APPENDIX H from *The United States–Greek Initiative for Technology Cooperation in the Balkans (The ITCB): Report of Accomplishments 1998-2003*, Nicholas A. Ashford, January 2004**:** Information and Communication Technology Development in the Balkans: System-wide Policy Guidelines for the Development of Information and Communication Technologies in Countries of South-Eastern Europe and Analysis of the Suitability of Public-Private Partnerships. MIT Master's' Thesis by Christos D. Sermpetis, January 2004, supported by the Initiative for Technology Cooperation With the Balkans (the ITCB) and the Southeastern Europe Telecommunications & Informatics Research Institute (INA Telecom).

Information and Communication Technology Development in the Balkans

System-wide Policy Guidelines for the Development of Information and Communication Technologies in countries of South-Eastern Europe and analysis of the suitability of Public-Private Partnerships.

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ABSTRACT

Abstract

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System-wide Policy Guidelines for the Development of Information and Communication Technologies in countries of South-Eastern Europe and analysis of the suitability of Public-Private Partnerships.

By Christos D. Sermpetis

Thesis Supervisor: Nicholas A. Ashford, Professor of Technology and Policy, School of Engineering

This thesis presents general guidelines for the development of Information and Communication Technologies in the countries of Albania, Bosnia and Hercegovina, Bulgaria, the Former Yugoslav Republic of Macedonia, Romania, and Serbia and Montenegro. To motivate the need for ICT development, its economic, societal, cultural and political benefits are presented. A historical look into an array of technologies related to information and communication are presented along with relevant U.S. telecom regulatory practices. A framework for ICT development is subsequently constructed, within the broader context of technology development. Regulatory implications are explored. Potentially disruptive convergence technologies (VoIP, WiFi and fixed wireless broadband) are presented along with the regulatory challenges they raise. ICT policy guidelines for these countries are subsequently presented along with three Greek initiatives for ICT development in the Balkan region. Country-specific E-Readiness assessments are explored and a region-wide ICT development plan is presented for the four least developed countries, Albania, Bosnia and Hercegovina, the Former Yugoslav Republic of Macedonia, and Serbia and Montenegro. Public-Private Partnerships (PPPs), a vehicle often proposed as promising for the development of ICT infrastructure are subsequently explored. After presenting a case study of a successful partnership related to ICT infrastructural development in Canada, we focus on assessing the suitability of such practices to the Balkan region and conclude on a series of guidelines that governments considering PPPs should acknowledge. The conclusion of this thesis put the proposed guidelines into perspective and raises the importance of genuine government intent as a critical factor for ICT development.

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Lastly, but most importantly, I would like to thank my family for their positive stance, ongoing encouragement and interest in this and all the projects that I undertake!

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1 Introduction and Motivation for this Thesis

The countries of the Balkans have undergone a bumpy transformation since the early 90's, evolving from government-controlled rigid economies to free markets. Information and Communication Technologies (ICT) represent one of the most important leverage factors that can advance this transition and lead to network economies and information societies.

The countries of Albania, Bulgaria, Bosnia, the Former Yugoslav Republic of Macedonia, Romania and Serbia and Montenegro have taken steps towards ICT development. Fragmented initiatives from the United States, the European Union and the Greek government have also been undertaken to assist this development. However, despite these efforts, the overall degree of penetration of basic products such as PCs and services such as fixed line telephony, almost ubiquitous in the US, remains very low.

Two major stakeholders of potential importance discussed in this study are:

- **The Initiative for the Technology Cooperation with the Balkans (ITCB)**[1]: ICT development in the Balkans was identified in 1997 as one of the top priorities of the Initiative for Technology Cooperation in the Balkans (ITCB) a council of academic and business members, established by former U.S. President Bill Clinton and Greek Prime Minister Costas Simitis.

- **The Southeastern Europe Telecommunications & Informatics research Institute (INA telecom)**[2]**:** INA is a Greek organization designed to facilitate investment in the Balkan region's telecom and informatics markets by analyzing regional market trends, enhancing the exchange of technological expertise and helping to develop a regulatory framework for the regions telecom markets. INA's activities also serve the larger effort on the part of Greece and the EU to gradually bring the developing nations of South-eastern Europe into line with European standards and norms. Set up in 2000 on the initiative of the Federation of Industries of Northern Greece (FING), INA officially opened its doors on January 4, 2002, in Thessaloniki, Greece.

The author of this undertaken research is a candidate for the Master of Science degree in Engineering and Management, jointly awarded by the Sloan School of Management and the Engineering Systems Division of the Massachusetts Institute of Technology. MIT's System Design and Management Program, that leads to the aforementioned degree, attempts to bring together the managerial and engineering disciplines in designing complex systems.

This thesis provides a systemic framework for ICT policy design for development in these Balkan countries. The parallel history and geographical proximity of these countries call for a system-wide structured approach in their ICT policies. Moreover, given the multi-dimensional nature of the dynamics affecting the transition from the present state to information societies, isolated measures are ineffective. This research effort adopts a systemic approach to addressing this challenge.

2 Scope

The countries that fall within the scope of this study are Albania, Bosnia, Bulgaria, the Former Yugoslavian Republic of Macedonia (FYROM), Serbia and Montenegro, and Romania, as shown in the map in figure 1. This figure is based on a map from the CIA world factbook[3]. The populations of these countries, according to the Economist Intelligence Unit are depicted in figure 2[4]

Figure 1: Scope

There are several reasons for focusing this research on the aforementioned subset of Balkan countries. Firstly, these countries constitute the scope of activity of the ITCB. Secondly, there are historic and cultural links between Bosnia, Serbia and Montenegro as well as the Former Yugoslav Republic of Macedonia since they were all part of the ex- Federal Republic of Yugoslavia. Although they don't necessarily share a common national identity, the Balkan countries share common ethnicities and related traditions and cultures. Albania is probably the least developed of the Balkan countries as of today, whereas Bulgaria and Romania are the only countries whose economies are developing at a rate that entitles them to EU candidacy.

The relatively slow progress of some of these countries combined to their physical proximity to Greece is at the base of Greece's attempts to contribute to their development. An embodiment of this contribution is the Hellenic Plan for the Economic Reconstruction of the Balkans (HiPERB),

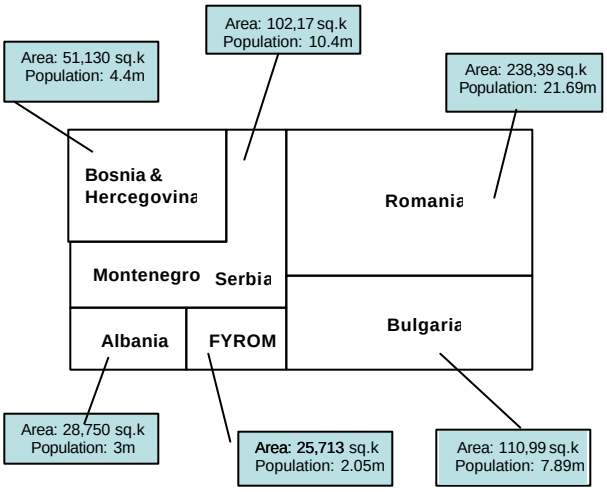

Figure 2: Areas and Populations

activated in 2003, that is anticipated to inject €550 million to in productive investments in these countries.

This thesis initially defines ICT and underscores the need for ICT development with respect to its economic, societal, cultural and political benefits. After a brief reference to regulation across industries and its application in ICT, a number of technologies are presented across the information and communication domains.

Subsequently, a framework is developed to identify the major factors that could contribute to the transition from the present state to network economies and information societies. The convergence of telecom and information technologies is addressed, new disruptive technologies are exposed and guidelines for successful ICT policy are presented.

The present capacity of information and communication technologies in the Balkan countries under consideration is analyzed, following the framework of “readiness for a networked world”, developed at the Center for International Development of Harvard University.

Finally, public private partnerships (PPPs) are presented and analyzed as a means of ICT development in the countries of this study. Potential benefits and shortcomings of their use are presented and guidelines are developed for increasing their probability of success.

3 What is ICT

The term ICT is an acronym for “Information and Communication Technology”. It is a refinement of IT (Information Technology) to include telecommunication technologies. Although less used in the engineering or business studies, the term ICT is extensively employed in macroeconomic or policy analyses.

Technological development and evolution of information and telecom technologies are clearly related, and in this context, the term ICT collectively denotes the spectrum of these inter-related technologies. In this study, “ICT” is used as a measure of the degree of evolution and usage of these technologies in specific countries and regions.

It is important to stress that these technologies, in themselves do not capture the whole picture of the ICT capacity of a country. Their accessibility, the importance of their role in the economy, their academic and social contribution and the existence of a policy framework around them are critical processes and have to be studied along with ICTs themselves within an analysis framework.

4 The Need for ICT development

Information and communication technologies support comprehensive development and therefore drive long-term social, economic, cultural and political benefits. If ICTs are used effectively, they can have positive impacts outside of the strict “technological” boundary and thus contribute to vibrant societies.

ICT, like railroads and other regulated industries [see section 5 below] follows the network growth paradigm - the value of a network increases as its number of users grows. By bridging the “digital divide” and connecting to the networked world, Balkan economies not only will contribute to the value of the network, but more importantly, they stand to benefit from increased interaction among local entities but also among countries in the region and the rest of the world.

The development of ICT can be viewed in multiple dimensions. It may represent the use of more advanced technologies in the infrastructure of either information processing (computer software, hardware) or telecoms (physical access media, routers, switches, modes of transfer, etc). It may come in the form of increased diffusion, like the deployment and broader use of a certain technology by a wider social community. Alternatively, ICT development may be embodied in new applications and uses of technologically advanced infrastructure. Lastly, innovation, not only in the employed “tools” but also in the business processes may emanate from and contribute to the adoption of new, electronic ways of transacting.

It is clear that ITC development has measurable economic return to players active in the value chain of these technologies, irregardless of physical borders. For example, let’s suppose that the Bosnian government orders and installs 1,000 PCs in order to bring the Internet in more schools. If the order is placed with a US PC vendor, this translates to increased revenues for the component makers, for the vendor, the importer, the technical consultants that installed the PCs as well as the local Internet providers who charge for new accounts. This “first order” economic effect of ICT development has

benefited ICT producing countries like Finland, Ireland and Korea where labor productivity growth over the period from 1996 to 2000 has been close to 1%[5]. However, this is not a prerequisite to development for non ICT-producing countries. ICT development can have a dual systemic impact, in the local economy and in society. We are more interested in the indirect effects of ICT development - as leverage over existing economic structures - than in the direct economic benefits from the ICT industry expansion itself.

In the following sections we examine the economic, societal, cultural and political benefits of ICT development and information societies (as defined in section 4.1.2 below). The onus is on the economic impact, since this is the main driver that can accelerate ICT development. In other words, it stands as an entry point, an initiator that can help the transition to information societies, which, in turn, will bring about all the other described benefits – social, cultural and political.

4.1 Economic Impact

4.1.1 Productivity

Productivity can be defined as the ratio of inputs to outputs, i.e. the "value of what you put into a production process compared with what you get out"[6]. In other words:

$$P = \frac{Ouput - Purchased\_Inupt}{Capital\_Costs + Labor} = \frac{Value\_Added}{Costs}$$

In simple terms productivity is how much value can be obtained from an existing labor and equipment infrastructure. Although the investment and usage of ICTs in society increases the capital cost structure of a company (through acquisition of its technological and communications infrastructure), the overall operational costs tend to drop since transactions are accelerated and disintermediated and workflow becomes more efficient. The increase in value added and the drop in operational costs result in an increase in the ratio described above as productivity. In other words, ICTs leverage existing infrastructure for example by better planning production, by allocating resources more efficiently, by reducing inventories, speeding up transactions etc. Improved productivity at company level leads, when aggregated, to improved productivity on a community and country level. Supporting evidence of the positive effect ITC can have on productivity is provided by a number of studies. It is suggested that productivity in the U.S. rose on average by two to 2.75% annually as a result of more widespread and efficient use of ICTs in the second part of the 1990s and that this increase in productivity is sustainable[7].

4.1.2 Information society

The ICT revolution will be the major stimulus to economic growth in the 21st century, like electricity, the telephone, railroad and the automobile each brought a paradigm shift in their economies and societies, in their respective times[8]. The U.S., Canada and Australia serve as examples of ICT–led growth, where productivity growth has remained strong as ICTs continue to spread, even during the recent economic downturn[9] Today's telecom infrastructure will eventually evolve in a fully digital network allowing the real-time exchange of all types of information – voice, image, video and data. This can be referred to as "Information Infrastructure"[10]. Upon this information infrastructure will be developed new generations of services – the "Next Generation Internet Services" that will fundamentally transform the economic and social transactions. We are already

experiencing the first wave of such services and their transformational effect in the embodiment of e-commerce – a case of transformation of economic transactions. Moreover, the advent of instant messaging is already substituting in part the traditional telephone communication, mainly among teenagers in ICT-developed countries like the U.S. and Britain. This is a case of transformation of the social interactions.

Upon such next generation Internet services will come to rely the so called "Network Economies", where communication networks provide opportunities for productivity improvements to people, organizations, communities and countries. As the paradigm of the new, network economies transforms all the institutions of society, the so called "Information societies" will emerge[11]. The different stages leading to Information Societies are depicted in the following figure[12].

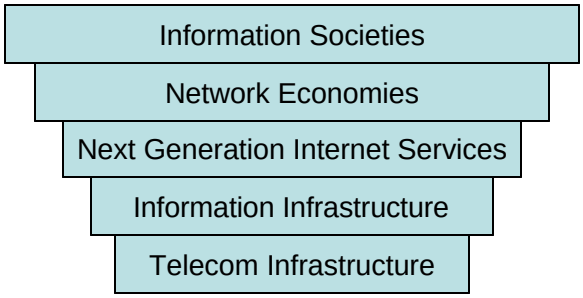

Figure 3: Steps to Information Societies

Our hypothesis, is that investments in the Information Infrastructure lead to increased productivity in firms and National economies. The causal relationship from lower to upper levels of Figure 3 above is easy to establish: Investment in Information and Telecom Infrastructure (levels I and II of the above figure) provides a base for the advancement of Network Economies (level IV), which ultimate leads to the shift of paradigm to Information Societies (level V).

How this transformation relates to productivity is depicted in Neuman's book "The Gordian Knot: Political Gridlock on the Information Highway"[13]. Neuman contends that information technology and network investment raise productivity at the firm level[14]. One might argue that the short term effects are deleterious to society since information infrastructure spending often suppresses the need for unskilled workforce, due to automation. However, its long-term impact on the economy is likely to be positive, since, apart from the immediate productivity gains, the workforce shifts gradually to a more skilled set of knowledge workers. Moreover, evidence shows that firm level productivity correlates positively with GDP growth. The above reasoning can be represented in the following diagram:

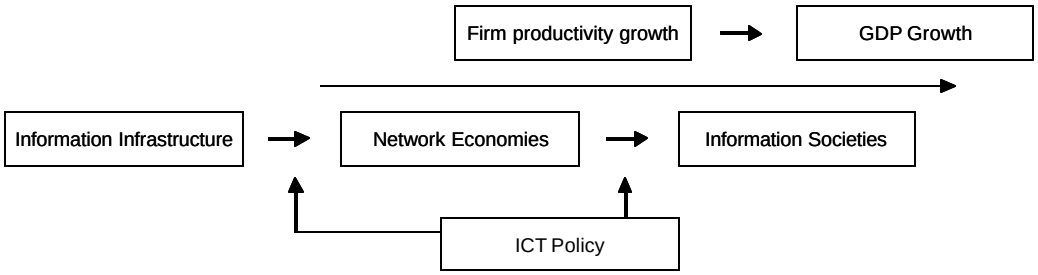

Figure 4: Information Society and Producticity

An important part of this transition is the nature and level of ICT policy adopted by specific countries. ICT policy, embodied in regulations affecting the telecommunication and information environment has a high degree of leverage on the transition: Successful policy can act as a catalyst, accelerating the movement to Information Societies and the related social and economic benefits. However, poorly planned policy can hinder ICT development and contribute to stagnant, "gridlocked" economies. This situation is best to be avoided in the first place, since this stagnation state tends to increase the difference between ICT-savvy countries and regions and the ICT-developing world. This "digital divide", already present between the Balkan economies and the developed world has to be dealt with through a radical approach that will be developed further in this thesis.

4.1.3 Elucidating misconceptions about the Information Society

It is sometimes believed that information societies are linked to a structural shift of the economy to services in the detriment of the primary economic sectors like agriculture and manufacturing. Although information societies do lead to the fostering of new, electronic services, these services are merely enablers on which the traditional economic sectors can flourish and undergo productivity increases. Although, as noted above, ICT can be viewed as having as deep implications to society as electricity and the railroads, it does so by leveraging existing economic structures to new levels.

As contended by [Cohen and Zysman][15], service economies aren't a natural evolution of industrial economies in the sense that services don't aspire to replace industry, in the same way that industry didn't flourish as a substitution of agriculture. This is because of linkages between these sectors of economic output, as elaborated below.

Technology in agriculture increased its yield and the productivity of the sector, which created the need for automated processing facilities and advancements in the chemical and biotechnology industries. Similarly, the industrial economy created the need for services like design and engineering, finance, accounting, insurance, production and inventory planning. This doesn't mean that the apparent prosperity of these services renders them more important than industries they intended to serve. Indeed, if industry lost its competitiveness with respect to other countries and gradually disappeared, the services sector would go with it, at least a significant part of it.

Similarly, the goal of ICT development and what many people refer to as "the information era" doesn't come as a substitute for the fundamental primary sectors of the economy like agriculture and industry, which have been the main economic drivers of the Balkan countries for many years. Instead, ICT development aims at leveraging existing economic sectors. For example, although increased connectivity to the Internet will provide short term revenues to ISPs, the main economic advantage for the region lies in the gradual change of how companies – in any economic sector – operate, communicate and transact. This change, it has been shown, leads to increased productivity virtually in any sector of the economy. Examples of different traditional sectors that stand to benefit from the application of ICTs include agriculture, education, health and tourism. The Commonwealth Network of IT for Development (COMNET-IT) has published a series of "Sectoral ICT Strategy Planning Templates", under the "Regional Initiative for Informatics Strategies"[16]. In this study, key issues, strategic opportunities, challenges, threats and strategic success factors and measures are presented on a "per-sector" basis.

4.2 Societal Impact

The social role of ICT development is undeniable. Through access to information, facilitated by the Internet, people can reach virtual libraries and other information sources dispersed around the world not constraint by physical (geography, climate), cultural or other barriers. ICTs transcend knowledge and country borders and thus can be used to enhance education and help create openness by virtual exposure to countries and cultures. Moreover, the mere use of the Internet, along with the content it delivers contributes to creating a more skilled, ICT-savvy workforce and a knowledge-based society.

ICTs also contribute to the acceleration and dissemination of research. Increased connectivity among the educational institutions around the world has increased the rate of production and the dissemination of scientific papers by the academic community.

Moreover, as seen in the recent years in the U.S., Europe and Japan, technologies like Internet-base instant messaging, mobile telephone voice communication along with SMS (short message service) written messages stand as new communications channels among community members. Overall, increased socializing through new ways of information exchange help strengthen the cohesive bonds between members of society.

Another aspect of ICT's contribution to society is through increased security. Technologies like TETRA (Terrestrial Truncated Radio) networks that public safety organizations like police and the firefighters increasingly depend on result in lower response times and better coordinated efforts with an evident social impact.

Yet another application of ICT, in healthcare this time, is depicted in the case of Saint Alphonsus Regional Medical Center, Boise, Idaho. Through technology, they achieved instant distribution of medical images to a number on interconnected doctors through the use of an optical fiber network [17]. If a number of doctors examine a series of diagnostic images of dubious or rare cases, the chances of a rare cancers being spotted early and treated are increased. This "safety in numbers" wouldn't be possible without the support of ICT.

This example along with all of the above underlines the societal benefits to be seized by developing ICT. There are countless other cases where technological development in information and telecoms leverage social services like education and healthcare.

4.3 Cultural Impact

Merriam-Webster defines "culture" as a "the customary beliefs, social forms, and material traits of a racial, religious, or social group"[18]. In such a context, ICTs provide new ways of eliminating barriers between minorities and ethnic groups. Thus, they foster inter-culture connections and understanding. ICTs stand as a means of dissemination of cultural traditions of indigenous and ethnic groups. Not only descriptions of traditions can be accessed online, but also cultural and traditional artifacts can be brought to market without geographical constraints. This contributes to the preservation of the diversity of local cultures and counters the forces of cultural homogenization of today's global world.

However, there is another dimension to culture, the "technology culture" that directly relates to ICT. This "technology culture" is embodied in people's inherent willingness to embrace new technologies as opposed to watching passively the advent of new

products. Typically, the U.S. society has a culture more receptive to technology. There is a positive connotation to digital technologies and people tend to adopt – and expect – new, technologically enhanced products. In contrast, the European culture tends to view technologically enhanced products more critically and people have first to be persuaded of the value added and their utility in order to slowly embrace them. Examples of this culturally-rooted behavior can be seen in the PDA (personal digital assistants) and tablet PC (a new kind of laptop computer on which one can take handwritten notes that are digitized in real time) markets. Although they are both rapidly growing in the U.S., European adoption rates are still lagging.

This culture and perception of technology can be shaped from the rate of adoption of ICTs. More importantly however, this culture determines the pervasiveness and the use of ICTs in the everyday lives of people in society. Therefore, this is factor that has an important impact on the adoption potential of ICTs in the everyday life of the members of society of the Balkan countries.

