European Policy Centre - EPC

The Economic Impact of a European Digital Single Market

Final Report | March 2010

INFORMED DECISIONS

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PREFACE

The European Policy Centre (EPC) and its project partners have asked Copenhagen Economics to provide an initial assessment of the economic benefits of a "European Digital Single Market". This report provides this assessment.

During the preparation of this report, we have had numerous discussions with the EPC task force and we are grateful for the all the comments and suggestions received during these meetings.

The EPC project partners is comprised of (in alphabetic order):

- Central Denmark Region
- Ericsson
- Intel
- Microsoft
- Nokia
- Sitra, the Finnish Innovation Fund
- Vodafone

The views and opinions of the authors expressed herein do not necessarily reflect those of the EPC or any of the organisations participating in the projects.

We have also had discussions with senior European Commission officials, key Members of the European Parliament and other stakeholders. We would like to thank all of them for valuable input. Having had these talks does neither imply that these persons agree with our view nor that they disagree with the views expressed in this report.

Furthermore, we appreciate the valuable comments and suggestions from EPC experts, notably Chief Executive Hans Martens, Chief Economist Fabian Zuleeg and Policy Analyst Annika Ahtonen. This also extends to EPC expert Richard Marsh (Verso Economics), who has performed an independent assessment of the quality of our assessment and the recommendations.

However, any errors and omissions are solely ours.

Partner Martin H. Thelle (project manager)
Brussels, 16 March 2010

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Chapter 1 EXECUTIVE SUMMARY

In this report we assess the economic impact of a Digital Single Market (DSM) in Europe.

Our conclusion is that the EU risks falling behind if the barriers to a Digital Single Market are not tackled. Global competitors, such as the U.S., Japan and S. Korea are expanding the digitalisation of their economies and increasing productivity and innovation is expected to follow. If Europe does not keep up, we risk missing out on a major boost to competitiveness.

We summarise our findings in nine points:

1. **The future is digital**: The digital economy is a major source of growth and innovation (up to +8 percent of EU GDP in 10 years – same size as Spain's GDP).
2. **Much has been done**: Steps have been taken to support a digital economy and to help create a more integrated European digital economy (e.g. E-commerce Directive).
3. **Still no Digital Single Market**: The EU digital market remains fragmented. The EU is still comprised of 27 individual digital markets rather than one single digital market (e.g. legal issues).
4. **The EU is not using its full potential**: As a result, the EU economy is not exploiting the full benefits of the digital economy (cross-border online trade is low, ICT usage is low, and there are few global EU digital firms).
5. **Cost of non-digital Europe**: There is a cost of not having a European DSM. Europe could gain 4 percent GDP by stimulating fast development of DSM by 2020. Based on expected 2010 GDP for EU27, this corresponds to a gain close to €500 billion or more than €1.000 for every citizen. DSM has similar impact as the 1992 Single Market Programme.
6. **Benefits across all private sector industries and firms:** A DSM provides a boost to growth and innovation. An integrated and harmonised Digital Single Market increases ICT usage and leads to productivity growth. This provides a substantial boost to EU2020 growth ambitions (ICT as a general purpose technology).
7. **Benefits for digital entrepreneurs and innovations**: A Digital Single Market could help foster entrepreneurship and innovation: helping new and small EU firms grow. This requires a large home market. Successful firms in the digital economy are knowledge intensive and have high R&D costs and high regulatory costs. A fragmented regulatory framework is blocking innovation and new firm creation.
8. **Benefits for EU consumers**: A Digital single market can deliver consumer gains from trade: DSM facilitates cross-border trade, increases competition, and broadens consumer choice. This leads to gains for consumers.
9. **Benefits for the public sector:** Better usage of ICT and digital services in the public sector (e.g. e-government) can improve the efficiency and quality of public services. This can lead to savings in public expenses and reduce public debt.

Besides these economic benefits, which are analysed in the study, we also flag that a DSM can also bring green benefits. Purchase of an MP3-file instead of a CD implies a small carbon footprint. Such dematerialization of our economy can be furthered by the DSM.

In summary, the digital economy can potentially provide a major boost to EU productivity and growth. We estimate that at least 4 percent additional GDP (EU27) can be gained in the longer run by stimulating further adoption of ICT and digital services through the creation of a DSM. This will also imply job creation. One estimate shows that in Germany alone, the improvement of digital infrastructure will trigger innovation and growth leading to an additional 427,000 jobs over the period 2015-2020.

These benefits do not come without a cost. Building a Digital Single Market in Europe requires an ambitious policy response, which must tackle issues of interest to Member States.

1.1. MAJOR POTENTIAL REQUIRES A COMPREHENSIVE POLICY RESPONSE

To achieve the positive impact of the digital single market will require a comprehensive policy response. The EU economy will doubtless need more investments in digital infrastructure and Europe will need more online subscribers and a higher penetration of household broadband. Europe will also need to upgrade e-skills and e-readiness.

But according to our assessment, the European economy will *not* be able to achieve the full potential of the digital economy without a framework encouraging innovation and diffusion of new content, services and applications across the entire union. A harmonised and well-regulated Digital Single Market is a prerequisite for delivering the required innovative push to the EU's digital economy.

1.2. POLICY MUST BUILD FOUNDATIONS AND REMOVE BARRIERS

The EU *lacks the foundations* for a DSM. There are large differences across Europe in terms of access to digital infrastructure. The capabilities to use digital technology (e-skills) are insufficient in many places. Furthermore, rules, regulations and standards are enforced differently across the EU, and fundamental policy attention is lacking.

There are *many barriers* hindering the creation of a Digital Single Market. A recent study on legal barriers to the DSM identified 100 issues spanning areas such as: privacy & data protection; content & copyright; liability of online intermediaries; e-payments; electronic contracts; net neutrality; spam; cybercrime; dispute resolution and self regulation. Issues of major importance are found in all these areas, and these unresolved issues hinder the use of online and digital services across European borders.

Making the Digital Single Market a reality will require a major policy response, which, judged by its economic potential, could be a key project for the Barroso II Commission. This effort should focus on creating a single and harmonised European online business environment which delivers a large scale home market for European firms, and thereby provides a much stronger incentive for digital innovations than is the case in the fragmented market in today's 27 Member States. Amidst this effort, it is paramount to create an online market

place in which consumers can trust and to ensure that the legal framework governing the use of data and intellectual property is fit for a digitalised market. As a consequence of these changes in the online business environment, innovations and supply of new European digital services and applications will increase, and the demand for new infrastructure will follow from what the DSM can offer, cf. Table 1.1.

Table 1.1 Making the Digital Single Market (DSM) a reality

DSM is a part of the solution for a number of problems and challenges:	However, DSM suffers from these key barriers:	Thus, policy attention should be on:
Europe needs new sources of growth	Lack of policy attention	Establishing a functioning Digital Single Market should be a key priority for the Barroso II Commission. Should commit to lead on and deliver DSM.
A severe lack of productivity growth Innovation gap vis-à-vis the U.S. High unemployment levels	Businesses find it difficult to operate online across borders, e.g. due to different regulations and enforcement of regulations in EU	Create a European online business environment.
	Lack of IPR / data protection	Ensure that the legal framework governing the use of data and intellectual property is fit for a digitalised market.
Lack of competition and cross-border trade	Lack of infrastructure. Insufficient e-skills and e-inclusion	Build the foundations and infrastructure for access and usage of the goods and services the DSM can offer.
Transforming the EU to a true knowledge economy	Lack of trust. Lack of consumer protection	Create an online market place in which consumers can trust.

Source: Copenhagen Economics.

1.3. STRUCTURE OF THE REPORT

The report is structured as follows: *Chapter 2* provides an introduction, where we present the background and purpose of the study, and define what we mean by a Digital Single Market and outline how it is approached in the study. *Chapter 3* links the DSM to Europe's productivity problem, and compares the contribution of ICT and digital technology between the U.S. and the EU. *Chapter 4* takes the temperature on the current state of the DSM in Europe. In *Chapter 5*, we quantify the cost of a non-digital Europe in terms of lacking productivity, missed employment opportunities and slower innovation and translate this into lost GDP growth and analyse impacts on the public sector and consumers.

Chapter 2 | Introducing the Digital Single Market

In this Chapter we explain the background and purpose of the study, and the approach we take to describe the economic impact of the Digital Single Market. We explain what we mean by a DSM, why it is important and how ICT and the digital economy can bring economic benefits.

2.1. Purpose of the study

The purpose of this study is to identify and quantify the economic impact of creating a Digital Single Market in Europe, and to outline the directions EU policy should take in order to make the DSM a reality. By extension, the study also aims to assess how far the EU is from a DSM.

2.2. Background

The context for this study is that much of our economic and social activity is already digital. Phenomena such as e-commerce, e-health, e-learning, e-government, e-procurement and user-provided content are well-known and growing rapidly in scope and volume.

The younger generation has taken up digital services much more rapidly than the rest of the population, and the generation entering their working careers over the next ten years will have been brought up with digital technologies as a natural aspect of their lives. This is further illustrated by the fact that "digital natives" (people for whom digital technologies existed when they were born) make up 73 percent of 16-24 year olds, whereas the average is 35 percent for the total population, cf. European Commission (2009a).

The future will bring a rapid and forceful move towards the knowledge economy with increased importance given to digital technology and services. These technologies have the potential to transform and improve the functioning of our society, economy and everyday life in fundamental ways.

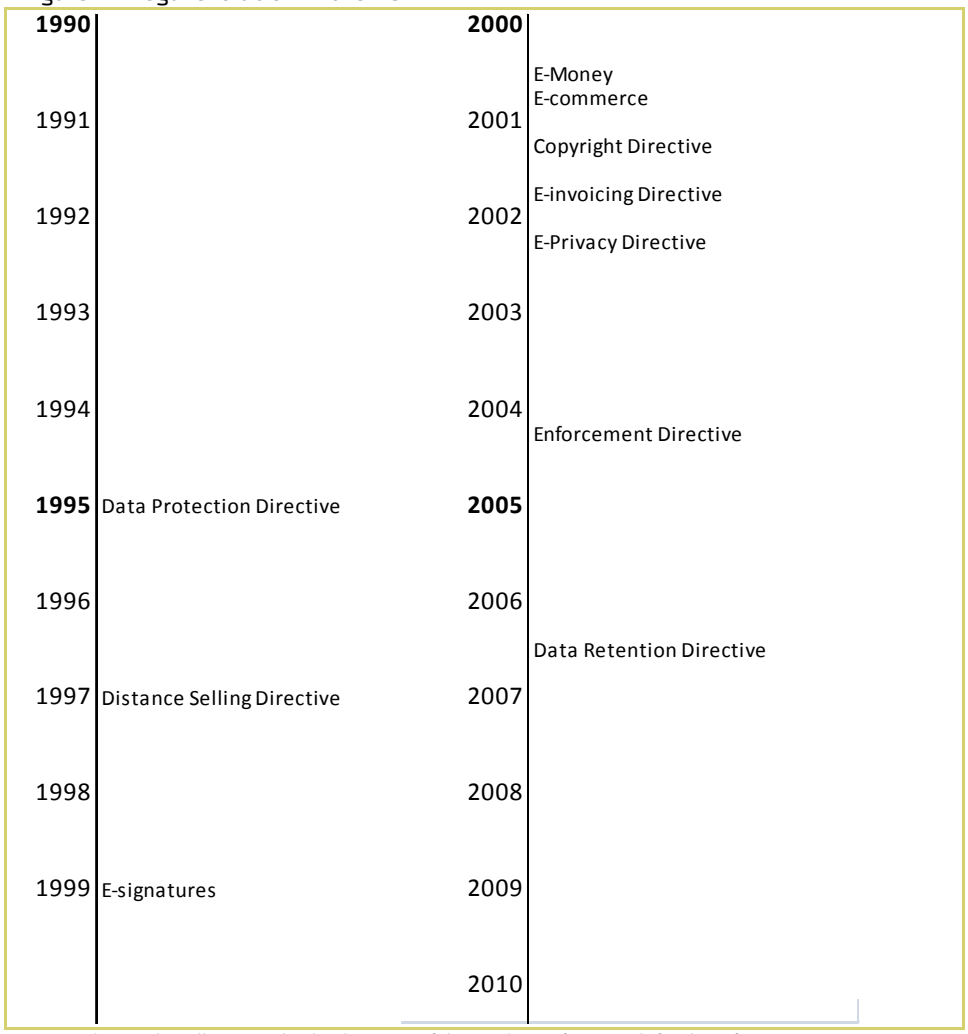
In this respect, digital technologies are similar to railroads and the combustion engine because they change the way we work, consume and live. Digital technology and ICT are so-called *general purpose technologies* which affect most areas of the economy, driving up general productivity levels and fostering innovation across a wide spectrum of activities. Therefore digital technology and ICT are major sources of growth and consumer benefits.

