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Drives and Barriers for Development of Broadband Access – CE Perspective

Zbigniew Hulicki
(AGH University of Science and Technology, Kraków, Poland
hulicki@kt.agh.edu.pl)

Abstract: Development of *e*-services in the CE (Central European) countries depends on a number of factors which can result in overcoming or extending digital divide between the "new" and "old" EU member states. These factors comprise both drives of and barriers to development of broadband access and growth of *e*-services. This paper provides insight into the environment for the CE mass–market broadband adoption, and examines each of the factors that condition this adoption: novel approaches to increase ICT penetration; clear policy and legal regulations; segmented service offerings for specific user needs in such markets; and innovative pricing schemes and service packages.

Keywords: broadband access, digital divide, e-services, ICT, Web-based multimedia services
Categories: C.2.4, C.2.5, H.3.5, H.4, H.4.3, J.4, K.4, K.4.2

1 Introduction

The latest innovations, based on the application of digital technology, through which the traditional boundaries between media and telecommunications have disappeared, have led to unprecedented development of new applications and services [van Dijk, 05]. Wireless communication became inseparable part of our live and along with development of wireless communication one can observe fast growth of multimedia services. This field is undergoing rapid development and paves also the way for the replacement of the existing services in the near future [Barbera, 06].

The explosive growth of ICTs (Information and Communication Technologies) has also changed the service demands of the users [Gupta, 06], [Hulicki, 06]. As a consequence, communication network operators are trying to satisfy the enormous bandwidth demand by providing the existing networks with large-capacity transmission capabilities of communication links. Besides, the idea of NGN (Next Generation Network) is developed with the purpose of integrating different multiple services (data, voice, video, etc.) and of facilitating the convergence of fixed and mobile networks. The specifications for NGN will enable a development of new network paradigms which will have features and capabilities to ensure the provisioning of new value-added multimedia services over the broadband access technologies that can be deployed in the market.

Despite of it, people still are not satisfied with the service offering. Moreover, in some countries and regions one can observe a number of barriers and factors which limit development and proliferation of *e*-services, and result in the slower development of national economy [EUarticle, 07]. Besides, such barriers can also lead

to and increase so-called "*digital divide*" inside a given country, not only between regions.

The digital divide is probably one of the concepts considered when reflecting on the social impact caused by ICTs, i.e. one perceives that these technologies are going to produce differences in the development opportunities of peoples [van Dijk, 05]. Initially, most people view this in purely economic terms [Marine, 04], i.e. it is basically referred to connectivity problems [Gupta, 06], [Skowroński, 06]. Later, the concept of the digital divide was changed. It evolved from inequalities in basic access to ICTs and their availability, to differences in the quality of the user experience [Hulicki, 06], [EUarticle, 07]. The debate over the future of the digital divide is now moving away from "quantity" in basic connectivity and access to ICTs to measures of "quality" and "capacity", including two other types of divide, i.e. usability and empowerment [Barbera, 06], [Gupta, 06]. Some papers consider also methods and tools to overcome (or bridging) it [Marine, 04]. However, a number of questions still need to be resolved because the digital divide is a result of the social gaps produced by economic, geographic, social, political, gender, generational, etc. inequalities.

In this contribution, the most important factors and barriers for development of broadband access and *e*-services growth will be discussed using the current state of the development of *e*-services in the CE region of Europe. Taking into account broadband and human needs, definitions of the digital divide process and the problem statement from a local and the EU perspective will be considered first, followed by an analysis of fundamental aspects of that process which include an insight into the environment for the CE mass-market broadband adoption, i.e. availability of ICT infrastructure, broadband technologies and *e*-services as well as broadband strategies and legal regulations. Then, drives and barriers, methods and tools for broadband adoption, development and *e*-services growth will be studied with respect to technical factors, an impact of legal regulations. Finally, some conclusions and remarks on the mentioned factors and barriers which result in or can lead to the digital divide will be provided, together with some recommendations on how to better satisfy user needs for broadband access and adoption of *e*-services, which can support a bridging of the digital divide.

