A new approach to regional digital divides

Blaž Rodič
Faculty of information studies
Sevno 13, 8000 Novo mesto, Slovenia
{blaz.rodic@fis.unm.si}

Abstract. *This paper describes a proposal for development of regional digital divide strategies that would supplement the EU and national strategies by targeting the neglected dimensions of the digital divide. We believe that affected regions cannot rely only on the market initiatives or wait for government intervention. They need to develop and implement their own strategies for bridging the digital divide. We also believe that poor uptake of e-services as a replacement for physical services is not only a consequence of lack of physical access and ICT skills, but also due to the intrinsic differences between currently available e-services for citizens and companies and physical services in e.g. banks and government offices. We believe that to bring users and e-services closer, regional strategies should foresee efforts to make the public e-services easier to use.*

Keywords. digital divide, information society, e-inclusion, regional strategies, public administration, e-services

1 INTRODUCTION

Development of new information and communication technologies (ICT) has produced a social division among those countries, regions and parts of populations that are producing and extensively using the ICT and those who are not. This division is often referred to as the "Digital Divide" [1]. Contrary to what one might think, the Digital Divide is not a social phenomenon present only in developing countries, it is a common phenomenon even in the most industrialized countries.

Digital divide in European regions is still a real problem affecting the economic perspective of regions, their inhabitants and their quality of life. Anything from 30-50% of all Europeans still see few or none of the ICT-related benefits. The main reasons are lack of access to equipment or networks, the limited accessibility of user-friendly technologies, price, motivation, limited skills and different generational attitudes to advanced technologies. In addition, only 3% of public web sites fully comply with web accessibility standards, creating additional hurdles for the 15% of the EU population with disabilities. [2]

The role of ICTs in enhancing economic growth and socio-economic development is now well established. Measuring the impact of ICT uptake and the progress countries are making towards becoming information societies is therefore a critical input to ICT policymaking. A useful tool to monitor such progress is the ICT Development Index (IDI), a composite index made up of 11 indicators covering ICT readiness (infrastructure and access), intensity of ICT use and ICT capability or skills. [3]

The digital divide keeps several groups of people from reaping the benefits of ICT development, ranging from well paid jobs to online public services such as e-government. Deep divides exist between those who possess the resources, education, and skills to reap the benefits of the information society, and those who do not. The most excluded groups are the elderly, the unemployed and those with a low level of education. But the digital divide is a symptom of a much larger and more complex problem – the problem of persistent poverty and inequality, as indicated by ***Figure 1***. Digital divide is a global problem; differences in income, education, as well as gender are factors influencing the uptake and use of broadband in OECD countries. [4]

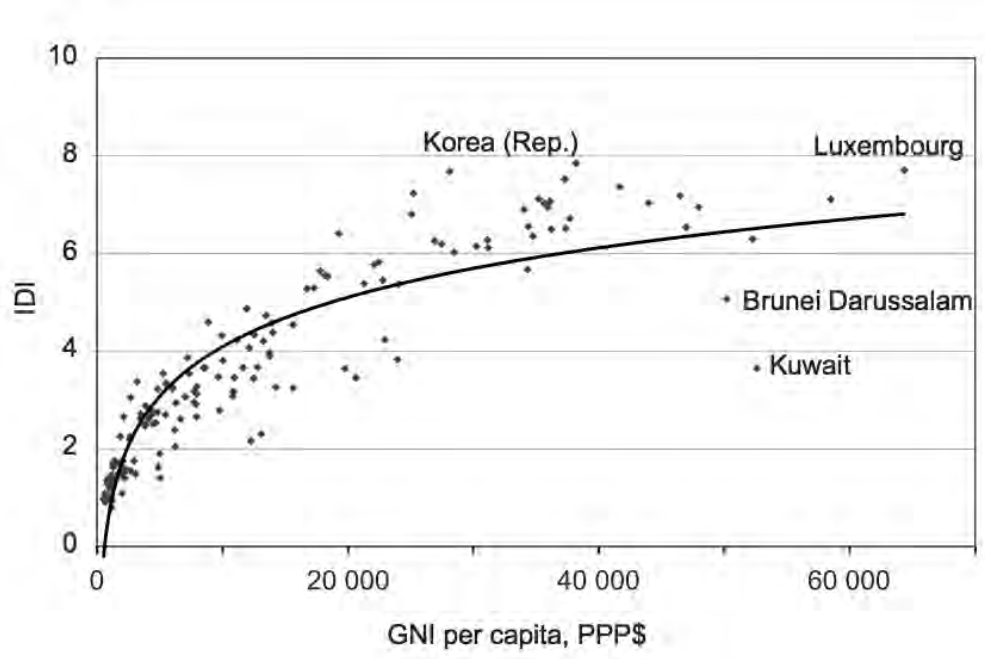

Figure 1: ICT development index (IDI) and Gross National Income per capita (Source: ITU, 2010)

Significant differences in the uptake of broadband in businesses, schools and households still exist among the OECD countries; some with far lower use levels than others. To improve the situation, the governments have fostered broadband content and applications, for example, by acting as model users, by promoting e-government services and broadband-related standards, by putting content online and by supporting the development and distribution of digital content by other players. [2]

