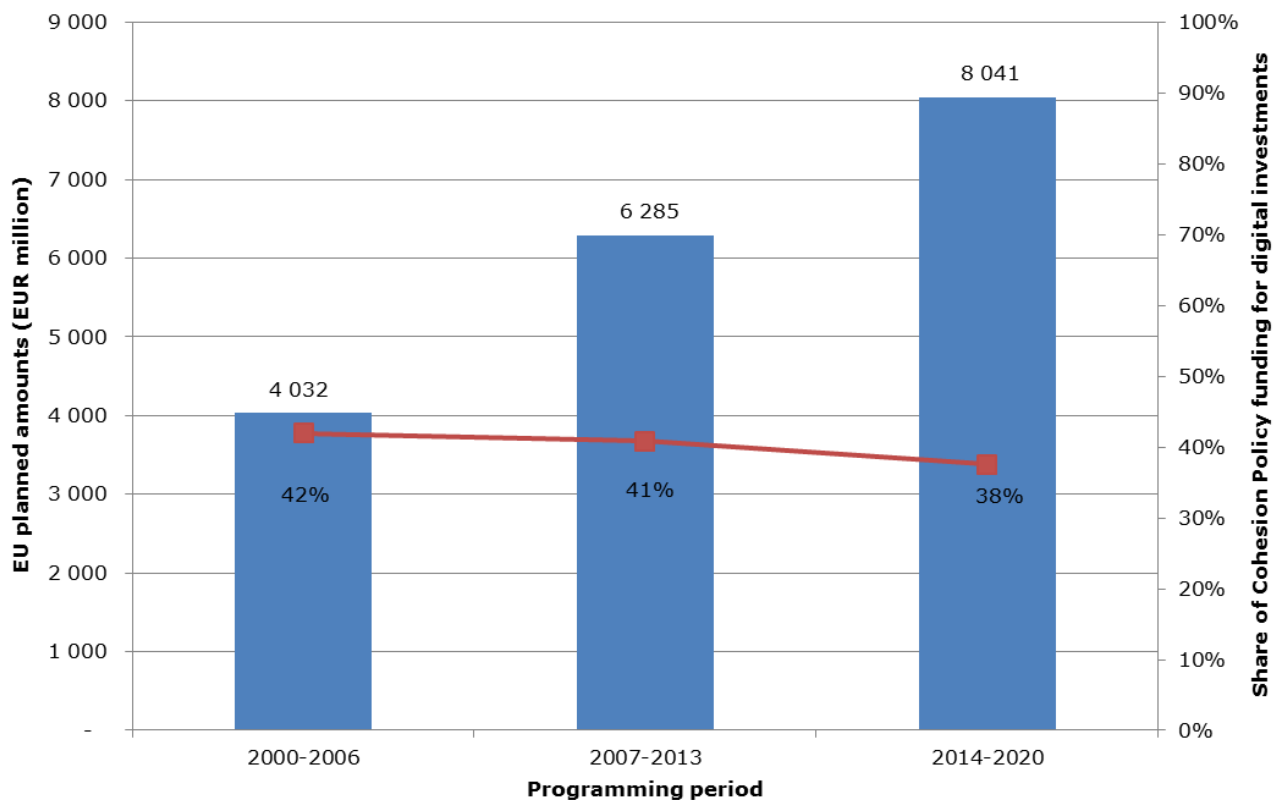
## E-services and applications for citizens

Mapping the long-term evolution of e-services and applications for citizens is rife with uncertainties, as it also includes digital skills and e-inclusion. These interventions are notably, but not exclusively, covered by the ESF. Unfortunately, there is a lasting issue of data availability regarding digital investments under ESF. In spite of these uncertainties, **this type of investment appears to be a key priority for Cohesion Policy, across the different periods.** Indeed, EUR 4.03 billion was dedicated to this consolidated area of intervention in 2000-2006, representing 42% of Cohesion Policy funding for digital investments. It has continuously increased in absolute terms, to reach EUR 8 billion in 2014-2020. Taking into consideration EU enlargements and related population changes, Cohesion Policy funding for e-services and applications has risen from EUR 10.7 per capita in 2000-2006 to EUR 15.9 per

<sup>195</sup> See the methodological annex for more details.

capita in 2014-2020. However, funding for this consolidated area of intervention has also faced a decline in relative terms, down to 38% of Cohesion Policy digital funding by 2014-2020. Data do not allow us to study in detail the long-term evolution of the e-public services and digital skills/inclusion dimensions of this consolidated area of intervention. For the 2014-2020 period 44% of these funds are dedicated to digital skills and inclusion, while 56% are for the development of e-services.

**Figure 6. Evolution of Cohesion Policy funding dedicated to e-services and applications for citizens, by programming period**



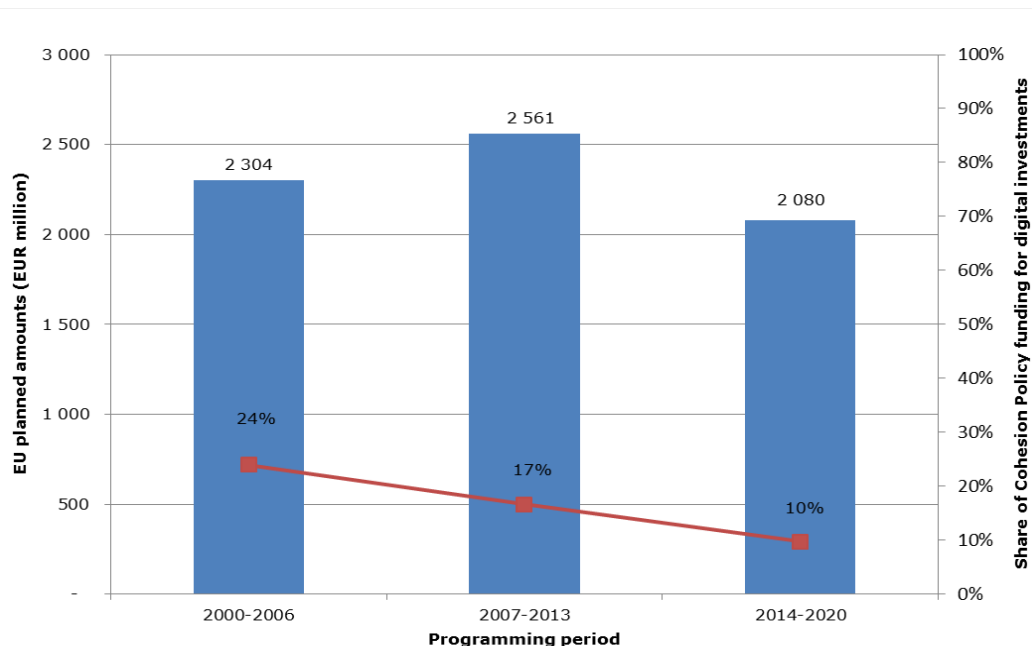
**Source:** Authors based on European Commission, JRC and Technopolis (see methodological annex II for details).

### ICT support for SMEs

ICT support for SMEs has become a priority during the 2000-2006 period, with about EUR 2.3 billion of Cohesion Policy funding, that is to say 24% of Cohesion Policy funds for digital investments (excluding Objective 3 regions).<sup>196</sup> This support has peaked during the 2007-2013 period, with about EUR 2.6 billion. It has then decreased to EUR 2.1 billion for 2014-2020, with only 10% of Cohesion Policy funding dedicated to digital investments (including all ESIF except EMFF). It has also faced decline when adjusted for population change, falling from EUR 6.1 per capita in 2000-2006 to EUR 4.1 per capita in 2014-2020. This pattern can be partly explained by the fact that **other programmes supported the digitalisation of SMEs during the 2007-2013 and 2014-2020 periods, outside the scope of Cohesion Policy.**

<sup>196</sup> See methodological annex for more details.

**Figure 7. Evolution of Cohesion Policy funding dedicated to ICT support for SMEs, by programming period**



Source: Authors based on European Commission, JRC and Technopolis (see methodological annex II for details).

### Synthesis of the consolidated areas of intervention

Thanks to this evidence, the long-term evolution of Cohesion Policy support for digital investments can be summarised as following:

**Table 4. Evolution of the priorities in terms of consolidated areas of intervention for digital investments under Cohesion Policy**

PERIOD	ICT INFRASTRUCTURES	ICT – OTHER FORMS OF SUPPORT	E-SERVICES AND APPLICATIONS FOR CITIZENS	ICT FOR SMES
1987-1993	Major priority (>50% of Cohesion Policy funding for digital investments)	No information	No information	No information
1994-1999	Major priority (>50% of Cohesion Policy funding for digital investments)	No information	No information	No information
2000-2006	Priority (>10% of Cohesion Policy funding for digital investments)	Modest priority (10% or less of Cohesion Policy funding for digital investments)	Main priority (>30% of Cohesion Policy funding for digital investments)	Priority (>10% of Cohesion Policy funding for digital investments)
2007-2013	Priority (>10% of Cohesion Policy funding for digital investments)	Priority (>10% of Cohesion Policy funding for digital investments)	Main priority (>30% of Cohesion Policy funding for digital investments)	Priority (>10% of Cohesion Policy funding for digital investments)
2014-2020	Main priority (>30% of Cohesion Policy funding for digital investments)	Priority (>10% of Cohesion Policy funding for digital investments)	Main priority (>30% of Cohesion Policy funding for digital investments)	Modest priority (10% or less of Cohesion Policy funding for digital investments)

Source: Authors.



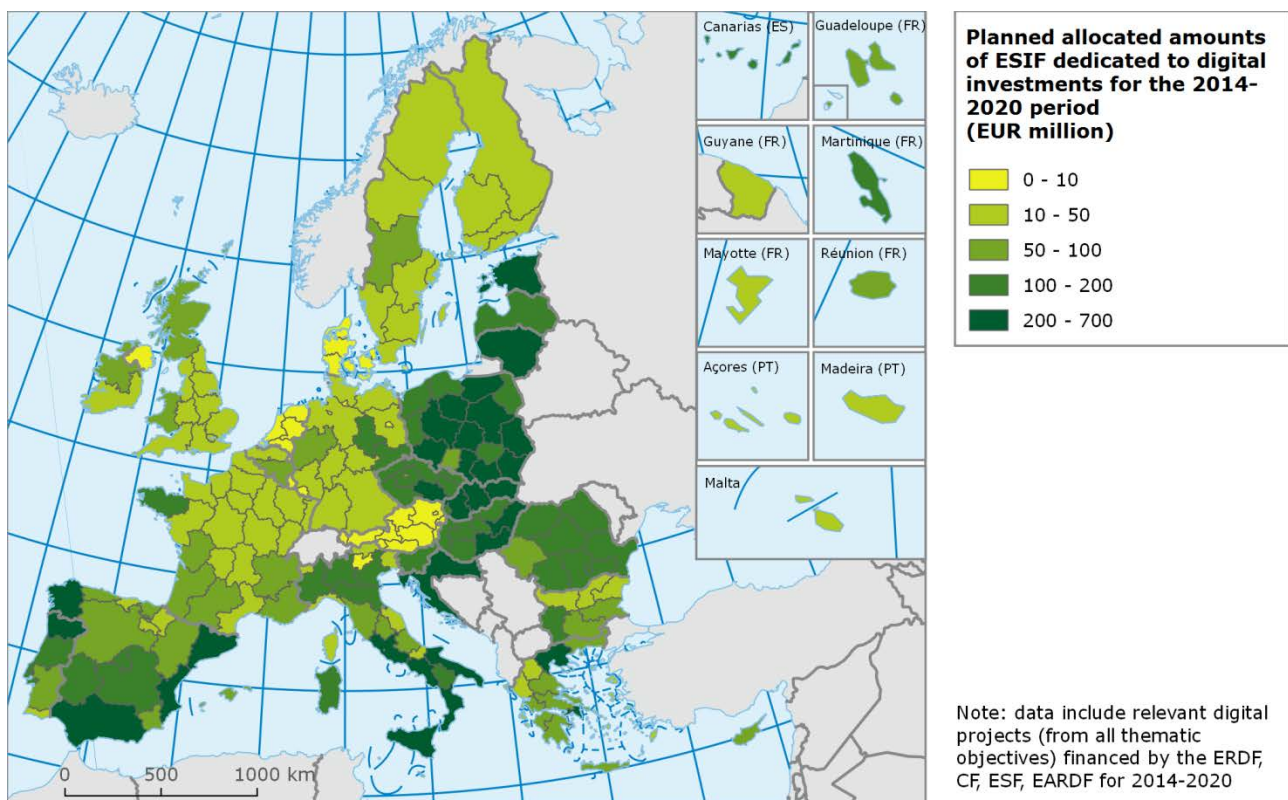
Insights from this long-term analysis thus include:

- The **key role of support for ICT infrastructures** at the beginning of the Cohesion Policy contribution to digital policy and in 2014-2020, after a period of relative decline (2000-2013);
- The **continuing support for e-services and applications for citizens** (including skills and inclusion) since 2000;
- The fluctuation of Cohesion Policy support for other consolidated areas of intervention (ICT – other forms of support and ICT for SMEs);
- The greater tendency to **spread investments out during the 2014-2020 period**, with two consolidated areas of intervention (ICT infrastructures and e-services and applications for citizens) considered as main priorities (>30% of Cohesion Policy digital investments' funding).

### 4.3 Geographical patterns

Geographically, the regions where the highest amounts of ESIF are spent on digital investments tend to be consistent with observed patterns during the previous periods and with the general distribution of funds under Cohesion Policy. Indeed, **regions in Southern and Central and Eastern Europe allocate the most to digital-related investments.**

**Map 9: Planned allocated amounts of ESIF dedicated to digital investments during the 2014-2020 programming period**



**Source:** Authors based on JRC (2017), ICT Monitoring – Planned ICT Investments under ESIF (2014-2020).

For absolute amounts, Member States in Southern (Italy, Spain) and Central and Eastern Europe are the largest beneficiaries of funding for ICT and the digital economy. **On a per capita basis, overseas and Central and Eastern European regions top the rankings.** On average the less developed regions spend EUR 113 per capita, as compared to EUR 49 per capita for transition regions and EUR 37 per capita for the more developed ones.

**Table 5. Planned ESIF allocations at the regional level during the 2014-2020 period**

REGIONS WITH THE HIGHEST PLANNED AMOUNTS FOR ICT/THE DIGITAL ECONOMY <sup>197</sup>	REGIONS WITH THE HIGHEST PLANNED PER CAPITA AMOUNTS FOR ICT/THE DIGITAL ECONOMY
Campania (IT): EUR 676 million	Ceuta (ES): EUR 1 063 <i>per capita</i>
Sicily (IT): EUR 642 million	Martinique (FR): EUR 307 <i>per capita</i>
Croatia (HR): EUR 578 million	Bratislava region (SK01): EUR 199 <i>per capita</i>

**Source:** Authors based on JRC (2017), *ICT Monitoring – Planned ICT Investments under ESIF (2014-2020)* and Eurostat (2017), *Database (regional and national statistics on digitisation)*.

#### 4.3.1 Sectoral concentration of funding at regional level

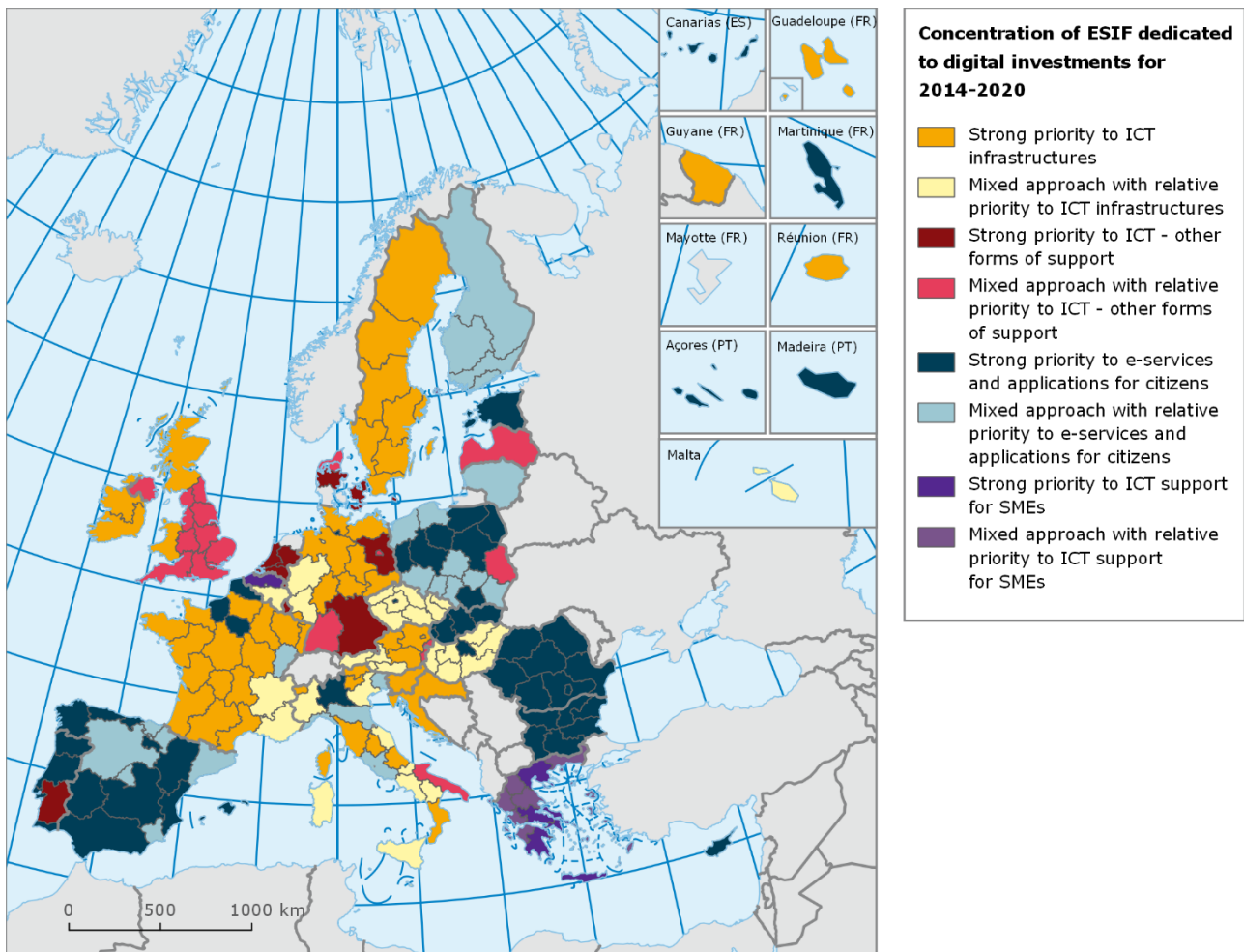
The majority of regions (59%) allocate more than 50% of their ESIF for digital investments<sup>198</sup> to a single consolidated area of intervention: e-services and applications for citizens (26% of the regions), ICT infrastructures (25%), ICT – other forms of support (6%) or ICT support for SMEs (3%). It suggests a **strategy of concentration rather than diversification**, however, it is mitigated by the presence of alternate sources of funding. It seems that while Southern and Central and Eastern European regions tend to focus on e-services and applications, Western and Northern European ones are more prone to focus on infrastructures and ICT for that programming period, as shown in the following map.<sup>199</sup>

<sup>197</sup> Please, note that data are not available at the NUTS 2 level for the following countries: Belgium, Croatia, Germany, the Netherlands and the United Kingdom. As it might bias the results, per capita expenditure is also provided in this table.

