Sabbatical Studies Report

Information Society in Croatia

Landsc@pes of Knowledge for Development

Jorge Ricardo da Costa Ferreira

Faculty of Social Sciences and Humanities

Nova University of Lisbon

jr.ferreira@fcsh.unl.pt

September 2012

Acknowledgements

This research work was made possible only with the help of the Faculty of Economics - University of Split that from the first moment gave its approval to accept me as an invited researcher at their facilities. Space, network infrastructures and a warm welcome were given to me by Professor Maja Fredotovic, responsible for my research in Croatia. Also to Silvija Golem and Vinko Mustra who helped me with some translations and other local research themes. Maja Cukusic that arranged four master students to help me with data retrieval, research and translating tasks (Barbara Bracic, Doris Vulic; Hrvoje Gabelica and Zivko Krstic). Without their help, the results couldn't be achieved.

And finally but not less important, the financial support. This sabbatical report was done with the financial support of e-Geo, Research Centre for Geography and Regional Development (in its first period from March to April) and a sabbatical grant from the Fundação para a Ciência e Tecnologia (in its second phase from May to August).

Contents

Introduction 4

I - Croatia: Society, Economy and Education 6
1.Key Figures 6
2.Education and Information Society ***6***
2.1.Education in Croatia – Small notes of contemporary history 7
2.2.Education and Information Society: Strategies with Common Links ***10***

II - Information Society: An Infrastructure for Development 11
1.Information Society and Internet: Creating New Geographies of Influence 11
2.Information Territories – New Paradigm, Same Asymmetries 13
3. Information Society and Infrastructures – Is Croatia Going Global? ***14***
3.1. Topology 15
3.2.The Private sector Investment in 'Telcos' ***19***

III - Research and Education Networks: Portugal and Croatia: an obvious comparison 22
1. RCTS and CARNET - History and numbers **22**
1.1.Rede Ciência e Tecnologia e Sociedade (RCTS) – Portugal *22*
1.2.CARNET – Croatia ***25***
2.Carnet E-Island Project – Digital Inclusion for Knowledge **28**

IV - Information Society: Where we stand and where to go from here? 32
1.CROATIA *32*
1.1.Notes about country' recent evolution on information policies ***32***
2.Portugal 34
2.1.Notes about country' recent evolution on information policies ***34***
3.Croatia, Portugal and Europe **37**

Final Considerations **48**
References 50
Annex 1 51

Introduction

Croatia has overcome a series of historical and cultural happenings. A war and serious internal conflicts after the break of Yugoslavia have left the country with structural problems that will need a few years to solve. With astonishing landscapes and a large stretch of coastline, Croatia has opened itself to tourism.

Presidential and parliamentary elections at the beginning of 2000 ushered in politicians who pledged commitment to Croatia's integration into the European mainstream. Croatia Constitution was changed to accommodate the shift of power away from the President to the Parliament. Croatia joined the World Trade Organization and opened the economy.

European Union accession talks were held up because the country's most prominent war crimes suspect, Ante Gotovina, remained at large until 2005. When finally convicted by the UN War Crimes Tribunal in The Hague in April 2011, Croatia successfully completed its EU accession negotiations. It is due to become the EU's 28th member state in 2013.

A dispute with Slovenia over the sea and land borders - dating back to the break-up of Yugoslavia - also threatened to delay Croatia's membership until June 2010. The country's EU accession treaty was finally signed in December 2011, after years of tortuous negotiations. A referendum was made on the following month.

Croatia was badly affected by the global financial crisis from 2008 up to 2009 and its tourism-oriented economy has suffered tremendous effects and the country has mostly been in recession since 2009.

Confronted like other countries in transition periods, with fast privatizations, inefficient legal and administrative system, high unemployment rates, Croatia has imposed itself has one of the leading countries in the Balkans. After the conflicts that broke Yugoslavia apart, Croatia established his monetary and fiscal system initiating the first steps into a market economy. But the rigid mechanism used to regulate the national *Kuna* introduced several problems and generated an overvalued currency. The situation worsened the trade deficit and threatened the economic stability. The success of tourism, foreign investment and a considerable growth domestic product (above some European countries) can guarantee to Croatia a place among the EU like a modern democracy and a truly free market economy.

The European Council granted the status of “candidate country” to Croatia in 2004 and Croatia opened EU accession negotiations on October 2005 and concluded them on June 2011. From an external observer, that is to be considered a tremendous success. However weaknesses in competitiveness have turned Croatia in a relatively small competitor when it comes to global markets. But although good results have been achieved by a strategic country alignment, the business’ location remains traditional - near big cities and large metropolitan areas, mainly Zagreb, Rijeka, Split and Dubrovnik. Like Portugal, Croatia seems to suffer from urban macrocephaly and rural exodus.

Croatia remains a country with an historical problem concerning development asymmetries. That is also true when it comes to knowledge dissemination. But the Information and Communication Technologies sector (ICT) has to be considered crucial to leverage economic growth assuming at the same time an important role in particular aspects of the so called Information Society (IS). The ICT sector is also crucial for the decrease of territorial asymmetries. But the difference between numbers is larger when it comes to the big cities or metropolitan areas compared with its peripheries or rural regions.

I. Croatia: Society, Economy and Education

1. Key Figures

Croatia has approximately 88.000 Km^2. From the total, 56.500 are in land and the other 31.500 are sea surface whit more than 1000 islands. According to the preliminary Census results (2011), Croatia has 4,290,612 inhabitants. Numbers are not comparable with the results of the 2001 census, as the methodology has been aligned with international standards (Kovac, I. 2012).

According to the census conducted on 2001, Croatia had a population of 4.437.460 and a data comparison would indicate that it lost 146.848 inhabitants, but this is actually the result of the changed statistical definition of the total population. If the latest methodology was applied to the results of the 2001 census, Croatia would now have nearly the same number of inhabitants as then.

The City of Zagreb has 792.875 inhabitants, or 18% of the entire country population, followed by Split-Dalmatia County with 455.242 inhabitants. Apart from Zagreb, only Split, Rijeka and Osijek have a population of over one hundred thousand (178.192, 128.736 and 107.784). Lika-Senj and Pozega-Slavonia counties have the lowest population, 51.022 and 78.031.

The census also shows that Croatia has 2.257.515 housing units, including 1.923.522 flats as permanent residences. The number of housing units grew 20 per cent in the last 10 years (by 376.648) and the bulk was built in Zagreb (73.421) and Split-Dalmatia County (64.277).

On social-economical data and according to IMF, the GDP evolution rate on Croatia 2011 was 0.8 which is bellow 1, a low figure. Slovenia for example had 1.9 and Slovak 3.2 and the Czech Republic, 2.0. In February 2012 the official number of unemployed was 342.951 (with 161.126 female), approximately 19.8%. The average subvention in Croatia is 1.652,88 kn (225 Euros). Looking at the data from the same official source, unemployment rate show a decline since 2004 until 2008 and from 2009, the number climbed more than 10% (more information available on http://statistika.hzz.hr).

2. Education and Information Society

A country's education system is one of the main indicators to competitiveness in human resources. Highly competitive human resources result from a quality education that is available to a large

percentage of the population. There is a major correlation between an increased level of education in a country and its economic growth (Hall, 2002; OECD, 2001; Bassani and Scarpetta, 2001). An additional year of education for a country's population counts as an increase in output per capita by four to seven percent (Bassani and Scarpetta, 2001). In developed countries and in transition countries the quality of education is even more important than the quantity of education in determining economic growth (Hanushek and Kimko, 2000).

The EU accession is going to put pressure in Croatia's' educational system. Croatia will need to develop a skilled workforce that can compete directly with other EU countries. Within the next four or five years, the Croatian workforce must change to a knowledge-based innovation-driven' economic and workers will need to be able to change jobs quickly, deal directly with customers and engage in continuous learning process. Workforce in Croatia must also be prepared for high rates of working mobility.

2.1. Education in Croatia – Small notes of contemporary history

Croatia has always had a high quality educational system based in a strong educational environment back from the Habsburg Empire. Along the years the system has included overall improvements starting from the base - the Croatian National Education Standard. The first university in the country was established by Dominican priests in Zadar in 1396 as the Universitas Jadertina, the General University. According to the Ministry of Science and Technology, the government arm formally in charge of higher education in Croatia in 2001, Universitas Jadertina had conferred the "degrees of Master of Science and Doctor of Science and was thus equal in status to the other eminent European universities of the time."

In 1991, approximately 29 percent of Croatia's population was of school age or between the ages of 3 and 24. Compulsory schooling for students generally between the ages of 6 and 14, was 89 percent in 1996. Twelve years of public schooling was the expected norm in Croatia in 1995, although attendance was compulsory for only eight years.

But the educational experience of most students in Croatia was severely disrupted by the war in the early 1990s. As of 2001, thousands of refugees who had left Croatia during the warfare of the 1990s had yet to be resettled, and those who had returned often were housed in temporary quarters away from their homes. Regular school attendance was thus especially hard for some children. Schools had been rebuilt and classes restarted shortly after the Dayton Accords signed in 1995. Consequently, some measures of educational enrollments, literacy rates, and other school-related statistics for the 1990s are

fairly imprecise or nonexistent. Certain knowledge gaps exist regarding the status of education in Croatia in the 1990s, making a full evaluation of the country's educational situation at the start of the new millennium somewhat difficult to achieve.

Nonetheless, in June 2000 a number of solid recommendations were being advanced to reform the education system in Croatia. However, they had not been carried out due to the need for public debate in the policy-formulation process. In the proposal drafted by the Government Ministry's Council of Education, the Council had identified several major flaws in the education system, the remedy of which could vastly improve the country's schools. There was a list of major deficiencies clearly referenced within the system:

1) Lack of democratic relations and procedures in the schools;

2) Authoritarian and conservative methods;

3) Overly rigid scheduling of the school day;

4) Inflexible rules for placing and promoting students;

5) Dualistic secondary education uncharacteristic of European systems;

6) Denying opportunities to higher education to about half the secondary-school population;

7) Inconsistent and formalistic grading system;

8) Over-centralization in educational administration;

9) Lack of recognition of parents' rights and obligations;

10) Poor-quality and inadequate physical facilities and equipment;

11) Few private schooling alternatives;

12) Little entrepreneurial activity supporting education;

13) Fragmentation among the parts of the education system;

14) Arts schools poorly coordinated with other schools;

15) Formalistic and unmotivating methods of evaluating teachers;

16) Lack of professional teaching publications and pedagogical literature understandable by or useful to most teachers;

17) Poor management of the education system, schools, and classes.

The Education Council carefully noted that teachers in Croatia "for some incomprehensible reason have been financially discriminated against and professionally thwarted and restricted, while the entire education system was run in a manner totally out of synch with European tradition and experience"

(Council 7). The results were especially surprising considering that Croatian schools and culture are centuries old, including at the university level.

In June 2000 the Education Council of the Ministry of Education and Sports made several recommendations to bring the country's education system into better alignment with European and UNESCO-approved international standards. The Council suggested adding a year of compulsory preschool education for all children between the ages of five and six beginning in 2010. Additionally, the Council recommended making nine years of basic education compulsory and divided into three phases:

(i) a “junior” phase where students would be taught in forms (classes);
(ii) an Intermediary phase where students would be taught in a combination of forms and subjects;
(iii) a “senior” phase where students would be taught subjects by specialized teachers. Two, three, four, or five years of secondary school, depending on the course of study chosen by the student, would follow this nine-year pattern of elementary schooling.

The overall goal of the reforms recommended by the Council was to make schools in Croatia capable of delivering education that would fulfill one basic requirement: making high-quality education available to all. As the Council noted, "A fundamental human right and a democratic prerequisite for equality among the young generation is the same educational (pedagogic) standard and quality of upbringing as the most important condition for social promotion and professional success" (Council 40).

The need to develop new textbooks, teaching approaches, educational programs, and course curricula sensitive to the needs of all of Croatia's people, including ethnic minorities, was highlighted in the Education Council's proposal for school reforms in June 2000. Similarly, providing students with the means to develop knowledge and skills in information and communications technology (ICT) has been a goal of education reformers in recent years. With the strengthening of the economy in the first few years of the 2000 decade and the improvement of education likely to come about through reforms initiated by the Croatian government in the year 2000, new programs in ICT were likely to be added to schools to qualify students for high-technology employment. In 1999 the number of personal computers in Croatia was 67 per 10,000 persons. This was more than triple the number of computers just two years earlier (22 per 10,000 in 1997). The new reforms for Croatia's schools in the 2000 decade surely would upgrade student knowledge and functionality in educational technology. This was evidenced by the Education Council's recommendation of a compulsory "national curriculum" that would develop in each student 18 areas of literacy, with "information technology" the third literacy area in the Council's

proposed list, just after "alphabetical" literacy and literacy identified as "mathematical, suited to the use of technical aids." That was obviously very important to Information Society Literacy and determinant to achieve a higher level of competitiveness.

2.2. Education and Information Society: Strategies with Common Links

According to Petrovecki et all (2006) Croatia has set out to close the gap between its own education and science system and that from the developed countries. The strategy was implemented in the entire education system.

According to EuroEducationNet (available on http://www.euroeducation.net) the Croatian higher education system comprises six universities, with some eighty faculties, art academies and schools of professional higher education; five polytechnics; six independent schools of professional higher education and nine private accredited schools of professional higher education. The mission of universities is scientific, artistic and developmental research, especially the implementation of scientific research programs that are of strategic interest to Croatia; artistic endeavor and professional work, as well as the undergraduate, graduate and postgraduate education based on them. The mission of polytechnics and schools of professional higher education is professional higher education and artistic and professional activities in accordance with the needs of their local community. Schools of professional higher education are mostly teacher academies or institutions established in certain fields where the need or resources to establish a full polytechnic were lacking. The higher education system in the Republic of Croatia is currently undergoing a comprehensive reform in order to be part of the European Higher Education standards with the implementation of the Bologna Declaration, signed by Croatia in 2001.

The new Act on Scientific Activity and Higher Education (2003, amended 2004) establishes a mixed system supporting on the one hand the specialist education at polytechnics, schools of professional higher education and universities, and on the other the academic education conducted only at universities. Under the new Act, academic and professional education are organized according to the system of transferable credits (ECTS).

Croatia educational system offers Polytechnics and Schools of Professional Higher Education and Universities offer two, three and four years' professional undergraduate studies (leading to a Certificate after three years and 180 ECTS credits) and train highly professional, artistic and, in some cases, scientific workers. Upon completion of a professional degree course, the students are awarded a

professional baccalaureate specifying the title of the profession. The graduates are allowed to continue their studies at a second stage or at the university. Polytechnics and Schools of Professional Higher Education also offer graduate study courses in one or two years leading to a diploma after accumulating 300 ECTS credits. The graduates are allowed to continue their studies at the university.

