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Europe's Digital Competitiveness Report

Volume 1: i2010 — Annual Information Society Report 2009
Benchmarking i2010: Trends and main achievements

{COM(2009) 390}

EXECUTIVE SUMMARY

The i2010 initiative is successfully meeting its challenges and delivering on its promises. Take up of ICT by European enterprises and citizens has risen substantially over the past few years and the rapid spread of broadband is stimulating a more intensive use of advanced internet services. The quality of access has improved and has become cheaper, while use has intensified, in particular through the advancement of user-created content and social networks. More and more people are going online, including those belonging to more disadvantaged social groups. Use is becoming more interactive and sophisticated and the internet has become a popular tool for communication and entertainment services. This report analyses developments in Europe's information society and benchmarks Member States' progress in implementing the i2010 initiative. It also looks at developments in the ICT sector in the face of the economic crisis, with a focus on the impact it is having on R&D investment.

The i2010 approach has delivered important results on the supply side of information society developments, in particular in relation to broadband communications (Chapter 1). With 114 million subscribers, the EU is the largest world market for fixed broadband access with fast growth in penetration rates. Half of European households and more than 80% of European businesses have a fixed broadband connection, three quarters of them with average download speeds above 2 Mega Bit per second (MB/s). Broadband internet is available to 93% of the EU25 population, up from 87% in 2005. A number of coverage challenges remain, in a reduced number of Member States and in some rural areas. The EU recovery package, highlighting the role of broadband investments as smart spending to ensure the long-term sustainability of the upcoming recovery, reiterated the importance of ensuring broadband for all in the near term. Several initiatives have been announced by Member States with the objectives of complete coverage and infrastructure upgrades (Chapter 7).

The rapid spread of faster and cheaper internet access has boosted internet use. In 2008, 56% of EU citizens were using the internet on a regular basis, up from 43% in 2005, and nowadays three quarters of them do so every day. This goes in parallel with a rapid change in habits and in the adoption of new ways of communicating and sharing information (Chapters 4 and 5). In 2008, 35% of Europeans declared using the Internet for advanced communication services, i.e. those services that go beyond the one-to-one communication systems and make possible the distribution and sharing of online information, content and applications. Although these services do not yet replace traditional forms of communication, they are getting increasingly widespread. Their adoption and use is very much linked to age: "Digital natives", i.e. people between 16 and 34 years old, and especially those aged 16 to 24, stand out as the most regular, intensive users. 73% of them have used the internet in the last three months for advanced communication services, more than twice as much as the population average, and they exceed other categories of the population in the use of the internet also for entertainment purposes. Digital natives are veritable users of an interactive borderless space in which content and services are made available for active users to download, exchange, create and re-create, distribute, share and re-use. This is confirmed by the rise in social networks and in user-created content in the past two years. The continued widening of the internet base and its increasing active usage strongly point to the rising social and economic importance of the internet and ICT (Chapter 4) and to the significance of the digital revolution challenges ahead, such as IPR and single market issues. The continued spread of these technologies will constitute both an important starting point for a productivity-led and sustainable recovery and a promise for the further development of the sector.

Continued increases in usage however have not yet compensated for certain take-up gaps. While broadband is available to more than 90% of EU population, effective take-up attains 50% of households. The main reasons why households do not have an internet/broadband connection relate to a perceived lack of need, costs and skills. These barriers are greater for those on lower incomes. Most importantly, one third of European citizens have never used the internet. Large gaps in internet usage are observed both across countries and across socio-economic groups. Digital inclusion is largely driven by age and education/income levels: In most countries, the largest disparities in internet use relate to groups aged 65-74, the economically inactive and the low educated (Chapter 2). Meanwhile, a second digital divide, based on quality of use, is emerging. These results suggest the importance of demand-side policies which focus on stimulating the use of the internet, reducing psychological and skills barriers, increasing awareness on its possible benefits, facilitating access for the old and the disabled, reducing financial barriers and encouraging the acquisition of skills and life-long learning. Although most of these disparities are due to disappear naturally with the ageing of the "digital natives", the introduction of new technologies and devices may give rise to new disparities with similar characteristics.

The use and the development of ICT are also increasingly embedded in production processes throughout the economy. Policies aiming at fostering ICT take-up by businesses should remain mainstream. While take-up of efficiency enhancing technologies by large enterprises is widespread, SMEs are often lagging behind. Use of key business applications such as RFID is increasingly extensive for inventory management systems but also for the labelling of single product items. Innovative wireless technologies will play a more and more important role in the delivery of productivity gains for the European economy. Policies must ensure that European businesses successfully tap into the economic benefits these technologies can offer (Chapter 6).

The ICT sector is highly innovative and is being impacted by the economic crisis, albeit less than other sectors of the economy. While the downturn is expected to have a significant impact on all sectors, manufacturing segments are being hit more strongly than service segments. The telecom equipment industry, which is Europe's traditional strength, and semiconductors are suffering more than other ICT segments. Service segments (telecoms and software) are tempering the crisis thanks to sustained demand for traditional services, while searching for new sources of margins in otherwise mature markets. The internet industry, on the other hand, is weathering the storm better than any other part of the sector (Chapter 8).

The ICT sector is the biggest R&D investing industrial sector and provides other industries with productivity enhancing technologies. Firm-level analysis, based on companies' annual and quarterly reports up to the first quarter of 2009, indicates that the world economic crisis is already impacting on R&D levels. Reduced cash flows and credit constraints have resulted in R&D investment declining pro-cyclically (Chapter 9). Given the economic deterioration and the key role played by ICT in stimulating economic growth, policies that stimulate smart investment in ICT are crucial to ensure a sustainable long-term recovery.

In the context of i2010 ICT policies have been mainstreamed and have already produced tangible outcomes in terms of take-up by both citizens and enterprises (Chapter 7). In the future, national ICT policies need to build on the achievements of the past, both at a national level as well as by learning from best practices internationally. However, they also need to tackle ongoing problem areas as well as venture into new territory. The digital revolution is a prime driver of economic growth and social change. As such, ICT is at the very heart of the Lisbon strategy and essential to its success. In times of economic and financial crisis, it is

important that this key role of ICT is not forgotten. Investments in ICT are 'smart' investments; helping to create and maintain jobs and growth now, to emerge from the crisis stronger and more quickly, while at the same time creating the basis for sustainable growth and jobs in the future. If we are serious about the Lisbon ambitions we must invest (as least) as much in the information highways of the future – a smart grid, broadband for all and better health care – as we do in more traditional infrastructure.

1. THE BROADBAND ECONOMY

Broadband is the basic infrastructure of modern knowledge economies and has been central to EU information society policy both in eEurope 2005 and i2010. One of i2010's main objectives was the development of a Single European Information Space offering affordable and secure high-bandwidth communications. Fast broadband access was then considered one of the main challenges posed by digital convergence, along with the need to promote new, rich online content, increase interoperability between platforms and devices and raise trust amongst investors and consumers through enhanced security.

Another objective of i2010 was to stimulate an inclusive Information Society that provides high quality public services and promotes quality of life. Digital convergence offers new opportunities but also brings new challenges, including the risk of a widening digital divide. i2010 aimed at expanding the geographical coverage of broadband to under-served areas. 90% of broadband coverage was one of the main objectives agreed by ministers in Riga[1] in 2006 and was already achieved by the EU25 in 2007. "Broadband for all" has been the goal of the "Bridging the broadband gap" initiative[2] as well as of the recent EU Recovery package[3], which earmarks around 1 billion euros for the development of broadband communications in rural areas. Given the differences in terms of broadband take-up and availability between the EU Member States and, within countries, between urban and rural areas, i2010 insisted on the importance of making sure that remote and less populated regions were not left behind.

This chapter analyses the main developments in broadband in recent years, focussing on performance indicators such as penetration, coverage, speeds and prices. It concludes with an update of the Broadband Performance Index, assessing the main strengths and barriers of EU Member States to continue progressing in the broadband economy.

1.1. Penetration of fixed broadband access between 2003 and 2009: Reducing the broadband gap

Since the launch of i2010 in 2005 the growth of fixed broadband connectivity in the EU has been steady, with high year-on-year growth rates that in some years equalled more than 20 million new broadband lines. This has brought about an increase in the number of households connected to the internet between 2004 and 2008, from 41 to 60%, of which 80% now have a broadband connection. In 2004, only 33% of internet households had a broadband connection. The percentage of enterprises connected to broadband has increased from 46.5% in 2004 to 81% in 2008.

The EU fixed broadband penetration rate (number of fixed broadband lines per 100 inhabitants, including both households' and enterprises' take up) as of 1 January 2008 was

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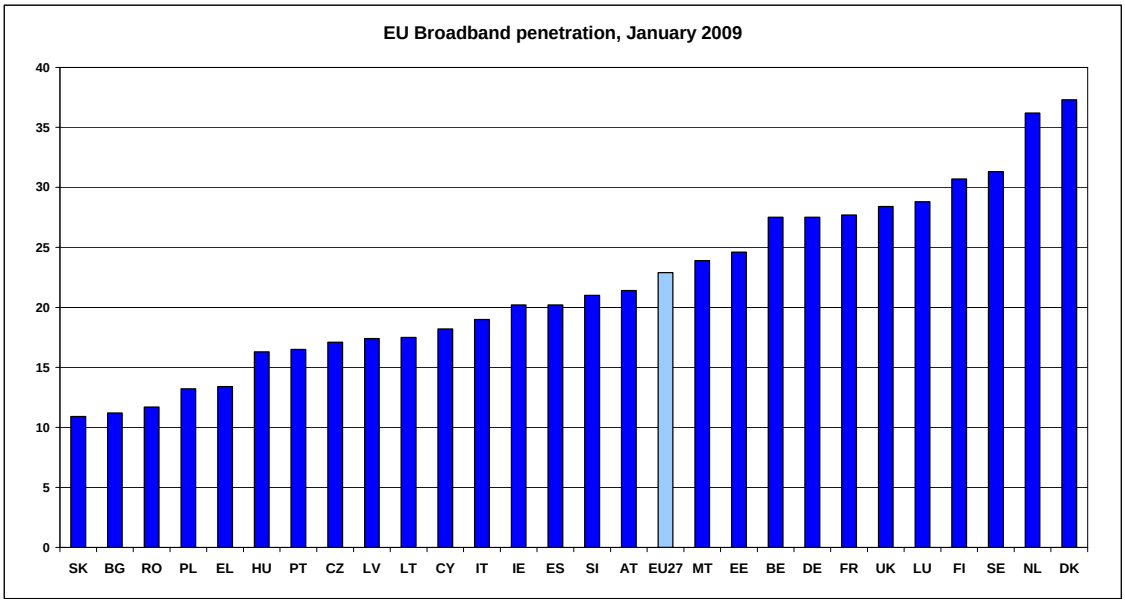
[1] Proceedings of the ministerial and the Riga declaration are available at http://ec.europa.eu/information_society/activities/einclusion/events/riga_2006/index_en.htm http://ec.europa.eu/information_society/eeurope/i2010/digital_divide/index_en.htm#Broadband_Gap_Policy

[2] More information can be found at http://ec.europa.eu/information_society/eeurope/i2010/digital_divide/index_en.htm#Broadband_Gap_Policy

[3] More information is available at http://europa.eu/rapid/pressReleasesAction.do?reference=DOC/09/1&format=HTML&aged=0&language=EN&guiLanguage=en

23% (Figure 1), up from 6.1% in 2004. Alongside fixed broadband, wireless connections have started to gain importance in the last couple of years as an alternative way for EU consumers to benefit from this service, even though in general mobile technologies currently allow transmission speeds below those of wired technologies[4].

Figure 1



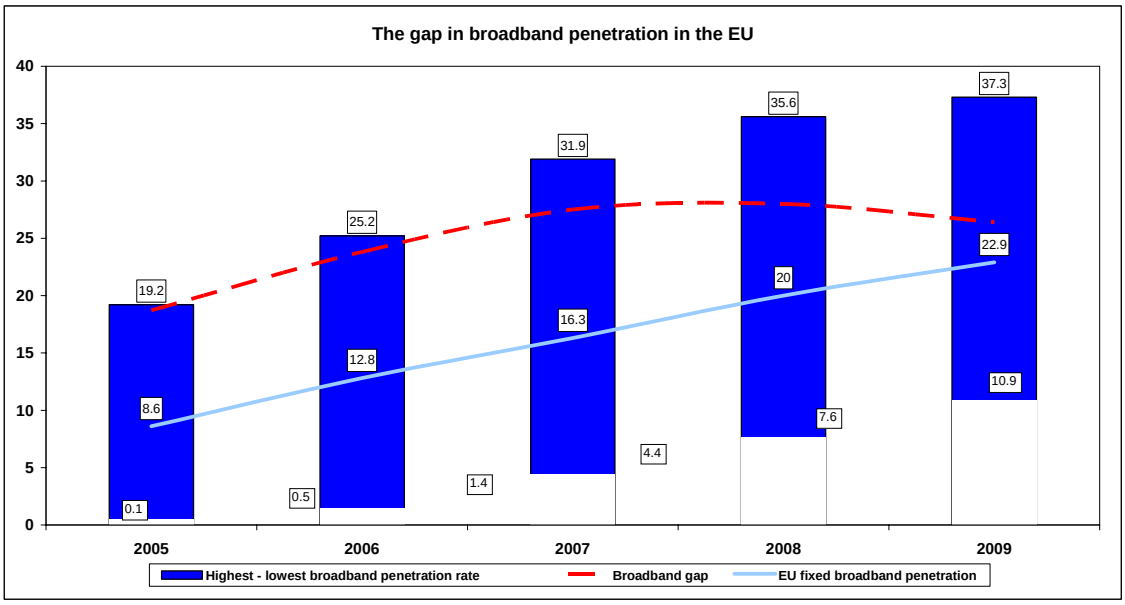
Source: Communication Committee (CoCom)

Take-up of broadband has been however uneven, resulting in significant fragmentation across Member States. In 2004 there were around 13.5 broadband lines per 100 citizens in Denmark and almost zero in Greece. The gap between the maximum and the minimum penetration rates increased in the aftermath of the 2004 enlargement of the EU to reach its peak at the end of 2007, when the difference between the countries with the highest and the lowest penetration rates attained 28 percentage points (p.p.). One of the main developments in 2008 was a change in this trend, as the gap between the highest and lowest figure reduced (albeit slightly)to 26.4 p.p. in January 2009 (Figure 2) and the dispersion of these figures for the individual countries also came down[5].

4 Reliable and meaningful data on effective wireless broadband lines are however not fully available and the Commission is working to improve this side of the i2010 benchmarking framework.

5 Dispersion of values, which increased in 2007 with the entry of BG and RO, also decreased significantly in 2008.

Figure 2



Source: Communications Committee (CoCom)

The reduction in the gap is the result of two trends: On the one hand, growth in countries with the highest penetration rates has started to level off, as there is less room for organic growth in these countries. In 2008 growth in Sweden was nearly flat and limited to around two percentage points in the Netherlands and Denmark. On the other hand, countries with fewer broadband lines have experienced significant growth rates over the last year – 7 percentage points in Malta, and more than 4 in Poland, Cyprus, Greece or Lithuania. Yet this positive development did not suffice to curve the decline in the overall number of broadband lines net additions, which was of 14 millions in 2008, as against 19 million during 2007 and 21 million the year before. The current economic slowdown may put a further brake to the growth in broadband take up.

Finally, the use of a mobile phone via UMTS (3G) to access the Internet is also increasing. Usage is high both in countries with high levels of fixed broadband, such as Sweden (9.5% of individuals) and Denmark (5.9%), but also in countries with low broadband take-up, like the Czech Republic and Slovakia, where respectively 5.3 and 4.8% of individuals used the 3G phone to connect to the Internet[6].

1.2. Broadband coverage: Towards broadband for all

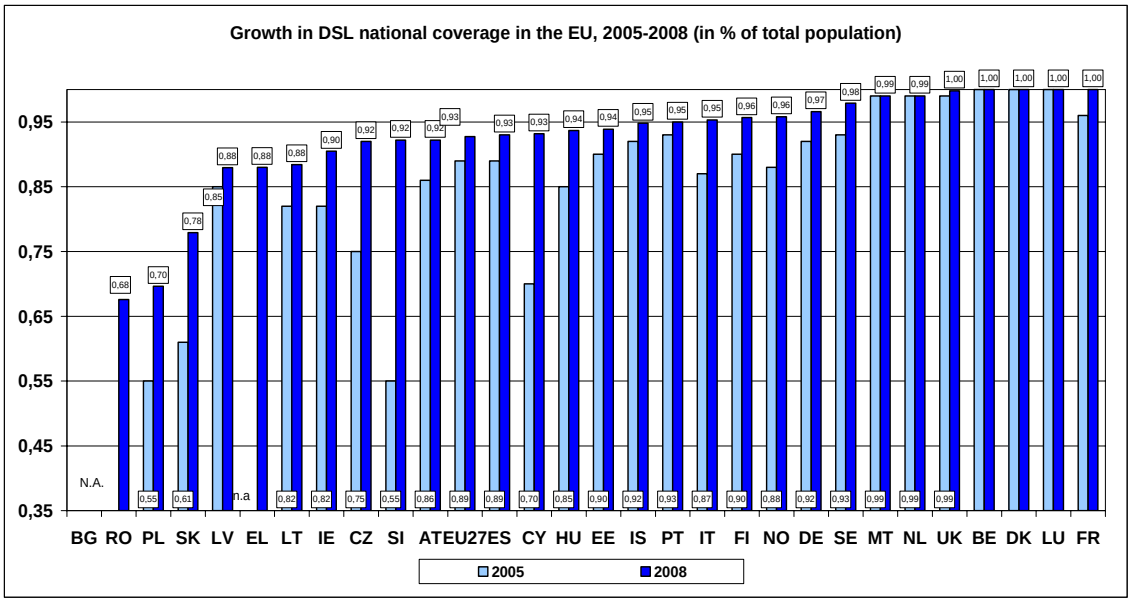
Avoiding a new digital divide - broadband have and have-nots - is another important objective of i2010. Broadband allows individuals and organisations to communicate and access services regardless of their geographical location. It enables businesses to communicate with clients and suppliers and limits business migration to urban areas. Broadband allows households to access advanced e-government, e-health and e-learning services, improving their quality of life and their participation into the social and democratic life. By its own nature, broadband bridges distances and is particularly beneficial to the development and attractiveness of remote and rural areas. Nevertheless, broadband roll-out has been concentrating in more populated areas because of high investment costs due to distance and population scarcity.

6 Source: Eurostat

Broadband access can be provided through different technologies, either wireline or wireless. As the footprint of the traditional telephone network, xDSL is the mostly deployed and used access technology in Europe. The second most common fixed access technology is cable modem, although limited to a subset of Member States and mainly deployed in urban areas. Coverage of DSL and cable modem networks well summarises broadband coverage. As these two networks tend to overlap, DSL coverage has been used as proxy measurement for broadband coverage in Europe. Due to the orography and distribution of population in some countries, 100% coverage of wired networks will probably never be reached. Currently, only smaller and flat countries like Luxembourg, Denmark, the Netherlands and Belgium exhibit 100% rates of rural coverage. Several countries do not seem to manage increasing wired coverage beyond 90% of rural population.

The average national coverage of DSL networks in the EU has increased from 87% of population in 2005 to 93% in 2007. Important differences between countries in 2005 have been levelled off over time (Figure 3), increasing the average coverage rate. Countries with lower coverage rates have made significant efforts to improve their standing: Greece increased coverage from 0 to 86% in the relevant period. Significant progress has also been made by Slovenia, Cyprus, Poland and Slovakia.

Figure 3



Source: IDATE[7]

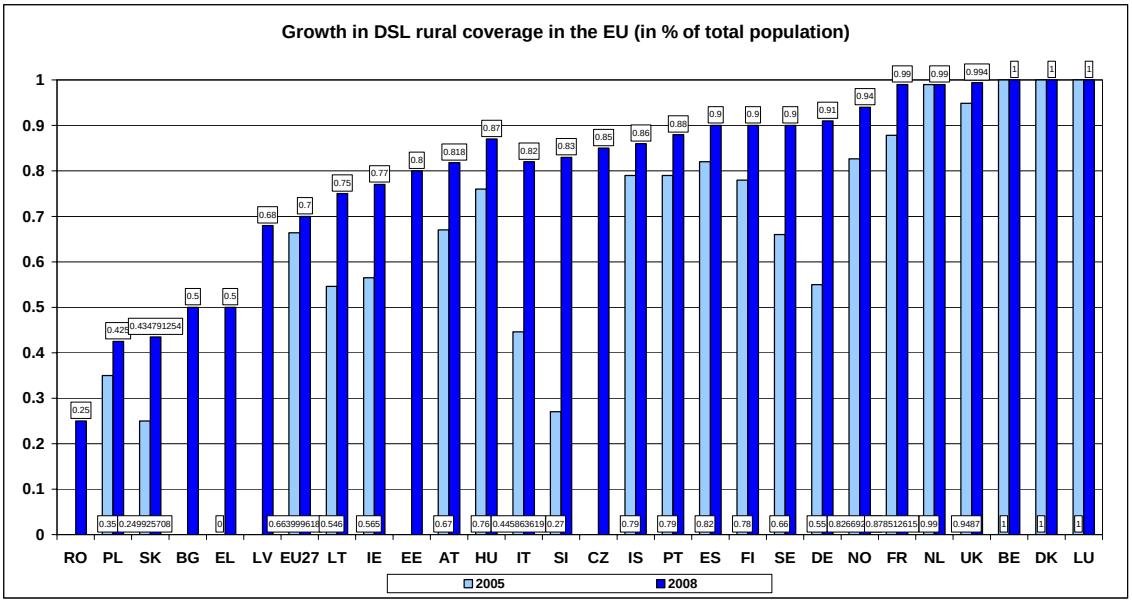
Extension of broadband coverage in rural areas is more uneven and can still be considered a policy challenge in several countries where broadband access is available to less than 50% of rural population. Progress at EU level has been slower than for national coverage: the EU average rate has only increased from 66 to 70% (Figure 4). Slovenia, Italy, Germany and Sweden concentrated their efforts in reducing the gap between national and urban areas with very positive results. Also Austria, Estonia and Ireland made further progress and in these countries the role of mobile technologies in filling the remaining gap seems to have been decisive. Further effort however is needed in Greece, Bulgaria, Slovakia, Poland and

[7] Study on *Broadband coverage in Europe: Survey 2009* by IDATE Consulting and Research, forthcoming. Previous reports are available at http://ec.europa.eu/information_society/eeurope/i2010/benchmarking/index_en.htm

Romania, where between 50 and 75% of the rural population cannot yet subscribe to broadband.

Over the last years, advanced fixed technologies based on optical fibre but especially wireless technologies such as UMTS (3G), WiFi and WiMax and to a certain extent satellite have made their inroads into the broadband market. Wireless access appears a more suitable technology to provide broadband local access in isolated and less populated areas and many national broadband policies have promoted their use in order to ensure universal availability. Fully comparable data on wireless broadband coverage are not yet available. The Commission has launched a study to gather further information on the actual coverage of wireless broadband networks as this form of access is becoming increasingly common in some Member States.

Figure 4



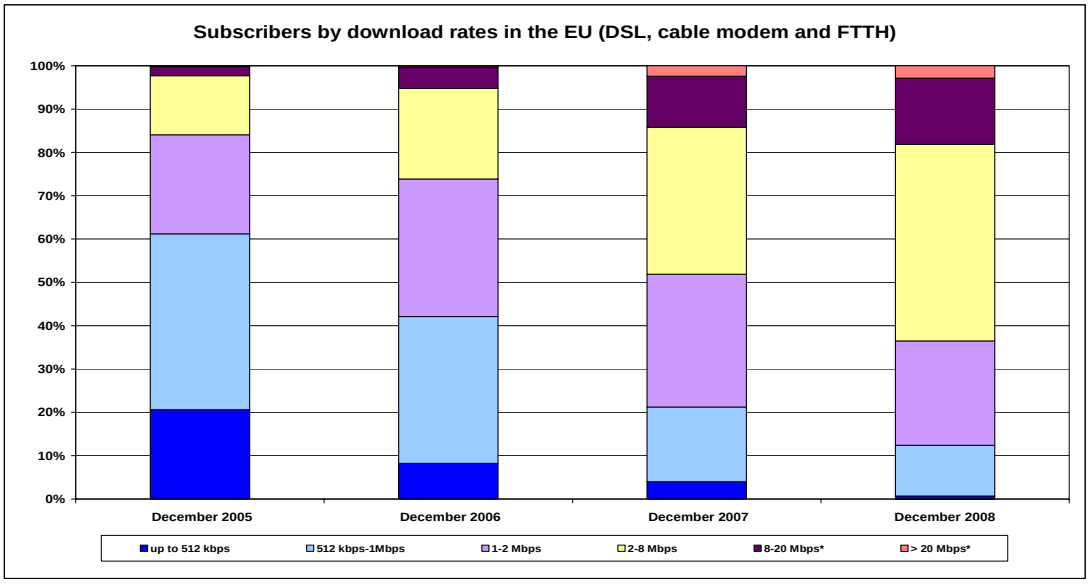
Source: IDATE

1.3. Increased competition brings higher speeds at lower prices

The average download speed of broadband subscriptions in the EU has greatly improved between 2004 and 2008. At the end of 2008 three quarters of EU broadband subscriptions are estimated to be associated to nominal speeds above 2 MB/s, a three fold increase relative to 2005. This increase in speed has driven (and has been driven by) growth in the use of new services which has enabled the rise of the Web 2.0. Speeds are expected to continue increasing as high definition video and IPTV become widely used, fast downloading and uploading requirements increase and shared internet use within households becomes more widespread.

In 2008 operators in many Member States continued to make plans to deploy very fast broadband connections based on fibre technologies. The extent to which the current economic downturn will impact on these plans is not clear yet. But Europe is still lagging behind the world leaders in high speed broadband especially as regards very fast connections. At the end of 2008 less than 5% of all fixed connections provided speeds in excess of 30 Mb/s (Figure 5).

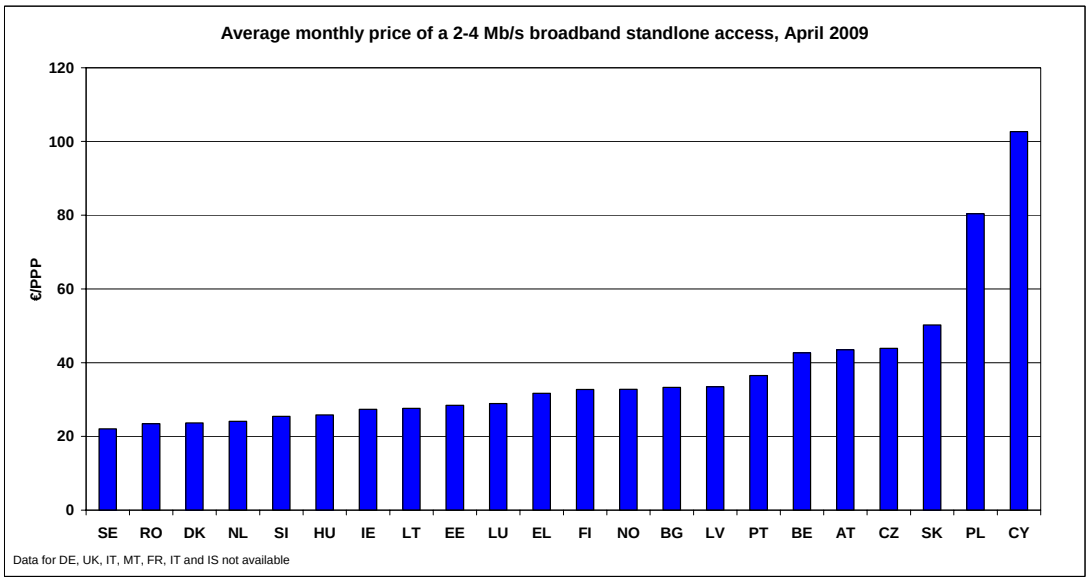
Figure 5



Source: IDATE. 2008 data refer to 8-30 Mbps and >30 Mbps access lines

Improvements in average speeds have occurred in parallel with a reduction in prices for broadband products. Although retail broadband price comparisons are complex tasks because product characteristics, usage conditions and quality of service greatly differ across offers, data indicate that the average price for a broadband standalone service with download speeds between 2 and 4 MB/s has decreased from an average of around €/PPP 52 per month in April 2007 to about €/PPP 37 in April 2008 and €/PPP 29 in April 2009. Despite this reduction and a general trend towards providing more affordable prices, significant differences between countries still exist and the price for an equivalent product can be up to five times higher in the most expensive countries.

Figure 6



Source: Van Dijk[8]

[8] Study on *Broadband Internet Access Costs, 1st semester 2009*, by Van Dijk Management Consultants, forthcoming. Previous reports on broadband access costs are available at http://ec.europa.eu/information_society/eeurope/i2010/benchmarking/index_en.htm

These positive trends on speeds and prices are the outcome of a regulatory framework for electronic communication services focused on opening up competition, encouraging lower prices and investment and greater choice for consumers. The regulatory framework has imposed obligations on the former telecom national monopolies in order to facilitate the entry in the market of new providers of electronic communication services so as to create competitive dynamics. The market share of the new entrants has steadily grown over the last years and new operators now sell 54% of all broadband lines, up from 44% in 2004. However, this trend came to an end in 2008, a year in which former incumbent operators on average just lost 0.4% of the market share and actually increased their share in a number of countries (Belgium, Bulgaria, Germany, Spain, Ireland, Latvia, Austria, Portugal, Romania and Sweden).

But the relative weight of alternative operators is not the only indicator of a healthy competitive broadband market. Competition has resulted in significant level of investment in the broadband networks, both by incumbent and new operators. It has also brought about innovation and delivered more choice for consumers. New offers have emerged: at the end of 2007, about a third of European households[9] subscribed to two or more communication services as part of a bundle.

Data in this chapter refer to fixed broadband access exclusively. In 2008 use of mobile broadband for value added services have started to emerge, both in countries where fixed broadband penetration and use is very high as well as in some countries where the reach of fixed broadband networks is more limited and mobile broadband is used as a replacement. The Commission is working to gather data on mobile broadband and will report on this segment in future benchmarking reports.

1.4. Indexing Broadband Performance in 2009

Under the Mid Term Review of the i2010 strategy, the Commission announced the development of a Broadband Performance Index (BPI), which was presented in September 2008[10], following consultation with Member States. The BPI is used to measure the relative performance of countries in the wide broadband economy; to identify relative weaknesses and strengths of individual countries to fine-tune policy making; and to better understand the relative propensity of countries to progress in the broadband economy. It is structured along six dimensions (broadband rural coverage, degree of competition, broadband speeds, broadband prices, take up of advanced services and socio-economic context) that are selected on the basis of their relevance to the objective of the index.

This indicator can help the EU and its Member States to better identify strengths and weaknesses of their broadband economies. Recognition of barriers to further developments for example facilitates the design of policy responses. By summarising the various dimensions that characterise broadband economies, the BPI complements the information provided by penetration rates.

Given the changing nature of the broadband economy, including changes in consumption patterns, availability of offers and technological take up, the composition of the BPI has been

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9 E-Communications Household Survey, June 2008, available at http://ec.europa.eu/information_society/policy/ecomm/doc/library/ext_studies/household_07/eb68_2infsoecomm_full.pdf

10 http://ec.europa.eu/information_society/eeurope/i2010/bpi/index_en.htm

slightly modified relative to 2008 (see the annex at the end of this section). Preference at this stage has been given to a better fine tuning of the index than to comparisons over time. The Commission and Member States have also agreed to revise the BPI in future to include data on the effective speed of broadband (rather than the nominal speed) as well as on mobile broadband.

Comparing 2009 results with the penetration rates (Figures 7 and 1 respectively), results show that countries such as France and the UK, with lower broadband penetration rates than Luxembourg or Finland, are closer to the best performing countries in the BPI ranking due to more positive results in competition, prices or speeds indicators. The BPI also highlights the very important role played by the socio-economic context, which includes indicators such as internet skills, penetration of PCs and effective use of 3G, which drives for example broadband performance in the Nordic countries.

The results of the BPI demonstrate, with just a few exceptions, that countries with the highest ranking have a balanced combination of the different factors. Both Sweden and the Netherlands have high levels of broadband coverage and competition, high average speeds and relatively cheap prices, with high levels of take-up of services and of the socio-economic context. Denmark, in third place, shares very similar features, but is lagging behind the others because of competition. These three countries are also those with the highest broadband penetration rates.

The second group of countries is characterised by having good scores in all dimensions except for one or two. For instance prices are relatively high in Belgium and Norway and average speeds are not particularly performing in the UK and Norway, while the socio-economic context is putting a brake on the overall ranking of France. But these four countries are better placed in the BPI ranking than in terms of broadband penetration rates.

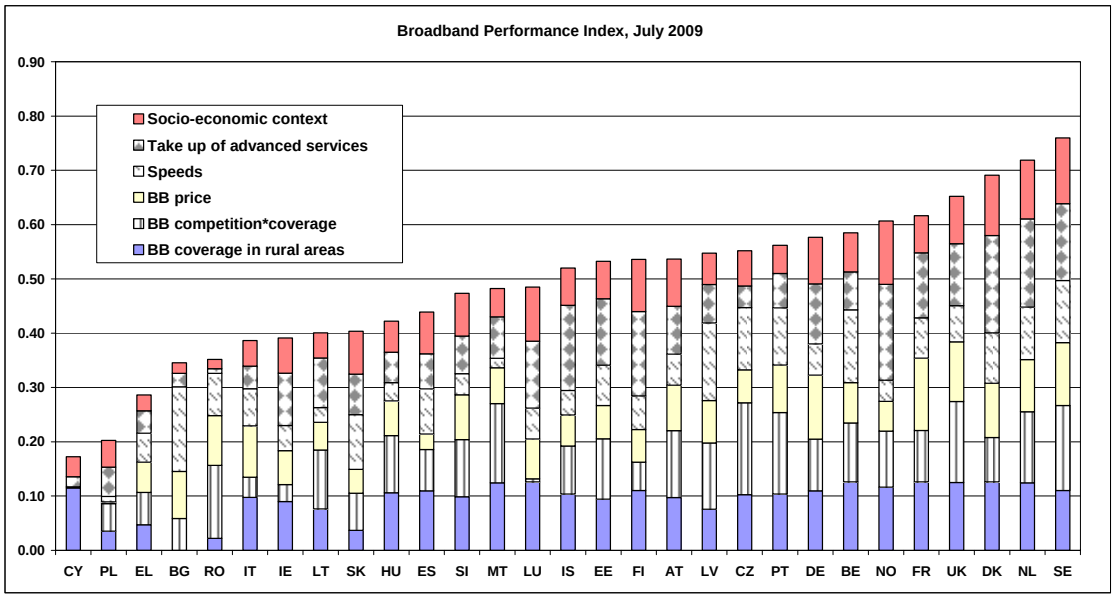
In countries with lower scores there are imbalances in the performance of different indicators. Finland and Luxembourg, for instance, which are the countries with the fourth and fifth highest broadband penetration rates respectively, score very well in the take-up of services and in the socio-economic context, but have expensive prices and limited competition outcomes. In Austria and Germany speeds and take up of services do not appear in line with the good performance of other dimensions.

Conversely, the Czech Republic, Latvia and Portugalare characterised by good competition levels and average speeds but have a medium socio-economic context and take-up of services. These three countries have similar broadband penetration levels at around 17% of their population. Very low ranking in particular dimensions (competition and prices in Spain or speed in Malta and Slovenia) combined with medium socio-economic context and take-up of services brings these countries to their lower position. Other countries such as Hungary, Ireland, Italy or Lithuania have low scores in the socio-economic context as well, coupled with either high broadband prices or low speeds, low competition levels or low take-up of services.

Poland, Greece, Bulgaria and Romania are still severely affected by infrastructure problems and low coverage rates, with particularly low levels of competition (except in Romania) and high prices in Poland and Greece. Romania and Bulgaria, where brand new infrastructure is being deployed in the absence of traditional telephone networks, display good scores in speed and prices. Cyprus has the lowest scores in competition levels, price and speed. The ranking

of all these countries, which have the lowest broadband penetration levels, is also negatively affected by low rates in the adoption of advanced services and by the socio-economic context.

Figure 7



Source: Commission Services

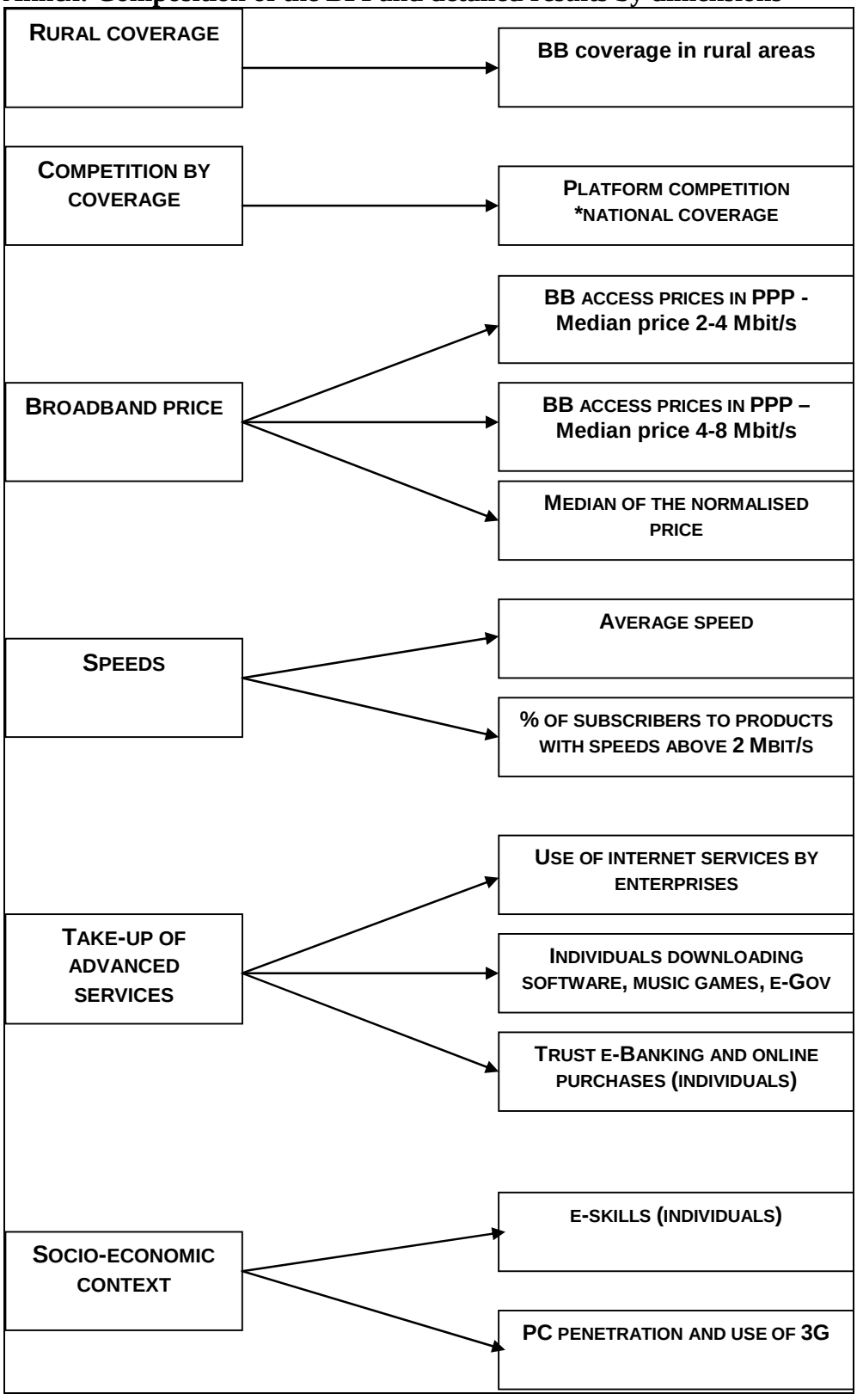
1.5. Conclusions

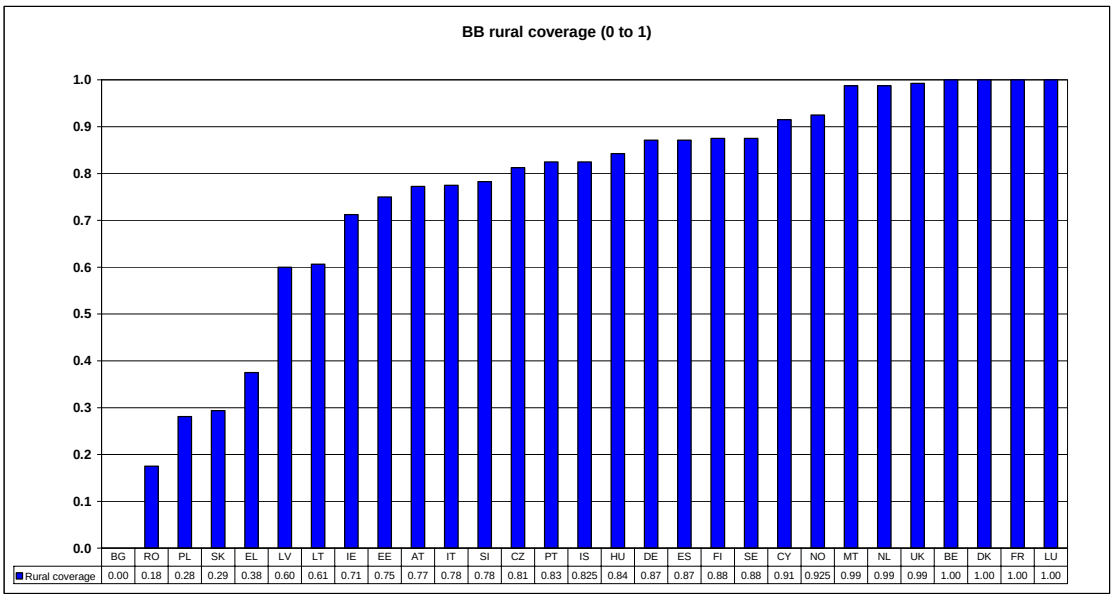
Between 2005 and 2009, the European Union has made huge progress in progressing in the broadband economy. With 114 million subscribers, the EU is the largest world market and shows fast growth in penetration rates. Half of European households and more than 80% of European businesses have a fixed broadband connection, three quarters of them with average download speeds above 2 MB/s. Sector regulation has stimulated more competition, reducing prices and increasing average speeds of broadband connections. Broadband internet is available to 93% of the EU25 population, up from 87% in 2005.

Nevertheless, coverage challenges remain, in a reduced number of Member States and in some rural areas. To support the European economic recovery and close the gaps in European broadband coverage, the European Economic recovery package has earmarked more than 1 billion euros for the development of broadband communications in rural areas to be distributed through the Rural Development Programme. To really make this work, Member States need to play an active role in targeting complete broadband coverage. Many have already taken up this challenge by aiming at 100% broadband coverage by 2010, or by 2013 at the latest. Others should follow their lead.

