SIESTA
Spatial Indicators for a 'Europe 2020 Strategy' Territorial Analysis

Applied Research 2013/1/18

Draft Scientific Report | Version 10/08/2012

Annex E

Digital Society

EUROPEAN UNION
Part-financed by the European Regional Development Fund
INVESTING IN YOUR FUTURE

This report presents the draft final results of an Applied Research Project conducted within the framework of the ESPON 2013 Programme, partly financed by the European Regional Development Fund.

The partnership behind the ESPON Programme consists of the EU Commission and the Member States of the EU27, plus Iceland, Liechtenstein, Norway and Switzerland. Each partner is represented in the ESPON Monitoring Committee.

Information on the ESPON Programme and projects can be found on www.espon.eu

The web site provides the possibility to download and examine the most recent documents produced by finalised and ongoing ESPON projects.

This basic report exists only in an electronic version.

List of authors

Lila Leontidou, Stelios Gialis and Anastasia Stringli.

Lila Leontidou coordinated this and wrote the section “EU2020S Digital Society - Systematisation and policy guidelines related to 4 maps”; S. Gialis wrote sections on Maps 21, 22 and 24; and Anastasia Stringli on Maps 23 and 25. The authors wish to thank Alex Afouxenidis for theoretical insertions, especially concerning territorial convergence and interactive media, and help with Maps 23 and 25; and Anastasia Vatsou for empirical work on the Balkans.

Table of contents

PART 1.

1. Text of description of each of 5 maps

1.1. Map 21: People working in the ICT sector (% of total employment)

Definition of the indicator

This indicator under discussion is derived from Eurostat's "Employment by economic activity" (Labour Force Survey). The survey population for this consists of enterprises with 10 or more persons employed and the reference area encompasses EU-Member States, Candidate countries, Iceland and Norway. Annual time series available from 2002 onwards and published on a yearly basis are used for the calculation of the indicator. Since 2008, definition of the ICT sector is based on NACE rev.2 classification and it includes both manufacturing[1] and services[2] related to computers, telecommunications, data, web-hosting and similar activities.

The concept of "persons employed", measured as the yearly average during the previous calendar year, as it is used by the Structural Business Statistics (SBS) is therefore applied. What's important to underline is that the number of persons employed is something distinct from the number of employees (that excludes unpaid workers) or the number of employees in full time equivalent units[3].

Relevance of the indicator

---

1 Specifically computer, electronic and optical products (26.1), computers and peripherals (26.2), communication equipment (26.3), consumer electronics (26.4) and magnetic and optical media (26.8), in parentheses the corresponding Nace rev.2 codes of the activities.
2 Specifically repair of computers and communication equipment (95.1), wholesale of computer and ICT equipment (46.5), software publishing (58.2), telecommunications firms (61), computer programming and consultancy (62) and data processing and web-hosting (63.1).
3 The number of persons employed is the total number of persons who work in the firm (e.g. working proprietors, partners working in the firm and unpaid family workers) even if they are absent for a short period (e.g. paid leave or special leave, on strike), as well as those who work "outside" but belong and are being paid by it (e.g. sales representatives, delivery personnel, repair and maintenance teams). It also includes flex-workers such as part-time and seasonal and home workers on the payroll. For further details on SBS and a detailed analysis of methodological choices, see: Eurostat, 2012, Methodological Manual for surveys on the ICT Investment / Expenditure, available at http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/EN/isoc_pi_esms.htm.

People working in the ICT sector is quite an important indicator in terms of the following two aspects: it offers for a direct measure of individuals who are involved in high value-added activities, while it provides an indirect estimation of the diffusion and the socio-economic significance of ICT within and across certain spatial entities. The Lisbon strategy, the eEurope endeavour as well as the EU2020's Strategy specifies the ICT sector as one of the core activities of the European societies, and decided on the need for quantitatively-substantiated policies for benchmarking and monitoring the expansion, the trends and the ongoing reformation in the sector. Therefore, a set of structural and a set of benchmarking indicators were defined for monitoring of the Lisbon process and the implementation of the eEurope and related policies. The 'Digital society' flagship is understood by the EU2020S in terms of enhancement of the activities of the ICT sector and related web-based networking activities. The 'Digital Agenda' aims to deliver sustainable economic and social benefits by means of the integration of EU's regions towards a digital single market based on fast and ultra fast internet. Interoperable applications are also a basic priority of the Agenda.

ICT activities are considered as weak aspects of the EU-27, at least as far as relative rates of expansion and exploitation are considered and related to the USA, Japan and other emerging economies. In this frame, the number of people employed in the ICT sector is significant for an account on the current situation as well as for an indicator of the gaps in ICT personnel in EU-27 that will have to be covered for the years to come. Thus, comprehensive and harmonised data on ICT expansion and employment is apparently needed.

the ten regions with the highest share			*the ten regions with the lowest share*			*the ten regions with or close to the median share (i.e. 2,25%)*		
MS	Region	people as a % of total employ.	MS	Region	people as a % of total employ.	MS	Region	people as a % of total employ.
CZ01	Praha	8,19	TR33	Izmir	0,34	DE41	Brandenburg -	2,32
SE11	Stockholm	7,67	TR42	Kocaeli	0,40	NL12	Friesland (NL)	2,30
UKJ1	Berkshire	7,51	TR72	Kayseri	0,41	PL63	Pomorskie	2,27
NO01	Oslo og	7,39	TR83	Samsun	0,43	FR24	Centre (FR)	2,26
UKI1	Inner	7,36	TR90	Trabzon	0,45	NO05	Vestlandet	2,26
DK01	Hovedstade	7,01	TR41	Bursa	0,50	UKD5	Merseyside	2,25
FR10	Île de France	6,71	TR21	Tekirdag	0,53	UKD4	Lancashire	2,25
SK01	Bratislavsk	6,65	TR32	Aydin	0,54	NO04	Agder og	2,22
ES30	Madrid	6,36	TR52	Konya	0,55	FR51	Pays de la Loire	2,20
BE10	Bruxelles	6,12	TR71	Kirikkale	0,55	CZ06	Jihovýchod	2,18
Country codes: BE Belgium, CZ Czech Republic, DE Germany, DK Denmark, ES Spain, FR France, NO Norway, NL								

Table 1 / Map 21 This table shows the ten nuts-2 level regions with the highest, the lowest and the median share of people working in the ICT sector in relation to total employment, in 2010.

Discussion of the geographical pattern of map 21

Introductory notes: the ICT sector has a strong regional dimension

The ever-increasing utilisation of intelligent systems and the overall technology-intensive character of the sector, coupled with falling prices, global competition and the needs of sustained accumulation in new sectors, as profits in traditional sectors are constantly decreasing, has resulted in the current importance paid on the ICT sector. Relevant ICT literature paid severe attention on issues of relative productivity, on increasing shares found in competitive markets, on employment and labour productivity, on workplace organisation and on the overall effects of ICT activities upon R&D and innovation.

The ICT sector produces about 5% of European GDP, with a market value of € 660 billion annually, while it contributes far more to overall growth and productivity as a large amount of investments is (in)directly connected to this sector. Still, development of ICT activities has been considered as a weak aspect of EU's competitiveness, as major established competitors (e.g. the USA) as well as emerging global players (see China and India) seem to perform quite better in the field. Thus, the need to enhance and promote technological reformation and innovation, in general, and ICT activities and employment more specifically, is a central task that should be accomplished throughout the European area (European Commision, 2010).

Yet, as several researchers outline, the sector is in close inter-relationship with its territorial context. In other words, the "ICT phenomenon" can be better conceptualised and empirically tested when studied in accordance to its regional dimension. Such an argument can be better understood when specific cases are brought to light and discussed: Baden-Württemberg in Germany and Silicon-Valley in the States, to name but a few, are spatial entities where innovation, R&D and the ICT are all strongly localised and socio-spatially embedded. This is why such cases are considered as successful and their good-practices are often analysed and discussed in the literature (Barrios et al, 2008; Koski et al, 2002).

The findings of the ESPON- SIESTA strongly support this argument. The regional distribution of ICT employment is highly uneven, with certain regions, many of them around capital cities, exhibiting high values and other regions, mostly in the European West and Southern areas, lagging behind. It should be noted that a relatively big area of the EU-27, encompassing candidate countries of the Balkans and Greece cannot be evaluated as no data were found for these countries and their regional settings. Yet, data missing is also an indirect, though insufficient, sign of the low penetration of the ICT sector in these countries.

Comparison of existing patterns with macro-regions and ESPON regions

The main divisions that are present in the EU-27 and the candidate countries in terms of the regional ICT sector employment, as pictured in map 21, are the following:

a) the North/ South division

b) the metropolitan/ non metropolitan areas division

c) the new/ old members running in parallel to the new/ candidate countries division

d) the technology-intensive and competitive/ less technologically advanced and non-competitive regions division

e) finally, the advanced/ less developed regions divisions

These divisions are not solid and clear-cut and they are not typical of the whole study area as different patterns may exist, while they should be interchangeably used in order to have an integrated theoretical explanation of figures and empirical observations. At first, an arc that starts from the wider London area and the South UK, runs through certain regions of the Benelux countries, the South Germany, Milano and the North of Italy and ends above Ile de France and Paris, is easily observable. Not surprisingly, all regions contained in this arc are spatial agglomerations of the North-West Europe, encompassing cities and towns that are important nodes of the global value chains, of a high-value added character, and belong to countries that are in the core of the EU's structures for decades now[4].

Secondly, many regional 'clusters' of important ICT employment can be located in the urban regions of Madrid, Dublin, Oslo, Copenhagen and Helsinki. These are spatial entities that contain capital cities and wider areas of established members of the EU-15, holding a relatively dynamic and externalised economy during the past two decades or so. The innovative level of Scandinavian countries on a global scale in ICT development and especially cellphones, is well established. Among the regions that exhibit the highest figures of ICT employment 'Bratislavský kraj', where Bratislava is located, is the only exception to the above two geographical entities of high ICT employment. In fact, Bratislava and Neuchdtel form a zone of important ICT sub-sectors specialisation. All the other cases are restricted to the metropolitan regions of London, Paris, Brussels and other agglomerations highlighted above (Barrios et al, 2008; Koski et al, 2002*)*.

Put it in terms of ESPON macro-regions, North-West Europe and the Atlantic Axis are well- advanced in terms of ICT employment while the Mediterranean Basin countries are lagging behind. The performance of regions that are within South-East Europe is somewhere in the middle. Theoretically speaking, it seems that agglomeration of economic activities plays an important role in the location of ICT firms although such activities

[4] Indicative well-known examples of ICT sub-sectors found therein are telecommunications, photonics, printing, and IT services in Cambridge; design and manufacturing of electronic systems, chip and, sensors making in Tuscany; and software firms, mobile phones, medical applications, control systems and in data systems in Kosice (ESPON KIT, 2012).

were expected to be relatively independent of the distance factor. It is believed that ICT location choices are better conceptualised when Marshallian externalities together with the famous New Economic Geography concepts, such as 'input-output' linkages and 'increasing' returns are taken into account. The latter (i.e. increasing returns) give firms an incentive to locate near markets and suppliers in order to save on transport costs, thus self-reproduced market-size effects that strengthen agglomeration do take place (ESPON KIT, 2012).

Discussion in the frame of EU2020s targets

A discussion of the evolution of the ICT sector helps to explain the unequal geography of the activity across the EU and the candidate countries. A series of multinational companies that were investing in the sector have started to alter their locational decisions since the late 1990s, in favour of newly accessed members such as the Czech Republic and Slovakia. Before that turning point, most of their subsidiaries in Europe where concentrated in urban centres and relatively affluent regions of Germany, UK, Ireland and Netherlands (i.e. North-West Europe). The basic advantages that seem to have attracted these investments in the emerging 'ICT poles' where the existing pools of specialised employees and ICT practitioners, existing industrial specialisation in the area (an important factor in the case of the computing-services sub-sector), dense networks of ICT SME's running in the area (relatively important for ICT manufacturing) and other factors such as growth rates and entrepreneurial climate in the region (ESPON KIT, 2012). For example, tax advantages provided by the Irish administration hold an important role for the concentration of the sector in urban centres of the country.

In their recent study and based on the Spanish case Barrios et al (2008) indicate that ICT investment lowers the developmental-gap between the regions of the country, despite the spatial concentration of relative activities and employees in the capital region of Madrid. This finding is in accordance with previous findings that consider regions significantly specialised in ICT producing as those regions that will mostly be favoured by the expansion of the sector.

In parallel to established ICT agglomerations of the EU-15, new regional growth poles can be identified, especially in regions where employees of the expanding computing services sub-sector are found (e.g. Dublin, Bratislava). This sub-sector is of an intensive innovative character, in need of large amounts of specialised employees, while requires relatively low investments in the form of fixed capital.

The ICT sector, as many other high-value added activities, is rather concentrated in diversified regional economies, at least when compared to traditional industrial sectors which tend to prefer non-diversified regional settings. SME's in the ICT sector are in many cases based on intensive R&D, which is in turn an outcome of, basically informal, knowledge exchange networks. On the other hand, multinational companies that have subsidiaries in regional economies of the eastern EU's newly accessed members, draw upon formal and internal networks channels, while their knowledge exchange ramifications frequently expand towards the European or the global arena.

The regional along with the sectoral are the most important dimensions that shape employment prospects in the ICT activities in the EU. Some prominent regions, such as the Île de France region stands, present an interesting diversification and almost all ICT sub-sectors have large amounts of employees represented therein. In parallel, features of highly-skilled and better-educated employees are quite important in all of these sub-sectors. This trend affects all IC-developed regions of the EU-15, as well educated ICT personnel in a specific ICT activity is a sign of relative high shares of such employees in all ICT sub-sectors in the region.

