

DIRECTORATE-GENERAL FOR INTERNAL POLICIES

**POLICY DEPARTMENT**  
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**INTERNET, DIGITAL  
AGENDA AND ECONOMIC  
DEVELOPMENT OF  
EUROPEAN REGIONS**

STUDY







**DIRECTORATE-GENERAL FOR INTERNAL POLICIES**  
**POLICY DEPARTMENT B: STRUCTURAL AND COHESION POLICIES**

**REGIONAL DEVELOPMENT**

# **Internet, Digital Agenda and economic development of European regions**

**STUDY**

**Vol. I**

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**DIRECTORATE-GENERAL FOR INTERNAL POLICIES**  
**POLICY DEPARTMENT B: STRUCTURAL AND COHESION POLICIES**  
**REGIONAL DEVELOPMENT**

# **Internet, Digital Agenda and economic development of European regions**

## **STUDY**

### **Abstract:**

This study describes the links between investments in Information and Communication Technologies and economic development at regional level, with particular emphasis on the strategy "Digital Agenda for Europe" and the contribution of Structural Funds. It is based on an in-depth analysis of seven regional case studies, and of horizontal issues at national and EU levels. It illustrates the growth potential that may result from an appropriate articulation between initiatives at the regional, national and EU levels.



# CONTENTS

<b>LIST OF ABBREVIATIONS</b>	<b>3</b>
<b>LIST OF TABLES</b>	<b>5</b>
<b>LIST OF MAPS</b>	<b>5</b>
<b>LIST OF FIGURES</b>	<b>5</b>
<b>EXECUTIVE SUMMARY</b>	<b>7</b>
<b>INTRODUCTION</b>	<b>11</b>
<b>CHAPTER 1 - INFORMATION AND COMMUNICATION TECHNOLOGIES, THE INFORMATION SOCIETY AND EXPECTED IMPACTS ON ECONOMIC DEVELOPMENT</b>	<b>13</b>
1.1 Defining Information and Communication Technologies and the Information Society	13
1.2 The expected impacts of ICT investment and adoption: an overview	15
1.3 ICT endowment in the EU: national and regional variations	20
1.4 Concluding remarks	34
<b>CHAPTER 2 - THE DIGITAL AGENDA FOR EUROPE AND THE REGIONS</b>	<b>35</b>
2.1 The DAE strategy	35
2.2 The DAE and the regions: a logical model	43
2.3 Implementation at regional level	52
2.4 Concluding remarks	63
<b>CHAPTER 3 - REGIONAL INITIATIVES: OUTCOMES AND IMPACTS</b>	<b>65</b>
3.1 Overview of the selected initiatives	65
3.2 Outcomes	76
3.3 Interactions between outcomes and impacts	87
3.4 Concluding remarks	92
<b>CHAPTER 4 - REGIONAL, NATIONAL AND EU LEVELS: THE VIRTUOUS CYCLE</b>	<b>93</b>
4.1 Enabling factors at regional level	94
4.2 Supranational issue: the contribution of the "Connecting Europe Facility"	99
4.3 National issue: the case of e-skills policies	102
4.4 Concluding remarks	108
<b>CHAPTER 5 - CONCLUSIONS AND RECOMMENDATIONS</b>	<b>111</b>
<b>REFERENCES</b>	<b>115</b>





## LIST OF ABBREVIATIONS

<b>BT</b>	British Telecom
<b>BYOD</b>	Bring your own device
<b>CAPI</b>	Centros de Acceso Publico a Internet
<b>CDC</b>	Cornwall Development Company
<b>CEF</b>	Connecting Europe Facilities
<b>CHR</b>	Centre for Rural Health
<b>DAE</b>	Digital Agenda for Europe
<b>ECDL</b>	European Computer Driving Licence
<b>EHR</b>	Electronic Health Registry
<b>ERDF</b>	European Regional Development Fund
<b>ESF</b>	European Social Fund
<b>EC</b>	European Commission
<b>EU</b>	European Union
<b>FTTC</b>	Fibre to the Cabinet
<b>FTTP</b>	Fibre to the Premises
<b>GDP</b>	Gross Domestic Product
<b>GP</b>	General Practitioners
<b>GPT</b>	General Purpose Technologies
<b>GVA</b>	Gross Value Added
<b>ICT</b>	Information and Communication Technologies
<b>IRISI</b>	Interregional Information Society Initiative
<b>ID</b>	Identity Card
<b>IS</b>	Information Society
<b>IT</b>	Information Technology
<b>LFR</b>	Less Favoured Regions
<b>MS</b>	Member States

<b>NACE</b>	Statistical Classification of Economic Activities of the European Community
<b>NGA</b>	Next Generation Access
<b>NHIF</b>	National Health Insurance Fund
<b>NHIS</b>	National Health Information System
<b>NHS</b>	National Health System
<b>NOHD</b>	Northern Ostrobothnia Hospital District
<b>NST</b>	Norwegian Centre for Telemedicine
<b>OECD</b>	Organisation for Economic Co-operation and Development
<b>PA</b>	Public Administration
<b>PASI</b>	Plan Andalucía Sociedad de la Información
<b>PEG</b>	Plan Estrategico de Guadalinfo
<b>PIA</b>	Pacchetto Integrato Agevolazioni (integrated support schemes)
<b>PIMA</b>	Plan de Innovacion y Modernización de Andalucía
<b>PPP</b>	Public private partnership
<b>R&amp;D</b>	Research and Development
<b>RISI</b>	Regional Information Society Initiative
<b>ROP</b>	Regional Operational Plan
<b>RTD</b>	Research and Technological Development
<b>SME</b>	Micro, Small and Medium-sized Enterprises
<b>SF</b>	Structural Funds
<b>SPOCS</b>	Simple Procedures Online for Cross-border Services
<b>TFEU</b>	Treaty on the Functioning of the European Union
<b>TFP</b>	Total Factor Productivity
<b>VDL</b>	Very High Data Rate Digital Subscriber Line
<b>VoIP</b>	Voice over Internet Protocol

## LIST OF TABLES

<b>Table 1.</b> The 2007 OECD definitions of ICT sectors (based on NACE Rev. 2)	<b>14</b>
<b>Table 2.</b> Actions under the responsibility of Member States	<b>40</b>
<b>Table 3.</b> Outcomes	<b>51</b>
<b>Table 4.</b> Information Society categories of expenditure (2007-2013)	<b>54</b>
<b>Table 5.</b> Information Society categories of expenditure by hard and soft factors (2007-2013)	<b>55</b>
<b>Table 6.</b> Regional context	<b>69</b>
<b>Table 7.</b> Overview of the initiatives	<b>72</b>
<b>Table 8.</b> Overview of the outcomes recorded by the case studies	<b>85</b>
<b>Table 9.</b> Range for the assessment of the policy approach towards the objectives of the Action 66	<b>103</b>
<b>Table 10.</b> Assessment of the policy approach towards the objectives of Action 66	<b>105</b>

## LIST OF MAPS

<b>Map 1.</b> Map of the selected projects	<b>67</b>
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## LIST OF FIGURES

<b>Figure 1.</b> Components of the effects of ICT development	<b>19</b>
<b>Figure 2.</b> Total fixed broadband coverage (supply as a percentage of the total population), 2010	<b>21</b>
<b>Figure 3.</b> Fixed broadband lines by speed, 2012	<b>22</b>
<b>Figure 4.</b> Percentage of households with access to the Internet at home, 2010	<b>23</b>
<b>Figure 5.</b> Percentage of individuals with computer skills (low, medium, high), 2011	<b>24</b>
<b>Figure 6.</b> Regular use of the Internet, 2008-10	<b>25</b>
<b>Figure 7.</b> Online purchases by private individuals, 2008-10	<b>26</b>
<b>Figure 8.</b> Percentage of enterprises with broadband access (fixed or mobile), 2011	<b>26</b>
<b>Figure 9.</b> Enterprises selling and purchasing via the Internet and/or networks other than the Internet, 2010	<b>27</b>

<b>Figure 10.</b>	
Internet access in households by NUTS 2 region, 2011	29
<b>Figure 11.</b>	
Broadband access in households by NUTS 2 region, 2011	30
<b>Figure 12.</b>	
Next Generation Access coverage	31
<b>Figure 13.</b>	
Regular Internet users by NUTS 2 regions - 2011	32
<b>Figure 14.</b>	
E-commerce by NUTS 2 regions - 2011	33
<b>Figure 15.</b>	
The virtuous cycle of the digital economy	38
<b>Figure 16.</b>	
Measurable targets and final objectives of the Digital Agenda	39
<b>Figure 17.</b>	
A simplified DAE logical model applied at regional level	49
<b>Figure 18.</b>	
The DAE logical model applied at regional level	52
<b>Figure 19.</b>	
ERDF and FSE allocation to the Information Society (2007-2013)	54
<b>Figure 20.</b>	
ERDF and ESF allocation to the Information Society by country (2007-2013)	55
<b>Figure 21.</b>	
ERDF and ESF allocation to the Information Society by hard and soft factors (2007-2013)	56
<b>Figure 22.</b>	
ERDF and ESF allocation to the Information Society by hard and soft factors and by country (2007-2013)	56
<b>Figure 23.</b>	
Allocation of SF to the Information Society by regions (2007-2013)	58
<b>Figure 24.</b>	
Allocation of SF to Category 10 – Telephone infrastructure including broadband	59
<b>Figure 25.</b>	
Allocation of SF to Categories 11 and 12 - Information and Communication Technologies	60
<b>Figure 26.</b>	
Allocation of SF to Category 13 - Services and applications for the citizen (2007-2013)	61
<b>Figure 27.</b>	
Allocation of SF to Category 14 - Services and applications for SMEs and other measures for SMEs (2007-2013)	62
<b>Figure 28.</b>	
Outcome patterns in the case of Guadalinfo (ES)	88
<b>Figure 29.</b>	
Outcome patterns in the case of digital literacy projects (LT)	88
<b>Figure 30.</b>	
Outcome patterns in the case of the e-learning project: Explorarium II (DE)	89
<b>Figure 31.</b>	
Outcome patterns in the case of Superfast Cornwall (UK)	90
<b>Figure 32.</b>	
Outcome patterns in the case of e-health projects (EE)	90
<b>Figure 33.</b>	
Outcome patterns in the case of the cross-regional e-health project	91
<b>Figure 34.</b>	
Outcome patterns in the case of the SMEs grant scheme for ICT adoption and diffusion	91

## EXECUTIVE SUMMARY

### Background

The objective of this study is to describe the **links between investments in Information and Communication Technologies (ICT) and economic development at regional level**, with particular emphasis on the “Digital Agenda for Europe” (DAE) strategy of the European Union (EU), and investments supported by the EU (Structural Funds and other funding mechanisms). The overall approach to the study is based on a set of different and complementary data collection tools and activities, including:

- a statistical analysis aimed at providing information on ICT performance at EU, national and regional levels;
- a comprehensive literature review taking stock of the existing knowledge and experience and offering interpretations of the patterns of influence between ICT investments and economic development in general, and at regional level in particular;
- field studies of seven selected ICT initiatives funded by the EU (primarily Structural Funds) to explore the mechanisms according to which the expected effects actually materialise;
- a desk review of additional “horizontal aspects”, determined at national and EU levels, which may enable or limit ICT’s influence on regional development.

### Main findings

The Digital Agenda for Europe is one of the seven flagship initiatives of the Europe 2020 Strategy, whose objective is to create the conditions for smarter, sustainable and more inclusive growth in the European Union, allowing Member States to better react to the difficulties resulting from the economic crisis. The DAE was developed on the basis of **compound theoretical underpinnings**, resulting from the pragmatic learning process of previous policy experience in the field, and in the context of the **overall poor performance of the EU in ICT endowment**.

From a theoretical perspective, the impact of ICT can be considered at macroeconomic level, at industry level or at firm level. It is also clear that ICT developments can entail **profound changes in society as a whole** – a process that is better reflected by the notion of the “Information Society”. According to empirical evidence, ICT and the Internet influence economic growth, but there are **important conditions that need to be fulfilled** if the expected growth effects are to materialise (e.g. complementary investments, institutional and regulatory framework, and other soft factors such as openness to new ideas, innovation culture, etc., that might be better addressed at regional level). The varying abilities of MS and regions to meet such conditions explain why the benefits of ICT diffusion seem to be unevenly distributed. Overall, the EU has a **lower ICT endowment** than that of its main competitors and its performance is not uniform, with **wide disparities** between and within MS, and between and within the regions.

In this context, the objective of the DAE is to **maximise the social and economic potential of ICT**. In order to do so, it tries to fill the ICT gaps that still exist between and within EU Member States and to increase the volume of investments in the sector, so as to approach the levels of digitalisation of other EU industrial partners. The DAE is based on the idea that a **virtuous cycle needs to be created between supply of, and demand for ICT and Internet-based applications**: an interoperable and borderless Internet system favours the creation of attractive contents and services that in turn stimulate demand for high speeds and

capacity. Thanks to the increasing demand, investments in faster networks may be sustainable and this, in turn, stimulates the creation and delivery of innovative services.

In addition, the DAE is characterised by the early recognition that the **local/regional dimension of the strategy is decisive** in the dynamics it is expected to foster. As a matter of fact, this is where awareness of and the capacity to use new technologies are best mobilised, which is as important as making available new technological solutions. Thus, in parallel with the development of the pan-European initiative, the DAE acknowledged that the regional level would be pertinent for identifying the opportunities offered by the Information Society and for carrying out plans and programmes in support of it.

Overall, the DAE establishes a **pertinent diagnosis** of the current obstacles to the further development of the Information Society in Europe and its impact on economic growth at different levels, and proposes an **adequate policy framework** to deal with these issues. It identifies seven pillars with corresponding “actions” (101 in total) whose implementation is shared between the European Commission and the Member States, and within the latter, with the regions. On these grounds, the Structural Funds have come to play a crucial role in the funding of the DAE, along with other funding streams (in particular Europe 2020 and the “Connecting Europe Facility” for the next programming period).

The analysis focused on initiatives at regional level (mostly funded by the Structural Funds) to identify the **channels through which projects impact on regional development** and on its two components: economic growth and social well-being. The in-depth analysis of seven case studies in different sectors (e-health, digital literacy, e-learning, broadband, ICT for small and medium-sized enterprises) shows that a **large number of outcomes and impacts** were recorded, ranging from increased digital literacy, improved human capital, efficiency, inclusion, productivity and competitiveness, more innovative public services and goods, to improved territorial cohesion, improved living conditions, reduction in social costs, empowerment and participation. Some projects have primary effects in terms of enhanced efficiency, others in terms of inclusion; some projects aim at Internet/ICT access *per se*, while others use the Internet *instrumentally*, to reach an independent objective; and some principally foster supply of ICT, while others activate demand. Overall, however, the interventions reviewed **all tend to contribute to the two dimensions of regional development**, no matter which objective they pursue, and even if it is through different patterns. This is important inasmuch as the rationale for carrying out a digital inclusion project, for example, goes beyond the objective of social inclusion, and also has wider implications for growth and regional development. The reverse seems to be less automatic as “efficiency projects” rely to a greater extent on complementary measures, investments or programmes for their effects on regional development to fully materialise.

In any case, there is a series of “**enabling conditions**” ranging from the most concrete and measurable factors to more subjective variables. They comprise complementary measures and investments, but also ICT infrastructure, digital literacy, stakeholder involvement, attitude towards openness and innovation, etc. One particularly important finding was that a correct articulation between the **contributions of the public and private sectors**, in terms of both funding and governance, is necessary for projects to be successful.

At national and EU level, the analysis of specific “horizontal interventions” (for example under the Connecting Europe Facility, or national policies aimed at enhancing e-skills) also identifies specific conditions that are necessary for the initiatives to deliver the expected effects and benefit regional development. For example, legal, regulatory and cultural barriers should be removed, interoperability ensured, there should be a sufficient level of transactions, standardisation should be promoted, etc. In particular, the local population and businesses

must be receptive and ready to take up the new technological solutions made available at national, cross-national or EU levels.

Overall, the report identifies different channels through which ICT investments might affect growth and development at regional level and the conditions necessary for this to happen. Fundamentally, it finds that the very **interplay between the different levels of actions and governance yields great potential for growth**. Responding to the needs of the European policy agenda to combine efforts to complete the Single Market and to foster regional growth dynamics through a “place-based” approach in the context of Cohesion Policy, **top-down initiatives and bottom-up projects should be combined, or at least developed in parallel**. In addition, the report shows that the private and public sectors should combine their respective contributions: the wide involvement of governments, industry, civil society and individuals, thanks to public-private partnerships, is necessary to foster a new, open and collaborative approach involving different DGs as well as national and local governments. Hence, the Digital Agenda proves to be a formidable **launching pad for experiencing a new form of policy governance, based on both horizontal and vertical partnerships**. The **regional level is at the nexus of this complex web of partnerships** and is decisive for shaping well-designed strategies that could spark off a virtuous growth process at EU level, benefitting EU regions.

## Recommendations

With a view to advising Members of the European Parliament on how EU support can best be utilised for ICT investments to boost the economic development of European regions, and while endorsing the recommendations put forward by previous studies and the EC, the present report proposes a restricted set of recommendations.

- **Implement as many different types of measure as possible in support of the Information Society, provided they are in line with the local needs and context.**

Recourse should be made to different types of intervention since these bring about complementary effects on regional development, almost independently of their initial objectives. This is because initiatives targeting the Information Society intrinsically touch upon a wide range of variables that foster synergetic effects benefitting both growth and well-being. That said, it is important that the type of intervention selected be adapted to local needs and be in line with the degree of maturity of the IS in the local context.

- **Embed IS support measures in wider and systemic strategies, and complement them with accompanying measures, especially efficiency-oriented IS measures.**

The potential of initiatives in favour of ICT development to influence a wide range of variables can be amplified through appropriate complementary measures. This is especially true of projects pursuing primary objectives in terms of efficiency, since they tend to yield spontaneous effects of a smaller systemic dimension.

- **Identify the appropriate mix of public and private support based on the project's objective and context.**

The evidence gathered in this report speaks in favour of the adoption of initiatives with a clear mission (revenue generating investment or provision of a public service) which, in turn, calls for an appropriate mix of public and private contributions in terms of both governance and funding. Again, this depends on the local context and specific conditions.

- **Ensure that a series of enabling conditions are met, in particular ICT receptiveness at regional level.**

Enabling conditions were identified which ensure that the projects reviewed at regional level deliver the expected effects in terms of regional development: ICT infrastructure, digital literacy, attitude towards openness and innovation, complementary investments or programmes, stakeholder involvement, and an appropriate articulation between public and private contributions. A favourable regional context in terms of acceptance and receptiveness of ICT and IS development is an important or even decisive factor as this is the privileged place where demand for ICT development can emerge, thus ensuring that technological developments are adapted to local needs.

- **Make sure that the regional setting is considered as a nexus between vertical and horizontal partnerships.**

The findings presented in the study suggest opening up the setting in which regional digital strategies are thought up, designed and implemented. While horizontal partnerships (between the private and public sectors, between different stakeholders) are necessary, a well-balanced supply and demand for ICT products and services should include input from beyond the regional setting.

- **Establish renewed confidence in the peculiar system of policy governance characterising the EU.**

Overall, this study illustrates that the articulation between place-based policies (Cohesion Policy) and policies pursuing the objective of achieving the Single Market has the potential to unleash virtuous growth dynamics on a European scale. This requires the eventual acknowledgement that the EU proposes a rather peculiar policy paradigm and calls for renewed confidence in the EU's capabilities to fully exploit its *sui generis* system of governance.



# INTRODUCTION

## Study objectives and research questions

### Objectives

The objective of this study is to describe the links between investments in Information and Communication Technologies (ICT) and economic development at a regional level, with particular emphasis on the “Digital Agenda for Europe” strategy of the European Union (EU), and investments supported by the EU (Structural Funds and other funding mechanisms).

The present research will contribute to better understanding the relationship between investing in the ICT sector and enhancing regional economic development, in particular by exploring the types of potential effects for different categories of ICT expenditures and different regional economic structures, and by analysing the mechanisms influencing such a relationship.

### Research questions

This report addressed two levels of research questions from which a third set of operational questions was derived, which were designed to guide the fieldwork.

- Level 1: One **general research question** of the overall study aims to investigate the link between the Digital Agenda initiatives and the impacts on regional economic development. This question is answered through the information provided in response to the specific research question (below) combined with a literature review. This research question is:

*"To what extent and under what conditions are the different types of initiatives promoted by the Digital Agenda (policies and regulations, hard investments and soft measures) expected to contribute to economic growth and social well-being at regional level?"*

- Level 2: Two **specific research questions** delving into the relationship between the different types of Digital Agenda initiatives implemented at different levels (EU, national and regional), and the intermediate economic and social effects that will eventually contribute to regional economic development. The questions are answered by information collected through case studies and an analysis of horizontal aspects, respectively, (see below). They are:

*"What are the expected effects of Digital Agenda initiatives at regional level and under which conditions do they materialise?"*

*"To what extent are Digital Agenda initiatives at EU/national level complementary or decisive in producing regional economic and social effects?"*

- Level 3: **Operational questions** guiding the collection of information for the selected case studies and horizontal aspects.

## Approach and methodological design

The working hypothesis is that the type of initiative (e.g. broadband, e-government, e-business, e-learning, demand stimulation, etc.) and the type of region (defined by different endowments and trajectories) determine the type and extent of the socio-economic impact of ICT investments at regional level. These relations will be explored through a comprehensive analysis of the effectiveness of ICT investment projects in promoting regional growth, complemented by desk research. Overall, the approach to the study is based on a set of different and complementary data collection tools and activities, including:

- a statistical analysis aimed at providing information on ICT performance at EU, national and regional levels;
- a comprehensive literature review taking stock of the existing knowledge and experience offering interpretations of the patterns of influence between ICT investment and economic development in general, and at regional level in particular;
- field studies of seven selected ICT initiatives funded by the EU to explore the mechanisms according to which the expected effects actually materialise;
- a desk review of additional horizontal aspects, determined at national and EU levels, which may enable or limit ICT's influence on regional development.

There are seven case studies that focus on specific initiatives carried out at regional level, which are representative of the different possible types of ICT investments (see Annex 7). The case studies consist of an in-depth qualitative analysis of each selected regional investment initiative carried out through fieldwork (face-to-face interviews with the main stakeholders). The objective was to identify the constituent features of the causality chain linking ICT investments and regional economic performance.

Given the essential role played by Structural Funds in financing regional ICT investment, the selected initiatives primarily concern investment projects in Internet applications and/or in projects in line with the fields of the Digital Agenda supported by the Structural Funds.

In addition, the study addresses horizontal issues in order to explore complementary aspects that may facilitate growth and competitiveness at regional level. The focus is on initiatives or factors developed at national or EU level, which stimulate and contribute to ICT development at regional level and, hence, regional economic growth and performance. Indeed, the development of ICT and its impact on growth and competitiveness at regional level both depend on initiatives specifically developed and funded at regional level and on initiatives that are horizontal and support the development of ICT in wide geographical areas. The question at stake is whether and to what extent the local initiatives are sufficient or if they need to be integrated and supported by horizontal initiatives adopted at national or EU level. How far do horizontal initiatives help synergies and favour the local development of ICT and Digital Agenda for Europe (DAE) objectives?

The report is organised as follows: Chapter 1 starts by setting the scene for the DAE strategy, in terms of theoretical underpinning and ICT performance in the EU, while Chapter 2 presents the DAE strategy together with its logical model, and infers an analytical framework underlying the research for this report. The two subsequent chapters address the role of EU initiatives funded at regional level, and at national and EU levels through complementary research tools (quantitative approach to Structural Funds patterns in the field of ICT, completed by fieldwork for case studies and desk research for the horizontal issues). The last Chapter draws conclusions and proposes recommendations.

## CHAPTER 1 - INFORMATION AND COMMUNICATION TECHNOLOGIES, THE INFORMATION SOCIETY AND EXPECTED IMPACTS ON ECONOMIC DEVELOPMENT

### KEY FINDINGS

- Information and Communication Technologies (ICT) are a collection of technologies and applications that enable the electronic storage, retrieval, processing and transfer of data to a wide variety of users: individuals, households, enterprises from most of the industries and public sector organisations. The Information Society describes a society where ICT, especially the Internet and mobile phones, affect many and different levels of society and the economy.
- Literature on the economic impact of ICT investments focuses on three different levels: macro, industry and firm. Empirical evidence is mixed. Some studies find positive impacts, while others find negative relationships between ICT investment and economic growth or productivity.
- Besides impacts on productivity and growth, the diffusion of ICT may have important impacts on the structure of the economy as well as impacts at a social level in terms of well-being and day-to-day life.
- Although investments in ICT may positively affect society as a whole, a positive impact on economic development and social well-being is not automatic. A series of conditions must be fulfilled, such as complementary investments and a proper institutional and regulatory setting.
- Throughout the countries and the regions of the European Union a number of disparities can be observed in terms of endowment of ICT infrastructure and digital skills, affordability of access to networks, quality of ICT services and Internet usage. Disparities occur at both geographical and socio-economic levels.

This chapter describes the contextual elements necessary to understand how and why a Digital Agenda for Europe developed, and what specific implications this has for European regions. It defines what the terms Information and Communication Technologies and Information Society cover, what the theory expects from them as far as their impact on economic growth is concerned, and what the current situation in the EU and EU regions is, i.e. what the current endowment would augur for the future in terms of economic development.

### 1.1 Defining Information and Communication Technologies and the Information Society

The “Internet”, “Information and Communication Technologies” and the “Information Society” refer to notions that are connected and overlapping and that are sometimes used interchangeably. Yet, they clearly cover distinct realities and it is important to account for these differences when attempting to identify their effects on economic development.

#### 1.1.1 Information and Communication Technologies

Information and Communication Technologies (ICT) are a collection of technologies and applications that enable the electronic storage, retrieval, processing and transfer of data to a wide variety of users. ICT belongs to the family of General Purpose Technologies (GPT), which are technologies that can potentially be adopted and adapted to almost all phases of the

production process in many sectors of the economy in ways that drastically change operations and products and the relationships between different sectors and stakeholders (JRC-IPTS, 2010). A GPT should have the following three characteristics: 1) pervasiveness: the GPT should spread to most sectors; 2) improvement: the GPT should get better over time and, hence, should keep lowering the cost to its users; 3) innovation spawning: the GPT should make it easier to invent and produce new products or processes (Bresnahan and Trajtenberg, 1996). In particular, ICT is characterised by:

- very dynamic technological changes, with rapid penetration and adoption rates;
- decreasing costs of new equipment and features;
- a rapidly increasing range of applications and penetration in an increasing number of realms of professional and personal life;
- an intertwined institutional market place, with the private sector acting in a decreasingly regulated environment (in most countries);
- a production and services package dependent on a range of qualities of skilled human resources;
- a convergence of technologies.<sup>1</sup>

Since ICT has penetrated many sectors in the last two decades, a significant number of sectors may be classified as ICT providers:

- ICT manufacturers;
- Providers of ICT network services;
- Wholesalers and retailers of ICT;
- Other ICT services.

Beyond such general categories, there is wide debate about the statistical definition and about which sectors should be termed as ICT sectors. In 1998 OECD member countries agreed to define the ICT sector as a combination of manufacturing and service industries that capture, transmit and display data and information electronically. This definition<sup>2</sup> was considered to be a first step towards obtaining some initial measurements of the ICT sector's core indicators.<sup>3</sup> Indeed, the purpose of the OECD definition is to provide a framework to compile statistics that are comparable from country to country, which is the basis for the proper measurement of ICT investments and of their impact.

In 2007 a new definition of what should be considered as ICT was proposed by the OECD based on the Statistical Classification of Economic Activities of the European Community (NACE) Rev. 2 (see the following table).

**Table 1. The 2007 OECD definitions of ICT sectors (based on NACE Rev. 2)**

NACE REV.2	DESCRIPTION
<i>ICT manufacturing industries</i>	
261	Manufacture of electronic components and boards
262	Manufacture of computers and peripheral equipment
263	Manufacture of communication equipment
264	Manufacture of consumer electronics
268	Manufacture of magnetic and optical media
<i>ICT trade industries</i>	
4651	Wholesale of computers, computer peripheral equipment and software

<sup>1</sup> Cohen et al. (2002).

<sup>2</sup> The definition was based on the International Standard Industrial Classification of activities (ISIC Rev.3)

<sup>3</sup> OECD (2002).

4652	Wholesale of electronic and telecommunications equipment and parts
<i>ICT services industries</i>	
5820	Software publishing
6110	Wired telecommunications activities
6120	Wireless telecommunications activities
6130	Satellite telecommunications activities
6190	Other telecommunications activities
6201	Computer programming activities
6202	Computer consultancy activities
6203	Computer facilities management activities
6209	Other information technology and computer service activities
6311	Data processing, hosting and related activities
6312	Web portals
9511	Repair of computers and peripheral equipment
9512	Repair of communication equipment

**Source:** Authors based on OECD (2011)

### 1.1.2 A broader view

The users of ICT are households and individuals, enterprises from most industries, and public sector organisations. As a result, ICT developments can impact on the economy and on society as a whole. In the 1990s ICT started to produce social and economic changes and played an increasingly key role in society. This is when the term 'Information Society' appeared to describe a society where information and communication technologies, especially the Internet and mobile phones, play a central role. Thus, the term 'Information Society' is not just about technology and its supply in a narrow sense, but it also refers to all the socio-economic aspects connected to the use of ICT, and institutional processes in which ICT-related changes are embedded.<sup>4</sup> Understood in this broader sense, the Information Society affects every level of society and of the economy, from the individual citizens and enterprises to private and public institutions and policy-makers at regional, national and EU levels. This holistic vision of the IS has been embraced by a number of sociologists<sup>5</sup> who have discussed the IS model and the cultural change due to the information revolution that has changed patterns of work, employment, time and space in everyday life.

## 1.2 The expected impacts of ICT investment and adoption: an overview

When addressing the impact of ICT a distinction should be made between investments strictly linked to the ICT sector (hence looking at the supply side of ICT) and the broader view of the Information Society where ICT developments are addressed in connection with the adoption or use of ICT. This distinction accounts for different possible approaches to the impacts of ICT and the Information Society.

### 1.2.1 Economic impact of ICT investments

The literature on the economic impact of ICT investments focused on three different levels, i.e. macro, industry and firm. The conclusions drawn from these studies are mixed – some found positive impacts while others found negative relationships. **At macro level, the impact of ICT capital as investment** is considered. Since Solow argued in 1957 that the United States' economic growth during the 1950s and 1960s was attributed mainly to 'technological change'

<sup>4</sup> European Commission (1999a).

<sup>5</sup> For instance Daniel Bell, Jean-François Lyotard, Manuel Castells and Nico Stehr.

as opposed to the conventional factors of labour and capital, numerous studies have been carried out to examine the impact of ICT on a country's economic performance. Indeed, investments in ICT require investments in capital stock (including both hardware and software), which bring about capital deepening and therefore may contribute to raising labour productivity.

However, measuring the impacts of ICT investment is not so straightforward.<sup>6</sup> A possible approach is based on a growth accounting exercise that looks at the problem from a supply perspective to disentangle the components of change in per capita output. In this approach, 'technological change' is the remaining unexplained component left over after calculating the effect on GDP of inputs such as labour, capital and education.

In general, two different methods can be used to estimate the effects of investments in ICT on economic growth. The first relies on the estimation of the productivity effects based on a quantification of the ICT capital including both hardware and software.<sup>7</sup> The second consists of using a production function to estimate the technological change and relating productivity growth to the use of ICT.<sup>8</sup>

In the last two decades many authors have claimed that investments in ICT have driven growth in the US economy since 1995.<sup>9</sup> Moreover, in relative terms, the contribution of ICT capital assets to GDP growth in the OECD countries seems to have increased from about 16% of total GDP growth to about 20% from the period 1990-1995 to the period 1995-2001.<sup>10</sup>

Another approach to examining the impacts of ICT investments is based on **industry level** considerations. Here, the **role of ICT producing sectors in influencing national or local economic growth and employment** is examined. Having a competitive ICT producing sector may be relevant to growth since ICT production has been characterized by technological progress and by very high and rapidly increasing demand. Different analyses showed that in a number of countries the ICT producing sector contributed significantly to productivity, while this was not true in other countries.<sup>11</sup> For example, the United States, Japan, Sweden, Finland and Ireland are all countries where the ICT sector grew significantly and contributed to growth in total output.

In fact, most of the impact of the ICT producing sectors is indirect and takes place through spillover effects. This requires focussing on the impacts of ICT on the performance of those sectors that are users of ICT. Nowadays, with the advent of the Internet economy, cloud computing and mobile devices, we may say that almost all sectors are ICT users. Studies have found that the contribution of the ICT-producing sectors to improving the growth performance reflects the productivity performance of the different ICT-related industries and their weight in the economy.<sup>12</sup> In addition, some sectors are more intensive users than others. Most of the high intensity users are service industries like finance, business services and distribution. In some countries there is evidence that sectors that have invested significantly in ICT have experienced an increase in the overall efficiency of labour and capital or in total factor productivity (TFP) growth.<sup>13</sup> This is due to the fact that these sectors received productivity gains from ICT use over and above the labour productivity gains received from investments in ICT, for instance because of network effects. The benefits of investing in and using ICT depend

<sup>6</sup> First it is necessary to define what "ICT investments" cover. Then, this depends in part on the availability of data and on comparability issues, among other things (Ahmed N., P. Schreyer & A. Wölfl, 2004). See Annex 2.

<sup>7</sup> See Oliner and Sichel (1994) and Sichel (1997).

<sup>8</sup> See Bailey and Gordon (1988) and Jorgensen and Stiroh (1999).

<sup>9</sup> See Oliner et al. (2000) and Jorgenson (2000) as well as Annexe 2.

<sup>10</sup> See Ahmed et al. (2004), Jorgenson (2001), Colecchia et al. (2001), van Ark et al. (2003) and OECD (2003).

<sup>11</sup> OECD (2004).

<sup>12</sup> Pilat et al. (2002).

<sup>13</sup> See OECD (2004) and Daveri (2002).



on sector-specific effects. ICT raises productivity in certain sectors much more than it does in others, and since countries have different sectoral specialisations and compositions, the gains from using ICT or investing in it may differ significantly in different countries or geographical areas. A number of empirical studies showed that, in spite of a relevant acceleration in ICT investments and use, a quarter of EU GDP growth and 40% of its labour productivity growth is estimated to be due to investments in ICT, while 60% of US productivity growth is explained by these technologies.<sup>14</sup> Moreover, productivity growth in Western Europe compared to the USA seems to be particularly slow in three main ICT-using service sectors, namely: retail, distribution and financial services.<sup>15</sup> We should also note that it is quite possible that the extent of market regulation in Western Europe slows the speed of adoption of new technologies and new ways of doing business.<sup>16</sup> Labour market regulations, for example, differ across the countries in Western Europe, which makes generalisations quite difficult.

Overall, in this context, it is no surprise that the empirical results of literature found both positive and negative impacts of ICT on aggregate productivity.<sup>17</sup> The inconclusiveness of these early studies on the impact of ICT on productivity growth was mostly due to incorrect measurement of ICT capital prices and quantities. Indeed, studies using more recent data found a positive correlation between ICT investments and productivity growth.<sup>18</sup>

Finally, at **firm level** the empirical evidence shows that the use of ICT may have several impacts on productivity and output growth that may not be evident at the aggregate level. Generally, the use of ICT can influence the production process of a firm through two different channels:

1. **Process innovation:** ICT is a technology embodied in capital goods so that it may increase the labour productivity. Also, ICT allows for an efficient use of information, which increases efficiency in general. Moreover, as firms introduce ICT into their processes, they may need to change the internal organisation in order to make it more flexible thanks to self-managed teams, multi-tasking and just-in-time production and delivery. Thanks to its impact on the production process, ICT may improve the competitiveness of firms and therefore their market shares. Besides, increased flexibility allows firms to outsource and, where necessary, to move part of the production process offshore.
2. **Product innovation:** the use of ICT may contribute to product innovation by enlarging the firm's product range and by customising its services. Product innovation has been particularly relevant in the service sector where ICT not only helped firms to improve their business, but also to develop new applications and to re-invent themselves.

In this regard, the Eurostat ICT impact project<sup>19</sup> reveals that on average a firm's performance is positively related to ICT usage. Interestingly, disparities in aggregate productivity growth are found to be mainly due to differences in performance at the industry, and also at the firm, level, including the presence of high-performing new firms.<sup>20</sup>

<sup>14</sup> European Commission (2005).

<sup>15</sup> O'Mahony et al. (2003).

<sup>16</sup> Gust and Marquez (2004).

<sup>17</sup> For example, examining the contribution of ICT capital to US industries' productivity growth, a negative relationship was found (see Morrison et al. (1991) and Berndt et al. (1995)). Frank (1987), studying labour productivity in insurance and banking between 1958 and 1983, found declines in capital productivity. Similarly, Parsons et al. (1990) argued that Canadian banks did not reap benefits from their ICT capital investments. Conversely, other studies found ICT had positive and significant impacts. Siegel et al. (1991) found significant impacts of ICT on total factor productivity in a study of US manufacturing. Schreyer (2000) estimated the impact of ICT on labour productivity amongst G7 nations and he found that they had benefited significantly from ICT investments in terms of remarkable average annual labour productivity growth over the period 1990 to 1996 (see Daveri (2000), who expanded Schreyer's (2000) study and found similar results).

<sup>18</sup> See for instance Sitroh (2004) who carried out a study of 158 industries and found significant returns on IT capital over the period 1987-2000.

<sup>19</sup> Eurostat (2008).

<sup>20</sup> See Cohen, Garibaldi and Scarpetta (2004).

### 1.2.2 Other impacts of ICT adoption

In addition to impacts on productivity and growth, the diffusion of ICT may have relevant impacts on the structure of the economy as well as impacts at a social level in terms of well-being and day-to-day life.

1. **Structural changes:** ICT is, at one and the same time, a sector and a general purpose technology that has important qualitative effects on the economy. The advent of the Internet economy, cloud computing and of software as a service brought new services and products and may change the composition of the GDP in favour of the service industry. The industrial, occupational and educational structure of the economy is changing and such changes may only be captured by economic data after a time lapse. ICT is definitely a driver of process, product and business model innovation, but it is still largely unexplored.<sup>21</sup>
2. **Social changes:** ICT is not only a pervasive technology for businesses, but also for citizens' day-to-day life: the use of ICT affects citizens, be they learners, workers, consumers, patients, creators, communicators or users of public services. ICT may increase well-being and may facilitate the participation of citizens in public life. The assessment of the social impacts of ICT received less attention than the assessment of the economic impacts.<sup>22</sup> Nevertheless, there is little doubt that the use of ICT by households has positive impacts on economic performance. For example, the use of ICT by households stimulates the demand for ICT and for digital content products and it also encourages the acquisition of ICT skills. Also, in the last decade, ICT has changed the way people work as well as where they work. The impact of such changes could be relevant for individuals as well as for societies and economies: for instance, the adoption of IT supported the diffusion of teleworking, which in turn may be more efficient for both workers and enterprises. During the last decade, the Bring your Own Device (BYOD) policy permitting employees to bring personally owned mobile devices to their workplaces and to use them for work, provided evidence that businesses cannot stop or slow down technology trends. Moreover, employees do not only use their own devices, but at work they also take advantage of the ICT skills they have developed on their own during their free time.

Overall, there are different categories of effects brought about by ICT developments (investments and adoption) that are deeply interwoven and contribute to shaping the Information Society (Figure 1).

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<sup>21</sup> Eurostat (2008).

<sup>22</sup> OECD (2007) and European Commission (2010)



**Figure 1. Components of the effects of ICT development**

Source: Authors

### 1.2.3 Enabling conditions

What the evidence above suggests is that even if investments in ICT are necessary, they are not sufficient to guarantee productivity benefits<sup>23</sup> or a positive impact on economic development and social well-being. Instead, a series of conditions must be fulfilled. For example, **complementary investments**, i.e. investments in human capital (skills) and changes in workplace practices and in the organisation of firms and production systems, such as new strategies, new business processes and new organisational structures, might be decisive. It was estimated that about a quarter of the US labour productivity growth between 1995 and 2006 was due to the contribution of these intangible assets.<sup>24</sup>

Moreover, in order to achieve full productivity benefits, the **institutional and regulatory framework** within which firms operate is also important. Indeed, in determining the conditions for investments, competition, innovation and entrepreneurship, the institutional framework influences the propensity of firms to invest and adopt ICT. Regulations for product and labour markets, including administrative burdens, are a barrier to innovation since they raise the entry costs for new firms. Where firms cannot adjust their workforce or organisation in a way that supports the exploitation of ICT, they may decide to limit investments or to relocate activities.

