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TABLE OF CONTENTS

1.	Introduction.....	3
2.	the European ICT sector: an international perspective	4
2.1.	Recent developments and outlook	4
2.2	R&D in ICT: the basis of competitiveness in a globalised economy	7
3.	Convergence.....	12
3.1.	Broadband	13
3.2.	Content Markets	18
4.	The Impact of ICT on non-ICT sectors.....	22
4.1.	eBusiness in enterprises	22
4.2.	Online Public Services: Government, Health and Education	28
5.	Inclusion.....	33
5.1.	Inclusion at the national level	33
5.2.	The Riga Declaration	35

1. INTRODUCTION

This Commission Staff Working Paper is presented as background for the i2010 Annual Information Society Report for 2007. Its purpose is to report on market trends and progress in the information society in Member States¹ and EEA countries. The report provides the basis to assess the validity of i2010 policies in preparation for the mid-term review in 2008.

The past year has been one of consolidation, the overall rapid ICT (information and communication technologies) market growth of earlier years has slowed but the first signs have appeared of fundamental change as Europe moves towards a knowledge-based economy. Many countries now have high levels of broadband adoption and are seeing the introduction of innovative advanced services. The transformation of the content market was already apparent in the revolution caused by online sales and new digital devices. Movie distribution and online TV are moving in a similar direction accompanied by an explosion of user content. The public sector is not lagging behind and there is a growing maturity of online public services. Public administration is leading the way with health and education closely following.

It would be wrong to give the impression that all is well and nothing remains to be done but watch the market take off, and so this Report sounds certain warnings. There has been buoyant demand for ICT products and services, in particular software, in which European industry is relatively weak in some respects, for instance, there is only one EU company in the world top 25. Growth of content is hampered by problems of connectivity and the need to overcome the inhibiting effects of piracy. The expected impact of ICT on core business processes in Europe has not yet materialised despite the general consensus of its potential to boost productivity. Finally, there remain dangers of social groups or regions being excluded from these benefits although 2006 saw the launch a major new initiative at European level to co-ordinate policies for inclusion.

Labour productivity growth rose to 1.5 per cent² in 2006 in EU27, although performance varies across Member States. ICT remain crucial to the achievement of productivity gains and this is reflected in the Member States' Progress Reports in 2006. Compared to 2005, Member States' put more emphasis on mainstreaming ICT policies which are broadly perceived as (i) drivers and components of innovation and development; (ii) tools for transforming government and business models; and (iii) tools to improve the quality of life for citizens. The Commission assessment of the 2006 Progress Reports was that overall progress is good, in particular in the priority areas that were identified last year: eGovernment, broadband communications and digital literacy. However, progress is uneven among the Member States, and implementation of the policies is delayed in some areas.

¹ If not specified otherwise, data for the EU refer to only the 25 Member States in 2006. EU27 figures will be available from 2007.

² Commission Services estimate based on University of Groeningen database.

2. THE EUROPEAN ICT SECTOR: AN INTERNATIONAL PERSPECTIVE

2.1. Recent developments and outlook

The ICT sector remains one of the most dynamic sectors of the economy with higher than average growth rates and research intensity. Over the last decade, innovations by the sector have made ICT products and services cheaper and lead to their wide adoption by the economy at large. ICT products have become increasingly commoditised and future growth can be expected mainly in new, niche and replacement products as well as in software and IT services. As a result, the sector should not be expected to sustain the rapid growth of the past and structural change within the sector is visible. Overall, growth in the ICT sector in the EU is forecast to be 2.9% in 2006, down from 4.2% in 2005.³

Within the ICT sector, the EU has traditionally had a comparative advantage in Electronic Communication Services, a sector that has recently faced a slowdown on the European market. The new dynamic growth area with ICT is software and IT services, a sub-sector largely dominated by US companies (table 1). This shift is one of the main changes that have been identified since the last i2010 Annual Report.

	Share of ICT sector (2006)	Growth rates		
		2004-5	2005-6	2006-7
Software & IT Services	31%	5.8%	5.7%	5.9%
Electronic communications services	45%	3.5%	2.3%	1.4%

Source: EITO 2007, not including Malta and Cyprus

Electronic communication services

Electronic communications is an important sector in its own right. Electronic communication services account for 35% of value added of the ICT sector, or 1.8% of the EU economy, and drive 12% of overall labour productivity growth⁴. The annual growth rate of revenues for electronic communication services has been slowing down since 2002 and 2005/6 has confirmed this trend. In real terms, however, the sector is still growing faster than the rest of the economy, thanks to fast declining prices.

The decline in revenue growth in the electronic communication segment is mainly driven by a slowdown in the growth of fixed and mobile voice services. This is a consequence of trends such as decreasing prices in markets characterised by improved competition, the emergence of Voice of IP (VoIP) and the saturation of GSM markets. Fixed data, broadband in particular, is the fastest growing segment with growth of 8.5% in 2006³.

³ EITO 2007

⁴ Commission services estimate based on University of Groeningen database and Eurostat (2003)

Although increased competition and new technologies have caused a slowdown in traditional activities, telecom operators are looking for opportunities that may bring rewards in the longer term. Mergers and acquisitions have been significant; a few operators have been investing or have announced investments in the upgrade of their infrastructure to next generation networks and have been developing innovative media-based broadband services. Operators have also internationalised their activities in developing markets in the EU and third countries. Investment in other European countries may lead to further consolidation and to the emergence of truly pan-European operators.

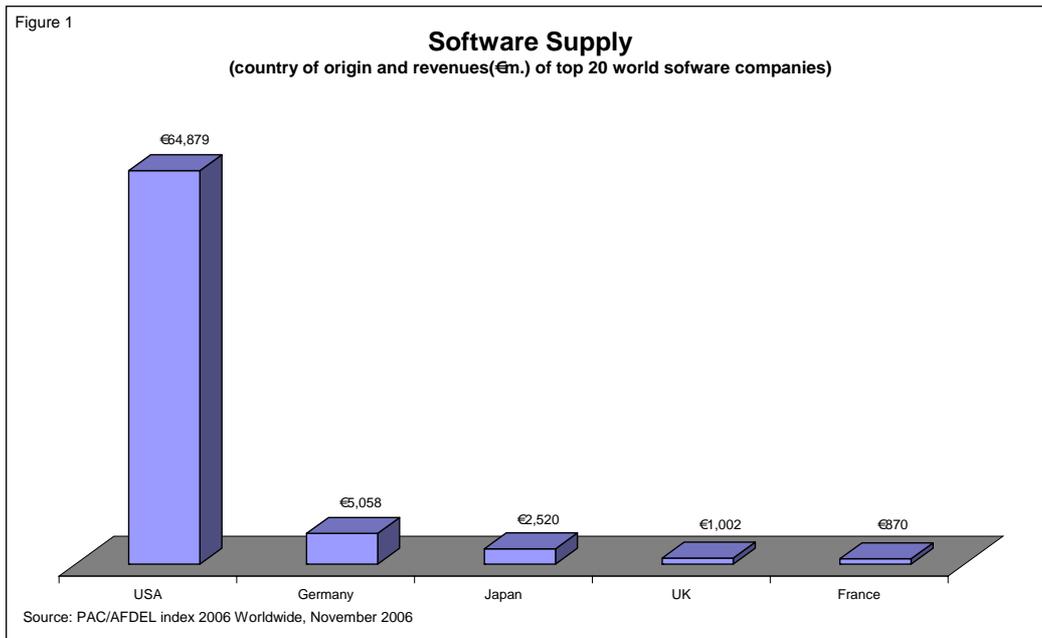
Software and IT Services

The software (11% of the total ICT market value) and IT services (20%) markets have had the highest growth rates in the European ICT-sector (table 1) and this is expected to continue over the coming years. According to a leading market analyst⁵ the growth prospects for the EU software market will remain good over the next five years. It seems that the EU software market is as dynamic as the US and Japan markets. However, growth in IT services is expected to be lower in comparison to software and to the US market. Faster growth in the US may be due to higher past investment in software which is now driving demand for associated IT services e.g. maintenance, upgrading.

Although the EU and the US software markets are of similar size, the supply side is dominated by US companies (see figure 1). Out of the top 20 companies in the world, only 3 are European. Europe is home for globally leading companies in some product segments such as enterprise software but the packaged software market is dominated by US companies.

Table 2		
Software and IT Services (Compound Annual Market Growth2005-2008)		
	Software	IT-services
EU27	6.4%	5.4%
USA	6.7%	6.3%
Japan	7.0%	3.2%
Sources: EITO 2007 (EU27, but no data for Cyprus or Malta); Gartner Dataquest Market Databook, June 2006 (USA, Japan)		

⁵ Gartner Dataquest Market Databook, June 2006 Update



To analyse growth in the software market, it is necessary to distinguish between the primary or core market and the secondary external market i.e. software that is either developed for internal use or bought as part of another product, thus not recorded in the core software market.

The demands of eBusiness drive many aspects of the core software market. Examples of the main demand drivers are: system software in the areas of security and storage software; Business Performance Management solutions focused on compliance in relation to, for example, finance; collaborations tools which bridge with other applications; and Enterprise Resource Planning Solutions. A large part of the revenue streams to software vendors, at least in packaged software, are maintenance and up-grades and this proportion is growing as the market consolidates. Moreover technological trends towards open source, software as service, convergence and web services, and Service Oriented Architecture are creating new demands.

Open source software might provide an opportunity for Europe to gain a bigger share of the software market⁶. This is due to the fact that open source may provide a better business model for small and medium enterprises (SMEs) and the European secondary sector. Europe can gain from being home of a strong community of open source developers. It may be that open source software is understated as it is not recorded in national accounts as software expenditure. As European firms invest more in open source compared to the US, the difference between the two regions becomes even smaller.

Software is also developed outside the core software and IT services market⁷. Growth for such software products is primarily generated by the manufacturers' need to differentiate products and services and is driven by demand from end-users. Software provides the essential

⁶ *Economic impact of open source software on innovation and the competitiveness of the Information and Communication Technologies (ICT) sector in the EU – Commission Services (2006)*

⁷ This is software developed internally or bought as part of another product, thus not visible in the core software market. This involves mainly manufacturing sectors such as automotive, aerospace, medical equipment, automation, telecom equipment, and electronics. These specific sectors constitute, in terms of value added, 14% of the total European manufacturing industry. The value of this software market is very difficult to quantify.

functionality in industrial and commercial systems; for example, air traffic, chemical processing plants, financial information, stock and point-of-sale systems in retailing and, of course, eGovernment services. In the automotive sector, embedded systems are used to make intelligent cars providing more road safety and more sustainability through better protection of the environment. Embedded systems in consumer electronics allow consumers to take advantages of the possibilities provided by the convergence development.

2.2 R&D in ICT: the basis of competitiveness in a globalised economy

Economic "globalisation" refers to the increasing integration of economies around the world, particularly through capital, trade and international R&D flows but also to global relocation of production. ICT goods and services are central to the growth in each of these and the ICT sector itself is one of the leading examples with high international trade and R&D flows.

The EU economy has faced difficulties remaining competitive in an increasingly globalised economic environment. Although there has been a recent rebound in productivity and output growth in Europe and a slowdown in the USA in 2006; on average since the mid-nineties, Europe had lower GDP growth than its partners; sluggish productivity growth and slow growth of GDP per capita.

The poor EU performance in ICT has often been emphasised as one of the reasons for the EU not drawing much benefit from globalisation. The academic debate on the gap between US and EU productivity growth has focused on lower levels of ICT adoption in Europe. American companies seem to make more effective use of information technologies than European companies, which have been slow in introducing innovative business processes. More recently, the poor performance of the ICT sector itself in Europe has been identified as a major weakness in the ongoing process of globalisation, characterised by greater trade integration and by higher research intensity in trade.⁸

The technology and research content of world trade has increased sharply over time, with R&D-intensive products, in particular ICT, being a major driving force in world trade since the 1990's. Over the period 1992-2003, the EU managed to maintain a dominant world market share thanks to its leadership in a variety of medium technology and capital intensive goods industries, e.g. cars and specialised equipment, and in one high-tech industry (pharmaceuticals). However, the EU has had a poor trade performance in other high-technology sectors most notably ICT. This contrast strongly with the performance of US and Japan and is a source of major concern, especially because many developing countries have started to invest heavily in R&D and education in order to move up the value chain.

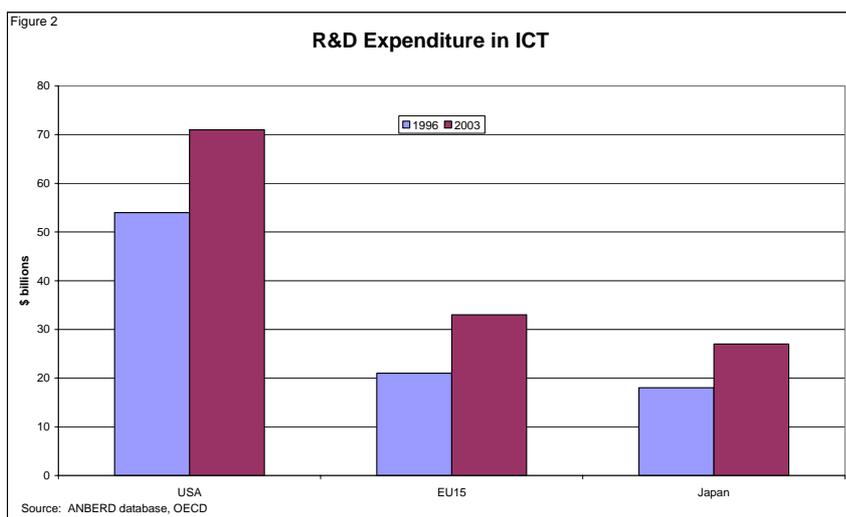
On the positive side, in the same period of time the EU managed to show a surplus on its trade in services, in particular, in financial and computer related services which are most often associated with the off-shoring phenomenon. This suggests that the service off-shoring outside the EU is not significant but could possibly reflect greater 'off-shoring' within the EU.

Despite these relatively reassuring trends, the concern on the EU's poor performance in ICT remain strong and requires a renewed effort in terms of investments in R&D and innovation.