Regions where ICT employment is relatively low or even absent present certain similarities and disadvantages: in fact they lack of a sufficient number of SME's or even bigger firms of an innovative character (e.g. spin-off firms) which are closely connected and frequently interact to local universities and centres of research (*see Table 2 & Table 3*). The latter connection to research centres and educational institutions is crucial, at least during the first years of an ICT company.

the ten EU-27 regions with the lowest share					
MS	Region	people as a % of total employment,	MS	Region	people as a % of total employment,
RO31	Sud – Muntenia	0,65	ES62	Región de Murcia	0,88
FR25	Basse-Normandie	0,75	GR23	Dytiki Ellada	0,92
RO11	Nord-Vest	0,82	FR23	Haute-Normandie	0,93
RO21	Nord-Est	0,86	PT11	Norte	0,94
FR43	Franche-Comté	0,87	RO22	Sud-Est	0,94
Country codes: ES Spain, FR France, GR Greece, PT Portugal, RO Romania.					

Table 2/ Map21 This table shows the ten EU-27 nuts-2 level regions with the lowest share of people working in the ICT sector in relation to total employment, in 2010.

For example, in the Greek case and based on previous studies on flexible specialisation and innovation prospects in the area, many regions with promising enterprises cannot innovate due to insufficient networking, lack of a common supply policy, isolated functioning, poor research dissemination policy and institutional framework etc. Nowadays, regions with poor ICT employment face two important competitive challenges: the one that comes from the already established ICT growth poles and the cumulative causation effect underlined above, and the second that comes from other global competitors, such as India and China where spatial concentrations of an innovative character have been recently developed. Ironically, many of these emerging ICT regions around the globe were triggered out when EU-based multinationals decided to invest abroad in search of lower-costs for specialised employment (Barrios et al, 2008).

Conclusion: promoting ICT employment as a means to overcome regional divergence

Metropolitan regions have historically attracted and at the same time reproduced specialisation and innovation. Given the high concentration of the ICT sector and relative employment in such cities and their wider areas, the full utilisation of their benefits and prospects could enhance regional innovation, close the gap between wealthy and less privileged areas, and offer for a diffusion of innovative and skilled employment towards the less urbanised areas (especially the regions in industrial transition and the urban-rural regions), the South and the candidate countries.

This theoretically informed study of map 21 proved that there is a very uneven distribution of ICT employment across EU regions. This distribution is determined by certain divisions, such as the metropolitan/ non-metropolitan regions division, which run across the European area and shapes the identity of its socio-spatial entities. In parallel to established ICT agglomerations of the EU-15, new regional growth poles can be identified, especially in regions where employees of the expanding computing services sub-sector are found. The idea of promoting through a coherent policy framework new ICT regional growth poles is substantial and should be incorporated to the EU 2020s Strategy. Such poles could encompass ICT sub-sectors that demand relatively high investments in human capital and skilled employment, rather than focusing on fixed-capital and expensive infrastructures development. The regions of Bratislava and Kosice in Slovakia, Cork in South Ireland, and similar cases prove that such a targeted policy could offer for new poles of ICT development in metropolitan regions of the EU south, such as Attica-Athens in Greece and the wider Zagreb area, where important though insufficient ICT employment already exists (*see Table 3*).

Future European policy and the E2020's implementation (European Commision, 2011), would require a promotion of ICT labour skills and the diffusion of ICT usage throughout micro- and mediums-sized firms. Such measures, along with the improvement of telecommunication and general ICT infrastructure will help the EU-27 and the candidate countries regions to develop and externalise their ICT potential as well as attract investments from abroad.

the share of EU-15 countries			*the share of the rest of EU-27 countries*		
MS	Country	people as a % of total employment,	MS	Country	people as a % of total employment,
AT	Austria	2,67	CY	Cyprus	2,13
BE	Belgium	3,40	CZ	Czech Republic	2,81
DK	Denmark	4,28	EE	Estonia	2,17
FI	Finland	3,88	HU	Hungary	2,53
FR	France	2,84	LV	Latvia	3,12
DE	Germany	3,18	LT	Lithuania	1,78
GR	Greece	1,95	MT	Malta	3,04
IE	Ireland	3,93	PL	Poland	1,98
IT	Italy	2,32	SK	Slovakia	2,41
LU	Luxembourg	3,94	SI	Slovenia	3,34
NL	Netherlands	3,51	BG	Bulgaria	2,30
PT	Portugal	2,12	RO	Romania	1,36
ES	Spain	2,74			
SE	Sweden	3,97			
UK	United Kingdom	3,47			
EU-15		3,02	EU-12 (27 minus 15 old	2,09	
EU-27: 2,84					

Table 3/ Map 21 - This table compares the EU-15 member states with the rest of EU-27 countries in terms of people working in the ICT sector in relation to total employment, in 2010. Note that it does not show a clear divide across the board.

References

Barrios, S., Mas, M., Navajas E. and Quesada J. (2008), Mapping the ICT in EU Regions: Location, Employment, Factors of Attractiveness and Economic Impact. European Commission: Joint Research Centre Institute for Prospective Technological Studies (available at http://ftp.jrc.es).

ESPON KIT (Knowledge, Innovation, Territory) project (2012), Draft Final Report (v. 24/2/2012), (available at http://www.espon.eu).

European Commision (2011), The urban and regional dimension of Europe 2020, 7th progress report on economic, social and territorial cohesion. Luxembourg: Publications Office of the European Union (doi:10.2776/50938).

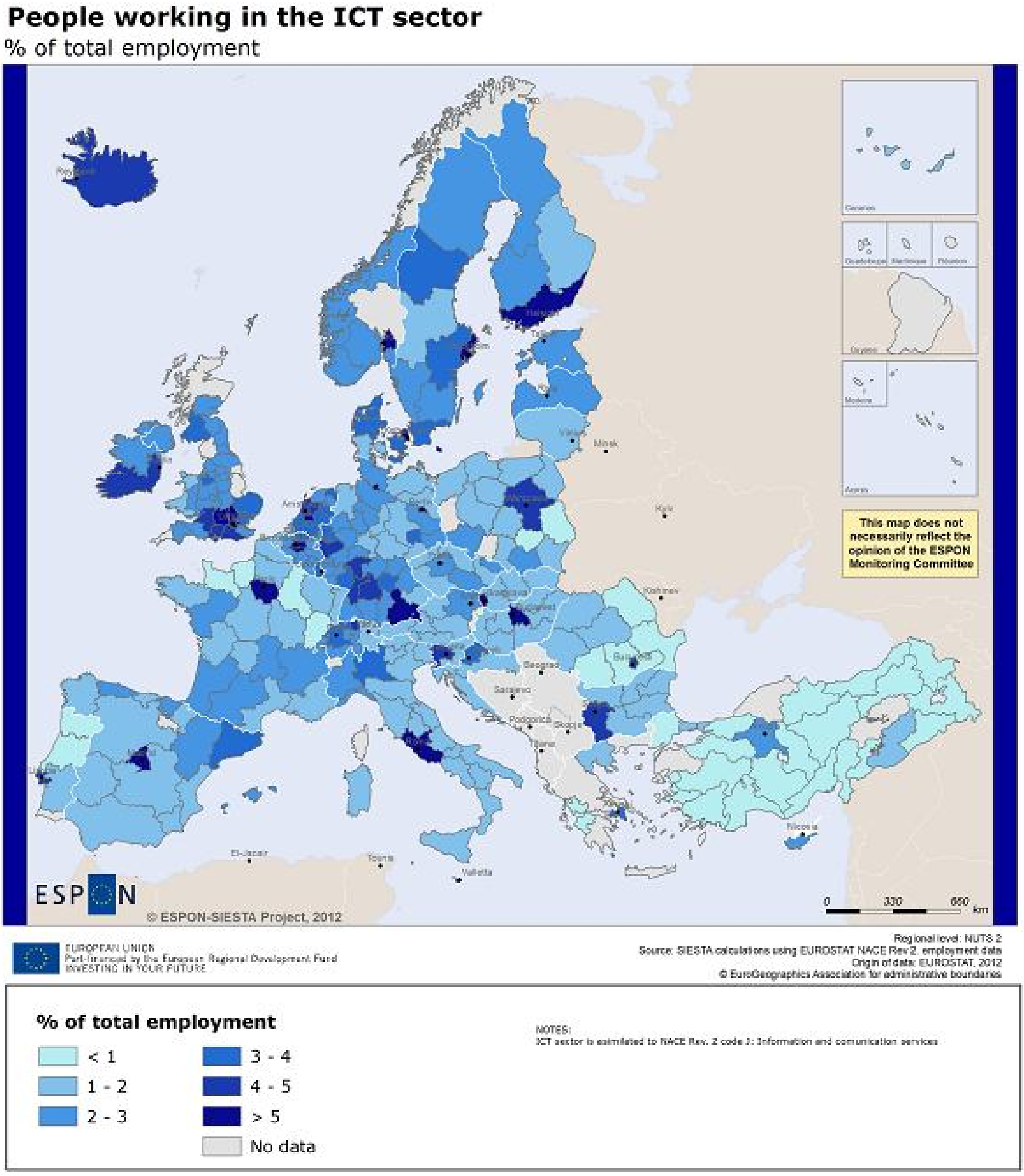
European Commision (2010), A Digital Agenda for Europe. COM(2010) 245 final/2 (available at http://www.espon.eu).

European Commission (2010), The Flagship "Youth on the Move" – COM(2010) 477 final.

European Commission (2010), The Flagship "An Agenda for New Skills and Jobs" – COM(2010) 682 final.

European Commission (2010), Investing in Europe's future. Fifth Report on Economic, Social and Territorial Cohesion. Luxembourg: Publications Office of the European Union.

Koski H., Rouvinen, P. and Ylä-Anttila, P. (2002), ICT clusters in Europe: the great central banana and the small Nordic potato. *Information Economics and Policy*, v.14.2, pp. 145–165.



Map 21. People working in the ICT sector

1.2. Map 22: ICT patent applications to the EPO (% of total patent applications, 2008)

Definition of the indicator

The indicator under discussion is derived from OECD's *Regpat* Database, which is one among the 4 different sets of patent data that the Organization has developed for research and policy analysis. Most of these datasets draw upon EPO's Worldwide Statistical Patent Database (PATSTAT) which offers an integrated and comparable set of information on applications that are submitted in patent offices across the globe. In parallel to EPO's data, the *Regpat* database also encounters patent applications filed under the Patent Co-operation Treaty (PCT) that designate the EPO, and are linked to almost 2000 regions across OECD's members through the inventors/applicants addresses.

In this frame, the indicator under discussion records ICT patent applications as a percentage of total applications during a given year. In other words, it is an indicator of invention as patents are a means of legal protection of inventions developed by firms, institutions or individuals[5]. To be precise, it is an indicator of the relative share of ICT inventions in relation to the whole patent applications within a specific territorial-unit. The survey population for this consists of all patent applications and the reference area encompasses EU-Member States and all other OECD countries. As for the ICT sector, since 2008 its definition is based on NACE rev.2 classification and it includes both manufacturing and services activities that have been thoroughly described in the case of map 21.

Relevance of the indicator

ICT patent applications along with other patent-related indicators is of relevance as it offers for a direct measure of the relative share of ICT as compared to total invention activity, while it stands for an indirect measure of the intensity and the embeddedness of ICT research and development within and across certain spatial entities. Put in other words, it is an indicator that reflects a region's inventive activity in ICT, and reveals the corresponding effort to transform R& D into new ideas and products, thus gain potential profits and establish future trademarks.

---

[5] Patents protect inventions and ensure that the holder holds market exclusivity on its invention. Every use of the protected invention requires the consent of the patent holder. The patent is usually submitted to a national patent office, and if successfully awarded it is valid for a maximum of 20 years and covers a specific area (usually a national or international market area). As soon as the protection period comes to an end the invention belongs in the public domain (Maraut et al, 2008).

During the past decade or so, Eurostat, OECD and other statistical agencies had exhibited important effort for developing patent statistics indicators. This signifies the need to monitor advancements in theoretical and applied science as well as in technological apparatuses which have been expanding throughout EU and the globe.

The inherited regional dimension of the indicator under study is of importance for policy making and decisions, as it provides proper benchmarking and evaluates regional performance in relation to national and EU R&D, innovation, and ICT promotion policies. As such, it enables the monitoring of the implementation of the Lisbon strategy, the eEurope endeavour as well as the EU2020's Agenda. Thus, comprehensive and harmonised data on ICT patent helps to reveal disparities and design harmonised and spatially-sensitive interventions for ICT clusters, incentives for patent-focused research, and networks of excellence and university-industry linkages.

the ten regions with the highest share			*the ten regions with the lowest share*			*the ten regions with or close to the median share (i.e.*		
MS	Region	ICT patent as % of total applicat	MS	Region	ICT patent as % of total applicat	MS	Region	ICT patent as % of total applicat
DE411	Frankfurt (Oder), Kreisfreie	100,0	AT314	Steyr-Kirchdorf	0,0	CH023	Solothurn	16,6
PT200	Regiyo Autσnoma	100,0	AT331	Auiеrfern	0,0	ITE14	Firenze	16,6
RO422	Caraş-Severin	100,0	BG322	Габрово	0,0	DEF06	Herzogtu m	16,6
BG412	София	100,0	BG323	Русе	0,0	DE93B	Verden	16,6
ES421	Albacete	100,0	BG333	Шумен	0,0	NO052	Sogn og Fjordane	16,7
FR910	Guadelou pe	100,0	CH054	Appenzell Innerrhod	0,0	PL522	Opolski	16,7
FR930	Guyane	100,0	DE251	Ansbach, Kreisfreie	4,1	FR513	Mayenne	16,7
GR24*	Sterea Ellada	100,0	DE422	Cottbus, Kreisfreie	4,3	DE12C	Freudens tadt	16,7
HR016	Medimurs ka	100,0	DE502	Bremerha ven,	8,2	DE279	Neu-Ulm	16,8
HR035	Splitsko-dalmatins ka	100,0	DE803	Rostock, Kreisfreie Stadt	9,5	DE119	Hohenloh ekreis	16,8
Country codes: AT Austria, BG Bulgaria, CH Switzerland, DE Germany, ES Spain, FR France, HR Croatia, IT Italy, NO Norway, NL Netherlands, NO Norway, PL Poland, PT Portugal.								

