



Unlocking the ICT growth potential in Europe: Enabling people and businesses

Using Scenarios to Build a New Narrative for the Role of ICT in Growth in Europe

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1. A new narrative for the role of ICT in growth in Europe

1.1 Introduction

Today, Information and Communication Technology (ICT) is deeply intertwined with almost every aspect of economic and social activities, and it continues to hold the promise of tremendous innovation and growth opportunities going forward if the right enabling conditions are put in place. The past 40 years have seen the emergence of ICT as the key general purpose technology (GPT) of modern times. The ICT revolution first affected the automation and computerization of manufacturing. With the invention of personal computers and the Internet, broad sectors of the economy previously untouched benefited through investment and productivity. In particular, market service sectors, which constitute the major portion of GDP in developed economies, have experienced major benefits from ICT. Recently, non-market sectors such as health, education, and government have become more receptive to positive growth effects from ICT.

Europe has also experienced positive effects from ICT on its economy, business growth, and living standards. However, ICT has lost some of its steam as a driver of growth since the mid-2000s. First, the economic and financial crisis reduced the potential to invest and to create new or expanded markets for products and services that benefited from ICT. In addition, fragmented regulatory frameworks, lack of ICT skills, underinvestment in ICT infrastructure, and even cultural constraints may have brought the innovation and growth effects of this technology to an early standstill.

The rise of mobile broadband Internet, big data, cloud computing, and more powerful devices necessitates a fresh look at the role of ICT in the economy and how ICT policy can be reframed to support new technologies. This report contains the new narrative on the role of ICT in Europe's economy and delineates the most important ICT policy areas for capturing the benefits of the technology (Chapter 2). It includes four scenarios describing possible different outcomes five years hence, taking into account uncertainties about global growth and Europe's ability to create a single market for goods and services (Chapter 3). These scenarios define challenges and opportunities policy makers face, and provide guidance to policymaking under uncertainty.¹

1.2 A new narrative

This chapter describes the opportunities and constraints of the role ICT can play in growth, starting from today's slow growth environment. As European policymakers search for solutions to take the economy out of recession in the short run and to resume a healthier structural growth path for the medium and long term, a key to generating faster growth is to unlock the existing ICT-enabled

¹ A Background Companion Report (*Unlocking the ICT growth potential in Europe: Enabling people and businesses – Background Report*) provides details about methodology and sources. The study uses insights from a group of more than 40 experts from the business, academic, and policy communities, combine with available data, to determine how ICT shapes economic and business performance and to identify areas for future research.

growth potential in Europe. This will give a larger role to technology and innovation and their translation into the production of more and better goods and services at lower prices for Europe's domestic markets and the global economy.

Two major game changers put ICT policy centre stage

Two factors have led to a new sense of urgency and a golden opportunity for ICT as a growth enabler:

- (1)** Europe's economic woes create a vacuum that technology and innovation can fill.
- (2)** The rapid diffusion of high-speed networks and mobile devices empowers consumers to drive demand in new ways.

European companies and citizens have a unique opportunity to leverage Europe's internal economies of scale and scope to exploit the benefits offered by ICT and at the same time secure Europe's role as a global growth centre.

Historically, Europe realised a sizeable quantitative impact from ICT

Pinning down the precise impact of ICT on economic growth is difficult, given the wide range of estimates gleaned from many economic and non-economic factors, including spillovers.² Europe seems to have fallen behind the United States in terms of impact of ICT-related investment and productivity on GDP growth from 1995-2007. The Conference Board estimates that one third (0.7 percent) of the average 2.2 percent GDP growth rate in Europe from 1995-2007 can be traced to ICT, of which more than half came from investment in ICT, one third from productivity gains in ICT production, and the remainder from productivity through ICT use (Table 1.1 below). The United States achieved a larger ICT contribution, almost double that of Europe, of 40 percent of the total GDP growth of 3.1 percent (ICT's share: 1.3 percent of 3.1 percent GDP growth) from 1995 to 2007. The larger U.S. contribution from ICT was due to a bigger impact from ICT investment and productivity of ICT producers, while the productivity effects from ICT use were much smaller and similar between the U.S. and Europe, at 0.1 percentage point. However, the market sector of the U.S. economy produced a much stronger productivity effect from ICT use at 0.5 percentage points of growth compared to only 0.2 percentage points in Europe from 1995-2007.

² Available studies point to positive effects and are likely to underestimate the true impact. Measurement of spillovers, which reflects the network effects of increasingly wide-spread connectivity as well as the benefit that consumers obtain from lower prices for the technology, is notoriously difficult to capture. See Chapter 3 of the Background Companion Report for further reading.

Table 1.1: Comparison of EU and US ICT growth impacts

	Europe					United States				
	EU-15 total economy 1995-07	EU-15 market sector 1995-07	EU-27			total economy 1995-07	market sector 1995-07	total economy 2001-05	total economy 2006-11	total economy 2001-11
			total economy 2001-05	total economy 2006-11	total economy 2001-11					
GDP growth	2.2	2.5	2.0	1.1	1.5	3.1	3.5	2.4	0.7	1.5
Labour productivity growth	1.3	1.6	1.6	0.9	1.2	2.0	2.6	2.0	1.2	1.5
Contributions to LP growth:										
IT investment/hour	0.4	0.5	0.4	0.3	0.3	0.7	0.9	0.5	0.4	0.5
MFP(ICT-production)	0.3	0.3	0.3	0.1	0.2	0.5	0.5	0.5	0.3	0.4
MFP(ICT-use)	0.1	0.2	0.0	-0.1	-0.1	0.1	0.5	0.1	-0.1	0.0
%-point IT contribution to LP	0.7	1.0	0.7	0.3	0.4	1.3	1.9	1.1	0.5	0.9
Total IT as % of LP growth	57%	60%	43%	32%	36%	64%	74%	54%	46%	55%
Total IT as % of GDP growth	34%	39%	34%	27%	30%	41%	55%	45%	78%	55%

Notes: The effects of multi factor productivity (MFP) from ICT production were obtained from Byrne, Oliner, Sichel (2013) for the U.S.. For Europe we assumed half of the U.S. effects, as was evidenced from the EU KLEMS database. The effects of MFP in ICT- using industries were based on the differential in labour productivity growth in ICT-using and non-ICT using industries from Mas (2012). LP denotes labour productivity.

Market sector equals total economy, excluding the government, education and health care sectors.

EU-27 refers to the 27 Member States prior to the accession of Croatia on 1 July 2013.

Sources: Building on van Ark (2013a, 2013b).

Since the financial and economic crisis began in 2008, ICT has contributed less to GDP and productivity growth in both Europe and the United States. While growth in ICT investment per worker dropped, especially in the United States, and productivity growth from ICT users marginally declined, productivity performance of ICT producers in the United States remained relatively strong compared to their European counterparts. With imminent economic recovery in the United States, the likelihood of a pickup of investment in ICT and productivity growth from its users seems more favourable to the United States again. Meanwhile, the contribution of ICT to growth has also increased in other parts of the world, notably in some of the largest emerging markets.³

The precise impact of ICT on business and consumers depends on a complex combination of trends, changes and uncertainties in the medium term, and it is also highly dependent on the broader economic, social and political context. Scenario analysis shows that the way ICT affects economic growth will depend on the pace of growth in the global economy and the speed at which Europe can accomplish the completion of the internal market, especially the Single Market for Services and the Digital Single Market.

³ See Corrado *et al.* (2014).

What will happen? Four plausible scenarios for the role of ICT in European economic growth

Robust global economic growth

EU keeps fragmented digital & services markets

<p>The digital savannah A fragmented EU market makes it difficult for firms to grow beyond borders, but several growing firms skip the EU market altogether and aim for global growth opportunities, in particular in the U.S. market, with varying success. Most firms are eventually acquired by U.S. or other non-EU firms, possibly including Chinese firms. EU consumers continue to face high prices as fragmented markets create niche opportunities. GDP growth in Europe does not accelerate much beyond 1.1 percent, with ICT effects limited to 20 percent of total GDP growth (about 0.2 percent-point).</p>	<p>The digital rainforest An integrated EU market leads nation-based firms to venture across borders, much like product firms did in the past. EU-based global firms compete vigorously in a robustly growing global economy. Consumers benefit from lower prices and more choice for products and services. GDP growth in Europe accelerates to 2.5 percent, with an ICT contribution of 60 percent (1.5 percent point).</p>
<p>The digital desert Slow global economic growth of 3 percent leads to a contracting economic environment in which nation-based EU firms have difficulties flourishing and engage in a “race to the bottom”. An occasional firm goes beyond national borders but insurmountable barriers keep it from going beyond the region. Such firms may be acquired by non-EU firms. Consumers are less incentivised to maximise utility of ICT products and services. Medium-term GDP growth in Europe drops to 0.8 percent, with ICT effects limited to 10 percent of total GDP growth, which in absolute terms is less than 0.1 percent per year.</p>	<p>The digital glasshouse An integrated EU market leads nation-based firms to venture across borders, much as product firms did in the past. EU-based firms compete in a global albeit regionalised market. But slow growth and accompanying protection prevent the emergence of a European Google, for instance. Consumers have more difficulty accessing highest quality goods and services at lowest prices, as protectionist attitudes shut out world class products. GDP growth in Europe does not accelerate at more than 1.1 percent, but ICT effects increase to 40 percent of total GDP growth (about 0.4 percent-point).</p>

EU creates single digital & services markets

Slow global economic growth

Note: The vertical axis shows the pace of global economic growth; the horizontal axis shows the degree of integration in the European Market. The growth estimates are based on estimates from *The Conference Board Global Economic Outlook 2013* and van Ark *et al.* (2013a).

A Digital Rainforest Creates Faster Growth but Big Challenges too

In an optimal economic environment of strong global growth and a fully integrated digital market—a digital rainforest—the combination of hyper-competition and the rise of European firms as first-class global players could mean substantial benefits from ICT on GDP level and growth. Indeed, in this scenario GDP growth in Europe could accelerate from the 1.3 percent average growth of the past decade (2002-2012) to as much as 2.5 percent average annual growth in the decade ahead, with a very significant contribution (up to 60 percent) of that growth coming from more ICT investment and more effective ICT production and usage.

While this type of environment would benefit from strong ICT-supported growth, it would also be characterised by constant change and great disruption, implying adjustment costs and a need for flexibility from all economic actors, factors which may be less desirable from a social than an economic point of view. Also, it may not be easy to leapfrog to such a situation in an economic environment that is threatened by the short-term concerns of financial instability and budget constraints and that suffers from a long-term structural growth deficit as the result of incomplete market integration, lack of scale, and weak incentives for greater competition.

To be sure, today Europe is not enjoying the benefits or suffering the perils of a digital rainforest. But neither is it in a digital desert. European citizens are well-connected, businesses that use ICT have generally improved their performance, and growth of the ICT sector has been reasonably strong in the past two decades. However, Europe's infrastructure looks unfit to cope with future demands from the next wave in ICT, especially the rise of mobile and the use of big data and cloud computing. Market fragmentation continues to hinder firms in scalability, flexibility, and cost-effectiveness. Businesses and small innovative firms are discouraged by the many barriers they encounter. Therefore, there is a heightened need for policymakers to act now to avoid the risk of Europe falling into a digital desert (Box 1.1). Serious ICT policy action can help to avoid a scenario in which medium-term GDP growth in Europe drops below 1 percent, with ICT effects limited to only about one-tenth of that growth.

Box 1.1: Is Europe at risk of becoming a digital desert?

There is cause for concern. Europe's underinvestment in infrastructure upgrades and capacity increases to meet increasing Internet and mobile communications demand, notably with data-heavy traffic such as video, means that there is a great need for investment upgrades and capacity increases. Calls for increased budget for infrastructure investment as part of the Digital Agenda for Europe (notably through Connecting Europe Facility loans) were significantly reduced in what was granted.⁴ Europe's weak economy does not help to generate support for such investments. Moreover, some stakeholders claim that regulation stifles network investments. In addition, a lack of consolidation of the industry in Europe means there are too many players, many of which cannot grow to sufficient scale.

⁴ See Appendix 2 and <http://ec.europa.eu/digital-agenda/digital-agenda-europe>.

Beardsley *et al.* (2013) point out that Europe's telecommunication industry is now not only lagging that of the rest of the developed world in many measures, but that it is also at risk of falling behind many developing countries that are rapidly leapfrogging older technologies. For example:

- “European-based companies lost 21 percent of the total industry profit pool between 2006 and 2011 to companies from other regions.
- In the handset market, European manufacturers lost 22 percent of their worldwide market share to Asian and North American companies between 2007 and the first half of 2012.
- Today's industry leaders on the services and applications side are mostly from outside the European Union. Most of the leading Internet companies—including Google, Facebook, eBay, Yahoo, Baidu, and Tencent—are based in either the United States or Asia. None of the 10 most-visited Internet sites hails from Europe.
- Five times more telecommunications-related patent applications are filed in the United States than in Europe.”

It is too early to argue that Europe cannot recover from those shortfalls, but a *laissez-faire* strategy is unlikely to revert these trends and would increase the risk for Europe to slide into a digital desert.

Source: Excerpt from Box 1.1 in Chapter 1 of the Background Companion Report.

Fragmented markets will continue to constrain the contribution of ICT

Even if the internal market were to remain as fragmented as it is today, some (national) champions in ICT could still gain by developing themselves into global players, especially as emerging markets and the United States see improved growth performance. In the digital savannah scenario, ICT could still bring a considerable contribution (20 percent) to the EU's GDP growth. However, GDP growth would remain constrained at around 1.1 percent due to the lack of a single market, with EU consumers facing high prices. Moreover, most firms could eventually be acquired by U.S. or other non-EU firms, including Chinese firms. In fact, this is the scenario Europe has lived under in the past decade or so.

Even if global growth remains slow, integrated markets help ICT to perform better

The financial and economic crisis in Europe and other mature economies casts doubts as to the sustainability of the current situation. Even if the global growth trend slows as anticipated, a better functioning internal market can still help to provide key products and services at lower prices to consumers (the digital glasshouse scenario). At the same time, a level playing field within the EU can create barriers for key outside players as slower global growth creates less growth potential elsewhere. In those cases Europe's ICT performance and its impact on growth will be more comparable to the past decade, with 1.1 percent growth, on average, but with 40 percent being allocated to ICT investment and productivity. In such a scenario, unrestrained use of ICT across the digital market can in fact partly compensate for the impact of slow global growth on the EU.