⁸ *i2010 First Annual Report on the Information Society COM(2006)215 and Global Trade Integration and Outsourcing: How Well is the EU Coping with the New Challenges?*, European Commission Economic Papers (October 2006)

ICT related R&D: US expenditure more than twice that of EU

The EU has a target of 3% of its GDP dedicated to R&D, 2% of which should come from the private sector. Recent data show that the EU is still far from the target, with a share of GDP spent in R&D more or less stable at around 1.9%. The 2006 Annual Progress Report on Lisbon underlines that all Member States have set a national R&D investment target and that if all of these targets are met, the EU will reach an R&D level of 2.6% of GDP in 2010. This would be a significant improvement, even if the key EU target of 3% is only reached later. In addition, research and development activities in the area of ICT emerge as new priorities in a number of Member States.



R&D investments worldwide are highly concentrated in three sectors⁹: Automobiles & Parts; IT Hardware (including telecom equipment); and Pharmaceutical & Biotechnologies. Each of these sectors has around 18% of global R&D investments. ICT industries account for a large share of the aggregate spending in total business R&D. This share was about 26% in 2003, while in the US this share was about 35%.¹⁰

In the ranking of the world top-50 companies by R&D investment, there are 18 EU companies, the same as the USA. European R&D spending in pharmaceuticals, automobile and chemical industries is higher than that of the US and Japan. In contrast, Europe lags considerably behind in ICT. In 2003, US R&D expenditures in ICT R&D were more than twice those of the EU (see figure 2).

OECD data show that a striking feature of the composition of R&D has been a shift away from computer hardware towards "computer and related activities" (which includes "software and IT-services").

Among the "IT hardware" companies listed in the top 50 by overall R&D investment (all sectors), the EU specialises in telecommunication equipment manufacturers and the US in semiconductors, computer hardware and telecommunications equipment, while Japan is exclusively represented by computer hardware companies.

⁹ 2006 EU Industrial R&D Investment Scoreboard, European Commission(2006) (http://iri.jrc.es/research/scoreboard_2006.htm)

¹⁰ Commission Services estimate based on OECD/Eurostat survey of R&D expenditure 2003

The increase in R&D expenditure corresponding to "computer and related activities" has been particularly sharp in the US, where it tripled between 1996 and 2003. The increase was anyway significant also in the EU, where, in the same period, R&D expenditure in this ICT segment more than doubled (Figure 3). However, the volume of R&D in this category in absolute terms is still relatively low in the EU compared to the US.

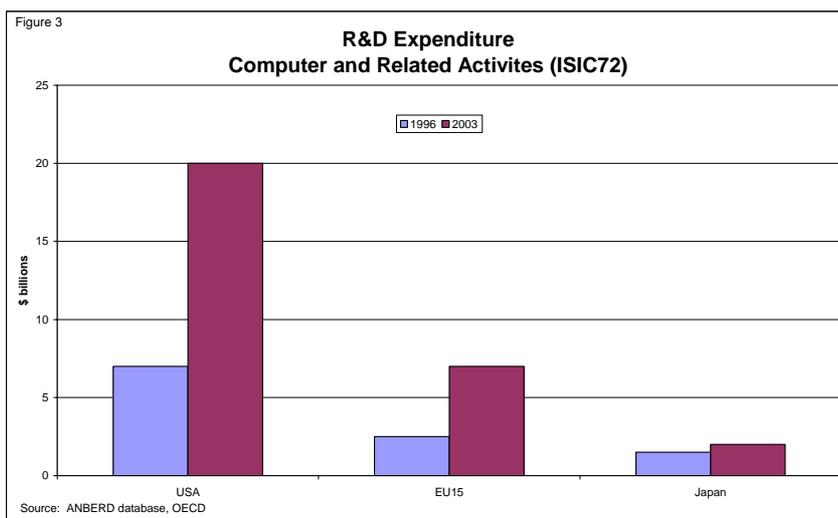
There are no EU companies among the top-50 classified as "Software and IT-services", and the investment by the leading company (US) in this segment is more than five times higher than that of the European leader which ranks outside the top-50 the list.

R&D investment is a crucial factor also in the primary software sector, as a very clear source of competitive advantage. There is a close correlation between research intensity and sales in the software sector. In other words, competitive advantage in the software sector requires increased R&D expenditure (see figure 4).

But the EU may be better placed in secondary software

"Software and IT-services" is one of the sectors with the highest average R&D growth rate over the last year¹¹. There is evidence that more research in software is done in the secondary software market, than in the primary software market (Figure 5).

On a worldwide basis, the secondary software sector, including automation, medical equipment, automotive, aerospace, consumer electronics and telecom equipment, spent €8 billion on R&D in software¹². This includes R&D in software developed internally, subcontracted or bought. R&D expenditure on software in the primary software sector was at the same time €39 billion. The EU has a strong position in the six industrial sectors mentioned above. Therefore the relative R&D position of the EU in the secondary software market is likely to be better than in the primary and this mitigates the overall conclusion of weak R&D investment in the EU.

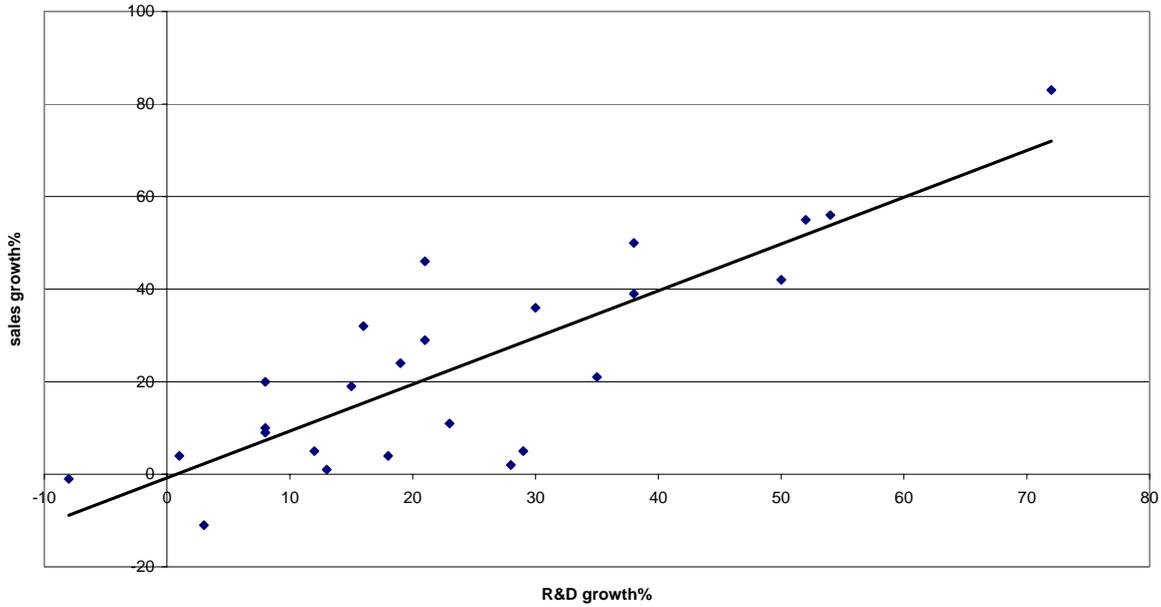


¹¹ 2006 EU Industrial R&D Investment Scoreboard, European Commission (2006) (http://iri.jrc.es/research/scoreboard_2006.htm)

¹² Software intensive systems in the future, IDATE News 366, 18 January 2006

Figure 4

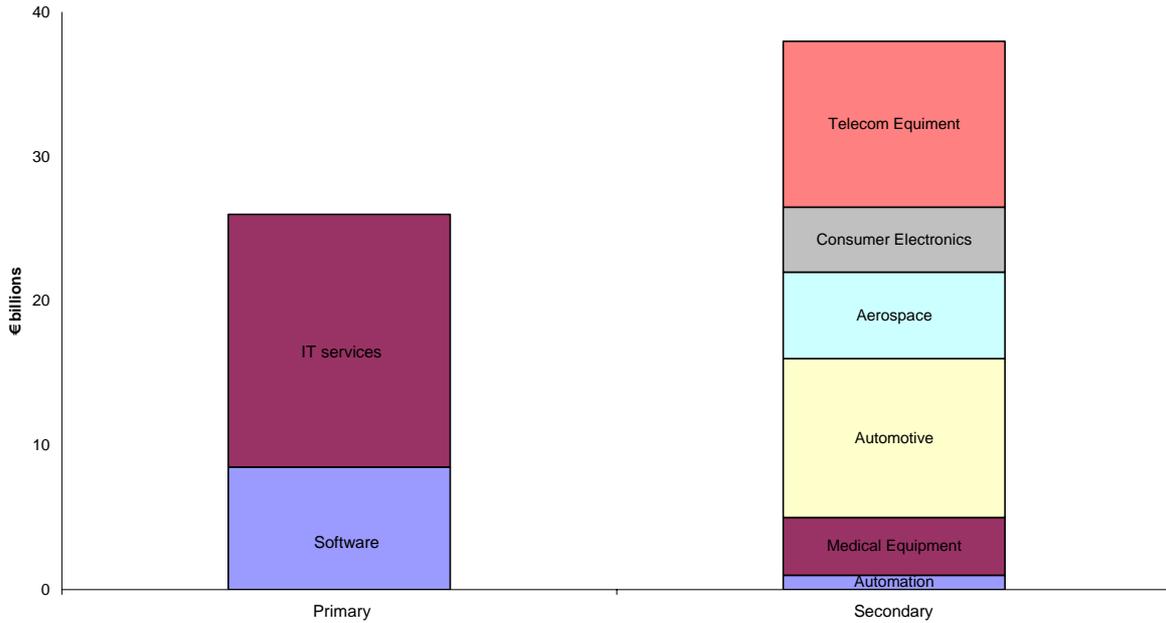
Software: Sales v. R & D
(top 25 software companies worldwide)



Source: DTI Scoreboard 2006 (note: three of the top 25 have sales growth over 140% and have been excluded)

Figure 5

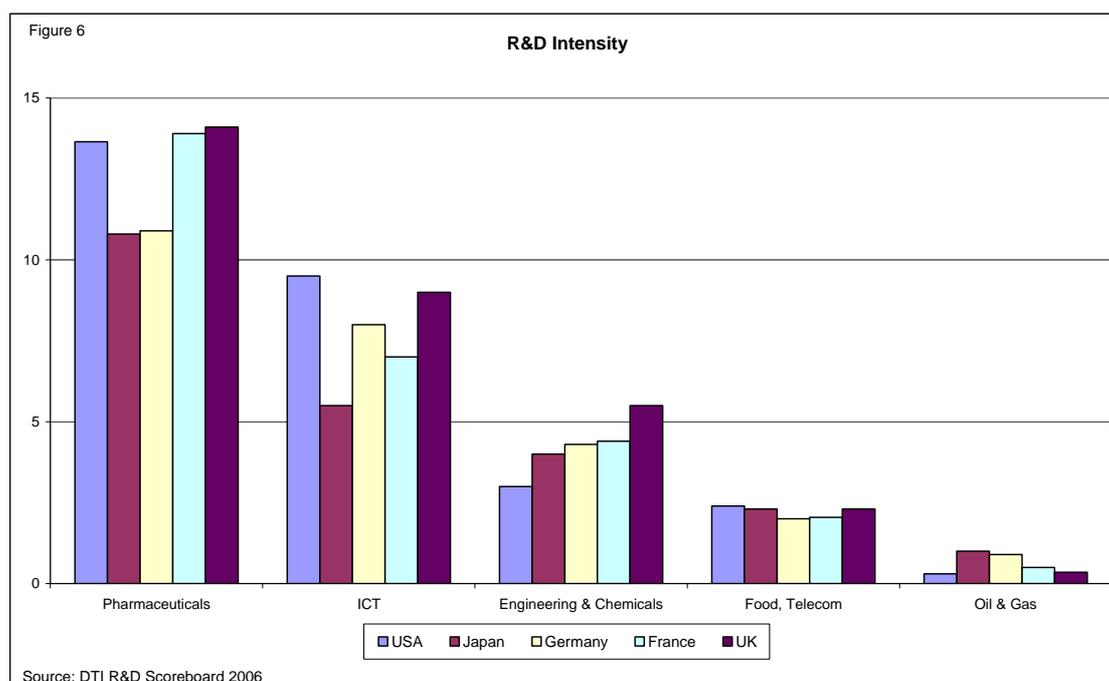
R&D in Software
(expenditure in primary v. secondary markets, 2002)



Source: IDATE

A more fragmented market with smaller companies in less R&D-intensive sectors

The research expenditure gap between the EU and the US is not due to a lower R&D intensity (R&D expenditure as a proportion of sales) among EU companies. To illustrate this point, figure 6 shows the R&D intensity for the top R&D investing companies in the US, Japan, UK, France, and Germany in five sectors: 1) Pharmaceuticals, 2) ICT, 3) Engineering and Chemicals, 4) Food, Telecom, 5) Oil Gas. This shows that R&D intensities of European companies are roughly equal to those of US including in the ICT sector.



The explanation for the research gap, particularly in ICT R&D, is the smaller size of the sector and its structural composition, in particular, the greater proportion of smaller enterprises in the European business landscape.

The main European weakness is the small number of 'middle-sized' companies¹³. Out of the top 1250 worldwide companies that perform R&D, 27% are middle-sized. In this category, 43% of the firms are from the US and, of those, 63% belong to the most R&D-intensive sectors, pharmaceuticals, software, and technology hardware. Some of them grow rapidly into companies with big turnovers and thus have the potential to be among the most R&D intensive companies. In comparison, only around 10% of middle-sized companies in the three most R&D-intensive sectors were European.

The European ICT market is structurally different from the US with a greater number of smaller companies in more fragmented markets, especially in software, and fewer companies in very R&D-intensive sectors. This structural difference leads to lower R&D investment compared to the US and ICT R&D in the EU not being focused on the most dynamic segments. Thus, the main European weakness is a smaller and more fragmented IT market and not lack of competitiveness of EU companies which are as research intensive as their US counterparts.