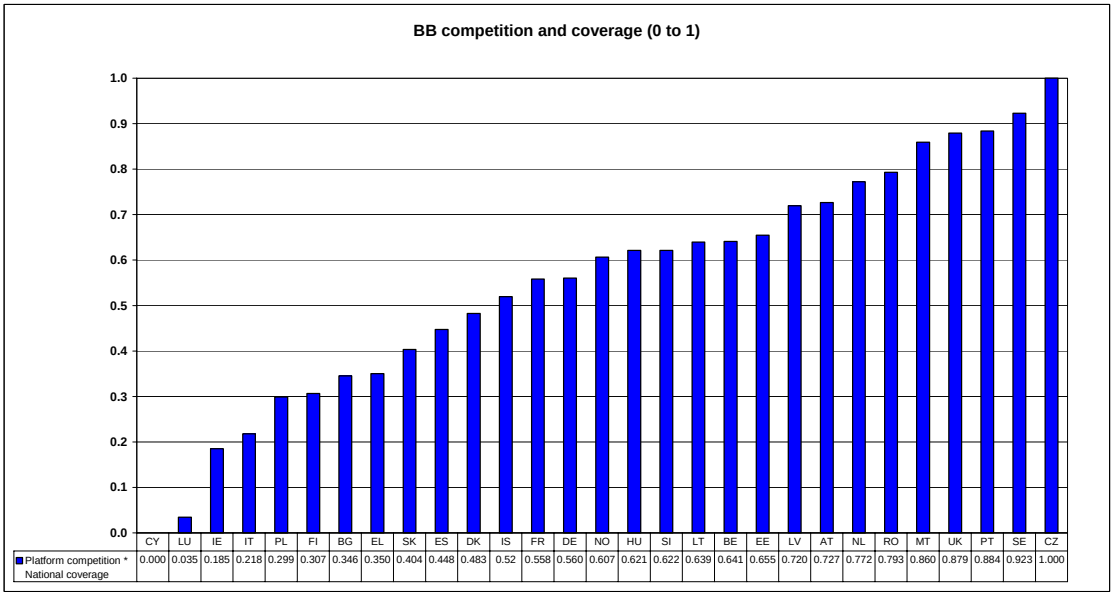
Another important area for policy action, highlighted in this chapter, is the need for Member states to adopt a more comprehensive approach to broadband roll out. Not only to support the supply side, but also to take measures to encourage broadband adoption. As availability of broadband now remains an issue only in limited parts of the EU, Member States should target broadband take up. While keeping a close eye on the evolution of competition, prices and infrastructure upgrades, demand-side actions on e-skills, online public services and awareness raising of the broadband benefits should help furthering citizens' uptake.

Annex: Composition of the BPI and detailed results by dimensions

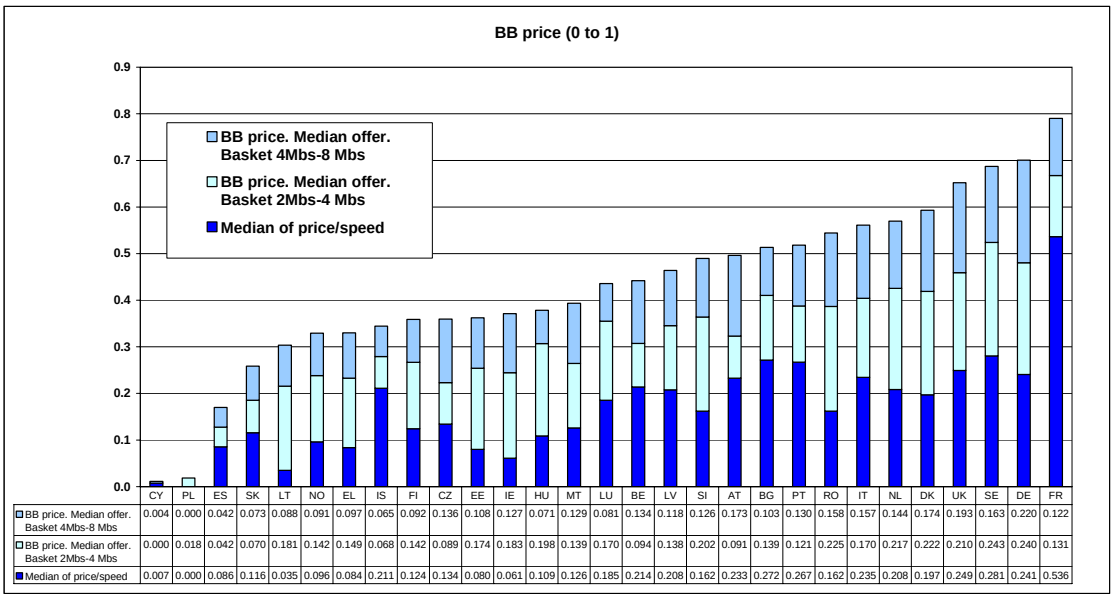




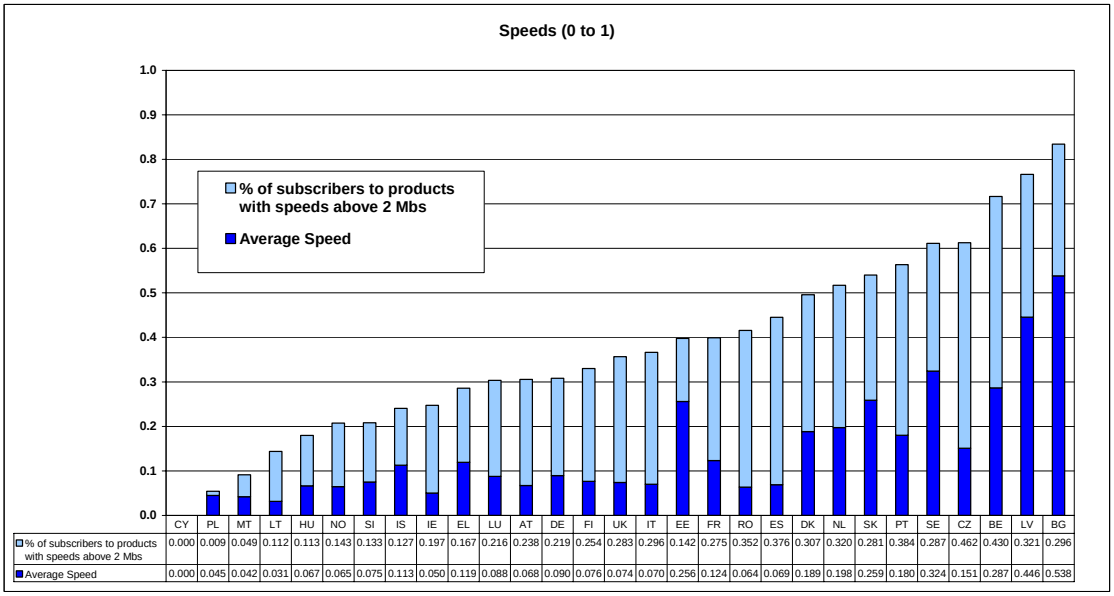
	BG	RO	PL	SK	EL	LV	LT	IE	EE	AT	IT	SI	CZ	PT	IS	HU	DE	ES	FI	SE	CY	NO	MT	NL	UK	BE	DK	FR	LU
Rural coverage	0.00	0.18	0.28	0.29	0.38	0.60	0.61	0.71	0.75	0.77	0.78	0.78	0.81	0.83	0.825	0.84	0.87	0.87	0.88	0.88	0.91	0.925	0.99	0.99	0.99	1.00	1.00	1.00	1.00



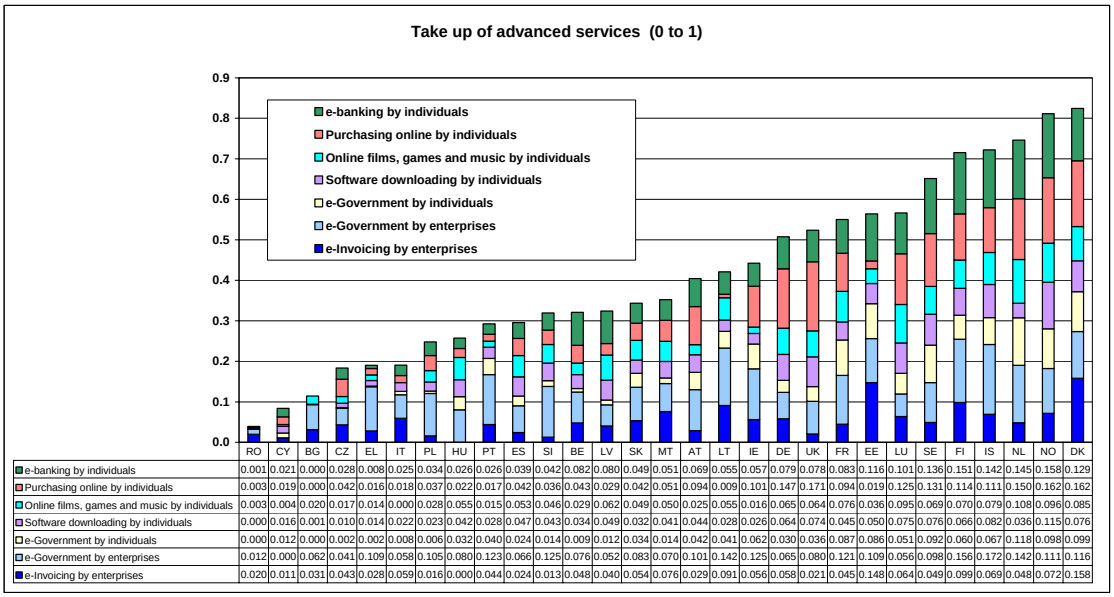
	CY	LU	IE	IT	PL	FI	BG	EL	SK	ES	DK	IS	FR	DE	NO	HU	SI	LT	BE	EE	LV	AT	NL	RO	MT	UK	PT	SE	CZ
Platform competition * National coverage	0.000	0.035	0.185	0.218	0.299	0.307	0.346	0.350	0.404	0.448	0.483	0.52	0.558	0.560	0.607	0.621	0.622	0.639	0.641	0.655	0.720	0.727	0.772	0.793	0.860	0.879	0.884	0.923	1.000



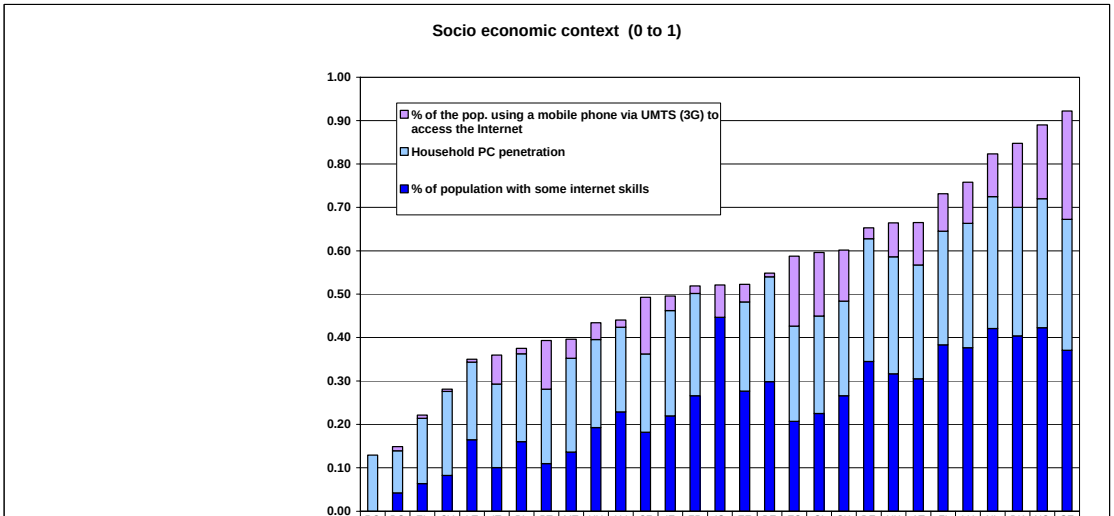
	CY	PL	ES	SK	LT	NO	EL	IS	FI	CZ	EE	IE	HU	MT	LU	BE	LV	SI	AT	BG	PT	RO	IT	NL	DK	UK	SE	DE	FR
BB price. Median offer. Basket 4Mbs-8 Mbs	0.004	0.000	0.042	0.073	0.088	0.091	0.097	0.065	0.092	0.136	0.108	0.127	0.071	0.129	0.081	0.134	0.118	0.126	0.173	0.103	0.130	0.158	0.157	0.144	0.174	0.193	0.163	0.220	0.122
BB price. Median offer. Basket 2Mbs-4 Mbs	0.000	0.018	0.042	0.070	0.181	0.142	0.149	0.068	0.142	0.089	0.174	0.183	0.198	0.139	0.170	0.094	0.138	0.202	0.091	0.139	0.121	0.225	0.170	0.217	0.222	0.210	0.243	0.240	0.131
Median of price/speed	0.007	0.000	0.086	0.116	0.035	0.096	0.084	0.211	0.124	0.134	0.080	0.061	0.109	0.126	0.185	0.214	0.208	0.162	0.233	0.272	0.267	0.162	0.235	0.208	0.197	0.249	0.281	0.241	0.536



	CY	PL	MT	LT	HU	NO	SI	IS	IE	EL	LU	AT	DE	FI	UK	IT	EE	FR	RO	ES	DK	NL	SK	PT	SE	CZ	BE	LV	BG
% of subscribers to products with speeds above 2 Mbs	0.000	0.009	0.049	0.112	0.113	0.143	0.133	0.127	0.197	0.167	0.216	0.238	0.219	0.254	0.283	0.296	0.142	0.275	0.352	0.376	0.307	0.320	0.281	0.384	0.287	0.462	0.430	0.321	0.296
Average Speed	0.000	0.045	0.042	0.031	0.067	0.065	0.075	0.113	0.050	0.119	0.088	0.068	0.090	0.076	0.074	0.070	0.256	0.124	0.064	0.069	0.189	0.198	0.259	0.180	0.324	0.151	0.287	0.446	0.538



	RO	CY	BG	CZ	EL	IT	PL	HU	PT	ES	SI	BE	LV	SK	MT	AT	LT	IE	DE	UK	FR	EE	LU	SE	FI	IS	NL	NO	DK
e-banking by individuals	0.001	0.021	0.000	0.028	0.008	0.025	0.034	0.026	0.026	0.039	0.042	0.082	0.080	0.049	0.051	0.069	0.055	0.057	0.079	0.078	0.083	0.116	0.101	0.136	0.151	0.142	0.145	0.158	0.129
Purchasing online by individuals	0.003	0.019	0.000	0.042	0.016	0.018	0.037	0.022	0.017	0.042	0.036	0.043	0.029	0.042	0.051	0.094	0.009	0.101	0.147	0.171	0.094	0.019	0.125	0.131	0.114	0.111	0.150	0.162	0.162
Online films, games and music by individuals	0.003	0.004	0.020	0.017	0.014	0.000	0.028	0.055	0.015	0.053	0.046	0.029	0.062	0.049	0.050	0.025	0.055	0.016	0.065	0.064	0.076	0.036	0.095	0.069	0.070	0.079	0.108	0.096	0.085
Software downloading by individuals	0.000	0.016	0.001	0.010	0.014	0.022	0.023	0.042	0.028	0.047	0.043	0.034	0.049	0.032	0.041	0.044	0.028	0.026	0.064	0.074	0.045	0.050	0.075	0.076	0.066	0.082	0.036	0.115	0.076
e-Government by individuals	0.000	0.012	0.000	0.002	0.002	0.008	0.006	0.032	0.040	0.024	0.014	0.009	0.012	0.034	0.014	0.042	0.041	0.062	0.030	0.036	0.087	0.086	0.051	0.092	0.060	0.067	0.118	0.098	0.099
e-Government by enterprises	0.012	0.000	0.062	0.041	0.109	0.058	0.105	0.080	0.123	0.066	0.125	0.076	0.052	0.083	0.070	0.101	0.142	0.125	0.065	0.080	0.121	0.109	0.056	0.098	0.156	0.172	0.142	0.111	0.116
e-Invoicing by enterprises	0.020	0.011	0.031	0.043	0.028	0.059	0.016	0.000	0.044	0.024	0.013	0.048	0.040	0.054	0.076	0.029	0.091	0.056	0.058	0.021	0.045	0.148	0.064	0.049	0.099	0.069	0.048	0.072	0.158



	RO	BG	EL	CY	LT	IT	PL	PT	MT	HU	LV	CZ	IE	FR	IS	EE	BE	ES	SI	SK	DE	UK	AT	FI	LU	NL	DK	NO	SE
% of the pop. using a mobile phone via UMTS (3G) to access the Internet	0.00	0.01	0.00	0.00	0.00	0.06	0.01	0.11	0.04	0.03	0.01	0.13	0.03	0.01	0.07	0.04	0.00	0.16	0.14	0.11	0.02	0.07	0.09	0.08	0.09	0.09	0.14	0.17	0.24
Household PC penetration	0.12	0.09	0.15	0.19	0.17	0.19	0.20	0.17	0.21	0.20	0.19	0.18	0.24	0.23	0	0.20	0.24	0.21	0.22	0.21	0.28	0.27	0.26	0.26	0.28	0.30	0.29	0.29	0.30
% of population with some internet skills	0.00	0.04	0.06	0.08	0.16	0.10	0.16	0.11	0.13	0.19	0.22	0.18	0.21	0.26	0.45	0.27	0.29	0.20	0.22	0.26	0.34	0.31	0.30	0.38	0.37	0.42	0.40	0.42	0.37

2. REGULAR INTERNET USAGE AND THE EINCLUSION PUZZLE: TACKLING DIGITAL DIVIDES

One of the goals of i2010 was to promote a more inclusive information society. The Riga Ministerial Declaration of 2006 set a number of targets with regard to improving eInclusion. They included the halving of disparities in regular internet use and digital literacy between disadvantaged groups and the EU population as a whole between 2005 and 2010.

This chapter looks at progress made in reducing disparities in the level of regular internet use and digital skills across socio-economic groups and countries. It also examines the barriers to internet and broadband take up and makes suggestions for future policy directions in the area of eInclusion.

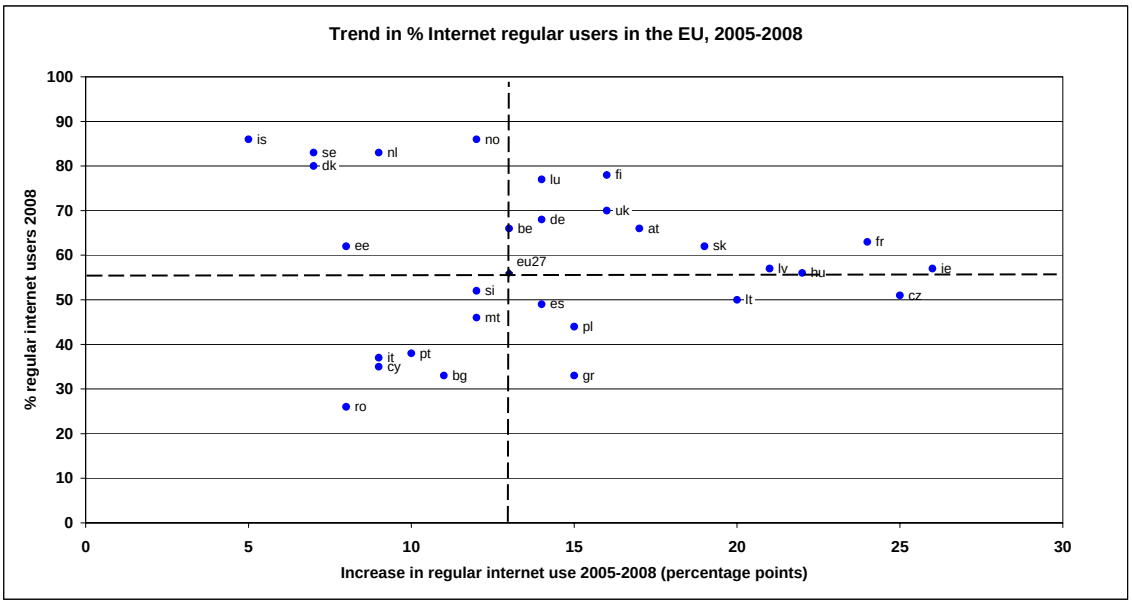
The results show that regular internet use has grown substantially, from 43% in 2005 to 56% in 2008, and has become more frequent. It is also more inclusive, with the most disadvantaged groups having progressed the most. Nevertheless, large gaps still remain, across countries and socio-economic groups, and a second digital divide, based on quality of use, is emerging. Empirical evidence shows that digital inclusion is largely driven by age and education levels.

While educational levels are difficult to influence in the short-to-medium term, the results suggest the need for policies focusing on encouraging use of the internet, especially by the most excluded groups, by reducing psychological barriers and increasing familiarity with its possibilities/benefits, facilitating access for the old and disabled, reducing financial barriers and encouraging the acquisition of skills and their continuous learning (i.e. Life Long Learning).

2.1. Regular internet use in the EU and its Member States

Regular use of the internet in Europe has increased markedly over the lifetime of the i2010 initiative. On average regular internet use, defined as at least once a week, has increased by 13 p.p. in the EU from 43% in 2005 to 56% in 2008 (Figure 1). This use has also become more frequent, with 43% of the population (i.e. 77% of regular users) now using the internet almost every day, compared to 29% in 2005.

Figure 1



Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

Regular internet usage has risen in all EU 27 Member States and in 17 European countries at least half of the population are now regular internet users. The countries showing the biggest increases since 2005 are Ireland, the Czech Republic, France, Hungary, Latvia, and Lithuania. The countries with the least improvement are Iceland, Denmark, Sweden, Romania, Estonia, the Netherlands, Italy, Cyprus and Portugal. While low growth in regular internet use in countries such as Iceland, Denmark, Sweden and the Netherlands can be attributed to their already very high rates of internet usage, in others, such as Italy, Cyprus, Romania and Portugal, which have some of the lowest rates of regular internet use, it is a source of concern.

Despite progress, countries' relative rankings have changed little at either end of the scale. The best performers in 2008 were the Nordic countries, the Netherlands and Luxemburg. The worst performers remained Romania, Bulgaria, Greece, Cyprus, Italy and Portugal. As regular internet use in the rest of Europe expands, these countries are being left behind. The two main exceptions are Ireland and the Czech Republic which have improved their positions significantly.

2.2. Disparities in regular internet use across socio-economic groups and the Riga goals

While progress in reducing disparities in regular internet use has certainly been made**,** more will need to be done if the Riga goals are to be achieved. The Riga Ministerial Declaration of 2006 set a number of targets with regard to improving eInclusion.[11] They included the halving of disparities in internet use and digital literacy between disadvantaged groups[12] and the EU population as a whole between 2005 and 2010.[13]

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11 See http://ec.europa.eu/information_society/events/ict_riga_2006/index_en.htm.

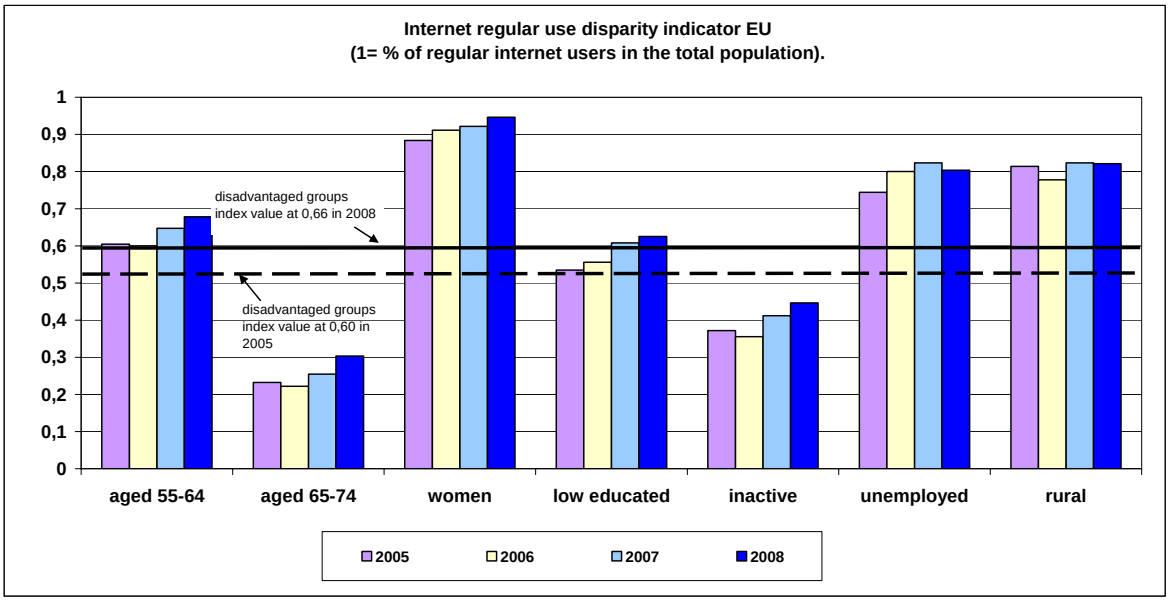
12 Disadvantaged groups were defined as older people, people with disabilities, women, lower education groups, unemployed and residents in "less-developed" regions.

13 Other goals included a 90% target for broadband coverage, increased coverage of underserved locations and reduced regional disparities in Internet access, a target of 100% accessibility of public web sites and commitments on fostering cultural diversity in the information society.

To monitor disparities in internet use and digital literacy over time, two penetration rate indices were developed. The first index measures disparity in regular internet use between a given disadvantaged group and the average for the total population. The second index measures disparities in digital literacy, through a combination of an individual's ability to perform one or more internet and computer related tasks.[14] A value of 1 for the index implies equality with the rate for the total population. Values below 1 imply a lower rate than the population and those above 1 imply a higher rate than the population. This section focuses on the first index, the one on digital literacy will be dealt with later.

The index of regular internet use has increased to 0.66 in 2008, from 0.60 in 2005, showing a marked improvement (Figure 2). The disadvantaged groups which have made the best progress are the low educated (+0.1 p.p.), inactive and aged 55-64 (+0.08 p.p. each). The least progress was made in the group of individuals living in sparsely populated areas (+0.01 p.p.). This means that the development in regular use of the internet for this group has been similar to that of the average EU population. While there has been good progress in reducing disparities with respect to the old, inactive and low educated, they remain to a large extent digitally excluded. In contrast, the category women, whose starting position was not that different from the average, has already achieved its Riga target.

Figure 2



Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

Looking across countries, there remain substantial differences in disparities and a number of countries have substantially greater disparities in regular internet use between socio-economic groups than the EU average (Table 1). The countries with the largest disparities are Romania, Greece, Bulgaria, Cyprus, Portugal, Slovakia, Spain, Lithuania, Slovenia and Italy. By contrast, the countries exhibiting the strongest degree of equality are the Netherlands, Sweden, Norway, Denmark, Finland and Luxemburg. This pattern corresponds largely to countries' overall connectivity. Indeed the correlation coefficient between the percentage of regular internet users in the population as a whole and the degree of disparity in regular use across countries is 0.94.

[14] See "Benchmarking from a policy perspective – eInclusion report", December 2006

When it comes to the performance of specific disadvantaged groups, again most countries have the largest disparities in internet use for the groups aged 65-74, the economically inactive and the low educated. The group which exhibits the largest variation in disparities across countries is for those aged 55-64.[15] While in countries such as Norway, the Netherlands, Denmark and Luxemburg there is very little inequality, in others, such as Romania, Cyprus, Greece and Bulgaria, there are very large disparities.

Table 1

Index of internet use in at risk groups by country in 2008

	aged 55-64	aged 65-74	women	low educated	inactive	unemployed	rural	total at risk index
eu27	0.68	0.30	0.95	0.63	0.45	0.80	0.82	**0.66**
be	0.73	0.32	0.92	0.67	0.52	0.77	0.92	**0.69**
bg	0.33	***0.04***	0.97	0.45	0.15	0.55	0.64	***0.45***
cz	0.53	0.16	0.94	0.80	0.31	0.55	0.90	**0.60**
dk	0.85	0.51	0.98	0.85	0.56	***0.84***	0.94	***0.79***
de	0.76	0.37	0.91	0.87	0.54	0.84	0.87	**0.74**
ee	0.52	0.24	1.00	0.82	0.39	1.03	0.94	**0.71**
ie	0.54	0.26	1.00	0.53	0.53	0.77	0.82	**0.64**
gr	0.33	0.03	0.85	0.27	0.18	0.85	0.70	**0.46**
es	0.43	0.14	0.92	0.51	0.29	0.88	0.78	**0.56**
fr	0.71	0.35	1.02	0.73	0.52	0.97	0.90	**0.74**
it	0.54	0.16	0.86	0.46	0.27	0.86	0.84	**0.57**
cy	0.31	0.11	0.91	0.37	0.29	1.00	0.69	**0.53**
lv	0.46	0.11	0.96	0.79	0.32	0.63	0.91	**0.60**
lt	0.44	0.10	0.98	0.68	0.24	0.62	0.84	**0.56**
lu	0.83	0.51	0.86	0.79	0.73	0.62	1.01	**0.76**
hu	0.61	0.27	0.98	0.61	0.45	0.71	0.86	**0.64**
mt	0.41	0.24	0.93	0.63	0.39	0.74	1.00	**0.62**
nl	0.88	0.49	0.96	0.78	0.70	1.14	0.95	**0.85**
at	0.68	0.35	0.89	0.65	0.52	0.88	0.89	**0.69**
pl	0.43	***0.06***	0.98	0.70	0.30	0.57	0.82	***0.55***
pt	0.45	0.11	0.89	0.58	0.21	0.76	0.76	**0.54**
ro	0.27	0.04	0.96	0.54	0.12	0.69	0.58	**0.46**
si	0.48	0.08	0.98	0.54	0.19	0.73	0.94	**0.56**
sk	0.45	0.10	0.95	0.66	0.27	0.45	0.97	**0.55**
fi	0.78	0.37	0.99	0.81	0.56	0.90	0.95	**0.77**
se	0.92	0.53	0.98	0.81	0.64	1.04	0.98	**0.84**
uk	0.79	0.41	0.94	0.47	0.56	0.83	0.90	**0.70**
is	:	:	:	:	:	:	:	**:**
no	0.88	0.45	0.97	0.86	0.66	0.91	0.99	**0.82**
Max.	0.92	0.53	1.02	0.87	0.73	1.14	1.01	**0.85**
Min.	0.27	0.03	0.85	0.27	0.12	0.45	0.58	**0.45**
Range	0.65	0.50	0.17	0.59	0.61	0.69	0.44	**0.40**
S.D.	0.19	0.16	0.04	0.16	0.18	0.17	0.11	**0.12**

Note: Figures in italics are for 2007, except for Poland where it is 2006

Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

2.3. Barriers to household take up of the internet

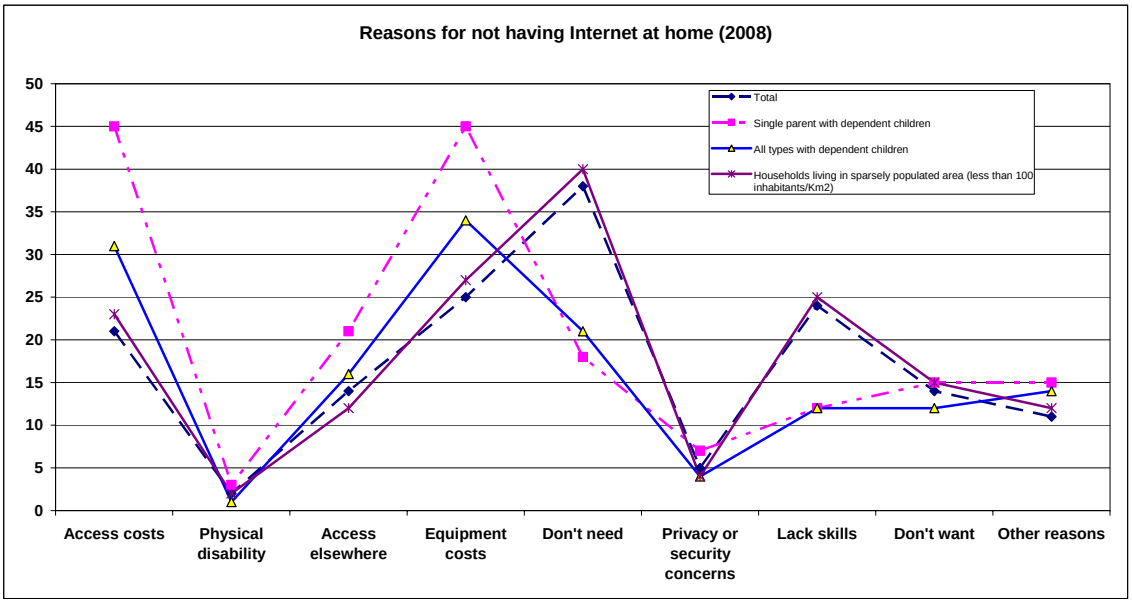
Despite progress made in regular internet use, about a third (33%) of the population of the EU had never used the internet in 2008 (which is nevertheless a significant improvement over 2007, when the figure was 40%), 27% had never used a computer and an even larger number had no internet access at home (40% in 2008).

According to the Community Survey on ICT usage in households and by individuals (2008), the main reason for not having internet in the home relates to the perceived lack of need

[15] Measured by the standard deviation.

(Figure 3); 38% of households responded that this was a reason for not having internet at home. Other important factors are costs for equipment (25%) and access (21%), as well as a lack of skills (24%). The least important reasons relate to privacy and security concerns[16] (5%) and physical disability (2%). The importance of these factors has not changed over time.

Figure 3



Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

With regard to physical disability, however, this does not mean that it is not an important reason for not having the internet, only that out of all households it is only relevant for a small number of them. A more important question is whether and to what extent for disabled people their disability is a reason for not having the internet. Recent findings of a study commissioned by the European Commission on the status of 'eAccessibility' in Europe shows that people with disabilities do indeed continue to face significant barriers to usage of everyday ICT products and services (Box 1).

[16] In a separate context, a 2008 Eurobarometer Survey on citizens' perceptions in relation to data protection showed that a large majority of respondents (82%) considers that data transmission over the internet is not sufficiently secure while only 15% of respondents trust data security transfers over the internet. See http://ec.europa.eu/public_opinion/flash/fl_225_en.pdf

Box 1: Overview of the results of the study on "Measuring Progress of eAccessibility in Europe"

In 2005, the European Commission produced a Communication on eAccessibility[1] highlighting the need for improving access to Information and Communication Technologies (ICTs) by people with disabilities. Three key approaches for EU-level policy intervention were identified: the application of accessibility requirements in public procurement (utilising freedoms given to Member states in transposing the Public Procurement Directives); the introduction of a product and service certification scheme; and better use of existing legislation (e.g. in telecommunications and employment).It also announced that a follow-up on the eAccessibility situation would be made two years after the Communication, at which time the Commission might consider additional measures.

As part of the follow-up to the Communication, the "Measuring progress of eAccessibility in Europe" (MeAC) study was launched and the results of this study were first published in 2007. A follow up report on the eAccessibility status situation as well as detailed country profiles were elaborated one year after the main benchmarking exercise had been conducted in 2007. The evidence collated in 2008 suggested that no significant changes in the overall eAccessibility status had taken place since 2007 and that the main conclusions remained valid.

These conclusions were that there was only limited progress towards eAccessibility detected in Europe, and further EU-level measures needed to be considered to stimulate progress in eAccessibility. Three key findings underpinned this conclusion:

The eAccessibility 'deficit': People with disabilities in Europe continued to be confronted with many barriers to usage of the everyday ICT products and services that are now essential elements of social and economic life. Such eAccessibility deficits could be found across the spectrum of ICT products and services, for example telephony, TV, web and self-service terminals. With regard to the internet, it was found that very few websites met accepted international accessibility standards: in 2008, 20% were accessible based on automatic testing and only 2.9 % based on more stringent manual testing. The figures were somewhat higher for governmental websites, but significantly lower for sectoral/commercial ones.

The eAccessibility 'gap': From a comparative perspective, the eAccessibility situation for people with disabilities across Europe as a whole, in terms of both eAccessibility status and eAccessibility policy, compared very unfavourably with that of comparison countries examined in the MeAC study (AU, CA and US). While, international comparison showed the relatively weak situation in Europe with regard to eAccessibility it also showed that it was not unrealistic to aim for a stronger one.

The eAccessibility 'patchwork': Finally, the situation across Europe for both eAccessibility status and eAccessibility policy was very much a 'patchwork'. The overall picture showed many important gaps, uneven attention across the spectrum of eAccessibility themes, and wide disparities across the Member States.

Further, the study also showed a strong relationship between eAccessibility status and policy, showing that good policy and good eAccessibility status were strongly linked, providing support for policies in the area of eAccessibility. The study also highlighted the positive impact that EU level policy had had, but also that further EU-level measures needed to be considered.

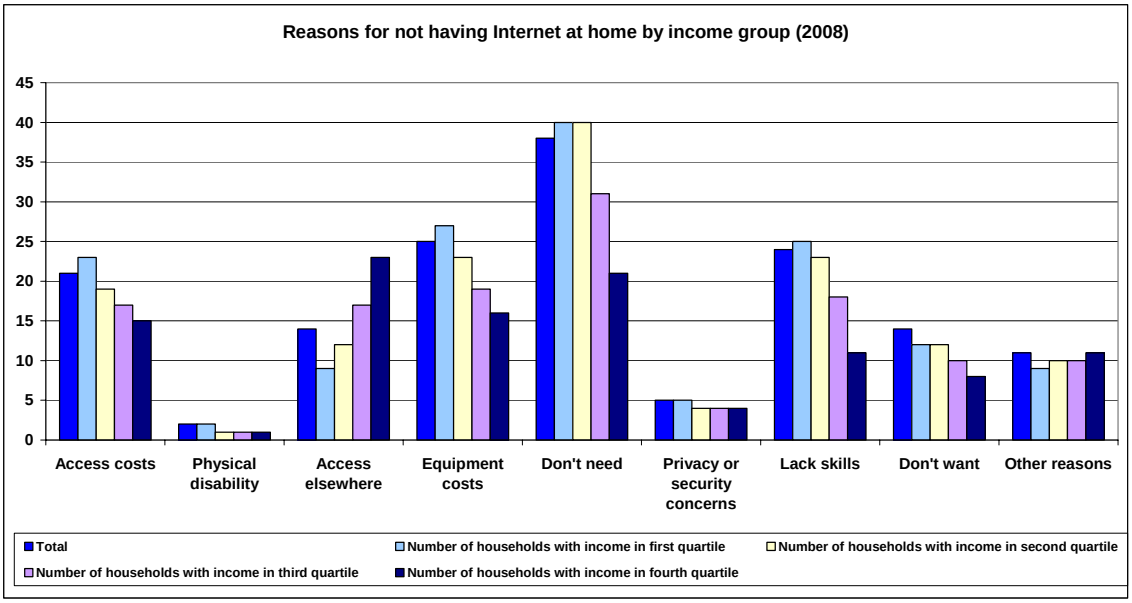
[1] http://ec.europa.eu/information_society/activities/einclusion/policy/accessibility/com_ea_2005/index_en.htm

Across different socio-economic groups the picture varies somewhat. In particular, for households with children, the main reasons relate to access and equipment costs. This is even more so the case for single parents with children. On the other hand, for these two groups lack

of skill and a perceived lack of need play a smaller role. This suggests that, for some groups, income/financial issues are still an important barrier to internet take up at home. Interestingly, the data also show that for those living in sparsely populated regions the reported reasons for not having the internet at home are basically the same as for the population at large, showing that living in a rural area does not affect people's perceptions.

Looking at reasons for not having the internet at home by income group confirms the importance of financial barriers for those on lower incomes (Figure 4). Access and equipment costs are, obviously, more important the lower the income. However, this also holds true for other reasons such as lack of skills, the perceived lack of need and not wanting internet at home. On the other hand, having access elsewhere is a more important reason for not having access at home the higher the income.

Figure 4



Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

2.4. Barriers to broadband take-up

Given the strong correlation between internet and broadband penetration (0.92 across countries), it is not surprising that the barriers to broadband adoption are similar to those of internet use. Looking at the figures for broadband penetration across various socio-economic groups indicates a strong role for income in determining penetration rates (Figure 5). Households with income in the first, or lowest, quartile have a rate of penetration less than half that of those with income in the fourth quartile.[17] The data also show that households in sparsely populated and lagging regions also have significantly lower rates of penetration. By contrast, households with children have higher rates of take up.

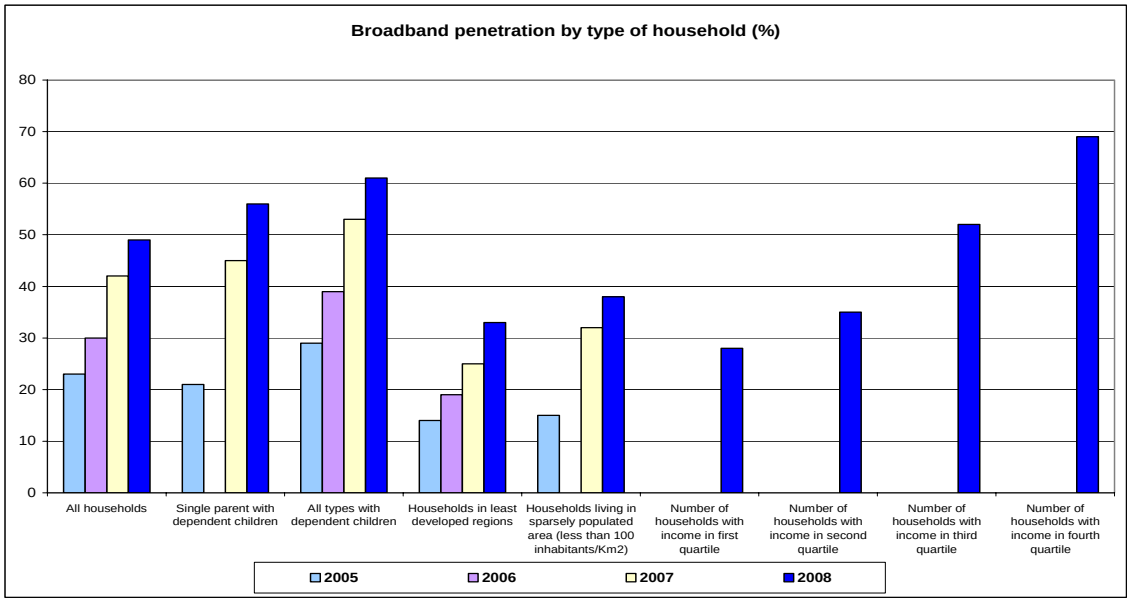
Data also show that strong increases in broadband penetration have taken place across all groups. In particular the situation of single parents with children has improved markedly and whereas this group was lagging in 2005 it now has a higher rate of penetration than the

[17] The lowest, or first, income quartile refers to the group of people falling into the lowest quarter of the income distribution. The fourth quartile is the group of people in the highest quarter of the income distribution.

average. Weakest progress has been made in least developed regions and sparsely-populated areas, which remain behind the average.