Much has already been done to prepare Europe for the digital economy

As with railroads and the combustion engine, policies and regulation had to develop (e.g. traffic regulation) and adapt (e.g. pollution control) to accommodate these technologies and ensure that the technologies were used for the improvement of our societies. The same is true for digital technologies.

Much has already been done at the EU and national levels to introduce a well-functioning framework for the digital economy. At the European level, directives have been adopted in the areas of e-money (passed in 2000, c.f. Official Journal of the EU), e-commerce (passed in 2000, c.f. Official Journal of the EU), e-invoicing (2006, c.f. Official Journal of the EU), e-privacy (2002, c.f. Official Journal of the EU), and digital music rights (2001, c.f. Official Journal of the EU). Much of the legislative efforts to create a pan-European framework for the digital economy peaked around 2005 and fewer directives and less legislative proposals have been tabled since 2005, cf. Figure 2.1.

Figure 2.1 Legal evolution in the EU



Note: The timeline illustrates the development of the regulatory framework for the information society
Source: Copenhagen Economics

Looking forward, the Commission realises that the job is not done yet. The digital economy is an important priority for the Barosso II Commission and it is at the core of the new Europe 2020 strategy. Under the heading *Digital Society*, the initiative "A digital agenda for

Europe" is one of three proposed flagship initiatives to generate smart growth in Europe. The purpose is to speed up the roll-out of high-speed internet and it specifically sets out to "*reap the benefits of a digital single market for households and firms*".[1]

Box 2.1 Flagship Initiative: "A Digital Agenda for Europe"

The aim is to deliver sustainable economic and social benefits from a Digital Single Market based on fast and ultra fast internet and interoperable applications, with broadband access for all by 2013; access for all to much higher internet speeds (30 Mbps or above) by 2020; and 50 percent or more European households subscribing to internet connections above 100 Mbps.

At EU level, the Commission will work:

- To provide a stable legal framework that stimulate investments in an open and competitive high speed internet infrastructure and in related services;
- To develop an efficient spectrum policy;
- To facilitate the use of the EU's structural funds in pursuit of this agenda;
- To create a true single market for online content and services (i.e. borderless and safe EU web services and digital content markets, with high levels of trust and confidence, a balanced regulatory framework with clear rights regimes, the fostering of multi-territorial licences, adequate protection and remuneration for rights holders and active support for the digitisation of Europe's rich cultural heritage, and to shape the global governance of the internet;
- To reform the research and innovation funds and increase support in the field of ICTs so as to reinforce Europe's technology strength in key strategic fields and create the conditions for high growth SMEs to lead emerging markets and to stimulate ICT innovation across all business sectors;
- To promote internet access and take-up by all European citizens, especially through actions in support of digital literacy and accessibility.

At national level, Member States will need:

- To draw up operational high speed internet strategies, and target public funding (including structural funds) on areas not fully served by private investments;
- To establish a legal framework for co-ordinating public works to reduce costs of network rollout.

Source: EU 2020 Strategy

Furthermore, a new Commissioner has been appointed as Digital Agenda Commissioner (Ms. Kroes), and many expect that this appointment to result in a major renewal of the effort to further strengthening the framework conditions for the digital economy in Europe. However, the digital agenda is not just an isolated effort by one DG.

ICT is also at the heart of the European Commission DG Enterprise and Industry's vision of how to shape the industrial future of the EU, called *Key Enabling Technologies for Europe's Innovation*[2].
Furthermore, the DSM is linked to efforts by the Internal Market and Services Directorate General[3], and to the dossier of the Research, Innovation and Science Directorate General[4].

[1] European Commission (2010) "E U R O P E 2 0 2 0 - A European strategy for smart, sustainable and inclusive growth" COM(2010) 2020, Brussels, 3.3.2010. http://ec.europa.eu/eu2020/

[2] The Commission in its Communication "Preparing for our future: Developing a common strategy for key enabling technologies in the EU", COM(2009)512. Identifying key enabling technologies (KETs) that strengthen the EU's industrial and innovation capacity to address the societal challenges ahead and proposes a set of measures to improve the related framework conditions.
http://ec.europa.eu/enterprise/sectors/ict/files/communication_key_enabling_technologies_sec1257_en.pdf

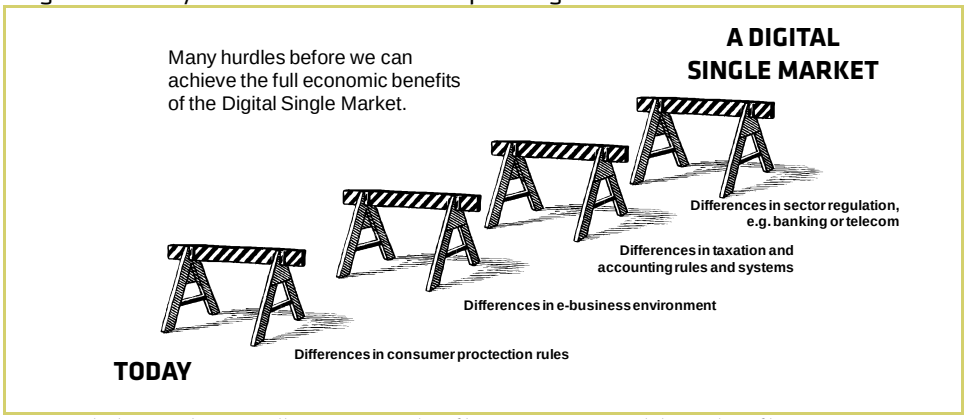
Barriers still exist to an integrated European Digital Market

There are still a number of barriers which impose obstacles for the development of the digital market in Europe. Some are concerned that fragmented policy making across DGs and across Member States have led to fragmented digital market.

Obstacles which can be identified include national differences regarding data protection rules, e-commerce rules and other legislation pertaining to information flows. Lacking convergence of e-governance and consumer protection are also seen as areas of hindrance for an internal market. A recent example of the difficulties inherent to the task of creating a single online market was seen following the Commission's impact assessment of reforming cross-border collective management of copyrights and performance rights of online music services. Several legal disputes followed the initiative from the Commission, and the creation of a single EU market for online music did not come about that easily.

There are many other such barriers to an internal digital market. There are many hurdles in the current regulation, and the question is how much remains to be done before we can start talking about a Single Digital Market. The full benefits may only materialise after removing the last hurdle. Removing the first barriers alone may have little impact.

Figure 2.2 Many barriers to a unified European digital market



Note: The barriers shown are illustrative examples of barriers among a much longer list of barriers
Source: Copenhagen Economics

2.3. What do we understand by the Digital Single Market (DSM)?

In order to evaluate the economic impact of a Digital Single Market, we must clarify what we meant by the phrase. When referring to the DSM in this report, we mean:

[3] See for example the hearing document of Commissioner M. Barnier, recognising the need for a renewed IPR regime for the knowledge economy:
http://www.europarl.europa.eu/hearings/static/commissioners/answers/barnier_replies_en.pdf

[4] See hearing document for Commissioner M. Geoghegan-Quinn emphasizing the link between innovation and the digital agenda:
http://www.europarl.europa.eu/news/expert/infopress_page/008-67165-012-01-03-901-20100112IPR67164-12-01-2010-2010-false/default_en.htm

- A harmonised and integrated European market without barriers between EU member states hindering the use of digital and online technologies and services
- A single market which encourages cross-border online trade
- A single market which encourages investments in new online services and applications
- A single market with a high level of e-skills and e-readiness
- A single market which encourages investment in digital infrastructure

Following this definition, the DSM makes it just as easy for a consumer or firm in an EU Member State to access online information, goods and services in another Member State as in the country where the consumer or firm is based.

It encourages investment in new innovative online services and applications when investors have unhindered access to a potential of 500 million digital consumers. This also provides firms with incentives to invest in the underlying digital infrastructure.

A Digital Single Market has competent market actors who can use digital resources to make purchases; exchange information; collaborate; search for information, and do many other things of value to firms, consumers and society. Thus, when assessing the economic impact of the digital single market we include the impact from:

- Increased usage of ICT and online services in the private sector which leads to innovation and wide-spread productivity gains for EU firms in virtually all sectors
- Increased usage of ICT and online services in the public sector which leads to wide-spread productivity gains in virtually all corners of the public sector
- Increased cross-border online trade which leads to consumer gains in terms of lower prices and better choice
- Increased broadband infrastructure which facilitates the use of online services and online trade

These effects are illustrated in Figure 2.3 below.

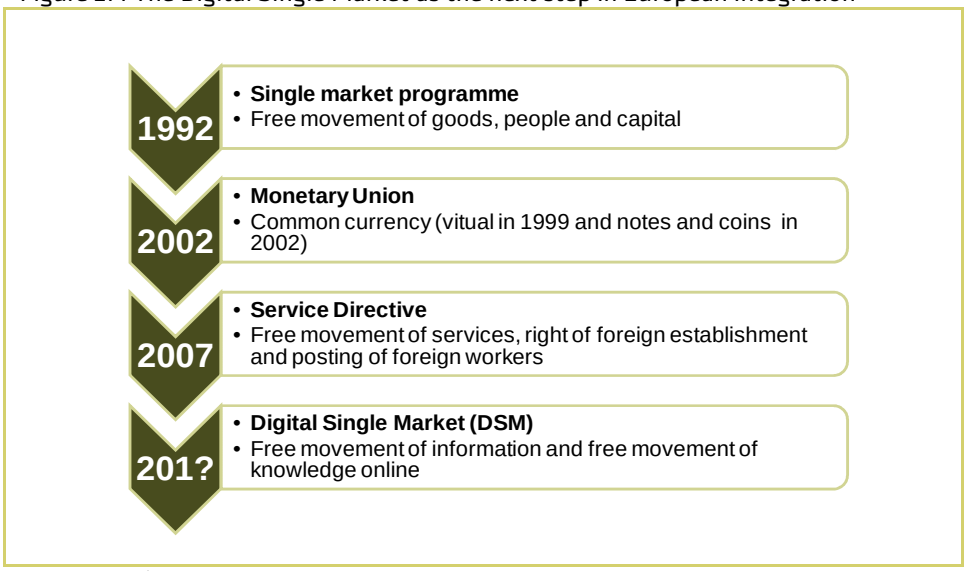
Figure 2.3 The Digital single market creates growth, innovation and competition

Source: Copenhagen Economics.

2.4. The Digital Single Market as the next wave of European integration

The DSM can be seen as the fourth wave of economic integration of the EU market. After the 1992 Single Market Programme, EMU and the common currency (Euro) in 1999/2002 and the 2007 Services Directive, the creation of a single market for digital goods and services can be seen as a fourth step of the European Union to foster growth, jobs and innovation. A Digital Single Market which ensures the free movement of information and knowledge could bring benefits to European consumers and business, because knowledge and information move online and are the key drivers of modern growth. The question we ask in this report is thus how the economic benefits of the DSM compare with the benefits of previous waves of European integration.

Figure 2.4 The Digital Single Market as the next step in European integration



Source: Copenhagen Economics.