Finally, ICT produces knowledge flows and knowledge spillovers (Karlsson & Johansson, 2006), networking, consensus building, openness to new ideas, leadership and entrepreneurship, innovation culture and collective learning, as well as a focus on innovation and the

<sup>23</sup> See for instance Lera-López et al., 2005.

<sup>24</sup> Van Ark (2010).

development of new products and services.<sup>25</sup> All these “**soft factors**” might be by-products of ICT development as well factors necessary for the benefits of ICT to materialise. Interestingly, while they might be the characteristics of any “community” developing thanks to ICT developments, they are traditionally considered to be particularly relevant at the **regional level** where social capital is likely to be specifically vibrant and pervasive. Thus, there are reasons to believe that the region is a pertinent level of analysis and action for designing and implementing strategies that promote the production and adoption of ICT.<sup>26</sup> There is also some evidence that ICT may positively contribute to regional convergence in terms of growth, despite inequalities in ICT investments. For example, it was suggested that ICT investments may contribute more to regional growth and convergence than other types of capital investments.<sup>27</sup>

### 1.3 ICT endowment in the EU: national and regional variations

It seems that ICT-led growth is highly concentrated from a geographical point of view. The economic benefits of ICT diffusion have been especially important in some European countries such as Ireland, Finland and Sweden (See Annex 2). This is true if we compare the USA with Europe, as well as if we compare countries inside Europe. Analyses conducted during the last decade for the USA and Europe showed that the contribution of ICT to total output growth was approximately double in the USA.<sup>28</sup> In parallel, a number of studies suggest that the EU’s low investment in ICT is a primary candidate for explaining the low productivity level of the European Union.

The objective of this section is to paint a picture of where Europe and the EU regions stand in terms of ICT endowment. If the latter is so important for economic growth, this should give us an idea about where the EU and its regions are heading in the future.

With the term ICT endowment we refer not only to the ICT infrastructure and equipment available in a country or in a region, but also to the capability aspect, i.e. knowledge, digital literacy and ICT skills.<sup>29</sup> The physical endowment of ICT reflects the level of networked infrastructure and access to ICT, i.e. the ICT readiness of a country. In order to measure the ICT readiness of a country a number of indicators exist such as the percentage of broadband coverage, the percentage of households with Internet access, the percentage of households with a computer, the number of Internet subscriptions. Instead, the skills endowment refers to the level of human capacity available in each country/region and to the population’s ability to make use of ICT. ICT skills can be assessed through household or business surveys that investigate the ICT competence of people; otherwise capability is usually approximated by the adult literacy rate and the secondary or tertiary gross enrolment ratio. In turn, both these kinds of endowment determine the degree of ICT use. In particular, ICT skills play a critical role in leveraging the full potential of ICT for socio-economic development. Before discussing the expected impacts of ICT investment and adoption, it is useful to outline the current ICT endowment available across European countries and regions.

According to the European Commission (2004, 2012) and the European Parliament (2010), throughout the European Union a number of evident disparities can be listed in terms of

<sup>25</sup> DTI (2009).

<sup>26</sup> JRC-IPTS (2010).

<sup>27</sup> JRC-IPTS (2008).

<sup>28</sup> See OECD (2008) and Daveri (2002).

<sup>29</sup> The notion of ICT skills applies in the case of (generally highly specialised) experts contributing to the production and supply of ICT, but it also includes digital literacy or digital skills that refer to the capacity of ICT users to effectively take advantage of ICT and the Internet. See Glossary in Annexe I.

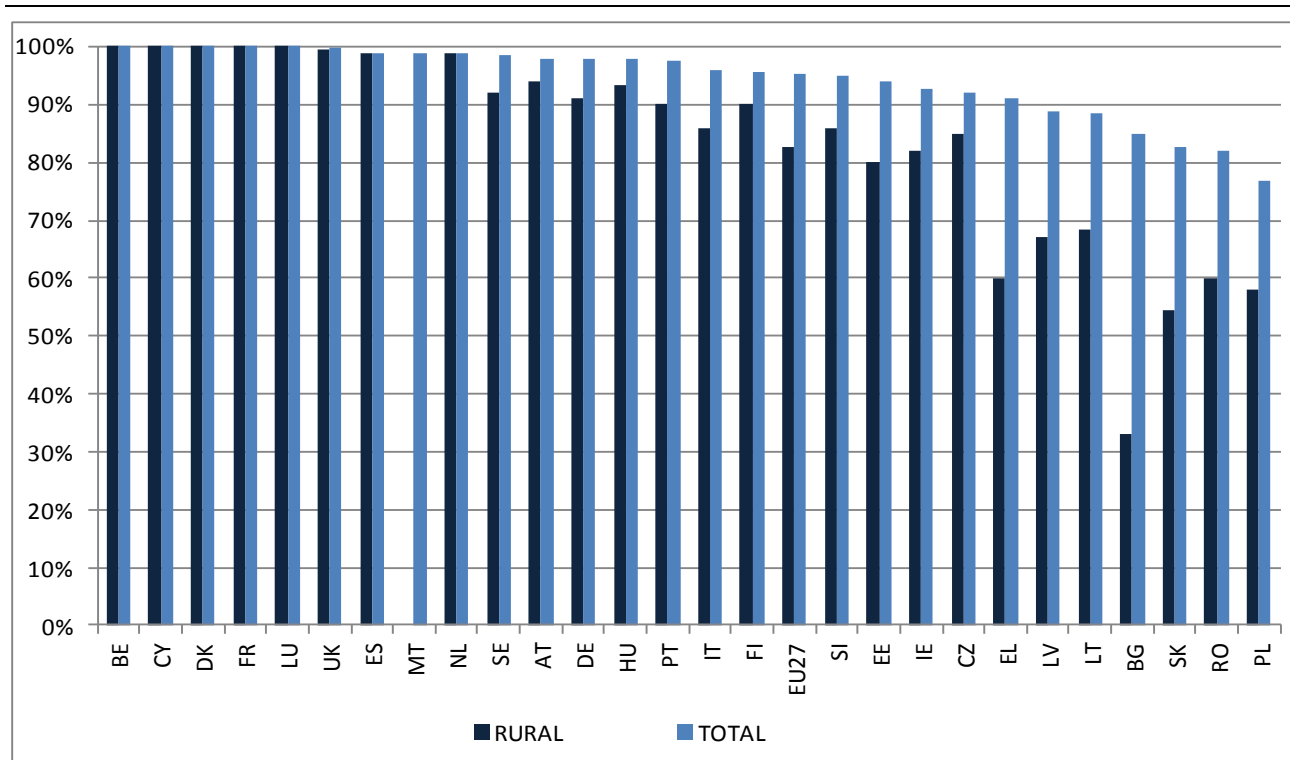
endowment of communication infrastructures and skills, affordability of access to networks, quality of ICT services and Internet usage.

Disparities can be specified at different levels: between Western and Eastern Europe, with the New Member States having a generally lower rate of penetration of new technologies; across Member States, with different national ICT development levels; and within single countries, between urbanised and peripheral/rural areas. Besides geographical divides, socio-economic disparities also exist. In particular, the elderly, less educated and people with low incomes use the Internet less and have relatively lower levels of ICT skills.

### 1.3.1 ICT across European Union countries – national variations

In order to describe the physical ICT endowment of countries across the European Union, we can look at the percentage of total fixed broadband coverage of the population, which is a representative indicator of ICT infrastructure diffusion. As Figure 2 shows, differences exist among countries, especially as far as rural coverage is concerned. Indeed, most of the New Member States perform below the EU-27 average. Instead, Belgium, Cyprus, Denmark, France and Luxembourg have 100% coverage both at rural and total population level.

**Figure 2. Total fixed broadband coverage (supply as a percentage of the total population), 2010**



**Source:** Broadband Coverage in Europe, Studies for the EC realised by IDATE (2005-2010 data)

**Note:** Percentage of the total population living in areas served by either DSL or cable modem networks

Differences among countries become more pronounced when the speed of fixed broadband lines is investigated.

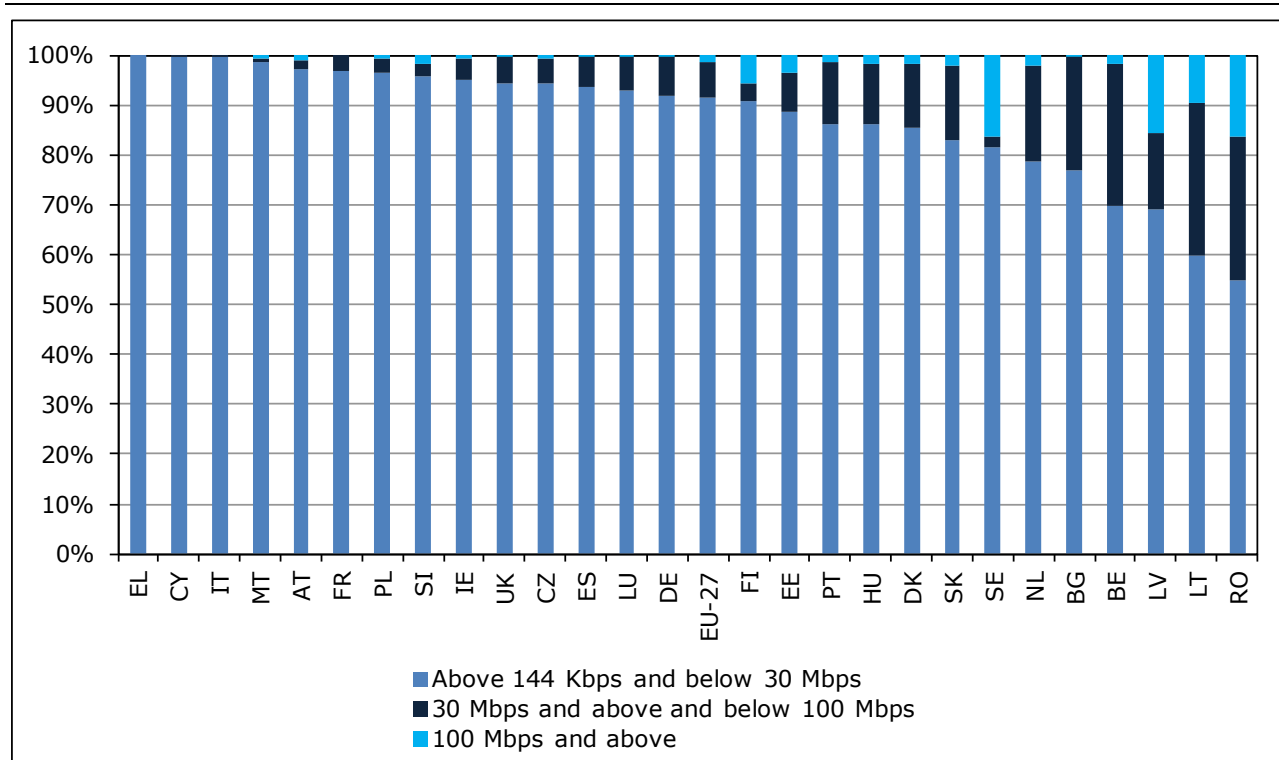
The main available broadband technologies are:

- "Standard Broadband", combining DSL, WiMAX and Standard Cable;
- "Next Generation Access (NGA) Broadband" combining VDSL and Docsis 3 cable modems.

While Standard Broadband includes the main fixed-line technologies that are capable of providing a basic broadband download speed of at least 144 Kbps for end-users, NGA Broadband includes technologies allowing speeds of at least 30 megabits per second. As Figure 3 shows, Sweden is well ahead of the other countries in terms of broadband speed. The next three countries with the largest endowment of fast and superfast broadband lines, i.e. Romania, Lithuania and Latvia, belong to the New Member States. They are followed by Finland. This pattern can be explained by the fact that Old Member States started to develop broadband networks earlier and therefore they used old technologies, instead, New Member States began later and were able to take advantage of new technologies.

Overall, most countries are still far from the NGA speeds, although standard broadband is already available in the great majority of EU homes.

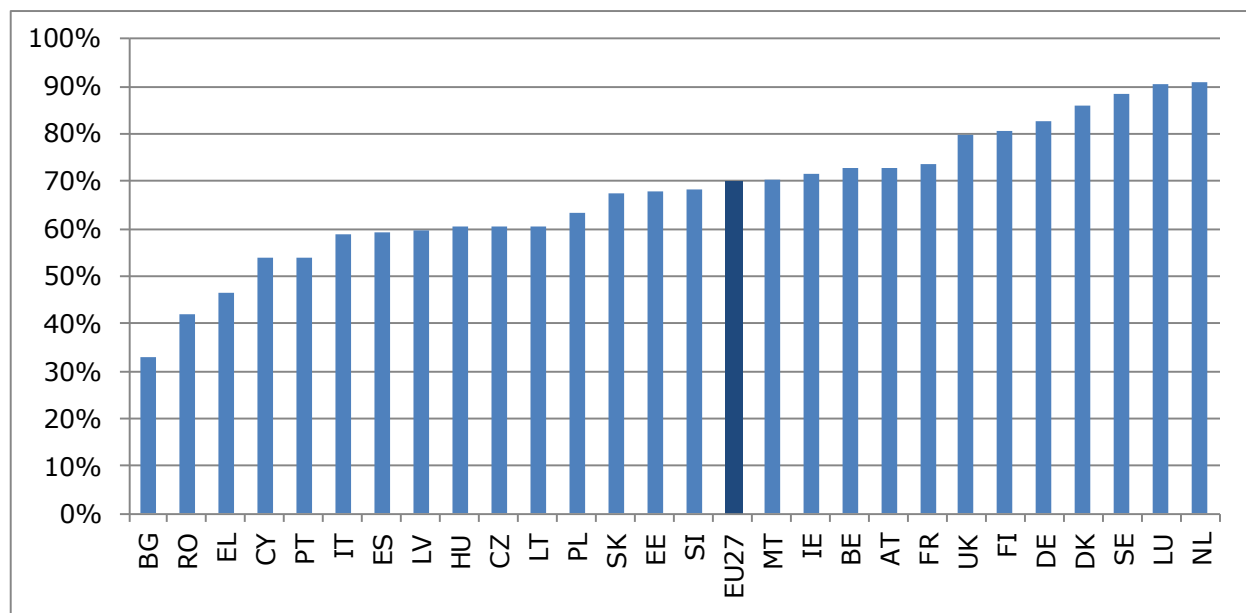
**Figure 3. Fixed broadband lines by speed, 2012**



**Source:** Broadband Coverage in Europe, Studies for the EC realised by IDATE

**Note:** the speed is classified according to the Digital Agenda categories

The fact that people are served by the broadband infrastructure (either DSL or cable modem networks) does not mean either that they have actual access to it or that they use it. Indeed, Figure 4 shows that the percentage of households with Internet access at home is below the percentage of broadband coverage and, again, many differences exist across countries. Still, the New Member States are lagging behind, with a percentage lower than the EU27 average. However, in this case Greece, Italy and Spain are also below the EU27 average. In turn, the degree of access and use of ICT infrastructure and services by citizens usually reflects their technical ability and their receptiveness to new technologies.

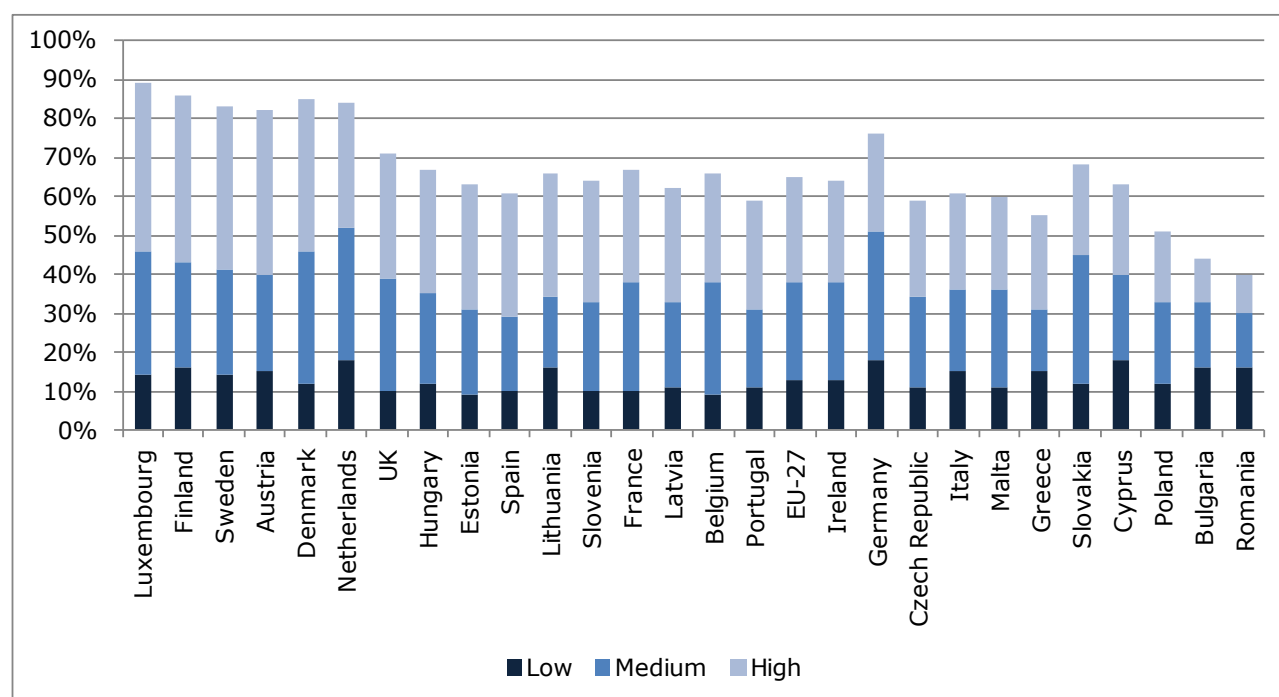
**Figure 4. Percentage of households with access to the Internet at home, 2010**

**Source:** Eurostat - Community survey on ICT usage in households and by individuals

ICT skills are measured every year in the Eurostat Community Survey on ICT usage on the basis of a set of questions related to the respondents' uses of computers and the Internet.<sup>30</sup> Figure 5 shows that in 2011 on average 75% of Europeans had at least some level of computer skills (defined as high, medium or low). The percentage of individuals having at least some level of Internet skills reached 73% in 2011.<sup>31</sup> Important differences exist among countries: for instance, as far as computer skills are concerned, Romania, Bulgaria and Poland come at the bottom of the ranking. In particular, in Romania and Bulgaria more than 50% of the population possesses no computer skills whatsoever. Instead, Luxembourg, Finland, Sweden and Austria have the largest percentages of high computer skills.

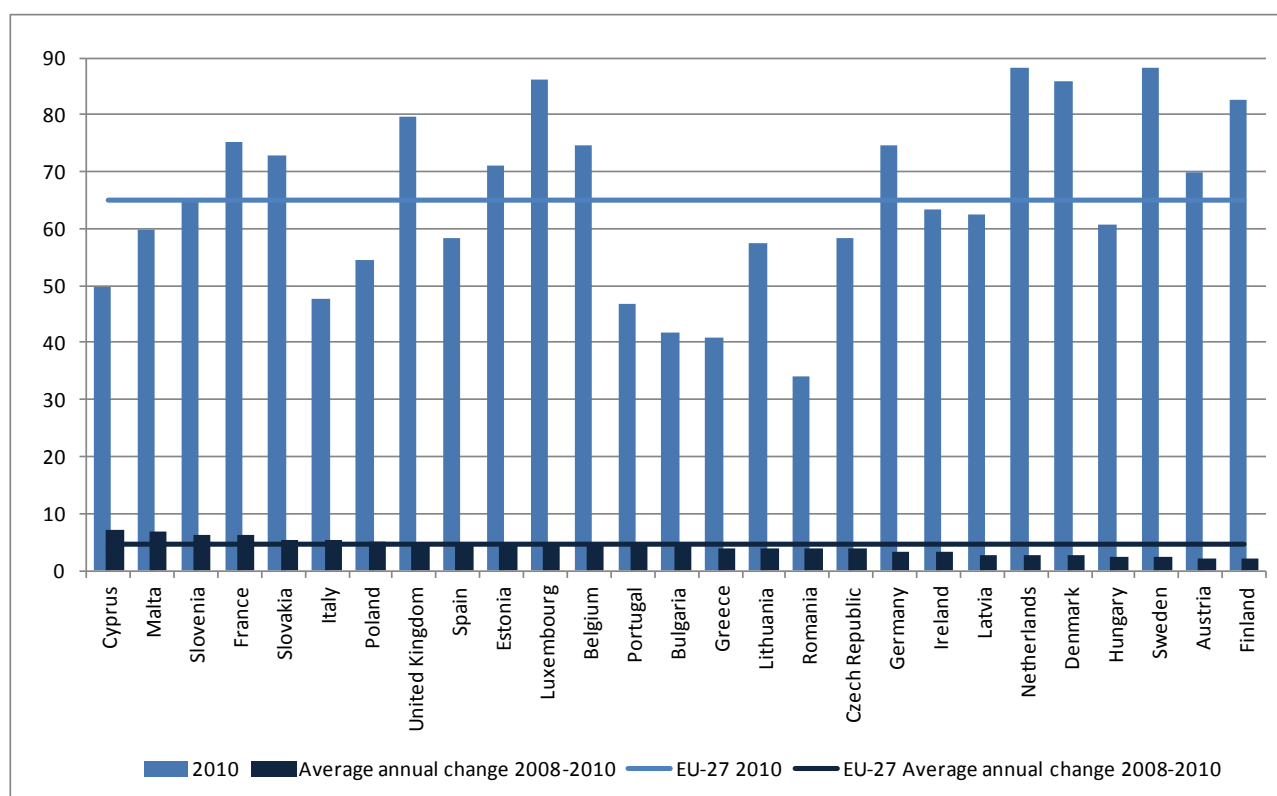
<sup>30</sup> A distinction is made between computer and Internet skills. Computer skills are defined as having performed one or more computer related activities, i.e. copying or moving a file or folder, using copy and paste tools to duplicate or move information within a document, using basic arithmetic formulas in a spreadsheet, compressing (or zipping) files, connecting and installing new devices, writing a computer programme using a specialised programming language. (See EC SEC (2010) 627). Instead, Internet skills concern the following activities: using a search engine to find information, sending e-mails with attached files, posting messages to chat rooms, newsgroups or an online discussion forum, using the Internet to make telephone calls, using peer-to-peer file sharing for exchanging movies or music, creating a webpage. Low digital (computer or Internet) skills refers to being able to do one or two of these activities, medium skills requires three or four, and high skills five or all of them.

<sup>31</sup> <http://ec.europa.eu/digital-agenda/sites/digital-agenda/files/KKAH12001ENN-chap5-PDFWEB-5.pdf>

**Figure 5. Percentage of individuals with computer skills (low, medium, high), 2011**

**Source:** Eurostat - Community survey on ICT usage in Households and by Individuals

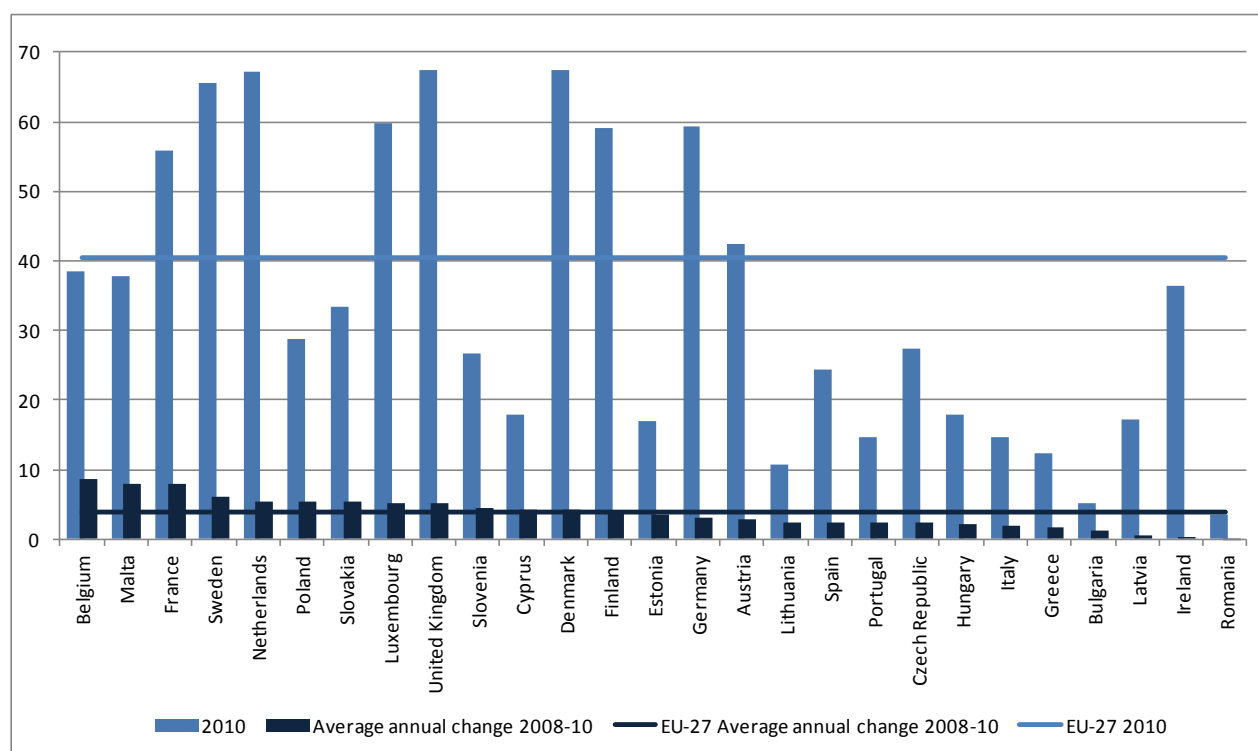
As far as the general use of ICT is concerned, large differences exist among countries in the regular use of the Internet. As shown in Figure 6, Romania, Greece and Bulgaria are well below the European average, while among the best performing countries we find Luxembourg, the Netherlands, Denmark, Sweden and Finland with over 80% of the population regularly using the Internet. Between 2008 and 2010 the average annual increase in the share of regular Internet users among the total population of the EU was 4.5%. The countries with both a share of Internet users and an annual growth rate equal to or above the EU average are Slovenia, France, Slovakia, the UK, Estonia, Luxembourg and Belgium.

**Figure 6. Regular use of the Internet, 2008-10**

**Source:** Eurostat - Community survey on ICT usage in Households and by Individuals

**Note:** share of persons who accessed the Internet on average at least once a week in 2010 and average annual change, in percentage points

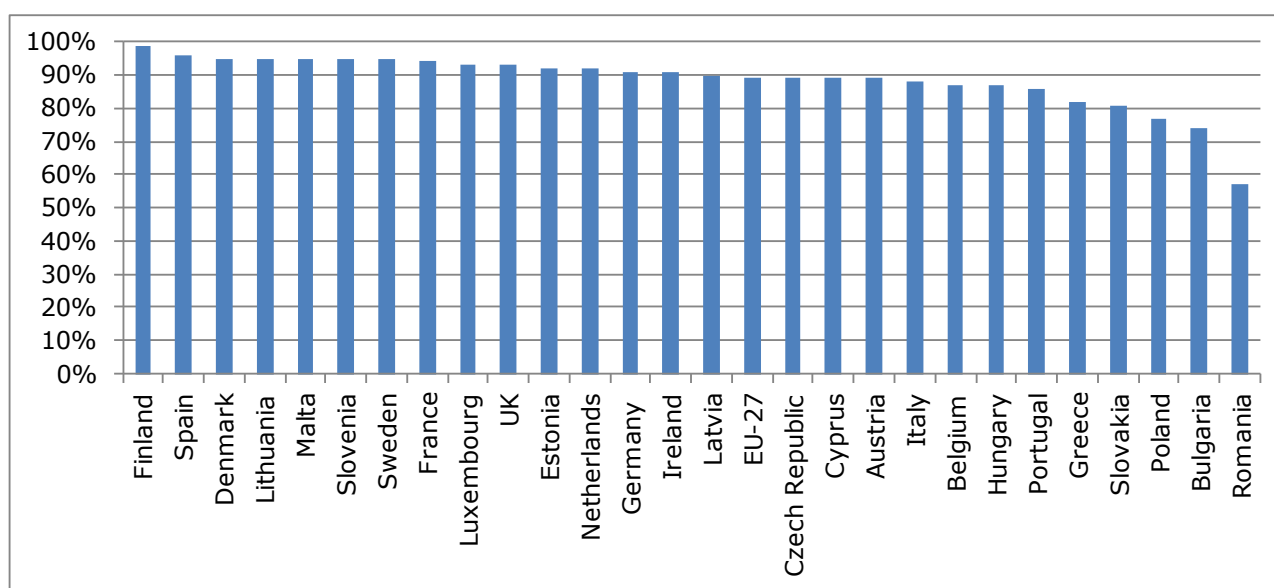
Another interesting indicator to look at is the share of online purchases made by individuals. In 2010 40% of Europeans made purchases online; however, this average is the result of countries with share of over 60% such as France, Sweden, the Netherlands, Luxembourg, the UK and Denmark, which are counterbalanced by countries with a very low share (below 15%) such as Romania, Bulgaria, Lithuania and Greece. The countries with a share above 60% are at the same time among those that are growing faster than the EU average. Belgium, Malta, Poland and Slovakia also recorded rapid growth in the percentage of the population shopping online between 2008 and 2010.

**Figure 7. Online purchases by private individuals, 2008-10**

**Source:** Eurostat - Community survey on ICT usage in Households and by Individuals

**Note:** share of persons who ordered goods or services over the Internet for private use in 2010 and average annual change, in percentage points

Besides the availability of physical ICT infrastructures and the level of access to and use of them by citizens, there is also another important indicator that captures the degree of relevance of ICT in a society: the access and use of ICT by business. Figure 88 shows that the share of enterprises with broadband access is quite high across Europe, indeed the EU-27 average is 90%. The countries with the lowest shares are Romania, Bulgaria and Poland.

**Figure 8. Percentage of enterprises with broadband access (fixed or mobile), 2011**

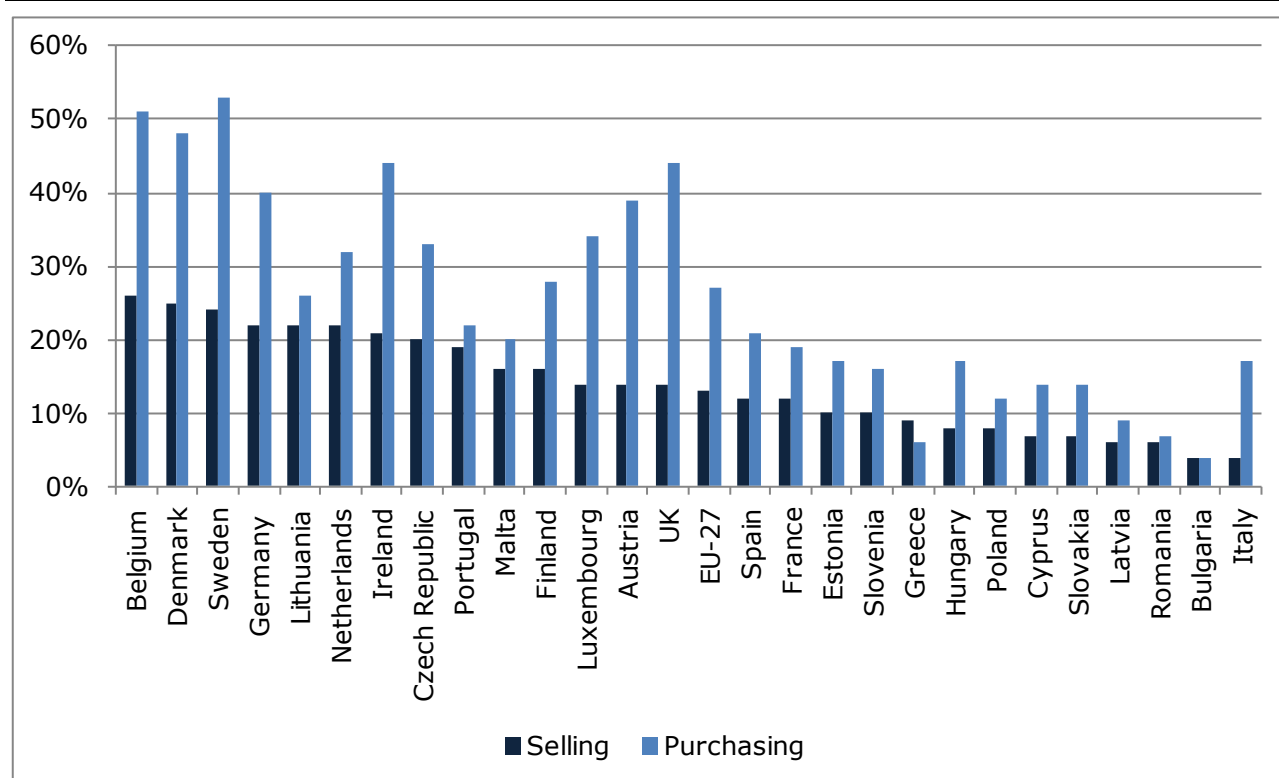
**Source:** Eurostat

**Note:** All enterprises, except the financial sector (10 or more persons employed)



As far as use is concerned, Figure 9 shows the share of enterprises selling and purchasing via the Internet and/or networks other than the Internet. In all the European countries the share of enterprises purchasing online is far higher than the share of enterprises selling online, except for Greece and Bulgaria. However, large differences exist across countries. Belgium, Denmark and Sweden are the best performing, while Greece, Latvia, Romania and Bulgaria record shares of lower than 10%.

**Figure 9. Enterprises selling and purchasing via the Internet and/or networks other than the Internet, 2010**



**Source:** Eurostat

**Note:** Percentage of enterprises selling/purchasing online (at least 1% of turnover). All enterprises, except the financial sector (10 or more employees)

### 1.3.2 ICT across the European Union – regional variations

The analysis of statistics on ICT at regional level is restricted to a number of core indicators for which regional data are available. In particular, the following four indicators were considered:

- Access to the Internet at home by household;<sup>32</sup>
- Access to the Internet via broadband by household;<sup>33</sup>
- Regular Internet users;<sup>34</sup>
- E-commerce by individuals.<sup>35</sup>

The maps provided in Figure 10 and 11 show that not all regions are equally successful in providing Internet access and broadband access to households. In general terms, the regional differences are quite large and the share of households with Internet access at home is higher than the share with broadband access. The regions with a percentage of Internet access above

<sup>32</sup> The percentage of households with access to the Internet at home.

<sup>33</sup> The percentage of households with access to the Internet at home via broadband (transfer speed of at least 144 Kbit/s).

<sup>34</sup> The percentage of individuals who used the Internet at least once a week within the three-month reference period.

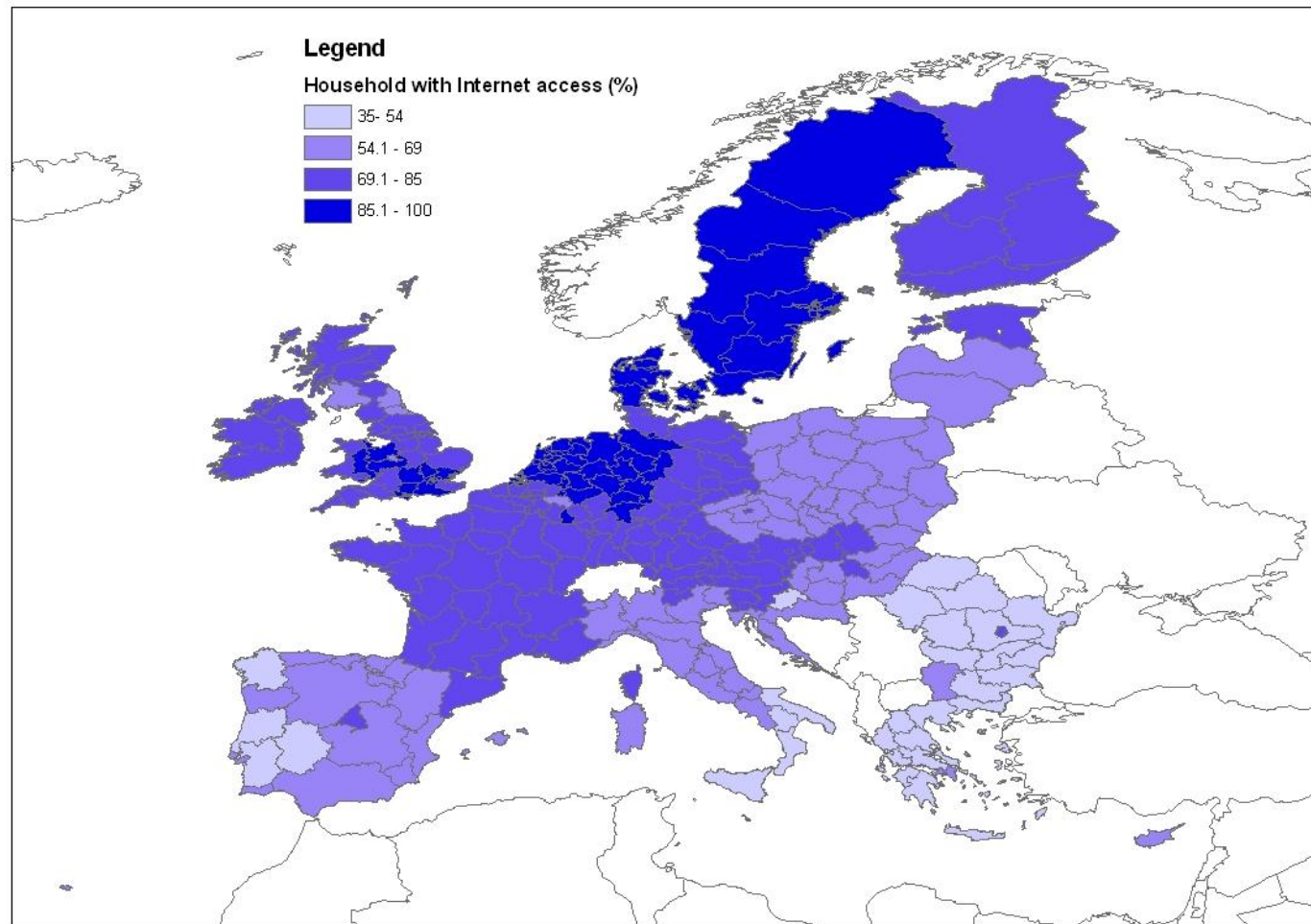
<sup>35</sup> The percentage of individuals who ordered goods and services over the Internet.

85% are all the regions of Sweden, Denmark and the Netherlands, the northern regions of Germany and some regions in the south of the UK. Instead, the regions with a high percentage of broadband access are few and are located in Sweden, Denmark, the Netherlands and North Rhine-Westphalia in Germany. The regions where half of the households have no Internet access are the southern regions of Italy (Sicily, Calabria, Molise and Puglia), Cornwall and the Isles of Scilly, North Eastern Scotland and Northern Ireland (UK) and all the regions of Greece (except Attiki), Bulgaria (except Yugozapaden), Romania (except Bucharest-Ilfov and Vest). Finally, there are some regions of Portugal and the Extremadura region of Spain that belong to the group with the lowest percentage of Internet access, but not to the group with the lowest percentage of broadband access.

Regular Internet use by individuals is defined as using the Internet at least once a week within a reference period of three months prior to the survey (see Figure 13). The regions with the highest percentage of regular Internet users (above 85%) are all the regions of Sweden, the Netherlands and Denmark, the southern and Eastern regions of Finland and a few regions of the United Kingdom such as the Highlands & Islands and Cumbria. Conversely, the regions with the lowest percentage (below 55%) are the eastern regions of Poland and all the regions of Portugal, Greece, Romania, Bulgaria (except Yugozapaden) and Italy (except Lazio, Lombardy, Veneto and the autonomous provinces of Trento and Bolzano).

Looking at e-commerce by individuals, we see from Figure 14 that the regions with the highest percentages (over 65%) of individuals who ordered goods and services over the Internet in the 12 months prior to the survey are almost all the regions of Denmark, the Netherlands and Sweden and the majority of the regions of Germany and the United Kingdom. In contrast, the southern regions of Spain, the eastern regions of Poland and all the regions of Portugal, Italy, Greece, Bulgaria, Romania, Lithuania, Latvia, Estonia and Hungary (except for Southern Transdanubia and Central Hungary) record the lowest percentages (below 25%) of individuals making online purchases.