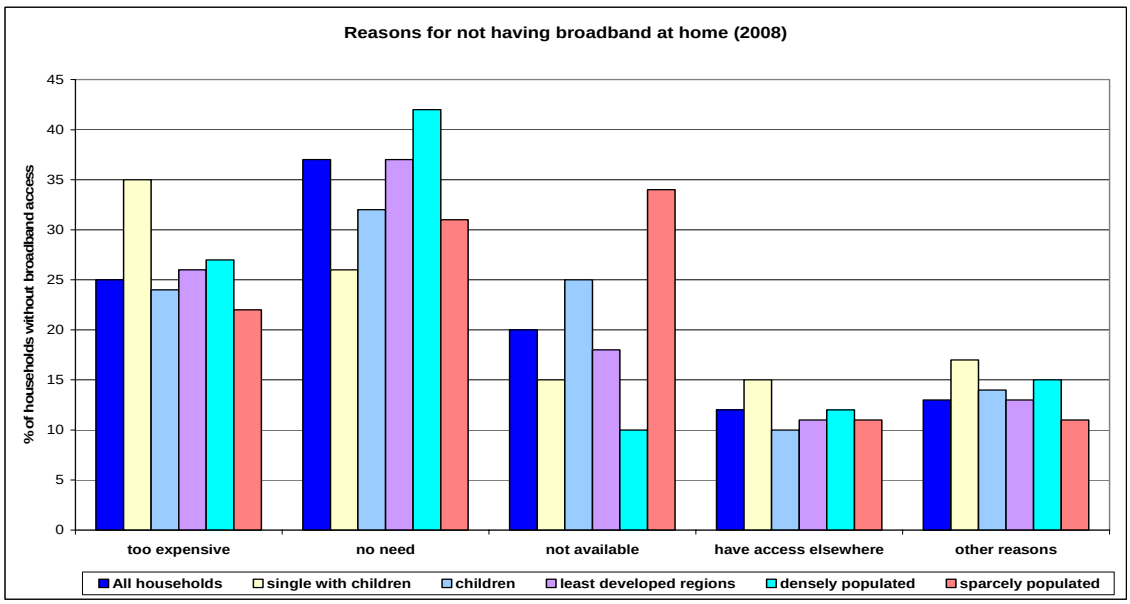
Turning to data on the reasons given for not having broadband at home also confirms the strong role of cost and a perceived lack of need (Figure 6). Another important reason is lack of availability. For people in sparcely populated regions this is the most important reason.

Figure 5



Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

Figure 6



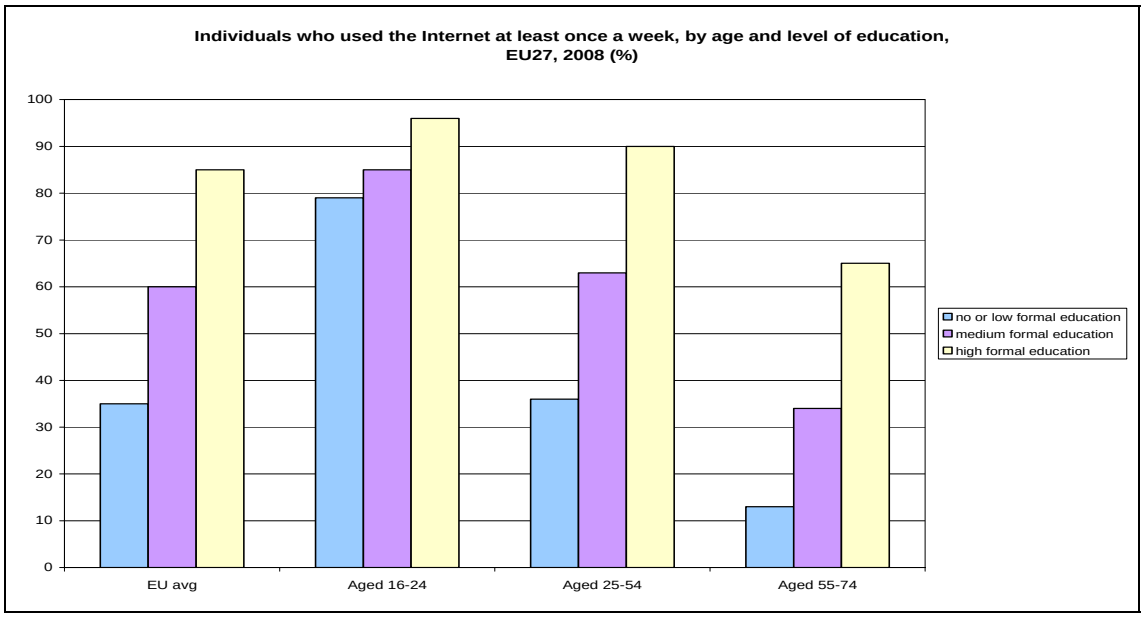
Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

2.5. Results of econometric studies

Socio-economic characteristics influence each other. Therefore, in order to isolate the impact of individual factors on internet/broadband take-up it is necessary to undertake econometric

analysis on microdata for individuals/households. Studies of this type suggest that age and education are the two most important factors influencing internet take-up (Figure 7).[18] [19]

Figure 7



Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

The important role of education in determining internet take-up is intuitively easy to understand, given the reported reasons for not having internet, as the level of education is an important determinant of income, is likely to affect levels of (digital) skills and could also influence the perceived lack of need for using the internet.

The finding that a large number of households without internet access respond that they don't need it will partly reflect choice and partly unfamiliarity with its benefits and the services available. In response, many countries are launching awareness campaigns to ensure citizens can make an informed choice. In relation to affordability, a gradual reduction in access and equipment costs, due in part to competitive markets promoted by the regulatory framework, will reduce this barrier. The importance of digital literacy policies is confirmed by the high proportion of households without internet access citing lack of skills as one of the main barriers to having internet at home.

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[18] As reported in OECD (2008), analysis of this kind, undertaken for France by Frydel (2006), shows that age and education are the main factors influencing internet access. A study for Japan, undertaken by the Ministry of International Affairs and Communication of Japan (2006), also showed that age was the most important factor, followed by income. Smaller impacts were observed for city size and gender. A cross-country study by Cette and Lopez (2008) also confirms the important role of education in determining cross-country differences in ICT usage. Another important factor is the role of labour and product market rigidities.
Analysis undertaken by European Commission staff based on micro data from the 2008 Eurobarometer survey and using the logistic method, found similar results for the EU. In particular, the analysis showed that the low educated (17.4%), inactive (21.1%), old (34.2%) and, to a lesser extent, the unemployed (49.3%) have significantly lower chances of being regular internet users than individuals not falling into these socio-economic groups.

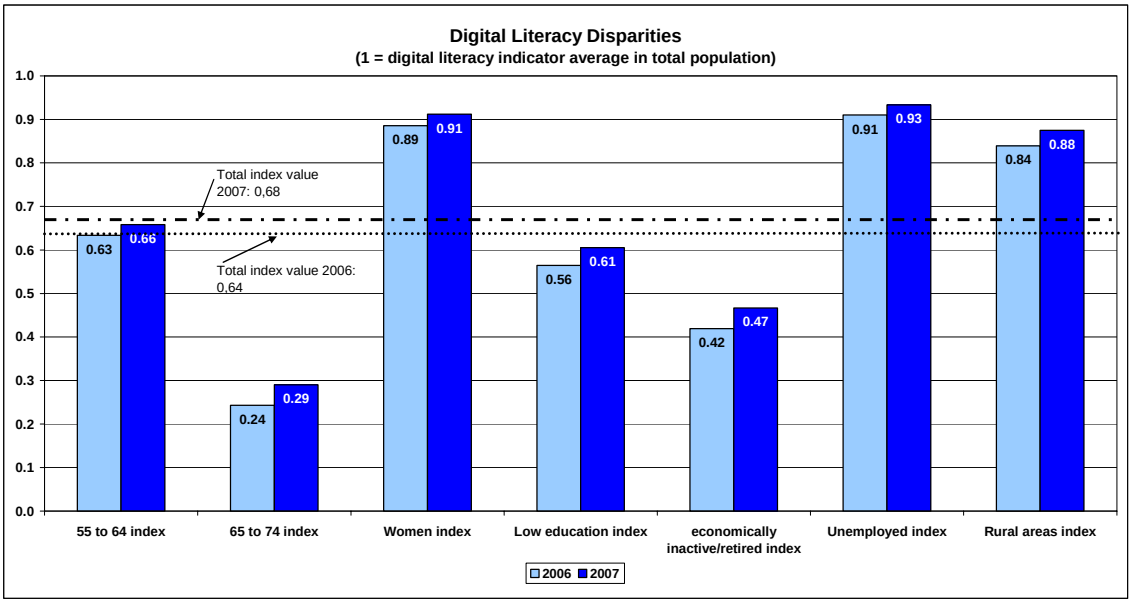
[19] See also Eurostat (2008), Internet usage in 2008 – Households and Individuals. Data in Focus Issue no 46/2008, and JRC-IPTS (2008), Digital Competence for Lifelong Learning, JRC Technical Note: JRC 48708, available at http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=1820

2.6. Disparities in Digital Literacy

Since 2005, progress has also been made in reducing digital literacy disparities**,** though as with regular internet use, more will need to be done if the Riga targets are to be met.[20] Over the period 2006-2007 the digital literacy disparities index increased from 0.64 to 0.68, reflecting an overall reduction in digital literacy disparities (Figure 8). A reduction in disparities can be observed across all the disadvantaged groups, with the biggest improvements being made in the categories exhibiting the largest disparities: those aged 65 to 74, the economically inactive and the low educated (all +0.05 p.p.). However, those in categories exhibiting the largest disparities remain largely excluded. The categories showing the least improvement are those which are closest to representing the average: women and the unemployed (both +0.02 p.p.).

Looking directly at developments in the rates of digital literacy (Table 2), the development in internet skills shows a positive trend over the period 2006 to 2007, both for the total population (+5 p.p.) as well as for individual disadvantaged groups, with in particular the unemployed showing a marked improvement (+7 p.p.). Computer skills have also increased across all groups, for the period 2006 to 2007, with this time the group of those living in rural areas showing the biggest improvement (+5 p.p.). The data show a very high correlation, almost one in 2007, between computer and internet skills within all the observed groups. As a result, the lowest level of both categories of skills is found among the old, inactive and the low educated.

Figure 8



Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

20 While the index can be calculated for the years 2005 to 2007, comparability over this period is hampered by a change in the questions related to computer skills, which differ between the years 2005 and 2006/2007 (no data on skills are available for 2008). As a result, on first comparison, it appears that digital literacy disparities have actually increased over the period 2005 to 2007, represented by a reduction in the index value from 0.69 to 0.68. However, looking at the comparable data for the years 2006 and 2007, an improvement can be observed.

Table 2

Digital Literacy								
Internet skills								
	EU total	aged 55 to 64	aged 65 to 74	women	low educated	inactive	unemployed	rural
2006	55	34	13	51	32	22	48	46
2007	60	39	17	56	37	27	55	52
Computer skills								
	EU total	aged 55 to 64	aged 65 to 74	women	low educated	inactive	unemployed	rural
2006	57	37	16	54	35	25	54	48
2007	60	40	19	57	38	29	57	53

Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

Looking across countries shows that the pattern of digital literacy disparities is similar to that for "regular use" (Table 3). Indeed, the correlation across countries between the disparities index for "regular internet use" and "digital literacy" is greater than 0.95. The worst performers in terms of digital literacy disparities are Bulgaria, Romania, Latvia, Lithuania, Greece, Malta, Poland, Cyprus, Portugal, Slovenia, Italy, and Hungary. The best performers are Norway, the Netherlands, Sweden, Iceland, Denmark, Germany, Luxemburg and Finland.

In terms of specific disadvantaged groups, most countries have the largest disparities for the groups aged 65 to 74, the economically inactive and the low educated. The groups exhibiting least disparities are women, the unemployed and those living in rural areas. Indeed, in a number of countries, the digital literacy of women and the unemployed is greater than that for the population as a whole (i.e. greater than 1). The group which shows the largest variation in digital literacy disparities across countries, measured by the standard deviation, is the group of the low educated.

As with the total index, digital literacy disparities of specific disadvantaged groups are highly correlated with disparities in regular internet use. The main exception is for 'women'. However, this is mainly due to the lack of variation in the data for this group, given its overall high level of equality with the EU average for both regular internet use and digital literacy disparities.

Table 3

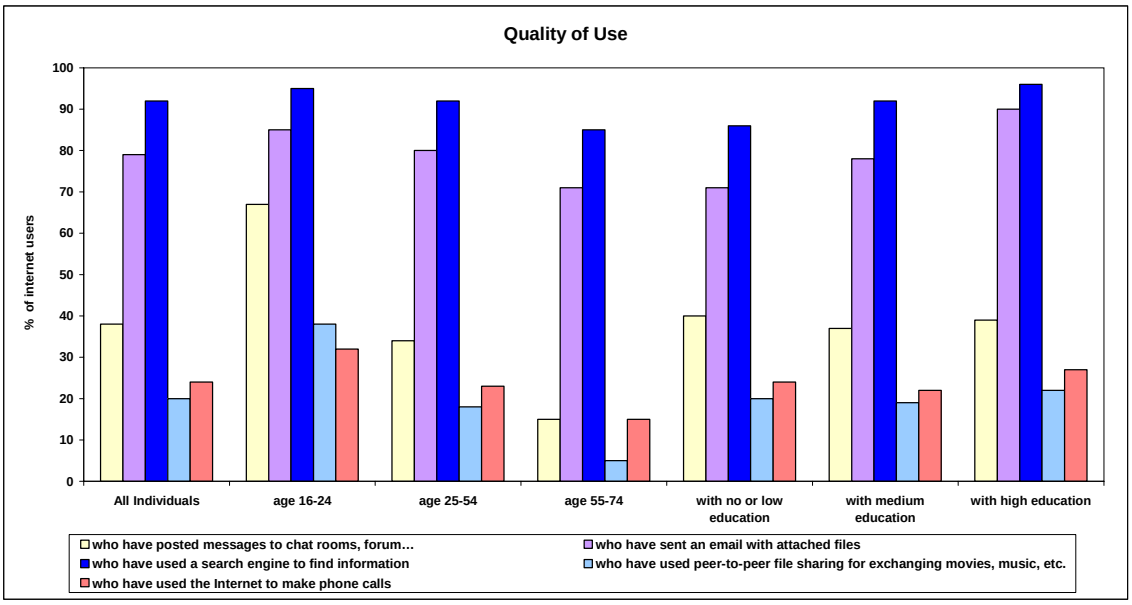
Index of digital literacy disparities in at risk groups by country 2007								
	aged 55 to 64	**aged 65 to 74**	**women**	**low educated**	**inactive**	**unemployed**	**rural**	**total at risk index**
eu27	0,66	0,29	0,91	0,61	0,47	0,93	0,88	**0,68**
be	0,70	0,30	0,93	0,65	0,49	0,88	0,85	**0,69**
bg	0,37	0,04	0,74	0,28	0,12	0,42	0,60	**0,37**
cz	0,56	0,17	0,89	0,73	0,40	0,64	0,91	**0,61**
dk	0,86	0,58	1,09	0,95	0,60	0,97	0,93	**0,85**
de	0,81	0,44	1,03	0,93	0,60	0,93	0,95	**0,81**
ee	0,51	0,15	0,91	0,78	0,35	1,02	0,92	**0,66**
ie	0,50	0,25	0,94	0,46	0,54	0,90	0,88	**0,64**
gr	0,30	0,07	0,74	0,25	0,25	1,30	0,84	**0,54**
es	0,42	0,15	0,90	0,52	0,35	1,00	0,82	**0,59**
fr	0,64	0,22	0,95	0,76	0,49	1,08	0,94	**0,73**
it	0,53	0,12	0,75	0,40	0,28	1,06	0,90	**0,58**
cy	0,35	0,11	0,82	0,31	0,33	1,27	0,70	**0,56**
lv	0,47	0,11	0,91	0,67	0,38	0,58	0,90	**0,57**
lt	0,35	0,07	0,87	0,65	0,23	0,58	0,78	**0,51**
lu	0,85	0,49	1,01	0,89	0,61	0,78	1,02	**0,81**
hu	0,60	0,19	0,94	0,52	0,41	0,64	0,83	**0,59**
mt	0,43	***0,21***	0,81	0,55	0,37	0,93	1,02	***0,55***
nl	0,81	0,52	1,08	0,89	0,68	1,13	0,98	**0,87**
at	0,71	0,40	1,00	0,70	0,57	***0,96***	0,92	***0,75***
pl	0,40	***0,07***	0,84	0,65	0,30	0,78	0,88	***0,56***
pt	0,46	0,10	0,80	0,56	0,23	0,98	0,80	**0,56**
ro	0,30	0,03	0,70	0,38	0,16	0,76	0,44	**0,39**
si	0,48	0,13	0,94	0,51	0,24	0,78	0,92	**0,57**
sk	0,43	0,14	1,02	0,65	0,37	0,75	0,97	**0,62**
fi	0,77	0,36	1,03	0,84	0,53	0,92	0,92	**0,77**
se	0,85	0,60	1,04	0,90	0,67	1,04	0,96	**0,87**
uk	0,78	0,37	1,00	0,41	0,57	***0,68***	1,02	***0,69***
is	0,87	0,65	1,14	1,04	0,62	0,81	0,95	**0,87**
no	0,80	0,67	1,10	1,02	0,68	1,01	0,96	**0,89**
Max.	0,87	0,67	1,14	1,04	0,68	1,30	1,02	**0,89**
Min.	0,30	0,03	0,70	0,25	0,12	0,42	0,44	**0,37**
Range	0,57	0,64	0,44	0,79	0,56	0,88	0,58	**0,52**
S.D.	0,19	0,20	0,12	0,22	0,16	0,20	0,12	**0,14**

Note: Figures in italics are for 2006 except for Malta where they are 2005

2.7. The emerging Second Digital Divide

Going beyond basic use of the internet, policy on eInclusion also recognises the importance of reducing disparities in the quality of internet use, the so-called Second Digital Divide. Data show that digital disparities also exist between socioeconomic groups with regard to the types of activities undertaken and the intensity with which they are performed. Results suggest that while all internet users, regardless of age or education, use the internet for communication and for access to information, there are sharp differences, particularly by age, for the more advanced services (Figure 9).

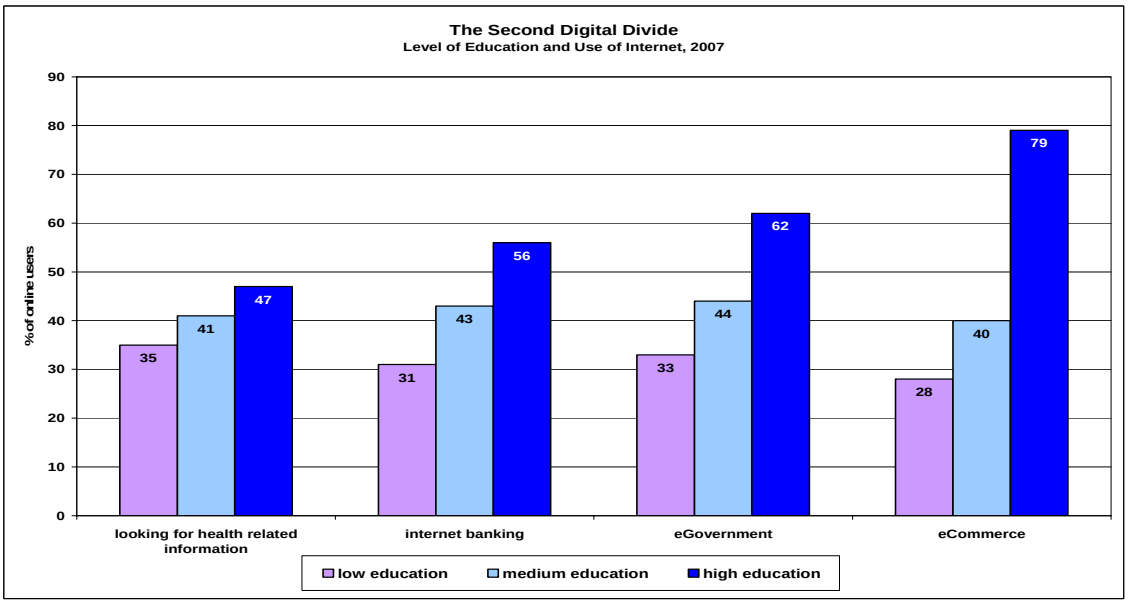
Figure 9



Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

Users with higher educational levels use the internet more intensively, in particular for online transactions and electronic public services (Figure 10). Not only do those with higher education use these services more, they also use them to a higher level; using more, and more complex, functionalities. This is shown, for example, in the use of eGovernment services where those with tertiary education are far more likely to go beyond basic information and use the internet to submit forms and carry out transactions.

Figure 10



Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

2.8. Conclusions

While i2010 has delivered significant progress in the area of eInclusion, it is clear that more will need to be done to close digital divides and achieve the ambitious Riga goals. Gaps continue to exist in regular use of the internet and digital skills, both across countries and

socio-economic groups. In particular, the most digitally excluded groups at the start of the initiative remain so. Across socio-economic groups, the old, economically inactive and low educated remain to a large extent digitally excluded. In addition, there remain significant barriers to the use of ICTs by the disabled.

The evidence shows that the main reported reasons for households not to have an internet/broadband connection relates to a perceived lack of need, costs, and lack of skills. These barriers are larger for those on lower incomes. Empirical analysis shows that these factors are to a large extent related to age and education levels. They are also major factors determining the quality of use (the so called Second Digital Divide). Further, while only a small number of respondents report that disability is a reason for not having the internet at home, this remains an important barrier to internet access at home for the disabled; as confirmed by the results of a recent European Commission funded study on the status of eAccessibility in Europe.

While educational levels are difficult to influence in the short-to-medium term, these results suggest the need for policies focusing on encouraging the use of the internet, especially by the most excluded groups, by reducing psychological barriers and increasing familiarity with its possibilities/benefits, facilitating access for the old and disabled, reducing financial barriers and encouraging the acquisition of skills and their continuous learning (i.e. Life Long Learning). With regard to the latter, evidence shows that there is an increasing tendency for informal acquisition of ICT skills. Therefore, there is potential to encourage more formal training as well as informal training, which can be conducive to reducing both first and second digital divides.

Finally, while perhaps intuitive, it should be highlighted that an eInclusion strategy focused on the inclusion of digitally excluded groups also targets an overall improvement in internet use. Supporting this intuition is the empirical evidence which shows that rates of regular use are highly correlated with measures of digital disparities.

3. THE IMPACT OF ICT ON SOCIAL CAPITAL

3.1. ICT and social capital

The term "social capital" refers to the norms and social relations embedded in the social structures of societies that enable people to co-ordinate action to achieve desired goals.[21] An ongoing Commission Study has analysed data from the 2008 Flash Eurobarometer survey: "Information Society seen by the citizens"[22] to draw conclusions on the relation between ICT take-up and social capital and, more in general, with the well-being of individuals.

Previous studies warned about potential negative effects of ICTs on social capital, as the internet may create superficial relationships as the time spent online reduces time devoted to face-to-face relationships. Further analysis showed that although this might be true, the internet appears to create a new type of social capital linked to community involvement, and that it might support existing face-to-face relationships by acting as an additional communication device, therefore increasing stocks of social capital.

The 2008 evidence above suggests that Internet use is associated with increased likelihood that users engage in civic activities (participation in social organizations[23]) within similar social backgrounds. While about half of internet users reported their participation in social activities, only a third of non-internet users did so (Figure 1). Similarly, frequent internet use is associated with higher levels of generalised trust[24] (Figure 2).

The cross-sectional data used in the analysis do not allow concluding that the internet has a one way enhancing effect on social resources, as this can work the other way around too[25]. Those with less social resources may be the ones who have fewer motivations or opportunities for using ICT and those who are rich in social resources might be more motivated for using the internet more frequently. In fact, most of the available analyses on the digital divide do suggest that the interrelation is one of reciprocal amplification.[26]

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21 http://stats.oecd.org/glossary/detail.asp?ID=3560

22 http://ec.europa.eu/public_opinion/flash/fl_241_en.pdf

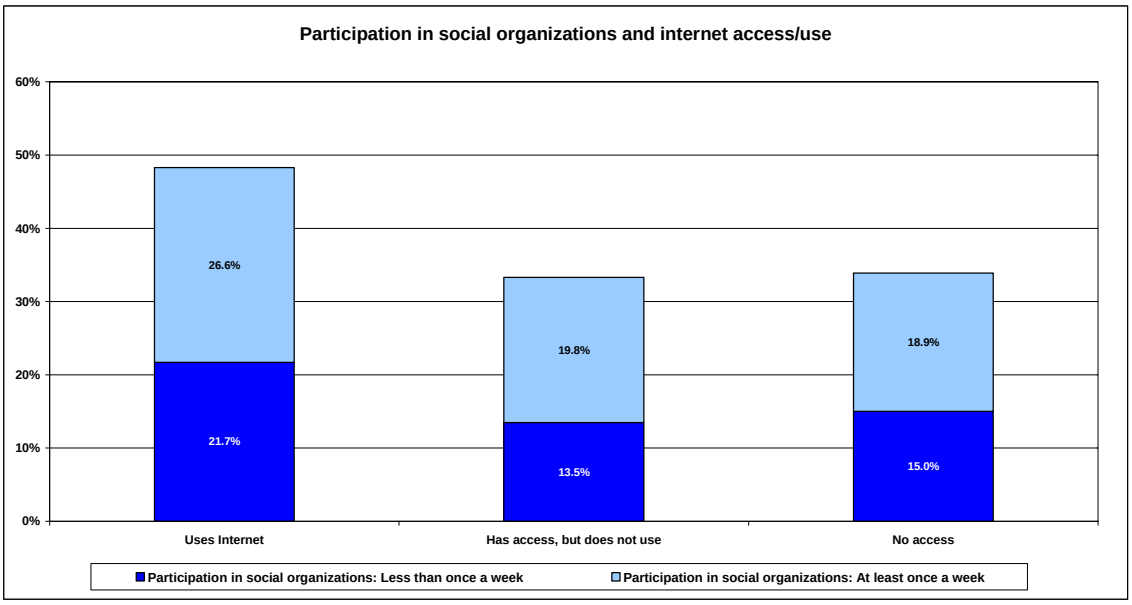
23 Like sports clubs, religious/voluntary aid organizations.

24 Trust is measured through the following question: "Generally speaking, would you say that you can't be too careful in dealing with people, or that most people can be trusted?" (0=no trust, 10=full trust). Having said that, medium level of trust corresponds to a score between 4 and 6 and high level of trust to a one from 7 to 10.

25 Causality testing would require the availability of panel databases to look at the changes in the social activities of individuals once they have started to use the internet. Neither panel data nor time series for this type of information are currently available.

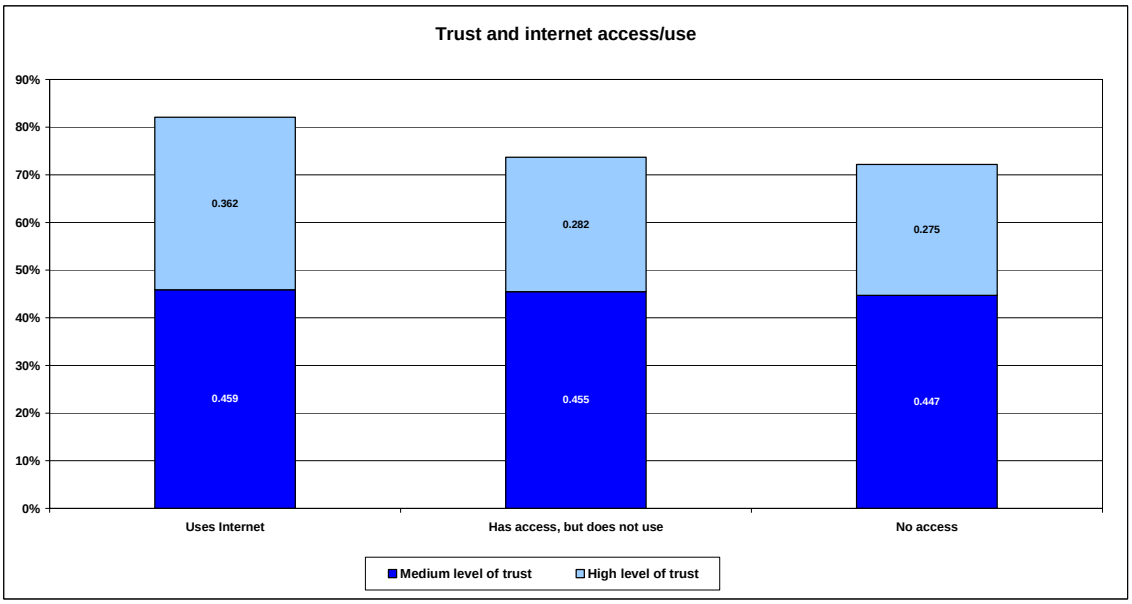
26 Van Dijk, J. (2005) "The deepening divide. Inequality in the information society", Thousand Oaks, Sage.

Figure 1



Source: Commission study on the Social Impact of IT, based on the Flash Eurobarometer – Information society seen by the citizens (2008)

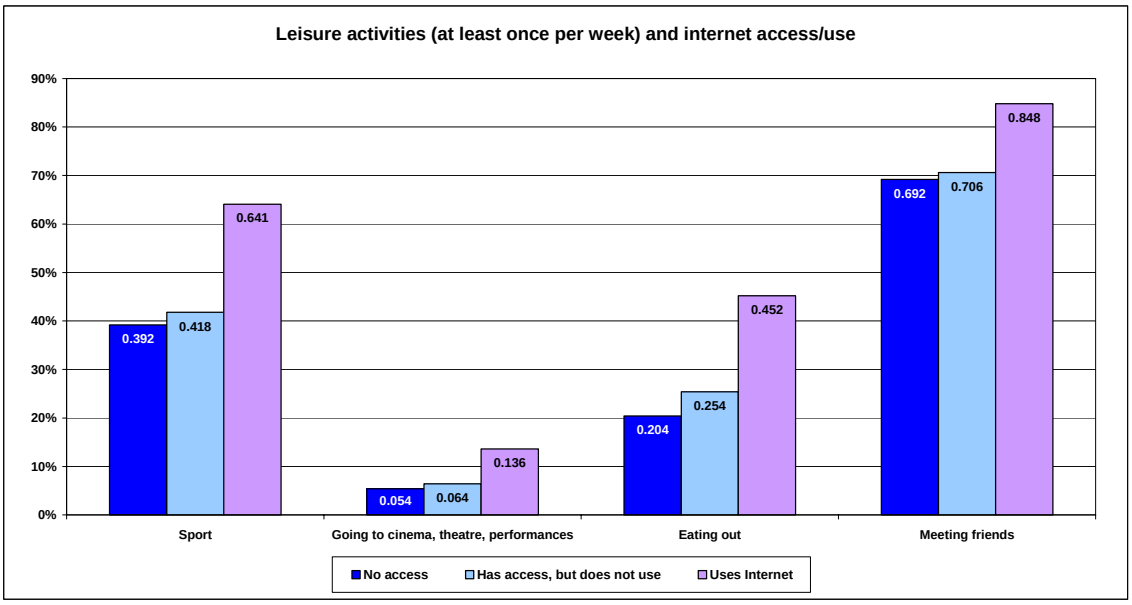
Figure 2



Source: Commission study on the Social Impact of IT, based on the Flash Eurobarometer – Information society seen by the citizens (2008)

Internet users are also much more active in social leisure activities than non-users (Figure 3). They are more likely to engage in active sport (64% of them weekly vs. 40% among non-users), more than twice as likely to go to the cinema/theatre/other performance and also more than twice as likely to visit a restaurant/café/pub/bar/club in a given period of time. They also tend to meet friends more often. Internet use is positively associated with engagement in social leisure activities independently from the socio-demographic background.

Figure 3



Source: Commission study on the Social Impact of IT, based on the Flash Eurobarometer – Information society seen by the citizens (2008)

Internet use is generally expected to relate to a decline in television watching. TV watching is more frequent among older and lower educated people who typically do not use the internet. However, when comparing internet users and non-users of similar social background, there is no difference in the frequency of TV watching.

3.2. A typology of internet use

Multivariate analysis[27] has allowed the development of a conceptual typology of ways of internet use: recreational, resource enhancing and instrumental (Table 1). A person is considered to be a recreational, resource enhancing or instrumental user if she/he pursues more of the respective activities than the average user. Recreational use is associated with playing, downloading media or software, using social networking sites, sharing videos and photos, etc. Instrumental usage includes buying and selling, eBanking and dealing with the public administration. The resource-enhancing use includes e-learning, reading the news, social networking and work.

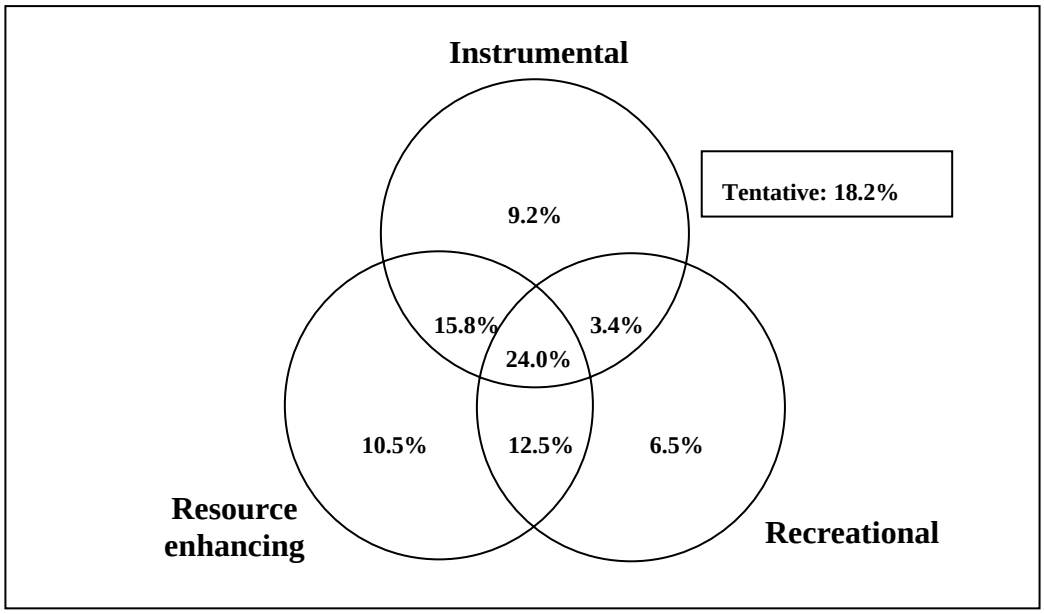
Table 1: Typology of internet uses

Recreation	Resource enhancing	Instrumental
Playing and downloading	Learning online	eBanking
Sharing media	Social networking	Buying and selling online
Transferring to other devices	Following the news	eGovernment
	Work	

[27] As the term indicates, "multivariate analysis" refers to techniques dedicated to the analysis of data sets with more than one variable.

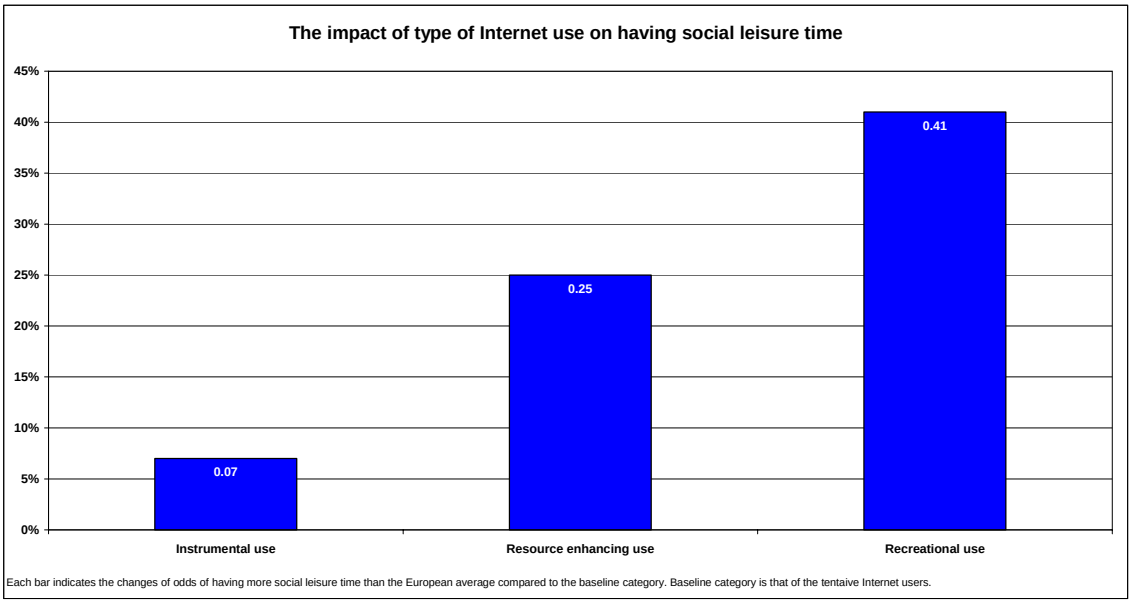
The categories are not mutually exclusive (Figure 4). About one quarter of EU27 internet users are "all-round users", meaning that they fall under all categories. On the contrary, 18% of EU27 users make "tentative users": they use e-mails and search engines but have not yet engaged in more advanced applications.

Figure 4



Results reveal that instrumental and resource enhancing users have higher chances to be active in civic organisations, coincide with an increase in general trust and are positively correlated with leisure time spent on social activities (Figure 5). When interpreting the results, it is important to bear in mind again that a clear causality cannot be established.

Figure 5



Source: Commission study on the Social Impact of IT, based on the Flash Eurobarometer – Information society seen by the citizens (2008)

The previous chapter has highlighted the main sources of digital divides and indicated that people with different social backgrounds have different access to information technologies.

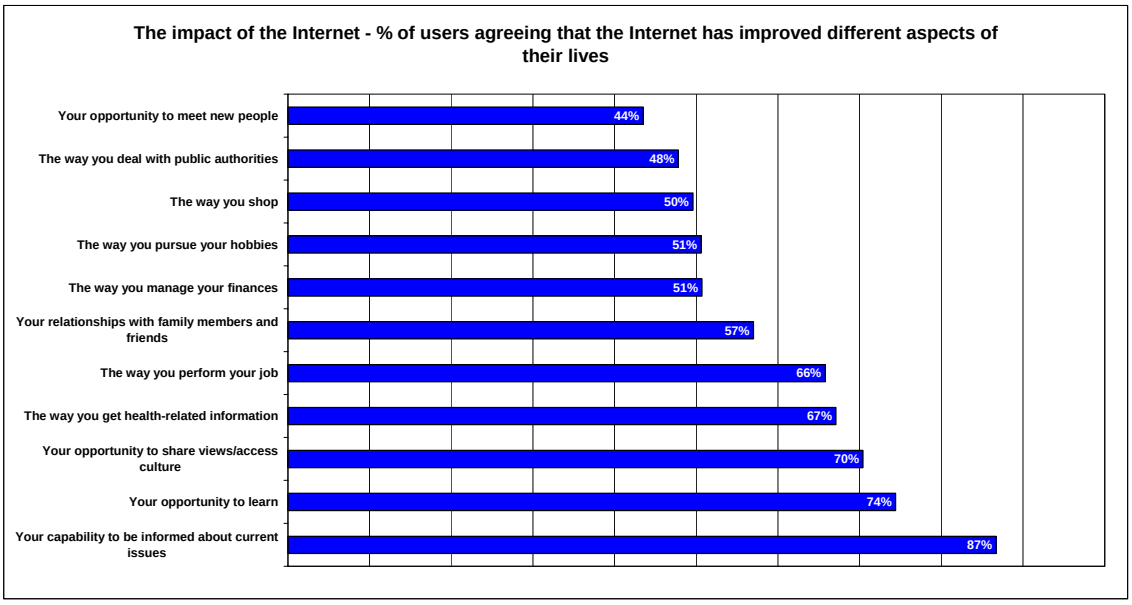
Among internet users, younger people tend to use it more often than older people; more educated people use it more often than less educated people, and urban residents more often than people residing in rural areas. Non-working users feature a higher frequency of usage than working internet users (because the former group includes students).

Recreational usage shows strong, negative association with age. The resource-enhancing mode of use also decreases with age. This trend does not emerge in the case of instrumental use (uptake is highest in the medium aged group). Each of the three types of use increases significantly with education, showing that less educated people tend to use the internet for fewer and less advanced purposes. Persons residing in urban areas tend to display an extensive rather than a tentative use of the internet. Finally, manual workers use the internet less often for resource enhancing and instrumental purposes than employees, but the intensity of recreational use among them is almost the same. This may indicate a situation where manual workers are less likely to use the internet as part of their job, and as such are less likely to learn about the manifold opportunities which the online world offers on top of its recreational functions.

3.3. Perceptions about the social impact of ICTs

The majority of internet users has a positive perception about the impact of the internet on everyday life and in particular on their resource-enhancing capabilities (learning, culture, health-related information and work). More than half of users feel that the internet has improved their relationship with family and friends while less than half says that the internet has added opportunities to meet new people or improved the way to deal with the public administration (Figure 6). As could be expected, higher actual use is correlated with positive opinions.

Figure 6



Source: Commission study on the Social Impact of IT, based on the Flash Eurobarometer – Information society seen by the citizens (2008)

Internet users also expressed opinions on the costs of non-internet usage. The majority agreed that those who do not use the internet are less reachable for professional purposes, are at disadvantage during their career and risk missing good online shopping opportunities. Non users, on the other hand, are more likely to report that they feel less threatened by internet-

related risks such as online fraud and unintentional disclosure of personal data (Table 3). Interestingly, older Europeans are more likely to agree that non-users are missing opportunities than younger Europeans (with similar social and cultural characteristics), suggesting that older people are well aware of the benefits of the internet.

Most people, except for frequent users, disagree with the statement that non users miss the opportunity of socializing with friends and family. There is also a general disagreement with the idea that non users are less open and less informed, but frequent users tend to disagree less than non users do. Non-users, on the other hand, reported significantly more often that they can avoid frustration caused by complicated technologies, take less risk and have more time for friends, family and for themselves.

Nevertheless in all of these issues, in spite of the significant differences, both users and non users somehow similarly agreed or disagreed with the statements proposed in the survey. In particular, both users and non users agree (even if at different degrees) on the fact that not using the internet means having fewer chances of finding good bargains and being disadvantaged in the work carrier. There is only one item where the opinions of Internet users and non-users diverged: the majority of Internet users think that non-users take the risk of becoming old fashioned (Table 2).

Table 2: Perceived implications of not using the Internet (% of those who agree)

"People that don't use the Internet" …	**Frequency of Internet use**				**N**
	No access	No or less than once a month	Once a day or once a week	Several times a day	
A. Miss the opportunity of greater contact with friends and family	42.1	35.1	43.7	53.5	11237
B. Are at a disadvantage in their career prospects	57.1	56.2	60.7	64.5	14673
C. Risk becoming old-fashioned	42.7	41.5	53.4	56.1	12671
D. Miss the opportunity of finding good bargains online (including airline tickets and trips)	59.1	58.9	74.8	80.1	17603
E. Are less open to the outside world	39.6	36.6	42.7	44.8	10484
F. Know less and are not as well informed as other people	41.7	42.0	43.7	47.0	11196
G. Have more time for themselves. family and friends	73.6	74.3	59.2	54.8	15778
H. Take less risk because they don't get exposed to the risk of online fraud	77.2	76.0	68.9	62.9	17025
I. Take less risk because they don't run the risk of other people finding out information about them	69.6	68.1	62.0	57.0	15253
J. Are less reachable for professional purposes	63.2	59.0	65.7	70.1	15920
K. Avoid the frustration of dealing with complicated technologies	57.1	55.3	55.6	53.2	13210

Source: Commission study on the Social Impact of IT, based on the Flash Eurobarometer – Information society seen by the citizens (2008)

With regards to the use of mobile phones, considering that penetration rates are roughly two times higher than for the internet, users were asked opinions about three main statements:

- Mobile telephony enables better management of leisure time, work and security;
- Mobile telephony leads to better or more contacts with family members, friends and the outside world.