2 Digital Divide Process – Definitions and Problem Statement

In recent years, as ICTs have become the backbone of the global information economy and given rise to the information society, more attention has been focused on the delivery of digital media over broadband data networks. The amount of information in a digital form is continuously increasing and access to ICTs, and broadband networks in particular, increasingly determines access to wealth and income, and will, in turn, determine the leaders in tomorrow's knowledge economy [van Dijk, 05]. It is also clear that the global information could be used for online education, telemedicine, *e*-government, international trade and many other applications that would solve vital problems in the developing world. Although the demand for new multimedia services is hard to evaluate and maybe there is no real killer application, the network operators in general tend to satisfy user demands and requirements, trying their best to ensure the provisioning of new value-added multimedia services over the broadband access technologies that can be deployed in

the market. However, despite the boom in the availability of access to ICTs, the differences in the usage of communication resources still exist and even are intensifying between countries and regions. This gap in access to and usage of ICTs has come to be known as the "*digital divide*" [Hulicki, 06].

The term "digital divide" reflects various differences among and within countries, i.e. it refers to the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard both to their opportunities to access information and ICTs and to their use not only of the Internet but also other *e*-services for a wide variety of activities. Thus, it expresses the difference in facilities for people to communicate, relative to their geographic location, their living standard and their level of education, and ultimately it can serve as an indicator of a country's economic and social situation [van Dijk, 05]. The digital divide would not have attracted so much attention were it not for its impact on development within a global economy increasingly based on the exchange of information and knowledge.

Unlike the traditional notion of the "*digital divide*" between social classes, the "global digital divide" is essentially a geographical division, i.e. the global digital divide is a term used to describe "great disparities in opportunity to access the Internet and the information and educational/business opportunities tied to this access between developed and developing countries [EUarticle, 07], [EEreport, 00].

However, another important aspect to be recovered from this contribution is that today, there is not only discussion about the Internet, but rather the ICT's usage. Besides, it is clear that new technologies may also constitute another exclusion factor to be added to the basics (poverty, illiteracy, age etc.). ICTs may therefore aggravate pre-existing problems [Marine, 04].

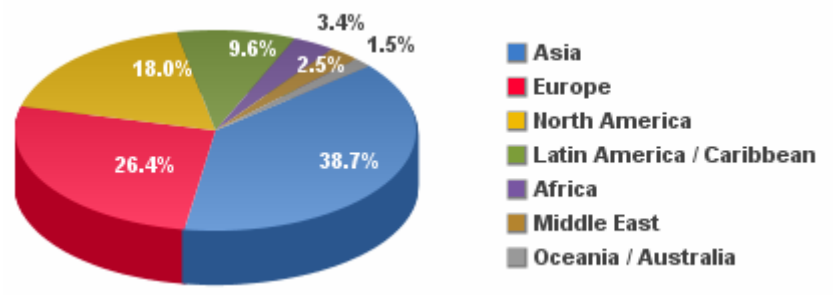

Figure 1: Internet usage in the world – Dec. 2007 (source: http://www.internetworldstats.com/stats.htm)

The most developed countries of the world with the resources to invest in and develop ICT infrastructure are reaping enormous benefits from the information age, while developing countries are trailing along at a much slower pace [van Dijk, 05] (cf. Fig. 1). This difference in rates of technological progress could also widen the economic disparity between the developed countries of Western Europe (the old EU members) and developing ones of CE Europe (the new EU members), thus creating a digitally fostered divide. Hence, from the EU (continental) perspective the digital

divide can be perceived really as a geographical division unlike a local perspective that would view it in the traditional notion.

On the other hand, in most cases people talk about the digital divide concerning the entire world, i.e. as if there only existed one and as if it had the same characteristics at any time or in any social space. This is one of the strongest aspects of the illusion behind the definition of this process. The problem of talking about the divide as a single gap is that then single and generalized solutions are sought. In fact, one should be talking about digital divides or consider various aspects of that divide, given the geographic localization, gender, age, culture, or socioeconomic conditions, and the combinations of these factors. In this manner, the conceptual and methodological approach and the resources and actions to face them would be related to their specific conditions.

As considered here, the digital divide raises a number of questions. Why does it occur and what are its causes? How wide is it and how is to be measured? What are its effects and what needs to be done to alleviate it? Another important aspect is also the nature of the digital divide, i.e. the initial conceptualisation of that process as a difference in access to the networks and ICTs has given room to a more comprehensive idea that encompasses the notation of effective use. These questions have only recently been raised, and as regards CE Europe it is difficult, as yet, to answer all of them with any certainty, especially as the digital divide concept evolves.