<sup>198</sup> Computations exclude expenditure that is not generally considered as contributing to ICT/the digital economy, even if they are coded under the Thematic Objective 2 that is dedicated to ICT. Indeed, the consolidated area of intervention cannot be traced for this expenditure. Moreover, it only accounts for a small minority of digital-related expenditure in ESIF (at most 15%, in most regions <1%).

<sup>199</sup> However, it does not imply greater or smaller amounts of expenditure. See the maps by absolute amounts for more details.

**Map 10: Concentration of ESIF dedicated to digital investments by consolidated areas of intervention during the 2014-2020 period**



Note: data only include the planned amounts dedicated to digital investments from the ERDF, CF, ESF, EAFRD and YEI. Computations exclude the expenditure that are not generally considered as contributing to ICT and the digital economy, even if they are coded under the Thematic Objective 2 that is dedicated to ICT. Indeed, the consolidated area of intervention cannot be traced for these expenditure. Moreover, they only account for a small minority of digital-related expenditure in ESIF (at most 15%, in most regions <1%)

Data are not available at the NUTS 2 level for the following countries: Belgium, Croatia, Germany, the Netherlands and the United Kingdom

A strong priority is defined as more than 50% of ESIF dedicated to digital investments being focused on a single consolidated area of intervention.

A mixed approach is defined by no consolidated area of intervention being granted more than 50% of the digital-related ESIF. In this case, the relative priority is the area of intervention with the highest share of dedicated ESIF.

**Source:** Authors based on JRC (2017), *ICT Monitoring – Planned ICT Investments under ESIF (2014-2020)*.

ESIF resources dedicated to the different consolidated areas of intervention vary widely by region, as shown in the following table:

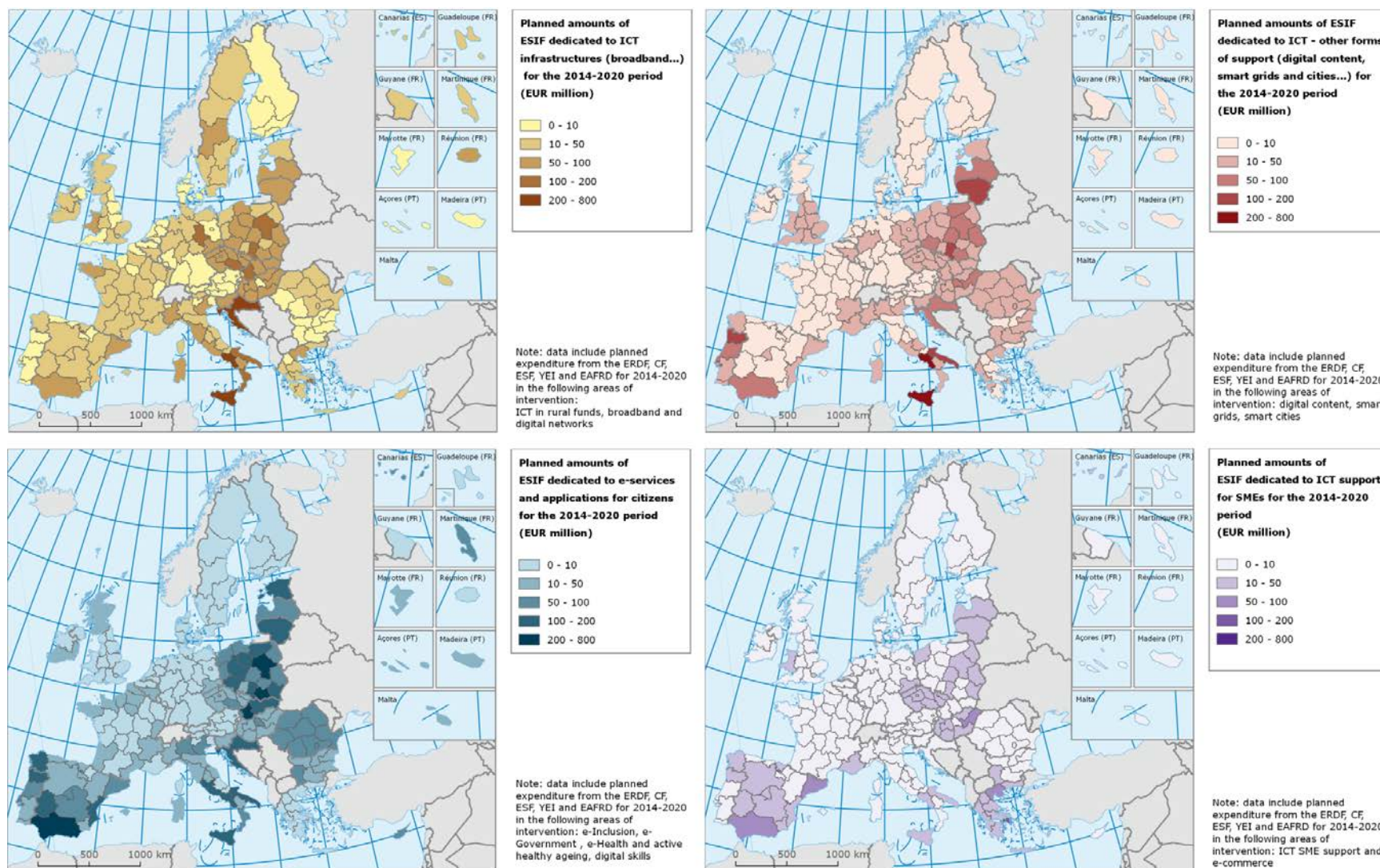
**Table 6. Regional patterns of allocations of planned ESIF by consolidated areas of intervention during the 2014-2020 period**

CONSOLIDATED AREA OF INTERVENTION	AVERAGE PLANNED ESIF EXPENDITURE BY REGION (ABSOLUTE AMOUNTS AND PER CAPITA)	REGIONS WITH THE HIGHEST PLANNED ESIF EXPENDITURE (ABSOLUTE AMOUNTS AND PER CAPITA)
<b>ICT infrastructures</b>	EUR 33 million EUR 20 <i>per capita</i>	Croatia (HR): EUR 335 million Martinique (FR): EUR 110 <i>per capita</i>
<b>ICT – other forms of support</b>	EUR 20 million EUR 1.5 <i>per capita</i>	Campania (IT): EUR 137 million Basilicata (IT) / Alentejo (PT): EUR 52 <i>per capita</i>
<b>E-services and applications for citizens</b>	EUR 38.5 million EUR 26 <i>per capita</i>	Andalusia (ES): EUR 313 million Ceuta (ES): EUR 1 051 <i>per capita</i>
<b>ICT support for SMEs</b>	EUR 10 million EUR 7.5 <i>per capita</i>	Attica (EL): EUR 184 million Epirus (EL): EUR 62 <i>per capita</i>

**Source:** Authors based on JRC (2017), *ICT Monitoring – Planned ICT Investments under ESIF (2014-2020)* and Eurostat (2017), *Database (regional and national statistics on digitisation)*.

The geographical patterns of expenditure for each consolidated area of intervention largely follow the distribution of all digital investments under ESIF. Indeed, the regions allocating the most resources to ICT infrastructures, ICT – other forms of support, e-services and applications for citizens and ICT support for SMEs, are located in Southern and Central and Eastern Europe. ICT support for SMEs is the only consolidated area of intervention that distinguishes itself by specific patterns, probably stemming from its relatively low budgetary envelope. For this type of support, regions in Spain, Greece, Hungary, Czech Republic, Eastern Poland and the Baltic States are the highest spenders, while regions in Southern Italy and Croatia, Bulgaria and Romania are less involved compared to other consolidated areas of intervention. Regions in Western and Northern Member States tend to allocate most resources to ICT infrastructures and e-services and applications for citizens.

Map 11: Planned amounts of ESIF dedicated to consolidated areas of intervention during the 2014-2020 period

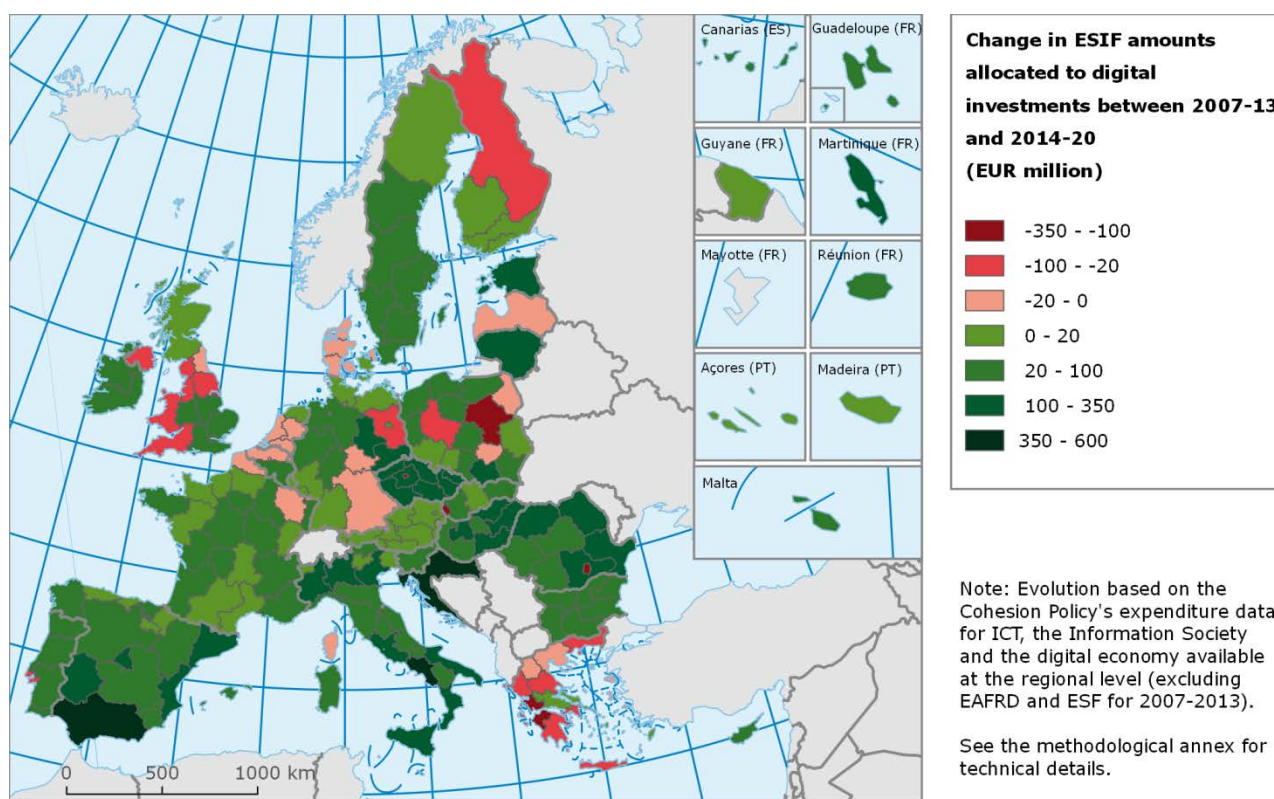


Source: Authors based on JRC (2017), ICT Monitoring – Planned ICT Investments under ESIF (2014-2020).

### 4.3.2 Geographical trends

In dynamic terms, data only allow for a comparison across the 2007-2013 and 2014-2020 periods at the regional level.<sup>200</sup> Overall, **Cohesion Policy funding for digital investments has increased significantly (up to EUR 100 million) for most regions.** Regions in Central and Eastern and Southern Europe have often benefited from a larger increase (more than EUR 100 million). Notable exceptions include regions in the United Kingdom and capital regions in several new Member States that have experienced a major decrease in dedicated funds for digital investments (e.g. the regions of Warsaw, Prague, Bratislava, Bucharest). These decreases seem to be mainly driven by ICT – other forms of support and ICT support for SMEs. It can also be hypothesised that these regions now have access to other sources of funding in these fields.

**Map 12: Regional evolution of planned amounts of ESIF dedicated to ICT/the digital economy between 2007-2013 and 2014-2020**



**Source:** Authors based on JRC (2017), ICT Monitoring – Planned ICT Investments under ESIF (2014-2020) and DG REGIO (2015), Database of the cumulative allocations to selected projects and expenditure at NUTS2.

## 4.4 Additional sources of EU funding for ICT and the digital economy

During the 2014-2020 period other sources of funding are also expected to contribute to Europe's objectives for the Digital Single Market and Digital Agenda.

In line with the ambition to develop the EU's ICT infrastructures, additional resources beyond the ERDF and EAFRD are planned. The **Connecting Europe Facility (CEF)** indeed promote tailored investments in cross-border ICT infrastructures for growth, jobs and

<sup>200</sup> Relevant data is only available at the regional level since the 2000-2006 programming period. Additionally, the breakdown by consolidated areas of intervention at the regional level is only available since the 2007-2013 programming period, which is required to correctly interpret the evolution of expenditure. It should however be noted that the ESF and EAFRD are included for 2014-2020 and not for 2007-2013.

competitiveness,<sup>201</sup> thanks to a EUR 1.04 billion budget (mainly through grants).<sup>202</sup> Funding from the EFSI would also finance ICT infrastructures over the period.<sup>203</sup>

Several other initiatives channel funding towards the achievement of the Digital Single Market's objectives, especially for the creation of digital content (Creative Europe 2014-2020<sup>204</sup>), training (Erasmus+)<sup>205</sup> and employment/social policy (Employment and Social Innovation Programme).<sup>206</sup>

**Horizon 2020**, the successor of the 7<sup>th</sup> Framework Programme for Research (FP7), cover ICT-related R&D projects in all its priorities (Excellent Science, Industrial Leadership and Societal Challenges). The dedicated budget has increased by about 25% compared to 2007-2013, to EUR 12.7 billion.<sup>207</sup> Funding would continue to support the whole chain from basic research to industrial applications, in particular in emerging technologies and with a cross-cutting approach. Moreover, Horizon 2020 is also designed to benefit SMEs; for instance, with its contribution to the establishment of a network of Digital Innovation Hubs (see below).<sup>208</sup> More specifically, the digitalisation of enterprises is encouraged during this period thanks to the **Competitiveness of Enterprises and Small and Medium-Sized Enterprises (COSME)** programme.<sup>209</sup> As a successor of the CIP, COSME allocate EUR 894 million to digitalisation (debt and equity).<sup>210</sup> The **European Investment Bank**, especially in the framework of the Investment Plan for Europe (the so-called Juncker Plan), would also contribute to the objectives of the Digital Single Market:

- A share of the EUR 81 billion for knowledge creation and the digital economy (e.g. digitalisation of SMEs, ICT infrastructures) from the European Fund for Strategic Investment (debt and equity);
- EUR 9.1 billion for SMEs' digitalisation from the European Investment Fund (venture and growth capital funds, facilitation of loans and leases to SMEs through financial intermediaries);
- EUR 16.1 billion for the telecoms and knowledge economy from other instruments of the European Investment Bank (corporate financing, notably through loans and Public Private Partnerships).<sup>211</sup>

These initiatives tend to balance the relatively lower amounts of ESIF dedicated to SME support for this programming period.

<sup>201</sup> Innovation and Networks Executive Agency (2017), *Connecting Europe Facility*.

<sup>202</sup> Innovation and Networks Executive Agency (2017), *CEF Telecom*.

<sup>203</sup> European Commission (2015), *Commission Staff Working Document: A Digital Single Market Strategy for Europe - Analysis and Evidence*.

<sup>204</sup> European Commission (2018), *Creative Europe*.

<sup>205</sup> European Commission (2017), *Did you know that Erasmus+ will help to give students' digital skills a boost?*

<sup>206</sup> Euro SMEs (2013), *EaSI - Programme for Employment and Social Innovation*.

<sup>207</sup> European Commission (2017), *ICT Research & Innovation - Horizon 2020*.

<sup>208</sup> European Commission (2017), *Pan-European network of Digital Innovation Hubs (DIHs)*.

<sup>209</sup> European Commission (2017), *COSME*.

<sup>210</sup> European Commission (2015), *Commission Staff Working Document: A Digital Single Market Strategy for Europe - Analysis and Evidence*.

<sup>211</sup> European Commission (2015), *Commission Staff Working Document: A Digital Single Market Strategy for Europe - Analysis and Evidence*.





## 5. ESIF SUPPORT TO THE DIGITAL AGENDA IN 2014-2020: TERRITORIAL NEEDS AND POLICY RESPONSES

### KEY FINDINGS

- In 2014-2020, some **important changes have been introduced in the ESIF regulatory framework** with implications for digital investments (thematic concentration, ex ante conditionalities, simplification and territorial approach).
- There are some issues at stake in the governance arrangement and delivery system underlying the contribution of ESIF to the DEA/DSM's objectives. The **level of priority for ICT infrastructures** raises some controversy and there is an unclear **demarcation between ERDF and EAFRD** in this area. There is some uncertainty about who exercises **responsibility over digital skills**, and insufficient coordination regarding the **use of ICT to address climate change**. Reaping the benefits from **synergies with other EU funding instruments**, in particular H2020 remains a challenge.
- Different areas could take advantage of more effort to diffuse digital technologies, for example climate change and ICT applications for agriculture.
- Case studies confirm that **strategic planning** and **partnerships** are two key success factors of regional digital strategies. **Smart Specialisation strategies** appear to be a privileged locus where to engage successful strategies. They are also a way to promote synergies with H2020.
- The support by the EC is important in order to **foster partnerships and promote good quality strategic planning**. The EC also supports a number of platforms to exchange good practices and build EU-wide partnerships.