Recently, ICT services have become more affordable worldwide, with fixed broadband services showed the largest price fall, followed by mobile cellular and fixed telephone services. Despite these improvements, the broadband price gap between developed and developing countries remains huge and broadband access remains the single most expensive and least affordable ICT service in the developing world. Moreover, countries with the highest broadband prices are all ranked relatively low in the IDI, reinforcing the argument that the affordability of services is crucial to building an inclusive information society. The IDI results show that although the digital divide is still significant, it is slightly shrinking, especially between those countries with very high ICT levels and those with lower levels. Moreover, high IDI growth in some developing countries illustrates that countries with low ICT levels can catch up relatively quickly provided their ICT sectors receive adequate policy attention. Fastest growing countries in the 2007-2008 period were among other TFYR Macedonia, Nigeria and Viet Nam (**Figure 2**). [3]

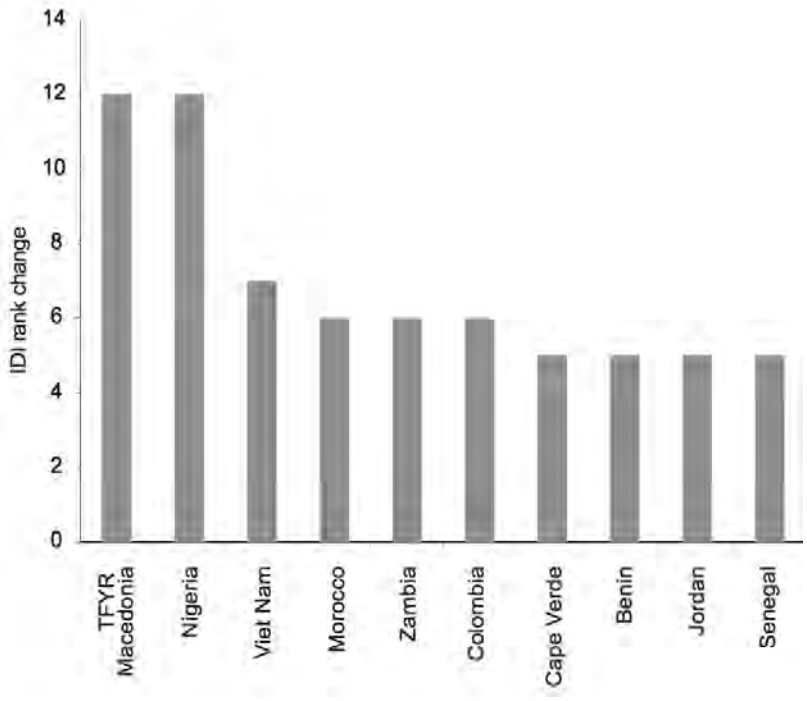

Figure 2: IDI rank change, top ten countries (2007-2008) (Source: ITU 2010)

This paper presents an initiative for development of regional digital divide strategies in Europe's regions, that will be submitted in the form of a project proposal to an upcoming EU transnational cooperation programme call. The initiative is based on two assumptions:

- regions affected by the digital divide should not rely only on the market initiatives or wait for government intervention. They need to develop and implement their own strategies for bridging the digital divide. These strategies should foresee efforts to make the e-services easier to use in addition to raising users' ICT skills and awareness and improving access to e-services.
- poor uptake of e-services as a replacement for physical services is not only a consequence of lack of physical access and ICT skills, but also due to the intrinsic differences between currently available e-services for citizens and companies and physical services in e.g. banks and government offices. We believe that to bring users and e-services closer, regional strategies should foresee efforts to make the public e-services easier to use.

2 DIMENSIONS OF DIGITAL DIVIDE IN REGIONS

In this paper we will focus on digital divides present within individual EU's regions. Regions are geographically and administratively distinct areas. In our opinion the digital divide between and within regions has three dimensions:

1. **physical access divide**: do the target users (e.g. individuals and SMEs) have the access to ICT (broadband connections, computers) that will allow to access to e-services, and in general reap social and economic benefit from the use of ICT?
2. **knowledge divide**: do the users have suitable ICT skills?
3. **e-content divide**: is there suitable region-specific content available (e.g. e-services relevant for remote communities) that has the potential to improve the quality of life of region's inhabitants, including SMEs?

For a region to reap social and economic benefit from ICT, all three dimensions of digital divide have to be addressed. Simply providing access will not suffice for groups of people without adequate ICT skills, and only by providing and stimulating the development of relevant e-services will the most affected groups of people (i.e. the elderly and remote communities) be able to fully benefit from ICT.