3 Fundamental Aspects of Digital Divide

It has been already mentioned that the digital divide can be considered as an expression of the social gaps. In order to understand it, it is necessary to analyze fundamental aspects of that process which include an insight into the environment for the CE mass-market broadband adoption, i.e. social appropriation conditions of these gaps and not simply reduce comprehension to the availability of the ICT infrastructure, connectivity and *e*-services. With this approach, one should also take into consideration the fact that the digital divide process continues to evolve and there are various illusions associated with it [Hulicki, 06].

The concept of the digital divide incorporates three essential problems [Hałka, 06], [EUarticle, 07]: infrastructure, capacity-building and usage of the resources. The first one concerns aspects viewed in economic terms, whereas two others deal with the usability and the empowerment, i.e. reflect user skills and capacities.

As one can deduce, the infrastructure is basically referred to connectivity problems and the possibility/difficulty of having computers available that are connected to the worldwide net. This also includes the problem of servers and backbones. In fact, through its ability to promote the efficient dissemination of information, the ICTs promise huge improvements to internal communications in and among countries, so that users can effectively help each other to solve their own problems. Sources of widespread public information such as television (or DVB (Digital Video Broadcasting)), telephone services, educational institutions and public libraries are taken for granted in developed countries. In developing countries, however, such infrastructure is seriously deficient, and this cripples users' ability to gather information and coordinate with each other to solve the problems.

Demand for and availability of services provided over the broadband infrastructure is the main precondition for successful development of broadband in any country [Mathea, 06], [Wild, 06]. Although access to the Internet via cable modems has been available since the end of 90s in the CE countries, significant development of broadband started only a few years ago, when ADSL (Asymetric Digital Subscriber Line) became available [Kovacs, 06], [Kuchar, 06]. Nowadays, development of broadband access and *e*-services in the CE region is accelerating. The *e*-services are provided by public institutions as well as by commercial entities. However, the penetration of broadband access lines varies with country and it is still much lower compared with most of the old EU member states [Hałka, 06], [Kovacs, 06], [Kuchar, 06], [EEreport, 00]. As regards the users and non-users of broadband, a wide gap exists between households in the north/west and south/east countries together with a gap between rural and urban areas in the new (CE) member states [EUarticle, 07]. Larger households are more likely to have broadband [Gupta, 06], but it is still a long way to broadband for all [Skowroński, 06], i.e. the young generation does mainly use the Internet and ICTs but around 50% of women and unemployed have never used them [Gupta, 06] (cf. Fig. 2).

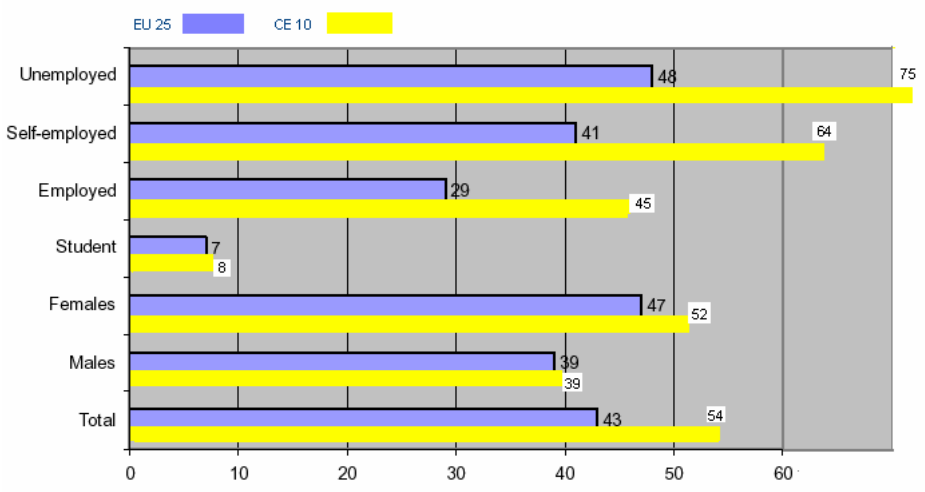

Figure 2: Usage of the Internet and ICTs in EU 25 and CE – Dec. 2006.