4.4 Political Impact

The political impact of ICTs emanates from two different processes: Sharing of opinions and interacting with government. The Internet is a new communication channel between the members of a community. The unrestricted formation of online communities exchanging views on matters of public governance is a step toward better democracies. The virtual world being decoupled from physical and racial characteristics, these communities transcend such group boundaries allowing for opinion–rich interaction to occur on a "no-prejudice" basis. Moreover, the online publishing of people's views, even in anonymous ways is a reacting force to political censorship and therefore a small step to more efficient democracies.

Moreover, assuming (and hoping) that the Balkan region has left behind the era of political turmoil, ICTs and specifically the Internet can have a major impact in increasing the efficiency of governments. The first steps in the evolution of "e-government" initiatives starts from uni-directional information dissemination whereby government information regarding the public administration's goals and initiatives is published online. It gradually evolves to more interactive ways of communication and culminates in online transactions, like filing tax returns, online bidding for public projects, etc.

In countries like Greece, that have tried to embrace e-government initiatives, more and more public services are gradually delivered through the web, eliminating long waits outside the administration offices and freeing more time for public workers to focus on other aspects of their work. The closer the interaction of the general public with the government the more efficiently political functions of the public administration can be delivered.

5 The need for ICT regulation[19]

5.1 Regulation across industries – a brief historical look

Looking in the U.S. history, the telecom industry in only part of the industries that have been regulated: Railroads, natural gas, banking and airlines have all undergone similar patterns of regulation and deregulation.

Before looking more closely to the history of the telecom industry, let's first briefly explore the two major commonalities among all these industries. Firstly, they all represent "network effects". In other terms, the value of the industry increases as more entities get connected. For example, railroad transportation became more appealing as more infrastructure was laid and more areas got connected. Similarly, banking became gradually the preferential method for financial transactions as more and more individuals and firms established a banking presence by opening accounts.

The second common point across all these seemingly very distinct industries is the fact that initially there wasn't any need for developing more than one infrastructure network. To return to the railroad example, once a rail line was established between two points it could carry all the traffic between them – there wasn't any need for a secondary, competing network. Similarly for the natural gas, the early days of state banks and, of course, the telephony network.

These inherent characteristics of the above industries naturally lead to monopolies. Financially sound initial entrants undertook the capital intensive task of developing infrastructure, and reaping the increasing benefits of the expanding network. This, in turn, deterred any potential new entrants since a competitive network would require important investment and wouldn't make economic sense. These dynamics lead to natural monopolies in the above domains.

The need for government intervention was a response to these monopolistic powers that could distort these markets and use techniques like price-setting or artificial supply-limiting. These practices were possible because of the lack of a correct balance of market forces. Therefore laws were enacted to curb the power of these monopolies and enforce an adequate level of service for a "fair" price.

History shows that prior regulated industries all underwent a "shock" – defined as a disruptive development – in some point in their respective history. In the case of the railroads, the shock was the building of the U.S. highway system and the instant increase of the usage of cars and trucks. In the history of natural gas a similar shock was the oil crisis that drove oil prices to levels unheard-of in the past. Similarly, the inflation of the '70s was a shock to the banking industry, whose rates were regulated at 5¼%. Finally, the telecom industry underwent (and still undergoes) a shock with advent of the Internet and Moore's Law, observing that the number of transistors per integrated circuit increases exponentially with time.

Bridled in regulatory laws, these industries didn't have the flexibility to respond to the disruptions and therefore lost important revenues and growth opportunities. In some of these industries, deregulation came too late, past the point of rapid recovery. For example, as of 2001, U.S. railroads carried 42% of the total ton-miles of goods for only

10% of the total revenue, since inflexibilities instilled by regulations had made them the proffered choice for transportation of bulk, low cost commodities[20].

The history of these industries shows a common "monopoly – regulation – liberalization" cycle. This cycle should be complemented as of today by one more phase, that of residual regulation. In this phase, regulation should be used in a minimal, historically informed way in order to ensure equality among market players, deterrence of monopolies and efficiency. For example, current U.S. laws oblige incumbent local exchange carriers (ILECs) to provide access to the local exchange to competitive local exchange carriers (CLECs) at cost. However, this regulation turns out to be unfair for the ILECs for the following reason: ILECs invest in building and maintaining infrastructure, some of which turns out to be commercially attractive, while other investments end up being written off. CLECs are attracted only to ILECs successful investments and access is provided at cost. Therefore, CLECs compete with the ILEC only in the attractive investments and have no downside to bear in investments that turn unprofitable. This burdens ILECs excessively. Therefore, residual regulation has to be carefully and realistically designed.

Another critical point in the process of deregulation is the timing. Too early deregulation doesn't give new entrants sufficient momentum and as a result the incumbent dominates once again. Deregulation that comes too late means that the dynamics have been developed in a way that new monopolies have already developed, while the initial incumbent goes out of business. Professor Charles Fine's ongoing research attempts to build a comprehensive systems dynamics model for finding the optimal point of deregulation.

5.2 Brief history of ICT regulation in the U.S.[21]

The legacy of U.S. ICT policy primarily consists of regulation of wire-line communications, regulation of cable, broadcasting and the Internet. Telephony services, provided by so called "common carriers" were considered to be natural monopolies in the respective territories that each carrier controlled. Initially, instead of fostering competition, regulators focused on controlling prices and practices. During the '60s the premise that telephony services should be provided through regulation of a monopolistic environment gradually started to recede. Regulations were first eased on telephone handsets and private branch exchanges whose provision wasn't any longer confined to the incumbent. Phased regulatory relaxation in the long distance market, initiated in the '70s gave rise to competition from MCI, Sprint and other companies. Concurrently, regulations on AT&T, the incumbent organization, were gradually removed. Similarly, in the late '80s similar advancements started to take place in the local telecom market. The enactment of the Telecommunications Act of 1996 was an organized attempt towards this objective. ILECs were required to allow new entrants access to "unbundled" network elements at cost rates. Although this removed the legal barriers to new entrants, economic and technical barriers cannot be removed quickly. Hence the still significant market power of the ILECs (over 90% of local market revenues).

Although cable and broadcasting systems are not included in the scope of this study, it will suffice to say that in the U.S. cable regulation has been much "lighter" than that of telephony. In general cable networks were initially deployed to provide television services to regions inaccessible to broadcast. Unlike common telephony carriers, cable

networks have control over the content they carry and are not required to offer nondiscriminatory access to their transmission networks to other. Regulation these networks mainly emanates from requirements to carry local content and limitations on the operators' ability to expand horizontally and vertically.

The Internet is by its inception unregulated, although it has been affected by the regulation of telephony, mainly with respect to methods of accessing it. Nondiscriminatory access obligations of ILECs have helped foster a number of Internet Service Providers providing access based on the telephony network. Moreover, pioneering CLECs offering Digital Subscriber Lines (DSL) have accelerated the deployment of similar services from ILECs at a larger scale.

Broadband Internet is a decisive stage towards the convergence of ICTs. This situation gives rise to new regulatory challenges, since different kinds of services, under different regulatory regimes are delivered through a unified, relatively new channel, namely broadband Internet. For example, what should be a regulatory regime that governs the delivery of Voice over IP services provided through broadband services delivered over the cable network? Partial answers to such questions were provided by the Telecom Act of 1996 although new steps will eventually have to be taken in parallel with the progression and diffusion of new technologies and practices.

5.3 Framework for further analysis

Professor Charles Fine proposes a general analysis framework to support industry and technology roadmapping. It can be seen in Figure 5[22]. Applied to the telecom industry, this model depicts the interrelated nature of corporate strategy, customer preference, technology, regulation, industry structure, business cycle dynamics and capital market dynamics. In the following sections of this thesis we will mainly focus on the technology and policy/regulatory dynamics, although concepts from corporate strategy will be presented, mainly to present how the private sector views regulation and how it influences strategic investment decisions.

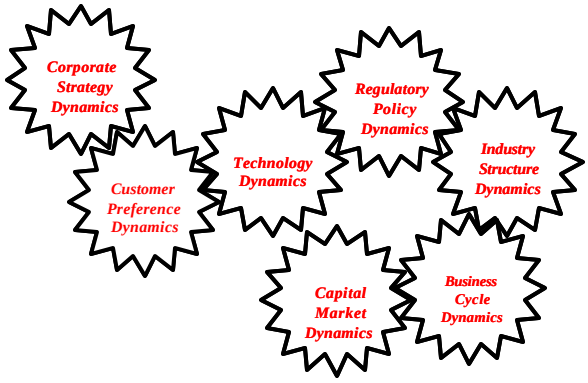

Figure 5[22]: Technological Framework

6 History of technologies

6.1 Fixed Telephony

Main (fixed) telephone lines are a given in most developed countries. The traditional fixed telephony system consists of the various exchanges interconnected through a cable grid. The end-users (households and organizations) are connected to the local exchanges via pairs of copper telephone lines. This basic telephony technology has existed for more than a century, in its analog format. Traditional fixed telephony has relied on the principle of a "switched network" (PSTN – public switched telephone network), whereby a physical wired connection is established between to communicating parties for the duration of their conversation.

Fixed telephony is getting more and more sophisticated as both ends of the line (the devices at the "consumer" end as well as the local exchanges) become digital. This digitization allows for new value added services like call waiting, call identification, digital voice mailboxes sending text messages, all transiting through the existing telephone infrastructure.

Telephony infrastructure (embodied in copper wire-lines) was the first physical medium to be used also for accessing the Internet. Many alternative technologies exist today for accessing the Internet through the telephone wires, each one with its advantages and limitations (see section 6.4 below).

The six countries under consideration in this thesis inherited a fairly developed telephone network from the communist era. However, this network was in many cases obsolete even in the transition point in 1991 and in the case of countries that were affected by turmoil like Bosnia (1996) and Yugoslavia (1999), underwent extensive damage.

6.2 Mobile Telephony

In the late '80s, the nascent field of mobile telephony was based on analog protocols. The GSM standard, deployed in 1991 enabled mobile telephony to grow at a phenomenal rate across Europe. Originally, the acronym GSM stood for Groupe Spécial Mobile, a group formed by the Conference of European Posts and Telegraphs (CEPT) in 1982 to research the merits of a European standard for mobile telecommunications. Today, GSM denotes the Global System for Mobile communications.

So fast the growth of mobile telephony has been in the past five years that today we are in an equilibrium, where the wired versus wireless telephony is balanced, in terms of the number of subscribers[23]. Wireless communications will soon dominate the global telecom market.

Moreover, mobile and fixed-line communications are no longer considered independent markets. On the contrary, fixed-to-mobile-substitution is expected to reduce incumbent's fixed-line telephony revenues by an average of 2.5% in 2003. In the U.S., this decline will be closer to 7%, while in Britain 6% of households have given up their fixed lines, since their voice communications needs are covered by mobile phones[24].

Wireless telephony has been deployed in all 6 countries under the scope of this study. It is a viable alternative to fixed telephony, especially for countries like Albania with a national teledensity as low as 16% in 2000[25] or rural regions of other Balkan countries where the installation of fixed telephony wire-lines wouldn't make economic sense and would be a low-priority item for national governments.

6.3 Computers & software

Computer usage is a prerequisite for usage of software that can increase the efficiency of traditional economic activities. If productivity is to increase for example in the manufacturing industry, software applications will have to be used for automating production planning, resource allocation, inventory management and distribution coordination. Moreover, computers continue to be the main access points to the Internet.

6.4 Broadband Internet

The Internet, the network that connects individuals and organizations around the world is nowadays used more as a distinct concept than as the group of interoperating technologies that constitutes it. In this section, we use the term "Internet" to denote the different ICTs that allow access to the global network.

The first way of accessing the Internet – and still the most used one worldwide - was through the public switched telephone network (PSTN). Users' computers, connected to modems (modulator–demodulator), codified digital signals over analog waveforms. These are transferred through the telephone lines to an Internet Service Provider (ISP). The ISP, connected to an Internet backbone processes the requests, fetches the requested data and streams them back to the individual users. The prevailing nominal speed for PSTN modem connections as of today is of 56,000 bits per second (56kbps), however, depending on the quality of the line, transmission speeds are often much lower.

The next Internet access technology deployed in many countries after PSTN was Integrated Services Digital Network (ISDN), a set of standards for digital transmission over normal telephone copper wire as well as over other media. ISDN typically provides end-users with speeds ranging from 64kbps to 128 kbps.

Although there isn't a formal definition for what constitutes "broadband" access, transmission speeds of over 100kb/s can be characterized as broadband. There is an array of different broadband access technologies ranging from speeds of 128kbps (ISDN) to 30 Mb/s in the ideal case of a single user being served by cable.

The following table synthesizes the different access technologies along with a brief explanation of their functioning, their worldwide market penetration as of 1998 and 2002, as well as the typical supplier and the limitations of their usage.

	Downstream	*Upstream*	*1998*	*2002*	*Delivery Medium*	*Typical Supplier*	*Application*
Dial-up modem	<56Kb/s	<56Kb/s	90.8%	66.8%	Traditional copper-wire telephony networks		"jerky" voice
ISDN	56-128Kb/s	56-128Kb/s	8.0%	20.4%	Telephony infrastructure	Incumbent	Good voice
DSL (Digital Subscriber Line)	1.5-9Mb/s	16-500Kb/s	0.1%	4.4%	Normal phone lines	Traditional incumbent telephony Suppliers; ISPs using telco's infrastructure	Excellent audio, satisfactory video
Cable	0.5-30Mb/s	0.1-1Mb/s	0.9%	7.7%	Cable TV networks	Cable TV suppliers offering an expanded range of services; may include telephony and broadband	From "jerky" to excellent, Digital Video Cam quality video
Fiber-to-the-home (FTTH)					Optical Fiber directly to the home	Telco, cable and other telecom infrastructure players	
Satellite	0.4Mb/s	0.1Mb/s			Wireless links to geostationary satellites currently at lower broadband speeds	Specialist satellite communications companies	"jerky" video, good voice
Wi-Fi	802.11b up to 11Mb/s 802.11g up to 54Mb/s				Wireless local area networks based on the IEEE 811 protocol	Commercial wireless ISPs; not for profit communitarian networks	Up to excellent quality Video
Fixed Wireless	Up to 1.5Mb/s				Microware line-of-sight links to fixed locations	Specialist telecommunications suppliers	Excellent audio, satisfactory video
Third generation mobile phones (3G)					Mobile cell phones	Mobile telephone companies with 3G licenses	Satisfactory, non-fragmented video
Powerlines					Electric power lines adapted to carry broadband	Electric Utilities; Intermediate service agents	

Table 1[26]: Internet Access Technologies

7 The path to Information Society - Holistic View

7.1 ICT Development as an instance of technology development

As suggested by [Luiten][27], technological development in general is a process of invention – innovation – diffusion, not in a linear sequence but with feedback loops and interactions between these phases. In other words, we cannot sharply distinguish between these three phases of technology development since technologies are continually adapted and advanced in order to "better fit conditions and requirements."

We believe that the specific topic of ICT development in the Balkans follows such a process, however with some idiosyncrasies that emanate both from its information and communication nature as well as from the geopolitical conditions that have prevailed in the Balkans in the last decades and have shaped the present ICT capacity of these economies.

7.1.1 Diffusion and Innovation for ICT in the Balkans

The Balkan region can't claim to be a center of information technology invention or telecommunications equipment research and development center. However, this doesn't hamper the region's opportunities for ICT development. This development is likely to follow a different path than the invention – innovation – diffusion process presented in section 7.1 above, specifically focused on the innovation and diffusion process.

We can assume that the information and communication core technologies that will play a major role in the development of the Balkans have already been invented (or, for that matter will be invented) elsewhere. Therefore, the challenges for the Balkans are twofold:

- Diffusion: How these technologies will be deployed to a sufficient degree so as to change the ways Balkan economies operate and their societies interact. Given the ever-changing nature of ICT, the effort of diffusion of these technologies has to acknowledge a sense of urgency, if the Balkan countries are to harness the increasing "digital divide"[28] with the rest of Europe and the rest of the developed world.

- Innovation: It is in the nature of ICTs to act as enablers to increase productivity in any and all sectors of the economy, unlike traditional sector-specific technologies whose results are constrained only in their field of usage. Related to this specificity of ICT is the fact that ICT-related innovation does not come in the form of technological R&D but rather in the way these new technologies are used to transform traditional business practices. ICT innovation is the bridging point between information and communication technological infrastructure and the productivity results presented in section 4.1 above. It is most relevant to non-ICT aspects like organizational change and the streamlining of business processes to take advantage of instant information, electronic transactions, reduced time to market, falling geographical constraints etc. In other words, "ICT innovation" in the Balkans must be viewed as process innovation that extracts increased

productivity for all the sectors of the economy through the usage of information and communication technologies.

The relatively low average present ICT capacity of the Balkan states means that the technologies upon which their ICT development will be based are known today. Moreover, a look at the U.S. economy sector–specific productivity growth over the last decade provides a spectrum of business process innovations that, when used in conjunction with the technical implementation of ICT leads to accelerated results. Therefore, the technical infrastructure and business process innovations that will help the Balkan states accelerate their path to becoming information societies are well known. The challenges lie on the efficient diffusion of technical infrastructure and the acceleration of business innovation that will make the most out of it, in terms of productivity.

7.1.2 The role of the Government – general framework

Technology policy is an evolving science that undergoes a learning process[29]. As a result of this fact, the number of technology policy instruments has been increasing over the years. Through this evolving process one can however distinguish some systemic patterns as noted by [Luiten][27], presented hereafter:

- During the 1960s and 1970s the focus of government policy for stimulating technological development was on the "supply-side" or "technology-push" side. Government intervention targeted inventions and innovation by stimulating investments in private sector R&D as well as in public research.

- This "science push" paradigm changed in the 1980's when it became clear that technological development wouldn't grow efficiently unless mechanisms were created to filter new technologies down to companies that would use and adapt them to maximize their economic utility. In this context, technology transfer centers and innovation centers were created and demonstration projects subsidized.

- From the early 1990s onwards, technological development started to be viewed as a systemic and interactive process among actors in interconnected networks. In this view, firms of the private sector cooperate to collectively further technologies, spread the risk of R&D efforts and avoid replication of their investments. This view is based on the dynamic interaction of "Actors" following some agenda guidelines to produce technological artifacts and apply them in their everyday business. These are the three concepts of the "triangle of technological development"[30]: "Actors" are firms, government, research institutes, etc.; "Artifacts" are inventions, prototypes, patents & other results of R&D; and "Agendas" are ideas and guidelines that orient actors in R&D and related decisions. This view also supports the social aspect of technology development whereby, actors, interdependent through networks invest selectively in R&D while interacting and co-operating.

The involvement of the government in the acceleration of technological development will be presented in the framework of section 7.2. Subsequently, in section 7.4 we will focus on ICT policy guidelines that can help foster ICT development.

7.1.3 The role of the government in ICT development in the Balkans

The various forms that government influence on ICT development can take are categorized within the following dimensions:

- **Supply-side vs Demand-Side**: Supply- side intervention, often called "technology-push" aims at stimulating processes that increase the availability of new technologies, while demand-side (market-pull) intervention aims at stimulating demand for the adoption of available technologies.

- **Generic vs Technology-specific**: Technology generic government intervention aims at developing ICTs in a technology neutral way. Technology-generic (or "technology-neutral" intervention can be understood by the following example, taken from the energy domain: In order to increase energy efficiency in manufacturing processes, governments may chose to regulate by increasing taxes on industrial energy consumption. This creates the need for more efficient processes without directing what efficiency-enhancing technologies will be preferred. If the government in this example decided to subsidize investments in solar powered equipment, this would be an example of technology-specific intervention.

  Transposed to ICT, an analogy would be to incentivize diffusion of infrastructure and usage of wireless Internet delivery through tax-reductions in related investments (technology-specific). On the other hand, broadband Internet delivery in general (not specifically through wireless channels) could be supported by governments measures such as the deployment of electronic tax-filing systems as part of e-government initiatives. Such measures increase the utility of local usage of the Internet and therefore stimulate demand for the Internet in a technology-neutral way.

- **Technical Infrastructure vs Applications of New Technologies**: Governments may chose to adopt measures that accelerate the development of the technical, infrastructural side of new technologies. This can be done through attracting investment in infrastructure (new wired or wireless networks, for example) or services. On the other hand, different influences can be exerted to stimulate the adoption and the actual application of new ICTs in the private and public sectors. The difference between accelerating infrastructure deployment and promoting applications of new technologies can be thought of in a sequential manner - infrastructure must be available before it can be applied. However, given the current availability of baseline infrastructure and the slow "yield" times of government measures, these categories of interventions are best applied simultaneously. Moreover, infrastructure and application are intimately linked in a mutually reinforcing cycle where the one drives the other.

The above distinctions don't represent an orthogonal classification framework. On the contrary, different government measures can be classified in a number of the above categories. Oftentimes measures belonging to different categories are interrelated and not all of them apply equally in the development of ICTs for the Balkans.

In the following paragraphs we will show that Technical Infrastructure is coupled with Diffusion, as presented in section 7.1.1, and that Application is coupled with Innovation.

As mentioned in that section, the "Technical Infrastructure" - i.e. technological devices upon which the Balkans ICTs will develop - have already been invented and found their way to the market in the developed markets of the U.S., Europe, Japan and parts of Asia. Examples of such products include computers, Internet routers, wireless access points, mobile phones, etc. The main goal of Balkan governments should be the diffusion of this technical infrastructure.