Table 2 This table shows the ten nuts-3 level regions with the highest, the lowest and the median share of ICT patent applications to the EPO, in 2008.

Discussion of the geographical pattern of map 22

Introductory notes: the spatial dispersion of patent applications reflects, inter-alia, the strong regional dimension of the ICT sector

The geography of patent and invention is a coin with two faces: one is the innovation face and the other is the socio-productive agglomerations face. Innovation is inseparable from the spatial entities where it potentially occurs. Innovative activities are unevenly dispersed within countries, as certain regions are of an innovative character while others present little or even no innovation efforts. An invention can flourish and start- up in places where specific mixtures of local/regional capabilities and/ or constraints are of influence. Such local capacities are the institutional framework, local tacit knowledge practices, governance, infrastructure and the general development of productive forces (e.g. skilled and general labour, composition of capital etc). The local effect of national and international policies in the level of market regulation, R& D promotion and legislation around intellectual property rights (IPR) do also matter.

The increasing rate of patent applications combined with the intensified competition between major global players in the economic and regulatory effects of inventions has resulted in the current importance paid on the ICT patent activity. The technology and knowledge-intensive character of the sector taken as granted, re-produced capital accumulation demands new patents to be registered as this is a major way to verify secured profits in the markets. Patent applications and rights cannot be theorised without a closer look on the deeper necessities that production and accumulation imposes on the sphere of property and intellectual rights across the globe.

A locally stabilised though internationally determined equilibrium between co-operation and competition, the two significant pillars of innovation, is unavoidably required on behalf of local firms and patent- producing experts. Yet, inventions are not solely the outcome of an environment that's friendy to entrepreneurship and encouraging for new ideas. The local pools of semi-skilled or highly-skilled labour as well as the labourers agency, compromise, and resistance that influences the local labour politics agenda, are also important.

Comparison of existing patterns with macro-regions and ESPON regions

The main divisions that are present in the EU-27 and the candidate countries in terms of the ICT patent applications to the EPO as a share of total relevant applications, pictured in map 22, are the following:

a) the new/ old members running in parallel to the new/ candidate countries division
b) the industrialised/ non industrialised areas division
c) the technology-intensive and competitive/ less technologically advanced and non-competitive regions division

As expected, following ICT employment which is highly uneven, a map of the regional distribution of the total absolute number of ICT patent application would definitely produce a spatial pattern that resembles a lot to the one of ICT employment.[6] There, certain regions, many of them around capital cities, would exhibit high values and other regions, mostly in the European West and Southern areas, would lag behind. Yet, map 22 pictures the relative importance of ICT patent activity in relation to total patent activity and as such, patterns revealed here are quite different. In this case, the intensity of ICT patent activity is more or less revealed, independently of how big or narrow the total inventing activity in the area is. This is why many regions of the European South, including places in the Southern territories of Italy, Spain, France and Turkey are performing quite well. Having this in mind, the uneven distribution of ICT applications to the EPO in relation to total patent activity, which resembles a little with the typical North/ South distinction that is monotonously repeated in every indicator that pictures development indicators in the EU regions, can be better explained.

The total number of ICT patent applications, to a large degree, and the relative share of ICT to total patent applications, to a lesser extent, is two good determinants of the economic base and the innovative capacity of a European country/ region. In 2008, Germany was the leading EU member in this field, with 4.980 ICT patent applications, followed by France with 2.126 and the United Kingdom with 1.255. The ICT patent shares of these countries are 22,1%, 29,1% and 29,9% respectively. A comparison between Germany and the other countries mentioned reveals a slight yet important widening of the gap among the “leader” and the “followers” in patent applications[7]. This is to certify the economic sovereignty of the German economy throughout the European arena.

[6] See for example “ICT patent applications to the EPO, by NUTS 3 regions, 2006” Map that is available through Eurostat’s map database (http://epp.eurostat.ec.europa.eu).

[7] Finland is a remarkable case of excellent performance as its ICT patent applications per million inhabitants value is ranked as first in EU and exceeds 124 applications. The next two countries in the top three places are Netherlands and Sweden. More than 50% of the Finnish patent applications are ICT-related, and the majority of them is generated by flousrishing telecommunication industry therein.

Yet, the 7.777 patents filed by USA and the 6.810 filed by Japan during the same year, which in turn correspond to significantly higher levels of ICT patent share to the EPO (34, 4 for USA and 41,3 for Japan) underline the continuing efforts paid by the European Commision in the level of patent applications promotion (European Commision, 2010; Barrios et al, 2008).

Seen from a regional point of view, the performance in relation to patent applications is quite diversified, as already implied. Among the top nuts-3 level regions in total number of ICT patents one can locate agglomerations nearby Stockholm in Sweden, Noord-Brabant in Netherlands, and Frankfurt and Oberbayern in Germany. More or less all these regions perform quite well as they usually overpass the level of 300 applications on a total level and their share of ICT patent exceeds 40%. These are the leading regions in the field although many other regions that perform quite better in terms of ICT share do exist (*as in Tables 1 & 2*).

Discussion in the frame of EU2020s targets

Santangelo (2002) through his study of a sample of USA patents that were granted to some big electronic firms in the EU, had studied the interaction set forth for patenting between USA and European electronics firms. Specifically, he studied companies of R& D that were located in German, UK and Italian regions and found that patenting is attracted to already existent areas of industrial development and agglomeration, taking a form of cumulative causation.

Many different aspects of European regional structures, with specific importance paid to economies of agglomeration, are able to explain the distribution of innovation. Of importance here is the exploitation of human capital and common resources by innovative agents and firms. The role of “clusters” and their interaction with “local externalities” and subsequent effects can also help to explain regional patterns of innovation and invention. Positive local externalities are in turn re-produced due to geographical proximity and the lower costs that are associated to easier communication and transportation, though certain negativities such of concentration, such as congestion, may occur. Local and national incentives for research and development, funded research groups, and other local agents can formate spillovers of knowledge and good-practices diffusion (KIT, 2012).

the ten EU-27 countries with the lowest share					
MS	Region	ICT patent as % of total applications, 2008	MS	Region	ICT patent as % of total applications, 2008
IT	Italy	14,9	ES	Spain	21,0
AT	Austria	19,2	DE	Germany	22,1
LV	Latvia	20,0	GR	Greece	23,8
DK	Denmark	20,4	CZ	Czech Rep.	24,0
CH	Switzerland	20,	BE	Belgium	25,0

Table 2/ Map 22 This table shows the ten EU-27 countries with the lowest share of ICT patent applications to the EPO, in 2008.

In terms of ICT patent applications, inventors' companies that are based in the USA file a higher number of patents than their EU counterparts. The ICT patent share for different kinds of telecommunication and technology applications is apparently higher for the USA and the EU 2020's implementation has to take serious measures in order to overcome this obstacle (Turlea et al, 2010).

Conclusion: patent applications as an indicator of unevenness across EU regions

The uneven distribution of ICT patent applications across EU calls for a re-theorisation of EU and national policies regarding the legal aspects and the socio-technical presuppositions of invention. The idea of promoting, through a coherent policy framework, new ICT patent-promoting growth centres in certain EU regions and localities should be incorporated to the EU 2020s Agenda. Potential locations that could welcome such centres are both i) already existing centres of intensive ICT activity, regional clusters of innovation and similar technologically advanced agglomerations (see map 21 for potential locations of this character) and ii) less-favoured spatial entities that hold a hidden ICT potential. As far as the latter are concerned, map 22 brought to light a variety of areas dispersed across EU, many of them in the European South, that though have a narrow basis of patent applications are still characterised by very intensive ICT invention efforts. The regions found in Sicily, Greece, South Spain and similar areas prove that such a targeted policy could offer for new poles of

ICT patent applications, not necessarily close to existent metropolitan regions of the EU, where a promising innovative and ICT-focused patent activity could be reproduced.

The discussion of regional ICT patent filing distribution revealed that, nowadays, a regionally-sensitive focus is of great importance for the conceptualisation of the determinants of spatial concentration of firms' and individuals patent activity as well as national and/ or cross-border regional hierarchies regarding inventions. This is so as, glo-calised structures of economic activity and frequent technological advances continuously re-create regional formations that innovate and others that stay behind, thus reproduced over time 'sticky places on a slippery space' through a cumulative causation dynamic.

Future European policy and the E2020's implementation (European Commision, 2011), would require a promotion of inventions and patent applications and a wider enhancement of innovative ideas produced by firms, researchers and entrepreneurs. Such measures, along with the improvement of general ICT infrastructure and the update of relevant legislation and the regulatory framework will help the EU-27 and the candidate countries regions to overcome stagnation and develop and externalise their patent potential.

References

Barrios, S., Mas, M., Navajas E. and Quesada J. (2008), Mapping the ICT in EU Regions: Location, Employment, Factors of Attractiveness and Economic Impact. European Commission: Joint Research Centre Institute for Prospective Technological Studies (available at http://ftp.jrc.es).

European Commision (2011), The urban and regional dimension of Europe 2020, 7th progress report on economic, social and territorial cohesion. Luxembourg: Publications Office of the European Union (doi:10.2776/50938).

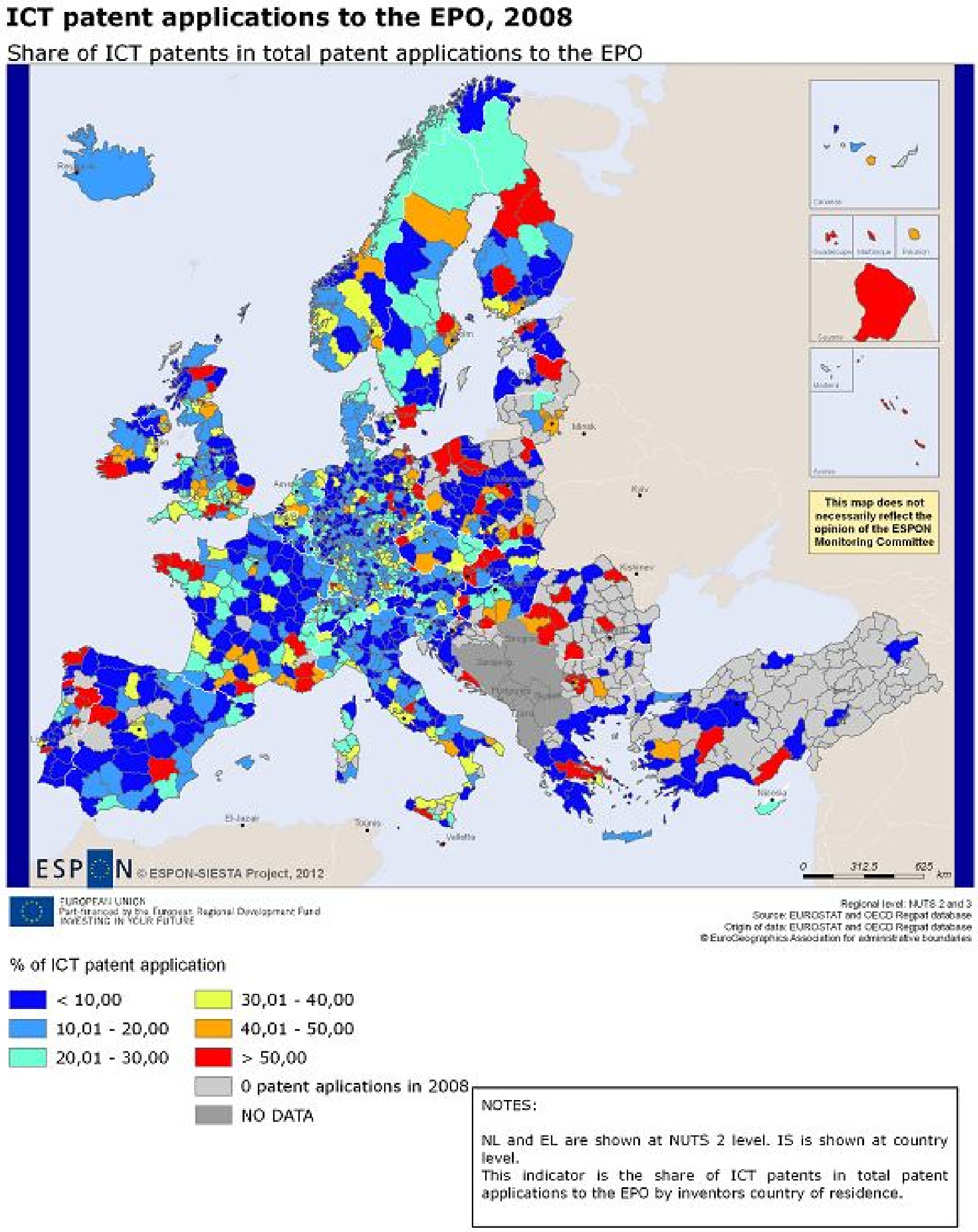
ESPON-KIT (Knowledge, Innovation, Territory) project (2012), Draft Final Report (v. 24/2/2012), (available at http://www.espon.eu).

European Commision (2010), A Digital Agenda for Europe. COM(2010) 245 final/2 (available at http://www.espon.eu).

Maraut, S., Dernis, H., Webb, C., Spiezia, V. and Guellec, D. (2008), The OECD REGPAT Database: a presentation. STI Working Paper, 2008/2, OECD (available at http://www.oecd.org/dataoecd/22/19/40794372.pdf)

Santagelo G.D. (2002) The Regional Geography of Corporate Patenting in Information and Communications Technology (ICT): Domestic and Foreign Dimensions. *Regional Studies*, v.36.5, pp. 495–514.

Turlea, G., Nepelski, D., de Prato, G., Lindmark, S., de Panizza, A., Picci, L., Desruelle, P., and Broster, D. (2010) The 2010 report on R&D in ICT in the European Union. EC: Joint Research Centre- Institute for Prospective Technological Studies, Luxembourg: Publications Office of the European Union.