Demand for *e*-services in a given country strongly depends on how well the population is prepared for using the services (cf. [Barbera, 06] , [Skowroński, 06]). However, the most popular *e*-services in the CE region are the same or similar as in the other regions of EU and include entertainment and leisure, communications (i.e. keeping in touch with other people), managing one's life, education and work [Gupta, 06]. Moreover, there are a number of successful public services (*e*-government and *e*-health) in operation in that region [Hałka, 06], [Kovacs, 06], [Kuchar, 06] and, despite quantitative differences, the usage of online information and communication services by the ICT users in the new and the old member states of EU reveals similar trends [Barbera, 06] , [Gupta, 06]. The same conclusion can be drawn on the usage of

paid online entertainment services (cf. [Gupta, 06], [Hulicki, 06]). Also, a number of online services for *e*-business (e.g. commerce, banking) are offered in the region [Hałka, 06], [Kuchar, 06].

It is clear that status of broadband infrastructure depends on the existing backbone and access networks. Apart from the incumbent (formerly national Telecoms), in the CE member states at least a few nationwide alternative operators offer their optical fibre backbones employing WDM (Wavelength Division Multiplexing) technology [Hałka, 06], [Kuchar, 06]. The largest operators own and operate the high-capacity DWDM (Dense Wavelength Division Multiplexing) transport networks with a ring topology to which metropolitan area networks covering major cities in a given country are connected. In Poland, Czech and Slovak Republic fibre-optic backbones of alternative operators are laid mainly along the electric power distribution lines, railway lines with radio relay extensions or the gas pipelines [Hałka, 06], [Kuchar, 06]. Apart from academic and research organizations national research and education networks can also serve both governmental institutions and non-profit organizations. In some countries such networks operate technologically advanced multi-Gb/s optical networks [Kuchar, 06].

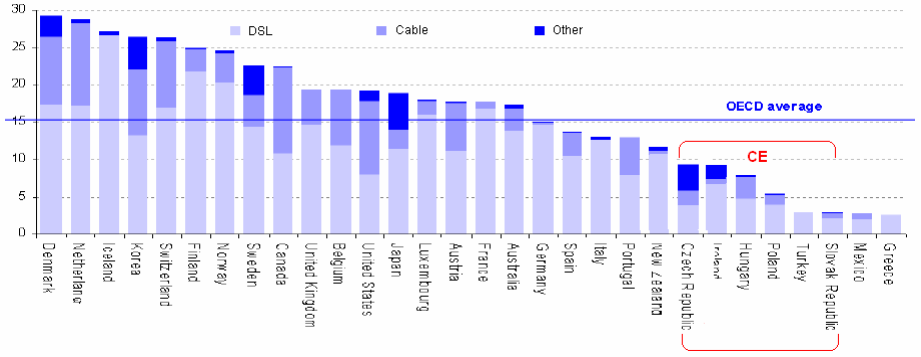

Figure 3: Usage of the broadband access technologies – CE vs. OECD (source: OECD).

On the other hand, access networks comprise mainly twisted copper pairs, wireless links and CATV (Community Antenna Television; Cable TV) networks equipped with modems. The remaining technologies have a marginal share of the CE broadband market [Hałka, 06] (cf. Fig. 3). The prevailing access technology is based on ADSL implemented on twisted copper pairs. Optical fibres have been deployed mainly by CATV operators, converting most of their networks into HFC (Hybrid Fibre-Coaxial) type. The cable modems at the customers' premises are of the EURODOCSIS standard and together with the CMTS (Cable Modem Termination System) equipment located at Head-End can provide broadband access to the Internet [Hałka, 06], [Kuchar, 06]. Also wireless cellurar networks utilizing CDMA (Code Division Multiple Access) technology are used to provide broadband access. 3G/UMTS (the third-Generation Universal Mobile Telecommunications System) networks using both a classical FDD (Frequency Division Duplex) with HSDPA

(High-Speed Downlink Packet Access) enhancement and a TDD-based (Time Division Duplexing) solution are currently operated by mobile companies, but their coverage is still limited to the big cities [Kovacs, 06], [Kuchar, 06]. The WiFi (Wireless Fidelity) access technology is used as well, in both the unlicensed 2.4 GHz and in the dedicated 5 GHz frequency band. In some countries of the region access to the Internet is also offered via geostationary satellites [Kuchar, 06] and at least a few operators provide users with broadband access by means of PLC (Power Line Communication) systems [Skowroński, 06].