Regarding the physical access, the digital divide is affecting efforts to improve the territorial cohesion and internal integration within the European Union. There were 115.1 million fixed broadband subscribers in the 29 European countries surveyed at the end of 2008, a 12% increase over the previous year. This translates into a 22.8%

penetration rate (22.8 subscribers per 100 inhabitants) on average. However, the rate ranges from 11% in Bulgaria to 37% in Denmark with other EU 29 countries in between (***Figure 3***), indicating poor territorial cohesion with the EU and thus a digital divide particularly between "old" and "new" members and also between north and south of the EU. [5]

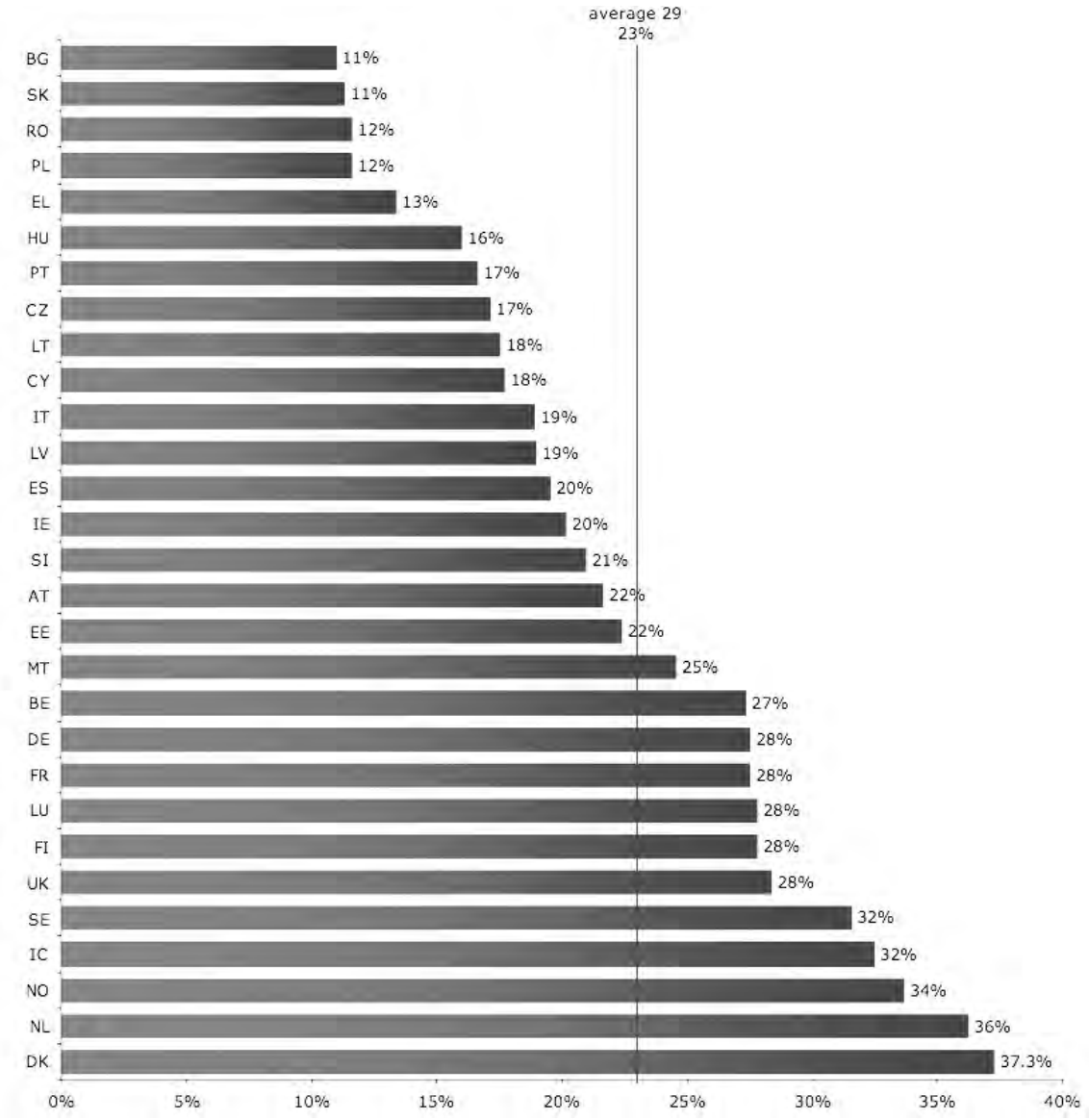

Figure 3: Fixed broadband penetration at the end of 2008 (source DG INFSO, 2009)

DSL and cable modem are by far the most prominent technologies. With 91.0 million subscribers, DSL accounted for 79.1% of total fixed broadband connections at the end of 2008 while cable modem accounted for 15.1% of the subscriber base (17.4 million subscribers). As to DSL penetration, national figures range from 3.1% in Romania and 3.2% in Bulgaria to 30.9% in Iceland, with a weighted average of 18.0% for the 29 countries (21.1% for Western countries). At the end of 2008, 9 countries were over the 20% mark (same number as at the end of 2007) with France and Germany at over 25% (***Figure 4***). There are disparities between penetration levels in rural areas and national levels which are generally larger in relative terms, which means that in rural areas, not only does deficient coverage limit penetration, but the late introduction of broadband in those areas has created further delays in take-up. The German and Danish markets stand out here, with national DSL penetration rates of 25.2% for the former and 22.8% for the latter, but only 14.4% and 11.3%, respectively, in rural areas. This indicates that an

internal, interregional physical digital divide is present even in the most developed EU members. [5]