This Chapter adopts a qualitative approach to assess the implementation of ESIF investments in favour of ICT and the digital economy during 2014-2020 on the ground. It relies on six case studies of initiatives supported by ESIF in different area, documentary analysis and interviews with informed stakeholders (see Annex III of this volume for the list of interviewees, and Volume II for the full case studies reports). First, the regulatory changes introduced in the current programming period, which are likely to have an impact on the implementation of ESIF digital investments are recalled. Evidence from case studies and interviews is then analysed, in order to assess, among other things, the influence of these regulatory changes on ESIF contribution to DEA / DSM.

### 5.1 ESIF funding in the digital economy during the 2014-2020 programming period: a new policy framework

For the 2014-2020 programming period the Cohesion Policy framework has been reformed in order to pursue several objectives:<sup>212</sup>

- Strengthen the links between ESIF and the EU 2020 Strategy;
- Concentrate resources on key growth sectors/themes;
- Ensure the existence of adapted conditions for investments;
- Focus on result-orientation, with strengthened monitoring;
- Improve the coordination of the different ESIF/other EU funding;

<sup>212</sup> European Commission (2014), *Investing in regions and cities: EU Cohesion Policy 2014-2020*.

- Develop an integrated approach to territorial development, including cross-border cooperation ;
- Strengthen the role of partners in the different implementation steps of the Policy.

These ambitions have a particular impact on digital investments, given the key role of ESIF to deliver the Digital Single Market and Digital Agenda for Europe.<sup>213</sup> In particular, ESIF are strongly linked to the realisation of the DAE and DSM's objectives thanks to a new system of thematic concentration of resources and pre-conditions to unlock funding.<sup>214</sup>

### 5.1.1 Thematic concentration of resources

In order to concentrate Cohesion Policy resources, a **limited series of Thematic Objectives has been established**. Funded interventions must be related to these TO, which are policy priorities that are linked to the EU2020 objectives. A specific TO has been conceived for ICT: TO2 'Enhancing access to, and use and quality of, information and communication technologies'.<sup>215</sup> It ensures a high level of funding for ICT and the digital economy. However, funding for digital investments is not restricted to TO2.<sup>216</sup> Indeed, TOs related to 'Educational & Vocational Training', 'Competitiveness of SMEs' etc., can also contribute to the realisation of interventions improving digital performance in line with the DAE/DSM's objectives.

### 5.1.2 Ex ante conditionalities

The 2014-2020 programming period links the availability of Cohesion Policy funding to the fulfilment of pre-conditions called ex ante conditionalities (EXAC). Indeed, difficulties during the 2007-2013 period, such as low absorption rates for broadband projects,<sup>217</sup> justified increased attention to such pre-conditions. EXAC related to sectoral strategies can take the form of standalone documents or be integrated into more comprehensive policy strategies.<sup>218</sup> Basically, EXAC designed to ensure adequate sectoral interventions (from planning to implementation) under Cohesion Policy should address the following requirements:<sup>219</sup>

- Assessment of the initial situation;
- Identification of regional/local priorities: clear objectives linked to local characteristics and contributing to the DAE objectives<sup>220</sup>;
- Planning and budgeting;
- Indicators for monitoring progress;
- Consultation approach, with private-public links.

For ICT and the digital economy, **the regions have to complete two EXACs** if they are willing to invest in TO 2 (the core TO for ICT):

<sup>213</sup> European Commission (2015), *Contribution of the European Structural and Investment Funds to the 10 Commission Priorities - Digital Single Market*.

<sup>214</sup> Ferry, Kah and Bachtler (2016), *Maximisation of Synergies between European Structural and Investment Funds and Other EU Instruments to Attain Europe 2020 Goals*.

<sup>215</sup> European Commission (2017), *Open Data Portal for the European Structural Investment Funds - Information and Communication Technology*.

<sup>216</sup> JRC (2014), *The Digital Agenda Toolbox*.

<sup>217</sup> Based on interviews with experts.

<sup>218</sup> Stancova and Sörvik (2015), *Assessment of Strategies for ICT Investments Using European Structural and Investment Funds: Reflections from Experts and Practical Examples*.

<sup>219</sup> Stancova and Sörvik (2015), *Assessment of strategies for ICT investments using European Structural and Investment Funds: reflections from experts and practical examples*

<sup>220</sup> JRC (2014), *The Digital Agenda Toolbox*.

- Digital Growth Strategy (often integrated into the Regional Innovation Strategy): primarily aims at ensuring the consistency of regional actions with the DAE objectives<sup>221</sup>;
- Next Generation Network Plan (required for broadband development): strategy to reach the quantitative objectives in terms of broadband development (especially by completing private investments in certain areas).<sup>222</sup>

### 5.1.3 Simplification and synergies

The overall Cohesion Policy framework has also been simplified in order to favour coordination and synergies between both ESIF and other EU programmes. A **Strategic Common Framework** has been established to promote an integrated use of ESIF, while a **Common Provision Regulation cover all the different ESIF** (even if specific regulations for each ESIF remain).<sup>223</sup> For example, this is particularly relevant for the EAFRD, which is thus expected to reintegrate the Cohesion Policy framework after having been slowly disengaged in the previous programming periods. Specific provisions have been modified to facilitate synergies between ESIF and other EU programmes (e.g. alignment of cost models between funds, requirement to specify the synergies in the strategic and programming documents).<sup>224</sup> Expected synergies can be of different types: coordinated actions around the same project, successive projects, parallel projects.<sup>225</sup>

### 5.1.4 Territorial approach

Finally, the framework has been adapted to favour an inclusive, integrated and territorial approach to regional policy. The **Integrated Territorial Investment (ITI)** tool has been designed in this context. It allows Member States to implement Operational Programmes at local levels with a cross-cutting perspective and with funding from different priority axes. It therefore aims to favour the emergence of integrated strategies for specific territories.<sup>226</sup> Other provisions going in the same direction are Community-led local developments (CLLD – following the LEADER approach), that allow local groups of stakeholders to combine different ESIF to address sub-regional issues<sup>227</sup>; and Sustainable Urban Development (SUD) under the ERDF.

## 5.2 Evidence from case studies

In order to assess the impact of the regulatory changes introduced in 2014-2020, and beyond, to capture the most recent dynamics of Cohesion Policy support for ICT and the digital economy, six case studies have been carried out. The objective is to explore how the above regulatory provisions translate on the ground, and more generally, what challenges and opportunities ESIF digital investments bring about. These initiatives account for the diversity of projects implemented on the ground, according to different characteristics:

- Type of regions (3 more developed, 1 transition, 2 less developed);
- Geographical coverage (East/West and North/South, rural and urban contexts);

<sup>221</sup> European Commission (2016), *Support to the Implementation of the ERDF Investment Priority: Enhancing Access to, and the Use and Quality of ICT.*

<sup>222</sup> European Commission (2016), *Support to the implementation of the ERDF INVESTMENT PRIORITY: ENHANCING ACCESS TO, AND THE USE AND QUALITY OF ICT.*

<sup>223</sup> European Commission (2015), *European structural and investment funds 2014-2020: official texts and commentaries.*

<sup>224</sup> Ferry, Kah and Bachtler (2016), *Maximisation of Synergies between European Structural and Investment Funds and Other EU Instruments to Attain Europe 2020 Goals.*

<sup>225</sup> European Commission (2014), *Enabling synergies between European Structural application: and Investment Funds, Horizon 2020 and other research, innovation and competitiveness-related Union programmes.*

<sup>226</sup> European Commission (2014), *Integrated Territorial Investment.*

<sup>227</sup> European Commission (2014), *Community Led Local Development.*

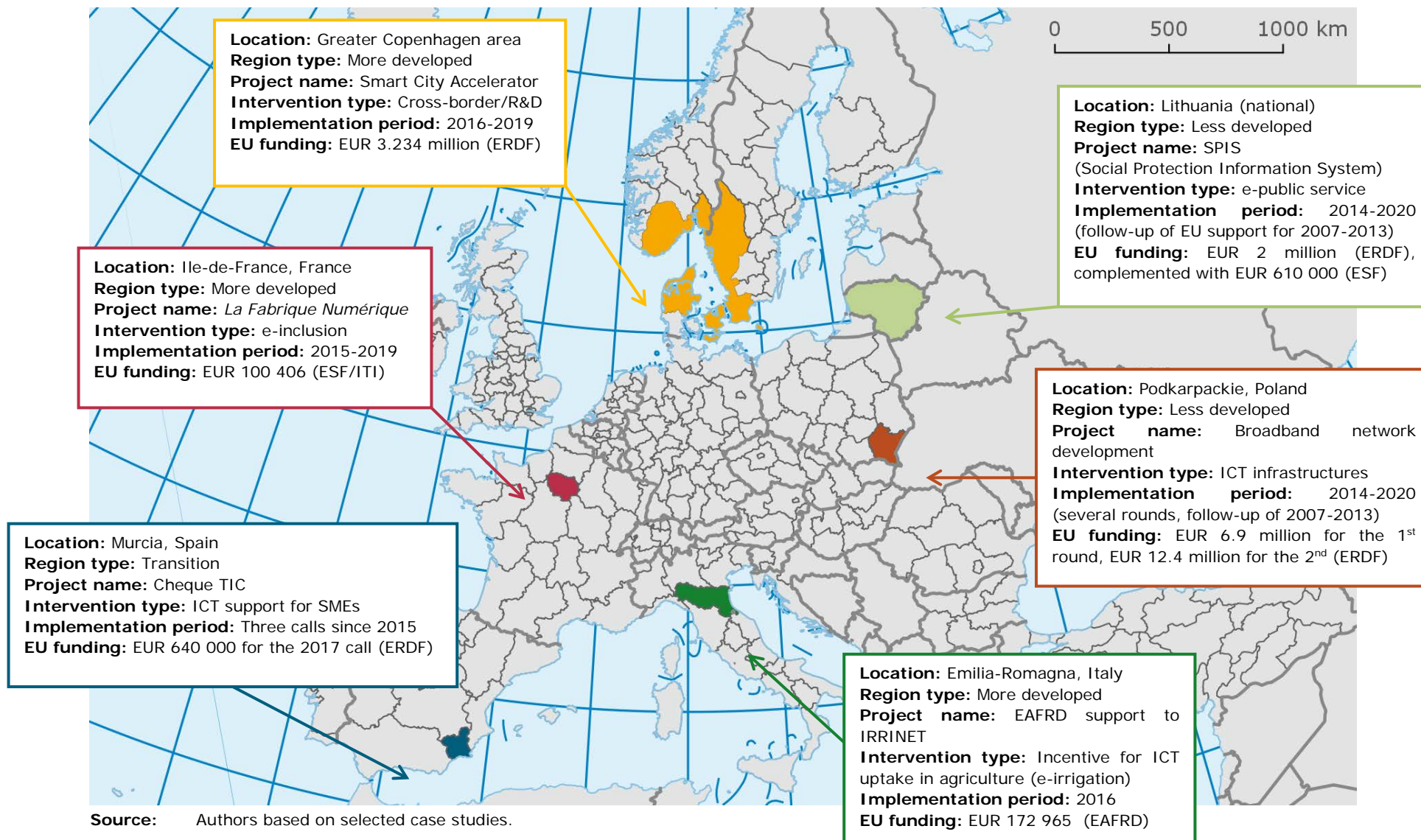
- Support from different ESIF (ERDF, ESF, EAFRD);
- Type and approach of projects (R&D, e-inclusion, ICT support for SMEs, e-public services, ICT infrastructures, ICT applications for agriculture);
- Scope of projects (in terms of financial amounts and objectives).

Thanks to these case studies, it is possible to explore:

- Territorial needs that regions face on the ground;
- Policy response to these needs, that is to say:
  - Strategic context;
  - Governance arrangements including partnerships;
  - ESIF added value;
  - Achievements and lessons learnt from the project.

Moreover, the selected case studies are often good practices and/or feature innovative approaches, which can both deliver valuable lessons for other initiatives in the EU and contribute to the development of Cohesion Policy post-2020. The following map gives an overview of the selected case studies. They are briefly presented before inferring relevant insights from a horizontal reading of the six cases.

Map 13: Overview of the selected case studies



### 5.2.1 Smart Cities Accelerator (Cross-border: Denmark and Sweden)

The Smart Cities Accelerator was selected in order to explore the potential of a cross-border approach (building on previous partnerships between cities, universities) to tackle the issue of climate change and energy transition using ICT. Geographical location and the key role of demonstrator projects linking R&D to local realities have also been central elements of interest for this choice.

The Smart Cities Accelerator (SCA) is a cross-border project bringing together municipalities, academic institutions and businesses from the Greater Copenhagen Area (Denmark and Sweden), in order to **promote energy optimisation and the shift towards renewables**, using ICT. Concretely, the SCA is based on knowledge-sharing and demonstration projects, with a total budget of EUR 6.5 million (50% of which is financed by the ERDF under the Interreg Öresund-Kattegat-Skagerrak Operational Programme 2014-2020).

The cross-border region of Greater Copenhagen is characterised by its knowledge-based economy (with several academic institutions and research centres) and important commuter flows. One of its main challenges is, therefore, the **transition towards a fossil fuel-free transportation and energy system**. Denmark and Sweden rank high in terms of digital performance in the EU, allowing opportunities for policy interventions. In this context, several national, regional and local strategies aim to use ICT to tackle climate change and energy issues, e.g. the cross-border regional strategy ORUS pursuing the ambition to become a 'climate-smart region' or Malmö city's environmental programme (including ICT for 'climate-smart urban development').

A major feature of the SCA project is its **complex partnership and governance framework**. Indeed, the SCA's activities are designed by combining vertical focus areas (technological topics, which are the responsibilities of academic institutions, e.g. 'development of tools for energy conservation') and horizontal focus areas (policy problems, led by municipalities, e.g. 'Learning'). It allows for the identification of the most relevant demonstrator projects (i.e. 'prototypes' of interventions that can be potentially generalised), and the increased commitment of all the stakeholders, including citizens. Finally, the EIT Climate-KIC (EU level partnership bringing together businesses, research centres and universities on climate issues) plays a key role by identifying solid start-ups and SMEs through which to implement the demonstrator projects. For instance, the SCA supported the EnergyBlock demonstrator (test of decentralised energy and blockchain technologies).

The **added value of ESIF is mainly to consolidate partnerships between stakeholders and encourage them to co-finance demonstrator projects**. However, the project has not built synergies with other EU sources of funding (e.g. H2020). The experience from the SCA shows that a **project governance with a holistic and multi-stakeholder approach can enable changes**, despite its complex implementation. Indeed, it allows for the identification and testing of the projects with the highest technical and policy relevance for using ICT in climate change/energy efficiency, thus boosting partners' motivation and long-term results.

### 5.2.2 La Fabrique du Numérique (Ile-de-France, France)

The *Fabrique du Numérique* has been chosen as an example of an innovative project linking digital technologies and social policy (tackling early school leaving). Moreover, it is contributing to the development of local partnerships and strategies, with the use of an **Integrated Territorial Investment (ITI)** in the context of a more developed French region.

La *Fabrique du Numérique* is a social fab lab, a small-scale workshop for digital fabrication, using ICT in order to tackle the issue of early school leaving. For 22 weeks, the selected youth develop their skills (general and technical/digital) by working on real-world projects, while also benefiting from social support. The goal is not to train ICT specialists, but rather to help local

youth to regain motivation to pursue further training or employment. Between 2015 and 2017, the ERDF provided support of EUR 100.406 to the project via an ITI.

*La Fabrique du Numérique* is located in the Ile-de-France region, more precisely in the city of Gonesse. As the capital region of France, it is one of the most economically and digitally developed in the EU. However, important regional disparities exist. In particular, the territory of Gonesse is characterised by high youth unemployment and problems of educational achievement. Several strategies at the regional and local levels aim to address these issues. In the regional Operational Programme, *La Fabrique du Numérique* is supported as an initiative promoting education and training, rather than ICT. Indeed, ICT is considered both as a sector and as a horizontal priority. Locally, the project is financed by an ITI and helps to develop an **Integrated Urban Strategy (bringing together multiple cities) with a strong digital dimension**.

As such, the governance framework is highly complex. At the project level, it requires cooperation between the project leader (City of Gonesse), two operators (an NGO: Co-Dev and a company: ECP) and various partners (local cooperation body between cities, social services, NGOs). At the strategic level, *La Fabrique du Numérique* catalyses the emergence of **stronger links within and between different public institutions in the context of a renewed territorial organisation**.

The contribution of the ESIF is dual: **increasing the scope of the project** (i.e. number of final beneficiaries, time span, etc.) and **favouring the emergence of new partnerships in an integrated approach**. *La Fabrique du Numérique* is yielding excellent results in terms of transition of its beneficiaries towards further training after the programme, as recognised by the URBACT label. The reasons are manifold: solid political leadership, high funding per trainee, adapted pedagogical approach and strength of partnerships. However, some limits remain, such as the need to clarify the territorial reach of the project or its links with other digital initiatives that are part of the emerging Urban Integrated Strategy. The medium-term sustainability of the economic and organisational model should also be considered.

### 5.2.3 EAFRD support for IRRINET (Emilia-Romagna, Italy)

The EAFRD support to IRRINET was chosen because it is an example of an intervention favouring the use of ICT in the agricultural sector. It also shows the **potential of EAFRD for digital investments beyond broadband development, in a more developed region**.

IRRINET is a software developed to improve water management in agriculture. It is accessible to users (farmers and water managers) through the IRRIFRAME platform on multiple devices, providing complex information in a simple user-friendly way (real-time and place-based irrigation scheduling for farmers). The internet version of this tool was first released at the regional level in 1999, following previous initiatives. Thanks to its success, it was generalised to the entire Italian peninsula in 2014. The development of IRRINET/IRRIFRAME was not supported by European funds; however, **the EAFRD provided a complementary subsidy to foster its use during the 2014-2020 period**, for a total cost of EUR 172 965 (EUR 15 per ha.). Moreover, the EAFRD supports the research activities of the regional water management organisation (*Canale Emiliano Romagnolo*).