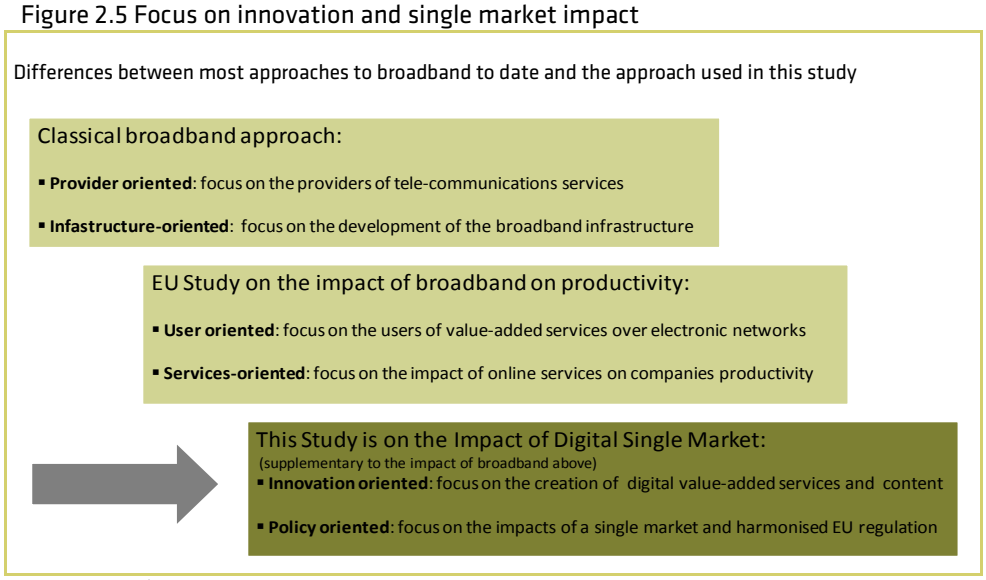
2.5. The approach taken in this study

The approach in this study builds upon and extends previous work, which has focused on physical infrastructure in the form of cables in the ground, via mobile infrastructure, satellites etc. (classical broadband approach) or which has focused on both physical infrastructure and take-up of internet (EU Study on the impact of broadband on productivity, see Micus, 2009).

Our main interest in this study is what is going on in the service layer on top of this infrastructure. We are particularly interested in the regulatory and policy-oriented factors that govern how we make use of these new technologies. The supply of broadband infrastructure and the penetration of these technologies into households and firms have increased very rapidly over the past few years. There is still a long way to go before new technologies have

reached full penetration. However, we believe it is timely to investigate the impact of regulation in the service layer and to focus on how new technologies are used to create innovative new ways of producing, selling and consuming.

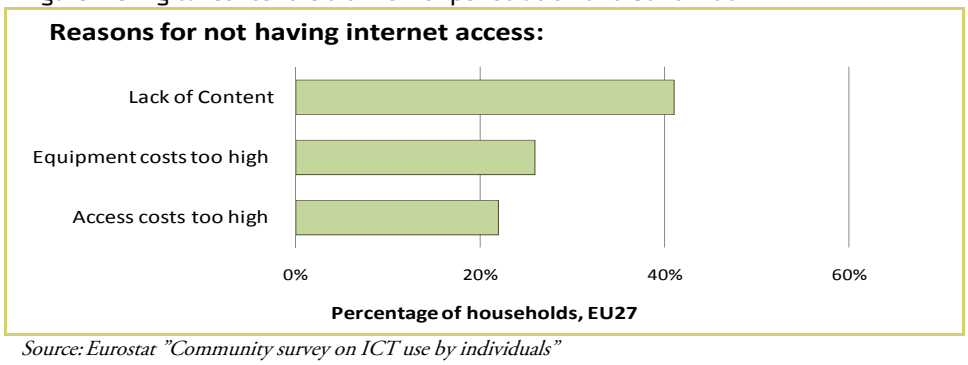
Figure 2.5 Focus on innovation and single market impact



Source: Copenhagen Economics.

Our approach can be illustrated by a simple observation. Normally, it is argued that supply of broadband and more bandwidth is the key to digitisation. Once the infrastructure exists, the rest will follow, so the argument goes. It is something of a chicken-and-egg discussion. We note that the impact also goes the other way around. Online content is also a driver for broadband penetration and bandwidth. Content stimulation and creation of new value-added services has an indirect impact on the development of broadband infrastructure, cf. Figure 2.6.

Figure 2.6 Digital content is a driver for penetration and bandwidth

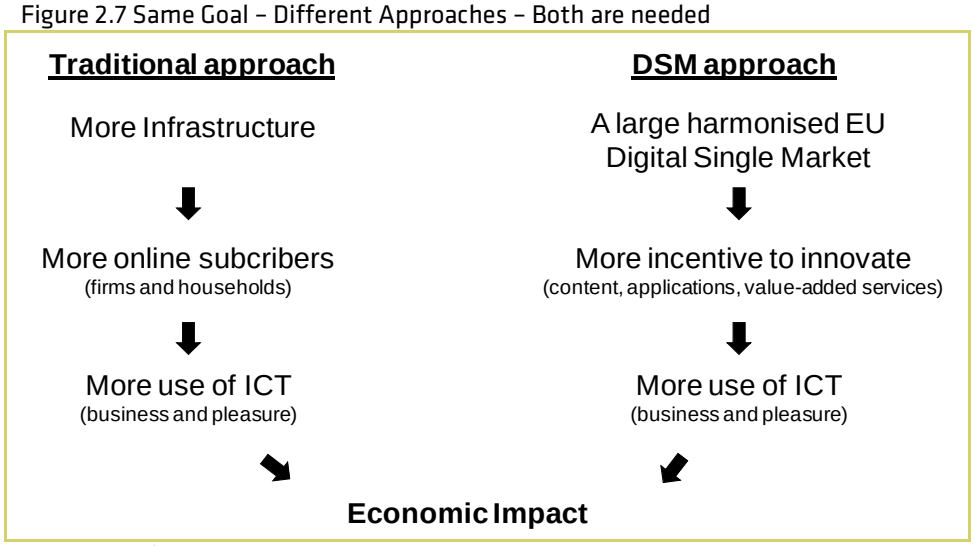


Source: Eurostat "Community survey on ICT use by individuals"

We link the economic gains to be had from the DSM to the barriers which currently prevent it from becoming a reality, and on this basis we suggest possible policy directions to take in

order to achieve the DSM. Furthermore, we underline the importance of a large integrated European digital market for innovation in online and digital goods and services, cf. Figure 2.7.

Figure 2.7 Same Goal – Different Approaches – Both are needed



Source: Copenhagen Economics

In the next Chapter we set the scene by describing Europe's productivity challenge and how the use of ICT has been a key driving force for productivity growth in the last decade.

Chapter 3 EUROPE'S PRODUCTIVITY PROBLEM

In this Chapter we provide a diagnosis of Europe's productivity problem and ask two questions: *First*, whether the use of ICT is a significant part of the problem, and *second* whether a Single Digital Market could form part of solution.

We answer 'yes' to the first question. Results from existing research show that 0.3 percentpoints of Europe's annual growth gap with the U.S. can be attributed to ICT usage. Furthermore, research points out that the difference between the EU and the U.S. is not so much in the provision and penetration of broadband, but is more related to differences in how we use these new technologies. It is how we use them that matters. What seems to be missing in Europe are integrated and advanced usage digital technologies and services which transform the way that firms do business, the way that governments govern and the way consumers consume.

We note that the potential impacts are large. Conservative estimates indicate that if ICT had contributed as much to productivity growth in Europe as it did in the U.S. since 1995, EU15 GDP for 2004 would see an increase of 3.2 percent. This corresponds to €582 for every European citizen. Added to this is the impact of higher multifactor productivity, where the difference between the U.S. and the EU are much larger. Thus, ensuring the best possible use of these technologies has a huge potential. The question is: what is preventing this potential from being realised? What is the cure for Europe's productivity problem?

We can answer 'yes', in part, to the second question, when arguing that the absence of a large and integrated European market for online goods and services and the costly barriers for cross-border applications can explain, to a certain extent, why diffusion of these new digital technologies occur at a slower pace in Europe. We do not, however, claim that the absence of a DSM is the only explanation for Europe's gap with the U.S. The DSM is no silver bullet which will solve Europe's productivity challenge overnight. The contribution of this study is simply to highlight that the lack of a large and unified digital market in Europe should appear alongside many other explanatory factors, and it is considered worthwhile to investigate the potential impact in further detail.

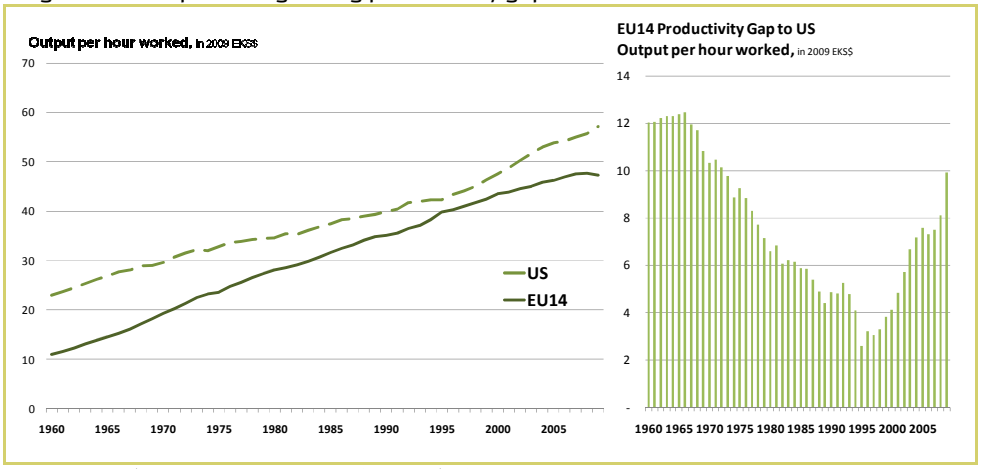
The remainder of this Chapter discusses further these two points. First, we review the research on the productivity gap between the EU and U.S. and look at the role of ICT in explaining that gap. We find that slower diffusion of the advanced ICT services is a major factor. We then move on to investigate the underlying reasons for the slow diffusion, and point to the role that the DSM can play in that context. During this discussion we also review the evidence base for the estimates of the impact on productivity and GDP.

3.1. EUROPE IS LAGGING BEHIND THE U.S.

Until around 1995, Europe had achieved a longstanding catch-up of its productivity level with that of the United States. One of the most puzzling economic facts of the last decade has been the reversal of this pattern.

American labour productivity growth slowed after the early 1970s Oil Shocks but accelerated sharply after 1995. Although European productivity growth experienced the same slowdown during the 1970s and 1980s, it has not enjoyed the same rebound during the 1990s as in the U.S. Consequently, the gap that had almost disappeared around 1995 is now almost as large in absolute terms as it was in the 1960s, c.f. Figure 3.1.

Figure 3.1 Europe has a growing productivity gap to the U.S. since 1995



Note: EU14 is EU15 except Germany (missing data)
Source: Own calculation based on The Conference Board Total Economy Database, Jan. 2010.

3.2. ICT IS A MAJOR CONTRIBUTOR TO PRODUCTIVITY GROWTH

Analyses of US productivity growth show that the vast majority of differences in productivity growth occurred in those sectors which either intensively use or produce IT (information technologies)[5].

> *"IT accounts for 48% of US labour productivity growth in 1995-04, much larger than IT share of GDP"*
>
> - Dale T. Jorgenson (2005)

Closer analysis has revealed that European countries had a similar productivity acceleration as the U.S. in IT *producing* sectors (such as semi-conductors and computers) but failed to achieve the spectacular levels of productivity growth in those sectors which *used* IT intensively (predominantly market service sectors, including retail, wholesale and financial services).

[5] See, for example, Kevin Stiroh (2002). Dale Jorgenson (2001), Stephen Oliner and Daniel Sichel (2000). In the 2002-2004 period Oliner and Sichel (2005) find that US productivity growth remained strong, but there was a more widespread increase in productivity growth across sectors. See Robert J. Gordon (2004) for a general discussion.

Van Ark, O'Mahony and Timmer (2008) analyse the benefits of the modern knowledge economy and significant differences between advanced economies. Average annual labor productivity growth (measured as GDP per hour of work) in the United States accelerated from 1.2 percent in the 1973–1995 period to 2.3 percent from 1995 to 2006. Conversely, the 15 European Union countries which constituted the Union until 2004 experienced a productivity growth slowdown between these two time periods. For these 15 countries as a group, labor productivity growth declined from an annual rate of 2.4 percent during the period 1973–1995 to 1.5 percent during the period 1995–2006.