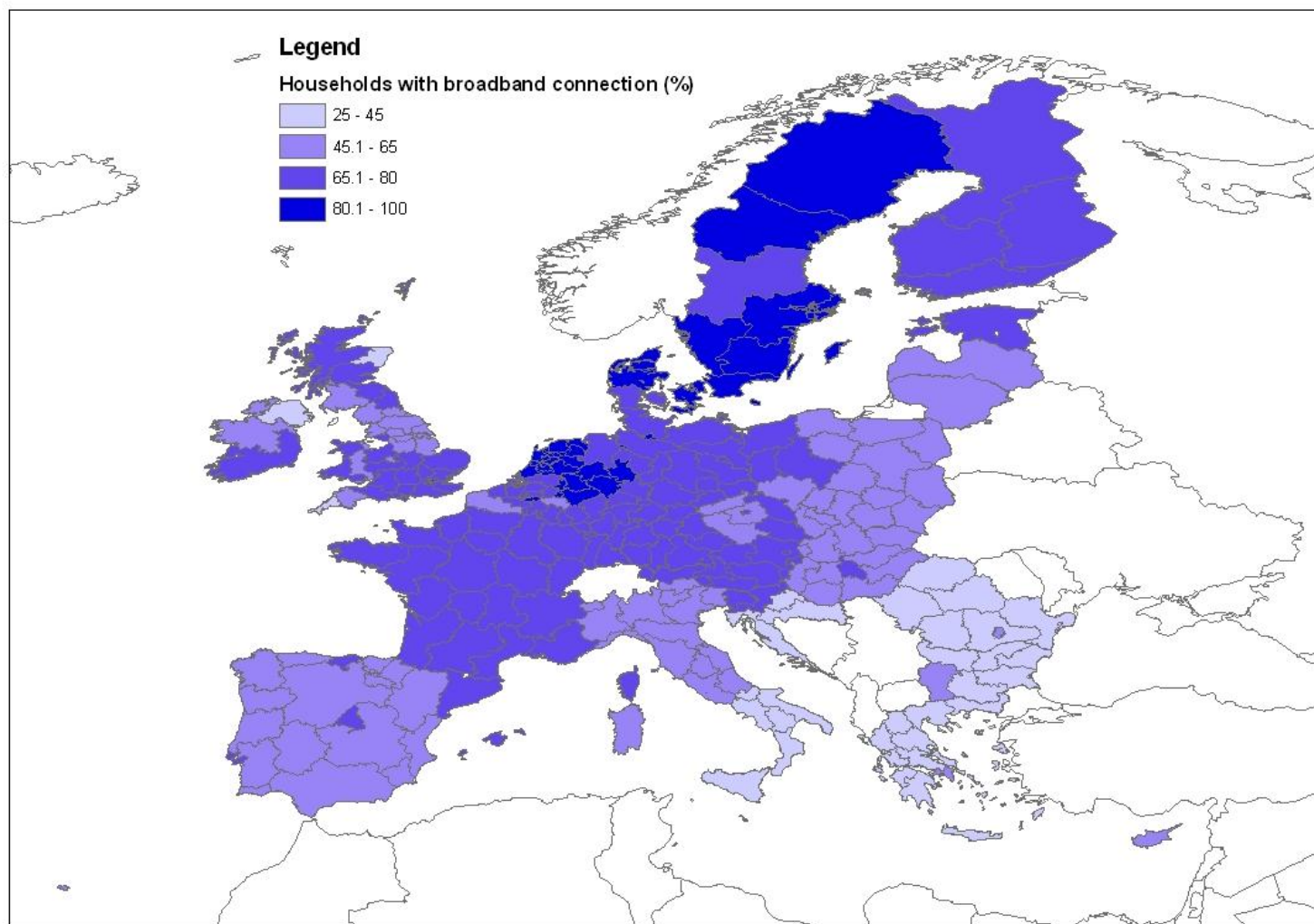
**Figure 10. Internet access in households by NUTS 2 region, 2011**



**Source:** Authors based on Eurostat (online data code: isoc\_r\_iacc\_h)

**Note:** Data for 2011 except for Åland (FI20) and Lincolnshire (UKF3), 2007; Devon (UKK4) and Highlands and Islands (UKM6), 2008; North Eastern Scotland (UKM5), 2006.

**Figure 11. Broadband access in households by NUTS 2 region, 2011**

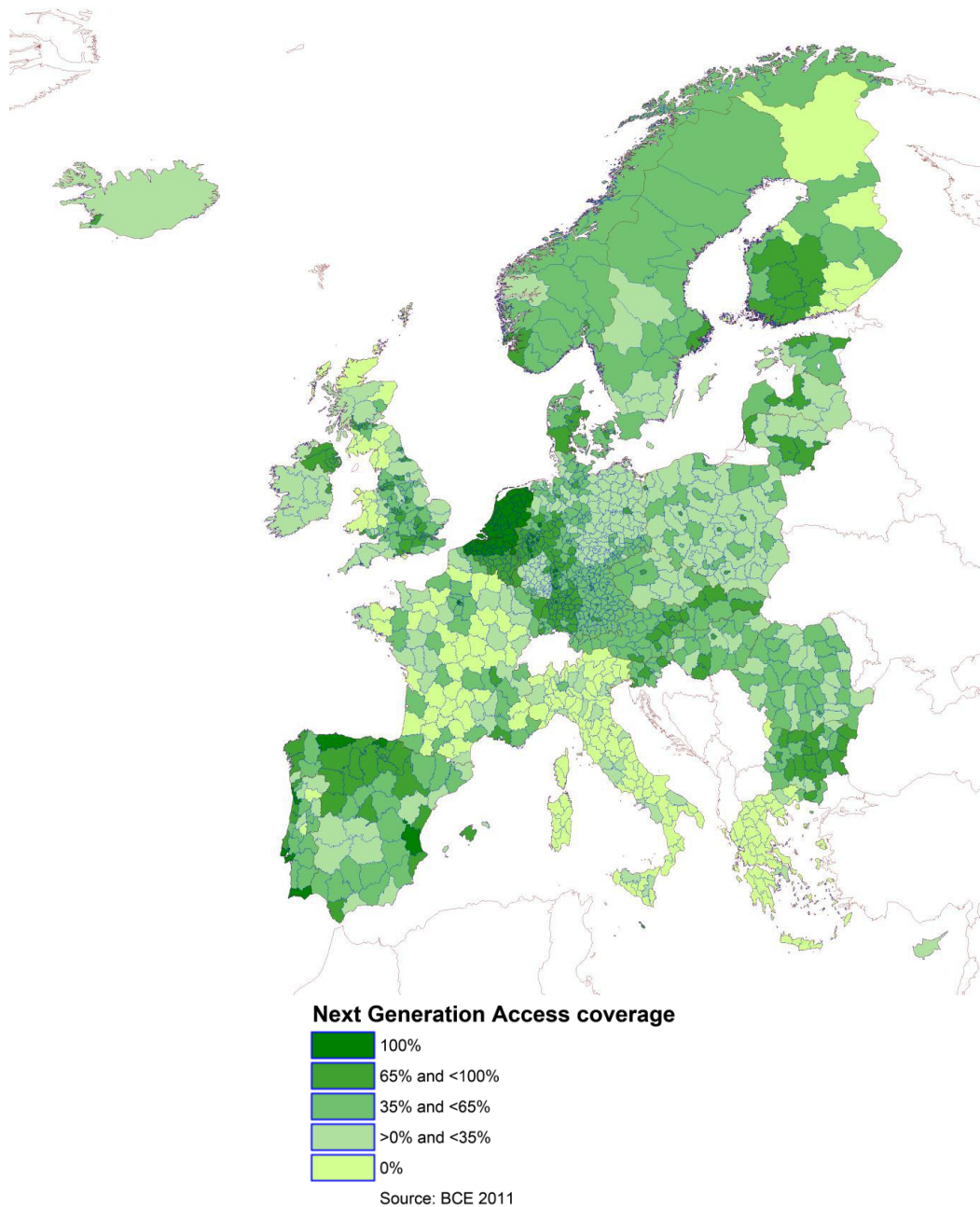


**Source:** Authors based on Eurostat (online Data code: isoc\_r\_broad\_h)

**Note:** Data for 2011 except for Åland (FI20), 2007; Devon (UKK4) and Highlands and Islands (UKM6), 2008; North Eastern Scotland (UKM5) and Lincolnshire (UKF3), 2006.

The next figure on NGA coverage (European Commission, 2012c) shows a wide variation across Europe. A few densely populated countries have almost 100% coverage, while 208 of the 1,324 NUTS 3 areas had 0% NGA availability at the end of 2011, many of them in Western Europe.

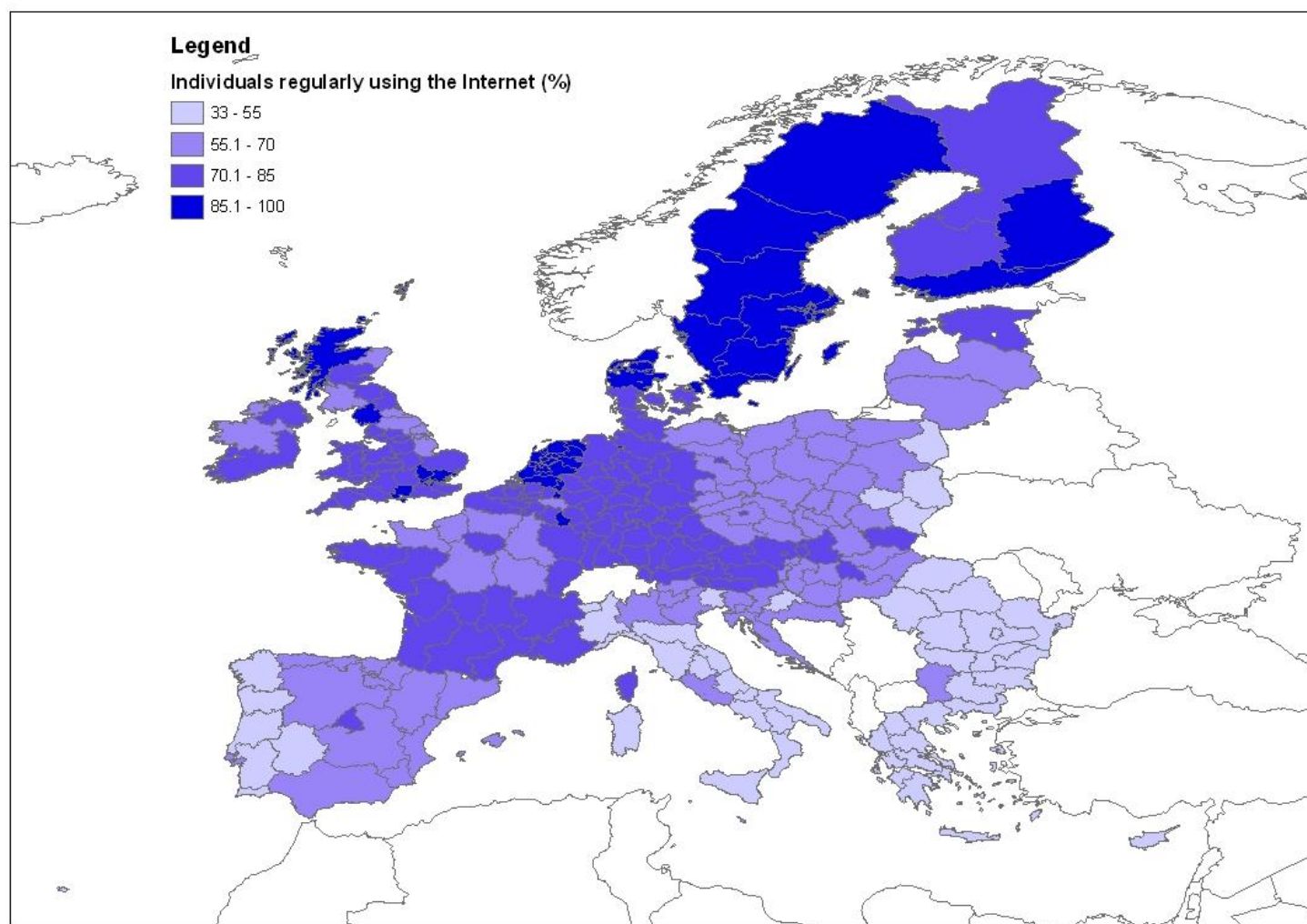
**Figure 12. Next Generation Access coverage**



**Source:** European Commission, Broadband coverage in Europe in 2011, 2012



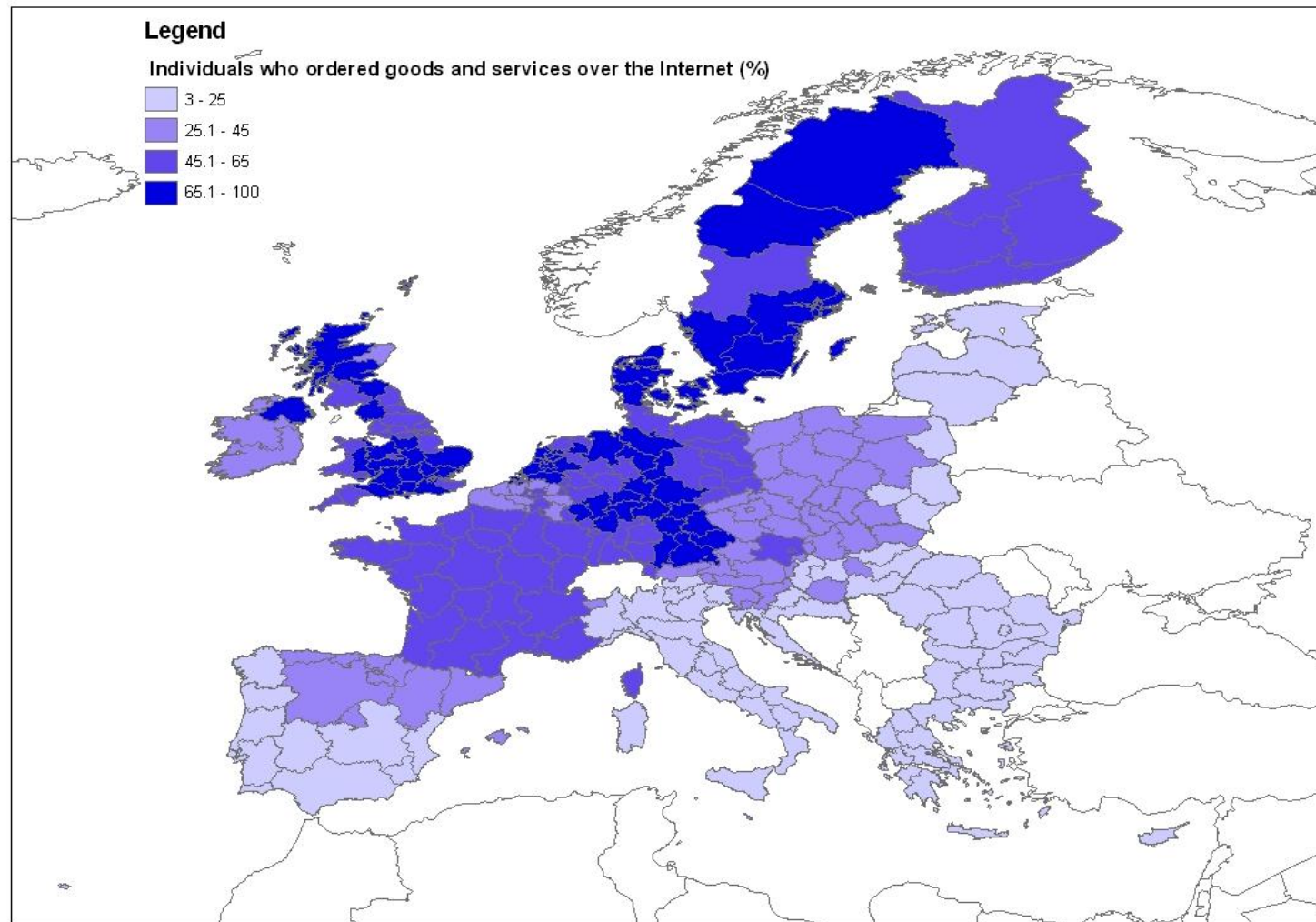
**Figure 13. Regular Internet users by NUTS 2 regions - 2011**



**Source:** Authors based on Eurostat (online data code: isoc\_r\_iuse)

**Note:** Data for 2011 except for Åland (FI20) and Lincolnshire (UKF3), 2007; Devon (UKK4) and Highlands and Islands (UKM6), 2008; North Eastern Scotland (UKM5), 2006. Regular use means using Internet at least once a week.

**Figure 14. E-commerce by NUTS 2 regions - 2011**



**Source:** Authors based on Eurostat (online data code: isoc\_r\_blt12\_i)

**Note:** Data for 2011 except for Åland (FI20) and Lincolnshire (UKF3), 2007; Devon (UKK4) and Highlands and Islands (UKM6), 2008; North Eastern Scotland (UKM5), 2006.

## **1.4 Concluding remarks**

According to both the empirical and the theoretical evidence, it is clear that ICT and the Internet influence economic growth, even though there are contrasting conclusions about the magnitude of these effects (and sometimes even their direction, positive or negative). The effects can be recorded at different levels: macroeconomic, industry and firm-level, not forgetting the wider systemic effects on the economy and society as a whole. For this very reason, there is justification for referring to the “Information Society” to account for the all-encompassing and pervasive influence ICT developments might bring about.

In fact, there are important conditions that need to be fulfilled if the expected growth effects of ICT developments are to materialise. Features such as complementary investments, institutional and regulatory framework, and other “soft factors” like openness to new ideas, innovation culture, social capital etc., which assume particular relevance at regional level, are important in this respect. The significance of factors at regional level is illustrated by the finding that investment in ICT can contribute more to regional growth than other capital investment.

The differing abilities of countries and regions to meet such conditions are decisive and account for the fact that ICT developments might trigger a wider growth effect in one country or region than in others. As documented by the available indicators for “ICT endowment” (i.e. ICT infrastructure and equipment, as well as digital literacy and the ICT skills that make it possible to effectively use the former), the benefits of ICT diffusion are unevenly distributed. Overall, the EU as a whole has a lower ICT endowment than that of its main competitors and its performance is uneven with wide disparities between and within Member States, and between and within its regions.



## CHAPTER 2 - THE DIGITAL AGENDA FOR EUROPE AND THE REGIONS

### KEY FINDINGS

- The overall objective of the DAE is to maximise the social and economic potential of ICT. It is built around seven pillars under which 101 actions have been designed.
- The implementation of DAE actions is shared between the European Commission (EC) and the Member States. Seventy-eight of the 101 actions are the responsibility of the EC and the remaining 23 the responsibility of MS. A sustained level of commitment is also required at regional level.
- A regional approach to Information Society policies is important not only to help laggard regions to catch up with the more prosperous ones, but also to avoid the danger of a “digital divide” within the same region. Also, the regional level is particularly appropriate for identifying the opportunities offered by the IS.
- Since the 1990s the Information Society has been considered as one of the main drivers of regional development. Starting with the programming period 2000-2006, Structural Funds have been perceived as crucial both to encourage ICT supply and to catalyse latent ICT demand in European regions.
- Over the period 2007-2013 a total of €15.6 billion of ERDF and €128 million of ESF were allocated to the Information Society in all MS and cross-border programmes. Large differences in SF allocation exist among countries as well as among regions.

### 2.1 The DAE strategy

#### 2.1.1 The origin of the DAE strategy: previous steps

In the 1990s, when ICT started to produce social and economic changes and play an increasingly important role in society, many countries and international institutions began to prepare plans and programmes for exploiting the potential of ICT. Examples are: the EU White Paper on growth, competitiveness and employment (1993), the US Clinton-Gore initiative on information superhighways (ISHs) in 1996 and the subsequent Japanese, Singaporean and South Korean plans. The European Union has placed increasing emphasis on the Information Society over the last two decades and it has become a key policy area since the 1990s. The process has been marked by important milestones that have paved the way for the strategy currently included in the Digital Agenda for Europe. Indeed, the Digital Agenda comes from quite a long series of policy documents dealing with the theme of the IS. In particular, it follows the “i2010 – A European Information Society for growth and employment” that constituted the policy framework for the period 2005-2009 and which, in turn, comes from the e-Europe 2005, e-Europe 2002 and e-Europe initiatives (see Box 1).

### Box 1. Milestones in the EU Information Society Policy Framework

**1993 – European Commission White Paper entitled “Growth, competitiveness and employment: the challenges and ways forward into the 21st century”.**<sup>36</sup> This document stressed the importance of developing a pan-European information infrastructure to spur European economic growth and competitiveness.

**1994 – European Council report entitled “Europe and the global Information Society” (the so-called Bangemann report).**<sup>37</sup> This document emphasised the urgency of actions to enhance the international competitiveness of European enterprises. In this frame of reference, the report recommended that market mechanisms should be preferred to finance information infrastructure, while the European Commission and the national governments should focus on actions to stimulate demand. Therefore, the Bangemann report is the document that marks the shift from a focus purely on infrastructure provision towards other, demand-side initiatives.<sup>38</sup>

**1994 – European Commission Action Plan “Europe’s way to the Information Society”.**<sup>39</sup> It was a two-year action plan that provided a general framework within which Information Society actions could be structured and consolidated.

**1996 – European Commission Communication “Information Society: From Corfu to Dublin – the new emerging priorities”**<sup>40</sup> was an update and a revision of the Action Plan of 1994.

**1996 – European Commission Green Paper on “Living and working in the Information Society: People First”.**<sup>41</sup> This was the first document to highlight the key social challenges linked to the development of the Information Society. It was followed by other documents such as the “Building a European Information Society for us all”<sup>42</sup> and the “Cohesion and the Information Society” reports.<sup>43</sup>

**1998 – European Commission Multiannual Community Programme (1998-2002) to stimulate the establishment of the Information Society in Europe.**<sup>44</sup> In the framework of this programme, the European Union allocated Ecu 25 million to various awareness measures and analyses of the technical, economic, social and regulatory aspects of ICT development in Europe.<sup>45</sup>

**1999 – European Commission Communication on the initiative “e-Europe – An Information Society for All”.**<sup>46</sup> This was a political initiative aimed at accelerating Europe’s transformation to an Information Society and at ensuring that the European Union fully benefits from the changes that the IS brings. The key objectives of the initiative were: 1) to bring every citizen, home and school, every business and every administration into the digital age and online; 2) to create a digitally literate Europe, supported by an entrepreneurial culture ready to finance and develop new ideas; 3) ensure that the whole process is socially inclusive, builds consumer trust and strengthens social cohesion. To achieve these objectives, the Commission proposes joint actions between itself, the Member States, industry and the citizens of Europe on ten priorities.

<sup>36</sup> European Commission (1993).

<sup>37</sup> European Council (1994).

<sup>38</sup> Taylor et al. (2001).

<sup>39</sup> European Commission (1994).

<sup>40</sup> European Commission (1996a).

<sup>41</sup> European Commission (1996b).

<sup>42</sup> European Commission (1997a).

<sup>43</sup> European Commission (1997b).

<sup>44</sup> Council Decision 98/253/EC of 30 March 1998.

<sup>45</sup> Dabinett (2001).

<sup>46</sup> European Commission (1999b).

**2001 – European Communication “e-Europe 2002 Action Plan: An Information Society for All”.**<sup>47</sup> It was the first phase of the e-Europe initiative and it targeted three areas: 1) cheaper, faster and more secure Internet, 2) investing in people and skills, and 3) stimulating the use of the Internet.

**2002 – European Communication “e-Europe 2005 Action Plan: An Information Society for All”.**<sup>48</sup> It aimed to stimulate positive feedback between infrastructure upgrading and service development. More precisely, it set out to create more favourable conditions for the deployment of infrastructure – often called the “supply side” of the broadband equation – and to support the development of services – the “demand side” – within a more secure digital environment. Finally, it also attempted to make the benefits of the Information Society available to socially excluded groups and people with special needs.

**2005 – European Commission Communication “i2010 – A European Information Society for Growth and Employment”.**<sup>49</sup> It was the EU policy framework for the Information Society and media for the period 2005-2009. It promoted the positive contribution that ICT can make to the economy, society and personal quality of life. With this, the Commission set up a High Level Group of Member States' representatives in charge of advising the Commission on the implementation and development of the i2010 strategy.

**Source:** Authors base on Taylor et al. (2001) and EU Information Society website

### 2.1.2 The objectives and content of the Digital Agenda for Europe

In June 2010 the European Commission laid down a long-term initiative, the so-called ‘Digital Agenda for Europe’.<sup>50</sup> The overall objective of the Digital Agenda for Europe (DAE) is to maximise the social and economic potential of ICT. In order to do this it is necessary to fill the ICT gaps that still exist between and within EU Member States and to increase the volume of investments in the sector, so as to approach the levels of digitalisation of other EU industrial partners.

The DAE is part of a wider European strategy. It is one of the seven flagship initiatives of the Europe 2020 Strategy, which aims to create the conditions for smarter, sustainable and more inclusive growth in the European Union, allowing Member States to better react to the difficulties resulting from the economic crisis.<sup>51</sup> The Internet and the common digital market are expected to make significant direct or indirect contributions to the achievement of these broad development objectives.<sup>52</sup>

The DAE is based on the idea that a virtuous cycle needs to be created. Indeed, an interoperable and borderless Internet system favours the creation of attractive contents and services that in turn stimulate demand for high speeds and capacity. Thanks to the increasing demand, investments in faster networks may be sustainable and this, in turn, stimulates the creation and delivery of innovative services.

<sup>47</sup> European Commission (2001).

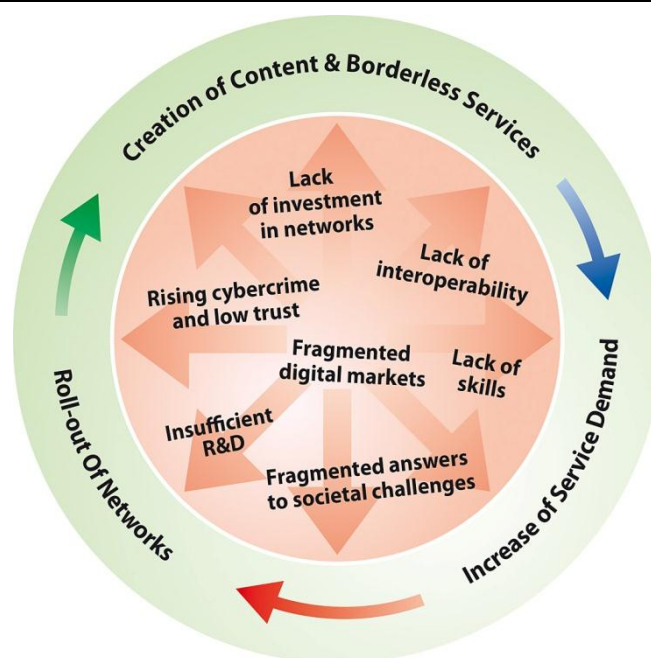
<sup>48</sup> European Commission (2002).

<sup>49</sup> European Commission (2005).

<sup>50</sup> European Commission (2010a).

<sup>51</sup> Europe 2020 is the EU's growth strategy for the current decade. The strategy focuses on five objectives: increasing employment, stimulating R&D investment, improving education, tackling and preventing the effects of climate change and reducing poverty and social exclusion. Each Member State adopted its own national targets for each objective.

<sup>52</sup> For instance, enlarging the coverage of Internet services and applications will support regional social inclusion and may also favour education (through the diffusion of online academic courses); reducing energy use in lighting will improve energy efficiency; increasing ICT R&D public spending will help to achieve the target of 3% of the EU's GDP to be invested in R&D.

**Figure 15. The virtuous cycle of the digital economy**

**Source:** The European Commission, 2012, A Digital Agenda for Europe

Together with the virtuous cycle, the Commission identified the seven most significant weaknesses affecting the digital market in Europe that need to be addressed and counteracted through targeted interventions by the European institutions and Member States. These weaknesses are:

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

Thus, the framework of the Digital Agenda is built around the need to tackle these seven problem areas and for this reason it contains seven pillars that focus on the improvement of both the 'hard' and 'soft' factors related to ICT. The former category includes improvements in ICT infrastructure, the latter actions such as enhancement of digital literacy and skills and improvement of interoperability, standards and security against cybercrime. Figure 16 presents the overall objectives, the seven pillars and the related targets to be achieved by the Digital Agenda programme.

Under each pillar, a number of actions have been designed to leverage the supply side and the demand and take-up of ICT. Indeed, the development of supply and demand for ICT has relevant impacts on the economic system. Annex 3 provides a list of the 101 specific policy actions foreseen by the European Commission across the seven pillars.

**Figure 16. Measurable targets and final objectives of the Digital Agenda**

OBJECTIVES	PILLARS	MEASURABLE TARGETS			
<ul style="list-style-type: none"><li>➤ Opening of new market opportunities</li><li>➤ Increase in enterprises' turnover and productivity</li><li>➤ Increase in social inclusion</li><li>➤ Increased and better conditions for innovation</li><li>➤ Energy efficiency</li><li>➤ Increase in goods, services, and information exchanges</li><li>➤ Improved efficiency of enterprises and Public Administration</li></ul>	1 – Digital single market	33% of SMEs selling online	20% of pop. buying online cross border	50% of pop. buying online	Roaming at national prices
	2 – Interoperability and standards				
	3 – Trust and security				
	4 – Fast and ultrafast Internet access	Basic broadband for all by 2013	Fast broadband for 100% of EU citizens by 2020	Ultra fast broadband for 50% of EU households by 2020	
	5 – Research innovation	100% increase in ICT R&D public spending			
	6 – Enhancing digital literacy, skills and inclusion	75% of pop. using internet regularly	15% of pop. never having used the internet		
	7 – ICT-enabled benefits for EU society	20% reduction in energy use on lighting	50% of pop. using e-government	25% of pop. using e-gov. and returning forms	Online availability of key cross-border public services

Source: Authors

The first pillar contains actions to foster the digital single market. This should be achieved, on the one hand, by eliminating regulatory barriers through simplifying copyright clearance and management and cross-border licensing; and on the other, by facilitating electronic payments and invoicing. Moreover, since the European online market suffers from lack of user trust in terms of security of payments and privacy, the Commission needs to review the EU data protection regulatory framework, publish an online Code of EU Online Rights and introduce an EU online trustmark. Finally, telecommunication services should be unified.

The second pillar concerns the enhancement of the interoperability of devices, applications, data repositories, services and networks across Europe. In order to do this, the Commission will continue to review its standard-setting policy and to promote the appropriate rules for intellectual property rights.

The third pillar involves online trust and security. The Commission is determined to combat cybercrime, child pornography and breaches of privacy and personal data security. In this regard, a lot of measures and initiatives are foreseen at Commission level, however, in parallel, member States are required to take measures to establish a well-functioning network at national level linked to the European one, and to carry out large-scale cyber attack simulations. In particular, the national alert platforms should be adapted to the Europol cybercrime platform.

The fourth pillar pertains to the provision of fast and ultra fast Internet access for all by 2020. In this regard the EU will guarantee universal broadband coverage by 2013 and establish next generation access networks (NGAs) to increase speeds by 2020; also, the Commission intends to reinforce its radio spectrum policy. In order to finance investment in broadband, the Commission intends to use European funds (ERDF or EAFRD, in particular).

The fifth pillar deals with increasing the share of investments in research and innovation in ICT, which is still insufficient compared to Europe's major trading partners. In this regard, the Commission intends to encourage private investment and to double public expenditure to develop ICT.

The sixth pillar involves enhancing digital literacy and increasing the e-skills and inclusion rates. In order to promote digital literacy and skills, especially for employment purposes, the Commission proposes to give priority to digital literacy and skills through the European Social Fund. It also wishes to develop tools to identify and recognise the skills of ICT practitioners and users. In parallel, Member States should implement long-term policies specifically targeting SMEs and disadvantaged groups. Also Member States have to implement provisions for disability in the Telecoms Framework and the Audiovisual Media Services Directive.

Finally, the seventh pillar concerns exploiting the potential offered by the use of ICT in the following areas: 1) climate change, through partnerships with emitting sectors; 2) managing ageing populations, through e-health and telemedicine systems and services; 3) digitisation of content, through the 'Europeana' digital library; 4) e-government; and 5) Intelligent Transport Systems, by applying the proposed Directive.<sup>53</sup>

### 2.1.3 Shared management and funding

The implementation of the above DAE's pillars and corresponding actions is shared between the European Commission and the Member States. Indeed, out of the 101 actions, 78 are the responsibility of the EC and the remaining 23, distributed across the seven pillars, are the responsibility of Member States (see Table 2 below). The EU monitors the implementation of the 23 Actions that are the direct responsibility of the Member States, and their progress towards the objectives (see Annex 4.). To reach the objectives, MS have to follow EU policy recommendations using the national policy instruments and regulations.

**Table 2. Actions under the responsibility of Member States**

PILLARS	TOTAL NO. OF ACTIONS	ACTIONS UNDER THE RESPONSIBILITY OF THE MS
I. Digital Single Market	21	Action 10: Member States to implement laws to support the Digital Single Market Action 11: Member States to transpose the VAT Directive
II. Interoperability and Standards	7	Action 26: Member States to implement European Interoperability Framework Action 27: Member States to implement Malmö and Granada declarations
III. Trust and Security	14	Action 38: Member States to establish pan-European Computer Emergency Response Teams Action 39: Member States to carry out cyber attack simulations Action 40: Member States to implement harmful content alert hotlines Action 41: Member States to set up national alert platforms
IV. Fast and ultra-fast Internet access	8	Action 46: Member States to develop national broadband plans Action 47: Member States to facilitate broadband investment Action 48: Use Structural Funds to finance the roll-out of high-speed networks Action 49: Member States to implement European Spectrum Policy Programme (ESPP)

<sup>53</sup> [http://europa.eu/legislation\\_summaries/information\\_society/strategies/si0016\\_en.htm](http://europa.eu/legislation_summaries/information_society/strategies/si0016_en.htm)



V. Research and innovation	7	Action 55: Member States to double annual public spending on ICT R&D Action 56: Member States to engage in large-scale pilot schemes financed by the Competitiveness and Innovation Programme
VI. Enhancing digital literacy, skills, and inclusion	12	Action 66: Member States to promote long-term e-skills and digital literacy policies Action 67: Member States to implement provisions on disability in Telecoms Framework and Audiovisual Media Services (AVMS) Action 68: Member States to mainstream e-learning in national policies
VII. ICT enabled benefits for EU society	28	Action 73: Member States to agree on common additional functionalities for smart meters Action 74: Member States to include specifications for total lifetime costs for public lighting in public procurement Action 89: Member States to make e-government services fully interoperable Action 90: Member States to ensure that Points of Single Contact function as fully fledged e-government centres Action 91: Member States to agree a common list of key cross-border public services Action 96: Member States to fulfil obligations under European Rail Traffic Management System (ERTMS)

**Source:** Authors based on [www.ec.europa.eu/digital-agenda/en/our-goals](http://www.ec.europa.eu/digital-agenda/en/our-goals)

**Note:** this table only includes the number of actions under the seven pillars of the DAE. Thus, it does not include the four actions of the DAE classified under the «international» label.

A sustained level of commitment is also required at regional level since the role of the regions is fundamental for achieving an even distribution of the benefits resulting from the implementation of the Digital Agenda.

Overall, the main funding sources made available by the EU to ensure the delivery of the Digital Agenda initiative are the Structural Funds. The European Regional Development Fund (ERDF), in particular, plays a primary role in financing local, regional, national and cross-border Information Society measures. A supportive role to the achievement of the Digital Agenda's objective is ensured by the European Social Fund (ESF), which finances interventions to promote education, skills and social inclusion. Over the period 2007-2013 €15.6 billion of ERDF and €128 million of ESF were dedicated to the Information Society in all Member States and cross-border programmes. The Cohesion Fund also participates in financing ICT projects, mainly concerning hard infrastructures. Other non-Cohesion Policy instruments are relevant for the achievement of the Digital Agenda's objectives. The European Agricultural Fund for Rural Development (EAFRD) provides support for ICT in the agricultural sector, particularly regarding the improvement of infrastructures and the facilitation of broadband investment.

In addition, in order to deal with the implementation of the objectives and actions under the direct responsibility of the EU, the EU can rely on a number of funding programmes managed by the European Commission and developed with reference to specific programming periods. The funding programmes aimed at achieving the DAE objectives are:

1. For the current programming period (2007-2013):
  - a. Seventh Framework Programme (FP7) for research with €9.1 billion reserved for ICT;
  - b. ICT Policy Support Programme developed under the Competitiveness and Innovation Framework Programme (CIP) aimed at stimulating a wider uptake of innovative ICT-based services and the exploitation of digital content across Europe by citizens, governments and businesses, in particular SMEs.
  - c. Safer Internet Programme aimed at fighting harmful conduct.

2. For the next programming period (2014-2020):
  - d. Horizon 2020 is the new EU programme for research and innovation running from 2014 to 2020 with an €80 billion budget.
  - e. Connecting Europe Facility (CEF) is a programme with a €29.3 billion budget aimed at boosting transport, energy and digital networks, removing bottlenecks and filling in the missing gaps in the EU's Single Market.<sup>54</sup>

#### 2.1.4 Performance and mid-term review

A Scoreboard<sup>55</sup> is prepared annually by the European Commission to assess progress with respect to the specific and measurable targets set out in the Digital Agenda, and it provides detailed data on all the policy areas covered and the gaps that still need to be filled. The 2012 Scoreboard states that the Commission has so far completed 34 actions, while 15 have been delayed or are at risk of being delayed. The remaining 52 actions are on schedule for completion by their respective deadlines. A table in Annexe 4 presents the current state of implementation of the actions under the responsibility of MS.

According to the Scoreboard, on the whole, the EU performance of the Digital Agenda is currently far from satisfactory. For example, two of the key Agenda objectives are to provide all European Union citizens with basic broadband coverage by 2013 and broadband speeds of at least 30 megabits per second by 2020.<sup>56</sup> Although standard broadband is already available for the great majority of EU homes (the coverage of fixed broadband networks was stable in 2011 at 95%), most of the countries are still far away from the speed objectives set by the Digital Agenda for 2020 (see Chapter 1). True, high-speed broadband coverage continues to grow, and the percentage of households with access to superfast connections (above 100 Mbps) has nearly doubled, but its market share remains very low and covers only 1.3% of households. EU investment in high speed Internet is not dynamic enough (57% of households subscribe to fibre in South Korea and 42% in Japan).

The NGA coverage shows wide variations across Europe.<sup>57</sup> A few densely populated countries are near 100% coverage, while 208 of the 1,324 NUTS 3 areas had 0% NGA availability at the end of 2011, many of them in Western Europe. Interestingly, this is a field in which the Eastern side of the EU is taking the lead. Some of the Eastern European countries (Lithuania, Bulgaria and Slovenia) have seized the opportunity to overcome the deficiencies of their legacy networks by rolling out fibre.

In addition, the large share of Europeans who have never used the Internet (24%) and the low proportion of SMEs selling their products online both provide evidence of the still limited relevance of the exchange processes.

Finally, the use of online public services for both citizens and businesses is stagnant at 41%. It might be considered that the consequence is an overall impact of ICT on productivity that is much lower in the EU than in the USA, and with a widening productivity gap. Indeed, the productivity of the ICT industry and the overall efficiency of the production process (in terms of multifactor productivity) show weaker performances in the EU, especially in the service industry (trade, finance, business services).

<sup>54</sup> The CEF budget amounts to €29.3 billion, of which €1 billion is available for investment in high-speed broadband infrastructure and digital services. The initial proposed budget was €50 billion.

<sup>55</sup> See Digital Agenda Scoreboard (2012) available from <https://ec.europa.eu/digital-agenda/en/scoreboard>.

<sup>56</sup> While Standard Broadband includes the main fixed-line technologies that are capable of providing basic broadband of at least 144 Kbps download speed for end-users, NGA Broadband includes the technologies that are needed to meet the Digital Agenda's objective of 30 Mbps.

<sup>57</sup> See European Commission (2012).



In 2012 the DAE was subject to a mid-term review, which refocused the Digital Agenda to better stimulate the digital economy. The Digital Agenda has delivered and is broadly on target, but this relative success calls for more to be done to achieve a virtuous cycle linking infrastructure, content, services, the market and innovation with greater productivity and growth.