Another of the aspects that stands out is a role of service providers (SPs) in development and availability of broadband services. Until recently, service providers have introduced new services by overlaying individual service platforms on top of their network infrastructure, leading to expensive, slow to build, and inflexible solutions. The competitive environment, however, demands that SPs should deploy and monetize new services on a technical architecture optimized for speed, cost and risk. Besides, because there is strong evidence to suggest that a trend towards mass–market broadband adoption is under way [Barbera, 06] , [Gupta, 06], [Mathea, 06], the challenge ISPs (Internet Service Providers) and ASPs (Access Service Providers) in the CE market face is finding ways to move from an early adopter stage to mass-market adoption. Hence, SPs will play a key role both in making the services available to end users and in making the services affordable.

One of the most relevant aspects of the concept being analyzed is impact of state policies and regulations on broadband development. During the last decade the telecommunications has undergone a profound change, triggered by deregulation and sustained by the high growth in information traffic carried by telecommunication networks [Kotlarski, 06]. In the CE region, telecom liberalization has improved the provision of network access (telephony and Internet) as a result of the involvement of dynamic private operators and providers seeking a good return on their investments. However, the benefits of liberalization have remained limited to the urban areas, as private companies have generally considered that rural access offers little in the way of profit [Kotlarski, 06], [Wild, 06]. Universal network access is therefore far from a reality in these countries and at the same time is the challenge that the CE regulation authorities must take up. It is worth remembering however that setting up a regulatory system to promote dynamic network development in both urban and rural areas requires an independent regulatory authority with adequate decision-making and sanctioning powers. But yet, in most countries of the region, there have been three bodies regulating the electronic communications sector [Kotlarski, 06].

The demand for broadband access to the Internet and online services has also been identified in the national strategies for broadband development, approved by the governments in 2004/2005 [Hałka, 06], [Kovacs, 06], [Kuchar, 06]. They rely primarily on private investments in developing both the ICT infrastructure and broadband services that would drive demand for broadband access. The governmental and municipal bodies are expected to be among the major providers of *e*-services followed by commercial service providers [Kuchar, 06]. However, the market conditions determined by legislation and regulation of wholesale local loop market affect the situation on the CE market that in turn reflects penetration of broadband access in the countries of the CE region. Therefore, drives and barriers for bridging digital divide should be discussed now.

4 Bridging Digital Divide – Drives and Barriers, Methods and Tools for *e*-Services Growth

4.1 Access to ICTs

Access to information and communication resources (ICTs) is increasingly considered as a basic social need in modern, highly developed societies [van Dijk, 05]. The Lisbon strategy has considered it to be a driving factor behind the EU's efforts to become the leading knowledge-based economy [EUarticle, 07]. This ambition was reflected in the two successive *e*-Europe action plans that tried to address the mentioned challenge. However, the plan is seldomly binding and member states are legally committed only by the provisions of the new regulatory framework for electronic communications relating to universal access and users' rights [Kotlarski, 06].

But yet, to get broadband to the home is a complex process requiring continuous attention and effort by authorities at all levels and of the regulators [Kotlarski, 06], [Marine, 04]. They must adopt consistent policies in order to create the right competitive environment. Besides, there are a number of factors influencing broadband adoption and *e*-services growth. One can categorize them into three groups:

- technical factors,
- legal regulations and policy, and
- barriers of growth according to users themselves.

The first group includes [Hulicki, 06]:

- availability of ITCs and broadband infrastructure, and
- user location – urban or rural, i.e. geographical conditions,

but also

- costs of broadband access and services,
- household income and purchasing power, and
- GDP (Gross Domestic Product).