Internationalisation of R&D

One of the most dynamic elements of the process of globalisation in the last decade is the internationalisation of R&D. Recent surveys organised by member countries and co-ordinated by the OECD and Eurostat show that industrial R&D is becoming increasingly

¹³ Data in this paragraph are taken from the DTI R&D Scoreboard 2006, (http://www.innovation.gov.uk/rd_scoreboard/downloads/2006_rd_scoreboard_analysis.pdf). This defines middle-sized companies as those with turnover between €74 million and €740million. The figures on the EU comparison are taken from *Recent Trends in the Internationalisation of R&D in the Enterprise Sector*, Thomas Hatzichronoglou OECD, Paper presented to IST conference, Helsinki 2006.

internationalised and that over the last ten years it has become the most dynamic activity of multinationals companies. According to the OECD, R&D performed abroad by OECD companies amounted to over 16% of total business sector R&D in 2001. This represents almost a 40% increase compared to 1993¹⁴.

According to this analysis, since the mid-80's the demand-side focus of R&D internationalisation has increasingly given way to supply-side motivations for multinationals to establish foreign R&D affiliates. The relative attractiveness of countries as locations for R&D facilities has also shifted from countries offering strategic market access to countries offering advanced knowledge systems, high quality R&D personnel, excellent universities and good collaboration between academia and the private sector.

In the short-run, this shift has favoured the US, which from the mid-90's has been able to attract a large amount of the new wave of internationalised R&D, at the expenses of EU countries which remain attractive more for production reasons and therefore for the demand-side driven research internationalisation.

3. CONVERGENCE

In recent years, regulatory and policy actions have concentrated on setting up the right conditions for ensuring broadband coverage and growth in take-up. These have included monitoring the adoption and implementation of the regulatory framework and looking at the state of competition both at platform and at operator level.

There is still a significant gap in the take-up of broadband by different EU Member States and the overall EU broadband market is still far from reaching a saturation point. There remain some problems with regards to broadband coverage, especially in rural and isolated areas.

However, most Member States are on track both in terms of coverage and take-up to achieve the i2010 objective to create affordable and secure high bandwidth communications. Broadband take-up, along with the convergence of networks, content services and electronic devices, is progressively creating the critical mass of users and the technological environment necessary for the first generation of high-bandwidth content services to emerge. The emergence of these services is in turn further stimulating broadband take-up and the wider adoption of ICT. However, a number of technological, economic and legal challenges must be addressed for online content services to achieve their full potential for growth and innovation. In particular, available bandwidth in Europe is adequate for content services such as music downloads but insufficient for higher bandwidth services, such as online movies, television or games. These new content services require wider broadband penetration and increased download and upload capacity.

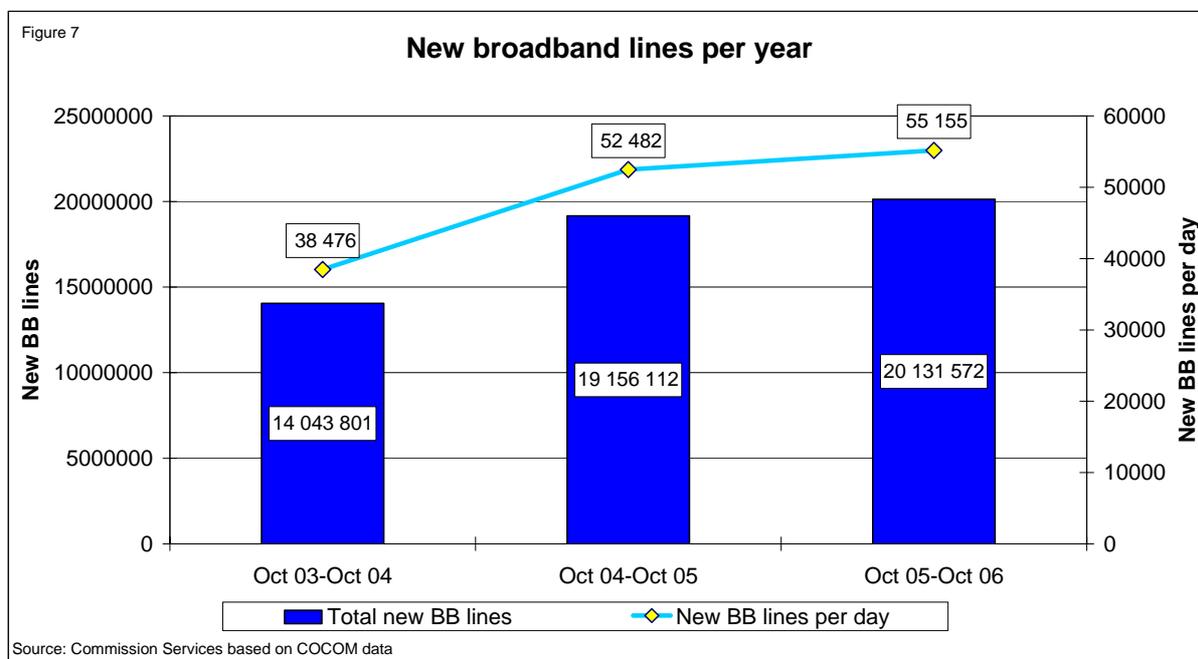
The terms of debate are shifting from market size and availability of broadband over legacy networks to the migration to next generation networks, online availability of high-quality content, user-created content and interoperability.

¹⁴ *Globalisation: Trends, Issues and Macro Implications for the EU*, European Commission Economic Papers (September 2006)

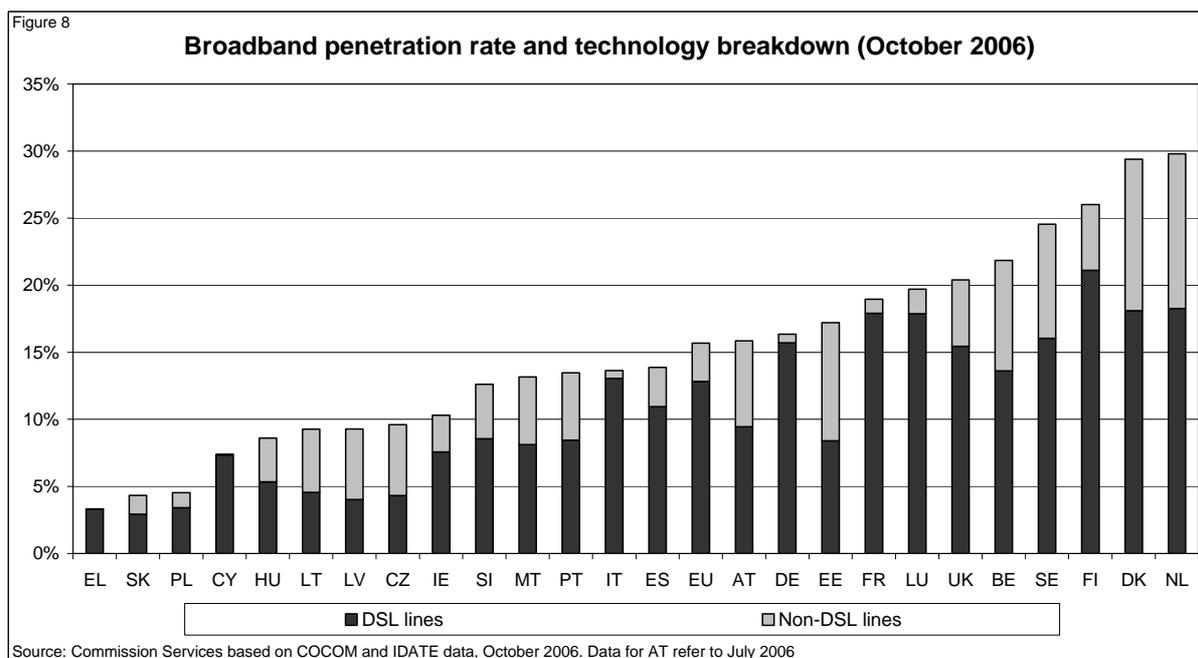
3.1. Broadband

Broadband lines growth still on the rise

In 2006 there was a record in the number of new broadband connections. 20.1 million new lines in the year to October 2006 as against 19.2 million and 12.5 million in 2005 and 2004 respectively (figure 7).

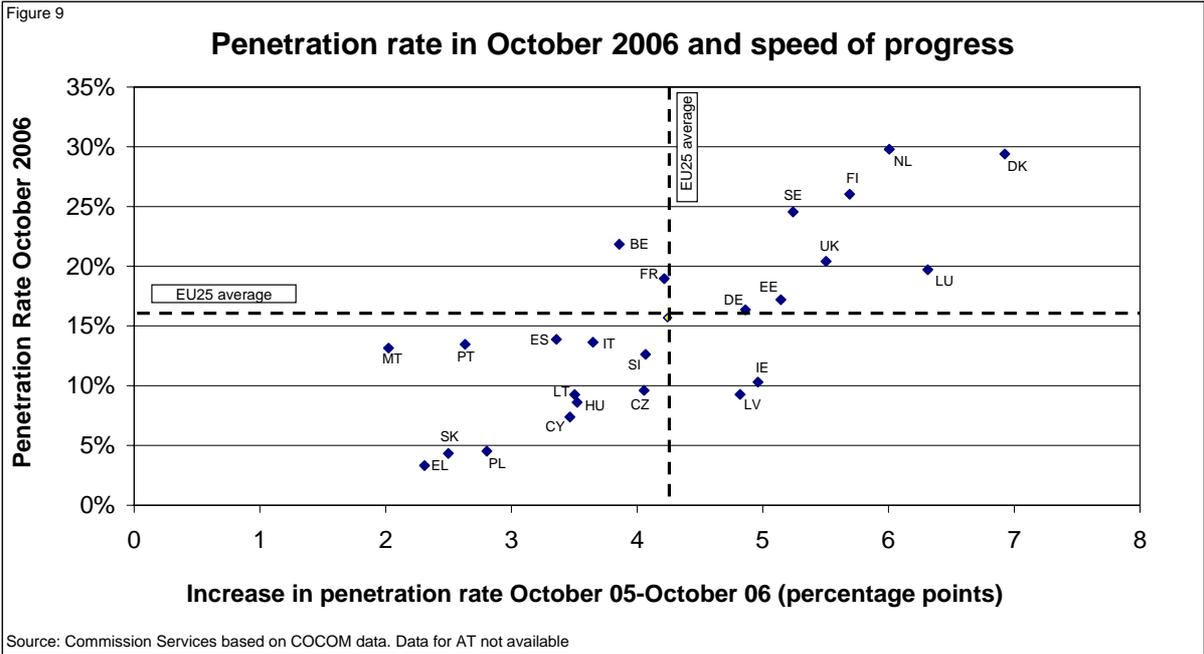


With 72.7 million lines as of 1 October 2006, broadband reached 15.7% of the EU25 population. Take up of broadband is still very uneven among Member States, with the penetration rate in the most advanced countries approaching 30%, while it is below 10% in 8 countries. In the other countries the penetration rate varies between 11% and 20% (figure 8).



It is significant that countries with the highest penetration levels show again the highest increases, and the gap between countries has slightly widened (figure 9). But prospects for

growth of broadband lines still seem promising in many Member States. In parallel to an increase in broadband coverage and download speeds, telecom operators' move to offer bundled services like triple-play services, including fixed-mobile convergence, and related flat-tariff packages make it increasingly interesting for consumers to sign up for broadband connections. The potential for broadband growth not only refers to the relatively high number of households currently connected to the Internet via a narrowband connection that could eventually shift to a broadband connection (around 40% of all EU25 Internet connected households). It also refers to the significant number of non-connected households that so far did not see a real incentive in subscribing to a broadband offer. It can therefore be expected that as the growth potential in countries such as Denmark and the Netherlands slows down¹⁵, other countries will continue sustaining the current growth rate.



At the international level, and according to the latest OECD data¹⁶, both Denmark and the Netherlands feature the highest broadband penetration levels, along with Iceland, and appear to have overcome traditional leading countries like Korea. Six EU Member States have a higher penetration level than the United States and Japan, while the EU countries immediately behind the US and Japan have had much higher growth rates.

When making international comparisons, quality of service is an important variable. Japan leads in terms of fibre-to-the-home (FTTH) with 6.3 million fibre broadband subscribers in June 2006. In this country there are more subscribers to fibre than to other access modes. In Korea, the total number of ADSL connections continues to decline as more users upgrade to fibre. In the USA, investment in fibre is continuing, while China is reputed to have at least 5 million FTTH connections. In Europe, investment in fibre has been more limited (less than 1 million lines in October 2006 and 87% of these are in Sweden, Italy and the Netherlands), and around two thirds of this investment has been supported by public authorities.

¹⁵ Penetration rate is measured as the number of lines per 100 inhabitants. A 30% penetration rate in DK and NL would indicate that around 60% of households are equipped with a broadband connection, approaching the 80% Internet penetration.

¹⁶ OECD data refer to June 2006 and are available at http://www.oecd.org/document/9/0,2340,en_2649_34223_37529673_1_1_1_1.00.html

While broadband coverage has increased in the latest years, further efforts are still needed in some regions, especially in rural areas, where consumers cannot yet benefit from a broadband connection due to demographics, geographical and technical factors. Further information on this issue is summarised in Section 5.