The authors go on to analyse so-called "growth accounts" from the perspective of the emerging knowledge economy. They focus on the summed contributions of three factors:

- direct effects from investments in information and communication technology
- changes in labor composition, largely driven by greater demand for skilled workers and
- multifactor productivity growth, which – as indicated by their research - might include the impact of intangible investments such as organizational changes related to the use of information technology

Van Ark, O'Mahony and Timmer (2008) demonstrate that the combined contribution of these three factors to labor productivity growth declined by 0.5 percentage points in Europe between the two time periods, from 1.6 percentage points from 1980–1995 to 1.1 percentage points from 1995–2004. In contrast, in the U.S. economy the contribution of these three knowledge economy components doubled from 1.3 percentage points from 1980–1995 to 2.6 percentage points from 1995–2004.

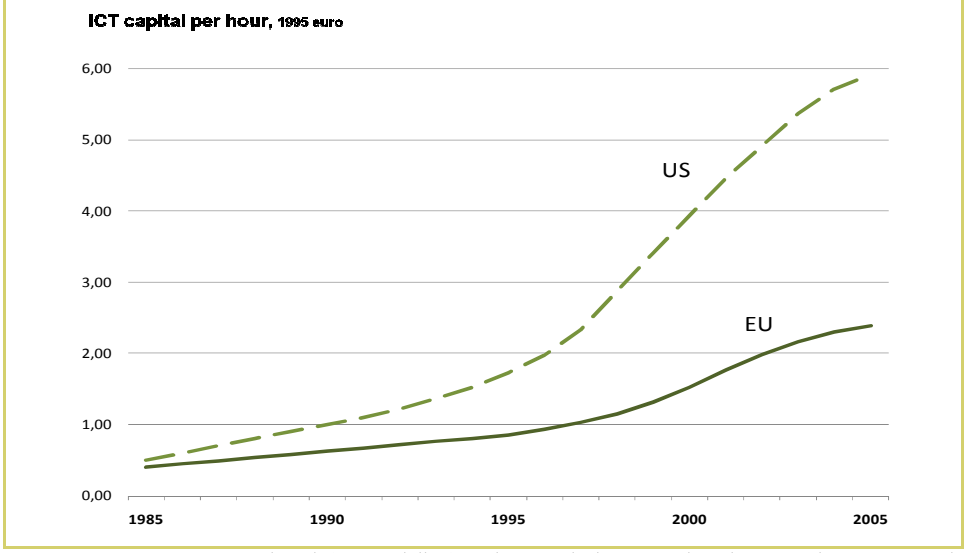
The annual growth contribution of ICT investments in the US was 0.8 percent during 1995 and 2004, while the same contribution was only 0.5 percent in Europe during the same period.[6] Thus this factor alone may explain 0.3 percentage point of the EU's GDP growth gap with the US. Adding to this is the contribution from ICT to multifactor productivity. Over ten years, the impact adds up, and Europe's GDP (EU 15) could have been 3.2 percent higher if the contribution from ICT investments had been at the same level. This suggests Europe has foregone increase in EU15 GDP of €176 billion for the year of 2004, or €582 per every EU-15 citizen.

Consistent with these trends, the data shows that IT intensity (IT capital per hour) appears to be substantially higher in the US than in Europe and this gap has widened over time, cf. Figure 3.2. Given the common availability of IT throughout the world at broadly similar prices, it is a major puzzle as to why these IT related productivity effects have not been more widespread.

[6] ICT investments are measured in ICT capital per hour.

Figure 3.2 US firms has invested much more in ICT than EU firms since 1995

IT capital per hour in Europe and the US, 1980-2005



Note: IT capital stock (in unit dollars) per hour worked. IT capital stock measured using perpetual inventory method and common assumptions on hedonics and depreciation. 2005 US $ PPPs The countries included in the "EU" group are: Austria, Belgium, Denmark, Finland, France, Germany, UK, Greece, Italy, Ireland, Luxembourg, Portugal, Spain, Sweden and the Netherlands.

Source: *Timmer, Ypma and van Ark (2005).*

Technology diffusion is a big part of the story

The very different trends in IT intensity (as measured by the investments in IT, as shown above) lead us to focus on the diffusion of these new technologies. There has been diffusion of ICT in Europe, but at a slower pace than in the US - particularly since the second half of the 1990s.

> *The **key differences** between Europe and the U.S. are in the **intensive ICT-using services**, with U.S. productivity growth showing a strong acceleration during the second half of the decade, whereas growth stalled in the EU.*
>
> *van Ark, Inklaar and McGuckin (2002)*

It is puzzling that new digital technologies spread faster and led to a higher ICT investment intensities in the U.S. than in the EU. There are at least two broad kinds of explanation for this situation. First, there may be some "natural advantage" to being located in the U.S., enabling firms to make better use of the opportunity that comes from rapidly falling IT prices. These natural advantages could include tougher product market competition; lower regulation; better access to risk capital; more educated or younger workers; larger market size; greater geographical space, or a host of other factors. Another school of thought stresses

that it is not the US environment per se that matters but rather the way in which US firms are organized or managed that enables better exploitation of IT.

A paper by Bloom et al (2007) shows that US multinationals operating in the UK have higher productivity than non-US multinationals in the UK, and this is primarily due to the higher productivity of their IT. Furthermore, organisations that are taken over by US multinationals increase the productivity of their IT, whereas observationally identical establishments taken over by non-US multinationals do not. The explanation provided for these patterns in the study is that US firms are organized in a way that allows them to use new technologies more efficiently.

Another explanation may be because the returns from investing in the new technology in Europe did not reward the investment to a sufficient degree. Which leads to a second question: why would returns from ICT in Europe be lower than in the U.S.?

3.3. THE REASONS WHY EUROPE IS LAGGING BEHIND

We now analyse the reasons why returns from ICT in Europe could be lower than in the U.S. We investigate three possible explanations:

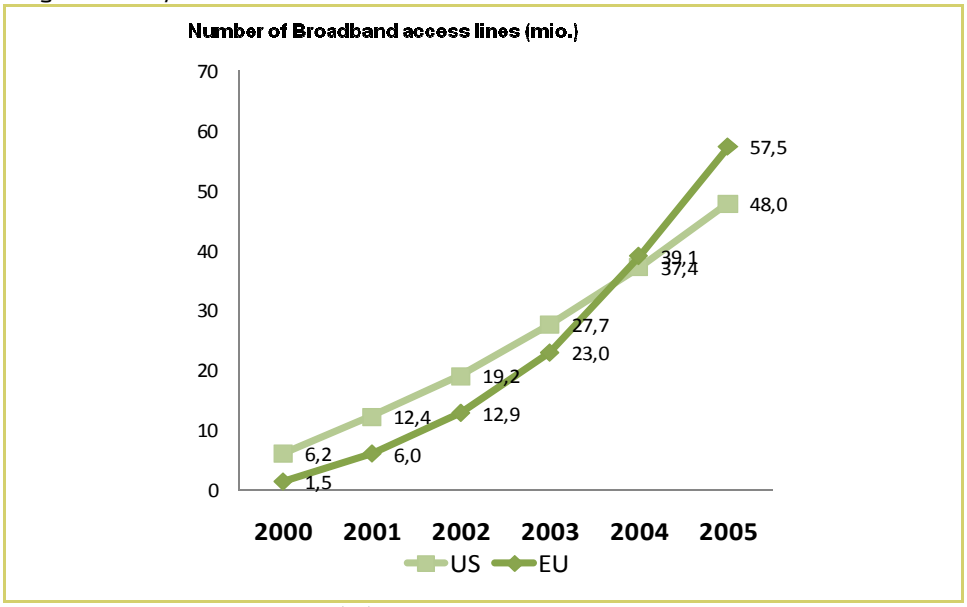
- Differences in the provision of the infrastructure
- Inappropriate regulation in the Member States
- Differences between Member States: Does a fragmented market discourage technology diffusion?

Differences in the provision of the infrastructure

One explanation for the slow pace of digital technology in Europe may be the differences in the provision of broadband or in the structure of the broadband sector.

First of all, it must be said that Europe is not behind on provision of broadband in terms of the number of broadband subscribers. The EU27 is ahead of its major competitors in terms of the number of broadband lines. Taken together across all 27 member states, EU firms, consumers and the public sector have access to a larger number of broadband lines than other OECD countries. An indication of this is given in Figure 3.3 below, which shows that the number of broadband lines in the EU had already outgrown the number of broadband lines in the U.S. by 2005.

Figure 3.3 Physical internet infrastructure in the EU and the U.S.



Source: OECD Communications Outlook 2007

The overall number of broadband lines has been larger and increasing more rapidly than in the U.S. since 2004 and so it would be difficult argue that slower diffusion of digital technology per se is a result of an overall lack of broad provision. This does not seem to be the most prominent explanation of the slow spread of digital technology.

The way in which the European broadband sector is structured turns out to be more important. For example, in mobile communications there is a large range of national and international operators, totaling close to 100 mobile operators. In the U.S., the majority of subscriptions are concentrated on 3-4 operators out of a total of 20 mobile network operators. The European situation is the result of a lack of market consolidation with "old national monopolies" keeping their strong position in local markets due to government protection in the past.

The EU broadband sector is fragmented and there is no pan-European internet service providers. Obstacles occur because of the fragmented European broadband provider industry. The U.S. has a few large (continent-wide) broadband suppliers, while Europe has many smaller suppliers, most of them competing on a national scale, and a few suppliers competing across borders (e.g. Deutsche Telekom/T-mobile, Vodafone and Telefonica). None have continent-wide operations. Given the broadband providers' role as facilitators of online services, a fragmented supplier industry may hamper certain developments.

As regards the provision of broadband (both fixed and mobile), we conclude that a high degree of fragmentation may account for part of the explanation for the slower diffusion of advanced online services in the past (before 2004).

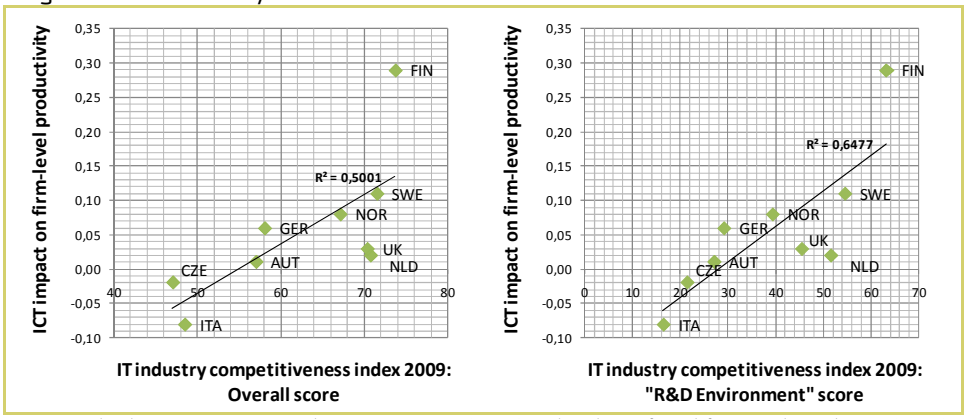
Inappropriate regulation in the Member States

A second source of explanation for the slow spread of ICT and digital services in EU could be found in the regulation of the sector in the individual Member States.

The regulation of the internet and ICT should address issues such as cybercrime, data privacy and spam while ensuring free movement and the possibility of transactions on the internet. High impact of ICT usage requires good regulation of the internet and good framework conditions for the ICT industry (e.g. R&D). If the framework for ICT industry is poor, firms and consumers cannot reap the full benefits from ICT usage.

When comparing indicators of ICT's productivity impact with indicators of the quality of regulation, it appears that better framework conditions for the ICT sector[7] (left-side panel) and more specifically, improved framework conditions related to R&D part (right side panel) result in more productive use of ICT (vertical axis in both panels showing the per unit impact of ICT usage on firm-level productivity).

Figure 3.4 Productivity and ICT framework conditions



Note: The diagrams compare productivity estimates (y-axis) with indices of good framework conditions (x-axis).
Source: EIU (2009) for x-axis and Eurostat (2008) for y-axis.