On the other hand, innovation related to ICT emanates from the way this technical infrastructure is assembled to facilitate and accelerate business processes. For example, computers, software and network material is assembled into a working unit to provide production planning and monitoring in a manufacturing plant. This "assembling" of technical infrastructure is part of the ICT innovation. This innovation is carried on in the adaptation of business processes in order to gain productivity enhancements from ICT. To follow up on the previous example, physical inventory control in the manufacturing plant is replaced by computerized inventory management, with sporadic physical control checks. This part of ICT-related innovation, increases productivity (as defined in section 4.1.1 above) and actually emanates from the application of ICT and the adaptation of business processes to take advantage of the provided automations. Therefore, "innovation" in this context means "business process adaptation" and is related to the application of these technologies.

Here lies a paradox that differentiates ICT from technologies in other sectors. The building of corporate information systems (computers, software, peripherals, network, sensors, etc) is not a standardized discipline and is replicated every time a company wants to build or further upgrade its systems. To use a metaphor in Scott McNealy's words (CEO, Sun Microsystems)[31] "…Our industry spends all of this time buying best-of-breed, state-of-the-art, little tiny components, as opposed to buying the car or the airplane. So we go out and buy landing gear, the avionics, the wing flaps,.., each from a different vendor. And then we hire an army of people to try to build a custom airplane…. It's unbelievably screwed up. What we're trying to do is engineer that problem away". Until this vision of standardized computing and networking environments materializes, these words vividly depict that need for the ICT integration services industry. System integrators and technical consultants attempt to assemble all the "componentry", the technological unitary devices that companies acquire, to build a coherent system where the desired functionality can emerge.

Representing the above couplings (Diffusion – Infrastructure and Innovation – Application) in a matrix with respect to the Supply and Demand dimension of government intervention, we get the following matrix:

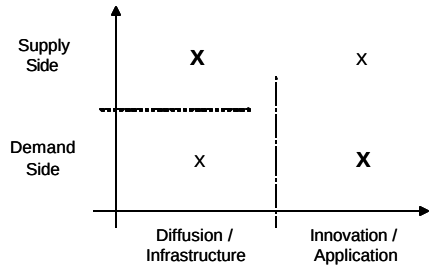

Figure 6: ICT Policy Framework

Therefore, government intervention has to target the diffusion of this technical infrastructure by adopting mainly supply - side interventions. Demand–side policy measures for the diffusion of infrastructure may also help, however we believe that, especially for telecommunication services, a baseline demand is already present. Creation and proliferation of ICT applications, along with innovation in business processes are stimulated by intervention primarily on the demand side (market-pull). To put this differently, firms innovate when they need to become more productive and thus more competitive. This is due to the fact that this stage of ICT development is specific to ICT adoption and implementation in every specific company of the private sector. However, we acknowledge that turning infrastructure to "solutions" and streamlining business processes around them can't happen efficiently without the help of integrators and consultants. A knowledgeable consulting/system integration sector that will address the integration needs of companies that are in the process of setting up their information and communication systems is required. Therefore the supply-side of these services – in the form of ITC consulting services, has also to be addressed.

The above matrix can therefore be viewed in the following way:

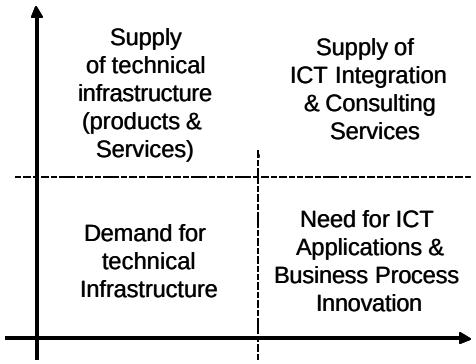

Figure 7: ICT Policy Framework - Refined

This figure summarizes the four major potential areas of government intervention for ICT development. The following section furthers this framework by attempting to elucidate the underlying dynamics and how they should be addressed through government intervention in the Balkans.

7.2 A Framework of ICT development

The following generic model Figure 8 depicts the main dynamics that enter into effect in the ICT development process. It represents a synthetic, graphical view of the outcomes of sections 6.1.3. and 6.1.1. above and also takes into account the findings of the OECD report entitled "*Seizing the Benefits of ICT in a Digital Economy*"[32]. We contend that these dynamics underpin the change of transition economies to information societies, applicable to all six Balkan countries under consideration in this study.

The basic thesis of this chart is that ICT development is primarily a combination of ICT supply and demand (Technology Push and Market Pull). This basic dynamic leads to the development of the information infrastructure, as defined in section 4.1.2 above and is a prerequisite for a successful transition to information societies. However, other factors like ICT literacy, capacity for corporate organizational change and trust in the digital economy act as catalysts in the transition from technical information infrastructures to information societies.

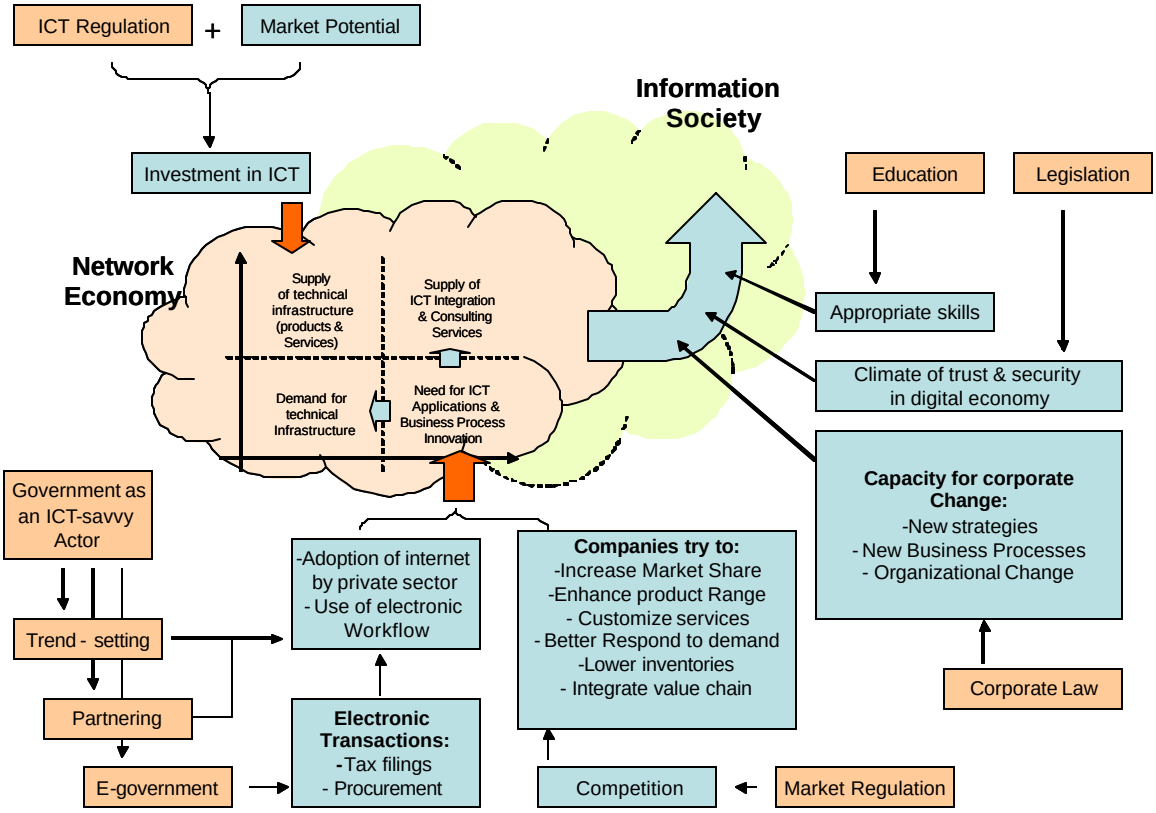

Figure 8: Framework for ICT development

In the above figure, the factors on which government intervention can be based are the ones in pink boxes – these are the "independent variables" if we are to adopt engineering terminology. Therefore, if a country commits to accelerating ICT development, it has to address ICT regulation, market regulation, corporate law, education and legislation relative to new electronic transactions in a systemic, combined way. Moreover, it has to pioneer transforming itself into an efficient ICT-savvy actor of

the economy by uptaking e-government initiatives. It is important to understand that the combined effect of all these factors creates the preconditions for ICT development. Isolated measures don't contribute proportionally to this means, since judicious combined addressing of these factors is bound to foster development much more than the "sum" of each distinct measure.

This general framework can be applied in all the Balkan countries under the scope of the study. Granted, these countries represent a diversity of "starting points" (or present capacities) as well as different potentials for development, as depicted in section 9 "ICT Readiness" below. However, we contend that these countries can be viewed as a system upon which common ICT development guidelines can be applied. Of course, country-specific idiosyncrasies will play an important role in the relative effectiveness of these common guidelines, however we believe that these differentiators will only play a role in a subsequent, implementation-specific level and not in the general principles presented in this study, aimed at guiding policy design. The basic dynamics of Figure 8 above are explained in the following sections.

7.2.1 ICT infrastructure supply and application demand virtuous cycle

7.2.1.1 Supply-side intervention targeting the diffusion of infrastructure

The supply side of ICT encompasses the availability of ICT hardware and software products as well as services like broadband Internet, mobile and fixed telephony. The common denominator in supply–side government influence options, as discussed above, is the targeted diffusion of these products and services. Infrastructural development is by nature a capital intensive business. Specifically in the telecom sector, laying new optical fiber networks or installing fixed wireless equipment to achieve broadband delivery over any sizeable territory requires significant investment. Balkan governments have to create a positive regulatory environment in order to attract private investment – foreign or domestic. Moreover, as will be explored in section 11 below, public–private partnerships could be a vehicle of infrastructure development.

Private sector investment is the consequence of market attractiveness, defined as the combined effect of "market potential" and "ICT regulation" depicted in figure 8 above. Actually a survey of 18 global telecom companies (or associations) active in several telecom services and in numerous countries shows that "…[for most companies] regulatory matters [were]… the top factor in their market entry and expansion decision-making, while most others viewed it as a close second to the market potential in a given market."[33] Market potential in the Balkan countries is an inherent characteristic of their respective population and its growth, buying power, language uniformity etc. and therefore it cannot be considered as an independent variable over which government has any control.

On the other hand, the ICT regulatory landscape is indeed shaped by each country's regulatory body, through the government's ICT policy. The causal link between policy in general and foreign direct investment in a country is depicted in a study by the OECD, where evidence shows that "…structural policy can influence foreign direct investment pattern..."[34]. ICT policy is unarguably a "leverage" area where, if careful and informed steps are taken, it can be turned into an investment attracting measure that contributes to ICT development.

One may notice in figure 8 above the lack of venture capital mechanisms as a supply-side government measure that could help accelerate ICT. There are two reasons for this: Firstly, as stated above the Balkans cannot be viewed as a "technology producing" region. R&D is almost non-existent and technological infrastructure is imported from abroad. Venture Capital in the U.S. and other countries is intimately related to the development and commercialization of new technologies. Therefore, the existence of venture capital mechanisms in the Balkans wouldn't meet a robust demand, and its scarce application would have doubtful impact on the development of ICT.

To take an example of failed venture capital policy one can look to Greece, another non-technology producing Balkan country were VC mechanisms were absent until recently. Despite the fact that this absence of venture capital firms indicated the inflexibility of the Greek corporate law, the arcane and friction-inducing processes of creation of new firms and the absence of technological expertise in the country, the Greek government decided to assume this role. It gathered a certain amount of risk-capital to be injected to small technological startups. However, this initiative, along with the added public burden of salaries, rents and other ongoing operational expenses has remained practically inactive since its inception.

Secondly, venture capital mechanisms presuppose the existence of a legal framework allowing for organizational flexibility in the corporate environment. This condition is indeed important for the application of business process innovation that will lead companies in reaping productivity increases from ICTs. It is examined separately, as an enabling factor that leverages the transition of network economies to information societies, in section 7.2.2 below.

7.2.1.2 Demand-side intervention targeting the innovation in business processes

The supply of ICT products and services through investment in technology infrastructure isn't sufficient for effective ICT development unless demand pulls these products and services into application in the operations of the economic activity of the private (and public) sector. As noted in section 7.1.3 above, demand–side government influence has two objectives: stimulating the demand for ICT infrastructural products and services but more importantly, stimulating the need for adoption and application of ICT solutions in the private sector.

There are two main mechanisms by which demand-side measures can complement ICT development policy: Government-induced ICT trend-setting and a healthy level of market competition. Let's consider the first influence factor, government-induced trend-setting. A recent view on policy for technology development [Luiten] considers governments as actors within a dynamic and interacting network of innovations. We would like to add that an idiosyncratic characteristic of the Balkan states is the fact that government is oversized and probably out of scale with respect to the private sector. This fact, probably a remnant of the communist era, makes the government a very important actor with increased leverage on the overall economic activity of these countries. The government's agenda should lead ICT development by example. By proactively adopting the application of new technologies, like wireless networking internally, government activates the supply of these infrastructural technologies, making this business more appealing to new entrants. However, probably the most important outcome from the self-transformation of government is in stimulating the demand for ICT solutions and applications in the private sector. By using the Internet to publish calls for proposals, expressions of interest and tender bids for government contracts or public – private

partnerships, firms of the private sector are "pushed" to quickly adopt practices like online interaction and electronic workflow as a vital part of their business processes. Similarly, the adoption of online procurement practices by government bodies, both for products as well as services creates the need for the private sector to become active in electronic marketplaces. This, in turn, drives the adoption of integrated solutions – hence the transformation of businesses.

This process has two related effects: On the demand side, government-induced demand for new business applications of ICT on the private sector also drives demand for technological infrastructure (as depicted with the blue arrow from the "Need for ICT applications" to the "Demand for infrastructure" in Figure 8 above). Secondly, the formation of new, innovative systems from ICT infrastructure drives demand for technology consultancies and systems integrators. Therefore, the effect of the government's self transformation to an ICT – savvy actor (a very prominent actor for that matter) systemically drives the adoption of ICTs by related actors of the private sector. Moreover, a healthy degree of competition in the market, as detailed below, tends to accelerate the diffusion of these solutions among firms.

The way a healthy level of competition in the private sector helps promote the demand for technology solutions through productivity increases. As depicted in section 4.1.1 above ICT is a productivity leverage factor that – if done right – can provide a competitive advantage at company level. A healthy level of market competition creates the necessary conditions for the private sector to transform technical infrastructure to value-delivering applications. If the private sector isn't driven to seek productivity increases as a competitive differentiator then the adoption of the ICT solutions will be slow, even stagnant, even if ICT infrastructure is present. Balkan states should therefore create the demand for the ICT industry's products and services by fostering increased competition by efficient market regulation.

7.2.1.3 The combined effect

The concurrent action of ICT supply and ICT demand-side policies is of utmost importance, as stressed by Won-Ki Min, Ministry of Information and Communication, Korea[35]. Mr. Min discussed that the balance between supply and demand side policies is very difficult, he contended though that it's more "a question of creating a virtuous cycle between supply and demand." What's even more important is that, given the interconnected nature of the spectrum of technologies collectively known as ICT, supply of one technology may trigger demand for a different one, thus leading to a systemic advancement of this domain. However, the effect of this interrelation among different technologies may also be negative: the stagnation of one technology often becomes an impeding factor blocking the advancement of other technologies.

Let's look at the following example that comes from the U.S. Stephen Baker, in "The technology Roadblocks, Where Danger Lurks"[36] notes the delay in broadband adoption in the U.S. He contends that until the number of broadband subscribers reaches a critical mass of 30 million households (this is the "demand" side of the dynamics), new, related businesses offerings from telecommuting to digital entertainment that could generate "hundreds of billions of dollars" (according to Brookings Institution economist Robert Crandall) can't be deployed in an economically feasible way (this is the "supply" side). Therefore, in this example, today's immature actual demand of 19.9 million U.S. households equipped with broadband connections – 17% of total – cannot justify the supply of new, related but different technologies, thus creating a delay in overall

advancement in ICT. This is the virtuous cycle referred to by Mr. Min that can accelerate or delay the development of ICT. For information, this critical "broadband tipping point" for the U.S. market could arrive in two years. Of course, Balkan countries are a long way from this point. However the above example stresses the "interrelated" nature of ITC technologies and thus underpins the contention that ICT policy should concurrently address both the supply and demand –sides of these technologies.

7.2.2 Information society enablers: Skills, Trust and Organizational Flexibility

The mechanics presented above can lead to ICT development through simultaneous action on ICT supply and demand, infrastructure diffusion, application adoption and business process innovation. When these dynamics are put in effect, they can help economies develop sufficient information infrastructure and sufficient corporate usage of this new infrastructure to move to the next level of network economies (see Figure 3 in section 4.1.2 above). However, the transition from a nascent network economy to information society cannot be guaranteed. The first steps in electronic transactions and the early productivity gains new ICTs don't automatically lead to the societal, economic, cultural and political benefits of information societies. This transition calls for the simultaneous action of three more enabling factors: enhancement of ICT skills of the civil society, fostering trust in the new electronic economy's fundaments and allowing for corporate organizational flexibility in order for the private sector to adapt to the new networked economy paradigm. These three enablers are controlled by government-influenced factors like education, legislation of online media and transactions and corporate law, respectively. Communities, even those that have achieved the transition from information infrastructure to network economy and whose "corporate citizens" do employ ICT solutions aren't likely to reap the benefits of information societies unless people, i.e. the broad civil society start integrating these technologies in their everyday lives and gain confidence on these new, immaterial ways of transacting.

The creation of ICT – savvy people starts at schools and passes through employee training initiatives of the private sector to public technology awareness programs of the public sector that offer lifelong learning to members of communities. Given the low present average ICT skills of the Balkan citizens, special effort has to be expended to make computers and the Internet integral tools of all levels of education.

Trust in the new paradigm of electronic communications, transactions and media, is another prerequisite to the advancement to information societies. Unsolicited emails, insecurity, piracy and the invasion or privacy all represent hampering factors to the evolution of information infrastructures to information societies.

- Unsolicited email, known as "spam" accounts for 50% of today's Internet traffic and costs companies an estimated $874 per year per worker with email, according to Nucleus Research Inc, in Wellesley, Massachusetts[37]

- Online insecurity, embodied in the action of vandals who attempt to deface websites, set loose destructive viruses or attempt to steal through credit-card fraud, discourages people from committing to online transactions.

- Online piracy of digitized media representing intellectual property has created a backlash from the entertainment industry that jeopardizes digital entertainment altogether.

- Invasion of privacy, through the means of digital receipts, electronic orders, and emails, none of which ever disappear tends to discourage the adoption of electronic transactions. In a different example, the proliferation of cell phones equipped with digital cameras (an estimated 37 million people will buy one in 2003, source BusiunessWeek, same citation as above) means that all of us will be surrounded by tiny cameras taking pictures that can be instantly uploaded on the web, thus eliminating any notion of privacy.

These phenomena can only be addressed by legislative action coordinated with awareness programs that inform individuals of the best practices that ensure the most efficient use of ICT while presenting minimal privacy risks. In an interconnected information grid, this may require transnational cooperation to result in multilateral agreements.

The third enabling factor that can accelerate (or, if not addressed correctly, hamper) the transition to information societies is capacity for organizational change. Companies have to adapt their processes and internal organizations in order to reap the benefits of innovation. Balkan countries have to create a framework that allows, even encourages organizational and structural flexibility. Enhanced information sharing allows for flatter hierarchies more adapted to the pervasive knowledge sharing brought by the adoption of ICTs. Small companies, accountable for an important part of the innovation process can only prevail in an environment that allows for flexibility, since this is one of their few competitive advantages over bigger, slower and more rigid organizations.

7.2.3 ICT Regulation

Although the contribution of all "government controlled" factors, shown in pink in Figure 8 above is equally important, we focus this study on further analysis only of ICT regulation. This is not to question the importance of factors like market regulation, education, and the establishment of a legal framework governing electronic transactions. Similarly, e-government initiatives and adaptation of corporate law to increase organizational flexibility have high importance but will only be addressed at a general level.

The dynamics of ICT regulation as a contributor to ICT development are presented in Figure 9 below. It shows the causal link between ICT policy and the development and supply of technology "solutions", i.e. products and services.

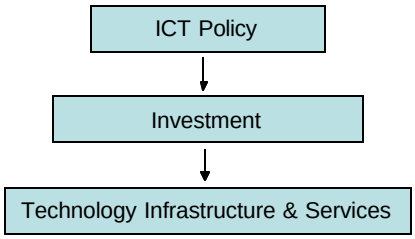

Figure 9: ICT Policy and Development

ICT policy can create a conductive climate for ICT investment or have the opposite effect if it protects the incumbent by blocking new technologies. Promising technologies that, unless explicitly addressed are likely to represent disruptions are presented in section 7.3. The importance of ICT policy in the transition economies of the Balkans is introduced subsequently, and basic principles that could help ICT policy design in the Balkans are presented in section 7.4.

7.3 Convergence – New Technologies

The mutation of the nature of information from analog to digital has been the reason for the telecom convergence that we are experiencing today. The information transfer channels, be they wired (telephone copper wires, optical fiber or cable) or wireless (irregardless of the spectrum of operation), all carry digital signals. Therefore, they all ultimately can carry any digitized content like computer files, images, audio and video.

Given the digital nature of information, it is easy to understand that all traditionally distinct networks compete today. Cable, once used only for broadcasting TV signal is today one of the main channels of broadband Internet. The public switched telephone network (PSTN), once used to carry analog telephony signals has turned into a digital broadband channel with the advent of xDSL technologies. Similarly, voice is no longer captive of the PSTN network. It can be digitized and transmitted over the Internet Protocol (IP) in the form of digital packets, through any channel of broadband delivery. Other "wired" channels of delivering broadband to the home are optical fiber ("fiber to the home", FTTH) and an emerging technology of broadband over power lines.