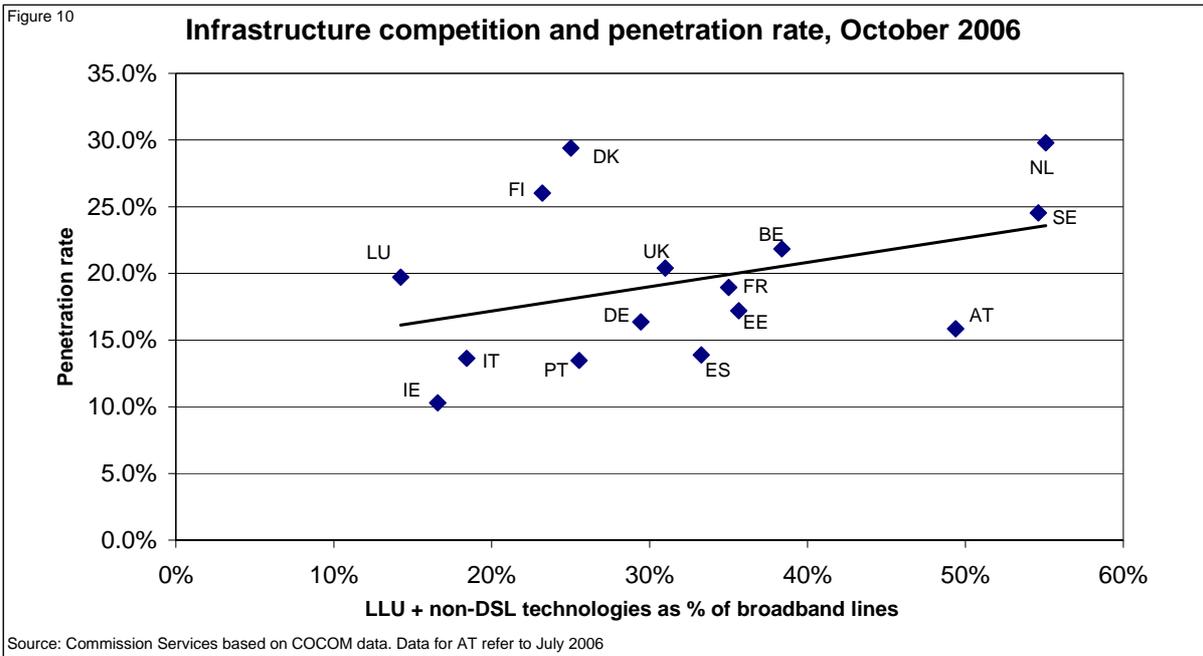
Competition: The effective role of regulation

While many factors contribute to broadband take-up, effective competition has played a key role in driving up penetration rates. Recent developments in terms of unbundling have brought about new perspectives for competition developments. Until recently, the best performing countries in broadband take-up have traditionally been characterised by competition between alternative platforms (mostly DSL v. cable), which allows consumers to choose between different modes of access. However, competition from alternative platforms is limited in Europe where DSL now represents more than 80% of broadband lines.

As the broadband market strongly relies on the network of incumbent operators, increased access to these networks has been crucial to the development of competition in countries that largely rely on DSL. Since 2004, sector regulation has brought about significant shifts in the DSL market. Over the past few years, the incumbents' market share has declined in the fixed broadband market (59% in 2003 – 48% in 2006). It is not a coincidence that these shifts are more evident in countries where the unbundling of the local loop has progressed significantly.

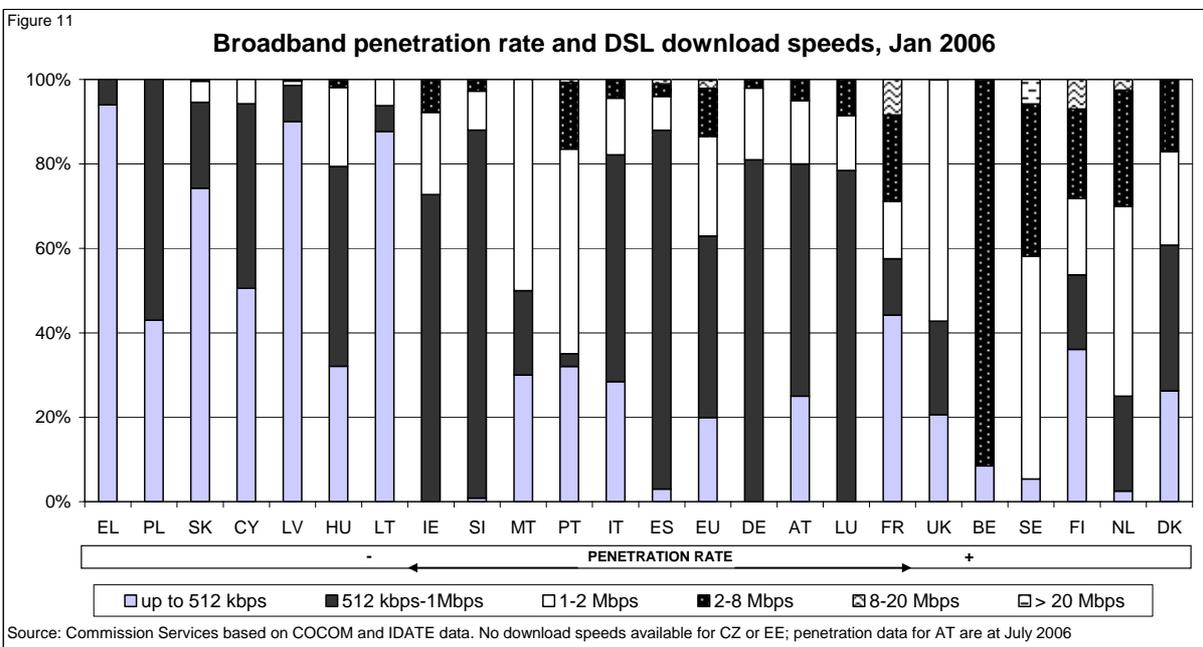
In the DSL market, new entrant market share has grown from 22% of broadband lines in 2003 to 43% in 2006. The number of unbundled loops in particular has increased from 27% to 46% of new entrants' DSL lines in the same period. Unbundling of the local loop allows alternative operators to provide single billing to their customers, provides the basis for the development of triple-play strategies (which bundle voice, data and video) and let operators modify the characteristics of the service in a competitive way.

This development is particularly clear in countries like France and Sweden, where DSL is the main broadband platform and effective regulation has led to a decline in tariffs and an increase in unbundled loops (an increase of more than 50 times in France and 30 in Sweden since 2003). In The Netherlands, fast growing penetration rates have been driven by a combination of effective competition in the DSL market (where all entry takes place exclusively through local loop unbundling) and between alternative platforms (cable networks). Infrastructure competition, including both LLU and alternative technologies, remains one of the main drivers of broadband take-up in the best performing countries (figure 10).



In figure 10, Finland and Denmark are outliers. Although LLU has progressed, in Denmark the incumbent still owns a significant share of cable networks, and in Finland the incumbent market share is still relatively high. Lower competition in the DSL market has consequences for the connection speeds available in these two countries, as shown in figure 11. Although they have very high levels of broadband penetration, the proportion of users with download speeds above 1Mbps is far lower than other leading markets.

Growing broadband penetration boosts download speeds and take-up of online services.



Data from user surveys point to a positive correlation between availability of broadband at home and use of online activities. 80% of individuals with a broadband connection use the Internet regularly, while only 63% with a dial up connection do it.

Countries with the highest broadband penetration rates benefit from faster download speeds (figure 11), and make a more intense use of high bandwidth demanding services, such as online gaming, music downloads or web TV. Moreover, there is a positive correlation between Internet skills and broadband penetration (table 3).

Within the group of most advanced countries, there are significant differences in the distribution of download speeds (Figure 11), influenced amongst other factors by the degree of competition. Within the group of countries with a penetration rate just above or below the EU average, download speeds between 512kb and 1 Mb/s seem to be the norm, and the number of regular users ranges from 30 to 60%. In this group, the use of applications that do not require high speeds, such as e-mail, is marginally lower than in most advanced countries, and there are significant differences with regards to the use of online gaming or web and radio TV, where broadband connectivity is needed.

Table 3		Broadband: penetration and use (in % of population aged 16-74)					
	BB Penetration	Regular. Int. Use	E-MAIL	GAMES/MUSIC	WEB RADIO/TV	TELEPHONY	INTERNET SKILLS ¹⁷
NL	30	76	76	42	28	10	29
DK	29	78	74	26	27	13	33
FI	26	71	67	33	20	14	28
SE	25	80	74	34	28	9	26
BE	22	58	54	20	11	8	19
UK	20	57	53	24	15	7	18
LU	20	65	65	26	22	16	31
FR	19	39	34	9	10	5	
EE	17	56	49	28	17	14	24
DE	16	59	60	18	12	10	25
AT	16	55	52	15	7	7	20
EU	16	47	44	18	12	7	20
ES	14	39	37	23		6	20
IT	14	31	29	11	5	3	16
PT	13	31	29	16	11	6	13
MT	13	36	31	17	10	4	15
SI	13	47	42	21	15	4	19
IE	10	44	45	11	9	6	7
CZ	10	36	37	12	6	9	14
LV	9	46	41	24	17	14	17
LT	9	38	32	24	17	11	16
HU	9	42	37	22	12	8	19
CY	7	29	25	17	9	5	11
PL	5	34	27	16	10	8	17
SK	4	43	42	18	8	7	19
EL	3	23	17	11	5	2	9

Notes
Regular internet use defined as at least once per week. Broadband penetration is % of total population
Sources:
Broadband Penetration: COCOM (2006)
Other indicators: Eurostat, Community Survey on ICT use in households and by Individuals, 2006

¹⁷ Individuals are counted as skilled if they have carried out at least 3 different Internet related activities in the past 3 months.

3.2. Content Markets

As a result of convergence between broadband networks, content services and electronic devices, it is now possible to broadcast, stream or download digital content through different networks on both fixed and mobile platforms. This is creating new delivery channels for traditional content like television, radio programmes, films, games or music. At the same time, convergence is opening the path to the development of groundbreaking content services, such as online gaming or interactive TV, meeting consumers' willingness to personalise content and to interact with it.

A major trend resulting from convergence is the development of new applications building on the capacity of ICT to involve users in the content creation and distribution process. Social computing applications such as blogs, podcasts, wiki, or video sharing, enable users to easily create and share text, videos or pictures. The rise of user-created content has taken major proportions, in the last years, and freely available user-created content is now competing with content produced by established providers, both in term of audience and share of advertising revenues.

Technological changes and convergence are also bringing about industrial change and leading to a growing interdependency between the content and ICT sectors. While innovation and uptake in the field of ICT offer promising opportunities for distribution and creation of content, the wide availability of digital content is driving adoption and usage of ICT and stimulating further technological development.

European users' eagerness to access a greater variety of content is accelerating broadband uptake and the updating of mobile handsets or replacement of video and music players. The boom in sales of electronic devices exclusively purchased to access digital content, such as personal digital audio players, clearly illustrates this trend. (Table 4)

Table 4					
Personal Digital Audio(MP3) Players					
Units Sold (000's)	2003	2004	2005	2006	2007 ^f
France	250	1,550	4,860	6,125	6,300
Germany	870	3,160	8383	7,113	7,003
Italy	59	433	2,535	3,750	4,000
Spain	82	1,041	3,077	3,844	4,538
UK	288	1,750	7,372	10,530	11,553
Total Western Europe	1,828	9,837	30,739	36,051	37,036
Source: EITO 2007					

By bringing down technical, financial and geographical barriers to the distribution of content, ICT also offer opportunities for the European content sector to reach new audiences, develop niche markets, or distribute its great variety of content on a global scale. While the digital exploitation of content is still emerging in Europe, it should constitute a growing share of the

¹⁸ Western Europe here includes: Austria, Belgium, France, Germany, Italy, Netherlands, Spain, Sweden, Switzerland and UK.

content sector revenues in the coming years. Music and video games sectors - the most advanced sectors in online content services deployment - will represent respectively 20% and 33% of the total revenue by 2010¹⁹.

The rise of user-created content is opening further perspectives for a more creative and innovative Information Society. In the same way that users exploited open source software to develop new collaborative processes, they are now using ICT to create and exchange their own content in innovative ways. In a knowledge-based economy, where creativity is an important source of competitiveness, the rise of user-created content holds great promise as a driver of ICT adoption and use and new creative skills.

Europe has witnessed an impressive array of online content developments over the last two years. If the market for online content is still emerging, it is one of the most dynamic, innovative and fastest growing parts of the content sector. Market research demonstrates that the outlook is bright, with revenues reaching €8.3 billion by 2010 in Europe, a growth of over 400% in five years. However, as for the move in the online environment, the music, movies, games, TV, publishing and radio sectors are evolving at very different pace, some being more advanced and promising than others in the mid term. (Table 5)

Digital Content				
Market Value and Penetration				
	2005		2010	
	Revenue (€bn)	% of sector	Revenue (€bn)	% of sector
Music (online and mobile)	196.3	2.0	1,794	20.4
Movies (VOD)	30	0	1,269	7
Games (online, mobile)	699	11.2	2,302	33.4
TV programmes (VOD and digital advertising)	4.5	na	689	na
Publishing	849	2	2,001	5.4
Radio	15	0.3	250	4.8
Total	1,793		8,303	

Source: *Interactive content and convergence; implications for the Information Society*, Commission Services (2006)

Music: The music sector is one of the most advanced content sectors, leading the way for the development of new usages and business models. After having been hit severely by digital piracy, the music sector has managed to establish a legitimate online market for its products and services, mainly through sales of music track downloads. In 2005, there were nearly 200 online music services in Europe²⁰. Online music market revenues are expected to grow by a factor of ten over the next five years.

The European market for music on mobile phones (full track download and ring back tones) is also developing fast, reaching €76.3 million in 2005. Mobile music market revenues are

¹⁹ *Interactive content and convergence; implications for the Information Society*, Commission Services (2006)

²⁰ *Digital Music Report*, International Federation of Phonographic Industry, 2005.

expected to grow and by 2010 online and mobile music revenues are expected to reach 20% of total European music revenues.

Film: As stated in the 2005 Cannes Declaration²¹ ; "[the] *advent of film online offers immense opportunities for the film industry both with regard to access to new audiences and with regard to wider circulation of European films, including on international markets.*" Still the online distribution of film is only a nascent market in Europe and represents a negligible share of the film industry revenue. Most of the market is represented by on-demand film distributed from set-top box based walled-garden services. Online distribution of film is only starting. However, online distribution revenues for films are expected to take off and, by the end of 2010, the film online segment will account for 7% of the film revenues in Europe. The mobile phone distribution of film is not expected to become significant before 2010, due to the characteristics of film in itself and bandwidth requirements.

Video Games: Born in the digital era, video games are one of the most advanced markets in terms of online distribution and exploitation. Video games are already available for online distribution on a great variety of platforms such as PC, video games consoles, mobile phones or interactive TV systems. The video game industry is also developing innovative content and business models, making the most of ICT and convergence, such as online gaming or game streaming.

The total value of the European online distribution and exploitation of video game content is already significant (representing 11% of the video game retail market). By 2010, online distribution and exploitation of video games on both mobile and fixed platforms is expected reach 33% of total European video games revenues.