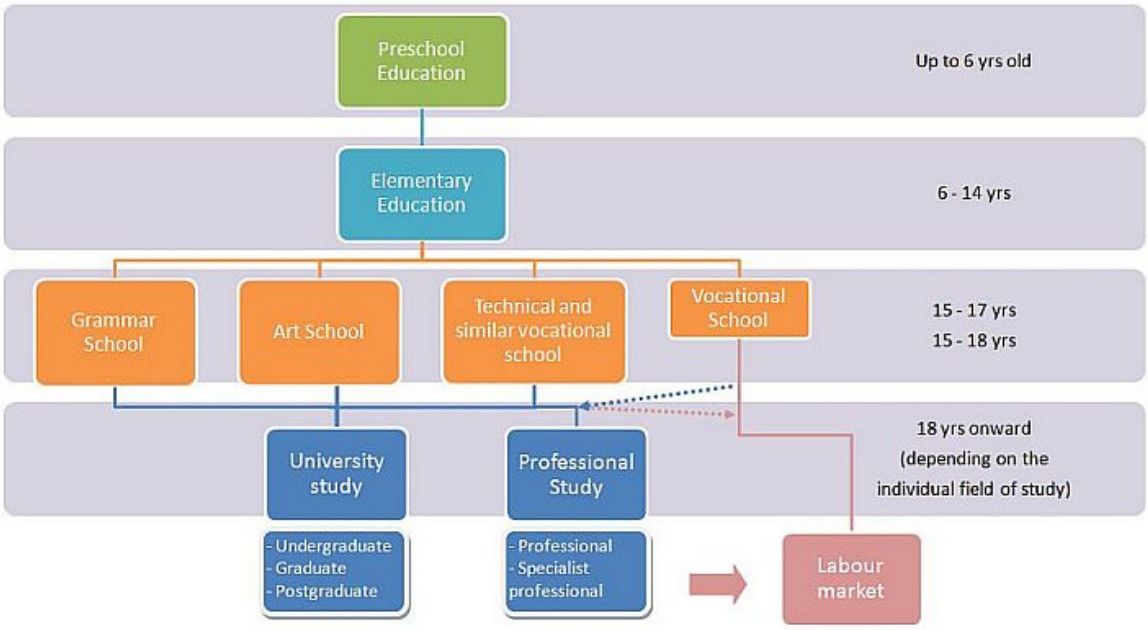


Fig. 1 - Education System in Croatia.

From 4-year primary school plus 4-year lower secondary to external evaluations; extending compulsory education from elementary to higher secondary education (11 to 12 years in total); introducing the Bolonha principles to lifelong learning. All of these brought Croatia to a closer alignment with European standards.

II. Information Society: An Infrastructure for Development

1. Information Society and Internet: Creating New Geographies of Influence

Technological evolution has showed that Internet is clearly a spacialised phenomenon. 'Internet is where its users are' (Kolko, 1991:1). And people who believed in the death of space can observe that space was only distorted.

More than territorial administrative borders, we see maps with international businesses, regional markets, economic clusters and cities. These elements define new frontiers. In what concerns education

and research, the same applies. An individual as an element of research conducts to poor research findings. On the opposite side, workgroups, different scientific and multidisciplinary approaches normally conduct to rich findings and state of the art research.

If we take a global peek into our modern world, we see modern networks as vital infrastructures. Every developed country has its own public Education and Research network and develops a research strategy. Normally it has two identical objectives. It must reach the highest number of connected people and its capacity should be adaptive to the needs.

It's obvious that the activities that contribute the most to a nation' R&D is always concentrated around important network nodes. This is common for all economic sectors. If we analyze more carefully, we could see that those nodes are highly positioned in Internet hierarchy.

As a result of markets' liberalization and global economy, goods, capital and labor have suffered enormous mutations. So, the territories are submitted to constant transformations and to a rearrange of social and economic spaces. More than countries, we see maps with international firms, markets, economic circuits, regions and cities. These elements define the new frontiers.

In the beginning, Internet announced the death of distance and the rise of places without identity. But for now, the Internet is mainly a physical network that connects millions of computers around the world. These computers have a geographical location. So we could say that Internet disseminates in space and it's physical, real and not virtual.

To understand Internet technology and dissemination it's necessary to apply theories, concepts, methodologies and instruments of geographical research. The fact that analysed elements could be telecommunication networks, web pages, hosts, domains or other variables, do not prevent, but rather compel, the use of Internet Geography. 'Web sites are a form of geography - geography of the screen' (Dodge, 2001b: 173).

Croatia has also undergone a program of information and knowledge dissemination. Although we cannot refer to as a specific program, we could see that ICT is growing as a priority sector within economy. Some reports and strategic documents clearly state the importance of information and their infrastructures (RERASD: 2012).

2. Information Territories – New Paradigm, Same Asymmetries

The dissemination of information is now determinant in terms of territorial competitiveness and both public and private sector take large benefits when the data-information-knowledge value chain repeats itself trough space and time.

Cities and regions define the global geoeconomy. However, the connections between them are becoming less visible. The location of decision centers is defined around hubs. Their dimension is sustained according to their attraction capacity and remains possible only through virtual space. This capacity is quantified in a more complex way taking into account that its most valuable asset, information, is very difficult to evaluate.

The localization of variables over the earth surface is becoming increasingly important and the georeferencing technologies are killer applications for competitiveness. The success of a large number of businesses relies on fast information updates. For business with large R&D investments and besides more traditional variables like space availability, a specialized labour force or high quality satellite services, there are other factors considered determinant to choose the perfect place: modern government information policies or an efficient telecommunications infrastructure are just a few examples.

The information volume disseminating trough territories is growing exponentially and Internet is probably its most significant global infrastructure in the world. Its unquestionable importance extends from economy to finance, from society to culture. Nowadays a large number of operations rely on this network and the amount of data that flows is unimaginable. Store capacity and memory continue to expand in size and contract in price and network capacity has to support all of this.

Competitiveness is played at world scale and telecommunications play a major role. The need for information corridors has become crucial. Information diffusion is a catalyser for regional development and lead to informational clusters. The polarization of places contrasts with the dispersion of spaces. And all this geographical hierarchies are important to achieve higher stages of territorial development. Knowledge networks are determinant to create critical mass and are crucial to globalization processes. To be out of the networks means only one thing: you do not have existence.

From that point of view, Internet is still (in its multiple platforms and technologies) one of the major variables to consider when choosing the perfect location for your business. Speed, capacity, complementary services, technology, added value, quality and price are priority aspects. Third generation Internet has turned consumers into producers of information. When you upload information into the web you're generating virtual communities in the form of blogs, tweets or sharing information with others on Facebook. But at the same time you are also creating social networks. At the end the virtual doesn't sty only on the virtual, it becomes physical and real. People share large quantities of information on social networks. But at the same time they like, they play, they talk and they buy.

For example in Croatia, the business of tourism is largely sustained on the Internet. Due to the low number of hotel accommodations, a real industry of private accommodations has grown all over the country. If Internet didn't exist, the business would not exist. It was impossible to rent a room in a rural region of Croatia. But it is possible. The capacity is present but sometimes it is not used efficiently.

3. Information Society and Infrastructures – Is Croatia Going Global?

Living in an Information Society only makes sense if all the citizens have access to it. But this global sense is not so global has we would like. Physical networks (coaxial cables, fiber optics, etc.) are far from global and sometimes this definition loses all its meaning.

When looking at a country' profile it seems obvious the differences between rural and urban areas when it comes to "going global". The strategy behind the connectivity rankings is always the same: just above a certain level of population density, companies are willing to invest in better connection infrastructures. When you don't have people, connectivity levels depend on public and governmental supports.

According to Caric, et. All (2011), broadband must be recognized as an imperative for economic Development and employment but also a key factor for improving healthcare system, science and culture. Rural areas must be a priority and Croatia needs to implement a strategy for these areas. The increase of intellectual potential must be developed or otherwise, the migration of young people to urban areas will progressively turn the rural areas into deserted and forgotten regions with even bigger asymmetries. A research paper presented in a conference from HAKOM (2011), the regulator of communications sector in Croatia, clearly identifies the main reasons for lower broadband penetration in rural areas:

a) Potential user density in rural areas is lower and distances greater thus resulting in more expensive implementation. Lower density leads to lower demand, that is, less income per use for operators;
b) Age structure of population in rural areas is less favorable. The elderly are less likely to use the Internet. They are unfamiliar with computers and often afraid of technology;
c) Rural population is often less educated which results in lower IT literacy which creates a barrier for internet use;
d) Rural population on average has lower income and cannot afford to buy computers and broadband access;
e) Exclusive focus on broadband access with modest offer of real applications and services cannot convince rural population of the usefulness of Internet use.

It's also important to refer some more general reasons to that gap between urban and rural regions. Issues like late privatization schedule, unsuitable concession agreements, insufficient investments and a general economic crisis context.

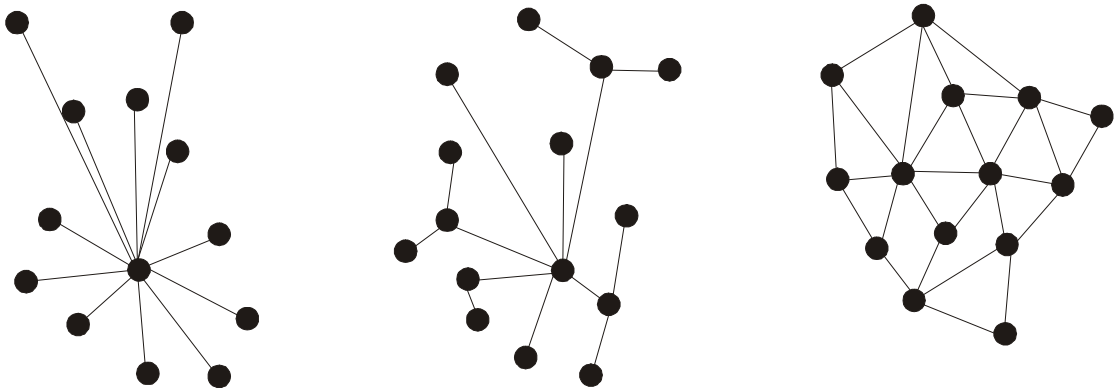
3.1. Topology

Network Topology Configurations and Economic Development

Telecommunication' networks and Internet seem to follow the existing urban network and although the technology will evolve into formulas that combat info-exclusion (either by reducing costs of the technology itself, either by the emergence of more flexible solutions for the dissemination of information such as wireless networks) the distribution of knowledge stills unequally distributed.

Castells (2000) refers that there's no centrality in networks. This is also the opinion of authors such as MOSS and TOWNSEND (1998) who claim that the network topology depends on the behavior of service providers, infrastructure owners, who have built an elaborate system of backbones, strongly hierarchical. NEWTON (1991) has a contrary opinion, and although he says that this system is the result of accumulation of telecommunications networks for several decades, also states that the infrastructure is distributed in completely different ways, affecting network connectivity and differing levels of dissemination information and knowledge in geographic space.

According to the analyzed networks (and a wider range of other topologies studied, but not described here), one can distinguish three models (or topologies) network: 'centralised' decentralized 'and' distributed '.



Centralized network Decentralised network Distributed network

Fig. 2 – Network Topologies.

Although (theoretically) the level of accessibility of two hubs or cities in a given backbone is equal, there are always peaks of congestion in networks. In an increasingly globalized economy, a center with a largest number of connections to major backbones will have a faster and more reliable access to the global flow of information. The greater the number of providers the more routers will exist and therefore flexibility exists in Internet traffic. This prevents the overloading of a backbone, since the alternative traffic flow is higher, thus giving a reduction in the likelihood of techniques failures. It seems unquestionable that a topology based on a 'distributed network' will always be technically better than a 'centralized network'. A "decentralized network" is an intermediate solution.

The two examples of Internet research networks analyzed a few pages ahead (RCTS and CARNET) can be categorized as centralized models. According to the technological development, this type of network is not ideal for the proper dissemination of information, once the infrastructure is poorly distributed throughout the territory, based on (very) congested routers and with 'no alternative routes". When congested, there's no ability to ensure continuity of flows with the same performance.

As an example of the second model, the decentralized, we can refer to the European network GEANT that despite extremely advanced technologically, still has in its topology, some physical constraints, particularly for more peripheral countries such as Iceland, Ireland and Portugal, with only two

connections to the backbone. Countries such as Germany or the UK have for example, 9 and 7 links to the backbone. This ensures higher performances, which are due to higher capacities of traffic flow, and less likely to jam the nodes, since the number is greater.

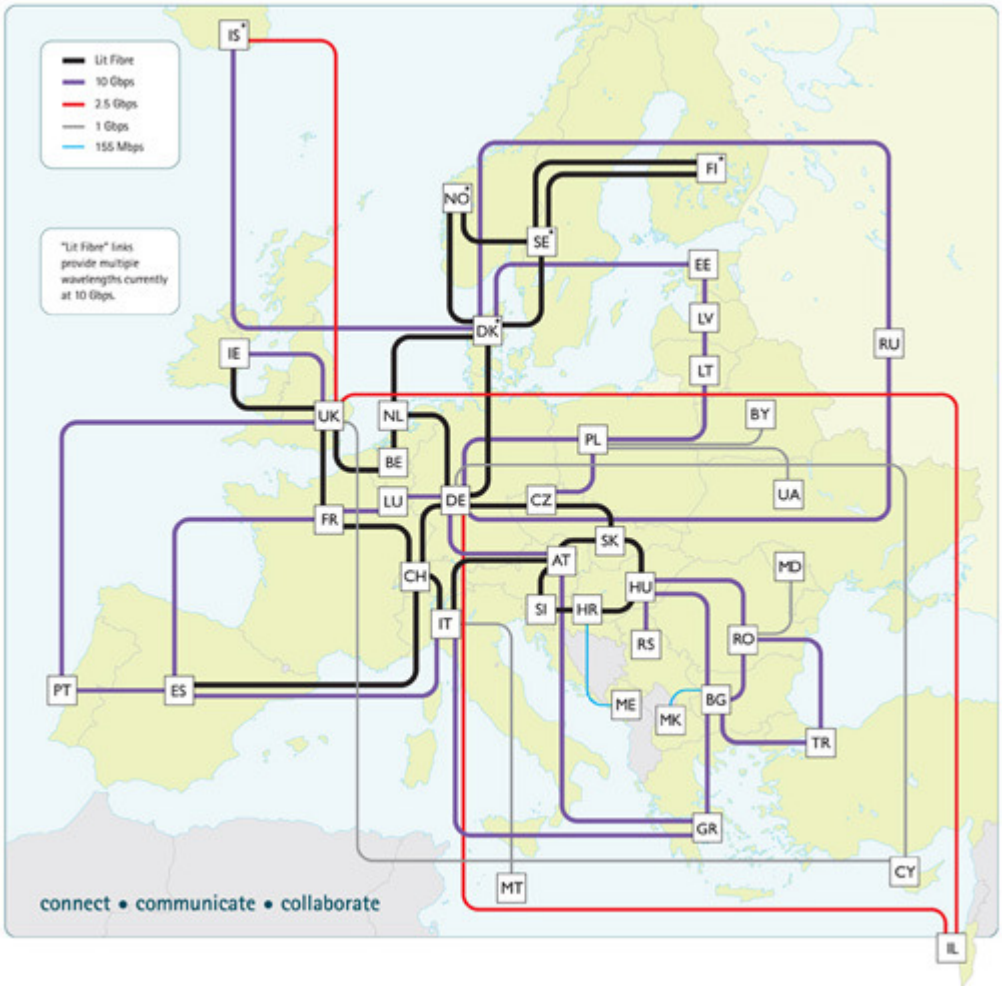


Fig. 3 - Geant European Network, 2012.

Croatia suffers the same problem as Portugal in terms of physical topology infrastructure. Analyzing network and taking into account some theories about physical infrastructuring and development, Croatia has a high probability of developing regional asymmetries.

If we take a closer look to some of the European networks, we could see a much more decentralized web of main nodes. From a theoretical approach, these kinds of networks would be much more appropriate to the development of a country because they close up gaps of information. For example the network of France, represents a distributed model, which from a theoretical perspective is more balanced when it comes to information dissemination. Looking at RENATER, the Internet research network from France, there is an obvious decentralized topology showing the existence of rings inside

the network. This permits a better diffusion of information and at the same time, better solutions to overcome technical problems.