However, the major advancement over the last five years has undoubtedly been in the wireless technologies. Wireless networks for mobile telephony, once analog, they are today fully digital, but for a very small and decreasing fraction. Due to its wireless nature, mobile telephony can be deployed much faster and at a lower cost than fixed lines. It comes as no surprise that the number of mobile users worldwide exceeded that of fixed lines for the first time in mid-2003. Mobile telephony is still mainly used for voice communication as of today (second generation, "2G" networks). However, high-speed data communications over mobile phones have been deployed in some countries like Japan where 3rd generation ("3G") mobile telephony has been embraced by the market since October 2001, when it was first deployed[38]. Other wireless technologies for data transmission include satellite broadband and the 802.11 protocol.

In subsequent sections selected disruptive technologies will be presented along with the disruption they represent to traditional ICTs. The regulatory guidelines presented in section 7.4 below attempt to minimize the technological disruptions in the way to ICT development in the Balkan economies as well as accelerate long-term growth.

7.3.1 The 802.11 standard (Wi-Fi)

Considering that broadband and wireless are the most important trends in the telecom industry today, a technology that can combines these two concepts is inherently promising. This protocol was initially used for wireless Local Area Networks (LANs) allowing pervasive access to the network from any office within a company without having to "wire" the laptop computer. Many "hotspots", i.e. public places offering wireless access, have been created around the world in airports, commercial venues, cafes, community centers etc, appealing to the 25 million Wi-Fi enabled laptop computers around the world today.

Wi-Fi, operating in the 2.4GHz frequency, was designed to provide connectivity over a maximum of 300 feet, for corporate, campus or government networks. However, focused beams have been able to travel 15 to 30 miles in recent experiments. Such solutions, along with central dispersion points and line of sight home antennas have recently found their way as a new means of connecting users over a wide area, using "rooftop" antennas. In these networks, every node acts both as an initiator of requests, but also as

a repeater of signals in transit. These "rooftop" networks, set up by enthusiastic people wanting to participate in these virtual communities use the unregulated spectrum of 802.11 to by-pass the traditional wired infrastructure. Such a network, with 50 working nodes is already in operation in Cambridge, MA[39], as an experiment of the Parallel and Distributed Operating Systems Group of MIT's Laboratory of Computer Science. However, similar networks are appearing in most cities around the world. For example, the Athens Wireless Metropolitan Network[40] is a self-organizing community of people seeking to bypass the barriers to networking posed by wire-line networks. This community counts a total of more than 1,500 nodes of which around 200 are active. The required equipment is relatively inexpensive, with a total cost of $200 to $400, excluding the cost of the computer[41]. As of today, installation requires technical computer skills, however it is easy to imagine that easy to install "plug and play" kits will be available in the future.

One can understand that the emergence of these networks could be a solution for the "last mile" problem of broadband delivery and optimists already vision such self-regulating networks "blanketing" cities providing high-speed Internet access to everyone. However, not all such networks need to emerge from users' initiative: Mark Anderson, in his "Future in Review" article[42] speculating on Wi-Fi as "cheap and ubiquitous broadband access" states that the city of Adelaide, Australia has already committed to providing complete urban Wi-Fi, while New York City is "seeding its parks with free service and Verizon is converting all its New York City pay phones into Wi-Fi transmitters."

This new technology could prove to be a disruption for Internet Service Providers, for traditional fixed line telecoms and, to a lesser extent, for mobile operators. As Mark Anderson puts it[43], using a Wi-Fi enabled laptop, "…you can call France and talk forever …, download whole movies from the public domain …, set up a visual conference …, swap files …, for free."

The disruptiveness of this technology is easily understood: First, ISPs have grown on a business model that relies on a basic assumption: One user per Internet connection. However, given these new networks that, once set up, users can use for free, many people can have access to the Internet by sharing the broadband connection of just one individual. Moreover, an antenna placed on the premise of an academic institution directly connected to the Internet backbone may provide free broadband Internet to a great number of people, leading to lost customers for the ISPs. This expanded availability of wireless broadband Internet (some call it "ubiquitous broadband") is likely to drive demand for Internet services and ecommerce, as part of the supply and demand spiral presented in section 7.2.1. However, it's also likely to undermine the incumbent's revenues by accelerating Voice over IP (see section 7.3.2), another disruptive technology that routes voice telephony over the Internet backbone, instead of the fixed-line infrastructure. Finally, mobile operators aren't likely to be affected by Wi-Fi, since this standard doesn't address the problems posed by mobility. [expand William Lehr, McKnight, Wireless Internet Access: 3G vs Wi-Fi]

Although Wi-Fi may still be a "low-impact" new technology, it's far from maturity and more probably just a glimpse of things to come. We can be sure that we haven't yet discovered its full potential, however, it can be seen as a "transitional technology, a stepping stone on the way towards true wireless broadband."[44]

7.3.2 Voice Over Internet Protocol

Under "Voice Over IP", as the name suggests, voice is digitized and transmitted over the Internet as a stream of digital packets. Although the Internet Protocol wasn't initially designed to offer consistent packet delivery times – and therefore transmit real-time voice, steps are being taken in this direction. In fact the "Internet 2" project[45] has re-designed the Internet Protocol and IP6 will be deployed versus IP4 that is used today. In IP6, specific streams of data can be identified (for example multimedia, telephony data included) and dynamically be assigned higher priority in order to provide for real - time data transfer. What's more, IP6 remains backward-compatible and therefore can work with today's infrastructure. However, it adds new possibilities that can be leveraged with newly designed software and hardware. Voice over IP technology, either in its current state or using IP6 is likely to create competition between fixed line operators and broadband ISPs. Products embracing this technology are already offered from telecom equipment manufacturers.

For example, Nortel Networks provides a "gateway" product that connects to the private branch exchange (PBX) of the company and then routes voice communications through the company's intranet or the Internet to the laptop of the concerned person, irregardless of his/her physical location[46]. This solution is still "incumbent – friendly" since the call's segment from the caller to the company's PBX and vice-versa is still routed through the traditional telephony network.

However, not all evolutions are "incumbent – friendly": Vonage, A small company based in Edison, New Jersey has started providing a phone service charging a flat rate of $34.99 per month for unlimited calls within the U.S. and Canada[47]. Subscribers use an "analogue telephone adaptor" to plug their standard phones to their broadband Internet connections. The calls are routed over the Internet, which explains why Vonage can offer such low prices. Moreover, the user can take his phone and adapter to Europe or Asia, plug it into the broadband connection and it still works – and callers from the U.S. and Canada are charged a local call. Unlimited phone calls to anywhere for a flat monthly fee is the next logical step.

Many online services like AOL and MSN Instant Messenger already offer voice calls routed over the Internet. However, this method presupposes that people are sitting in front of their Internet connected computers, equipped with headphones and microphone and already possess enough skills to actually use this service. Vonage's offering, for a relatively low, flat service fee bypasses all these hurdles to provide a service completely similar to the traditional telephone experience – except for the pricing.

This technology, ultimately allows for "free" telephone connections to any location, as long as broadband Internet is available. According to a recent survey by consulting company Frost & Sullivan, VoIP is "poised to take off in Europe, the Middle East and Africa, and traffic in those areas could reach 57 billion minutes by 2008"[48]. New methods of billing will have to be devised for calls initiated through the Internet towards actual fixed or mobile subscribers, as well as for the inverse situation whereby a call initiated through a fixed or mobile connection terminates in a device connected to the Internet.

Pessimists contend that if voice over IP was adopted as the preferred means of placing phone calls, today's total Internet bandwidth wouldn't be sufficient. Moreover, as suggested by Henry Houh, Empirix Corporation[49], Voice over IP could be menaced by

ISPs blocking or downgrading the quality of voice data and charge a premium for providing these services. This practice could emanate from national ISPs that are affiliated with incumbent telephony organizations – hence their interest in protecting the incumbent's telephony revenues. However it could be adopted by a wider set of ISPs, seen as a source of additional revenues and an opportunity to acquire new business in the fixed telephony market.

There are already controversial decisions being taken in countries around the world, attempting to limit or downright ban VoIP. The most recent example of this kind is Panama, where in a decision taken on the 25th of October 2003, ISPs are required to block the 24 UDP ports most commonly used to route VoIP calls. This decision was taken after it was decided that VoIP was a phone service, thus violating the exclusive contract of Cable & Wireless Panama, a joint venture between the Panama government and U.K.-based telecom Cable & Wireless. As of April 2002, other countries that had banned VoIP included Cuba, Egypt, Israel, South Africa, Kenya, Mexico and Argentina[50]. Such decisions may protect short-term revenues for the local incumbents, however they have a detrimental long-term effect: They send very clear messages to potential investors globally that the country in question is not receptive to new technologies. How do such decisions affect local investment strategies of Global telecom players? It's safe to say that any telecom organization would be suspicious of such incumbent protectionist measures that could devaluate their investments overnight with legislative action. We contend that the long-term harm to the ICT development of countries adopting such policies outweighs the short-term economic benefit.

It's too early to fully assess the consequences of the disruption of VoIP. Along with the advent of IP6 may come ad-hoc billing for multimedia traffic as opposed to non-time sensitive data traffic, which may create new dynamics on the telephony part of ICT. We believe that routing voice over the Internet Protocol is a natural evolution and therefore telephony should increasingly be viewed as a sub-technology of broadband Internet.

7.3.3 Fixed Wireless Broadband

In fixed wireless, one or more radio transmitters are located in places with an enhanced line-of-sight (tall buildings, antennas, hilltops etc.) and are connected through wireline to a controller that is in turn connected to a high-capacity Internet backbone. The ISP-side radio equipment operates on the globally license-free 2.4 GHz and 5.8 GHz ISM bands. Subscribers are provided with a small kit, containing a microwave antenna, radio and modem. The antenna usually has more than 90 degrees of useful arc, so it only need to be pointed to the general direction of the ISP access point. This kit is installed on the outside of their site – home or office - and it connects through wire to their computer or network router. The radius of coverage of a single ISP access point is up to 5 miles (8km) in unobstructed places (line-of-sight).

The underlying technology of fixed wireless broadband delivery isn't significantly different from that of the 802.11 protocol. The main difference of these two broadband deployment methods resides in their mode of operating. Fixed broadband was designed as a point–to–multipoint delivery method, while the 802.11 protocol enables peer-to-peer networks to emerge, even though this was not the primary intended use of the protocol (see previous section). Related to this fact is the reality that fixed wireless provides a way of tracking broadband customer since, by design, wireless ISP-side points and servers are centralized. Therefore, customer usage and billing are relatively simple to operate. However, in peer-to-peer emergent 802.11 wireless networks, Internet

services are either provided for free from a centralized source (for example in public areas such as airports) or they can be obtained through connecting to other users that do have access to the Internet, again without having to pay.

A study conducted by Kanchana Wanichkorn and Marvin Sirbu entitled "The Role of Fixed Wireless Networks in the Deployment of Broadband Services and Competition in Local Telecommunications Markets" compares the cost of deploying Broadband Fixed Wireless Networks (BFWN) to the cost of DSL and cable networks. This study, focusing on the state of Delaware, U.S.A. concludes that in areas of density of less than 100 lines / square mile BFWN is more cost effective than DSL and cable. Moreover, "BFWA is a viable solution for medium-density areas where DSL and cable modem services may not be available due to distance limitations of DSL and lack of cable infrastructure". The link with the Balkan states, where fixed wire-lines only connect a relatively small percentage of the population, is obvious. This technology, combined with Voice over IP (see section 7.3.2 above) could cover Internet and telephony needs without the need for installation of wire-lines.

7.3.4 Technology Synthesis – Guidelines for the Balkans

Taking into consideration the above trends, it becomes clear that ICT development in the Balkan countries under this study should center on the following:

- Building a robust digital backbone using optical fiber. The National backbones are the high-capacity networks that provide connectivity to the large population centers the countries. Backbones are also connected with other countries through multiple Internet and telephony exchanges. Backbone infrastructure should be decoupled from the "last mile" delivery to the home and should be based on fiber optic technology that is unsurpassed in terms of capacity up to date.

- Using wireless technology to solve the "last mile" issue, i.e. to deliver broadband Internet to the end-users. This technology may be fixed wireless or 802.11 or any by-product of these technologies.

- Aiming at deploying broadband Internet instead of fixed-line telephony – fixed telephony is gradually becoming a sub-service of broadband Internet as depicted in section 7.3.2 above.

- Continuing expansion of the mobile telephony market. In most European countries where 3G licenses were auctioned, the prices paid by the winning bids were so high that threatened that over-indebted some of the otherwise strongest telecom organizations. Moreover, no operator has yet deployed 3G because of the enormous cost associated with the necessary infrastructure update. "Transition" solutions like 2.5G and Edge are considered, however it still is not clear which technologies will prevail. This fact, in combination with the lower spending on mobile communication of the Balkan population with respect to the rest of Europe, make deployment of such advanced mobile services un-necessary for the time being. Therefore, mobile expansion in the region should concentrate on increasing coverage for voice and SMS services and eventually roll-out "tried and tested" 2G value-added services like ringtones, sms info services etc.

7.4 Regulatory implications

7.4.1 The "western" paradigm in ICT regulation

If we look at the history of ICT regulation in the United States, four different regulatory areas have been historically addressed[51]:

- Regulation of wireline communications (through common carriers)
- Regulation of cable
- Regulation of broadcast services and
- Regulation relative to the Internet. Although the Internet is considered "unregulated", a series of regulatory measures concerning the rights to attach devices directly to the network, its definition as a non-basic common carriage service as well as a series of access provision measures have indirectly fostered its expansion[52].

Understandably, the convergence of telecommunication technologies described in section 7.3 above blurs the boundaries and creates overlaps in these historically distinct fields of regulation, which create inconsistencies. Either additional, incremental regulation should address these inconsistencies or the whole concept of regulating distinct areas should be considered outdated and thus fundamentally revised. I believe that the regulatory field is already complex enough in "ICT developed" nations. Given that regulatory transparency ranks as the number one or two decision criterion among global telecom companies[53]. We believe that if the existing ICT regulatory framework of "ICT developed" nations is applied to transition economies, its complexity will deter foreign investment, a major driver in ICT development as depicted in section 7.2.1.1 above. Therefore, a series of ICT policy guidelines are presented in the sections that follow, in order to help guide efficient ICT regulation for the transition economies.

7.4.2 Distinction between "steady-state" ICT regulations and "transition-state" regulations

There is an important distinction to be drawn between the ICT policy adopted in the US and other developed countries and the paradigm that would probably better benefit the transition economies of the Balkans. Technology regulation is an empirical field that undergoes a "policy learning process" [Luiten][54]. Developed countries have incrementally built their telecom infrastructures and regulation has followed a parallel path following a "trial and error", reactive approach, whereby problems were faced as they emerged and the effectiveness of rules adopted was assessed "a posteriori" with corrective measures wherever applicable. This type of regulation can be considered as "steady state" ICT regulation since it applies to economies that have slowly grown to their state as of today – in other words to developed countries that already have a decent telecom infrastructure that is incrementally improving. Their main concerns concentrate on the monitoring of telecom players in order to make sure that no monopolistic powers are developed, which could distort the efficiency of the market.

Developing countries, on the other hand are faced with a different reality - a pressing need for ICT development. Their ICT policy should therefore be fundamentally different from the aforementioned "steady state" ICT policy and regulation. "Developing state" ICT policy has a unique mission, that of accelerating the growth to network economies and information societies, as defined in section 4.1.2 above. It is a leverage factor that can

help accelerate this road to economic and societal benefits but – if done wrong – it can also lead to regulatory gridlock as defined by [McKnight][55] and stagnation. The following distinctive characteristics must be taken into account concerning ICT policy design for the Balkan economies:

- ICT policy should be incepted by technology savvy people, and be proactive: It should anticipate new technologies, thus avoiding the "destruction" part of the "creative destruction" cycle.

- ICT policy should be incepted in a historically informed way, thus avoiding errors of the past.

- It should be designed from a systemic view of each country as part of a broader geopolitical system and aim for long-term economic growth through foreign investment, market competition, government transformation and through cultivating a positive culture towards technology.

These guidelines for ICT policy design in the Balkan region are further explored hereafter. They are not orthogonal, in other words, there are not independent from one another; dependences and cross-influences do exist among them. However they are presented separately to allow for better analysis. If applied correctly and in unison, they could allow these transition economies to "leapfrog" over failed technologies and ineffective regulatory tactics.

7.4.3 Proactive regulation from technology-educated regulators

[McKnight][56] describes the evolution of ICTs as a series of cycles of "creative destruction", whereby just as the technology starts to crystallize, with the market players and regulators converging to equilibrium, new, disruptive technologies emerge that change the rules of the game so fundamentally that cause the "destruction" of firms and the re-definition of industries, and re-initiate the cycle of adaptation, regulation and eventual convergence to a new state.

For Balkan economies to prosper, the states of the region shouldn't have to undergo "destructions" in ICTs, at least not any time near the deployment of new technologies. It is easy to see how the wrong ICT policies can have a detrimental effect in ICT development. To apply this "creative destruction" framework, if a strategic technology that ICT policy designers bank on for development gets caught in the "destruction" part of the cycle early after deployment because of obsolescence, energy, money and most importantly, time are wasted. Moreover, new efforts will have to be expended in order to align with new paradigms brought by the new technologies that caused the disruption. Policy design, when performed by people who do not have the necessary insights on the emerging technological trends is likely to aim for technologies that are bound to be obsolete when finally deployed.

This situation can be avoided however by choosing to regulate for the future technologies or – if uncertainty is overwhelming – to regulate in a technology – neutral manner. This concept of regulating for future state, that I refer to as "shooting a moving target" can be achieved by committing motivated, educated, forward looking people in the regulatory and policy design government process.

Let's look at the following example: Digging to lay wire-lines in Albania in order to extend fixed-line telephone infrastructure to the homes of larger part of the population in remote areas isn't efficient. By the time these infrastructure projects are complete, the population will admittedly have access to voice services, however broadband Internet will most probably not be delivered through these lines because of the long distances from the local exchanges (this is a limitation of the xDSL technology). If work has to be undertaken to wire communities, this should be done using optic fiber (fiber to the home concept). However, the "last mile" delivery of broadband Internet can forego the wire-line infrastructure altogether and use wireless solutions - the most effective and efficient way of providing broadband Internet and telephony to low-population density areas. Incentives should be sought to get domestic or foreign companies to invest in wireless solutions for delivering broadband over the "last mile".

Initiatives like the Program for ICT Legal and Regulatory Assistance to countries of the Balkan Region, jointly proposed by INA and the ITCB (see section 1) to the Greek Ministry of Foreign Affairs aim at helping in this direction. This plan will be more thoroughly explored in section 8.2.2 below.

7.4.4 Historically informed ICT policy - avoiding errors of the past.

The main two barriers to ICT development committed in the past are the complexity and low transparency of the regulatory environment and the protection of the incumbent organization by regulators.

Concerning the first factor, evidence shows a negative correlation between the degree and complexity of regulation and the level of ICT development[57]. In other words, the more stringent the ICTs regulations the more they tend to slow down privatization, competition and the consequent economic benefits. This finding is aligned with the contentions of many private sector industry leaders like Sam Palmisano, CEO of IBM who states that "If we overregulate, overcontrol, impose too many burdens and too much bureaucracy, that could make people risk averse and dampen the entrepreneurial spirit…"[58], an important fuel to technological advancement and innovation.

Regulatory complexity in developed countries may stem from the accumulation of numerous incremental adjustments every time intervention is needed. In a "steady state" of ICT development, this regulatory landscape, although far from optimal, may be tolerated. However, in developing countries, where regulatory instruments aim acceleration of ICT development, such regulatory complexity is an importance factor of hindrance. In fact the most important factors that telecom companies looking to invest in new markets consider are the following[59]:

- Regulatory transparency – how clear and simple ICT regulation is. Significant market potential may offset complex regulations in influencing a go/no go decision to invest in a new market, however regulatory simplicity definitely makes a country more prone to private sector (domestic or foreign) investment.

- Regulatory stability – how often regulatory rules change and for what reasons. Private investments are exposed to regulatory "adjustments" that can devalue their investments overnight. Country records that show regulatory stability are preferred for investment in ICT infrastructure.

- Responsiveness – how easily it is to interact with the regulatory body and how fast and accurate responses to questions are. Evidence shows that interactions between regulators and operators are most challenging in times of transition[60]. The liberalization and privatization processes currently under way in the Balkans add importance to this factor.

The second major regulatory factor hampering ICT development is the regulator's tendency, observed in many countries, to protect the incumbent. [Neuman, McKnight and Solomon][61] contend that through a history of the evolution of the telecom industry in the U.S. a pattern emerges. This pattern is a constant battle of established players to block or hamper the growth of potential competitors by two primary strategic advantages: Their market power and the regulatory structure.

Even today, there is a common belief among the private sector that regulators often tend to protect the incumbent's interests. This issue was one of the key findings of a survey conducted by the ITU[62]. This survey analyzed the views of 18 telecom firms with global operations in local, national and international fixed lines, Internet, wireless and data services as well as satellite communications. It recognized the increased importance of regulators in times of transition (privatization, liberalization) and one of the key impressions of private sector that was voiced in this survey is that regulators tend to protect the incumbent or dominant market player.