Map 22. ICT patent applications to the EPO

1.3. Map 23: Broadband penetration rate 2006-2009

Definition of the indicator

The broadband penetration rate describes the number of dedicated, high-speed connections per 100 inhabitants. This indicator shows how widely broadband access to the internet has spread in the countries on the general level, not specifying by user group. Broadband lines are defined as those with a capacity equal or higher than 144 Kbits/s. This speed is measured in download terms. Various technologies are covered; ADSL, cable modem as well as other types of access lines.

Relevance of the indicator

This indicator reveals the number of broadband lines contracted as a percentage of the total population.

According to the Broadband Policy approved by the Federal Cabinet in 2004 the broadband is defined as ‘always-on internet connection with a minimum download speed of 128 kbps connectivity’.

The ‘always-on’ facility means that the user has access to the internet as soon as he/she switches the internet browser on and does not need to dial the ISP number for a connection. The major differences between the traditional narrow-band (dial up) internet access and broadband internet access are in the speed of access and ‘always-on’ capability of broadband due to which a range of applications become available.

Broadband penetration rate 2006-2009								
the ten regions with the highest percentages			the ten regions with the lowest percentages			the ten regions with or close to the median (i.e. 47)		
MS	Region		MS	Region		MS	Region	
SE11	Stockholm	84	RO22	Sud-Est	17	AT34	Vorarlberg	48
SE22	Sydsverige	80	GR21	Ipeiros	17	UKG2	Shropshire and Staffordshire	48
IS00	Ísland	80	GR22	Ionia Nisia	17	AT32	Salzburg	48
DK01	Hovedstaden	79	GR23	Dytiki Ellada	17	AT11	Burgenland (AT)	47
NL31	Utrecht	79	GR24	Sterea	17	DEC0	Saarland	47
SE12	Östra Mellansverige	79	GR25	Peloponnisos	17	AT12	Niederösterreich	47
SE23	Västsverige	79	RO12	Centru	14	ES53	Illes Balears	47
SE31	Norra Mellansverige	78	RO11	Nord-Vest	13	AT31	Oberösterreich	47
NL32	Noord-Holland	76	RO31	Sud - Muntenia	12	HU22	Nyugat-Dunántúl	47
DK04	Midtjylland	76	RO41	Sud-Vest	11	ES64	Ciudad	46
SE33	Övre	76	RO42	Vest	10	SI01	Vzhodna	46
			RO21	Nord-Est	9	SI02	Zahodna Slovenija	46

Table 1/ Map 23 This table shows the ten nuts-2 level regions with the highest, the lowest and the median share of broadband penetration rate 2006-2009.

Discussion of the geographical patterns of map 23

Introductory notes

Access to information and communication technologies (ICT) is at the heart of the digital divide, and geographic location is just one aspect of that divide. Regional statistical data on access to the internet within households and the availability of broadband for going online exist at European level. Fast internet access is one specific action area of the Digital Agenda for Europe. New and innovative developments of electronic services rely on fast wired and wireless internet access. It is therefore essential to foster and monitor the development of fast internet access as part of the benchmarking framework. It is assumed that by 2013, all citizens within the EU should have access to broadband.

Comparison of existing patterns with macro-regions and ESPON regions

By 2020, the minimum bandwidth of the broadband Internet connections should be 30 Mbps, with 50 % of the households having a speed of at least 100 Mbps.

In contrast to supply-side statistics, Eurostat indicates the actual uptake of ICT by the population. In 2010, 7 out of 10 (70 %) of households on average in Europe with members aged between 16 and 74 years had access to the internet at home and 6 out of 10 (61 % of households) accessed the internet via broadband. These numbers have grown rapidly in recent years, with an average annual growth of 5 percentage points for internet access and 6 percentage points for broadband access between 2008 and 2010. While access to the internet makes it possible to participate in the information society, broadband connections enable internet users to fully exploit the potential of the net.

Many advanced internet services, such as social networking sites, uploading and downloading of media content (video and audio files) or the use of online maps and satellite images, automatically require a broadband connection. Websites are becoming richer in content, and this constantly increases the demand for traffic volumes, even for less advanced services such as e-mail communication. The national differences in internet connections and broadband access of households in 2010 are considerable. They range from 33 % in Bulgaria to 91 % in the Netherlands for internet connections and from 23 % in Romania to 83 % in Norway and Sweden for broadband access. The European Union averages are 70 % for internet connections and 61 % for broadband access, which means that some countries are lagging well behind the EU average (Eurostat, 2011). The EU average for the development of internet connections between 2008 and 2010 is 4.9 percentage points and 6.1 percentage points for broadband access. The best performing countries as regards new internet connections are, the former Yugoslav Republic of Macedonia, Turkey, Poland, Greece and the Czech Republic, with an average annual increase of more than 7.3 percentage points, while the least performing countries are Sweden, Austria, Denmark and Norway, with an average annual increase of less than 3 percentage points. A similar picture can be drawn for broadband access of households. Here, the best performers are Croatia, Germany, Poland, Greece and Italy, with an average annual increase of 9 percentage points or more. In Bulgaria and Denmark the average annual increase was 3 percentage points or less.

When interpreting these results one has to bear in mind that it is easier to achieve high growth rates at a lower level, whereas growth rates tend to decrease when reaching higher levels. In order to maintain high growth, efforts and investments have to be intensified. This rule is borne out when one observes the take-up and development of Internet and broadband connections. Linear regressions between take-up and annual average growth are significant and yield a decrease in the growth of Internet connections at higher levels of connected households. It could be expected that countries like the Netherlands, Denmark, Austria or Sweden would exhibit low growth, as they have already reached high levels of Internet access.

Taking these observations into account, countries could be classified according to levels of Internet and broadband access in below and above EU average levels which have already been reached. A similar grouping could be applied to the average annual development of internet and broadband connections. France and Luxembourg perform above the EU average as regards the levels and the development of Internet connections, whereas Estonia, Lithuania, Slovenia, Slovakia, Bulgaria and Latvia are below average when it comes to the level and growth of Internet connections. The situation concerning broadband access is more mixed, i.e. the differences between the countries are more pronounced. Germany, Malta and Slovenia show an annual growth and take-up above the EU average between 2008 and 2010, while Turkey, Portugal, Lithuania, Hungary, Romania and Bulgaria are below the EU average. (Eurostat:2011). The statistics on internet connections and broadband access are closely related, as broadband is a type of Internet connection and efforts are being made at both European and national levels to foster broadband access to the Internet. However, not all countries and regions are equally successful in deploying fast Internet connections that enable users to make full use of the potential of the Internet.

The situation for broadband access is to some extent comparable to the development of internet connections. The regions with the highest increase in broadband access are located in the UK (North East, North West), the Netherlands (Drenthe), the Czech Republic (Severozápad), Italy (Sardegna), Croatia Središnja i Istočna (Panonska) Hrvatska) and Germany (Brandenburg, Hessen, Sachsen, Sachsen-Anhalt, Schleswig-Holstein, Thüringen) with an average annual growth of at least 12 percentage points.

With respect to growth of net connections, the regions with the lowest growth (below 1 % point) are located in the Netherlands, Bulgaria, Norway and the UK. With the exception of Severoiztochen (Bulgaria), the regions are well above the EU average in broadband take-up. All regions in Germany, Greece, Croatia, Ireland, Italy and Poland are above the EU average as regards the average annual growth of broadband access in percentage points.

Discussion in the frame of EU2020s targets

The Digital Agenda for Europe is one of the seven flagship initiatives of the Europe 2020 Strategy, set out to define the key enabling role that the use of Information and Communication Technologies (ICT) will have to play if Europe wants to succeed in its ambitions for 2020[8].

The development of high-speed networks today is having the same revolutionary impact as the development of electricity and transportation networks had a century ago. With the on-going developments in consumer electronics, the lines between digital devices are fading away. Services are converging and moving from the physical into the digital world, universally accessible on any device, be it a smart-phone, tablet, personal computer, digital radio or high-definition television. It is projected that by 2020 digital content and applications will be almost entirely delivered online.

Broadband penetration grew by leaps and bounds initially after being widely introduced in the early 2000s. By 2004, in the USA and the UK, over half of internet users were using broadband at home, at the office, or in both locations. However, broadband penetration began to decline rapidly in many Western nations after this point, as early adopters had already picked up the technology and older Internet users felt that they either couldn't afford it or didn't need it. This often occurs with new technology which initially captures the public imagination and then falls off as it reaches peak saturation in the market.

The area of the world with the highest broadband penetration is Asia, which bypassed traditional dial-up access to the internet in many locations and jumped to satellite or DSL broadband services. Europe is next, with

[8] The Digital Agenda is built upon wide consultations, in particular on inputs from the *Digital Competitiveness Report 2009* - COM(2009) 390; the Commission's 2009 public consultation on future ICT priorities; the Conclusions of the TTE Council of December 2009, the Europe 2020 consultation and strategy; and the *ICT Industry Partnership Contribution to the Spanish Presidency Digital Europe Strategy:,* the own-initiative report of the European Parliament on *2015.eu* and the Declaration agreed at the informal Ministerial meeting in Granada in April 2010. All these are available at: http://ec.europa.eu/information_society/eeurope/i2010/index_en.htm.

the Scandinavian countries having the highest rate of broadband penetration. North America follows, with South American and Africa slowly catching up.

In both Europe and Asia, the spread of broadband penetration has been encouraged by countries who support competition between multiple companies and the development of better technology. In some cities, citywide broadband Internet access is provided at low cost, while others such as San Francisco, California have developed initiatives to provide free broadband to all citizens.

Conclusion

More needs to be done to ensure the roll-out and take-up of broadband for all, at increasing speeds, through both fixed and wireless technologies, and to facilitate investment in the new very fast open and competitive internet networks that will be the arteries of a future economy. Our action needs to be focused on providing the right incentives to stimulate private investment, complemented by carefully targeted public investments, without re-monopolising our networks, as well as improving spectrum allocation.

With an increase in affordable technology and competing providers, broadband Internet is affordable for many consumers, who make the switch after being frustrated by slow dial up connections. Many telecommunications companies also try to increase their broadband penetration by offering it as part of bundled phone, Internet, and/or cable services. Combining this with low prices makes broadband appeal to low income subscribers. 70% of Internet subscribers in Western nations were expected to adopt broadband by 2010.

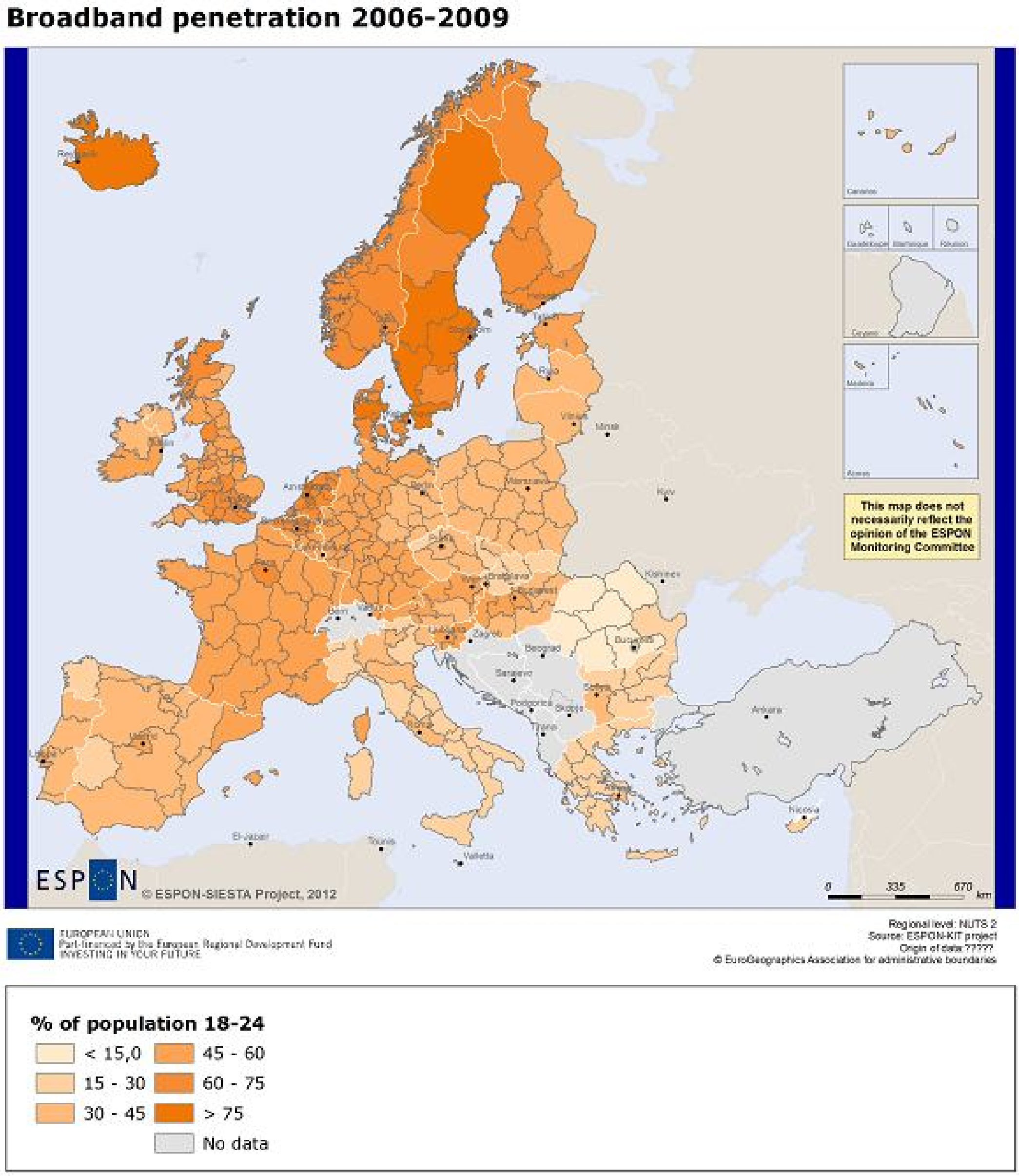
References

European Commision (2010), A Digital Agenda for Europe. COM(2010) 245 final/2 (available at http://www.espon.eu).