- Mobile telephony results in more stress and higher costs.

Frequent mobile users obviously tend to agree with the positive views. The young are less sensitive when it comes to stress and costs, but they do not appear to experience more contact benefits than older generations. The lower educated tend to be more enthusiastic about the positive effects of mobile phones, both in terms of time management and contacts. Negative perceptions about the impacts of the mobile phone, in particular in terms of costs and stress, are more likely among older individuals and in rural regions, among people outside the labour market and those with low educational attainment.

3.4. Conclusions

The results reported in this chapter on the social impact of ICT show that, contrary to previous predictions, internet use is positively associated with social capital. In general internet users are more likely to be active in social organisations and are more active in social leisure activities. They also exhibit higher levels of trust.

Furthermore, the general perception of internet users is that the internet has a positive impact on their everyday life, especially in relation to their resource enhancing capabilities. They also think that non-users incur costs, for example related to fewer chances to find bargains and being disadvantage in their careers. Many of these opinions were shared by non-users. Non-users emphasised worries over security and frustration related to internet use, as well as the time they had for friends/family/themselves.

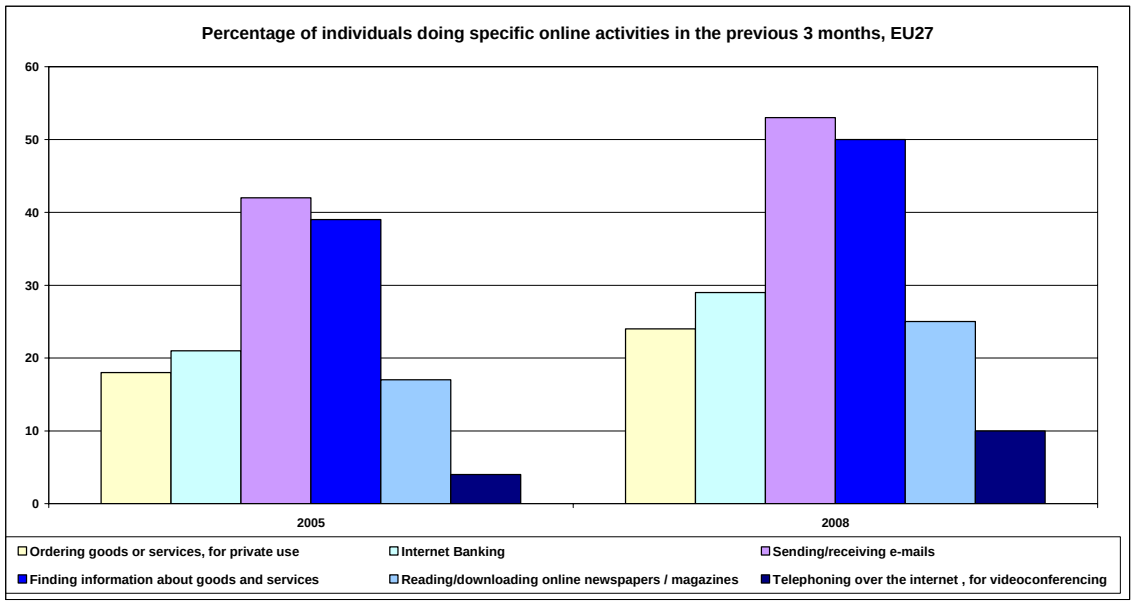
This evidence suggests that there are strong social (and economic) benefits to internet use and that, even in their own opinion, non-users are missing out on the chances offered by internet use. It also shows that non-users have certain fears related to the social impact of ICT, which users do not share, suggesting that lack of familiarity with the internet may be an inhibiting factor. This confirms conclusions drawn in Chapter 2 in relation to the need of raising awareness of the benefits and opportunities of internet use.

4. THE INTERNET AS A COMMUNICATION TOOL

Over the last five years the EU has witnessed great progress in the expansion of internet access, broadband connectivity and uptake of internet services, primarily through fixed access lines and very recently through mobile networks. The rate of households with access to the internet through broadband increased to 80% in 2008, up from 33% in 2004, and the percentage of population that accessed the internet on a frequent basis (every day or almost every day) increased from 23% to 43% over the same period. European consumers are rapidly changing their habits and increasingly adopting new ways of communicating, sharing information and interacting with business and public administrations. This change is growing in parallel to the take-up of broadband connectivity, which is gradually offering higher download and upload speeds at cheaper prices.

The percentage of the EU population using internet services has grown substantially since 2005 (Figure 1). The largest increases have occurred with respect to the proportion of the population using the internet for sending and receiving e-mails, as well as for finding information about goods and services, increasing by 11 p.p., to 53% and 50% respectively, over the period up to 2008. Government take-up has also grown, with 28 and 68% of citizens and business using eGovernment services respectively. Other less popular services which require more advanced internet skills have also grown markedly, with the proportion of the population using these increasing by between 6 and 10 p.p..

Figure 1



Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

In order to measure the take-up of advanced services in the EU, i.e. all those services that go beyond the one-to-one communication systems and make possible the distribution and sharing of online information, content and applications, be it on wired or wireless networks, in 2008 Eurostat dedicated a special module of the survey on the use of ICT by households and individuals. The aim was to measure the use of these services, looking at the use of information and entertainment services, the use of mobile internet and the willingness to pay for audiovisual content. Data from the module provide rich information on the take up of advanced services by countries and by socio-demographic characteristics.

This chapter focuses on the results of the special module with regards to the use of the internet for advanced communication services. Section 1 focuses on how Europeans use the internet to communicate. While use of internet to communicate is growing, section 2 shows that internet does not yet replace other traditional means of communication. Section 3 spreads light on the intensive use by the younger cohorts of the population, while section 4, on the use of mobile phones for advanced communication services, demonstrates that advanced mobile communications still have a long way to go before reaching similar take-up levels.

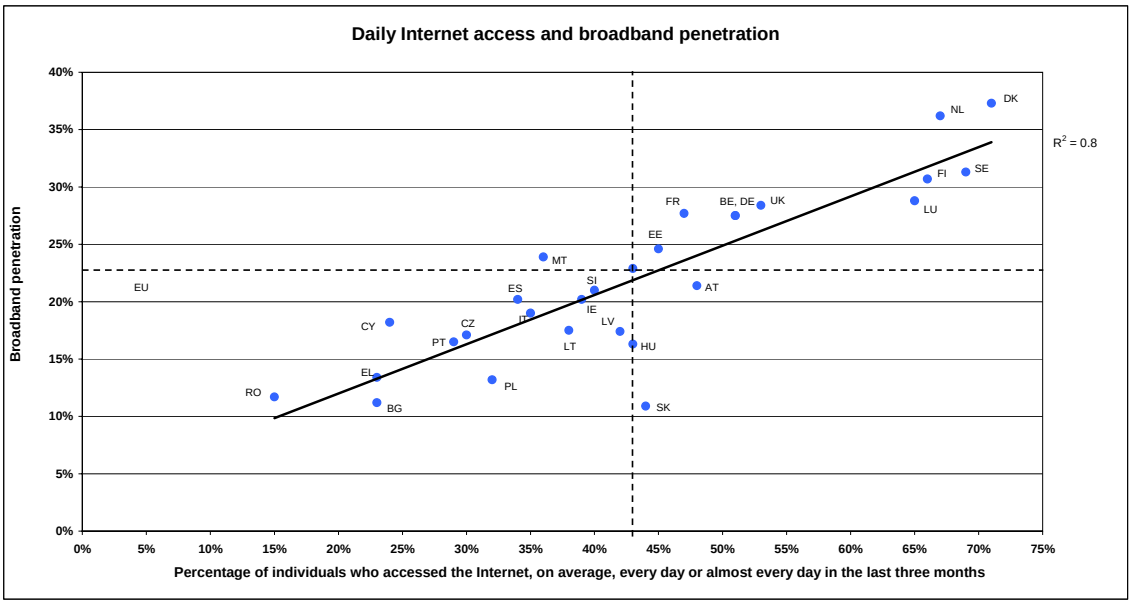
4.1. How do Europeans use the internet to communicate?

Communication is at the origin of the internet and communication activities remain the primary action of internet users. E-mail was the first mass adoption service in the history of the internet and is now widely seen as a traditional means of communication; with 53% of the EU population in 2008 reporting they had used it within the last three months.

Use of advanced communication services is also on the rise. According to Eurostat figures, in 2008 35% of Europeans declared using the Internet in the last 3 months prior to the survey for advanced communication services, which include creating or maintaining web logs, using instant messaging, posting messages to chat sites, newsgroups or online discussion forums, telephoning over the internet and video calls and reading web logs.

A key factor supporting both the more frequent use of the internet and the take-up of advanced services is the continuing spread throughout the EU of faster and cheaper broadband access. The data shows that there is a strong correlation between frequent internet use and rates of broadband penetration across EU countries (Figure 2).

Figure 2

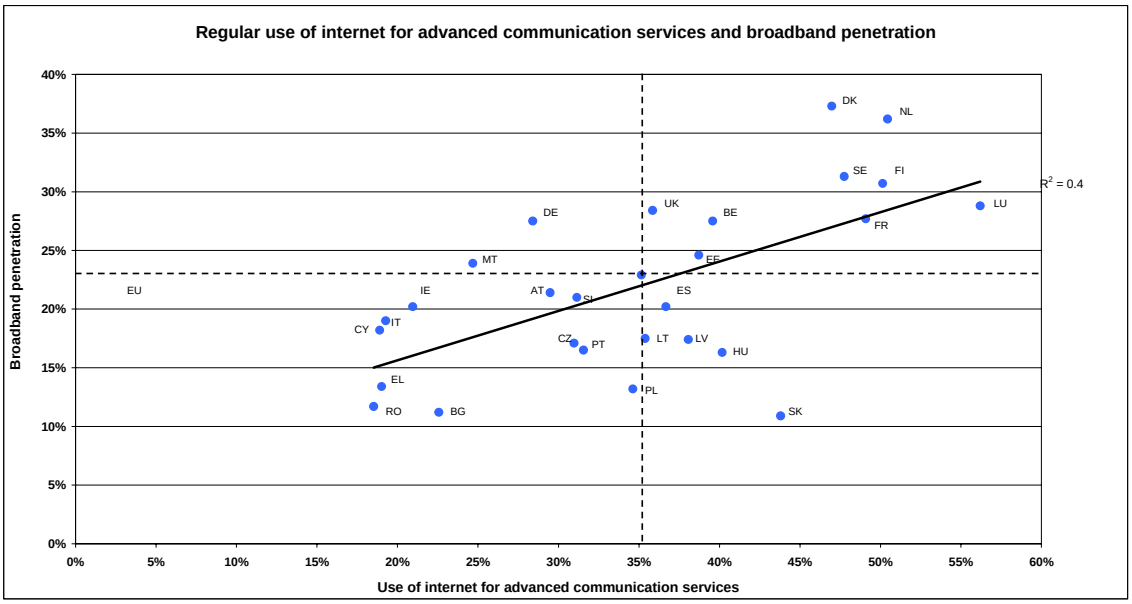


Source: Commission services based on Eurostat and COCOM data (2008)

Adoption of advanced communication services is also correlated with the level of broadband penetration, although the correlation is somewhat weaker (Figure 3). The main outlier countries include Germany and Malta, which exhibit relatively low use of advanced communication services compared to their relatively high broadband penetration level, and Poland, Hungary, Latvia and, as with frequent use, especially Slovakia, which feature a

relatively low level of broadband penetration despite having a high percentage of population using advanced services.

Figure 3



Source: Commission services based on Eurostat and COCOM data

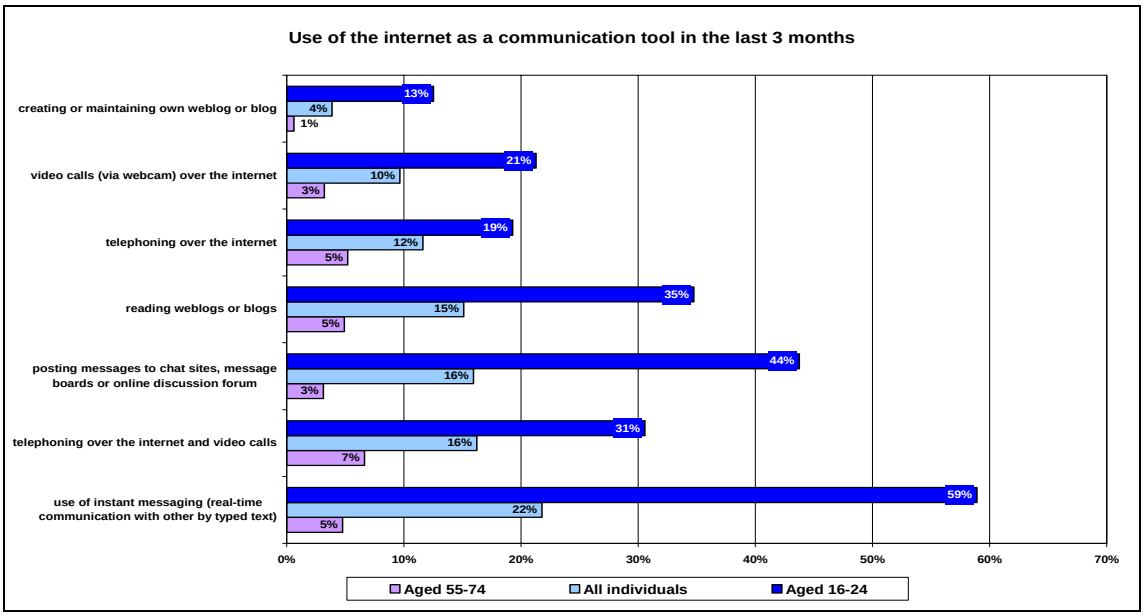
One of the reasons behind the weaker level of correlation is the fact that the take-up of advanced communication services that do not demand much bandwidth, like instant text messaging, is less dependant on the widespread availability of broadband. Spain, Estonia, Portugal and Poland are more intensive users of this service than other countries with higher broadband penetration rates.

Beyond broadband availability, other factors are also critical to the understanding of the different levels of adoption of the internet for communication services. Users' awareness and skills, preferences and price of traditional communication services, or other socio-economic factors may help to explain these differences. Users may also decide to subscribe to a broadband service not for communication purposes but primarily to get access to entertainment content and services.

Sending and receiving e-mails is still the most popular communication service through the internet (Figure 1): in 2008, 53% of surveyed individuals reported to have sent or received an e-mail in the last three months. Within advanced services, instant messaging appears as the most attractive communication application of the internet with 22% of EU citizens using it (Figure 4), followed by internet telephoning and video calls (16%) and posting of messages to news groups and online fora (16%), along with reading blogs (15%).

Predominance in the use of one or another service is very much linked to age. For younger people, e-mail is also a very dominant application (78%) closely followed by instant messaging (59%). Posting of messages (44%) and reading blogs (35%) are the following most common services. Interestingly, telephone over the internet and video calls is not one of the most demanded uses by younger users, exactly the opposite of what happens with people aged 55 to 74, of which 7% seem to find in internet telephony and video calls the most interesting service.

Figure 4

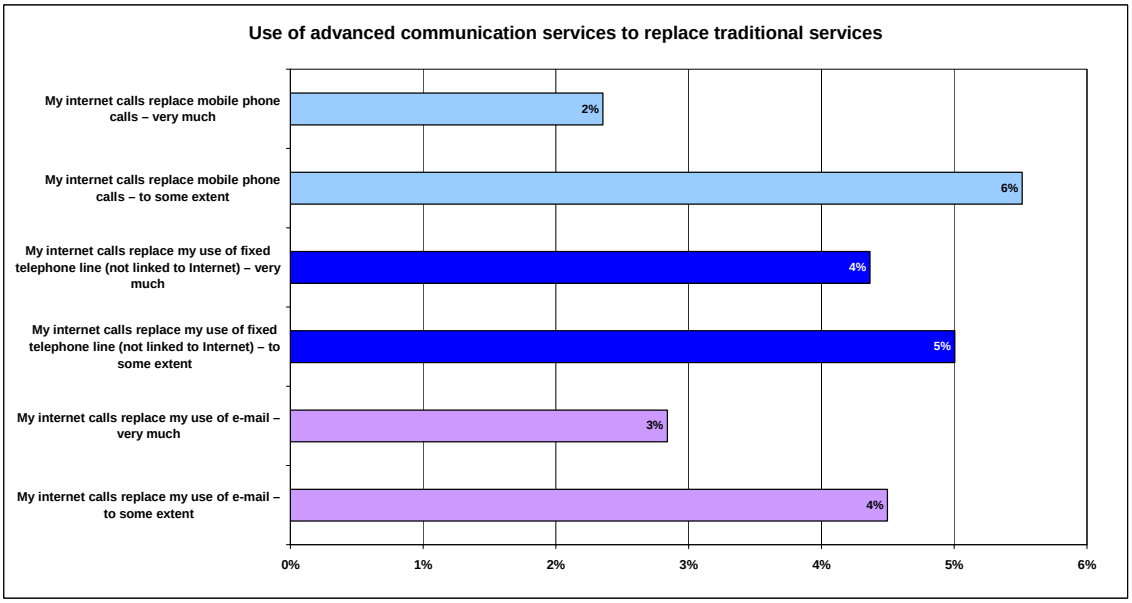


Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

4.2. Does the Internet replace other means of communications?

Despite the significant growth in the use of the internet for advanced communication services, such services do not yet reduce the use of other means of communications, such as e-mail, fixed and mobile calls (Figure 5). Results indicate that there is no real substitution effect and new communication services are used along with the traditional ones, for which frequency and level of use may vary, but are still demanded.

Figure 5

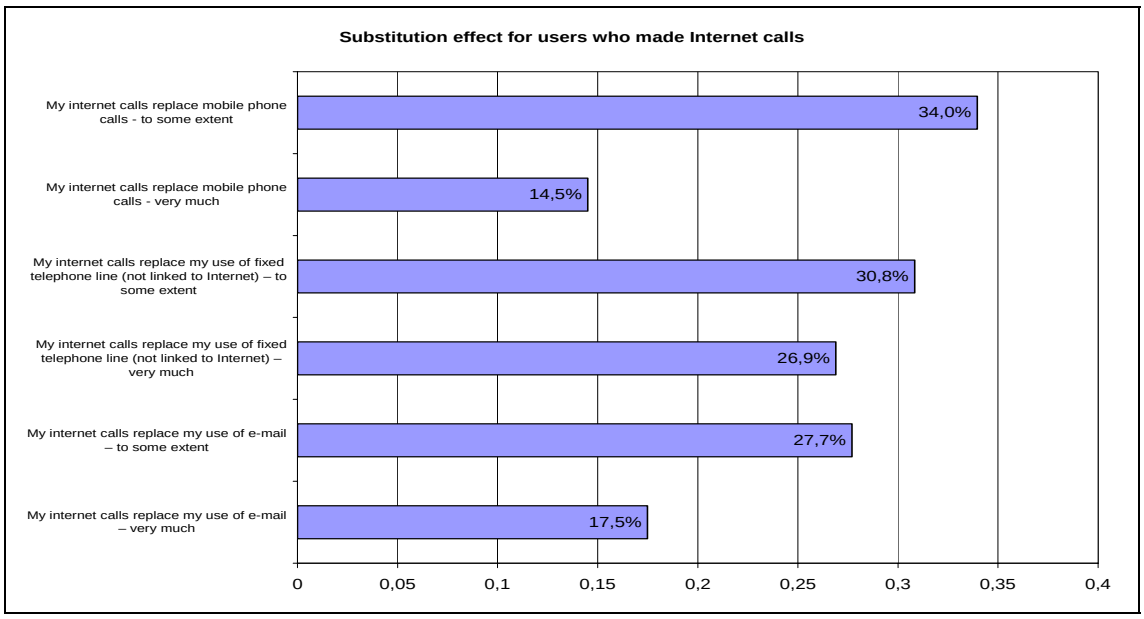


Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

However, this conclusion only holds when looking at the general population. When considering internet users who made internet calls, evidence of the substitution effect starts to emerge. For approximately one third of the people using this service, online calls have replaced the use of mobile or fixed line calls. For 27% of users, the replacement effect on

fixed line calls was even higher (Figure 6). Thus it appears that once one starts to use internet telephony, the uptake of traditional communication methods may decline. But since only 12% of the Europeans takes up the service, its total impact remains limited.

Figure 6



Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

One could also expect that the increase in the use of instant messaging and posting of messages would affect the uptake of e-mail services. However the growth in the use of e-mail has been steady since 2004 (Table 1) and only 3% of individuals indicate that internet calls replace the use of e-mail. Some research points to the shift by young users from e-mail applications to instant messaging services, although preferences for a particular service do not necessarily entail a significant drop in other communication channels. Another reason for the growth in the use of e-mail is that, for many new Internet users, this application still appears easy to grasp relative to other interactive services which require more advanced skills.

Table 1

	2004	**2005**	**2006**	**2007**	**2008**
Percentage of individuals who used the internet for sending and receiving e-mails in the last three months	37%	42%	42%	48%	53%

Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

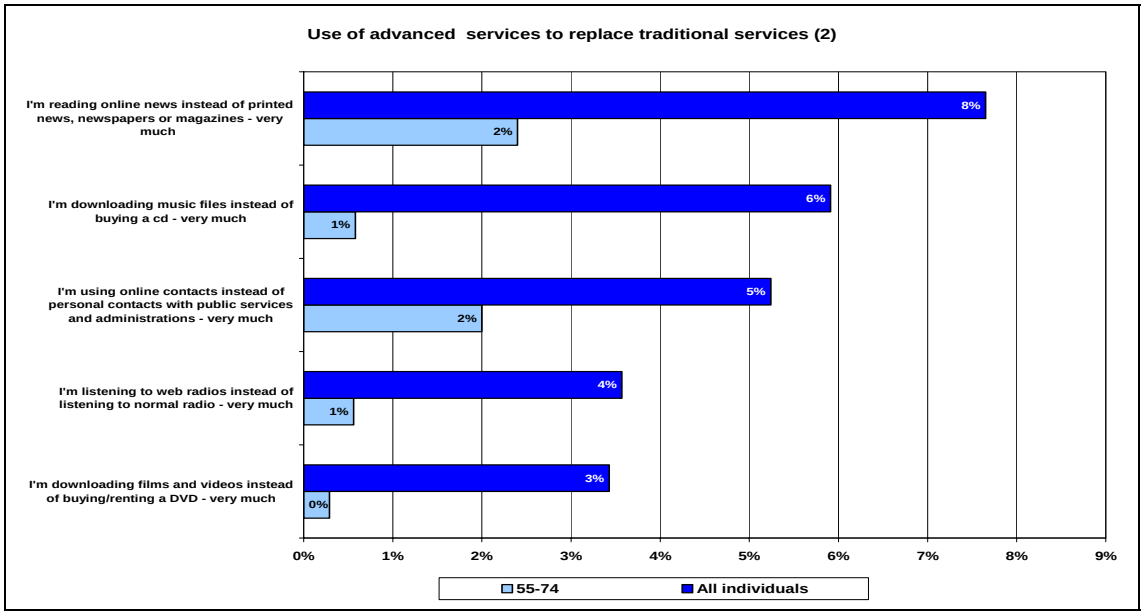
Similarly, the Internet can be used for making calls and video calls and, depending on which application is used, at zero cost. However, the rate of substitution is not very high, suggesting that users are not yet abandoning traditional communications means. Only 2% of the population acknowledge an intensive replacement of mobile calls by internet calls, a figure that is also low (4%) in the case of fixed calls.

Since most users of advanced communication services rely on a fixed connection and only 3% of the EU population uses a third generation mobile phone to access the Internet, internet calls will not fully replace mobile calls in the near future, despite the fact that more and more mobile calls are also made from home or the work place, where fixed internet connections are available. In the case of fixed telephony, new pricing models for fixed calls and the rise in the number of bundled broadband packages offering free voice telephony as a free service on top

of the broadband connection may partly explain why users do not feel the need to replace their fixed telephone line with internet communications services.

Similar conclusions can be drawn in relation to entertainment services (Figure 7). There still remains a significant part of the population which refuses to adopt advanced information/entertainment services. On average, 3% of the population download films and videos instead of buying/renting a DVD; 4% is listening to web radios instead of listening to normal radio and 6% prefers to download music files instead of buying music CDs. Similar percentages are observed with regards to the use of online contacts instead of personal contacts, with public services and administrations or the reading of online news instead of printed news, newspaper or magazines. These rates are particularly low for those aged 55-74.

Figure 7

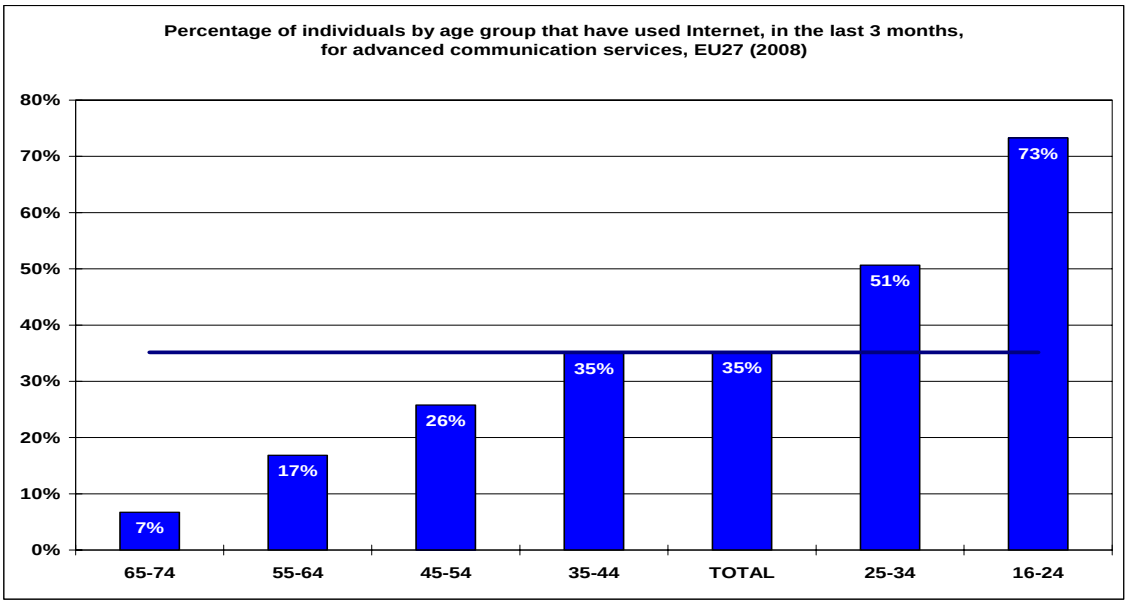


Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

4.3. Youngsters are the most intensive internet users

Young people are active users of the internet as the main channel for information and communication purposes (Figure 8).

Figure 8



Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

"Digital natives", i.e. people between 16 and 34, and especially those aged 16 to 24, most of them students, stand out as the most regular, intensive users of internet advanced services. There is an evident, profound break with previous generations in the attitude towards the use of internet services. This is linked to the level of internet and informatics skills. The percentage of young people with medium internet skills is twice as much the European average (for all individuals aged 16-74) and the number of individuals aged 16 to 24 with IT skills obtained through formalised educational institution is three times higher than the average (Table 2).

Table 2

	16-24	25-34	35-44	EU avg.	45-54	55-74
Percentage of individuals who accessed the Internet, on average, every day or almost every day in the last 3 months (2008)	66	57	49	43	39	20
Percentage of individuals who have obtained IT skills through formalised educational institution (school, college, university, etc.) (2007)	65	38	16	22	8	3
Percentage of individuals who have carried out 3 or 4 of the Internet related activities (medium Internet skills) (2007)	43	33	24	23	17	8

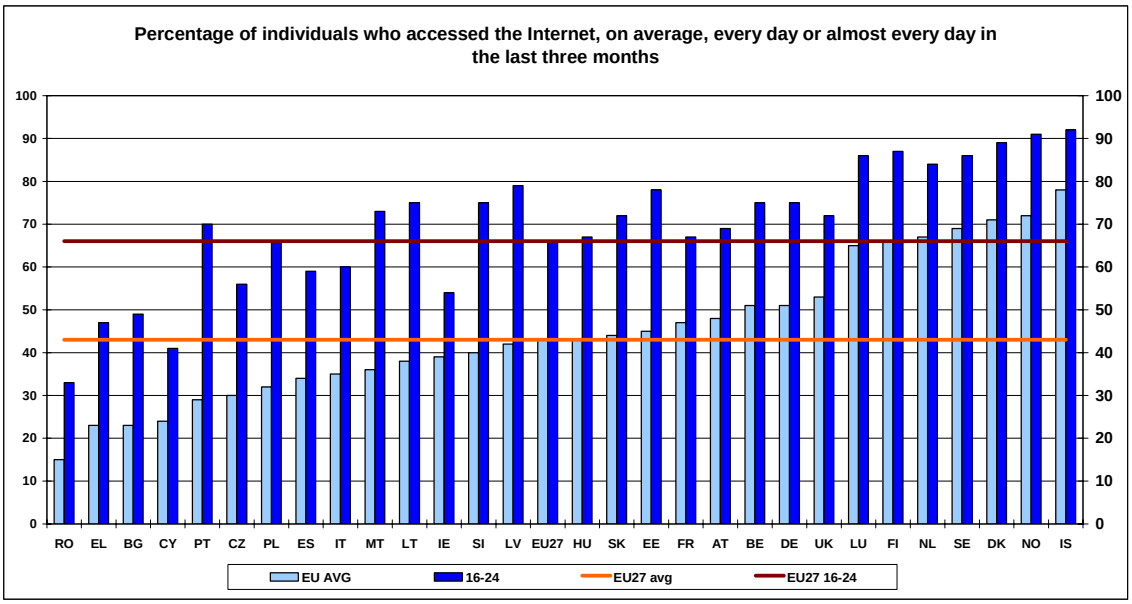
Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

On average 43% of EU population accessed the Internet everyday or almost every day (Figure 9). However, this percentage increases more than 20 p.p. when it comes to people aged 16-24,

with 66% of them accessing the internet everyday. In the most advanced countries, around 90% of young people connect on a daily basis. With the exception of Romania and Cyprus, in all countries the percentage of young people connecting to the internet everyday is higher than the average of the whole EU population. The difference between the whole EU population and the youngest users is about 23 p.p.. This difference lessens in the most advanced countries to about 18 p.p., but can be more than twice as much in the less advanced countries (Romania, Greece, Bulgaria, Portugal).

It is also worth noting that differences between countries are reduced when the 16-24 age group is taken as a reference. Besides the most developed countries, young people in Latvia, Portugal or Poland have similar frequency of use as in the UK, Germany or Belgium.

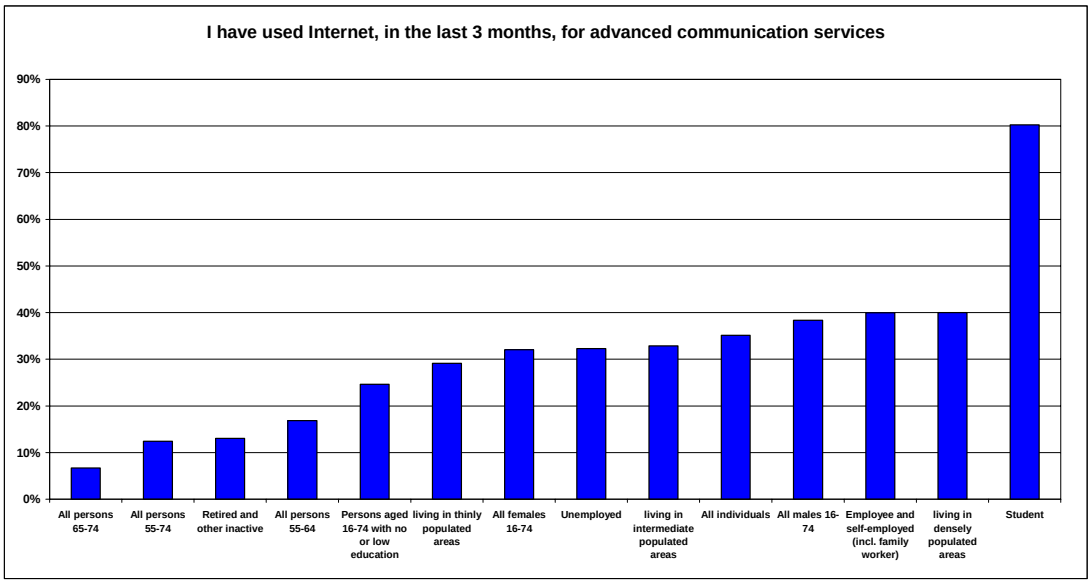
Figure 9



Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

80% of students and 73% of the EU population aged 16-24 have used the internet in the last 3 months for advanced communication services (Figure 10). This is twice as much the amount of regular users in the employees and self employed category and 45 p.p. higher than the 35% of the EU population. In all other types of services, both for communication and entertainment purposes, students and young people always exceed other categories of population. Their attitude towards the web is different in that most of them are not passive consumers of web pages or static online content pushed by a reduced number of content generators, but veritable users of a borderless space in which content and services are made available for active users to download, exchange, create and re-create, distribute, share or re-use.

Figure 10



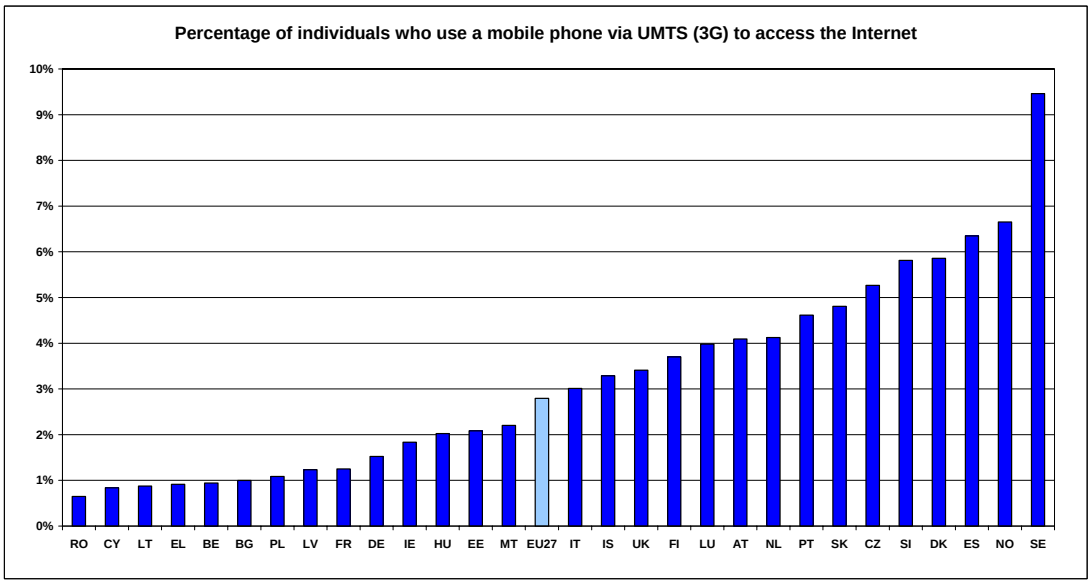
Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

This is confirmed by the shift in the focus from availability of online content to the significant rise of social networks and user created content in the last two years. Young internet users are intensive consumers that fully exploit the many possibilities offered by the web.

4.4. The mobile phone for advanced communication services: An emerging service

Advanced services are mostly being used through fixed broadband connections and the role of mobile services is not yet tangible. Only 3% of the EU population aged 16-74 uses a third generation mobile phone to access the Internet. Interestingly, a heterogeneous group of countries are the top performers, with Nordic countries along with Spain, Slovenia, Czech Republic, Slovakia and Portugal. Some countries with good levels of fixed broadband penetration are amongst the laggards: Belgium and France for example have usage rates similar or below Bulgaria, Poland and Latvia (Figure 11).

Figure 11



Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

These data refer exclusively to the use of third generation (3G) mobile phones to access the Internet. In many countries the use of 3G networks via USB dongles and datacards to get a broadband access for a laptop or a desktop is much higher[28].

Although 3G broadband access has a number of advantages over fixed broadband access - it can reach areas not covered by fixed broadband access, there is no need to pay a line rental and it provides access everywhere and connection is immediate, as a USB key just needs to be connected to a computer - it appears that 3G is not yet a full substitute of fixed broadband technologies for private consumers, especially in less densely populated areas.

One reason for this lack of full substitutability is that third generation mobile technology provides much lower access speeds than fixed broadband access. Enhanced 3G mobile technology, also called 3.5G, offers much higher speeds, but coverage of 3.5G networks is limited to major cities with high population density[29]. This compares to coverage rates of around 90% for DSL technologies in most countries. Outside areas with 3.5G coverage, only third generation coverage is available and in many cases this technology has to rely on low-speed second generation mobile networks to guarantee full national coverage.

Another reason is the different price and usage conditions of mobile and fixed access, resulting in higher monthly consumer prices for mobile services. Contrary to the pricing system of fixed broadband access, based on unlimited consumption in exchange of a flat rate in most EU countries, pre and post-payment are still predominant pricing models for mobile phones. On average 41% of EU citizens subscribe to post-payment contracts and 35% to pre-paid packages. Only 4% of the EU population pay a flat rate for internet access via the mobile phone in connection with post-payment schemes, but this situation is expected to change in the future as more and more mobile operators start offering flat rate packages in an attempt to increase take-up of advanced services as well as frequency of access[30].

Mobile handsets have come a long way since the first models appeared on the market and their ergonomics and usability has improved significantly, on top of being capable of many more functionalities. Despite these improvements, it is clear that for a number of applications and services mobile handsets cannot compete against laptop or desktop computers as performance is still better, both at hardware and software level. It also appears that many sites and services are not yet fully adapted for being browsed or used with a mobile handset. These factors altogether can explain the low adoption of mobile handsets as a tool for using advanced internet services. However, smartphones are developing quickly and several companies are strongly competing on the Mobile Operating Systems arena, which will certainly lead to an increase in the growth of mobile applications.

Sending photographs or video clips via MMS messages represent by far the most popular advanced services via a mobile phone (Figure 12). When asked, 18% of EU population said

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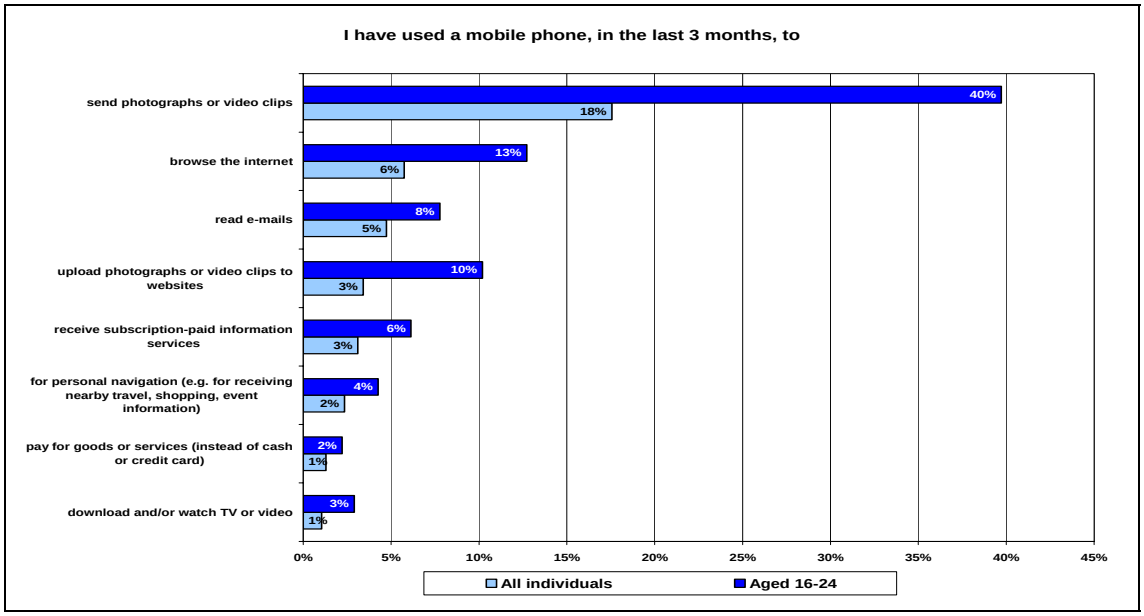
28 See the 14th Progress Report on the single European electronic communication market, available at http://ec.europa.eu/information_society/policy/ecomm/library/communications_reports/annualreports/14th/index_en.htm

29 Around 60% of the overall population according to Screen Digest

30 Eurostat data used in this report were collected in the first half of 2008. According to the OECD, data caps / bitcaps were applied to 36% of all broadband connections in the OECD in September 2008. The percentage was much higher for wireless broadband over satellite and fixed-wireless networks at 63%. Broadband plans over mobile networks were the most restrictive, with 89% of offers imposing a data limit each month. However, many new tariff plans for mobile services, including flat rates, have been made available since the second half of 2008.

they had sent a photo or a video clip in the last three months, a figure that rises to 40% in the case of young people. Internet browsing and e-mail reading are the next most regular applications, but the level of adoption is much lower at 6 and 5% of the EU population, respectively. Use of these services by younger generations follows the same patter, i.e. around twice as many the numbers of users. Use of other services (subscription-paid information services, personal navigation, mobile payments and TV and/or video watching) are still marginal activities.

Figure 12



Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

Gradual adoption by the population of mobile services is expected to increase mobile traffic at a much higher rate than fixed, though from a lower basis. However, according to recent literature, by 2020 consumers will still spend much more time using fixed online data applications than mobile (Table 3)[31].

[31] Gartner's *User survey analysis: Next-Generation Communications Consumer, Worldwide, 2020,* February 2009

Table 3: Average hours per week using fixed online and mobile data applications

	Average	Growth in average use by 2020
Fixed		
Internet blog	0.52	7%
Photo blog	0.28	18%
Video blog	0.34	36%
Instant messaging	1.30	26%
Chat rooms	0.50	15%
Social communities	0.80	22%
Fixed average	**0.62**	**21%**
Mobile		
Mobile blog	0.09	61%
Mobile photo blog	0.07	35%
Mobile video blog	0.09	39%
Mobile instant messaging	0.33	46%
Mobile chat rooms	0.12	49%
Mobile social communities	0.13	45%
Mobile average	**0.14**	**46%**
Total for fixed and mobile	**0.69**	**23%**

Source: Gartner

Provision of mobile content by mobile operators was initially not very successful, mostly due to low quality services and bad pricing conditions. The spread of 3G networks, new pricing conditions including flat rates and the entry into the mobile content market of handset manufacturers and of open distribution platforms are expected to contribute to change the situation. At the moment, the very gradual development of mobile broadband networks is enabling content companies that are leaders in the fixed segment to take the lead in the mobile broadband content arena, a situation that is not likely to change. The growing mobile content market is therefore becoming very similar to the fixed broadband one.

4.5. Conclusions

Use of advanced communication services is on the rise. In 2008, 35% of Europeans declared having used the Internet in the last three months for advanced communication services. The continuing spread of faster and cheaper broadband communications has been one important

factor behind these results. Sending and receiving e-mails is still the most popular communication service through the internet. Predominance in the use of one or another service is however very much linked to age.