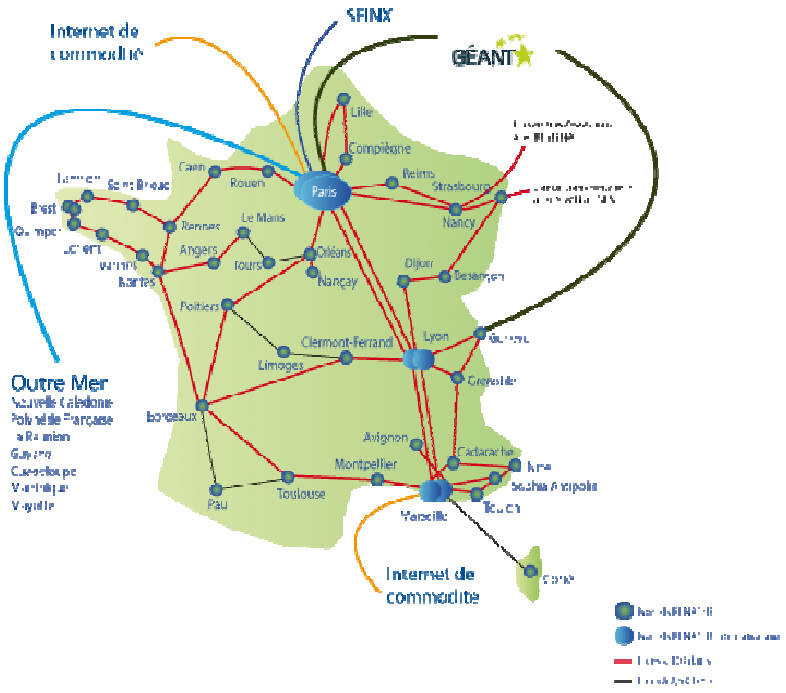


Fig. 4 – RENATER network from France, 2012.

Looking at the German network (G-Win Network) operated by DFN we could also see that the network has a decentralized topology. Like the French it permits a better diffusion of knowledge throughout the territory.

Fig. 5 - G-Win Network from Germany, DFN, 2012.

The shape of the network infrastructure is obviously very important and looking at some of the European topologies we observe in some cases a correlation between the shape of the network and the economical development. But Information society doesn't survive only with the public sector and governmental projects. The success is also about private investment in media and telecommunications.

3.2. The Private sector Investment in 'Telcos'

Technologies can overcome distances like for example with satellite platforms. Like in other countries, public and private companies worked together. Telecommunications are obviously a very important part of information society. OIV is an important player. Created in 1924 when radio enthusiasts from Zagreb joined together to form the Constituent Assembly of the Radio Club Zagreb, OIV took its first steps with a radio concession issued to a group of members of the Radio Club Zagreb. Government gave its approval to the foundation company Radio Zagreb and the set up some regulations. For the first time, radio station transmitter of 350 W sent a dedicated program into the air on Medium Wave (MW).

When Radio Zagreb became a state enterprise during 1940, the new administration started considering the possibility of increasing the power for the Otok transmitter as well as the construction of a new. It should be located in such a place that it could cover most of the Croatian territory. At night, that same transmitter would be covering most of Europe too, thanks to its space waves. On the 30th anniversary of Radio Zagreb, the first television transmitter of Yugoslavia was putted into operation on Sljeme Mountain in Zagreb. That was the beginning of a communication revolution that changed the way of life. In 1986 the first professional satellite receiver was installed and in 1992 the transmission of analogue programs from satellites began its transmission. The digital satellite program starts with its transmissions on 1997.

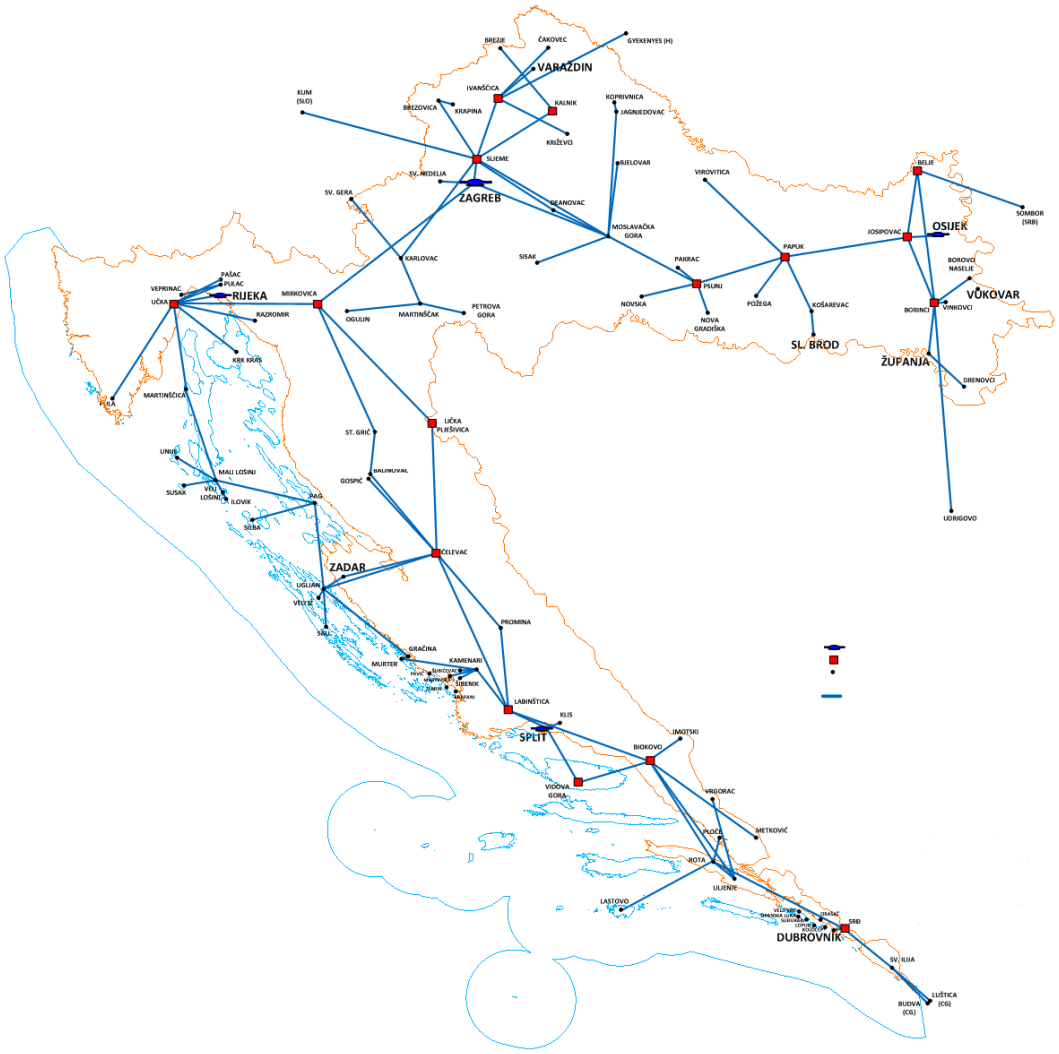


Fig. 6 - Digital microwave links (includes a high capacity network based on SDH[1] technology and access connections in the cities). Transmission buffers can also be visualized.

Croatian broadcast and WiMAX network operator Odasiljaci i Veze (OiV) could become a national fibre optic network operator from 2013, reports local daily Poslovni Dnevnik. The investment could amount to HRK 10-15 million, according to Darko Paric, Assistant Minister for Administration for e-Croatia. In the

[1] SDH (Synchronous Digital Hierarchy) is a standard technology for synchronous data transmission on optical media. It is the international equivalent of Synchronous Optical Network. Both technologies provide faster and less expensive network interconnection than traditional PDH (Plesiochronous Digital Hierarchy) equipment.
SDH uses the following Synchronous Transport Modules (STM) and rates: STM-1 (155 megabits per second), STM-4 (622 Mbps), STM-16 (2.5 gigabits per second), and STM-64 (10 Gbps).

construction of this project, OiV will use the existing infrastructure of state-owned companies HEP, Janaf, Plinacro, HAC and HZ. According to a study by the Zagreb Faculty of Electrical Engineering and Computer Science, only HEP has some 2,700 kilometers of fibre optic infrastructure.

GTS Central Europe is another important player. As a leading infrastructure-based provider of telecommunications services in Central and Eastern Europe, GTS owns and operates an extensive fiber optic and data center network throughout the region. In the Czech Republic, Hungary, Poland, Romania and Slovakia, the company combines its regional footprint with deep local networks to deliver a broad range of services.

In terms of private network investment, GTS Central Europe, a leading infrastructure-based telecommunications operator and data center service provider in EU, has extended its fiber optic network to Croatia. This investment follows continued growth of GTS's international network within Balkan region and complements previous fiber constructions towards Serbia and with Slovenia.

According to Ignacio Irurita, CTO at GTS Central Europe, "the new network extension to Croatia offers present and future customers the opportunity to improve the levels of connectivity and adds new services to the Southeast European market.(…).Our plan is to continue expanding the infrastructure both geographically as well as in network depth in metropolitan areas. We are currently working on further network infrastructure expansions throughout the easternmost part of our network, creating the ultra high speed communications highway in Central and East Europe".

The capacity of the system reaches 40 Gb/s per channel and a total of 96 channels, but thanks to the new generation DWDM system, can increase to as much as 100 Gb/s. The new technology facilitates a flexible response to customers' demands both in terms of network interfaces and bandwidth. The parameters of the network enable GTS to offer its full service portfolio also to customers in the newly commissioned area, and address capacity demands driven by IP traffic growth in the Balkan region.
The new fiber optic network connects Budapest through Zalaegerszeg and Nagykanizsa, crosses the border at Letenye and extends to Varasdin. The new network section measures 180 km and increases the total length of GTS's backbone network in Hungary to 2300 km.

One of the most important leverages of Information Society is attributed to the national networks of research and education that have been built over the last few years. Mainly implemented with public funds and developed on common standards, European countries have been evolving their networks to connect with the GEANT European network. The next chapter will address them

III. Research and Education Networks: Portugal and Croatia: an obvious comparison

1. RCTS and CARNET - History and numbers

1.1. Rede Ciência e Tecnologia e Sociedade (RCTS) – Portugal

History

Portugal followed the same steps of other world countries in what concerns to Internet evolution, but only in the 80's Portugal began seriously. In the beginning there was only a remote terminal access by a telephone line to other computers, located mainly in Great Britain or in the United States. This was only a privilege of a few professors or post-graduate students that kept international accounts in foreign servers.

In the mid 80's the first Portuguese node of *European Academic Research Network* (*EARN*) was installed by the *Portuguese Unix User Group(PUUG).* This works as an extension of BITNET, the European network offering email services, file transfer and remote job submission. Meanwhile in Portugal and benefiting from the fact that many universities and research institutions have available the DIGITAL VAX systems, as well as the fact that it started commercial operation of the public X.25 network, created a wide network that used the protocols of the manufacturer . This network had e-mail services and file transfer. But networks were not compatible with each other which required the operation of several gateways, limiting the availability of the services and representing a considerable management effort. The only service available was universal email.

However the European level and under the auspices of the European Union, which had realized the crucial role of research networks and training for scientific progress, the project was launched CoSine (Cooperation in OSI Networking) who came later to create a trans-European network protocols used to connect the OSI networking research and education in different countries. This network had speeds that, under current standards, we can consider ridiculous. Indeed speeds of 64 kbps were available throughout Europe. The network had its input node located in Portugal at the University of Minho in Braga. By 1990 the university teachers and researchers involved in these networks, and they were having a membership of more elements, combined their efforts to FCCN which, however, also tried to create a network for delivery throughout the country. At the time there was a perception that the family of IP protocols IP (Internet Protocol) was having a development and success at international level,

leading to the protocols standardized by ISO. These facts led to the creation of the IP Forum, which gathered those who had been developing networks such as FCCN and sought to gradually migrate existing networks to TCP / IP, which came to pass.

The network FCCN began to increase its scope and was designated RCCN (Community Network National Scientific). The network, at certain times, had several difficulties arising from insufficient funding, the high costs and poor quality of national telecommunications and, consequently, the international bandwidth was very modest. Yet since 1990 and as a result of the technical effort of the Forum and the implementation of the IP network within the FCCN the research community and national higher education contributed to the creation of the Internet in Portugal. At this point, in 1991, was installed on the server which managed the domain .PT.

Until 1994 Internet access was almost a privilege of the gods. Only in the last five years of the 90's Internet start to grow and became to generalize between different targets. First universities and research centers and then the first private Internet Service Providers (ISP) with the competitive prices. In 1996, the initial phase of preparing the Green Paper, the Government decided to make the necessary investments for the network to the national scientific community was strengthened and extended to other communities. The starting point was difficult. To get an idea of a specific aspect but which reflects the modest development of the national research and education in the early 1997's international connectivity RCCN (at the time this was still the name of the network) was 1 Mbps, achieved through 2 circuits of 512kbps.

Nationally bandwidths greater than 1 Mbps were available only in areas of Lisbon and Porto, in acceptable condition. On the other hand the challenge given by the Government to FCCN was to strengthen the network, causing higher bandwidths to all higher education and, simultaneously, to connect all schools from 5th to 12th grade to the Internet, using the network as infrastructure base structure. This was achieved in late 1997 and about 1,650 of these non-higher education schools were connected to the network through a network of 14 points of presence (PoPs - Points of Presence) based in institutions of higher education and supporting the technical point of view and educational schools of their surroundings.

However, the international connectivity of RCTS suffered significant increases. These were necessary to monitor the improvement of the national network which had meanwhile been made and, on the other hand, benefited from the projects of the European Union who came to lead to the creation of the GÉANT network.

The Support Infrastructure, International Integration and users

International integration is done primarily through the TERENA association, which aggregates all academic networks in Europe. FCCN is a founding member of European Internet Exchange Association (Euro-IX), which promotes the common interests. It is also a partner of DANTE, a private non-profit company dedicated to managing and implementing the technical and operational aspects of major projects and services provided to the European academic networks and member of RIPE-NCC, the organization responsible for managing scarce internet resources in Europe (i.e. IP addresses and Autonomous Systems numbers).

Between 1997 and 2001, successive reinforcements RCTS in technology and scope. At the end of 2001 all the system of research and higher education were connected to RCTS; also the all public and private schools from 1st to 12th grade, including some kindergartens, a total of about 11,000, these schools were connected to digital technology (ISDN), an symmetrical bandwidth of 128 kbps, about 350 municipal libraries, more than 200 cultural and scientific associations and more than 200 associations of citizens with special needs By the end of 2006, all the 42 (public and private) Universities as well the 8544 Portuguese schools were connected to the NREN. These two numbers correspond to 100% of the statistical universe.

Fig. 7 - RCTS network from Portugal 2012.

1.2. CARNET – Croatia

History

Croatia had a late start and it was only on October of 1991 that the first meeting of the Committee for the establishment of Croatian Academic and Research Network - CARNet took place. The Committee appointed by the Minister of Science, Technology and Informatics had the challenge to organize a network capable of supporting communications to students, scholars and research community in all the Republic of Croatia and connect them to the world. It was formerly founded by the Croatian government in 1995 operating under the Ministry of Science, Education and Sports. The headquarters are in Zagreb with 5 regional centers in Rijeka, Osijek, Split, Pula and Dubrovnik.

The whole project of planning, construction and financing of the network CARNet throughout all 20 years was actively followed and supported by the Ministry, as well as a number of institutions, partners and organizations. A special contribution to the development of the Croatian Academic and Research Network was also provided by the University Computing Centre in Zagreb - Srce. A special partnership CARNet was also developed with the Faculty of Electrical Engineering, University of Zagreb, and that partnership is ongoing ever since, while the Faculty remains actively involved in the development of services that CARNet builds and maintains.

In the early years, besides establishment of the advanced communication network to all academic institutions in the Republic of Croatia, CARNet achieved two major breakthroughs: the establishment of the first Croatian Internet connection to the world, on November 17th of 1992, which started the age of Internet in the Republic of Croatia, and three months later, on March 27th of 1993, when CARNet registered and started to administer the national top-level Internet domain .hr.