Clearly, no matter what scenario the EU finds itself in by 2017, Europe needs to move to the next stage in ICT, growth and innovation. In spite of the fact that it is impossible to put a precise number on the impact of new investments in ICT on growth and employment, *laissez-faire* would be a risky strategy that could plunge Europe into the digital desert. Instead, smart policy and business actions can help Europe to use its ICT infrastructure effectively, making its companies productive and competitive and its citizens empowered and wealthy.

1.3 Priorities to Raise ICT's Contribution to Economic Growth

Europe is well placed to exploit its strengths

The good news is that Europe is well placed to benefit from the potential of ICT in the future. The huge size of its GDP, which has made it the largest economic bloc in the world, its relatively high levels of per capita income and productivity, the major and increasing contributions from European firms to producing for the global value chain of manufactured goods, and the above-average level of innovation infrastructure in which business, government, and research interact, are putting Europe in a favourable position to book results, for example, by improving Europe's ability to bring its innovations to market. But time seems to be running out. Other countries and regions are racing ahead, and in the digital world, many activities can flow to where they will flourish, with lags proving increasingly difficult to make up.

If Europe wants to build on its existing strengths, it must not wait longer with making meaningful, and sometime bold, changes. It must overcome its current complacency, political complexity, and inertia to act. Government and European Commission actions are likely to be successful only if they happen in concert and, importantly, create more scale and scope for growth across Europe and create the conditions that allow a greater role for consumers and businesses to drive the impact of new technologies through their effective use.

- Pre-conditions for reaping the ICT growth benefits need to be secured by a high-quality and affordable infrastructure in all sectors, capable of supporting the growing cloud,⁵ big data, and including high-speed fixed and mobile broadband. This must be matched by investments in the soft infrastructure to equip people with the skills to analyse and synthesise big data and use them to create new business opportunities.
- Government and business can work together to develop and foster the skills and willingness to use ICT within the context of a fully integrated single market. This market can be supported by providing effective platforms that increase readiness and by focusing on government investments where businesses leave them on the table because of the high

⁵ One useful definition of 'the cloud': "The provision of computing infrastructure, platform or application service as a utility, which can be consumed by any Internet connected device, using open standard protocols where variability in demand is satisfied through the dynamic and automatic provisioning of pooled hardware, network, and software service resources providing the illusion of infinite scalability and are generally billed for on a pay-as-you-go basis." Thus, there are essentially three layers of cloud computing: Infrastructure as a Service (IaaS), which is a computing resource management model; Platform as a Service (PaaS), which is a software development model; and Software as a service (SaaS) which is an application delivery model. Source: <http://www.adamalthus.com>.

externalities. Governments play a key role in making the necessary investments and reforms to the educational system to ensure that people are taught the technical and user skills required for today's and tomorrow's world, putting an emphasis on the employability of graduates.

- Governments will need to focus increasingly on facilitating a regulatory environment in which businesses, both inside the ICT sector and outside it, can thrive (and fail). This increases the incentives to innovate by reducing the risks associated with innovating and introducing new technologies, helping the private sector to realise the spillovers that justified the original government investments.

Providing an ICT infrastructure that enables growth remains important

While uncertainty remains about the impact of ICT infrastructure investments, and it may be greater than estimates suggest as a result of data quality and availability as well as methodological and estimation challenges, results tend to point to positive impacts. For example, surveying the literature (Box 1.2, and Chapter 3 in the Background Companion Report) shows that for broadband investments, the GDP contribution tends to range between 0.3 and 1.4 percent for every 10 percent increase in penetration (Katz, 2012). The Internet economy, to which having a high-class infrastructure is a prerequisite, has been estimated to represent as much as 5.7 percent of GDP for the EU27 as a whole (BCG, 2012). The employment multiplier from ICT (e.g. broadband or high tech investments) has been estimated to range between 1.4 and five new jobs (Katz, 2012, and Moretti, 2012). Finally, it has been estimated that cloud computing might add an additional 0.8 percent to U.S. GDP growth.⁶

Not everything requires big public investment

The second piece of good news is that many of the measures required to optimise Europe's potential do not involve large investment programs but rather require reforming existing situations, a welcome finding given current budgetary pressures.

Many of the actions required to accelerate growth are related to reducing regulatory barriers, improving market integration, simplifying administrative rules and procedures, and improving the allocation of funding budgets already available.

Some measures that are urgently required do involve some investments, but it is important to realise that these will have multiplier effects across all sectors of the economy, reducing costs and improving public services and living standards across Europe. These smart investments should focus on putting in place the best high-quality, high-speed infrastructure and investing in education and skills.

⁶ See <http://www.kurzweilai.net/can-cloud-computing-boost-gdp>.

Box 1.2: Some observations on ICT impact estimates

While the ICT-producing sector contributes to growth in its own right, the impact of ICT-using sectors is even greater. The productivity effects of the use of ICT are difficult to capture though, especially since the use of ICTs is also particularly important in the services sector, and ICT enables innovation, in particular non-technological forms of innovation (e.g. organisational change), all of which are notoriously difficult to measure.

In Europe, many studies have sought to explain the differences in the extent to which Europe and the United States have been able to translate ICT into productivity gains, and why Europe has traditionally been less successful in reaping the benefits of ICT (van Ark *et al.*, 2008; van Ark *et al.*, 2013b). Some results have pointed to differences in the organisational structure of firms that enable U.S. firms to better exploit the benefits of ICT. Framework factors are also important, and in particular legal and regulatory frameworks, such as inflexibilities in the labour market, have been found to hamper ICT impacts (see also Box 1.4).

The impact of IT investment on labour productivity is mostly larger than the role of multifactor productivity growth in ICT-producing industries, especially in Europe. Europe's ICT-producing sector is of about the same size, in terms of GDP share in the economy, but its productivity growth is much slower due to more niche market focus and smaller markets in Europe. However, the joint productivity effects from ICT-production and ICT-use across the economy is about the same as the investment effects.

While IT investment effects have held up reasonably well during the last period, 2006-2011, which included the financial and economic crisis of 2008-09 and the slow recovery since, multifactor productivity effects have dropped off significantly both in Europe and in the United States (Table 1.1 above).

Recent work also points to the importance of investments in complementary (intangible) assets, spillovers, and network effects (e.g. Corrado *et al.*, 2013, 2014). These, in turn, emphasise the importance of having integrated markets that allow for these effects to occur, and provide companies with the scale they need to grow. This becomes even more important with the likely increase of the role of the demand side in driving technology adoption and impact.

Source: Excerpt from Chapter 3 in the Background Companion Report.

New research by Corrado *et al.* (2013, 2014) suggests that conditions in the United States have been very conducive to benefits from important spillover and network effects, especially from the "C" in ICT. However, significant barriers in Europe remain to exploit those effects. Byrne and Corrado (forthcoming) also show some potential bottlenecks in Europe's ability to benefit from the next Internet and ICT wave (Box 1.3).

Box 1.3: Benefiting from the next ICT wave

Internet and communication capital have been important because they enabled networked computing and improvements in business processes throughout the economy. With big data and high performance computing (HPC) now rapidly becoming key to future ICT strategies, having the appropriate "connective tissue" HPC business applications, as well as the skills to exploit them, will be equally important.

HPC is used for a wide range of activities, such as product design and testing applications conducted in large industrial R&D labs, plant layout design, logistics and traffic monitoring, financial market pricing/trading/event monitoring, medical imaging/patient monitoring/disease tracking, as well as network traffic routing in telecom. Currently, only large firms tend to possess the scale for HPC systems, though this is likely to change as the cloud becomes more widely adopted and more vendors offer big data solutions. Providing HPC availability more broadly, especially to small and medium-sized businesses with intermittent needs, will undoubtedly require harnessing the cloud and other Internet “second wave” forms of communication.

To optimise networked computing for business HPC computing, countries require a high-class communication infrastructure—both in general businesses as well as its publicly accessible networks—to harness the power of ICT. This will be crucial as the data traffic on those networks continues to grow exponentially. HPC itself is also a form of ICT infrastructure and it should be of concern to European policymakers and business leaders that Europe’s capabilities in industry are lagging while its resources in the academic sector are rich (Byrne and Corrado, forthcoming, and Table 3.1.2 in Chapter 3 of the Background Companion Report).

Source: Excerpt from Chapter 3 in the Background Companion Report.

A healthier regulatory environment will help

Most measures that must be taken to increase ICT impact go beyond the purview of individual European Commission and government departments. Realising a greater impact from technology and innovation depends on regulation (in ICT-related areas, but also in product and labour market regulation and other areas: Box 1.4), the cost and ease of doing business, and access to finance. The complexity of regulatory frameworks ill-adapted to new technologies and innovations is also a huge barrier to reaping the benefits of ICT. Failing to achieve the digital single market imposes not only a huge short-term cost on citizens and businesses, but also threatens Europe’s long-term prosperity.

The European Commission has a central role to play in harmonising regulatory frameworks, ideally ending up with a single coherent framework rather than some imperfect sum of 27 different frameworks. But Member States have at least an equal role in implementing the harmonised rules with a view to simplifying administrative procedures, rules, and regulations that affect cross-border activities, be they digital transactions, flows of data, international sourcing of talent and skills, or business regulations. Measures to facilitate and enable access to finance, including from public and European sources, and especially for smaller firms, are also crucial, including for smaller, riskier and more innovative initiatives. Being allowed to fail and try again is important in an economic environment that requires a lot of innovation, because innovation is inherently risky and requires a process of trial and error. Bankruptcy regulations need to be adapted to this environment and harmonised across countries.

Box 1.4: The importance of regulation, competition, and scale

In explaining ICT productivity differentials between the United States and Europe, framework factors are also important, especially those related to legal and regulatory frameworks, such as inflexibilities in the labour market. Indeed, if a technology allows a firm to be more productive, and if translates into restructuring of employment, these benefits will only become apparent if the firm has the ability

to implement the efficiency gains and restructuring of the workforce. Thus the framework conditions need to be supportive for the benefits of ICT to occur.

Many studies have strongly argued the point about resolving regulatory issues that are constraining the growth impacts of ICT. For example, Grajek (2012) argues that “the areas in which the right policies could unlock the greatest ICT-led growth are product and labour market regulations and the European Single Market”. Bloom *et al.* (2010) also suggest that policies are needed to promote product market competition, greater flexibility, and faster adjustment in the labour market, as well as openness to trade. These results are well-known, but very little is changing, and certainly not fast enough. Many firms and entrepreneurs also report frustrations with the complexity and constraints of regulatory frameworks.

Scale is also increasingly important with the diffusion of new technologies and applications, including high speed broadband networks, the cloud, and big data. The scaling advantages of new technologies and offerings enabled by these trends highlight the limits of fragmented digital markets and the lack of integration among key user segments in services industries across Europe.

Source: Excerpt from Chapter 3 in the Background Companion Report.

Getting ready for the next wave

The contribution of ICT to growth is still hampered by cultural reluctance to embrace change. The consumer may be in the driver’s seat, ready to pick up on the latest technological changes and drive the next phase, but he does not yet have his “driving license” to lead Europe there. Europe lacks the skills to exploit the opportunities ICT can create. This includes hard and soft skills: technical skills, business and management skills, and the technological savvy to identify business opportunities in new technologies and applications (van Welsum and Lanvin, 2012). Entrepreneurial skills, which must be enabled by framework conditions, including a dynamic business environment, are also lacking, as is a cultural readiness to embrace technology and change.

These are major barriers, but governments and the European Commission can help by formulating a strong and coherent vision for all stakeholders. Public funding and procurement contracts can be made more accessible to smaller firms, helping them to transition to the new environment and ease their adjustment process. Governments can also lead by example, reforming their own administrations and making more services available online in conjunction with measures that increase citizens’ willingness to use these online services and engage with their government administrations online (see Box 1.5 for some examples of what the Commission and governments can do).

Box 1.5: What can the Commission and Member States’ governments do?

The roles of governments and the European Commission are crucial, notably in laying out a vision, reforming and investing where necessary, putting in place favourable framework conditions, using public procurement to further innovation, and leading by example:

- **Articulating a broad and cross-cutting vision** that all departments and stakeholders can adhere to: (1) Where does Europe want to be 10 years from now? (2) What does it take to get there?

- **Removing regulatory barriers** that keep businesses and people from unlocking their potential. This may mean removing regulation that is hampering innovation and/or the transformation that ICT can bring about, or it may mean regulating so these changes can occur. Regulation also plays a vital role in the performance of the ICT sector (Katz, 2011, and Box 2.4 in Chapter 2 of the Background Companion Report).
- **Dealing with funding and finance issues, including public funding for research**, which is often biased against smaller, riskier, and more innovative players and projects. Obtaining European funding may be so complicated and costly in terms of time and administrative procedures that smaller players give up. The public sector can also fund blue sky research that might otherwise not find funding. Such funding should not be biased in favour of incumbents, should not exclude small players and newcomers, should support technologies and applications rather than companies and sectors, and should bring ideas closer to market.
- **Putting in place the right investment conditions to stimulate entrepreneurship as well as the hard and soft infrastructure.**
 - Putting in place the conditions allowing for the creation of scale effects. This can take place at many different levels, for example, by:
 - achieving the digital single market in practice,
 - creating a single market for content,
 - reducing barriers and by harmonizing regulation to reduce fragmentation in the markets, which will create the scale needed to benefit from network effects,
 - increasing the use of English which may contribute to creating scale in the market for talent, especially if combined with reducing barriers to cross-border recruitment and increasing the flexibility of labour markets,
 - removing barriers for firms, and SMEs in particular, to grow internationally providing them with the scale they need to be able to grow,
 - reducing barriers to entry in markets to ensure healthy levels of competition, including by reducing the power of incumbents.
- **Using public procurement to drive innovation and encourage ICT uptake.** This can be done in a variety of ways, including by:
 - making the adoption or delivery of certain technologies or application part of the specifications of procurement contracts,
 - reforming government procurement practices and considering purchasing more from small and innovative companies,
 - simplifying procurement practices and procedures significantly, making them more accessible to smaller companies.
- **Leading by example: the public sector could move more activities online** (see Chapter 3.3 of the Background Companion Report), re-organise and streamline their administrations, adopt new technologies and solutions, equip workers with the right skills, and include more IT-savvy people in government, including in high positions.

Source: Excerpt from Chapter 2.6 in the Background Companion Report.