Television, the most popular medium, has also started its move into the online environment, with the rise of IPTV, and the distribution of television programme over the Internet. IPTV constitutes a new delivery platform, using Internet protocol and broadband to deliver television programmes in a 'walled garden' environment. It is increasingly used by telecom operators to deliver TV over their DSL networks and develop their triple play offers. IPTV is forecast to rise from 700,000 subscribers in 2006 to nearly 9 million by 2009²².

Broadcasters and pay-TV operators are also starting to distribute their content over the open Internet. This segment is likely to become an ever-significant aspect of the total European TV market.

Radio online is already reaching 15 million weekly listeners in Europe and is expected to more than double by 2010 to reach 32 million listeners. Digital radio broadcasting on mobile is likely to be the fastest growing radio segment, with 21.7 million weekly users by 2010. Radio podcast services are also expected to grow rapidly from 200.000 weekly listeners in 2005 to 11 million in 2010. However, by 2010, advertising revenues from all forms of digital radio distribution should only account for approximately less than 5% of all radio advertising revenues.

²¹ Declaration of the European Ministers for Audiovisual Affairs and the Member of the Commission in charge of Information Society and Media attending the 2005 Europe Day at Cannes – 17 May 2005. See http://ec.europa.eu/comm/avpolicy/docs/other_actions/cannes_declaration_2005_en.pdf

²² EITO 2005

Publishing: In the publishing industry, European newspapers already draw 1 to 4 per cent of their advertising revenues from online advertising and this is growing rapidly exceeding 5% of the revenues of the sector in 2010, almost exclusively from online mobile advertising.

Next Challenges for Content

By some measures, Europe is second behind Japan and Korea for mobile content distribution and second behind the US for broadband distribution. Although the European online content market is set on a path to steady growth, technological, economic and legal challenges need to be overcome for Europe to realise faster market uptake.

Broadband take-up in Europe, which started significantly in 2003, has created a critical mass of users for a first generation of online content services to emerge. The positive trend in broadband take-up is expected to support further developments and growth in the online content sector. However, the differences of broadband take-up between EU Member States risk remaining high, leading to disparities in the online content services adoption. Furthermore, the rise of advanced online content - providing for an increased level of quality and/or interactivity - such as downloads of High Definition movies, or online gaming, will require improvement of broadband download and upload capacity.

The slow uptake of 3G in Europe, the mobile data and international roaming costs, as well as sometimes confusing pricing and data tariff structure, constitute major roadblocks to the development of online content services on mobile. As for the provision of mobile television services, on-demand video services are already available with 3G point-to-point technologies. However, this does not offer an economically viable solution to provide mobile television services on a large scale. Digital broadcasting allows for the provision of mobile television services, but requires proper spectrum allocation to develop. The fragmentation of industry standards for mobile platforms and Digital Rights Management (DRM) are further concerns in the mobile environment, where content like games or video needs to be reformatted to many different mobile phone platforms, generating additional costs and complexity.

Another major challenge is the need for many market players to adapt to new distribution technologies and business models, cutting across national borders and traditionally separate sectors. The emerging online content services compete with more established content distribution channels for consumer attention, but also for access to attractive and exclusive content. In this context, online content services providers are still facing difficulties in setting terms of trade with content owners, and accessing content due to existing exclusive distribution deals or conflicting rights. The complexity in the clearance of underlying rights for online exploitation, due to the lack of European wide licenses mechanisms or the difficulties in identifying and locating right holders also affect the deployment of content services on a national or Pan-European basis. While innovative and collaborative solutions to exploit and license content online are progressively being found, this remains a major obstacle slowing down the roll out of online content services. In this respect the main challenge is to find ways to maximise the circulation and exploitation of digital content rights in Europe.

Securing access and distribution of content in the digital environment also remains a major challenge, since online piracy still siphons off potential revenue and deters media companies from putting their content online. Efficient DRM systems to manage and protect digital content may offer an alternative for a secure and sustainable roll-out of digital distribution. However, concerns over consumer acceptance of DRM, the lack of interoperability,

standardisation or licensing in DRM systems, may hinder digital content services and devices in the mid term, and lead to the development of alternatives solutions.

Many other challenges affecting the roll-out of online content services remain to be addressed in the coming years, such as the consumer acceptance of new distribution and business models, the lack or cost of adapted payment or billing systems, or the skill shortage in some media companies to develop and manage online content services. In addition, the rise of user-created content is raising a whole range of new challenges, notably with regard to legal liability for content distribution, the re-use of copyright protected material, or the protection of privacy.

4. THE IMPACT OF ICT ON NON-ICT SECTORS

Consumers are currently driving convergence. The recent upsurge in the software market indicates that businesses are also adopting new and more mature eBusiness solutions, which will make them ready to benefit from convergence. However, the take up of ICT by the business sector remains limited, in particular to large companies. After a decade of sustained investment in ICT, the public sector is consolidating the efficiency gains and has improved service delivery through the availability of on line services. Efforts are being made to spread these trends throughout the public sector.

4.1. eBusiness in enterprises

ICT tend to have a positive impact on productivity through different channels²³. In the short term, rapid technological progress in the production of ICT goods by the ICT sector leads to reductions in the relative prices of ICT products and encourages businesses and the economy at large to invest in ICT. This short-term impact on productivity can be measured (the so-called “ICT-related productivity growth”) from macroeconomic statistics. Empirical evidence based on growth accounting models shows that ICT drove a 0.5% annual productivity growth in the EU, in the period 2000-2004. ICT contribution accounted for almost half of the overall productivity increase of 1.1% in the same period.

However, the impact of ICT in the longer term is even more profound, because it enables enterprises to introduce important organizational innovations and it tends to translate into leaner and more efficient business processes. IT systems and applications allow a better management of internal business processes through their integration, as well as improved and more efficient relations with customers and suppliers. In particular, eBusiness tends to automate processes along the whole value chain, with benefits for all the enterprises belonging to it.

The Commission has shed some light on the role of eBusiness in speeding up productivity growth through an *ad hoc* study²⁴ that combined data on economic performance and on

²³ For a complete coverage of this issue, see *i2010 First Annual Report on the Information Society*, COM(2006)215, 19.5.2006

²⁴ *An econometric analysis of the impact of the eBusiness readiness Indicators on Labour Productivity Growth* - European Commission (2006) Joint Research Centre (Econometrics Unit at IPSC): The analysis is made on data taken from the OECD STAN database and from the Eurostat survey on ICT use in enterprises. Countries covered are: AT, BE, CZ, DE, DK, ES, FI, IE, IT, LU, NL, PT, SE and UK.

eBusiness take-up²⁵, in different economic sectors, in some EU Member States. The analysis found a positive correlation between the use of ICT and productivity growth, meaning that, *ceteris paribus*, economic sectors with more eBusiness intensive users perform better than the others. This result points more directly to the positive role of ICT in the economy, through innovation in the organization and the management of processes. ICT take-up by enterprises allows a remodelling of business processes and this tends to positively affect productivity growth.

Additional evidence on the positive role of eBusiness in driving up the efficiency of business processes is provided by the 2006 edition of the *e-Business W@tch*²⁶. According to the survey, 44% of enterprises, representing 57% of the overall employment, said that they had experienced a positive effect of ICT on the efficiency of their business processes. The perceived positive impact of ICT is correlated with the enterprise size: 76% of large (250+ employees) gave a positive feedback compared to 38% of micro enterprises (less than 10 employees).

ICT does not only translate into leaner processes but it is also felt as an important factor for improving relations with client: 44% of businesses, comprising 52% of total employment reported an ICT led improvement in the quality of the customer service.

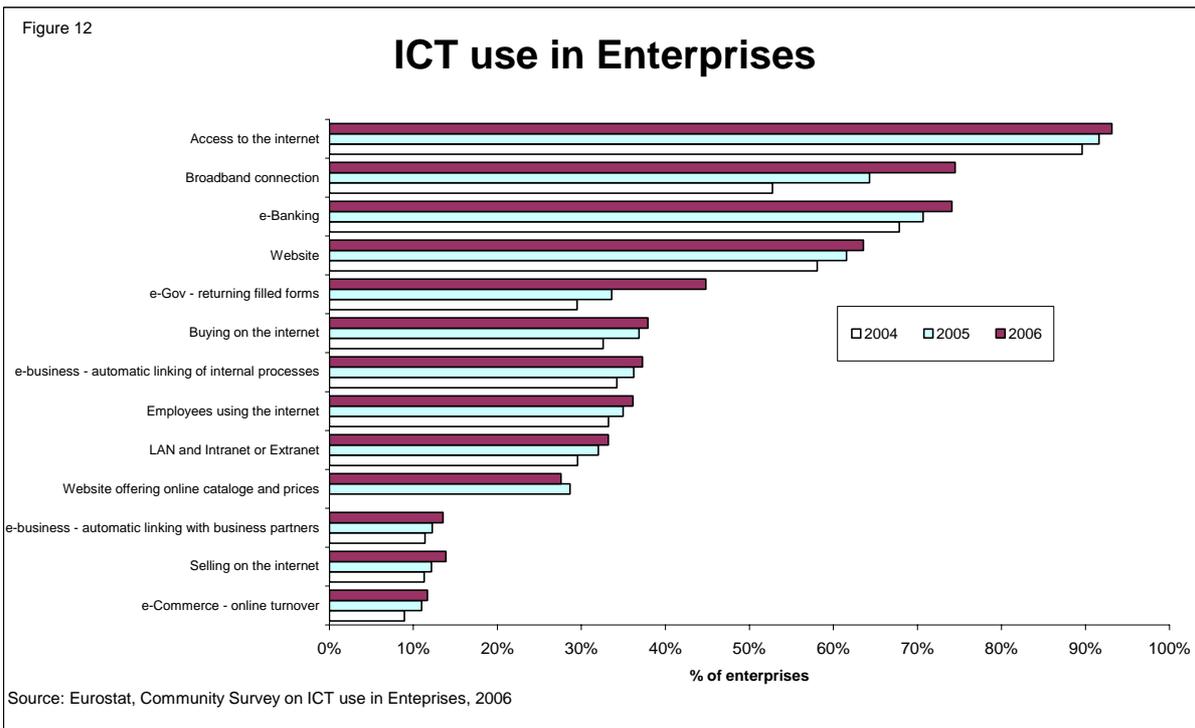
Main trends in ICT uptake by enterprises

Evidence from the Community enterprise survey on use of ICT shows a mixed picture on ICT uptake by businesses.

The main positive evidence is in the use of broadband connections (figure 12) that has strongly increased over the last 3 years and is now used by three quarters of EU enterprises. Steady improvements can be observed in the area of eGovernment with almost half of businesses returning filled forms electronically.

²⁵ eBusiness take-up is measured by a composite indicators, comprising the following list of variables: online sales and purchases, integration of internal business processes, automatic linking with business partners and e-banking.

²⁶ *2006 eBusiness Watch* – European Commission (2006) - <http://www.ebusiness-watch.org/resources/documents/BR06.pdf> - It focuses on: Food & beverages, Footwear, Pulp and paper, Consumer Electronics, Shipbuilding and repair, Construction, Tourism, Telecommunications and Hospital services. Countries covered are: CZ, DE, ES, FR, IT, HU, NL, PL, FI, UK (they account for 85% of the EU GDP).



However, the impact of ICT in core business processes is less visible: 14% of EU businesses are selling on the Internet and a slightly lower percentage has established automatic links with their business partners, although a moderate positive trend can be observed for both indicators. 64% of EU businesses have a website but only a minority of them are using it for offering services to business partners such as providing an online catalogue and information on prices.²⁷

The slow take-up of ICT in remodelling processes and practices is confirmed by the fact that the migration from traditional to electronic forms of communication is quite limited: only 30% of EU enterprises have replaced postal mail with messages sent over electronic channels (e-mail, Internet or extranet) for the exchange of documents with business partners (figure 13). For the remaining 70% the substitution process is partial or it has not yet started. There are several reasons behind this limited take-up ranging from cultural factors and a resistance to change in some organizations, to concerns for the integrity and the confidentiality of the messages and concerns for the legal validity of electronic documents.²⁸

Furthermore, although e-commerce has been discussed as a major instrument in companies' effort to expand their markets, especially for the smaller among them, the 2006 *e-Business W@tch* results confirm a trend that was already identified in 2005: for the majority of firms which reported some electronic trading activity (i.e. either buying or selling online), the location of the main business partners with whom they trade electronically is within the same national or even regional borders — and only 10% said that they order electronically mainly from international suppliers, while less than a quarter said that they receive online orders

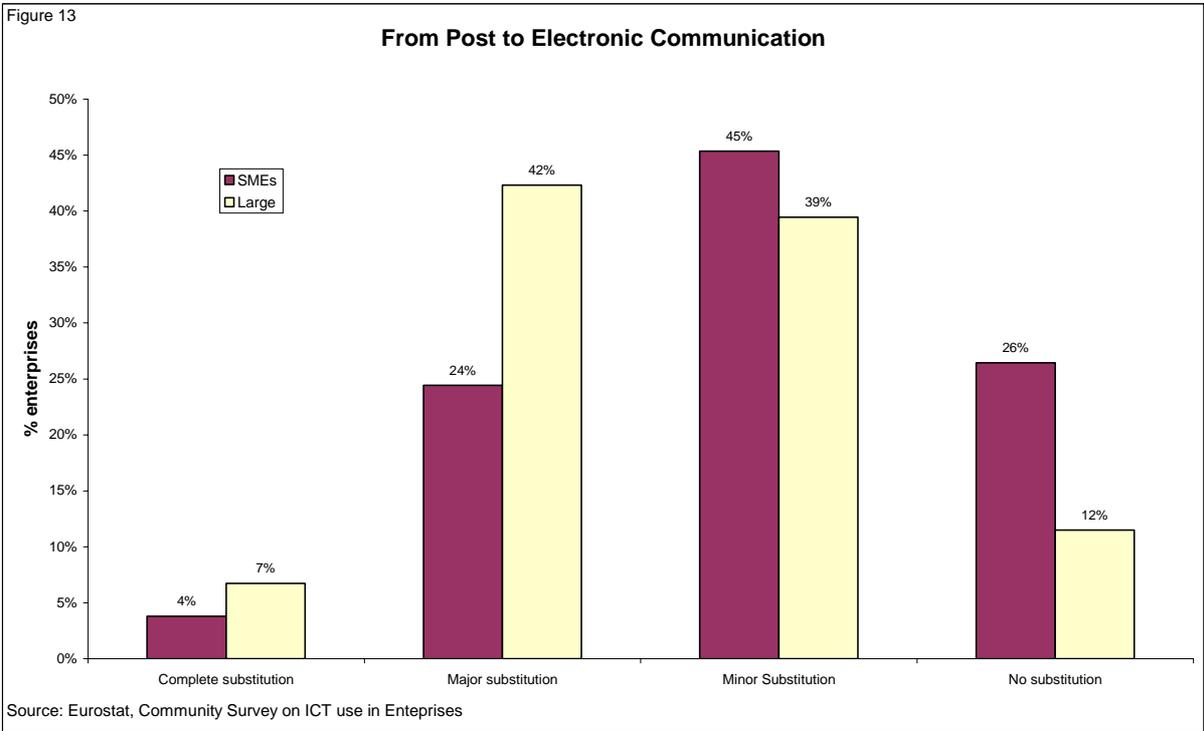
²⁷ The need to increase the level of uptake of ICT by business and especially SMEs was one of the recommendations of the ICT Task Force, a group composed of representatives of ICT industry, trade unions, SMEs chambers of commerce, consumers, investors and academia set up to make recommendations to foster the competitiveness of Europe's ICT industry.