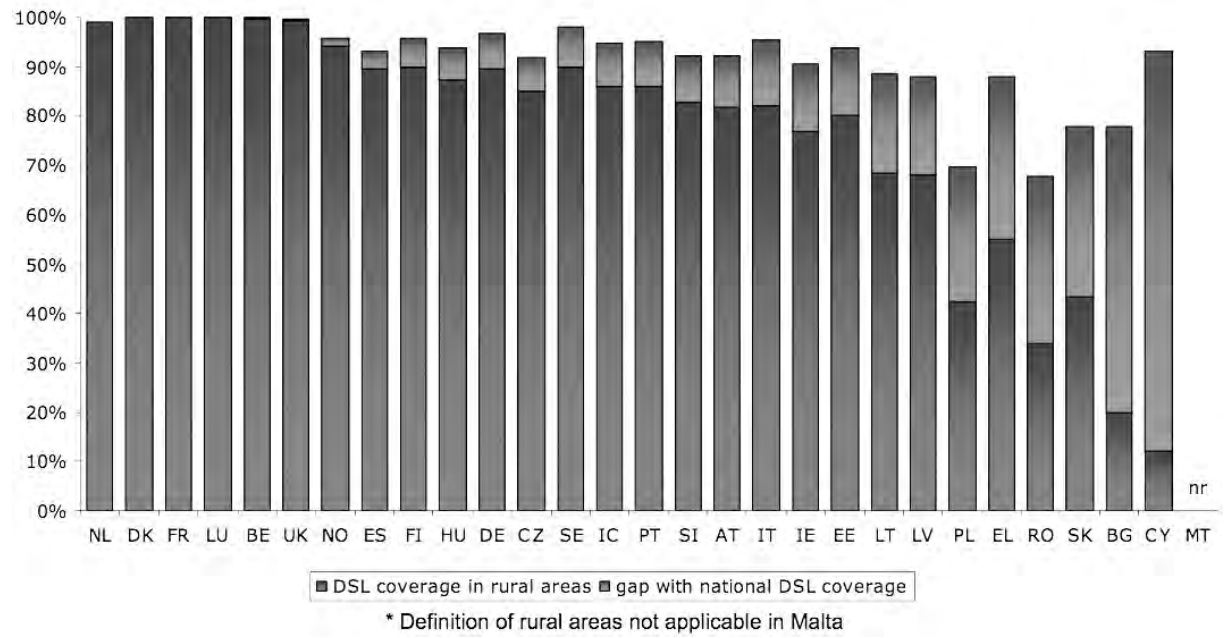

Figure 4: Gaps between national and rural DSL broadband coverage (source: DG INFSO, 2009)

Territorial coverage for 3G (UMTS) is lower than population coverage due to the fact that the first rollouts were performed in densely populated areas (large towns, dense suburban areas) and, except in a few countries, rural areas are still largely underserved. In average, UMTS territory coverage was close to 40% at the end of 2008 (***Figure 5***). 3G networks were largely upgraded to HSDPA: however, there are still significant gaps in some countries between UMTS and HSDPA coverage levels, notably in a few Nordic countries (Sweden, Norway). Average for HSDPA coverage is 27%. [5]