There is an evident, profound break with previous generations in the attitude towards the use of internet services. In the most advanced countries, around 90% of young people connect on a daily basis. However, across all EU Member States, use of advanced services is significantly higher among the young and the gap between countries for this age group is smaller. More frequent and advance use is linked to the higher level of internet and informatics skills of this generation, to a large extend obtained though formalised education. Their behaviour as regards the internet is also somehow different from the rest of the population: in particular, the young are more extensive users of advanced internet services. 73% of them access advanced communication services. The next chapter will look at further implications of such behaviour.

As such, the young – and in particular students - can be considered as lead users of advanced internet services, showing the way for other groups in society. The phenomenon is a clear indication of the economic and social impact the internet will carry in the future and of the size of the change brought about by the digital revolution. It is also a positive indicator for future declines in the digital divide. Nevertheless, this does not mean that social differences in internet use will disappear and policy action should continue to be taken to minimise these differences.

5. THE USE OF THE INTERNET FOR ENTERTAINMENT PURPOSES AND ITS IMPACT ON CONTENT MARKETS

The diffusion of broadband has brought about growth in a variety of online activities. Next to the online distribution of professionally-produced media content, such as music, films, video games and publishing content, 2008 has been characterised by the explosion of social network services, notably Facebook (Annex: most viewed websites) and Twitter, confirming the trend started a few years ago towards a more participative use of the web[32]. The diffusion of high capacity internet has also brought about a rise in the illegal distribution of online copyrighted material and, according to the content industry, levels of internet piracy are very high in some EU Member States.

The previous chapter highlighted the emergence of a generation. These young users also stand out from the rest of the population in their attitude towards the payment of online content and the perception that many of the services and content are available on the internet free of charge or simply provided in exchange of a flat rate internet connection.

This stylised fact is posing a number of challenges to policy makers, regulators and industry. In the context of the review of the EU regulatory framework for electronic communications, for example, the introduction of an amendment by the European Parliament in May 2009, after reaching an agreement, was motivated by the treatment of file sharing over the internet. Decisions on key aspects of the telecoms reform were put on hold because of a question relating to internet use rather than to traditional telecom aspects.

While Europe is one of the most creative regions of the world in terms of production of quality content and features high rates of broadband take up, it is yet to take full advantage of digital content markets, including the advertising market which represents the biggest online content market in revenues followed by online games, music and videos.[33] Technological advances in ICT, together with the increasing internationalisation of audiovisual markets, are the two main challenges for policy-making in the audiovisual sector today.

The regulatory framework has been reviewed to respond to the increasing importance of on-line delivery of audiovisual content. The Audiovisual Media Services Directive adopted in 2007 sets European standards for the new services so that national borders don't stand in the way of reaching viewers and users. It has to be implemented by Member States by the end of 2009[34]. In relation to support instruments the MEDIA 2007 programme seeks to ensure that the latest ICTs and trends are incorporated into the business practices of beneficiaries[35].

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32 In February 2009, for example, Nielsen estimated that memberships for micro-blogging service Twitter rose more than 1,300%. In the same month, Nielsen claimed that Facebook - already the largest online social network - saw growth of 228%. Source: Datamonitor "The Rise of Social Networking and Emerging Channels in Customer Service"- quoting research by Nielsen.

33 OECD Information Technology Outlook 2008

34 Available at http://ec.europa.eu/avpolicy/reg/avms/index_en.htm

35 After exploring new ways of distributing European content through pilot projects, the Commission published a first call for proposals entirely dedicated to Video on demand three years ago: in the first year 11 VOD platforms with a majority of European content were supported for a total amount of € 4.2 million. In response to this year's call 17 legal offers of shorts, documentaries and features films with a broader European coverage will receive around € 5.75 million.

Apart from challenges posed to audiovisual regulatory and support instruments the overall development of online distribution of creative content in Europe, regardless of its origin needs to be addressed. The online distribution of creative works such as music, films, video games and publishing content is transforming the creative industries in Europe. Sales of content on packaged media are rapidly decreasing, but online distribution does not yet compensate for these falling revenues, despite the high potential that clearly exists. De-materialisation of creative content distribution is shaking up the business models of the creative industries, with both potential opportunities and potential losses and bringing new players into the media industries' landscape.

By way of a response to these transformations, the European Commission launched the "Content Online in the Single Market" initiative[36]. This initiative included the "Content Online Platform", a stakeholders' discussion and cooperation platform (creators, rights holders, content providers, consumer associations, internet service providers and the telecommunication industry)[37]. One of the main issues that the Content Online Platform focused upon was improved availability of creative content through the establishment and development of new online business models.

The Platform considered that in most cases, online offers are not yet sustaining. Due to the "prototype" business model widely applicable to creative content in Europe, it is difficult to attract risk capital for new online business models and it is difficult in the short term to finance the transition to digital distribution with the revenues of physical sales as these are shrinking for a number of types of content[38].

Established business models of the traditional media companies are based on sophisticated approaches to advertising and subscription models built upon the presumptions of both the ownership or control of intellectual property (i.e. content) and the ownership or control of expensive distribution networks (so that the content can reach the audience).

Consumers expect easy access and cross-platform availability, including across borders. Their willingness to pay for legal online offerings and to accept limitations to the availability of content is depending essentially on an accurate pricing, but also on how they can use legally acquired content, including copying it. The – legal - availability of creative content online is intrinsically tied to the issue of licensing, as creative content is only – legally - offered online when it is licensed accordingly. Discussions within the Content Online Platform have shown that, in general, on the level of licensing and rights management, workable solutions responding to these challenges have yet to emerge.

5.1. Willingness to pay for content

Results from the 2008 survey reveal that less than 5% of Europeans had paid for online content in the last 3 months. For the youngest age group (16-24), this figures is twice as high. When looking at the individuals that did not pay for online audiovisual content, half of them state that nothing would make them change their minds. For approximately 30% of them, lower prices would be an incentive to pay, while other improvements (wider choice or

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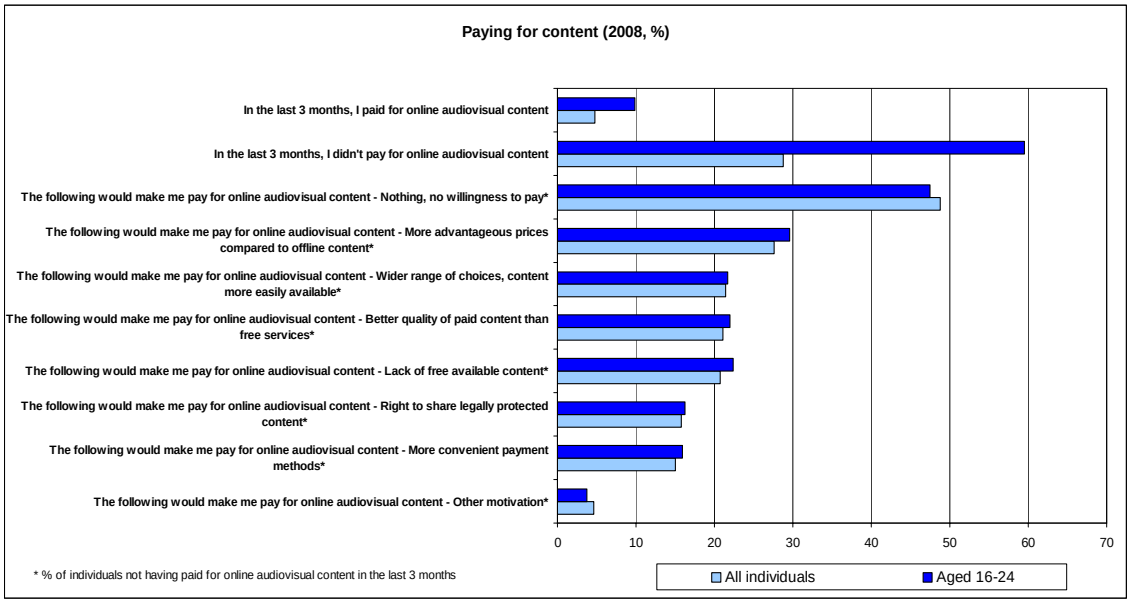
36 See: http://ec.europa.eu/avpolicy/other_actions/content_online/index_en.htm.

37 The Final Report of the Content Online Platform was published on 12 May 2009: http://ec.europa.eu/avpolicy/docs/other_actions/col_platform_report.pdf

38 This does not seem to apply to videogames, that were "born digital", nor to books whose physical sales remain stable and have even increased in some markets.

availability, enhanced quality, better payment methods, the right to share material) or the lack of freely available content would convince between 15 and 20%. Interestingly, the willingness to pay of youngsters and the general population is very similar (Figure 1).

Figure 1



Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

The limited willingness to pay in return for service improvements suggests that the take up of advanced content services is linked to the perception that many of these services are free or are provided in exchange for a flat rate internet connection. For many users, and especially the younger cohorts, adoption of advanced services seems to be driven by the principle of "eat as much as you can" in exchange of a fixed fee. Once the connection to the internet is established, it is just a matter of streaming or downloading and copying the content of choice. Along with free applications – chats, internet telephony and videoconferencing, open source applications and free content, web pages, radio and TV, blogs, user created content - a number of other applications and content services are available on the web and can either be legally purchased or illegally downloaded and shared for free.

Moreover, the low percentage of individuals that consider the possible lack of freely available online content as a reason for paying, calls into question the argument put forward by representatives of the content industry that European consumers will in the long term suffer from a lack of commercial availability of high quality content if the current model of audiovisual content distribution, based on illegal copying, is not curved.

Box 1: Digital content illegal exchange

There are currently no official statistics on online piracy in the Internet. Peer-to-peer traffic gives an approximation on the size of the phenomenon, as these protocols are mainly used to exchange files. Other sources are based on industry claims and surveys on usage.

Industry[39] claims that online music piracy accounts for 95% of the total digital music market. The situation is not very different in the online video market. It is estimated that worldwide only one out of five movie downloads is carried out legally[40].

Some evidences of illegal downloads in European Member States are provided by studies carried out for the industry that illustrate to a certain extent the current situation:

- France: 13.7 million films were distributed on P2P networks in May 2008, compared with 12.2 million cinema tickets sold[41].
- Germany: P2P traffic was more prolific than all other internet traffic combined and represented nearly 70% of all traffic[42]. Over 45% of all files transferred on eDonkey2000 were music files
- Spain: There were an estimated 1.6 billion songs downloaded illegally in 2008[43], compared to 2 million legal "à-la-carte" downloads. This means that just 0.1% of total tracks downloaded in Spain was legal. Digital sales are flat at 10% of the market.

The exchange of digital content is evolving dynamically over the Internet. Peer to peer (P2P) solutions are being improved and new platforms to store data are flourishing, making content more available than before. It is very difficult to measure the exchange of content over the Internet. A proxy measure is the rise in visits to websites offering IP addresses to content in P2P networks (sometimes without retribution to its creators, such as The Pirate Bay) or stock websites (such as Megaupload).

5.2. New content and new platforms for exchange: User Created Content

Business models based on "user created content" can be established much more easily than professionally-produced content offers, simply because they carry lower development costs. The opportunities it represents are exploited more by new entrants in the media industry, such as YouTube, than by "traditional" media distribution companies which are lagging behind.

User Created Content refers to content made publicly available through telecommunication networks, reflecting a certain amount of creative efforts and created outside professional routines and practices.[44] There are very few official figures regarding the diffusion of User

39 IFPI (International Federation of the Phonographic Industry) Digital Music Report 2009: http://www.ifpi.org/content/library/DMR2009.pdf

40 NPD Group - IFPI Digital Music Report 2009

41 Equancy and CO and Tera Consultants - IFPI Digital Music Report 2009

42 Ipoque - IFPI Digital Music Report 2009

43 Promusicae/Gfk: http://www.promusicae.org

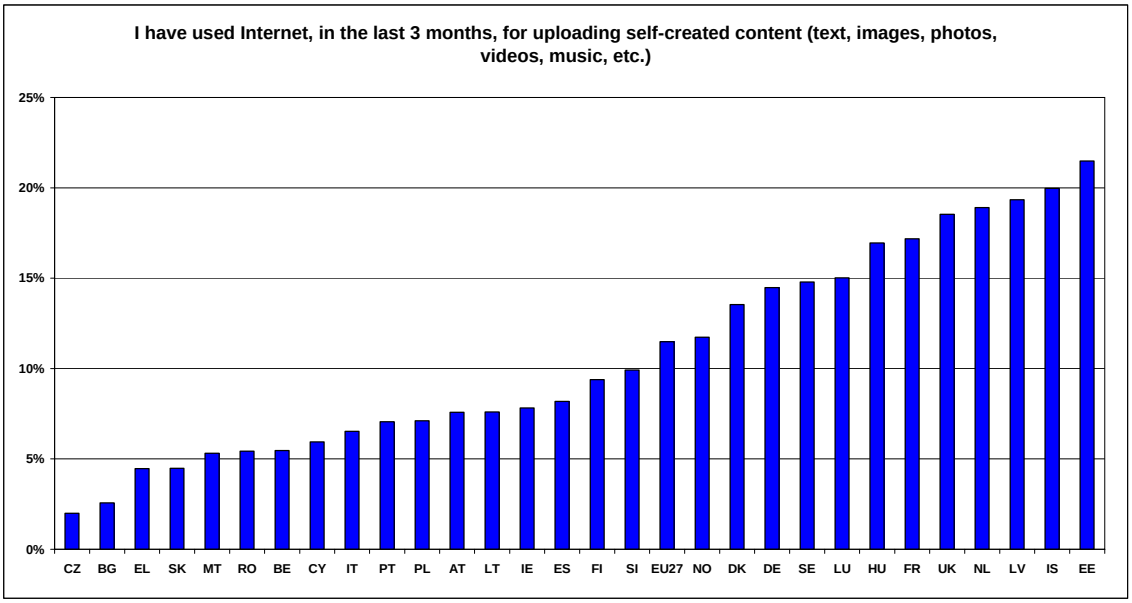
44 Study on *User-created content: Supporting a participative information society* IDATE for the European Commision December 2008.

Created Content. The assessment of the magnitude of the phenomenon is based on usage statistics and user data from the main websites.

User Created Content sites are mainly financed through advertising and the vast majority of users are not remunerated. It is important to note that because of the high costs of storage and delivery of this content, together with the uncertainty of the associated business models (the share of advertising expenditure associated with user created content is less than 1.5% in Western Europe[45]), only large companies can nowadays afford to underwrite such sites. The most important platforms for User Created content are located in the North America[46]. These platforms are social networks like Youtube (specialised in videos), MySpace (specialised in music) or flickr (specialised in photographs).

With regards to the uploading of content, Estonia is the leading Member State with 21% of citizens declaring to have uploaded content in the last 3 months. In Latvia, the Netherlands and the UK almost 20% of citizens have declared to have done so. In the countries lagging behind (Czech Republic, Bulgaria, Greece and Slovakia) less than 5% of the population has declared to have uploaded content in the recent months (Figure 2).

Figure 2



Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

5.3. The use of the internet for entertainment purposes and to replace other means of communications: a challenge for the content industry

Increased adoption of broadband with higher download and upload speeds is enabling the emergence of a multicast Web 2.0 model which strongly differs from the traditional one-to-many information/content model. This new paradigm calls into question the traditional broadcasting and content industry business models in which professional communicators and

45 Study on *User-created content: Supporting a participative information society* IDATE for the European Commision December 2008.

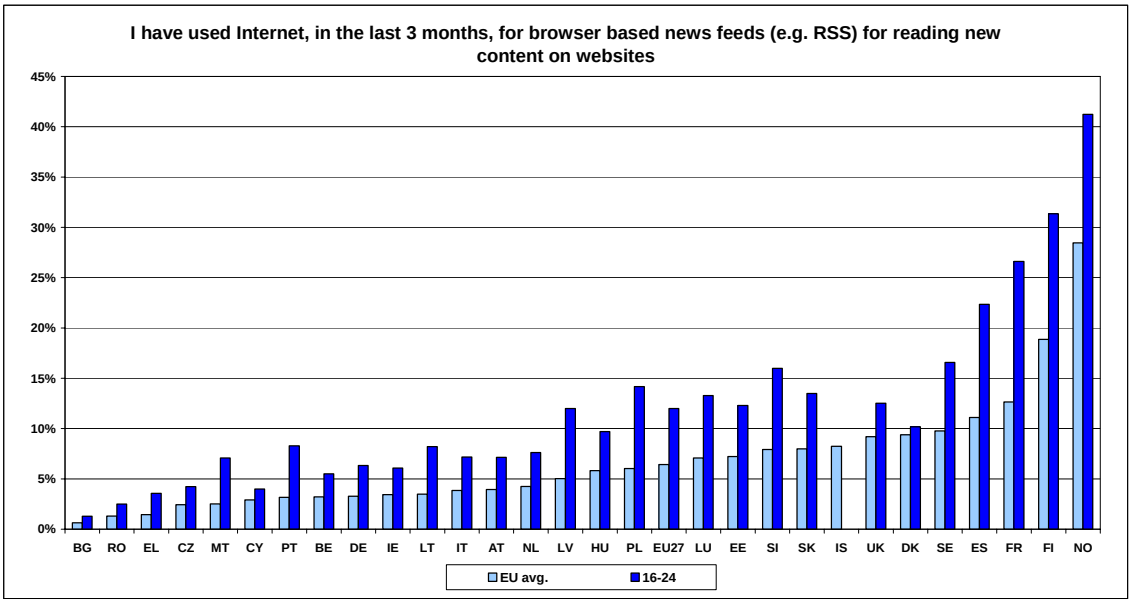
46 According to the Alexa, the US were the leading country regarding MySpace (66.9% of the users), flickr (31.5% of the users) and You Tube (22.63% of the users).

content creators had the technical and financial means to address a wide and rather passive audience.

The newspaper industry, for instance, is struggling to survive amidst falling readership and advertising revenues, a trend set in motion by the emergence of the new Internet services and exacerbated by the economic crisis. European newspapers have the advantage of much stronger balance sheets than their US counterparts, unencumbered by debt, but even so the combination of recession and structural change is very challenging.[47] Most publishers' websites do not make money and are subsidised out of print revenues. An increasing number of users get informed through personal web pages based on the RSS[48] Technology (Figure 3), which allows receiving up-to-date information from other websites in a different number of formats; the number of blogs which can be labelled as online citizen journalism are counted by millions. Also news sites that aggregate headlines from many different sources are increasingly being used by web users as the main source of daily information, a controversial trend from the publishers' viewpoint, concerned for their copyrights and revenue opportunities.

8% of EU citizens now read online news instead of printed magazines and newspapers. This figure increases to 18% in the case of occasional online readers. The impact of the Web 2.0 in the written press is undeniable and may be compounded by neighbouring developments such as the roll-out of ebook readers, intended to replace newsprint.

Figure 3



Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

The radio is another visible example. The rate of replacement for radio is not very high yet (4%), but 11% of EU citizens do, on some occasions, listen to web radio instead of listening to the "normal" radio. While it is true that television and radio are also using the internet as a

47 See for instance, Andrew Currah, *What's happening to our news: An investigation into the likely impact of the digital revolution on the economics of news publishing in the UK*, Oxford University, Reuters Institute for Journalism, January 2009

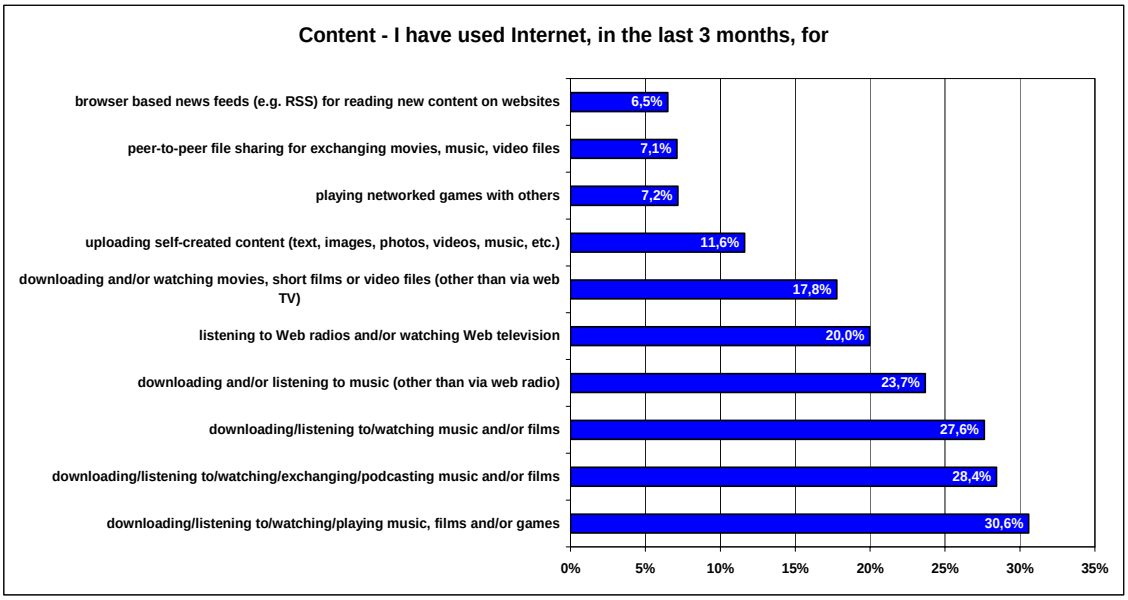
48 RSS means Really Simple Syndication: according to Wikipedia, a family of web feed formats used to publish frequently updated works—such as blog entries, news headlines, audio, and video—in a standardized format.

new distribution platform, the distinctive element in all cases is the notion that "pull content"[49] allows users to choose what to watch listen or read, when and where. 20% of EU citizens used the internet in the last 3 months, for listening to Web radios and/or watching Web television.

Most of the content downloaded in Europe comes from the US, where the most used Internet services and online content shops are located. Most downloaded movies are produced in the US[50].

In terms of use, downloading of music is the main activity performed by Europeans in 2008 (Figure 4), carried out by 24% of EU individuals and followed by listening to Web radios and /or watching Web television (20%). Movie downloading is also a very common activity. Playing networked games with others (7%) and activities requiring uploading of information (images, photos, videos or music) (12%) are not yet as widespread as content downloading. Only 7% of respondents have declared to have used peer-to-peer.

Figure 4



Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

5.3.1. Online music

About a quarter of European citizens have downloaded and/or listened to music online in 2008 (Figure 5), with large disparities between Member States. In the Netherlands or Norway, 40% of citizens listen or download music, and in 16 other countries over 20% do so. The difference with the laggards reaches up to 25 percentage points.

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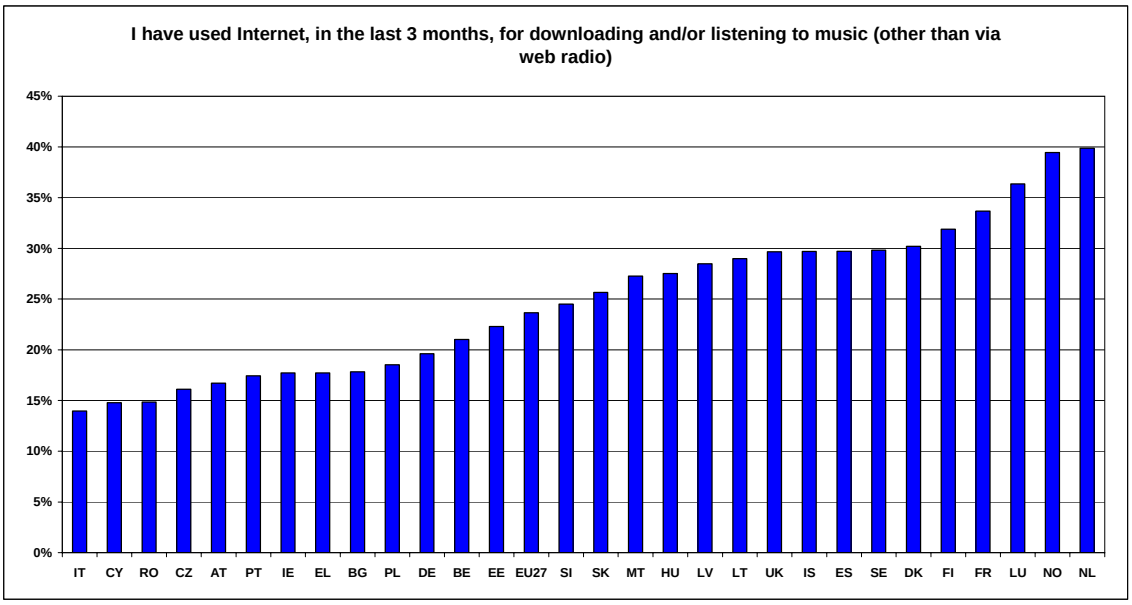
49 Consumers can either "pull" the information they demand at their own request or receive information that is "pushed" by content suppliers

50 According to iTunes, 8 of the top 10 movie downloads through this online shop in May 2009 were US productions.

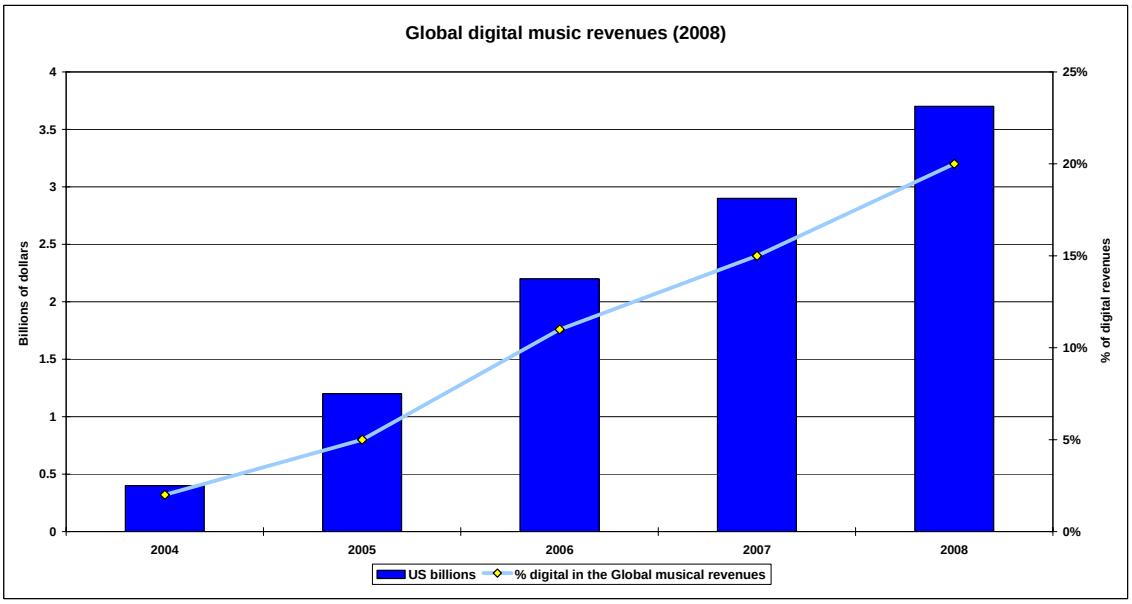
Figure 5



Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

According to industry reports, digital platforms now account for around 20% of recorded music sales, up from 15% in 2007 (Figure 6). The digital music business in the world in 2008 experienced a sixth year of expansion, growing by an estimated 25% to US$3.7 billion in trade value.

Figure 6



Source: IFPI, (International Federation of the Phonographic Industry) Digital Music Report 2009

In Western Europe[51] music downloads have grown by 76%. The industry is working to try to find successful and sustainable business models in an environment dominated by free solutions. 2008 has been the year where the bulk of business models has migrated from being

51 Screen Digest. Western Europe: Austria, Belgium, Denmark, France, Finland, Germany, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the UK

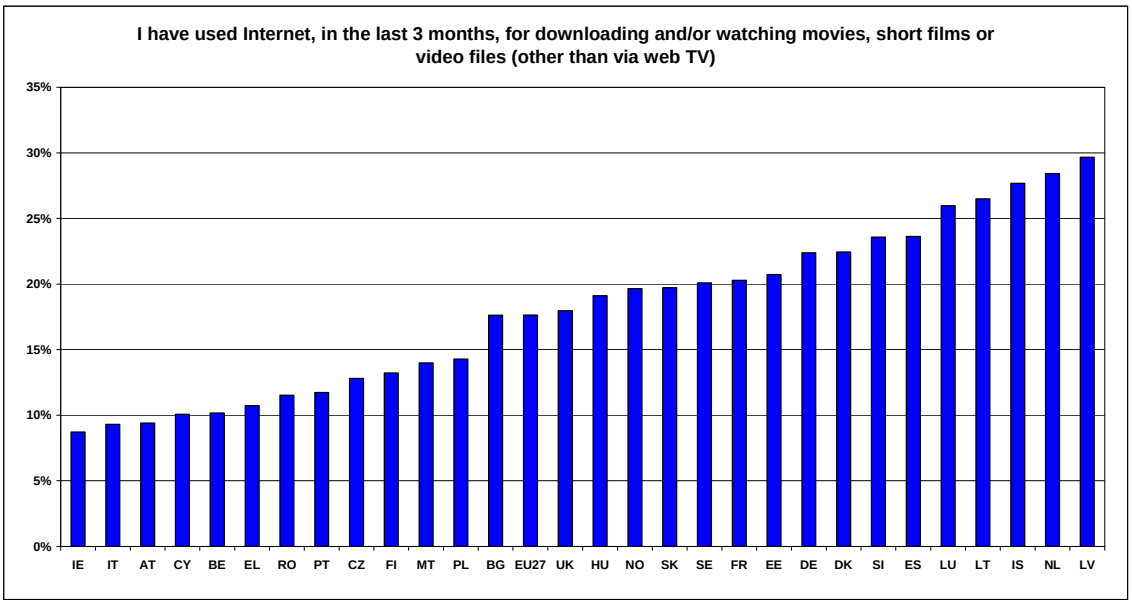
based on sales from downloads to being based on the access to the music financed through advertisement[52]. These models are based on subscription fees or advertisement and/or are bundled with other services and devices (like Apple's iPhone).

A related successful model in 2008 is digital music associated to videogames (for example Guitar Hero or Rock Band franchises): music games were responsible for 15% of all games sales in the first half of 2008 and for 22% of the year-on-year growth of the videogames sector.[53]

5.3.2. Online video

Less than 20% of European citizens used the internet for online video in 2008. This includes both short video clips like the ones available on You Tube as well as video streaming and downloading. There are again significant differences between Member States: In Latvia or the Netherlands almost 30% of citizens regularly download and watch movies, and this figure is higher than 20% in 10 other countries. The difference with the laggards reaches up to 20 percentage points.

Figure 7



Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

Business models providing free video content, financed through advertisement, dominate video consumption as the PC remains the most used device for video through the Web.. The YouTube website is the most popular access to video streaming (Table 1), although video streaming websites are not yet profitable[54].

52 With the success of websites like Spotify

53 NPD Group - IFPI Digital Music Report 2009

54 According to Google's financial statements, Youtube has 1.65 million $ of daily losses.

Table 1: Number of videos viewed from the top three sites June 2008 (excl. ad-networks[55])

UK	FRANCE	GERMANY	USA
YouTube (1.4 billion)	YouTube (0.5 billion)	YouTube (1 billion)	YouTube (4.2 billion)
BBC (45 million)	DailyMotion (0.3 billion)	ProSieben (40million)	MySpace (0.5 billion)
MSN (22 million)	TF1 (37 million)	RTL (32 million)	Yahoo (0.3 billion)

Source: Screen Digest 2009

The paid market for online video has not yet proved a sustainable model overall, because of high bandwidth storage and delivering costs together with low paid consumption. Unprofitability has led to the closing of several online stores in 2008. iTunes remains the most successful store, managing content over revenue-generating platforms such as the iPod digital media players as well as the iPhone.

Against this background the video-on-demand sector is still growing and several business models are being tested by different providers in almost all Member States[56]. 256 services were available in November 2008 through a variety of platforms: Internet (168 services), IPTV (74 services), cable (23 services), satellite (12 services) and Digital Terrestrial TV (1 service). Business models range from free to subscription services, from rental to download-to-own and services linked to the ownership of dedicated players, etc. However, rental access to individual services remains the most used model. Most of the services are restricted to users resident in certain countries; only a minority is open to a supra national audience. France is the country where VoD services are most developed.

Video on demand is considered by many as a competitor or a substitute for the rental or sale of DVDs. Recent evidence from some of the most developed markets shows however that the revenues generated from VoD services (mainly through the IPTV mode) remain modest and are unable to compensate for the decline in revenues from the sales and renting of DVDs. In France[57], in 2008 revenues from DVDs totalled almost € 850 million (- € 88 million vs. 2007) while VoD (mainly through IPTV services) totalled € 53 million (+ € 24 million vs. 2007). The same patterns were recorded in the UK[58], where falling DVD revenues (- € 64 million vs. 2007) were not compensated for by surging of VoD revenues (+ € 27 million vs. 2007).

5.3.3. Videogames

Around 7% of Europeans have used the internet (in the last three months) for playing networked games. About 10% have done so in Denmark, Hungary, Latvia, Finland and Norway, while less than 4% have followed in Italy (Figure 8).

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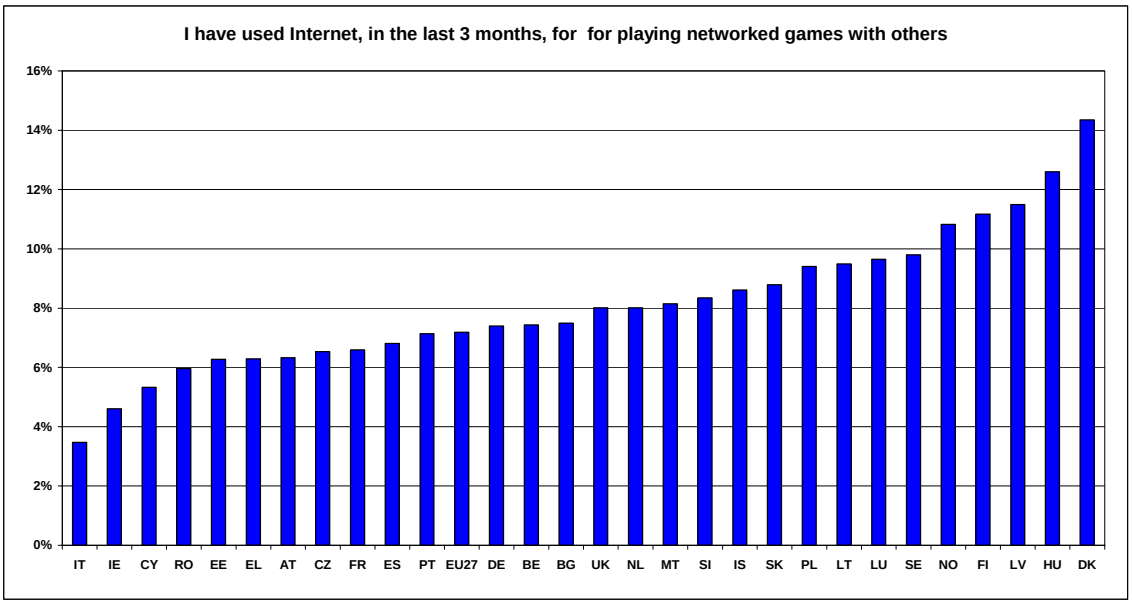
55 An ad – network is a company that connects web sites that want to host advertisements, for instance video advertisement, with advertisers.

56 European Audiovisual Observatory, 2008 Yearbook

57 CNC, Bilan 2008

58 UK Film Council, 2009 Statistical Yearbook

Figure 8



Source: Eurostat Community Survey on ICT Usage by Households and by Individuals

Out of the main online content markets, the videogame segment has featured the highest growth rates over the last 3 years, driven by the introduction of generations of game consoles enabled for Internet surfing. Video Games are increasingly segmenting and furthering audiences reaching beyond hardcore gamers. In the last years, companies like Nintendo have launched videogames targeting adult population attracted by technical aspects such as graphics and sound effects.

Global revenues for the video games industry account to 48.3$ billion in 2008 and are projected to grow to 68.3$ billion by 2012. The online video game market is expected to double between 2008 and 2012. Other software segments will continue to grow but at a lower rate.[59]

Sources of growth are new models of online gaming and mobile gaming. Vivendi's World of Warcraft is a European success story and its subsidiary Activission Blizzard is the world's number one developer of videogames when only software is taken into account.

The use of mobile terminals for gaming has increased, in the last year, due to the development of mobile broadband flat rates and casual gaming platforms such as AppStore. Casual gaming represents a major revolution in the videogame industry and expands its consumer base. The casual games sector drives a third of the industry's total revenues and is expected to account for half of it by 2012[60].

5.4. Conclusions

The diffusion of broadband has brought about rapid growth in the distribution of online content, legal as well as illegal. While young users are at the forefront in the use of the internet for content and entertainment activities, they also stand out from the rest of the population in their attitude towards the payment of online content; they are generally

59 IDATE Communications and Strategies, New Challenges for the video game industry, 1st Quarter 2009

60 IDATE Communications and Strategies, New Challenges for the video game industry, 1st Quarter 2009

unwilling to pay for many of the services, except those providing some additional added value over and above that provided by those services they can obtain for free.

This stylised fact is posing a number of challenges to policy makers, regulators and industry. While Europe is one of the most creative regions of the world in terms of production of quality content and features high rates of broadband take up, it is not yet taking full advantage of digital content markets. American content and online shops have to a large extent cornered the market, raising revenues through online advertising, and experiencing success stories such as Appstore.

For Europe to successfully compete in the market for content, solutions to these problems need to be found; through finding innovative and sustainable business models as well as a favourable regulatory environment.

Annex: Most Viewed websites

Top 5 Internet sites per country may 2009[61]

Most visited websites per country May 2009	1	2	3	4	5
Belgium	Google.be	Facebook.com	Windows Live	YouTube.com	Skyrock
Bulgaria	Google.bg	Vbox7.com	Google.com	Zamunda.net	Abv.bg
Czech Republic	Seznam.cz	Lide.cz	YouTube.com	Szn.cz	Google.com
Denmark	Google på dansk	Facebook.com	YouTube.com	Google.com	Windows Live
Germany	Google.de	Google.com	YouTube.com	Ebay	Wikipedia
Estonia	Google.ee	YouTube.com	Google.com	NETI	Delfi
Greece	Google.gr	Facebook.com	YouTube.com	Google.com	Yahoo!
Spain	Google.es	Windows Live	YouTube.com	Google.com	Facebook.com
France	Google.fr	Skyrock	Facebook.com	Windows Live	YouTube.com
Ireland	Google.ie	Google	YouTube.com	Yahoo!	www.bebo.com
Italy	Google.it	Facebook.com	YouTube.com	Windows Live	Yahoo!
Cyprus	Google.com	YouTube.com	Facebook.com	Windows Live	Yahoo!
Latvia	Google.lv	Draugiem.lv	Inbokss	One	Delfi
Lithuania	Google.lt	one.lt	Google.com	YouTube.com	Delfi
Luxembourg	Google.lu	YouTube.com	Facebook.com	Google.com	Windows Live
Hungary	Google.co.hu	Iwiw.hu	YouTube.com	Google.com	Origo Freemail
Malta	Google.com.mt	Google.com	YouTube.com	Facebook.com	Windows Live
Netherlands	Google.nl	Hyves.nl	Windows Live	YouTube.com	Google.com
Austria	Google.at	Google.com	YouTube.com	Facebook.com	ORF ON
Poland	Google.pl	Nasza-klasa.pl	Onet.pl	Allegro	Wirtualna Polska
Portugal	Google.pt	hi5	Windows Live	YouTube.com	Sapo - Portugal Online!
Romania	Google.ro	Yahoo!	YouTube.com	hi5	Google.com
Slovenia	Google.si	Google.com	Facebook.com	YouTube.com	24 ur - Naslovnica
Slovakia	Google.sk	Azet.sk	YouTube.com	Zoznam.sk	Google.com
Finland	Google.fi	YouTube.com	Google.com	Facebook.com	IRC-galleria
Sweden	Google.se	YouTube.com	Google.com	Facebook.com	Windows Live
United Kingdom	Google.co.uk	Facebook.com	Google.com	YouTube.com	Yahoo!
United States	Google.com	Yahoo!	Facebook.com	YouTube.com	Myspace
Japan	Yahoo.co.jp	FC2	Google 日本	YouTube.com	楽天 rakuten
China	Baidu.com	QQ.COM	sina	Google.com	淘宝网 taobao

The most viewed sites on the Internet in EU-27 are:

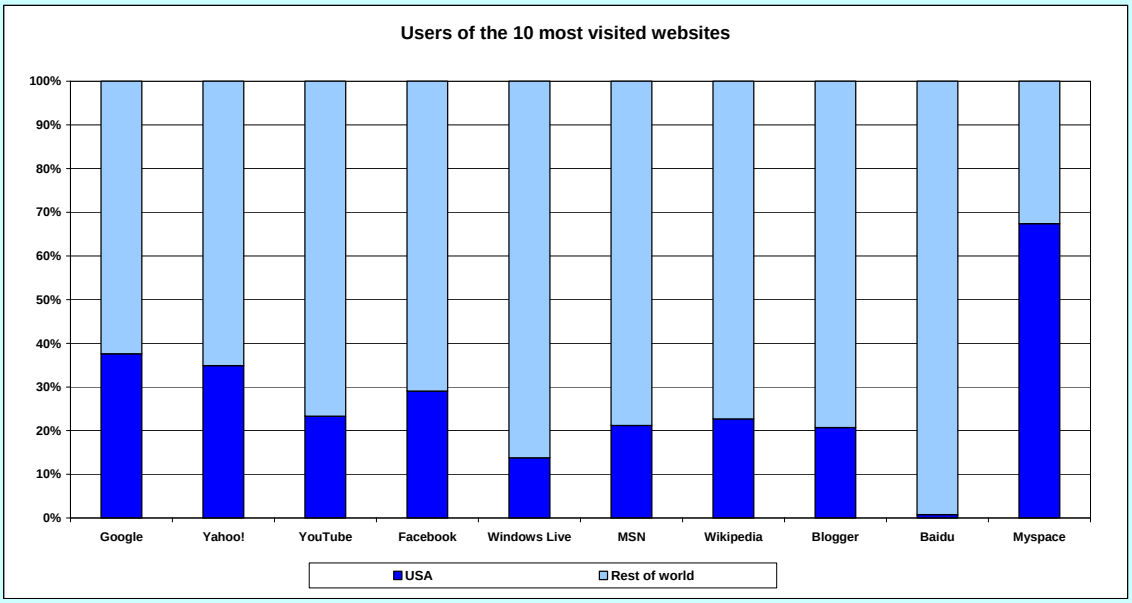
- Search services such as Google and Yahoo
- Social networks such as facebook
- Video services like Youtube
- Collaborative/Web 2.0 websites like Wikipedia

[61] www.alexa.com

It is interesting to note that most viewed websites in Europe are almost the same as in the US and Japan (dominated by American companies) while in China, the top three websites are Chinese.

Google websites are the most viewed in 26 of the 27 member States, showing that search is the top activity on the web and therefore advertisement in this category is one of the main sources of revenues in the industry. The other two main categories in the Internet are online free video and social networking. The only country where the most viewed website in Europe is not owned by Google is the Czech Republic with www.seznam.cz (a local web dedicated to search, email services, news and weather forecasts among other services).