We conclude that weaker regulation of the ICT and internet sectors may be associated with lower productivity impact from using ICT. This, in turn, influences the return on the investment in ICT, and so, poor ICT framework conditions may negatively influence the incentive to invest in new technologies. If the return on ICT (in terms of higher productivity) is low, then firms invest less in it and the rate of diffusion of new technologies will be slower than is the case in good framework conditions.

[7] See Economist Intelligence Unit (2009), "Resilience amid turmoil Benchmarking IT industry competitiveness 2009". The U.S, ranks first on this index, followed by Finland, Sweden, Canada and the Netherlands.

Country Differences: Does a fragmented market discourage innovation?
The third area of investigation concerns the impact of differences between Member States and the question as to whether this can form an obstacle to innovation and diffusion of new digital technologies.

An area in which fragmented EU policy is problematic is that of standards. The development of standards for digital communication is central to the development of the market for digital goods and services. Consumers and firms may be reluctant to purchase new computers, mobile phones or programs if they are uncertain whether there will be matching applications in the future. Similarly, firms' development efforts depend on what they anticipate consumers will demand, and if they expect consumers to be holding back demand, firms will delay or abandon development efforts.

Differences between EU countries can delay the achievement of common and shared standards. One example of a case where the EU was successful in setting standards early to facilitate market development is that of mobile phones: the rise of major EU mobile phone manufacturers has, to a major extent, been facilitated by the European mobile phone standard (ETSI GSM standard adopted by Council Directive 87/372/EEC of 25 June 1987), which was later adopted in much of the world. This created a large market for European mobile phone manufacturers.

However, the early adoption of mobile phone standards in the EU is a relatively rare example. In the areas of electronic payment, e-invoicing, e-signature, e-identity and e-contracts, EU countries lack a common approach.

On the third point, we conclude that a fragmented market may be a significant reason for low ICT investment in the EU. Differences in regulation between EU countries means that separate products and services must be developed for each EU country, which means that some innovative goods and services with high development costs will not be profitable if launched in the EU market.

Market size is good for innovation
To illustrate this further we need to look at what characterises firms which deliver digital innovations. They can generally be characterised as:

- Knowledge intensive
- Large R&D investments
- Very low marginal costs
- Substantial network effects (value increases with number of users)
- Substantial regulatory costs (each new market add a cost)

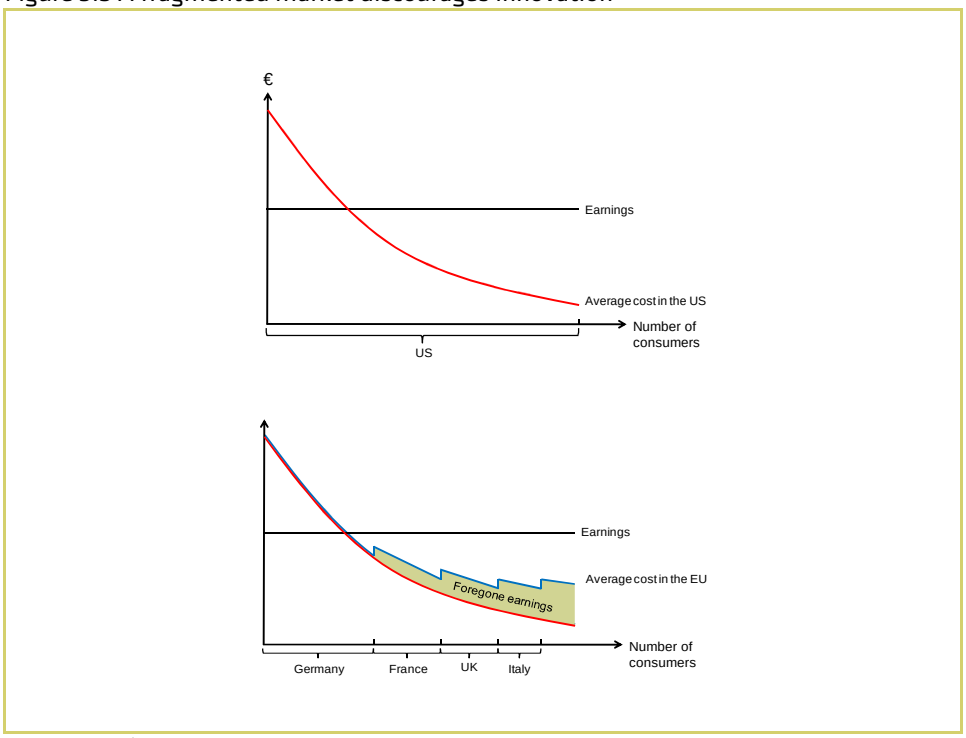
In sum, these characteristics naturally entail that these innovations require a large market to reward the R&D investment. The low marginal costs and the positive network effects are accelerated by achieving a large scale market.

A barrier to innovation is created when firms perceive the EU market for electronic products and services as small, due to differences in regulation and consumer preferences. The costs of reaching a certain scale may become when compared to the level of demand in EU markets. This means that the profitability for certain innovations may be too low.

As a result, despite the same total market size and similar broadband penetration, the fragmented EU market may provide less encouragement for innovation than the US.

Figure 3.5 illustrates this point. The top panel compares costs and revenue associated with the sale of an innovative online service in the U.S. for different levels of activity – measured by the number of consumers. The bottom panel compares costs and revenue for the same innovative online service in the EU. There are assumed to be economies of scale, which implies that average costs decrease as the level of activity increases. In the U.S., the same type of service can be sold in the entire market, which gives rise to a large surplus measured as the area between the earnings and average cost curves. In the EU, however, separate versions have to be sold in Germany, France, UK and Italy etc, which means that economies of scale cannot be exploited on the same scale as in the US. This leads to a loss of earnings. In some cases this loss of earnings makes it unprofitable for firms to launch innovations.

Figure 3.5 A fragmented market discourages innovation



Source: Copenhagen Economics.

3.4. Conclusion

Our diagnosis of Europe's productivity problem points to the use of ICT is a significant part of the problem and the Digital Single Market as part of the solution.

For the DSM to have pronounced economic impact, it must alter the way we use ITC and digital technologies. Comparisons with the U.S. highlight those factors presenting the main challenge. If solved, and if adopting similar usage as in the U.S., EU15 GDP for the year 2004 would have been 3.2 percent higher than otherwise. Lack of diffusion of new advance technologies accounts for this result.

We have investigated three possible explanations for slower diffusion in Europe: Differences in the provision of the infrastructure, inappropriate regulation in the Member States and differences between Member States.

We have concluded that slower diffusion does not seem to be explained by a lower provision of broadband per se (but the fragmented structure of European providers may matter). We have also concluded that good regulation in Member States is associated with higher productivity impacts from firm-level ICT usage, and we have demonstrated that a fragmented market discourage technology diffusion and innovation, particularly in the digital economy.

Chapter 4 STATE OF EUROPE'S DIGITAL SINGLE MARKET

In this Chapter we take stock of European integration of the digital markets. We consider the extent of cross border e-commerce in comparison with how much e-commerce which takes place within each EU country, as an indication of whether there are barriers to European consumers doing electronic purchases abroad. We compare European performance regarding cross-border trade with the general level of internet access of the Europeans, and we describe possible barriers which prevent European firms and consumers from trading with each other across borders.

4.1. EVIDENCE OF THE LACK OF A DIGITAL SINGLE MARKET

We can see the evidence of a fragmented digital market several places:

- Lack of cross-border online trade
- Lack of price convergence between countries with most e-commerce
- Lack of global EU digital economy firms
- Existence of barriers to cross-border online activity

Lacking cross-border online trade is a clear direct indicator of a fragmented digital market. Whether this fragmentation is due to regulatory barriers or cultural/behavioral barriers is another matter. Either way the underlying consequence is that digital firms need to approach each individual market separately, and this implies additional country-specific costs (either in development or operation).

Lack of price convergence is an indirect indicator of an absent DSM. We are particularly interested in the price convergence between countries which have high shares of e-commerce usage. We also analyse at price differences in the digital economy sector itself (e.g. mobile communication and broadband subscriptions).

The lack of global European digital economy firms is seen as an indicator of the ability of the European economy to foster innovations in the digital economy, as represented by globally successful firms. In the last decade, no EU equivalent of *Google* has emerged. Many EU digital firms have the U.S. not the EU as their second growth market after their national market. Examples of European success stories are found in the network and communications equipment industry (Nokia, Siemens, and Ericsson). Emergence of these global mobile technology firms was built *inter alia* on a large home market in the EU created by harmonization of standards and framework conditions. Looking outside the network and communications equipment industry, there are fewer examples of similar success stories. A small and fragmented home market may explain why certain scale dependant online services did not develop as fast as they could in the EU.

Finally, existence of concrete and identifiable barriers to cross-border online activity is the most direct evidence of the lack of a DSM. To go forward effectively, more knowledge is

needed about which barriers might be blocking an integrated EU market, and which policy interventions are most effective to make progress on market integration.

In the following we present these four areas of evidence in further detail.

4.2. LITTLE CROSS-BORDER ONLINE TRADE

There is only minimal cross-border e-commerce in the EU, and there are major differences between EU countries. At the EU level, 7 percent percent of consumers shop online cross-border while 33 percent shop online in total, and only 21 percent of EU online retailers are selling cross-border, as illustrated in Table 4.1.

Table 4.1 Consumers who have used e-commerce by EU country, 2008

	Total	Seller located in own country	Seller located in another EU country	Seller located outside the EU
Netherlands	68%	62%	16%	10%
Sweden	66%	61%	17%	11%
Denmark	63%	56%	23%	11%
United Kingdom	54%	52%	12%	11%
Finland	49%	42%	14%	6%
EU27	33%	30%	7%	4%
Greece	11%	6%	5%	3%
Lithuania	9%	7%	3%	1%
Portugal	9%	7%	2%	1%
Romania	7%	6%	1%	0%
Bulgaria	4%	4%	1%	0%

Source: European Commission, Special Eurobarometer 298, 2008.

This lack of cross-border e-commerce becomes even more pronounced when one takes into account that from 2006 to 2008 the share of Europeans who had purchased at least one item on the internet increased from 27 percent to 33 percent while cross-border e-commerce remained more or less stable, c.f. European Commission (2009c).

Weak cross-border trade may also be part of the explanation for the slower increase in e-commerce in the EU compared to the U.S. According to a comparison of available statistics, the EU is approximately four years behind U.S. regarding the use of the internet for buying and selling. In 2009, e-commerce comprised some 13 percent of EU firms' turnover, a share which was reached in the US in 2005, cf. Table 4.2.

Table 4.2 Share of enterprises' turnover coming from e-commerce

	2004	2005	2006	2007	2008	2009
EU	9.0%	10.0%	10.0%	11.0%	12.0%	13.0%
US	11.6%	13.5%	14.3%	15.3%	-	-

Note: EU numbers are share of enterprises' turnover on e-commerce. US numbers are e-commerce share of total sales, it covers 4 sectors: Manufacturing shipments, Merchant wholesale incl, retail and selected services.
Source: Eurostat and US Census Bureau.

4.3. LACK OF PRICE CONVERGENCE

One of the major benefits of European market integration is increasing competition, leading to lower prices and better welfare for consumers and society as a whole.

Symptomatic of the lack of a DSM is the absence of price convergence within the digital sector, with mobile communication prices varying on a scale from one to five from lowest (Denmark) to highest (Spain), cf. Veugelers and Van Pottelsberghe (2009). Paradoxically, as noted by the researchers, the lowest prices are observed in countries with a high GDP per capita, making the differences even sharper from a social-inclusion perspective. Similarly, average monthly broadband subscription prices in 2008 varied on a scale from one to 2.5 from lowest (Greece, the United Kingdom and Finland) to highest (Slovakia), again cf. Veugelers and Van Pottelsberghe (2009).

Lack of a DSM also has broader and much more pronounced impacts by not delivering the price convergence pressure on many other goods and services outside the digital sector itself (e.g. travel, books, music, pharmaceuticals, banking, insurance etc). The emergence of a DSM can be expected to contribute to European price convergence, because it facilitates the consumers' exploitation of potential price differences between suppliers in different countries. Furthermore, e-commerce facilitates cross-border price comparisons like no other technology or instrument.