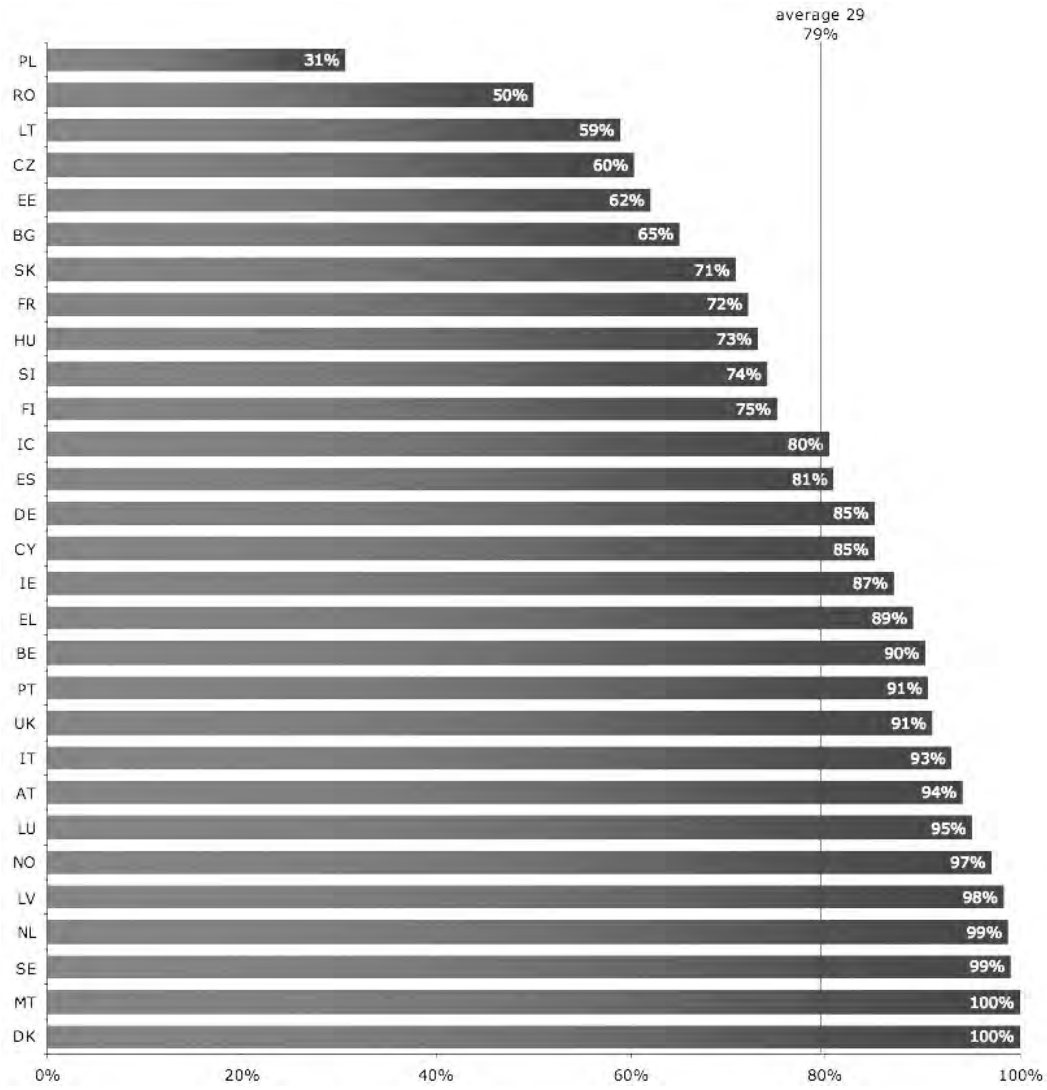

Figure 5: National 3G (UMTS) coverage at the end of 2008 (source: DG INFSO, 2009)

According to OECD [4], the private sector should take the lead in developing well-functioning broadband markets, but there are clearly some circumstances in which government intervention is justified. For example, connecting underserved areas and promoting efficient markets. Governments need to actively look for ways to encourage investment in infrastructure. Civil costs (e.g. building roads, obtaining rights of way) are among the largest entry and investment barriers facing telecommunication firms. Governments should take steps to improve access to passive infrastructure (conduit, poles, and ducts) and co-ordinate civil works as an effective way to encourage investment. Access to rights-of-way should be fair and non-discriminatory. Governments should also encourage and promote the installation of open-access, passive infrastructure any time they undertake public works. Also, in order not to hinder regional initiatives, governments should not prohibit municipalities or utilities from entering telecommunication markets.

Regarding the ICT knowledge divide, there is still a very high difference in regular (at least once a week) internet usage within the EU-27 states between different age and gender groups (***Figure 6***). While in the 16-24 years age group there's negligible difference between genders (88% female individuals vs. 87% male individuals), in the 55-74 years age group, males (38%) are nearly half more likely to use the internet at least once per weeks than females (26%). Regarding the age influenced digital divide, the usage of internet in the 55-74 years age group is less than half of that in the 25-54 years age group and about a third of the usage in the 16-24 years age group. The digital divide (measured by weekly internet use) also exists between the groups of individual with different

levels of education, especially in age groups 25-54 years (92% of individuals with higher education vs. 40% of individuals with no or low formal education) and 55-74 years (69% of individuals with higher education vs. 15% of individuals with no or low formal education). [6]

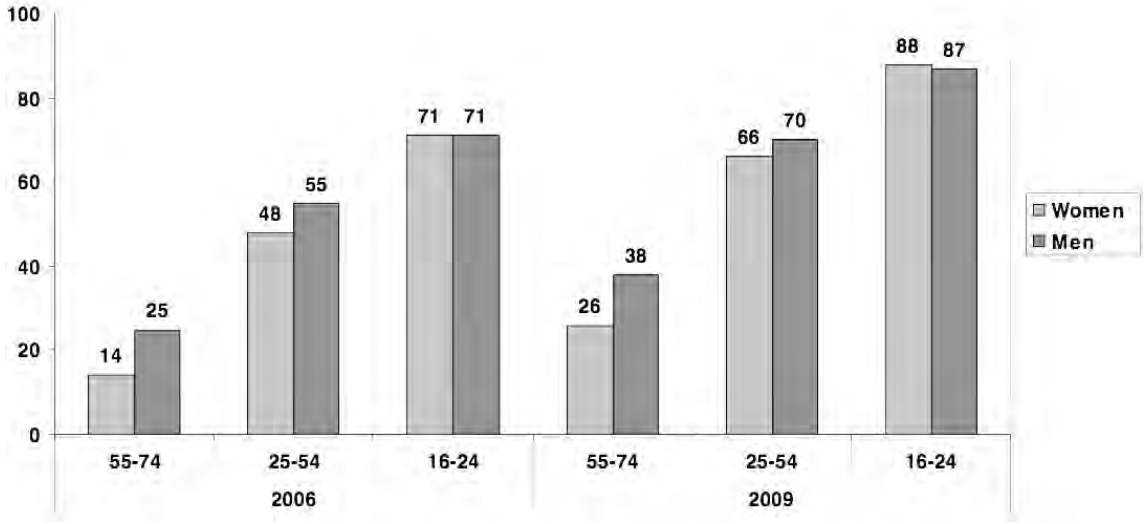

Figure 6: Difference between shares of regular internet users by gender and age group (source: EUROSTAT, 2009)

And finally, regarding the e-content aspect of the digital divide, it is discouraging to know that only 3% of public web sites fully comply with web accessibility standards, creating additional hurdles for the 15% of the EU population with disabilities. [2]

Thus it is crucial that government and business support the evolution towards more advanced broadband applications in social sectors such as tele-work, education, energy, health, and transport, where real progress is needed. Governments have a lot of experience when it comes to ensuring efficient telecommunications markets. However, when it comes to broadband applications, services, software and content, this is mostly new territory. [4]

In order not to create more social divisions, but rather to use ICTs to bridge the existing divisions, the EU has decided to build an information society for all - an *e-inclusive* society [2]. The European Union has outlined several strategies to reduce the digital divide, including the "e-Europe 2002", stemming from the Lisbon strategy [7], "e-Europe 2005" the i2010 strategy, and finally the current strategy, Digital Agenda 2010-2020 [8].