There are two major issues with regulation that specifically addresses the incumbent organization. First, by conception it is asymmetrical, therefore inherently introduces disparities on the framework of operation of market players, not to mention added regulatory complexity. As incumbents are state owned or in the process of being privatized, regulation often protects their market powers and here lays the second detrimental effect of such regulation: By protecting incumbents, new technologies (those that could challenge the existing revenue streams of the incumbent) are artificially "blocked". Moreover, the threat that these technologies pose to the incumbent's market is a proof that they can offer better and / or cheaper services to the community. Therefore, by protecting the short-term economic viability of the company-level of the incumbent, regulators hamper long-term nationwide economic growth by delaying all the societal, cultural and political benefits of information societies.

Regulating to protect the incumbent telecom organization is the example not to follow for Balkan countries. In some cases (for example Albania) the incumbent is still fully state-owned and artificially protecting it (by discouraging external players or maintaining high prices) would be a case of short-sightedness, where the benefits of a societal transformation are jeopardized by decisions that yield only short term results.

Historically-informed regulation can emanate from historically-knowledgeable regulators who understand the dynamics of ICT development. Such people from different backgrounds, working in teams would establish a deliberation process eliminating personal biases and eventual personal agendas.

7.4.5 ICT Policy designed from a systemic view

We shall use the term "systemic" to denote a multi-dimensional analysis of ICT policy that adopts a holistic view. There are many factors that suggest that ICT development in the Balkans needs to be addressed in a systemic manner:

- In today's global economy, foreign investment has a range of alternatives. When large telecommunication companies select countries in which to deploy their operations the first or second most important factor is the regulatory environment[63]. Evidence suggests that global telecom firms evaluate regions more than specific countries. If the regulatory framework is not transparent or conductive to new entrants, businesses chose to invest into neighboring countries if they offer a more conductive environment[64]. Therefore, the efficiency of ICT regulation may become a "competitive advantage" of certain countries in attracting foreign investment more efficiently than their neighbors. This view of regions as interrelated systems of countries calls for ICT regulation that shows some kind of uniformity across the Balkan countries, as will be presented in the regional ICT development plan in section 10.3.2.

- Within a certain country, technology is not an independent functional area that can be regulated in isolation. One could even argue that it is too broad and horizontal (supportive to other areas) to be referred to as a "functional area". [Luiten][65] contends that technology does not exist as independent artifact, but rather it "involves economic, technical and social element, all of which are highly intertwined". In this context it becomes clear why ICT development is so dependent on all the factors that are depicted in figure 8. These factors have to be addressed in a combined way: Addressing isolated factors is not effective[66].

Therefore, ICT policy must be incepted using two criteria. Firstly the fact that ICT policy may be the decisive criterion in foreign investment on the part of global organizations must urge regulatory agencies to at least match ICT regulator practices of neighboring countries in terms of clarity, stability and responsiveness. Alternatively we believe that better results can be achieved through cooperation for region-wide development on a transnational level (see section 10 below). Secondly, regulators must understand the multiplicity of the factors that affect ICT development and their inter-related nature. For ICT policy to be successful, all the factors depicted in figure 8 above must be addressed in a systemic way.

Apart from a conductive ICT regulatory environment, measures should be taken to instill and maintain a healthy level of competition in the market. This competition will drive the need for increases in productivity and therefore for automated solutions. The government, a prominent actor in these transition economies should lead by example through e-government initiatives that will drive ICT adoption by the civil society and by the private sector. Additionally, a series of enabling factors have to be addressed, starting from increasing the ICT-skills of civil society. Concurrently, new legislation has to be enacted in order to protect the consumer in the context of online transactions, thus creating the necessary trust for adoption of the new economies. Lastly, providing companies of the private sector the means to adopt information and communication solutions is of little help if they do not have the flexibility to quickly adapt their organization to the new electronic processes in order to increase productivity. Thus legislation needs to provide the framework for organizational flexibility that will empower the private sector. This will create the necessary dynamic to bring these economies closer to the ideal of information societies.

8 Future Initiatives – The involvement of Greece

Not having been part of the ex-communist block, Greece, another Balkan country, has undergone faster ICT development than the countries under the scope of this study. Greece's membership to the European Union has also helped in this respect. The saturation of the Greek internal market in fixed and mobile telecommunication, as well as the market potential of Greece's neighboring countries has lead OTE – the partially privatized Greek incumbent - and virtually all the other leading mobile telephony operators to invest in Balkan countries. OTE holds investments in all the countries of this study except Bosnia and Hercegovina. Greek IT conglomerate Intracom holds investments in virtually all these countries.

Greek investment in the region has undoubtedly accelerated the development of ICT. However, apart from direct investment Greece has also undertaken other initiatives towards a more active role in the technological development of the region – through government sponsored plans and non-governmental initiatives. Three such initiatives and plans are presented hereafter.

8.1 ITCB

Of possible future relevance to ICT development in the countries of this study are the activities of the Initiative for the Cooperation in the Balkans (ITCB). The ITCB operates in these countries in order to :

- promote economic stability, peace restoration and peaceful transition to free enterprise economies in the Balkan Region
- strengthen the Stability and Understanding in the relationships among the US & Greek private sector firms and among private and public entities in the Balkan Region
- provide economic benefits to the Balkan Region.

The ITCB focuses on technological aspects in the areas of the environment, information technology and telecommunications, food and beverages and agriculture. The above goals are pursued by engaging the private sector and academic institutions in bringing and developing technologies to benefit nations of the region. The Council's objective is not limited to providing contact between U.S. and Greek Institutions and their various Balkan counterparts, but also to serve as a discussion forum for new ideas to improve the region's technological opportunities and capabilities.

ITCB financing in its initial stages was provided by the Hellenic Ministry of Economy and Finance, the Hellenic General Secretariat for Research and Technology and the US Department of Commerce. Future support is being sought.

8.2 INA^2

Greece's biggest telecom and informatics companies have pooled their resources and expertise to create the South-eastern Europe Telecommunications and Informatics Research Institute (INA), an organization designed to facilitate investment in the region's telecom and informatics markets by analyzing regional market trends, enhancing the

exchange of technological expertise and helping to develop a regulatory framework for the regions telecom markets.

INA's activities serve the larger effort on the part of Greece and the EU to gradually bring the developing nations of South-eastern Europe into line with European standards and norms. Prospective clients of the institute include state bodies and organizations in Greece and abroad, as well as private entities involved in the telecom industry, universities and research institutes. The recent successful Greek experience in the areas of telecommunications and IT will serve as a model for the development of regulatory and institutional infrastructures in the region, which is home to 50 million residents.

Set up in 2000 on the initiative of the Federation of Industries of Northern Greece (FING), INA (from the Greek word for fibre - as in fibre-optics) officially opened its doors on January 4, 2002, in Thessaloniki.

8.2.1 SETA[67]

Affiliated with INA, the Southeastern Europe Telecom Academy (SETA) aims to play a significant role in the Telecommunications Market of the SE Europe. Its main objective is two-fold. Firstly, to operate as a node for dissemination of information between actors involved in the market, best practices on regulatory issues and the promotion of co-operation, integration and convergence of the SE European countries among each other and with their neighboring countries. Complementary, the facility will operate as a center for the provision of high quality training on regulatory issues concerning the telecommunications market and secondly, to offer technical, legal and financial advice on the basis of an assessment of the technological, legal, regulatory and business environment of the markets in SE European countries.

8.2.2 Joint INA-ITCB project proposal

INA and the ITCB submitted in fall of 2003 a joint proposal to the Greek Ministry of Foreign Affairs for a 36-month project targeting the provision of assistance to the countries of the Balkan region on issues relevant to the technological, legal and regulatory frameworks for Information Technology and Telecommunications. Proposed actions are as follows:

- Creation of a small pool of high quality individuals trained through postgraduate-level education on ICT technology policy.

- Use of this high quality pool of individuals in collaboration with Greek ICT-experienced and local partners to perform studies and research on ICT issues in the region and produce reports and papers on ICT issues concerning the Balkan countries

- Organization of training events and seminars and workshops in Greece and the Balkan countries targeting government ICT-related officials, academics, and ICT business people

- Creation of an Internet “Information Portal” as a node of information for all produced work concerning ICT

The program shall be coordinated for the most part by INA. The potential remaining partners are:

- Centre for Research and Technology Hellas that houses the Initiative for Technology Cooperation with the Balkans (ICTB)
- Massachusetts Institute of Technology, Technology and Policy Program in the Engineering Systems Division department.
- Transport and Telecommunication Ministry of Albania.
- Telecommunications regulatory entity of Albania.
- Transport and Telecommunications Ministry of Bulgaria.
- Telecommunications regulatory entity of Bulgaria.
- Transport and Telecommunications Ministry of FYROM.
- Telecommunications and Information Technology Ministry of Romania.
- Transport and Telecommunications Ministry of Federal Republic of Yugoslavia.

8.3 Hellenic Plan for the Economic Reconstruction of the Balkans (HiPERB) - Greek Ministry of Foreign Affairs[68]

In conformity with its obligations as a member state of the European Union and as a member of the Development Assistance Committee (DAC) of the OECD, Greece has committed itself to allocate annually 0,20% of its Gross Domestic Product (GDP) to international development aid.

In this context, Greece has drawn up the Second 5-Year Program of Hellenic Development Aid for the period 2002-2006; an important part of this program, is the Hellenic Plan for the Economic Reconstruction of the Balkans (HiPERB). The HiPERB is the first effort made by Greece as a donor country to incorporate various separate development aid initiatives into a single comprehensive plan so as to promote an integrated development policy. The HiPERB is a five-year plan that undertakes the financing of projects, investments and activities in 6 Balkan countries, namely Albania, Bosnia and Herzegovina, Bulgaria, the Federal Republic of Yugoslavia (Serbia and Montenegro), the Former Yugoslav Republic of Macedonia (FYROM), and Romania.

The HiPERB, which was adopted by the Hellenic Parliament in March 2002 (Bill 2996, Official Gazette n.62, 28 March 2002), aims at modernizing infrastructures, promoting productive investments, supporting democratic institutions and the rule of law, strengthening the Welfare State as well as contributing to the training of manpower and the overall human resources in the beneficiary countries. The HiPERB's, ultimate goal is, therefore, to contribute to the political, economic and social stability in the entire region of South-Eastern Europe; the guiding principles of HiPERB are those of partnership and transparency.

The HiPERB provides for an amount of 550 million € to be granted to the six above-mentioned Balkan countries within the next five years. More specifically, almost half of the allocated amount will be channeled to the Federal Republic of Yugoslavia (265 million € of which 250 for Serbia-Montenegro and 15 for Kosovo), 74.84 million € to the FYROM, 70.93 to Romania, 54.79 to Bulgaria, 49.89 to Albania and 19.53 million € to Bosnia and Herzegovina (see Figure 10). These funds will be granted gradually over the next five years. With the signing of Bilateral Agreements of Development Co-operation with all six above-mentioned countries the legal framework for the activation of the HiPERB is, since August 2002, completed. Greece now expects the submission of proposals, by the beneficiary countries, for approval and materialization of specific projects, through the respective Greek embassies in the region.

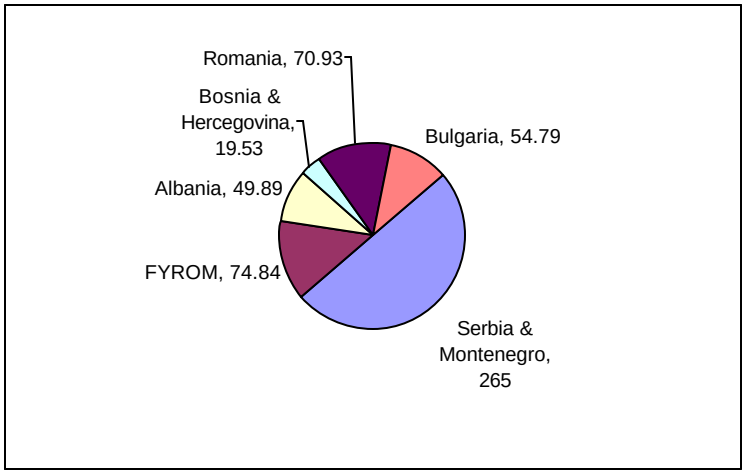

Figure 10: HiPERB funding per country

9 ICT Readiness

9.1 General

In order to assess different ICT development policies for the countries within the scope of this thesis, their present ICT capacities have to be determined, together with their respective capacity for development. These two measures are analogous to the y-position and the slope of the graph in a 2-dimensional representation of a function, where the x-axis is the time and the y-axis is the ICT capacity. These two measures are captured in one concept, namely ICT readiness.

To assist the human brain's capacity to understand multi-dimensional quantities, people naturally try to construct metrics that can summarize multiple attributes in a single number. Although this is particularly difficult for concepts such as ICT readiness, a rigorous approach was devised and applied in 2002 by the World Economic Forum and the Center for International Development of Harvard University in order to create the "Networked Readiness Index" (NRI)[69]. This synthetic metric encompasses enabling factors that determine the usability of the network as well as the usage of the Network itself[70]. It's this combination that allows us to contend that the Networked Readiness Index reflects the present capacity as well as the growth potential. The above study provides a ranking of 75 countries with respect to the NRI. The 77 rest of the 151 countries in the world with population of 1 million or more are not included because "..of the sheer difficulty of collecting data in them, a challenge closely correlated with a lack of economic and ICT development."

9.2 Readiness for the Networked world[71]

The ICT readiness of a community portrays the level of preparedness of that community to become part of the *networked world*. It captures the existence and accessibility of ICT technologies, their degree of penetration in the society, their importance in the economy as well as the existence of a policy framework around ICT. This method, proposed by the Center for International Development of Harvard University provides a well-suited framework for analyzing the ICT Readiness of the countries treated in this thesis. This analysis quantifies the countries' readiness in a total of 19 different dimensions that can be grouped in 5 categories, as will be discussed below.

However, as Colin Maclay[72] suggests, there are too many variations to make a precise number meaningful. This is "..more of a process to examine the key issues, taking different perspectives into account and generating a nuanced picture of what's happening." Moreover, "..the process of investigation raises awareness and deepens and broadens the understanding of the issues. Importantly, it provides a common basis/language for understanding the opportunities and problems, and a starting point for planning how to address them. Different entities also learn to work together, understanding alternative perspectives and approaches, identifying potential opportunities and developing trust in the commonness of some goals."

Readiness is the degree to which a country is prepared to participate in the Networked World. It is gauged by assessing a country's relative advancement in the areas that are most critical for ICT adoption.

One of the merits of this study is that the quantitative assessment can be summarized in a "filled radar" graph. In this graph the overall ICT readiness is proportional to the shaded area, distributed on all 19 axes. This provides for an intuitive visual "image" of each country's readiness that can be used as a common language and base for subsequent discussion and comparison. ICT readiness is assessed in following five dimensions:

Access: It is the boundary where the technology meets its actual users. Obviously, it is the minimum necessary condition for a country's participation in the Networked World. This category captures the availability and the affordability of the use of the network, as well as of supporting hardware and software that provide entry points to the network.

Learning: This category captures the extent of use of ICT technologies in education as well as the proliferation of a skilled workforce in ICT-related sectors. The use of ICT in education is a catalyst in understanding and promoting widespread use of ICTs in the future. Moreover, it provides the basis for developing skills that will reinforce and support ICT economic sectors in the future.

Society: This category captures the extent of everyday use of ICTs in society. This category is important since it is not directly correlated to the amount of ICT investment.

Economy: The usage of ICTs as a new medium for economic transaction between businesses, individuals and the government is captured in this category. Additionally, the impact of ICT-related workforce to the economic activity of a country is also captured under this category.

Policy: It determines a framework with importance leverage on ICT development. Policy can bolster or paralyze ICT development. It is embodied in telecom regulation as well as trade policy, that sets the rules for import – export of ICT hardware and trade over the Internet.

For each one of the above five categories, each country is assessed against a number of specific and measurable attributes. The quantification of the country's readiness on each attribute ranges from 1 (the lowest level) to 4 (the highest) with 0.5 accuracy.

9.3 E-Readiness Assessment per country

9.3.1 Albania[73]

Albania's telephone network was one of the least developed in the communist world. Albtelecom, the incumbent, state-owned organization had increased fixed-line teledensity to 15.5% by 2000. The privatization attempts of Albtelecom have remained fruitless until now, despite two attempts in 2002 to attract foreign investors for a stake of 51-76%

The relative low penetration of fixed lines lead to the rapid expansion of mobile telephony, initially provided solely by Albanian Mobile telephony (AMC). Since 2000, AMC has been sold to Greek-Norwegian consortium of Cosmote – Telnor. A second GSM mobile license was awarded to Vodafone.

Usage of the Internet, has been very low. According to the Economist Intelligence Unit, by the end of 2002, 60,000 Albanians owned personal computers, however only 20,000 had access to the Internet. Part of the reason for this is the fact that severe power cuts hinder the usage of PCs. Moreover, Internet connection costs are very high, sometimes as high as half the average monthly wage.

The spider plot of representing the E-readiness of Albania is depicted in Figure 11. Please refer to appendix A for the actual data of this plot.

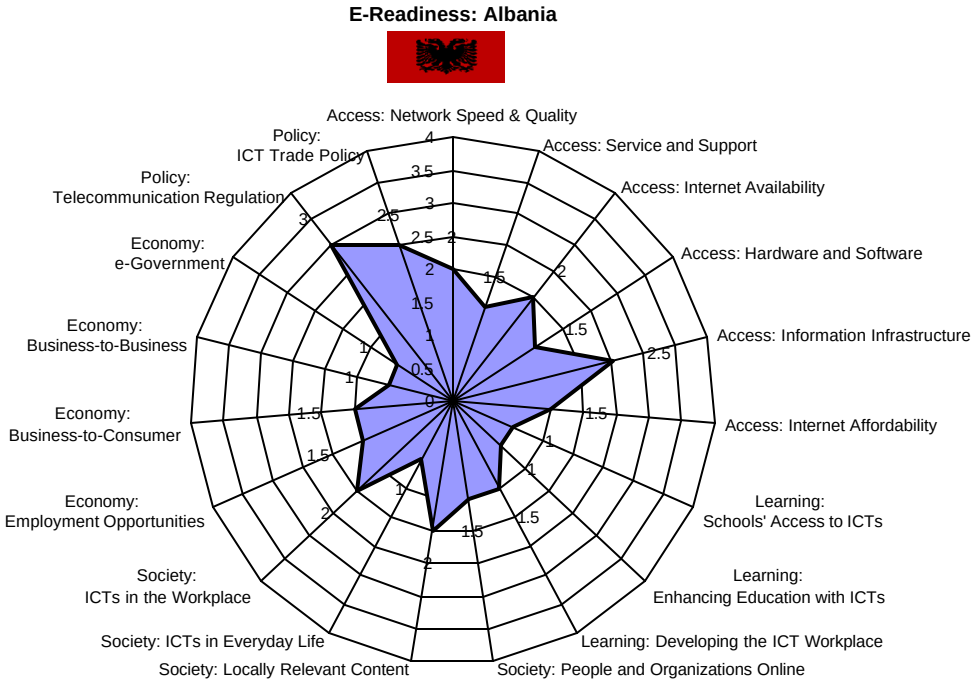

Figure 11: Albania E-Readiness

9.3.2 FYROM (Former Yugoslav Republic of Macedonia)[74]

In 2001 the Former Yugoslav Republic of Macedonia had 538,500 fixed telephone lines, a density of 26.4 per 100 inhabitants. The telecommunications operator, Makedonski Telekomunikacii (MT), was privatized in December 2000, when an agreement was reached to sell 51% of its shares to Matav of Hungary, in which German telecoms company Deutsche Telekom holds a majority stake. MT has a monopoly on the fixed-line service until January 2005.

In November 2001 the government agreed the US$25m sale of a second global system for mobile communications (GSM) license to Greek telecoms company OTE. The service is expected to start later in 2003. MT's mobile service, Mobimak, was introduced in 1996, and has grown strongly since. Cellular mobile subscribers rose to 384,000 in 2002 from 115,700 in 2000. Metered use of fixed-line telephones fell by 26% year on year in 2001, probably owing to a combination of reduced business use during the economic downturn, rising call charges and competition from mobile telephones. Cell-phone subscriptions have now reached 10.9 per 100.

MT's Internet service, MTnet, has grown by leaps and bounds, from 76 dial-up users when it started up in December 1995 to 21,587 at end-2001, when it grew by 124% year on year. According to the International Telecommunication Union (ITU), Internet usage grew from 30,000 users in 1999 to 70,000 in 2001, or 342 users per 10,000 inhabitants.

The spider plot of representing the E-readiness of the Former Yugoslav Republic of Macedonia is depicted in Figure 12 below. Please refer to appendix B for the actual data of this plot.