Emilia-Romagna is a major agricultural region in Italy, known for its high-quality production (Protected Designation of Origin/Protected Geographical Indication products) and efficient irrigation system. Water availability is generally good in the region, yet some areas face severe risk of droughts. Regarding digital aspects, Emilia-Romagna fares better than most Italian regions. Still, **ICT penetration is particularly poor in the agricultural sector**, with only 30% of farmland managed by ICT-using enterprises in 2010. These realities are partly taken in consideration in the regional Rural Development Programme for 2014-2020. There are no main priorities explicitly mentioning ICT, with broadband access being part of the 'Social Inclusion'

one. However, **ICT is declined as a horizontal priority**. In this framework the EAFRD subsidy is seen as supplementary. It is linked to the use of IRRINET by farmers that are also committed to ‘Adopt Integrated Production Systems’. It is, therefore, limited to a small number of farmers. The IRRINET project implies close cooperation among stakeholders for design, implementation and diffusion: the regional water management organisation (Canale Emiliano Romagnolo), the Italian Water Boards Association, an IT company (AltaVia srl) and regional authorities.

**The contribution of the EAFRD to the uptake of IRRINET by farmers is likely to be limited**, given its already wide adoption. Still, the EAFRD contribution might trigger greater familiarity with ICT and the adoption of digital solutions by some farmers. This shows the limits of EAFRD to digitalisation in a rural context. Instead, the EAFRD support for research projects to improve IRRINET could illustrate a more pertinent contribution of ESIF in the case of Emilia-Romagna.

#### **5.2.4 Social Protection Information System (Lithuania)**

The Social Protection Information System of Lithuania was chosen as an example of long-term initiative in the field of e-government. It also provides insights on the experience of a Baltic transition region.

The Social Protection Information System (SPIS) is a complex database designed to ensure an adequate provision of social support and services across the different municipalities in Lithuania. Its aims include collecting, storing and exchanging data on social services, favouring collaboration between municipalities and State authorities, preventing undue support and simplifying application procedures. Discussions about this project were launched in 1997 and implementation began in 2010-2013 with Cohesion Policy support. During the 2014-2020 period, Cohesion Policy provides funding to develop SPIS further (e.g. full online service for social help applications) with EUR 2 million from the ERDF. It is complemented by ESF funding to enable social workers to use SPIS during their visits.

**Increasing the effectiveness of the social assistance provision is considered a necessity in Lithuania**. Indeed, the processes of application and reception of social assistance were previously inconvenient for beneficiaries and municipalities alike (processing time, administrative burdens, risk of fraud). At the same time, the country benefits from a good level of digital performance (especially in connectivity). Thus, there are **both needs and opportunities for the development of e-government projects for social services**. Indeed, SPIS is linked to several initiatives, both with ICT as a sector and as a horizontal priority: e.g. the ‘Digital Agenda of the Republic of Lithuania’ and the ‘Programme for the Development of Public Administration for 2012-2020’.

**Governance is one of the key strengths of SPIS**. Indeed, municipalities (which are responsible for the implementation of social services) are not required to provide all the related information to the Ministry of Social Security and Labour. The project was thus delivered thanks to a **long-term consensus-building approach, allowing greater motivation of stakeholders to use SPIS, willingness to improve the system and mutual support**.

The ESIF (ERDF and ESF) are the main contributors to the development of SPIS. Without Cohesion Policy support, the development of a centralised system and funding for improvements over time would not be possible (restricting these services to municipalities with important budgets only). Achievements include the reduction in administrative burdens and easier access for beneficiaries, the sharing of information between stakeholders and improved monitoring. However, limits related to digital skills (among beneficiaries and social workers) and data confidentiality should be highlighted.



### 5.2.5 Broadband network development (Podkarpackie, Poland)

The development of the broadband network in Podkarpackie was chosen as it is a major area of intervention of ESIF support for digital performance. Moreover, it adopts an interesting governance approach benefiting from the experience of the previous programming period in Less Developed Regions from a Central and Eastern European Member State.

The project aims to develop the broadband network in the Polish region of Podkarpackie, especially in rural and deprived areas. It builds on the lessons learnt during the previous programming period, by focusing on access rather than backbone infrastructure and by reorganising the responsibilities of stakeholders. The network is delivered by private operators taking part in tenders. The contribution of the ERDF was EUR 6.9 million for the first round and EUR 12.4 million for the second.

The region is characterised by a fragmented economic and digital geography, with its capital Rzeszow attaining a relatively good performance compared to other areas. The ambition is to reduce the number of broadband 'white dots' (areas with low broadband coverage) where private operators cannot invest without public support. The strategic approach is based on a national Operational Programme called Digital Poland, in line with regional and local digital and economic strategies (e.g. Podkarpackie 2020). It is also supported by important complementary measures, such as support for ICT in schools or educational schemes for digitally excluded people.

The governance structure is the main feature of this project, in a **Public Private Partnership-like approach**. Indeed, the project is managed centrally by a competent public authority (Digital Poland). **Telecommunication operators are the sole beneficiaries of funding, becoming the owners of the infrastructures realised** (with conditions for technology neutrality and openness to other operators). They are also responsible for maintenance, implying their attention to the long-term prospects. This has led to a **greater focus on access rather than backbone networks, communication and demand stimulation activities**. This remedied a situation which generated frustration among the population and firms during the previous period, as they could not be connected to the backbone infrastructures. Regional and local authorities are also involved, boosting demand and reducing administrative barriers.

**The ESIF contribution was decisive** in the realisation of this project, because private operators would not develop broadband in the targeted areas without support. Success factors for this project are the policy-learning process to fine-tune the invention compared to 2007-2013, the central management with the necessary competences, the business model with private operators, the focus on access and complementary measures (demand stimulation), and the involvement of local stakeholders. Difficulties remain in the implementation because of administrative problems (lack of modern digital maps of areas, delays in authorisation procedures, etc.).

### 5.2.6 Cheque TIC (Murcia, Spain)

Cheque TIC was selected because of its innovative approach in addressing the lasting issue of SMEs' access to digitalisation (and more generally to ESIF funding). It also illustrates the experience of a transition region located in Southern Europe.

Cheque TIC is an Innovation Voucher for the delivery of ICT services to SMEs located in the Murcia region in Spain. Thanks to this system, supported SMEs do not pay the full costs to acquire ICT services (e.g. creation of an online store, increased cyber security) from accredited providers (experts from ICT companies). It also reduces administrative burden for SMEs, as the justification documents and actual financial transfers are the responsibilities of the service providers. **Cheque TIC is derived from a generic Innovation Voucher scheme** launched

in the region in 2009. After a pilot initiative in 2013, it was generalised with three calls of Cheque TIC (2015, 2017, 2018). For the 2017 call, it had a total budget of EUR 800 000, including EUR 640 000 from the ERDF.

The region benefits from a dynamic entrepreneurial ecosystem with an important share of microenterprises. However, it is lagging behind in terms of the digitalisation of companies (employment of ICT specialists, use of the internet, etc.). Cheque TIC, therefore, aims to tackle this issue by facilitating SMEs' access to ICT services (identification of relevant services and financial support). Moreover, the initiative is integrated into different strategies (Operational Programme, Regional Strategic Plan) considering ICT as a sector *per se* and as a horizontal priority (e.g. alignment with RIS3 priorities for human capital and knowledge network).

The project is managed by the regional development agency (INFO), which gradually shifted from a top-down to a partner-centric approach. **Thanks to dialogue with business organisations, the most relevant ICT services for SMEs have been identified.** Providers are also only individual experts from private companies, ensuring both expertise and non-distortion of the market.

Therefore, **ESIF contribute to the creation of an innovative policy instrument to tackle the under-digitalisation of SMEs.** The smooth delivery mechanism for SMEs (low administrative burdens, simplified process), business-orientation of ICT services (increasingly advanced as time progresses) and partnerships with local stakeholders (business organisations, etc.) are the key factors of success for the initiative. Based on the success of this initiative, INFO is leading a project funded by H2020, which aims at developing new Innovation Vouchers favouring transnational exchanges of innovation services at the EU level. It will also increase the visibility and quality of innovation vouchers by creating a European label (exchanges of good practices, diversity of provided services etc).

## 5.3 Issues at stake

### 5.3.1 Strategic framework at regional level

Evidence from fieldwork and interviews with stakeholders highlights the importance of having good quality strategies for digital developments. The mechanism of *ex ante* conditionalities is important in this respect as it fuels awareness and the adoption of relevant strategic plans. However, available evidence points to **possible weaknesses in the two dedicated *ex ante* conditionalities (relevant to TO2)**. For example, the fact that there are two distinct EXACs (one dedicated to a 'Digital growth strategy', the other to 'Next generation networks') could hinder the adoption of a comprehensive vision, which is important in the case of ICT to avoid investments being overly focused on one dimension of the digital agenda (e.g. ICT infrastructure). It is also argued that such plans leave little room for considerations dealing with the *demand* for ICT products and services. In fact, different opinions converge to underline the **decisive role played by the EXAC related to Smart Specialisation Strategy**. Smart Specialisation Strategy is an EXAC related to TO1 (i.e. investments in R&D and innovation), but where considerations for ICT developments and the digital economy naturally find a place. As a matter of fact, addressing the digitalisation issue in Smart Specialisation Strategies makes it possible to broaden the partnership with relevant stakeholders and better align digital priorities with overall regional priorities. This shows the importance of adopting a broad approach to ICT developments, as a cross-cutting priority rather than a sector *per se*.

### 5.3.2 Partnership

One main finding valid across all case studies is the **relevance of partnerships to steer effective digital strategies**. An effective partnership makes it possible to reduce the risks of deadweight, i.e. situations in which public intervention substitutes rather than adds to private initiatives. For example in the Spanish case, the partnerships led to optimal decisions in order to determine which technologies were best suited to respond to local SMEs' needs. In fact, partnership with the business community is a way for regional authorities to **deal with a possible shortage of technical skills in the area**. In the Polish case, partnership helped devise a performing business model, engaging private telecommunication companies to take over a substantial share of risk. Clearly, ESIF, and the ERDF in particular, have added value to this important factor of success. However, case studies and consultations with stakeholders show that the process of establishing and implementing a smooth partnership capable of delivering results is long and difficult, and that **it should be genuinely piloted from within** - not imposed through ready-made solutions from outside. The LT case study illustrates the difficulty of consensus-building in a context where there is no bidding constraint, but also its remarkable effects once this is achieved. Likewise, the cross-border case study is an illustration of a very large partnership involving 11 different stakeholders (urban authorities, universities and companies) that managed to create an overall dynamic of commitment also involving the local population. As an interesting corollary, a sound partnership might be a basis to further develop and **establish relationships outside the regions**, and transnational/cross border links with partners in different Member States. This increases the potential for developing synergies between funding sources (see below). The French case study suggests that ESIF in a cross-cutting area like ICT can contribute to the development of integrated urban strategies and local partnerships, in spite of the difficulty of this task.

#### Box 5: Smart specialisation strategy of Slovenia

The Smart Specialisation Strategy of Slovenia highlights the potential of this approach to build partnerships between stakeholders and to improve the governance to deliver results<sup>228</sup>. Nine priorities and strategic partnerships were identified taking the form of innovative clusters. The largest focuses on Smart Cities with 150 members, directly contributing to the improvement of digital performance. Other partnerships allow the deployment of digital solutions as a cross-cutting intervention, for instance regarding the digitalisation of tourism. Also, the cluster 'Factories of the Future' target industrial modernisation and digitalisation (Industry 4.0).<sup>229</sup>

**Source:** Slovenian government (2015), Slovenia's Smart Specialisation Strategy S4.

### 5.3.3 Complementarity and synergies

#### Complementarity between ESIF

##### Institutional cooperation

When looking at synergies and complementarity *among* ESIF, there are different possible levels of analysis. One level is institutional and considers the relations between the DGs in charge of ESIF either directly (DG REGIO, DG EMPL, DG MARE, DG AGRI) or indirectly (DG CNECT). These appear to be **influenced by past histories of cooperation and differences in 'culture' between DGs**. According to several respondents there are contrasting approaches, in particular between DG REGIO and CNECT, the former being a traditional advocate of bottom-up strategies generated by regions through multiannual programming, while the action of the latter is more ascribable to a (grant) project approach designed in a more top-down manner. DG CNECT monitors not only the negotiations dealing with the

<sup>228</sup> Based on interviews with experts.

<sup>229</sup> Slovenian government (2015), *Slovenia's Smart Specialisation Strategy S4*.

programming of TO2 in MS Operational Programmes, but also implementation and possible re-programming. This gives it the opportunity to follow specific priorities. For example, according to one interviewee, current priorities are ICT infrastructure, digital skills and e-government, while earlier, the emphasis was on SMEs (with the creation of Digital Innovation Hub – see below). One could argue that this might explain the emphasis placed on ICT infrastructure illustrated in the above sections, for example.

### Complementarity between the ERDF and the ESF

Another issue concerning the complementarity between ESIF has to do with the specific relations between the ERDF and the ESF (which actually is not an ICT-specific issue). At a grand strategic level, at the beginning of the programming period great expectations were placed on enhanced complementarity. However, partial and preliminary feedback from implementation at regional level still stresses **difficulties, in particular in the context of local strategies such as ITI or CLLD**. A distinct, but related, issue is the consideration that DG EMPL would be more interested in the overall objective of employment (and how to bring those farthest from the labour market back to employment) than in the promotion of digital skills *per se*. This is illustrated in the absence of ESF Investment Priorities dedicated to ICT, for example. It is also confirmed by the very organigram of DG EMPL where no division explicitly deals with digital skills. In fact, the existing initiatives to foster digital skills at EU level are under the aegis of DG CNECT.

#### Box 6: Coordination between ERDF and ESF at project level: an example

The e-schools project (2014-2022) in Croatia mobilises funding from both the ERDF and the ESF (in total EUR 153 million) in order to achieve a shared objective: improving the level of digital maturity in primary and secondary schools. Concretely, schools receive support for digital competences, training of teachers (ESF) etc., combined with acquisition of ICT equipment and content (ERDF), enabling a contribution to the different dimensions of digital maturity.

**Source:** European Commission (2017), *Education and Training Monitor 2017 Croatia*.

### Complementarity between ERDF and EAFRD

A third area in question concerns the **delimitation ('demarcation') between the ERDF and EAFRD as far as ICT infrastructures in rural areas are concerned**. In the absence of clear criteria to determine under which responsibility these projects fall, some uncertainty remains with the resulting risk of a lack of effective support. To help deal with rolling out of broadband (including in rural areas), the Commission set up a network of 'Broadband competence Offices' (see Box). As the case study on Poland shows, there is indeed a **dire need for competence and technical support in the field**.

#### Box 7: Broadband Competence Offices

Broadband Competence Offices are public or publicly-appointed authorities which inform citizens and business on broadband developments and deployments in their area. They also support public authorities on technical issues related to broadband (regulation, technologies, use of ERDF, EAFRD and other funds etc.). Alongside other funding, they benefit from EUR 3 million from DG REGIO, AGRI and CNECT.

**Source:** European Commission (2018), *Broadband Competence Offices Network*.

## Synergies with other funding instruments

Synergy among EU funding instruments is an objective that has long been pursued.<sup>230</sup> In the area of ICT, potential for synergy is high as there is a large number of instruments addressing the issue from different angles. But this potential for synergy can also transform into **risks of overlaps in the absence of adequate coordination mechanisms and/or clear demarcation**. The case studies do not provide evidence that the reforms introduced to improve coordination and synergies have yielded significant improvements. They rather tend to illustrate the **enduring perceived complexity of administrative requirements** by beneficiaries.

## Synergies with H2020

Synergies between ESIF and H2020 are in principle the most straightforward to establish. R&D concerning the development or application of new digital technologies is of direct interest to regions engaging in digital strategies. Several initiatives and arrangements are addressed to beneficiaries to help them combine the two sources of support.<sup>231</sup> The Digitising European Industry Initiative is a relevant Action Plan in this respect. In particular, it launches Digital Innovation Hubs, expected to bring SMEs to digital technologies and vice versa (see boxes below).

### Box 8: Digitising European Industry Initiative

The Digitising European Industry Initiative (DEI) was launched in 2016 by the European Commission to address the specific challenges linked to ICT and, more globally, to the '4<sup>th</sup> Industrial Revolution'. Its aim is to boost the EU's competitiveness and ensure that enterprises of all sizes benefit from the potential offered by ICT.

The initiative is organised around five complementary pillars:

1. European platform of national initiatives for digitising industry: coordination of the Member States to ensure a consistent policy at the EU level, involving all the relevant stakeholders in initiatives with the adapted critical mass.
2. Digital Innovation Hubs (DIH): one-stop-shops for companies (especially SMEs) to improve their businesses thanks to digital technology (see Box 8 below).
3. Strengthening leadership through partnerships and industrial platforms: public private partnerships for research in key digital technologies (funded by Horizon 2020: high performance computing, cyber security); platforms to bridge technological advances and industrial applications by creating a vibrant ecosystem (e.g. on topics such as connected smart factories).
4. Preparing Europeans for the digital future: initiatives to favour the training/reskilling of Europeans in the context of a digital economy (Digital skill and jobs coalition see Box below).
5. A regulatory framework fit for the digital age: update of regulations in key fields such as cyber security and free data flow.

**Source:** Authors, based on European Commission (2017), Pillars of the Digitising European Industry initiative.

<sup>230</sup> Ferry, Kah and Bachtler (2016), *Maximisation of Synergies between European Structural and Investment Funds and Other EU Instruments to Attain Europe 2020 Goals*.

<sup>231</sup> Two examples are 1) the Stairway to Excellence project, which supports the EU13 Member States and their regions to build synergies between ESIF, H2020 and other EU programmes, and 2) the Seal of Excellence initiative in which ESIF contribute to fund excellent projects rejected by H2020 because of fund limitation. See European Commission (2018), *Stairway to Excellence*.

**Box 9: Digital Innovation Hubs**

Launched in 2016 in the Framework of the DSM, an Action Plan for the Digitisation of EU Industries included several of initiatives<sup>232</sup> particularly the creation of a Network of Digital Innovation Hubs (DIH). Funded by the Horizon 2020 programme (EUR 500 million) and supported by the DG CNECT, DIH are regional one-stop-shops to help businesses (especially SMEs) to gain competitiveness through digitalisation (e.g. adoption of technologies, adapted business models etc.). DIH are a form of regional multi-partner cooperation (companies, public services and governments, universities and research centres...) that should be implemented by Member States, building up from existing initiatives if relevant.