ICT has considerable potential to contribute to growth and recovery in the EU and to mitigate the consequences of possible decelerating global growth. Shifts in global economic activity are also showing up in the greater importance of technology in emerging economies. At the same time, as many of the larger emerging economies are on a slowing long-term growth trend, the pace of increase in global demand is coming under pressure, forcing Europe to strengthen its own role in driving growth and demand. And as the scaling advantages of new technologies and offerings such as big data and broadband increase, the limits of fragmented digital markets and lack of integration among key user segments in services industries across Europe become an ever bigger constraint.

To unleash ICT's potential in Europe and prevent the region from falling behind, action is needed now. National governments and the European Commission must commit to a long-term coherent and strategic vision for the role of ICT, reforming and investing where necessary, putting in place favourable framework conditions, using public funding and public procurement to further innovation and leading by example.

2. Using scenarios to analyse the ICT growth potential in Europe

2.1 Building scenarios for a new narrative

Technological development and innovation takes place among many uncertainties, and this is particularly the case for general purpose technology (GPTs).⁷ In the case of ICT, though, there have been some surprisingly accurate predictions. For example, Moore's law—which states that the number of transistors on integrated circuits doubles every two years—has proven remarkably prescient. This is even more striking, as Gordon Moore's forecast was based on observations and extrapolation early in the development of IT (late 1950s and early 1960s).⁸ Other ICT-related trends have displayed similar features, sometimes leading to a sense of inevitability, at times feeding a technological evangelism. In hindsight, when the twists and turns of development have been erased, straight-line or exponential projections seem straightforward.

However, while Moore's projection stands out, medium- and long-term forecasts around ICT development and its impact on economic growth are subject to considerably bigger uncertainty. As a GPT spreads wider and penetrates deeper, the combined effect of strands of development, new uses, and unexpected barriers makes accurate predictions difficult, as evidenced by past market forecasts for main frame computers, minicomputers, and personal computers. Experts in the digital market could not see the potential of tablets when the iPad was launched, and firms like Motorola and Nokia did not see the significance of the smartphone. Much of these uncertainties are related to a lack of understanding how preferences develop and how the demand for the new products and services in the market will evolve.

Even if a trend is spotted, such as the underinvestment in ICT in a number of EU countries in the 1990s-2000s (Timmer and van Ark, 2005), its meaning and implications may remain unclear, and figuring out a response may be even harder. Uncertainty increases when interactions among key trends lead to disruption. For instance, the size of the U.S. home market, increased defense spending, sustained investment in technology education, the fostering of an entrepreneurial culture, and an increase in venture capital funding have helped to create dynamic and globally competitive firms in the United States, and these have emerged with each new generation of technology. And forays by major ICT companies such as Google, Amazon, Microsoft, and Apple into foreign markets raise major regulatory uncertainties regarding privacy, security, data ownership, and even national security, which can seriously affect the demand side of the ICT market.

A one-world forecast for ICT in the next five years is bound to fall short in capturing interactions among speed of global economics, pace of technological development, and degree of integration of markets, which in turn affect demand aggregation, firm consolidation, specialisation, and entrepreneurial innovation. A policy narrative based on such a forecast is likely to be incomplete.

⁷ GPTs are technologies that address fundamental practices in society and consequently diffuse widely and enter deeply into the fabric of society, measurably enhancing productivity at an aggregate level. Typical examples are the steam engine and the automobile. It has become increasingly clear that ICT is also a GPT.

⁸ Moore may have initially used 18 months as the period for doubling the capacity and until 1975 may have slightly adjusted his theory so as to increase its accuracy. Industry may have taken the observation and extrapolation as a goal, thus converting a prediction into "law".

Therefore multiple scenarios describing plausible futures are a better tool for reframing the current narrative by including elements critical to ICT-enabled economic growth. (See Appendix 3 for a quick introduction to scenarios and how to use them.)

2.2 Reframing the current narrative

As a starting point for policy analysis, it is useful to distinguish between **espoused policies** (such as the adopted harmonisation Directives intended to achieve a single market) and **policies that are actually in use** (as reflected by whether and how the Directives are implemented in practice), and to then determine the distance between them.

Support for the supply side

The ICT policy framework informing current DG Connect policies can be inferred from the goals statement of the Digital Agenda for Europe (see Box 2.1.1). The current narrative is centered on the support for ICT development, i.e., a support for supply side framework. Such support includes providing hard infrastructure (broadband, broad access, interoperability) and soft infrastructure (skills training in schools and communities, developing e-leaders steeped in ICT and entrepreneurship).

Box 2.1.1: The Digital Agenda for Europe

The Digital Agenda for Europe (DAE) was launched in May 2010 and identified the key challenges preventing ICT from unleashing its full growth potential. These challenges include lack of investment in new fast broadband networks, fragmentation of digital markets, lack of ICT skills in the population, trust and security issues, low level of research and innovation, as well as the lack of interoperability. The original DAE contained 101 actions, grouped around seven priority areas:

1. A vibrant digital single market
2. Interoperability and standards
3. Trust and security
4. Fast and ultra-fast Internet access
5. Research and innovation
6. Enhancing digital literacy, skills and inclusion
7. ICT-enabled benefits for EU society.

A review of the DAE published on 18 December 2012 identified seven key areas for further efforts to stimulate the conditions to create growth and jobs in Europe:

1. Create a new and stable broadband regulatory environment
2. New public digital service infrastructures through Connecting Europe Facility loans
3. Launch Grand Coalition on Digital Skills and Jobs
4. Propose EU cyber-security strategy and Directive
5. Update EU's Copyright Framework
6. Accelerate cloud computing through public sector buying power

7. Launch new electronics industrial strategy—an "Airbus of Chips".

Source: <http://ec.europa.eu/digital-agenda/digital-agenda-europe>. See also Appendix 2 for more information on the policy context.

While bulk of investment in ICT and network comes from the private sector, the Commission's support for the supply side has included significant investments in hard infrastructure. Indeed there has been a desire among policy makers to use, for example, the Structural Funds, more intensively to address possible market failures, and to support the roll-out of networks in rural areas where private sector provision is not profitable and thus insufficient.

However, there have also been arguments put forward against Commission-level support for infrastructure. First, the relationship between ICT investments and economic growth, while generally positive, has not been unequivocally quantified, as it is strongly conditional on factors such as productivity and policy, making the level of government support hard to determine. Second, public support for ICT infrastructure carries the risk of crowding out private sector investments, even if state aid rules provide some protection. Thirdly, in the light of the current tight EU and national budgets there is the risk that support schemes not pursued and resources are wasted.

A policy framework centered on support for the supply side may be reaching its limits under current economic and political conditions, where policymakers face pressures to cut spending, and where ICT-related spending increasingly competes with alternative spending objectives. There are various possible responses to increase the attractiveness of investments. For instance:

1. Address outcomes by improving impact measurement of ICT investments, in particular of the full benefits that can be expected from investments made (including spillover and network effects and other second-order effects throughout the economy). This can potentially increase the achieved benefits of such spending and convince decision makers to invest in ICT-related measures.
2. Address costs by relying on member states to make a significant part of the investment in ICT, both hard and soft infrastructure, and amplify the effects by additional EU investments. A potential drawback is that such support could accentuate existing differences between member states and does not necessarily contribute to resolving market fragmentation.

While such strategies have the potential to make a valuable contribution, they stay largely within the current narrative, and the change in the cost-benefit calculation may be limited, at least within the current narrative.

Enabling the demand side

This report will therefore go beyond the current narrative on the relationship between ICT policy and economic growth, which is dominated by support for supply, and put a stronger emphasis on enabling the demand side—that is, structuring demand in terms of fragmentation and aggregation and the removal of barriers to allow an increase in overall demand for ICT goods and services. Fragmented demand, which often results from weakly integrated markets, can be a strong inhibitor of entrepreneurial activity as it reduces the size of the potential market (and even more so for those operating in a niche), and consequently limits the rewards for risk taking relative to the required investments. This can apply in particular to cases where large initial investments may be needed

upfront in development and marketing but where the subsequent marginal cost of production is very low.

The European Commission has been working on ways to enable the demand side of ICT, and it has espoused policies that have already been adopted or will likely be adopted and/or implemented in the near future, such as Digital Single Market-related policies. Many experts (see Chapter 2 of the Background Companion Report) provided examples of policies that are espoused but not actually used. The role of the demand side is likely to become more important. Today the user is a key driver of the technology and the direction of change. For example, consumers increasingly expect customisation of goods and services as their reviews and 'likes' on social media can create a feedback loop that influences consumer behaviour and preferences and location-based services open up new business opportunities. Increasing amounts of data are being generated, for example through the increased use of mobile devices and in combination with other sources of data (e.g. from machine-to-machine communication), and become available for analysis and exploitation, to better serve consumers, but also to change how businesses are being run. (See also Section 3.2.2 of the Background Companion Report.)

These developments have implications for policy areas outside the realm of DG Connect aimed at removing barriers. These involve transition from insolvency rules to access to finance, from payments to dispute resolution, and from public procurement to regulated professions. Indeed, a new policy narrative on role of ICT and economic growth, that explicitly recognizes the demand side should stress more clearly the need for intense collaboration between Directorate Generals (DGs), such as DG MARKT, DG JUST, etc., cut across the European Commission, but also including the European Parliament and Member States.

2.3 Key trends and uncertainties

How will the external environment in which DG Connect's policy framework operates look over the next five years? What key trends and uncertainties will shape that environment? The suggested planning horizon for this scenario exercise was 2017. However, changes in key variables in the external environment have only a gradual impact, with the largest effects often extending well beyond the five-year period. For instance, changes in cultural features such as entrepreneurship may take more than five years to show meaningful effects. While the seeding can be done in the period 2013-2017, much of the harvesting may occur after this period. The historical experience of 1995-2007 described in the Background Companion Report has clearly confirmed these long lead effects.

This scenario exercise identifies trends and uncertainties (retrospective as well as prospective) by combining: (i) lessons from the literature and available data, (ii) current Commission policy documents, and (iii) insights of experts from the policy, business, and academia (see the Background Companion Report). We interviewed experts to gain insights on a wide range of trends and uncertainties, held a video panel to select the key ones, and conducted a scenario brainstorming meeting in Brussels to test the overall structure of the scenarios and solicit further input.

Enabling technology trends that enhance the supply side of ICT include:

- the merging of ICT-related technologies (high-speed, low-cost access, mobility and ubiquity, and the cloud platform);

- the integration of functionality in devices and apps with increasing performance (local content, location-based services);
- the Internet of things⁹ and the Internet of everything (low-cost sensors, cameras, and emitters, as well as constant data gathering, communication, and aggregation); and
- the integration of ICT with other technologies (robotics, advanced manufacturing, 3-D printing, nanotechnology and molecular biology).

These enabling technology trends, in particular in combination, drive economic transformation:

- The cloud lowers the cost of business, increases access to high quality specialised services, transforms ownership from a capital expenditure model to a leasing or “pay per” model.
- Social media transforms the relationship between firm and consumer as well as firm and employee, supplier, and other stakeholders such as investors, analysts and activist groups.
- Big data creates access to new analytic and data mining capabilities, transforming existing business processes and creating new business opportunities.

Finally, these transformations in economic and business activities can affect the major players in the market by:

- (i) increasing the productivity of large firms through scale advantages;
- (ii) lowering the barriers to entry for subject matter experts and giving them access to new capabilities;
- (iii) letting high-tech, high-risk, and high-return start-ups focus on what they are good at by providing “plug-and-play” environments;¹⁰
- (iv) potentially transforming sectors which tend to lag in introducing ICT (e.g., healthcare, education, transportation, utilities, and government), resulting in significant efficiency and quality improvements;¹¹ and
- (v) providing consumers and other users with a larger range of alternatives and options.

Table 2.2.1 summarises the views and rankings of experts on the main drivers, new trends and main barriers to the impact of ICT on economic growth.¹²

⁹ This concept refers to the fact that more and more objects (things) are embedded with sensors, enabling them to communicate with each other and other devices.

¹⁰ “Plug and play” refers to an environment where key resources are readily available to a start-up firm so that it can focus on technology and product development and funding and easily tap into available networks at low costs. For instance, ecosystems like Apple have made it relatively easy for start-ups to develop products, services, apps, and business models.

¹¹ See Chapter 3 of the Background Companion Report.

¹² See Chapter 2 of the Background Companion Report.

Table 2.2.1: ICT in context: Main drivers, trends and barriers to ICT impacts

1. Drivers of ICT impact	2. Implications and trends	3. Barriers to ICT impact
<p>1.1. TECHNOLOGY DRIVERS</p> <ul style="list-style-type: none"> ■ The cloud ■ Mobile broadband ■ “The Internet of things” 	<p>2.1. IMPLICATIONS FOR BUSINESS</p> <ul style="list-style-type: none"> ■ Transformation of supply chains and supply chain management ■ New business models—from ownership (transfer) to continuous service ■ New innovation eco systems, production platforms, global market place ■ Transform the interactions with clients/consumers through mass customisation ■ Transform the interactions with workforce 	<p>3.1. EDUCATION/TRAINING BARRIERS</p> <ul style="list-style-type: none"> ■ Lack of training/education in skill, or the wrong skills ■ Outdated education systems and educators ■ Lack of a clear common vision for Europe on the importance of ICT ■ Lack of awareness of potential of ICT ■ Many ICT projects fail due to framing and design errors making investors reluctant
<p>1.2. TECHNOLOGY-ENABLED USE DRIVERS</p> <ul style="list-style-type: none"> ■ Data-driven innovation through big data gathering, analytics and synthesis ■ Innovation in services and apps ■ Network-based innovation ■ ICT-enabled start-ups 	<p>2.2. NEW TECHNOLOGY TRENDS</p> <ul style="list-style-type: none"> ■ Wearable computing ■ Voice and eye-tracking recognition ■ Mass customisation through real-time behavioural data ■ Robotics, machine learning, and advanced manufacturing ■ 3-D printing ■ New collaboration and organisational tools 	<p>3.2 ORGANISATIONAL AND CULTURAL BARRIERS</p> <ul style="list-style-type: none"> ■ Lack of entrepreneurship ■ Lack of full exploitation of existing technologies and capabilities ■ Lack of capability to bring new products to market ■ Difficulty accessing venture and angel capital ■ Cumbersome access to EU funding and support for SMEs ■ Legacy technologies/systems/ investments including perverse incumbent behaviours
<p>1.3. TECHNOLOGY-ENABLED DEMAND DRIVERS</p> <ul style="list-style-type: none"> ■ Ubiquitous connection and the expectation of it ■ The expectation of ICT as a utility ■ Consumers/households driving 	<p>2.3. SECTORS WITH SUBSTANTIAL UNEXPLOITED ICT IMPACTS</p> <ul style="list-style-type: none"> ■ Education ■ Healthcare ■ Government 	<p>3.3. POLICY BARRIERS</p> <ul style="list-style-type: none"> ■ Fragmented legal and regulatory frameworks ■ SME rules, regulations, and legislation ■ Lack of flexibility and mobility

<p>adoption</p> <ul style="list-style-type: none"> ■ Cheap access and the expectation of it 	<ul style="list-style-type: none"> ■ Transportation 	<p>in labour markets</p> <ul style="list-style-type: none"> ■ Too much focus on infrastructure, and not on developing demand¹³ ■ Too much red tape to start, staff, and fund a business
<p>1.4. KEY UNCERTAINTIES</p> <ul style="list-style-type: none"> ■ Network capacity ■ Interoperability ■ Regulations 	<p>2.4. KEY UNCERTAINTIES</p> <ul style="list-style-type: none"> ■ Privacy issues ■ Security issues ■ National/EU security 	<p>3.4. KEY UNCCERTAINTIES</p> <ul style="list-style-type: none"> ■ Attitudes and willingness to adopt and use new technologies and applications ■ Social barriers

The issues in [3.3.] concern the main policy barriers and touch on EC policies at the demand side.