However, overall European price convergence appears to have been reduced to a new-Member-State phenomenon, as the price convergence between EU15 countries has more or less stopped, whereas price convergence in EU25 and EU27 is taking place at a fine pace, c.f. Table 4.3.

Table 4.3 EU price convergence indicator (coefficient of variation of prices)

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
EU27	37.8	35.4	35.6	33.3	32.5	32	32.9	31.7	29.7	28.3	26.2	24.3
EU25	33.7	32.2	32	29.9	29	28.5	29.5	28.1	27	25.7	23.8	21.6
EU15	13.3	12.8	12.8	13.7	13.8	14.2	14	13	13	12.6	12.1	12.5

Note: The coefficient of variation is the ratio between the average price differential between EU countries and the average price in all the EU countries, so the statistic is an indicator of the "average price difference in percent of the price".

Source: Eurostat.

The lack of price convergence in the "old" EU countries despite the rapid development of the digital economy is well-aligned with the fact that cross-border e-commerce in EU is limited.

To summarize, the data on e-business and intra EU e-trade indicates that there are serious barriers to the Digital Single Market. The major differences between EU-countries indicate that the lack of trade is not because e-consumers by nature do business locally, because some countries do manage to have much e-commerce across the border.

4.4. GLOBAL FIRMS OF THE DIGITAL ECONOMY

It is difficult to measure whether European digital firms are more or less innovative than their US counterparts. There are examples of successful innovations in both continents. One practical way to address this question is to use the size of the digital economy firms as an indicator of the ability to foster innovations in the digital economy. Emergence of globally successful firms in a R&D intensive sector is a reasonable proxy for innovation capabilities.

Analysing lists of global digital economy firms shows that the EU appears to have become specialized in the hardware sector within the digital economy. In the telecommunications industry, many of the world's largest companies are European, e.g. Deutsche Telecom, Vodafone, Telefonica and Orange. Some of these were originally national telecom monopolies, but are now competing from a strong base across several EU countries. In the network and communications equipment industry, the EU is remarkably strong with world leaders such as Nokia, L.M. Ericsson and Alcatel-Lucent.

Table 4.4 World's largest firms in communications equipment and telecommunications, 2009

	Communications equipment			Telecommunications		
World rank	Company	Revenue $ millions	Country	Company	Revenue $ millions	Country
1	Nokia	74,224	Finland	AT&T	124,028	U.S.
2	Cicco Systems	39,540	U.S.	Nippon Telegraph&Telephone	103,684	Japan
3	L.M. Ericsson	31,688	Sweden	Verizon communications	97,354	U.S.
4	Motorola	30,146	U.S.	Deutsche Telekom	90,260	Germany
5	Alcatel-Lucent	24,859	France	Telefónica	84,815	Spain

Source: Fortune 500.

This strong position in telecommunications is not mirrored in the computer industry, where Europe does not have a single firm in the world top 10, c.f. Forbes Fortune 500.

This negative impression is reinforced when one also looks at the world's largest software companies, c.f. Table 4.5. Europe has one company in the top five and four companies in the top twenty.

Table 4.5 World's largest 20 software companies, 2009

Number	Name	Revenue in million $	Country
1	**Microsoft**	61900	U.S.
2	**IBM**	103630	U.S.
3	**Oracle**	22102	U.S.
4	**SAP**	16111	Germany
5	**Nintendo**	19886	Japan
6	**HP**	117837	U.S.
7	**Symantec**	6152	U.S.
8	**Activision Blizzard**	5032	U.S./France
9	**Electronic Arts**	4268	U.S.
10	**CA**	4305	U.S.
11	**Adobe**	3544	U.S.
12	**EMC**	14876	U.S.
13	**Konami**	3318	Japan
14	**SunGard**	5596	U.S.
15	**Cisco**	39455	U.S.
16	**Autodesk**	2303	U.S.
17	**Dassault**	1855	France
18	**BMC**	1698	U.S.
19	**Namco Bandai Games**	4738	Japan
20	**Sage**	2244	UK

Note: The software firms are ranked according to their turnover from software. This implies that for example Microsoft tops the list above IBM because Microsoft has higher software turnover than IBM, which also sells hardware and consulting services.
Source: www.softwaretop100.org

4.5. Barriers to the Digital Single Market

There is a range of barriers to the DSM. They can be put in three broad categories. The first type of barrier stems from the fragmentation of the EU legal system. The second type stems from differences in culture between the EU countries, which lead consumers in different EU countries to demand different characteristics from their goods and services. A third set of barriers (other barriers) encompass the lack of consumer protection and more generally, trust in the internet.

The first type of barrier means that suppliers have to adapt their business model from Member State to Member State. The second type of barrier means consumers may be reluctant and have difficulty navigating and understanding webpages in other Member States. The third type of barrier indicates that consumers will be reluctant to do business on the internet regardless of which country they originate.

The barriers of interest - specifically from a European policy perspective - are those which can be alleviated through changes to the legal barriers, or other barriers directly or indirectly under the influence of policy makers.

The issues related to the legal barriers to the DSM can be summarised in a list of recommendations required to prepare the current EU legal framework for the information society if there is to be a true Single European Information Space.

One hundred recommendations are found and grouped in 13 areas (general, scope of directive, applicable law etc) and each recommendation is categorised according to importance (low, medium and high). "High importance" means that the implementation of the recommendation is considered critical in the study. Based on this criterion, the areas of "privacy and data protection (area 4)" and "content and copyright (area 5)" include the most issues of critical importance, cf. Table 4.6.

However, it must be noted that only one critical issue may represent a serious barrier, and neither the importance nor the number of issues should be taken as an indication of its economic importance.

Table 4.6 Barriers to digital single market

			Importance of issue			
No.	Area	**Total number of issues**	1 = low	2 = medium	3 = high	**Average importance**
1	General	7	-	3	4	**2,6**
2	Scope of directive	5	1	4	-	**1,8**
3	Applicable law	4	-	2	2	**2,5**
4	Privacy & data protection	21	4	10	7	**2,1**
5	Content & copyright	16	-	9	7	**2,4**
6	Liability of online intermediaries	5	-	2	3	**2,6**
7	E-payments	5	1	-	4	**2,6**
8	Electronic contracts	6	-	6	-	**2,0**
9	Net neutrality	9	-	4	5	**2,6**
10	Spam	10	-	7	3	**2,3**
11	Cybercrime	4	-	2	2	**2,5**
12	Dispute resolution	5	-	5	-	**2,0**
13	Self regulation	3	-	3	-	**2,0**
	TOTAL	**100**	**6**	**57**	**37**	**2,3**

Note: The barriers are grouped according to importance. This refers to the relative importance of each recommendation (high, medium or low). "High importance" means that the implementation of the recommendation is considered critical, while "low importance" means that the recommendation is considered a "nice-to-have". Medium importance recommendations are not considered critical, although their implementation is nevertheless important.

Source: Own analysis based on a draft report prepared for the Commission and presented at a workshop in Brussels in October 2009.

We have further analysed these legal issues and the one hundred recommendations in order to identify where these barriers intervene in the digital economy. We have used three simple categories: business-to-consumer (B2C), business-to-business (B2B) and cross-cutting barriers depending on where in the value chain they cause problems. Our findings suggest that the legal issues identified are equal in numbers across all three groups and that there is no marked difference in the relative importance of the issues affecting different parts of the digi-

tal economy. One example of such barriers is within the area of telehealth (healthcare services via telecommunications technologies), cf. Box 4.1.

Box 4.1 Industry fears legal barriers to telehealth

In a recent position paper, the European medical technology industry says fragmented legal systems are stifling the evolution of IT solutions for healthcare across the EU.

Europe's healthcare needs are changing, with more citizens requiring long-term care for chronic conditions, according to medical technology industry group COCIR. Demand for better services means that EU-wide healthcare could soon be facing serious financial and staffing problems, it says.

Telehealth is the delivery of preventive and curative healthcare services via telecommunications technologies, ranging from patient-doctor telephone discussion and videoconferencing to robotic technology. Industry groups believe that telehealth services must be developed further to provide cost-effective solutions for doctors, nurses and patients in future.

The industry believes that telehealth solutions must be developed at EU and national level to help combat growing financial and staff shortages in the European health sector. However, it highlights several weaknesses within the current legal systems. COCIR, an industry group representing the healthcare IT sector, has called on the European Commission and member states to establish a single legal framework to overcome problems such as licensing, liability and cross-border jurisdiction.

It also warns that Europe's current financial model for healthcare is unsustainable and sees telehealth as a key area for the future.

The group insists that telehealth methods will improve detection of diseases, reduce mortality and hospitalisation rates and empower patients to deal with their conditions. But some doctors believe that an increase in the use of technology could have a disruptive impact on clinical practice and downgrade their role.

The group calls for more cooperation between healthcare stakeholders to accelerate the adoption of telehealth in routine clinical practice and increased funding for large-scale projects aimed at evaluating the impact of healthcare IT solutions.

It also highlights the low level of integration of telehealth solutions in existing European systems and recommends more dialogue in order to establish a sustainable economic model for telehealth.

Source: European Coordination Committee of the Radiological, Electromedical and Healthcare IT Industry (COCIR): COCIR Position Paper for a better deployment and use of telehealth (EurActive 23-feb-2010)

4.6. Conclusion

What can be concluded at this point is that the DSM is affected by a large number of barriers - some being more important than others - and that these form a complex web of regulation affecting the digital economy across all parts of the value chain. Therefore, all that can be said at this point (without further detailed analysis of the economic importance of the individual barriers and their interactions) is that a policy intervention focusing solely on one segment of the legal barriers – e.g. consumer protection – will be unlikely to address the majority of barriers affect the impact of the DSM. A broad based, multi-pronged approach is needed, which explores how barriers affect all the links in the digital value chain from innovation to the final consumer benefit.

Chapter 5 IMPACTS OF A DIGITAL SINGLE MARKET

In this chapter we quantify the possible impacts of a DSM on the EU economy. We analyse impacts on productivity, employment, consumer and the public sector.

5.1. MACRO ECONOMIC IMPACT (GDP)

How significant could the economic impact of a European Digital Single Market be? Our answer to this question is based on model scenarios using estimates of the productivity impact of increased use of digital technologies and services in Europe.

Scenarios and how they relate to the Digital Single Market

The scenarios can be used to quantify the possible impact of an accelerated diffusion of digital technologies and services in Europe. This acceleration can be formulated as the difference between the "base case" (assuming "business-as-usual" and a continuation of the current trend) and a "best case" (assuming an acceleration of the use of digital technologies and services), cf. Box 5.1.

Box 5.1 Three scenarios for the GDP impact of the digital economy

In a study for the European Commission (DG Information Society and Media), entitled *"The Impact of Broadband on Growth and Productivity"* the consultants MICUS (2009) has developed a model of the macro economic impact of broadband.

The study by MICUS (2009) works with two key scenarios:

- **"Best case"**: The speed of adoption of online services increases to that of advanced knowledge societies (Belgium, Denmark, Finland, Luxembourg, Netherlands and Sweden). The adoption rate in these countries was on average 4.1 percent during 2004-2006. The advanced knowledge societies are also better at taking advantage of online services. Therefore, the best case scenario has both a higher adoption rate and a greater effect on GDP.

- **"Base case"**: The speed of adoption of online services continues at the speed during the period 2004-2006.

The study also operates with a "worst case". This is less relevant for our purpose, but for the sake of completeness, it is assumed that the speed of adoption of online services drops to that of countries with less developed broadband (Bulgaria, Greece, Latvia, Poland, Romania and Slovakia). The adoption rate in these countries was on average 1.8 percent during 2004-2004 with a corresponding lower ability to take advantage of online services. Therefore, the worst case scenario has both a lower adoption rate and a lower effect on GDP.