The EU's enlargement in 2004/2007 has tended to exacerbate most of the above mentioned factors or disparities, with population in the CE member states having on average lower income levels and lower ICT penetration rates. According to Eurostat figures [Gupta, 06], the income, rural, educational and age gaps are all greater in the CE region than in the former EU-15. However, in terms of ICTs the gap is much smaller than expected [EUarticle, 07], i.e. during the past decade ICTs have become widely available to general public in both accessibility and cost. In the CE countries, the main barrier to setting up telecommunication infrastructures lies in the lack of available investment [Hałka, 06], [Kuchar, 06]. This problem is even more crucial in rural areas which are still very poorly served, i.e. gaps remain in the use of ICTs among the population depending on factors such as age, employment status, educational level and the degree of urbanization of the area where one lives [Skowroński, 06]. A better indicator, which gives an idea of the relative importance attached to ICTs by users, is their per-income availability (cf. Fig. 4). On this

indicator, low- and middle-income countries of the CE region are behind the old member states [Barbera, 06] . Although broadband is now available in the all EU states, it remains at least ten times more expensive in the CE region than in the EU-15 and is often unavailable outsides urban areas [Hałka, 06]. Still high prices for broadband access with respect to the purchasing power of average citizen hinder faster development of *e*-services. In addition to broadband infrastructure, important indicators of the divide appear to be computer availability – and potentially the availability of alternative access through TVs, mobile phones etc. – and Internet access.

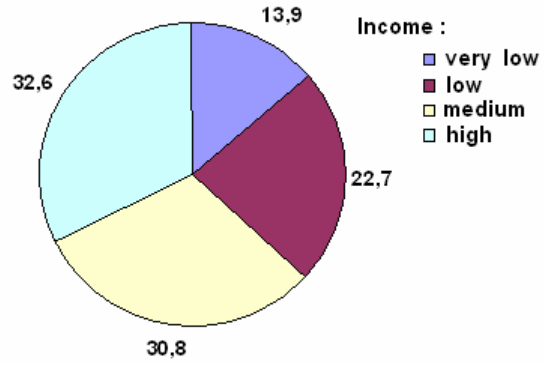

Figure 4: Availability and usage of ICTs in CE [Hulicki, 06].

4.2 A Role of Broadband Strategies and Regulations

Governmental initiatives to narrow the digital divide are referred to the policies addressed in broadband strategies. These focus on the social and regional aspects such as the provision of ICT services on multiple devices or platforms other than PC, i.e. digital TV, satellite, 3G mobile phones etc. The mentioned aspects have been a particular focus of attention with actions being launched to cover remote and under-served areas with broadband connections (cf. [Hałka, 06], [Wild, 06]). On the other hand, because ADSL is, and in the foreseeable future will remain, the dominant technology for broadband access of end users in the CE region, it is vital for the regulators to ensure that this technology will be used as much as possible. But, in compliance with the Local Loop Unbundling (LLU) rule, the CE incumbents offer ADSL connectivity on a wholesale basis to alternative providers of ADSL retail services [Kuchar, 06]. Resale is the only viable option, but it gives the alternative providers little chance to change the service which they resale. The only available real alternative is LLU-based DSL but in most countries of the region its penetration is still minimal, compared to the penetration of DSL lines by the incumbents [Hałka, 06], [Kovacs, 06]. Therefore, the regulatory bodies must adopt clear and compatible policies, rules and regulations to create competitive environment so that the alternative operators will have a chance to succeed in the retail market. The importance of policy and regulatory reform needs to be underlined. The policy rationale is the social benefits to be derived from the diffusion and greater use of ICTs

and related improvements to the economic activity. The liberalisation of telecommunication markets and rigorous implementation of competition in the CE countries will stimulate new investment and increase demand for communications access and services through falling prices and the offer of new innovative products.

The market conditions determined by legislation and regulation reflect penetration of broadband access in the CE region. Because in this region market forces alone are unable to provide broadband access, the Commission has – as an exception to competition law – allowed member states to use structural funds for broadband deployment. This reflects some historical prerequisites of the CE citizens for provision of services to all through public funds. Moreover, because the investment in the infrastructure outside large cities has long payback periods, the state aid is necessary not only to reduce the payback period of potential investments but also to reduce the necessary working capital for operators while a critical customer mass is being built. It is also important to nurture the most promising initiatives and set up larger scale trials or pilot projects [Wild, 06]. This type of project could be usefully financed by public startup funds, possibly in partnership with private financing through Public-Private Partnership (PPP) schemes. A pilot project's essential goal must be to study the economic viability of the proposed service platforms if balanced business plans are to be drawn up. Lastly, when as many "infrastructure pieces" as possible have been set up through the pilot projects, potential investors (public or private) can commit to the large scale deployment of infrastructures based on conventional cost-effectiveness criteria.