**Source:** European Commission (2016), *Digitising European Industry - Reaping the full benefits of a Digital Single Market* European Commission (2017), *Pan-European network of Digital Innovation Hubs (DIHs)* Complemented by interviews with stakeholders.

However, different sources of evidence highlight the **difficulties of ESIF-H2020 synergies on a large and systematic basis**, i.e. in other ways than through single and experimental initiatives. There seems to be an underlying conceptual issue: it is necessary to more clearly define a delimitation of competence between the two instruments. For example, it is argued that Cohesion Policy should not be mobilised to finance R&D activity that is, in principle, covered by H2020 as the respective objectives of the two funding instruments are different (scientific excellence and economic development)<sup>233</sup>. Evidence from interviews is mixed. Some suggest that the frontier is not so neatly defined and that there is rather a continuum, while others argue in favour of a more decisive focus of ESIF on applications. Some concrete examples show that there is room for basic R&D within Smart Specialisation Strategies as the Slovenian case above shows.

**Synergies in the field of urban development and climate change**

An area with much potential for synergies between ESIF and other EU instruments using digital technologies is urban development, in general and smart cities (and their rural counterparts, smart villages) in particular. Smart cities are seen as a part of the EU Urban Agenda, which is 'an integrated and coordinated approach to deal with the urban dimension of EU and national policies and legislation'. As illustrated in Section 4, substantial funding is de facto targeting Smart Cities under Cohesion Policy for the 2014-2020 programming period, with EUR 2 billion. However, **in spite of the importance of Structural Funds in terms of funding for smart cities and smart grids, their role is weakly highlighted in policy documents compared to other instruments**<sup>234</sup>. Evidence suggests that the underlying framework for Smart Cities is rather fragmented, with varying levels of coordination between initiatives and DGs. DG REGIO is less involved than other DGs (such as CNECT or ENER) and seems to essentially focus on building synergies between EU funds<sup>235</sup> (see Box 10).

In general, smart cities projects in the EU are in line with EU2020 objectives, in particular as far as their ambition to address climate change is concerned. Yet, in spite of the relevance of smart cities for climate change, there is **no formal coordination between DG REGIO and DG CLIMA on the use of ICT solutions (including smart cities) to contribute to climate change action**<sup>236</sup>. Beyond the case of smart cities, DG CLIMA, ENER, CNECT and DG REGIO do not seem to sufficiently cooperate on climate change issues. As such, the mainstreaming of climate action in the ESIF<sup>237</sup> does not explicitly recognise the role of ICT. This is a further

<sup>232</sup> European Commission (2016), *Digitising European Industry - Reaping the full benefits of a Digital Single Market*.

<sup>233</sup> Dominique Foray, Kevin Morgan, and Slavo Radošević (2018), *From rivalry to synergy: R&I Policy and Cohesion Policy*.

<sup>234</sup> Judit Torokne Rozsa (2016), *Linking Smart Cities to Structural Funds*.

<sup>235</sup> Judit Torokne Rozsa (2016), *Linking Smart Cities to Structural Funds*.

<sup>236</sup> Based on interviews with experts.

<sup>237</sup> Ricardo Energy and Environment, IEEP, Trinomics, and Climatekos (2017), *Climate mainstreaming in the EU Budget: preparing for the next MFF*.

illustration of a missed opportunity – at least at a grand strategic level and an example of relative disconnect between the higher strategic level and actual developments on the ground, requiring further cooperation between DGs and other relevant stakeholders.

#### Box 10: Smart cities and smart villages

##### Smart cities

Smart cities can be defined as “multi-stakeholder municipally based partnerships aimed at addressing problems of common interest with the aid of ICTs, which underpin ‘Smart’ classification”<sup>238</sup>. In the EU policy context, several stakeholders are involved in Smart Cities initiatives, with political/strategic and financial dimensions<sup>239</sup>:

##### EU funding (initiatives and programmes):

Technology: Smart Cities and Communities (DG ENER, DG MOVE, DG CNECT)

Funding: Elena facility (DG ENER, EIB, IFI)

Funding: Juncker Plan (EC)

Funding: Horizon 2020 (EC)

Funding: COSME (EC)

Funding: ESIF (DG REGIO)

##### Political leadership (no EU funding):

Covenant of Mayors (DG ENER, JRC)

Climate Adaptation (DG CLIMA)

##### Smart villages

Smart villages are an emerging concept referring to rural areas and communities consolidating their existing strengths through the use of digital technologies and innovation. It should combine existing building blocks in a strategic perspective. As such, it is jointly promoted as a concept by DG AGRI, REGIO and MOVE, mobilising existing funds (e.g. ERDF, EAFRD)<sup>240</sup>.

Source: Authors based on references in footnotes.

#### 5.3.4 The case of broadband

As shown by the data analysis, there has been a surge of investments in ICT infrastructures possibly motivated by the necessity to keep up with the latest technological developments (broadband of the latest generation). This is sometimes criticised by interviewees who consider that it illustrates **a bias in favour of ICT infrastructures at the expense of other softer investments and investments for SMEs or to stimulate the demand side (digital skills)**. It affects the overall balance between investment areas, which is deemed necessary in the perspective of the holistic approach chosen by the EC.

The Italian case study suggests that the almost exclusive focus of EAFRD on broadband in rural areas risks missing a vast array of opportunities to develop IT applications in agriculture. The Polish case study touches upon different critical issues in the debate around ICT infrastructures. The 2014-2020 experience could take advantage of one clear lesson from the preceding programming period about the need to cope with access conditions while rolling out backbone networks. Of course the latter are a prerequisite, but the former is the ultimate objective and this should not preclude simultaneously dealing with the two aspects of ICT

<sup>238</sup> European Parliament et al. (2014), *Mapping Smart Cities in the EU*.

<sup>239</sup> Georg Houben (2015), *Smart Cities and Communities*.

<sup>240</sup> European Commission (2017), *EU Action for Smart Villages*.

infrastructures in order to avoid frustration and consequent loss of commitment from potential users. The other important feature illustrated by the the Polish case study concerns the governance arrangement eventually adopted, which gave way to a sustainable economic model. As a matter of fact, the choice was made to make private telecom companies beneficiaries and therefore, devolve to them the responsibility for their projects. Again, this was a lesson learnt from the previous programming period in which local authorities charged with implementing projects soon became overwhelmed by the complexity of the task. This was an effective way of dealing with the risk represented by insufficient administrative capacity of local authorities.

### 5.3.5 ESIF support to SME digitalisation

SME access to ESIF (ERDF in particular) is a recurrent issue, which is not specific to the ICT area. As a matter of fact, ERDF is often beyond reach for the smallest and most vulnerable SMEs as they **do not necessarily have the administrative capacity to cope with the different requirements to apply for and implement ERDF projects** (administrative burden). This issue becomes more acute when it comes to ICT, compared to 'traditional' SMEs projects. Indeed, greater speed and flexibility are needed for projects in an area characterised by fast mutations such as ICT. In this respect, the Spanish case study illustrates the use of 'vouchers', an effective measure to reach SMEs and offer them support that is easy to manage and well-tailored to their specific needs.<sup>241</sup> The success of the initiative and its scaling up through a H2020 project augurs well for its future generalisation.

The other concern about SMEs raised by the findings above, has to do with the apparent small (and even diminishing) share of ESIF support dedicated to the digitalisation of SMEs. As argued, the relative scarcity of ESIF may be compensated by other sources of funding and initiatives both at EU and national levels. More evidence is needed to fully appreciate both SMEs needs in terms of digitalisation and policy responses (by ESIF as well as other instruments).

### 5.3.6 The role of the EC

There are different ways in which the EC helps ESIF reach DEA / DSM objectives. One first important contribution is its assistance in **helping regions improve strategic planning**. Ex ante conditionalities related to digital investment – and in particular Smart Specialisation Strategy are instrumental in this respect. The EC impulse is important, and can make a difference as illustrated by the Lithuanian case study but also the Slovenian example mentioned above. The EC support can palliate deficiencies in administrative capacity or simply provide the right incentive.

The EC also very often acts as a **'knowledge broker', promoting exchanges of information and good practices**, for example to connect potential partners across borders. One such initiative with some visibility is the Smart Specialisation Platform, but there are also many other examples, of smaller reach initiatives, with less visibility and means (see the following Boxes).

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<sup>241</sup> ICT Innovation Vouchers Scheme for Regions is supported by the DG CNECT as a tool for regional and national authorities to facilitate the digitalisation of SMEs. SMEs are put in touch with ICT service providers. The advantage is reduced administrative burden. See European Commission (2017), *ICT Innovation Vouchers Scheme for Regions*.



**Box 11: The Smart Specialisation Platform**

The Smart Specialisation Platform allows regions to cooperate for the development of Regional Smart Specialisation Strategies (S3). In particular, Thematic Platforms bring regions together on specific policy issues, with advice from the European Commission<sup>242</sup>. Among them, the Smart Specialisation Platform for Industrial Modernisation (S3P-Industry) aims at supporting 'EU regions committed to generate a pipeline of industrial investment projects following a bottom-up approach - implemented through interregional cooperation, cluster participation and industry involvement'<sup>243</sup>. Within this S3P-Industry, the 'Industry 4.0 for SMEs' is of high relevance to achieve the DAE/DSM.<sup>244</sup>

**Source:** European Commission (2017), *What is Smart Specialisation? - Smart Specialisation Platform*; European Commission (2018), *Industrial Modernisation*.

**Box 12: Other examples of EU-level platforms of exchange dealing with digitalisation****Urban Agenda for the EU – Digital Transition partnership**

The Urban Agenda for the EU includes 12 thematic partnerships, one of which deals with 'Digital Transition'. The European Commission thus provides a framework for discussion for urban areas willing to develop projects in partnerships to tackle digital transition issues<sup>245</sup>.

**Digital Cities Challenges / Transforming regions and cities into launch-pads of digital transformation and industrial modernisation**

This initiative launched by EASME with COSME funding provides tailored policy advice, coaching and support to 15 cities in Europe, in order to operationalise the recommendations of the 'Blueprint for cities and regions as launch pads for digital transformation' and to improve local capacity in digital transformation<sup>246</sup>.

**ESF Transnational Cooperation**

The European Commission has set up Thematic Networks for policy learning and exchanges of good practices related to the implementation of ESF projects. One of these networks is related to Learning and Skills, potentially including digital skills<sup>247</sup>.

**Digital Skills and Jobs Coalition**

Digital Skills and Jobs Coalition is a multi-stakeholder (e.g. Member States, companies, social partners, non-profit organisations and education providers) collaboration platform launched in December 2016 by the European Commission (DG CNECT) to reduce digital skills gaps in Europe. The members are committed to take actions for: digital training for the youth, upskilling of the workforce, modernisation of the education and training systems, improvement of citizens' digital skills<sup>248</sup>. The Coalition notably shares scalable projects yielding good results for these goals (e.g. Digital Skills Awards).<sup>249</sup>

**Source:** Authors based on references in the footnotes.

<sup>242</sup> European Commission (2017), *What is Smart Specialisation? - Smart Specialisation Platform*.

<sup>243</sup> European Commission (2018), *Industrial Modernisation*.

<sup>244</sup> The Vanguard Initiative is also a comparable initiative. See Vanguard Initiative (2014), *Joining Forces for Investment in the Future of Europe*.

<sup>245</sup> European Commission (2018), *Digital Transition*.

<sup>246</sup> European Commission (2018), *Role of Cities and Regions*.

<sup>247</sup> European Commission (2017), *Transnational Cooperation*.

<sup>248</sup> European Commission (2017), *The Digital Skills and Jobs Coalition Members Charter*.

<sup>249</sup> European Commission (2017), *Digital Skills Initiatives*.

## 6. CONCLUSIONS AND PROSPECTS

### 6.1 Main findings and conclusions

#### 6.1.1 EU digital performance and the response of Cohesion Policy

Despite some solid assets, **EU digital performance is characterised by weaknesses**. While it boasts a strong research basis and a rather dynamic start-up ecosystem, the continent as a whole tends to underperform, compared to competitors such as the USA, Japan and South Korea, in terms of advanced ICT infrastructures and uptake of ICT products and services by citizens and enterprises (in particular SMEs). Moreover, these general features conceal an inconsistent situation with different 'digital divides' at play between and within Member States (e.g. between Western and Central and Eastern Europe as far as ICT infrastructures are concerned, between North and South concerning digital literacy, between urban and rural areas, between generations, etc.).

The EC adopted **early measures** to deal with this situation. It developed a conceptual framework, based on a holistic/comprehensive approach to digital developments in the economy and society. Such a framework is particularly pertinent to deal with the multiple and interconnected issues at stake and remained remarkably stable despite the fast pace of technological advance (and shifting terminology). This culminated with the **adoption of the Digital Agenda for Europe and the Digital Single Market in 2010 and 2015, respectively**. In this policy paradigm, the influence of digital technologies on all areas of the economy and society is acknowledged: **the supply of ICT goods and services must be accompanied by concerns for demand conditions, while social cohesion objectives coexist with the aim of strengthening firms' competitiveness**. Since the very beginning, the **contribution of Cohesion Policy to EU digital policy has been expected to be substantial**, because of both its important budgetary envelope and adequate territorial approach (e.g. to address issues such as the digital divide).

In aggregate terms, **patterns of ESIF digital investments** are broadly aligned with the holistic approach supported by the European Commission, i.e. that they are **diversified across a large range of areas**. Also, reflecting wider historical trends of Cohesion Policy, one would have expected a progressive decline in the importance given to ICT infrastructures to the benefit of more emphasis being placed on investments dedicated to people and the quality of life, such as e-government, e-health, etc. However, this is only partially confirmed through data analysis. In fact, 'softer' digital investments were already important in 2000-2006, while the proportion of ICT infrastructures in ESIF funding increased in 2014-2020. As new areas of investment such as Smart Cities and Smart Grids emerged in 2007-2013, this seems to have happened at the expense of digital investments dedicated to SMEs, whose proportion in Structural Funds has decreased over the years. However, it should be noted that EU investments for the digitalisation of SMEs may have taken place through other channels (e.g., the Juncker Plan).

A combined approach based on data analysis and fieldwork (case studies) reveals some **'gaps' in how ESIF contribute to the DAE/DSM**, resulting in some inefficiencies and missed opportunities. For example, the fact that the EAFRD focuses almost exclusively on broadband in rural areas appears to fall short of opportunities to diffuse ICT applications in a **rural context** (as is well illustrated by the Italian case study). In the same vein, the use of digital technologies to tackle **environmental issues and climate change** in particular is *de facto* implemented on the ground, through initiatives such as Smart Cities or Smart Grids. However, this is hardly spelled out at a more strategic level, with possible missed opportunities for scaling-up and coordinating interventions in this area. Lastly, **reaping the benefits of synergies with other EU instruments seems to still be limited**, in spite of efforts in this

direction. This is the case for H2020, the reason probably having to do with continuing difficulties in defining a clear division of responsibility between Cohesion Policy and the Research Frameworks for research activities. One **lesson learnt** from the evidence collected in this respect is the fact that the mission of ESIF is not to support basic research into future technologies (e.g. to pinpoint a specific field of research in particular, such as 5G, mobility, etc.), but more geared towards encouraging the application of the basic outcomes of the research – for example, in the context of Smart Specialisation Strategies as illustrated immediately below.

### 6.1.2 Digital strategies at regional level

**At local levels**, data analysis shows that regional authorities often prefer to concentrate ESIF resources for digital investments on a few priorities rather than spreading interventions thin. These strategic choices stem from a variety of factors, including territorial needs and the national framework and policies. Converging evidence from case studies, documentary analysis and interviews with stakeholders identifies the **quality of strategic planning** as a decisive success factor for regional digital strategies. The contribution of the ex ante conditionalities is relevant in this respect. However, if there is a consensus on the positive role played by Smart Specialisation Strategies (i.e. the EXAC pertaining to Thematic Objective 1 on Research and Innovation), **the role of the two ICT-specific ex ante conditionalities (relative to TO2) raises some controversies**. Addressing digital investments in the framework of a Smart Specialisation Strategy enlarges the regional and local partnerships and allows for a better alignment of digital priorities with overall regional ones. On the contrary, following the option consisting of adopting two distinct strategic plans (one for ‘digital growth’, the other related to next generation networks) risks yielding a fragmented vision of the issues at stake, as opposed to the ‘holistic’ approach advocated by the EC. At the same time, this might be justified by the complexity of successfully managing ICT infrastructures.

The existence and quality of regional and local partnerships are another important factor contributing to the success of regional digital strategies. It is also an area in which ESIF have a specific added value. Again, converging evidence collected by this study shows that **the wider and the more structured the partnerships, the better the quality of strategic planning**. In the context of ESIF contribution to DAE/DSM, partnership acquires a specific importance as it favours a virtuous circle of investments in and usage of digital technologies, involving stakeholders on both the supply and demand sides. Interestingly, partnership can also be a way to deal with the possible shortage of administrative capacity at regional level, by making access to specialised knowledge possible. Finally, collected evidence shows that this is not a straightforward process and that the contribution of the EC, through the proposal of instruments such as the ITI, specific guidance, etc., can make a decisive contribution to the emergence and consolidation of such partnerships.

### 6.1.3 Assessment of ESIF digital investments

Overall, **evaluating the performance of ESIF digital investments is challenging**. It is almost impossible in aggregate terms given the variety of areas covered by ESIF investments. The only approach yielding meaningful results is to restrict the analysis to specific areas of investment. It is necessary to resort to a combination of qualitative and quantitative approaches as purely quantitative methodologies are subject to data limitations (see below). For example, a low absorption rate and the absence of correlation with performance indicators show some difficulty in the implementation of ICT infrastructures. Uncertainty about which approach to take (in particular concerning the need to ensure access to backbone networks) and the fact that ICT infrastructures are admittedly very complex projects to handle can be an explanation for these results. There is also limited evidence concerning the digitalisation needs

of SMEs or the levels of digital skills. However, such limited evidence does not imply limited impacts.