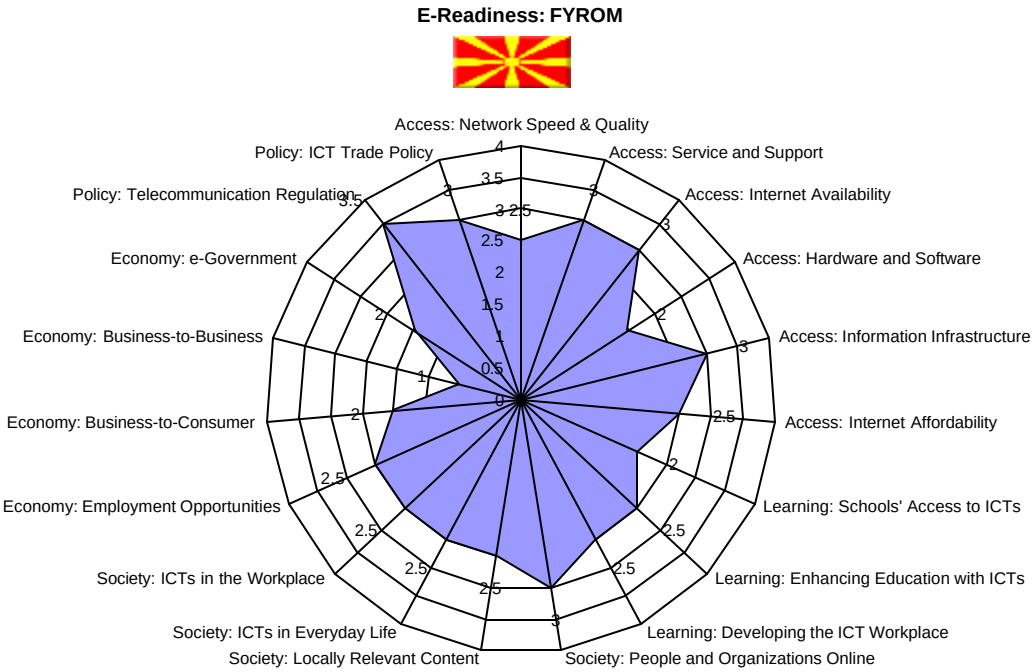

Figure 12: FYROM E-Readiness

9.3.3 Bosnia and Herzegovina[75]

The rehabilitation of physical damage to BiH's telecommunications system has proceeded quickly and efficiently. By 1999 there had been a significant improvement in services, and there are plans to expand and modernize the system under the co-ordination of the European Bank for Reconstruction and Development (EBRD). In 1999 there were 367,900 main telephone lines, 9.58 for every 100 inhabitants, compared with 237,800 in 1995. This is significantly less than in 1991, when 696,000 lines were in operation and a penetration rate of 15.3% was reached.

There were 219,700 mobile cellular subscribers in 2000, 5.53 for every 100 inhabitants, or 37.4% of total telephone subscribers. The number has been growing rapidly. Internet use is still low: in 1999 there were 3,500 users, 9.12 for every 1,000 inhabitants.

In parallel to the rehabilitation of services, a reorganization of the telecoms sector has been under way. There are three service providers, one in each of the three main ethnic areas. In March 2001 the sector was placed under the new Communications Regulatory Agency (CRS), with the aim of accelerating market reform. In April the CRS granted global system for mobile communications (GSM) licenses to the two state mobile telephone operators, PTT-BiH and Mobilna Srpska, and invited tenders for a third. [EIU]

The spider plot of representing the E-readiness of the Former Yugoslav Republic of Bosnia and Hercegovina is depicted in Figure 13 below. Please refer to appendix C for the actual data of this plot.

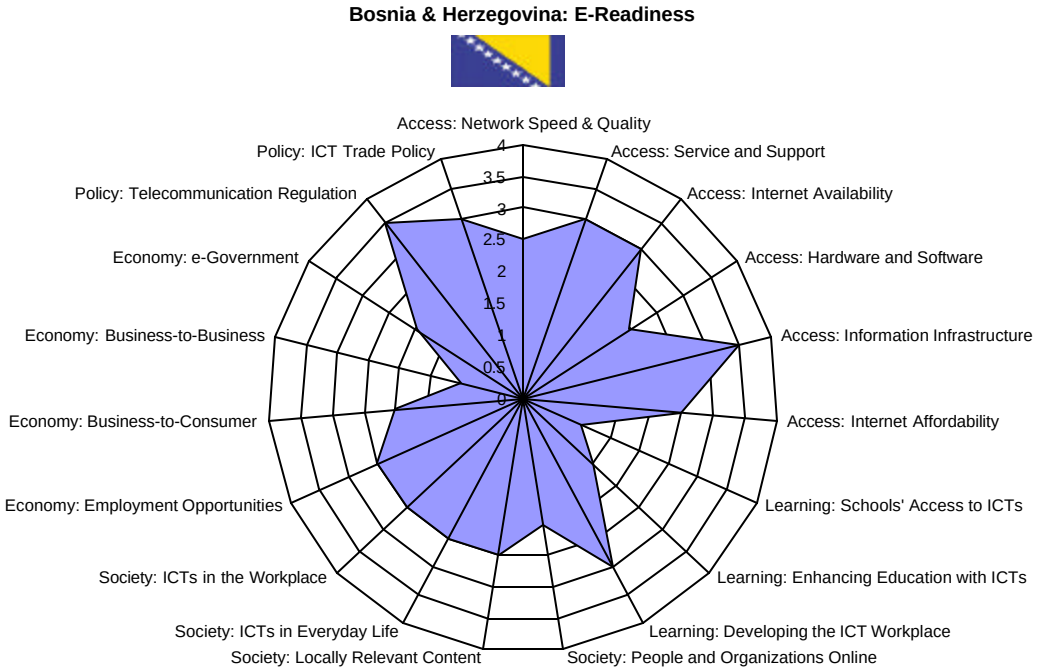

Figure 13: Bosnia and Hercegovina E-Readiness

9.3.4 Serbia and Montenegro[76]

War and sanctions have delayed the modernization of Yugoslavia's telecommunications system, causing it to lag behind other countries in the region, including those that it used to lead. In 2000 there were an estimated 2.4m main phone lines, and an average teledensity of 22.6 per 100 population, up from 1.59m main lines in 1989 and a teledensity of 15.3 per 100. This is far below the average for OECD countries.

The two licensed telecoms operators are Telekom Srbija and Telecom Montenegro, which together share the Yugoslav market and are responsible for network operation and provision of services. In 1997 amendments to the Communications Systems Law made possible the restructuring of the telecoms sector by separating the postal services and telecoms. The Srbija PTT Services Public Holding Enterprise was reorganized and Telekom Srbija was established as a new enterprise. It was then privatized. The government of Montenegro owns 89% of the shares of Telecom Montenegro; the remaining 11% were distributed among the employees of the former Public PTT Enterprise. The firm is being restructured, and privatization is envisaged under a new program adopted by the Montenegrin government in 2001. The telecoms infrastructure incurred heavy damage from the NATO bombing campaign of 1999. All cable systems have been repaired, and the terrestrial telecoms system is now set for comprehensive modernization.

The inadequacy of the fixed-line service has led to fast growth in the mobile telephone sector in both Serbia and Montenegro. In Serbia there are two licensed mobile telephone network operators: Mobtel and Telekom Srbija. Although the government awarded Mobtel exclusive cellular rights for 20 years, the Telekom Srbija deal in 1998 included a second license for mobile telephony in Serbia. The company began to operate its own global system for mobile communications (GSM) network in late 1998. At the end of 1999 it had 100,000 subscribers and covered 15% of the territory and 30% of the population. In Montenegro there are two licensed mobile telephone operators: Pro Monte and Telecom Montenegro.

Access to the Internet as a public service was introduced only in 1997. At the beginning of 1999 there were more than 30 Internet providers in Yugoslavia at about 60 locations, of which about 25% were in Belgrade. There were about 800,000 Internet users in mid-2002. The largest provider is EUnet. The deal concluded between the Serbian government and Microsoft in 2001, which will deliver Microsoft computer and software systems to the Serbian administration in exchange for Serbian co-operation over software piracy, is likely to have a big impact on the general level of Internet and other software-based services over the next few years, although the pricing structure is an impediment (local calls are cheap, but are subsidized by high international charges).
[EIU]

The spider plot of representing the E-readiness of Serbia and Montenegro is depicted in Figure 14 below. Please refer to appendix D for the actual data of this plot.

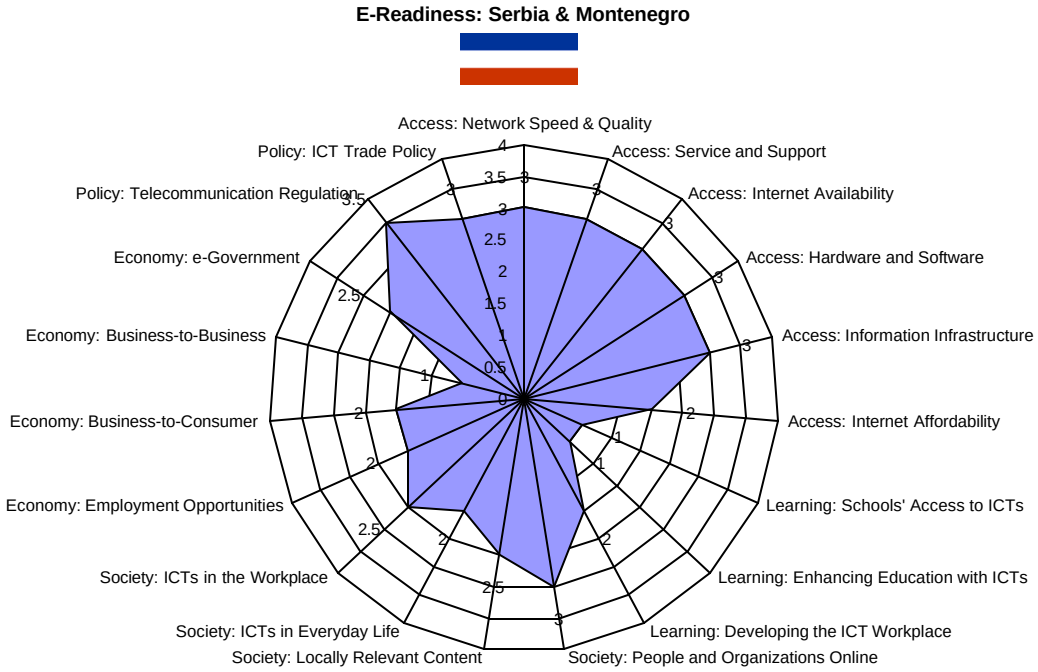

Figure 14: Serbia and Montenegro E-Readiness

9.3.5 Bulgaria[77]

Bulgaria inherited a telephone system with one of the highest line densities in the Soviet bloc, and this has risen further since 1989—to around 39 per 100 inhabitants at end-2002, with around five-sixths of these connected to private domestic phones. However, the quality of the network is less impressive. Only around 32% of lines were digital at end-2002, although this represented a significant rise from 15% at end-2001; digitalization is projected to account for 45% of all lines by the start of 2005 and 80% by the start of 2008. (Of long-distance lines, 85% were digital at end-2001.)

There are two GSM (global system for mobile communications) operators, and mobile penetration is rising fast: official data put year-end penetration rates at 3.9% in 1999, 11.3% in 2000 and 19.2% in 2001, and press reports suggest that penetration had risen to over 30% by early 2003. A third GSM license was originally offered as an optional extra with the sale of BTC, but it is not clear whether the eventual deal will include it.

Internet penetration is low, even by regional standards, but estimates differ. According to official estimates, just 5.8% of the population had access to the Internet at end-2001 and official projections anticipate this rising to only 14% by end-2005 (in contrast, one market research agency put Internet use at 14% in January 2002, while the Economist Intelligence Unit's own estimate for end-2001 is 12.6% and its projection for end-2002 19%). Computers are expensive, with just over 120,000 owned by Bulgarian households. Digital phone lines are costly, and analogue lines are often of poor quality.

Telecoms liberalization should lead to improvements, although tariff rebalancing will, at least initially, tend to make home use more expensive.

The spider plot of representing the E-readiness of Bulgaria is depicted in Figure 15 below. Please refer to appendix E for the actual data of this plot.

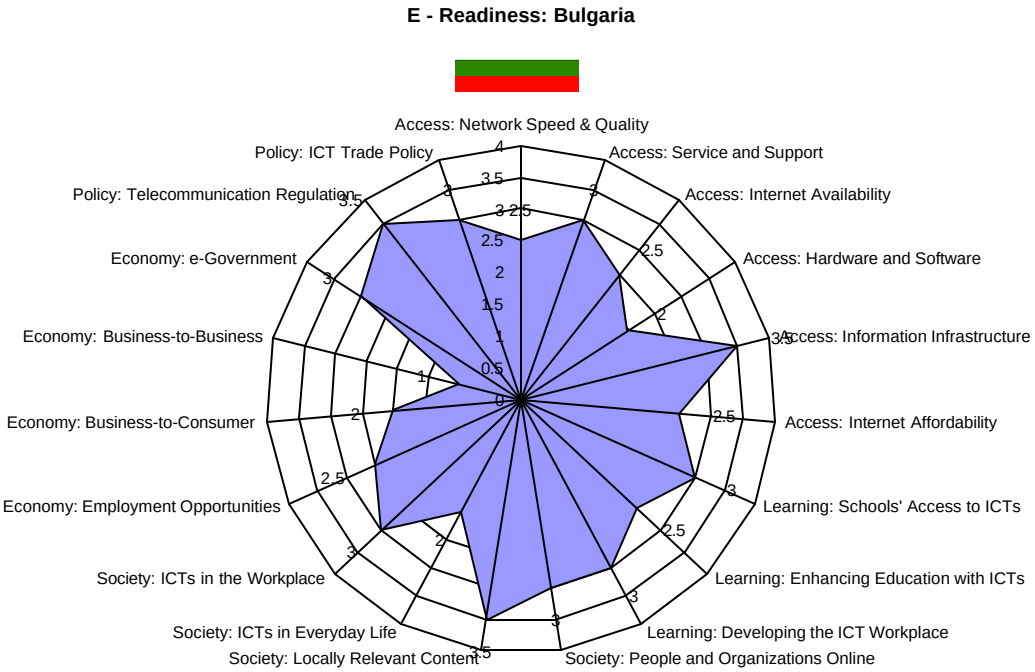

Figure 15: Bulgaria E-Readiness

9.3.6 Romania[78]

Romania's outdated communications network has greatly hindered the development of IT, and remains a major source of increased costs and time loss for companies operating in Romania. The fixed-line telephone market, which has been a monopoly of the national operator, Romtelecom (which is owned by OTE of Greece), was liberalized on January 1st 2003. Twenty operators (including companies from Europe, the US and Asia) and four state-owned operators, including Romanian Post, have expressed an interest in entering the market. Romtelecom's monopoly position has contributed to high tariffs and low levels of penetration, and a consequent high level of usage of mobile telephones.

Romania has four mobile suppliers, MobiFon, Orange, Cosmorom and Telemobil. The number of individual mobile telephone subscribers has doubled since 2000 and now exceeds the number of fixed-line subscribers. At the end of June 2002 there were 4.01m fixed-line subscribers, equivalent to 46% of households. Mobile telephone subscribers were estimated at 4.5m at end-June 2002, following an increase of 621,700 new customers in the first half of 2002, compared with 60,328 new fixed-line subscribers. The government plans to invest US$7bn-8bn over 15 years in a program supported by the World Bank and the European Bank for Reconstruction and Development (EBRD).

Although Internet penetration remains fairly low, usage is growing rapidly at about 5-6% per month, despite the cost, which is well above US or west European levels. As a result Internet users have risen from around 1m users at the end of 2001 to 2.1m users by mid-2002. Teenagers dominate consumption, with an estimated 32% of all teenagers making some use of Internet services, compared with 25% of those aged 20-29. Only 4% of the population between the ages of 40 and 59 are Internet users and only 1% of those over 60. There are more than 150 Internet service providers (ISPs). Cable TV companies have networks in all cities and in many rural areas, and the largest of them have started to offer telephone and Internet services over these networks. The cost of Internet access via cable is still prohibitive for poorer Romanians, and most cable firms market their online services to businesses.

At the high end of the market, private satellite communications systems (VSATs) provide large companies seeking other means of accessing the Internet with a high-bandwidth leased-line connection to ISPs from locations that Romtelecom's network does not serve. As big ISP players enter the market, Internet services should become much more competitive, with lower prices and higher quality services.

The spider plot of representing the E-readiness of Romania is depicted in Figure 16 below. Please refer to appendix F for the actual data of this plot.

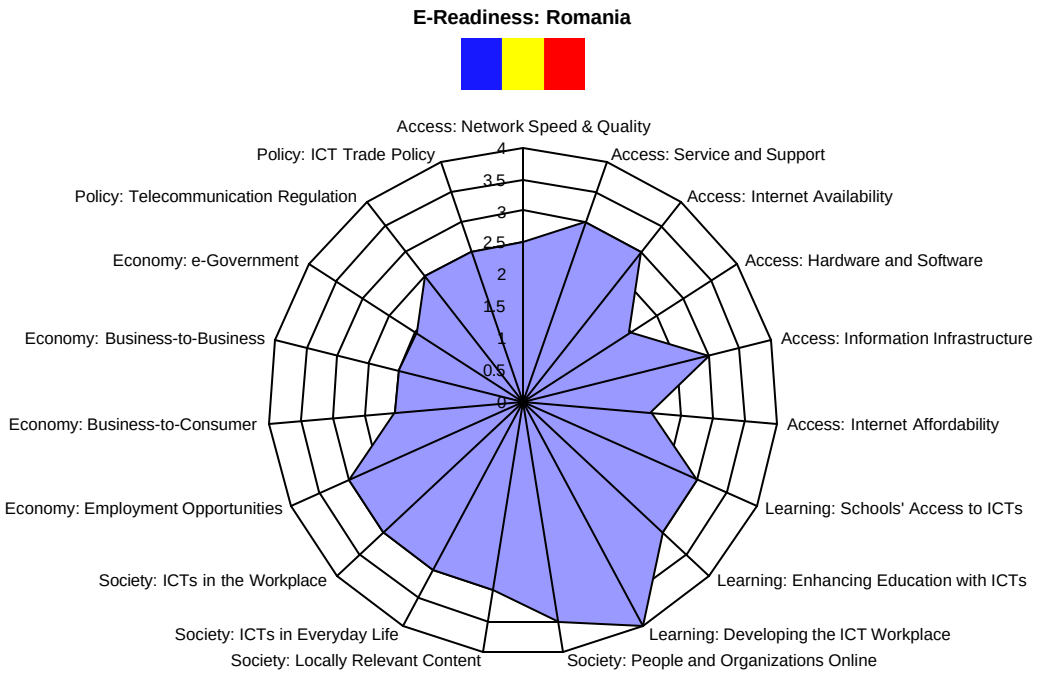

Figure 16: Romania E-Readiness

10 System-Wide ICT development Plan

In this section, a transnational ICT development plan will be proposed. We believe there is enough commonality among the present capacity of ICT in Albania, Bosnia, the Former Yugoslav Republic of Macedonia and Serbia and Montenegro to justify a common approach to the ICT development challenge. Such an approach, however also pre-supposes commonality among the present hindrance factors (barriers) to development. Although some of these factors are indeed common among these countries (low GDP and low population density rural areas) we do not claim to have a thorough view of the hindrance factors specific to all of the above economies since that research is beyond the scope of this thesis.

Localized economic idiosyncrasies, cultures and local politics and their impact on the effectiveness of a trans-national ICT development plan are very difficult to collect and assess. Therefore, the system-wide plan presented in this section remains at a conceptual general level, with some organizational and operational guidelines. There are plans of follow-up research projects that will take a closer look at the idiosyncrasies of the above countries in close cooperation with the Southeastern Europe Telecommunications & Informatics research Institute (INA telecom)[2]. We hope that these projects will shed more light on the per-country realities and their impact on a joint ICT development plan.

10.1 General

It is evident from section 9.3 above that the two most developed countries in ICT among the six that comprise the scope of this thesis are Bulgaria and Romania. This finding is compatible with the "Global Information Technology Report"[69]. The Networked Readiness Index (NRI) ranking of this report places Bulgaria in the 53rd position among 75 countries, while Romania ranks 65th. As noted in section 9.1 above, the 75 countries included in this study are the ones for which ICT data collection was possible. The remaining 77 countries (with populations of above one million) that are not listed in this ranking are assumed to rank lower than Bangladesh, Vietnam and Nigeria, the three last countries in this index ranking (positions 73, 74 and 75 respectively). Given that Albania, Bosnia and Hercegovina, the Former Yugoslav Republic of Macedonia and Serbia and Montenegro are not listed, their Networked Readiness (current usage and development potential) severely lags with respect to Bulgaria and Romania.

This disparity in Networked Readiness of these countries leads us to forming two groups among the countries under the scope of this study:

- **Bulgaria and Romania**: Ranked 53rd and 65th respectively on the NRI, they are both economically stronger than any of the four other countries of the study. Their GDP per capita (PPP) were $5,469 and $6,309 for 2001[69]. They are both EU candidates with an expected admission in 2007.

- **Albania, Bosnia and Hercegovina, the Former Yugoslav Republic of Macedonia, Serbia and Montenegro:** They present general similarities in their ICT development level. None of these countries is included in the Networked Readiness Index, which means that their readiness is below that of Nigeria, the

country with the lowest ranking of 75. Moreover their potential accession to the EU has not yet been determined.

10.2 Bulgaria and Romania

Bulgaria and Romania are under way in their EU accession process. They will join the EU in a second round of accession in 1997 (the first round of EU enlargement will occur in 2004 and concerns Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia, and Malta).

In Bulgaria, the EU accession perspective has secured major investment and "a renewed commitment in the progress of ICT development"[79]. However, many problems still insist, as noted in EU's "2003 Regular Report on Bulgaria's progress towards accession"[80], in particular:

- Although a new law was adopted in September of 2003 aiming at aligning with the acquis[81] especially regarding operators with significant market power and the unbundling of the local loop, liberalization has been slow and of little effectiveness; the incumbent operator Bulgarian Telecommunications Company still has significant market power in the fixed line market.

- The administrative capacity of the regulatory body has to be reinforced; complete separation of the regulator from government ownership in the incumbent telecom organization needs to be ensured.

- With the legislative framework falling into place, focus should now be on implementation which needs to be complemented by decisive action.