As it has been already mentioned, much of the discussion about new ICTs and social equality has been focused on the oversimplified notion of digital divide, mainly related to the income (or economic terms). However, a central premise is that the ability to access, adapt, and create knowledge using ICTs is critical to social inclusion. This focus on social inclusion shifts the discussion of the digital divide from gaps to be overcome by providing equipment to social development challenges to be addressed through the effective integration of technology into communities, institutions, and societies [van Dijk, 05]. What is most important is not so much the physical availability of computers and the Internet but rather people's ability to make use of those technologies to engage in meaningful social practices. Therefore, two other types of divide will have much greater impact in the years to come, i.e. usability (usage, based on individuals who know how to use these technologies and those who do not) and usage quality (or empowerment, based on the differences between those same users) [Hulicki, 06].

The usability and empowerment divides can alienate huge population groups who miss out on the ICT's potential. Thus, an approach is required based primarily on usage and services, and in which the technology is not considered as an end in itself but more as a tool. There is enormous potential in this area, comprising a multitude of initiatives based on individual competences or small creative and dynamic organizations that can develop new proximity services [Hałka, 06]. The public authorities will have a key role in creating conditions that favor the lasting emergence of such potential.

4.3 Human Barriers of Growth

Because the new ICTs offer new, interesting opportunities for broadband access, they may help to overcome some traditional divides or "exclusions". But simultaneously, the availability of ITCs and broadband infrastructure may constitute another exclusion factor, e.g. the advanced age of elderly citizens added to their low income, disabilities and their educational level can intensify their remaining at the margin of the social system, i.e. in this context the new technologies can act as a factor of exclusion rather than one of inclusion. Hence, it is also necessary to examine barriers of growth according to users themselves. Therefore, the last subcategory of factors influencing broadband adoption and *e*-services growth will comprise [Hulicki, 06]:

- digital, i.e. ICTs, computer and Internet, literacy,
- user education, skills and socialization,
- awareness and technological affinity, and
- personal factors such as age, gender and disability.

Other important indicators concern differences in the profiles of countries, individuals and businesses that use the possibilities offered by the new ICTs.

The concept of the digital divide has changed over time and now it also concerns the development of capacities and skills required to use ICTs (capacity-building and education). In this sense, the concept of digital literacy related to the digital divide began to be developed [van Dijk, 05].

Lower (in comparison with EU-15) digital literacy of some users' groups is the Web's biggest accessibility problem in the CE region [Hulicki, 06] (cf. Fig. 5). The fact that technology remains so complicated that many people couldn't use a computer even if they got one for free, is far worse than the economic divide, which is vanishing rapidly in industrialized countries and does not seem to be the issue for the CE region in the future. Besides, many others can use ICTs, but don't achieve the modern world's full benefits because most of the available services are too difficult for them to understand. Hence, the usability divide will take longer to close, but at least we know how to handle it – it is simply a matter of deciding to do so. The empowerment divide, however, is the hard one: even if ICTs were extraordinarily easy to use, not everybody would make full use of the opportunities that such technologies afford [van Dijk, 05]. This refers to the limitation/possibility that people have to use the resources available on the Web, and it is a common feature of any country.

On the other hand, the CE countries can learn valuable lessons from the policies, programmes and general approaches of EU-15 aimed at strengthening and extending both the infrastructure and access as well as the skills of the users. Particular attention is paid to policies to improve access in public institutions (local and regional government facilities, libraries, etc.) so that individuals can access ICTs at low or no cost, build familiarity and develop skills [Gupta, 06]. Policies for making available low-cost and subsidized access in schools seek to build the future skills base of the workforce and to enhance diffusion [Hulicki, 06], [EUarticle, 07]. In some countries