In general, a frail knowledge basis underlies policy developments in support of digital investments. This study shows from many different perspectives how difficult it is to gather **comprehensive updated and reliable evidence on EU interventions in the digital economy** (let alone their effects). The Annex illustrates the different methodological dimensions of this issue (e.g. sectoral and geographical granularity, competing or overlapping sources). It is particularly challenging to account for policy interventions in this area because of the pervasive and cross-cutting character of digital technologies, which are difficult to trace *per se*, independently of the specific sector in which they apply. The coexistence of different sources with different approaches, reflecting the dispersed governance described above, further aggravates the issue. This makes it difficult to establish a sound knowledge basis on which to develop an informed policy.

#### 6.1.4 The role of the European Commission

**The EC plays an important role in stimulating partnerships** in the context of Smart Specialisation Strategies and helping regions to devise good quality strategies. A network of Broadband Competence Offices provide technical assistance for digital infrastructure projects, but there is no specific facility to support regions with low administrative capacities. **The EC also acts as a ‘knowledge broker’**, establishing exchange platforms with possible partners in other Member States, and diffusing information on good practices. There are many of such exchange platforms, some of them with low coordination, and sometimes with rather similar missions (e.g. Vanguard Initiative and Smart Specialisation platforms).

**Providing an effective governance arrangement at EU level to underlie the contribution of ESIF to the DAE/DSM’s objectives is challenging.** This is, in part, due to the cross-cutting dimension of digital investments taking place in many different areas, which requires the involvement of different DGs of the EC.<sup>250</sup> While shared responsibility is a condition of effectiveness to deal with the specificity of digital investment support, it is also a source of difficulty requiring conscious and forceful coordination efforts. As the ERDF represents the bulk of the funds addressed to the DAE/DSM objectives, the place-based approach promoted by DG REGIO is a key thrust characterising ESIF support to digital investments. DG CNECT, with a different tradition of “project culture”, also plays an important role in programming and implementation as it supervises the enforcement of ex ante conditionalities and monitors reprogramming in the area. As such, it stamps its mark over ESIF patterns, for example, by favouring broadband development. Other coordination issues in the governance structure are related to the **insufficient ‘demarcation’ between ERDF and EAFRD as far as ICT infrastructures** in rural areas are concerned and the relative indeterminacy of the ownership over digital skills addressed by the ESF. Finally, there is little formal coordination between DG CLIMA and DG REGIO regarding the use of ICT to address climate change under Cohesion Policy, in spite of the mainstreaming of climate actions in ESIF and the potential contribution of Smart City/Smart Grid projects in this respect.

## 6.2 Prospects and recommendations

Based on the main findings above, and considering possible developments, both inside the ESIF framework and outside (main technological trends, unexpected events, evolving policy agenda, etc.), it is possible to envisage the most likely prospects and devise recommendations. Brexit, one of the main future challenges on the EU agenda, was not found to have a direct impact on the way in which Cohesion Policy contributes to the DEA/DSM.

<sup>250</sup> This might reflect similar difficulties at national and regional levels, which further reinforces the complexity of the governance arrangement underlying digital investments support.

Indirectly, however, the **likely decrease in ESIF budget for the next programming period following Brexit** should be taken into consideration as it will have inevitable consequences on the prioritisation of support to digital investments (total amounts and types of investment).

The other feature to consider is the hypothesis of the continuity of the current system of shared management in which regional and local stakeholders play a key role. The findings of the study summarised above offer **a clear endorsement of the shared management system and of the territorial approach it makes possible**, which is especially appropriate to tackle digital issues (e.g. digital divides). Finally, as digitalisation is considered a high priority in the next Multi-Annual Financial Framework, it will be important that Cohesion Policy focuses on its 'core competence' to effectively contribute to the wider policy thrust in this area. As shown above, the main added value of Cohesion Policy resides in its ability to support the adoption of regional digital strategies and to foster partnerships between relevant stakeholders – at regional level and beyond.

The main areas where actions are needed to improve the contribution of Cohesion Policy in supporting digital investments are identified below – some specific measures are also proposed. These should be taken as indications for further reflection as their adoption should be preceded by a full and proper assessment of their feasibility and expected outcomes. Specific attention has been dedicated to possible measures in areas where the European Parliament has a major influence (e.g. affecting underlying ESIF regulations).

### 6.2.1 Focused European Commission support

The support of the European Commission appears to be decisive for digital investments in some specific circumstances and it should concentrate on these cases. Its contribution in steering effective partnerships is one area where EC support can make a substantial difference. Specific support for digital investments could be deployed in sectors and regions where it is highly needed, based on the model of the initiatives taken in the field of ICT infrastructures.

The EC could thus address the case of regional authorities with low administrative capacities through a dedicated facility, for example. However, it must ensure that, in the context of limited budgetary resources, a balance is struck between support to projects and investments (the core of EU support) and support to the administrations in charge (which can only be complementary). Also, it should refrain from increasing the number of exchange platforms with low visibility and little critical mass as these risk dispersing resources and obfuscating the objectives pursued. Possible specific actions could be:

- ⇒ The establishment of a **specific support facility** to help regional authorities with low administrative capacity to mainstream digital priorities in their regional development strategies;
- ⇒ At the same time, **relevant regulation should stipulate that the majority of funding should be allocated to digital projects**, compared to the proportion of funding supporting administrative capacity or exchange platforms. The European Parliament should then scrutinise this proportion and ensure that support concentrates in countries/regions where it is most needed (an effective information system would allow for this, see below).

### 6.2.2 Smart Specialisation Strategies

It should be made clear that **Smart Specialisation Strategies are the privileged locus to formulate and implement regional digital growth strategies**. As argued above, Smart Specialisation Strategies make it possible to involve a wide partnership and more broadly to align ESIF digital investments with regional priorities. They are also an instrument that is

appropriate for addressing SME needs and for fostering synergies with other EU funds, in particular H2020 (see below). Currently, the system of ex ante conditionalities does not require that regional digital strategies be connected to Smart Specialisation Strategies. A specific action could be to **streamline the system of ex ante conditionalities connected to digital investments**:

- ⇒ Refer to the existing EXAC dealing with the adoption of Smart Specialisation Strategies, but explicitly require that the latter integrate digital priorities (also addressing e-inclusion issues, as these are inextricable aspects of the 'digital transformation' digital investments aim to trigger). This new version of the S3 EXAC would replace the current EXAC dealing specifically with digital growth strategies;
- ⇒ Maintain an EXAC dealing with the deployment of broadband, which requires specific technical competence and a sectoral approach but ensure that it refers and is strongly linked to the EXAC dealing with Smart Specialisation Strategies.

### 6.2.3 Synergies with H2020 and other EU funding instruments

Besides pursuing the goal of simplification, mobilising Smart Specialisation Strategies in order to foster synergies between ESIF and H2020 seems to be a promising approach. It should be clearly acknowledged that both **ESIF and H2020 pursue distinct objectives** (economic development and excellence in research, respectively) and that they refer to different time frames (short/medium term and long term, respectively). However they can indeed **be successfully combined within Smart Specialisation Strategies**. Some possible actions are proposed below:

- ⇒ One possibility could be to set up an additional ex ante conditionality requiring that specific attention should be given to synergies between EU funding instruments in general, and in the case of digital investments in particular. The disadvantage is that this may not address the cause of the problem, and could create excessive administrative burden.
- ⇒ A preferred route could be to develop appropriate enabling conditions (simplification together with clear guidelines), and effective arrangements bringing together ESIF and H2020 projects in complementary rather than substitutive way. **Digital Innovation Hubs are useful instruments in this respect that could be consolidated or extended**, following their assessment (both collective and individual).

### 6.2.4 Extending the diffusion of digital technologies

The evidence collected in the context of this study shows that there is great potential for diffusing digital technologies in areas covered by ESIF, but that this is not done in an entirely comprehensive way. In particular, the study **identified climate change and the rural economy as areas where ESIF could do more to promote digital solutions and applications**. Although no specific evidence has been collected in this study, it is presumably also the case for the sectors covered by the EMFF (re: resource monitoring systems). Specific actions could include the following:

- ⇒ The **structure of Thematic Objectives could be reviewed** to account for the horizontal specificity of digital investments. TO2 could cover only broadband investments, which have a clear sectoral aspect. The other ICT expenditure could be considered in relation to investments in other relevant TOs and 'digitalisation' could become a horizontal priority valid across TOs.
- ⇒ Earmarking a proportion of expenditure for digital investments could be adopted for each ESIF. This would encourage national and regional authorities to pay attention to digital

priorities, especially for the EMFF and EARDF, but there is the risk of increasing the administrative burden.

- ⇒ Another possibility is to devise ring-fenced programmes or Community initiatives to encourage digital investments in specific areas, for instance for climate change or the applications of emerging technologies (e.g. big data, blockchain). At the regional level, this would be possible only where administrative capacity is strong enough.

### 6.2.5 Knowledge basis

A sound knowledge basis should underlie policy developments in support of digital investments. More research should be carried out to assess the relative performance of ESIF in pursuing the objectives of the DAE/DSM. One particular area where more evidence is needed is SMEs' digital needs and the impact of digital investments on them. This requires *inter alia* the following possible measures:

- ⇒ **Improving monitoring systems** by:
  - Including more indicators dedicated to digital performance among the core indicators (for instance in the field of digital skills);
  - Encouraging national/regional authorities to adopt specific indicators accounting for digital performance (e.g. by providing specific guidance);
- ⇒ **Tagging expenditures** that fall under other categories of expenditure, but that have a digital component (e.g. generalisation of the 'secondary theme' currently allowing this identification for the ESF);
- ⇒ Improving the quality and exhaustiveness of **data on digital performance at regional level** (especially for SMEs) and consolidating different existing sources.

### 6.2.6 Streamlining the governance and delivery systems

Finally, there is room to improve the governance of the different ESIF contributing to the DAE/DSM. **A clear division of responsibilities should be proposed and overall coordination should be reinforced.** This effort could be based on the legitimacy of the Vice President responsible for the DSM (one of the seven vice presidents in the Junker Commission). It also presupposes more inter-service collaboration (under the supervision of the Vice President), and the potential recourse to Task Forces involving the concerned DG on specific issues of interest (either making the most of existing ones, or creating new ones if necessary to tackle emerging topics and/or technologies). This should go hand in hand with a clearer definition of areas of competence, avoiding overlaps and reinforcing complementarity between funds. Possible specific actions could be:

- ⇒ The adoption of a **policy document** translating the objective of the DAE/DSM into more operational objectives and targets, and making explicit the division of roles among the main stakeholders;
- ⇒ A clearer **demarcation of the competence of ERDF and EAFRD** over digital projects – especially digital infrastructures in rural areas. For instance, investments for broadband could be delivered in rural areas only through the ERDF, allowing the EAFRD to focus on how to address rural challenges with ICT (e.g. e-agriculture, e-tourism, smart villages). This demarcation can be achieved through a reform of the articles of the Regulations setting out the scope of support for the ERDF/EAFRD.





## ANNEX I. THREE EMERGING TECHNOLOGIES IN A NUTSHELL

### I.1 Artificial Intelligence/ Cognitive Computing

The Turing Archive for the History of Computing<sup>251</sup> defines artificial intelligence (AI) as ‘the science of making computers do things that require intelligence when done by humans’. AI development is therefore primarily concerned with enabling computers to solve complex problems. AI systems, however, are essentially about results, not specifically building machines or algorithms that can think like humans. They are used today in a variety of places, from the recommendation engines in most of e-commerce websites to the natural language processing (NLP) used in smartphones and other mobile devices.

Cognitive computing (CC) describes technology platforms based on artificial intelligence systems. These platforms encompass machine learning, reasoning, natural language processing, speech recognition and vision (object recognition), human-computer interaction, dialogue and narrative generation, among other technologies. The terms refers more to new hardware or software that mimics the functioning of the human brain and helps to improve human decision-making than to the scientific framework underlying and enabling computers to perform intelligence-based, human-like activities.

Artificial intelligence and cognitive (AI/CC) technologies started to take centre stage since 2016 across the globe and continue to attract new investments and attention from all industries. The AI/CS market is still nascent, but it has immense potential. AI/CC technologies and platforms will continue to expand at a rapid pace in the coming years.

Developing and broadening the technology capabilities such as conversational AI, image, audio and video analytics, deep learning, hypothesis generation would be among the key priorities for technology vendors.

There is also a growing trend of integrating AI/CS systems with enterprise collaboration tools to add new capabilities and to make these tools more intelligent. This trend is likely to get stronger in the future and will lead to massive re-engineering of the workplace to make it more responsive, agile and to be able to facilitate data-driven decision making across business functions. AI/CS technologies are poised to transform the way business are operating today. It will free the knowledge worker from the mundane or low-value tasks, to focus on higher value jobs. The ability of AI/CS systems to process structured and unstructured data inputs makes its applications broader than most of its peer technologies. Companies have already started to engage AI bots at customer touch points to handle customer queries quickly and efficiently.

These AI systems with natural language processing and generation capability, can respond to customers via voice/text channels just like its human counterpart. This will transform the way enterprises interact and engage with customers and deliver services to its end users in the future. However, only a minority of enterprises have begun to explore the potential of AI/CS technologies today, but it is expected to change in the near future as many organisations are currently in the planning or evaluation stage. Potential use cases for AI/CS technologies are broad and varies across different industries. AI/CS technologies have started to make its mark as many organisations seek new ways to reduce the cost to serve, time to market, and improve operational efficiency.

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<sup>251</sup> [http://www.alanturing.net/turing\\_archive/archive/index/archiveindex.html](http://www.alanturing.net/turing_archive/archive/index/archiveindex.html)

## **I.2 Cloud Computing**

Cloud computing is the delivery of computing services—servers, storage, databases, networking, software, analytics and more—over the Internet ('the cloud'). Companies offering these computing services are called 'cloud providers' and typically charge for cloud computing services based on usage, similar to how you are billed for water or electricity at home. Cloud has been a key area of focus and investment for enterprises across the world for the past five to ten years, and a significant number of European organisations have already shifted to a cloud-first strategy to meet their digital transformation objectives. The need for IT agility and speed that underpin most digital transformation projects are key factors triggering European organisations to buy new cloud solutions. Additionally, organisations looking to avoid new major capital investments in data centres or facing major hardware upgrades are also factors paving the way for cloud adoption.

There are two major cloud consumption models -public cloud services and private cloud services.

- In a public cloud model, cloud resources are shared among different enterprises or consumers, and it is designed for a market, not a single organisation.
- In a private cloud model, cloud resources are shared within a single enterprise, and it offers greater levels of control and security compared to public cloud.

In Europe, public and private cloud usage is found to be at similar levels, but most organisations are turning towards hybrid and multi-cloud strategies now. Hybrid cloud offers the best of both worlds where organisations can use public cloud for less critical data at a lower cost while safeguarding their mission critical data in private clouds. Multi-cloud is another trend gaining attention – it involves using multiple cloud services at the same time or even different service providers for similar workloads. The multi-cloud approach offers many benefits such as reduction of lock-in risk with a single mega-platform vendor, the ability to choose cost-effective options for different workloads etc. This multi-cloud approach is expected to accelerate in the coming years with the growth in number and types of public and private cloud providers in the market.

## **I.3 Big Data and Analytics**

Big data analytics (BDA) can be described as a new generation of technologies and architectures designed to economically extract value from very large volumes of a wide variety of data by enabling high-velocity capture, discovery, and/or analysis. Big data and analytics market comprises of hardware, software and services, which are closely tied together to derive value from the data.

Increasingly, organisations are realising the value of data and are turning to technologies, such as big data and analytics to enable them to compete effectively in a highly digitised world. Most European enterprises currently using BDA are found to have narrow focus and small-scale and limited use cases for BDA deployments. Enterprise-wide BDA adoption is something that many organisations find challenging. However, the emergence of robotic process automation, cognitive platforms, a shift towards cloud models and reduced cost of data storage will enable organisations to deploy BDA at scale in future.

Companies undergoing digital transformation consider BDA to be a critical part of their digital strategies. The primary reason is that BDA is essential for real-time decision making, based on the right information at the right time, which is the key to success in the digital world. It enables organisations to become more customer-centric, to innovate quickly and to respond swiftly to changing market conditions. In addition, the growth in the Internet of Things (IoT) produces vast volumes of high-speed data, which need to be captured and analysed to develop data-driven and digitally enhanced products, services, and experiences.

The demand for data capturing, management and analysis technologies will continue to increase with the growing digitisation efforts in enterprises and the increasing number of data producers, such as IoT. Additionally, the increasing adoption of cloud, mobility and social platforms accelerates the demand for technologies to process structured and unstructured data forms as well as tools for data integration.



## ANNEX II. METHODOLOGICAL ANNEX

### II.1 Overview of the methodology

The main objective of this study is to provide a critical assessment of the contribution of the European Structural and Investment Funds (ESIF) to the Digital Agenda for Europe and the Digital Single Market, which should yield useful insights for the next programming period post-2020. This major goal can be broken down into more specific objectives, as highlighted in the Terms of Reference of the study<sup>252</sup>: overview of Cohesion Policy's past roles and achievements in ICT/the digital economy, critical analysis of the state-of-play during the 2014-2020 programming period, critical assessment of possible prospects for the post-2020 period. The study dedicates specific attention to horizontal elements, notably the role of local and regional authorities in delivering the Digital Agenda through Cohesion Policy interventions, but also territorial needs in different types of regions and urban-rural linkages. Based on these specific objectives, an approach linking different data collection and analysis tools has been adopted, consisting of:

- Statistical analysis of quantitative data, aimed at understanding patterns of digital performance, Cohesion Policy expenditure for digital investments, and the relationships between them;
- A comprehensive literature review exploring existing knowledge on the links between Cohesion Policy and digital investments, in order to identify relevant arguments and also gaps to be complemented with other methods;
- A series of interviews with experts, notably from different DGs of the European Commission, to collect information on evolutions, current and future patterns and issues linking Cohesion Policy and digital investments. They have also been decisive to obtain firm knowledge on emerging topics and initiatives (e.g. climate change and ICT, Digital Innovation Hubs). Overall, a total of 36 interviews have been carried out in the framework of this study (10 with EU policy officers and ICT policy experts and 16 with regional stakeholders);
- A set of six case studies, selected to cover the variety of initiatives (types of projects, geography) supported by Cohesion Policy for digital investments during the 2014-2020 period, focusing on good practices and innovative approaches. These case studies have been conducted by experts using tailored desk research and in-depth qualitative interviews with local stakeholders, thus enabling the analysis of the real-world dynamics at play.