Global top 10 websites (in terms of traffic) and their users



Source: Alexa.com, 13.05.2009

6. ICT UPTAKE BY EUROPEAN BUSINESSES AND PRODUCTIVITY IMPACTS

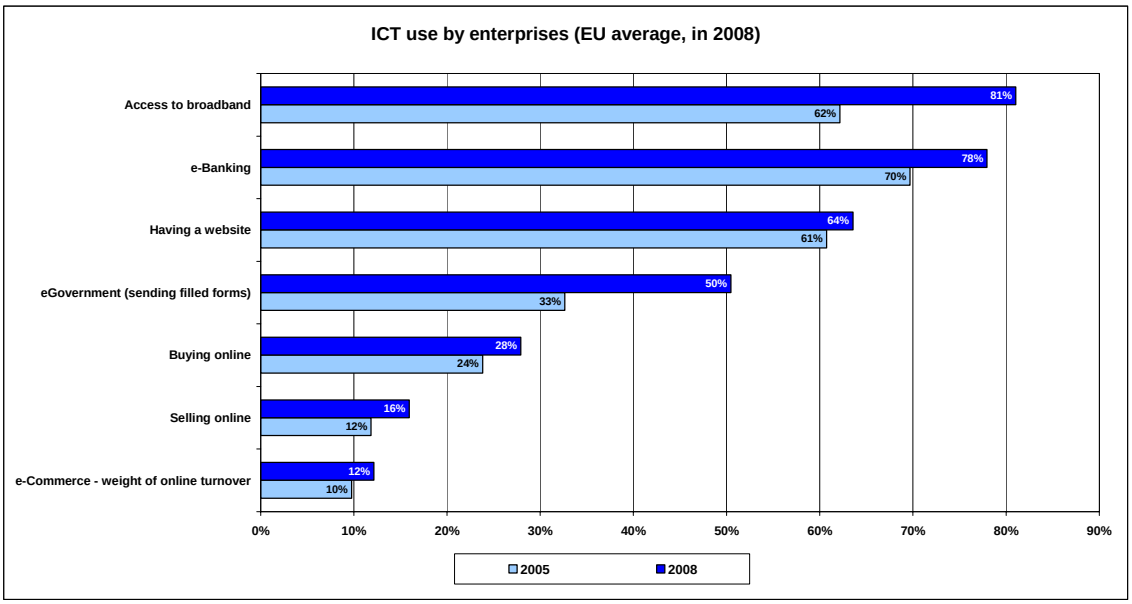
Economic theory attributes an important role to the ICT take up of businesses for increased efficiency, innovation and growth. Therefore, the take up of ICT by European businesses is crucial for the raising of Europe's productivity potential and future growth prospects. This chapter looks at recent progress made in the take up of ICT by European businesses and recalls the importance thereof for the economy. The next section, section 6.1, provides an overview of recent trends in the take up ICT by EU businesses. Section 6.2 looks at the status of supply chain management. Finally, section 6.3 reviews the theory and evidence on the economic importance of ICT.

6.1. Developments in ICT uptake by EU businesses

Developments in ICT uptake by EU businesses over the period 2005 and 2008 show a mixed picture. In some areas significant progress has been made. For example, connectivity has increased strongly, with the percentage of enterprises having a broadband connection climbing from 62% in 2005 to over 81% in 2008 (Figure 1). Progress has also been made in the area of e-Banking, with use rising from 70% to 78% over this period. Significant improvement in the uptake of online public services has also taken place, with half of EU enterprises using the internet for sending filled forms to the public administrations in 2008, compared to 33% in 2005. This steep increase reflects efforts made by the public sector with regard to electronic public services, as public services are increasingly becoming available online.

Less progress, on the other hand, has been made in the area of electronic transactions. Only 12% of total enterprise turnover is made online, an improvement of only 2 p.p. with respect to 2005. Therefore, while connectivity is now high, the actual implementation of use of ICT in business processes, especially those involving relations with customers and suppliers, remains limited.

Figure 1

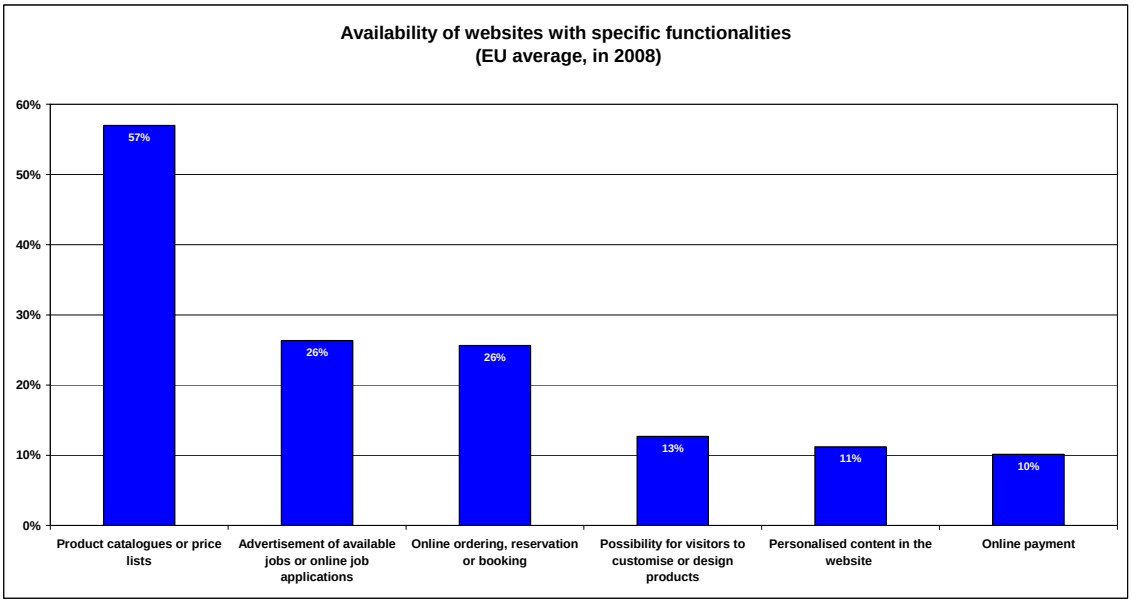


Source: Eurostat, Survey on ICT in enterprises (10+ employees, excluding the financial sector)

Additional evidence on e-commerce take-up available from statistics on website functionalities (which does not account for enterprises selling online through external providers) shows that while having a webpage is quite common among EU businesses (64% penetration in 2008), availability of services through the internet is limited and this applies especially to those offering a high value added to customers. In particular, while 57% of websites contain product catalogues and/or price lists, 26% allow for online ordering/booking and a mere 10% for payment (Figure 2). Interactive customisation of content and the possibility to design products tend not to be widespread either and limited to slightly more than 10% of websites. Finally, roughly one fourth of website shows advertisement of available jobs.

There are, however, large differences across industries, reflecting their activities. For example, the percentage of websites having an ordering/booking functionality is equal to 75% in the hotel industry and goes down to 33% and 19% in the trade and manufacturing sectors. The possibility to personalise content is relatively high in financial services websites (28%) and quite uncommon in the manufacturing sector (8%).

Figure 2



Source: Eurostat, Survey on ICT in enterprises (10+ employees). 100 = enterprises having a website.

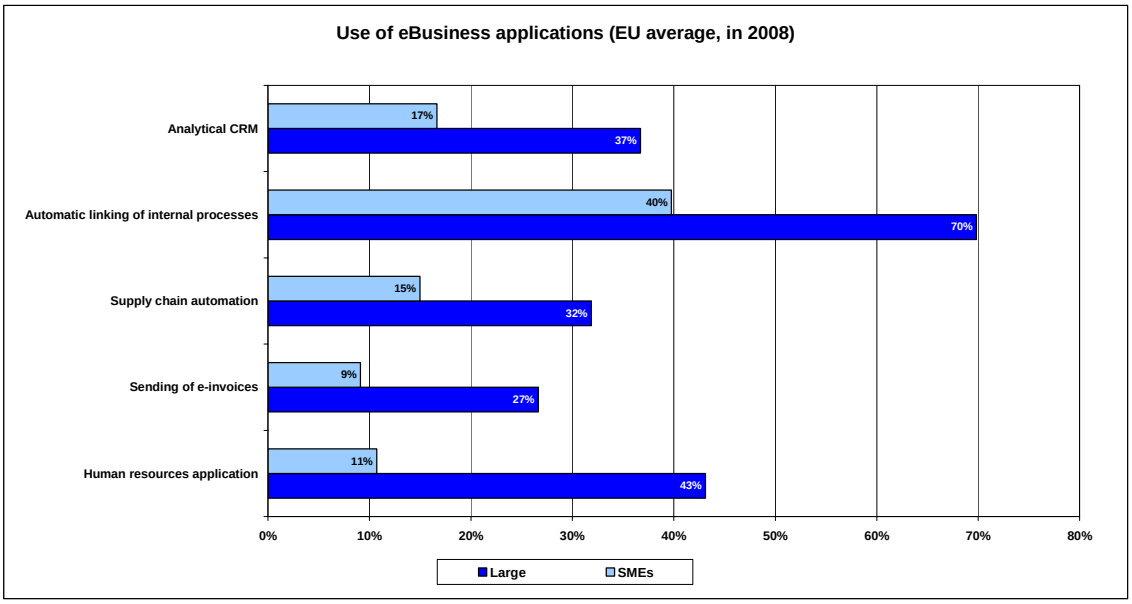
Furthermore, statistics on the take-up of advanced solutions aimed at supporting enterprises business processes reveal the following (Figure 3):

Use of ICT for the automation of internal business processes through the automatic exchange of information and for the management of human resources is quite common, especially among large enterprises.

eBusiness applications enabling the automatic link with business partners, including those automating the supply chain and the transmission of invoices, are still used by a minority of EU enterprises. In fact, when ICT is used for integration with customers and suppliers a wide range of issues ranging from technical, business and legal ones have to be dealt with, increasing the complexity of the exercise.

Firm size is still an important factor when looking at uptake. Use of advanced applications tends to require heavy investments, strong ICT and eBusiness skills for which economies of scale matter.

Figure 3



Source: Eurostat, Survey on ICT in enterprises (10+ employees).

6.2. Supply chain management

Supply chain management is one of the areas in which ICT can bring strong benefits in terms of efficiency gains. Nevertheless, evidence shows that penetration of applications for supply chain automation is still relatively low throughout the economy (Figure 4). In wholesale and retail trade, e.g. the industries in which these applications are most heavily used in relative terms, the electronic share of information with suppliers is limited to 16% of businesses. In addition, only 10% of businesses in manufacturing industries are using ICT for integrating vertically along the supply chain. Companies dealing with postal services, transportation, logistics and telecommunications (transport and communication sectors) show higher propensities to the use of applications enabling the automatic detection of the status of delivery, though even here they are still quite small in absolute terms.

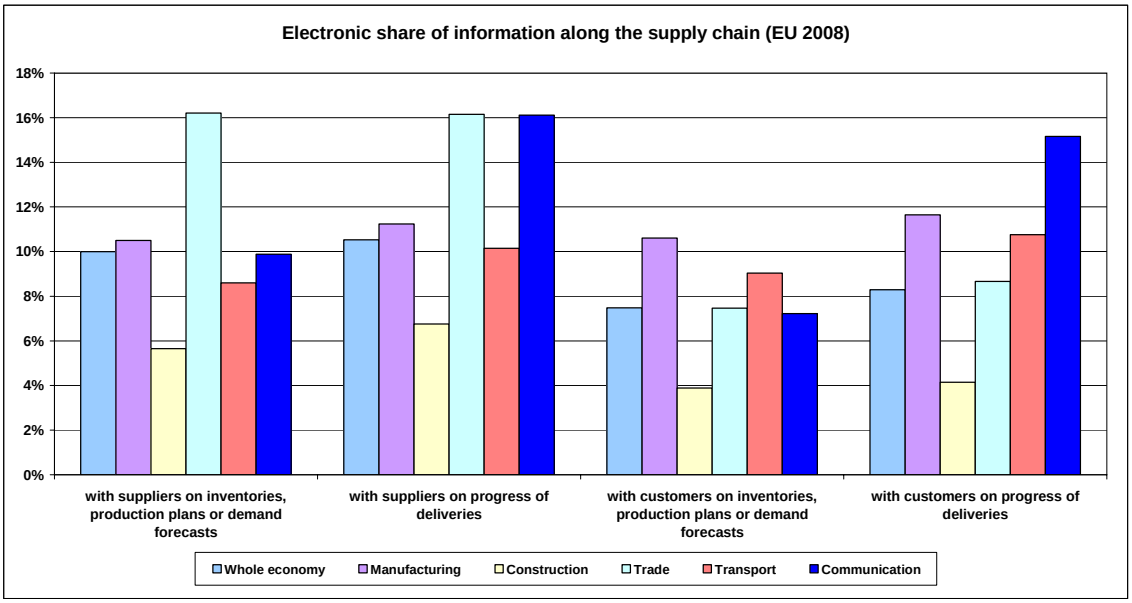
The size of enterprises is an important factor to take into account: use of e-supply chain management in large enterprises is about twice as much as that of SMEs. According to the "hub and spoke model"[62], large enterprises tend to be connected with their business partners, often SMEs, through common networks in which they represent the centre. According to this model, large enterprises have sufficient bargaining power to impose common business and technical standards to their partners[63] and often cover a share of the fixed investment needed to build up the network. Conversely, in supply chain markets where transactions take place among small enterprises, no actor can set a common standard and afford building the network architecture with a negative impact on the take up of solutions for process automation. Data

62 The model describes a value chain where a large enterprise (the hub) is dealing with several SMEs (spokes).

63 This is the case, in particular, of large manufactures and retailers.

weighted by enterprise size reveal that the impact of eBusiness solutions like supply chain management is larger than that suggested by un-weighted data: while 15% of enterprises are exchanging information with suppliers and/or customers electronically, these enterprises represent 30% of the economy in terms of persons employed.

Figure 4

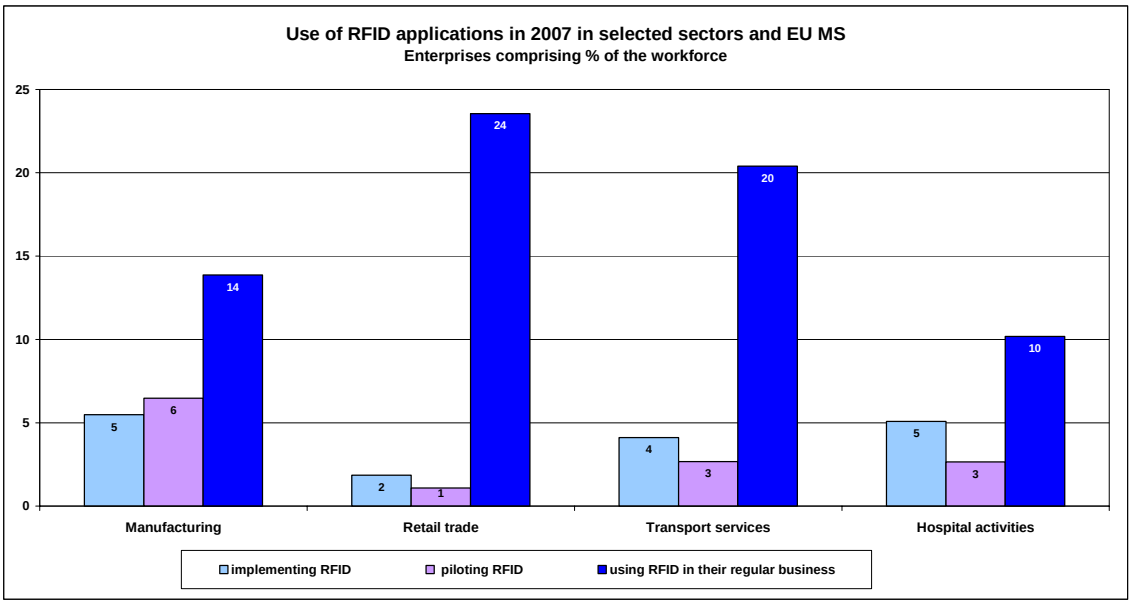


Source: Eurostat, Survey on ICT in enterprises (10+ employees).

ICT is expected to provide further benefits to businesses through the diffusion of more recent technologies which are being increasingly deployed in the economy. In particular, RFID[64] applications are already used by a number of enterprises (Figure 5). This finding confirms RFID usage in logistics and freight transportation – from vehicle tracking to warehouse processes optimisation and reusable assets tracking – but also in passenger transportation, due to the increasing deployment of RFID in contact less smart cards for payments. Take-up is also high in retail trade (27%) and in manufacturing (25%). The reason behind these results is that process manufacturers are facing increased pressure from their retail customers, in tagging pallets or cases with RFID in order to improve supply chain processes. Finally take-up in hospitals is more limited (18%). In addition, the majority of respondents indicates that RFID is used for inventory management (enterprises comprising 70% of the workforce) while nearly half of the respondents showed usage or intended use of RFID for labelling single product items (47% of the workforce). Other key application areas include person identification, production tracking and container or pallet tracking (Figure 6). This evidence suggests that benefits from RFID can be expected in the area of the supply chain, including logistics, transportation and inventory optimization.

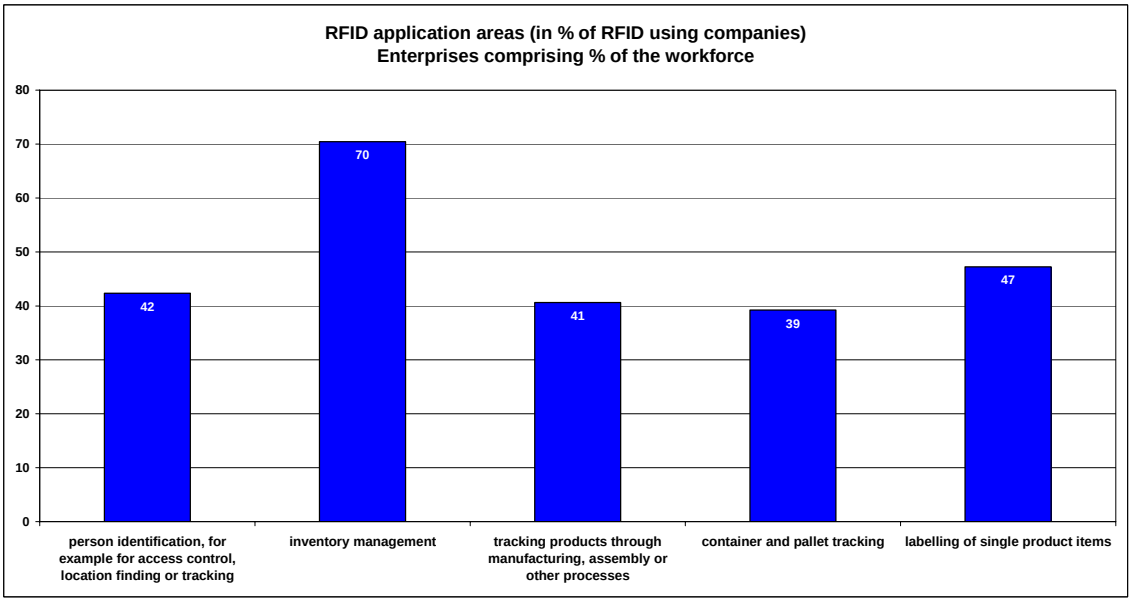
64 Radio Frequency Identification

Figure 5



Source: eBusiness Watch 2007. The survey had a scope of 434 interviews conducted in 7 EU countries (France, Germany, Ireland, Italy, Poland, Spain and the UK) in September 2007.

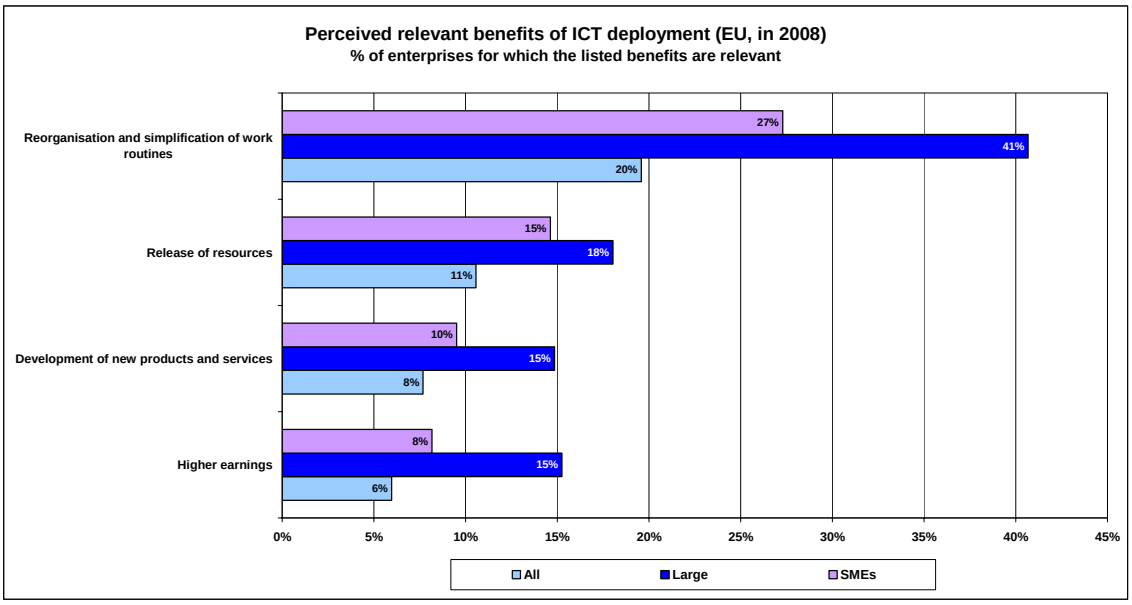
Figure 6



Source: eBusiness Watch 2007. The survey had a scope of 434 interviews ("total"), conducted in 7 EU countries (France, Germany, Ireland, Italy, Poland, Spain and the UK) in September 2007

ICT benefits for businesses are normally expected to materialise through processes efficiency, innovation and market potential. Evidence shows that enterprises perceive ICT more as a tool for boosting productivity and reducing costs, rather than an instrument for increasing the number of reachable customers and the related turnover of the enterprises (Figure 7). This is consistent with findings on ICT take-up (Figure 3) which show that applications aiming at increasing the enterprise internal efficiency are more widespread with respect to those enabling e-commerce. Similarly, only a minority of businesses consider ICT an enabler for the rollout of new products/services. Finally, large enterprises tend to be more positive when assessing the impact of ICT with respect to SMEs.

Figure 7



Source: Eurostat, Survey on ICT in enterprises (10+ employees).

Additional evidence on ICT impacts comes from the analysis based on empirical observation at enterprise level. A pilot Eurostat project covering some EU Member States[65] has come up with some initial evidence on the positive role of broadband connectivity on productivity, even if results are not fully consistent across countries and economic sectors. This seems also to confirm that the impact of ICT on productivity is not simply a matter of how much ICT a firm has, but also how ICT is used. In this respect, availability of ICT and eBusiness skills is a crucial factor.

6.3. The economic impact of ICT: theory and evidence

6.3.1. The impact of ICT on productivity and growth

In the context of the current economic and financial crisis, it is important to remember the central role played by the production and take up of ICT in driving innovation, productivity and growth[66]. Firstly, ICT-producing industries contribute directly to productivity and growth through their own rapid technological progress; secondly, ICT use improves the productivity of other factors of production (or inputs); and thirdly, there are 'spillover effects' on the rest of the economy as ICT diffusion leads to innovation and efficiency gains in other sectors.

The development of the EUKLEMS database, supported by the 6th Framework Programme, has allowed a direct comparison of the divergent productivity experiences of the US and the EU and the identification of the contribution of ICT to such divergence. Labour productivity growth in the US accelerated from 1.2% in the period 1973-1995 to 2.3% in 1995-2006. Conversely, the 15 EU countries that constituted the Union until 2004 experienced a productivity growth slowdown between these two periods (from 2.4% to 1.5%). Most of the

65 DE, FR, IT UK, NL, SE, CZ, IE, AT

66 A detailed analysis of the issue was produced in the i2010 HLG note "The economic impact of ICT: evidence and questions" (2006), available at http://ec.europa.eu/information_society/eeurope/i2010/docs/high_level_group/note_on_economic_impact_of_ict.pdf

economic literature attributes these divergent trends to the slower emergence of the knowledge economy in Europe as opposed to the US.[67] The bulk of the EU productivity downturn is widely believed to stem from an outdated and inflexible industrial structure: with an excessive focus on low-medium technology industries, slow to adjust to the pressures of globalisation and of rapid technological change. This resistance to change contributed to the slow adoption of ICT and their integration into the business process in Europe.

In the mid-90s, the US experienced a productivity boost due to higher productivity originating from ICT-producing industries, as well as from a capital deepening effect due to investment in ICT assets throughout the economy. These changes were driven by the rapid pace of innovation in ICT, fuelled by the continuing fall in semiconductor prices. By contrast, the EU experienced lower productivity and growth contributions from investment in ICT and from ICT-producing industries (due to a smaller share of the ICT industry). However, the largest difference between the EU and the US, and for that matter between EU countries themselves, was due to the contribution of the overall efficiency of the production process. "Multifactor productivity growth" (which measures the joint influences on economic growth of technological change, efficiency improvements, returns to scale and other factors) accelerated from 0.5% to 1.4% in the US, while in the EU it fell from 0.9% to 0.3% . In particular, the US experienced more rapid productivity growth in market services, such as trade, finance and business services, than the EU.

Therefore, for Europe to increase its productivity potential, and benefit from ICT, it needs to find mechanisms to exploit service innovations for greater efficiency gains, and a new model of innovation and technological change, with greater emphasis on human capital, organisational change and other intangible investments, to make use of its own innovative capabilities. Further, a more flexible approach towards labour, product and capital markets would allow resources to flow to their most productive uses; structural reforms in the context of the renewed Lisbon agenda are already delivering on these aspects. Finally, the achievement of a truly single market is important in order to exploit competition benefits as well as economies of scale.

6.3.2. The impact of ICT on employment

There is wide consensus that ICT take-up, meaning business expenditure in hardware, software and electronic communications tends to translate into productivity growth both through a direct effect, due to the increase in the capital per worker ratio, and indirectly, thanks to efficiency improvements.

At the same time, in the political debate on the ICT impact on employment, one line of reasoning, which finds an echo in the general audience, stresses that technical progress allows firms to produce the same output with less input – and especially less labour – leading to "technological unemployment." This opinion, based on the assumption that the output of economies remains fixed over time, does not find support neither in economic history nor from a theoretical point of view and most of all it is contradicted by hundreds of years of economic history.

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[67] B. Van Ark, O'Mahony M. and Timmer M.P. (2008), "The productivity gap between Europe and the United States: Trends and causes", Journal of Economic Perspectives, vol. 22, No 1, pp 25-44.

The recent Commission study (2008): "The Impact of ICT in employment"[68], clearly indicates that according to economic theory the long term impact of ICT diffusion on employment is likely to be negligible or even positive while a negative effect can be expected only in the very short run. In addition, the ICT effect on employment will depend on the specific features of the industry and the country considered, including the labour market legislation. Empirical evidence based on analysis of data at industry level in EU Member States, US and Japan[69] is in line with the theoretical considerations and does not support the hypothesis of a systematic positive or negative effect of ICT on employment in the long run. Econometric estimates of ICT impacts across countries and industries are highly dispersed around a small negative number and in most cases statistically not significant[70].

Hence, there is no evidence that ICT systematically influences the levels of overall employment across all countries and sectors. Rather, this impact will depend on the particularities of the country or sector, including the supply of labour.

6.4. Conclusions

ICT take-up by European businesses over the period 2005 and 2008 shows a mixed picture. Significant progress has been made in connectivity, eBanking and the uptake of online public services, reflecting efforts made by the public sector with regard to electronic public services. Less progress has been made in the area of e-commerce.

Evidence on the take-up of advanced solutions aimed at supporting enterprises' business processes shows that use of ICT for the automation of internal business processes through the automatic exchange of information and for the management of human resources is quite common, especially among large enterprises. But eBusiness applications enabling the automatic link with business partners, including those automating the supply chain and the transmission of invoices, are still used by a minority of EU enterprises.

A weak take-up of ICT solution which enhances efficiency standards, in particular by SMEs, raises concerns in terms of productivity impacts. Policy efforts in terms of awareness raising and facilitating access to ICT solutions should be intensified, while the spread of wireless solutions is a clear promise for future productivity gains.

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68 Available at: http://preprod.europa.infso.cec.eu.int/information_society/eeurope/i2010/docs/benchmarking/impact_of_ict_on_employment.pdf

69 Data available within the EU KLEMS project.

70 ICT is measured as the ratio between ICT investments and output (ICT/Y). A coefficient of one means that, by increasing ICT/T by 1%, employment would increase by 1% too.

7. DEVELOPMENTS IN NATIONAL ICT POLICIES[71]

One of the major successes of i2010 is that it has lead to the mainstreaming of ICT policies. Member States have increasingly recognised the importance of ICT for productivity and growth throughout the economy and the potential it has for enabling the achievement of a broad variety of socio-economic objectives. As such they have integrated policies on ICT in to many other policies and more and more Member States have formulated integrated national ICT strategies in order to try to maximise the benefits of ICT in their economies.

7.1. Overview of main ICT policy priorities and developments across Member States

Member States with national ICT strategies include Bulgaria ('Programme for the Development of Information Technologies'), Cyprus ('National Strategy for the Information Society'), Estonia ('Estonian Information Society Strategy 2013'), Finland ('A renewing, human-centric and competitive Finland. The National Knowledge Society Strategy for 2007-2015'), France ('Plan Numerique'), Greece ('Digital Strategy'), Ireland (a 'National Knowledge Society Strategy' is in preparation), Malta ('Smart Island National ICT Strategy 2008-2010'), Poland ('Strategy for Information Society development till 2013'), Portugal ('Connecting Portugal'), Slovenia ('Strategy for the Development of the Information Society in the Republic of Slovenia (si2010)'), Spain (the 'AVANZA plan'), and the UK ('Digital Britain').

Many of these strategies follow or have similar goals to that of the i2010 initiative. Box 1 provides an overview of Member States' strategies.

Box 1: An overview of EU Member States national ICT strategies

A total of thirteen EU Member States currently have or are setting up integrated national ICT strategies. This box gives a brief overview of these strategies.

In **Bulgaria,** "in the third quarter of 2008 proposals for the adoption of two programmes with a three-year term of operation were elaborated: a national Programme for the Development of Information technologies and a national Programme for the Development of Broadband access. They are aimed at systematising the efforts and providing for adequate conditions for accelerated convergence with the advanced in this regard in the EU." (Republic of Bulgaria NRP 2008-2010)

Cyprus is developing an integrated National Strategy for the Information Society, the main target of which would be to exploit the opportunities provided by Information and Communication Technologies for improving competitiveness of all sectors of economic activity. For this objective the following measures will be promoted: appointment of a Commissioner for Information Society; creating an appropriate institutional and regulatory framework for executing various activities via Internet; improving conditions of safe access and safe transactions via Internet; changing the way of thinking and culture of the population and introducing both ICT and Internet into everyday life; and Expanding the coverage of broadband networks in rural areas to allow all citizens to have access from their homes to all services offered online. (NRP 2008)

[71] This chapter has been written on the basis of Member States own information derived primarily from their National Reform Programmes and/or ICT strategy documents.

The "**Estonian** Information Society Strategy 2013" covers the period from 2007-2013 the objectives are the following: that each member of society leads a full life, using the opportunities of the information society in every possible way and actively participating in public life ("nobody will stay or will be left behind"); Estonia's economic growth is based on the wide use of ICT solutions; and public sector is citizen-centred, transparent and efficient. (Estonian Information Society Strategy 2013 (2006)

France's national strategy has the goal of making it one of the best ICT countries by 2012, by providing 100% coverage of fixed and mobile broadband and introducing digital television. The plan rests on four priorities: (1) to provide access of the whole population to the internet and digital services, (2) to develop the production and supply of digital content, (3) to increase and diversify usage and digital services within enterprises, administrations and households, and (4) to modernise the governance of the digital economy.

"The aim of **Finland**'s information society policy is to increase the user-friendliness of services and the competitiveness and productivity of companies, and to promote regional and social equality. In terms of information society development, the key measures will be directed towards developing the following: information society infrastructure; the innovation environment and markets; content and services; expertise and preparedness. The public sector structures will be revamped and provision of electronic public services will be increased. In transport, the opportunities offered by telematics will continue to be exploited more widely and effectively." (NRP 2008, p63).

The **Greek** 'Digital Strategy 2006-2013' aims to perform a "Digital Leap to Productivity and Quality of life". The strategy comprises two main objectives: enhanced business productivity through the use of ICT and new skills; and improved quality of life through ICT. These two strategic objectives are further decomposed into six sub objectives: to boost ICT uptake by businesses; offer a large number of digital services to businesses; support the ICT sector as a pillar of the Greek economy; improve citizen welfare through ICT; and develop e-services for the citizen. (The Greek Digital Strategy, Ministry of Economy and Finance, Special Secretariat for Digital planning).

Ireland is developing a 'National Knowledge Society Strategy' focused on the development of its knowledge economy in order to help accelerate the development of knowledge-intense areas such as: digital traded services; eLearning products and services; and clinical trail infrastructure. More generally the Strategy will bring together the various actions and supports which will result in Ireland having the ability to develop, produce, licence and export products and services based on knowledge-intense ideas.

The 'Smart Island National ICT Strategy 2008-2010' aims to set a vision for **Malta** to become one of the top 10 information societies in the world. The main objectives of which are to: prepare Malta for the next generation of technology by laying the foundations for a world class infrastructure; overcoming the last mile of the digital divide and making ICT a social equaliser; developing a smart workforce by investing in people and nurturing their skills and potential; using IST to improve quality of life; re-inventing government by transforming public service delivery and governance; enhancing the productivity of the private sector and its competitiveness through the adoption of eBusiness; and promoting Malta as an ICT hub for FDI whilst using ICT as a pillar for economic growth. (Malta NRP, p82).

Poland's current digital strategy is the 'Computerization Plan for Poland in 2007-2010'. A new strategy is also being formulated for the period up to 2013: 'Strategy for Information

Society Development till 2013'. Together, these two strategies will be used to accomplish the following: Counteracting digital exclusion through financing access to the Internet for people of low incomes; and widening access to the Internet through supporting micro-, small and medium entrepreneurs intending to provide this service in the regions where this kind of business operation is not profitable.

In **Portugal**, the 'Connecting Portugal' programme, launched in 2005, will continue to be implemented giving special priority in the 2009-2010 period to R&D activities in the area of information and communication technologies and to eScience instruments; this includes the high performance network for research and education, digital scientific libraries, the opening access information and scientific data stores and the Grid computing super computing and the work platforms for distance research.

Slovenia has developed a 'Strategy for the Development of the Information Society in the Republic of Slovenia (si2010)', which constitutes a framework for the political direction to be taken towards developing an information society in Slovenia and, in terms of its structure, follows the European i2010 initiative. The purpose of this Strategy is, with the aid of efficient deployment of information and communications technologies, to promote competitiveness and productivity, ensure balanced social and regional development, and improve the quality of life of society as a whole and of each individual. The main objective of the Strategy is to promote further the development of the information society, which will have a considerable impact on increasing efficiency and innovation in the Slovenian economy and society. Furthermore, it will result in an increase in the number of jobs with a high added value, an improved quality of life and more balanced regional development. (Slovenia, NRP, 2008-2010)

In **Spain**, the 'Avanza Plan' has the objective of convergence with the European Union in the field of Information Society. The plan comprises a series of specific programmes focused on citizens, companies, the digital context, digital public services and eAdministration. Also since the end of 2008, the implementation of the 'AvanzaDos Plan' has begun with new strategic lines for developing the information society for the period up to 2012. In view of problems finding locations for mobile telephony antennas, one of the plan's proposals within the framework of boosting infrastructure is to reward local governments that do allow the antennas, thus contributing to improved coverage.

Finally, in the **United Kingdom**, the recent 'Digital Britain' report sets out the next steps of the British government to maximise the economic and social opportunities of ICT, with four action points: to assist the private sector in delivering an effective modern communications infrastructure, including a universal service commitment to ensure access to 2MB/s broadband services by 2012, and proposals to assist the development of next generation broadband to those areas that will not benefit from commercial deployments; to enable Britain to be a global centre for the creative industries in the digital age, including public service content, within a clear and fair legal framework; to ensure that people have the capabilities and skills to flourish in the digital economy, and that all can participate in digital society; and actions to modernise and improve its service to the taxpayer through digital procurement and the digital delivery of public services.

Whether Member States have an integrated national ICT strategy or not, the types of ICT initiatives employed are often similar across countries. Though, their depth and complexity differs, to some extent, depending upon their state of ICT advancement, both generally and within specific areas.

Priority areas include, in particular, the diffusion of Broadband infrastructure and ICT equipment, the encouragement and promotion of Internet/ICT use, the development of digital skills (eLiteracy), the implementation of ICTs within government and for the provision of government services (eGovernment), the digitalisation of the legal system (eJustice) and of health services (eHealth), and the integration of ICT into the education system (eLearning and eScience). In addition to these generally prioritised areas, some Member States also put emphaisis on areas such as encouragement of eCommerce and eBusiness, ICT R&D, eSecurity and Green ICT. Table 1 shows the ranking of these policies and the Member States involved in them.

Table 1 :Ranking of policies and MS engaged in them:		
1.	Infrastructure and Broadband diffusion:	AT, BE, BU, CY, CZ, DE, DK, EST, FI, FR, EL, ES, HG, IE, LT, LI, LU, MT, NL, PL, RO, SI, SK
2.	eGovernment:	AT, CY, CZ, DE, DK, EST, FI, FR, EL, ES, IT, LT, MT, NL, PL, RO, SI, SK, UK
3.	eLearning/ICT in Schools	BE, BU, CY, EST, FI, FR, IE, EL, ES, LT, MT, NL, SI,
4.	eSecurity	AT, CY, FI, FR, EL, ES, LT, LI, LU, SK
5.	eScience and ICT R&D and Innovation	BE, BU, CZ, DE, FR, ES, LU, PL
6.	eInclusion/digital literacy	BU, EL, ES, HU, MT, RO, SK
7.	eHealth	CY, CZ, EST, EL, ES, PL, SI
8.	Encouraging use of ICT	BE, FR, EL, RO, SI, MT
9.	eCommerce and eBusiness	BE, CY, EL, ES,
10.	eJustice:	CZ, ES, PL, SI
11.	Green ICT:	DK, IE and LU
12.	Harmful content/protection of minors	FI

7.2. Specific ICT policies

Countries' ICT policies can be broadly grouped into three main types of policies. The first covers policies devoted to infrastructure deployment, the second covers encouragement of use and digital literacy, and the third relates to policies in the area of ePublic services.

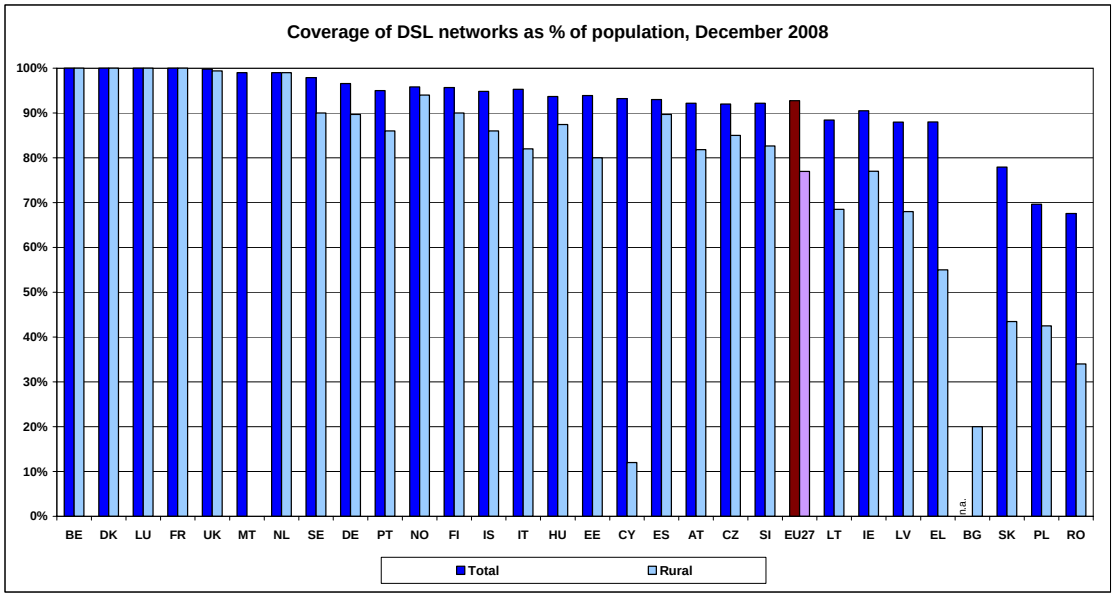
7.2.1. Infrastructure deployment: fixed and mobile broadband diffusion

All EU Member States put an emphasis on policies to increase the coverage of broadband throughout their economies. In particular, an increasing number of countries have now set targets for broadband coverage of the population; a large number of which are set at 100%.

Countries with 100% *broadband targets* include Austria, Germany, France (fixed and mobile by 2012, already 98%), Hungary (end 2010) Ireland (2010), Latvia (2010) and Slovenia (2010). The United Kingdom proposed a commitment to universal service. In addition,

coverage is approaching 100% in Belgium (100%), Denmark (100%), Luxemburg (100%), the United Kingdom (100%), Malta (99%), the Netherlands (99%, and investing in 100% fibre optic networks), France (99%) and Sweden (98%). In Greece a target has been set of 60% coverage by 2009 and in Latvia 98% by the end of 2010. Policies are increasingly focused on closing the gaps in rural areas, where provision of infrastructure by the market is not profitable.

Figure 1



Source: IDATE

With regard to increasing the availability of *broadband in schools* many Member States have dedicated policies. In Belgium, a project called 'Cyberclasses' was initiated in 2008 to equip all schools in the French speaking community with computers, servers and broadband (ADSL) within two years.[72] Other Member States with policies to implement and/or upgrade ICT infrastructure in schools include Cyprus, Estonia, France, Greece, Spain, Ireland, Latvia, Malta, the Netherlands and the United Kingdom. Slovakia plans a policy in this area.

A number of Member States are also making efforts to increase the *coverage of wireless networks*, particularly in urban regions, for example with the implementation of wireless hotspots (RO and EL). Indeed in Finland, wireless broadband coverage is expected to be available to the whole population by the end of 2009. In Greece, special emphasis is being put on the development of WiMax and satellite Internet combined with WiFi, in order for wireless technologies to cover as many areas as possible (and notably hard-to-access and remote areas) and ensure fully reliable connections; higher speeds and lower costs for users/consumers.

Policies are also being implemented to extend the coverage of *mobile services*. In this regard, some countries (FR, LU, EL, ES, IE, FI, SE, DK, UK and SI) have introduced or are introducing regulations/strategies designed at the reorganisation of their radio spectrum in order to increase the efficiency of its use, either to make the way for mobile digital television and/or to allow for the further development of broadband. Some countries, such as Spain, have actively encouraged the diffusion of mobile telephony antennas by rewarding local authorities which allow them in their areas. Some countries are also working on very high

[72] In 2004, 84 % of the Dutch speaking schools disposed of a broadband connection.

speed access via mobile (FR). In Sweden, 99% of the population was already covered by mobile networks in 2007.