²⁸ See *Legal and Administrative Practices Regarding the Validity and Mutual Recognition of Electronic Documents*, Commission Services 2006
<http://ec.europa.eu/enterprise/ict/policy/legal/2006-bm-cr/dumortier-final-report-draft.pdf>

mainly from international buyers. Interestingly, no major differences have been identified in this respect between different size classes, and even the substantial difference between those selling and those buying online should be mainly attributed to the significant international dimension of e-tourism.

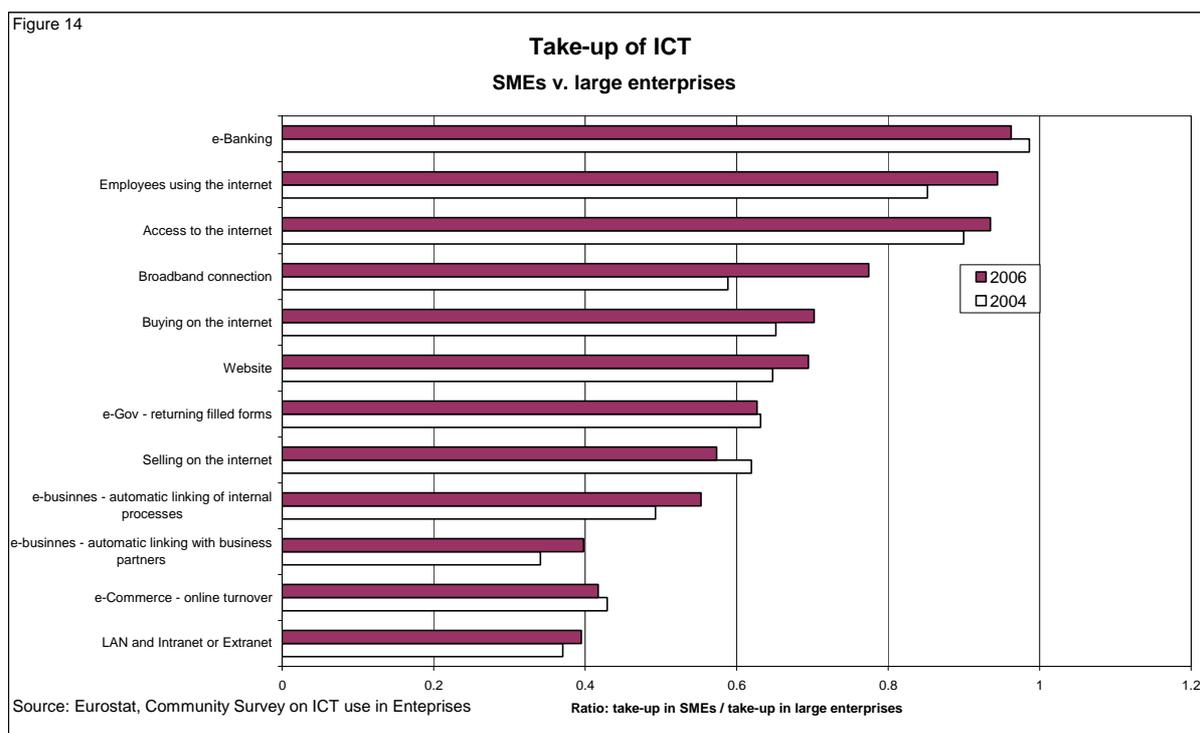
This apparent reluctance of companies for cross-border electronic trading in Europe could be attributed to a variety of reasons, ranging from cultural and societal (such as language or preference to doing business with already known and trusted partners) to uncertainties about the legal and regulatory environment (e.g. in terms of applicable taxation or complaint's resolution mechanisms), to worries about the involved logistics operations or the security of such transactions and the electronic systems that support them. Nevertheless, this is an issue which should be closely monitored and analysed if European companies are to reap the full potential of electronic commerce.

These obstacles tend to affect SMEs to a larger extent, and this translates into their lower take-up relative to large enterprises.



The gap between large enterprises and SMEs applies in general to all the indicators on ICT adoption in enterprises, the intensity being correlated with the complexity of the applications (figure 14). The difference in the level of ICT take-up between the two groups reduced between 2004 and 2006 mostly notably for broadband connectivity.

Figure 14



The apparent slow progress in the take up of eBusiness solutions indicated here needs to be qualified. The survey on ICT usage shows the number of companies adopting eBusiness solutions, but gives no indication on the volume of investment in ICT by businesses and on the size of the economy affected by ICT investment. Large companies are heavy ICT users and generate most of the value added of the economy. Therefore the impact of eBusiness in terms of efficiency goes well beyond what the low take-up rates in the survey might suggest. Moreover as mentioned in section 2, sales of eBusiness solutions are on the rise with software upgrades, maintenance and interfaces representing more than 3 times the initial investment in software and indicating a continuous move towards more integrated and more efficient systems. This trend is confirmed by the 2006 *e-Business W@tch*, which shows that 65% of enterprises (measured by employment share) made investment in ICT hardware, software or networks in 2005. In addition, companies representing 25% of the overall employment in the economy are planning to increase their budget in ICT²⁹, while only 8% are expecting to reduce it. The impact of eBusiness on the economy is therefore larger than suggested by data on the survey on ICT usage.

Obstacles to ICT uptake

The still limited diffusion of eBusiness in the European economy is due to a set of different obstacles that can be grouped into two main categories³⁰:

- structural factors relating to the general economic environment and including, *inter alia*, cultural resistance of EU businesses to innovation, low flexibility in the production environment and the labour market;
- ICT specific factors, ranging from lack of affordable eBusiness solutions suitable for SMEs, to ICT skills shortage and interoperability problems.

²⁹ Investments in ICT include hardware, software, services and personnel.

³⁰ ICT Task Force (http://ec.europa.eu/enterprise/ict/policy/doc/icttf_report.pdf)

Statistical evidence available from 2006 *e-Business W@tch*³¹ (Table 6), the Eurostat survey on ICT use in enterprises and other sources, gives some indications on ICT specific obstacles, by looking at company perceptions. In addition, detailed results by enterprise size, suggest the need of policies targeted to SMEs that are in general more sensitive to most of the existing preventing factors.

	Total	1-9	10-49	50-249	250+
Company too small	68	75	54	36	19
e-Business technologies too expensive	40	46	30	37	40
Technology too complicated	35	37	31	33	13
Compatibility problems with partners	26	31	19	34	20
Security issues	33	36	25	31	35
Legal challenges	21	25	17	23	24
Reliability of IT suppliers	22	22	24	30	19
Source: e-Business w@tch 2006					

Lack of awareness of the possible benefits appears to be one the most relevant issues. The majority of micro and small enterprises (up to 49 employees) not adopting eBusiness believe their size prevents them from having a good return on investment. This result supports the findings of the OECD study on eBusiness which found that the leading reason given by European SMEs for not engaging in eCommerce was that it did not suite the nature of their business³².

Another major impediment to eBusiness is the **cost of the necessary technologies**, a reason given by 40% of enterprises to the eBusiness Watch. This applies particularly to micro enterprises but is a general problem regardless of the company size. Businesses and in particular small ones tend to be cautious about implementing costly projects when there is a large margin of uncertainty on expected future returns.

Lack of skills also plays an important role though not for large enterprises. More than 30% of enterprises with less than 250 employees cited technological complexity as a reason for not implementing eBusiness in their organizations. This is not surprising, since only 12% of micro enterprises and 15% of small ones employ ICT specialists. Further, the 2006 survey on ICT use in Enterprises shows that 12% of enterprises needing to recruit personnel with ICT specialist or user skills had problems in doing so, due either to lack of skills on the labour market or to the high level of remuneration costs.

Enterprises refer also to **interoperability** as an obstacle to automatic linking with business partners. This is a problem encountered by 26% of enterprises not implementing eBusiness. In addition interoperability is considered an important issue for the implementation of eBusiness projects by 27% of all enterprises surveyed.

³¹ The assessment in the eBusiness watch confirms the comprehensive review of obstacles to eBusiness carried by the ICT Task Force.

³² OECD:: ICT, eBusiness and SMEs (2004) <http://www.oecd.org/dataoecd/32/28/34228733.pdf>

Data security is felt relevant by 36% of enterprises not implementing eBusiness. The automatic exchange of sensitive information poses concerns for enterprises and it could constitute an obstacle to eBusiness take-up.

Legal concerns do not appear to be a major obstacle but 20% of enterprises considered it a relevant factor. This finding is in line with the results of the public consultation³³ launched by the European Commission on the subject of legal barriers to eBusiness between September and November 2003. Most of the contributions were made by SMEs, in line with the fact that more than 90% of EU enterprises are SMEs. The majority of responses confirmed that enterprises do not perceive legal issues as a major barrier for conducting eBusiness. The most cited impediment was the lack of clarity of the existing regulation, while lack of cross country harmonization, absence of regulation, and lack of awareness of the existing regulation followed with equal weight. Insufficient knowledge of existing legislation on eBusiness should be regarded as a major problem, because it applies to roughly the half of respondents.

4.2. Online Public Services: Government, Health and Education

2006 saw a growing maturity of online public services: more services were put online, the level of sophistication increased and more Europeans dealt with the public sector online. The leading Member States were placed at or near the top of rank in international comparative studies of public services provision. The investment efforts made by governments are being rewarded with visible benefits in terms of efficiency or quality of service delivery. Public services at large are confronted with more complexities than government administrations when developing IT solutions, partly because they involve actors beyond the public sphere. However services like health and education are catching up quickly.

Investment

Online services are not a separate category in public accounts and it is difficult to measure levels of investment. The Commission³⁴ estimates total ICT expenditure by public administrations in the EU to be about €36.5 billion and eGovernment expenditure to have been €1.9 billion in 2004. Most eGovernment related expenditure is investment and this represents about 5% of public investment. The majority of ICT expenditure is in regional and local governments which together make up 55% the total.

Investment is boosting online availability of government services³⁵. Basic services in all Member States are now available online and there has been significant increase in the level of sophistication of service delivery. Nearly half of the 20 basic services in Member States offer full online transactions. The average level of sophistication and the proportion of services available at the fully transactional level grew by 10 percentage points in part as a consequence of the rapid progress made in the new Member States (by 16 and 14 percentage points respectively for the two indicators).

³³ The open consultation on legal barriers in eBusiness took place between 15 September and 17 November 2003. Replies were received from 671 enterprises across the European Union and the Acceding and Candidate Countries.

³⁴ *eGovernment Economics Project (EGEP) Measurement Framework* Commission Services 2006
http://217.59.60.50/eGEP/Static/Contents/final/D.1.3Expenditure_Study_final_version.pdf

³⁵ *Online Availability of Public Services: How is Europe Progressing?* Commission Services (June 2006)
http://europa.eu.int/information_society/eeurope/i2010/docs/benchmarking/online_availability_2006.pdf

Efforts by all levels of government are now beginning to show signs of achieving real change. This is demonstrated below in terms of take-up of services and the fact that some Member States are world leaders in the provision of online public services.

Investment in eHealth has recently taken off. Health was investigated in the e-Business W@tch survey of 2006 which surveyed 834 acute care hospitals in 18 countries. It found that hospitals were in general better equipped with basic ICT equipment than other sectors and that they were relatively strong in relation to eProcurement. However it identified their main weaknesses as being in relation to the introduction of ICT solutions directly with patients.

Health information is very sensitive and this makes exploitation and implementation of innovative solutions more difficult. It is further complicated by the need for new skills and reorganisation in healthcare, the significant involvement of public authorities, the fragmentation of the market, and concern surrounding a number of perceived legal issues pertaining to health like reimbursement, security and privacy issues.

Despite the difficulties, the potential returns on eHealth investment are large and offer a solution to the strain of health care budgets that is evident in many member states. It is estimated that by 2010 eHealth will account for 5% of the total Member States' health budgets. The Commission has launched studies to investigate eHealth developments in more and will report on these in future i2010 Annual Reports.

Take-up

The Eurostat enterprise survey found that 64% of enterprises now use the Internet to interact with public authorities. This underlines the important contribution that **online public services** make to business efficiency. Services that are available for full online transactions can reduce business costs and, in this way, eGovernment strategies make a direct contribution to the Lisbon agenda.

There is a growing consensus that eGovernment is a key factor for increasing competitiveness. Public services, more responsive and better fitted to user needs, provided electronically, are perceived as essential to reap the benefits of the information society and reach the two of the four priorities of the renewed Lisbon Strategy: unlocking the business potential, ageing population. Many Member States report in their 2006 Progress Reports on the reduction of administrative costs for the public administration as well as for businesses. Measures taken include Internet portals to reduce the costs of company registration; the introduction of electronic ID cards; unified ICT platforms for back-office reorganisation; and, the launch of portals for citizens. These developments will affect the administrative burden and make a substantial contribution to the Lisbon political commitments to reduce the administrative burden by 25% by 2012.

For EU25, the Eurostat household survey found that 35% of internet users (i.e. individuals who used the Internet within the last three months) used the internet to replace personal contacts or visits to public administrations and a further 37% would be interested in doing so. Only 28% of internet users stated they were not interested and the overwhelming majority are potential clients for online public services.