European Commission, (2009), *Europe's Digital Competitiveness Report. Main achievements of the i2010 strategy 2005-2009*, Brussels

Eurostat (2011), Information Society, Eurostat Regional yearbook 2011.

OECD, (2000), *The digital divide: diffusion and use of ICTs*, STI/ICCP/IE(2000)9/REV1,OECD,Paris.



Map 23. Broadband penetration rate 2006-2009

1.4. Map 24: E-commerce: individuals who ordered goods or services over the Internet for private use (percentage of individuals)

Definition of the indicator

The indicator under discussion is derived from Eurostat's "Individuals who ordered goods or services over the internet" survey. The survey population consists of all households having at least one member in the age group 16 to 74 years and the reference area encompasses EU-Member States, Candidate countries, Iceland and Norway. Annual time series available from 2006 onwards and published on a yearly basis are exploited for the calculation of the indicator.

Questions around purchases of financial investments (e.g. shares), confirmed reservation for accommodation, online lotteries and betting, directly-paid obtaining information for services via the Internet and purchases that are made via Internet auctions, are included in the survey. On the other hand, goods and services that were electronically bought for free are not taken into account (e.g. free software)[9].

Relevance of the indicator

The ICT and the corresponding economic activities are an integral part of the EU society and economy, transforming the way things are produced and exchanged in profound ways, as already mentioned in previous parts of this section. Measurement and monitoring of the expansion of the Digital Economy and the Information Society through proper socio-economic, business and production indicators is a crucial task of the European 2020's Strategy. Continuous reformation and improvement of the appropriate tools is also required in order for this task to be completed.

The indicator under discussion is considered in the Flagship "A Digital Agenda for Europe". According to the Agenda, the percentage of population buying online should overpass the 50% threshold, the current data being 37% for individuals aged 16-74.

9 Questionnaire respondents are restricted to individuals that conducted the order over the Internet in person, regardless of whether the order was carried out on somebody else's behalf. The respondents usually declare the date that the transaction took place independently of the date of delivery and payment. For further details on methodological choices see: Eurostat, 2012, Methodological Manual for surveys on the ICT Investment/ Expenditure, available at http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/EN/isoc_pi_esms.htm.

In this regard, measuring the diffusion of e-commerce across EU's spatial entities and highlighting its effect on changing economic, social and cultural practices of individuals and families is quite important. As has been highlighted by previous Espon projects, several problems and inequalities have a negative effect on internet development. One aspect of these is the (in) effective penetration of commercial exchanges via Internet, in turn closely related to the uneven access of families and enterprises to relevant facilities. Speeding up interchanges and economic development between different European localities is thus an issue of overcoming limited access to e-commerce.

the ten regions with the highest share			the ten regions with the lowest share			the ten regions with or close to the median share (i.e. 36%)		
MS	Region	individuals in %, 2010	MS	Region	individuals in %, 2010	MS	Region	individuals in %, 2010
UKD1	Cumbria	81,00	BG42	Yuzhen tsentralenden	2,00	AT31	Oberösterreich	39,00
NO07	Nord-Norge	81,00	BG11	North West	2,00	MT00	Malta	38,00
UKH2	Bedfordshire & Hertfordshire	80,00	BG12	North Central	2,00	IE02	Southern & Eastern	38,00
UKH3	Essex	80,00	BG22	South Central	2,00	BE23	Prov. Oost-Vlaanderen	37,00
NL23	Flevoland	77,00	RO11	Nord-Vest	2,00	AT21	Kärnten	36,00
UKJ3	Hampshire & Isle of Wight	77,00	RO31	Sud - Muntenia	2,00	BE34	Prov. Luxembourg (BE)	35,00
UKJ2	Surrey	76,00	BG31	Severozapaden	3,00	CH07	Ticino	34,50
UKJ1	Berkshire	75,00	BG32	Severen tsentralen	3,00	CZ01	Praha	34,00
NO05	Vestlandet	75,00	RO21	Nord-Est	3,00	BE32	Prov. Hainaut	34,00
NL31	Utrecht	74,00	RO22	Sud-Est	3,00	BE22	Prov. Limburg	34,00
Country codes: AT Austria, BG Bulgaria, NO Norway, NL Netherlands, RO Romania, IE Ireland, BE Belgium, CZ Czech Republic, CH Switzerland, UK United Kingdom								

Table 1 / Map 24 - This table shows the ten nuts-2 level regions with the highest, the lowest and the median share of individuals who ordered goods or services over the Internet in 2010.

Discussion of the geographical pattern of map 24

Introductory notes: E-commerce, digital divide and the geography of it all

Much of recent debate and research and policy discussion regarding uneven access to digital services and the Internet has an explicit focus on the idea of the "digital divide", which is a dualistic perception of relative inequality. Other scholars underline that human capital, individual resources and behavioural factors hold an important role regarding the determination of the "digital divide".

Alternative studies focus on how Internet's usage and diffusion is re-produced and transformed; they indicate that interrelated factors such as individuals' consumerist choices, firms' demand and supply strategy, progress in available software tools and institutional provisions (i.e. privacy rules, intellectual property legislation, economic and normative rules) are of great importance. Such factors shape the choices of European citizens regarding e-commerce and the usage of Internet in general, thus re-producing uneven access to the digital economy (Malecki, 2009). However, the question is not only access, but also confidence. Important matters such as fraud, theft and hacking should not be underestimated.

In several perceptions of the new economy and the digital society, geography and spatiality are theorised as of secondary importance; annihilation of space by time, it is said, will unavoidably close the gap between different localities and a homogeneous world of production, commerce and consumption will sooner or later arrive. Yet, as map 24 reveals, the irrelevance of geography remains a misguiding notion, as region and locality do matter if an integrated explanation of the serious gaps of digital technologies and e-commerce penetration is to be explained (Zook and Samers, 2010).

Comparison of existing patterns with macro-regions and ESPON regions

The main divisions that are present in the EU-27 and the candidate countries in terms of e-commerce's diffusion can be categorised as follows:

a) the North/ South division
b) the urban/ rural areas division
c) the new/ old members countries division
d) finally, the advanced/ less developed regions divisions

As in Map 21, these divisions are not clear-cut and they cannot be observed throughout the whole study area as different patterns may exist, while they should be interchangeably used in order to have an integrated theoretical explanation of figures and empirical observations. A departing observation can be that e-commerce regional differences are relatively lower within the national framework, at least when compared to the differences between different European countries. For example, e-commerce's exploitation is relatively low across the regions of Italy, Spain and Greece (i.e. a major part of the Mediterranean basin macro-region), and even in the capital cities and the metropolitan regions of these countries e-commerce is not widely utilised. The same occurs across the regional formations of UK, Norway, Finland, Germany and other countries of the North, though e-commerce is widely accepted and used in these countries.

The above taken as granted, important divisions do exist between the North and the South as well as between old and new members of the EU. In parallel to the state-level differences discussed above, it is indicative that all Central-West Balkan countries along with Greece, Portugal and the South-half of Italy have very low values in e-commerce (*Table 2*). The arc starting from the wider London area towards Benelux and ending at Northern Italy, also known as the EU's 'blue-banana' corridor that was discussed in map 21, is significantly altered in the case of e-commerce. Here, the shape that encompasses the privileged areas of EU, in terms of e-commerce diffusion, takes the form of a 'U' that starts from North Ireland, cross the UK, passes through Benelux, Netherlands and climbs up to the Baltic area until it reaches the edges of North Scandinavian territories.

the ten EU-15 nuts-I regions with the lowest share					
MS	Region	individu	MS	Region	individuals
GR2	Central Greece	8	PT2	Açores	12
ITF	Southern Italy	8	PT3	Madeira	13
GR1	Northern Greece	9	PT1	Continental	15
ITG	Insular Italy	11	GR3	Attica	17
GR4	Aegean Islands & Crete	12	ITE	Central Italy	17
Country codes: ES Spain, FR France, GR Greece, PT Portugal, RO Romania.					

Table 2 / Map 24 This table shows the ten EU-15 nuts-2 level regions with the lowest share of e-commerce, in 2010.

Most regions contained in this ‘U’ are spatial agglomerations of the European North, encompassing cities and rural areas that are relatively well-off and far richer than the Southern EU[10] (*as in Table 1*). It is indicative that all EU-27 nuts-2 regions with the lowest share are in Bulgaria and Romania, and all EU-15 nuts-1 regions with the lowest share are in Greece, Portugal and Italy (*Table 2*).

One explanation behind the relatively low intra-state differences observed can be attributed to the normalising effect of the urban-rural digital division within the regions. In other words, as studies do highlight, individuals living in the cities are more akin to the use of Internet and e-commerce, at least when compared to the rural citizens of the same region. It should not be forgotten that in isolated, rural, mountainous and island communities certain problems of technological infrastructure prohibit the expansion of broadband. But this whole edifice collapses when the Nordic countries are examined, where the opposite has happened: isolation in forests boosted the use of ICTs.

Many regional ‘clusters’ of important ICT employment that were found in the urban regions of Madrid, Dublin, Oslo, Copenhagen and Helsinki are also areas where e-commerce is heavily utilised. This proves that a positive correlation between ICT, digitalised local economies and e-commerce may exist, though specialised studies are required in order to establish this issue. This trend cannot be observed in promising newly acceded members of the East, such as Slovakia, as high ICT diffusion therein is not accompanied by a high penetration of Internet services. Thus investments in innovative sectors may or may not lead to an overall advancement of regional productive and consumerist structures; the outcome seems to be determined by other factors such as growth in terms of GDP per capita, available income, skills and education level, consumerist behaviour and others.

From a theoretical perspective, e-commerce seems to perform better within and around already advanced regions, thus existent agglomerations of economic activities do play an important role for these e-commerce spatial re-arrangements. Despite its independence of the distance factor, e-commerce does not trigger a massive trend towards tele-commuting and settlement in rural areas (Malecki, 2009; ESPON-KIT, 2012).

Discussion in the frame of EU2020s targets

[10] Indicative examples of these advanced regions are Bedfordshire & Hertfordshire and Essex in UK, Utrecht and Flevoland in Netherlands, the Oslo region and Vestlandet in Norway and the Helsinki region in Finland. Yet, the ongoing economic crisis has largely changed the situation across EU, seriously affecting the advanced regions as well.

Relevant EU documentation and guidelines underlines the need to overcome fragmentation in the digital markets of the Union (European Commision, 2010), as the 'Digital Agenda for Europe' has already underlined. It is believed that EU-27 is consisted of many state-based online markets while citizens are prevented by these national barriers from taking advantage of the benefits of a digital unified market.

Two basic indicators which are related to e-commerce can be derived from the Benchmarking framework (2011-2015) endorsed by the EU Member States in November 2009. These are:

- Promoting eCommerce: 50% of the population should be buying online by 2015. (Baseline: In 2009, 37 % of the individuals aged 16-74 ordered goods or services for private use in the last 12 months.)
- Cross-border eCommerce: 20% of the population should buy cross border online by 2015. (Baseline: In 2009, 8 % of the individuals aged 16-74 ordered goods or services from sellers from other EU countries in the last 12 months.)

A comparison of the first indicator with the figures highlighted above discussion and pictured in map 24 signifies that still remains a lot to be done for almost all Southern and East EU-27 regions as well as for the candidate countries, in order for the 50% threshold to be overpassed.

Conclusion: developing e-commerce, enhancing economic cohesion across EU regions

It seems that the digital gap between advanced and less developed regions is in many cases more important that their distance in terms of typical measures of growth such as the GDP. A closer look on map 24 depicts that individuals living in less prosperous and poorly developed regions of the EU are less likely to buy goods or services via the Internet. Thus, those living in such regions face important barriers in their access to online services, while they do not seem to frequently use these services once these difficulties have been overpassed (Zook and Samers, 2010).

Couclelis (2004) questions the territorial liberating limits of e-commerce for both consumers and firms, through studying its effects on traditional locational patterns of the retail sector. She finds out that distance will remain important as e-commerce will not end the physical movements for retail, while regional structure principles are also to remain important for the years to come. A comparison of the first indicator with the figures highlighted in the above discussion and pictured in map 24 signifies that there still remains a lot to be done for almost all Southern and East EU-27 regions as well as for the candidate countries, in order for the 50% threshold to be overpassed. Infrastructural development is not the only important issue here. Research is overdue for the role of hacking and assaults on confidence in ther slow dissemination of e-commerce.

It should not be forgotten that 'commerce' and 'shopping' are both two general terms that are further analysed into a vast amount of activities. These activities may or may not require physical interaction; some of them can be easily and cheaply executed while others are cheaper through the Internet. In any case, commerce has an inherent spatial dimension as it requires real or virtual interaction and movement of goods and/ or individuals between different locations. This is why the uneven regional expansion of e-commerce across the EU, is an sufficient sign of unequal exchange, mediated by digital technology, between individuals of different income, education and background that live in regions of differentiated development, institutions, economy and culture. Any agenda, such as the EU 2020's that fails to incorporate such an analytical discussion of the reasons behind e-commerce's development, will probably fail to address the issue.

E-commerce could offer for a radical transformation of everyday movements and commuting, virtually minimising the gaps between spaces of work-recreation-consumption-living, and contributing to a more sustainable pattern of regional development. The new paradigm of the 'digital society' and the 'weightless economy', with ICTs and e-commerce lying in the core of it, could only turn to a reality if specific policy measures that help in minimising the digital divide and fraud are taken. It should not be forgotten that almost all previous innovations in telecommunications had not managed to close the rich/ poor gap nor had they accomplished goals such as regional homogenisation.

References

Couclelis, H. (2004), Pizza over the Internet: e-commerce, the fragmentation of activity and the tyranny of the region. Entrepreneurship & Regional Development, v16.1, pp. 41-54.