On March 1st, 1995, Croatian Government adopted the Decree on the establishment of the Croatian Academic and Research Network - CARNet as an institution for information and IT infrastructure activities in the systems of the education and science in the Republic of Croatia.

In June of 2005 CARNet started the activities to connect the primary and elementary schools to the network which would be the base of the future academic network. Among the many pioneering initiatives, a few of them deserve to be mentioned:

1995 - The first implementation of a national network based on ATM technology;

1996 - The first transmission of video over the network;

1997 - The first remote lectures Internet based;

1999 - Coordination of the Croatian Internet Exchange (CIX);

2000 - The launch of the first regional Cisco Networking Academy;

2003 - The first traffic exchange between users over IPv6 protocol.

2003-2004 -The modernization of the network on the gigabit technologies;

2005 - Implementation of hosting for online services for secondary and elementary schools (HUSO);

2006 - Provision of individual access to CARNet network;

2007 - Launch of the Portal for schools and implementation of the project e-Islands;

2008 - Establishment of content filtering;

2009 - Construction of a based fiber optic infrastructure.

In 2010 CARNet initiated and gave its support to the National Information System for Applications to Universities (NISpVU) and developed a web application for managing the schools' *e*-Diary. It has 100 employees and 40 associates

The Support Infrastructure, International Integration and users

Network infrastructure is owned by the CARNet institution, but the phisical structure (cables) are rented from a telecommunication service providers (ISPs).

In Croatia, the CARNet network connects the major Croatian towns and cities on the continent and a number of points of presence (PoPs) on the islands. The larger university centres like Dubrovnik, Osijek, Pula, Rijeka, Split, Zadar and Zagreb) have high speed connections (from 155 Mbit/s to 1 Gbit/s), while smaller centers are connected at the speeds ranging from 2 Mbit/s to 100 Mbit/s. Zagreb has a particularly advanced infrastructure, connecting larger faculties and scientific institutions at the speeds of up to 10 Gbit/s. The currently supported version of the TCP/IP protocol is IPv4.

Thanks to the project "e-Split,", which CARNet has accomplished in cooperation with the City of Split, Split is the first city in which CARNet has its own optical network. Through that optical network 158 CARNet member institutions, in the city area, are connected to CARNet network.

Acording a CARNet press release (October 2011) users include member institutions and individual users. Member institutions are institutions belonging to science and higher education system, as well as those

belonging to the primary and secondary schools. CARNet has 241 member institutions from the academic community connected to the CARNet network at 437 locations. There are 1386 members from the primary and secondary school systems, connected at 1919 locations. Individual users are higher education students, professors, researchers, primary and secondary school students, teachers and employees at primary and secondary schools and student homes.

Data retrieved from the last Terena Compendium (2010) shows that 106 Universities are now connected, 41 Institutes of higher Education, 36 Research Institutes, 422 Secondary Schools, 905 primary Schools, 10 Libraries, museums or national archives, 15 Non-University hospitals and 11 Government departments.

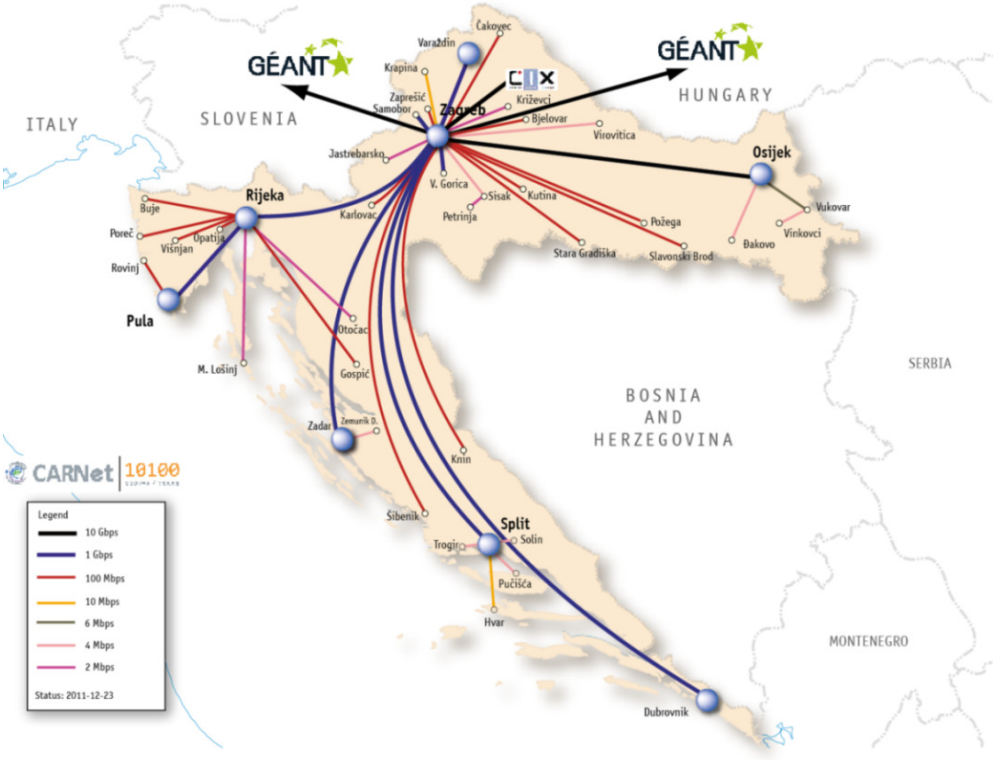


Fig. 8 - CARNET network from Croatia, 2012.

Carnet is involved in several projects that include for example, the Nikola Tesla National Portal for Distance Learning with lots of interactive digital material for secondary schools (available on http://lms.carnet.hr), online courses in Moodle (available on: http://moodle.carnet.hr). This moodle application was used by an average of 7500 people per month (2010).

The CARNet network established this connection through the GÉANT pan-European research network, with the current connection speed of 10 Gbit/s. The connection to other Internet service providers in Croatia has been implemented through the Croatian Internet Exchange Point – CIX.

Croatia has done some progress to overcome lower levels of connectivity concerning some of the islands that are part of its territory. When it comes to digital gaps, the sea is also a problem. One of the most interesting projects of e-inclusion developed by Carnet is the *e-island* project that connects the most remote 21 primary schools in different islands and locations via Wireless/radio to the backbone infrastructure. This project covers a complete system for remote teaching enabling e-learning and remote teaching on low inhabited and depopulating Croatian islands.

2. Carnet E-Island Project – Digital Inclusion for Knowledge

Installing the newest available technology for e-learning (H.323 videoconference system, wireless infrastructure, smart boards, etc) the E-Island project permits that teachers from a main school on the land could teach pupils on the islands; broadcasting of seminars to the teachers. This project also equipped schools with projectors, cameras, speakers and microphones.

The connection is established between the Elementary Schools in the "continent" and the Branch Schools in the Islands. The e-Islands project comprises the following elementary schools and branch schools on islands) divided by four main connection Hubs (Zadar, Sibenik, Trogir/Split and Dubrovnik).

Link to CARNet PoP Zadar:

- *Zadarski otoci Elementary School, Zadar*
•Ist Branch School, Ist
•Olib Branch School, Olib
•Veli Iž Branch School, Veli Iž
- *Petar Lorini Elementary School, Sali*
- *Maria Martinolića Elementary School, Mali Lošinj*
•Ilovik Branch School, Ilovik
•Susak Branch School, Susak
•Unije Branch School, Unije

Link to CARNet PoP Šibenik:

- *Fausta Vrančića Elementary School, Šibenik*
•Prvić Branch School, Prvić Šepurine
•Zlarin Branch School, Zlarin
- *Juraja Šižgorića Elementary School, 22000 Šibenik*
•Krapanj Branch School, Krapanj

Link to CARNet PoP Dubrovnik:

- *Ivan Gundulić Elementary School, Dubrovnik*

•Koločep Branch School, Koločep
- *Antuna Masle Elementary School, Orašac*
•Lopud Branch School, Lopud
- *Slano Elementary School, Slano*
•Suđurađ Branch School, Suđurađ
•Šipanska luka Branch School, Šipanska luka

Link to CARNet PoP Split:

- *Majstor Radovan Elementary School, Trogir*
•Drvenik Branch School, Drvenik Veli

The next maps show the location of the nine Elementary Schools (two in Sibenik) and the fourteen Branch schools, divided by the 4 main Hubs. The option to use GIS software (ArcGis 10®) with the digital cartography became an option as for future studies a spatial analysis could be needed. All the information about settlements, roads and administrative borders was uploaded. Other variables could also be uploaded to the system as long as they are available for general public, like for example demographic or economical data.

Fig. 9 – E-Island Dubrovnik Hub.

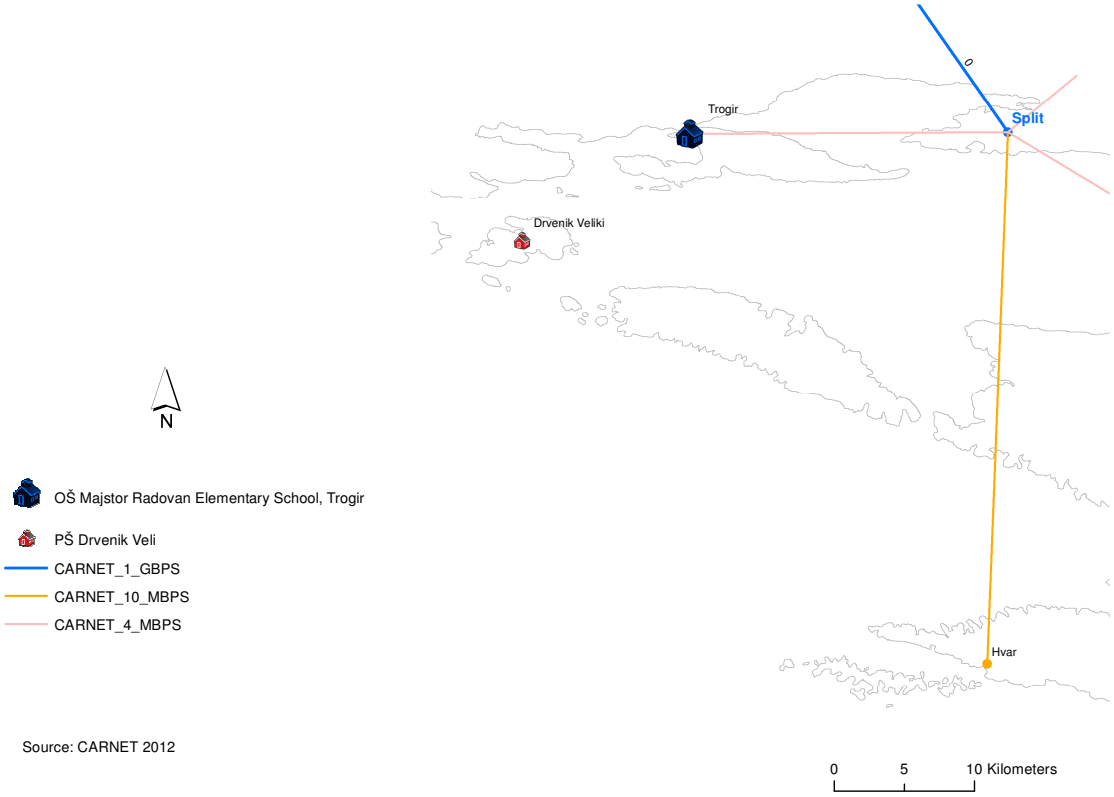


Fig. 10 – E-Island Split/Trogir Hub.

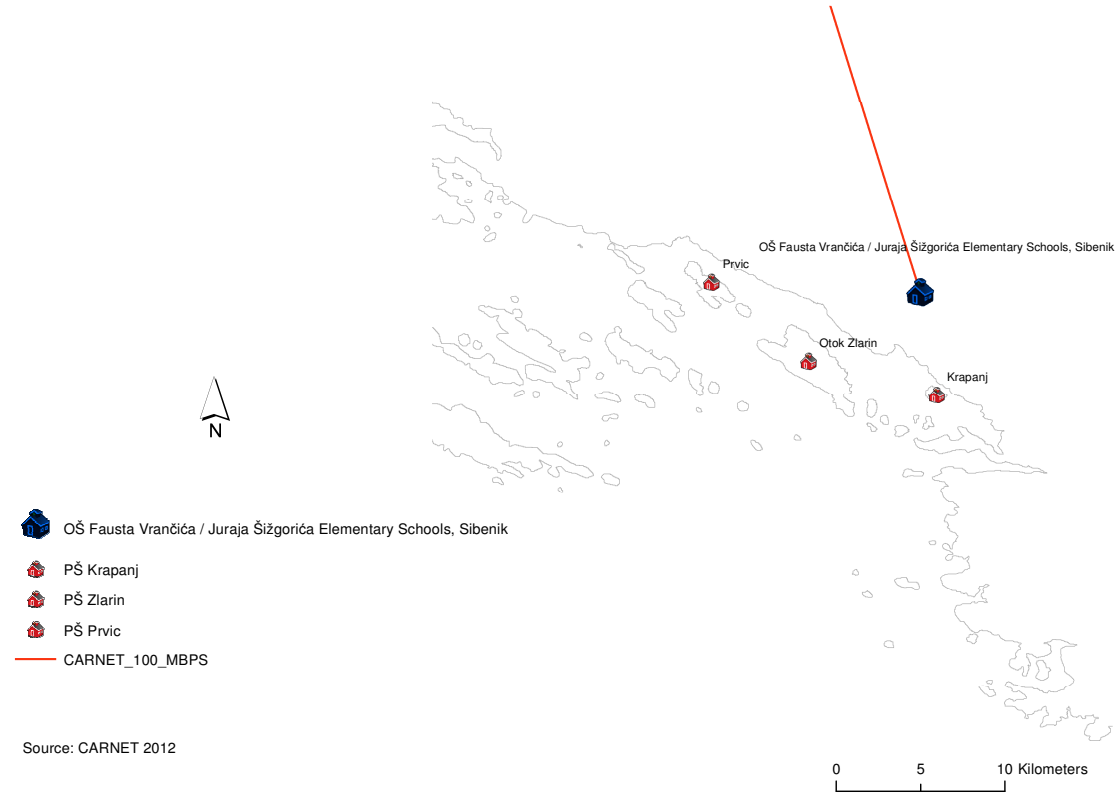


Fig. 11 – E-Island Sibenik Hub.