### II.2 Specific issues related to statistical data

Data analysis has been widely used in the context of this study, mainly for three objectives: trace the patterns of digital performance across Member States and regions, assess the investment priorities of Cohesion Policy related to digital investments beyond policy documents, gain a closer understanding of the possible relationship between Cohesion Policy (funding and strategy-building) and digital performance over time.

Available data have provided some evidence to address these three topics. However, several limits related to data have also been uncovered, which restricted the potential analyses. Highlighting these limits is critical to correctly understand the results obtained so far and to allow for future improvements in data collection, design and processing.

Schematically, the encountered data issues can be divided into three major strands:

- Availability of data;

<sup>252</sup> European Parliament (2017), *Terms of Reference for a Research project on Digital Agenda and Cohesion Policy IP/B/REGI/IC/2017-094*.

- Level of detail and granularity (nomenclatures for Cohesion Policy) ;
- Level of detail and granularity (geography).

### **Overview of data sources (availability and retrievable information)**

Data on digital performance and Cohesion Policy expenditure allowing the identification of funding related to digital investments are often lacking or too incomplete to conduct detailed analyses.

The following tables synthesise the state of (relevant) data availability for Cohesion Policy by programming period and by fund, highlighting the critical issues connected to the research questions of this study:

- Existence of datasources and extent of their coverage of digital investments expenditure (i.e. are they identifying the entire scope of investments related to digital investments? Typically, there are difficulties to identify expenditure that are not physical ICT infrastructures) ;
- Based on used nomenclatures, level of detail and relevance of the data breakdown for digital investments ;
- Type of expenditure (planned, allocated, actual payments) ;
- Regionalisation of data (i.e., availability at regional level).

**Table 7. Summary of available data sources for Cohesion Policy's support to digital investments, by programming period and by fund**

PROGRAMMING PERIOD	ERDF/CF	ESF/YEI	ERDF	EMFF
<b>1987-1993</b>	<p><b>CORDIS</b><sup>253</sup>: Data on Community Initiatives for ICT only Planned expenditure Non regionalised</p> <p><b>European Commission</b><sup>254</sup>: Physical infrastructures (without further breakdown) Planned expenditure Non regionalised</p>	No data available for digital investments.	No data available for digital investments.	No data available for digital investments.
<b>1994-1999</b>	<p><b>European Commission</b><sup>255</sup>: 'Telecoms' and 'Telematics' Planned expenditure Non regionalised</p>	<p><b>European Commission</b><sup>256</sup>: Data on Community Initiatives for ICT only, no identification of digital investments in the overall ESF funding Planned expenditure Non regionalised</p>	No data available for digital investments.	No data available for digital investments.
<b>2000-2006</b>	<p><b>European Commission (DG REGIO database)</b><sup>257</sup>: 'ICT and Information Society' as a whole Allocated expenditure, actual payments Regionalised</p> <p><b>Technopolis</b><sup>258</sup>: e-Europe priorities</p>	<p><b>Technopolis</b><sup>259</sup>: e-Europe priorities Planned expenditure, excluding objective 3 regions (about 50% of ESF) Non regionalised</p>	No data available for digital investments.	No data available for digital investments.

<sup>253</sup> CORDIS (1993), *Final Phase of STAR Programme*; CORDIS (2014), *Community Initiative for Regional Development Concerning Services and Networks Related to Data Communication (TELEMATIQUE), 1991-1993*.

<sup>254</sup> European Commission and EY (1997), *Ex-Post Evaluation of the 1989-1993. Synthesis Report*.

<sup>255</sup> European Commission (1997), *Cohesion and the Information Society*.

<sup>256</sup> CORDIS (1996), *ADAPT Amended to Include Information Society Priority*.

<sup>257</sup> DG REGIO (2008), *Regional Expenditure Study 2000-2006: Breakdown of ERDF, Cohesion Fund and ISPA Expenditures by Regions, by Sectors and by Objectives*.

<sup>258</sup> Technopolis (2002), *Final Report for the Thematic Evaluation of the Information Society*.

<sup>259</sup> Technopolis (2002), *Final Report for the Thematic Evaluation of the Information Society*.

PROGRAMMING PERIOD	ERDF/CF	ESF/YEI	EAFRD	EMFF
	Planned expenditure Non regionalised			
<b>2007-2013</b>	<b>DG REGIO</b> <sup>260</sup> : 6 priority themes' codes for Information Society Allocated expenditure, actual payments Regionalised	<b>European Commission (DG EMPL database)</b> <sup>261</sup> : 6 priority themes' codes for Information Society, no details on ESF expenditure for IS coded under generic codes Allocated expenditure, actual payments Regionalised	No data available for digital investments.	No data available for digital investments.
<b>2014-2020</b>	<b>Cohesion Data</b> <sup>262</sup> : Categories of Intervention (31 related to ICT, including 18 indirectly) Planned/allocated expenditure, partial data for actual payments (TOs) Non or partly regionalised  <b>JRC</b> <sup>263</sup> : Areas of intervention based on Categories of Intervention (31 related to digital investments) Planned expenditure (estimates based on OPs) Regionalised (estimates based on population for some MS)	<b>Cohesion Data</b> <sup>264</sup> : Categories of Intervention (31 related to ICT, including 18 indirectly), ESF 2 <sup>nd</sup> theme for digital investments Planned/allocated expenditure, partial data for actual payments (TOs) Non or partly regionalised  <b>JRC</b> <sup>265</sup> : Areas of intervention based on Categories of Intervention (31 related to digital investments) Planned expenditure (estimates based on OPs) Regionalised (estimates based on population for some MS)	<b>Cohesion Data</b> <sup>266</sup> : Thematic Objective (2 ICT) and a specific Focus Area (FA 6C ICT) Planned/allocated expenditure, partial data for actual payments (TOs) Non or partly regionalised  <b>JRC</b> <sup>267</sup> : Areas of intervention based on Categories of Intervention (31 related to digital investments) Planned expenditure (estimates based on OPs) Regionalised (estimates based on population for some MS)	No data available for digital investments.

**Source:** Authors based on sources in the footnotes.

<sup>260</sup> DG REGIO (2015), *Database of the Cumulative Allocations to Selected Projects and Expenditure at NUTS2*.

<sup>261</sup> European Commission (2015), *2007-2013 Database of Structural Funds (by Member State and Priority Themes)*.

<sup>262</sup> DG REGIO (2018), *ESIF 2014-2020 Categorisation ERDF-ESF-CF - Planned*; European Commission (2018), *ESIF 2014-2020 EU Payments (Daily Update)*.

<sup>263</sup> Sörvik and Kleibrink (2016), *Mapping EU Investments in ICT - Description of an Online Tool and Initial Observations*.

<sup>264</sup> DG REGIO (2018), *ESIF 2014-2020 Categorisation ERDF-ESF-CF - Planned*; European Commission (2018), *ESIF 2014-2020 EU Payments (Daily Update)*.

<sup>265</sup> Sörvik and Kleibrink (2016), *Mapping EU Investments in ICT - Description of an Online Tool and Initial Observations*.

<sup>266</sup> European Commission (2018), *2014-2020: EAFRD Allocation by Focus Area (EU Planned Financing)*; European Commission (2018), *ESIF 2014-2020 EU Payments (Daily Update)*.

<sup>267</sup> Sörvik and Kleibrink (2016), *Mapping EU Investments in ICT - Description of an Online Tool and Initial Observations*.



**Table 8. Summary of the available data related to digital investments for the ERDF/CF by programming period**

PROGRAMMING PERIOD	DATA AVAILABILITY	LEVEL OF DETAIL / BREAKDOWN	TYPE OF EXPENDITURE	REGIONALISATION
1987-1993	Limited scope	Low	Planned only	No
1994-1999	Limited scope	Low	Planned only	No
2000-2006	Extensive scope	Moderate	Allocated and actual payments	Yes
2007-2013	Extensive scope	Moderate	Allocated and actual payments	Yes
2014-2020*	Extensive scope	High	Allocated/planned and actual payments (partial)	Yes (partial estimated) –

**Table 9. Summary of the available data related to digital investments for the ESF/YEI by programming period**

PROGRAMMING PERIOD	DATA AVAILABILITY	LEVEL OF DETAIL / BREAKDOWN	TYPE OF EXPENDITURE	REGIONALISATION
1987-1993	None	N/A	N/A	N/A
1994-1999	Limited scope	Low	Planned only	No
2000-2006	Limited scope	Moderate	Planned only	No
2007-2013	Limited scope	Moderate	Allocated and actual payments	No
2014-2020*	Extensive scope	High	Allocated/planned and actual payments (partial)	Yes (partial estimated) –

**Table 10. Summary of the available data related to digital investments for the EAFRD by programming period**

PROGRAMMING PERIOD	DATA AVAILABILITY	LEVEL OF DETAIL / BREAKDOWN	TYPE OF EXPENDITURE	REGIONALISATION
1987-1993	None	N/A	N/A	N/A
1994-1999	None	N/A	N/A	N/A
2000-2006	None	N/A	N/A	N/A
2007-2013	None	N/A	N/A	N/A
2014-2020*	Extensive scope	High	Allocated/planned and actual payments (partial)	Yes (partial estimated) –

**Table 11. Summary of the available data related to digital investments for the EMFF by programming period**

PROGRAMMING PERIOD	DATA AVAILABILITY	LEVEL OF DETAIL / BREAKDOWN	TYPE OF EXPENDITURE	REGIONALISATION
1987-1993	None	N/A	N/A	N/A
1994-1999	None	N/A	N/A	N/A
2000-2006	None	N/A	N/A	N/A
2007-2013	None	N/A	N/A	N/A
2014-2020*	None	N/A	N/A	N/A

**Source:** Authors' assessment.

**Note:** \* programming period still ongoing, resulting in partial data availability or use of estimates as of 2018.

Based on this assessment, the following statements can be made:

- There is an important gradient in the potential statistical analyses, depending on the ESIF concerned. Typically, the ERDF/CF offer the most extensive flexibility, based on data availability, level of detail, type of expenditure covered and regionalisation. The ESF is characterised by a long-lasting issue of limited level of detail for expenditure related to digital investments. It also poses challenges of regionalisation.
- For the EAFRD, exploitable data is only retrievable for 2014-2020, while there is none for EMFF as of 2018.
- There is an improvement in terms of data availability and quality over time, with the 2014-2020 programming period being a key step, in spite of limitations linked to the fact that this period is still ongoing as of 2018 (implying reliance on estimates for regionalisation and partial data on actual payments).

Regarding data on digital performance, the main sources are listed in the following table. Major issues are related to the absence of detailed data at the regional level, especially for firms.

**Table 12. Summary of data sources for digital performance**

DATA SOURCE	DESCRIPTION	PERIOD COVERED	GEOGRAPHICAL LEVEL
<b>IDC Data</b> (see also Annex c) <sup>268</sup>	ICT spending and forecasts at the global level (89 countries covered). Worldwide Black Book taxonomy is made up of five primary market segments: devices, infrastructure, software, IT services, and telecom services. The data is in current US dollars to allow international comparison.	1995 - present	Member States
<b>DESI (Digital Economy and Society Index)</b> <sup>269</sup>	Digital Economy and Society Index (DESI) overall index is calculated as the weighted average of the five main DESI dimensions: 1 Connectivity (25%), 2 Human Capital (25%), 3 Use of Internet (15%), 4 Integration of Digital Technology (20%) and 5 Digital Public Services (15%). Indicators used for the construction of the index are also available (Member State level).	2014-2017	Member States
<b>Eurostat / ICT Community Survey</b> <sup>270</sup>	Various indicators on citizens and business use of ICT in the EU. Some indicators are available at the regional level (mostly NUTS 2), notably: <ul style="list-style-type: none"> <li>• ICT patent applications to the EPO by priority year by NUTS 3 regions</li> <li>• Individuals regularly using the internet by NUTS 2 regions (tgs00050)</li> <li>• Individuals who accessed the internet away from home or work (isoc_r_iumd_i)</li> <li>• Individuals who have never used a computer by NUTS 2 regions (tgs00051)</li> <li>• Individuals who ordered goods or services over the internet for private use in the last year by NUTS 2 regions (tgs00052)</li> <li>• Individuals who used the internet for interaction with public authorities (isoc_r_gov_i)</li> <li>• Individuals who used the internet, frequency of use and activities (isoc_r_iuse_i)</li> <li>• Percentage of households with broadband access in relation to households with internet access, by NUTS 2 regions (tgs00049)</li> </ul>	Various, mostly 2006-2017	Member States, NUTS 2 regions for some indicators and periods

<sup>268</sup> IDC (2017), *Worldwide Black Book Standard Edition*.

<sup>269</sup> European Commission (2018), *DESI — Digital Scoreboard - Data & Indicators*.

<sup>270</sup> Eurostat (2017), *Database (regional and national statistics on digitisation)*.

DATA SOURCE	DESCRIPTION	PERIOD COVERED	GEOGRAPHICAL LEVEL
	<ul style="list-style-type: none"> <li>Economically active population by sex, age, educational attainment level and NUTS 2 regions (1 000) (lfst_r_lfp2acedu)</li> <li>Employment in technology and knowledge-intensive sectors by NUTS 2 regions and sex (1994-2008, NACE Rev. 1.1) (htec_emp_reg)</li> <li>Employment in technology and knowledge-intensive sectors by NUTS 2 regions and sex (from 2008 onwards, NACE Rev. 2) (htec_emp_reg2)</li> </ul>		
<b>European Innovation Scoreboard</b> / <b>Regional Innovation Scoreboard</b> <sup>271</sup>	The European (Regional) Innovation Scoreboard provides a comparative analysis of innovation performance in EU countries, other European countries, and regional neighbours. It assesses relative strengths and weaknesses of national innovation systems and helps countries (regions) identify areas they need to address.	2007-2017	NUTS 2 regions
<b>Digital Transformation Scoreboard</b> <sup>272</sup>	This scoreboard provides 'evidence on the extent of digital transformation in Europe', allowing the data-based consolidation of policy-making and business strategies.	2017-2018	Member States
<b>DG CONNECT: Lead Indicators for DG CONNECT policy priorities</b> <sup>273</sup>	This dataset complements the 'digital agenda key indicators' dataset, presenting some additional indicators used to illustrate some important aspects of the results (mostly technical oriented) to achieve at the European level.	Various	Member States
<b>Europe's Digital Progress Report 2017</b> <sup>274</sup>	The EDPR report combines the quantitative evidence from DESI (Digital Economy and Society Index) with country-specific policy insights, allowing us to keep track of the progress made in terms of digitalisation by each Member State and providing an important feedback loop for policy-making at EU level	2016-2017	Member States

**Source:** Authors based on sources in the footnotes.

Last but not least, the identification of relevant data sources is made difficult by the multiplication of existing analyses based on the same raw data.

### Level of detail and granularity (nomenclatures for Cohesion Policy)

A major issue in conducting long-term analysis of the Cohesion Policy's contribution to digital investments is that the nomenclatures used to organise expenditure data are time-variant, as shown in the following table.

<sup>271</sup> European Commission (2017), *Regional Innovation Scoreboard*.

<sup>272</sup> European Commission (2018), *Digital Transformation Scoreboard*.

<sup>273</sup> European Commission (2018), *Lead Indicators — Digital Scoreboard - Data & Indicators*.

<sup>274</sup> European Commission (2017), *Europe's Digital Progress Report 2017*.

**Table 13. Cohesion Policy nomenclatures and links with digital investments**

PROGRAMMING PERIOD	NOMENCLATURE USED AND LEVEL OF DETAIL FOR DIGITAL INVESTMENTS
1987-1993	No nomenclature available to single out expenditure related to digital investments (only specific Community Initiatives and physical infrastructures category for the ERDF)
1994-1999	<p>Specific digital-related categories for the ERDF<sup>275</sup>:</p> <ul style="list-style-type: none"> <li>• Telecom (basic and advanced)</li> <li>• Telematics</li> </ul> <p>No digital category for the ESF (only specific Community Initiatives)</p>
2000-2006	<p>Specific digital category for the ERDF/CF, without further details accessible (in spite of more refined categories at the measure level)<sup>276</sup>:</p> <ul style="list-style-type: none"> <li>• 32 Telecommunication infrastructure and information society</li> </ul> <p>No specific digital category for the ESF.</p> <p>Specific digital categories defined by e-Europe priorities for ERDF/CF<sup>277</sup>:</p> <ul style="list-style-type: none"> <li>• Cheaper, Faster Internet (infrastructure)</li> <li>• e-commerce</li> <li>• Participation and access for all in the Knowledge-Based Economy (KBE)</li> <li>• Working in the KBE and digital skills</li> <li>• Youth in the digital age</li> <li>• e-government</li> <li>• Intelligent transport</li> <li>• Digital content</li> <li>• Faster Internet for Researchers</li> <li>• e-health</li> <li>• Secure networks and smart cards</li> </ul> <p>However, these categories are not used in the DG REGIO consolidated database.</p>
2007-2013	<p>Specific priority themes' codes related to Information Society for ERDF/CF/ESF<sup>278</sup>:</p> <ul style="list-style-type: none"> <li>• 10 Telephone infrastructures (including broadband networks)</li> <li>• 11 Information and communication technologies (...)</li> <li>• 12 Information and communication technologies (TEN-ICT)</li> <li>• 13 Services and applications for citizens (e-health, e-government, e-learning, e-inclusion, etc.)</li> <li>• 14 Services and applications for SMEs (e-commerce, education and training, networking, etc.)</li> <li>• 15 Other measures for improving access to and efficient use of ICT by SMEs</li> </ul> <p>More ESF funding is likely to be related to Information Society, but recorded under different priority themes' codes.</p>

<sup>275</sup> European Commission (1997), *Cohesion and the Information Society*.

<sup>276</sup> DG REGIO (2008), *Regional Expenditure Study 2000-2006: Breakdown of ERDF, Cohesion Fund and ISPA Expenditures by Regions, by Sectors and by Objectives*.

<sup>277</sup> Technopolis (2002), *Final Report for the Thematic Evaluation of the Information Society*.

<sup>278</sup> DG REGIO (2015), *Database of the Cumulative Allocations to Selected Projects and Expenditure at NUTS2*.