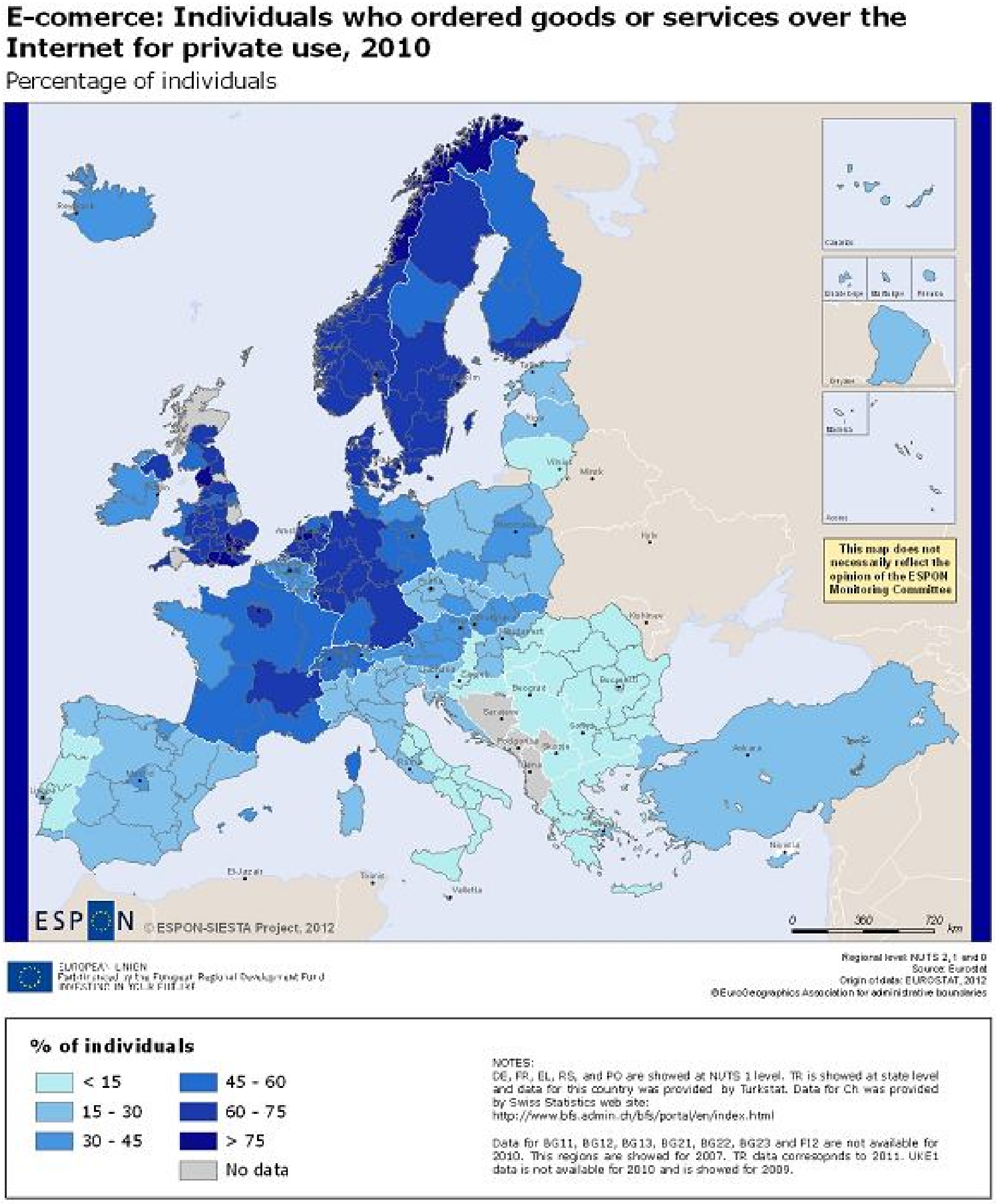
European Commision (2011), The urban and regional dimension of Europe 2020, 7th progress report on economic, social and territorial cohesion. Luxembourg: Publications Office of the European Union (doi:10.2776/50938).

European Commision (2010), A Digital Agenda for Europe. COM(2010) 245 final/2 (available at http://www.espon.eu).

European Commission (2010), Investing in Europe's future. Fifth Report on Economic, Social and Territorial Cohesion. Luxembourg: Publications Office of the European Union.

Malecki E. (2009), The Economic Geography of the Internet's Infrastructure. Economic Geography, v.78.4, pp. 399–424.

Zook, M., and Samers, M. (2010), Tele-mediated servants and self-servants of the global economy: labour in the era of ICT-enabled e-commerce. In McGrath S., Herod A. and Rainnie A., 2010, Handbook of employment and society: working space. E. Elgar, Massachusetts, pp. 124-143.



Map 24. E-commerce: individuals who ordered goods or services over the Internet for private use

1.5. Map 25: Individuals who have never used a computer

Definition of the indicator

There is no explicit eurostat’s definition for this indicator. The terms 'computer literacy' or 'ICT literacy' are commonly used in various contexts, with variations such as 'IT literacy' or 'technology literacy'. As reflected by the terms themselves, these concepts typically emphasize the aspects of knowing and being able to use computers and related software.

Since the late 1990's, however, when the understanding of the needs for reflective skills in technology usage began to increase (Martin, 2008), more advanced interpretations can also be found. According to Bawden's review (Bawden, 2001) computer literacy has been most commonly considered in the literature through a pragmatic skills-based approach:

"In practice, this translates to an introduction to the skills required to operate a variety of computer applications packages – word processing,

databases, spreadsheets, etc. – together with some general IT skills, such as copying disks and generating hard-copy printout."

This narrow understanding of the skills required for computer use is quite frequent. This often results in educational settings in tool-oriented approaches, where teaching is reduced to relatively trivial software instruction. However, there are also examples of broader definitions of computer literacy, which go beyond the simple skills approach and involve their critical usage for personal and social benefit. Bawden (2001) cites some early examples such as:

• ‘whatever a person needs to be able to do with computers and know about computers in order to function in an information-based society’ (Bawden, 2001)

• 'computer literacy has to do with increasing our understanding of what the machine can and cannot do' (Bawden, 2001)

Relevance of the indicator

For the purpose of this project it is useful to use as key indicator, the percentage of people/individuals who do not use personal computer, in order to have a basic evaluation of the digital divide of a country. The European Union has a module on the use of ICTs among individuals that annually collects detailed information on this subject but it is of relative importance for the purpose of this report because it only covers European member states. There are also basic macro-data available worldwide on the use of the Internet[11].

Differences in access to information and communication technologies (ICTs), such as computers and the internet, create a "digital divide" between those who can benefit from opportunities provided by ICTs and those who cannot. Most OECD countries have specific policies to foster the use on ICTs and the rationale for most of these policies is that there are large social benefits from diffusing ICTs more widely through the economy and society due to large spill over and positive externalities associated with diffusion, greater use and improvements to the skill base. Furthermore, due to the large network effects associated with ICTs, there are positive efficiency and multiplier effects associated with diffusing ICTs more widely and raising ICT skills throughout the economy (OECD, 2000).

[11] (http://www.internetworldstats.com/stats.htm)

This table shows the percentage of individuals who have never used a computer 2011								
the ten regions with the highest percentages			the ten regions with the lowest percentages			the ten regions with or close to the median (i.e. 22,0)		
MS	Region		MS	Region		MS	Region	
BG11	North West	66	NO05	Vestlandet	1	CZ03		21
BG12	North Central	66	NO01	Oslo og	2	ES24	Aragón	21
BG22	South Central	66	NL23	Flevoland	3	CZ0	ČESKÁ REPUBLIKA	22
BG23		65	UKD1	Cumbria	3	CZ05	Severovýchod	22
BG1		64	UKJ3	Hampshire & Isle	3	CZ06	Jihovýchod	22
BG13		62	IS		3	ES51	Cataluña	22
BG2		58	IS0		3	AT11	Burgenland (AT)	22
RO22	Sud-Est	55	IS00		3	CZ08	Moravskoslezsko	23
RO31	Sud - Muntenia	55	NO04		3	IE01	Border, Midland and Western	23
RO41	Sud-Vest Oltenia	55	NL32	Noord-Holland	4	ES2	NORESTE	23
			SE1	ÖSTRA SVERIGE	4	ES21	País Vasco	23
			SE11	Stockholm	4			
			SE12	Östra Mellansverige	4			
			SE23	Västsverige	4			
			UKD2		4			
			UKF3	Lincolnshire	4			
			UKG2	Shropshire & Staffordshire	4			
			UKH2	Bedfordshire& Hertfordshire	4			
			UKH3	Essex	4			
			UKI1	Inner London	4			
			NO0		4			

Table 1/ Map 25 - This table from Map 25 shows the ten nuts-2 level regions with the highest, the lowest and the median share of individuals who never used a computer (2011).

This table shows the percentage of individuals who have never used a computer (average 2006-2010)								
the ten regions with the highest percentages			the ten regions with the lowest percentages			the ten regions with or close to the median (i.e. 26,93)		
MS	Region		MS	Region		MS	Region	
BG11	Bulgaria	69	UKD1	Cumbria	5	ES51	Cataluña	27,5
BG22		67,5	NO04	Agder og	5	HU22	Nyugat-	27,25
BG12		66,5	NL23	Flevoland	4,8	LV00	Latvija	26,5
BG23		66,5	SE12	Östra Mellansverige	4,6	UKM3	South Western Scotland	26,5
BG1		65,5	SE23	Västsverige	4,6	SI0		26,25
BG13		63,5	NO0	Norway	4,3	CZ0		25
BG2		59,5	SE1		4	AT11		24,6
EL2		59,5	IS00	Ísland	4	UKE1	East Yorkshire	24,5
RO31	Sud - Muntenia	59	IS0		3,6	ES3		24,1
RO41	Sud-Vest Oltenia	58,25	NO01	Oslo og Akershus	3,6	ES30	Comunidad de Madrid	24,1
			SE11	Stockholm	3,5			

Table 2/ Map 25 - This table from Map 25 shows the ten nuts-2 level regions with the highest, the lowest and the median share of individuals who never used a computer (average 2006-2010).

Discussion of the geographical pattern of map 25

Introductory notes

Comparison of existing patterns with macro-regions and ESPON regions

Discussion in the frame of EU2020s targets

Skill in computer use not only transforms economic possibilities but also the lives of those who are influenced by such technological change. Moreover there is evidence that shows how the use of new technologies can lead to greater public participation, providing the public with new tools to make their voices heard (European Commission: 2009). For all these reasons, the use of personal computer and/or the internet can foster people's capabilities and it has been included in the list of smart growth indicators defined by the Agenda of Europe 2020 and it is of paramount importance in the evaluation of the social dimensions for development.

Not having access to a computer at home in 2010 is certainly a sign of being, if not excluded, at least left aside of the information society. But a step further in the direction of an increased distance with the information society is mirrored by the situation of never having used a computer. To be in such a situation for an individual is the outcome of many different factors.

Employment is significantly associated with computer non-use. Being unemployed is systematically associated with a higher probability to never have used a computer, compared to employed people. The probability to have never used a computer decreases with the levels of educational attainment, density of population, and income. In general, the higher the levels, the smaller the probability. Education levels have by far the strongest and the most widespread effect across countries. The probability of having access to a computer at home generally increases with the population density of the region where the household lives. In the EU 18+2 aggregate area (European area), households located in urban areas have a 33% higher probability of having access to a computer at home than households living in thinly populated areas. In three countries only (Greece, Latvia, and the Netherlands), the probability follows a U shaped pattern: it is the highest in medium-dense populated areas, the lowest in low-dense populated areas, and in between in the highly dense populated areas. Denmark and Bulgaria show the biggest gap between the different types of regions of residence: individuals located in urban areas are respectively 2.5 and 3 times more likely to have access to a computer at home than those living in thinly populated urban areas.

Conclusion

There are two main reasons for countries to develop policies that help to reduce the digital divide: the first is economic development or innovation and the second is social inclusion or the reduction of a level of inequality that tends to become too high. Traditionally, the first reason is more important for governments and corporations, though legitimizing digital divide policies usually is framed more in terms of social inclusion and access for all. Clearly, “digital divide” levels reduce the potential of the labour force and of innovation. Advanced high-tech societies cannot afford to exclude about a third of their potential labour force and of all talent for innovation that it contains.

Moreover, information and communication technology is considered to be a growth sector in the economy that should be supported in global competition. With regard to economic development and innovation the digital divide statistics in the former section must be matter of serious concern for the EU.

References

Bawden, D. (2001). Information and digital literacies: a review of concepts. *Journal of Documentation, 57*(2), 218-259.

Chirkov V. I., (2001), Culture, personal autonomy and individualism: their relationships and implications for personal growth and well-being, University of Saskatchewan, Saskatoon, SK, Canada.