The EU can encourage efficient competition among technologies and discourage inefficiently-high incompatibility, through creation or coordination of multi-stakeholder platforms and networks, and by applying multi-stakeholder governance principle. These would be enabling the adoption of common standards and market wide approaches to public policy concerns. The challenge is to intervene in a way that replaces inflexible 'black-letter' prescriptions with mechanisms that help identify the best approach and engage the efforts of those best-placed to help it. [9]

The launch of the European strategy for the development of e-government was the "e-Europe 2002" initiative, presented in March 2000 at the Lisbon European Council and approved at the Council of Feira (June 2000). The main objective for e-government was that Member States should ensure "generalized electronic access to main basic public services by 2003". Before the end of "e-Europe 2002" effective period, the Commission presented the continuation of this initiative as the "e-Europe 2005" programme at the Seville European Council in June 2002. Concerning interactive public services the objective was that "the Member States should have ensured that basic public services are interactive, where relevant, accessible for all, and exploit both the potential of broadband networks and of multi-platform access" [7].

3 Experiences with digital divide in regions

We have examined several past and existing national programmes and projects within the EU and abroad, and can conclude that most efforts and funds are still directed towards improving the broadband infrastructure. Access to broadband will solve one dimension of the digital divide problem, that is the lack of physical access to the internet. The knowledge divide and e-content divide meanwhile receive insufficient attention, leaving plenty of space for local and regional initiatives.

However, while major efforts to provide broadband to all communities are underway, remote communities are usually the last to gain access to broadband. Reasons for this are mostly economical: construction of broadband links between urban centres, where telco exchanges are mostly located to remote communities carries a high cost, that is hard to recover as remote communities have relatively small populations and thus few subscribers.

Our first-hand experience comes from two projects: CRIPREDE [10], and Mo.Di [11]. CRIPREDE (Creating a Research and Technology Development (RTD) Investment Policy for Regions in Emerging and Developed Economies), was a FP6 project involving six EU regions. Besides developing an Adaptive Model for fostering regional RTD, CRIPREDE succeeded in initiating and facilitating RTD-oriented networks at regional levels, thus fostering knowledge and RTD-related learning and also an exchange of ideas across countries and regions. Valuable lessons from the CRIPREDE project include the importance of regional variations in legislation, entrepreneurial culture, and other key factors on the development of regional strategies, requiring adaptive tools and approaches, and the importance of building a regional consensus by assembling and guiding the regional stakeholders.

Mo.Di (Montagne Digitale), an Interreg IIIC South project, included eighteen communities from four EU countries. Mo.Di has provided valuable lessons on the implementation of the pilot project in communities affected by the digital divide. A key factor of local success of the project was the involvement of the local population in the definition of the project itself, as an active participant to it, rather than a passive subject of an experiment as often is the case. Local facilitators played a key role in the involvement of the population. We have learned that parts of the population most affected by the digital divide (the elderly in remote areas) can be strongly motivated to gain ICT skills, as long as they are given the opportunity. Another lesson was the limits imposed by national and regional regulations in introducing new e-services. In the course of the project, the inhabitants of remote areas were given the opportunity to gain ICT skills, learn about the available e-services of the public administration, banks etc., and were able to access the internet and e-services at public internet points with the help of tutors. The final survey indicated (***Figure 7***) that more than half of the participants believed that the distance between them and the public administration can be reduced by online services, however over a quarter of participants found that the services they want are not provided online, and they still have to go to the nearest public administration office to get the service they need. This indicates that some services that are important to the residents of remote areas should be implemented online, or perhaps provided by field teams from public administration, where an online service is not possible or not practical.

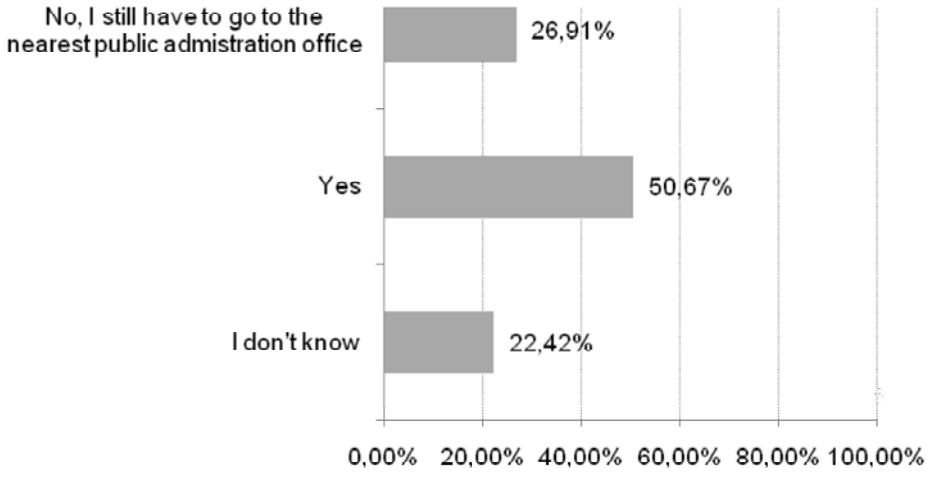

Figure 7: User satisfaction with public administration services (source: Rodič 2010)