Turning to **education**, a European schools survey³⁶ in 2006 confirmed there has been a significant rise in the availability and use of ICT over the past five years. 96% of schools now have Internet access and 67% already have a broadband connection for educational purposes. However take-up needs to continue improving to catch up with the US where 95% of public schools had already a broadband connection in 2003.

The schools survey also found that take-up of ICT has been widespread in the teaching profession. Over 90% classroom teachers use computers or the Internet to prepare lessons. 74% also use them as a teaching aid. Over 80% think that pupils are more motivated and attentive when computers and the Internet are used in class, and that they have significant learning benefits for collaborative work.

Take-up of online **health** services is less advanced than public administration services, however, the interest is already there with one European in five using the Internet to seek health related information and this rises to nearly half in the leading member states. ICTs are already widely used in health for example for communication between primary and secondary care but not yet for services to patients. This was reflected on the very low proportions in the household survey – less than 2% – using advanced online health services.

EU v. Rest of the World

It is difficult to compare public service provision between countries with widely differing governmental structures. Some attempts³⁷ have been made using composite indicators to reduce the variation to a single measure. Three broad conclusions can be drawn:

- USA and Canada lead the rankings with the best EU member states a close second.
- There is a wide dispersal in the ranking of EU member states with the best close to the best in world but others lagging behind. The UN study notes that income is a key determinant of relative positions but it is not the only explanatory factor.
- The studies give stable and consistent results. This is true across the different studies and also over time, for example, the UN study covering nearly all countries found only minor reshuffling of ranks in the top 50 which includes all EU countries.

Impact

An estimate of the overall impact of online public services on the EU economy was given by the Commission's eGEP study³⁸. This estimated that projections on eGovernment expenditure would lead to a 1.5% GDP growth increase for the period 2005-2010. This excludes the

³⁶ *Benchmarking Access and Use of ICT in European Schools 2006* – European Commission http://ec.europa.eu/information_society/eeurope/i2010/docs/studies/final_report_3.pdf

³⁷ These include: *United Nations Global E-Government Readiness Survey 2005*. The UN Survey assesses more than 50,000 features of the e-government websites of the 191 UN Member States to ascertain how ready the Governments around the world are in employing ICTs to improve the access to and use of basic social services. *Leadership in Customer Service: New Expectations, New Experiences*, Accenture,(2006). This covers 22 countries of which 12 are in the EU and its overall assessment allocates the countries into 4 classes. Only the USA and Canada are in the highest class but 3 EU member states are in the second class and one is overall ranked third.

³⁸ *eGovernment Economics Project: Measurement Framework*. Commission services (2006) http://217.59.60.50/eGEP/Static/Contents/final/D.2.4_Measurement_Framework_final_version.pdf

impact of cost savings from eProcurement and eGovernment expenditure and the addition of these would increase the overall GDP growth attributable to eGovernment in the period 2005-2010 to 2%.

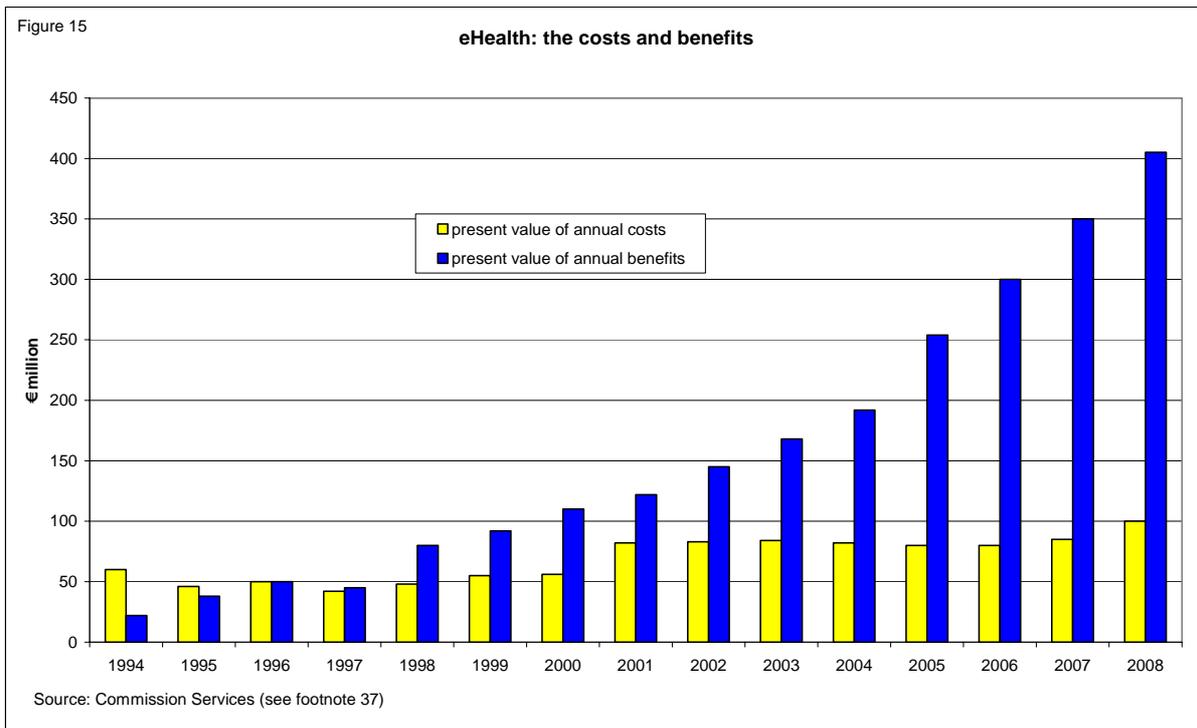
At the micro level, several Member States have estimated the impact of public services. These include:

- The BundOnline service ATLAS (www.atlas.zoll.de) replaces written customs declarations and notices of duties and taxes with electronic notification, making customs clearance faster and more efficient. In 2004, 11 million declarations and notices online resulted in savings of around €107m, equivalent to about €10 per declaration/notice.
- The UK Environment Agency achieved savings of over £1m in nine months deploying a system to award contracts for goods and services via electronic auction.
- The French government has developed an evaluation methodology called MAREVA. To give a precise evaluation of financial gains of eGovernment services for the State and the public sector, as well as of gains and benefits for their users. This is currently being applied to the 40+ projects of the ADELE programme which represent an investment of €188 million this year. They are expected to deliver €90m direct productivity gains. Overall, the programme's budget for 2004-2007 is €1.8 billion and savings of €5 billion per annum are expected by 2007.

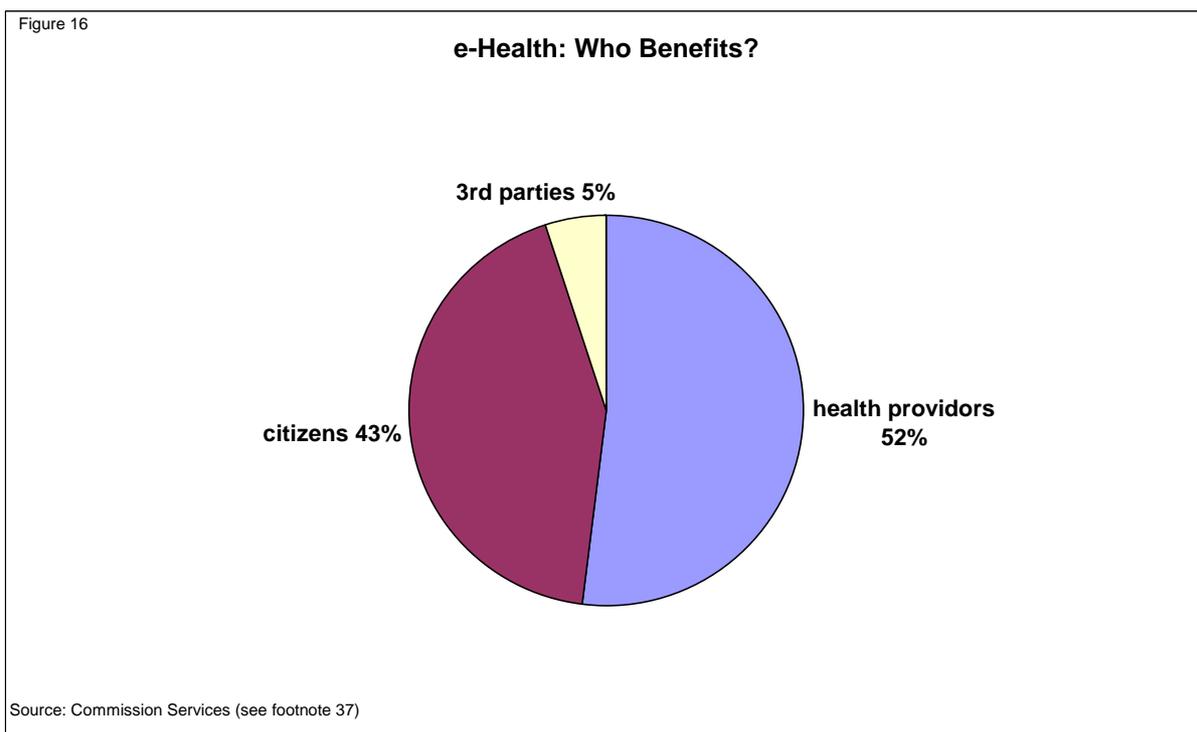
To assess the impact of eHealth, the Commission examined ten applications³⁹. On average the present value of annual benefits exceeds annual costs for the first time in year four. Where the eHealth application is upgrading or modifying an already existing service, development costs are in addition to the running costs of the existing service. Benefits are only realised after the application has been implemented, or it is in routine operation. For the ten cases, benefits were realised very shortly after implementation was completed and utilisation was underway. The study also found that once the cumulative benefits exceed the costs, the gap between them is sustainable.

The overall impact of the ten projects is illustrated in figure 15. From 1994 to 2008, the annual present value of benefits grows continuously from below €20 million in 1994 to about €200 million in 2004 and estimated €400 million in 2008. The associated costs stay broadly stable after the initial planning and implementation phases, and do not reach beyond €10 million per year.

³⁹ *Good Health Services across Europe – Evidence on their economic benefits and lessons learned.* This forms part of the Study on Economic Impact of Health. www.ehealth-impact.org



The study also looked at the distribution of benefits: just over half the total benefit accrued to health provider organisations (HPO) and most of the rest directly to citizens (figure 16).



In Education, a number of studies provide evidence on the return on investment of ICT in schools in terms of pupil performance⁴⁰:

⁴⁰ *Is ICT living up to its full potential in schools? A review of ICT impact studies in Europe*, European Schoolnet, 2006: These include different studies conducted between 2002-6 by the British Educational Communication and Technology Agency (BECTA), and the elearning Nordic study (Ramboll Management, 2006)

- Schools with higher levels of e-maturity demonstrate a more rapid increase in performance scores than those with lower levels;
- A UK study found evidence for a causal link between an increase in ICT investment and a rise in educational performance in primary schools in particular in English and Science;
- The 2006 OECD study⁴¹ identified an association between the length of time students have been using computers and their performance in mathematics.

Another important educational impact of ICT is on perception:

- ‘e-learning Nordic 2006’ shows that pupils, teachers and parents consider that ICT has a positive impact on learning, and allows for programmes tailored to individual pupils’ needs.
- The Dutch Government noted teachers becoming more and more convinced of improved educational achievements through the use of ICT.⁴²
- In a Commission study of teachers in spring 2006, teachers using ICT had positive attitudes to their impacts on students, particularly for collaborative work and for being more attentive while in class.

The positive messages from these studies are, however, countered by indications that the majority of teachers have not yet embraced new pedagogical practices. The foundations for more profound changes have been laid, but more time is needed to achieve wider impact on teaching methodologies.

5. INCLUSION

This section looks at inclusion policies at national and European level. All Member States have inclusion policies (see 5.1) and there is a broad consensus in their objectives. While they set different priorities, they converge around certain important themes notably, the geographical digital divide, digital literacy, eAccessibility and online public services. The communality in strategies led to a Ministerial Declaration in Riga setting broad policy areas for action and fixing a target to reduce by half the gap in Internet usage for groups at risk of exclusion. The Riga Declaration is outlined in section 5.2 along with an analysis of the Community survey of households and individuals to establish the base line of usage disparities between different groups within the population.

5.1. Inclusion at the national level

In 2006, the Commission reviewed eInclusion policies at European and National level and concluded that eInclusion policies and actions have made significant progress in implementing the goal of an inclusive knowledge-based society.⁴³ It focused on three facets of eInclusion: the access divide (or “early digital divide”) which considers the gap between those

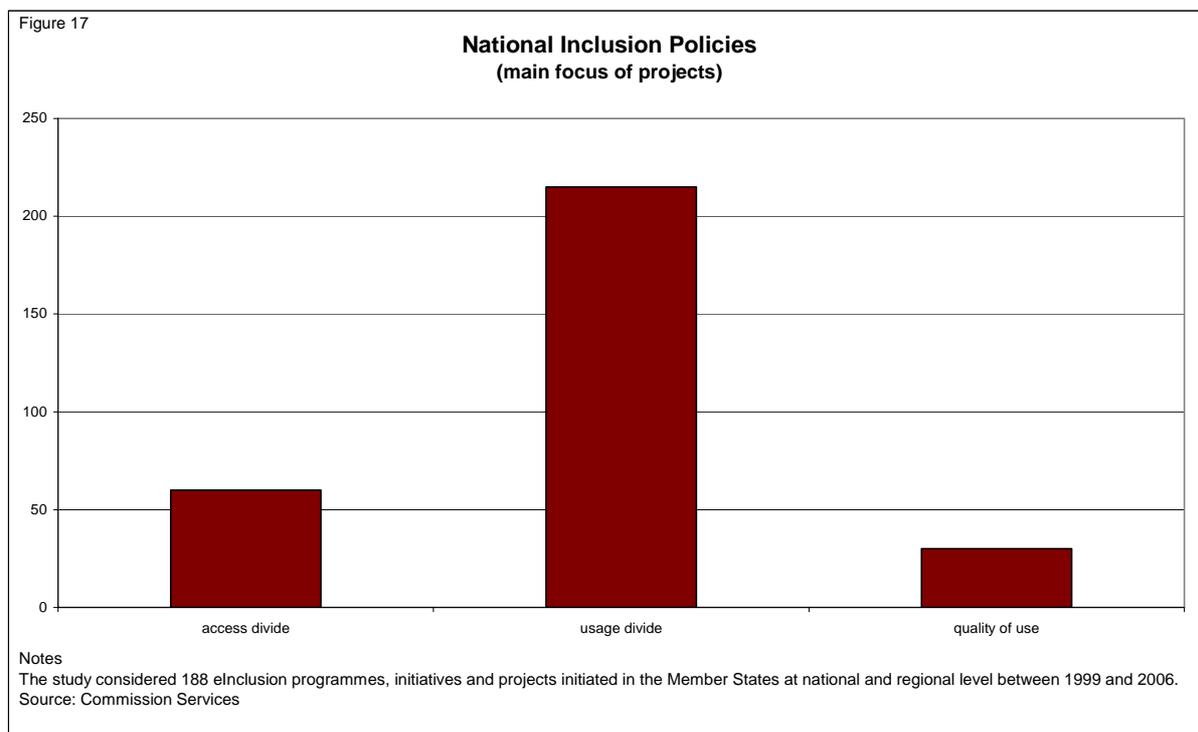
⁴¹ *Are pupils ready for a technology-rich world?: what PISA studies tell us*, OECD 2006

⁴² *Eight Years of ICT in Schools*, Ministry of Education Culture and Science, Netherlands

⁴³ *Status on e-Inclusion Measurement, Analysis And Approaches For Improvement*, Commission Services (2006) http://ec.europa.eu/information_society/eeurope/i2010/studies/index_en.htm.

with and those without access; the usage divide (“primary digital divide”) concentrating on those who have access but are non-users; and, the divide stemming from quality of use (“secondary digital divide”) focusing on differentials in participation rates of those people who have access and are users. This review showed an important consensus: all Member States and associated countries have introduced eInclusion policies whatever their level of ICT saturation.