2.4 Developing a scenario framework

Two key drivers are shaping the future of economic growth and the role of ICT in the EU:

1. The pace of global economic development, ranging from slow to robust, resulting from:
 - a. the degree to which financial instability and government deficits are settled; and
 - b. the economic growth prospects of key regions such as
 - i. mature markets (the United States, Japan, the EU);
 - ii. large emerging economies (e.g. China, India, Brazil); and
 - iii. newly emerging economies (e.g. Indonesia, Mexico, South Africa).
2. Whether the EU will achieve a Digital Single Market and a Single Market for (digital and other) Services in practice:
 - a. Too many barriers still block the free flow of online services and entertainment across national borders.¹⁴
 - b. "...despite progress in some specific service sectors, the overall Internal Market for services is not yet working as well as it should... there was still a huge gap between the vision of an integrated EU economy and the reality as experienced by European citizens and service providers... A recent Euro barometer survey has

¹³ Developing demand could consist, for example, of using smart regulation and procurement power to aggregate demand, set standards, and support demonstration projects. For instance, smart online governmental websites would encourage not only development activities (for outside contractors) but also encourage and educate citizens to use ICT. See Chapter 3.2 of the Background Companion Report.

¹⁴ Source: <http://ec.europa.eu/digital-agenda/en/our-goals/pillar-i-digital-single-market> (last accessed June 7, 2013)

shown that currently only 8 percent of SMEs engage in cross-border activities because of such difficulties.”¹⁵

While the European Commission and the Member States have been committed to creating a Digital Single Market and a Single Market for Services for some time, there remains a gap between espoused policy and policy in use.¹⁶

Ad 1) Global economic growth

The pace of global economic growth affects the opportunities and challenges for EU-based firms.

In our scenarios, robust global economic growth at 4 to 4.5 percent annually could occur under the following conditions: (i) if the recovery of the U.S. economy beyond 2013 is strong, political gridlock diminishes, and U.S. political decision makers stay away from austerity policies, the United States could grow at 3 to 3.5 percent per year; (ii) if the Euro zone is able to transcend national debt, financial system upheavals, austerity programs and accelerate many of its much needed structural reforms, it may grow at 2.5 percent per year; (iii) despite a slowing growth, if China undertakes appropriate reforms, it could continue to grow at 6 percent annually. Alternatively, global economic growth would remain slow at 3 percent annually if the United States continues to grow below trend, i.e. below 2.3 percent, Europe at below 1 percent, and China and emerging markets at 5 percent or less.

Robust versus slow global economic growth will determine the pressures felt by national governments to shield employment and local firms and provide the conditions for more open or protected regional development. This will determine the ease or difficulty with which local or regional firms expand beyond their regions.

After 2017 global economic growth may slow down due to demographics and a slowdown in emerging economies as they are approaching the technological frontiers.

Ad 2) A Digital Single Market and a Single Market for Services The prevailing conditions of scattered digital and services markets across Europe are one of the main barriers preventing Europe from seizing the benefits of ICT. U.S. firms such as Microsoft, Apple, Google, Amazon, and Facebook currently dominate global markets, not only because of a Silicon Valley type of entrepreneurial culture (educational institutions, entrepreneurs, and venture capitalists), but also because of a large home market. Similar considerations apply to firms such as Alibaba in the Chinese market.

Smaller home markets inhibit differentiation, specialisation and scale. The lack of a sufficient home market for services not only affects SMEs and start-ups but also larger telecommunication firms. None of the national telecommunication firms in the EU, for instance, has been able to consolidate to the degree to which firms such as AT&T and Comcast have in the U.S. And it is not by coincidence

¹⁵ Source: http://ec.europa.eu/internal_market/top_layer/services/index_en.htm (last accessed June 7, 2013)

¹⁶ “Considerable heterogeneity on barriers both across sectors and Member States before implementation and still significant heterogeneity after implementation” Source: http://www.oecd.org/trade/gft/Monteagudo_The%20economic%20effects%20of%20the%20implementation%20of%20the%20Services%20Directive_GFT%202012.pdf “...while the internal market for goods has been functioning reasonably well, the Single Market for service is not equally developed and is still far from a reality”. Source: http://ec.europa.eu/economy_finance/publications/economic_paper/2012/pdf/ecp_456_en.pdf

that Chinese firms have become some of the largest firms in their global industries. Finally, the lack of integration and standardization creates barriers for growing ICT-based businesses beyond their national borders.

Overall, the lack of sufficient aggregate demand due to a fragmented home market for digital and other services and the tendency of local regulators to focus on local incumbents, especially under current economic conditions, limits efficiency, rationalisation, profits, investments, and the capacity to acquire high-tech start-ups.

The key uncertainty is if and when the Member States will implement a Digital Single Market and a Single Market for Services in practice. Under current circumstances, the effects of such a single market will not occur overnight, but may take five years or more to materialise. Ultimately these markets will allow three developments that will contribute to better outcomes for consumers in terms of better products, greater choice, and lower prices:

1. A single market will expose business to more competition, leading to the consolidation and rationalisation of incumbent players. Some of them may become the driving force behind regional ecosystems whereby significant activities can be outsourced, leading to new demand for suppliers. Vigilance is required to monitor whether consolidation is not merely creating local near-monopolies.
2. A single market will encourage start-ups to innovate in niche environments with the prospect of either building new large firms or being acquired by the newly emerging ecosystems.
3. A single market may provide SMEs with the incentive to go beyond the relatively protected niches they operate in and consolidate, merge or acquire other SMEs to develop scale to compete.

Resolving these and other demand-side barriers is a longer-term development of which the full effects may only be visible beyond 2017, depending on the degree and implementation of the single market in practice. In the meantime, however, European firms may be able to build on some advantages Europe has in certain sectors such as high quality and affordable public transportation, education, and healthcare where other regions in the world have weaknesses in provision and price of such services for the majority of citizens.

2.5 Developing the Scenarios

Combining the two key uncertainties—the pace of global economic growth (on the vertical axis), and the degree of integration towards a digital single market and single market for services (on the horizontal axis)—leads to the following possible environments:

1. **Digital desert:** A future of low global economic growth with a continuing fragmented EU environment for digital services
2. **Digital glasshouse:** A future of low global economic growth with movement toward integration with a Digital Single Market and a Single Market for Services

3. **Digital savannah:** A future of robust global economic growth with a continuing fragmented environment for digital services
4. **Digital rainforest:** A future of robust global economic growth with momentum toward integration with a Digital Single Market and a single market for services

The scenarios:

Robust global economic growth

EU remains a fragmented digital & services market

<p>The digital savannah A fragmented EU market makes it difficult for firms to grow beyond borders, but several growing firms skip the EU market altogether and aim for global growth opportunities, in particular in the U.S. market, with varying success. Most firms are eventually acquired by U.S. or other non-EU firms, possibly including Chinese firms. EU consumers continue to face high prices as fragmented markets create niche opportunities. GDP growth in Europe does not accelerate much beyond 1.1 percent, with ICT effects limited to 20 percent of total GDP growth (about 0.2 percent-point).</p>	<p>The digital rainforest An integrated EU market leads nation-based firms to venture across borders, much like product firms did in the past. EU-based global firms compete vigorously in a robustly growing global economy. Consumers benefit from lower prices and more choice for products and services. GDP growth in Europe accelerates to 2.5 percent, with an ICT contribution of 60 percent (1.5 percent point).</p>
<p>The digital desert Slow global economic growth of 3 percent leads to a contracting economic environment in which nation-based EU firms have difficulties flourishing and engage in a “race to the bottom”. An occasional firm goes beyond national borders but insurmountable barriers keep it from going beyond the region. Such firms may be acquired by non-EU firms. Consumers are less incentivised to maximise utility of ICT products and services. Medium-term GDP growth in Europe drops to 0.8 percent, with ICT effects limited to 10 percent of total GDP growth, which in absolute terms is less than 0.1 percent per year.</p>	<p>The digital glasshouse An integrated EU market leads nation-based firms to venture across borders, much as product firms did in the past. EU-based firms compete in a global albeit regionalised market. But slow growth and accompanying protection prevent the emergence of a European Google, for instance. Consumers have more difficulty accessing highest quality goods and services at lowest prices, as protectionist attitudes shut out world class products. GDP growth in Europe does not accelerate at more than 1.1 percent, but ICT effects increase to 40 percent of total GDP growth (about 0.4 percent-point).</p>

EU becomes a single digital & services market

Slow global economic growth

Note: Growth estimates are based on estimates from The Conference Board Global Economic Outlook and van Ark *et al.* (2013a).

Given inherent uncertainties, any of these futures could unfold. Fragmentation or integration is largely dependent on the decisions of member states, in turn influenced by at time fickle political constituencies.

The scenarios generate the following questions:

- How effective will current DG Connect policies be in each of these environments?

- What policy initiatives are required now to develop a more robust policy across scenarios? What indicators will predict which scenario will develop in one to three years?
- What policy actions will lead to or prevent the outcomes described in each scenario?

These scenarios are not predictions, but sketches of plausible environments in which European firms and the European Commission DG Connect may have to operate. Key trends, such as the drivers of ICT, are common to all scenarios. They include the penetration of ICT in virtually every economic activity, as well as the integration of ICT with other new technologies such as advanced manufacturing, 3-D printing, robotics, nanotechnology, and molecular biotechnology, and electronics and automotive products.

Analysis of the scenarios will help to answer the following questions:

1. **Competition among large firms.** How will large firms, which may have operated in relatively shielded home markets or have significant foreign operations, thrive?
2. **Competition among SMEs.** How will SMEs with a more domestic focus thrive compared to SMEs with substantial business outside the EU?
3. **Competition among start-ups.** How will start-ups thrive, particularly those in high-tech niches?
4. **The benefits to consumers and employees.** How will consumers fare—will they benefit from lower prices, more innovation, and/or higher wages?
5. **Economic growth and IT spillovers.** How much productivity growth is driven by spillovers from ICT investment? (Box 2.4.1)

Box 2.4.1: Estimating the GDP growth effects for the scenarios

To fully understand the implications of the different scenarios sketched for the future of ICT in Europe, we undertook an effort to estimate the ICT effects on GDP growth. As discussed in Chapter 3.1 of the Background Companion Report, the growth effects of ICT are highly uncertain because of the difficulty to measure prices and spillover effects from ICT. However, on the basis of the earlier work on ICT impacts of growth reviewed in the Background Report, and recent work at The Conference Board, we present a middle range estimate.

For the scenarios we focused on growth effects rather than level effects (as most other studies do). Growth estimates are anchored in historical measures of GDP levels, which show an average GDP growth performance of approximately 2.2 percent for the European Union 1995-2007. Approximately 0.4 percent of that is made up by ICT capital, and 0.3 percentage point comes from the productivity of IC-producing firms. However, the productivity effects from the use of ICT have been only 0.1 percent during this period. Hence approximately 35 percent of growth is accounted for by ICT. While growth has been much slower since 2008, the contribution of ICT may have remained positive, but was offset by negative effects from non-ICT factors in the economy

The two “middle of the road” scenarios (savannah and glasshouse) assume growth performance at approximately 1.1 percent from 2013-2018, with an overall contribution of total capital at 0.9 percent and Multi Factor Productivity (MFP) at 0.2 percent, following The Conference Board Global

Economic Outlook's base scenario (also reported in van Ark *et al.*, 2013a). The savannah scenario assumes smaller ICT effects (20 percent of GDP) than the glasshouse scenario (40 percent of GDP), as large companies in the savannah scenario will not be able to generate investment and productivity advantages as effectively as in the glasshouse scenario. In the latter case, even though growth remains slow, companies are able to benefit from the positive impact of the single market on investment, and especially productivity.

The desert scenario assumes growth of 0.89 percent from 2013-2018 and an effect from ICT of only 10 percent, as incentives for investment in ICT will be seriously lacking.

The rainforest scenario assumes that the contribution of ICT investment and productivity can double relative to the base scenario (30 percent). The 60 percent ICT contribution reflects approximately a 1.5 percent contribution (0.5 percent more than 1995-2007) leading to an acceleration in GDP growth to 2.5 percent.

2.5.1 The Digital Desert

The desert is a dry and inhospitable environment with sparse and often temporary growth after sporadic rain showers. Such an environment results first from global economic growth continuing at a slow rate of 3 percent per year.

The U.S. recovery continues at a rate of 2 percent per year with a pattern of rising expectation, only to slow: a pattern of two steps forward, one step back. The U.S. political system remains close to deadlock through several elections (2014, 2016) with minor shifts. Cuts to the federal deficit continue to affect federal support of science and technology, education, and procurement power.

Europe itself continues anemic growth of one percent per year, or less, due to government cutbacks, high unemployment in large parts of Europe, and continuing financial instability around the Eurozone.

At the same time, China's growth rate is decreasing to 5 percent per year, in part due to the transformation from an investment-driven to a consumer-driven economy, as well as restructuring of state-owned enterprises and a clamp-down on easy credit. The other BRICs (Brazil, Russia, and India) experience slower growth.