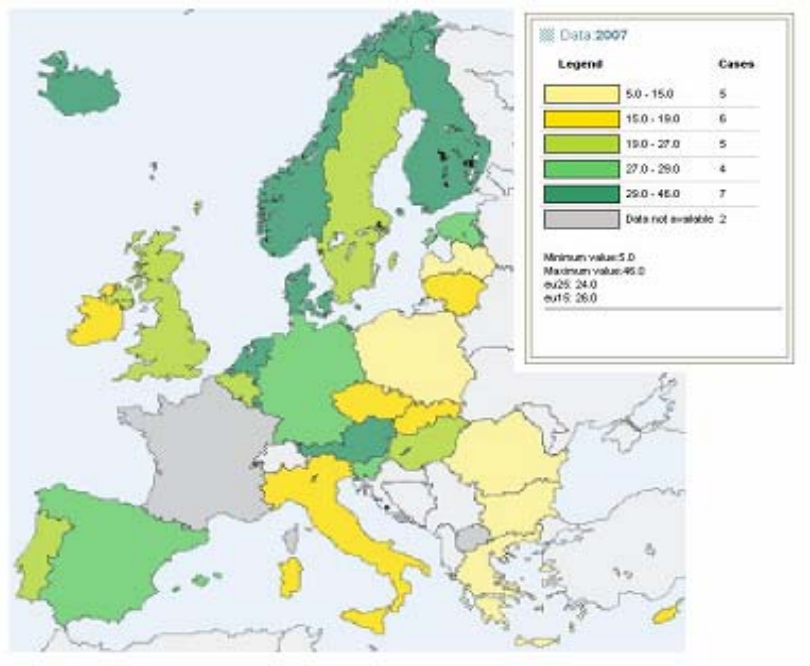

Figure 5: Percentage of the population with the high digital literacy (source: http://epp.eurostat.ec.europa.eu).

of the region measures have also been taken to improve access for underprivileged groups, the disabled and the elderly [Kovacs, 06], and in the whole region for rural, remote and low-income areas, for reasons of equity and to enhance overall economic efficiency via network effects [Wild, 06].

Given the importance of education and its close links to income, the CE policies to improve ICTs/computer/Internet literacy and build the related skills base in educational institutions can be seen as particularly important over the long term.

Recently, the concept of the digital divide has also incorporated the possibilities of using the technology not only to access information, knowledge, but also a new way of education to take advantage of the "new opportunities" in the region, such as the development of business, online medical servicing, telework, and enjoyment of new forms of entertainment and leisure. This aspect is also related to user awareness and technological affinity which can potentiate such development. When a social group appropriates a technology, it is capable not only of using it to transform its own living conditions, but also transforms the technology itself by means of technological innovation processes with social identity [van Dijk, 05].

As one can deduce, the complexity of the digital divide and the possible relationship between the incorporation of the ICTs in social dynamics and the social transformation that it implies are not easy to investigate. Hence, to recapitulate, drives and tools for development of broadband access and *e*-services growth will include:

- novel approaches to increase ICT penetration,
- clear, consistent policy and legal regulations to create the right competitive environment,
- segmented service offerings for specific user needs in such (CE) markets that would stimulate the demand for broadband, and
- innovative pricing schemes and service packages to extend the scope of *e*-services.

5 Conclusions

The paper provides an overview of the situation in the development of broadband access and e-services in the CE region of the EU, and attempts to identify the main factors affecting further progress in this area. The paper finds that the digital divide is shrinking in most technologies, especially mobile telephony, but that limitations in the availability and affordability of broadband remain a cause for concern. Although broadband is now available in all countries of the region, it remains at least ten times more expensive in the low-income new member states than in the high-income EU-15 and is often unavailable outside urban areas. The demand for broadband access is driven by increasing availability of *e*-services but there are still many obstacles to be overcome. The barriers to faster development of broadband in the countries of the CE region are manifold. They include low purchasing power of the population, unavailable broadband infrastructure in rural areas, immature regulatory environment and digital (ICTs) illiteracy especially of the older generation. Overcoming these barriers is a complex problem since all the issues have to be tackled simultaneously.

In order to better satisfy user needs and get broadband to the home some effort has to be taken that would make broadband access more diverse and attractive, and increase availability of free or cheap access in public institutions. At the same time, continous attention must be drawn to other measures that would stimulate the creation of converged *e*-services and offer more public online services on local and regional level, together with ICT, computer and Internet education, especially to unemployed, self-employed and eldery citizens.

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