Given the recent technology trends, on 18 December 2012 the European Commission presented a Communication refocusing the Digital Agenda in the following areas in order to better stimulate the digital economy:

- Strengthening the digital single market for content and services;
- Speeding up public sector innovation enabled through interoperable ICT;
- Regaining world leadership for network services, by stimulating private investment in high-speed fixed and mobile broadband networks;
- Fostering a secure and trustworthy Internet environment for users and operators;
- Establishing a coherent framework and conditions for cloud computing services;
- Support the proliferation of digital skills, to fill the gap between demand and supply of ICT professionals;
- Implementing an ambitious strategic research and innovation policy based on funding key enabling technologies.

All pending actions from the original Digital Agenda will be delivered, while the Communication proposes a package of specific actions supporting one key transformative action per domain. Overall, the *"full implementation of this updated Digital Agenda should increase European GDP by 5%, or €1,500 per person, over the next eight years, by increasing investment in ICT, improving e-skill levels in the labour force and reforming the framework conditions for the Internet economy. In addition, massive gains in productivity in traditional industries are expected by the introduction of Internet-related processes"*.<sup>58</sup>

## 2.2 The DAE and the regions: a logical model

### 2.2.1 An appropriate level of action

The idea that the regional level is particularly appropriate for tackling ICT development is not recent. Interestingly, in parallel with the development of the pan-European initiatives, the DAE recognised early on that the regional level would be pertinent for carrying out plans and programmes in support of the Information Society. In the mid-1990s, when the IS reached the top of the policy agenda at EU level and when the EU Cohesion Policy began to consider the IS as one of the main drivers of regional development,<sup>59</sup> the need to adopt comprehensive regional IS strategies became necessary and critical.

A series of pilot exercises and policy experiments began. The first experimental actions were launched in late 1994 in the framework of the Interregional Information Society Initiative (IRISI). This initiative involved six less-favoured regions<sup>60</sup> of Europe that agreed to work with each other and the European Commission to develop a strategy for exploiting the new opportunities of the IS in order to re-engineer their failing economies and fractured societies.<sup>61</sup> Based on the IRISI experience, the Regional Information Society Initiative (RISI) was launched

<sup>58</sup> Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, The Digital Agenda for Europe - Driving European growth digitally, Brussels, 18.12.2012 COM(2012) 784 final.

<sup>59</sup> See for instance European Commission (1997a) and the European Commission (1997b).

<sup>60</sup> Central Macedonia (Greece), Nord Pays de Calais (France), North West England (UK), Piedmont (Italy), Saxony (Germany) and Valencia (Spain).

<sup>61</sup> Dabinett (2001).

in 1997 with a total budget of Ecu 20 million. In particular, it was financed through Article 10 of the ERDF and Article 6 of the ESF. Under the initiative there were two lines of action. The first provided support for multiregional initiatives focused on demonstrating best practices in the use of ICT in key sectors; the second aimed at integrating the concept of the IS into regional economic development and employment policies.<sup>62</sup>

Both the RISI and IRISI required that regions should have Less Favoured Region (LFR) status in order to be eligible to receive support. The rationale behind this was that the IS could help laggard regions to accelerate development and to catch up with the other prosperous regions in terms of economic performance and social cohesion. Moreover, within these initiatives the LFRs were assisted in developing their strategic planning competences in order to set up regional digital strategies consistent with their needs.

Following these initiatives, the European Cohesion Policy has been oriented towards the IS starting from the programming period 2000-2006. This was motivated by the recognition that a region's competitiveness lies in its potential for innovation and that new technologies can be an instrument for social integration - or a source of exclusion if not available to all. As a consequence, since the beginning of the century, the Structural Funds have been perceived as crucial not only to encourage the supply side of the IS but also, and especially, to catalyse latent demand, which, although potentially huge, is still currently relatively weak in some regions.<sup>63</sup>

In the framework of the European Cohesion Policy, the adoption of a regional approach to Information Society policy is not only important to help laggard regions to catch up with the more prosperous ones, but also to avoid the danger of a 'digital divide' within the same region. The term 'digital divide' refers to many different situations where a gap exists between two groups of people or geographical areas in terms of diffusion of ICT infrastructure, accessibility and skills (see Glossary in Annexe I).

As a result, regional investment in the IS should have a prominent role in LFRs characterised by geographical isolation and low density of population, features that make the cost of upgrading the existing infrastructure to broadband capability unsustainable. Indeed, in these regions there is clearly a risk that, because investment is potentially unprofitable in the short-term, the realisation of some expensive ICT infrastructures may be endangered in the long-term.

Already in the communication on "Cohesion and the Information Society" of 1997 there is the recognition that the regional level is the most appropriate for identifying the opportunities offered to it by the Information Society. Indeed, 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>64</sup> Following this belief, European regions are considered to be crucial nodes of Digital Agenda implementation since they 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.<sup>65</sup>

<sup>62</sup> Taylor et al. (2001).

<sup>63</sup> Technopolis et al. (2002).

<sup>64</sup> European Commission (1997b) p. 11.

<sup>65</sup> Technopolis et al. (2002) p.10.

The idea that if the Digital Agenda doesn't "go local" then it fails,<sup>66</sup> is also embedded in several recent initiatives. First of all, in order to discuss how the DAE might be revised to provide more of a local element, the "DAE Goes Local" event was organised in Brussels on 4/5 April 2010. Then, in autumn 2010 the European Commission carried out the so-called "Going Local" exercise. It consisted of visiting the main stakeholders in each Member State in order to raise awareness of the DAE, and to generate support for DAE actions. Finally, in autumn 2011, 'Going Local II' was organised in the wake of the previous edition, but with a greater focus on the specific priorities in the Member States. "Going local" events are also organised by Member States in order to promote and support the implementation of the DAE at local level.<sup>67</sup>

## 2.2.2 Areas of intervention at regional level under the DAE

The different pillars described above cover different areas in which the EU and EU countries and regions are encouraged to intervene. Here follows a description of the possible area of interventions that can be mobilised at regional level, and that are expected to foster regional development.

**Broadband investment.** Broadband is a high-speed and high-capacity transmission medium that can carry signals from multiple independent network carriers. This is done through a single coaxial, fibre-optic cable, twisted pair or wireless connection by establishing different bandwidth channels. Broadband technology can also support a wide range of frequencies and it is used to transmit data, voice and video simultaneously over long distances.

Broadband is often defined as download speeds of at least 256 kilobits per second (Kbit/s),<sup>68</sup> this is the definition used by many organisations such as the OECD, the United Nations Conference on Trade and Development, and the Partnership for Measuring ICT for Development. However, the definition of broadband based on the speed aspect is not so commonly shared since it may not keep pace with technological advances or with the speeds that services and applications require in order to function properly.<sup>69</sup>

In order to measure the infrastructure development of broadband, two aspects have to be considered: first, the coverage, which represents the availability of the broadband infrastructure, and second, the penetration, which represents the actual broadband connectivity among a population or businesses.<sup>70</sup>

Within the Digital Agenda framework, three types of broadband are identified: basic, fast and very fast broadband. In particular, the objectives of the DAE are: 1) to bring basic broadband to all Europeans by 2013; 2) to ensure that all Europeans have access to fast Internet (above 30 Mbps) by 2020; and 3) ensure that 50% or more of European households subscribe to very fast Internet connections (above 100 Mbps) by 2020.

In order to achieve these objectives a mix of investments in different kinds of technologies is needed. On the one hand, investments in the so-called first generation broadband<sup>71</sup> are necessary to guarantee universal broadband coverage with basic Internet speeds. On the

<sup>66</sup> Digital Agenda Assembly (2011) Report from the workshop.

<sup>67</sup> For example, the 3rd edition of the "Going Local Italia" took place in Rome and Milan on 3/4 June 2013.

<sup>68</sup> ITU (2009)

<sup>69</sup> Fornefeld, M., Delaunay, G. and Elixmann, D. (2008) *The Impact of Broadband on Growth and Productivity*, A study on behalf of the European Commission, p. 9, available at [http://ec.europa.eu/information\\_society/eeurope/i2010/docs/benchmarking/broadband\\_impact\\_2008.pdf](http://ec.europa.eu/information_society/eeurope/i2010/docs/benchmarking/broadband_impact_2008.pdf)

<sup>70</sup> Fornefeld et al. (2008).

<sup>71</sup> It refers to Internet accessed over legacy telephone, copper and TV cable networks (COM(2010) 245 final/2).

other, investments in next generation access (NGA) networks<sup>72</sup> are needed to gradually increase access to fast and very fast Internet.

These investments can be public, private or joint. Of course, public intervention is essential when the market fails. In other words, public investment is required to support the roll-out of broadband networks in remote and rural regions, and thus to avoid the 'digital divide' between urban and rural areas. In this sense, investment in wireless systems (terrestrial and satellite) can play a key role.

**E-service** is a broad concept that refers to all the services and applications for the citizen provided via the Internet or exploiting ICT. Rowley (2006) defines e-services as 'deeds, efforts or performances whose delivery is mediated by Information Technology'.

Therefore, this category encompasses a wide range of investments where the major items are:

- E-government and e-Procurement
- E-health
- E-learning

E-government investment refers to ICT investments such as Wide Area Networks, the Internet and mobile computing that enable the public administration and the public authorities to interact digitally with citizens, businesses and other public authorities. The advantages associated with the use of e-government solutions are the increased efficiency and effectiveness of the delivery of public services, the widening of participatory opportunities and the improvement of governance transparency. However, in order to fully reap the benefits in terms of cost-effectiveness, e-government relies on a high degree of Internet usability and of access point availability as well as on the wide diffusion of IT skills among the population.

According to the European Commission, e-health is the overarching term for the range of tools based on ICT that are used to assist and enhance the prevention, diagnosis, treatment, monitoring and management of health and lifestyle.<sup>73</sup> Thus, e-health investment includes a wide range of ICT investments to ensure digital interaction between patients and health-service providers, institution-to-institution data transmission, or peer-to-peer communication between patients and health professionals. Investment in e-health also includes the building of health information networks, electronic health records, telemedicine services, and personal wearable and portable communicable systems for monitoring and supporting patients. According to the European Commission the deployment of e-health technologies can improve the quality of care, reduce medical costs and foster independent living, including in remote places.<sup>74</sup> However, to exploit the full potential of e-health services, the EU and Member States need to remove legal and organisational barriers and to ensure full interoperability of patient records and equipment.

E-learning refers to ICT tools such as computers and networks that enable the transfer of skills and knowledge. E-learning applications and processes include web-based learning, computer-based learning, virtual education and digital collaboration. Contents can be delivered via the Internet, intranet/extranet, satellite TV, CD-ROM and DVD. Within the DAE framework, Member States have to promote e-learning in national policies for the modernisation of education and training.

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<sup>72</sup> Wired access networks that consist wholly or partly of optical elements and that are capable of delivering broadband access services with enhanced characteristics (such as higher throughput) compared to those provided over already existing copper networks. Source:

[http://europa.eu/legislation\\_summaries/information\\_society/strategies/si0018\\_en.htm](http://europa.eu/legislation_summaries/information_society/strategies/si0018_en.htm)

<sup>73</sup> [http://ec.europa.eu/health-eu/care\\_for\\_me/e-health/index\\_en.htm](http://ec.europa.eu/health-eu/care_for_me/e-health/index_en.htm)

<sup>74</sup> COM(2010) 245 final/2

**Digital literacy and ICT skills.** Investment in digital literacy is essential to educate citizens to use ICT services and the digital media. Indeed, the construction of high-capacity infrastructures such as very fast broadband is not sufficient to make the population actually use and take advantage of the technologies, since many people lack basic digital skills.<sup>75</sup> In other words, investment in digital literacy is fundamental to tackle the problem of low levels of people's readiness to take advantage of the potential of the Internet and other ICT tools.

If more and more daily tasks are carried out online and more and more services such as paying taxes or booking medical appointments are provided only online, the importance of making people ready to deal with these situations, is evident. In particular, special attention must be devoted to improving the digital literacy of elderly, low income, less educated, unemployed and disabled people.

Beside the need for digital literacy in everyday life, there is a growing demand from industry for highly skilled ICT professionals: by 2015 90% of jobs in the EU will demand at least basic computer skills<sup>76</sup>. Also the ICT industry has a strong potential for job creation and is in need of high level ICT skills. Despite the increasing demand for ICT skills from industry, the number of ICT graduates in the EU has been decreasing since 2006. Also, the decrease in the number of ICT graduates combined with an increasing number of retiring ICT practitioners is leading to a significant e-skills mismatch between demand and supply.

Investments in ICT skills help to improve the attractiveness of ICT careers especially among women aged 15-42. For these reasons, Action 10 of the DAE proposes digital literacy and competences as a priority for the European Social Funds regulation 2014-2020.

**E-business investment** refers to investments in hardware, software or communication tools that integrate business functions, streamline workflows and enhance interactions with clients and suppliers. **E-commerce** comes under the wide umbrella of e-business and it refers to the buying and selling of goods and services via the Internet or other computer networks.

Investments in both e-business and e-commerce are important if enterprises want to compete in a globalized market. In particular, the European Commission considers e-commerce essential to help European companies - particularly SMEs - to take advantage of the Single Market, driving down prices and bringing their goods to the world.<sup>77</sup> For this reason, the DAE lays strong emphasis on the e-commerce Directive.<sup>78</sup>

Moreover, in order to spur e-commerce investment the DAE imposes these three indicators: 1) 50% of the population should be buying online by 2015; 2) 20% of the population should be buying cross-border online by 2015; and 3) 33% of SMEs should conduct online purchases/sales by 2015. Obviously, the first step towards achieving these targets is the consistent implementation of a common legislation in e-commerce, e-invoicing and e-signatures across all Member States.

**Investment in ICT R&D** refers to the R&D investments made by both the ICT industry sector and the public sector. According to a report published by the JRC-IPTS,<sup>79</sup> the ICT sector is one of the most research-intensive sectors in the EU economy, i.e. it has a high ratio of R&D expenditure compared to its value added. In 2009, despite the decrease due to the crisis, the

<sup>75</sup> Fornefeld et al. (2008).

<sup>76</sup> IDC, (2009).

<sup>77</sup> [http://ec.europa.eu/information\\_society/tl/ecowor/ebusiness/index\\_en.htm](http://ec.europa.eu/information_society/tl/ecowor/ebusiness/index_en.htm)

<sup>78</sup> Directive 2000/31/EC of the European Parliament and of the Council of 8 June 2000 on certain legal aspects of Information Society services, in particular e-commerce, in the Internal Market.

<sup>79</sup> JRC-IPTS (2012) The 2012 Predict Report - An Analysis of ICT R&D in the EU and Beyond. Available at: <http://is.jrc.ec.europa.eu/pages/ISG/documents/OnlineversionFINALPredict2012withnumbersv2.pdf>

ICT sector accounted for 17% of the EU's total business R&D expenditure, while only representing 4% of EU GDP.

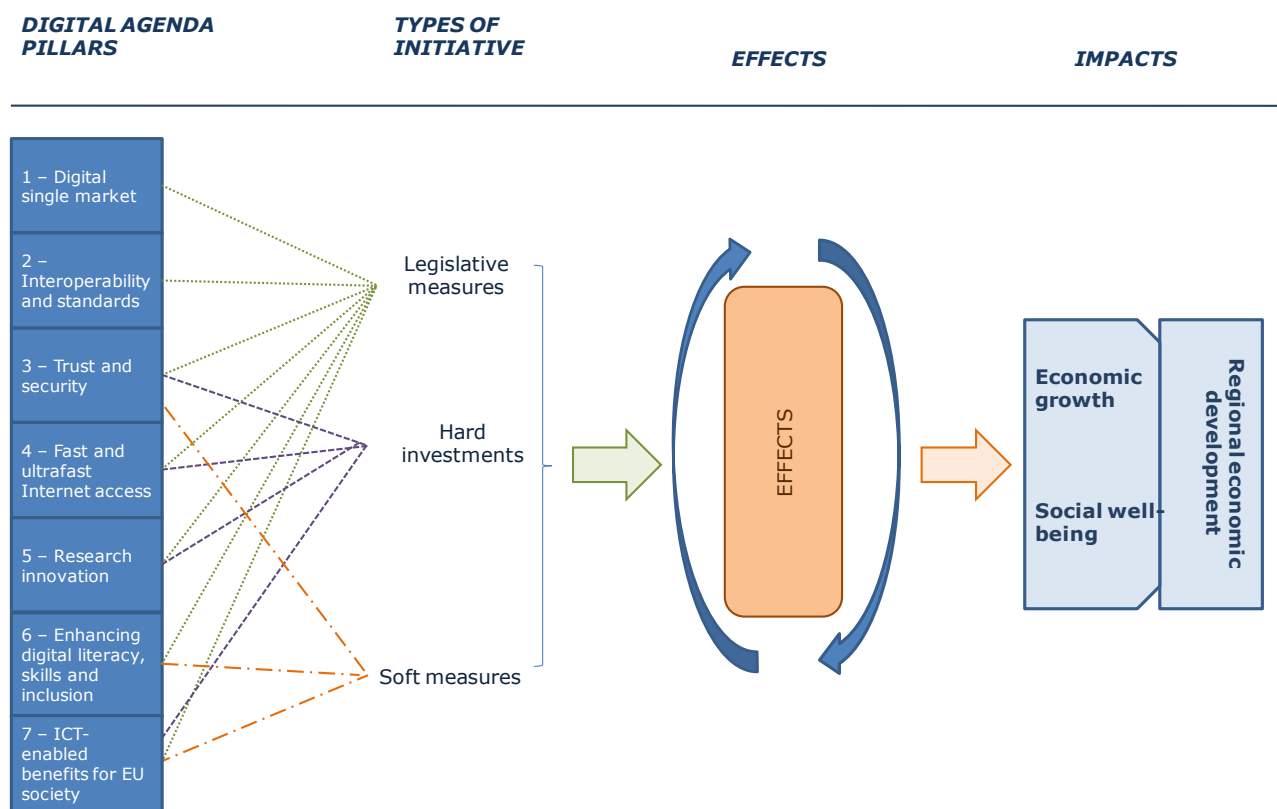
However, according to the European Commission, there is a lot of room for improvement. Indeed, at least two factors hamper potential investments in R&D in the ICT sector; first, the level of EU public sector spending is below average compared to other competing economies, and second, the fragmentation of the European market and the dispersion of financial means for innovators are limiting factors for ICT R&D. In order to tackle this under-investment problem, the DAE requires Member States to double their total annual public spending on ICT R&D by 2020, so that an equivalent increase in private spending is leveraged.

**Demand stimulation investment** includes a wide range of investments made by the public authorities in order to stimulate the demand for ICT in geographical areas characterised by lower degrees of ICT infrastructure, accessibility and use.

Three main demand stimulating strategies exist. First, promoting ICT awareness and e-skills through digital literacy programmes. Second, providing subsidies to worse-off people in order to make ICT services and devices affordable. Third, using public procurement of innovation and R&D to improve the quality and the performance of public services and to stimulate ICT R&D in enterprises.

### **2.2.3 The DAE's logical model and the study's analytical framework**

Overall, the DAE adopted a very wide approach covering the infrastructural and technical aspects of ICT development and the socio-economic aspects connected to the take-up of ICT by businesses, individuals and the public sector. It assumes that a virtuous circle will be nurtured linking supply and demand for ICT-related products and services. A simplified logical model underlying the DAE strategy applied at regional level is summarised in the figure below.

**Figure 17. A simplified DAE logical model applied at regional level**

Source: Authors

The DAE's pillars and corresponding areas of intervention are translated into specific initiatives that can be broadly grouped into the following three categories:

**Legislative measures, policies and regulations:**

- Transposal of EU Directives and promotion of EU strategies
- New laws or revision to existing laws
- Drafting of plans/programmes
- Adoption of new rules and regulations

**Hard (tangible) investments:**

- Internet and broadband infrastructures
- Investment in ICT R&D
- Development of new applications, software and services

**Soft (intangible) measures:**

- Training/education
- Awareness campaigns

The effects of the adopted initiatives can be sub-divided as follows:

- **Outputs** are the final products of the considered initiative, whose production is mostly within the control of those implementing them.
- **Outcomes** are the direct and intermediate changes produced for specific constituencies as a result of the initiatives, whose occurrence also depends on some intervening variables. A distinction can be made between direct and indirect outcomes according to their distance from the output in terms of the number of possible intervening variables.



- The term **Impacts** is used to indicate broader and longer-term changes corresponding to the final objectives of the policy initiatives (economic growth and employment creation) for the economy and for society as a whole (here at the regional level), to which policy initiatives contribute, together with several other intervening variables.

More specifically, the outputs contribute to an overall increase in the use of the Internet or ICT. Examples of relevant outputs (together with possible corresponding indicators) at the regional level are:

- Provision of public e-services (indicator: number of people reached);
- Provision of infrastructure to access the Internet, such as broadband, public access points, etc. (indicators: number of people reached, number of access points, increase in the nominal speed);
- Provision of training to use ICT and the Internet (indicator: number of beneficiaries);
- Provision of support to invest in/purchase ICT material (indicators: number of households/business concerned).

As to outcomes, they can materialise along a very wide spectrum of possibilities depending on the objective of the initiatives, their area of intervention and their intended target, i.e. businesses, Public Administrations or citizens (who may be: taxpayers, customers, patients, students, elderly people, migrants, rural population, disadvantaged groups, etc.). Table 3 below illustrates a series of identified outcomes that may result from the outputs of DAE initiatives taken at regional level. It relates them to the categories of possible beneficiaries/targets of the initiative, and proposes corresponding indicators. Here only outcomes at regional level are considered, which makes it possible to determine a more limited list. However, this list is by no means exhaustive.

It is also important to stress that outcomes nurture complex relations amongst themselves, which are far from reflecting a linear causal pattern. As a matter of fact, more or less direct outcomes might yield secondary indirect outcomes and maybe even third order indirect outcomes. Much depends on a series of “intervening variables” making the effective materialisation of these outcomes possible. For example, digital inclusion is not simply a matter of access to the Internet; it is the result of *appropriation* as well as purposeful use of ICT by which individuals “strongly and permanently incorporate ICT into their daily practices”.<sup>80</sup> Here, appropriation would be an intervening variable whereby increased use of ICT translates into improved inclusion. Other examples of enabling factors are a favourable regulatory framework or a supportive complementary investment programme, as identified in Chapter 1. Also, among the enabling factors are what we call the “horizontal issues”, i.e. initiatives developed at national or supranational level that support synergies and favour the local/regional development of ICT and DAE objectives. In other words, regional ICT development may take advantage of horizontal factors shaped at national or EU level that support regional ICT development.

Finally, the success of the initiatives in achieving the expected outcomes may depend on a number of factors closely related to the design and implementation of the initiative, such as its appropriateness, the dedicated resources, the organisation of the activities foreseen to achieve the initiative, etc. However, these are not strictly the focus of this study, which is, rather, to identify the channels through which ICT investments impact on regional development.

<sup>80</sup> Codagnone, C. (2009), “Vienna Study on Inclusive Innovation for Growth and Cohesion: Modelling and demonstrating the impact of e-Inclusion”, Report for the European Commission.

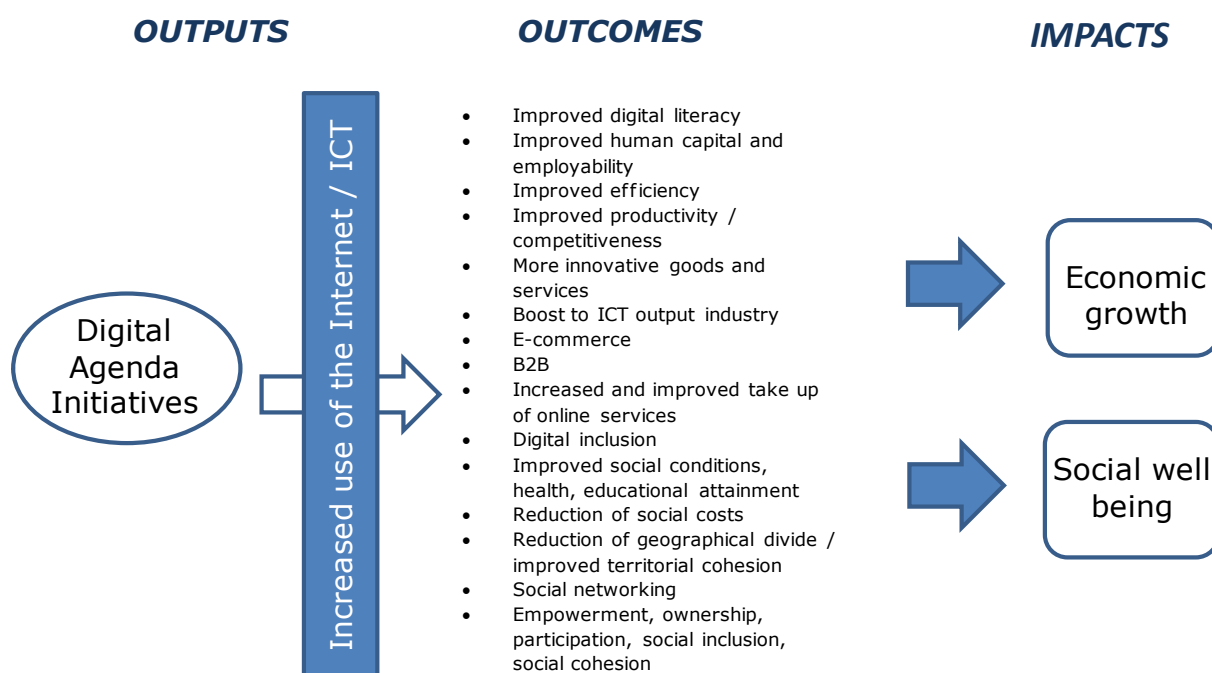


**Table 3. Outcomes**

MORE FREQUENT USE OF THE INTERNET / ICT	OUTCOME	BUSINESS	PA	CITIZENS	DESCRIPTION/EXAMPLES OF INDICATORS
	Improved digital literacy	X	X	X	
	Improved human capital and employability			X	Reduced possibility of unemployment: improvement of employability. Higher expected salary
	Improved efficiency in the production of goods and services	X	X		Cost savings, time savings
	Improved productivity/competitiveness	X	X		Process innovation contributing to making labour and production more efficient Internal organisation changes contributing to making labour and the production process more efficient
	More innovative goods and services	X		X	Increase in turnover of enterprises that are users of ICT Increase in employment of enterprises that are users of ICT Widening of the range of products and services offered by enterprises
	Boost to ICT industry	X			Increase in turnover of enterprises producing/selling ICT products or providing related services Increase in employment of enterprises producing/selling ICT products or providing related services Set up of new companies producing ICT products
	E-commerce	X		X	Increased number of enterprises offering e-commerce services Increased number of households purchasing online
	B2B	X			Business relationships upstream and/or downstream of the supply chain
	Increased and improved take-up of online public services		X	X	Better use and take-up of public services by citizens Better use and take-up of public services by enterprises Better use and take-up of disadvantaged groups and areas
	Social inclusion			X	Internet access benefitting social groups at risk of exclusion: elderly, immigrants, etc. Number of individuals reached
	Improved social conditions, health, educational attainment			X	
	Reduction of social costs		X		Decrease in social and health services costs
	Reduction of geographical divide/improved territorial cohesion	X	X	X	Reduction in income inequalities within and across regions Reduction in core-periphery divergences
	Social networking			X	
	Empowerment, ownership, participation, social inclusion and social cohesion			X	Reduction in marginalisation of disadvantaged social groups

Overall, the series of outcomes have both direct and probably indirect impacts on regional development through deeply intertwined patterns. Here a broad definition of “regional development” is adopted, covering both economic growth and social well-being.<sup>81</sup> The figure below summarises the different elements of the DAE logical framework outlined above, applied at regional level.

**Figure 18. The DAE logical model applied at regional level**



**Source:** Authors

This analytical framework will be used for the development of the case studies presented in Chapters 3 and 4, while some light will be thrown specifically on horizontal issues in Chapter 4.

## 2.3 Implementation at regional level

### 2.3.1 Regional digital strategies

As illustrated above, regional digital strategies are of primary importance for benefitting from the opportunities offered by the Information Society. However, since the Information Society is a broad concept and can take different forms according to the values declared by people, companies and governments, regional strategies differ across countries.<sup>82</sup> Indeed, regions can give more or less weight to the following elements: 1) assuring access to the ICT infrastructure; 2) stimulating awareness among citizens about potential ICT and Internet opportunities; 3) providing citizens with the chance to develop various digital skills; 4)

<sup>81</sup> Although there is no universally accepted definition of social well-being, a study for the European Commission lists income, employment, health and education as the main determinants of it. See Dhéret, C., Zuleeg, F., Chiorean-Sime, S. and Molino, E. "Well-being 2030 A new vision for 'Social Europe'", 2011. Available at: [http://www.epc.eu/pub\\_details.php?cat\\_id=2&pub\\_id=132](http://www.epc.eu/pub_details.php?cat_id=2&pub_id=132)

In another study for the European Commission, regional development was disaggregated into different elements: economic development covering direct economic growth and endogenous dynamics, and quality of life covering social cohesion, territorial cohesion, environmental sustainability, institutional quality and social happiness. See Ex-post evaluation of investment projects co-financed by the European Regional Development Fund (ERDF) or the Cohesion Fund (CF) over the period 1994-1999. Ten projects observed, Final Report, available at: [http://ec.europa.eu/regional\\_policy/sources/docgener/evaluation/pdf/9499\\_final\\_report\\_091112.pdf](http://ec.europa.eu/regional_policy/sources/docgener/evaluation/pdf/9499_final_report_091112.pdf)

<sup>82</sup> Ziemia et al. (2012).

ensuring legal and institutional regulations for the development and use of information infrastructures; 5) encouraging the whole community to undertake initiatives and projects concerning the development of IS, i.e. developing e-services.<sup>83</sup>

European Cohesion Policy offers a way to explore the key elements of regional digital strategies and the main approaches followed by regions to incorporate the IS into their planning. According to the report by Technopolis (2002), there are four main approaches that have been taken by regions in seeking to shape their way to the Information Society. Namely:

- Vertical approach, i.e. the IS is treated as one priority amongst many;
- Horizontal approach, i.e. a single National Operating Programme or cross-cutting theme is dedicated to IS actions;
- Combined approach, i.e. the vertical and the horizontal approaches are combined;
- Fragmented approach, i.e. the IS is treated as a separate element in some/all of the priorities, this represents neither a vertical nor a horizontal approach.

Instead, following a quantitative approach, Reggi et al. (2012) found that the digital strategies for Information Society development pursued by laggard regions of Europe (convergence regions) can be grouped into three different types. Namely:

- Investing mainly in infrastructure services connected to public e-services development such as interoperability, security and access;
- Investing mainly in public e-services;
- Devoting a relatively high proportion of total expenditure to both ICT development among SMEs and broadband networks.

However, Reggi et al. (2012) point out that the current digital strategies of the less-developed European regions are far from being well-balanced and place-based. Indeed, resources tend to be invested in those areas that already show a good relative performance, rather than focus on the weaknesses of their regional IS context.

### **2.3.2 The Structural Funds – patterns of expenditure at national level**

In the programming period 2000-2006 the Information Society became a high priority of Cohesion Policy, and the Structural Funds were regarded as the key financial instrument to promote it. As illustrated above, the rationale behind the promotion of the IS by Cohesion Policy lies in the large disparities between/within countries and regions in terms of the adoption of ICT, together with the belief that the regional level is particularly appropriate for implementing effective IS strategies.

In the programming period 2007-2013 the focus on the Information Society remained high and the following categories of expenditure were included in the framework regulation of the Structural Funds.<sup>84</sup>

<sup>83</sup> See Ziembra (2012).

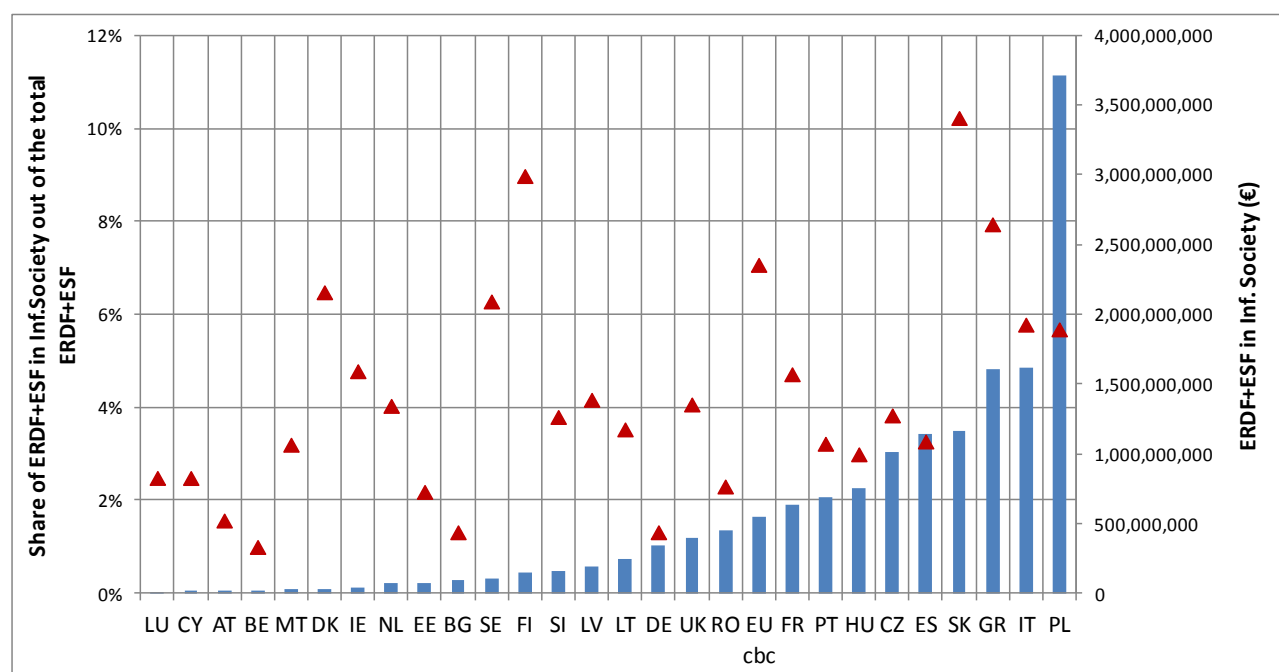
<sup>84</sup> EC Regulation 1083/2006.

**Table 4. Information Society categories of expenditure (2007-2013)**

CODE	PRIORITY THEME
10	Telephone infrastructures (including broadband networks)
11	Information and Communication Technologies (access, security, interoperability, risk-prevention, research, innovation, e-content, etc.)
12	Information and Communication Technologies (TEN-ICT)
13	Services and applications for the citizen (e-health, e-government, e-learning, e-inclusion, etc.)
14	Services and applications for SMEs (e-commerce, education and training, networking, etc.)
15	Other measures for improving access to and efficient use of ICT by SMEs

Source: Authors based on EC No. 1828/2006

Over the period 2007-2013, €15.6 billion of ERDF and €128 million of ESF were dedicated to the Information Society in all Member States and cross-border programmes. Large differences in allocation exist among countries (see Figure 19). Poland, Italy and Greece allocated the largest amounts of Structural Funds to the Information Society of all the EU27 countries. In terms of share, however, Slovakia and Finland allocated more than 8% of their overall Structural Funds to the Information Society. Instead, the share of SFs allocated to the Information Society by Austria Germany, Bulgaria and Belgium was less than 2%.

**Figure 19. ERDF and FSE allocation to the Information Society (2007-2013)**

Source: Authors based on DG REGIO database

Out of the €15.6 billion ERDF dedicated to the Information Society, €5.13 billion was allocated to co-finance the development of services and applications for citizens,<sup>85</sup> followed by investments in ICT.<sup>86</sup> Instead, out of the €128 million of the ESF, 70% was allocated to the development of services and applications for citizens and 20% to the support services and applications for SMEs.<sup>87</sup> Figure 20 provides a detailed breakdown of the ERDF and ESF allocation to each category of expenditure under the Information Society. The fact that the amount of funds allocated to the development of services and applications of citizens is far

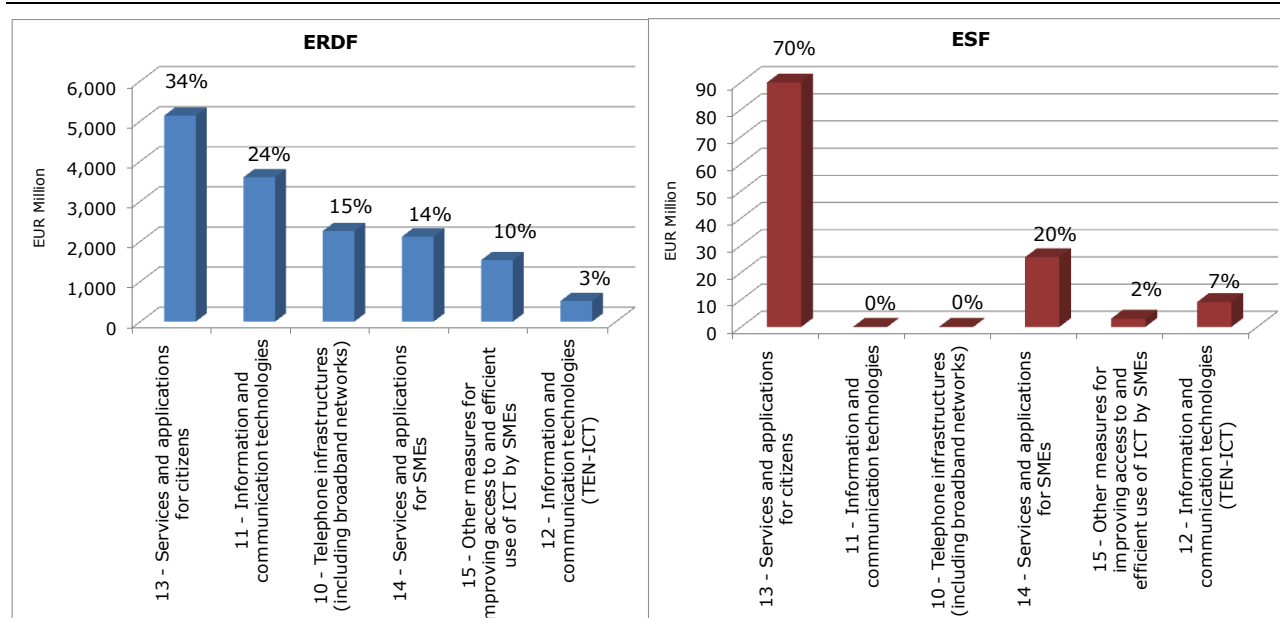
<sup>85</sup> Such as e-health, e-government, e-learning and e-inclusion services.

<sup>86</sup> Such as access, security, interoperability, risk-prevention, research, innovation, e-content and others.

<sup>87</sup> Such as e-commerce, education and training, networking.

higher than the other categories of expenditure seems to reflect the long-standing trend in EU policy to invest in e-government, in order not only to obtain efficiency and effectiveness gains in the provision of public services, but also to improve role of government bodies in the public procurement of advanced technologies.<sup>88</sup>

**Figure 20. ERDF and ESF allocation to the Information Society by country (2007-2013)**



**Source:** Authors based on DG REGIO database

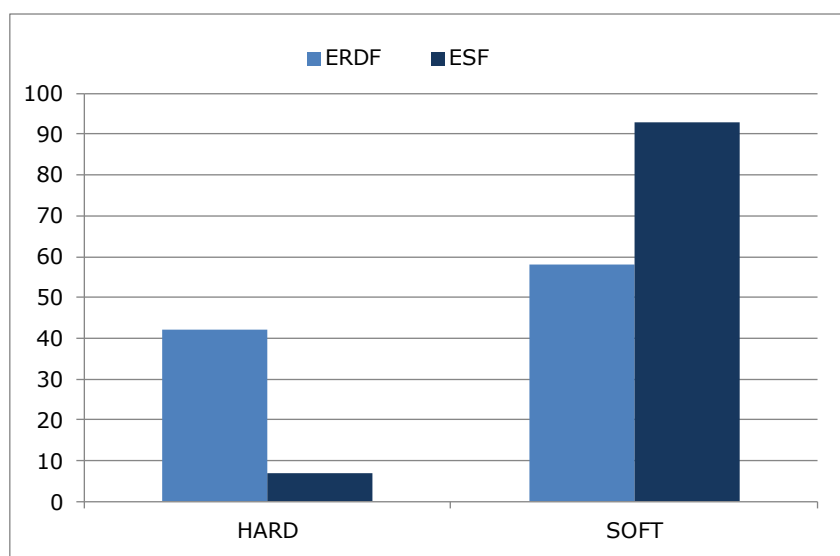
If we group the categories of expenditure related to the Information Society into the two macro categories, 'hard' and 'soft' factors, as presented in Table 5, we can observe that over the period 2007-2013, a greater emphasis on 'soft' components can be detected (see Figure 21). However, as presented in Figure 22, the relative importance attached to different types of IS expenditure varies a lot across countries.