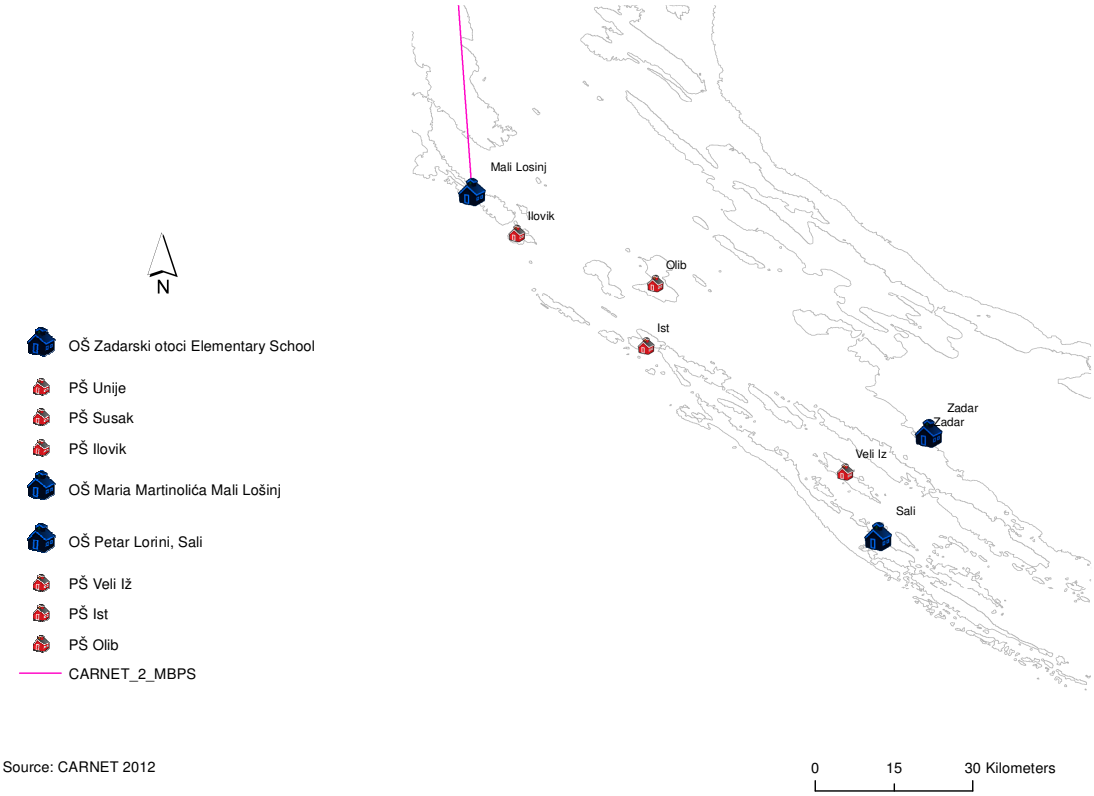


Fig. 12 - E-Island Zadar Hub.

About this E-Island project, a more profound analysis is being carried out with the collaboration of the Faculty of Economics from the University of Split. From all the primary schools in the islands, four have been chosen and visited (Lopud, Zlarin, Sepurine and Drvenik Veli). To evaluate the importance of the Carnet project, on the island community, on students, on teachers and methods and practices of teaching, a survey has been made.

Although a few schools were inquired, the process of collecting data has been slow and complicated has for all the documents had to be translated (teachers don't speak English or because the primary schools didn't have the authorization from the Elementary schools/main schools) to answer the survey. Because of that, the results of these surveys have to be evaluated in future research works (survey could be analyzed in the annex 1).

IV. Information Society: Where we stand and where to go from here?

1. CROATIA

1.1. Notes about country' recent evolution on information policies

The slow liberalization of public telecoms, the false desegregation of local loops and the separation of copper from coaxial cable inside major incumbent' telecoms became major problems when it comes to competitiveness inside the Information sector. And that's what happened in Croatia. This situation was harmful to all the players and delays the normal advances on telecom infrastructures.

After a few years of market liberalization, fixed telephone services are offered by nine (commercial) operators, with the former incumbent T-HT still holding more than 80% of financial share in the market. The number of fixed telephone users was about 40% of the population in 2008. A growing competition among "fixed" providers has brought about a 9.5% rate of operator switches during 2009. There were 130% of mobile phone users, which is an increase of 20% to 2007.The number of broadband internet and cable internet access is nearing 20% of the population (more than a million users) while the number of internet users reached nearly 50% percent in the end of 2008.

In 2006 HT bought Iskon, its major competitor and affirmed its monopoly on Internet access. This operation threatened the true meaning of the liberalized intended market. In 2006, the IPTV MAXtv, launched HT company which covered more than 90% of DSL subscribers, and had more or less 150.000 subscribers in 2009. The service permitted a triple-play offer.

After a decade of satellite dishes, a few cable operators have moved into the television market since 2000. In 2008, they had 140,000 thousand subscribers, which represents approximately 7% of the households, mainly in urban areas. Their coverage is fragmented, mostly because its high costs in more rural areas.

Available "information society data" for Croatia is based on Eurostat and Europe's Digital Competitiveness Report (using the same Eurostat statistical base). Numbers show that the country is behind EU Member States in most dimensions of the IS, with the notable exception of e-business. Several initiatives have been launched in 2008 to progress information society in Croatia and bridge the digital gap:

- Electronic Communication Act to comply with the aquis communitaire;

- Operational Plan of implementation of eCroatia to progress of the ICT infrastructures;
- Action Plan for the development of broadband Internet access to achieve 500.000 broadband connections until the end of 2008.
- Strategy for the Development of eGovernment adopted by the Croatian Government over the period 2009-2012 to build a modern, transparent, efficient and streamlined public services for citizens.

Also to be considered as very important when it comes to information dissemination, the television signal. The analogue to digital transition is of major importance to information quality and standards. The first tests for this transition (DVB) started on 2007 with the pilot projects of digital Istria (Hakom, 2011). During October 2011 Croatia began transmitting experimental digital terrestrial television broadcasting –DVB - with open signal on a specific channel but no more information is available, except for new DVB-T2, a second generation DVB that is being tested also in Croatia.

Broadband

In general, Croatia performs below the EU average on broadband indicators. Only 50 % of households are connected to the internet. As regards household broadband penetration, Croatia now stands at 39 % following a significant growth of 12 pp from 2008 to 2009.

Internet Usage

In Croatia, regular and frequent internet users are largely underrepresented compared to the average situation in Europe. More than 50% of the Croatians never used the internet. These rates are reflected in the internet services. Except for reading online newspapers, Croatians perform under the average of the EU. This is also the case for eGovernment services. Especially for the use by citizens, the gap is still very wide. This also applies to eCommerce.

ICTs in the Economy

While developments in eCommerce are slow, eBusiness solutions are fast and positive. Most applications are used even more than on average in the EU27. However, the availability of eSkills among employees is limited and this may put a brake to further eBusiness developments.

eGovernment

Croatia is making up for a late start in eGovernment and has not yet reached a state of maturity. It has made considerable efforts to increase the availability of online services and to deliver these in a user-friendly manner. eGovernment in Croatia used to be part of the general ICT strategy, eCroatia. In 2009, it gained more prominence after a dedicated eGovernment strategy was adopted. The strategy focuses primarily on putting in place back-office building blocks for the development and effective delivery of eGovernment services. eGovernment activities are strongly aligned with the EU's policies, inspired by Croatia's bid for EU

membership. The gap with the EU is still very wide, especially for use by citizens. In 2009, the availability of services for enterprises scored 63 %, below the average.

Development Trends

According to Nada Buric (Consultant for Communication Strategies, Aion Ltd) and being an EU candidate country, Croatia is expected to amend its media laws to meet more transparency and effectiveness, to remove political influence from the media and to fully liberalize the telecommunications market. Attention must be focused on total independence of the public television (HRT) and the public news agency (HINA). Both appear to encounter problems in implementing standards of professional journalism while protecting themselves from possible political influence. National television is expected to face open-market controversies once Croatia enters the EU.

In a successful move to secure the leading position on the national TV scene, public television HRT selected new television leadership among politically unaffiliated professionals in early 2004. They sharpened the edge of news reporting, gave more space to professionally anchored political talk shows and introduced new shows that address public interest. New strategy also included local production of largely viewed soaps, regular daily political talk shows on controversial topics, richly produced musical shows. However, the structure soon changed and the new leadership left space for criticism of political influence and power struggles, often ending up in accusations of censorship.

2. Portugal

2.1. Notes about country' recent evolution on information policies

The Portuguese telecommunication sector was deregulated at the beginning of the 1990s, which had as an immediate effect the end of the monopoly by Portugal Telecom and the entrance of new competitors in the market of telephone fixed telephony. After the deregulation it occurred an expansion of telecommunication services, supplied by private companies, which comprised not only fixed telephony services but also mobile communications and cable television services.

In 1996, Portugal Telecom was privatised and enlarged its intervention to the markets of mobile, cable television, Internet, content production and distribution. The Portuguese State holds a golden share in the company's capital. According to latest data available, mobile phone penetration in Portugal reached about 146 percent of the population in the third trimester of 2009, which corresponds to 15.5 million subscribers. In the European Union, Portugal holds the 5th most high penetration rate of mobile phones users. The UMTS services is increasing since 2007 (up to 5.2 million users in the 3rd trimester of 2009). Vodafone Portugal, TMN and Optimus are the main service providers.

Mobile phone service clearly supplants the telephone fixed telephony. This service has a penetration rate of about 38.5 percent of the population, which corresponds to 4.2 million subscribers. Portugal Telecom holds the main position in this market, with a share of around 65 percent, followed by Sonaecom (15 percent), Zon (10 percent), Cabovisão (6 percent), Vodafone (2 percent), Oni (1 percent) and Ar Telecom (0.8 percent).

Although there is some optimism around new technologies and the process of migration to digital, the introduction in Portugal of digital terrestrial radio and television broadcasting (DTB) has been rather slower than expected. The license ascribed in 2001 to a consortium to operate a platform of Digital Terrestrial Television ended up being revoked. After the launching of a new license opening contest in 2008, Portugal Telecom application was the selected one, against the Swedish Airplus. The technical procedures began in 2010. At this time Portugal is behind schedule but until the end of 2012, Portugal is 100% DVB.

Portugal continues to progress in Information Society development, in particular in the areas of eGovernment,eBusiness and eCommerce. 2009 saw important developments in the area of eScience and eEducation: the RCTS (Science, Technology and Society Network) was connected to the European network Geant2 at 10 Gbps, with its own fibre optic connections reaching about 80 % of the country’s higher education institutions (measured by the number of students enrolled). As a result, Portugal now has one of the most advanced European research and education networks, integrating advanced eScience services such as:

• the Online Scientific Library — the 'Web of Knowledge' — and the Portuguese Scientific Open Access Repository, which brings together the entire country's open-access repositories in the science field within a national system for integrated research;
• an integrated national Virtual Campus with broadband wireless access from over 5 000 access points providing academic services and teaching content;
• video broadcasting and recording of scientific meetings;
• high-definition videoconferencing for higher education institutions;
• voice over IP, which provides cost-free telephone communications across the entire public higher education system. In addition, the number of computers and internet
connections in basic and secondary education has been increased and all primary and secondary public schools have a broadband connection.

Developments in network infrastructure include the construction of open multi-operator networks with over 1 200 km of optical fibre cable, also in rural areas.

Broadband

Despite the high availability of DSL, fixed broadband penetration is relatively low in Portugal (18.6 %), standing in 22nd place in the EU. Nevertheless, 98 % of connections are at least 2 Mbps. Household connectivity went up only by 2 pp in 2009, and stands at 48 %.
A positive development here is that 96 % of connected households have a broadband connection. Despite the low figures for fixed broadband among households, fixed broadband penetration among enterprises has made significant progress since 2006, and exceeded the EU
average in 2009. Wireless internet markets are developing at a high rate: both laptop and 3G mobile phone use are above average and Portugal is one of the leading countries in mobile broadband.

Internet Usage

Portugal has one of the lowest rates of regular and frequent internet use in the EU, and half of the population has never used the internet. Overall usage of online services is also relatively low. The main exception is use of the internet for seeking information about
education and training, which at 27 % of the population is well above the EU average of 24 %. Take-up of eCommerce by individuals is underdeveloped and is only growing very slowly, though if other electronic means such as ATMs are taken into account, the percentage of
eCommerce users is higher.

eGovernment

Portugal has made substantial efforts to provide all public services online. As a result, it is one of the leading countries in Europe. However, this success in the supply of electronic services stands in contrast with the low usage of eGovernment by citizens (though the percentage of the population returning completed forms through eGovernment services is the 9th highest in the EU). On the other hand, usage by enterprises stands above the EU average. This is likely to be due to the high share of the population without a completed secondary education. Portugal's broad drive to improve competitiveness through ICT deployment and administrative simplification is poised to improve this situation.

Development Trends

The decrease of revenues and investment is affecting dramatically ICT sector performance with implications on contents and services. This is not specifically for Portugal but also on a global scale. The free daily press is suffering some changes and some creative and multimedia strategies are being defined on the Internet to overcome problems and the diminishing revenues from traditional daily printed media. In spite of the economic difficulties they go through, main media conglomerates reinforce their positions and probably will grow even further, in the country and abroad, which raises questions regarding the future of pluralism of information.

Convergences between technologies, networks, services and enterprises will most probably stimulate an approach between media and regulators but in the mean time and due to other more important subjects, they will probably remain untouched.

The telecommunication market is supervised by Anacom – National Authority of Communications, which monitors the electronic communications as well as the postal sector in Portugal, including telephony and the Internet and radio.

3. Croatia, Portugal and Europe

After this sectoral analysis, it is important to graphically see some data comparisons to obtain a general perspective inside European space. By analyzing the numbers we should have a broader perspective about where are the major differences between the countries, Croatia and Portugal and what are their

current positions in the overall European scenario. Of course Croatia has not joined EU yet but it will be during the next months.

An important way of measuring educational expertise in information technologies is to look at the individuals' level of computer literacy (or skills acquired). This is very important because it gives overall knowledge of the population's skills and its ability to use information technologies. Indicators like for example the percentage of individuals that are frequently users of Internet.

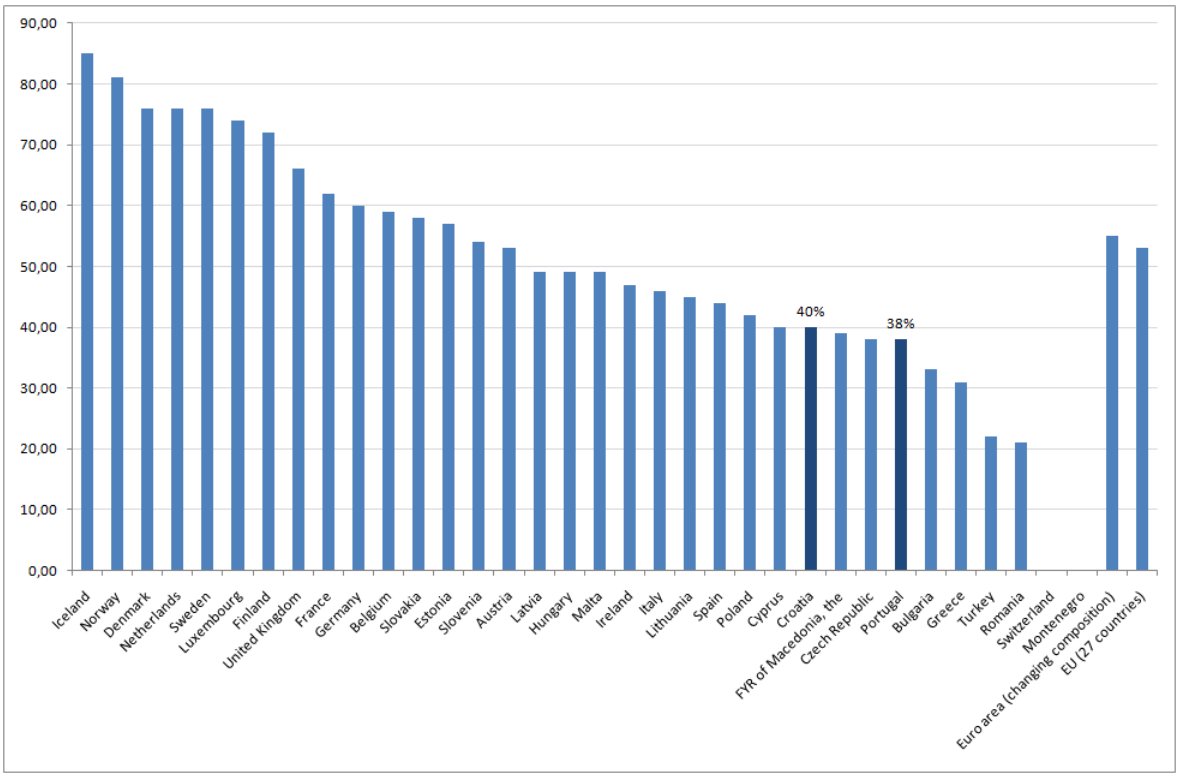


Fig. 13 - Individuals the frequently use Internet (2010).