In this slow-growth global economic environment—with low growth in the United States, very low growth in Europe, slowing growth in major emerging countries, and increasing growth in a new group of countries in East Asia and Africa—competition between regions is a zero-sum-game with protectionist tendencies through non-tariff trade barriers. Trade tensions and conflicts about products and services embodying key technology are frequent (e.g. Chinese solar panels and in a 'tit-for-tat', French wine).

In this tough economic climate, global firms with large competitive home markets are at a distinct competitive advantage. Initial specialisation, rapid revenue growth, and economies of scale (followed later by economies of scope) are core strategies for start-ups and small firms to build competitive advantage in such markets, providing the building blocks for a globalisation strategy. At the same time, competing large firms in such markets manage elaborate ecosystems and provide the petri dish

for SMEs and high-tech start-ups to flourish. European firms are at a distinct disadvantage globally, as they are largely confined to national markets within a fragmented European digital market and a fragmented market for services.

Larger firms in the EU quickly hit the wall of national borders and are unable to create sufficient economies of scale. In turn, they are unable to develop sufficiently differentiated ecosystems that allow start-ups and smaller firms to play a critical role. Moreover, skipping other EU member state markets and jumping to large and hypercompetitive markets such as the United States and China is a high-risk strategy when global growth is low. For SMEs, the calculations are similar but even more challenging; for start-ups, the situation is dire, in particular in small home markets. Young would-be entrepreneurs may decide to leave for the United States and either join or start a high-tech firm. Within the EU they may decide to create their start-ups in countries with relatively more favourable climates for digital entrepreneurship, such as the UK.

Given unfavorable economic conditions of low growth and fragmented markets, improvements and ICT innovation in education, healthcare and government remain extremely limited, depriving EU-based firms of a potential source of competitive advantage.

There is a lack of fertile ground in large home markets. An occasional flower may bloom but it either wilts quickly or is transplanted, i.e., acquired by firms with a home base outside the EU. Skype and TomTom are examples of this phenomenon. The resulting lack of entrepreneurship makes potential investors look elsewhere. The market structure and the entrepreneurial culture reinforce each other. National and EU policies to support ICT development, entrepreneurship, and adequate schooling are unable to unlock the barrier of insufficient aggregate demand. In many ways, indigenous entrepreneurship is bottled up. Many e-leaders¹⁷ work for non-EU firms operating in the EU, and a not insignificant number of e-leaders move to the US with its recently revamped immigration system that—under pressure of firms like Google, Microsoft, IBM, Facebook, and Amazon—favors highly skilled workers via rewards to their education in the United States with an H-visa and a path to citizenship.

Consumers in this scenario suffer from high prices, stagnating wages, decreasing job opportunities, and a lack of innovative products.

2.5.2 The Digital Savannah

Savannahs are environments in which grass, scrubs, and scattered trees flourish, thanks to seasonal rain showers. The digital savannah results when global economic growth reaches an average of 4.5 percent per year due to the combined effect of regional growth patterns.

The U.S. recovery takes off at 3-3.5 percent per year as a result of sustained and robust growth in the private sector, stimulated by lower unemployment (dropping eventually below 6 percent) and increasing housing prices. The federal deficit begins to decrease substantially, easing concerns about the federal debt and diminishing calls for rigorous austerity measures.

Europe stabilises its financial system, and austerity measures give way to economic growth policies. Most of the Euro zone begins to show signs of healthy growth, and the Euro zone as whole grows at 2-2.5 percent per year.

¹⁷ See van Welsum and Lanvin (2012).

China successfully manages the transformation from an investment-driven to a consumer-driven economy, in part by creating stable conditions for a market-oriented economy and substantially scaling back the role and the influence of central and regional governments in economic life. Like China, other emerging and newly emerging markets benefit from increasing demand in mature economies, leading to increasing exports. China grows at 6-7 percent per year.

The EU digital and services markets remain fragmented despite leaders espousing a single market. Large telecom providers continue to dominate national markets, but the size of their national market also presents the limits of growth. Lack of size and demands for increasing returns are in ways incompatible. A lack of significant increase in revenue holds back investments, while a dominant position and a relatively protected niche ease some of the pressures to increase efficiencies. Lack of scale prevents sufficient differentiation and focus on a supply and value chain that would allow SMEs and high-tech start-ups to flourish.

Countries with a larger home market, or countries which traditionally have focused on international and global markets, will fare marginally better than countries with smaller home markets and/or a more internal focus. There are several responses to the predicaments of determined entrepreneurs in in this scenario (and which resemble past product-based strategies):¹⁸

1. Proactive large national champions with a sizable home market to give them an initial launching platform, such as Spain's Telefonica, skip other EU member state markets and focus on a large market like Latin America or Asia, where they are sufficiently competitive.
2. After an initial focus on their sizable home markets, SMEs carve out small but lucrative global niches in various global value chains, such as Germany's often family-owned SMEs. These firms act as highly specialised, innovative, and high-priced suppliers that develop indispensable intermediate services.
3. Entrepreneurs in smaller and often more open and more competitive economies develop niche strategies for a global market from the very start.

However, existing and newly emerging global players from outside the EU will extend or begin to develop strong global positions while making inroads into the EU at the expense of smaller local players and tapping into the limited entrepreneurial activities resulting from the EU's supply side focus. The bulk of the added value in emerging ecosystems is generated by the center, as firms like Apple have amply demonstrated, often located outside the EU. To the extent that ICT innovations occur in the education, healthcare, and government sectors, they are either driven by vendors from outside the EU, or they are innovations with potential, scoped up by vendors from outside the EU. While there are some success stories, they are relatively scattered.

The resulting environment lacks the diversity of the rain forest. In this environment investment in ICT by the EU has only limited payoff, and the private sector is unwilling or unable to make the critical investments that firms with larger home markets have been making.

¹⁸ van Ark *et al.* (2013a).

2.5.3 The Digital Glasshouse

A glasshouse is a structure for growing plants, flowers, fruits, and vegetables that allows the sunlight to penetrate through walls and roof, enabling growth that otherwise would not be possible. Glasshouses let countries such as the Netherlands grow fruits and vegetables year-round. Similarly, the establishment of a digital single market in the EU—with interoperability at a minimum, and moving towards EU payment standards, and sufficient privacy and security—allows for the development of technology that can be used throughout the EU with minimal additional efforts (e.g., transaction costs). In a Digital Single Market, cross-border interactions become significantly easier, in particular when accompanied by pan-EU payment systems. SMEs and start-ups from one country have a fighting chance to tender for projects, for example, with a telecom or a hospital in another country. Combined with a Single Market for Services, potential markets will initially double, then triple, and beyond. Entrepreneurs will make increasingly high risk/high reward investments to capture some of these markets. Moreover, as telecoms, hospitals, educational systems, etc. respond to new market conditions, they will begin focusing, rationalizing, and growing in size. In turn they will not only merge with and/or acquire cross-border competitors, they will start outsourcing non-core activities and acquire key technologies from SMEs and start-ups and leverage these in EU-sized markets. This not only creates niches for smaller firms but also an active market for IPOs and IP.

However, the glasshouse is situated in a global environment of slow economic growth, with the United States growing at 2 percent per year, the EU at 1 percent or less, and China at 5 percent. In such an environment, a greenhouse may turn into a very uncomfortable hothouse with withering temperatures and humidity, competition among large firms within a single market becoming a zero-sum game centered on defending current positions, on mergers and acquisitions, and on painful organisational restructuring. An internal focus might generate larger, perhaps more profitable firms, but firms that are still in a relatively weak position globally. Consumers may profit from innovation offered by start-ups and SMEs without reaping the other benefits of innovation: lower prices, better wages, and employment of the larger firms.

In a low-growth global environment, regions with large home markets such as the United States, the EU, China, and India operate as distinct glasshouses, each growing particular species based in part on unique regional configurations. The EU glasshouse environment may sprout important SME and start-up activities, including in healthcare, education, transportation, and government—sectors in which Europe has unique characteristics. If the glasshouse does not turn into a withering hothouse for larger organisations such as groups managing multiple hospitals, such endeavors have a fighting chance to be scalable and competitive in a global environment, given their ability to be innovative and price competitive. The EU will develop distinct offerings suited to the future, rather than merely replicating offerings of current global players such as Google, Apple, Facebook, and Amazon. Kushida *et al.* (2011, 2012) have demonstrated that their business models are temporary configurations, based on (i) past circumstances in which they emerged and (ii) current opportunities available. Each firm is finding its way into the future, fully aware that significant changes are in the offing.

At the same time, globalising firms from outside the EU can be required to live up to critical values of the EU in terms of privacy, security, and national security. Firms may appreciate this requirement rather than see it as an imposition and may respond by drawing on EU talent to design differentiated product and services offerings at a global scale that can be leveraged outside the EU.

In this glasshouse scenario, previous and new investments in the supply side of ICT begin to pay off in a way that may not happen in the savannah scenario.

2.5.4 The Digital Rainforest

The tropical rainforest is, in ways, a glasshouse on a global scale. It is a lush environment in which the magnitude of diversity is far greater than in a regional glasshouse scenario and competitive pressures reach new levels. In this scenario, robust global economic growth occurs with the United States at 3-3.5 percent growth per year, Europe at 2-2.5 percent, and China at 6-7 percent. The EU is rapidly evolving into a digital single market and a single market for services (as well as for products, labour, and capital).

Robust global economic growth of 5 percent per year provides significant opportunities for globalizing firms and leveraging of distinct, if not unique, regional capabilities with relatively limited non-tariff protection and trade tensions. The tropical rainforest has two critical aspects—incredible variety and high competitiveness—and both stimulate global economic growth. It is the world of competing ecosystems—as if Google were competing with Alibaba—each configuring elaborate value and supply chains, creating and connecting ever-changing niche environments for smaller players.

While the rainforest at first appears to be very attractive in terms of robust global growth and a single EU market, allowing EU firms to compete vigorously, it also brings many existing firms out of their comfort zones. They must cope with new offerings, new business models, suppliers, employees, regulators, competitors, and investors, while change continues at a fast pace.

The key to the rainforest scenario is the ability to reconfigure your ‘operating model’ quickly—at an individual, organisational, country, and regional level. The pace of development of individual ICT technologies is fast, their integration with other technologies relentless, and the potential for business and societal innovation unprecedented. Without the quick establishment of a Digital Single Market and a Single Market for Services, the ability of individuals and organisations to take full advantage of the rainforest is constrained, and the EU remains relatively weak.

2.6 Testing current policy against individual scenarios

How will current policy fare in each of the four scenarios? What lessons do the scenarios teach that may lead to changes in the current policy?

2.6.1 Current policy in the digital desert scenario

In a slow global growth environment, in which the EU grows at one percent or less annually, the EU remains a digitally fragmented market and is unable to become a single market for services: the digital desert scenario. The EU falls further behind other regions. This outcome calls for more support—more investments in infrastructure (with calls for interoperability, etc.), education, and entrepreneurship. Given the slow growth environment and prevalence of tight budgets, this support will be difficult to obtain, as competing policy units may argue more strongly in protecting their own limited funds. The current fragmented structure of the EU market and the different market structures in large regions outside the EU, will make it difficult for ICT development to be translated into innovation, entrepreneurship, and economic growth, even with sufficient support for the supply side of ICT.

Slow global economic growth, the threat of instability in the financial system, and cuts in government expenses by individual countries create near-desert conditions in which it is difficult for ICT “sprouts” to blossom. Those that do are easily targeted for takeover by non-EU eco system firms. Increasingly, non-EU firms will dominate the EU market and set technology standards and business. Where needed they will grudgingly adapt to the prevailing fragmented regulations and standards and compete directly with each other rather than with EU rivals. The EU will slide into a “me-too” position globally in ICT. Moreover, the slow growth environment will cause investments in potentially important sectors such as education, healthcare, and government to lag. EU innovation will falter, and non-EU firms may innovate in the EU and disseminate the innovations globally, reaping the profits.

The digital desert scenario in some ways reflects current conditions. It is clear that if barriers to the digital market are not brought down quicker and more effectively, other regions will be able to ascend the learning curve and dominate through competing ecosystems. The EU will fall further behind until the gap is extremely difficult to bridge. Given the dominance of the ICT sector by the United States and the emergence of viable Chinese and Korean competitors, the EU will fall further behind if it continues with business as usual.

2.6.2 Current policy in the digital savannah scenario

If global economic growth of 5 percent materialises over the next few years and concerns about financial instability and government budgets are replaced by actions fostering economic growth in the EU, government investments may become available, either through member states or the European Commission. To the extent that those investments follow support supply side policy, their effectiveness will be limited. Within the digital savannah, various ICT technologies may be combined with other advanced technologies in manufacturing, robotics, 3-D printing, with further spillover into nano-technology and molecular biology. But without aggregated demand such technologies may lead only in limited ways to innovations that find their way into the market place, and development potential will not be realised.

Determined firms from member states that have traditionally engaged in global trade may skip the step of making the EU their home market altogether and develop early bridgeheads in the United States and/or start exporting to China.. ICT may also become an integral part of current products such as cars, and countries such as Germany may use their product platforms to launch integrated offerings in the United States, China, and other markets. Countries which are focused more on local and EU markets, or countries severely affected by austerity regimes, may have difficulty competing on a global scale.

In the end, the EU may develop three of four different patterns of coping, some more successful than others. Member state policies may trump DG Connect policy. But even firms that go outside the EU may face global competition and be squeezed by innovative U.S. firms targeting higher-end consumers and Chinese firms attempting to move to that higher end.

2.6.3 Current policy under the digital glasshouse scenario

What would trigger a Digital Glasshouse scenario? The long way revolves around slow integration of financial services in the EU, gradual spread to other sectors, and resulting demand for standardized ICT and changes of regulations. A faster route is growing recognition among member states that

regardless of the extent of economic growth—robust or slow—the situation will at best slowly deteriorate, with unacceptable performance differences among EU member states, questioning of EU rationale, and fast deterioration in those countries which have been hit hardest since the financial crisis. The EU has moved beyond a tipping point. More of the same—keeping up or increasing support for the supply side of ICT in order to foster economic growth—is no longer enough and has not been good enough for a long time (but obscured in the decade before the financial crisis on 2008). There is a realisation that support of supply is “pearls for swine” Without an adequately integrated market that allows for aggregation of demand, support for supply will always fall short and will always show lower returns than expected, calling into question the investment.