**Table 5. Information Society categories of expenditure by hard and soft factors (2007-2013)**

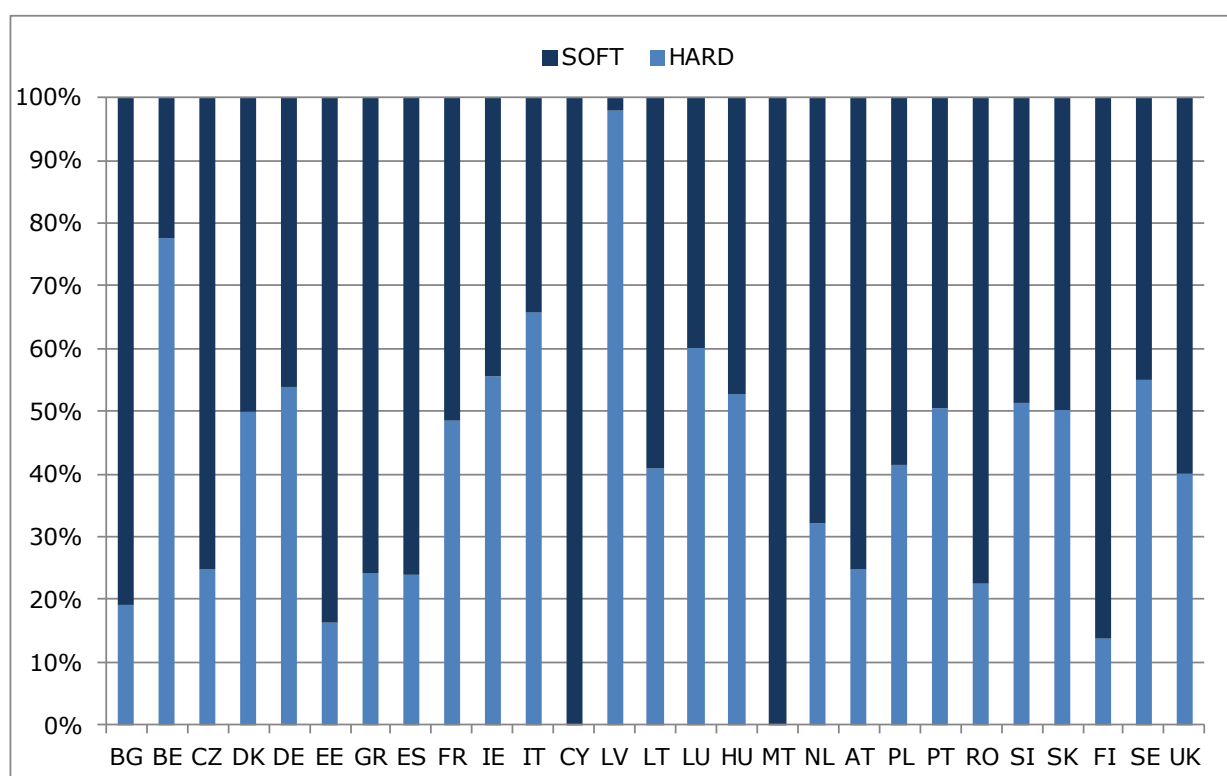
HARD		SOFT	
CODE	DESCRIPTION	CODE	DESCRIPTION
10	Telephone infrastructures (including broadband networks)	13	Services and applications for citizens (e-health, e-government, e-learning, e-inclusion, etc.)
11	Information and Communication Technologies (access, security, interoperability, risk-prevention, research, innovation, e-content, etc.)	14	Services and applications for SMEs (e-commerce, education and training, networking, etc.)
12	Information and Communication Technologies (TEN-ICT)	15	Other measures for improving access to and the efficient use of ICT by SMEs

**Source:** Authors based on EC No. 1828/2006

<sup>88</sup> Edquist *et al.* (2000).

**Figure 21. ERDF and ESF allocation to the Information Society by hard and soft factors (2007-2013)**

Source: Authors based on DG REGIO database

**Figure 22. ERDF and ESF allocation to the Information Society by hard and soft factors and by country (2007-2013)**

Source: Authors based on DG REGIO database

### 2.3.3 The Structural Funds – patterns of expenditure at regional level

Below we present a description of the SF allocations for the Information Society planned by regions for the programming period 2007-2013. Figure 23 shows the share of funds allocated to the IS by the EU regions (NUTS 2) out of the total amount of SF. There are significant variations across regions in the share of resources dedicated to the IS. Many regions allocated

less than 2% of the total amount of SF to the IS, among these were all the Bulgarian regions, many central regions of Germany and Belgium and some regions of the UK. Conversely, very few regions allocated more than 10% of total SF to the IS, they are: Sardinia (IT), Eastern Macedonia and Thrace, Thessaly, Epirus (GR), Corsica (FR), three out of the four NUTS 2 regions of Slovakia (Západné Slovensko, Stredné Slovensko and Východné Slovensko), Itä-Suomi (FI), Norra Mellansverige (SE), Gibraltar (UK) and Cornwall and the Isles of Scilly (UK). Of these regions, the one that allocated the largest share to the Information Society (26%) was the British overseas region of Gibraltar.

The maps presented in Figure 24 to Figure 27 explore how the European regions allocated resources across the categories of expenditure under the Information Society. The six categories of expenditure referred to the IS were grouped in the following way:

- Category 10: Telephone infrastructures (including broadband networks);
- Categories 11 and 12: Information and Communication Technologies (including TEN-ICT);
- Category 13: Services and applications for the citizen (e-health, e-government, e-learning, e-inclusion, etc.);
- Categories 14 and 15: Services and applications for SMEs and other measures for SMEs.

From the maps it is clear that of the total amount of resources allocated to the IS, the category of expenditure to which regions allocated the least funds is the one involving telephone infrastructures including broadband (Category 10). Indeed, the majority of European regions allocated less than 10% of IS resources to this category and around 30% of these regions allocated no resources at all to this category. Bucking this trend were Brabant Wallon, Hainaut and Namur in Belgium and the Irish region of Border, Midland and Western. These regions allocated more than 70% of all resources for the IS to Category 10.

With regard to the planned funds for ICT (including TEN-ICT), the regions that allocated more than 70% of resources to Categories 11 and 12 are located in Germany.<sup>89</sup> Together with the German regions, also Brittany, Corsica and Guyane (FR), Sicily (IT), Latvia, Bratislavský kraj (SK), and Bedfordshire and Hertfordshire (UK) allocated more than 70% of the total funds for the IS to Categories 11 and 12. Instead, the regions that planned low investments of SF in ICT are located in Spain, the UK, Ireland, Romania and Bulgaria.<sup>90</sup>

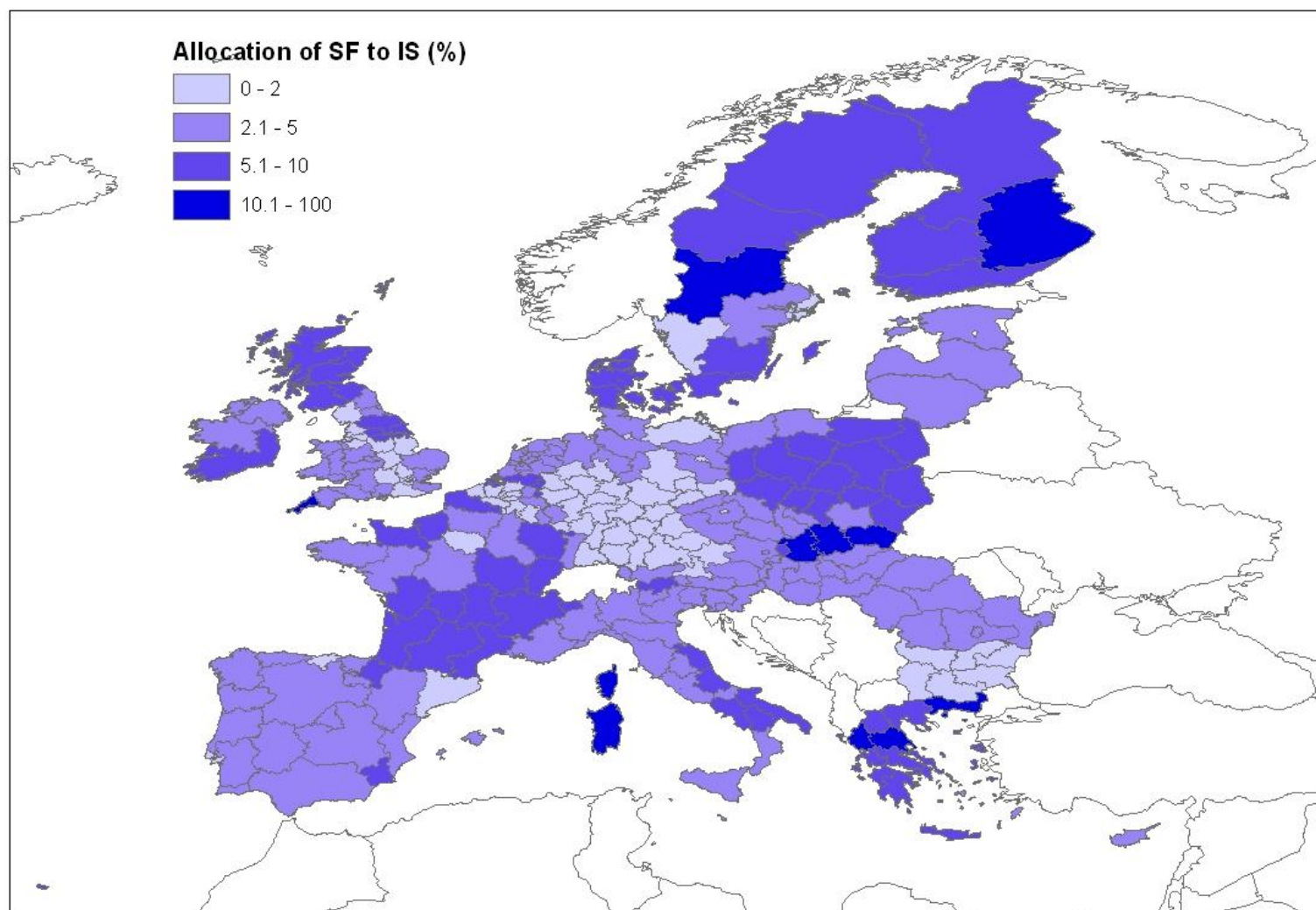
Looking at the share of IS funds allocated to e-services for citizens (Category 13), the regions with the highest shares are located in the south of Spain. Cyprus and Malta also allocated around 90% of their total IS resources to Category 13. Instead, e-services for SMEs and other measures for SMEs are the categories to which the majority of UK regions allocated the largest shares of IS funds; in particular, East Wales, Merseyside, the region of Gloucestershire, Wiltshire and Bristol, the region of Northumberland, Tyne and Wear and the region of Tees Valley and Durham recorded shares above 90%. Also the regions of Bruxelles-Capitale (BE), Länsi-Suomi (FI) and Västsverige (SE) allocated more than 70% of total IS funds to Categories 14 and 15.

<sup>89</sup> In particular: Berlin, Brandenburg–Nordost, Brandenburg–Südwest, Darmstadt, Gießen, Kassel, Mecklenburg-Vorpommern, Chemnitz, Dresden and Leipzig.

<sup>90</sup> Also Malta and Cyprus, which are single regions, allocated less than 10% of the total amount of SF to Categories 11 and 12.



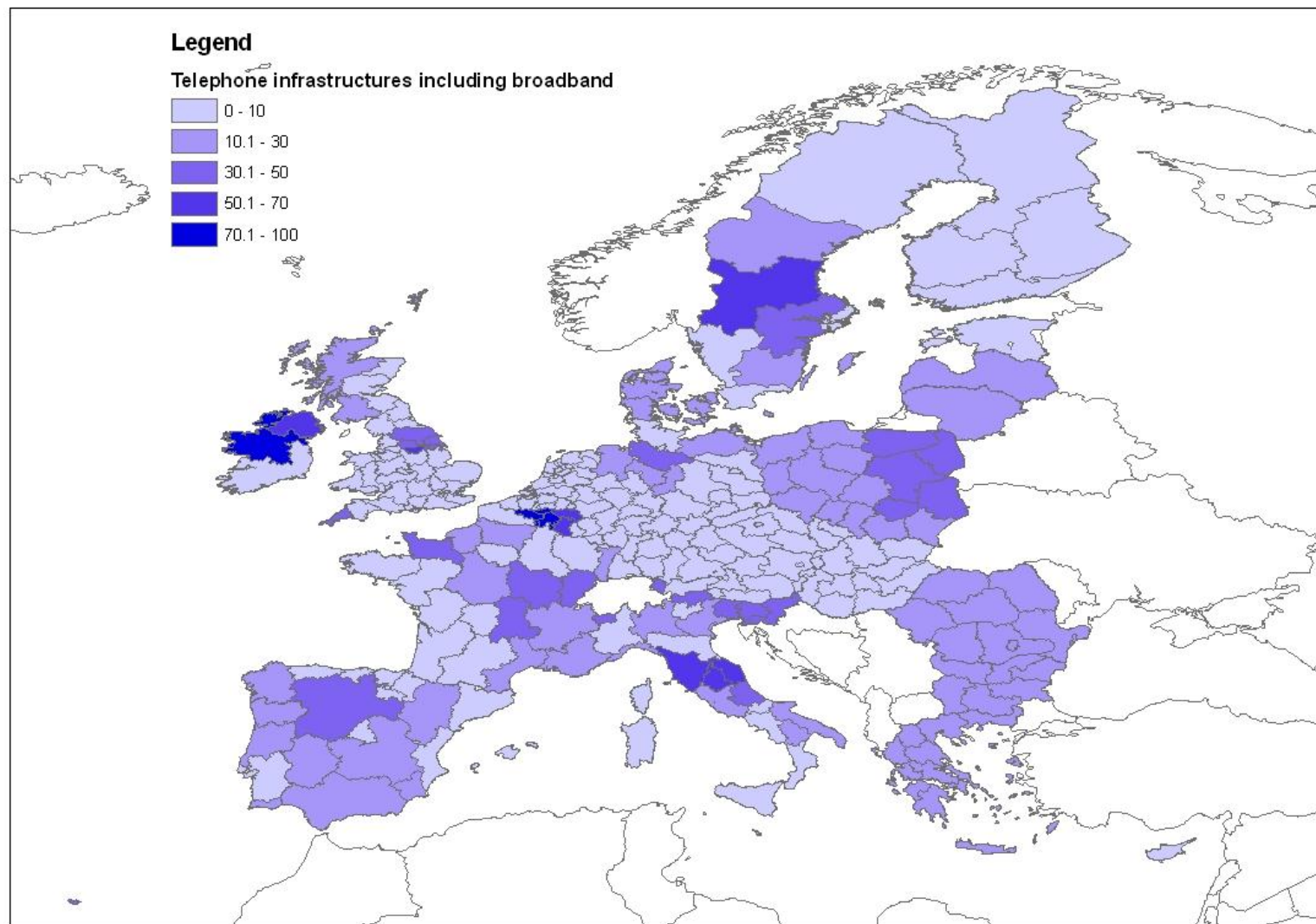
**Figure 23. Allocation of SF to the Information Society by regions (2007-2013)**



**Source:** Authors based on DG REGIO database  
**Note:** Percentage of SF allocated to IS out of the total amount of SF



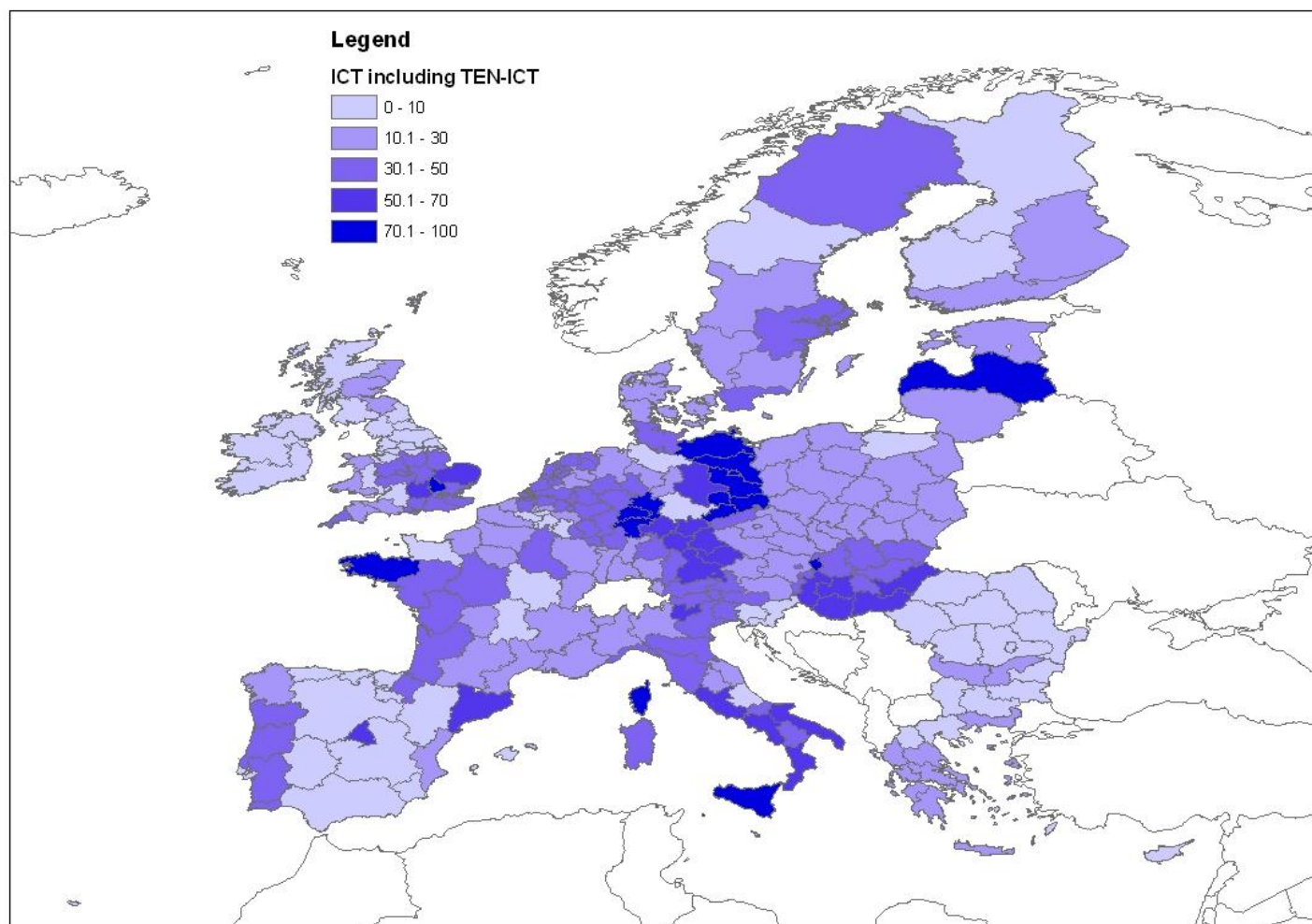
**Figure 24. Allocation of SF to Category 10 – Telephone infrastructure including broadband (2007-2013)**



**Source:** Authors based on DG REGIO database

**Note:** Percentage of SF allocated to expenditure Category 10 out of the total amount of SF allocated to the IS

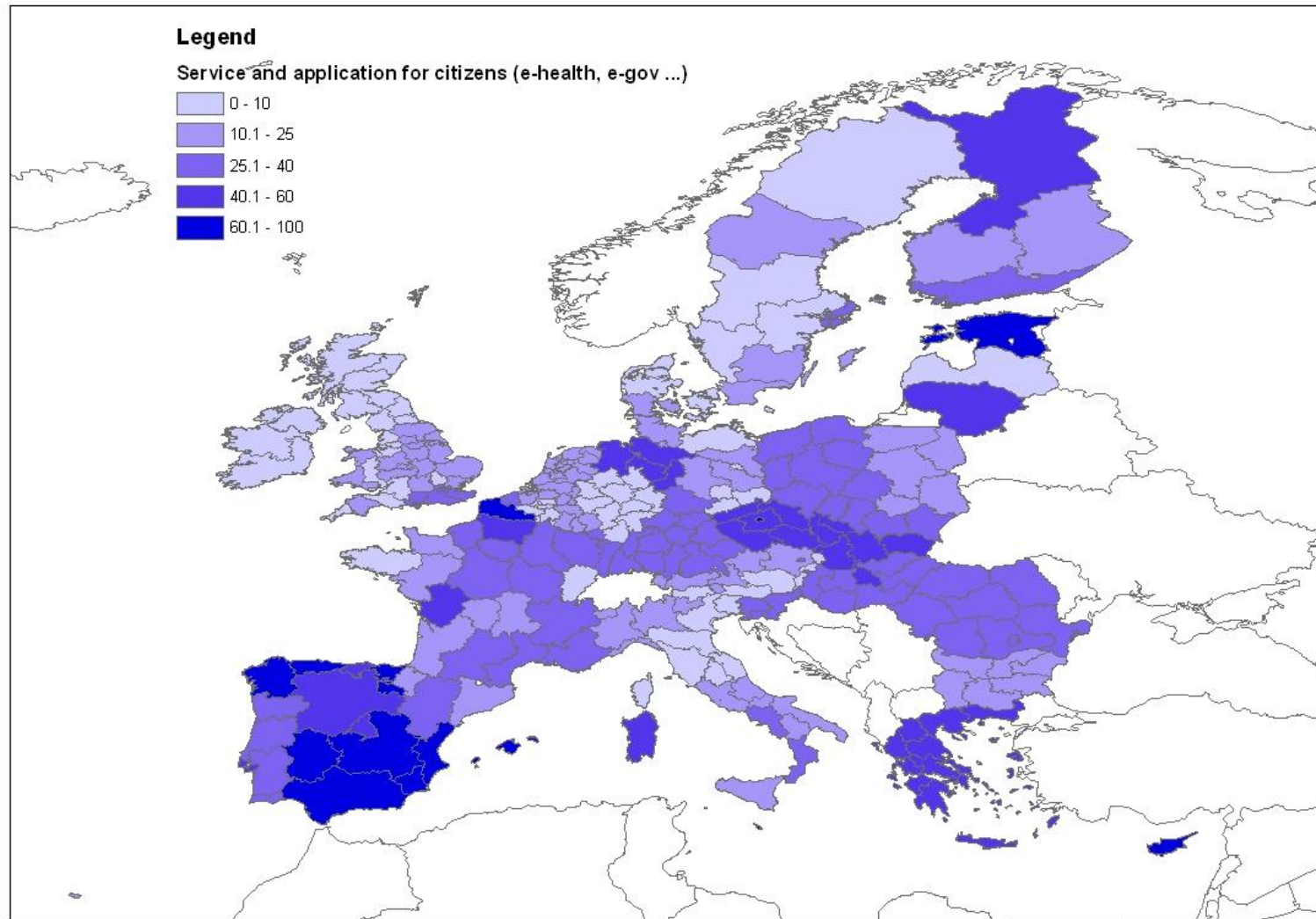
**Figure 25. Allocation of SF to Categories 11 and 12 - Information and Communication Technologies (2007-2013)**



**Source:** Authors based on DG REGIO database

**Note:** Percentage of SF allocated to expenditure Categories 11 and 12 out of the total amount of SF allocated to the IS

**Figure 26. Allocation of SF to Category 13 - Services and applications for the citizen (2007-2013)**

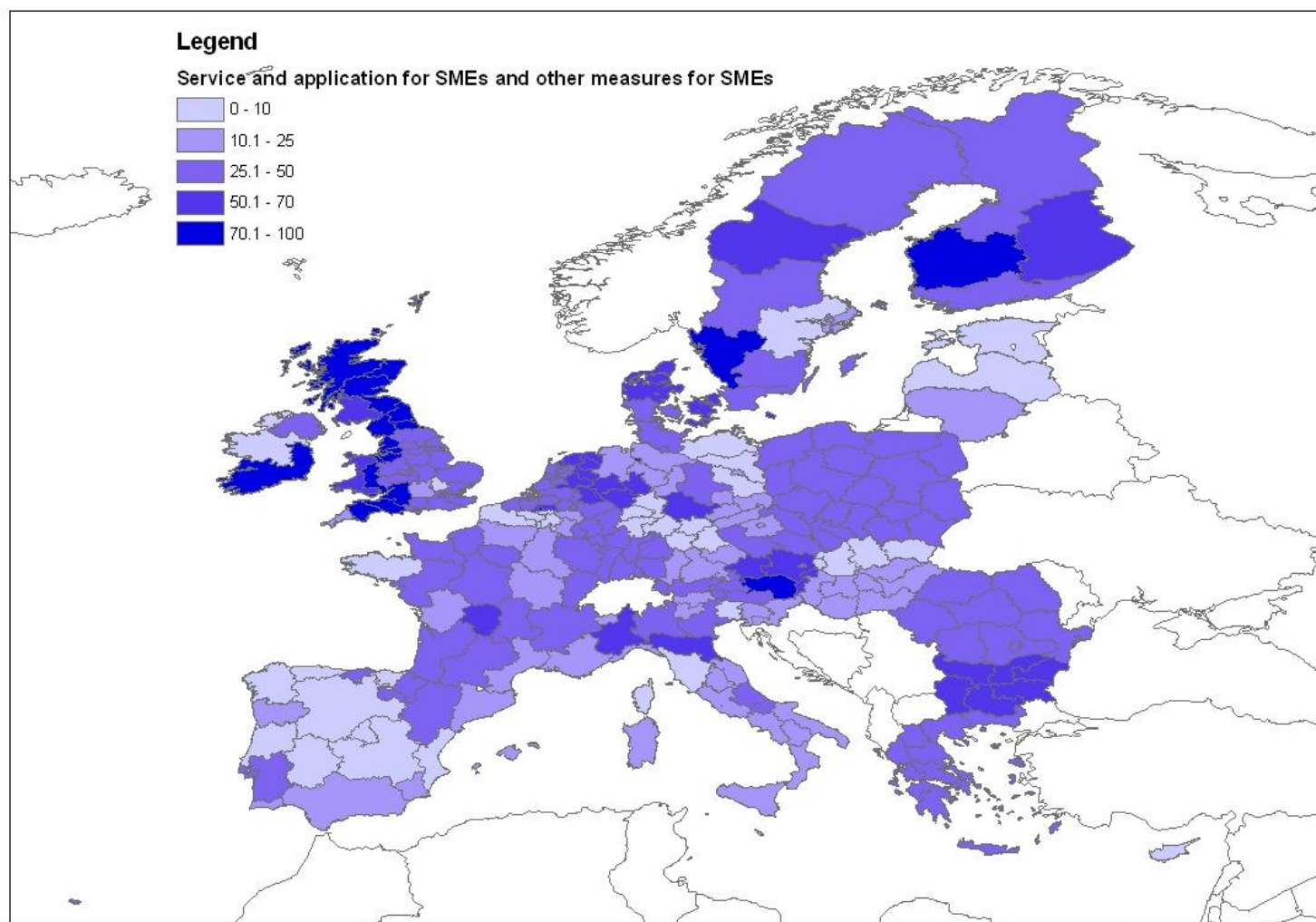


**Source:** Authors based on DG REGIO database

**Note:** Percentage of SF allocated to expenditure Category 13 out of the total amount of SF allocated to the IS



**Figure 27. Allocation of SF to Category 14 - Services and applications for SMEs and other measures for SMEs (2007-2013)**



**Source:** Authors based on DG REGIO database

**Note:** Percentage of SF allocated to expenditure Category 14 out of the total amount of SF allocated to the IS

## 2.4 Concluding remarks

The Digital Agenda for Europe is the successor of a number of policy initiatives that have developed at EU level since the 1990s on pragmatic grounds (basically learning from past experience). It proposes an all-encompassing approach covering the different dimensions of the Information Society it wants to promote, and recognises the existence of a virtuous circle between supply of, and demand for ICT and Internet-based applications. It proposes no less than 101 specific policy actions across the seven pillars expected to tackle significant weaknesses affecting the digital market in Europe. It is implemented through “shared management” between the EC and the Member States. Within the latter, regions are mobilised to a large extent.

Since the earliest developments of the strategy, the local/regional dimension has been recognised as essential for its successful implementation. Thus, the regional level is considered to be pertinent for identifying the opportunities offered by the Information Society and for carrying out plans and programmes in support of it. More specifically, it is essential for fostering latent demand for ICT. Thus, the Structural Funds have come to play a significant role in the implementation of the DAE. Interestingly, patterns of SF investments in ICT are very varied across MS and regions, and are not necessarily always guided by evidence-based considerations. In fact, investments tend to reinforce areas that already have some kind of advantage.

Overall, the DAE adopted in the wider context of the Europe 2020 Strategy establishes a pertinent diagnosis of the current obstacles to the further development of the Information Society in Europe and its impact on economic growth at different levels, and proposes an adequate policy framework to deal with these issues.



## CHAPTER 3 - REGIONAL INITIATIVES: OUTCOMES AND IMPACTS

### KEY FINDINGS

- The case studies analysed show the significance of the contribution of SF to financing different types of ICT projects, namely: e-health, e-learning, digital literacy, broadband Internet access and ICT support for SMEs.
- The initiatives reviewed are governed by distinct logics and objectives that vary greatly and depend on the needs and structural features of the regional setting in which they develop.
- There is a broad distinction between initiatives targeting access to and use of ICT/the Internet as such and those for which ICT/the Internet is instrumental in delivering a service or in reaching an objective.
- Initiatives dealing with equity have significant effects in terms of empowerment and social participation, while initiatives aiming at bringing efficiency gains perform well as far as improved living conditions or the reduction in social costs are concerned. However, they also achieve transversal outcomes such as digital literacy and improved territorial cohesion that are recorded indiscriminately by both categories of initiatives.
- The different initiatives reviewed show mixed, and generally balanced, impacts in terms of both economic growth and well-being. This reflects the fundamental peculiarity of interventions in the field of the Information Society which, if they are successful, affect a series of variables of different dimensions in all-encompassing, patterns.

The aim of this chapter is to provide evidence on the outcomes that have been produced by different initiatives contributing to the implementation of the Digital Agenda at regional level. The objective is to discuss which outcomes have materialised or are likely to materialise and under which conditions, i.e. which intervening variables have made – or are likely to make – possible the achievement of a set of outcomes. Evidence was collected by means of an in-depth analysis carried out for seven regional case studies developed on the basis of the logical model outlined above.

Given the primary role played by Structural Funds in financing regional ICT investments, the initiatives analysed involve the financing of different types of ICT investments in line with the Digital Agenda strategy and mainly co-financed by the SF in the 2000–2006 or the 2007–2013 programming periods.

### 3.1 Overview of the selected initiatives

Six regional and one cross-regional initiatives were selected (for a full account of the selection process, see Annex 5.). These initiatives are representative of the different types of ICT investment carried out at regional level to implement various pillars of the Digital Agenda (ICT for SMEs, e-health, digital literacy, e-learning and broadband coverage). The selection covers initiatives located in regions under different Objectives. Six initiatives are in Convergence Regions,<sup>91</sup> two are in regions under the Competitiveness and Employment objective<sup>92</sup> and one initiative is under the Territorial Cooperation objective.<sup>93</sup>

<sup>91</sup> Andalusia (ES), Cornwall (UK), Estonia and Lithuania.

<sup>92</sup> Berlin (DE) and Umbria (IT).

<sup>93</sup> It involves Finland, Sweden, Scotland (UK) and Norway.

The initiatives analysed are:

Estonia:

- Electronic health registry (EHR)
- Digital Prescription

Berlin (DE):

- Explorarium II

Andalusia (ES):

- Guadalinfo

Umbria (IT):

- SMEs grant scheme for ICT adoption and diffusion

Lithuania:

- Libraries for Innovation
- Development of computer literacy skills

Cornwall and the Isles of Scilly (UK)

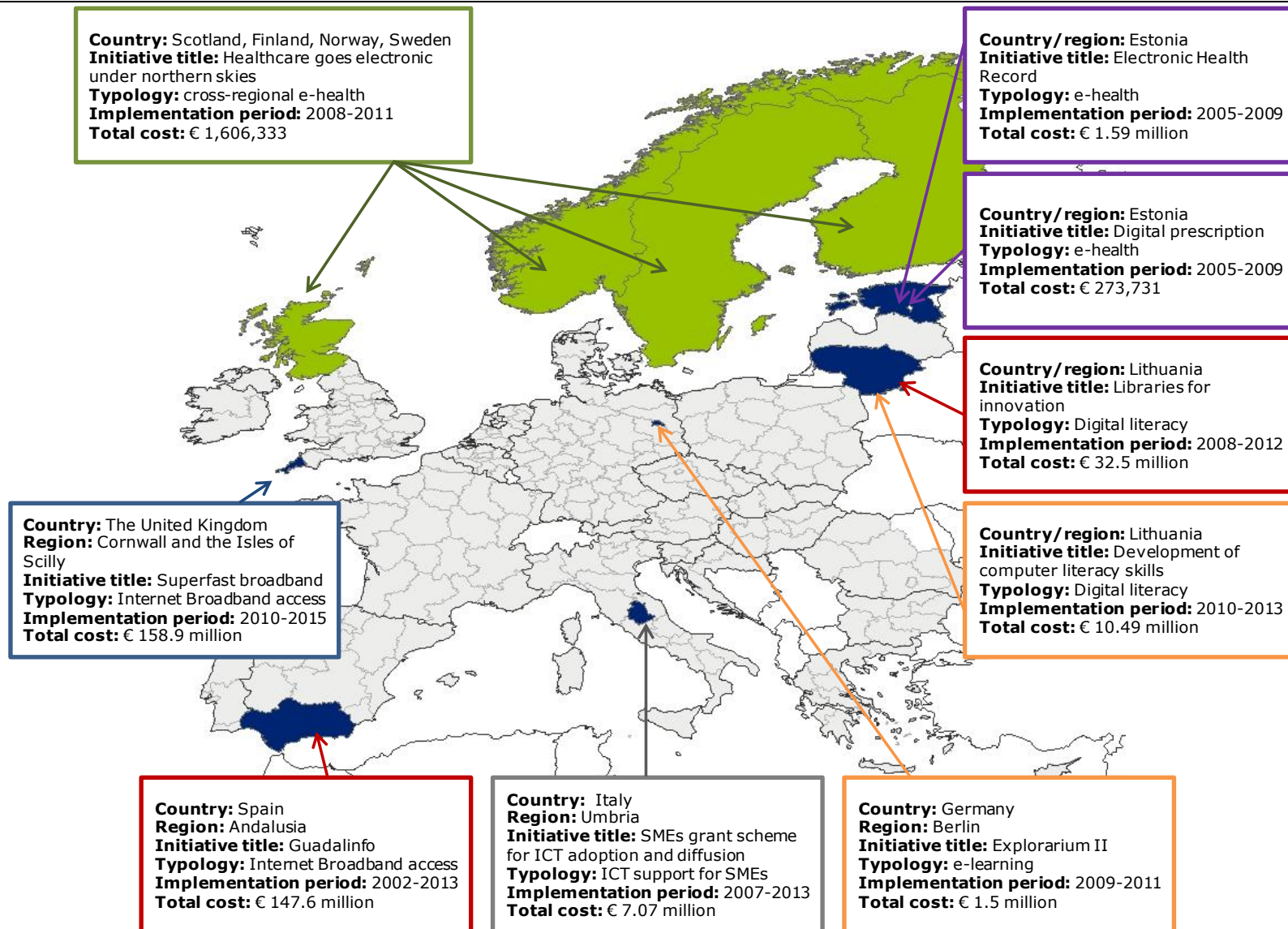
- Superfast Cornwall

Cross-regional (NO, FI, SE and Scotland, UK)

- Healthcare goes electronic under northern skies

An overview of the geographical coverage of the analysis carried out is provided by the map below.



**Map 1. Map of the selected projects**

Source: Authors

### **3.1.1 The regional/national context**

The regional or national context in which the initiatives were carried out varies a lot, especially in terms of ICT performance. Table 6 below presents some representative indicators in order to show the main characteristics of the regions/countries covered by the cases studies.

Apart from the Umbria (IT) and Berlin (DE) case studies, the others involve peripheral areas of Europe. Also, the majority of the regions/countries involved have low population densities. Indeed, in 2011 the population density in all the regions/countries except for Berlin (DE) was well below the European average. Half of the regions/countries concerned, i.e. Estonia, Lithuania, Andalusia and Berlin, had an unemployment rate above the European average. In particular, in Andalusia around 30% of the population was unemployed in 2011. The regions/countries involved also had different levels of GDP per capita. Indeed, half of them, i.e. Estonia, Lithuania, Andalusia and Cornwall, had a GDP per capita below the EU average, in contrast to the other half of the regions/countries involved.

As far as the features related to ICT are concerned, Sweden, Finland, Norway, Estonia, Scotland (UK) and Berlin (DE) boast relatively high levels of broadband coverage, high access and use of the Internet by citizens, and a high provision of electronic public services compared to the other regions analysed. Conversely, Andalusia and Umbria are characterised by low levels of fast broadband coverage, low access and use of the Internet and low ICT competence. Andalusia and Lithuania show high disparities between urban and rural areas. Indeed, before the initiatives took place, these two regions/countries were characterised by a high digital divide in terms of Internet access and use, as well as ICT competence. Finally, at the time of project financing (2010), Cornwall's broadband infrastructure was based upon technology that physically limited the speed, flexibility and quality of connections. Moreover, this region showed a digital divide between the area of Cornwall and the Isles of Scilly, which are located 28 miles off the south west tip of the country.

**Table 6. Regional context**

LOCATION	INITIATIVES	POPULATION DENSITY <sup>94</sup>	GDP per CAPITA <sup>95</sup> (Euro)	UNEMPLOYMENT RATE <sup>96</sup>	INTERNET ACCESS AT HOME BY CITIZENS <sup>97</sup>	INTERNET USE BY CITIZENS <sup>98</sup>	INDIVIDUALS WHO HAD NEVER USED A COMPUTER <sup>99</sup>
Convergence Region of Estonia	<ul style="list-style-type: none"> <li>• Electronic Health Registry (EHR)</li> <li>• Digital Prescription</li> </ul>	30.9/Km <sup>2</sup>	15,500	12.5%	68%	71%	22%
Convergence Region of Lithuania	<ul style="list-style-type: none"> <li>• Libraries for innovation</li> <li>• Development of computer literacy skills</li> </ul>	48.3/Km <sup>2</sup>	14,900	15.4%	61%	58%	34%
Convergence region of Andalusia (ES)	<ul style="list-style-type: none"> <li>• Guadalinfo</li> </ul>	95.6/Km <sup>2</sup>	18,500	30.4%	55%	2002:22.8% 2010: 52%	30%
Competitiveness region of Berlin (DE)	<ul style="list-style-type: none"> <li>• Explorarium II</li> </ul>	3,921.7/Km <sup>2</sup>	27,400	11.9%	84%	74%	12%
Competitiveness Region of Umbria (IT)	<ul style="list-style-type: none"> <li>• SMEs grant scheme for ICT</li> </ul>	107.3/Km <sup>2</sup>	22,800	6.5%	60%	45%	41%
Convergence region of Cornwall (UK)	<ul style="list-style-type: none"> <li>• Superfast Cornwall</li> </ul>	150.9/Km <sup>2</sup>	17,600	6.2%	79%	80%	7%
Finland, Sweden, Norway, Scotland (UK)	<ul style="list-style-type: none"> <li>• Healthcare goes electronic under northern skies</li> </ul>	Average 30.98/Km <sup>2</sup>	<ul style="list-style-type: none"> <li>• Finland 27,700</li> <li>• Sweden 30,200</li> <li>• Norway 44,300</li> <li>• Scotland 26,300</li> </ul>	<ul style="list-style-type: none"> <li>• Finland 7.8%</li> <li>• Sweden 7.5%</li> <li>• Norway 3.2%</li> <li>• Scotland 7.9%</li> </ul>	<ul style="list-style-type: none"> <li>• Finland 81%</li> <li>• Sweden 88%</li> <li>• Norway 90%</li> <li>• Scotland 69%</li> </ul>	<ul style="list-style-type: none"> <li>• Finland 83%</li> <li>• Sweden 88%</li> <li>• Norway 90%</li> <li>• Scotland 71%</li> </ul>	<ul style="list-style-type: none"> <li>• Finland 8%</li> <li>• Sweden 5%</li> <li>• Norway 4%</li> <li>• Scotland 14%</li> </ul>

**Source:** Authors

<sup>94</sup> Data for 2011 (except for Cornwall for which data refers to 2010) from Eurostat database on Regional demographic statistics.