But when the research is focused on the information society global scenery you have to look the other way, this is, the individuals who never used internet.

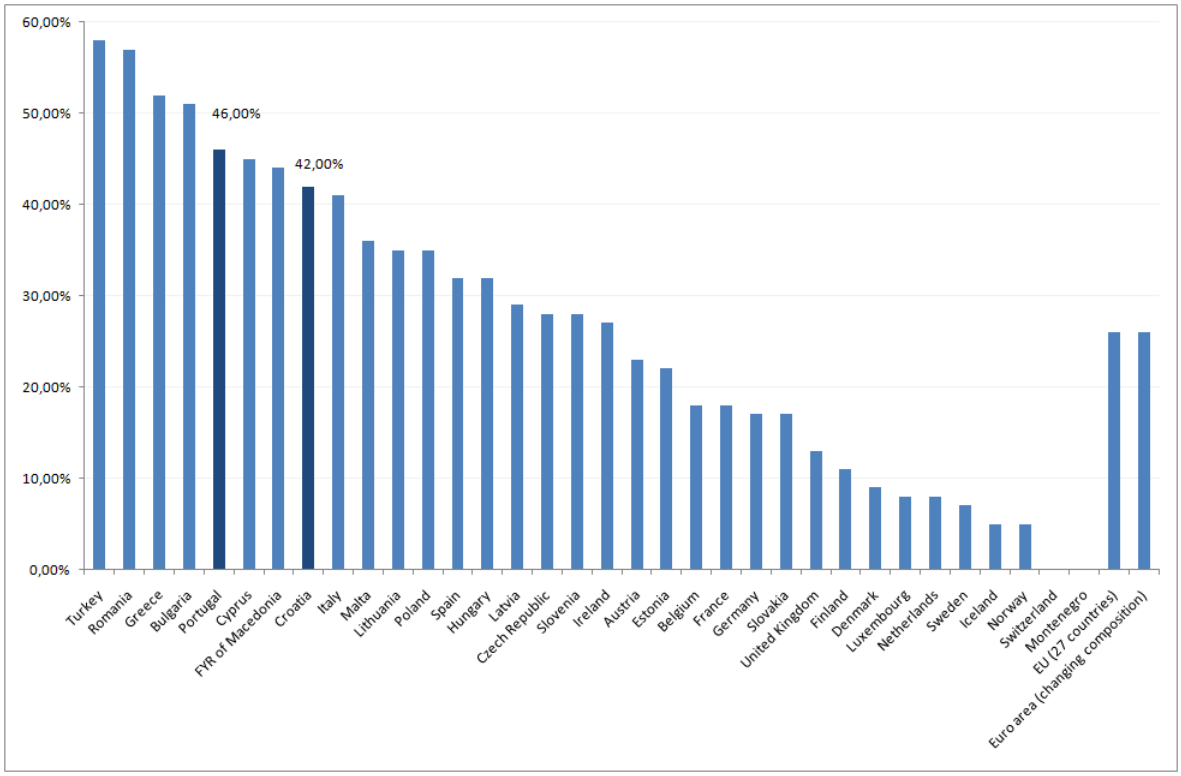


Fig. 14 - Percentage of individuals who have never used the Internet (2010).

These data could reveal the age structure of Croatian population. If we take a look at the demographical data, it's clear that Croatia has a more young population structure. Computer literacy and the adoption of ICT are clearly dependent on that because younger people have much less resistance to technology.

But although Internet is very important to the levels of connectivity involved in information society, computer literacy is also about computer tasks that could be carried out by individuals. It's a well known fact that sometimes younger people dominate social networks, internet platforms and mobile devices but they don't know how to do basic computers tasks like making a spreadsheet or a good presentation. So, the next charts can show individual specific skills in the use of computers. The Eurostat calls it Individuals who have carried out 1 or 2 of the computer related activities.

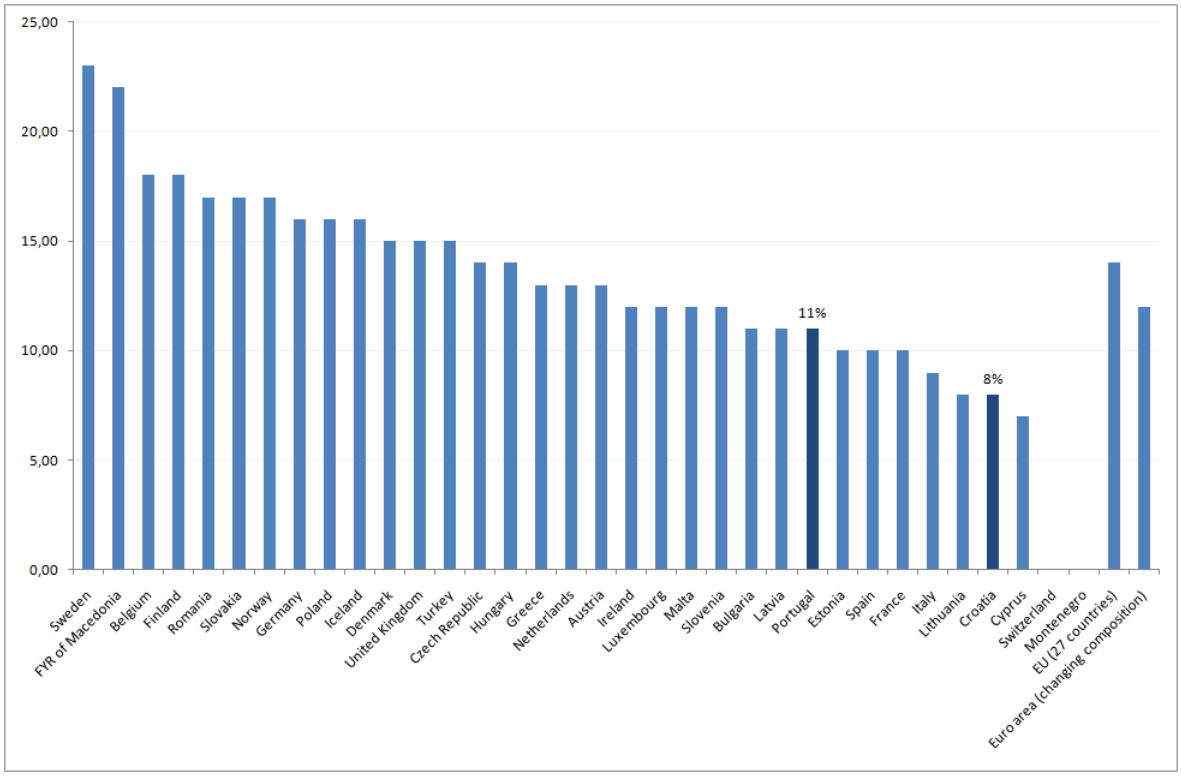


Fig. 15 - Individuals who have carried out 1 or 2 of the computer related activities (2009).

Although in decline due to the intensive use of social networks like Facebook or HI5 and others like Linkdin, the email continues to be one of the most intensive related activities individuals do in a computer. The next chart shows the percentage of individuals using the Internet for email.

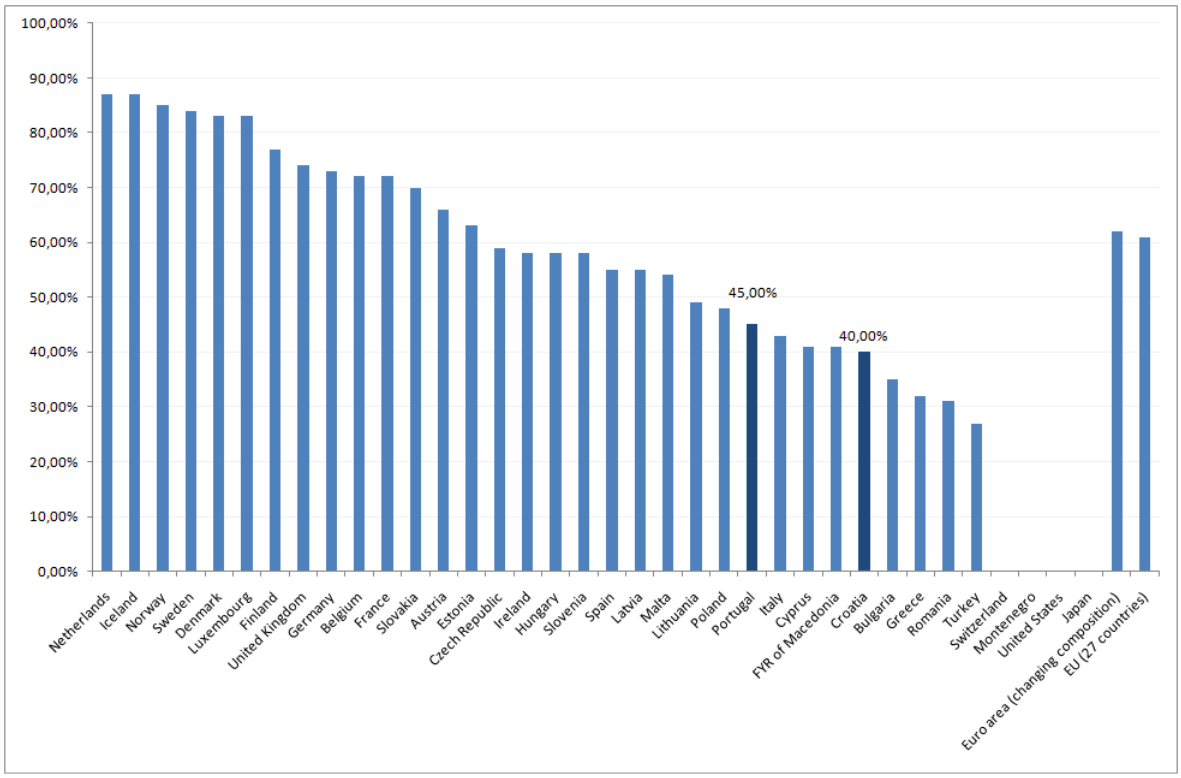


Fig. 16 - Level of individuals using the Internet for sending/receiving e-mails (2010).

But Internet is also a tool for creating content and disseminating information. That's the paradigm of WEB 2.0. with the Wikis, the blogs, the forums and the social networks. People don't download but also upload lots of information in the net. So, the importance of the next indicator is obvious.

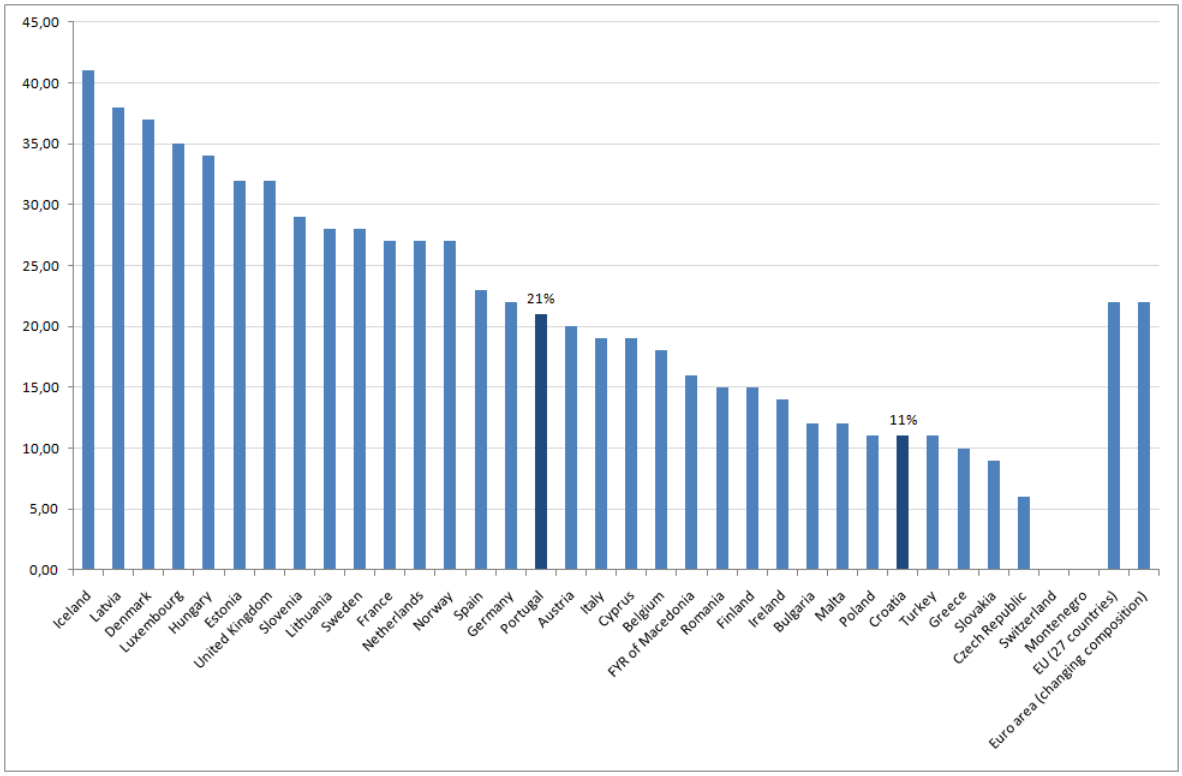


Fig. 17 - Individuals using the Internet for uploading self-created content (2010).

The Level of internet access in the households is considered an important indicator because it gives us a certain percentage of information dissemination across the physical infrastructure of the country. The technologies could be different and Internet infrastructures could deliver the signal in a broad range of speeds. From very low speeds to broadband connections supported by fiber optics.

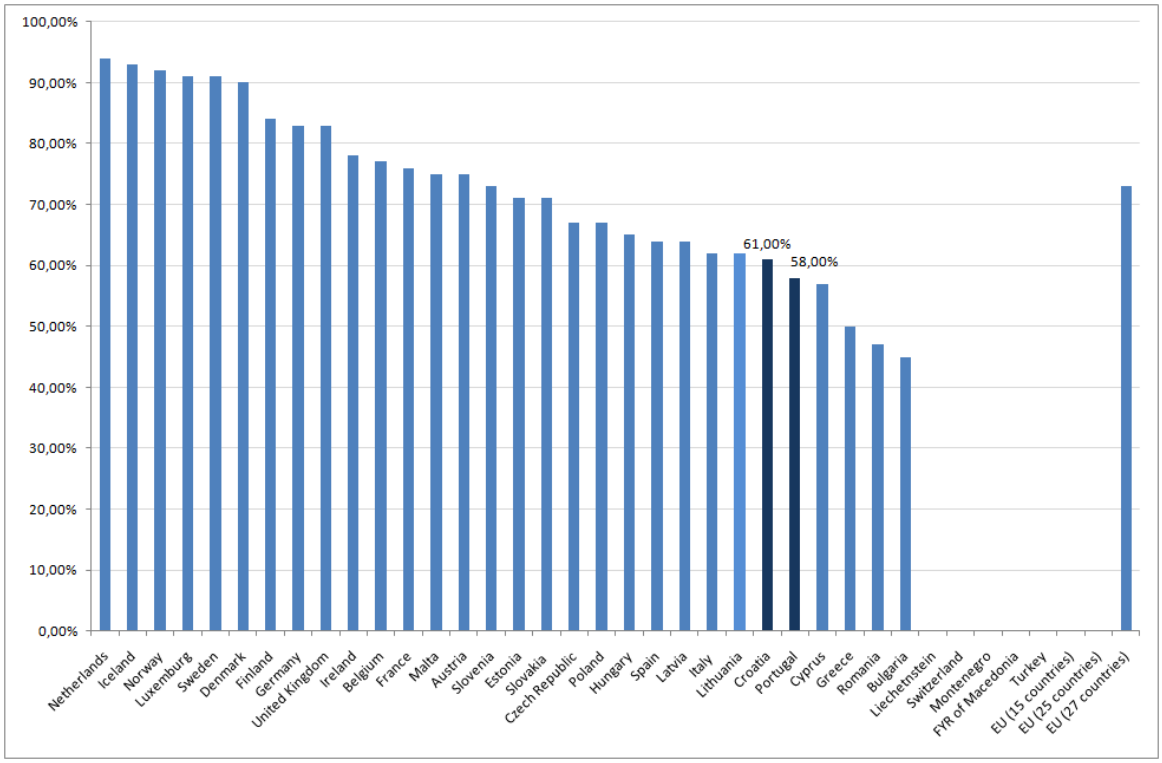


Fig. 18 -Level of internet access in the households (2011).