This realisation is fostered by the observation that the EU is losing power in a global system (as illustrated, for example, by the *Financial Times* headline on June 6, 2013: *China tells EU to admit decline in power*) and that individual countries and their economies have a difficult time being more than an extension of regions with more integrated markets: the United States and China, and perhaps over time, India, Brazil, and Russia.

Whether the impetus is geopolitical, cultural, or economic, the EU member states embark on a rapid process for establishing a digital single market and a single market for services in practice, leading to an EU integrated market for products, services, labour, and capital. Demand aggregation is, a political and regulatory activity, reshaping laws, rules, and regulations. This holds only if it is accompanied by (i) education and promotion that the EU is a single market, (ii) the use of government procurement as a way to demonstrate potential, (iii) the encouragement of experiments in the private sector, and (iv) monitoring for implementation and compliance.

However, with low global growth and EU economic growth of one percent, the effective creation of a single market for services (implemented, monitored, and enforced) creates countervailing dynamics.

First, it will dislodge large incumbents from relatively comfortable national niches and increase competitive pressure, leading to consolidation through mergers, acquisitions, and takeovers. However, in a low-growth environment, this will lead to prolonged jockeying for position, acrimonious merger and acquisition talks, decisions under repeated deadlines and crises, and painful restructuring. The longer the period of slow growth lasts, and the lower the growth, the more entrenched the positions. Member state governments may not be able to refrain from influencing the process or intervening outright. . While intended to strengthen the EU capabilities, prolonged internal focus and suboptimal decision-making may leave them relatively weak. While rationalisation and economies of scale are possible, consumers get neither lower prices nor innovative services. Wages and employment stagnate.

Second, start-ups and SMEs benefit from cross-border commercial activities and expanded markets. With larger markets, determined entrepreneurial firms take the plunge and invest with an eye to higher revenues and profits. SMEs and start-ups may be helped even more if the process of restructuring the larger firms is less prolonged and agonizing. In such a case, consolidation and competition lead to larger pan-EU telecom and ICT firms. The quest for distinctiveness leads larger firms to a strategic focus, spinning off non-core activities, and a competitive market of suppliers. Here too consolidation, restructuring and spin-offs will take place. In the end a mosaic of pan-EU ecosystems and niches develops. Strategic focus leads to leaner organisations, increasing productivity and profits. Profits can be invested in innovation, not only internally but also open

innovation with competitors, suppliers, SMEs, and start-ups. Similar developments are possible in financial services, healthcare, education, and even government.

2.6.4 Current policy in the digital rainforest scenario

The rainforest has an abundance of water and sun, creating a lush environment and generating a large variety of specialized life forms that help to de-carbonize the atmosphere. , the environment is full of two vital ingredients—water and sun—which together with existing soil and vegetation create a lush environment, foster specialisation and generate a large variety of species. They also play a critical part in the de-carbonisation of the atmosphere. The rainforest is a complex, layered, and highly competitive environment in which species vie for vital resources and dynamically adjust to ever-changing niches or create their own new niches.

A digital rain forest scenario can emerge if global economic growth reaches robust levels of 5 percent per year and the United States, China, and key emerging countries transform themselves successfully while EU members implement a digital single market and a single market for goods, services, labour, and capital in practice.

As in the digital glasshouse scenario, a single internal market exposes EU firms early on to the potential of expanding their product/services markets, supply chains, labour markets, and capital markets beyond the national borders. In this way, emerging pan-EU firms are exposed to intra-EU competition which prepares them for global competition and enables them to position themselves in expanding global markets in a way that they can compete directly with global firms of non-EU countries.

In the digital rainforest, pan-EU firms must move beyond the conditions of the digital glasshouse. Rather than merely focusing on the local market (as in the digital desert), or bypassing the EU market to opt for a high-risk entry into non-EU markets such as the U.S. market (as in the digital savannah), they focus strategically on a competitive EU market that can be leveraged globally.

However, entering a hypercompetitive global environment comes with new challenges. Firms that traditionally operated within their national borders and engaged in an emerging pan-EU market will once again have to rethink their strategic choices and organisational focus. Firms that sprouted in a more integrated market and focused on the EU market from the beginning must carefully choose strategies for entering the global market. Finally, a new breed of firms will emerge that will not only focus on the EU market in their early development, but will also keep an eye on the global market for their services, their supply chains, and their labour and capital markets. Such firms may move into a global arena earlier and faster than prior generations, much like firms such as Facebook, Google, and Amazon did. In fact early on in their development these firms may face direct competition from global eco system firms and smaller firms from outside the EU that opted for a similar global strategy.

This hypercompetitive environment of existing, emerging, and faltering ecosystems, combined with the constant creation of new niches and designs based on technological innovation and entrepreneurship, is a world of what may feel at times like unsettling and disruptive change. The ability to start fast, fail early, reconfigure quickly, and innovate on the spot at the technical, business model, and organisational level will be critical. Some old vestiges may fold or (sub)-merge in new

vestiges, and, for example, the names on the stock exchanges in Europe may change from those prevalent over the last half century.

How would the current policy framework of support for supply side hold up in this new and unfamiliar environment? Development of infrastructure is a necessary but not sufficient condition for ICT-driven growth. EU support of the supply side of ICT will achieve the greatest payoff in this scenario because of two favorable conditions for demand: robust global economic growth including in the EU, and a single fully integrated EU digital market and market for ICT-related and ICT-enabled services. Investment in ICT infrastructure, hard and soft, will help firms capitalise on their initial investments. Smaller firms may reach across borders in the EU and move beyond. High tech start-ups with high risk and high reward innovation strategies will benefit from the guidance provided by ecosystems firms and make it possible to actively engage in such systems.

However, a support for supply policy framework would require critical adjustments. As demand increasingly becomes the driver of ICT growth, some support of supply can be scaled back and left to the private sector as market failures are less likely in a more competitive environment. Other support needs to be re-targeted to areas under- or not served by the private sector, while other support needs to be maintained, e.g. insistence on universal access. Moreover, rather than focusing merely on an ICT infrastructure push, three developments will take center stage: (i) the combined effects of various ICT technologies, (ii) integration with other key technologies such as robotics, advanced manufacturing, 3-D printing, nanotechnology, and molecular biology, (iii) the penetration of ICT in those sectors that have been underusing ICT—including education, healthcare, transportation, and government. It is at the intersections of technologies and new sectors that innovations will take place. They will take place in a demand-driven environment that allows for specialisation and aggregation—key elements of successful business development. E-leadership can be learned and developed at the level of the start-up, the SME, and large firms. Demand provides the opportunity for e-leadership to develop, not as a set of theoretical skills, but in practice. E-leadership will merge with leadership, and the focus will be on managing combinations of ICT technologies, their integration with other future technologies within the context of transforming underserved sectors, and, above all, of designing and reconfiguring business models in a dynamic market place.

2.7 Contours of a more robust policy framework

2.7.1 Summary of how the current policy performs in each individual scenario

In the digital desert, with slow global growth and fragmented EU markets, local firms confined to smaller markets than their competitors will be at a double disadvantage: they face formidable barriers to growth, and their competitors from the United States and China will use their large home markets to accrue potentially insurmountable scale and scope advantages. Without reinforced demand policies the EU's policy framework will be unable to foster viable EU global competitors. It would provide foreign firms with EU supported capabilities to enter the EU country by country. Viable EU players will not be catering to the needs of EU consumers, e.g. regarding privacy, universal access, pricing, and national security, and will not contribute to broadening the variety of offerings of large non-EU global firms. From an EU policy point of view, using ICT to ignite economic growth can best be summarized by the phrase “you can’t get there from here.”

In a digital savannah, with robust global growth but continuing fragmentation of the EU market, some local firms may do better due to economic growth in their home markets. Many attempts to establish viable firms will languish. A few determined firms will bypass the EU market and, rather than entering a neighboring country, will establish a presence in the United States, move there or to China, and/or supply Chinese firms. Most of those few successful firms are also acquisition targets for non-EU firms. The current policies will have a limited payoff. The EU will continue to rely mainly on existing large firms, which are not necessarily best equipped to master the new possibilities of the digital world.

In a digital glasshouse, with low global growth and an integrated EU market, country-based firms have a fair chance to grow into EU players and viable global competitors. A critical condition is that integration combines with close monitoring by the EU Competition Authorities to safeguard against anti-competitive defensive consolidation. In this competitive EU environment with product, services, capital, and labour markets that function effectively and efficiently, consumer preferences drive growth and will change rapidly, as do technologies and the extent to which they interact. The more strategically and organisationally nimble firms will excel. A support for supply framework will have a much higher pay-off because it will have been complemented by scaled-up demand in a more integrated single market.

Finally, in a digital rainforest, with robust global growth and an integrated Europe, aggregation of demand in the EU leads to consolidation, restructuring, and rationalisation of key players into ecosystems. This results in higher profits, more investment, specialization, and innovation through spin-offs and high tech start-ups. This leads to more vibrant growth within the EU and creates conditions for EU firms to become leading global players. But hyper-competition places rigorous demands on both ecosystem designers and those who operate within and/or across ecosystems in terms of business model, strategy, organisation, and talent policy innovations. This environment is characterized by constant changes which may be experienced as disruptive and unsettling. Consumers have greater choice and pay lower prices. The support for supply framework will have even higher pay-offs.

In conclusion, the effectiveness of the current policy of support for supply side varies greatly per scenario and spans the range from low benefits and unsustainable in the digital desert to highest benefits but incomplete in the digital rainforest.

2.7.2 How does the current policy perform across scenarios?

The shape of the environment in the medium-term, before 2017, depends on the speed of global economic growth and the degree of integration EU member states are able to accomplish. DG Connect could face any of the four environments. Without knowing which scenario will unfold, it is prudent to consider how the current policy will fare across scenarios (Table 2.6.).

Table 2.6.1: How does the current policy framework perform across scenarios – a summary

<p>Savannah—robust global growth, fragmented EU digital environment</p> <ul style="list-style-type: none"> - “Support for supply side” will help innovation in a limited way to find the way to the EU market place, but the opportunity to develop new business models and firms will not be 	<p>Rain forest—robust global growth, integrated EU digital environment</p> <ul style="list-style-type: none"> - “Support for supply side” combined with a Digital Single Market and a Single Market for products, services, labour and capital, leading to de facto aggregated demand, will
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<p>realized.</p> <ul style="list-style-type: none"> - A few determined firms directly entering larger and growing regional markets such as the US may benefit from investments by the EU but will face a highly competitive global environment. A pattern of a limited number of firms moving beyond the home market may emerge. - Non-EU firms will continue to face very significant challenges in terms of competition, public policy, and offering consumer choice. - An unchanged policy will not provide the biggest benefits. 	<p>lead to the highest benefits.</p> <ul style="list-style-type: none"> - But the currently policy will be incomplete if it is not able to swiftly adjust to rapidly changing technological realities, consumer preferences, shifting companies' needs and new political realities (e.g. trade block of EU and US). - Much institutional change in sectors such as education, healthcare and government itself will be needed to take advantage of a truly integrated EU market in turn embedded in a rapidly changing global market place.
<p>Desert—low global growth, fragmented EU digital environment</p> <ul style="list-style-type: none"> - “Support for supply side” will not be able to sustain the current situation as undersized firms in undersized market & niches compete with large either more differentiated or more specialized non-EU headquartered firms. - Continuing domination of US firms and emerging Korean and Chinese firms. A significant part of the value of the support for supply side will be appropriated by non-EU firms through using EU hard and soft infrastructure. - Privacy, information and national security values tend to be pushed by non-EU organisations. - With an unchanged policy, the EU will increasingly fall behind and face increasingly difficulties catching up. 	<p>Glasshouse—low global growth, integrated EU digital environment</p> <ul style="list-style-type: none"> - “Support for supply side” will provide necessary ingredients for firms, consumers and government agencies to take advantage of the emergence of an integrated market leading to more variety for consumers, more differentiation among firms, and higher productivity and economic growth in the EU. - But these ingredients are not sufficient as integration under conditions of slow global growth will also lead to increasing and unproductive competition and local protection (more competition for the same pie). Sub-optimal quasi-monopolistic tendencies (and the possibility of regional trade conflicts) require close monitoring. - Formal arrangements to create a Digital Single Market and a Single Market for Services may be thwarted by informal practices.

This summary leads to the following conclusions:

1. If the EU remains a fragmented market for services without a single digital standard, and aggregate demand remains elusive, then the effectiveness of the current policy is at best limited (digital savannah). The current policy will not help to prevent the EU from sliding into the digital desert, and fall further behind the United States and, in the future, China and Korea.
2. If the EU becomes an integrated/single market for services with a digital single market, enabling aggregation of demand over time, then the current policy is more aligned and therefore more effective (digital rain forest). The current policy will be less effective if the benefits of integration are thwarted by uncompetitive consolidations (digital glasshouse).
3. If a slow global growth environment ensues (with mature markets stuck in relatively slow growth and emerging markets slowing down) with a fragmented EU, the current policy is

unable to prevent the EU from falling further behind (digital desert). Member State-based firms face barriers at the border, consumers face products and services globalised by large non-EU firms, and the EU is left trying to impose privacy, information, and national security values. Technological innovation in the EU with its potential of new businesses will minimally contribute to EU growth. Alternatively, if the EU becomes integrated but in a slow growth environment (digital glasshouse), the current policy is likely to make an important contribution to the development of EU capabilities but the effects may be limited in the face of slow-growth-induced protection and defensive consolidation.

4. If the world economy grows robustly but without integration (digital savannah), the effects of the current policy will remain limited. Individual member states policies will trump EU policies and current differences among states will be accentuated. Alternatively if the EU becomes an integrated market, then the current policy will have its largest effects, assuming that integration will also bring a digital single market.

Clearly, looking across the possible digital futures DG Connect may face over the next five years, the current policy of support for the supply side of ICT to generate economic growth must be better balanced by a strengthening of the policy framework for the demand side.

2.7.3 Lessons for the design of a new policy framework

The payoff of the current policy of support for supply side' could be significantly improved by focusing on the use and demand side, by making sure that consumer and business usage and needs are effectively and efficiently translated into aggregated demand. While finding support for infrastructure investments may be difficult under current economic conditions, this can be offset by removing barriers that prevent the aggregation of demand at EU level, significantly raising the potential for returns on initial investments.