<sup>95</sup> Data for GDP per capita 2010 (PPS) from Eurostat [http://epp.eurostat.ec.europa.eu/cache/ITY\\_PUBLIC/1-21032013-AP/EN/1-21032013-AP-EN.PDF](http://epp.eurostat.ec.europa.eu/cache/ITY_PUBLIC/1-21032013-AP/EN/1-21032013-AP-EN.PDF)

<sup>96</sup> Data for 2011 from Eurostat [http://epp.eurostat.ec.europa.eu/cache/ITY\\_PUBLIC/1-04072012-BP/EN/1-04072012-BP-EN.PDF](http://epp.eurostat.ec.europa.eu/cache/ITY_PUBLIC/1-04072012-BP/EN/1-04072012-BP-EN.PDF)

<sup>97</sup> Data for 2010 from Eurostat database on Regional Information Society.

<sup>98</sup> Data for 2010 from Eurostat database on Regional Information Society.

<sup>99</sup> Data for 2010 (except for Berlin for which data refers to 2011) from Eurostat database on Regional Information Society.

### 3.1.2 The main features of the initiatives reviewed

The initiatives reviewed belong to different types of ICT investments and have different objectives. They also differ in terms of financing and governance structures as well as in the period of implementation.

As far as the nature of the initiatives is concerned, there are e-health projects in Estonia, digital literacy projects in Lithuania and an e-learning project in the region of Berlin (DE), two initiatives dealing with broadband Internet access in Andalusia (ES) and in Cornwall (UK), and one measure dealing with ICT support for SMEs in the Umbria region (IT). Also, a territorial cooperation project dealing with the exchange of good practice in e-health initiatives was studied.

Although the distinction is not very clear-cut, the projects reviewed can be differentiated on the basis of whether they foster the supply of ICT and related applications (e-health, broadband access) or they promote demand for ICT (e-learning, ICT for SMEs, digital literacy). Broadly speaking, the primary objective of the e-health projects is to increase the quality and the efficiency of public healthcare services, while the aim of the cross-regional project was to promote the transfer of innovative e-health applications among participants in order to overcome the accessibility challenges faced by the regions of the Northern Periphery. The objectives of the digital literacy projects are to increase ICT skills and the use of computers and the Internet by targeted groups. Broadband Internet access projects aim to reduce the risk of digital exclusion of some areas and groups of people. The objectives of the measure dealing with grant schemes for SMEs are to help SMEs to adapt their infrastructure and machinery and to encourage SMEs to take up ICT to carry out daily activities. Finally, the e-learning project aims to enhance the use of the Internet as a learning device.

All the reviewed initiatives except for "Libraries for Innovation" (LT) were co-financed by the Structural Funds either in the programming period 2000-2006<sup>100</sup> or in 2007-2013.<sup>101</sup> The majority of these were financed by the ERDF (six out of nine).<sup>102</sup> For most of the initiatives, the European contribution covers the largest share of the total cost. Exceptions are those projects selected for Andalusia (ES) and Cornwall (UK), which were mostly financed by regional and private contributions, respectively. Only in three cases were there any private contributions.<sup>103</sup> Private contributions account for large shares in the "Libraries for Innovation" (LI) and "Superfast Cornwall" (UK) initiatives (80% and 57%, respectively). There was a small share (2%) of private contribution for the "Guadalinfo" initiative (Andalusia).

There were three different types governance structures in the selected initiatives: 1) publicly managed; 2) partnership; 3) foundation. The Guadalinfo project<sup>104</sup> (Andalusia, ES), the Explorarium II" project (Berlin, DE), and the "Development of computer literacy skills" (LT) and "SMEs grant scheme for ICT" (IT) initiatives were fully publicly managed by the national or the regional administration. The "Libraries for innovation" (LT) initiative was also publicly managed since the Lithuanian National Library coordinated the project.

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<sup>100</sup> Namely, the two Estonian e-health projects and part of the "Guadalinfo" project (Andalusia, ES).

<sup>101</sup> All the projects except for the two Estonian e-health projects, part of the "Guadalinfo" project (Andalusia, ES) and the project "Libraries for innovation" (LT).

<sup>102</sup> One initiative, i.e. Libraries for Innovation from Lithuania, was not been financed by the Structural Funds.

<sup>103</sup> Source: Case studies report.

<sup>104</sup> It is characterised by a "pyramid" governance structure where at the top there is a Consortium made up of the regional government and eight provincial councils, at the middle there are town councils and the zone team leader and at the bottom there are the local facilitators.

However, in this case the initiative stemmed from a tripartite agreement between the Ministry of Culture of the Republic of Lithuania, the National Library of Lithuania and the Bill & Melinda Gates foundation. Moreover, up to 80% of this project was financed by private stakeholders. A public-private partnership was set up between the Cornwall Council and BT, one of the leading providers of communication services in the UK, to manage the "Superfast Cornwall" (UK) project. A larger partnership was put in place for the cross-regional project. In this case, a triple partnership existed among academic and research centres, the public sector and private sector businesses. Finally, the two Estonian e-health projects were managed by a foundation including public and private sector stakeholders.

A summary table presenting the main features of the initiatives reviewed is provided below. The initiatives can ideally be split into two broad categories, those targeting access and use of ICT/the Internet as such, and those for which ICT/the Internet is instrumental in delivering a service or in reaching an objective. In the first group, a further distinction can be made between projects that provide not only access, but also incentives or support to use ICT/the Internet ("Guadalinfo" and "Superfast Cornwall") and projects that only concentrate on promoting an effective use of the Internet (without dealing with the access issue: "Libraries for innovation" and "Development of Computer Literacy skills" in Lithuania, and "SMEs grant scheme for ICT adoption and diffusion"). The second group comprises the Estonian and cross-regional e-health projects, and the German e-learning initiative.

**Table 7. Overview of the initiatives**

NAME	SECTOR	REGION & COUNTRY	DESCRIPTION	TIME	TOTAL COST	FINANCING STRUCTURE	PROGRAMME	GOVERNANCE
Electronic Health Registry (EHR)	e-health	Convergence Region of Estonia	The Electronic Health Registry is a nationwide system that integrates data from Estonia's different healthcare providers to create a common record for each patient. The main application of the EHR is the Patient Portal, which was launched together with the EHR and which allows citizens to use various e-health related e-services.	<ul style="list-style-type: none"> <li>• Development and Implementation : 2005 -2009</li> <li>• Operation: 2009 - forever</li> </ul>	€1,594,941	<ul style="list-style-type: none"> <li>• ERDF: 73%</li> <li>• National Government: 27%</li> </ul>	"Estonian National Development Plan for the Implementation of EU SF – Single Programming Document 2004-2006", 4th priority - "Infrastructure and Local Development", Measure 4.5 – "Information Society Development".	Operational management of the initiatives was conducted by the Estonian e-Health Foundation, established in 2005 by a number of public and private sector stakeholders.
Digital Prescription	e-health	Convergence Region of Estonia	Digital Prescription is a centralized, paperless system for issuing and handling medical prescriptions. The system operates via the Digital Prescription Centre – a national database containing all prescriptions created by healthcare providers in Estonia. Pharmacists and chemists have access to the Digital Prescription Centre and dispense medicines to people upon presentation of an identity document.	<ul style="list-style-type: none"> <li>• Development and implementation : 2005 -2009</li> <li>• Operation: 2010 - forever</li> </ul>	€ 273,731	<ul style="list-style-type: none"> <li>• ERDF: 75%</li> <li>• National Government: 25%</li> </ul>	"Estonian National Development Plan for the Implementation of EU SF – Single Programming Document 2004-2006", 4th priority- "Infrastructure and Local Development", Measure 4.5 – "Information Society Development".	Operational management of the initiatives was conducted by the Estonian e-Health Foundation, established in 2005 by a number of public and private sector stakeholders.
Explorarium II	e-learning	Competitiveness Region of Berlin (Germany)	Explorarium II provides training and coaching to enable teachers at schools located in disadvantaged areas to use a digital learning platform as well as to improve their knowledge of blended learning. The catchment area included districts with a high share of non-German children and children with a migration background.	<ul style="list-style-type: none"> <li>• Development: 2005 -2009</li> <li>• Implementation : 2009-2011</li> </ul>	€1,500,003	<ul style="list-style-type: none"> <li>• ESF: 50%</li> <li>• Regional Government: 50%</li> </ul>	Operational Programme ESF Berlin 2007-2013, 2nd priority - Human Capital Development, Measure 2.4.	The initiative was managed by the Berlin Administration for Education, Youth and Sport. The execution was provided by a non-profit organisation.

SMEs grant scheme for ICT adoption and diffusion	Support ICT use/adoption by SMEs	Competitiveness region of Umbria (Italy)	It provides grants to SMEs for the introduction and use of ICT as part of their development strategy and competitiveness. The initiative comprises seven calls for proposals with different scopes and eligible beneficiaries. Two ordinary ICT calls broadly addressing the diffusion of ICT and adoption by SMEs in the industrial, retail and craftsmanship sectors; three calls targeting ICT adoption by SMEs in specific sectors (tourism and audio-visual); and two competitiveness packages financing the ICT components of wider investment operations.	<ul style="list-style-type: none"> <li>• 2007-2013</li> </ul>	€7.07 million	<ul style="list-style-type: none"> <li>• ERDF: 50%</li> <li>• Regional Government: 50%</li> </ul>	ROP ERDF 2007-2013, Axis I - "Promoting and consolidating innovation and RTD processes for the competitiveness of the productive system", Measure 1.2 – "Promoting ICT access".	The measure is managed by the Managing Authority of the Regional Operational Programme.
Guadalinfo	Internet broadband access	Convergence region of Andalusia (Spain)	The Guadalinfo project aims to make broadband Internet accessible to all inhabitants including those living in the most remote areas. It was implemented in three phases: 1) 25 telecentres were set up in 25 disadvantaged municipalities; 2) extension of Guadalinfo to all municipalities with fewer than 10,000 inhabitants; 3) extension of Guadalinfo to all municipalities with between 10,000 and 20,000 inhabitants. Each centre does not solely provide users with Internet access, but also promotes a set of different activities including training and innovative projects.	<ul style="list-style-type: none"> <li>• First phase: 2002-2004</li> <li>• Second phase: 2004-2008</li> <li>• Third phase: 2008-2013</li> </ul>	€147.6 million	<ul style="list-style-type: none"> <li>• ERDF: 21%</li> <li>• Regional Government: 46%</li> <li>• Local public authorities: 31%</li> <li>• Private sector: 2%</li> </ul>	The project was implemented across two programming periods and benefitted from funds under three operational programmes: <ul style="list-style-type: none"> <li>• Operational Programme ERDF for Andalusia 2000-2006</li> <li>• National Operational Programme "Sociedad de la Información"</li> <li>• Operational Programme ERDF for Andalusia 2007-2013</li> </ul>	Guadalinfo's management model is structured as a "pyramid" where communication flows from the strategic ("Ferdinando de los Rios" Consortium made up of the regional government and eight provincial councils) to the more operational levels (town councils, zone team leaders and local facilitators). Top-down information relates to strategic



								decisions and directives. Bottom-up information relates to operations feedback. Also, communication flows horizontally across the zone team leaders, who meet on a monthly basis to ensure the consistency and coherence of the programme in their relative areas of competence.
Libraries for Innovation	Digital literacy	Convergence region of Lithuania	The project involves the provision of updated software and hardware in public libraries all across the country and training for library staff. The project also involves the provision of training for citizens, especially the elderly and those living in rural areas, to learn how to use computers and the Internet.	• Implementation : 2008-2012	€32.5 million	<ul style="list-style-type: none"> <li>• National government: 12%</li> <li>• Regional government: 8%</li> <li>• Private sector: 80%</li> </ul>		The project was initiated by the Bill & Melinda Gates Foundation and provides co-financing from Microsoft Corporation and the Ministry of Culture. The project was coordinated by the Lithuanian National Library.
Development of computer literacy skills	Digital literacy	Convergence region of Lithuania	This measure provides grants to support the development of computer literacy skills among workers and enterprises in target areas. The targeted population is people over 45 years of age and resident in one of the 14 depressed territories of Lithuania.	• Implementation : 2010-2013	€10.49 million	<ul style="list-style-type: none"> <li>• ESF: 100%</li> </ul>	This is a measure under Priority 1- Quality Employment and Social Inclusion - of the Operational Programme for Human Resources Development 2007-2013.	The measure is managed by the Ministry of Social Security and Labour of Lithuania.

Superfast Cornwall	Internet broadband access	Convergence region of Cornwall and the Isles of Scilly (UK)	It is a complex engineering project delivering superfast broadband throughout the Cornwall region, including infrastructure, wholesale platforms and end-user applications. It involves laying 130,000 km of optical fibre cable.	<ul style="list-style-type: none"> <li>• Implementation : 2010-2015</li> </ul>	€158.9 million	<ul style="list-style-type: none"> <li>• ERDF: 42%</li> <li>• Regional Government: 1%</li> <li>• Private sector: 57%</li> </ul>	ERDF Convergence Programme Cornwall & Isles of Scilly; 3rd Priority – Transformational Infrastructure.	Public-private Partnership between the Cornwall Council (Cornwall Development Company - CDC) and one of the leading providers of communication services in the UK, British Telecommunications plc (BT). Both BT and CDC are responsible for the delivery of the project. BT is the owner of the broadband infrastructure.
Healthcare goes electronic under northern skies	Cross-regional e-health project	Finland, Sweden, Norway, Scotland (UK)	<p>This cross regional project promoted the transfer of existing e-health applications among participants with the aim of using ICT technologies to overcome the accessibility challenges faced by the regions of the Northern Periphery and ultimately, to boost the economic development and growth of the area.</p> <p>Under this project five pilot e-health services were implemented. Namely, the Check-up bag, Tele-dialysis, the Remote Wound Clinic, the Mobile Eye Screening Unit and Remote Speech Therapy.</p>	<ul style="list-style-type: none"> <li>• First phase (mapping of existing e-health services) 2008</li> <li>• Second phase (identification of sites): 2009</li> <li>• Third phase (implementation): 2010-2011</li> </ul>	€1,606,333	<ul style="list-style-type: none"> <li>• ERDF: 58%</li> <li>• Local public authorities: 42%</li> </ul>	European Union's Periphery Programme 2007-2013; 1st Priority – Promoting innovation and competitiveness in remote and peripheral areas.	The project governance takes the form of a triple partnership among academic and research centres, the public sector and private sector businesses in the different countries. The Lead Partner of the project was the Northern Ostrobothnia Hospital District.

**Source:** Authors based on case study reports

## 3.2 Outcomes

### 3.2.1 Digital literacy

Digital literacy can be either a primary objective pursued through the activation of formal training, or it can be a consequence of an increased use of ICT/the Internet, obtained informally, through a learning-by-doing process. Several projects reviewed had achieved improved digital literacy as a main outcome.

Due to their two-fold purpose, not solely of providing access to the Internet, but also of promoting a set of activities such as training and innovative projects, The “Guadalinfo” and “Superfast Cornwall” projects have contributed to the achievement of improved digital literacy. In the case of the “Development of computer literacy skills” and “Libraries for innovation”, digital literacy was an objective in itself. The main outcome of the former was the improvement in the digital skills of targeted groups of people, seniors resident in rural areas or people with disabilities, while in the context of the latter, training was offered to 2,700 employees of public libraries and 1,500 of them subsequently became involved in training the library visitors. In this way, the library staff acquired the necessary competences to continue to provide training even after the end of the project.

Instead, improved digital literacy was an indirect outcome of some of the projects like “SMEs grant scheme for ICT”, the cross-regional e-health project or “Explorarium II”. Indeed, the diffusion of new ICT tools and solutions can improve digital literacy in a spontaneous manner. In fact, when the competence required is not particularly complex, a learning-by-doing process is enough to prepare people to use digital technologies. Both “Superfast Cornwall” and “Guadalinfo” also contributed to improved digital literacy in this indirect and spontaneous way. When more complex operations entailing more advanced competences are concerned, in principle professional training is needed to consolidate specific ICT skills. But, for instance, thanks to the “Remote Wound Clinic” and “Remote Speech Therapy” initiatives under the cross-regional project, both patients and health professionals improved their knowledge and skills and started to use video conferencing without dedicated support (see box below).

#### **Box 2. Remote Wound Clinic and Remote Speech Therapy**

The **Remote Wound Clinic** is an innovative Norwegian application piloted in Finland. It offered specialist services from the University Hospital to residents of a remote community at their local health care centre. A full-HD video-link was established between the outpatient dermatology and surgery clinics at Oulu University Hospital and the Pudasjärvi health care centre. Through this video-link patients with complicated wounds or leg ulcers were able to receive consultations from a dermatologist or a plastic surgeon located 90 km away. Specially trained nurses were also present on both sites. A video-link between the healthcare centre and the patient’s home was also established, allowing a home nurse to contact the healthcare centre and consult the wound nurse on how to treat a wound. The service was delivered using two compatible video conferencing sets - Tandberg C20 Full HD with two 42” screens. The home nurse used portable equipment, Tandberg Centric 1700 MXP.

**Remote Speech Therapy** is a Swedish innovation piloted in Finland and Scotland. It consists of a ‘virtual therapy’ carried out by therapists based at rural hospitals serving patients living in remote communities. In Finland a full-HD video-link was established between the Pudasjärvi healthcare centre and two remote schools. The speech therapist was located at the healthcare centre and portable video-conferencing equipment was used in two remote schools. This allowed the children to receive therapy sessions at their schools, avoiding unnecessary travel and interruptions to their school day. The service was delivered using two compatible video conferencing sets. The speech therapist used Tandberg C20 Full HD with two 42” screens and

the schools had portable Tandberg Centric 1700 MXP units. In Scotland Remote Speech Therapy was piloted in North Highland, using existing NHS Highland<sup>105</sup> hospital video-conferencing units. The first trials in spring 2010 linked a patient in Wick with a stroke speech therapist at the regional hospital in Inverness (165 km south). After positive evaluation, remote therapy is now being expanded to other client groups and locations.

**Source:** Case study report "Healthcare goes electronic under northern skies"

### 3.2.2 Improved human capital and employability

Improved human capital and employability is a common indirect outcome of the projects that contributed to improving digital literacy, namely "Libraries for innovation", "Development of computer digital skills", "Guadalinfo", "Explorarium II" and to some extent "SMEs grant scheme for ICT" and "Superfast Cornwall". Indeed, thanks to the new ICT competences acquired either spontaneously or during training, people improved their human capital and, in turn, their employability and competitiveness in the job market.

Workers without digital skills are more and more likely to lose their jobs. At the same time, those looking for a job have greater chances of finding one if they possess digital skills. Stemming from this awareness, part of the training organised under the "Development of computer literacy skills" measure was aimed at developing those skills directly related to participants' needs in the labour market. For instance, doctors who attended these training courses learned how to use the new e-health system and public servants from local municipalities received ECDL<sup>106</sup> certificates, which are mandatory for their jobs.

In addition to acquiring basic ICT competence, which helps to become more competitive in the job market, participants of training courses also discovered that a job search is faster and easier online. In this regard, a survey commissioned by one of the organisations receiving support from the "Development of computer literacy skills" measure revealed that 32% of course participants started using the Internet for job searches. Also, Guadalinfo users are 4.8% more likely to seek employment online or make frequent online searches for further training.

Thanks to the "Explorarium II" project, the human capital in participating schools was effectively improved not necessarily (only) as the result of improved digital literacy as in the previous cases, but because of the enhanced learning capabilities that the project is supposed to achieve. During training and coaching hours, teachers learn to use a learning platform together with their students. In this way, not only did the teachers' competences increase, but also those of their students. Teachers stated that students involved in the project understood the opportunities of using computers and Internet access as learning tools. Additionally, since the project was also intended to promote the inquiry-based learning method, students participating in the coaching courses showed better verbal and written language skills and more self-confidence than students not participating. This, in turn, will have an impact on their future employability.

Finally, one may also consider that those projects aimed at improving health conditions (e.g. the Estonian e-health projects) will, in the long term, also positively affect human capital and employability.

<sup>105</sup> NHS Highland is one of the 14 regions of NHS Scotland. Geographically, it is the largest Health Board, covering an area of 32,500 km<sup>2</sup> from Kintyre in the south-west to Caithness in the north-east, serving a population of around 300,000 people.

<sup>106</sup> European Computer Driving Licence. It is a computer literacy certification programme.

### 3.2.3 Digital inclusion

The explicit aim of the Lithuanian projects “Libraries for innovation” and “Development of computer literacy skills” was the provision of equal access for all, i.e. comprising those at risk of digital exclusion. The digital inclusion of some disadvantaged groups like people living in rural areas, less educated people, the elderly, unemployed and people with disabilities, has improved. As far as the “Libraries for innovation” project is concerned, in 2011 72% of the digital assistance organised under the initiative was provided for residents of rural areas, 54% for the retired, 49% for the unemployed and 20% for people with disabilities. Digital inclusion is also an intended outcome of the “Development of computer literacy skills” measure since it specifically targets seniors and residents of rural areas. Moreover, some organisations that benefitted from support from this measure concentrated on training unemployed people and persons with disabilities or people in detention facilities.

An inclusion outcome was achieved in the “Guadalinfo” project thanks to the activities promoted by the 64 CAPIs (*Centros de Acceso Público a Internet* or Public Internet Access Centres) located in the suburbs of Andalusian towns with the greatest risk of social exclusion. Moreover, in these centres the initiatives targeted the more disadvantaged social groups in terms of digital literacy, namely women, the elderly, people with disabilities and immigrants.

Finally, digital inclusion is an outcome of the “Explorarium II” e-learning project, specifically aimed at teachers at schools located in those districts of Berlin with high share of non-German children or children of a migration background. The overall share of students of a migration background was above 65% in the schools involved in the project, and the objective was to reduce the dropout rate of this specific group at risk. The project also intended to deal with a generational divide between older and younger teachers.

In general terms, the above mentioned projects have achieved the outcome of digital inclusion since they have given more disadvantaged people the possibility of accessing ICT and of acquiring the basic skills in order to effectively join the Information Society. In some cases, there is an overlap with those projects that foster territorial cohesion, when groups at risk of social exclusion are also characterised by a geographical or territorial dimension (see below section 3.2.9).

### 3.2.4 Improved efficiency

In a number of projects the adoption of ICT or the use of the Internet allowed for efficiency gains in both businesses and public administrations. Improved efficiency was thus a main expected outcome of several of the initiatives reviewed, namely the two Estonian e-health projects, the cross regional e-health project, the “Superfast Cornwall” project and the “SMEs grant scheme for ICT” measure. Interestingly, these are projects that do not record outcomes in terms of digital inclusion.<sup>107</sup>

Thanks to modern IT solutions, the “Electronic Health Record” and its essential application, the Patient Portal, was expected to increase the efficiency of public healthcare services. Indeed, the healthcare providers are supposed to spend less time dealing with bureaucratic paperwork. Also, the EHR was intended to enable faster and more convenient ways of collecting medical data to compile statistics. However, due to a slow take-up of the system, the expected benefits were not fully achieved.

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<sup>107</sup> With the exception of the e-learning project; but as explained below, its contribution to efficiency is indirect and the channels of materialisation of the outcome differ from those of the other cases.

Conversely, in the case of the “Digital Prescription” project, the efficiency outcome was fully achieved. On the one hand, pharmacists reported that the processing of digital prescriptions required less time since the necessary information was already available in the system. Also, they noticed a simplified process of double-checking and editing the reimbursement codes assigned to medicines covered by the National Health Insurance Fund. On the other hand, the “Digital Prescription” helped healthcare providers to allocate the correct level of reimbursement of the prescribed medicines and this, in turn, has reduced the number of financial claims from patients regarding incorrect levels of reimbursement issued by the NHIS.

The pilot e-health services under the cross-regional project also show how they could contribute to improving the efficiency of the health service providers. In fact, thanks to the new ICT solutions implemented, the time and cost of consultations and examinations can be reduced. For instance, in Finland the project’s partners found that the use of video-conferencing for wound treatment was cost-effective. It was indeed assessed that a video-conferencing session leads to a saving of €135 per patient compared to conventional visits to the hospital.

In the case of the “Superfast Cornwall” broadband project the gain in terms of improved efficiency was an important outcome for the business sector. Technologies enabled by superfast broadband allow firms to save costs and time and to make their businesses more efficient. For instance, a video-conference allows people working in different locations to meet up, thus saving travel time and costs. Also, it enables more flexible working, making it possible for people to work from home (or other locations) and, at the same time, to communicate with their colleagues. Cost-savings can be obtained also by making calls over the Internet rather than through the usual landline or mobile routes. This is achieved through the Voice over Internet Protocol (VoIP) that enables users to make calls from wherever there is a fast Internet connection. Improved efficiency in business activities is also linked to the use of cloud-based applications, which means that all business information is hosted out on the Internet (the ‘cloud’), instead of on the computer or office-based server.<sup>108</sup> Moving data and applications into the ‘cloud’ means that people can access information from wherever they are working through a broadband connection. Cloud systems also allow for more efficient and effective work.

The investments for adopting ICT made by SMEs under the “SMEs grant scheme for ICT” measure have increased their efficiency due to the implementation of process innovation. Thanks to investments in such areas as web-oriented systems, management software, Business Intelligence systems or engineering software, SMEs have benefitted from more reliable, timely and consistent collection, processing and transmission of the information generated by the production process. By way of an example, the experiences of the companies Fin.Cave S.p.a and GTP S.r.l. are reported in the box below.

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<sup>108</sup> Facebook, Google’s suite of Apps and webmail like Hotmail are all examples of cloud computing because the applications and data are not stored on the user’s personal computer, but are stored in data centres accessed over the Internet.

**Box 3. Fin.Cave S.p.a and GTP S.r.l**

**Fin.Cave S.p.a** is a mining company producing and distributing stones and bituminous material. It has invested in a remote control system of productive and accounting data, in particular for the logistic activities. The new system enables the truck drivers to report their daily activity and the characteristics of the transported materials through a remote system and telematic support. This system has enabled time savings as well as an improvement in the reliability and the promptness of the logistical reporting system.

**GTP – Gruppo Poligrafico Tiberino S.r.l.** represents a network of SMEs active in the printing and cartography industry delivering integrated services of communication, printing, packaging and related services (including logistics). It works by capitalising the competence and assets of the partner companies, by identifying new business opportunities, coordinating research and innovation activities, developing standards and tools for value chain management and cooperation. It works as a virtual company building on the enterprise community of its partners. The investment implemented by GTP S.r.l. aimed to develop new IT solutions for sharing and managing the accounting and productive data of the partner companies. The project allows for more efficient and reliable data management, especially for collaborative projects that require the sharing of resources, competences and assets.

**Source:** Case study report "SMEs grant scheme for ICT"

Lastly, it is interesting to note how the "Explorarium II" e-learning project was reported to have increased efficiency, not directly through the use of ICT, as is the case of other projects, but through increased digital literacy, which increases the efficiency of investments in ICT.

**3.2.5 Improved productivity/competitiveness**

An indirect outcome of the improved efficiency resulting from the adoption of ICT is the increase in productivity and/or competitiveness. This is especially true in the case of the "Superfast Cornwall" project. Indeed, superfast broadband has enabled people and businesses to work more efficiently, for example by getting more work done in a day, thus improving productivity. At the same time, having the advantage of a superfast connection, companies can find new opportunities to do business in the international market, thus improving their competitiveness. The same mechanisms are at work in the cross-regional e-health project.

The capacity for businesses, especially SMEs, to survive in an increasingly technologically advanced market is at risk, thus supporting ICT adoption can avoid the mortality of the weakest businesses. As a result, in some cases, the adoption of ICT is not an option in order to increase the efficiency and thus the productivity of enterprises, but it is rather a necessity to keep the business alive. This emerged from the "SMEs grant scheme for ICT" case study. Maintaining their competitive position was the main outcome of the investments specifically targeted at supporting local TV operators and micro cinemas. Since the technological development driving the audio-visual industry was not affordable for small operators, if they had not been supported by the measure, they would have risked being forced to exit the market.

**3.2.6 More innovative public services and goods**

Some projects improved the quality of existing public services or offered new ones. This can be both a primary objective and a direct outcome. Indeed, the projects aimed at providing online e-services (the two Estonian e-health projects and the cross-regional e-health project) deliver more efficient and innovative or even radically new public services. For example, the Estonian "Electronic Health Record" enables citizens to claim disability status or to receive social insurance certificates online. Also, the "Digital Prescription" recorded very high usage and satisfaction rates among all the stakeholders (healthcare providers, pharmacists and citizens).



In contrast, for the Lithuanian project “Libraries for innovation” the fact that to some extent it “reinvented” the traditional role of libraries in local communities was an indirect consequence of its primary objective (digital inclusion).

In Umbria one important outcome of the “SMEs grant scheme for ICT adoption and diffusion” was the improvement in the quality and number of services or products. ICT can improve the quality and reliability of services thanks either to building on the improved efficiency in the business process (hence the former outcome directly influences the possibility of the efficiency gain reflected on the end-users) or to enlarging the number or nature of the services offered.

### **3.2.7 Increased take-up of online public services**

Many of the projects reviewed more or less directly brought about an increased take-up of online services. The improved take-up of online public services was stimulated by the increased digital literacy achieved under the “Development of computer literacy skills”, “Libraries for innovation” and “Guadalinfo” measures. The survey commissioned by the organisation that received support from the “Development of computer literacy skills” measure revealed that 56% of their participants indicated that computer literacy training had provided them with the incentive to use public e-services. Actually, according to the Lithuanian National Statistical Institute, between 2008 and 2012 the share of Lithuanians who used public e-services for filling-in and sending completed official forms increased by 14%. According to the mid-term evaluation of “Guadalinfo” carried out in 2011, Guadalinfo users are more likely to frequently use online public services, such as downloading and sending official documents and forms, taking telematic medical appointments, applying for personal employment histories and obtaining driving records from the Department of Motor Vehicles.

The “Superfast Cornwall” broadband project also contributed to improving the take-up of online public services. Prior to project implementation, accessing the basic online services from home was time-consuming and frustrating because of the low connection speed. For instance, even downloading an e-mail took a long time, so people were forced to move to local computer centres to use faster connections. Thanks to the superfast broadband allowing for a reliable and fast connection regardless of the number of people using the Internet in the same house, citizens can interact with public authorities online and join all the public e-services available.

### **3.2.8 E-commerce**

The increase in e-commerce services is a further direct outcome of the “Superfast Cornwall” project. Indeed, the project has opened the door for new opportunities to do business in the international market by selling products and services over the Internet. Several businesses can confirm the increase in their e-commerce activities after the implementation of “Superfast Cornwall”. By way of an example, the box below illustrates the experience of the company ARCOL.

**Box 4. ARCOL**

ARCOL was one of the first businesses to be connected to 'Fibre to the Premises' superfast broadband, obtaining download speeds of over 90 Mbps. It is a manufacturer of fine quality resistors for the electronics industry. It is the only manufacturer of its type in the UK and it produces between three and a half and four million resistors annually at its base in Truro. It is active in more than 30 countries around the world, with 80% of production being exported. As stressed by ARCOL's Director, the ADSL line existing prior to project implementation was giving an average download speed of around 1.5 Mbps, thus limiting and slowing the activity of the company. Thanks to the project, the new fibre connection is regularly providing 92 Mbps, which enables the company to do everything much faster. Moreover, nine of ARCOL's staff who regularly work from home are now able to easily and quickly access company information through cloud computing services and can communicate with other colleagues in the office (through video-conference applications). Superfast broadband also gave ARCOL the chance to relocate one of its salesmen to Buckinghamshire, in order to service the UK market more effectively. The sales and purchasing team can now rely on an interactive portal, where transactions are immediately processed. The new connection has also enabled the company to improve its e-commerce service, by responding much faster to customers all over the world. All of these new advantages are expected to generate an increase in turnover, but are likely to materialise in the long-term.

**Source:** Case study report "Superfast Cornwall"

The increase in the take-up of e-commerce services was also a direct outcome of some of the investment projects supported under the "SMEs grant scheme for ICT" measure. Some of the supported projects were indeed aimed at developing web portals and systems to sell services and products online.

Finally, e-commerce was an indirect outcome of the Lithuanian project dealing with digital literacy. A survey commissioned by an organisation that received support from the "Development of computer literacy skills" measure revealed that after their training courses, 16% of the participants started buying online.

### **3.2.9 Reduction of the geographical divide/improving territorial cohesion**

A major outcome achieved by the "Superfast Cornwall" project was the reduction of the geographical divide and the improvement in territorial cohesion both between the remote Cornwall region and the remainder of the county and within the region, which also include a small archipelago of islands, the Isles of Scilly. For instance, thanks to the technologies enabled by superfast broadband people are no longer forced to travel to London for business meetings, as they can just use the Internet.

Also, the cross-regional e-health project shows the potential contribution of e-health applications to reducing geographical divides and fostering territorial cohesion between rural and urban areas. As a matter of fact, all the e-health applications implemented under the project aimed at ensuring access to health services for people living in remote areas. The project has proved that where the population density is very low, such as in rural areas of northern periphery countries, the exploitation of ICT technologies can help to reduce the real distances between patients and healthcare providers or specialists.

Finally, the reduction of the geographical divide was an outcome of the "Guadalinfo" project and the Lithuanian projects "Libraries for innovation" and "Development of computer literacy skills". In the case of "Guadalinfo" the gap, in terms of broadband Internet access, between the urban centres and the small isolated and disadvantaged villages was reduced thanks to the

setting up of 756 telecentres<sup>109</sup> in all the municipalities with fewer than 20,000 inhabitants. Instead, the reduction of the geographical divide between the advantaged/urban and disadvantaged/rural areas of Lithuania was an objective of the “Libraries for innovation” project to equip 1,276 urban and rural public libraries with computer hardware and software, and thanks to which 97% of rural libraries became connected to the Internet. The “Development of computer literacy skills” project was also implemented in distressed territories and digital literacy training helped to reduce differences in digital competences between Lithuania’s core and peripheral areas. To some extent, even the “Explorarium II” e-learning project contributed to territorial cohesion inasmuch as it was addressed to schools in distressed areas of Berlin.

Overall, the reduction of a geographical divide, whether it takes the form of a rural/urban divide and/or sheer remoteness, appears to be dealt with by several projects that explicitly target this objective, even when it is not the primary objective. It was an outcome achieved by all the initiatives reviewed except two (the “SMEs grant scheme for ICT adoption and diffusion” and the Lithuanian e-health initiatives).

### **3.2.10 Improved living conditions**

The e-health projects reviewed contributed to making the lives of the targeted individuals easier. One of the main outcomes brought about by the two Estonian e-health projects and the pilot e-health services under the cross-regional project is time savings and the reduction of costs, mainly transport costs, for patients. In the Estonian case, thanks to the EHR system, citizens no longer have to visit various doctors in order to get their complete medical information, which used to be very time-consuming. Similarly, the Digital Prescription leads to citizens’ time savings since they are no longer required to fix medical appointments for routine refills. As to the pilot e-health services under the cross-regional project, a common feature of the various services was to bring healthcare to the patients instead of the other way round. Rather than travelling to the main hospitals, thanks to innovative ICT applications, patients were examined at home or at the nearest healthcare centre, thus allowing a saving of time and a reduction in travelling costs. In the Lithuanian projects, increased Internet take-up was also reported to make a number of daily activities (banking, selling/purchasing goods, using public services, taking courses etc.) simpler as they are easier online than offline. The “Superfast Cornwall” project was also reported to have contributed to improving everyday life at home (some examples are provided in the box below).

<sup>109</sup> A total of 694 telecentres were located in municipal areas and 64 in suburbs.

**Box 5. Households benefiting from the Superfast Cornwall project**

Tim Goldburn, the clinical negligence partner at Preston Goldburn Solicitors in Falmouth, said: "I can connect to the office Virtual Private Network straight from our Document Case Management system, use digital dictation and carry out medical and legal research online, all at the same time. My wife can manage the payroll using electronic banking, while my son and daughter can either study online or more likely use Facebook or iPlayer without causing me any loss of connection speed. Before we had superfast, there was no way we could all be busy online without the connection slowing right down. I have just completed an eight-part series of three-hour live medical and surgical video-conferencing training sessions, which were presented by some of the county's leading surgeons, without having to leave home. Superfast broadband is also going to open up new and cheaper ways of increasing our firm's skills and expertise by taking full advantage of webinars and remote training".

Joyce and Colin Duffin live in the seaside village of Portreath on the north coast. They are working more efficiently by using their superfast connection. Joyce says, "I am able to do much more research online as part of my council duties and read news stories as soon as they are available". Also, Colin says that "The amount of work I can get through in a day is much greater now the connection speed keeps up when I want to send files or access content online. It really does prove that with the right connections you can work just as efficiently from anywhere and the bonus is I get to spend more time with the family. I also save money on fuel and I'm pleased that I'm saving a bit for the environment too".

**Source:** Case study report "Superfast Cornwall"

Improved living conditions also materialise through improved health conditions expected from the e-health projects in Estonia.

**3.2.11 Reduction in social costs**

Some projects have led to a reduction in social costs. In particular, the e-health projects reduced the cost of healthcare thanks to time and cost savings related to increased efficiency and take-up. The reduction in social costs was also an indirect outcome of the "Explorarium II" project. As a matter of fact, considering that in Berlin the school dropout rate among students of a migration background is relatively high and that there is a positive correlation between low formal education and the dependence on social transfers, the focus of the project on schools with high share of children of a migration background has the potential to contribute to reducing the rate of persons receiving unemployment or social benefits from the Berlin state. Also, the expected long-term effects of the project to form "labour pools" in sectors characterised by a relative shortage of adequate skills will contribute to reducing social costs. By (potentially) reducing transport costs, various projects (Superfast Cornwall, the e-health projects) also brought about a reduction in a specific social cost: the environmental cost.

**3.2.12 Empowerment and participation**

An indirect outcome of many of the initiatives studied is the empowerment of citizens. Indeed, as reviewed above, gaining improved digital literacy and access to ICT enables people to carry out many different activities (increased take-up of online public services and broader interaction with public institutions, joining social networks, seeking employment opportunities online, buying online, also signing petitions online, etc.) which may contribute to a feeling of fulfilment. This is the case of the Lithuanian projects and of Guadalinfo. This latter project provided users with opportunities to develop their own ideas and initiatives (e.g. micro-businesses). Also, the two Estonian e-health projects clearly contributed to the empowerment of patients by establishing "patient-centred" systems. Allowing patients to have full information

about their health conditions and to monitor their medical history has made them better informed and more actively involved in the treatment process. Empowerment might also result from improved digital inclusion, as in the “Explorarium II” project.

In fact, not only have the projects contributed to individual empowerment, but also to increasing the participation of people in both virtual and real communities. Increased virtual participation in society is shown by the larger number of people participating in social networks. Interestingly, some projects also brought about stronger local communities. Thus, increased participation in the real society is an outcome of projects like “Guadalinfo” and “Libraries for innovation” where telecentres and libraries have become places where people meet and socialise. In other words, they have become places favouring integration and social cohesion. In the case of Guadalinfo, for example, this was said to be an important factor improving the attractiveness of the territory.

### 3.2.13 Synthesis

Table 8 below provides a snapshot of the outcomes brought about by (or expected from) the initiatives explored in the case studies.