But being connected isn't everything and because new multimedia content and services demand better quality and speeds, broadband access is crucial. This indicator shows large differences in the analyzed countries. But for broadband, between Croatia and Portugal, there are minor differences.

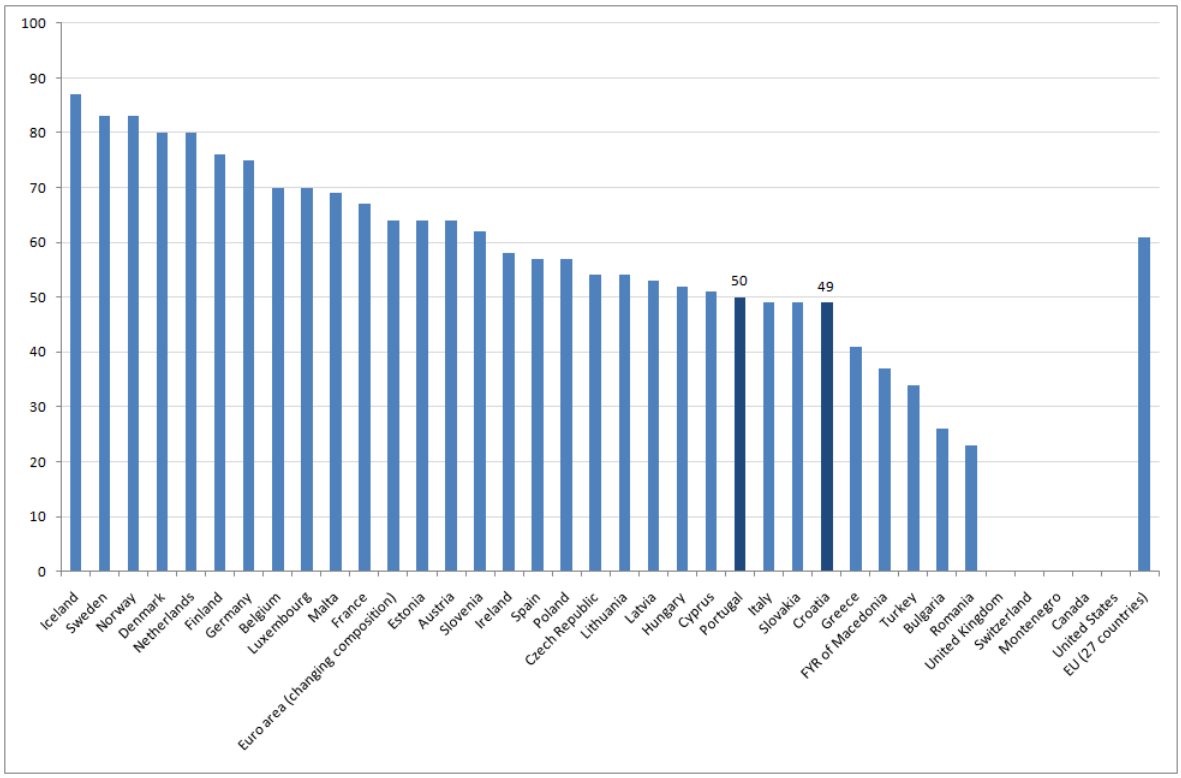


Fig. 19 - Percentage of households with broadband connection (2010)

Information Society is also about being connected anywhere, to access information at any point. Connectivity is also about mobility and wireless protocols have permitted high percentages on Internet connectivity. The next indicator shows a comparison in the access of Internet by wireless technology on a laptop.

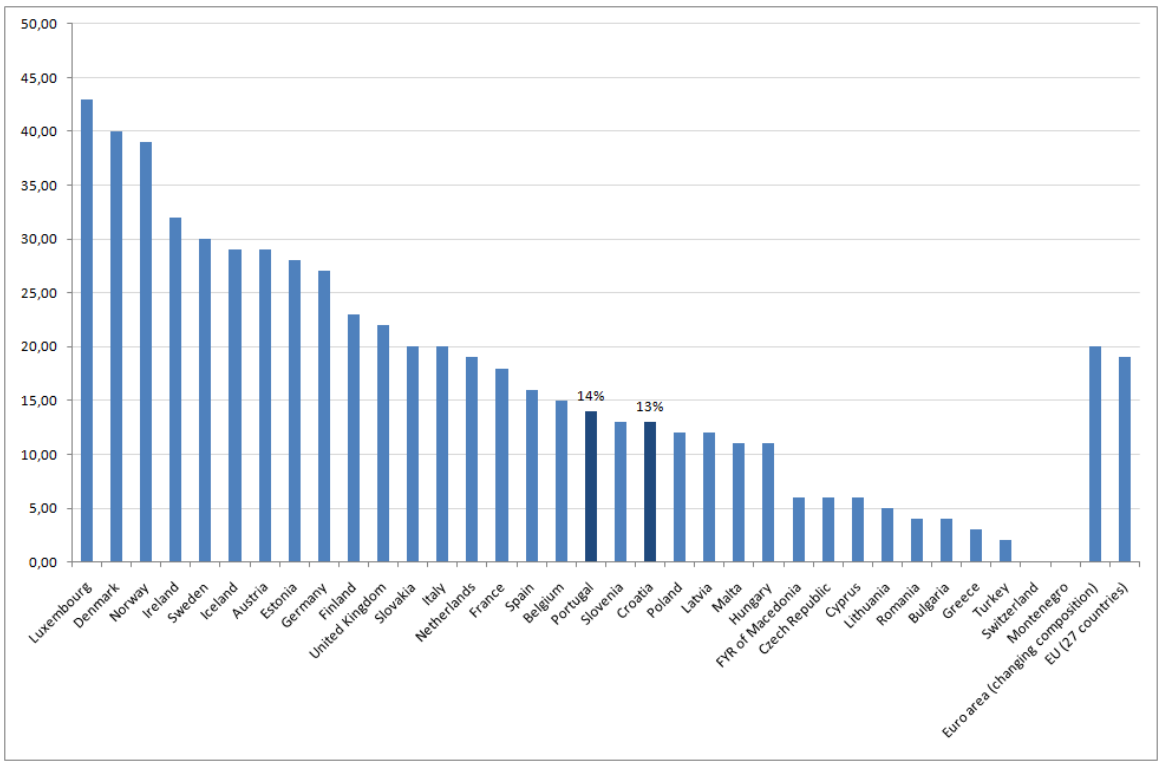


Fig. 20 – Level of Internet access by wireless technology on a laptop (2010).

Acording to Eurostat, there are also some information society structural indicators that can be used to monitor the evolution of the countries in what concerns to the transition to a Knowledge society. For example, e-Government, is a substantial part of a larger information society policy, based on a strategy aimed to increase competitiveness.

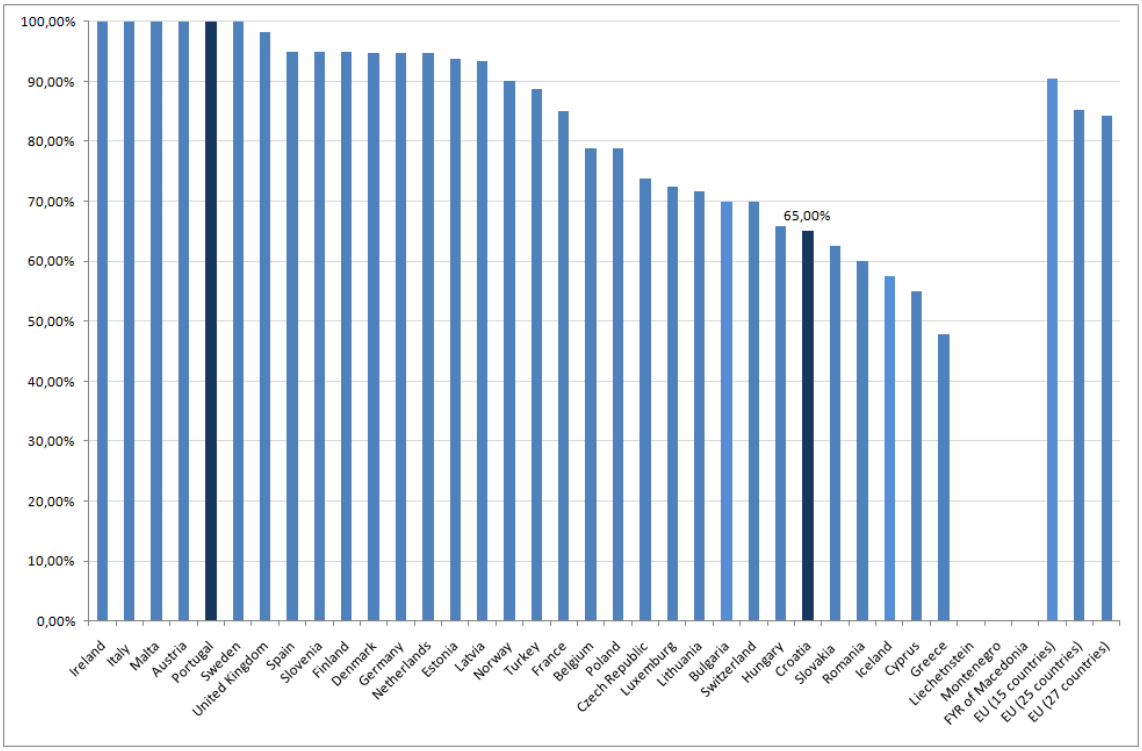


Fig. 21 - E-government on-line availability (%) of 20 basic public services (2010).

In the e-Government indicators the quantity of services offered is of no importance if people don't use them. So, another important indicator is the e-Government.

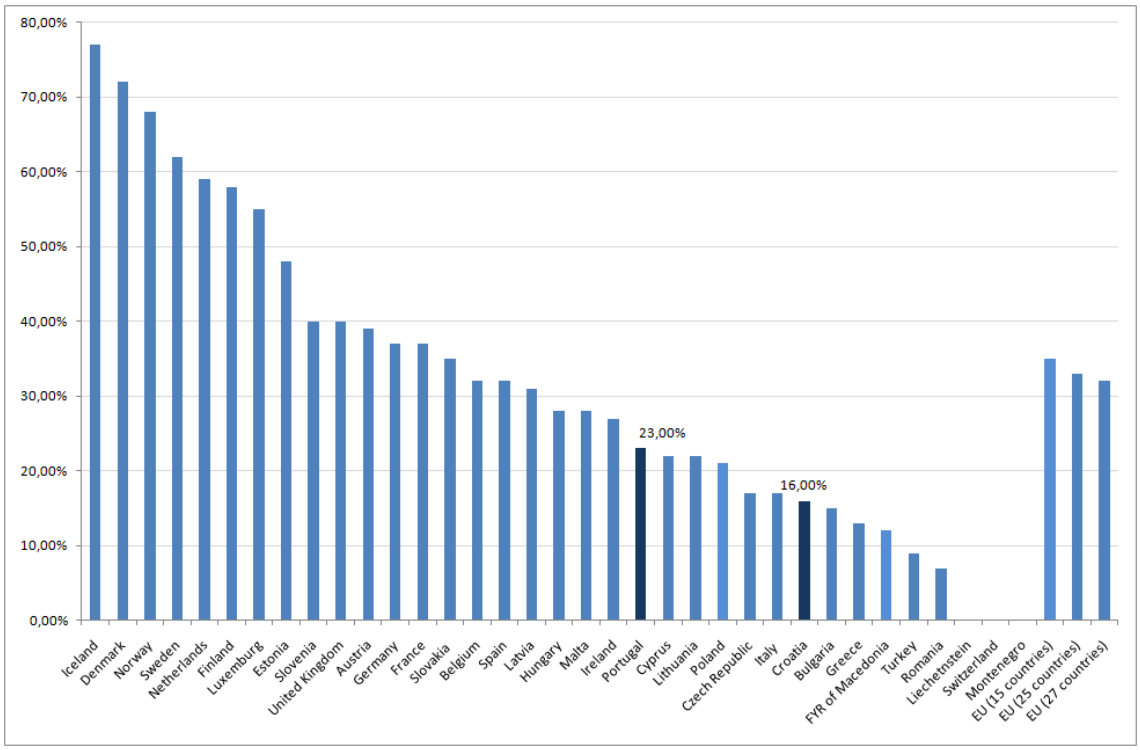


Fig. 22- E-Government usage by individuals (%) aged 16 to 74 using the Internet for interaction with public authorities (2010).

The usage by individuals (percentage aged 16 to 74) using the Internet for interaction with public authorities reflects also an attitude of digital citizenship. It is however important to mention that a country could have one or two services available and those could be very used.

If the use of e-Government is important to capture the new ways of dealing with vital information but in a virtual form (for example for paying taxes or as a form of active e-citizenship) the usage of e-Government platforms by enterprises is also a very important indicator.

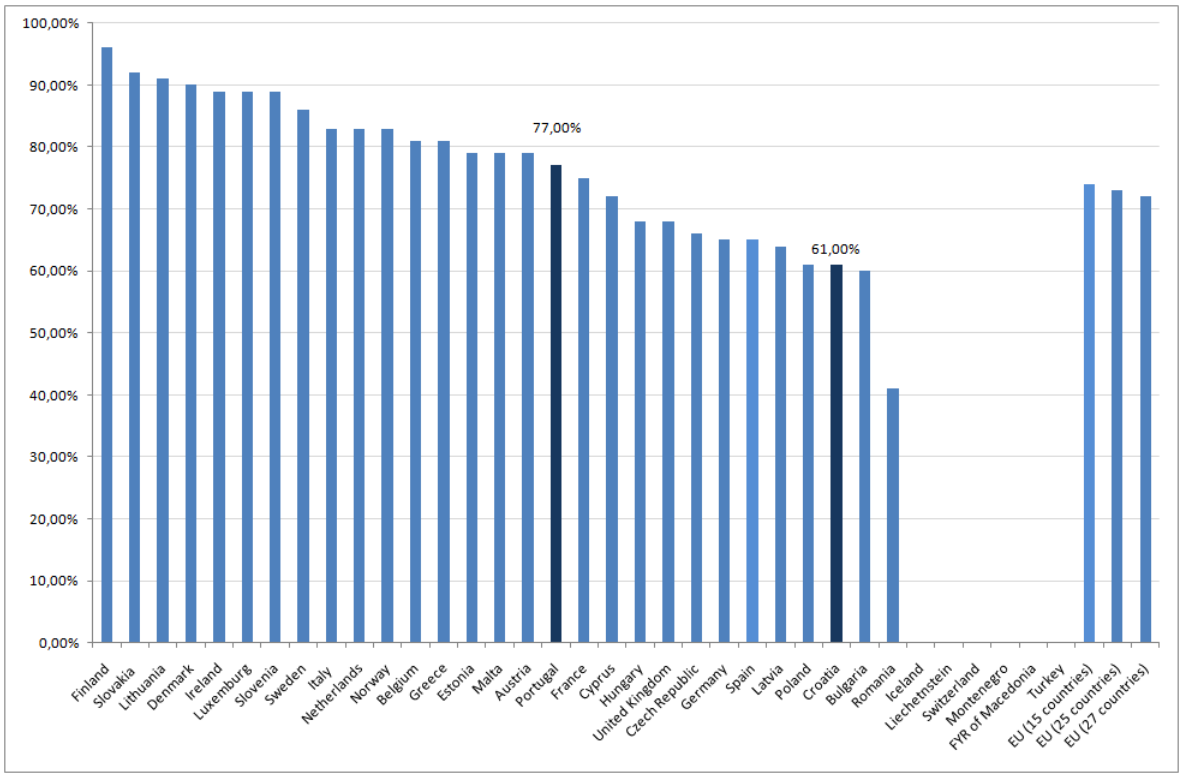


Fig. 23 - E-Government usage by enterprises (2009).