PROGRAMMING PERIOD	NOMENCLATURE USED AND LEVEL OF DETAIL FOR DIGITAL INVESTMENTS
2014-2020	<p>Thematic Objective 2 for 'Enhancing access to, and use and quality of information and communication technologies (ICT)'<sup>279</sup>. However, it only covers some expenditure from the ERDF/EAFRD. Thus, an approach based on Categories of Intervention (see following paragraph) is more beneficial.</p> <p>Specific Categories of Intervention related to digital investments (13 directly, 18 indirectly) for all ESIF<sup>280</sup>.</p> <p>For the ESF, a specific '2<sup>nd</sup> category theme' can be used to track expenditure whose main focus is not digital investments, but which contribute to 'enhancing the accessibility, use and quality of ICT'.</p> <p>Based on these Categories of Intervention, specific areas of intervention were identified by the JRC for all ESIF<sup>281</sup>:</p> <ul style="list-style-type: none"> <li>• e-Inclusion</li> <li>• e-Government</li> <li>• e-Health and active healthy ageing</li> <li>• digital skills</li> <li>• ICT in rural funds</li> <li>• broadband and digital networks</li> <li>• digital content</li> <li>• smart grids</li> <li>• smart cities</li> <li>• ICT SME support and e-commerce</li> <li>• non-core ICT categories of intervention in TO2</li> </ul>

**Source:** Authors based on sources in the footnotes.

The above described situation directly leads to the following problems:

1. For older programming periods (before 1994-1999), funding related to digital investments as a whole is impossible to distinguish from other policy objectives, thus forcing the use of ad hoc estimates (e.g. based on expert inputs or for specific Community Initiatives only)
2. For the more recent programming periods (1994-1999 and onwards), the European Commission's databases allow for the identification of funding related to digital investments. However the levels of detail and classification systems used still vary considerably, with highly detailed and reliable data only emerging since 2007-2013.

Overall, these issues force the long-term analysis to be restricted to the evolution of the expenditure as a whole or to rely on broad categories of analysis (called 'consolidated areas of intervention' in the framework of this study: e-services and applications for citizens, ICT, ICT infrastructures, ICT support for SMEs).

It should be noted that the situation has particularly improved since the 2007-2013 period, and that the nomenclatures of 2007-2013 and 2014-2020 can be easily compared. However, the level of detail available for digital skills and e-inclusion is still very low.

### Level of detail and granularity (geography)

Another key issue for data analysis during this study was the geographical coverage of several datasets. It is the case both for data on Cohesion Policy expenditure and for digital performance. Indeed:

- Cohesion Policy expenditure data for digital investments is only available at the regional level for some funds (ERDF/CF) and for some programming periods (2000-2006 and

<sup>279</sup> DG REGIO (2018), *ESIF 2014-2020 Categorisation ERDF-ESF-CF - Planned*; European Commission (2018), *ESIF 2014-2020 EU Payments (Daily Update)*.

<sup>280</sup> Sörvik and Kleibrink (2016), *Mapping EU Investments in ICT - Description of an Online Tool and Initial Observations*.

<sup>281</sup> Sörvik and Kleibrink (2016), *Mapping EU investments in ICT - description of an online tool and initial observations*.

onwards). A critical lasting problem is the absence of regionalised expenditure data for the ESF.

- Regional digital performance is poorly assessed by current statistics, in spite of recent progress since the late 2000s. In particular, there is still a severe lack of data for the digital performance of enterprises at the regional level, while information on physical infrastructures and the behaviour of citizens is now relatively well developed. Additionally, in some Member States, regional digital performance is only retrievable at the NUTS 1 level.

## A II.1 Approach to data analysis

Issues related to data developed in the previous section influenced the adopted approach for data analysis. In order to ensure transparency and replicability of results, the different choices and assumptions that underpin the statistical analyses of this study are presented below.

### Specific challenges regarding the 2014-2020 programming period

As the 2014-2020 programming period was still ongoing during the realisation of this study, it is worth highlighting the particularities of the data used in the analysis for that period. Indeed, Cohesion Policy benefited from a refined system of monitoring and access for 2014-2020, enabling a more detailed analysis than for previous periods. At the same time, there were uncertainties on the data, especially for its amounts dedicated to digital investments and regionalisation.

Cohesion data is a website (open data portal) providing information on planned and – to some extent – actual expenditure of the ESIF for the 2014-2020 programming period. However, the available data come with major limits. There is no clear and readily available categorisation of expenditure that are related to digital investments. Indeed, expenditure is broken down by Thematic Objective, thus limiting the analysis to TO 2 (ICT). However, it only encapsulates a small part of Cohesion Policy investments that are contributing to DAE/DSM. For instance, it was estimated that 10-15% of the TO 1 ('Strengthening research, technological development and innovation') expenditure are related to ICT<sup>282</sup>. Data can also be retrieved by more detailed Categories of Intervention, but are therefore listed by OP and only partly regionalised.

In order to tackle these limits, the analysis for 2014-2020 was instead based on the JRC database, extracted from the SFC2014/Infoview database and Cohesion Data from 20/01/2017. The JRC developed a detailed methodology to compile data contributing to digital investments based on the Categories of Intervention. It notably enables the database to classify and capture information based on the ERDF, CF, ESF (including the secondary theme for ICT), YEI and EAFRD, at the regional level. The choice was made to re-use this JRC database directly rather than apply the same methodology on more recent data. Indeed, it ensures an easy replicability of this study's results. Moreover, the limits connected to the JRC methodology would not have been improved with another iteration of their methodology with more recent data.

In particular, it should be noted that the JRC data used during the analysis is composed of estimated planned amounts (rounded up to integers). For the regionalisation of expenditure, a weighting based on population was used for some countries (e.g. Poland and its national OP for ICT), thus limiting its precision.

### Expenditure data: allocations or payments

For the older programming periods (1994-1999) and before, the only available data are allocated expenditure, i.e. planned funding regardless of the actual payments that may occur. Similarly, for the 2014-2020 programming period, the JRC data allowing an in-depth analysis is based on planned expenditure rather than on actual payments.

<sup>282</sup> Based on interviews with experts.

For the 2000-2006 and 2007-2013 programming periods, both allocated expenditure and payments can be available. To ensure consistency with the other programming periods, the allocated expenditure data were retained for further analysis, bearing in mind that it does not take into consideration the potential changes in absorption capacity across programming periods.

### Estimates of the overall ESIF amounts for digital investments

Given the variety of nomenclatures used during the different programming periods of Cohesion Policy, there are uncertainties at play, even when estimating the evolution of the overall amounts. In order to avoid this issue, different estimates of the planned EU funding were computed, as following:

- **Low estimate:** these amounts are related to funding that can be attributed to digital investments with absolute certainty. They include ICT infrastructures, investments in businesses, e-public services... They exclude most of the investments in human capital (ESF envelope), as they are often less directly attributable to a digital perspective in the data.
- **Main estimate:** these amounts include expenditure that can be traced to digital investments with a very high degree of certainty, with interventions in human capital (ESF) whenever possible. They should be considered as the basis for cross-period comparisons.
- **High estimate:** these amounts are built based on an extensive definition of digital investments (e.g. inclusion of a share of the overall ESF resources). As such, they should be considered with caution because they may overestimate the amounts.

For a full understanding of the results of these estimation strategies, the following table details data sources and computation methods used.

**Table 14. Sources and computation methods for the different estimates of Cohesion Policy amounts planned for digital investments (1980s-2010s)**

PERIOD	LOW ESTIMATE	MAIN ESTIMATE	HIGH ESTIMATE
1987-1993	TELEMATIQUE + STAR Community Initiatives <sup>283</sup> .	Average of low and high estimates	TELEMATIQUE + STAR + 1.5% of Structural Funds for infrastructures <sup>284</sup> . The 1.5% estimate was used by the European Commission regarding ICT in Structural Funds for the 1994-99 period. It is assumed that this was no higher for 1987-1993 <sup>285</sup> .
1994-1999	ERDF (for telecoms, telematics) + related Community Initiatives <sup>286</sup> .	ERDF + All Community Initiatives (including ADAPT-BIS from ESF) <sup>287</sup>	ERDF + Community Initiatives + 1,5% of ESF funding <sup>288</sup> . The 1.5% estimate was used by the European Commission regarding ICT in Structural Funds for the 1994-99 period.
2000-2006	ERDF + CF (ICT infrastructure and Information Society priority) <sup>289</sup> .	Information Society expenditure (Objective 1&2 regions from a sample of Operational Programmes, without the Objective 3 regions/ESF) <sup>290</sup> .	ERDF + CF (ICT infrastructure and Information Society priority) + estimate of the ESF funding related to Information Society <sup>291</sup> .
2007-2013	ERDF + CF allocated amounts (Information	ERDF + CF + ESF allocated amounts (Information Society	ERDF + CF + 10% of the total ESF funding. The 10% figure was chosen by analogy with

<sup>283</sup> CORDIS (1993), *Final Phase of STAR Programme*; CORDIS (2014), *Community Initiative for Regional Development Concerning Services and Networks Related to Data Communication (TELEMATIQUE), 1991-1993*.

<sup>284</sup> European Commission and EY (1997), *Ex-Post Evaluation of the 1989-1993. Synthesis Report*.

<sup>285</sup> Technopolis (2002), *Final Report for the Thematic Evaluation of the Information Society*.

<sup>286</sup> European Commission (1997), *Cohesion and the Information Society*.

<sup>287</sup> CORDIS (1996), *ADAPT Amended to Include Information Society Priority*.

<sup>288</sup> European Commission (1998), *The European Social Fund*.

<sup>289</sup> DG REGIO (2008), *Regional Expenditure Study 2000-2006: Breakdown of ERDF, Cohesion Fund and ISPA Expenditures by Regions, by Sectors and by Objectives*.

<sup>290</sup> Technopolis (2002), *Final Report for the Thematic Evaluation of the Information Society*.

<sup>291</sup> LSE Enterprise Ltd et al. (2010), *Final Report for the Ex-Post Evaluation of the European Social Fund (2000 - 2006)*.

PERIOD	LOW ESTIMATE	MAIN ESTIMATE	HIGH ESTIMATE
	Society priority codes 10 to 15) <sup>292</sup> .	priority codes 10 to 15) <sup>293</sup> .	estimates made during other programming periods (it is probably an overestimation).
2014-2020	Investments under Thematic Objective 2 (only infrastructures) <sup>294</sup> .	ERDF, CF, ESF, YEI, EAFRD (all relevant categories of intervention) <sup>295</sup> .	ERDF, CF, ESF, YEI, EAFRD (all relevant categories of intervention and 10% of the funding for non-core categories of intervention) <sup>296</sup> .

Source: Authors based on sources in the footnotes.

### Deriving policy-relevant categories from existing nomenclatures

It is necessary to go beyond the analysis of the whole amounts dedicated to digital investments to understand the evolution of priorities under Cohesion Policy. As seen in the dedicated sections, there were important variations across the different programming periods in terms of nomenclatures. Therefore, so called ‘consolidated areas of intervention’ were created, to encapsulate broad forms of interventions. These consolidated areas of intervention were designed based on the level of detail available for 2007-2013 and 2014-2020, yet ensuring retro-compatibility for some sectors during the previous programming periods (especially regarding physical ICT infrastructures).

The basic definition of the consolidated areas of intervention, as well as their correspondence with the nomenclatures used in the different programming periods, are developed in the following table.

**Table 15. Consolidated areas of intervention and correspondence with existing Cohesion Policy nomenclatures**

CONSOLIDATED AREA OF INTERVENTION	BASIC DESCRIPTION	CORRESPONDENCE WITH COHESION POLICY NOMENCLATURES
<b>ICT Infrastructures</b>	ICT infrastructures are typically investments for broadband development (rural or urban).	<p>For 1987-1993 the STAR initiative and a share of the physical infrastructures funding</p> <p>For 1994-1999 the ERDF category ‘Telecoms’</p> <p>For 2000-2006 the following e-Europe priorities: Cheaper, Faster Internet (infrastructure) and Faster Internet for Researchers</p> <p>For 2007-2013 the following priority theme code: 10 Telephone Infrastructures (including broadband)</p> <p>For 2014-2020 the following areas of intervention defined by the JRC: ICT in rural funds, broadband and digital networks.</p>
<b>ICT – other forms of support</b>	The ICT – other forms of support category groups together a wide range of investments, including interoperability, R&D and innovation, smart grids and smart cities to the promotion of digital content (media oriented).	<p>Not applicable for 1987-1993 and 1994-1999</p> <p>For 2000-2006 the following e-Europe priorities: digital content, intelligent transport, secure networks and smart cards</p> <p>For 2007-2013 the following priority theme codes: 11 Information and communication technologies and 12 Information and communication technologies (TEN-ICT)</p> <p>For 2014-2020 the following areas of intervention defined by the JRC: digital content, smart grids, smart cities.</p>

<sup>292</sup> DG REGIO (2015), *Database of the Cumulative Allocations to Selected Projects and Expenditure at NUTS2*.

<sup>293</sup> European Commission (2015), *2007-2013 Database of Structural Funds (by Member State and Priority Themes)*.

<sup>294</sup> Sörvik and Kleibrink (2016), *Mapping EU Investments in ICT - Description of an Online Tool and Initial Observations*.

<sup>295</sup> Sörvik and Kleibrink (2016), *Mapping EU investments in ICT - description of an online tool and initial observations*.

<sup>296</sup> Sörvik and Kleibrink (2016), *Mapping EU investments in ICT - description of an online tool and initial observations*.



CONSOLIDATED AREA OF INTERVENTION	BASIC DESCRIPTION	CORRESPONDENCE WITH COHESION POLICY NOMENCLATURES
<b>E-services and applications for citizens</b>	E-services and applications for citizens cover the different interventions targeting people and their links with ICT, such as e-government services, e-learning, digital skills, e-inclusion etc.	<p>Not applicable for 1987-1993 and 1994-1999</p> <p>For 2000-2006 the following e-Europe priorities: Participation and access for all in the KBE, Working in the KBE and digital skills, Youth in the digital age, e-government, e-health</p> <p>For 2007-2013 the following priority theme code: 13 Services and applications for citizens (e-health, e-government, e-learning, e-inclusion, etc.)</p> <p>For 2014-2020 the following areas of intervention defined by the JRC: e-Inclusion, e-Government, e-Health and active healthy ageing, digital skills.</p>
<b>ICT support for SMEs</b>	ICT support for SMEs encapsulates the interventions aiming at fostering the digitalisation of SMEs, notably the use of e-commerce but also cyber security...	<p>Not applicable for 1987-1993 and 1994-1999</p> <p>For 2000-2006 the e-Europe priority e-commerce</p> <p>For 2007-2013 the following priority theme codes: 14 Services and applications for SMEs (e-commerce, education and training, networking, etc.) and 15 Other measures for improving access to and efficient use of ICT by SMEs.)</p> <p>For 2014-2020 the following areas of intervention defined by the JRC: ICT SME support and e-commerce.</p>

**Source:** Authors based on European Commission, JRC, Technopolis.

## Geographical coverage

Cohesion Policy expenditure is territorialised using the NUTS system. This system ensures the existence of comparable territorial units across the EU, ranging from level 0 (national level) to level 3 (most refined level of detail). Most analyses should be performed at the NUTS 2 level, as it closely corresponds with the administrative regions involved in Cohesion Policy.

However, this system brings some difficulties to the analysis:

- Some funds do not have territorialised databases of expenditure (typically the ESF, EAFRD and EMFF, except for the 2014-2020 period with the JRC estimates of planned expenditure). As there is no straightforward and rigorous methodology to ensure a consistent territorialisation for these data, they are not included in the analysis.
- The NUTS classification system changes over time (with five different revisions: NUTS 2003, 2006, 2010, 2013 and 2016).<sup>297</sup> It implies code changes and shifting boundaries for some regions. For the sake of consistency, the expenditure of the different programming periods was recorded under the NUTS 2013 system (by following official Eurostat conversion tables and using GDP per capita PPP for split regions when relevant).
- For the 2014-2020 programming period the JRC data used to explore the Cohesion Policy's contribution to digital investments are not available at the NUTS 2 level for some countries (namely: Belgium, Croatia, Germany, the Netherlands and the United Kingdom). To ensure consistency over programming periods, the corresponding levels of detail (NUTS 1 or 0) were used for these countries for geographical analyses during the 2000-2006 and 2007-2013 programming periods. NUTS 2 regions were used for statistical analyses for these countries when possible.

<sup>297</sup> Eurostat (2018), *History of NUTS*.

- For the 2014-2020 period the JRC attributed cross-border expenditure to the different involved regions by population weighting, precluding its identification. As such, no further data analysis of cross-border funding was performed. Cross-border expenditure was attributed to its administrative regions of management for the 2000-2006 and 2007-2013 programming periods.

### **Cohesion Policy funding and digital performance improvement**

Linking Cohesion Policy funding for digital investments and the improvement in digital performance over time is a challenging task, stemming from:

- Availability of data on digital performance (especially at the regional level) and funding for digital investments outside the scope of Cohesion Policy
- Issues of time scales (e.g. time lags between funding decision, implementation and actual effect on performance)
- Econometric technicalities in building models (e.g. high multicollinearity between explanatory variables, heteroskedasticity and autocorrelation of the error terms).

To circumvent these issues, the decision was taken to focus on data analysis techniques to compare the relative performance of similar regions (proxied by the Cohesion Policy classification based on levels of development). The idea is not to explore a causal relationship, but groups of regions based on levels of funding and improvements in performance.

## ANNEX III. LIST OF INTERVIEWS

INSTITUTION/ENTITY	ROLE	DATE OF THE INTERVIEW
European Commission - DG REGIO	Policy Officer	18/01/2018
European Commission - DG REGIO	Policy analyst	18/01/2018
European Commission - DG CLIMA	Policy Officer	21/02/2018
European Commission - DG CNECT	Programme Officer – EU Policies	02/03/2018
Joint Research Center	Former project officer	08/03/2018
University of Ferrara and Urbino	Expert in innovation economics	8/03/2018
Slovenian Government Office for Development and Cohesion Policy	Smart Specialisation and IT specialist	13/03/2018
European Commission - DG CNECT	Deputy Head of Unit	15/03/2018
IDC	IT specialist	15/03/2018
European Commission - DG EMPL	Policy Officer	16/03/2018

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This study provides a critical analysis of the contribution of Cohesion Policy and the European Structural Investment Funds to the Digital Agenda for Europe and the Digital Single Market. Based on the analysis of past and current patterns of ESIF digital investments and selected case studies, this study shows that Cohesion Policy should concentrate where its added value is highest, i.e., on support to the formulation of effective regional digital strategies and on the promotion of partnerships between relevant stakeholders, at regional level and beyond.

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