**Table 8. Overview of the outcomes recorded by the case studies**

Outcome /Initiative	e-health (EE)	e-health (cross reg)	Digital literacy (LT)	Broadband access (Andalusia ES)	Broadband access (Cornwall UK)	e-learning (Berlin DE)	ICT for SMEs (Umbria IT)
Digital literacy		(X)	X	X	X	X	X
Human capital and employability	(X)		X	X	X	X	X
Digital inclusion			X	X		X	
Improved efficiency	X	X			X		X
Improved productivity/competitiveness					X		X
Provision of innovative public services and goods	X	X	(X)				X
Take-up of e-services	X	X	X	X	X		
E-commerce			X		X		X
Improved territorial cohesion		X	X	X	X	(X)	
Improved living conditions	X	X	X		X		
Reduction in social costs	X	X				X	
Improved environment	X	X			X		
Empowerment	X		X	X		X	
Social participation			X	X			

**Source:** Authors based on case studies.

**Note:** (X) denotes an outcome of minor magnitude or importance.

Some outcomes were recorded that had not been envisaged in the analytical framework, they are mostly related to positive effects on the environment and “improved living conditions”, i.e. the contribution of ICT projects to making citizens’ lives easier. In a few cases, some very peculiar channels were activated through which the projects had an impact on regional development. This was the case of “Guadalinfo”, which records significant effects in terms of institutional learning, with resulting increased productivity of the public administrations involved, and positive impact on economic growth through a reduction in social costs. However, this outcome is very much linked to the implementation of the project and is, as such, short-lived.

Also, interestingly, no negative outcomes whatsoever were recorded. For example, one might have thought that digitalisation could lead to distant disembodied social and economic interactions taking place to the detriment of face-to-face relations. In fact the opposite occurred, and on at least two occasions, the initiatives were the origin of an upsurge in social relations, contributing to reinforcing social capital.

Overall, the various initiatives are governed by distinct logics and objectives, which are very different and depend on the needs and structural features of the regional setting in which they develop. There is a broad distinction between initiatives that take the Internet and ICT as objectives *per se* and those that *use* the Internet to achieve other (related) objectives (corresponding to a purposeful or instrumental use of the Internet). Of course, the latter initiatives develop in settings where the basic requisites in terms of access to the Internet and digital literacy are fulfilled, while the former precisely endeavour to establish these very requisites in places where they are insufficient (i.e. in regions with less well developed ICT endowments). However, it is interesting to note that once the fundamental difference in rationale is acknowledged, the two types of initiatives do not differ drastically as far as other potential outcomes are concerned. There is no distinct pattern characterising the outcomes recorded by projects taking ICT development as an objective *per se*, and those of projects that use ICT instrumentally.

On the face of it, what seems to be a more decisive discriminating criterion is the issue of whether the projects foster effects primarily in terms of efficiency or in terms of digital inclusion. Indeed, an old trade-off between efficiency and equity appears to emerge from the analysis of the case studies. It is striking to note that those projects that obtain significant efficiency gains (the e-health projects, “Superfast Cornwall” and “SMEs grant scheme for ICT adoption”) are distinct from those that primarily address inclusion issues (how to ensure that social groups at risk of exclusion not only do not also suffer from a digital divide, but can also avail themselves of ICT and the Internet to combat and even reverse such social exclusion).<sup>110</sup> Interestingly, the first category does not only concern private businesses (like the “SMEs grant scheme for ICT adoption”) but also public administrations providing online services (the e-health projects). In turn, it is worth noting that the two categories of projects tend to record *sui generis* effects. For example, the “inclusion projects” have significant effects in terms of empowerment and social participation, while the “efficiency projects” perform well as far as improved living conditions or the reduction in social costs are concerned. Conversely, there are “transversal” effects, recorded indistinctly by both categories of projects: digital literacy (and the consequent improved human capital and employability) and improved territorial cohesion. There is also a relation between the inclusion/efficiency criterion and the mode of governance and funding solutions. Unsurprisingly, “efficiency projects” make more room for the

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<sup>110</sup> It is worth insisting that in this report digital inclusion refers to social variables and does not take into account geographical considerations (see Annex 1). Of course, there can be (frequent) overlaps when social groups at risk of exclusion are also situated in territorial enclaves or in remote areas – but as far as possible the analysis attempts to make the distinction. In this sense, the two projects that deal with territorial divides, “Superfast Cornwall” and the inter-regional e-health project, are not considered to contribute to “inclusion” as defined in a social sense.

participation of the private sector (the reference in this respect is the private-public partnership concluded by BT and the Cornwall Council), while “equity projects” tend to be fully publicly managed by national or regional administrations.<sup>111</sup>

### 3.3 Interactions between outcomes and impacts

The different projects reviewed show mixed, and generally relatively balanced, effects in terms of both economic growth and well-being. In this respect, the distinction between “efficiency projects” and “inclusions projects” outlined above holds.

The projects primarily focused on inclusion are characterised by similar patterns (see Figure 28, Figure 29 and Figure 30). They contribute to social well-being mainly through digital literacy and inclusion, empowerment and increased employability, as well as improved territorial cohesion. The two Lithuanian digital literacy projects and “Guadalinfo” also strengthen local communities by contributing to creating new social spaces around the “libraries for innovation” and “telecentres”, respectively. Interestingly, the three cases are also characterised by potential for contributing to economic growth through different channels, all related to increased digital literacy:

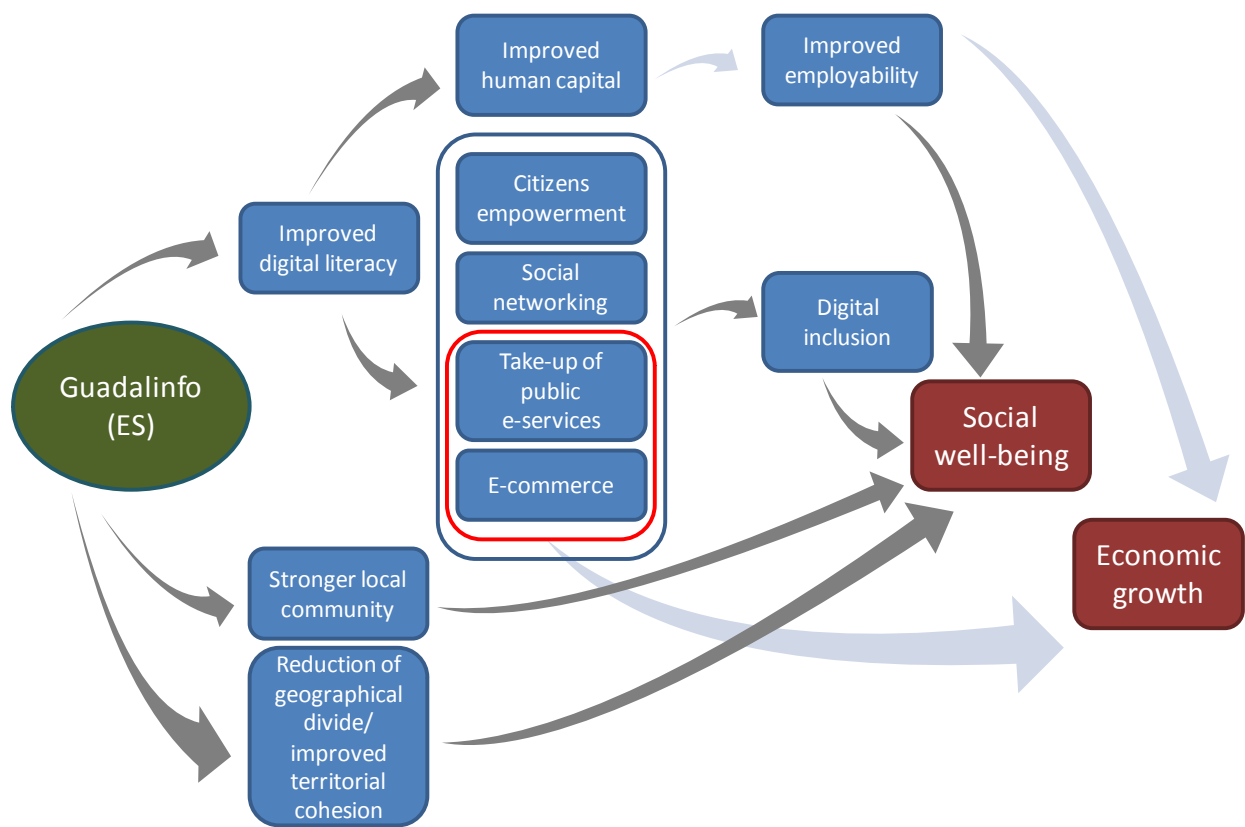
- Increased take-up of e-services making possible efficiency gains and a reduction in social costs;
- Increased e-commerce;
- Improved human capital resulting in improved employability and productivity.

These channels are activated differently depending on the maturity reached by the Information Society in the cases reviewed, and on whether the project aims to develop Internet access *per se* (“Guadalinfo” and the two Lithuanian digital literacy projects) or as a means of achieving other objectives (“Explorarium II”). In the “Guadalinfo” case, these expected outcomes are still embryonic, but there are signs that the project is giving rise to enhanced individual initiatives, recourse to basic e-services, and improved job search practices. The e-learning project “Explorarium II” shows how the contribution to social aims (the integration of students with migrant backgrounds) is expected to have important positive economic consequences on the future dynamics of the labour market (although this is in the long-term). Indirectly, the reduction in social costs resulting from the expected improved job position of students with migrant backgrounds is also supposed to contribute to unleashing potential for economic growth. Finally, as far as the digital literacy projects in Lithuania are concerned, the expected effects in terms of reducing the digital divide and strengthening the local communities are associated with positive economic effects resulting from the increased use of the Internet to carry out basic activities like shopping, job searches, etc., as well as improved human capital.

<sup>111</sup> In fact this is also the case of the “SMEs grant scheme for ICT adoption”.

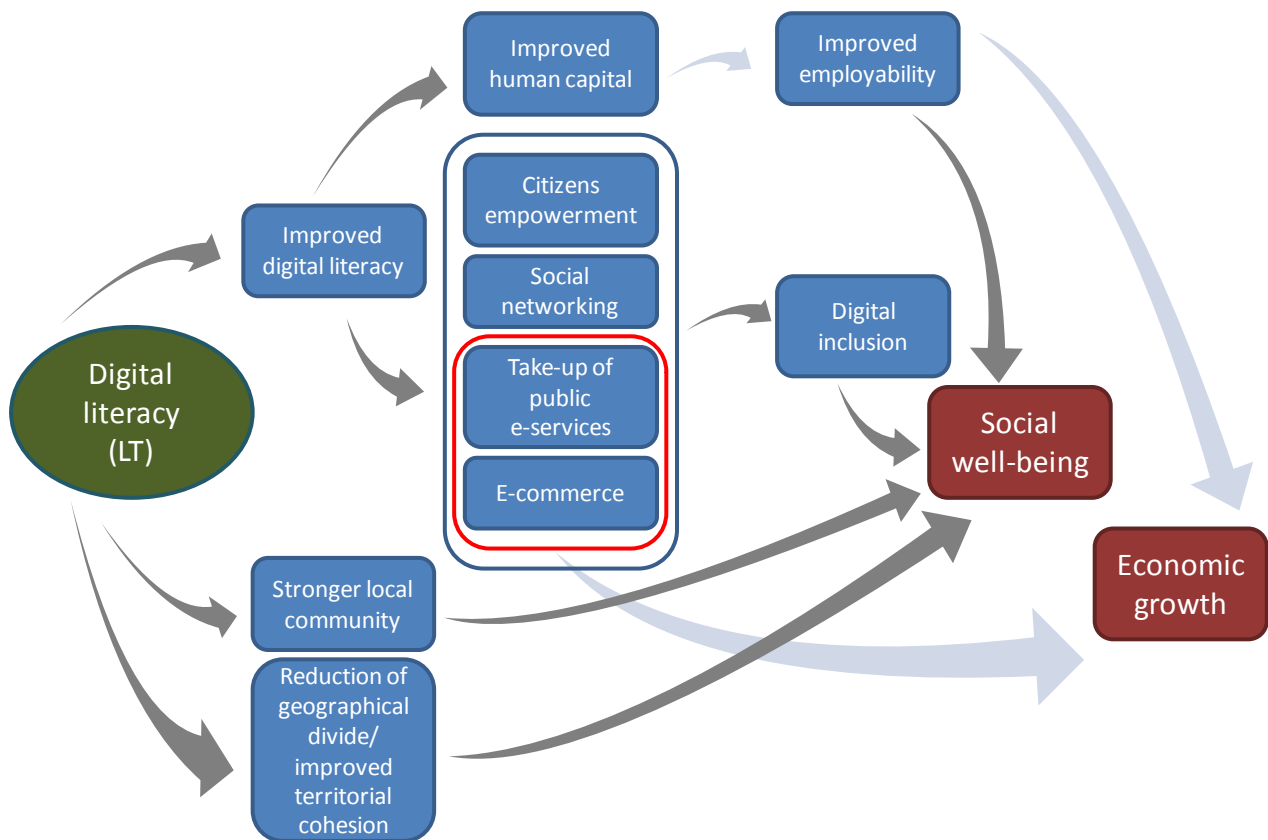


**Figure 28. Outcome patterns in the case of Guadalinfo (ES)**

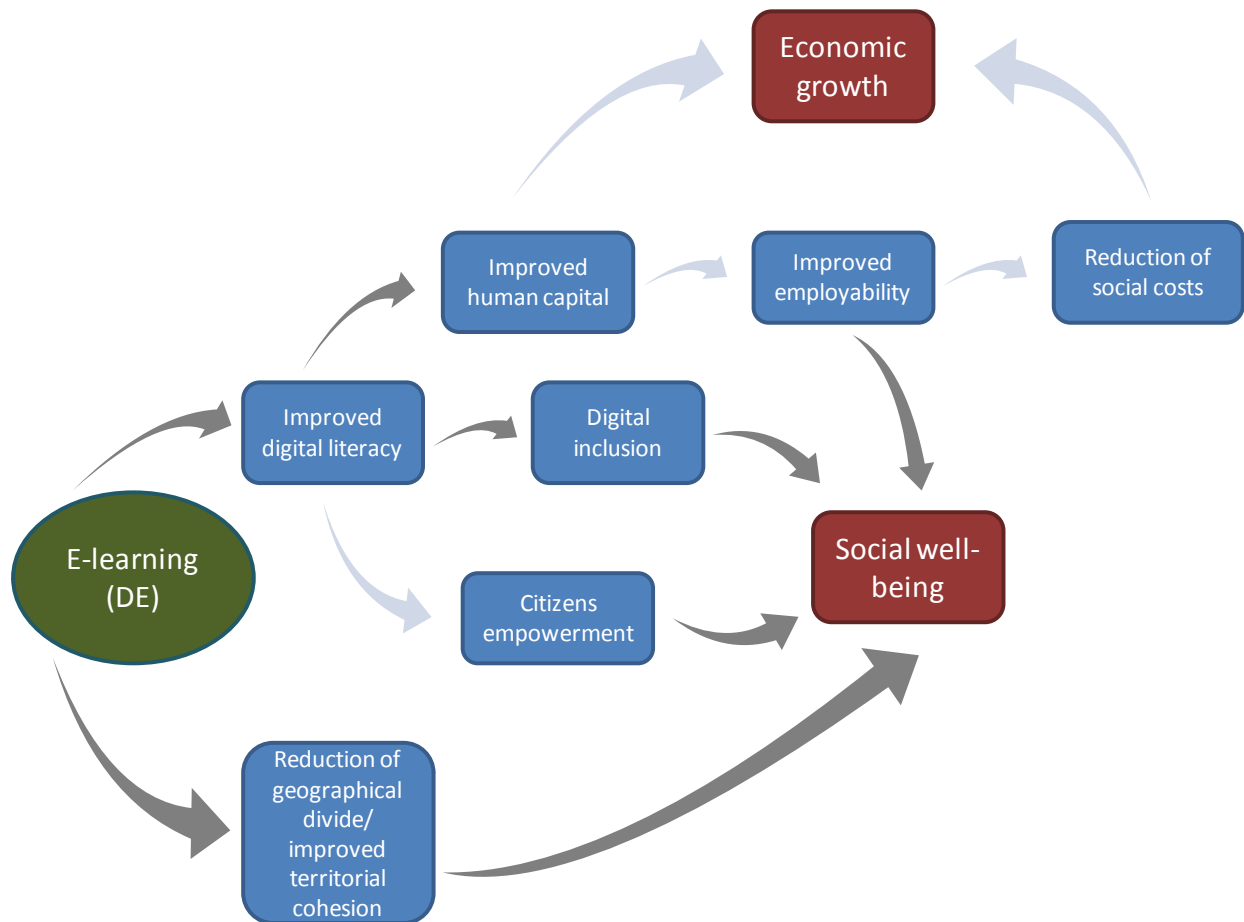


Source: Authors

**Figure 29. Outcome patterns in the case of digital literacy projects (LT)**

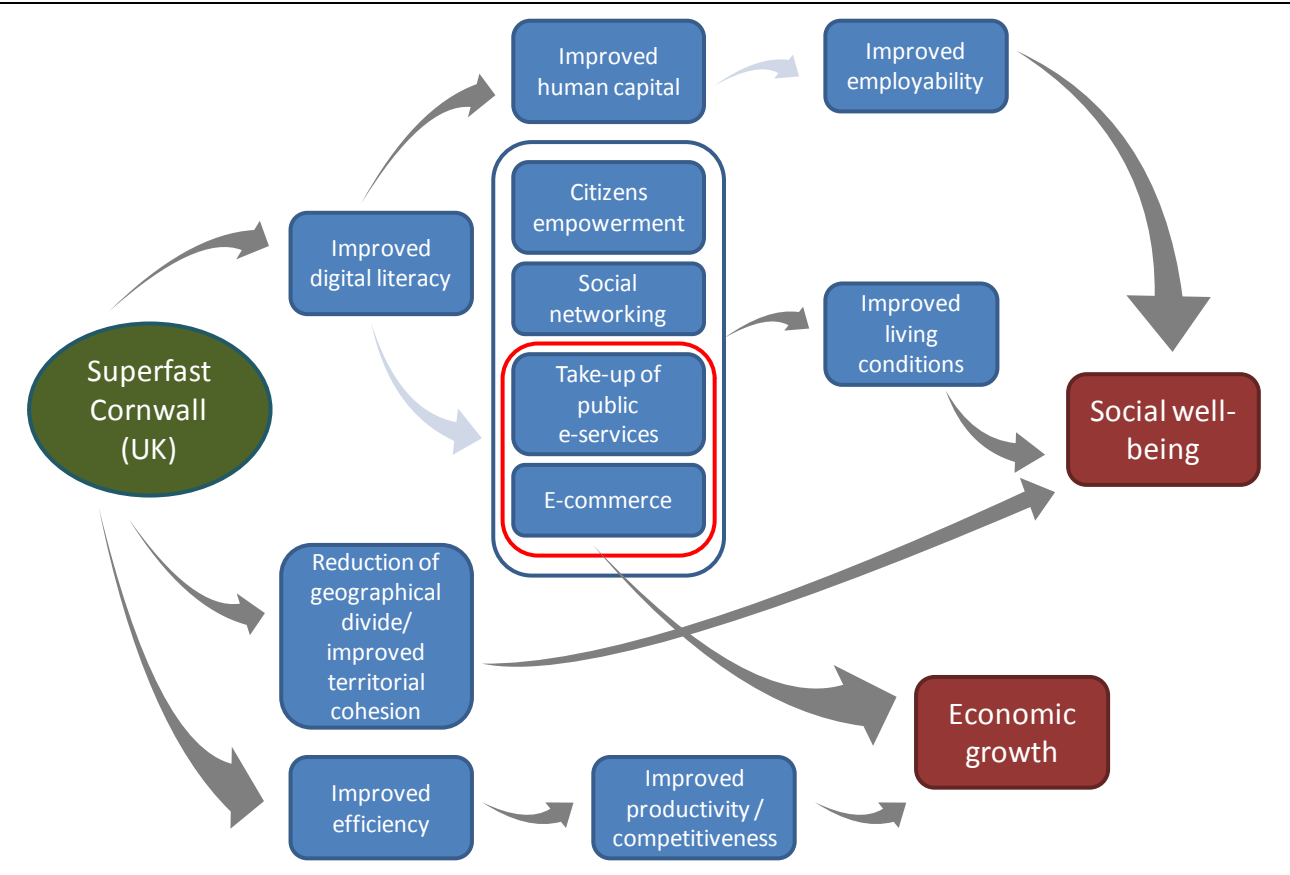


Source: Authors

**Figure 30. Outcome patterns in the case of the e-learning project: Explorarium II (DE)****Source:** Authors

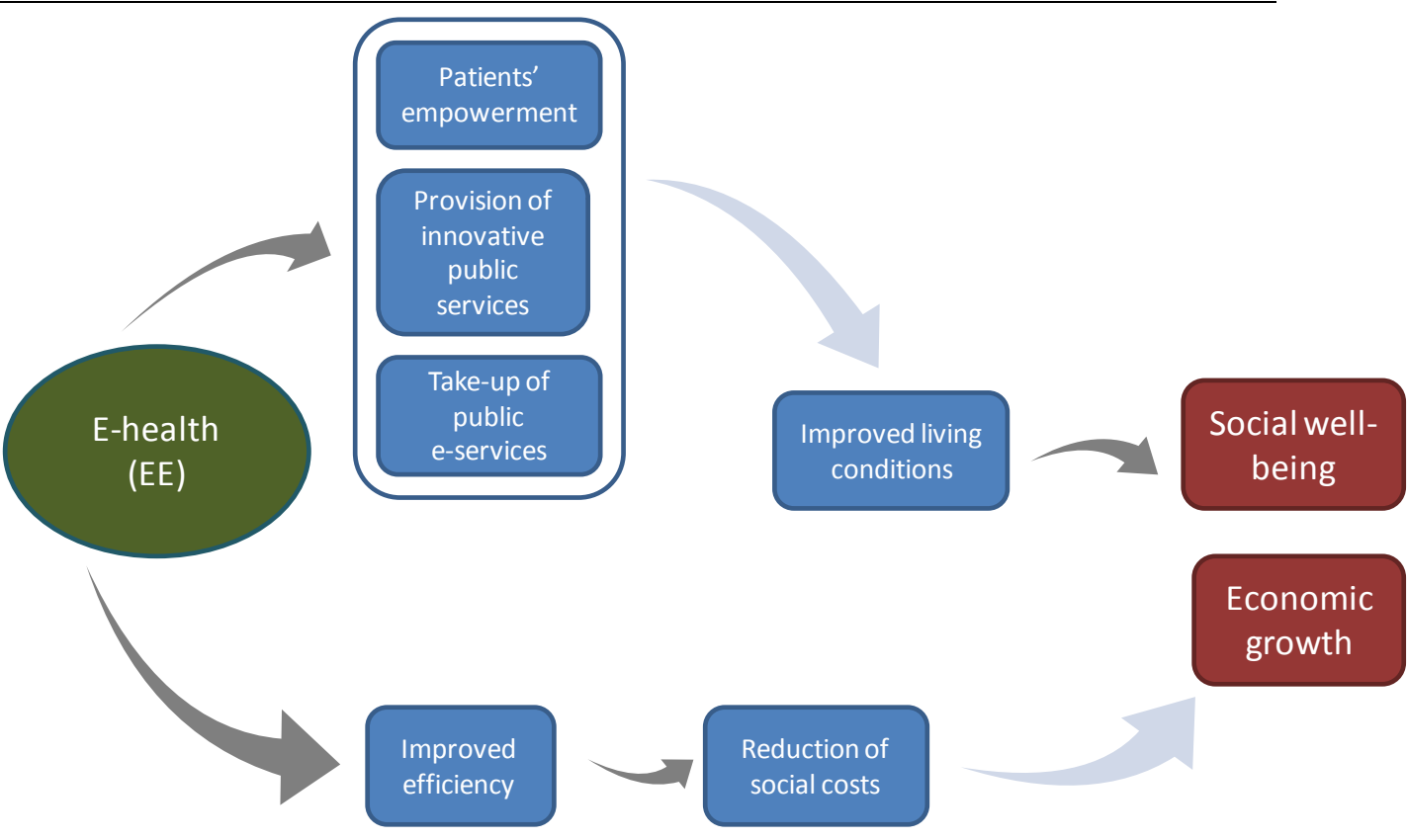
Projects whose main outcomes relate to efficiency gains also tend to generate comparable patterns (see Figures 31, 32, 33 and 34). The main channels through which they activate potential in terms of economic growth are through efficiency gains resulting in improved productivity and competitiveness as regards businesses ("Superfast Cornwall" and "SMEs grant scheme for ICT adoption and diffusion") or in reduced social costs for public administrations (the Estonian and cross-regional e-health projects). Again, the same projects also have interesting effects in terms of social well-being. This is straightforward as far as the e-health projects are concerned, since they bring about easier solutions and better health conditions. As regards the "Superfast Cornwall" project, it is envisaged that it will improve the situation of both businesses and households. Even if the primary effects are expected in economic terms, the fact that different programmes support an inclusive approach to the benefits of broadband Internet leads to expected social well-being effects. Thus, interestingly, the "Superfast Cornwall" project displays patterns that combine "efficiency" and "inclusion" projects. The only outlier is the "SMEs grant scheme for ICT adoption and diffusion" which brings about effects almost exclusively on growth and very little on social well-being (even though the scheme has some indirect positive social well-being effects resulting from the support granted to small cinemas).

**Figure 31. Outcome patterns in the case of Superfast Cornwall (UK)**

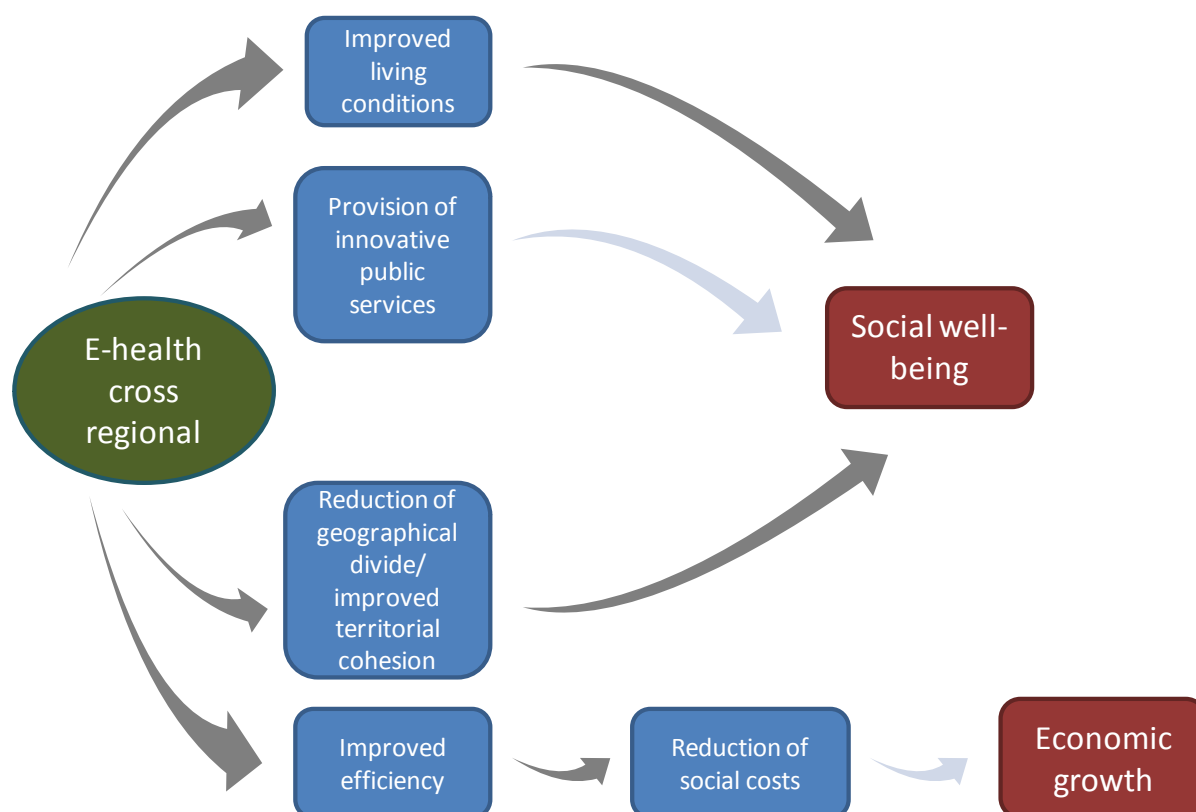


Source: Authors

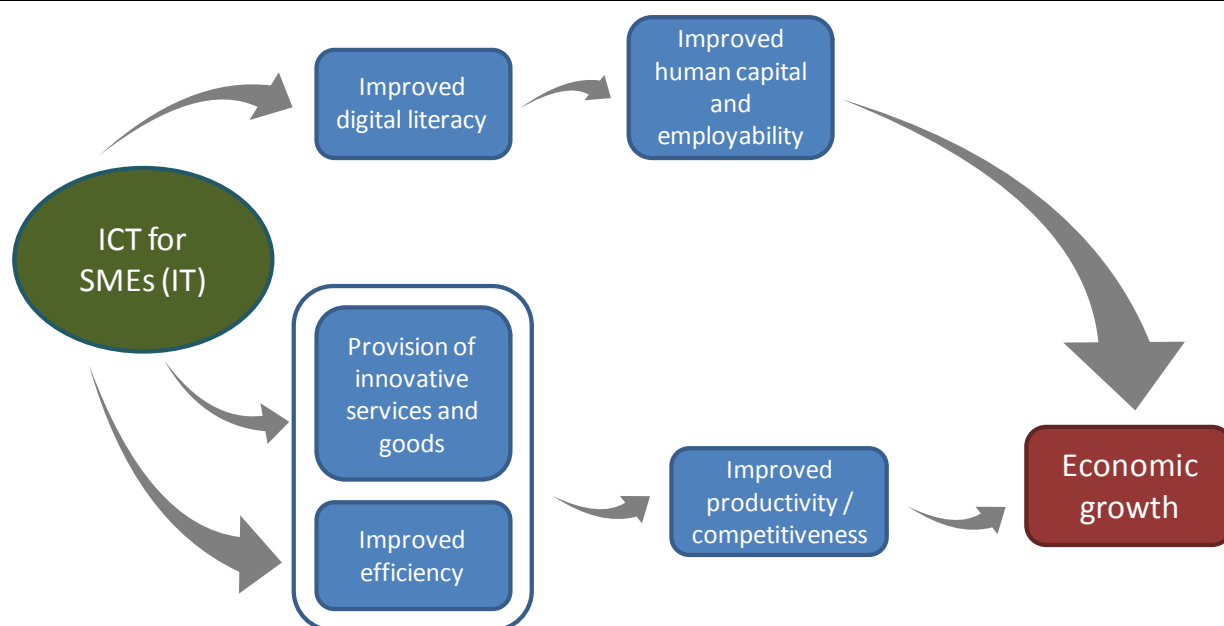
**Figure 32. Outcome patterns in the case of e-health projects (EE)**



Source: Authors

**Figure 33. Outcome patterns in the case of the cross-regional e-health project**

Source: Authors

**Figure 34. Outcome patterns in the case of the SMEs grant scheme for ICT adoption and diffusion (IT)**

Source: Authors

If the projects reviewed tend to bring about positive effects on both economic growth and well-being, this is either because these effects intrinsically nurture one another (positive effects on well-being translate into positive effects on growth, or efficiency effects recorded in the delivery of online public services translate into social well-being), or because flanking measures brings about complementary effects (typically, growth effects are complemented by improved well-being effects resulting from related initiatives as in the "Superfast Cornwall" project).

Hence, even though a strong dividing line suggests distinguishing between projects aimed principally at digital inclusion and projects with primary effects in terms of efficiency, in the end, the impacts on regional development tend to be balanced in terms of both economic growth and social well-being.

### 3.4 Concluding remarks

Overall, the projects reviewed illustrate the importance of SF in funding a whole range of possible investments in support of the development of the Information Society at regional level. These projects are very different with distinct rationales: some projects target access to the Internet/ICT *per se*, while others use the Internet *instrumentally*, to reach an independent objective. Also, they may either be driven by primary objectives, in terms of enhanced efficiency or of digital inclusion. Much depends on the needs and structural features of the regional setting in which they develop. In general, the projects reviewed were well adapted to their socio-economic context.

These projects bring about a series of different outcomes and impacts, ranging from increased digital literacy, improved human capital, efficiency, inclusion, productivity, competitiveness, more innovative public services and goods, to improved territorial cohesion, improved living conditions, reduced social costs, empowerment and participation. Importantly, no negative outcomes were recorded, but some projects could not fully deliver the expected outcomes.

Interestingly, despite their differences, the projects reviewed tend to contribute to regional development and its components, i.e. economic growth and social well-being, in a balanced way. This is obtained through peculiar patterns in which the different outcomes interact with one another, and reflects the fundamental peculiarity of interventions in the field of the Information Society that affect a series of variables of different dimensions in all encompassing, complex patterns.

## CHAPTER 4 - REGIONAL, NATIONAL AND EU LEVELS: THE VIRTUOUS CYCLE

### KEY FINDINGS

- At regional level the case studies identify a series of “enabling conditions” that make it possible to achieve a set of outcomes, such as complementary measures and investments, well-developed ICT infrastructure, favourable legal environment, political leadership, digital literacy and attitude towards openness and innovation. The correct articulation of the contributions from the public and private sectors is of specific relevance in terms of both funding and governance.
- Two horizontal initiatives at national or supranational level were selected for a detailed analysis of how they support the regional and the local development of ICT and resulting impacts. At cross-regional level, the Simple Procedures Online for Cross-border Services (SPOCS) pilot project aimed at providing seamless cross-border electronic procedures for setting up a business in another EU country is an example of pan-European digital services under the CEF framework. It shows that common regulatory aspects and the standardisation of semantic interoperability are also fundamental for the sustainability of networked services.
- At national level policies promoting e-skills record mixed performances. Only seven MS have an explicit strategy document aiming to promote long-term e-skills and digital literacy policies, and nearly all MS declare they have projects targeting disadvantaged people or employees, but these projects are scattered and are not very specific.
- The analysis of these horizontal issues shows that they can be fundamental for the local development of ICT and related growth. However, they must be complemented by local policy initiatives to overcome the local barriers and to support the local communities in taking up the opportunities offered by the new technologies.

While the previous chapter illustrated regional initiatives co-financed by Structural Funds and investigates their outcomes and the channels through which they impact on regional economic development, this chapter focuses on factors making possible the materialisation of these impacts. It draws, in part, on the in-depth case studies to identify enabling factors at regional level, but it also extends the investigation beyond the regional setting to identify factors or initiatives at national or EU level (so-called “horizontal issues”) that contribute to enhancing the growth effect of ICT at regional level. Although the aim of these initiatives at national and EU levels is not directly and specifically to stimulate and contribute to ICT development and to the implementation of the DAE at regional level, they usually support, and in some cases may be necessary for, the local development of ICT and the consequent impacts.

The main objective of this chapter is, therefore, to specifically explore the relationship between various initiatives addressing ICT development at different levels and their local impacts. It is clear, for example, that there is a strong need for further investments in Next Generation Access (NGA) networks and technologies at local level in order to reduce the costs of rolling-out mobile and fixed broadband infrastructures. Nevertheless, to justify such investments, it is necessary to increase the supply and demand for content and services within an effective Digital Single Market, which requires the harmonization of single market rules, mainly through national and supranational regulations and policies.

In order to analyse policies at supranational and national level and their influence and interaction, if any, on local development, two horizontal issues were selected at supranational and national levels that planned, respectively, to support competitiveness and growth and to contribute to the achievement of the European Single Market. They are:

- the Connecting Europe Facility (CEF)
- the national policies addressed to enhancing ICT skills within Europe.

They are analysed following the examination of enabling factors at regional level.

## **4.1 Enabling factors at regional level**

The seven case studies make it possible to identify a set of factors that enable the materialisation of the effects on regional development described in the previous chapter.

### **4.3.1 Political leadership**

Strong and innovation-oriented political leadership was one of the key institutional factors supporting the development of the two Estonian e-health projects. The Estonian political leadership was indeed forward-looking. Since the 1990s a number of successive Estonian governments have viewed the development of ICT and e-services as important priorities and, as a result, they began to develop a favourable environment for ICT and e-services. Importantly, improvements in ICT infrastructure and comprehensive legislative support went alongside political support.

In the “Guadalinfo” case, the project was perceived as fulfilling a mission to provide a public service and, as such, the initiative benefitted from strong political commitment, which was decisive in launching and maintaining the project.

### **4.3.2 Favourable legal environment**

Backed by strong political support, a favourable legislative environment has been established in Estonia. In 1998 the Estonian government adopted the first Information Society strategy “Principles of the Estonian Information Policy”. The document set out an action plan for the introduction of the Information Society into all areas of government activity, including health. Two key legislative documents for the projects reviewed were the Health Services Organisation Act and Associated Acts Amendment Act, adopted by the Estonian parliament in December 2007. The amendment not only obliged medical practitioners to send data to the EHR, but also clearly defined the usage rights of the medical information. This legislation ensured a constant increase in the amount of medical information in the system and reduced fears of private information misuse.

### **4.3.3 Well-developed ICT infrastructure**

One of the key enabling factors of the two Estonian e-health projects was the utilisation of already existing ICT infrastructures and tools. Indeed, a well-developed broadband network, a technological solution called X-Road and the electronic ID cards were all important prerequisites for the e-health initiatives (see box below).



**Box 6. X-Road and Electronic ID cards**

**X-road** is a data exchange layer that enables the safe exchange of data among various private and public sector databases. As a result, the Estonian people and institutions can securely access and exchange data kept on various databases. This tool was crucial for the development of various e-services and nowadays virtually all the e-government services in Estonia operate based upon X-road.

**The electronic national ID**, introduced in Estonia in early 2002, serves not only as an identification document, but can also be used as a digital key for all secure public e-services. Indeed, electronic processor chips embodied in the cards contain relevant personal data and hold certificates for authentication and a digital signature. The introduction of the electronic IDs provided the opportunity for safe and convenient access to e-government services across Estonia.

**Source:** Case study report "E-health"

Using such existing infrastructures allowed the Estonian government to save costs and increased the take-up of new services. For instance, the exploitation of the electronic IDs, which were already widely used for access to other e-services in Estonia, to pick up digital prescriptions or to access personal medical records facilitated the uptake of the services among citizens and contributed to containing costs.

The existence of a well-developed ICT infrastructure was identified as an important prerequisite also for the cross-regional project. First of all, the inadequacy of the ICT infrastructure was an extremely important evaluation factor in the identification of where to locate the pilot initiatives. Then, some of the pilot initiatives were hampered by technical constraints (e.g. connection speed, reliable Internet service, broadband accessibility) due to the lack of suitable ICT infrastructure. The lesson learned was that the running of e-health applications with unsuitable technology will inevitably lead to failure, as was shown by the Norwegian experience, where the initiative was piloted for only three months.

The existence of an affordable broadband connection is considered to be a prerequisite for the materialisation of the outcome expected from the Italian "SMEs grant scheme for ICT adoption and diffusion".

**4.3.4 Complementary support programmes, measures or investments**

The case studies show that many initiatives were part of a more comprehensive regional strategy with accompanying measures to stimulate demand or trigger new activities.

This is the case of "Superfast Cornwall", where the full exploitation of superfast broadband depends on the number of households and businesses connected to the infrastructure. In order to stimulate demand, the project promoters invested €699,850 to publicise the opportunities offered by broadband throughout the community. Besides advertising activities, the Cornwall Council also put in place or supported parallel programmes (see box below) aimed at ensuring the materialisation and the full exploitation of the benefits associated with superfast broadband.

### Box 7. Programmes in support of “Superfast Cornwall”

A **business support programme** was implemented to assist 50 innovative and forward-looking businesses in making investments that exploit the opportunities of superfast broadband, including entering new markets, investing in advanced technologies and the methodologies necessary for the business to expand, and investing in business research and development.

A **skills programme** is being developed to identify what skills training is needed and how to deliver this in a way that is most relevant to local businesses. On the basis of a survey, a series of needs have been identified (among which SEO, Internet marketing, security, etc.). Local training organisations are being engaged to develop a training programme to enable businesses to full take advantage of the opportunities offered by superfast broadband.

A **digital inclusion programme**. Superfast Cornwall Company is working with BT's Digital Inclusion programme, Get IT Together, and the UK charity Citizens Online to provide free or low cost computer training for new ICT starters. The aim is to ensure that everybody in the Cornwall Region gets the chance to benefit from the opportunities opened up by the Internet and superfast broadband (e.g. finding the cheapest car insurance, ordering prescriptions online; submitting job applications, keeping in touch with friends and relations).

Finally, a host of research projects were launched under the **Superfast Cornwall Labs** initiative in order to explore the opportunities related to superfast broadband in some specific sectors.