Source: Micus (2009)

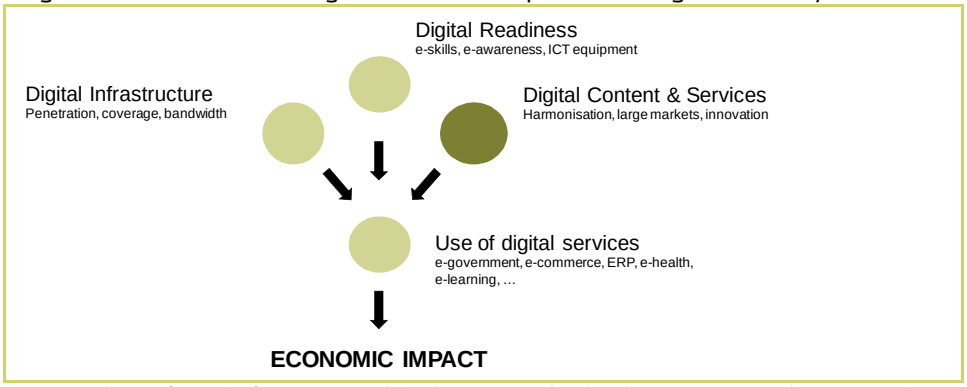
The model and scenarios are useful for our purpose, because it allows us to quantify the effects of increased use of online services, improved digital infrastructure, and improved e-skills. These are all anticipated results from a move towards a faster implementation of a DSM in Europe.

Consistent with our approach, as described in Chapter 2, we argue that further investments in infrastructure and in e-skills alone will *not* be sufficient to bring about an acceleration of usage of advanced digital technologies and services. We went on to show, in Chapter 3 that better regulation of the digital economy and harmonisation of the regulation across European borders can create a framework which stimulates competition and innovation and thereby accelerates the creation of new digital technology and services. Our argument here is

that this is precisely what is needed to make the difference between "business-as-usual" (i.e. the base case) and the accelerated diffusion of the digital economy (i.e. the best case).

The most recent study prepared for the European Commission in the digital economy, see Micus (2009) focuses on two factors, namely "digital infrastructure" and "digital readiness" as the main policy drivers for economic impact. It is the impact of these two factors which are specifically analysed in their study. In our approach, we add a third factor - "digital content & services" - and stress the impact of a well-functioning market, providing incentives for innovation in the services layer. Such innovations require harmonisation and a large unified market in order to achieve the required scale and scope.

Figure 5.1 Factors influencing the economic impact of the digital economy



Note: The two factors "infrastructure" and "readiness" are analysed in the Commission study, see Micus (2009). We add the factor "content & services" and argue that it is directly related to the digital single market.
Source: Copenhagen Economics.

We claim that the "best case" scenario will not stand a chance of materialising without the third factor, which aims at stimulating content provision and innovation in the service layer of the digital economy. The policy instruments required to foster this third factor are regulatory harmonisation, large scale markets and a focus on innovation. These are exactly the ingredients brought about by the DSM.

The digital single market stimulates the development and take-up of online services, encourages online trade, has a population with high e-skills, and it encourages investment in digital infrastructure. It is hard to predict to what extent DSM will affect the take-up of online services and how it will influence on e-skills. We argue that the impetus provided by a DSM will make a significant contribution to the possible acceleration of the diffusion of digital technologies. That said, we assume below that the impact of the DSM corresponds to the difference between the best case and the base case scenarios.

Impact on GDP in Scenarios

The digital economy is a major source of growth and innovation. Analysis of the GDP impact of these scenarios (see technical appendix) shows that the digital economy can contrib-

ute with up to a 12 percent increase in EU27 GDP between 2010 and 2020 (corresponding to an increase in the annual growth rate of +1.09 percent).

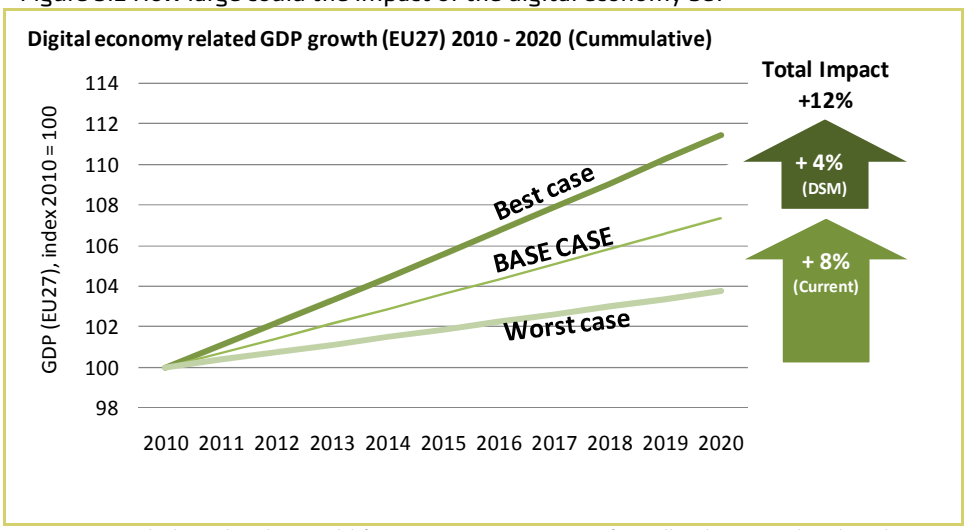
1. **Best Case**: Over a ten year period from 2010 to 2020, the cumulative impact of a best case acceleration of the digital economy on EU27's GDP is in the order of 12 percent higher GDP in 2020, cf. Micus (2009).

2. **Base Case:** Broadband penetration and uptake of digital technologies are already increasing at a rapid speed, so even without any further acceleration the digital economy will continue to add to GDP. A continuation of the current trend, as in a "base case" scenario, will add 8 percent to EU27 GDP over a ten year period, cf. Micus (2009). An 8 percent increase of EU27 GDP is large, and it corresponds roughly to the size of Spain's GDP.

3. **Net impact of acceleration (= best case – base case):** The net impact of a best case acceleration of the digital economy on EU27's GDP is estimated to be in the order of 4 percent over a ten year period. This is calculated as the difference between the "best case" (+12 percent) and the "base case" (+ 8 percent).

Figure 5.2 shows GDP growth contribution from the expansion of the digital economy in EU over the next ten years. In the best case, increased adoption of online services increases EU GDP growth by almost 12 percent. In the base case, the effect is almost 8 percent and the net impact of an accelerated digital economy is 4 percent.

Figure 5.2 How large could the impact of the digital economy be?



Source: own calculation based on model from Micus (2009) "Impact of Broadband on Growth and Productivity A study on behalf of the European Commission (DG Information Society and Media)

5.2. Cost of non-digital Europe

As noted earlier, we interpret the difference between the best case and the base case as the potential impact of the DSM.

Seen in this way, we can argue that there is a cost of *not* having a European Digital Single Market. Over a ten year period, Europe could gain 4 percent GDP by stimulating fast development of the DSM.

To put this figure into perspective, we can translate it into an absolute amount of GDP. Based on expected GDP for EU27 in 2010 of approximately €12 trillion (according to Eurostat's latest estimate), a 4 percent increase corresponds to a gain of almost €500 billion (€494 billion) or more than €1.000 for every citizen.

Based on the estimated GDP impact, the DSM could therefore have a similar impact as what was expected from the 1992 Single Market Programme.

This quantification of the cost of non-digital Europe takes into account two effects of the DSM:

1. Improved use of online services leads to higher productivity because information flows faster to knowledge service industries which depend on information for their production of services. Improved use of online services also increases productivity because it stimulates innovation in processes, organizational practices and in goods and services.

2. Improved use of online services leads to structural change in the EU economy with activity moving away from manufacturing and traditional service sectors towards knowledge services. This happens because productivity in knowledge services increases, leading resources towards this industry.

5.3. Productivity effects

Estimates of how digital technologies translate into productivity in the private sector are crucial to the assessment of the economic impact of the DSM.

Based on the model we apply, a 1 percent percentage point increase in the take-up of online services will lead to a 0.2 percentage point (approx) increase in the growth rate of GDP. Thus, for example, if firms' rate of investment in online services increases by 1 percentage point and the rate of increase in consumers' e-skills and access increase by 1 percentage point, this would have a major impact on EU GDP in the long run.

The estimates we apply in this study are not significantly different from those found elsewhere in related literature, c.f. Table 5.1. For example, Eurostat (2008) found that a 1 per-

centage point increase in the share of employees with broadband access leads to a 0.29 percent increase in productivity in Finland. If this improvement in infrastructure is matched by improved e-readiness, then the results from Eurostat (2008) are close to our estimates.

Table 5.1 Studies on the effect of broadband use on productivity and growth

Study	Research questions	Result
Eurostat (2008)	How does expansion of broadband use affect productivity in Europe?	Different estimates for different countries: A one percentage point increase in share of employees with broadband access leads to an effect of between zero and 0.29 percent increase in total factor productivity in Finland.
Eurostat (2008)	How does expansion of broadband use affect productivity in Netherlands and UK?	Broadband use has an insignificant direct effect on total factor productivity in Netherlands and UK. But it has an indirect effect on productivity because broadband use affects the total ICT capital. The indirect effect is: A one percentage point increase in number of employees with broadband access leads to a 0.03 percent increase in total factor productivity in Netherlands and the UK.
Polder et al (2009)	How does ICT affect innovation and productivity in Netherlands in manufacturing and services?	The use of broadband and electronic commerce positively affects organizational innovation, product innovation and process innovation in the service sector. Thereby there is a positive effect on productivity also. In the manufacturing sector, broadband use positively affects product and organizational innovation, whereas e-commerce positively affects process innovation. It is difficult to quantify the effects due to the estimation approach used in the paper, and the authors do not provide any simulations.
Katz et al (2009)	How does investment in broadband technology affect employment and output in the German economy?	Investment in broadband leads to increased GDP of euro 170.9 billion over a ten year period in Germany, corresponding to 0.6 percent of GDP. This included effects related to the infrastructure construction.

Source: Copenhagen Economics.

5.4. EMPLOYMENT EFFECTS

The development of the DSM will also have significant employment effects. The DSM will increase flexibility, competitiveness and innovation. This will lead to greater employment in the EU and to a shift in employment structure towards more high-skilled jobs. This does not imply that the low skilled labour will become unemployed, but that their job-content increases because they move to sectors with higher productivity. However, it must be acknowledged that there are transition costs related to the inevitable transformation away from 'old' industries.

The improvement of digital infrastructure alone will have important stimulating effects on the economy. For example, Katz et al (2009) estimate that fulfilling the German National Broadband Strategy, where 75 percent of the population has access to 50 Mbps by 2014, will generate around 300,000 jobs from network construction alone. In the current business cycle situation of the EU, this is potentially a welcome stimulus to a construction industry which is more or less idle in some areas.

However, the dynamic employment effects of moving towards a DSM will generate even more jobs in the longer run. Using the MICUS model, we estimate an employment increase in the EU of 30,000 per year due to moves towards the DSM, including an increase in the adoption of online services from 3 percent to 4 percent per year. This is perhaps a conserva-

tive estimate, because Katz et al (2009) estimate that in Germany alone the improvement of digital infrastructure will trigger innovation and growth leading to an additional 427,000 jobs over the period 2015-2020.[8]

5.5. CONSUMER BENEFITS

The Digital Single Market would promote competition between firms in EU Member States leading to lower consumer prices, greater product variety, and easier access to information for consumers. Consumers will benefit from increased competition through the DSM in both the short term and long run.

The welfare improvement to consumers is primarily concentrated in those markets where e-commerce is most likely to make an impact on competition. Markets in which e-commerce is best suited to challenge traditional trade is for standardized products which are easily exchanged for the following reasons. This is because e-Business does not allow consumers to see and feel the goods before the goods are actually delivered. Furthermore, small and light products are most cheaply exchanged. Services and digital content such as e-Banking, telephone services, digital music, and travel are particularly well-suited for e-commerce.

The table below shows the share of online sales out of total sales in EU, U.S., and Canada. For example, the share of total sales in the market for electronics and electrical in the EU is 22 percent. The table does not necessarily indicate that EU is ahead of the U.S. with respect to online business. If the EU markets are smaller than those in the U.S., then the market share of electronic commerce can be higher in EU while firms' share of revenue derived from electronic commerce is simultaneously lower.