A number of Member States are also investing in *fibre-optic networks* for very high speed access. While in some countries these network investments are limited to the scientific community, in others they are intended for more general use by the population. France has implemented a strategy in this regard with the goal of achieving 4 million users by 2012 and developing very high speed mobile. Lithuania has built networks in the main urban regions. The Netherlands has committed itself to 100% fibre optic networks. Finland has also set the goal of making high-speed broadband available to the whole population by 2015. Luxemburg is also investing in such networks. Slovenia states its intentions to develop fibre optic networks. In Greece, in September 2008, a project for developing Next Generation Networks based on fibre optic technologies for the establishment of an open access network providing high speed connections (100 Mbps minimum) was presented, thus, allowing for the gradual interconnection of more than 1.5 million residences.

Other infrastructure projects include the setting up of *public access points* in some Member States (e.g. in HU (rural and socially disadvantaged), LV (rural areas), LT and RO) and projects designed to increase the ICT capacity of the scientific community (eScience), such as investments in the building of supercomputer centres in a number of Member States (BE, BU and DE).

7.2.2. Encouraging the use of ICT/broadband, eInclusion and digital literacy

In addition to the actual provision of infrastructure, Member States are implementing a range of policies designed at increasing the up-take and use of broadband and ICT more generally by various sections of society.

Member States believe that an important way to encourage a general increase in the take-up of broadband is through the encouragement of *competition* (BE, CZ, DE, EL, FR, PL, SI, SE and the UK).

Further to promoting competition in telecoms, a number of Member States have put policies in place focused on increasing the use of ICT by improving the *digital literacy* of the population. Many of these programmes are in the area of eLearning[73], focused on improving the ICT skills of students and teachers (BU, CY, EE, FI, EL, IE, LV, MT). However, some programmes are aimed at the general public, improving the skills of the workforce (BU, EE, ES, MT) and/or that of the scientific community.

With regard to the general public, in Belgium, the action 'Internet pour tous' (Internet for everyone) was carried out over the period 2006-2007 to encourage the use of broadband. The action provided a packet including broadband access, a computer and attending a training course with subsequent VAT reimbursement. Hungary's 'Digital Literacy Action Plan (2008-2010)' has the objective of reducing the country's proportion of 'digitally illiterate' (measured by the proportion of the population that does not use the Internet regularly) from 51% (2007) to 33% by 2010. In 2008, the rate was 44%. The plan is based on two pillars: reducing cognitive barriers and strengthening motivation; and developing skills. The plan will be

[73] Policies in the area of eLearning are discussed in more detail under the relevant section of the discussion on ePublic services.

evaluated and where necessary fine-tuned at the end of 2008 and 2009. Its implementation is intended as a response to the EU e-Inclusion and e-Skills initiatives.

Member States are also carrying out initiatives to *promote ICT awareness and use*. In Malta for example there are a number of initiatives specifically designed at promoting ICT use to disadvantaged groups, including the unemployed and inactive, the disabled and women. They include the 'Smart Start' initiative, designed to help the unemployed, those on social benefit, the disabled and non-profit organisations to purchase a PC in good working order. The 'Blue Skies Scheme' which provides households without an Internet connection with a connection at a cheaper rate, 'Smart women' which provides ICT training to women. 'Star Office' provides office software cheaply to students and the disabled. There is also an ICT awareness campaign aimed at attracting students.

A number of countries are also encouraging the *use of ICT by SMEs* (BE, CZ, ES, and HU). In Belgium, l'Agence Wallone de Telécommunications (AWT) has developed an awareness raising strategy aimed at encouraging the use of ICT in SMEs.

In the Czech Republic, the 'Operational Programme Enterprise and Innovation' is designed to foster the development of SMEs which plan to invest in information and communication technologies; through making use of EU funds. The programme 'ICT in Enterprises' provides support to entities that are planning to upgrade their information systems to increase the effectiveness of their internal operations (e.g. production, ordering or stock control) and improve their external relations (with customers, suppliers or public administration bodies etc.). In addition, the programme 'ICT and Strategic Services' is designed for firms who decide to purchase or construct a building and employ developers and programmers with the aim to develop or upgrade ICT products and services.

In Spain, the government signed 39 agreements with the Autonomous Communities in 2006-2007 to encourage e-commerce, in particular electronic invoicing. These agreements mobilised 87.8 million euros in funding, half of which came from the Central Government.

Finally, as part of its e-Economy Action Plan, Hungary has set up an SME training and motivation programme. The programme includes a series of actions designed to strengthen the digital maturity of SMEs and remove barriers to ICT introduction and use. On the one hand, the aim is to train SME owners and executives, increase their demand for ICT equipment and services and raise awareness of the importance of ICT. On the other hand, it aims at implementing organisational structural changes and management developments to promote the wider scope use of ICT equipment by SME owners and executives. Trainings to be held within the framework of the action aim to encourage company executives to invest in ICT equipment by demonstrating how company processes can be upgraded by using this type of equipment. The training will also provide information on available financial sources, since according to surveys (e.g. eBusiness W@tch), the lack of the latter largely constrains the development of the ICT-related physical infrastructure in enterprises.

7.2.3. Online public services

The area of ePublic services broadly includes policies in the areas of eGovernment, eHealth, eJustice and eLearning.

All Member States are active in the implementation of policies in the area of *eGovernment* and the i2010 eGovernment Action Plan, which was approved by the Council of Ministers in June 2006 and has already concrete impact throughout Europe. Within national governments,

common policies include the expansion of office automation, the digitalisation of public administration, the networking of national governmental departments as well as between central and local authorities and the implementation of electronic public procurement (eProcurement). eProcurement was identified as a particularly important "high impact service". In this respect, Governments are following up the i2010 eGovernment Action Plan's objective to reach 100% availability and 50% effective use of eProcurement by 2010. Member States are currently working on large scale pan-European pilot projects on electronic public procurement and the authentication of electronic identities in order to combat risks of fragmentation of the internal market due lack of interoperability of information and communication technologies. This is the first step to better cooperation between administrations, also beyond national borders.

With regard to the provision of public services, and communication between government and the general public, many Member States have set up or are setting up 'one-stop-shops' for citizens and businesses and points of single contact for businesses, , in line with the requirements of the EU's Services Directive. Many Member States are also implementing electronic company registration and provisions for online submission of tax declarations. In some countries, they are introducing systems of data repositories for communication between individuals and companies and state bodies. Finally, the majority of Member States have policies for the implementation of eParticipation in place and are supporting disadvantaged groups to get online and making public websites more accessible and user friendly to this end.

Many of the above mentioned policies are being implemented as part of a package of measures designed at achieving efficiency gains, reducing administrative burden and cutting 'red tape'. In particular, the move to electronic registration of companies is, in many cases, seen as a way of encouraging entrepreneurship (by reducing the time it takes to set up a business), making company information available to citizens across the EU and, therefore, meeting commitments made in this regard.

At the same time as developing eGovernment, Member States have also been working on improving the conditions for electronic communications between governments and citizens, businesses and the government through the development and promotion of electronic identification (eID) and electronic signatures. Austria, one of the European leaders in eGovernment, emphasises in particular eSecurity (Box 2).

Box 2: eSecurity in Austria

In Austria, since January 2008, the social security eCard can be registered over the Internet as a 'Bürgerkarte' and authenticated for the purposes of electronic signature. This was made possible through a simplification of the 'Signaturgesetz' (the law governing signatures), which took place together with a number of other legal changes introduced to enable the development of eGovernment. These changes also made it possible to use the card for private transaction authentication with for example banks and insurance companies, providing customers with protection against 'Phishing'. In addition to electronic identification and signature, the card can also be used for encryption for the transmission of sensitive data.

Further to the 'Bürgerkarte' a new software programme has been developed for the creation of signature of PDF documents. The authentication of signatures on electronic documents can be verified via a dedicated website (www.buergerkarte.at/signature-verification/). It is hoped that these tools will encourage the electronic sending of invoices, an area in which is believed will deliver significant efficiency and cost savings.

Further developments in the area of eSecurity include the introduction of electronic proxies, development of recorded electronic delivery of documents and dual document delivery (electronic and paper), and the development of an eSecurity handbook.

In their National Reform Plans (NRP's), a number of Member States report on the policies they are implementing in the area of *eHealth* (CY, CZ, EE, EL, ES, PL and SI). The range of activities includes equipping hospitals with new computers (ES), developing national health information systems (CY, EE, EL and PL), setting up web portals for public access to medical services such as managing hospital visits online (CY and PL), development of digital prescriptions (EE and ES), electronic health cards (EL) and setting up of electronic medical files (EL and ES). In addition, Greece is implementing an eHealth action plan also covering a number of initiatives related to tele-medicine.

A number of countries have also introduced policies in the area of *eJustice* (AT, CZ, ES, FR, PL, SI). These policies also include introduction of computers, digitalisation of records and the setting up of eCourts.

Programmes in the area of *eLearning* include 'Cyberclasses' in Belgium (mentioned above). In Cyprus promotion of eLearning includes increasing the number of computers and their connection to the internet, interconnecting schools via Intranet, developing an electronic system providing parents with information on their child's performance and attendance etc. and providing continuous training to teachers in IT technologies and new analytical programmes. Estonia's eLearning programme focuses on developing learning software, updating study methods, complementing hardware and improving teacher qualifications in the use of eLearning. In Finland, a project started in 2008 on the 'Utilisation of Information and Communication Technology in Education and Study' will develop a new electronic learning environment by 2010. In addition to the goal of 100% coverage of educational institutions with broadband, the French eLearning policy is developing a services portal which will allow all members of the education community simple and secure access to all content and services adapted to their needs, as well as to digital resources, communication services and services for collective/collaborative work. From 2010, universities will be obliged to use electronic homework books and schools will have to move to paperless internal communication. Further, a number of projects will be introduced which require broadband access, for example the project targeted at learning of languages via video conference with native speakers.

In Greece, a number of projects continue to be run to increase the digital literacy and use of students. They include projects to encourage access to broadband ('DIODOS'), to subsidise the purchase of laptops for top ranking first year students ('See your life digitally'), a pilot project (starting in 2009) to provide specially designed laptops to school pupils aimed at getting them acquainted with new technologies early on ('A laptop per student'), and certified training courses for top student ('e-ducate') [Also 'Organic.Edunet' (eContent) and 'EDET' (research network: ICT R&D)].

In Spain, the Avanza Plan has provided IT equipment in almost 9,000 schools, benefiting 2.5 million students (around 45% of the student population). Also, the 'Networked Campus Programme' provides public universities with wireless Internet. The 'Latvian Educational System Informatization Programme for 2007-2013' envisages the establishment of an educational information system, teacher training in the use of ICT, development of electronic education materials, establishment of an interactive portal for teachers and parents, computerization of schools and libraries and a number of other measures to improve the quality of education. Malta's eLearning Strategy also focuses on infrastructure in schools,

teachers' and students' skills and resources, including actions to provide teachers with laptops, introduce high speed Internet, setting up an eLearning platform, training teachers, and developing web-based learning resources. The Netherlands and Slovenia are also implementing similar actions in the area of eLearning.

7.2.4. Other policies

Other ICT policy areas in which some Member States have been active include ICT R&D (ES, EL, BU and PT), Green ICT (DK, IE and LU), harmful content/protection of minors (FI) and Quality of life/flexible working arrangements/teleworking (EE).

7.3. Conclusions

The information provided by National authorities in their National Reform Programmes shows that Member States across the EU have recognised the important role played by ICTs in our modern Knowledge-based societies. ICT policies have come to the forefront of national policy making, being integrated into many different areas of policy and increasingly formulated as part of larger-scale national ICT strategies with similar objectives to that of the i2010 initiative. Policies have largely been focused in three main areas: infrastructure provision to achieve complete coverage of the population, in particular in relation to broadband; policies encouraging take-up and use of ICT and acquisition of digital skills; and provision of ePublic services.

Going forward national ICT policies need to build on the achievements of the past, both at a national level as well as by learning from best practices internationally. However, they also need to tackle ongoing problem areas as well as venture into new territory.

Information and communication technology is a key driver of economic growth and social change. A wealth of evidence shows that ICT is an important source of productivity, innovation and growth, increasing our competitiveness, creating jobs and driving globalisation, while at the same time presenting us with new instruments with which to tackle a number of our societal challenges such as climate change, energy efficiency and an ageing population. As such, ICT is at the very heart of the Lisbon strategy and essential to its success.

In times of economic and financial crisis, it is important that this key role of ICT is not forgotten. Investments in ICT are 'smart' investments; helping to create and maintain jobs and growth now, and emerge from the crisis stronger and more quickly, while at the same time creating the basis for sustainable growth and jobs in the future. In the short term, ICT investments support employment in ICT-related sectors. In the longer term, they increase efficiency, lead to innovation and make the whole economy more competitive.

In the current economic situation, pressure on national budgets and private financing may slow down the rate of planned ICT investment. Community funding can contribute to support public investment. Under Cohesion Policy programmes, €15.2 billions are foreseen for investment in ICT in the period 2007-13. These programmes should be accelerated to give a timely boost to public ICT investment at the national, regional and local level.

If we are serious about the Lisbon ambition for a "dynamic, knowledge-based society" , we must invest (as least) as much in the information highways of the future – a smart grid, broadband for all and better health care – as we do in more traditional infrastructure. The crucial role of ICT for economic recovery has been recognised in the European Economic

Recovery package, which foresees up to 1.02 billion in EU funds for investment in broadband networks. In basing the recovery on ICT and innovation, we are also presented with the opportunity to restructure the economy towards a more sustainable future, by reducing our environmental impact, increasing our energy efficiency and creating a more inclusive society.

8. THE IMPACT OF THE ECONOMIC DOWNTURN ON THE ICT SECTOR

In the second half of 2008, the dramatic worsening of the financial crisis led to severe disruptions in credit intermediation and a significant fall in consumer and business confidence. As the financial crisis intensified last Autumn, economic indicators deteriorated and global economic activity fell sharply during the last quarter of 2008, with historical drops in trade and production. The economic outlook remains uncertain as the world faces its worst crisis since the Second World War. The crisis has important repercussion on the European economy.

According to the Commission's Spring forecast (4 May 2009) GDP growth in the EU and the euro area dropped below 1% in 2008 (down from just under 3% in 2007). In 2009, real GDP is expected to fall by 4% (See Annex). The downturn is projected to be broad based, with almost all Member States expected to post negative growth rates this year. GDP growth should stabilise somewhat in 2010 but remain slightly negative, at -0.1% both in the EU and in the euro area. Inflation is expected to continue to fall rapidly this year, entering negative territory for a few months in the middle of the year. Unemployment in the EU will soar to 9.4% in 2009 and 10.9% in 2010; and in the euro area to 9.9% and 11.5%, respectively (see Annex). Budget deficits and debts will also rise sharply.

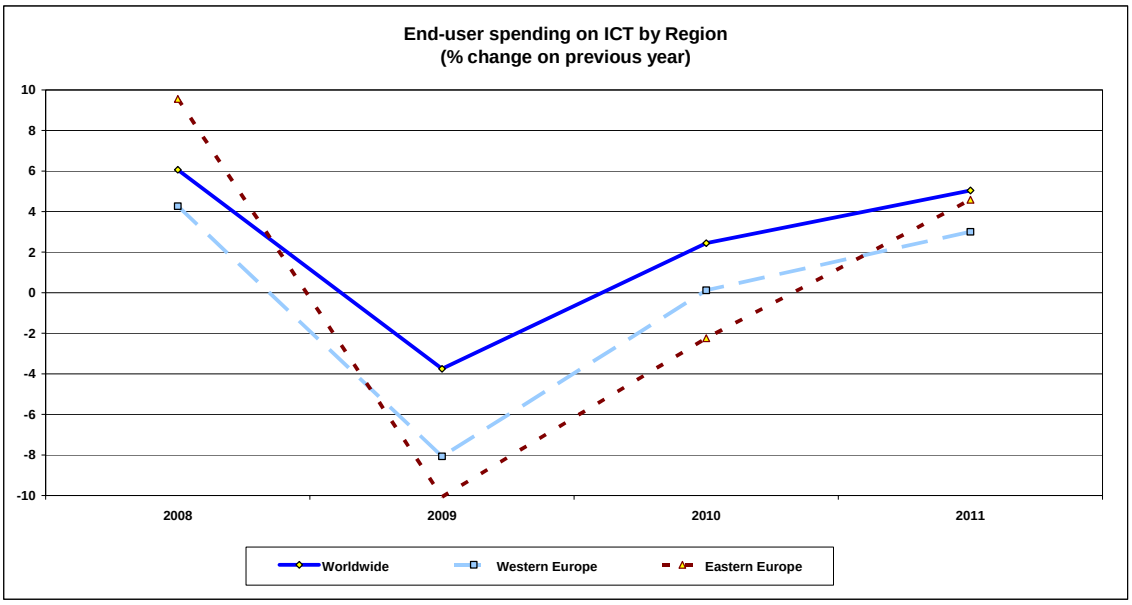
This chapter provides an overview of the impact the crisis is having on the ICT sector on the basis of recent updates of leading consulting analysts.[74]

8.1. The impact of the crisis on the ICT sector

Latest data on the ICT sector in Europe available from Gartner (March 2009) shows that the economic crisis is having a major impact on the ICT sector in Europe. While in December the sector seemed to be holding up quite well compared to other sectors, latest forecasts project a strong downturn. In Western Europe, total end-user spending on ICT is now expected to fall 8% in 2009 and to remain flat in 2010 before increasing to 3 percent in 2011. In Eastern Europe, the situation is expected to be worse, with a 10% decline in 2009 and a 2% decline in 2010. In 2011, spending is projected to increase by 4%. While the downturn is expected to have a significant impact on all segments, some sectors (manufacturing) will be more strongly hit than others (software).

[74] As changes are taking place rapidly, current forecasts are being frequently updated and include a high element of uncertainty about the length and the severity of the economic downturn. Thus, estimates provided in what follows should be treated with caution.

Figure 1



Source: Gartner (March 09)

8.1.1. Consumer goods and services

According to Gartner (March 2009), worldwide spending in computer hardware is expected to fall sharply in 2009 (-15%), revising its December 2008 forecast (-5%). A 1% rebound of the same market is expected in 2010. The forecast is however gloomier for Europe. While in Western Europe the computer hardware market is also expected to shrink by 15% in 2009, the recovery is expected to come later. The market is expected to continue contracting in 2010 before recovering modestly in 2010. In Eastern Europe, the outlook is substantially worse. Sales are expected to contract 27% this year and will only start to recover in 2011.

Problems in the personal computer business have increased the likelihood that 2009 will bring the first decline in PC sales[75], showing that corporate buyers in particular are cutting back, and low-priced machines could replace sales of traditional laptops. Negative expectations are also reflected in the sentiment of the European IT hardware producers. In November 2008, the confidence indicator[76] for the European computer industries[77] was at its worst level in more than 20 years and the situation was confirmed in December (latest available data), with likely layoffs to accommodate the impact of weaker demand on balance sheets.

The impact of the current economic downturn should be less severe on world demand for software. According to Gartner (March 2009), global software spending should stagnate in 2009 (0% growth). Never-the-less, this is a clear slowdown from the 7% that was still expected in December 2008. A return to growth of 5% is forecast already for 2010. In Europe, the software segment is expected to fare worse than at the global level, especially in Western Europe. Spending is expected to decline by 6% and 4% in Western and Eastern Europe,

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75 FT, 9.2.2009: http://www.ft.com/cms/s/0/855ae2ce-f648-11dd-a9ed-0000779fd2ac.html

76 http://ec.europa.eu/economy_finance/db_indicators/db_indicators8650_en.htm. It includes: assessment of order-book levels, assessment of stocks of finished products (negative sign), production expectations for the months ahead.

77 NACE 30: Computer and office machines. Seasonally adjusted values.

respectively, in 2009. In 2010, however, software sales are expected to show a marked recovery, recording growth rates of 4% and 6%, respectively.

Global spending on IT services is forecast to contract 2% in 2009, down from 10% growth in 2008, but to rebound in 2010 with around 4% growth. In comparison, IT services are projected to decline 8% in Western Europe and 3% Eastern Europe in 2009. However, here too, a recovery is expected in 2010 with growth of 3% and 7% projected, respectively, for the two regions.

The combined expectations for software and IT services markets suggests that businesses will keep on spending to keep their information systems running, but may tend to postpone new projects. Nevertheless, increased pressure on profitability might push businesses to invest in solutions leading to better process efficiency. Furthermore, regulation in the financial sector is expected to have a positive impact on demand for software.

In 2008, the European telecom service sector continued to grow (1.3% in real terms, 0.5% in nominal terms), and investment was still on the rise (about 52 billion euros). The telecom services sector is not as profitable as it was in previous years but is withstanding the deterioration in the economic climate better than other sectors thanks to the stability of its cash flow (due to the essential nature of basic telecom services, increasingly offered at flat rates) as well as to relatively low debt levels. Many consumers now consider communications services (fixed and mobile voice and broadband access) along with other utilities such as electricity, natural gas, water or sewage that cannot be easily dropped from consumption habits.

The economic deterioration in 2009 however is expected to put further downward pressure on investment and consumer spending with the risk of postponing the launch and the take-up of new and innovative services. A contraction in revenues in 2009 is however to be expected. According to Gartner (March 2008) growth in consumption of telecom services is forecast to decline in Western and Eastern Europe in 2009 (-6% in both regions) and to continue declining in 2010, though at a slower rate. A return to positive growth is projected in 2011.

The decline was already evident in 2007, driven by the maturity of some markets. In 2008, before the crisis unfolded, operators were looking for improvements in average revenue per user through deployment of new services, cuts in operational expenditure by means of next generation networks deployment, and investment in dynamic economies in Eastern Member States or in emerging economies like South America. In future, however, lower spending capacity by businesses and households may slow the adoption of new services (as consumers rationalize spending plans to focus on core telecom services) and make major operators focus on the less mature markets. The credit crunch and uncertainty in terms of take-up may delay investment in high-speed and mobile broadband. The evolution of the crisis in emerging economies is not helping the strengthening of the revenues generated outside Europe.

8.1.2. The internet segment

The economic crisis is also having an impact on firms in the Internet sector, which is heavily US dominated. Growth in revenues of the major players declined continuously throughout 2008. However, the picture is somewhat fragmented – while some firms continue to post positive rates of growth others have moved into negative territory. In the retail segment, while Amazon still posted positive year-on-year growth in the first quarter of 2009 of 18% (nevertheless, down from 37% in Q1 2008), eBay had experienced a negative rate of -8%

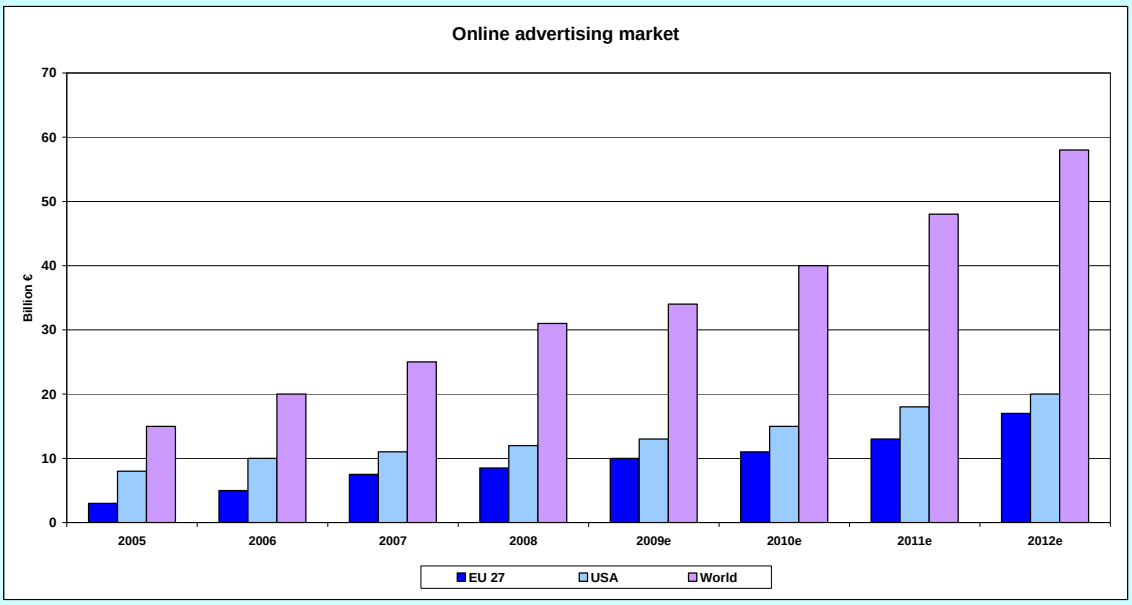
(down from 24% in the first quarter of 2008). Similarly, in the online advertising segment, Google reported 6% year-on-year growth in quarter 1 (down from 42% a year earlier), compared to negative growth of 13% for Yahoo (down from 9% in the first quarter of 2008).

Business models in the internet sector are largely based on advertisement. Evidence is emerging that the online advertising market will actually benefit from the crisis, as it is acting as a catalyst for the transfer of advertising to the online market from more traditional forms of media (See Box 1).

Box 1: The impact of the economic crisis on the market for online advertising

Online advertisement is the main source of revenues for Internet companies. Thus the impact of the economic crisis on online advertising is of critical importance to the future of this sector. As marketing spending is one of the first costs businesses cut when faced with a slowdown in sales, the crisis could be expected to have a particularly significant impact on the Internet sector.

While advertising on traditional media has been severely hit by the global economic downturn, online advertising has kept growing, though at a slower pace than hitherto.



Source: Idate News 466 – 27 April 2009

According to IDATE, in 2009 the Internet will likely be the medium to enjoy the greatest increase in ad spending, even if overall investments will be down, thanks to higher accountability and to innovative formats.

The global online advertising market had a net worth of €30.6 billion in 2008, and will climb to €58.8 billion in 2012 – accounting for 15% of advertisers' total spending.[1] The average growth rate increase between 2009 and 2012 would be 19.6%.

According to IAB Europe[2], online advertising in Europe was worth €11.2 billion in 2007 (a 40% increase from €7.2 billion in 2006). The European online advertising market is closing the gap with the US (€14.5 billion in the same period). The sectors spending the most in online advertising in 2007 were Entertainment & Leisure, Telecoms and Finance & Insurance.

Nevertheless, the decrease in the overall advertising market is not balanced by the increase in the online advertising market. According to recent forecasts[3], expenditure in general advertisement will decline by 6.9% in 2009.

The economic crisis could actually be beneficial for the Web. As consumers are spending more time at home, consumption of the internet and media may increase. Moreover, search activities on the web are driving Internet advertising growth as consumers are shifting from premium to value products and look for bargains.

Indeed, the reasons for the sustained growth of the online advertising market are: firstly, a growth in Internet use (both in terms of time spent and total number of users); and secondly, the shift from advertisers from traditional media to the Internet.

New forms of advertising such as viral marketing[4] in social networks or gamevertising[5] are taking full advantage of the interactive possibilities of the web and of digital content. Expenditure in advertising based on location through mobile devices is expected to increase with the development of mobile broadband.

Search and display are the most dynamic advertising segments. Most of the growth in internet advertising will come from search advertising (driven by companies like Google, Yahoo and Microsoft). Search marketing will represent half of the global online advertising market in 2009, or 17.2 billion EUR (53% of the market in 2012, generating an estimated 31.3 billion EUR).[6]

The display advertising internet category can be split into banner advertising and online video. While banner ads are getting increasingly commoditised, online video is growing through volume and premium rates. Revenues from display ads will go from 12.3 billion EUR in 2009 to 21.2 billion EUR in 2012 in the world. Display share of the global market will stabilise at around 36% thanks to the development of video advertising formats. Video ads are expected to be the online format with the strongest growth in the future.[7]

1 IDATE News 466 – 27 April 2009

2 Interactive Advertising Bureau Europe, 2nd June 2008. Europe = AT, BE, DK, FI, FR, DE, EL, IT, NL, NO, PL, SL, ES, SE, TK, UK

3 ZenithOptimedia: 14 April 2009

4 Marketing techniques applied to social networks and blogs that take full advantage of interactivity to increase to word-of-mouth with Internet network effects.

5 Advertising in videogames.

6 IDATE News 466 – 27 April 2009

7 IDATE News 466 – 27 April 2009

Other success stories include Apple. Its year-on-year growth rate of revenues for Q1 2009 was 8.7%. However, this is down considerably from the 25% rate of growth recorded in Q4 2008. Apple is one of the companies monetising an open innovation model. As of April 2009, in the nine months since its launch, one billion applications were downloaded from "App Store", its internet based shop, half of them in the last quarter (with an estimated value of €149.5 million)[78]. App store sells five million applications through the web per day.

The reasons behind the success are the big supply coming from third-parties (Apple retains 30% of the revenues coming from these applications while the rest goes to the developer) and the simplicity of the interface. However, the company makes the bulk of its revenues from the sales of devices and not from the sale of content. It is interesting to note that the digital content (for instance videogames developed by third-parties) is being used as a tool to create

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value for the product. It is estimated that without the "App Store", Apple would have sold between 10% and 15% less iPhones.[79]

8.1.3. The ICT manufacturing sector

European manufacturers remain world leaders in the production of network equipment, with around 70% of the worldwide market, leveraging on their technological leadership and multinational presence. However, the rapid deterioration of the economic conditions since the last quarter of 2008 is reflected in estimates of expenditure in telecom equipment, both with regards to infrastructure equipment[80] and to mobile handsets. In March 2009 Gartner estimated the year-on-year growth rate for the segment for 2009 at -6½% at the global level and at -9½% and -10% for Western and Eastern Europe respectively. This represents a significant downward revision from the still positive rates of growth forecast for 2009 at the end of last year. While a slowdown in global sales of mobile handsets (-7%) can be blamed for most of the decline, expenditure in infrastructure equipment (-3%) is also expected to decline.

Nonetheless, views on the impact of the current climate on growth are diverging. With the exception of Ericsson, both Alcatel-Lucent and Nokia Siemens Networks have seen negative annual growth rates in revenues in the last quarter of 2008 and first quarter of 2009. One manufacturer expects a lift in demand driven by data traffic growth, boosted by uptake of wireless datacards in laptops, while the two others are less optimistic, with one forecasting a reduction between 8% and 12% in revenues from telecommunications equipment and related deployment services.

- While the handset divisions of equipment manufacturers may expect a bad financial year in 2009, there are diverging views on how increasing traffic in mobile broadband and investment in next generation fixed broadband access will spur demand for communications infrastructure by telecom operators;

- Manufacturers expect an increase in demand for network equipment in emerging markets such as China and India. Global contract sales of Huawei jumped by 46% in 2008 to €18.3 billion; the company also forecasted sales of more than € 23.5 billion in 2009 and has proved the best performing company in the segment. Its low prices, in part related to the strength of the euro, may represent a further barrier to the recovery of European companies.

8.1.4. Semiconductors

Semiconductors are a key intermediate input into ICT equipment, as well as into other goods, such as cars. As such, they are considered as a crucial input into other sectors. Production is highly cyclical (dropping sharply during downturns and recovering quickly in upturns) and the current slowdown is no exception. According to Gartner (March 2009), 2009 will witness strong negative growth in worldwide chip sales (-24%), driven by a slowdown in PC purchases, digital appliances and mobile handsets. Semiconductor companies have already cut their production by closing some facilities or by lowering the utilisation rate and are tightening inventory control. This should have a positive impact on market prices. The

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79 Global Equities Research

80 Infrastructure equipment is divided into seven major segments: access, switching, routing, transport, business support systems, operations support systems and mobile infrastructure

uncertainties of the semiconductor industry ultimately reflect the overall economic and financial turmoil. 2010 and 2011 are however expected to be strong rebound years; with growth expected of 7.5% and 9.8% respectively (Gartner March 2009).

Not all the difficulties in the semiconductor industry can be attributed to the economic crisis. The crisis comes on top of chronic oversupply, for example in the dynamic random access memory market (DRAM), which has seen many conglomerates separate or sell their semiconductor business over the last two years in order to restore their own profitability. The beginning of this year already saw Qimonda (controlled by Infineon and the world's fifth-largest manufacturer of DRAM chips), file for bankruptcy as a result of the combined effect on its business of the slide in chip prices and decreased access to financing on the capital markets. Other important players are also suffering severely from the crisis.

8.2. Conclusions

This chapter has analysed he extent of the impact of the economic crisis on the ICT sector. The analysis, which is based on market data, shows that, while at the end of 2008 the sector seemed to be holding up quite well compared to other sectors, it is now being significantly affected and is expected to undergo a downturn. In Western Europe, total end-user spending on ICT is now expected to fall eight percent in 2009 and to remain flat in 2010 before increasing to three percent in 2011. In Eastern Europe, the situation is expected to be worse, with a 10 percent decline in 2009 and a two percent decline in 2010. In 2011, spending is projected to increase by four percent. While the downturn is expected to have a significant impact on all segments, some sectors (manufacturing) will be more strongly hit than others (software). The telecom equipment industry, which is Europe's traditional strength, and semiconductors are being hit by the crisis more than other ICT segments. The service segment (telecoms and software) is tempering the crisis thanks to sustained demand for traditional services. The internet industry, mainly US dominated, is weathering the storm better than any other part of the sector.

The ICT sector is the largest R&D investor in Europe and research activities are largely concentrated in its manufacturing segments. The economic slowdown, its uncertain outlook and the expected brake on earnings suggest a slowdown in the growth of R&D expenditure. There is a risk that the current financial crisis may undermine the recent positive development in R&D investment rate by European businesses. As the private sector will tend to limit its R&D spending, it would become all the more important to ensure that the public sector sustains, and even increases, its support to R&D. The next chapter of the report looks at the impact of the crisis on R&D spending in more detail.

Annex

Table 1: GDP at constant prices (annual % change)

	2006	2007	Estimates 2008	Forecasts 2009	Forecasts 2010
BE	3.0	2.8	1.2	-3.5	-0.2
DE	3.0	2.5	1.3	-5.4	0.3
IE	5.7	6.0	-2.3	-9.0	-2.6
EL	4.5	4.0	2.9	-0.9	0.1
ES	3.9	3.7	1.2	-3.2	-1.0
FR	2.2	2.2	0.7	-3.0	-0.2
IT	1.8	1.5	-1.0	-4.4	0.1
CY	4.1	4.4	3.7	0.3	0.7
LU	6.4	5.2	-0.9	-3.0	0.1
MT	3.2	3.9	1.6	-0.9	0.2
NL	3.4	3.5	2.1	-3.5	-0.4
AT	3.4	3.1	1.8	-4.0	-0.1
PT	1.4	1.9	0.0	-3.7	-0.8
SI	5.9	6.8	3.5	-3.4	0.7
SK	8.5	10.4	6.4	-2.6	0.7
FI	4.9	4.5	0.9	-4.7	0.2
€ area	2.9	2.7	0.8	-4.0	-0.1
BG	6.3	6.2	6.0	-1.6	-0.1
CZ	6.8	6.0	3.2	-2.7	0.3
DK	3.3	1.6	-1.1	-3.3	0.3
EE	10.4	6.3	-3.6	-10.3	-0.8
LV	12.2	10.3	-4.6	-13.1	-3.2
LT	7.8	8.9	3.0	-11.0	-4.7
HU	4.1	1.1	0.5	-6.3	-0.3
PL	6.2	6.7	4.8	-1.4	0.8
RO	7.9	6.2	7.1	-4.0	0.0
SE	4.2	2.5	-0.2	-4.0	0.8
UK	2.8	3.0	0.7	-3.8	0.1
EU	**3.1**	**2.9**	**0.9**	**-4.0**	**-0.1**
US	2.8	2.0	1.1	-2.9	0.9
JP	2.0	2.4	-0.7	-5.3	0.1

Source: European Commission Spring Forecast, May 2009

Table 2: Number of unemployed (as % of the labour force)

	2006	2007	Estimates 2008	Forecasts 2009	Forecasts 2010
BE	8.3	7.5	7.0	8.5	10.3
DE	9.8	8.4	7.3	8.6	10.4
IE	4.5	4.6	6.3	13.3	16.0
EL	8.9	8.3	7.7	9.1	9.7
ES	8.5	8.3	11.3	17.3	20.5
FR	9.2	8.3	7.8	9.6	10.7
IT	6.8	6.1	6.8	8.8	9.4
CY	4.6	4.0	3.8	4.7	6.0
LU	4.6	4.1	4.9	5.9	7.0
MT	7.1	6.4	5.9	7.1	7.6
NL	3.9	3.2	2.8	3.9	6.2
AT	4.8	4.4	3.8	6.0	7.1
PT	7.8	8.1	7.7	9.1	9.8
SI	6.0	4.9	4.4	6.6	7.4
SK	13.4	11.1	9.5	12.0	12.1
FI	7.7	6.9	6.4	8.9	9.3
€ area	**8.3**	**7.5**	**7.5**	**9.9**	**11.5**
BG	9.0	6.9	5.6	7.3	7.8
CZ	7.2	5.3	4.4	6.1	7.4
DK	3.9	3.8	3.3	5.2	6.6
EE	5.9	4.7	5.5	11.3	14.1
LV	6.8	6.0	7.5	15.7	16.0
LT	5.6	4.3	5.8	13.8	15.9
HU	7.5	7.4	7.8	9.5	11.2
PL	13.9	9.6	7.1	9.9	12.1
RO	7.3	6.4	5.8	8.0	7.7
SE	7.0	6.1	6.2	8.4	10.4
UK	5.4	5.3	5.6	8.2	9.4
EU	**8.2**	**7.1**	**7.0**	**9.4**	**10.9**

Source: European Commission Spring Forecast, May 2009

9. R&D IN ICT AND THE WORLD ECONOMIC CRISIS

R&D is the main driver of innovation and technological change, and as such, it is the main determinant of long-term productivity growth and living standards. This chapter addresses the evolution in ICT R&D expenditure over the last years. It starts off with a macro-economic analysis of the importance of ICT research in the EU27 Member States. A distinction is made between business spending and governmental funding, both in terms of absolute amounts and GDP percentages, revealing important differences within the Union, as well as a considerable gap with Europe's main international competitors. This gap, particularly the EU-US gap, is mainly explained by differences in the size and the composition of the ICT industry. Indeed, when looking at firm-level evidence, the R&D effort (R&D spending relative to total sales) in the two economic areas is very similar.

This is why in a second step the country-based analysis is complemented by a comprehensive firm-level analysis covering the period 2000-2009. The data is provided by companies' annual and quarterly financial reports. For all sectors, a fallback is observed following the dotcom bust in the beginning of the 21st century, with recovery taking place after 2005. First quarterly results indicate however that the world economic crisis is already impacting on R&D levels. Reduced cash flows and credit constraints (including a reduction in venture capital) is making R&D investment pro-cyclical.

Given the crucial contribution of innovation by the ICT sector to productivity growth, long-term strategic choices by governments in this area are of fundamental importance. The chapter therefore concludes by drawing attention to initiatives taken at EU level to deflect the actual crisis.

9.1. Country-level analysis

R&D intensity is more industry than country specific. Industry specificity may be due to the fact that each industry has a particular technological trajectory (roadmap) and cost structure, including what share of the revenues can be devoted to R&D, and the specific competitive conditions it faces.

However, country-level analysis provides additional insights on the economic role that ICT R&D plays in the EU Member States. The latest available evidence[81] refers to 2005 and shows that the ICT sector is the largest R&D investing sector of EU, US and Japanese economies. Although the ICT sector in the EU contributes only about 3% of total employment and about 5% to total GDP, it drives 26% of overall business expenditure in R&D (BERD)[82] (Figure 1) and employs 32% of business sector researchers. The sector also provides other industries with productivity enhancing technologies, hence contributing directly and indirectly to increasing labour productivity and EU competitiveness.

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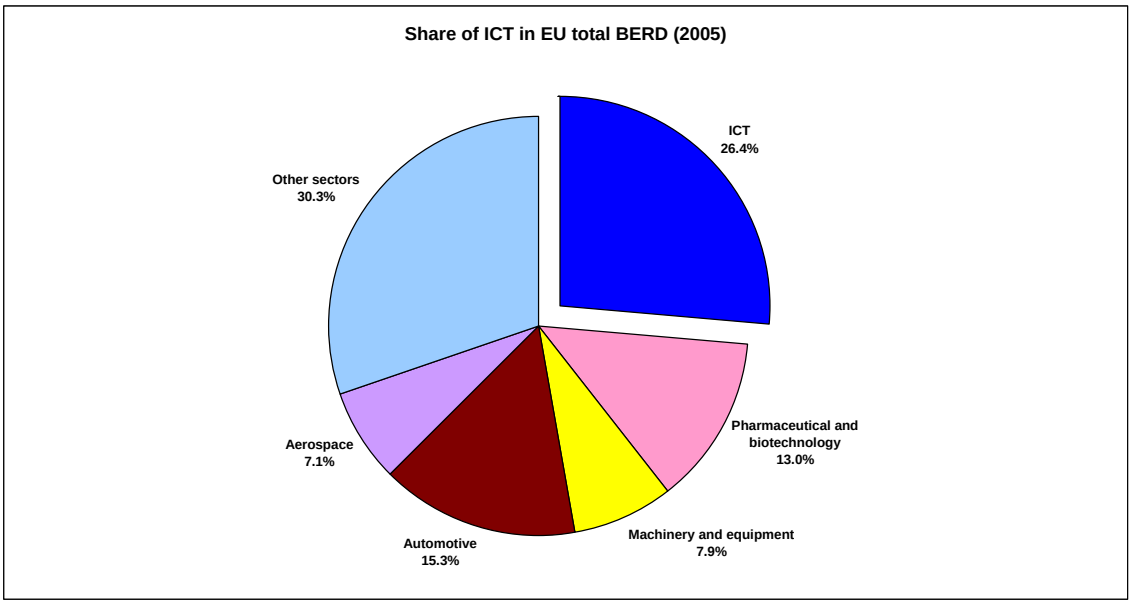
81 JRC-IPTS Report: "The 2009 Report on R&D in ICT in the European Union" (Turlea et al.,2009). This report is part of the project: "Prospective Insights on R&D in ICT" (PREDICT) funded by the European Commission. Report available at: http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=2259.

82 2005 figures, the latest available.