While certain supply side policies will continue to be needed, they are there increasingly to enable the demand side of the new phase for ICT. This orientation of policy will significantly increase the odds that a DG Connect policy, especially in conjunction with ICT-related policies from other DGs, will be robust across scenarios.

A policy narrative that would enable and foster the aggregation of demands with all its consequences would include the following elements:

1. Urgency

- Given that the EU is falling behind the United States and some Asian countries on a number of measures, there is urgency to begin enabling and fostering demand.
- Urgency is reinforced by recent slow economic growth and rising unemployment.
- Business as usual is not an option. The scenario exercise clearly indicates that the situation will not rebound to previous levels: the United States was already ahead, the crisis has created damage in the EU, and China, Korea, and India have continued to develop their ICT capabilities.

2. Aggregating demand by removing barriers

- Aggregation of demand for ICT products and services and their wide and deep integration into society's practice and businesses starts with the mechanisms that allow for aggregation, such as a fully implemented Digital Single Market, and Single Market for Services, in particular ICT-related and ICT-enabled services.
- Much of enabling the role the demand side can play in generating additional impacts from ICT on growth starts with the reduction, removal, and harmonisation of standards, rules, regulations, and laws that inhibit the aggregation of demand. This process may start slowly, but will then become self-reinforcing once a threshold of sufficient aggregation has been reached.

3. Focus on the needs and use of consumers and business

- Aggregating demand is grounded in the use of ICT, and products and services dependent on ICT. Policies will have to change, much like IT departments in firms must adapt from a technology push approach to a technology pull when consumers and employees use mobile devices to open the system. Policy attention to use of ICT and ICT-related products needs to increase and should stimulate demand aggregation, including across borders.

4. Give technological innovation and new business models a chance

- Aggregating demand will lead to firms—start-ups, SMEs, or larger firms—improving their offerings of products and services to meet consumer needs and preferences.
- Aggregating demand and larger markets will lead to consolidation of firms that have been operating in small or medium-sized home markets.
- Consolidation, if not intended as protective and / or controlling the environment, will lead to strategic focusing and specialization, and restructuring and rationalization. This, in turn, leads to the reshuffling of businesses with a reconfiguring of capabilities, spin-offs, acquisitions, and outsourcing. It unlocks knowledge and capabilities and creates a market for starts-ups, fostering venture capital and angel investments.
- Market restructuring in turn becomes the driver for the support of the supply side of ICT: the hard infrastructure of technical network, and the soft infrastructure of education, training, and retraining.

5. Focus on sectors where the EU has significant strength in demand and capability

- Through integrating the use of ICT in the capabilities and offerings in key sectors, such sectors can become environments for innovation, new offerings, and new business models that have export potential beyond the EU.
- Member State governments and the EU can use government procurement policies to aggregate demand across borders and put in place experimental and pilot programs to further integrate cross-border capabilities.

6. Monitor implementation

- In particular in a slow-growing environment, it is important to address protective dynamics (e.g. preferential treatment within a local home market) and defensive (anti-competitive) consolidation aimed strictly at gaining control over the environment. DG Connect will need to work closely with other directorates in the European Commission, such as Industry and Competition and Regulatory Authorities.

- A critical test of the success of the new policy is whether firms and consumers will actually trade and consume across borders. How does growth across borders compare to trade within borders? And, critically, are local firms, after reaching the limits of their local markets, crossing borders within the EU, or are they quickly establishing beachheads outside the EU, in particular in the United States and/or China?

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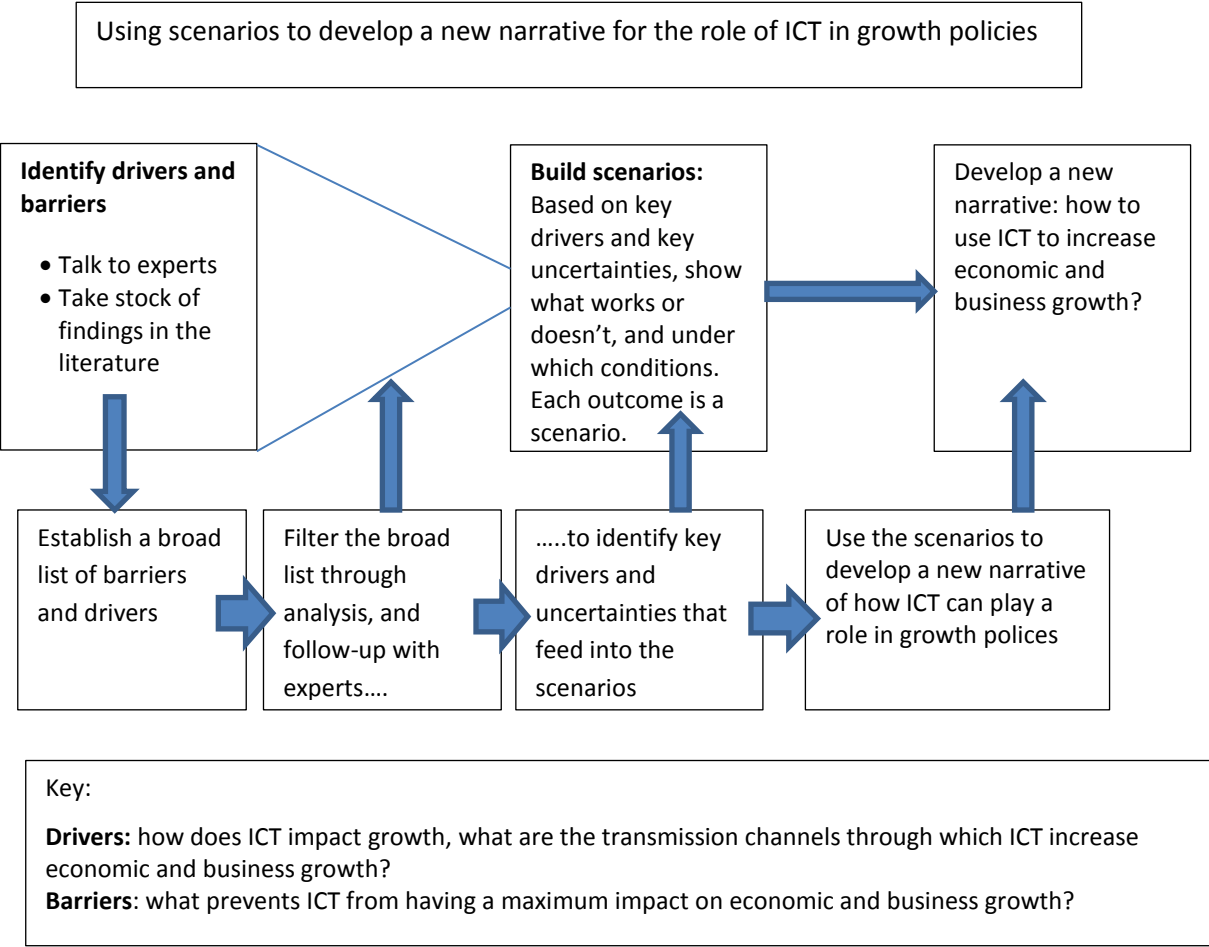
Appendix 1: Summary of the study approach

The Conference Board was commissioned by DG Connect to “use scenario analysis to build a new narrative for the role of ICT for growth in Europe. The study should bring together existing knowledge about ICT and growth to build scenarios, assessing which environments are most conducive to growth benefits induced by ICT”, and for ICT policy in growth policy, to be used as an input into the development of a new policy agenda. Knowledge and research gaps were also to be identified, making suggestions for areas where more research is needed to help shape the next research agenda.

Mapping out ICT’s impact on the future economy and the business environment is an inherently uncertain exercise, especially given the rapid pace of continuous technological change and increasing technological convergence. Therefore, rather than starting from a static outlook for ICT trends or economic growth dynamics, the approach of this study was to develop multiple scenarios on how ICT developments and economic growth may relate to one another for the remainder of this decade. In addition to a review of the available empirical evidence, insights from experts were used to develop the key drivers, uncertainties and barriers that determine how ICTs shape economic and business performance. The scenarios were developed using different combinations of those factors, and were used to articulate a “high level narrative” that describes the several, most compelling different roles ICTs can play in growth, and, in particular, in stimulating a slow growth environment. The purpose of the narrative is to help policymakers frame the growth and ICT development agenda for Europe, help the communication around the role of ICT in growth, and relate it to the Digital Agenda and Europe 2020.

The study approach is depicted in the diagram below. Much emphasis was put on the engagement with experts from the business, policy and academic communities through individual interviews, a video panel discussion, an in-person scenario brainstorming meeting, and several follow-up discussions with individual experts. In addition, we also talked to a group of young professionals and technology enthusiasts, and a round table was set up to gather the input from a group of digital web entrepreneurs.

Figure A1.1: Summary of the study methodology



We conducted 41 phone call interviews with experts from the business, policy, and academic communities. The following questions were used to guide the interview conversations, and they were shared with the interviewees in advance of the call:

1. How does ICT—its development, production, and/or usage—most impact economic growth?
2. What ICT trends will, could, or should have the biggest impact on economic growth in the period up to 2017?
3. What looming or foreseeable new technologies, product, or services related to ICT could have the biggest impact on economic growth in the future?
4. How are countries and governments succeeding or failing to leverage ICT to its fullest potential in driving economic growth?
5. What role, if any, can government policy play in maximizing the potential for ICT to drive economic growth?

6. In a context of austerity and competing policy and fiscal objectives, how can one convince those who are skeptical about the role government can play in ICT?

We summarised the information from the interviews and drew up a broad list of drivers and barriers, of which we asked the experts to rank their top five. These rankings were discussed at a panel video conference with the experts and were used to draw up an initial set of scenarios that was discussed during an in-person brainstorming scenario session in Brussels. The discussions and feedback from that meeting, as well as subsequent follow-up discussions with various experts, were used to build the scenarios presented in this report. See Appendix 1 and 2 of the Background Companion Report for more details on the study approach and the list of experts we engaged with for this study.

Appendix 2: The policy context

This appendix briefly lays out some of the current scope of ICT policy in Europe, and of Europe's ICT policies in the broader context of growth policies, that formed the background for the scenario development, focusing on two policy documents: the Annual Growth Survey and the Digital Agenda for Europe.

The Annual Growth Survey

The text of the 2013 Annual Growth Survey (AGS) reflects the delicate task European and national policymakers are currently facing in their challenge to achieve a growth-friendly rebalancing and restoring of Europe's competitiveness, while being mindful of social and environmental objectives. Policymakers face pressure to implement austerity measures, but at the same time they are asked to keep investing, and even increase productive investments.

The AGS text identifies five priorities. ICT can play a role in achieving each of them. However, the current AGS text sells the potential for the role of ICT in growth short, considering only three channels: broadband, ICT and jobs/skills, and e-government. Below we highlight other channels through which ICT can play a more ambitious role with a broader scope, even within the priorities currently framed in the text of the AGS.

1) ***Pursuing differentiated, growth-friendly fiscal consolidation***

ICT has an impact on fiscal consolidation by making the economy more efficient, improving scope for the efficiency of reforms and scope for cost cutting, increasing productivity and growth, and improve efficiency and effectiveness of spending. The AGS's recommendation that *"Investments in education, research, innovation, and energy should be prioritised"* represents a dual opportunity for growth impacts from ICT as, in addition to direct effects on growth, this will also improve the impact of ICT on fiscal consolidation, and ICT can contribute to making the delivery of these objectives more cost efficient. The same points apply about the AGS recommendations health care and age-related expenditure (*"reforms of healthcare systems should be undertaken to ensure cost-effectiveness and sustainability, assessing the performance of these systems against the twin aim of a more efficient use of public resources and access to high quality healthcare"*) notably through E-health, which includes digitizing the administration, service, and delivery of service through new e-health applications. ICT can also help to *"ensure greater efficiency of tax administration"*, for example, by continuing to move declarations and other tax formalities and payments online.

2) ***Restoring normal lending to the economy***

ICT can have an impact on Europe's financial health through some of the existing recommendations, such as, for example, *"Promoting new sources of capital, including business-to-business lending, providing more possibilities to issue corporate bonds and facilitating access to venture capital."* Indeed, ICT can help identify and provide new sources of funding, including through crowd-financing. At the same time, these recommendations (access to capital, venture capital) will also help the

development and adoption of new ICT-related technologies, products and services and therefore contribute to growth.

3) **Promoting growth and competitiveness for today and tomorrow**

ICT has a direct and indirect impact here by enabling a profound restructuring of economic activities, increasing innovation and competitiveness, growth and productivity. The priorities that are listed in the text for the framework conditions can all be enhanced and improved with ICT, and at the same time they also improve the framework conditions for being able to better exploit ICT for growth. The importance of achieving the Single Market (especially for services) is highlighted in the AGS text, and this is also important for developing the ICT and ICT (enabled) services sectors. There are some specific mentions in the text of the AGS relating to both improving network industries and ICT, among others, notably:

The performance of network industries across Europe also has a critical knock-on effect on the rest of the economy and can be significantly improved by:

- *Developing the right incentives for the rapid country-wide roll-out of high-speed Internet infrastructure and the development of mobile data traffic. Frequency bands for wireless broadband need to be freed up by governments.*
- *In line with the e-commerce directive, applying harmonised rules on transparency and information requirements for businesses and consumers.*

And: "The performance of product markets would also be greatly improved if national standardisation bodies deliver the objectives set at the EU level, in particular to move from national to European-level standards. Full use should be made of the notification of technical rules for ICT products and services to facilitate their circulation in the single market."

4) **Tackling unemployment and the social consequences of the crisis**

ICT can have direct and indirect impacts on relieving the unemployment situation and other social pressures. Direct impacts can arise when ICT helps to create new sources of growth and new business opportunities. While there is currently much debate about the (lack of) employment generating capability of ICT, there are other important labour market effects to consider, such as more flexible working environments, including remote working arrangements and more flexible hours. These capabilities come with a need to enhance entrepreneurship and e-leadership skills, as well as ICT user skills more generally. Indirect effects come from boosting growth which will create more jobs. The AGS section on *Preparing for a job-rich recovery* also specifically mentions ICT: *"To tap the job potential of expanding sectors, such as the green economy, healthcare and ICT, through a future-oriented and reliable legal framework, the development of adequate skills and targeted public support."* ICT can also contribute to increasing employability more generally, and especially of young people.