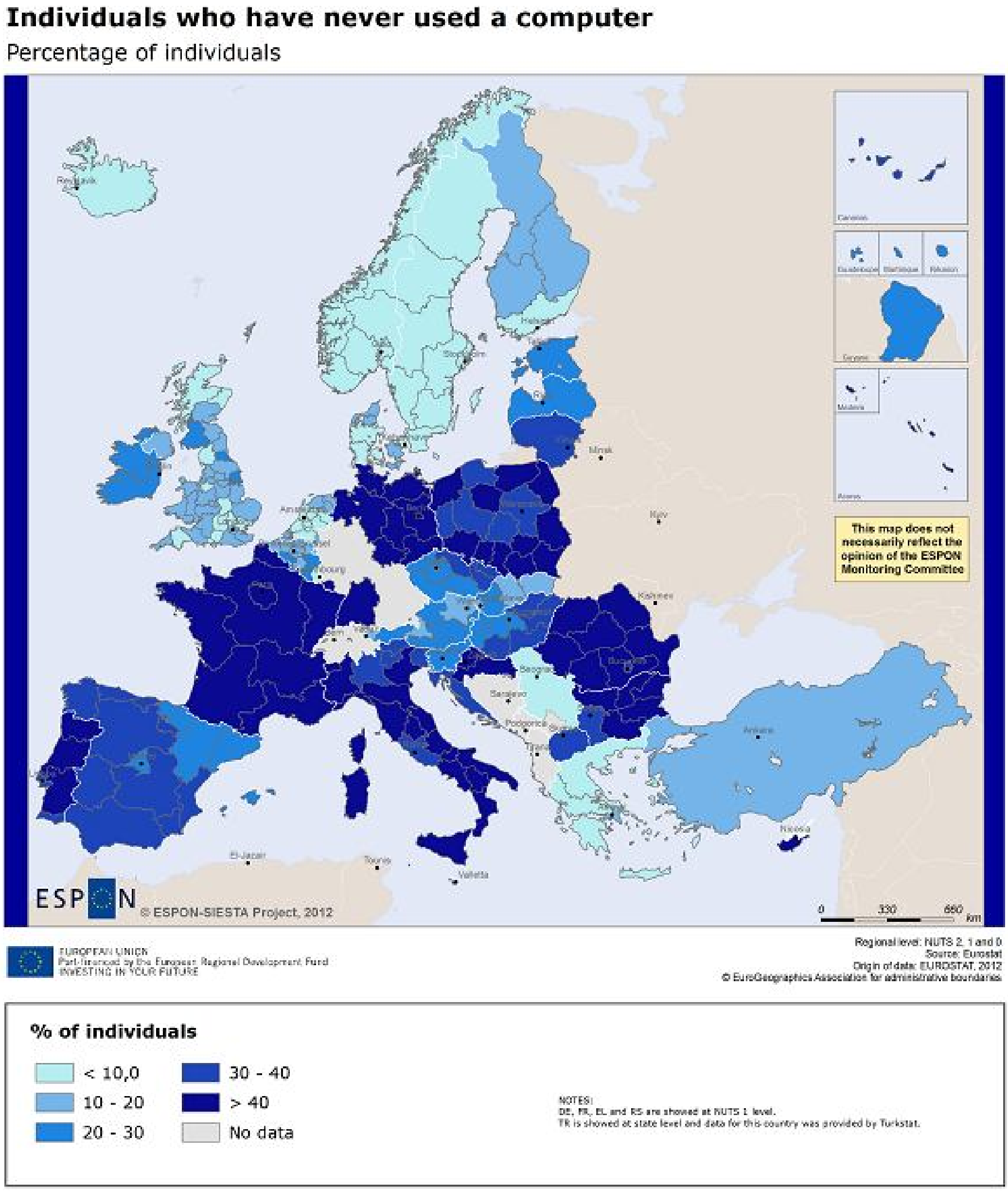
European Commision (2010), A Digital Agenda for Europe. COM(2010) 245 final/2 (available at http://www.espon.eu).

European Commission, (2009), *Europe's Digital Competitiveness Report. Main achievements of the i2010 strategy 2005-2009*, Brussels

Martin, A. (2008). CHAPTER SEVEN: Digital Literacy and the "Digital Society". [Book Chapter]. Digital Literacies:Concepts, Policies & Practices, 151-176.

OECD, (2000), *The digital divide: diffusion and use of ICTs*, STI/ICCP/IE(2000)9/REV1,OECD,Paris.

Ryan R. M., Deci E. L., (2000), "Self-determination theory and the facilitation of intrinsic motivation, social development and well-being", American Psychologist, 55, 68-78.



Map 25: Individuals who have never used a computer

PART 2.

2. EU2020S Digital Societies: Systematization and policy guidelines related to 5 maps

The growing importance of Information and Communication Technologies (henceforth ICTs), digital penetration, wireless communication and social media in economic, political and socio-cultural development comes to stark contrast with the scarcity of available research on their societal role. The rapid transformation of digital societies has been felt by present generations who were living adult lives without a mobile phone until the mid-1990s, or without a computer, for that matter. After briefly discussing above what is seen in each of the maps, we now turn to what they represent all together, what is left out of them, and what policy guidelines towards “Smart Growth” can be concluded from them – although obstacles and action areas detailed in the flagship initiative “A Digital Agenda for Europe” (summarized in Lois Gonzalez ed., 2012: 25-28) are not really relevant with mapping as such. Nevertheless, we will try to territorialize the flagship initiative “A Digital Agenda for Europe” in combination with the flagship initiatives “Innovation union”, “Youth on the Move”, and “an Agenda for New Skills and Jobs”, which are all relevant with it and are basic dimensions of “Smart Growth”.

The fascinating task of discovering and then explaining geographies of the digital society in Europe and globally, is certainly diminished by the necessity of using the few available disaggregated data plotted into some crude indicators.[12] The 5 ESPON-SIESTA maps presented above, in accordance with EU2020S guidelines (Lois Gonzalez ed. 2012), have prioritized indicators on producers (people working in the ICT sector, patents) and users of wireless communication via computers (broadband

[12] “Such indicators might include, for example: the number of computer shops and Internet café’s, or the per capita number of cellular phones (which increasingly incorporate IT services) as some proxy for the availability of physical access; the range of e-services provided by the local authority and number of hits on their website as a measure of flow; and the number of government services providing different forms of reply or interactivity as a proxy for the attitude of the local authority to public participation (Smith, 2001). These are only rather crude indicators and clearly suggest that some focused survey work is always required to supplement them, and achieve a minimum of intelligence out of such measures.” (Craglia et al. 2004: 61).

penetration, e-commerce, no computer). In this respect, the maps fall into the two broad categories of production vs consumption, i.e. **innovation** in ICTs vs societal **penetration** and dissemination of digital technology. So Maps 21 and 22 more or less relate with production (though Map 21 not exclusively) and can be discussed with reference to ESPON KIT (2012), while maps 23, 24 and 25 can not. These relate with consumption and dissemination – which may approach production as digital technologies become more interactive!

2.1. Regional and urban weaknesses or challenges

We start with a systematisation of the regions or cities (using if applicable macro-regions and ESPON types of regions) suffering production or consumption weaknesses and presenting challenges to Digital Societies. This systematisation of regions was certainly done above, map by map. It was shown that weaknesses occur on the Eastern and Southern periphery of Europe especially as concerns broadband penetration (weakest Balkans, Map 23), e-commerce (Map 24, worst Southern Europe), and individuals who have never used a computer (Map 25b). However, the core/ periphery dichotomy weakens in the case of production. Though it persists on Map 21, i.e. people working at the ICT sector (where the weakest are the south-eastern regions), it vanishes on Map 22. This map of course does not show a measure of patent applications in each region, but only the intensity of ICT patents in relation with other sectors.

However, Map 25a introduces the time dimension as a complication, with the EU core as rather disadvantaged in this respect until 2010, but springing to a strong position in 2011. This is an adequate hint, that the assessment through mapping is not adequate or reliable, not only because of the risks of the 'ecological fallacy'. Reversals in Maps 25 a and b may hide opportunities in other respects. There were alternative opportunities for populations in the EU core who had never used a computer until 2010. Map 25a, indicating lesser penetration of computers in the dense European core at these earlier dates, must be seen in its geographical context. France was content with teletext for a long time and did not create as important a digital dependence as peripheries of the EU. The high percentage of population who never used a computer till 2010, could be related with this and, more recently, with more sophisticated digital infrastructure like cellphones incorporating IT services, i-pods, etc. This can only be resolved with additional data and surveys.

Besides the above example, peripherality has interesting contradictory impacts. It often disadvantages ICT development, but also often creates dependence on computers and wireless technology. Scandinavian supremacy and innovations must be seen in the context of the relevant landscapes. Forests with a very sparse settlement pattern are quite important for the boost of production and penetration there. The Greek islands are also a positive environment. Though production here has lagged, there is a very fast penetration of ICT usage, especially boosted by residential tourism (Leontidou 2006).

Through the above two examples and many others not discussed here, we come to realize that the mapping of indicators is not sufficient. Research is a meticulous process and mapping is only a first step. “Surveys are likely to be necessary at any rate to address particular areas of disadvantage, and capture more qualitative measures of relevance, use, and need of Internet-based information and services. As an example, and following the recommendations of the e-inclusion report (CEC, 2001) the number and extent of local on-line community initiatives in disadvantaged neighbourhoods are important indicators to be developed to ensure that cumulative social exclusion is not ignored or hidden inside average city-wide measures.” (Craglia et al. 2004: 61).

With reference to consumption or ICT dissemination, all maps corroborate the general agreement that income and GDP relate positively with digital penetration rates (Castells et al. 2004: 9-10). Weaknesses concentrate where digital exclusion or illiteracy occurs. It has been pointed out several times that «the digital revolution has transformed the lives of many, but also has left untouched the lives of many others. As a result, a large segment of the world population misses out on the tremendous political, social, economic, educational, and career opportunities created by the digital revolution. This gap between the information haves and have-nots is commonly referred to as the *digital divide*» (Yu, 2002: 2). This has snowball effects towards poverty and disadvantage. “The distribution of benefits is far from evenly spread. As argued by the e-inclusion report of the EC (CEC, 2001), whilst Internet usage increases in all groups, access gaps are getting broader. Moreover, digital exclusion is frequently cumulative, adding to other social disadvantage.” (Craglia et al. 2004: 54-55).[13]

[13] “As shown by the report, people with low income, the less educated, and the unemployed are well below the average level of Internet access; older people and the disabled are another particularly disadvantaged group; and gender differences are particularly strong within groups that are disadvantaged for other reasons. The e-inclusion strategy put forward by the document rightly recognizes that it should be part of broader actions aimed at combating social exclusion.” (Craglia et al. 2004: 54-55).

It is to these problems – social in addition to territorial – that current and future research ought to be directed, if weaknesses in ICT development are to be targeted. The geographical distributions of income and GDP do not explain the whole range of variations. “Beyond economic indicators, there are other factors such as culture and government policy, that may influence the rate of wireless technology penetration (Castells et al. 2004: 10). There are also strong geographical factors which may supersede income and GDP, as the analysis of Map 25 illustrates. “In the competition among member states, regions, and cities to win the prize for the `most connected', the danger is that the emphasis will continue to be given to measures of physical access, and much less on social access (Kling, 1999), that is, the extent to which users have the ability to search, retrieve, interpret, and use the information they are seeking. Moreover, that pockets of disadvantage will be conveniently ignored to concentrate on average measures.” (Craglia et al. 2004: 54-55).

As to ICT production, policy guidelines are complex and impossible to detail in view of the two relevant maps. ESPON KIT (2012) includes research leading to policy-relevant conclusions in this respect. What can be commented upon here is employment policy. A shortage of ICT practitioners is mentioned by the Agenda (Lois Gonzalez ed. 2012: 30, 38), at the same time when ICT experts are released into unemployment, redundant, especially in the European South worst affected by the crisis. Map 21 most probably reflects the shortage of ICT jobs. This relates in a negative way with the flagship initiative “an Agenda for New Skills and Jobs” and in this, policy is essential. Besides wasting achievements of educating a population in e-skilled jobs for the Digital Society, the ‘brain waste’ of ICT workers is a serious matter, also mentioned by the EU2020S (Lois Gonzalez ed. 2012: 37). Policy for employment creation and insertion in the Southeast and the Southwest of Europe is urgent, especially given the economic crisis.

Map 22 underlines the above weaknesses… …

2.2. Regional and urban strengths or potentials

The systematisation of the regions or cities (using if applicable macro-regions and ESPON types of regions) showing strengths in the context of Digital Europe, is basically the other side of the coin. Europe is quite strong in ICT development globally, though the systematisation of regions done above shows that strengths decline as we move to the Southern and Eastern periphery of the EU. By contrast, the Nordic countries are important and have innovated globally in ICT development.

This started with the mobile phone. Cellphone penetration moved from North America in the early 1990s to Europe in the new millennium. This “shift in the trend can be attributed to the spillover effects from the four Nordic European countries that propelled Europe into the forefront of wireless communication technology usage. Europe ... has followed most closely the classic S-shaped diffusion curve for mobile adoption, while North America and Asia have relatively more gentle trends. At this point, a second observation that stands out is the growth spurt experienced in Europe between 1997 and 2000.” (Castells et al. 2004: 7). “Nordic countries worked together in the establishment of an European standard normative, GSM, which is, indeed, one of the factors that helped the diffusion of mobile telephony in the continent ... The GSM standard was assumed by all the EU members, meaning that the same standards had been imposed in the richer part of the continent (Agar, 2003).” (Castells et al. 2004: 13).

Strengths and potentials have spread from the cellphone to the computer and the Internet. They mostly concentrate in cities. Metropolitan areas do not figure as particularly stronger in two of the maps, but they do figure as exceptional in e-commerce (Map 24) and people employed in the ICT sector (Map 21). In these respects, mapping shows that cities are dense concentrations. The same holds for the dissemination of social media, since many urban environments are rich in information systems and data sources. “Cities are particularly affected by the impacts of ICTs. Although early analysis predicted that the development of ICTs would be the `death of distance' (Cairncross, 1997) rendering the urban agglomerations meaningless, the evidence points to the contrary: cities remain very much the central nodes of power relations and communication infrastructures even in the new digital economy (Castells, 1996).” (Craglia et al. 2004: 54).

In the case of other indicators, however, peripherality apparently creates ICT dependence. Worldwide, “the countries with the highest urbanization levels do not have the highest mobile penetration rates. Uruguay and Argentina are the most urbanized but have the eighth and sixth highest mobile penetration respectively.” (Castells et al. 2004: 8).

The strength of the Internet currently is not only that it connects remote locations, but that it also becomes increasingly interactive. This exchange, communication, interaction and movement cannot be captured in a cross-sectional figure on a map. Other means are necessary to understand the rapid movement of “multimodal communication from anywhere to anywhere where there is the appropriate infrastructure” (Castells at al. 2004: 1) or “the deep connection between wireless communication and the emergence of a youth culture (that leads to what we call a mobile youth culture)" (Castells et al. 2004: 3), or "the transformation of language by texting and multimodality, the growing importance of wireless communication in socio-political mobilization, 'particularly outside formal politics' (p.3), or changes in the practice of time and space resulting from wireless communication." (Castells et al. 2004: i), or other such strengths with particular geographical consequences.