Table 5.2 Electronic commerce's share of markets for different consumer goods

Market	EU	US	Canada
Leisure travel and recreation	21%	N/A	59%
Electronics and electricals	22%	13%	11%
Apparel	10%	17%	21%
Groceries	7%	4%	6%
Automotive	7%	2%	31%
Media	6%	4%	5%
Household goods	4%	6%	16%

Source: Copenhagen Economics based on DIW econ, 'A Single Market for an Information Society – Economic Analysis', July 9 2009.

Consumer benefits in the short run

In the short term, consumer welfare is improved in at least four ways:

[8] A possible explanation for the major difference in the estimates of Katz et al (2009) and MICUS (2009) is that the former take into account improving external competitiveness of German industry and services, leading to reduced offshoring or even sourcing activities back to Germany. This type of effect is not accounted for in the MICUS model.

First, the Digital Single Market leads to more competition in the short term since more firms are able to compete. More widespread digital infrastructure and faster internet access make e-commerce attractive for an increasing number of firms. As a result, consumers benefit from intensified competition leading to a greater variety of available products and lower consumer prices. DIW (2009) summarize the findings in the literature by stating that "Overall, most research leads to the result that prices are lower online than offline…". One of the estimates which quantified the effect, Brynjolfsson and Smith (2000), found that prices are 9-16 percent lower online than offline.

Second, the DSM leads to cross border e-commerce. In comparison with traditional means of trade, where the consumers must be present in the retailer's shop, it is easy for consumers to engage in cross-border trade via e-commerce. Thus, e-commerce means more trading opportunities for consumers with international firms. As of 2008, 15 percent of EU citizens has made a cross-border transaction through e-commerce.[9]

Third, consumers gain access to greater variety of goods. More integration of digital markets opens up competition to new firms, and consumers are able to purchase products which were not previously sold in their local market. Being able to consume a product which is more closely aligned to consumers tastes increases the consumer's welfare and increases his/her demand for that good.

Fourth, consumers' search costs for finding information about products and price are reduced. As high speed broadband is deployed to a greater number of people, information gathering becomes increasingly straightforward for consumers. As a result, the search cost of finding the product the consumer would like to buy, and the time required to scan the market for the best available offer, will be reduced. This may also impact on offline retail prices, cf.Box 5.2.

Box 5.2 Online price comparisons

Three in five Europeans who have internet access at home have compared prices online – for example by visiting price comparison websites (36 percent of Europeans have made such comparisons online; 17 percent subsequently purchased the product on the internet, 10 percent in a shop and 13 percent did not eventually make the purchase).

Both price and quality comparisons (both domestic and cross-border) are thought to be easier by internet buyers. Therefore, promoting transparency and comparability of information on the internet will have spill-over effects on retail markets in general, whether consumers decide to purchase online or not.

Note: As reported in the Commission's "Report on cross-border e-commerce in the EU", SEC (2009) 283 final.

Source: *Special Eurobarometer 298 (2008) and IPSOS Belgium: 'Retail satisfaction survey' (Aug-Oct 2008).*

Consumer benefits in the long run

In the long run, consumer welfare is improved in at least seven ways:

[9] DIW econ, 'A Single Market for an Information Society – Economic Analysis', July 9 2009, p. 20.

First, improvements of national and international policies via the DSM will also stimulate competition in the long run.

Second, market scale and better regulation encourage innovation. Greater integration of European product markets through the DSM allows firms to reach a greater number of consumers. This increases firms' incentives for investment in innovation due to the greater number of potential consumers in the market. To derive the full benefits of innovation created by increased e-commerce in trade public regulators must ensure that regulation supports innovation, cf. the European Commission.

"All in all, the results confirm the crucial importance of ICT for innovation. Policy makers may thus be well advised to recognise that there should be a link between ICT policies and innovation policies."
European Commission, 'The Sectoral e-Business Watch - ICT and e-Business Impact Studies – 2009', p. 7.

Third, competition creates pressure on firms to find cost reducing production methods for existing products. Intensified competition puts pressure on firms to lower prices, forcing firms to find cost reductions in production in order to remain competitive. One example of firms' need to innovate in order to remain competitive is the European glass, ceramics and cement industry, cf. the European Commission.

"The ability to innovate is a critical success factor for European glass, ceramics and cement industries to keep their position in high value-added market segments. ICT has an important role to play as an enabler of process innovation."
European Commission, 'The Sectoral e-Business Watch - ICT and e-Business Impact Studies – 2009', p. 4.

Fourth, competition increases firms' incentives to invest in new product development. Intensified competition lowers firms' profits in existing markets. To find new profit opportunities, firms invest in development of new products through which they can earn higher profits at least in the short run (for example through leader position in the market or through patents). Competition therefore fosters innovation, leading to economic growth. Consumers will benefit from availability of new products, better quality of products and lower prices.

Fifth, existing products become available in new markets. The DSM will allow firms to enter the market in other Member States and sell products which would not otherwise be available to consumers in this market. The increase in the variety of available goods gives consumers more choice.

Sixth, more production will occur where production is most efficient. Greater competition as a result of e-commerce forces firms to lower production costs. Firms with high production costs will be forced to leave the market, because they cannot offer consumers prices the same prices of their competitors. As a result, production ends up with those firms which are most efficient.

Seventh, consumers' search costs are reduced. Deployment of high speed broadband makes information gathering easier for consumers. Therefore, finding products and information on product prices can be achieved more rapidly.

5.6. PUBLIC SECTOR

The public sector makes up a large share of economic activity in the EU. The DSM also has the potential to significantly increase value creation in the public sector. This potential is found in three dimensions, c.f. GNKS Consult (2008):

- Increased cost-effectiveness in the public sector: Fewer employees are needed to fill in different forms and doing administrative work.

- Increased effectiveness in the public sector: The quality and user-satisfaction associated with public services increases, because users perceive interaction with public sector as being easier, faster and more successful.

- Improved governance: Public sector facilitates more accountable, flexible, participatory and democratic services where the public sector responds faster to and is better aligned with citizens' preferences and needs.

The DSM can increase productivity in the public sector through increased take-up and investment in e-government, e-education and e-health, for example. With regards to e-health, it allows public sector employees to save transport time in relation to meetings or telephone conversations with citizens. The OECD (2001) concludes that the cost of administrative burden to business in the EU15 amounts to between 2 and 7 percent of GDP, but there are cases where e-government has led to a 30 percent reduction in the total cost of procured goods and services. An example of a case where electronic public services have been estimated to have a potentially significant impact is hospitals in Australia. Collins (2009) estimated that the rollout of broadband to Australian hospitals would lead to net economic benefits in the order of 190 million Australian dollars over 10 years.

Public authorities also seeing an increasing opportunity to make their services available online, cf. OECD. "Since the early 1990s, e-government has been largely driven by technology. The new opportunities technological development provided were used to improve government administrations and the quality and speed of service delivery. Improvements in the penetration of broadband has also made access more economically affordable, thus enabling countries to take advantage of technology and further improve their e-government services (e.g. making them more interactive and transaction-oriented)", (Source: OECD 2009, 'Rethinking e-Government Services', p. 39).

However, it is important for governments to think beyond this simple gain in efficiency, because until recently there has been widespread dissatisfaction amongst the users of such

technology. Users often perceive e-government as something that has to do with reduced services: The government wants to save money and cuts down on user-contact, c.f. SCF Associates (2009). This has, in some cases, led to the somewhat paradoxical situation that those who are most in need of public sector contact are also those with least electronic access. Therefore, there exists a real risk that no real economic advantage will materializes because the lower cost is offset by lower value.

The challenge is thus how e-government can become more effective than conventional public services. There is a real potential. For example, if consultations with public sector employees could take place as video conferences, where people do not have to leave their workplaces at odd hours to go to meet with public sector employees in person, it may generate greater value. Furthermore, sometimes young people do not want to move far away from home to study at the best universities in the country or in the world, because they want to stay close to their family and networks. Video-teaching with two-way communication makes it possible for a far better match between students and universities, with the best teachers and universities being available to more people, providing better education and better lives for young people. This provide opportunities for specialist education (e.g. music tuition) becoming available in more schools

In order to successfully achieve this transformation of public services, the public sector must be responsive to the needs of citizens. User-driven innovation is not just for the private sector, but also for the public sector. Linking innovation in the public sector with the digital economy has the potential to improve the lives of citizens, but so far relatively little progress has been made on this issue.

Internet usage makes the public sector more productive, which is positive. But the public sector may also become more expensive, which has some negative effects given ageing populations. The reason for the potential increase in public expenditure is that once a technology becomes more productive, demand for this service tends to increase.

All in all, current evidence suggests that use digital technologies in the public sector can lead to both an improvement of the service, and a reduction of the cost of delivering that service.

5.7. Conclusion

This chapter described the impact of a Digital Single Market on the European economy. We used a model which takes into account the structural change and productivity effects induced by increased digitization of the European economy. We quantified the effect of the DSM by using information about how the use of online services generates economic value in advanced knowledge societies and argued that a large and harmonized market is a necessary precondition for the acceleration of Europe's digital economy. If the integration of online services can be accelerated as assumed in the best case scenario, we estimate an economic gain of 4 percent of GDP from 2010 to 2020.

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Chapter 6 TECHNICAL ANNEX

Based on MICUS' model, a one percentage point increase in the take-up of online services will lead to approximately 0.2 percentage point increase in the growth rate of GDP. Thus, if for example, firms' rate of investment in online services increase by 1 percentage point and the rate of increase in consumers' e-skills and access increase by 1 percentage point, this would have a major impact on EU GDP in the longer run.

Box 6.1 MICUS' model – effects of MICUS' base case scenario

The calculation of economic effects in MICUS' model has two steps:

1. A combination of improved physical infrastructure and improved e-readiness leads to increased take-up of online services. The development of infrastructure and e-readiness are each described using composite indicators covering many aspects. Infrastructure encompasses e.g. the share of the population with DSL access and the share of population with cable modem access. E-readiness encompasses e.g. the share of population with high IT skills and the share of employees working with science and technology. From 2004 to 2006, physical infrastructure in EU improved by 4.7 percent per year, which could e.g. come from an increase of 4.7 percent in all types of internet access, and a corresponding decline in the share of population without internet access. From 2004 to 2006, EU e-readiness improved by 2.7 percent per year. It is assumed that infrastructure and e-skills are equally important, so the combined effect of better infrastructure and better e-skills is an increase in use of online services of 3 percent per year.

2. The increased take-up of online services leads to

   a. Structural change in the EU economy. Jobs shift from the rest of the economy towards business services at a rate assumed to be equal to the rate of increase in the take-up of online services. Productivity in business services, described as value added per employee, is almost twice as high as in the rest of the economy, so this leads to a net increase in GDP per year. Business services constitute 13 percent of the economy, so the shift of 3 percent of employment from the rest of the economy, which constitute 186 million jobs in EU, to business services leads to a reduction of employment of 707 thousand per year in the rest of the economy. However, 60 percent, corresponding to 424 thousand of the displaced employees find new jobs in the business service industry. The 707 thousand displaced jobs in the rest of the economy had about half productivity (55,000 euro per job per year) of the 424 thousand jobs in the business service sector (105,000 euro job per per year), so the net effect is an increase in GDP of 5.7 billion euro per year.

   b. Higher productivity in all economic sectors. An increase in the use of online services of 1 percent leads to an increase in manufacturing productivity of 0.05 percent, c.f. Atrostic and Nguyen (2006) and an increase in non-business services productivity of 0.1 percent, c.f. Rincon et al (2001). The effect on business services is assumed to be 0.2 percent. The productivity increase is assumed to lead to an employment increase of 11 percent. Thus, the effect of a change in online services adoption of 3 percent leads to a productivity impact in non-business services of approx. 3*1.11*0.1=0.3 percent. This is multiplied by the productivity level of euro 55,000 per year and multiplied by the employment in non-business services of 122 million to give a GDP impact of approx. 23 billion euro per year. Similar calculations can be done for manufacturing and business services. The sum of GDP impacts in business services, manufacturing and non-business services is an annual GDP impact of 73.7 billion euro.

   c. The total annual value added effect is 5.7 + 73.7 billion = 79.4 billion, which corresponds to approx. 0.7 percent of EU GDP for the period 2004-2006.

Source: Copenhagen Economics, based on MICUS (2009).