Experiences from several regions show that local communities and regions can also successfully tackle the physical access dimension of the digital divide, as long as the relevant stakeholders, including the internet service providers are involved. Such cases involve the NYnet project (http://www.nynet.co.uk), with the long-term goal of economic revival of rural North Yorkshire (United Kingdom). NYnet Ltd is a public company set up by the County Council for the purpose of providing a communications network capable of delivering high-speed broadband services to citizens, businesses and public sector bodies in North Yorkshire. NYnet aims are:

- to provide 'faster, better and cheaper' public sector networks to enable more efficient and effective corporate services,
- to provide an infrastructure capable of delivering more advanced public services to citizens and business,
- to deliver a financial surplus to be re-invested in further social and economic development.

NYnet started in 2007 with a 10M UKP budget (including EU funds) and is still an ongoing project. Current NYnet contract ends in 2017 and includes a 42M UKP budget. In June 2010 NYnet's NYCC contract obligations from 2008 were completed: NYnet aggregated nearly all Public Sector customers and over 700 sites (350 schools, also public offices, libraries, 15 Fire Service sites, council's Disaster Recovery and Storage Area Network facilities). NYnet's focus from June 2010 is on NGA (Next Generation Access) to Business Parks using FTTP (Fiber to the premises). NYnet is now seen as sustainable project company, with revenues of over 6M UKP per year, and is expected to be EBITDA positive (will generate profit) by the end of 2011 [12].

An example from the USA is the UTOPIA (Utah Telecommunication Open Infrastructure Agency) project (http://www.utopianet.org/) that started in 2003. UTOPIA is a joint project of originally 11, now 16 cities in Utah, as a way to provide critical telecommunications infrastructure to their residents. The project aims to provide wholesale FTTP. The network is to be owned by communities that will in turn offer access to internet providers. The UTOPIA project is unique in that the regional initiative preceded the national efforts to roll out broadband to US homes, and that the cities are the project partners. However the concept was not as successful as foreseen, and UTOPIA was way behind schedule in 2008, with only 10.000 homes connected instead of forecasted 80.000 [13]. It is speculated [14] that the problem is the relatively high costs (approximately 3000 USD) for optical connection to the home, which is more than twice the typical US suburban costs, and has to be paid by the residents. However new federal funding was obtained in 2010 and is anticipated to produce over 200 new jobs and complete an additional 20% of the needed network infrastructure.

4 WHY REGIONAL DIGITAL DIVIDE STRATEGY DEVELOPMENT

The goal of this proposal is to tackle this issue through regional strategy development projects to tackle the digital divide in participating regions and addressing several technological issues related with the uptake of public e-services in Central Europe. The proposal represents an opportunity to assemble all regional stakeholders able to influence the digital divide, form a partnership, and help them reach an agreement on a list of actions needed to reduce the digital divide in the region (the digital divide strategy). The partnership and strategy can be used to leverage the region's position in obtaining national and EU funds for broadband development, ICT education and e-services development and promotion.

The field survey in the start of the project would provide information on the knowledge of ICT and e-services, and preferences for e-services in communities, affected by the digital divide, while the pilot project is a chance to promote the e-services and improve the knowledge of ICT in selected communities, and monitor the e-service use. Through development of the new generation user experience for e-services we aim to develop guidelines on how the user interface of e-services should be developed to be more accessible to users with low ICT skills, eventually changing these users' preference for conventional, physical services by the public administration.

In order to tackle the digital divide, affected regions cannot rely on the market or wait for government intervention, but should develop a digital divide bridging strategy that will be supported and eventually implemented by the key stakeholders:

- e-service providers (regional and local authorities, private e-service providers - represented through regional chambers of commerce),
- e-service users (citizens, SMEs, represented by local communities, crafts chambers, interest groups, etc.),
- education providers (secondary and tertiary education institutions),

- other stakeholders with potential to influence the digital divide (regional development agencies, telecommunication service providers).

The process of stakeholder engagement and strategy development is very complex and sensitive, and a good strategy building model will be crucial for the success of the project. The implementation of the digital divide bridging strategy will need to include a good practice model for improving the accessibility and uptake of e-services.

Our thesis is that the poor uptake of e-services as a replacement for physical services is not only a consequence of the digital divide, e.g. lack of access to broadband internet and poor awareness of available e-services, but also due to the intrinsic differences between currently available e-services for citizens and companies and physical services available in urban centres. We believe the uptake of e-services would be higher if they were made more intuitive and attractive by using the analogies with physical services and provided live assistance through video or voice calls and instant messaging. To rephrase, to bring users and e-services closer, efforts to make users more ICT aware and improving access to e-services should be complemented by making the e-services easier to use, also by making them more familiar to the users by copying the key qualities of physical services. Poor uptake of e-services is a consequence of the digital divide i.e. poor or no access to broadband internet, poor awareness and knowledge of available e-services, and insufficient quality of e-services, i.e. content and technological implementation including user interfaces, back-office integration and multi-platform implementation. The key difference from today's physical and e-services should be a shift from "form oriented services" to "process oriented services". From the user's view, services should transit from a seemingly haphazard, fragmented collection of documents and filling of forms to a clearly defined process, where the administration (e-service) provides guidance ("walk-through") to the user that is trying to accomplish a goal (changing residence, renewing a driver's license, starting a company…). This will allow the development of digital era governance by fully exploiting the potential of digital storage and internet communications to transform governance.