The analysis of eInclusion policies following the three digital divides showed that EU countries are placing emphasis mainly on fighting the usage divide.



However, the review also showed that activities addressing the access divide are still very much a feature in national policies though their relative importance differs greatly between countries. In general, the more sophisticated a national ICT infrastructure and the greater the ‘hardware saturation’, the more likely a country is to tailor access activities to exclusion factors and to explore the viability of extending new technological modes of access.

The broad conclusions on national eInclusion policies are as follows:

- **Access divide:** Growing diversification of technological choices for high-speed Internet access (in particular efforts to use digital television or electricity network) is reducing the importance of factors such as geography and income. However, quality and speed of provision remain an issue in isolated and remote areas without sufficient aggregate demand to justify the operation of commercial markets. Speed disparities can affect both use and quality of use, including the potential to take-up advanced online services. Thus, though access may be a diminishing problem it is unlikely to disappear and the continuing roll out of new technologies will pose new questions of who has access and who has not.
- **Usage divide:** as seen in section 4.2, Member States have been investing in the provision of public content and services and also in providing basic ICT user skills to citizens. In general, the priority target group for accessibility policies has been people with disabilities, and less consideration has been given to the elderly. In the case of training and skills, there

has been a focus on the unemployed and the successes of this policy are demonstrated in the Community Survey of Households which shows relatively high skill levels of the unemployed (see table 8). As yet, there is little attention paid to the needs of ethnic minorities.

- **Quality of use:** disparities in quality of use are, as yet, only addressed in the policies of those Member States most advanced in the adoption and usage of ICT. This is likely to change as more countries advance to higher levels and new divides become apparent. Some of the issues already being addressed concern digital 'demotivation' e.g. participation in eDemocracy.

Member State policies show the multi-dimensional nature of the eInclusion and this contradicts commonly held view that Member States can easily be positioned on a continuum – from 'infrastructure' through 'usage' to 'quality'. No Member State is adopting just one approach in its fight against digital exclusion. On the contrary, they are using a wide range of platforms in order to reach out and engage at-risk groups.

This review shows that the aims and objectives of eInclusion policies in Member States are aligned with those at EU level, albeit at varying degrees. The vision of eInclusion as articulated at EU level encompasses a wide range of issues which themselves have been the subject of specific national policies e.g. geographical digital divide, digital literacy, eAccessibility, online public services. Policies are not only closely aligned but financially supported by EU Structural Funds and many countries feel there should now be greater EU involvement in monitoring and quantification of eInclusion.

A first step in realising co-ordinated action on inclusion was made at the Riga conference in June 2006 and this is discussed in the following section.

5.2. The Riga Declaration

The Riga Declaration was supported by Ministers and representatives from 34 countries. It specifies 6 broad policy areas for action in 2008:

- (1) older workers and elderly people;
- (2) the geographical digital divides;
- (3) eAccessibility and usability;
- (4) digital literacy;
- (5) cultural diversity in relation to inclusion;
- (6) inclusive eGovernment.

The commentary below focuses on the first four action areas; actions in relation to eGovernment have already been considered (see 4.2) and the issues of cultural diversity and inclusion will be considered in future Annual Reports as no data is available at present. The Declaration also defines specific benchmarks to monitor progress in its implementation and the most important for this discussion is the target to reduce by half the gap in Internet usage for groups at risk of exclusion.

Internet usage disparities

The 2006 Community Household Survey showed that 47% of individuals living in the EU regularly use the Internet (at least once a week). It found sharp deviations in the proportion of regular users, in particular by:

- **Age:** 73 % of those aged 16-24 but only 10% of those aged over 64;
- Level of **education:** 77% with high education, 25% of those with low education level;
- **Employment** status: 38% of unemployed and 17% of economically inactive persons compared to 60% of those employed, and 84% students.

age	Education attainment			
	average	low	Medium	high
average	47	25	53	77
Persons aged 16-24	73	67	76	90
Persons aged 25-54	54	25	56	83
Persons aged 55-74	20	7	27	53

Source: Eurostat, Community Survey on ICT use in households and by Individuals, 2006

This is consistent with what was been found in previous years⁴⁴, age and to a lesser extent education, are by far the main sources of exclusion from the Information Society (Table 7). However, there is one interesting exception to the correlation between usage and education, lower education attainment is not an obstacle to a high use of Internet among the young people (16-24 years old). In this age group, 67% of those with low education level are regular users but this drops to 25% of those with the same education level aged 25-54 and 7% of for those aged 55-74.

Address the needs of older workers and elderly people

Older users are not a homogenous group and amongst them differences by age, gender, education level and economic status tend to be more acute than for younger age bands. Overall, 29% of those aged 55-64 and 10% of those aged over 65-74 are regular users. Although these rates are still considerably lower than the EU average rate (47% in 2006), there has been some improvement in the relative position of those groups since 2005 but only in the working age groups and not for the retired. Usage rates are particularly low amongst women in these older age groups. This relates to the fact that they are more likely to be economically inactive: either not in the labour force or in post-retirement age. These figures underline the difficulty in meeting the Riga target to halve Internet usage disparities for the elderly by 2010.

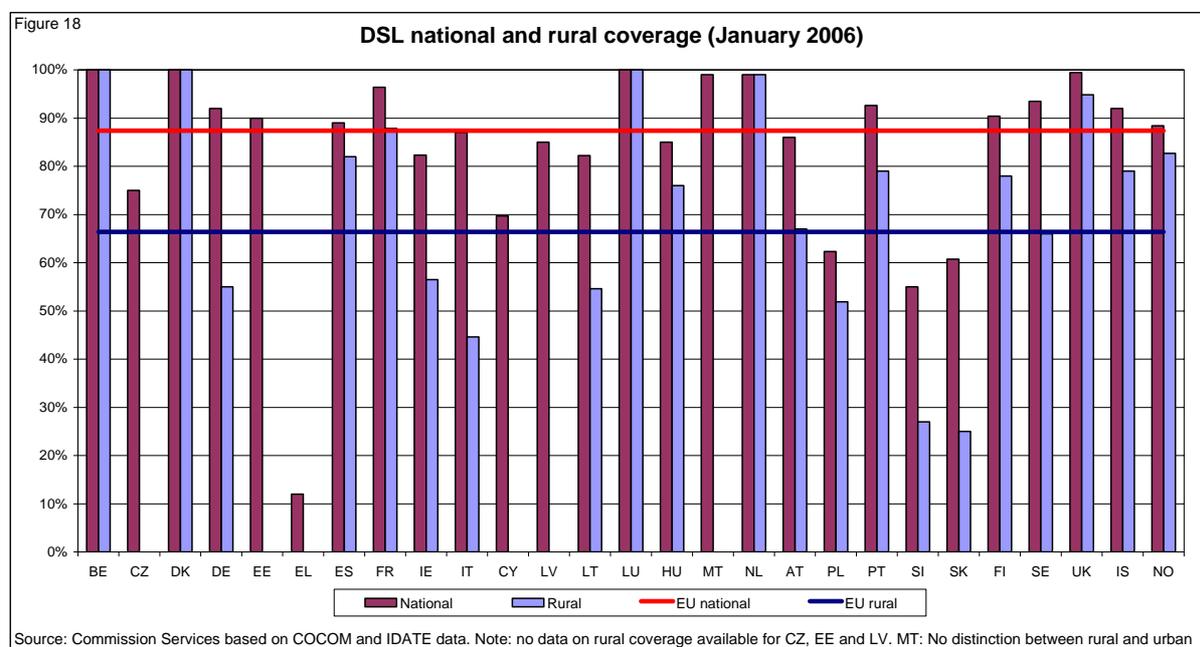
⁴⁴ See *i2010 First Annual Report on the Information Society*, COM(2006) 215 and *Information Society Benchmarking report*, European Commission (2005)

In addition, a large proportion of the disabled and chronically ill fall in the older age groups and policies to improve accessibility are also very relevant to them. The Community Household Survey does not collect data on the relationship between age, disability and ICT use; there is evidence from various surveys and projects⁴⁵ that around 40% of people older than 50 have some degree of activity limitation due to health problems and almost 50% report that they have some long-term health problems⁴⁶. The elderly and in particular the very elderly are also the fastest growing age segment of the European population.

The geographical digital divide

In the Riga Declaration, Member States agreed to significantly reduce regional disparities in Internet access across the EU by increasing broadband coverage in under-served locations.

The commitment is to increase broadband coverage in Europe to at least 90% of the population by 2010. In January 2006 DSL reached 87% of EU25 population⁴⁷. Coverage of rural areas, however, was 65.9%, with lower download speeds available than in urban areas and less competition between alternative providers⁴⁸.



In countries with the highest broadband penetration levels, already 90-100% of the population can have a broadband access (i.e. the Riga target is already met). However in countries where the penetration level is below 10% of the population, the picture is more diverse, with some countries enjoying around 80% coverage, while in the less developed ones this figure goes to 70-60%.

eAccessibility and usability

⁴⁵ such as SHARE (Survey of Health, Ageing and Retirement in Europe) and ESAW (European Study of Adult Well-Being), and SeniorWatch surveys.

⁴⁶ *ICT, Ageing and Independent Living*. Commission Services <ftp://ftp.jrc.es/pub/EURdoc/22352-ExeSumm.pdf>

⁴⁷ Coverage measurements do not include those consumers that cannot benefit from DSL access because of the long distance between their residence and the switch.

⁴⁸ *Broadband Coverage in Europe*, Commission Services (2006, data as of 31.12.2005)

The Riga Declaration sets three targets for accessibility:

- By 2007, make recommendations on accessibility standards and common approaches, which could become mandatory in public procurement by 2010;
- Assess the necessity for legislative measures in the field of eAccessibility, and take account of accessibility requirements in the review of the electronic communications regulatory framework beginning in June 2006;
- Ensure that all public websites are accessible to all by 2010.

The latest measurements show that only 3%⁴⁹ of public web sites comply with the minimum web accessibility standards and guidelines and suggest that the Riga target is very ambitious.

Digital literacy and competences

In the Riga Declaration, Member States committed to halve the current gaps in digital literacy and competence between disadvantaged groups and the average population by 2010. Progress on this target will be measured on the basis of available indicators and further work in the context of i2010. In 2006, the indicators for computer and Internet skills have shown that the groups with the lowest computer and Internet skill levels are the less educated, older people and the economically inactive. The level of non-users (those who have never used either a computer or the Internet) is also higher in these groups and over 40% of the EU 25 average. The unemployed, though slightly below the EU average, have better computer and Internet skills levels than the other 3 groups.

Table 8							
Internet User Skills							
Internet user skill level	EU25 average	Low educated	Aged 55-64	Aged 65-74	Retired/inactive	unemployed	
Never used	43	67	65	85	76	48	
Low	31	17	26	12	17	27	
Medium	20	12	8	3	6	19	
High	6	4	1	0	1	6	
Computer User Skills							
Computer user skill level	EU25 average	Low educated	Aged 55-64	Aged 65-74	Retired/inactive	unemployed	
Never used	41	65	61	83	73	44	
Low	13	10	13	7	11	14	
Medium	24	15	16	7	11	23	
High	22	10	10	3	5	19	

⁴⁹ Web accessibility figure coming from the study for the 2005 UK Presidency “eAccessibility of public sector services in the EU”.

Notes

1. Figures are the percentage of the population in the particular group

2. Low educational level applies to those with no formal education, primary or lower secondary education (corresponding to UNESCO's ISCED classification levels 0, 1 or 2)

Source: Eurostat, Community Survey on ICT use in Households and by Individuals, 2006

This first overview of eInclusion indicators confirms that the Riga Declaration priorities are relevant at the EU level and the required policy efforts needed to reach the targets are substantial given the initial conditions⁵⁰. Current measurements suggest wide differences in ambition of these targets: that on broadband coverage might be met before 2010 whereas that on eAccessibility will require a major push at EU level given the current low accessibility level of public sites. In relation to the groups at risk of exclusion, major efforts will have to be placed on increasing the Internet user rate and digital literacy amongst the elderly and the low educated; another important group to focus policy efforts in coming years are the non-users. In 2006, over 40% of EU citizens have never used either a computer or the Internet (table 8). This situation varies from country to country and efforts will have to focus on different targets accordingly.

⁵⁰

The importance of digital literacy and competences not just to inclusion but to the competitiveness of "businesses of all sectors and sizes" was stressed by the ICT Task Force.