Figure 1



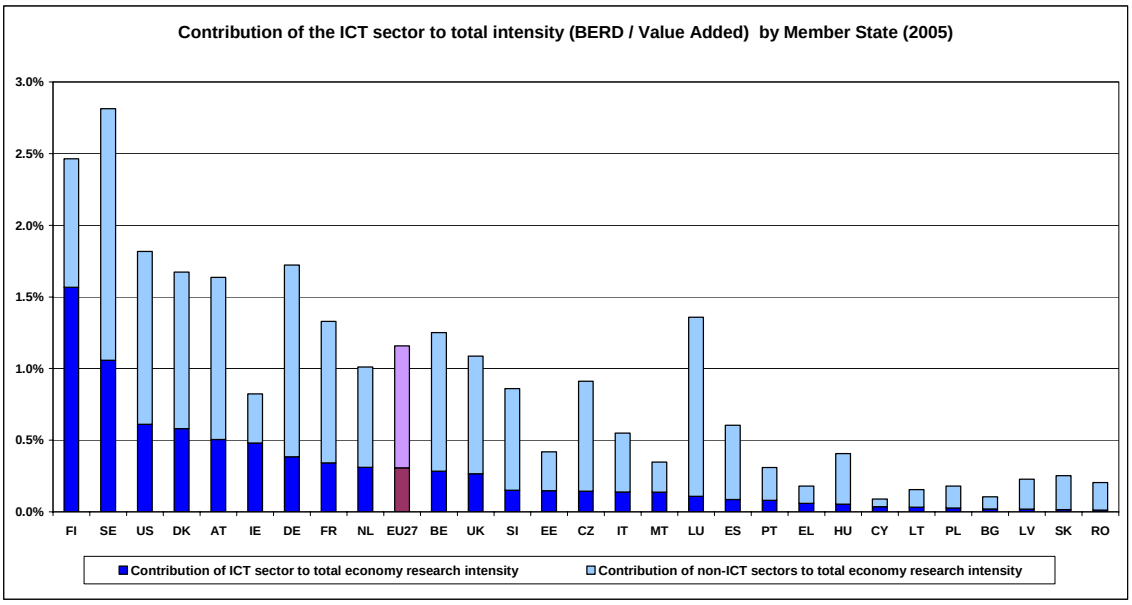
Source: PREDICT 2009 Report

R&D in ICT in the European Union is highly concentrated. The EU-15 accounts for 98% of the total while the new Member States are responsible for 2%. Germany (26.2%), France (17.3%) and the UK (12.8%), the largest economies, are the biggest spenders. When relating R&D to the size of the different economies, a different picture emerges: it is in the Nordic countries (Finland, Sweden and Denmark) where the contribution of the ICT sector to the overall R&D intensity is the highest (Figure 2). Secondly, the majority of low R&D-intensive Member States (i.e. all new Member States) is catching up with the remainder of the Union[83], and structural and knowledge economy indicators in these countries are showing improvements, which in return could increase the attractiveness of foreign direct investment (FDI)[84].

83 This is not the case for four new Member States (Bulgaria, Poland, Malta and Slovakia), for which the gap with the rest of Europe is actually increasing.

84 Report on a DG JRC-IPTS Workshop: "Raising Private Sector R&D in the New Member States: Does it help their economies catching up?" (Seville, 13.12.2007)

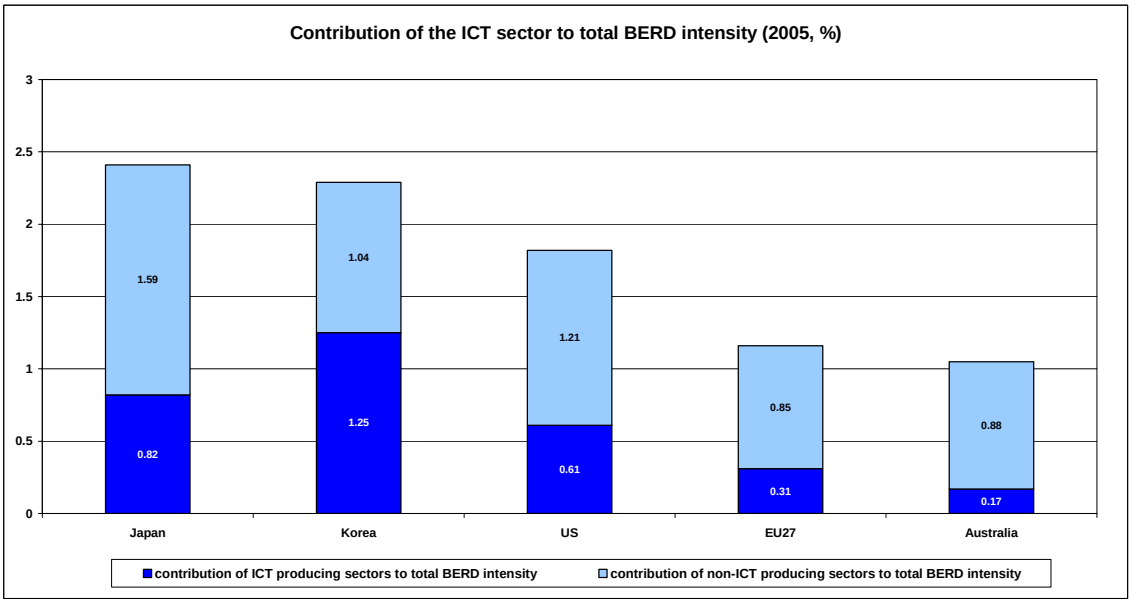
Figure 2



Source: PREDICT 2009 Report

The EU's main competitors (i.e. USA, Japan and Korea) are investing significantly more in ICT R&D (relative to GDP) than the EU. The EU and the US for example have similar GDP levels, but total R&D expenditure in the ICT sector is twice as high across the Atlantic, creating a gap of €33 billion[85]. This difference can be attributed to lower ICT R&D expenditures by both the business sector and the public sector (Figures 3 and 4).

Figure 3



Source: PREDICT 2009 Report

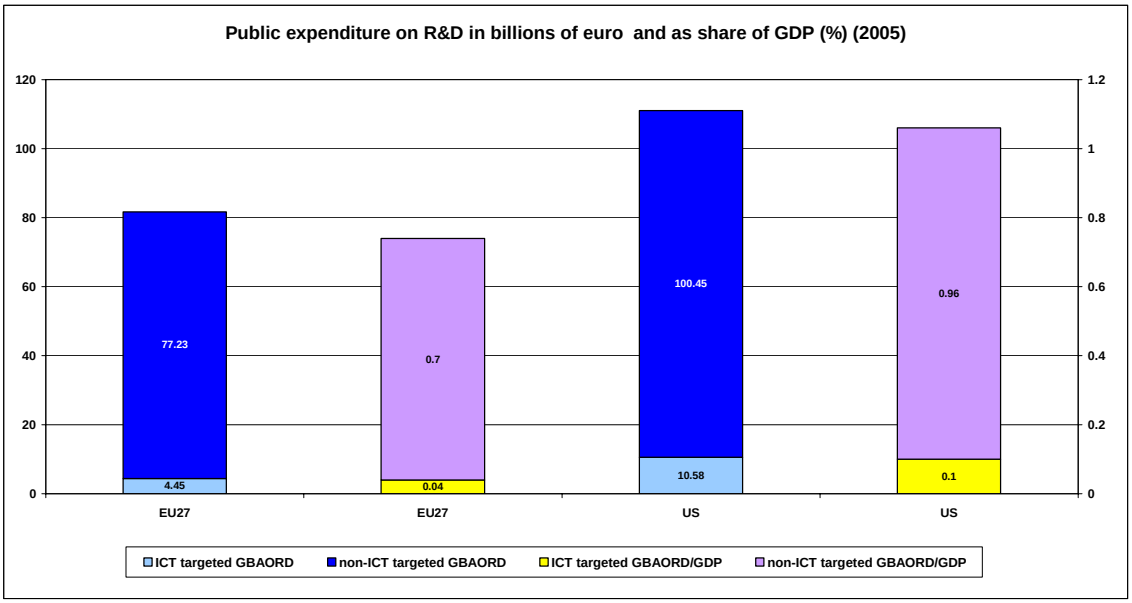
Regarding business R&D, the lower expenditure rate is not necessarily a result of individual EU ICT companies spending less on R&D than their American counterparts. On the contrary,

85 Total R&D expenditure in the USA stands at € 68.5 billion, compared to € 35.9 billion in the EU27 (at purchasing power parity, 2005 figures)

the company R&D effort (intensity) is similar for comparable EU and US firms in the different ICT sub-sectors[86]. The gap is primarily due to the smaller size of the EU ICT business sector relative to the US.

Recent estimated data on public R&D funding (government budget appropriations or outlays on R&D — GBAORD)[87]indicate that EU governments account for only a relatively small part of ICT R&D. In 2005, their support to ICT R&D was €4.45 billion, well below the US figure of €10.58 billion. Moreover, the intensity was higher in the latter country: in the US, public spending on ICT R&D stands at 0.10% of GDP, compared to 0.04% in Europe (Figure 4).

Figure 4



Source: Predict 2009 - The R&D expenditure is plotted on the left axis, the GDP contribution on the right axis.

Finally, according to Innovation Surveys, the ICT sector is one of the most collaborative sectors after energy and chemicals industries. Among innovative ICT firms in four EU countries, about 34% engage in some type of collaboration for innovation (versus 24% of all firms), and 13% of ICT firms cooperate with universities and public research organisations (versus 8.5% of all firms).[88]

9.2. ICT R&D investment trends by sectors

9.2.1. Methodology

This section develops an analysis of R&D based on spending data reported by companies in their annual reports. In general, this kind of data does not provide information about the place where R&D is actually performed.[89] The most recent available data are the 2008 annual reports and the first quarterly reports of 2009 (Q1 2009).

86 JRC-IPTS Reference Report "Mapping R&D Investment by the European ICT Business Sector" (Lindmark et al. 2008). Report available at http://ftp.jrc.es/EURdoc/JRC45723_RR.pdf

87 JRC-IPTS Report: "The 2009 Report on R&D in ICT in the European Union" (Turlea et al.,2009). http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=2259

88 OECD, using the 2007 European Community Innovation Survey

89 The company's whole R&D investment is attributed to the country in which it has its registered office.

The database that is used is the EU Industrial Investment Scoreboard. This database presents information on 2000 companies from around the world on R&D investments. The set of companies it covers comprises the top 1000 R&D investors whose registered offices are in the EU and the top 1000 registered elsewhere.[90]

The 2008 EU Industrial Investment Scoreboard, covering fiscal year 2007, counts 187 EU ICT firms among the top-1000 R&D spending companies. They employ around 1 million person in total and invest € 26,240 million in R&D. The most important ICT sub-sectors are: telecom equipment, telecom operators, semiconductors and software. Their R&D spending amounts to more than 90% of the ICT R&D total. The remaining ICT segments are computer services, internet, computer hardware and electronic office equipment, with significantly lower R&D rates.

These figures reflect the strengths and weaknesses of the European ICT industry. For example, there is little left of the computer hardware industry and Europe is nearly absent in the Internet industry, in which companies like Google, Yahoo or MSN have acquired seemingly unchallengeable positions. The telecom equipment industry is Europe's traditional ICT strength. Europe has also world leaders in business and industrial software.

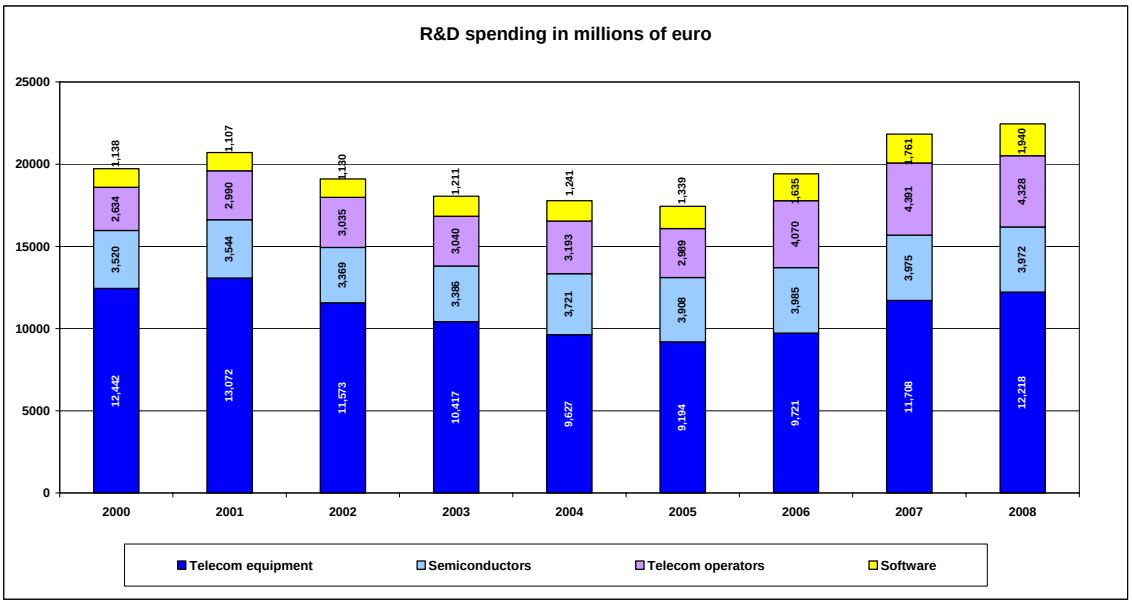
The following analysis considers R&D spending by the top spending firms in the list of the Scoreboard in the four main ICT sub-sectors. The cut off date for firms' annual reports was fiscal year 2008 and for their quarterly reports was 1Q/2009.

When interpreting these data, two important elements must be kept in mind: figures may be inflated by mergers and acquisitions and all amounts are expressed in euro, meaning that exchange rate variations are changing the evolution of the original data in the country's currency. Over the period 2000-2008, the euro constantly appreciated against the dollar, by 32% between January 2000 and December 2008.

In the four main ICT segments R&D investment has increased by 11.4% in 2006, 12.5% in 2007 and 2.9% in 2008 (Figure 5). Following the dotcom-bubble in 2001, total spending went down four consecutive years. The recovery started after 2005.

[90] http://iri.jrc.ec.europa.eu/research/scoreboard.htm

Figure 5



Source: Annual reports of a sample of the EU top ICT companies in R&D spending representing 90% of total R&D spending recorded by the 2008 Scoreboard

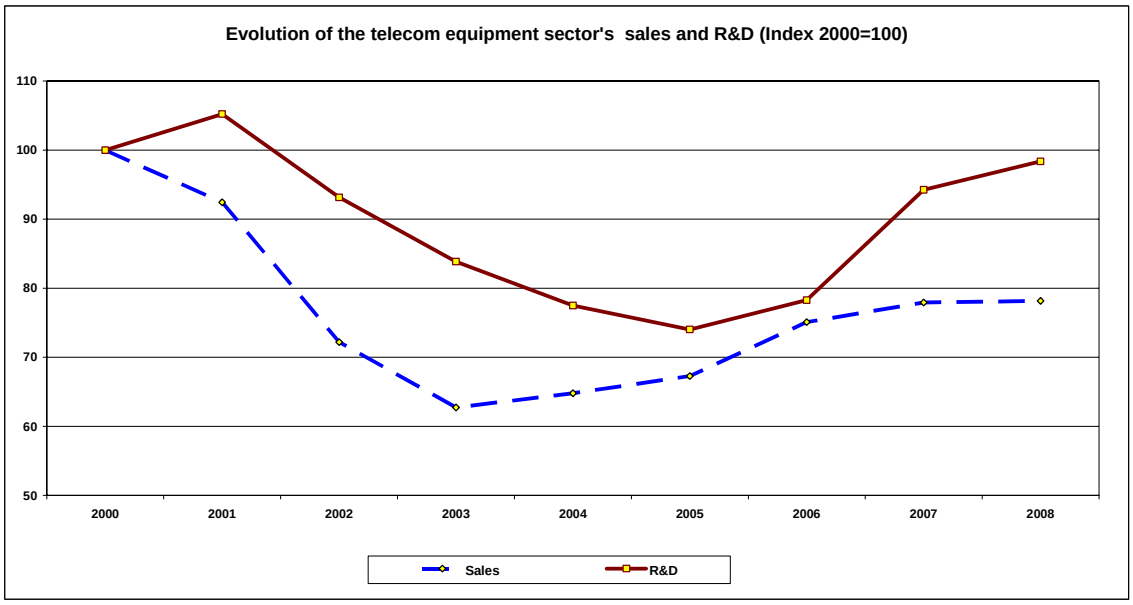
Because of the economic downturn, 2009 is expected to feature a slowdown in R&D investment. The next sections take a closer look at R&D spending in the first quarter of 2009 for each segment.

9.2.2. Telecom Equipment Industry

The telecom equipment industry is the largest segment of the ICT sector in terms of total R&D expenditure. It is also Europe's traditional ICT strength. In 2008, EU companies together had a 34% share of the fixed and IP infrastructure world-wide market and an 81% share in the mobile infrastructure world-wide market.

Between 2000 and 2004, the European telecom equipment industry, after reaching a peak in competitiveness due to the remarkable success of the GSM standard, saw a drop in sales and R&D following the crash of the dotcom bubble and less favourable economic growth (Figure 6).

Figure 6



Source: Annual Reports of the sample of Alcatel-Lucent, Ericsson, Nokia and Siemens COM, representing more than 90% of the EU Scoreboard sample for the telecom equipment sector

In the second half of the decade, the European telecom equipment industry went through important restructuring. In 2006, Ericsson acquired assets of Marconi telecommunications operations and Alcatel and Lucent entered into a definitive merger agreement. In 2007, Nokia Siemens Networks combined Nokia's networks business and Siemens' carrier related operations for fixed and mobile networks.

Between 2005 and mid-2008, world GDP expanded vigorously offering new market opportunities in emerging and developing countries, fostering an ever increasing globalisation of the industry that extended its business outside the maturing telecommunications markets in the advanced economies and started experiencing new competitive pressure from Asian players.

The restructuring of the telecom equipment R&D activities has been globalised together with other operations of this industry. Today, Alcatel Lucent R&D has approximately 23,000 R&D personnel (including Bell Labs), with a worldwide presence in 23 countries and around 50 major centres. The R&D workforce distribution is continental: European Mediterranean Area 39%; Americas 33%; Asia Pacific 28%. Nokia has R&D centres in 11 countries, employing 14,500 people which represent approximately 32% of Nokia's total workforce. Major R&D centres are located in various European countries, India and USA. Ericsson, with over 19,300 people employed in R&D, has set up a network of research facilities and Centres of Excellence in Europe (Sweden, Ireland, Italy, Greece and Hungary), the Americas, India and China.

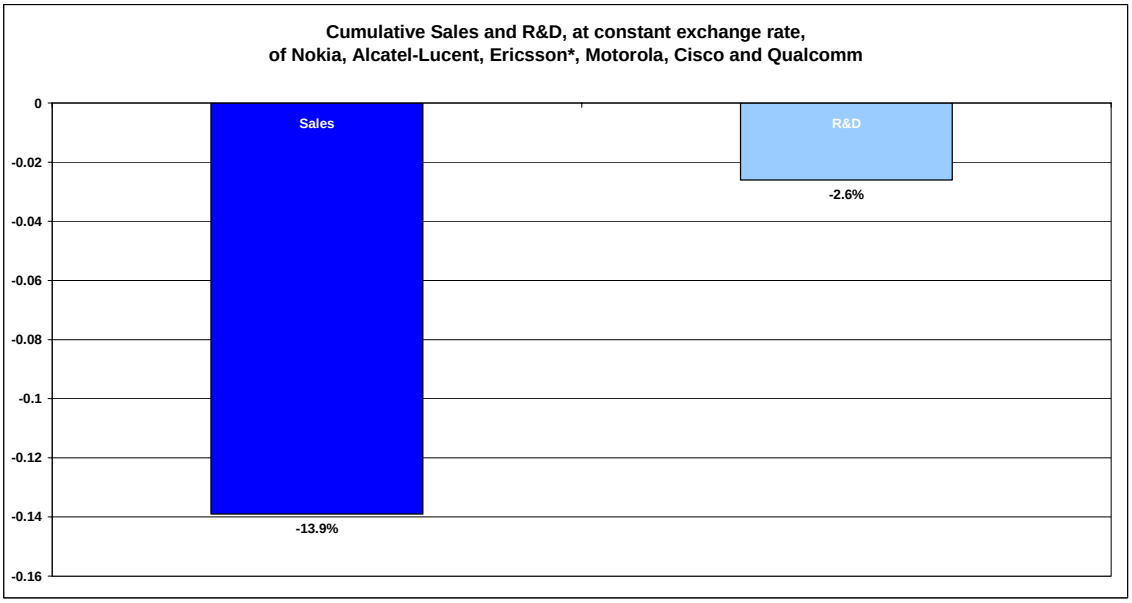
R&D is increasingly devoted to improving users' experience. In its R&D orientations, Alcatel-Lucent is adopting a user-centric approach — putting the end user at the centre of all activities — a critical component in a service provider's ability to stay competitive, create services and generate profitable growth. Nokia's new user interface research, located in Europe and in the United States, with teams in China, India, and Africa also focuses on a user experience that meets cultural preferences.

The current economic deterioration is affecting the telecom equipment industry (Figure 7). The handset business saw a dramatic decline in consumer demand for handsets and a massive de-stocking starting in the fourth quarter of 2008 and extending into the first quarter of 2009. The turn in the inventory cycle is generally expected to be reached in the next quarter.

The effects of the global economic recession on investment in networks remain difficult to predict. Nokia and Nokia Siemens Networks expect the mobile infrastructure and fixed infrastructures and related services market to decline approximately 10% in euro terms in 2009. Alcatel-Lucent expects the global telecommunications equipment and related services market to be down between 8% and 12% at constant currency in 2009. According to Ericsson, investment in wireless networks largely continues, and rollouts of new networks and new technologies accelerate in markets such as the US, China and India.

The combined R&D spending in fiscal year 2008 of Nokia, Alcatel-Lucent and Ericsson amounted to €12.2 billion, an increase of 4.3% compared to the previous year, but also an increase lower than the previous year. The first quarter of 2009 saw a significant drop in sales, mostly explained by the mobile handset business, and for most companies also in R&D. Among the European and US global telecom equipment companies, only Nokia and Qualcomm reported an increase in R&D.[91]

Figure 7



Source: Financial Reports

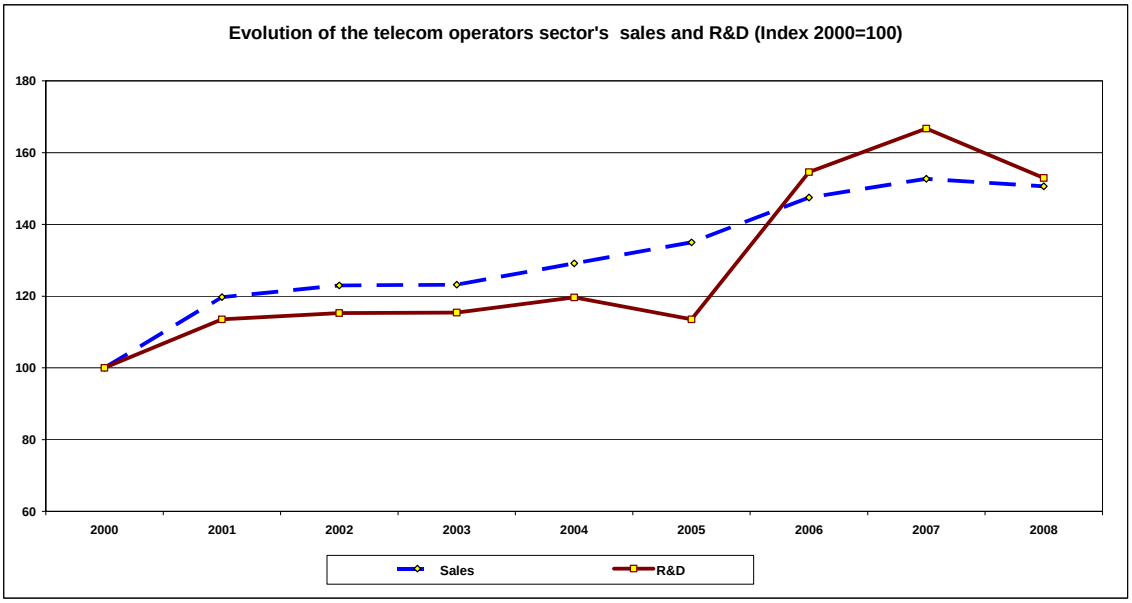
The R&D intensity in the telecom equipment industry is among the highest in the ICT sector, reaching 16% for Nokia Siemens Networks, Alcatel-Lucent and Ericsson in fiscal year 2008. R&D spending is decreasing less than sales: in 1Q/09, the R&D intensity increased to 19% for Nokia-Siemens and Alcatel-Lucent.

[91] The 50/50 joint venture between Ericsson and STMicroelectronics, merging STMicroelectronics' wireless business and Ericsson Mobile Platforms, started operations in February 2009 making it impossible to compare 1Q/09 with 1Q/08. Between 4Q/08 and 4Q/07, Ericsson's R&D increased by 3%.

9.2.3. Telecom operators

The R&D intensity in the telecom service segment is very low, in general less than 2%, following a shift from R&D conducted by the previous public monopolies to R&D mostly conducted by equipment suppliers. Recently, the emergence of the Web 2.0 and Enterprise 2.0 services is the driving need for increasing and re-focusing R&D. The seven largest operators' [92] R&D spending reveals a significant increase in R&D between 2005 and 2008 (Figure 8).

Figure 8



Source: Annual Reports of a sample that consists of 7 largest telecom operators, representing more than 90% of R&D spending recorded by the EU Scoreboard for this industry

The increase in R&D spending since 2005 is explained both by a significant increase in capitalised software development costs[93] and by the fact that before 2005 telecom operators did not mention capitalised software as part of their R&D spending. These investments are primarily related to the development and adaptation of internally developed software, as well as software platforms and architectures, with the aim of improving processes for the provision and operation of services and products. Development costs for software can be important in the total R&D budget. Not all telecom operators however distinguish between operational R&D and software R&D.

Operators are also following the same trend as equipment manufacturers and orienting their R&D to services and end-users centric goals and the overall R&D intensity will most probably increase in the coming years. Examples are: Deutsche Telekom Laboratories' was founded in 2005 and its major fields of focus include: intuitive usability, the integration of different media and devices, facilitating access, improving security and setting up high-performance networks. Telefónica I+D has become the largest private R&D centre in Spain. It has set up an international network connecting more than 150 universities and several

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92 Corresponding to 90% of total R&D spending as reported by the 2008 EU Scoreboard for this sector

93 In accordance with the international accounting standard IAS 38 "Intangible Assets", R&D expenses are recorded as expenses in the year in which they occur, except for development costs which are capitalised when several criteria are met. Capitalised software developments are those incurred during the programming, codification and testing phases. Costs incurred during the design and planning, product definition and product specification stages are accounted for as expenses.

hundreds of organisations in 42 countries worldwide. France Telecom set up in 2006 Orange Labs, with a staff of 3,800 researchers in 18 laboratories.

Too few telecom operators in the sample release their R&D spending in the quarterly reports and the impact of the crisis on their R&D during the first quarter of 2009 cannot be assessed.

9.2.4. Semiconductors Industry

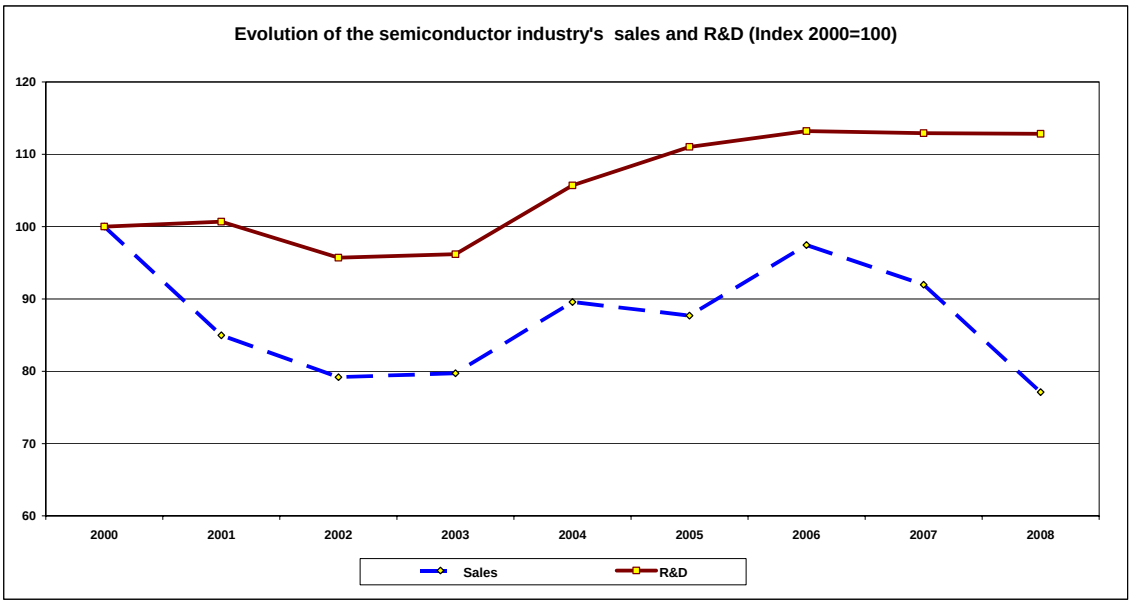
Semiconductors were first developed in the United States (Bell Labs, Fairchild, Texas Instruments). The European semiconductor industry developed mainly under the protective umbrella of conglomerates that ultimately decided to spin-off their semiconductor business units. Semiconductors in mobile communications and embedded in final goods such as cars provided new market opportunities. At the beginning of the new millennium three European chip companies were in the global top ten.

The development of semiconductors relies on interactions and collaborative relationships between the manufacturer, the semiconductor equipment and materials industry and R&D research centres. Although its manufacturing world share declined, Europe has a world class, innovation eco-system in semiconductors, with a few dedicated regions with a critical mass and specific semiconductor competences such as Dresden, Dublin, Eindhoven, Leuven and Grenoble. These clusters are key assets for the competitiveness of the European industry and address all application fields. European public-private R&D partnerships are also considered the best in the world, although they would benefit from more efficient commercialisation of their R&D. The semiconductor industry has the highest R&D intensities of all ICT sectors. For fiscal year 2008, the R&D intensity of European semiconductors firms was about 22% for NXP, 21% for STMicroelectronics, 17.5% for Infineon and 18% for ASML (semiconductors equipment).

As semiconductors are intermediate goods, the industry is structurally highly cyclical and has been subject to significant economic downturns at various times. The industry is also characterised by continuous technological progress in the manufacturing of semiconductors (Moore's Law) which leads to transitional excess supplies.

The semiconductor industry has the highest R&D intensity of all ICT segments. R&D spending went down 5% after the dotcom bust in 2001, as a result of a major fallback in the demand by other industries. The sector however recovered quickly. During the last years, R&D amounts remained relatively stable, and there was no dramatic decline in 2008 despite a significant decline of its revenues (Figure 9).

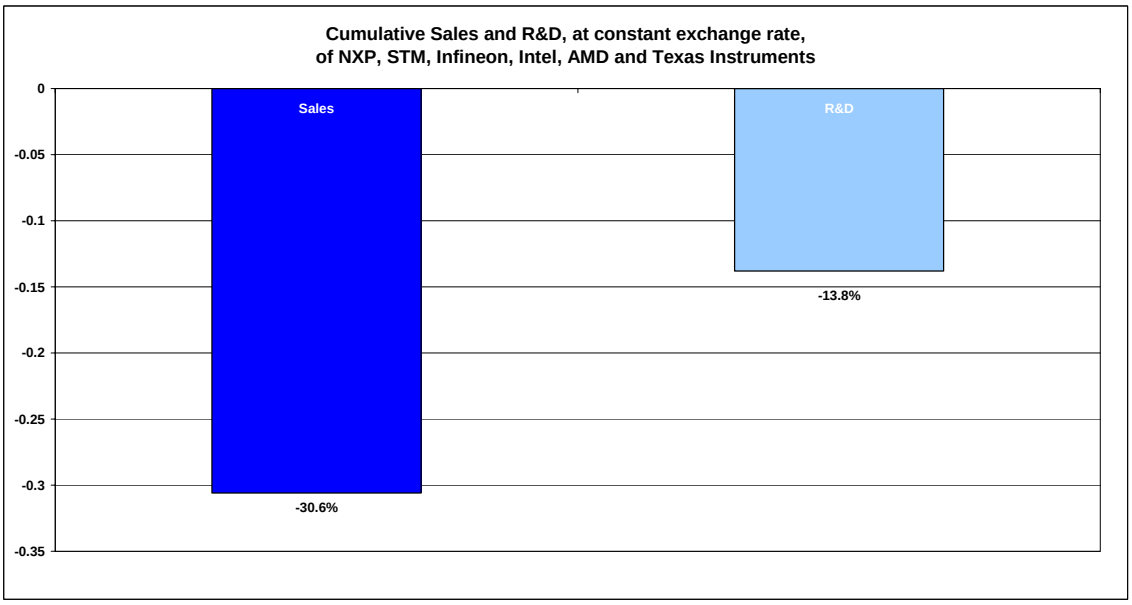
Figure 9



Source: Annual Reports STMicroelectronics, Infineon, Qimonda and NXP

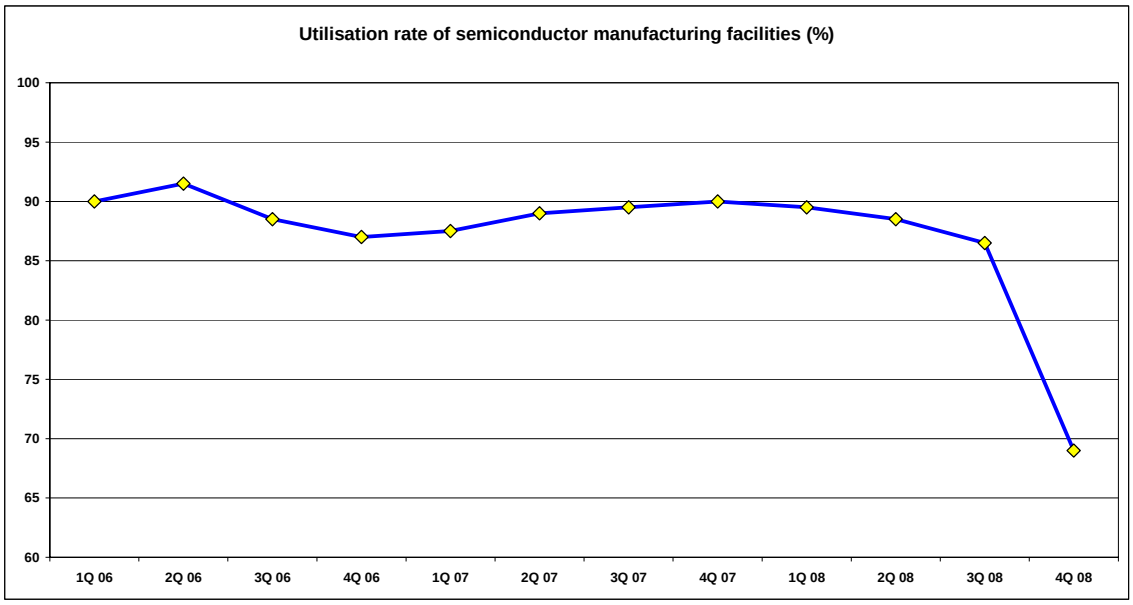
Despite recent stability, when the financial crisis extended to the real economy in the fourth quarter on 2008, the semiconductor market collapsed in a way never experienced before as reflected by the negative results in Q1 2009 reports (Figure 10). During the fourth quarter of 2008 and the first quarter of 2009, the utilisation rate of semiconductor facilities was at an historical low and led to important losses (Figure 11). Hopefully, as for mobile handsets, a turn in the inventory cycle seems to be in view, although the level of demand is still uncertain.

Figure 10



Source: First Quarter 2009 Financial Reports

Figure 11: Utilisation rate of semiconductor manufacturing facilities (%)



Source: OECD, 2009

9.2.5. Software

This section is about the software industry defined as an activity producing a software original that is reproduced and sold, some are packaged, some are customised and some are linked to complementary services. Inevitably, the grouping is heteroclite, including games, manufacturing tools (computer aided design and manufacturing), business and internet software. [94]

This industry is highly fragmented. In 2005, there were an estimated 18,000 European packaged software companies.[95] Most of these had less than 15 employees and €1 million in revenue. This market fragmentation contrasts with the fact that R&D is highly concentrated.

The EU Scoreboard, which shows that total R&D expenditure in the software industry in Europe, rose 14% per year (Table 1). This is slightly higher than in other parts of the world. Moreover, R&D intensities in Europe and in the rest of the world are roughly similar, suggesting that the European software sector is growing at a faster pace than elsewhere.

Table 1: Software R&D in 2007

	Changes in R&D investment 2007-2006 (%)		**R&D CAGR* (2004-2207) (%)**		**R&D intensity 2007 (% R&D/Sales)**	
	EU	**Non-EU**	**EU**	**Non-EU**	**EU**	**Non-EU**
Software	14.7	12.6	14.0	12.1	15.0	14.5

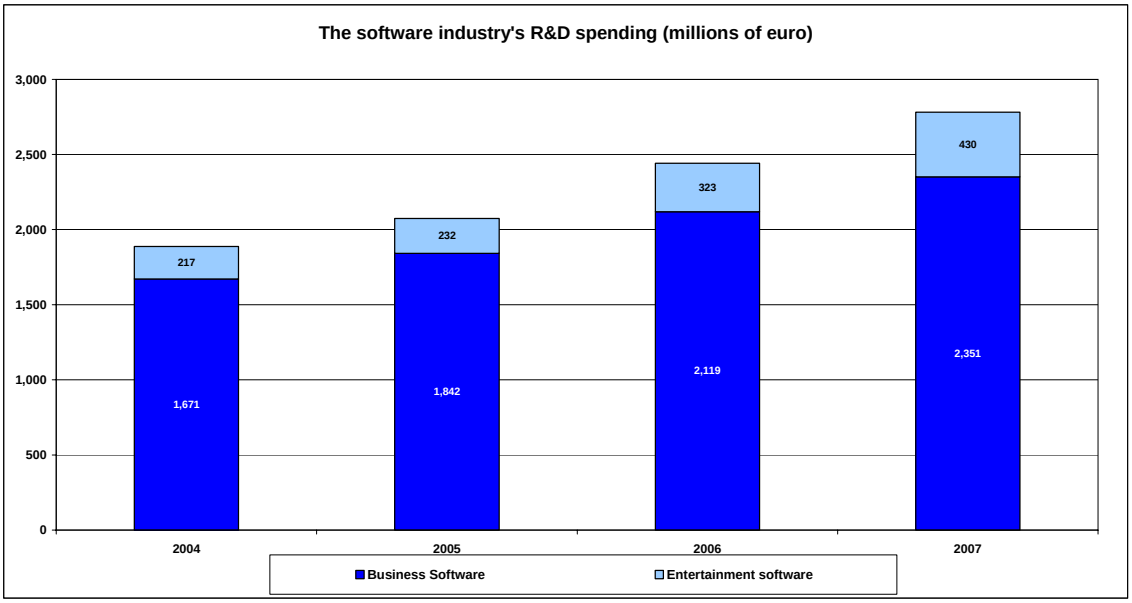
***** Compound Annual Growth Rate
Source: EU Industrial Investment Scoreboard

94 It should be reminded that an important part of R&D expenses are in fact own-account software developments. Indeed, in services as well as in manufacturing industries, much research relies on or results in new software. Eurostat and the OECD are currently and jointly implementing a new method for measuring R&D investment in software (SNA93 - Revision of the system of national accounts)

95 IDC figures

According to the Scoreboard, total R&D expenditure by the European software industry in 2007 was around 4 billion. The 3 biggest companies (SAP, Dassault Systems and UbiSoft) are responsible for half of that amount, while the 11 biggest companies account for 71%. Within these 11 companies, 7 provide business solutions, while the others produce software for entertainment purposes (i.e. mainly games). Growth of their combined R&D expenditure over the period 2004-2007 is significant (Figure 12).

Figure 12



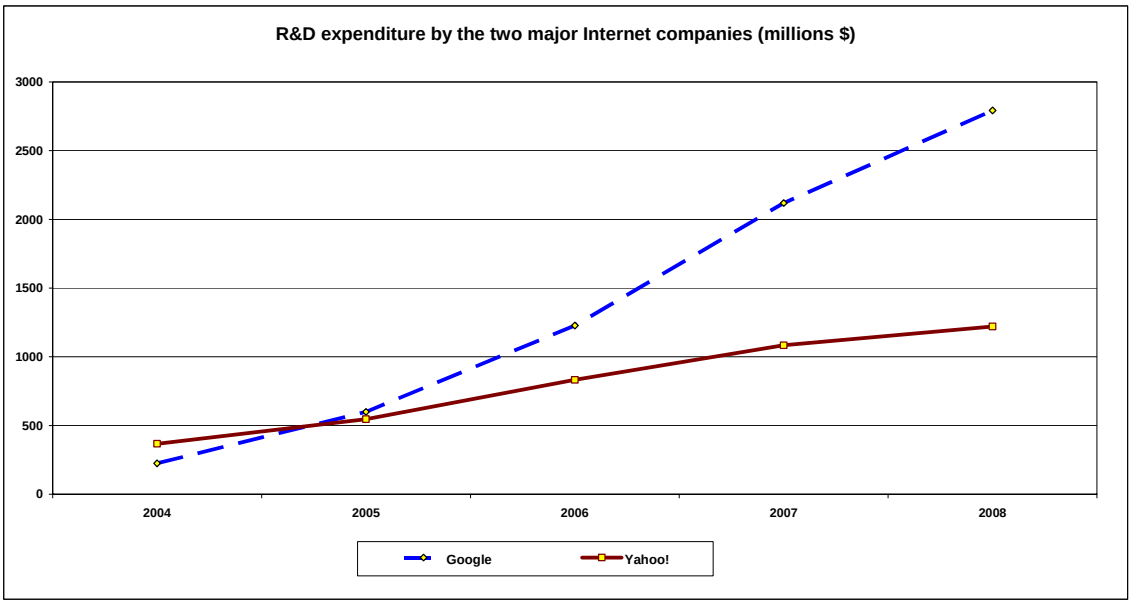
Source: Scoreboard 2008

Although total R&D spending is lower for the entertainment companies, their R&D intensity is generally higher: with 33.6%, it largely exceeds the 14.1% for business software companies. The gaming industry is typically characterised by a constant need for innovation: as hardware becomes more powerful and cheaper, the demand for cutting-edge graphics and improved features booms, forcing the developers to constantly invest in R&D in order to insure competitiveness.

9.2.6. Internet companies

The search engines, social networks and web mail services that are shaping the Internet are of US origin. The 2008 Scoreboard does not identify any single major EU firm providing Internet related utilities (email, search engines, social networks). Two firms, Google and Yahoo, account for 88% of R&D carried out by Internet companies. Their R&D spending is in line with revenue performance over the relevant period.

Figure 13



Source: Annual Reports

9.3. Conclusions

Technological innovation in the ICT sector is an important driver of productivity growth. The cyclicality of R&D investment and the preliminary evidence of its decline illustrated in this chapter may have important repercussions on the ability of the EU to sustain an acceleration in productivity growth and stimulate a durable recovery. Recovery strategies based on broad innovation strategies would help foster long-term growth. The EU stimulus packages do recognise the importance of ICT R&D and innovation for the competitiveness of the whole economy and for its ability to address the key societal challenges ahead.

The European Economic Recovery Plan proposed by the Commission on 26 November 2008 includes public-private partnerships for research and development in three initiatives aimed to develop new technologies for the manufacturing, construction and automotive sectors. ICT plays an important role in all three areas:

- In the Factories of the Future initiative, concerning innovation in modern manufacturing, ICT provides essential tools to face today's industrial challenges such as increasingly global networked operations, more agile manufacturing and customisation, lower carbon emissions and energy efficiency as well as optimised design of manufacturing systems and better process life cycle management.

- In the 'Energy-Efficient Buildings' initiative, ICT helps to improve energy efficiency in buildings through, for example, better monitoring and control of energy consumption, advanced lighting systems, and smarter and optimised interconnections with the power grids.

- In the 'Green Cars' initiative, ICT is essential for developing fully electrical vehicles, e.g. for battery management and power supply, for control mechanisms and for the interconnections with the transport and power infrastructures.

With ICT underlying innovations in all businesses, it is only through the development of a solid ICT-knowledge base and by shaping its development that Europe will be able to make the best of the technology throughout its economy.