The new generation of e-services will include the best elements of physical services and current e-services and utilize proven e-commerce and direct communication technologies to provide a new level of user experience and service efficiency. New e-services should add value also for the administration/clerks, not only for the users (individuals, SMEs). Physical services and current e-services both have distinct advantages and disadvantages. To make the situation more complex, the sets of disadvantages and advantages that depend on the segment of users, especially user location, access to ICT and their digital awareness. The focus of the project, i.e. the target group are users that have yet to cross the digital divide, especially on users that reside in remote regions, away from urban centres. The exact set of disadvantages and advantages is to be determined through qualitative and quantitative research, i.e. use of focus groups to gather the set of service qualities, and use of structured user survey to determine the role and importance of each service quality. However our hypothesis is that the disadvantages and advantages perceived by our target user group are the following (Tables 1 and 2).

Table 1: Disadvantages and advantages of physical services

Advantages	Disadvantages
• user friendly: familiarity with paper documents, • human assistance is provided • conventional ID is required	• physical accessibility: distance and time to travel, • schedule is fixed • efficiency: services take a lot of time, especially if having to wait in a line

Table 2: Disadvantages and advantages of current e-services

Advantages	Disadvantages
• physical accessibility: can be used from home - if ICT is available, • no set schedule for use • efficiency: no waiting in lines, fast service execution	• knowledge of computer UI concepts is required • availability of ICT is required (HW, SW, and internet) • digital forms of ID are required (knowledge of ICT is required)

According to our hypothesis, new e-services will be perceived as more attractive than physical services if they are at least as accessible as physical services in terms of physical access and ease of use. Therefore, the new e-services should be:

- easier to use then current e-services: i.e. as easy to use as physical services,
- more efficient (time to travel, distance, usage time) than physical services,
- easily physically accessible, preferably from user's homes or offices, or at least from nearby secure kiosks.

Of course the e-services should be also safe and reliable. One potential hindrance to be overcome is digital authentication. Even in regions where ID cards include a smart-card, users would need to purchase a smart-card reader. Another potential problem (for some services) is verification of documents: how to verify authenticity where user has to present paper documents? However this problem is being mitigated by the move of public services to the one-stop-shop model, where the gathering of documents from various administration offices is the task of the administration, not the user. Similarly, the need to present paper documents would require a scanner on the user side, and that need would be also made redundant by shifting the gathering of documents from various administration offices from a user responsibility to administration responsibility.

5 CONCLUSION

Use of ICT can provide new opportunities for increasing accessibility in an intelligent way. As the roll-out of broadband as well as of internet use is currently still lagging behind in new Member States and in rural areas, Europe can meet challenge to encourage the catching-up-process of ICT-infrastructure and to promote the intelligent use of ICT for its purposes, such as the access to services in remote areas. The supply and quality of information and communication technologies also form prerequisites concerning the level of economic and social integration of economies and persons. Although broadband access is now available to a lot more citizens, there are important exceptions, mainly in the new Member States and in sparsely populated regions, where the respective countries have to cope with a large backlog. Disparities between Member States have not been reduced yet.

Differences can not only be shown concerning the supply of ICT infrastructure, but also regarding the use of those technologies between and within countries, regions and social groups. Access to information (both in general and concerning specific supply of public services) is to an increasing extent offered exclusively by ICT. This form of information also allows high potential of development, but only if access is available and the knowledge is present. Access to ICT could also be restricted for people confronted with social or regional disadvantages for example for people living in peripheral regions with no ICT infrastructure, people with low income due to unemployment, illness. Nonetheless, some of the rural areas have the potential to accomplish the process of structural change successfully. Key factors are the possibility of access to infrastructure, knowledge and technology.

Therefore, the proposal's goals include promotion of ICT and e-services in areas affected by the digital divide, gauging end-users' knowledge and awareness of e-services, training of end-users, and gathering of user feedback during the development of solutions for technological issues of e-services. Through promotion of e-services, rising of awareness and skills of end-users and improvements in technical implementation of e-services the project will work towards changing the users' preference for conventional, physical public services to a preference for the e-services. Core outputs of the proposed project will facilitate the coordination of efforts to reduce the digital divide in participating regions and eventually in other regions in Central Europe, resulting in improved access to and uptake of e-services in Central Europe, and thus reducing the need to travel, and improving the attractiveness of the regions as places to live and work, thus improving their competitiveness.

The implementation of regional digital divide strategies will contribute to reduction of disparities between Europe's regions and improve the CE's regions' competitiveness through increased usage of e-services by end users, also, the improved e-business readiness of SMEs is foreseen, making the distant areas a more attractive place to live and also to work from.

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