5) **Modernising public administration**

ICT can have a direct impact on more efficient government, including digitizing the public sector and through e-government. The AGS text says: *"many Member States have undertaken measures to increase the efficiency of their public services as well as the transparency and quality of their public administration and judiciary. Such reforms have been particularly far-reaching in countries in financial*

distress. Examples include reorganising local and central government, the rationalisation of the public sector pay system and of the governance of state-owned enterprises, reform of public procurement processes, regular comprehensive expenditure reviews and the promotion of efficiency measures across the public sector, such as a greater use of shared services and information technology solutions.” ICT can directly and indirectly contribute to implementing these reforms and enhancing their impact.

The AGS text further mentions some additional factors where ICT can also play a role directly and/or indirectly. Indeed, *“the Commission considers the following to be particular contributors to growth:*

- *Employing sound financial management by making full use of public procurement opportunities in support of market competition and developing e-procurement capacities across the single market. Such actions not only contribute to greater efficiency and fairness but also help to combat corruption.*
- *Simplifying the regulatory framework for businesses and reducing the administrative burden and red tape, particularly at national level.*
- *Ensuring the widespread, interoperable digitalisation of public administration, aimed at fostering user-friendly procedures for service providers and recipients, as well as administrative simplification and transparency. Cross-border interoperability of online services and research centres throughout the EU is particularly important.”* (pp.12-13)

The Digital Agenda

The Digital Agenda is one of seven flagship initiatives¹⁹ launched by the Commission to help meet the objectives of "Europe 2020" and the areas it prioritised, including innovation, the digital economy, employment, youth, industrial policy, poverty, and resource efficiency.

The "Digital Agenda for Europe"²⁰ identified the key challenges preventing Information and Communication Technologies (ICT) from unleashing their full growth potential. These include a lack of investment in new fast broadband networks, the fragmentation of digital markets, the lack of ICT skills in the population, trust and security, the low level of research and innovation, as well as the lack of interoperability. The Digital Agenda for Europe (DAE) was launched in May 2010 and aimed “to help Europe's citizens and businesses to get the most out of digital technologies.” The original DAE contained 101 actions, grouped around seven priority areas: (1) A vibrant digital single market; (2) Interoperability and standards; (3) Trust and security; (4) Fast and ultra-fast Internet access; (5) Research and innovation; (6) Enhancing digital literacy, skills and inclusion; and (7) ICT-enabled benefits for EU society.

According to OECD (2012), the DAE would thus “provide a coherent legal framework for the integration of economies online, including a pan-European licensing for online rights management,

¹⁹ See http://ec.europa.eu/europe2020/europe-2020-in-a-nutshell/flagship-initiatives/index_en.htm

²⁰ See <http://ec.europa.eu/digital-agenda/digital-agenda-europe>

strengthening EU data protection rights of consumers, updating the e-Signature directive, and ensuring interoperability of secure e-authentication systems.”

While the original goals and actions remain valid, a review published on 18th December 2012 identified “Seven key areas for further efforts to stimulate the conditions to create growth and jobs in Europe:

1. Create a new and stable broadband regulatory environment
2. New public digital service infrastructures through Connecting Europe Facility loans
3. Launch Grand Coalition on Digital Skills and Jobs
4. Propose EU cyber-security strategy and Directive
5. Update EU's Copyright Framework
6. Accelerate cloud computing through public sector buying power
7. Launch new electronics industrial strategy – an ‘Airbus of Chips’.”

According to the Commission, “full implementation of this updated Digital Agenda would increase European GDP by 5%, or 1500€ per person, over the next eight years, by increasing investment in ICT, improving eSkills levels in the labour force, enabling public sector innovation, and reforming the framework conditions for the Internet economy. In terms of jobs, up to one million digital jobs risk going unfilled by 2015 without pan-European action while 1.2 million jobs could be created through infrastructure construction. This would rise to 3.8 million new jobs throughout the economy in the long term.” (DAE website, *op cit*).

European Commission Vice President Neelie Kroes, who is in charge of the Digital Agenda, is vocal and passionate about the DAE goals and the impacts they can have. On 30 May 2013 she called on the European Parliament to make a real difference for European citizens by aiming to end mobile roaming charges in the EU by the time of the next European elections in 2014. She also argued that mobile network operators should no longer be able to block telecommunications services such as Skype.²¹ Commissioner Kroes said she would “fight with her last breath” to achieve this goal,²² which will directly help European citizens and businesses. Ms Kroes argues that Europe is currently facing the unacceptable economic and social threat of “a lost generation,” with Europe’s unemployment rates and especially youth unemployment hitting new records.²³ She argues that the single market is “the Crown Jewel”, and that for the telecommunications sector, borders should be meaningless: “Europe cannot afford to have meaningless objects standing in the way to the good quality services delivered over the devices European citizens own.” These arguments are clearly underpinned by the idea of creating and using a strong digital economy to leverage the economic impacts of ICT to help Europe overcome the crisis. On 4 June 2013 Ms Kroes announced she would launch the first EU-wide strategy on net neutrality, arguing that “new European rules on net neutrality will oblige Internet service providers to be transparent about connection speed and stop blocking competing services such as Microsoft Corp's Skype”. Ms Kroes argued that the strategy would provide “a

²¹ See <http://www.euractiv.com/infosociety/commission-moves-abolish-roaming-news-528144> .

²² Watch Commissioner Kroes’ speech at; <http://www.youtube.com/watch?v=b-RDh2vf26A>

²³ The belief that high youth unemployment poses a threat to economic peace and prosperity, and represents an incredible waste of precious resources, also echoes the words of Franklin Delano Roosevelt (U.S. President, 1933-1945): “No country, however rich, can afford the waste of its human resources. Demoralisation caused by vast unemployment is our greatest extravagance. Morally, it is the greatest menace to our social order.”

safeguard for every European, on every device, on every network—a guarantee of access to the full and open Internet.” The telecom companies, on the other hand, are against additional legislation, arguing that “Investments in additional capacity and technical solutions to meet growth in Internet traffic needs should be matched with operators’ freedom to develop new economic models in the market.” (Robinson, 2013)

The Grand Coalition for Digital Jobs²⁴ was launched in March 2013 and constitutes an example of a cross-cutting initiative where multiple stakeholders, including several of the Commission’s Directorate Generals (Connect, Education, Employment and Enterprise) work together towards a common goal, namely to “tackle the lack of ICT skills and the several hundred of thousands of unfilled ICT-related vacancies.” More initiatives to work together on common goals and strategies, involving more and different combinations of Directorate Generals are needed to be able to address the struggles Europe is currently facing in a comprehensive and coherent manner. Vice-President and Commissioner Kroes was one of the main initial driving forces behind this initiative, which brought high-level representatives together for the launch. Indeed, Ms Kroes was joined by President José Manuel Barroso, Vice-President Antonio Tajani, Commissioners László Andor and Androula Vassiliou, as well as Richard Bruton, the Irish Minister for Jobs, Enterprise and Innovation. This high-level participation at the initiative’s launch illustrates the sense of urgency attached to this issue, as well as a willingness to work together and with multiple stakeholders.

Some of the interactions between different European initiatives and stakeholders are illustrated in Figure A2.1.

²⁴ See <http://ec.europa.eu/digital-agenda/en/grand-coalition-digital-jobs-0> .

Figure A2.1: The Grand Coalition for Digital Jobs



Source: http://ec.europa.eu/commission_2010-2014/kroes/en/blog/coalition-digital-jobs .

Appendix 3: Using scenarios

3.1 A quick introduction to scenarios

What are scenarios, and when to use them?

In a relatively stable economic environment, forecasting based on extrapolation of past trends can be relatively accurate, in particular in the short-term term. However, interactions between (often unexpected) economic, technological, demographic, social, political and regulatory change can disrupt the economic and business environment. These disruptions can create significant uncertainties, and make forecasting based on extrapolation increasingly inaccurate, in particular in the medium- and longer-term. To capture the uncertainties prevailing under those conditions, and understand the implications of various policy actions, it is necessary to think in terms of alternative futures rather than one future.

Scenarios are future environments with the following characteristics: they are plausible (it might happen), mutually exclusive (they are alternatives without overlap), and internally coherent (events flow causally from each other). They are descriptions of alternative and plausible future environments which an organisation or policy unit may face in the medium- and longer- term, and are stretched to make their implications clear. To go beyond forecasting and extrapolation, scenario planning distinguishes between trends that are fairly certain to continue, called “predetermined”, and trends that involve significant uncertainties, called “uncertainties”. The longer the planning horizon, the fewer predetermined and the more uncertainties there tend to be. Scenario planning treats uncertainties as an inherent part of the planning process that cannot be reduced to a single forecast.²⁵

The scenario planning process

A typical scenario planning process starts with framing the guiding question, assessing current policy or strategy, and establishing a meaningful time horizon. It then goes through the following steps:

1. Assess uncertainties

- Identify trends and underlying drivers and the range they can operate in within the planning horizon.
- Distinguish between predetermined and uncertainties.
- Determine the range of plausible outcomes of the uncertainties and their impact on the environment.

²⁵ The conceptual framework for The Conference Board’s scenario methodology draws on Wack (1985a, b), Overmeer (1989, 1995, 1996), van der Heijden (1996), and van der Heijden *et al.* (2002), as well as The Conference Board framework for developing a yearly Global Outlook, based on its modeling of productivity, growth and innovation (see <http://www.conference-board.org/data/globaloutlook.cfm> and

- Decide on the set of key uncertainties.
- Assess uncertainties around potential constraints in the environment, their implications and their impact on the development of trends.

2. Craft scenarios

- Stretch the ranges of uncertainties to explore plausible futures and investigate the likely impacts.
- Focus on those key uncertainties that combine *high uncertainty and high impact*.
- Sketch three to five plausible environments the decision-making entity may face in the future, based on a combination of two or three key uncertainties.²⁶
- Develop each scenario into *a plausible, coherent and compelling description of a future state*.

3. Test the current policy, or strategy, against scenarios

- How will the entity fare in each scenario?
- What are the implications of each scenario and what will be the impact on the entity?
- How *robust* is the strategy / policy across scenarios?

3.2 Using scenario analysis

While the sequence of steps is straightforward, there are number of issues when actually using scenarios that require further clarification.

First, scenarios are about assessing trends and uncertainties in the external environment over which the decision-maker has little influence. Hence the decision-maker cannot pick and choose a scenario but rather has to accept that a particular external environment is plausible and assess how the entity may thrive in it.

Second, it is very common for decision-makers steeped in strategy or policy to view scenarios as strategy or policy alternatives. However, scenarios are not about policy itself but about the external environment creating a virtual test bed (the representation of that environment) to assess the effectiveness of policies in the future. The policymaking or strategic planning process has to be separated from determining the environmental trends, and needs to be set aside until the work on the scenarios has been sufficiently developed.

<http://www.conference-board.org/data/productivity.cfm>).

²⁶ It is important to note that each of these environments *could* occur. It is not about ‘picking’ a scenario that is considered most likely or most favourable, it is about testing how a policy or strategy would fare under each possible outcome.

Third, sketching environments over which government policy-makers do not have control or influence can be challenging. However, global economic development and technology are examples of forces of great impact over which a local or regional government has relatively little control and influence and which have significant uncertainties attached to them over the medium- and longer-term.²⁷

Fourth, scenario planning is not about precisely pinpointing the future but about accurately sketching plausible futures against which policy is tested through a strategic dialogue so that decision-makers have “memories of the future”: sufficiently developed mental models which enable a decision-making group to quickly size up developments, and act in real time. Sometimes it suffices to develop “starter scenarios”, broadly outlining the key drivers, uncertainties and barrier to trigger a strategic or policy dialogue. At other times more elaborate descriptions of scenarios are needed. Sometimes scenarios address the high-level policy framing, at other times more specific investment proposals. For the purpose of this report, scenarios will be used to reframe a high-level policy narrative.

Fifth, for scenarios to be effective, i.e. to challenge the policymaker’s thinking, they may need to be stretched. For instance, if a set of forces pushed a variable to two times the current level, one should ask “what if this variable were four times the current level?”²⁸ At times, scenarios describe what was theretofore unthinkable.²⁹ Hence the scenarios set forth below will deliberately push boundaries and will be described in succinct and memorable terms, capturing the essence of an alternative future. In the end a set of internally coherent, and mutually exclusive, scenarios force policymakers to address at times improbable but plausible futures that could have a high impact if they were to materialise.

Sixth, there is critical difference between policies which policymakers, politicians and constituencies refer to when they describe what they are trying to do, called “the espoused policy”, and the policy that can be inferred from actual behaviour, called “the policy-in-use”. Juxtaposition of these two policies, and the distance between them, is often a critical starting point for policy analysis.

About the authors

²⁷ In any scenario analysis, there are two key considerations in selecting a scenario framework: (1) the dominant forces around which scenarios are designed should be orthogonal or independent of each other; (2) the forces should be beyond the control of the strategist or policymaker (exogenous vs. endogenous variables). Clearly in the case of a government entity such as *the European Commission*, the question can be raised what is exogenous and what is endogenous. This analysis takes the position that the Commission is an executive branch of the EU, heavily dependent on the positions taken by individual countries, and the collective outcome of their decision making and implementation efforts. Hence the fragmentation of markets in the EU is seen an exogenous variable, not entirely outside the influence of the Commission, but certainly not an endogenous variable like a member government which can decide on local regulation and implement it in practice.

²⁸ Andy Grove, former chairman of the Board of Intel, famously asked himself “what if a particularly critical factor becomes 10 times as big—the 10X factor?” Grove (1996).

²⁹ The origins of scenario thinking come from Herman Kahn, an influential policy analyst at the Rand Corporation in the 1960s, who challenged conventional thinking about the outcomes of nuclear war by “thinking the unthinkable”.

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Bart van Ark is executive vice president and chief economist of The Conference Board. He leads a team of almost two dozen economists in New York, Brussels and Beijing, who produce a range of widely watched economic indicators and growth forecasts, as well as in-depth global economic research. A Dutch national, he is the first non-U.S. chief economist in the 97-year history of The Conference Board.

Bart van Ark is an expert in international comparative studies of economic performance, productivity, and innovation. He continues to steward the longstanding research collaboration of The Conference Board with the University of Groningen in the Netherlands; a professor there since 2000, he holds the university's chair in Economic Development, Technological Change and Growth.

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Bart van Ark has been extensively published in national and international journals, and is frequently featured in major international business media, including Bloomberg, CNBC, the Financial Times and The Wall Street Journal.



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