Overall, Bulgaria is gradually meeting the majority of the commitments for accession, as depicted in Chapter 19 ("Telecommunications and Information Technologies") of its obligations for EU membership[80]. More general problems affecting ICT development, like remaining bureaucracy, instances of corruption and financial constraints in both government and the private sector are likely to gradually recede.

Romania has historically shown regional leadership in ICT, as it was a significant exporter of hardware and software in Eastern Europe during the 1990s. A series of government reforms since 2000 have signaled a greater commitment to ICT as a national priority: A new Ministry of ICT has been established as well as new parliamentary mechanisms to ease adoption of ICT legislation. The National Regulatory Authority for Communications became operational in September 2002. The Authority is responsible for implementing national policies in the field of electronic communications and postal services. The year 2003 marked full liberalization of the telecommunications market with the removal of the incumbent operator's remaining exclusive rights to offer fixed voice telephony and leased wire line services. Overall, Romania has already achieved a considerable degree of alignment with the EU acquis regarding ICT. Further steps should concentrate on the provision of users' rights and universal services.

Overall, we believe that Bulgaria and Romania, well into the EU accession process, are developing significant momentum for ICT development. This momentum combined with

their respective present capacities should be enough to keep them on track on the road towards Information Societies. This effort will be further renewed when these countries become full members of the EU.

For the above reasons, the transnational ICT-development plan presented below does not include Bulgaria and Romania, instead it focuses on the remaining four countries which are in the most need for ICT development stimulation. At some point later, all the countries in the region should be linked through future initiatives.

10.3 Transnational ICT-development plan for Albania, Bosnia-Hercegovina, the Former Yugoslav Republic of Macedonia and Serbia-Montenegro

10.3.1 Motivation

These four countries are significantly poorer than Bulgaria and Romania. The GDP per head is shown in Figure 17 below. The Networked Readiness Index ranking shows that there is a broad correlation between income and network use[82]; in other words, richer countries are greater users of ICT. In consistence with this study, the four countries under study in this section lag in ICT preparedness with respect to Romania and Bulgaria. Given the per-country analyses of the sections above we can assume that these countries share enough similarity in their present ICT capacity to be addressed in the context of a joint, transnational ICT-development plan and enough commonality of goals to make this plan effective.

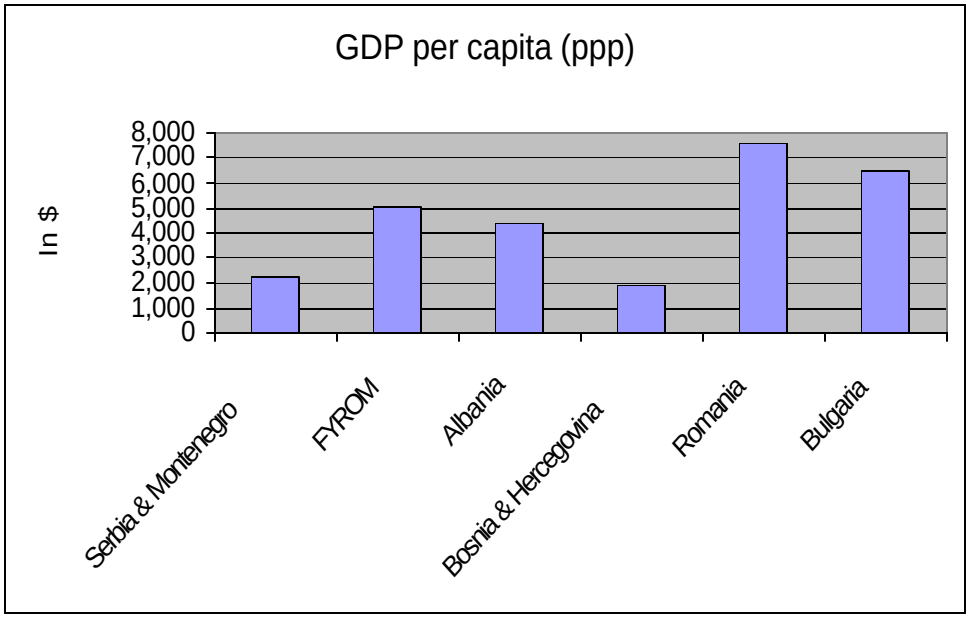

Figure 17: 2002 GDP per capita (ppp)[83]

The reasons behind our motivation for this regional plan are the following:

- ***EU accession***: In December of 2002, the Presidents of the four countries along with Croatia sent a joint letter urging the European Union to give a clear

perspective for their efforts to join the Union at the coming Summit in Copenhagen[84]. As depicted by this action, accession to the European Union is a common strategic goal of these countries. ICT capacity is one of the dimensions of necessary convergence to EU aquis, for these countries to be able to assume the obligations of EU membership.

Moreover, economic criteria are also pre-required for EU accession. Given that the causal relationship between ICT development and economic prosperity is bi-directional, ICT is a strategic area that can accelerate economic growth to reach the levels necessary for EU-candidacy. Therefore, the common EU perspective of these countries is a very compelling reason for them to subscribe to a region-wide ICT-development plan.

> ***Low present capacity***: It works not only a motivational factor but also as the "advantage" of having little or no "technological legacy" to manage. This relative independence of past technologies and systems provides fertile ground for a common technology strategy, without constraints relevant to the usage of older investments.

> ***Common need for ICT expertise***: This need, common among these countries focuses on two different levels. Firstly, ICT policy being an empirical field [Luiten][54], sharing of experiences among these countries stands to their benefit. Similarly, ICT policy and regulatory feedback from other countries that preceded in this path, like Bulgaria and Romania can be shared more effectively in the context of a joint organization.

Secondly, ICT expertise is needed for the construction of a technology roadmap. Jointly addressing this issue through a common deliberation process and sharing of country-specific expertise results in a stimuli-rich process with better results than each country working in isolation.

> ***Increased momentum***: Unfortunately, many local or national ICT development initiatives last just as long as the government that incepted them. Participating in a regional ICT development plan transcending national boundaries creates momentum mechanisms potentially overcoming the disruptions of periodic government changes. This ensures longer-term planning and protects previous efforts and commitments.

A side-effect of the increased momentum characteristic of this plan is the increased importance that national governments are likely to give to their respective regulatory bodies. Transnational cooperation for ICT policy provides national regulators the added quality of and external contact point for the government. This unavoidably provides visibility to regulators within the government structure and functioning, thus underscoring their vital role in the government's operations.

> ***Attraction of private-sector investment***: Feedback to regulators from the private sector shows that regional regulatory uniformity, such as in the European Union is attractive to private investment[85]. Harmonized regional regulation allows operators to provide uniform service offerings to customers across country boundaries in a more cost-effective fashion.

These four countries are already member of the European Conference of Postal and Telecommunications Administrations – CEPT – an organization aiming at establishing a transnational European forum for regulatory discussion on telecom[86]. However, we believe that the huge disparities of ICT present capacity among the 45 current member countries of this organization may be hampering its effectiveness.

> **Creation of a Regional "System of Innovation"[87]:** Creating a harmonized evolving regulatory framework combined with the physical proximity of these four countries will contribute in creating a regional dynamic that may prove conductive to foreign direct investment.

  What's more important however is the potential for facilitated relationships between players and institutions within this region. Complementary national specializations in specific policies or technologies can be examined and filtered into the regional policy priorities and technology strategy. Increased cross-border interaction in different levels capitalized on the "network effect" to accelerate development and build the regional dynamic.

> ***Economies of scale***: Four countries collectively sharing the effort of constructing a technology roadmap (see section 10.3.2 below) can operate on a smaller per-country budget. Aggregating local ITC expertise as well as jointly attracting foreign experts in the process of devising an ICT technology strategy represents economies of scale than each country working in isolation. Additionally, in the implementation phase the bargaining power of the governments of these countries is increased towards external service or infrastructure providers, for example in the context of upgrade or expansion of e-government ICT platforms.

> ***Implementation and organizational knowledge sharing***: With policy priorities and technology strategies crystallized these four countries can share experience in tactical or implementation issues: Organizational adjustments to the regulator's structure or implementation issues that e-government plans have to address are just two examples that can be dealt with faster by sharing experiences. Duplicate work is avoided and errors experienced by one country are proactively corrected in the others.

10.3.2 Transnational Region-wide Plan

The proposed regional plan should be based on the following high-level priorities:

> **Continue telecom sector reform decisively and thoroughly**. "Market-based telecom reform" alludes to the liberalization of the fixed and mobile telecom sector and to the privatization of the incumbent national telecom organization. In all four countries under this regional plan steps have been taken in this direction. However, legislative reforms don't suffice to create a modern, competitive telecom landscape that is conductive to new investments and open to new entrants. In order to allow market forces to work in the telecom sector, genuine intent from the governments must be committed. The study "Telecommunications Sector Reform - A Prerequisite for Networked Readiness" by McKinsey & Company[88] covering 150 countries shows that "regardless of the level of their

GDP, countries that have reformed their telecommunications sector have achieved a significantly higher Internet penetration than their economic peers". Internet penetration being a proxy of ICT-readiness, the importance of the telecom sector reform becomes obvious.

Transnational cooperation among these four countries will help in this direction by enhancing government commitment and eliminating periodic disruption due to changes of government, as explained in section 10.3.1 above. Moreover, periodic assessments of the advancement to liberalization and privatization of the incumbent will engage these countries to ongoing effective reform since they will have to undergo these changes anyway in their accession to the EU.

> **Common technology roadmapping:** ICT technology evolves within a pattern of successive creation and destruction. This process bears inherent uncertainty because disruptive new technologies can render obsolete significant prior investments before they can be fully depreciated. One way to reduce the uncertainty faced by governments having to take technology-related decisions is to perform technology roadmapping. This systematic process of assessing and documenting forthcoming technologies, identifying market potential, maturity levels, trends and disruptions leads to more risk-informed decisions and more sustainable development.

  Technology roadmapping is performed more efficiently in a joint, transnational framework like the one proposed because of the significant exchange of views across national systems, but also because of the lower shared cost of acquiring outside expertise.

> **Common technology strategy**: The strategy that takes into consideration the technology roadmapping described above should guide technology investments through judicious ICT policy. Not only should strategic goals target sustainable, scalable and open technologies, but also they should be aligned with the *acquis*[81] of the EU in this sector. This pre-alignment with EU-standards will facilitate the accession process of each one of the four countries when they occur. A fiber optic digital backbone coupled with wireless "last mile" solutions, as presented in section 7.3.4 above may provide a robust basis for increasing teledensity and provision of Internet access.

> **Focus and prioritization**: Evidence among 150 countries[89] suggests that the ones that focused one or two medium term objectives have made better progress towards their goals. Such objectives could include increasing benefits to customers, increasing industry efficiency, enhancing universal service or attracting investments. Depending on a deliberation process among these countries the priorities should focus on a small number of important goals. Understanding the motivational points exposed in section 10.3.1 above, Albania, Bosnia-Hercegovina, FYROM and Serbia-Montenegro should have all the reasons for agreeing on common focal points.

> **EU-visibility and periodic progress reporting**: The increased ICT-development momentum of this transnational plan should be periodically presented and discussed with European Commission representatives. This will help create ongoing relationships and as well as accelerate a "pre-accession"

process. As a side-effect, dissemination of actions and concrete results related to this transnational ICT-development plan will add credibility and international recognition of the effort.

> **Actively benefit from the HiPERB[90]:** Greece has put forth the "Hellenic Plan for the Economic Reconstruction of the Balkans", as presented in section 8.3. This plan allocates considerable amount of funds to be injected in "productive investments" in these countries. Although the amount per country varies, all four countries under this plan should work to propose national projects aligned with their common strategy. This ensures that the funds made available will be absorbed, not in a haphazard way but as part of a strategy. Leveraging these funds towards common goals should be a focus of the transnational technology strategy.

10.3.3 Organizational Structure and Operation of Transnational ICT Development Plan

The joint ICT Development Plan should be incepted and monitored through a transnational committee. This structure should have the following organizational characteristics:

> Cross-disciplinary, permanent committee with equal representation of each one of the four countries. Each country should participate in the committee with at least:
  - One national coordinator, to serve as a bridging point between his/her country and the committee.
  - A panel of technology, economy, law, foreign and ICT policy experts from government, industry and academia.
  - A set of executives from regulatory agencies.
  - A high-level government executive representing the Prime Minister.

> Participation of foreign expertise. Greece has both the regional knowledge and ICT policy expertise (through initiatives like the ITCB and INA, presented in sections 8.1 and 8.2 respectively). Moreover, the geographical proximity and cultural acceptance of Greece with these four countries will facilitate the involvement of Greek expertise. Moreover, through the ITCB, U.S. experience can be brought to bear.

  The creation of this transnational ICT development plan and its subsequent organization presents potential for the joint INA-ITCB project presented in section 8.2.2. The pool of highly-trained individuals in technology and policy, nationals of the countries participating in this plan should be included in the committee in order to provide much-needed expertise and coordination.

On an operational level, this committee should hold periodic meetings for goal-setting and result reviews. The actual works on a national level (specific policy design, legislative, enforcement, and administrative work) would happen between the meetings. Ad-hoc meetings would be called either for decision-making on emerging issues or for special assignments like external technology or policy consultancies.

Recently there have been fragmented attempts of cooperation for a common approach to EU-accession among subgroups of these four countries like Albania and FYROM[91].

Moreover, these countries are also members of common initiatives like the Central European Initiative (CEI)[92], Southeastern European Cooperative Initiative (SECI)[93] and the Stability Pack for the South-eastern Europe[94]. Linkages with these initiatives and organizations should be institutionalized and synergies sought in view of potential cooperation, cross-fertilization of interrelated projects and increased impact.

10.4 Conclusion

We believe that there is untapped potential leverage in a transnational cooperation of the four countries, Albania, Bosnia-Hercegovina, the Former Yugoslav Republic of Macedonia and Serbia-Montenegro. Part of the reason why such transnational cooperation plans have not been applied in the past is that political commitment and ongoing effort have to be injected in them. Moreover, implementation-specific aspects like organizational structure and mode of operation can virtually doom an otherwise well-incepted and agreed-upon initiative to failure if not addressed in a commonly accepted way.

Greece (and the U.S.), through the Initiative for the Technology Cooperation with the Balkans (see section 1) and the Southeastern Europe Telecommunications & Informatics Research Institute (section 1) have the potential to offer technological and policy expertise. Moreover, organizational and operational assistance, very important in regional initiatives, can be provided. We believe that national governments will find compelling reasons to adopt this plan, like those presented in section 10.3.1 above. The results of accelerated ITC development and even accelerated EU accession largely outweight the anticipated commitment effort for these countries.

11 Public – Private Partnerships (PPPs)

11.1 General

11.1.1 Introduction

If we adopt a general view of public-private relationships, any contract whereby the involved parties are an organization of the public sector on one side and a private entity on the other is in fact a public-private relationship. Examples of public-private relationships include procurement contracts like, for example office supplies, or service agreements, like cleaning services for government offices by a public company. Similarly, a private contractor entering into a contract to undertake a single, non-recurring project like, for example, the repair of a damaged part of a port due to severe weather enters in to a public-private relationship.

The term "partnership" on the other hand, as defined by Merriam Webster dictionary, is "a relationship… usually involving close cooperation between the parties having specified and joint rights and responsibilities". This definition brings forth the notion of ongoing cooperation, crucial in public – private partnerships. Close interaction for a non-trivial amount of time, between public and private actors for achievement of a common goal could be a fair description of a public-private partnership.

PPPs can be viewed as a specific vehicle in a process of privatization. The process of privatization, defined as "the range of efforts by governments to move public functions into private hands and to use market-style competition" [Minow][95], can range from governments divesting from traditionally state-controlled organizations to abolish monopolies of the past (railroads, telecom) to partnering with private entities to carry out infrastructural projects more efficiently.

Recently there has been increased discussion about PPPs. The Directorate General for Regional Policy of the European Commission undertook a wide consultation process within the Commission, involving the European Investment Band (EIB), the European Bank for Reconstruction and Devlopment (EBRD), PPP units and task forces of the Member States and Candidate Countries. The results are summarized in a study on PPPs entitled "Guidelines for Successful Public-Private Partnerships" issued March of 2003. Although this report does "not attempt to define current of future policy"[96] through the guidelines it presents, it nevertheless states that "The European Commission has a particular interest in promoting and developing PPPs within the framework of the grants that it provides" potentially surfacing an underlying intent or at least increased interest in PPP schemes.

Before undertaking a critique of PPPs and analysis of their suitability to ICT development in the Balkan Region, we will first define them and attempt to present a taxonomy based on the separation of the public and private responsibilities and risks (section 11.1.3 below). Furthermore, look on their usage in several countries (section 11.1.4) and their historic application in ICT (section 11.2), before focusing on their suitability for ICT development in the Balkans (section 11.3). Finally, we present a series of guidelines for their application (section 11.4).

11.1.2 Definition and Drivers for PPPs

According to PriceWaterHouseCoopers on a study for PPPs in the Republic of Ireland[97], a Public Private Partnership is a partnership between the public sector and the private sector "for the purpose of delivering a project or a service traditionally provided by the public sector". Although public private partnerships come in different forms, a commonality among successful projects is the fact that better value (more benefit at a lower cost) can be delivered "…through the exploitation of private sector competencies and the allocation of risk to the party best able to manage it."[98]

This definition depicts the involvement of the private sector in projects that were typically viewed as falling within the public sector's responsibilities. Such projects include infrastructural work such as roads and water treatment.

Through involvement of the private sector, the public government can be viewed as a shifting from delivering an asset (and paying up-front for its construction) to purchasing a service. This transition can have a significant impact on the public sector's balance sheet. To cite the example given by McCann Fitzgerald[99], a consultancy in the republic of Ireland, "… the cost incurred in an infrastructural project is transferred from the capital account to a series of future payments from the current account. The transaction could be regarded as 'off-balance sheet'."

According to the same consultancy, there are many factors that enter into consideration and that may induce the public sector to partner with private organizations for the purposes of a specific project. The most important ones are presented hereafter, although, as we shall see in section 11.3.2 below, many of them are purely theoretical and do not necessarily hold when applied in practice:

- Value (defined as "Benefit for money" by Professor E. Crawley[100], MIT): As stated in the definition, the mere existence of PPPs relies on the assumption that the public sector receives higher benefit for less money from the partnering with the private sector than the value it would receive if it up took the project by itself. In performing this cost-benefit analysis, the costs incurred by the contracting authority (the public authority entering in the PPP agreement) must be less than the cost it would have incurred had it undertaken the infrastructural investment itself.

- Faster delivery of Project: Another factor driving the public sector to choose a PPP solution in an infrastructural project is the agreement that the primary contractor will deliver the project more quickly than the contracting authority, if it undertook the project itself.

- Allocation of Risk: One of the key characteristics of PPPs is that risk is allocated and managed to the entity best suited to do so. PPPs are used by the public sector to transfers risks that they would otherwise have to incur themselves. The primary contractor may, in turn, allocate risk to subcontractors or to other companies operating at the same level, in the case of a consortium.

- Sponsor Liability: The infrastructural projects that often form the object of PPPs may call for a varied set of skills. This is the basis for the formation of consortia of companies in which different private companies pool resources and skills needed

for the undertaking of the project. The percentage of capital that these companies contribute to the consortium usually determines their respective risk level.

> Cash flows: They are usually periodical payments from the public contracting authority (public sector) to the company or consortium of companies representing the "private" part of the PPP. Cash flows are set in advance as part of the contract and they are generally modulated in a way to reflect the quality of the services actually delivered.

11.1.3 Taxonomy of PPPs

The following taxonomy of PPPs is based on different degrees of investment responsibility of the public domain. The leftmost part of the X-axis represents a fully public project with no implication of the private sector. On the other hand, the rightmost part represents public projects that are fully "outsources" to the private sector with the government's role limited to setting the regulatory framework and agreeing on the covenants governing the project. This chart is adapted from the UNDP's Public Private Partnerships for Urban Development (http://www.undp.org/pppue/).

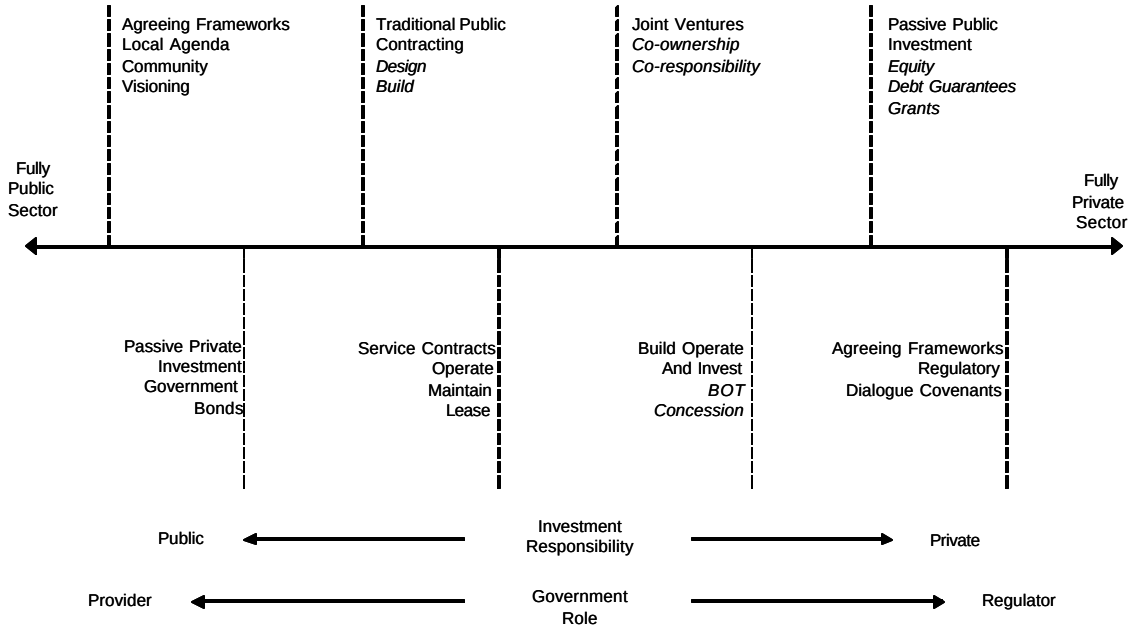

Figure 18[101]: Taxonomy of PPPs

McKann Fitzgerald, the Irish consultancy mentioned above contends that there is a trend for Private sector involvement in what would have been regarded in Ireland as traditionally within the domain of the public sector. Examples from history include toll roads (in the form of turnpikes) in the UK and private sector funding of certain canals and bridges in France in the eighteenth century. More recently, the UK has gradually adopted PPPs, under the name of Private Finance Initiative or "PFI".