When compared with Portugal, some of the Information Society Croatian' numbers remain far, but the EU integration can overcame this context. One the most important fact is that Croatia shows (now) an obvious advantage scenario (before joining EU). The country shows advantages over a lot of other European countries. Of course, nowadays technological context is different from the one Portugal had during first half of the 90's. There's an obvious context of Internet technology' maturity, especially in wireless technologies. These advances have been critical to surpass the digital divide.

The Eu promotes the active inclusion of persons with disabilities in society, in line with the EU human rights approach to disability issues. Inclusion is one of the main pillars of the i2010 initiative on the Information Society (IS).

In 2008 the European Commission adopted the “Communication Towards an accessible information society”. The background document to the Communication explains: “We are living in a society where many aspects of our daily life are increasingly dependent on technology-based products, ranging from emails and the internet to digital television, automatic teller machines and ever more sophisticated inventions.”

In January 2009 the Croatian government adopted a Strategy for the Development of e‑Government for the period of 2009-2012. It aims to lay down the foundations for the building of a modern, transparent, efficient and streamlined public service for citizens. The new strategy is in line with the provisions of the Croatian Public Administration Reform Strategy, in particular those relating to the use of ICTs as a key tool. The purpose of the Strategy for the Development of e‑Government is to put public services online in order to make them more accessible to end-users. This idea is crucial for regional development and also to reduce territorial asymmetries.

But the evolution of ICT sector is quite heterogeneous among different countries. They vary according to different evolution rhythms and political options. Public policies, liberalization of markets and sectors, technology convergence, mobile telephony, xDSL technologies, wireless and triple-play are just a few examples of how many technologies can be involved in such evolutionary scenery.

In November 2005, and after a long period of consultations, the Portuguese Council of Ministers finally approved the so-called Technological Plan (Plano Tecnológico). This reference document made an official commitment to implement a strategy of growth and competitiveness based on knowledge, technology and innovation. The coordinating body of the Technological Plan had the mission to follow up and monitor the implementation of initiatives, and to promote and support projects developed by the civil society within the scope of the plan. The plan itself was based on three axes and its main goal was to reinforce growth and competitiveness in Portugal:

• knowledge - to qualify the Portuguese for the knowledge society, fostering structural measures which aim at enhancing the average qualification level of the population, implementing a broad and diversified lifelong learning system, and mobilizing the Portuguese for the Information Society;

• technology - to overcome the scientific and technological gap, reinforcing public and private scientific and technological competences, and recognizing the role played by enterprises in the process of creation of qualified jobs and R&D-related activities;

• innovation – to boost innovation, helping the productive chain adapt to the challenges of globalization by means of the diffusion and development of new procedures, organizational systems, services and goods.

The Technological Plan consisted of an action agenda for the whole Portuguese society, which aimed at mobilizing enterprises, families and institutions to overcome the modernization challenges that the country has been facing. Within this context, the Portuguese government has assumed the Technological Plan as a priority in the implementation of its policies. The measures of the Technological Plan would constitute a strong pillar for the growth and competitiveness of the Portuguese national reform plan,

Likewise, Croatia has to redirect national government strategies and investments to leverage information' dissemination to build a knowledge society. And Croatia has a very strong education strategy that comes from earlier decades. Arguably, optic fiber alone does not raise education levels nor can broadband teach how to read and write. Similarly, broadband cannot
bring children nearer to a school which is 50 kilometers away from their home. Technology helps but it does not solve structural problems.

Hence, other variables such as, for example, the expenditure on education or university graduates and researchers' employment rates should be considered as well when assessing the development level of a country in the context of a transition to the knowledge society.

Final Considerations

Croatia has done major efforts to compensate a late start on the Information Society issues. The lack of regional statistics to assure the complete quantification of gaps and asymmetries across the territory arose as the main concern. Not only for information society but also for social, economical and innovation indicators. Without reliable numbers, research can only be based on qualitative data.

Doing research about digital gaps and the relation between information society and development is challenging but it gets even more difficult when you have no regional statistical data. And for Croatia the only information available was population.

When it comes to information society, the strategies adopted seem appropriate. Looking at the governmental and public policies adopted over the last few years, it's possible to see a considerable evolution. Internet infrastructures, research and education networks that link all the schools, universities and research labs. Likewise, a strategic alliance has been undergone with private companies because public domain doesn't own all physical infrastructures and from an economical point of view it would be a disaster to own all the physical infrastructures. So the option is to use private networks as a part of CARNET infrastructure.

Looking at the data between Croatia and Portugal at the national level, there are considerable similarities in what comes to information society indicators. But when we try to analyse more deeply into regional disparities it appears that Croatia has more differences between the regions, although this considerations are based on readings and qualitative reports rather than quantitative data. Gaps between the coastal areas and the more rural regions within the continent continue to exist and the population concentrated on some cities (as a result of employment opportunities) has been growing over the last years.

Croatia is also very similar to Portugal in relation to new technologies and their adoption. Mobile technology, wireless broadband, use of computers at home or digital literacy, are just a few examples of some variables that have grown considerably. Other aspects like television signal broadcasting (DTT) or e-Government to digital citizenship are not so advanced.

CARNET has done a considerable amount of investments and looking at the example of E-Island Project and although the surveys have not been received and analysed yet, the educational and social aspects of project implementation seemed positively obvious. Talking with the young students, teachers and people from the islands, the feedback is good but the problems persist after the project.
A primary school in the islands is of course good. Children are very young and travel every day to another place to attend school it would be almost impossible because boats connecting the islands are scarce.

For some of the islands, the fact that they could have a primary school, is also a motive of pride but the fact that the economical tissue of the island could not hold less younger children because there is no economy apart from the 3 months of summer and their tourism activity, remains as the major problem.

It seems obvious that Internet and information infrastructures reflect a regional dynamic. Internet is an element that reinforces economic and social dynamics, especially when related to the new information and knowledge sector. In different countries across the world, there are some case studies where Internet seems to induce a new information potential, giving to people the necessary tools to leap across the digital divide: India is a successful example.

Creating an Index for Information Dissemination was considered (at the beginning of this work) as a priority, but due to the lack of regional statistics it became impossible to achieve.

Strategies based on geo-marketing should also be addressed. Although tourism have long been considered as governmental priority along the Adriatic coast, rural regions still lack a more strong effort on territorial marketing.

Information society is not “the solution” but it also helps people to develop skills. To disseminate information across a territory creates knowledge and knowledge leads to growth and presumably to development. But this piece of research also showed weaknesses. Croatia needs to strengthen economical tissue on more rural or peripheral regions. Public research labs, tourism schools, private research facilities, new University Campus resulting from aggregation of different Faculties or Universities could be considered as anchor projects. These investments on research and education could leverage regional development delivering a continuous path after sustainable projects of digital inclusion like the CARNET e-Island.

REFERENCES

Bassani, A. and Scarpetta, S., 2001. “Links Between Policy and Growth: Evidence from OECD Countries”. OECD Economics Department Working Papers. Paris: OECD.

Berryman, S. and Drabek, I., 2002. Mobilizing Croatia’s Human Capital to Support Innovation-Driven Growth. Washington: World Bank.

Hall, R., 2002. “The Value of Education: Evidence from Around the Globe” in E. P. Lazear. Education in the Twenty-first Century. Stanford: The Hoover Institution, 25-40.

HAKOM, 2011. Croatian_approach_to_Digital_Dividend, Paper presented at SoftCOM, Hvar.

Hanushek, E., and Kimko, D., 2000. “Schooling, Labor Force Quality, and the Growth of Nations”. The American Economic Review, 90 (5), 1184-1208.

ILO, 2003. Learning and Training for Work in the Knowledge Society, Chapter III [online]. Geneva: ILO. Available from: [www.ilo.org/public/english/employment/skills/recomm/ report/ch_3.htm].

OECD, 1999a. Thematic Review of National Policy for Education: Slovenia. Paris: OECD.

OECD, 1999b. Thematic Review of the Translation from Initial Education to Working Life: Hungary. Paris: OECD.

OECD, 2001a. Education Policy Analysis 2001. Paris: OECD.

OECD, 2001b. The Well-being of Nations: The Role of Human and Social Capital. Paris: OECD.

OECD, 2001c. Thematic Review of National Policies for Education: Croatia. Paris: OECD.

OECD, 2001d. Thematic Review of National Policies for Education: Serbia. Paris: OECD.

OECD, 2002. Thematic Review of National Policies for Education: Bulgaria. Paris: OECD.

RERASD, 2011. Razvojna Strategija Splitsko-Dalmatinke Zupanje 2011-2013.

UNDP, 2011. Regionalni indeks konkurentnosti, Hrvatske.

UNESCO, 2002. EFA Global Monitoring Report 2002 [online]. Available from: [http://www.unesco.org/education/efa/monitoring/monitoring_2002.shtml].

UNESCO/OECD, 2002. World Education Indicators. Paris: OECD.

World Bank, 2002. World Development Indicators. Washington: World Bank.

ANNEX 1

Information Society in Croatia – Knowledge for Development

Topic: Networks for Science and Education

CARNET_ E-Islands Survey

School: _____ Number of pupils __
Adress: _____
Email:_____

1. How do you rank E-Island as a digital inclusion Project considering Information Society?

   □ Very Good
   □ Good
   □ Average
   □ Below average
   □ Not good
   □ Don't Know /Not Applicable

2. How do you consider the implementation of E-Island project in your school?

   □ Fast
   □ Average
   □ Slow
   □ Don't Know /Not Applicable

3. Rank from 1 (worst) to 5 (best) the achievements of the project

   □ Infrastructures
   □ School equipment
   □ Broadband Internet
   □ Education environment
   □ Digital contents

4. Do you think the project was a success for the students?

   □ Yes
   □ No
   Why?

   _____
   □ Don't Know /Not Applicable

5. How do you evaluate the student's involvement and cooperation?

   □ Very Good
   □ Good
   □ Average
   □ Below average
   □ Not good
   □ Don't Know /Not Applicable

6. Do you think this project was good for the region/island

   □ Yes
   □ No
   Why?

   _____

□ Don't Know /Not Applicable

7. How do you evaluate the project since the beginning

□ It has evolved quite well and it is a success from a learning prespective
□ It was maintained since the start with no considerable evolution
□ It has been declining in importance
□ It has no importance at the present moment

In case of last option, why do you consider that?
_____

8. How do you evaluate CARNET support?

□ Very Good
□ Good
□ Average
□ Below average
□ Not good

9. Do you consider these kind of projects crucial to education and learning
□ Yes
□ No
Why?
_____
□ Don't Know /Not Applicable

10. Do you think this project has developed technological skills?

□ Yes
□ No
Why?
_____
□ Don't Know /Not Applicable

11. Do you think this project could evolve in the future to consider other aspects besides learning, education and infrastructures? If so, state a few of them.

a) _____
b) _____
c) _____
d) _____

12. Suggest new variables or topics you consider as priorities to improve the quality and scope of the CARNET E-islands project.

_____
_____
_____
_____

Informacijsko društvo u Hrvatskoj – Znanje i razvoj

Information Society in Croatia – Knowledge for Development

Tema: Umrežavanje za znanost i edukaciju

Topic: Networks for Science and Education

CARNET_ E-Islands Survey

Škola: _____ Broj učenika__

Adresa: _____

Email:_____

13. Kako rangirate projekt ***E-otoci*** kao dio digitalnog projekta Informacijsko društvo ?

    □ Vrlo dobro
    □ dobro
    □ Prosječno
    □ ispod prosječno
    □ Nedovoljno
    □ Ne znam/Nije primjenjivo

14. Kako ocjenjujete implementaciju projekta ***E-otoci*** u Vašoj školi?
    How do you consider the implementation of E-Island project in your school?

    □ Brzo
    □ Prosječno
    □ Sporo
    □ Ne znam/Nije primjenjivo

15. Rangirajte od 1 (najgore) do 5(najbolje) ostvarenja projekta
    Rank from 1 (worst) to 5 (best) the achievements of the project

    □ Infrastruktura
    □ Oprema škole
    □ Broadband Internet
    □ Edukacijsko okruženje
    □ Digitalni sadržaj

16. Smatrate li projekt uspješnim za učenike?
    Do you think the project was a success for the students?

    □ Da
    □ Ne
    □ Zašto _____
    □ Ne znam/Nije primjenjivo

17. Kako ocjenjujete sudjelovanje i kooperaciju učenika?
    How do you evaluate the student's involvement and cooperation?

    □ Vrlo dobro
    □ dobro
    □ Prosječno
    □ ispod prosječno
    □ Nedovoljno
    □ Ne znam/Nije primjenjivo

18. Smatrate li projekt dobrim za Vašu regiju/otok?
Do you think this project was good for the region/island

□ Da
□ Ne
Zašto

_____

□ Ne znam/Nije primjenjivo

19. Kako ocjenjujete projekt od njegovog početka?
How do you evaluate the project since the beginning

□ Razvijao se vrlo dobro i bio je uspješan iz perspektive učenja
It has evolved quite well and it is a success from a learning prespective
□ Održavan je od početka bez značajnog razvoja tijekom vremena
It was maintained since the start with no considerable evolution
□ Bilježi pad relevantnosti
It has been declining in importance
□ Nema utjecaja u sadašnjem trenutku
It has no importance at the present moment

U slučaju odabira zadnje opcije, navedite objašnjenje? In case of last option, why do you consider that?

_____

20. Kako ocjenjujete CARNET pomoć?
How do you evaluate CARNET support?

□ Vrlo dobro
□ dobro
□ Prosječno
□ ispod prosječno
□ Nedovoljno

21. Smatrate li ovakve projekte ključnima za obrazovanje i učenje?
Do you consider these kind of projects crucial to education and learning
□ Da
□ Ne
Zašto?

_____

□ Ne znam/Nije primjenjivo

22. Smatrate li da je ovaj projekt omogućio razvijanje tehničkih vještina?
Do you think this project has developed technological skills?

□ Da
□ Ne
Zašto?

_____

□ Ne znam/Nije primjenjivo

23. Smatrate li da bi se ovaj projekt mogao razvijati tako da u budućnosti obuhvati i neke druge aspekte izuzev učenja, obrazovanja i infrastrukture? Ako je odgovor potvrdan, navedite neke od tih aspekata!

Do you think this project could evolve in the future to consider other aspects besides learning, education and infrastructures? If so, state a few of them.

e) _____
f) _____
g) _____
h) _____

24. Predložite nove varijable ili teme koje smatrate prioritetnim za podizanje kvalitete i obuhvata projekta CARNET-a ***E-otoci!***
Suggest new variables or topics you consider as priorities to improve the quality and scope of the CARNET E-islands project.

_____
_____
_____
_____