**Source:** Case study report “Superfast Cornwall”

Another example in this sense is provided by the “Explorarium II” project, which was part of a broader initiative embedded in the “e-education Master Plan” of the Berlin government. The project was complemented by several activities funded by the different public administrations. Among the various activities, it is worth mentioning the one connecting the coaching within “Explorarium II” with the formal qualification of “Advanced Multimedia Teachers”. This link had the potential to provide an additional incentive for teachers to participate in “Explorarium II”.

The “SMEs grant scheme for ICT adoption and diffusion” project also shows that complementary steps and additional investments are necessary to reap the full benefits of the support granted under the scheme. In particular, continuous investments in ICT are required (for maintenance, upgrading etc.), as well as organisational changes. As concrete examples, in both the Italian and Estonian case studies in order to support the smallest operators (respectively small cinemas and health providers) it was necessary for them to upgrade their systems to keep up with the developments brought about by the ICT initiative.

#### 4.3.5 Digital competences and positive attitude towards innovation

One of the key conditions of materialisation of ICT adoption and diffusion of ICT is digital literacy and a positive attitude toward ICT technologies and/or ICT-driven innovation. This is, for instance, the case of “Superfast Cornwall”, the “SMEs grant scheme for ICT adoption and diffusion” and the two Estonian e-health projects. Indeed, digital competences are an enabling factor for a better exploitation of the potential of ICT. Again, the use of ICT can involve the cultural and psychological propensity to welcome new ways of managing daily activities both for citizens and businesses.

Having a positive attitude towards innovation is especially important when public administrations introduce innovative digital services. Indeed, if the citizens’ receptiveness and willingness to adapt to the novelties is low, the rate of take-up of new services will be very low and the benefits associated with them are put at risk.

Similarly, as revealed in the case study dealing with “SMEs grant scheme for ICT adoption and diffusion”, a propensity to welcome the introduction of new technologies in business activities is fundamental in order to stimulate process and product innovation. Having a positive outlook that stems from the ability to think differently rather than resisting and becoming defensive is also important to accept the organisational changes that the introduction of ICT often involves or requires.

#### **4.3.6 A clear vision of the “mission” of the initiative and corresponding funding streams**

Whether the initiative is ascribable to a public service logic or whether the public sector steps in to compensate for a market failure determines the way in which the financial sustainability of the project is ensured.

In the case of “Guadalinfo” the project is considered to deliver a public service, while for the Lithuanian digital literacy projects the objective of inclusion makes it difficult to impose tariffs. In these two cases, the gratuitous nature of the service is a key enabling factor. However, while the Lithuanian “Development of computer digital skills” project is not subject to sustainability issues (when the project is over, so is the training), the other two projects (“Guadalinfo” and “Libraries for innovation”) are networks of Internet points offering access free of charge and continuous financing is needed to guarantee the maintenance, the upgrading of computer software and hardware, the payment of employees and the continuous provision of training. In the case of “Libraries for innovation” the Ministry of Culture is formally responsible for co-financing this initiative in the future. However, this implies that at least another lender is needed. Some libraries are able to attract private sponsors. However, in order to guarantee an adequate level of financing, additional funds need to be leveraged. In this regard, the coordination centre established within the Lithuanian National Library will play an important role. The “Guadalinfo” project is considered to be a public mission and no tariff or fee is introduced in order to maintain the principles of equal opportunities, universality of access and social inclusion. Hence, the Andalusian regional government is committed to allocating €18 million on annual basis to operate and maintain the service. In this context, not much effort was made to seek complementary private funds.

On the face of it, the presence of a strong public-private partnership (PPP) is one of the key enabling factors of the “Superfast Cornwall” project. In the presence of market failures, and when the public sector wants to implement a major project, i.e. large-scale infrastructure projects, but it does not have sufficient financial resources and it cannot sustain all the risks associated with the project, a private-public partnership is a fine solution. In this case, the broadband coverage is being provided by a PPP between the regional government of Cornwall and one of the leading providers of telecommunication services in the UK, namely British Telecommunications plc (BT). At the time the project was designed, the option of a project led by the public sector was rejected since the risks would have been carried entirely by public entities and a significant opportunity to leverage the private sector would have been missed.

#### **4.3.7 Stakeholder involvement and people’s acceptance**

The engagement of a variety of stakeholders was an important enabling factor for the successful implementation of the more complex projects reviewed. In particular, this was the case of the Estonian e-health projects and the cross-regional project. In the former case, since the EHR and the Digital Prescription projects were included in a broader initiative aimed at developing the Estonian NHIS and since this initiative was complex and required inter-institutional and cross-sectional coordination, a high level project management board was created. It consisted of representatives from the Ministry of Social Affairs, the Ministry of Economic Affairs and Communication, the Estonian Informatics Centre, a consortium of

suppliers and the Estonian e-Health Foundation, which comprises a number of public and private sector stakeholders, including various hospitals and professional associations. The engagement of several stakeholders as well as their strong support at an early stage, since each party expected certain benefits, was an important prerequisite for the implementation of the projects.

Similarly, the cross-regional e-health project involved a large number of stakeholders from different countries and of a different nature, i.e. universities, national and local public authorities, hospital districts, healthcare centres and ICT service providers. Here, the involvement of several stakeholders was intrinsically linked to the nature of the project. However, their coordination and the continuous flow of information among various actors have proved to be determinant factors for successfully implementing the service across borders.

Stakeholder involvement was one factor influencing people's acceptance of the above-mentioned projects. Indeed, the support of end-users is fundamental in order to achieve a high rate of usage of the new e-health services.

#### **4.3.8 The human dimension**

It is interesting to note that rather than “dehumanising” economic and social exchanges, certain ICT initiatives reviewed in the case studies actually bring about an increase in social relationships. In fact, the “human dimension” is sometimes an enabling condition. For example, in the cross-regional project, the presence of a nurse assisting the patients who benefit from remote assistance is an important factor determining the success of the initiative. Likewise, in the “Explorarium II” project, the direct and personal relations between a coach and the teachers are decisive. Finally, it is worth mentioning the crucial role played by the “facilitators” who animate the telecentres, as well as the zone team leaders in the “Guadalinfo” project. Their commitment and flexibility account for a significant part of the success recorded by the project.

#### **4.3.9 Other enabling conditions**

Finally, there is a series of enabling conditions that are closely linked to the implementation of the considered measures. Although they are not the primary focus of this study, it is worth identifying them as they nevertheless contribute to shaping the final outcomes/impacts.

For a start, the maximisation of benefits associated with an initiative usually occurs only if its beneficiaries are well identified and targeted. This has not always been easy, as some of the case studies show. First, when the initiative takes the form of a grant scheme for SMEs such as that of the Umbria case study, the selection is usually biased by the fact that applicants are most probably among those more advanced in terms of awareness and use of ICT. While the choice to focus on the best performers may be justifiable in terms of resource concentration and selection, there is clearly an issue of effectiveness in removing the structural weaknesses of the regional businesses. As a result, a measure that does not address the weak ‘readiness’ of most of the potential beneficiaries to adopt ICT and, instead, supports the more advanced and already aware applicants, is not fully accomplishing its mission.

Similarly, the Lithuanian initiatives dealing with the supply of ICT training courses experienced a problem of proper targeting. First, since the training courses offered by the two initiatives were organised simultaneously without exchanging participant lists, it is likely that some people participated in the courses provided by both of the projects. Secondly, the supply of courses financed by the “Development of computer literacy skills” measure in depressed territories was too high, while the demand for training in “non-problematic” territories was not

satisfied. Thirdly, since no mechanisms existed to control whether training was provided to people actually facing digital exclusion, some organisations targeted people who already intensively used the Internet. All this undermined the full achievement of the potential benefits of the project.

The role of EU financing support has also been a supportive factor. On some occasions, the case studies identify a leverage effect of the Structural Funds. For example, the two Estonian e-health projects and the cross-regional project probably would not have been implemented without SF support because the projects were not profitable from a private operator's perspective and because the government did not have sufficient financial resources to cope with the investment required. Also, evidence from interviews related to the cross-regional project confirms that some pilot initiatives would never have been taken into account by the health system if a substantial contribution had not been provided by the EU.

Finally, in the case of the "Superfast Cornwall" broadband project the contribution of the SF was deemed an important factor enabling the implementation of the project. Indeed, the ERDF provided the resources needed to cover the project's funding gap as private telecommunications operators would not have invested in the areas covered by the project because it would not have been profitable. This market failure led to a funding gap that the SF could fill. Conversely, SF support did not prove to be decisive in a context where the political commitment in favour of the initiative was so strong that the initiative would have taken place anyway.

## **4.2 Supranational issue: the contribution of the "Connecting Europe Facility"**

The Connecting Europe Facility is a plan in line with the Europe 2020 strategy, aimed at improving key infrastructures, i.e. the transport, energy and digital networks. The plan is based on the assumption that investments in key infrastructures will support net job creation and boost European competitiveness. Furthermore, the development and interconnection of key infrastructures will help completing the European Single Market.

The European Commission planned an overall budget of €29.3 billion of which €1 billion are to be specifically allocated to ICT infrastructures (CEF digital), i.e. to broadband networks and pan-European digital services.

CEF digital will support broadband as well as services such as e-ID, e-procurement, e-health, Europeana (digital library for cultural heritage), and e-justice. Such services, based on infrastructures and wide interoperability, are expected to save money and improve the quality of services.

High-speed broadband is a key infrastructure of the future: broadband networks generate innovation that shapes user-demand in the electronic communications markets of the future. Specifically, broadband investments will stimulate:

- New demand for content/services, which in turn stimulates new supply of broadband;
- Societal innovation in health and demographic change, energy and resource efficiency, transport and congestion as well as climate change where broadband networks can offer potential for speedier green transformation (deployment of smart energy networks);
- More flexible ways of working (self-employment, teleworking) allowing reconciliation of work and family life and the inclusion of excluded people;
- Contents self-generated by users especially in creative industries and entertainment.

High-speed broadband will also support the creation of digital service infrastructures that are innovative and interoperable, and cross-border services in fields such as education and culture, e-ID management systems, e-procurement services, infrastructures for Public Sector Information (PSI), cross-border e-health services, security infrastructures, critical information infrastructures and safe Internet service infrastructures.

One of the main policy challenges of the DAE is, in fact, to ensure the interoperability and cross-border availability of online service infrastructures developed by the public sector in Member States, in regions and localities. Pan-European digital services distributed over networked infrastructures (networked services) will contribute to the achievement of the European Single Market; without these infrastructures the European Single Market will remain incomplete.

The European Commission provided an ex-ante assessment of the diffusion of broadband and digital service infrastructures in the trans-European networks,<sup>112</sup> which pointed out that:

- The effects of broadband penetration on productivity are more than proportional;
- An increase in broadband household penetration produces an increase in the country's GDP;
- Different consultancies estimated that digital service infrastructures are able to produce significant savings;
- The European Commission estimates that broadband can contribute to the net creation of over 100,000 jobs per year;
- Further social (and environmental) impacts can affect depopulated rural areas through the development of teleworking, e-commerce or smart meters<sup>113</sup>.

Furthermore, broadband and digital service infrastructures may have a relevant impact on rural areas because:

- Broadband is a key location factor for business;
- Broadband and services improve the quality of life;
- Broadband prevents the de-population of rural areas.

In order to compare the main impacts expected from the CEF, as outlined above, with current developments, the box below provides a more in-depth analysis of a pilot project developed in previous years in line with the CEF policy objectives and setting. Among the pilot projects developed and recently completed, the Simple Procedures Online for Cross-border Services pilot (SPOCS) was selected.

#### **Box 8. SPOCS: a pilot project – Impacts and main barriers**

Simple Procedures Online for Cross-border Services (SPOCS) is a pilot project launched by the European Commission aiming to provide seamless cross-border electronic procedures for setting up a business in another EU country in the context of the Services Directive. SPOCS aimed to build the next generation of online portals (Point of Single Contacts) through cross-border electronic procedures. For example, businesses seeking to expand into other countries usually struggle to comply with all the regulations they need to follow. Concretely, if an Italian company wants to expand its business to Bremen, Germany, the information provided by the Bremen Point of Single Contact (PSC) does not currently specify the Italian documents required. SPOCS will allow him/her to complete all the administrative procedures online and cross-border via the PSC. Thus, SPOCS aims to provide **integrated cross-border interoperability modules for sharing, sending and storing information on e-government services**.

<sup>112</sup> European Commission (2011).

<sup>113</sup> A system enabling two-way communication of energy consumption between a meter and a central system.



Overall, the SPOCS were expected to improve the competitiveness of European businesses and particularly SMEs by providing a fully interoperable Point of Single Contact, to develop businesses and reduce the administrative burden. In particular, the SPOCS were expected to further enhance the quality of electronic procedures and were designed for businesses with an interest in cross-border activities. The SPOCS were set up on the basis of the 2008 CIP ICT PSP Programme of Work. The pilot projects ran from 2009 to 2012. The total cost of the projects was €24 million, of which €12 million was funded by the European Commission.

The pilot projects tried out a new technology applied in sectors like e-documents, e-delivery, e-safe and e-services. The process had two main waves. The first wave of pilot projects included Austria, Germany, Greece, Italy and Poland. The pilot schemes in these countries went live in July 2009 with the professions of Travel Agents, Real Estate Agents and Master Builders. The second wave encompassed the countries that joined the SPOCS during the extension process: Lithuania, Portugal and Slovenia. The second wave started in 2012 with other professions like Architects and Tourist Entertainment Companies.

In total, SPOCS solutions were applied in eight Member States that actively participated in the piloting phase. The results can be considered reliable and can be generalised also in other Member States. The final evaluation of the SPOCS pilot projects showed that the functionality of SPOCS software modules was rated positively by all MS and that half of the piloting countries (Germany, Greece, Italy and Lithuania) are considering or planning to expand the use of SPOCS (for professions other than those initially selected for SPOCS or in other e-government systems). Nevertheless, *legal restrictions* in some countries limited their real use or required the identification of *ad hoc* solutions in order to give SPOCS transactions legal value. It was very difficult to evaluate the impacts (in terms of competitiveness and growth) of the SPOCS in a pilot setting because usage was not sufficiently wide and the economic crisis contributed to limiting the use of SPOCS tools.

The evaluation showed that SPOCS services indeed provided integrated cross-border interoperability modules for sharing, sending and storing information on e-government services as planned, generating improvements in quality and in efficiency, functionality and user friendliness. Nevertheless, participants also highlighted a number of barriers such as:

- The low volume of transactions;
- Multilingualism issues;
- Legislative barriers: lack of legal regulations at the MS level (e.g. a legal basis for cross-border e-delivery or identification of legal persons and electronic mandates);
- Issues related to different national approaches to e-ID (electronic identification), e-signatures and semantic aspects.

An ex-post evaluation is not yet available since the project ended in 2012 and the time-lag is still too short. Nevertheless, some inputs concerning the sustainability of the project can be provided. Almost all participants believe that sustainability does not only depend on SPOCS, but that the Connecting Europe Facility (CEF) will be important to extend the project later on by providing activities to sustain the building blocks and carry on the results in the direction of the Digital Agenda. They also believe that EU funding and coordination is still needed to support SPOCS solutions. Also, the piloting countries highlighted the role and the collaboration with standardization bodies as a very critical issue for sustainability. Finally, most of the participating MS believed that the experience and technical solutions gained from the SPOCS were very important for the further evolution of the services offered by their PSC.

**Source:** Evaluation of the project deliverables and interview with the Project Leader.

Horizontal issues at supranational level may have relevant impacts on local or regional development, if the local population and businesses are ready to take up the new services and to take the opportunities provided by the new technology. To take advantage of the opportunity, it is necessary to know about the new services or technology, to know how to use



it in a cost-effective way, to know how to overcome the technical barriers (for example with electronic identification) and the structural and organizational barriers (insufficient volume of transactions, innovation in the internal processes).

In order to meet such conditions, supranational horizontal issues need to be accompanied by bottom-up initiatives, which prepare and support the readiness of the local economy in the take-up of the technologies and services.

### **4.3 National issue: the case of e-skills policies**

Among the actions for which Member States are directly responsible, Action 66 “Member States to promote long-term e-skills and digital literacy policies” was selected.<sup>114</sup> First, the performance in terms of e-skills and digital literacy in the EU is briefly reviewed before the policy response is analysed.

#### **4.3.1 ICT skills in the EU**

Another horizontal issue was selected, this time at national level. The choice fell on initiatives to promote ICT skills and digital literacy. Indeed, the growing demand for highly skilled ICT professionals from industry and the increasing importance of ICT in everyday life makes digital literacy an indispensable skill for citizens (by 2015, 90% of jobs in EU will demand at least basic computer skills). Also, the ICT industry has a strong potential for job creation and is in need of an ICT-savvy workforce.

ICT skills are specifically important for the following reasons:

- Digital literacy allows a fruitful use and take-up of online public and private services;
- The ICT industry has strong potential for job creation;
- Most of the industries are ICT users and, to reap the benefits of ICT for growth and employment, they need high-level ICT skills.

Conversely to industry demand, after recording a growth trend leading to 71,000 per year in 2006, the number of ICT graduates in the EU started decreasing in subsequent years. A decrease in the number of computing students and graduates combined with an increasing number of retiring ICT practitioners will lead to a significant e-skills supply gap; it is estimated there will be up to 700,000 unfilled job vacancies in 2015 for the whole Europe (IDC Europe and Empirica, 2009). Although the proportion of the European population regularly using the Internet is constantly increasing, there are still 24% of Europeans that have never used the Internet. Moreover, in 2011 only 27% of Europeans had high-level ICT skills, another 25% medium level and 14% had low-level ICT skills, which means that 34% of the European population had no ICT skills at all (see Chapter 1).

The mismatch between demand and supply of ICT skills shows that there are two main issues:

- There is a need for basic digital literacy for the population in order to reap the benefits of ICT at social and economic level;
- There is a need for medium and high-level ICT skills to satisfy the demand from businesses and the public sector in order to improve productivity and upgrade the supply of ICT products and services.

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<sup>114</sup> [http://daeimplementation.eu/dae\\_actions.php?action\\_n=66](http://daeimplementation.eu/dae_actions.php?action_n=66)

### 4.3.2 Policy response

In 2006 the European Parliament and the European Council highlighted the strategic relevance of ICT competency (Recommendation of the European Parliament and of the Council, 2006). Since then the development of ICT competency has been a strategic issue of European policies. In this context, what are the current policy responses engaged by MS? It is important to understand whether and how the policy approaches adopted by MS impact on the supply of ICT skills and on regional/local growth and development. Currently, data about ICT skills at regional level are not available, so the analysis is based on qualitative information.

In order to understand the policy approach of the MS to the development of ICT skills it is considered useful to better measure the progress of Action 66. At present, the DAE Scoreboard shows that at the end of 2011 the achievement of Action 66 had to be delayed.<sup>115</sup> The action was delayed in 12 countries out of 27, and in 11 countries it appeared to be completed, while for the missing four countries information about the achievement of the objective was not available. Here, the issue is not to know whether the country has or has not implemented the initiatives of the mentioned Action, but to understand how far the initiatives are integrated in the policy agenda of the country and in the territory, and if they may have the expected impacts.

The assessment of the implementation of Action 66 uses the grid presented in the below table.

**Table 9. Range for the assessment of the policy approach towards the objectives of the Action 66**

EVALUATION			SCORE
	Yes	The information provided by the MS shows that they fully implemented the initiatives necessary to reach the objective detailed by the indicator	1
	No	The MS did not implement any initiatives to reach the objective detailed by the indicator	0
	Planned	The information provided by the MS provides evidence that the country is planning the initiatives necessary to reach the objective detailed by the indicator	0.5
	Sparse initiatives	The information provided by the MS shows that there are only sparse initiatives addressed to reaching the objective detailed by the indicator	0.25
	Non specific initiatives	The information provided by the MS shows that there is not a specific initiative addressed to reaching the objective detailed by the indicator, but that there are other initiatives that occasionally or possibly reach the same objective	0.25
	Yes (without evidence by MS)	The MS declares it fully implemented the necessary initiatives, but without providing any evidence	0.75
	No status provided by MS	No data or information submitted	0

Source: Authors

<sup>115</sup> The assessment is available at <http://daeimplementation.eu/dashboard2.php>, based on a questionnaire that each country has to complete.

Table 10 below provides the Member States' assessment of the implementation of Action 66. The assessment is based on the following aspects/indicators:

- Existence of an explicit strategy document;
- Existence of funding for digital literacy/skills projects and programmes;
- Existence of programmes specifically targeting women and disadvantaged people;
- Existence of programmes targeting employees (older workers, SMEs);
- Integration of ICT in classroom teaching and vocational training;
- Existence of programmes offering ICT skills training in informal environments (public libraries, telecentres).

**Table 10. Assessment of the policy approach towards the objectives of Action 66**

	DOES AN EXPLICIT STRATEGY DOCUMENT EXIST?	IS THERE FUNDING FOR DIGITAL LITERACY/E-SKILLS PROJECTS AND PROGRAMMES (INCLUDING EU FUNDING)?	ARE THERE SPECIAL PROGRAMMES ENCOURAGING WOMEN, OLDER WORKERS ETHNIC MINORITIES AND OTHER TARGET GROUPS TO USE ICT?	ARE THERE SPECIAL PROGRAMMES TARGETING EMPLOYEES (ESPECIALLY OLDER WORKERS AND SMES)?	IS ICT BEING INTEGRATED IN CLASSROOM TEACHING AND VOCATIONAL TRAINING?	ARE THERE PROGRAMMES OFFERING ICT SKILLS TRAININGS IN TELECENTRES, PUBLIC LIBRARIES AND OTHER INFORMAL ENVIRONMENTS?	SUM
AT	1	1	0.25	1	1	0.25	4.5
BE	0.25	1	0.5	0.25	0.25	0.25	2.5
BG	0	0.25	0.25	0	0.25	0	0.75
CH	0.25	1	0.25	0.25	0.25	0.25	2.25
CY	1	1	0.25	0.25	0.25	0	2.75
CZ	0.25	1	0.25	0.25	0.25	0.5	2.5
DE	0.25	0.25	0.25	1	0.25	0	2
DK	0.25	1	0.25	0.25	1	1	3.75
EE	0.25	1	0.25	0.25	0.25	0.25	2.25
EL	0.25		0.25	0.25	0.25	1	2
ES	0.25	0.25	0.25	0.25	0.25	0.25	1.5
FI	0.25	1	0.25	0.25	0.25	1	3
FR	0.25	1	0.25	1	0.25	1	3.75
HU	0.25	1	0	0.25	0.25		1.75
IE	0.25	1	0.25	1	1	1	4.5
IS	0	0	0	0	0	0	0
IT	0.25				0.25	0.25	0.75
LT	1	1	0.25	0.25	0.25	1	3.75
LU	0.25		0.25	0.25	1	1	2.75
LV	1	1	0.25	0.25	1	1	4.5

MT	1	1	0.5	1	0.25	1	4.75
NL	1	1	1	1	0.25	0	4.25
NO	0.25	1	0.25	0.25	0.25	0.25	2.25
PL	0.25	1		0.25	0.25	1	2.75
PT	0	0.25		1	0.25	1	2.5
RO		1	0.25	1	1	0.25	3.5
SE	1	1	0.25	1	0.25	0.25	3.75
SI	0	0	0.5	0.25	0.5	1	2.25
SK	0.25	1	0.5	0.5	0	0.25	2.5
UK	0	1	0.25	0.25	0.25	0.25	2
EU27	0.41	0.83	0.31	0.51	0.42	0.57	2.87

**Source:** Authors based on information provided in [www.daeimplementation.eu](http://www.daeimplementation.eu)

The analysis of the policy approach adopted by the MS shows that most of them adopt very sparse and non-specific initiatives. In fact, only seven MS have an explicit strategy document aiming to promote long-term e-skills and digital literacy policies. Most MS have funds allocated to projects and programmes, but the absence of a framework policy document suggests that funds may not be managed according to the policy relevance of the projects and this also makes it more difficult to dedicate the funds to the more urgent needs. Nearly all MS declare they have projects targeting disadvantaged people or employees, but these projects are scattered and are not very specific. Finally, most of the MS declare that they provide training in informal environments, but many initiatives are again scattered.

The assessment of Action 66 shows that the MS' initiatives addressed to classroom teaching and vocational training are still sparse occurrences, starting as bottom-up initiatives not linked to an integrated policy programme, with the risk that these policy initiatives will not capture as many people as necessary.

The improvement of digital literacy mainly focuses on initiatives for disadvantaged people, on initiatives integrating ICT in classroom teaching and vocational training, and on initiatives providing ICT training in informal environments. Where basic digital literacy is required, it is fundamental that the policy actions reach the majority of the people. To reach all the interested population, national and integrated policies are necessary. Such policies also guarantee the homogeneous quality of the actions and initiatives. Integrated policy measures for e-inclusion and digital literacy ultimately result in reduced social costs, increased social cohesion and economic growth.<sup>116</sup> Moreover, an econometric study of the Italian market, which was part of the Vienna study, also showed that low educated workers aged between 35 and 49 with no digital skills have a 5% higher probability of being unemployed than those with digital skills.

Furthermore, where specific business needs have to be met and specific ICT skills need to be provided, it is necessary to design local policies so that they suit the territory's needs. This is why in recent years the EU has designed policy actions locally, based on a public-private partnership where most of the stakeholders (National Government, Ministry of Education, industry associations and trade unions) cooperate to achieve a policy objective.

For example, policy actions targeting employees should be bottom-up actions based on private-public partnerships in order to satisfy the specific local needs. In almost all the MS these initiatives are present, but still very sparse. In fewer than 30% of the MS we found bottom-up actions targeting employees and based on private-public partnerships that were not isolated initiatives, but widespread in the MS.

Overall, the policy approach adopted by most MS for the ICT skills issue is still very fragmented. Yet there are MS with wide and integrated policy approaches that provide examples of good practice (see Box 9 below).

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<sup>116</sup> See the "Vienna Study", Codagnone (2009)

**Box 9. Some national good practices in ICT skills policies****Ireland**

Despite the economic downturn in Ireland and in many other countries, the Irish technology sector has fared relatively well with demand for high-level ICT skills continuing throughout. The main reason for this is the significant ICT cluster in Ireland, both due to strong foreign direct investments from global companies, and to the many indigenous Irish technology companies. The Irish Government put in place a number of policy initiatives in order to fill the demand-supply gap for ICT skills.<sup>117</sup>

**Latvia**

In Latvia representatives of the government sector, non-governmental organisations and key industry players signed a cooperation agreement, the “e-skills partnership”, aimed at the development of e-skills for jobs in Latvia. A memorandum of cooperation was signed by the Latvian Information and Communications Technology Association (LIKTA), Ministry of Environmental Protection and Regional Development, Ministry of Economics, Ministry of Education and Science, Ministry of Welfare, Latvian Chamber of Commerce, Latvian Open Technology Association and the Latvian Internet Association.

This cooperation will comply with the priority axes defined by the European Union and Latvian policy development documents as Latvia 2030, the National Development Plan for Latvia 2014-2020, the Information Society Guidelines for Latvia 2014-2020, Digital Agenda for Europe, and the Grand Coalition for Digital Jobs initiative. By signing the memorandum, the government, non-governmental organisations and entrepreneurs agreed to cooperate in four main areas: ICT training for labour market needs, youth involvement in ICT, modern and interactive learning processes, and educating the society on the necessity of digital literacy.

**Malta**

Malta set up the Malta Information Technology Agency (MITA) as a prime government agency with a mandate spanning from ICT policy to programmes and initiatives in Malta. MITA manages the full implementation of IT programmes in government focusing on enhancing public service delivery, and provides the infrastructure needed for the provision of ICT services to government. MITA is also responsible for the propagation of ICT within society and the economy and for promoting and delivering programmes with the intention of enhancing ICT education and the use of ICT as a learning tool.

eSkills Alliance Malta was established in October 2010 and is a public sector initiative with the primary objective of ensuring that there is a ready supply of qualified ICT personnel tuned to the requirements of industry.

The eSkills Alliance brings together representatives from the public sector, the private sector and educational institutions.

**Source:** Authors

**4.4 Concluding remarks**

This Chapter shows that a number of conditions are necessary for initiatives promoting the DAE goals to bring about a positive impact on regional development. First, initiatives at regional level require a series of enabling factors, ranging from the most concrete and measurable factors to more subjective variables. These comprise complementary measures and investments, but also ICT infrastructure, digital literacy and attitude towards openness and innovation. The finding that a correct articulation is needed between the contribution of the public and private sectors in terms of both funding and governance is of particular relevance.

<sup>117</sup> Department of Education and Skills (2012).



As far as the supranational and national horizontal issues are concerned, it is possible to suggest the following conclusions:

- The CEF will be a relevant tool for the implementation of the DAE objectives;
- Funding and coordination are necessary but not sufficient conditions for the sustainability of the projects;
- Common regulatory aspects and the standardisation of semantic interoperability are also fundamental for the sustainability of networked services. There are countries with very different administrative structures and procedures, which may require some standardisation or, in some cases, the implementation of *ad hoc* technical solutions;
- The policies at national level need to take into account the more recent policy governance founded on place-based and public-private partnerships as suggested by the European Union;
- The private-public partnership is an essential tool in order to design policies addressed to very specific local issues.

These horizontal factors reviewed show that they are fundamental, and even necessary at times, for the local development of ICT and related growth. They are issues that must be addressed at EU and national level, but they need local policy initiatives to overcome the local barriers and to support the local population and economy in taking advantage of the new technologies. The last decades are full of examples and investments that provide evidence of the fact that the availability of ICT technology is a necessary condition for development and ICT-driven growth. However, awareness of and the capacity to use the technology are just as important as the availability of the technology itself.



## CHAPTER 5 - CONCLUSIONS AND RECOMMENDATIONS

### Main findings and conclusions

In order to understand how ICT investments can contribute to the economic development of European regions, this report collated different types of evidence collected at different levels (local, regional, national and EU), and using different perspectives (ranging from a macroeconomic and quantitative approach, to a qualitative approach based on case studies). This approach is appropriate to account for the **variety and complex patterns of outcomes and impacts brought about by ICT investments**, which affect different dimensions of regional development, from efficiency to social inclusion. This is no surprise given the intrinsic constituent features characterising the *Information Society*, which is actually what the apparently bland term “ICT investments” refers to, and which requires all encompassing and systemic approaches in order to explore its different dimensions. Yet, in these enmeshed patterns, some clear features emerge.

The Digital Agenda for Europe, which aims to maximise the social and economic benefits of ICT in the EU, was developed on the basis of compound theoretical underpinnings, and in the context of the overall poor performance of the EU in ICT endowment. From a theoretical perspective, there are reasons to believe that **ICT and the Internet influence economic growth**; however, there are **important conditions** that need to be fulfilled for the expected growth effects to materialise. The benefits of ICT diffusion seem to be more important in some countries or areas than in others, without any clear univocal explanations as to why. Thus, the conditions for materialisation of the expected effects of ICT investments are difficult to grasp in policy terms since no single fulfilled condition enables immediate effects, and no simple causal relations can be traced. Overall, **the EU has a lower ICT endowment** than that of its main competitors and **its performance is not uniform**, with wide disparities between and within MS, and between and within the regions.

In this context, the Digital Agenda strategy, which mostly results from a pragmatic learning process stemming from previous policy experience in the field, establishes a **pertinent diagnosis of the current obstacles to the further development of the Information Society in Europe** and its impact on economic growth at different levels. Recognising the existence of a virtuous cycle between supply of, and demand for ICT and Internet-based applications, it puts forward a long series of different actions involving various layers of competence. The latter is not a mere wish list, but testifies to a profound understanding of the specific treatment required by the development of the Information Society, adapted to the particular institutional setting characterising the *sui generis* mode of governance of the EU. In particular, it acknowledges that **the regional level is an appropriate level of action**, since it is well suited to identify the opportunities offered by the Information Society and to foster latent demand for ICT and the Internet.

At regional level the in-depth analysis of seven case studies of initiatives undertaken in line with the DAE logic shows the **importance of Cohesion Policy in funding investments in support of the Information Society**, and reveals interesting specific lessons. Despite their variety (e-health, digital literacy, e-learning, broadband, etc.), the interventions reviewed all tend to contribute to the two dimensions of regional development, i.e. economic growth and social well-being. Some projects have primary effects in terms of enhanced efficiency, others in terms of inclusion; some projects aim at Internet/ICT access *per se*, while others use the Internet *instrumentally*, to reach an independent objective; some principally foster the supply of ICT, while others activate demand. However, no matter which objective they pursue, and

although this is achieved through different patterns, they tend to generate **complementary positive effects on regional development**. This is very important inasmuch as the rationale to carry out a project of digital inclusion, for example, goes beyond this specific objective, and also has wider implications for growth and regional development. The reverse seems to be less automatic as “efficiency projects” rely to a greater extent on complementary measures, investments, or programmes for their effects on regional development to fully materialise.

In any case, there is a series of “**enabling conditions**” ranging from concrete and measurable factors to more subjective variables, including complementary measures and investments, but also ICT infrastructure, digital literacy, stakeholder involvement, attitude towards openness and innovation, etc. One particularly important finding was that a **correct articulation between the contributions of the public and private sectors**, in terms of both funding and governance, is necessary for projects to be successful. The respective importance of the public and private sectors depends on the projects’ objectives and their context of implementation.

At national and EU level the analysis of specific interventions (for example under the Connecting Europe Facility, or national policies aimed at enhancing e-skills) also identifies the specific conditions needed for the initiatives to deliver the expected effects and benefit regional development. For example, all legal, regulatory and cultural barriers should be removed, interoperability should be ensured, there should be a sufficient level of transactions, standardisation should be promoted, etc. In particular, the **local population and businesses must be receptive and ready to take up new the technological solutions** made available at national, cross-national or EU levels.

Overall, the report identifies different channels through which ICT investments might affect growth and development at regional level and the conditions necessary for this to happen. Fundamentally, the very **interplay between the different levels of actions and governance also yields great potential for growth**. If the different levels of action were considered independently, without taking a systemic view, the identified effects would be likely to be restricted to their framework of origin. If instead, the interactions between the different levels are taken into account, it appears that there is considerable room for unleashing growth effects on a wider scale. As a matter of fact, if supply and demand for ICT/the Internet (and the IS in general) in a bounded regional setting are reinforced by interventions beyond the regional level, not only are growth effects going to be recorded at regional level, but also the chances are that the local/regional contribution will prove to be decisive in grasping the full benefits of the projects/policies/programmes carried out at national/EU levels. For example, initiatives at the national level to foster e-skills can significantly boost competence at regional level, which, in turn, can be decisive in consolidating the demand for content and infrastructure that will be met by supply beyond the regional level. Conversely, the effort to foster harmonisation and cross-regional e-services can be ineffective without a concrete knowledge of local conditions in terms of needs and possible obstacles (technical, etc.). Thus, “horizontal issues” are not only necessary for regional development, but the reverse is also true, and this triggers a virtuous cycle of growth, with probable repercussions at regional level.

This implies that, in a multilevel governance setting, **top-down initiatives and bottom-up projects should be combined, or developed in parallel**. It responds to the needs of the European policy agenda to combine efforts to complete the Single Market and to foster regional growth dynamics through a “place-based” approach in the context of Cohesion Policy. Furthermore, if the suggestion that the private and public sectors should combine their respective contributions is borne in mind, the Digital Agenda may turn out to be a formidable **launching pad for experiencing a new form of policy governance, based on both horizontal and vertical partnerships**. It entails a new, open and collaborative approach

involving different DGs as well as national and local governments. Most of the goals can only be reached through the wide involvement of governments, industry, civil society and individuals, thanks to private-public partnerships. The **regional level is at the nexus of this complex web of partnerships** and is decisive for shaping well-designed strategies that could spark off a virtuous growth process at EU level, benefitting EU regions.

## Recommendations

On the basis of the findings summarised above, and with a view to advising Members of the European Parliament on how EU support can best be utilised for ICT investments to boost the economic development of European regions, the present report proposes a restricted set of recommendations. While endorsing the recommendations put forward by previous studies and the EC, the present study provides additional insight and deepens specific points. The former can be summarised as follows:

- regional digital strategies should be based on a sound analysis of the implementation context and the specific conditions, needs and opportunities of the territory;
- they should adopt a holistic and integrated perspective;
- well-balanced support of supply and demand for ICT products and services is needed;
- a well balanced approach is needed between market and public mechanisms to provide infrastructure and to stimulate ICT demand;
- where the market fails to provide an adequate level of ICT infrastructure and services at an affordable cost, the public sector has to intervene.<sup>118</sup>

Although it is based on an analysis of single projects rather than of entire strategies, evidence from the present study confirms the importance of adopting an integrated and balanced perspective, but also extends an invitation to go beyond the regional setting and considers the dynamics resulting from the interactions between initiatives at the regional national and EU levels. Overall, the findings from this study suggest focussing on the following specific issues:

- **Implement as many different types of measure as possible in support of IS, provided they are in line with local needs and context.**

Evidence from case studies suggests that the wide range of possible types of intervention should be fully exploited. Recourse should be made to different types since they bring about complementary effects on regional development, almost independently of their initial objectives. Hence, whether projects pursue objectives primarily in terms of efficiency or of inclusion, whether they foster supply or demand, and whether they target access to the Internet and ICT *per se* or in order to reach other objectives, does not seem to really matter as far as the final impact on regional development is concerned. This is because initiatives targeting the Information Society intrinsically touch upon a wide range of variables that foster synergetic effects benefitting both growth and well-being. That said, it is important that the type of intervention selected be adapted to local needs and be in line with the degree of maturity of the Information Society in the local context.

- **Embed IS support measures in wider and systemic strategies, and complement them with accompanying measures, especially efficiency-oriented IS measures.**

Whether initiatives in favour of ICT developments are embedded in a wider regional strategy of development and closely related to a set of complementary investment programmes or measures, is a key issue. Again, this is related to the constituent feature of these initiatives, i.e. their potential to influence a wide range of variables that can be amplified through

<sup>118</sup> See the final report for the study "Information Society and Economic and Social Cohesion – the role of the Structural Funds" carried out for DG Regional Policy (2002) and the "Community strategic guidelines on Cohesion Policy" (2006).

appropriate complementary measures. This is especially true of projects following primary objectives in terms of efficiency since they tend to yield spontaneous effects of a smaller systemic dimension.

➤ **Identify the appropriate mix of public and private support based on the project's objective and context.**

The evidence gathered in this report speaks in favour of the adoption of initiatives with a clear mission: is the investment revenue-generating or does it correspond to the provision of a public service? This calls for an appropriate mix of public and private contributions both in terms of governance and funding. Again, the evidence collected suggests that this depends on the local context and specific conditions.

➤ **Ensure that a series of enabling conditions are met, in particular ICT receptiveness at regional level.**

Different enabling conditions were identified, which ensure that the projects reviewed at regional level deliver the expected effects in terms of regional development: ICT infrastructure, digital literacy, attitude towards openness and innovation, complementary investments or programmes, stakeholder involvement, and an appropriate articulation between public and private contributions. All these conditions are generally project- and context-specific and it is difficult to identify a rule that could apply indiscriminately. However, looking at a broader perspective, beyond the regional setting, it appears that a favourable regional context in terms of acceptance and receptiveness of ICT and IS development is an important or even decisive factor that must be fulfilled. As a matter of fact, the regional setting is the privileged place where demand for ICT development can emerge, thus ensuring that technological developments are adapted to local needs.

➤ **Make sure that the regional setting is considered as a nexus between vertical and horizontal partnerships.**

The findings presented above suggest opening up the setting in which regional digital strategies are thought up, designed and implemented. While horizontal partnerships (between the private and public sectors, between different stakeholders) are necessary, a well-balanced supply of and demand for ICT products and services should include input from beyond the regional setting. Initiatives at national and EU levels aimed at removing bottlenecks, pursuing harmonisation, developing e-skills, etc., are necessary for regional projects to trigger their expected development effects. Conversely, regional factors are determinant in influencing the reach of the former. IS strategies should therefore take into account and fully exploit the beneficial effects of these different patterns of interactions.

➤ **Establish renewed confidence in the peculiar system of policy governance characterising the EU.**

Overall, this study illustrates that the articulation between place-based policies (Cohesion Policy) and policies pursuing the objective of achieving the Single Market has the potential to unleash virtuous growth dynamics on a European scale. This requires the eventual acknowledgement that the EU proposes a rather peculiar policy paradigm. In this respect, the long list of actions put forward by the Digital Agenda strategy should be taken seriously, not just as a dull list of requirements, but as concealing an innovative concept of policy governance in which the regional level is a nexus of horizontal and vertical partnerships. This calls for renewed confidence in the EU's capabilities to implement and fully exploit a *sui generis* system of policy governance.

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