2.3. Policy guidelines for a Digital Europe

Introduction

The scarcity and poverty of research on digital societies has boosted the imaginations of visionaries, futurologists, planners and artists at least until the turn of the millennium, often with views which subsequently proved to be wrong (e.g. Cairncross 1997). We still run such a danger, if we rely on maps for the production of policy guidelines.

The ESPON SIESTA project expects a set of policy guidelines not expressed thematically, but in a territorial way (for instance, the need to cooperate between regions in such a direction). It is necessary to refer here to the policies already existing of the EU, and the EU2020S itself, which are territorially weak. Several of them concerning production, innovation and the knowledge economy are detailed in ESPON KIT (2012) by a methodology wherein maps are secondary and auxiliary. Its findings confirm that a minimal basis of knowledge and R & D is the presupposition for new initiatives to take root and flourish. Nothing can be achieved by directing funds towards retarded regions.

The present mapping exercise does not contain enough data to supersede those policy proposals, which are based on case studies as well as mapping. From the examination of the 5 maps we have already proposed some policy guidelines from the perspective of employment in order to combat uneven regional development, since Map 21 mostly reflects the shortage of ICT jobs rather than the shortage of ICT expert personnel. Policies for employment creation and insertion in the Southeast of Europe are urgent, especially given the economic crisis. However, even in this, the maps do not deal with two important qualifications: (1) the very "transformation of the work process and of the work place by wireless communication" (Castells et al. 2004: 2) and (2) the fact that "the more a technology is interactive, the more it is likely that the users become the producers of the technology in its actual practice" (Castells et al. 2004: 1).

Besides, we should be in full awareness that still, 8 years after Castells et al. (2004) produced a report on wireless communication, “because of the novelty of the phenomenon and the slow motion of traditional academic research to uncover new fields of inquiry, the stock of contrasted knowledge on this subject is too limited to grasp empirically the emerging trends that are transforming communicative practices.” (Castells et al. 2004: 1).

Limitations of ESPON-SIESTA Maps

There is a scarcity of research in new phenomena of ICT development, and a low level of insertion of ICT developments into the social sciences. Policy guidelines are thus a difficult task, given limitations of data availability, not only in EUROSTAT and beyond. Social surveys are urgently needed to understand and explain. An additional difficulty is that policies for a Digital Society **cannot** be formulated in a territorial way, except for the obvious aspect of cooperation between regions, which is facilitated by networking, social media and the interactive opportuninies offered by ICTs. Otherwise, policies must be formulated thematically. In fact, the advent of the Digital Society signals what has been called by many «the process of *convergence*». Territorial integration is almost automatic and takes place at one or many of the following levels (van Dijk: 7):

1. infrastructure – for example combining the different transmission links and equipment for telephone and computer (data) communications;
2. transportation – for example Internet telephony and web TV riding on cable and satellite television
3. management – for example a cable company that exploits telephone lines and a telephone company that exploits cable television;
4. services – for example the combination of information and communication services on the Internet;
5. types of data – putting together sounds, data, text and images

Another major limitation of the maps and the additional sets of data for the discussion of policy guidelines for the Digital Society, is that the rapidity of transformation makes “descriptive data become rapidly obsolete” (Castells et al. 2004: 2). The ESPON-SIESTA maps have been constructed to represent a small set of indicators among many, in one time period. The indicators mapped are rather out of date even two years after data collection, in the face of a rapidly changing reality, and they do not capture at least two time periods in order to help us assess ICT change and diffusion of wireless communication, which is rather more important than a cross-sectional image of it, as the comparison of Maps 25 a and b demonstrates. The limited availability of diachronic cross-country indicators has often blocked the ESPON-SIESTA ambitions. In addition, there are sources for additional indicators which the EU2020S has not tapped, probably because they are not within its priorities.[14] As ICT develops, additional indicators can be created, digitally.[15]

The maps do not capture the new interactive Digital Societies, nor the diversity of alternative ICT infrastructures and interactions among actors, cities and regions in the different countries. As already a comparison between Maps 21 and 25 has shown, there are complexities, with some places poor in one respect of digital technology and rich in another, which can be only understood by surveys in particular locations and markets. "There are different ways of accessing the Internet or other data sources wirelessly, such as via cell phones, pagers, laptop computers, PDAs or other specially designed devices, such as the Blackberry." (Castells et al. 2004: 29).[16] The ESPON-SIESTA maps are heavily tilted towards one aspect of ICT penetration, i.e. computers, and they also stop at the time when these started to merge with cellphones, which increasingly incorporate IT services, especially after the generalization of wi-fi access. Digital infrastructure has now become more sophisticated and i-pods have appeared.

---

[14] "A number of indicators have been developed at the European level to benchmark progress in the implementation of the e-Europe framework (see http://europa.eu.int/information society/eeurope/2002/benchmarking/index en.htm). The indicators reflect the priorities of e-Europe and therefore focus on cheaper and faster Internet access, working with information technology skills, public participation, e-commerce, and the availability of government and other services on-line. Under each of these headings there are several indicators used, some of which are relatively straightforward, such as percentage of the population regularly using the Internet, or number of computers at school per 100 pupils, whereas others are rather debatable, such as measuring `participation' through the number of Public Internet Points per 1000 inhabitants and percentage of central government websites." (Craglia et al. 2004: 60).

[15] "Automated ways of identifying the locations of Internet users are becoming increasingly sophisticated (see, for example, Atlas of Cyberspace at http://www.cybergeography.org/atlas/ and The Economist, 2001), and set to increase with the development of location-based services. However, the exploitation of such sources of data faces two main challenges: commercial sensitivity, and therefore access, and the need to have the full and informed consent of the data subjects for secondary analysis." (Craglia et al. 2004: 61).

[16] "Technological standards, for example the relatively unsuccessful Wireless Application Protocol (WAP) developed in Europe for cell phone web browsing, or the more successful Japanese I-mode system, Wide Area Networks (WANs), and wireless Local Area Networks (WLANs) or Wi-Fi also represent different ways of organizing wireless data access, that are being used in different markets." (Castells et al. 2004: 29).

The ESPON-SIESTA maps do not disregard the importance of the cellphone, social media and e-learning in social transformation, but omit them for lack of appropriate disaggregated data. By contrast to a necessarily limited mapping exercise, therefore, policy guidelines must take into account several additional aspects of ICT technology and use, which the EU2020S has not tapped. Examples are the penetration of the cellphone, the use and width of social networks, and the institutionalization of e-learning. These important aspects of Digital Societies with relevance to producing policy guidelines, deserve at least this brief mention here.

Conclusion on Digital Societies

We have stressed that mapping a few crude indicators with availability as the basic criterion, is very interesting in understanding European spatial patterns, but inadequate for explanation and for a systematic list of policy guidelines. The comparison of patterns among the 5 maps and between these 5 and the rest of the maps of ESPON-SIESTA, can certainly not identify the economic, geographical, industrial, governmental policy and socio-cultural factors affecting the adoption of wireless communication technology in different regions and countries (as in Castells et al. 2004: 35-38), and the impact of this adoption on societies. Our few policy guidelines, which are relevant with the flagship initiative “A Digital Agenda for Europe”, must be read in combination with policy guidelines for the flagship initiatives “Innovation union”, “Youth on the Move”, and “an Agenda for New Skills and Jobs”. The above are to be found in many EU (and national) policy documents concerning the development of digital society in Europe as a whole. In general policy terms the main (unanswered) question still is: is the advancement of digital society primarily an economic project, is it a political one, or is it targeted towards social and cultural considerations and concerns? The EU is in the middle of a crisis which makes the adoption of demanding policies problematic or unlikely, and that’s an understatement.

In the mapping exercise, we have followed the route of all researchers who seek “less rigorous but pragmatically feasible indicators that capture at least some of the dimensions identified.” (Craglia et al. 2004: 61). However, infrastructure, high-speed broadband connections, and high Internet velocity access is a very small part of the story. There is a “need to focus not just on measures of physical access to the Internet but also on the extent to which the information available can make a difference to the quality of life, for example, through better provision of services, more direct dealing with government, greater participation, stronger community action, and whether the citizens across social and economic groupings have the skills, education, and knowledge necessary not only to access such information, but also to interpret it and use it to their benefit (social access)." (Craglia et al. 2004: 60). In any case, the projection is that as the older generation passes out, "digital illiteracy" will become more scarce in Europe.

ICTs tend to form clusters of production, which create inequalities and uneven regional development, as the ESPON KIT (2012) project indicates. This, however, is balanced out by networks of penetration and communication, which contribute in territorial cohesion through the facilitation of interaction among people, collectivities, cities, regions, universities, enterprises, institutional units, and several other entities. The high share of GDP invested in R&D (over 3%, see Lois Gonzalez ed. 2012: 21,23-24), the provision of infrastructure, high-speed broadband connections and Internet velocity access are therefore useful in promoting territorial cohesion, but do not seem to be the exclusive ways forward, and certainly not necessarily conducive to the knowledge society (ESPON KIT 2012).

Planners and policy makers could work the other way round in order to engage populations in the digital society. It is doubtful that the improvement of high-speed broadband connections is a policy guideline which will boost demand for the Internet, nor can this be created by "educating" people who are "digitally illiterate" (Lois Gonzales ed. 2012: 27, 38, 42). Rather, the EU should encourage the activation of interest and involvement by supporting activities presupposing interaction within the Internet. Populations may be encouraged to seek physical access to the Internet and to improve their skills by the modernization of public administration, by improvements in e-Government and e-Learning, which will contribute towards the improvement of their quality of life. During the crisis in Europe, the Digital Society points to a way forward, provided that policy makers encourage several ICT-assisted low-cost activities which would be otherwise impossible or unaffordable.

Finally, it has to be pointed out that in general we have to distinguish between the 17 EU member states (eurozone members), the more recent entrants to the EU, and the rest of the European countries which are not part of the EU. There are differences across and among them. The question is, which type of model will the EU, and Europe more generally, itself follow in order to regulate and develop the «digital society». At least three types of thinking regarding future developments can be discerned:

firstly, the (neo)liberal model of deregulation; secondly, and in some opposition to that, we still have the European public service/public utility model which is directed towards the role of governments to regulate the field; and, finally, at EU member-state level, there are national models to consider.

The positive projection we have already stressed in the beginning is that in this interactive Digital Society there is a very concrete «process of *convergence*». Integration is almost automatic and takes place at many levels (van Dijk: 7), especially via social networking sites. European integration and territorial cohesion will certainly benefit from any policy for the facilitation of such communication.

References

[see also references after each one of the 5 maps]

Agar, J. 2003. *Constant Touch: a Global History of the Mobile Phone*. Icon Books, UK

Cairncross, F. 1997. *The Death of Distance: How the Communication Revolution will Change our Lives* . Orion, London

Castells, M. 1996. *The Rise of the Network Society*. Blackwell, Oxford

Castells, M., Fernandez-Ardevol, M., Linchuan Qiu, J. & Sey, A. 2004. *The Mobile Communication Society: A cross-cultural analysis of available evidence on the social uses of wireless communication technology*. Annenberg School for Communication, University of Southern California, Los Angeles

CEC 2000. *e-Europe: An Information Society for All*. Commission of the European Community, Brussels

CEC 2001. *e-Inclusion: The Information Society's Potential of Social Inclusion in Europe*. SEC (2001) 1428, Commission of the European Community, Brussels

CEC 2002. *e-Europe 2005: An Information Society for All: Action Plan*. COM(2002) 263, Commission of the European Community, Brussels

Craglia, M., Leontidou, L., Nuvolati, G., Schweikart, J. 1999. *Evaluating the Quality of Life in European Regions and Cities: Theoretical Conceptualisation, Classical and Innovative Indicators*. CdR- Studien, E-197/99, four languages, Office for Official Publications of the European Communities, Luxembourg

Craglia, M., Leontidou, L., Nuvolati, G. & Schweikart, J. 2004. Towards the development of quality of life indicators in the 'digital' city. *Environment & Planning B: Planning and Design*, vol. 31, no 1: 51-64

ESPON KIT (Knowledge, Innovation, Territory) project 2012. Draft Final Report (v. 6/6/2012), (available at

http://www.espon.eu/main/Menu_Projects/Menu_AppliedResearch/kit.html)

Kling R. 1999. Can the `next generation internet' effectively support `ordinary citizens'? *The Information Society* 15, 57-63

Leontidou, L. 2006. European Informational Cultures and the Urbanization of the Mediterranean Coasts. In Giaoutzi, M. & Nijcamp, P. (eds) *Tourism and Regional Development: New Pathways* (Ashgate, Aldershot): 99-112

Leontidou, L. 2010. Urban social movements in 'weak' civil societies: The right to the city and cosmopolitan activism in Southern Europe. *Urban Studies*, 47, 6, Special Issue *Cities, Justice and Conflict*: 1179-1203

Leontidou, L. 2012. Athens in the Mediterranean "movement of the piazzas": spontaneity in material and virtual public spaces. *City: Analysis of Urban Trends, Culture, Theory,Policy, Action*, vol. 16, no 2: 279-292

Lois Gonzalez, R.C. (ed) 2012. *SIESTA - Spatial Indicators for a 'Europe 2020 Strategy' Territorial Analysis - Background Analysis* - Version 2/12/2011 (Updated 30/3/2012), University of Santiago de Compostela

Smith, R.S. 2001. *Public Participation in the Digital Age: A Focus on British Local Government*. PhD dissertation, Department of Town and Regional Planning, University of Sheffield, Sheffield

van Dijk, J. 2006.*The Network Society. Social Aspects of New Media.* SAGE, London

Yu, P.2002. *Bridging the Digital Divide: Equality in the Information Age.* Cardozo Law Shool, Working Paper Series, no. 44.

www.espon.eu

The ESPON 2013 Programme is part-financed by the European Regional Development Fund, the EU Member States and the Partner States Iceland, Liechtenstein, Norway and Switzerland. It shall support policy development in relation to the aim of territorial cohesion and a harmonious development of the European territory.

ISBN