11.1.4 International usage of PPPs

In the recent years there has been a growing acceptance that PPPs can be used around the world in order to meet public sector investment needs in a way that offers better value to the citizens and taxpayers. The following chart lists the countries that were most active in considering PPPs as of January 2000, and the industry sectors affected by PPPs[102]. It only includes projects where the private side of the PPPs has been involved in the construction or operation of a facility. "Trivial" forms of private sector financing like simple borrowing, finance leases or sale and leaseback transactions are not included.

	# of Contracts	Roads	Rail	Water	Waste	Power	Healthcare	Education	Prisons	Offices	Regeneration	Sports
Australia	10-20	+	+	+			+		+			
Belgium	5-10	+	-	+	+		+	-			+	
Canada	>100	+	+	+	+					+		
Finland	0-5	+	-				+			+		
France	>100	+	-		+	+						
Germany	0-5	-	-	-	-							
Greece	0-5	-	-				-	-				-
Holland	0-5	+	-	-								
Ireland	5-10	+	-	+	-	+		-	+	+	-	
Italy	0-5	-	+		+							
Japan	0-5				-					-		
Portugal	5-10	+	-	+			-					-
South Africa	5-10	+		-			-	-	+			
Spain	0-5	+	+				+					
Sweden	0-5		+									
UK	>100	+	+	+	+		+	+	+	+	+	+

Table 2: International PPP usage

+: Has been used, -: Under consideration

Indicative of the increasing popularity of PPPs is the fact that the European Investment Bank (EIB) had helped in establishing only €200million worth of PPPs in 1990, while the cumulative worth of PPPs that the EIB helped sign up until 2000 was over €6 billion[103].

In the above table it is obvious that Canada, France and the United Kingdom have been the most active in undertaking PPPs. Of these countries the U.K has adopted PPPs in the widest range of uses. However, the above table does not include ICT-related projects, since this area has attracted PPPs only very lightly. In fact, among these countries only Canada has been active in using PPPs in ICT – in the Alberta Supernet project presented below.

11.1.5 Allocation of risk

An integral part of the definition of PPPs and one of the major reasons behind their existence is the allocation of risk to the party best suited to manage it. As with any project, there is an important level of risk associated with PPPs. The fact that this

institution is primarily used for large-scale infrastructure projects further increases these risks.
Below is a classification of risks based on the presentation given on the 23rd of June 2003 by Robin Earle, Senior Banker, Infrastructure Business Group, European Bank for the Reconstruction and Development.

The Construction phase of the project presents the following related risks

- Commercial Risk
  - Contractor goes into liquidation
  - Contractor fails to meet schedule
  - Cost Overruns
  - Infrastructure fails to meet specification
  - Sponsor goes into liquidation

- Political and economic Risk
  - Shortage of Funds
  - Change in project Viability
  - Political Risk (political changes, instability)

- Force Majeure Events

The Operating phase of the project presents the following risks:

- Commercial Risk
  - Project owner goes into liquidation
  - Operator fails to perform
  - Supplier fails to deliver

- Political and economic Risk
  - Prices move adversely
  - Inability to remit or convert funds
  - Increase in cost of financing
  - Political Risk (political changes, instability)

- Force Majeure Events

There are studies and suggestions on how to mitigate these risks. However, these are dependent on the exact project, the structuring of the PPP and the financial and economic realities of the country and business environment where the project takes place. Consequently, they are beyond the scope of this thesis.

11.1.6 Potential Benefits of PPPs

There are a number of benefits associated with the usage of PPPs, as compared to the traditional practice whereby the government would venture into infrastructure projects based on its own resources and skills. The main benefits[104] are summarized below. As a cautionary note, these benefits are not specific to ICT development nor to the Balkan region. They are rather theoretical and their applicability to ICT specifically to the Balkan region will be analyzed in section 11.3.2 below.

- Acceleration of infrastructure provision, because the public sector does not need to commit the full amount of the investment up front.

- Faster implementation, since PPP contracts are constructed in such a way that private sector is provided with monetary incentives to proceed with the implementation at its maximum capacity.

- Reduced lifecycle costs, assuming that the private sector is not only responsible for constructing the infrastructure but also for operating and maintaining it over time. In this context, it will optimize the design for low lifecycle cost, something not always feasible within the budgeting mechanisms of the public sector.

- Better allocation of risk, since the deliberation process between the private and public sectors on the risks involved with the project and the consequent price fixing lead to a more thorough consideration of all the risks likely to influence the project during its whole lifecycle.

- Better incentives to perform, since contracts are "engineered" in a way to provide monetary incentives for the private sector to perform at its best on an ongoing basis

- Improved quality of service, because of the incentives mechanism described above.

- Generation of additional revenues, since the private sector may be more creative in devising additional revenue flows either by better utilizing spare capacity of the infrastructure or by the disposal of surplus assets.

- Enhanced public management, since the public sector, liberated from operational concerns focuses its resources in service planning and performance monitoring.

11.2 PPPs in ICT

Research shows that there has been an extremely limited amount of PPPs in ICT infrastructural projects. The most publicized is Canada's Alberta SuperNet. This low adoption of PPPs for ICT infrastructure development may be due to the combined effect of the three following factors:

- Until recently, virtually all countries had a single incumbent that was a publicly-owned telecom operator that undertook all the infrastructural development needed to deploy, upgrade and maintain the telecom network. This public monopoly emanated from the nature of telecoms, since there was no need for more than one network to carry telephony services across the country. Under this situation, self-sufficient state monopolies in telephony did not need to partner with private entities.

- The countries that have made the most use of PPPs – and that would be likely to adapt this institution to ICT - are the ones that have the lowest need for ICT infrastructure development. For example, the U.S. the U.K. and France, three of the most active adopters of PPPs already had an important ICT infrastructure

deployed before their respective privatization of the incumbent telecom company. Therefore they lack the need to devise ways of building ICT infrastructure in their post-privatization telecom era.

- Technology risk. The "clock speed" of the information and telecommunication industry, as defined by [Charles H Fine][105] is much faster than that of civil engineering technologies and projects. In other words, technology in telecom changes at a much faster rate than the underlying technology of typical historical domains of PPPs like water/waste management, bridges, railroads, etc. Consequently, ICT infrastructure projects represent a significant technology risk, embodied in new, disruptive technologies that may render important investments outdated. Which private entity would be willing to invest in building cable telecom backbone infrastructure when wireless developments may create competing networks at a fraction of the cost in the future? This risk of "creative destruction" and the relative uncertainty even about technologies that seem to have prevailed and crystallized like optical fiber reduces the private sector's willingness to invest.

Despite this low adoption of PPP practices in ICT infrastructural projects, a number of smaller-scale ICT projects have been accomplished through partnerships between public and private sector. One typical such project will be exposed, that of the state of Karnataka in India that has managed to equip seven hundred schools with ICT labs in a very short amount of time through a partnership with a private computer training institute.

11.2.1 Alberta SuperNet, Canada

Rural Albertans faced a disadvantage in the network economy as the necessary broadband infrastructure either did not exist in their area or the access fees would make it prohibitive because of rural rates. The low density population Canada's Province of Alberta made it unattractive to private investment for building infrastructure and rollout of broadband Internet. This situation was not just a "last mile" problem, in other words would not be solved by connecting disparate households to the Internet backbone. In fact there was no Internet backbone altogether in most communities of this region.

Despite Alberta's relatively limited population – 3 million in total, the local government recognized the potential benefits of the interconnection of their communities. Indicatively, Albertans wanted to have access to educational, medical, business and government services through electronic interconnection. They wanted to allow students to participate in virtual learning opportunities, workers to undergo life-long learning by taking real-time courses on their computers, patients and doctors to be able to consult other medical specialists and business owners to have access to markets without having to leave their rural communities.

Alberta's government decided to undertake the building of the digital infrastructure in partnership with the private sector. Bell was chosen as the prime contractor for building the network, while Axia Supernet Ltd was assigned the management and operation of the Alberta Supernet for a period of 10 years. Through this partnership was created one of the most up-to-date fiber optic and wireless network, scheduled to be completed in 2004.

In total, this network connects 4,700 facilities - schools, hospitals, libraries, government buildings and municipalities - dispersed in 422 communities across the province. This network is divided into a "Base Area Network" and an "Extended Area Network". The

base area segment is a 2,500km backbone connecting Alberta's 27 largest communities representing $102 million of investment for Bell. In the base segment, connectivity was purchased wherever possible or otherwise built (fiber optic).

The extended segment represents 11,000 additional km of connectivity provided to 395 smaller communities, funded by the government of Alberta for an estimated investment of $193 million. In this segment, Bell is the primary contractor for building the infrastructure and has further partnered with 27 smaller contractors. New fiber was typically laid for the extended segment in utility right-of-way areas alongside major highways. However, wireless was also deployed in areas presenting challenging terrain. The overall mix of fiber to wireless in the Alberta SuperNet is 80 versus 20%.

The partnership between the government of Alberta, Bell West and Axia aims at bringing broadband Internet to all 422 communities of Alberta. In each one of these areas, points of presence (POPs) are designed in order to enable to local private companies to deploy connectivity to this backbone for commercial purposes. Therefore, apart from government facilities (schools, community centers, etc), local businesses and households will be able to access broadband Internet at rates comparable to those in highly-populated urban areas. Already 19 Internet Service Providers have signed letters of agreement to purchase bandwidth on Alberta SuperNet to reach smaller communities in the Extended Area. In the event that no commercial interest appears to bring market and provide SuperNet's services to community residents, principal contractor Bell West is contractually obliged to provide such services.

In summary, the public-private mix in this case of deployment of ICT infrastructure was relatively elaborate. Bell West assumed risk and ownership of the deployment of the network in the base area, where presumably the higher population density will allow it to recoup the infrastructural investment in a reasonable amount of time. Bell West was also the primary contractor for the building of the extended area network, although in this context they were mere "builders" of infrastructure, since the investment and ownership of this segment of the network belongs to the government of Alberta. A third party private company Axia Supernet Ltd is responsible for a 10-year management and operation of SuperNet. Early performance measures conducted by Axia monitoring of 150 services showed an availability lever of 99.95%, which is above performance targets. Finally, the way SuperNet was designed encourages more private sector participation, especially for the connection of households to the recently deployed backbone. This allows for the proliferation of local Internet Service Providers.

11.2.2 ICTs in schools project in Karnataka, India

Robert J. Hawkins Manager of the World Links Program at the World Bank Institute[106] cites the example of the equipment of schools in Karnataka, India with ICT labs as an example of successful partnership between public and private sectors. A number of states like Karnataka in India have implemented a variation of the community learning center. NIIT, a private computer training institute was contracted by the local government or Karnataka to install and maintain the school computer labs as well as provide an instructor to give students technical training. The compensation of NIIT was a 5-year program for the provision of the training and the right to use the facilities after school hours for delivery of their own private training courses to the community. This scheme allowed the equipment of 700 schools with ICT labs in only 45 days.

11.3 Suitability of PPPs as a vehicle of ICT development in the Balkans

This section discusses the potential upside of the usage of PPPs in the Balkan realities, as well as the potential detrimental factors that would work against this vehicle.

11.3.1 Why PPPs may be suited to ICT development in the Balkans

It could be argued that PPPs could offer a solution in accelerating ICT in the Balkans for the following reasons:

- Balkan countries are in need of extensive infrastructural development in ICT. These transition economies, unlike most other countries of the Europe inherited an obsolete infrastructure from the communist regimes. In some cases (Bosnia, Serbia) war further destroyed infrastructures, further exacerbating their situation. Although in the last five years these countries have taken steps in developing their ICT infrastructure, more needs to be done. PPPs, by definition well suited to infrastructural, capital-intensive projects could provide an efficient and faster way of deploying infrastructure, as the Alberta paradigm demonstrates. The experience of the private sector, eventually global companies that have undertaken similar contracts abroad, may speed up development and deployment of such projects as the installation of fiber optic or wireless networks.

- PPPs require no significant capital expenditures up-front. This fact positions them as a potentially preferred means of financing infrastructure development, especially in the still fragile and cash-starved governments of the Balkans.

- PPPs are potentially aligned with the privatization process taking place in ICT in the Balkans. Traditionally, infrastructural needs in ICT were addressed by investments from the incumbent organization. After partial of full privatization of incumbents, the government will have to devise new ways of fueling infrastructure development. This applies especially to remote, rural areas, where economics would not justify business interest due to the high cost of building infrastructure and the consequent improbable return on investment. PPPs could spread the funding of building a communications backbone between the public and private sector. The Alberta SuperNet case shows how combined government-private investment resulted in a network that would not have been developed if each sector had to start on its own.

- Moreover, the recent privatization of the incumbent in most of the countries under the scope of this thesis means that there are still informal linkages between government authorities and the incumbent's structure. These linkages could be leveraged into a formal project structure in the case of a PPP. However, these linkages also represent an increased level of risk since they create an environment conductive to bribery and corruption, as analyzed below.

- PPPs are aligned with the policy view of technology development as a "social process" within a "network of actors" [Luiten]. Under this view, the government is just one among a network of players whose interaction and iteration fuels technology development. PPPs spread the investment among several actors while intensifying their interaction and co-operation. Moreover, government takes

an active role in technology deployment (at least in the infrastructure level) as an (important) actor among others. This facilitates its understanding of the dynamics of ICT development as well as the most pressing problems that stand in the way. If these feedback mechanisms can be formalized and channeled through to the regulators (and that is a big "if"), ICT policy designers may be better informed of the realities and consequences of their strategies.

- Balkan governments can use increased interaction with the private sector, a characteristic of PPPs, to lead by example in the adoption of innovative network transactions. In section 7.2.1.2, it was suggested that one of the ways governments can influence the development of ICT by acting on the demand side, is by transforming themselves into an ICT-enabled player. For example, governments can use the Internet to announce public contests, call for proposals, collect bids and inform the public. By adopting electronic interface with the private sector, firms are driven to adopting similar electronic processes in their everyday business. It is a logical consequence that if government's interaction with the private sector is increased, for example through PPPs, "online only" constraints set by the government have an increased impact in their "push" for adoption by private firms. Although this fact is not among the primary objectives of PPPs, it stands however as a second order effect of the use of PPPs by Balkan governments.

The above factors favor PPP adoption in the Balkans in the context of ICT development. However, for every one of them there is a counter argument that seems to be rooted more on the operational realities that prevail in these countries. These factors will be presented before the discussion of alternatives.

11.3.2 Why PPPs may have difficulties in contributing to ICT development in the Balkans

11.3.2.1 Limitation

First and foremost, as stated above, PPPs are conceived as infrastructure projects. If we revert to the framework for ICT development as put forth in Figure 8, this kind of development affects only the technical infrastructure diffusion of ICT and only acts on the supply side of the system. Acknowledging this is acknowledging a limitation of PPPs in fostering ICT development. Even if PPPs in the deployment of network infrastructure produce successful results, this is just a partial contribution to the transition to network economies. The combined effect of an active, competitive marketplace asking for broadband Internet, stimulated by the adoption of online transactions by the government is needed to fuel ICT growth to network economies. Of course, the confluence of all the other factors presented in the above framework is also needed.

11.3.2.2 A Reality Check from a Systemic View

Before addressing the financial reasons that cast some doubt on the suitability of PPPs to ICT development, it is important to first take a "reality check". Public – private partnerships are complex, non-standardized contracts, rather difficult to implement and operate. They are based on the premise that, although the government has the intent of offering quality infrastructure to the civil society, the private sector may be more efficient in doing so. This efficiency mainly emanates from the private sector's speed (due to

usually less bureaucratic structures), creativity (due to the need to constantly adapt to and confront competition) and flexibility with respect to ways of raising capital.

Let us take a step back at this point to briefly examine the basics of a Public – Private system in the case of a partnership for an infrastructural project to be used by civil society. Using the systemic view adopted by [Maier, Rechtin][107], in this scenario, the beneficiary of the project is the civil society. However, the "buyer" of the project, the one who specifies it and takes a decision to award it to a specific private firm or consortium of firms is the government on behalf of the public. The actual "provider" of the system, taking it from specifications to reality is the private sector. This tripod can be seen in Figure 19.

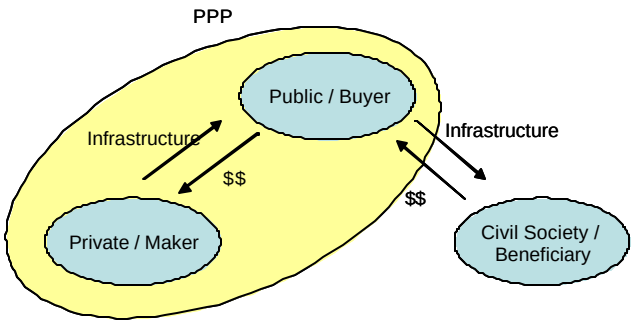

Figure 19: Architecture of a PPP System

In this case, the government acts as a proxy of the civil society (as is its role) in identifying the society's needs, prioritizing them and translating them to specifications of the infrastructural system to be built. This would also be the case if the project was to be build by the government itself. However, in the case of a PPP, an additional "level" has been added, namely the private sector. Not only does the government have to ensure that it effectively transmits these requirements to the private entity, but also consistently control the quality of the infrastructural "product". Required quality depends on the nature of the infrastructure and therefore has to be decided on a project-by-project basis. For example, in nuclear power generation and manned space flight, "ultraquality", (defects have all been eliminated and are too rare to determine with high confidence, [Maier, Rechtin]) is an imperative usage. However, in public health and pollution control, the level of acceptable quality is only one of many economic, social, political and technical factors to be accommodated. Quality has to be audited and controlled by the public entity throughout the project.

Things are further complicated by the fact that these two parties have totally different "utility functions", in other words totally different goals and motivations. The government's motivation is (ideally) securing a public benefit, while the private sector's intent is the maximization of its shareholders' value. The public sector follows rules; the private sector "sees rules and regulations as constraints and deterrents to efficiency." [Maier, Rechtin][108]. These different aspirations stand, by themselves as an inherent diverging force within PPPs, as shown in figure Figure 20.

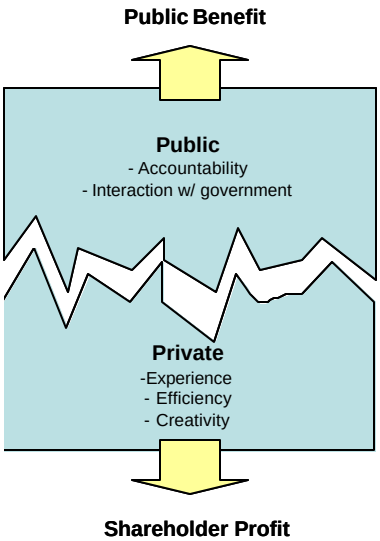

Figure 20: Natural Tension of PPPs

One way of relieving the natural tension between these two entities is through adequate contract design, in other words by defining the boundary in a robust way. Taxation, regulation, services provided, subsidies, cash flows and employment are common instruments defining

the interface between public and private entities. However, a quick "reality check" presented hereafter, shows that designing "well thought-out" contracts, a difficult task in itself, is further hampered by realities like conflict of interest and possible litigation.

For that purpose, let us adopt now a less idealistic viewpoint. Governments are human organizations and it is understood that not all people have the ethical caliber to maintain integrity when faced with perceived opportunities for personal profit. Therefore, what happens if government decision makers value personal profit more than the public benefit? In this case PPPs provide grounds for bribery for preferential treatment, contract award influence or contractual obligation distortions. In the Hamilton-Wentworth water treatment case in Canada, senior regional civil servants who had taken an active role in designing the public-private partnership shifted over to the private company[109]. Although this does not necessarily portray unethical behavior, it nevertheless raises suspicions about the obvious conflict of interest that these individuals had. This is an acute problem in the Balkans.

In the same context, what happens if the experience, creativity and efficiency of the private party are used to misinterpret contracts with the government, opt-out, limit their investment, lower delivered quality or ask for additional fees? Such reactions should be expected, especially in projects that deviate from their ideal, planned execution, requiring more resources, taking more time than expected of plainly requiring more investment than initially anticipated.

A study from the University of Greenwich Public Services International Research Unit reviews the performance of public and private sector suppliers in a number of transitional and developing economies. Although this report refers to water-related PPPs, this report states that "..among others, major long-term concessions have gone ahead without competitive tendering. Private water operators frequently insist that contracts remain secret, sometimes even from elected municipal officials. Two major French water multinationals have been convicted of paying bribes to obtain contracts in France. Major companies are being prosecuted for alleged bribery of officials involved in the Lesotho Highlands project…"[110]. These unfortunate realities have to be factored–into our analysis of PPPs, and care must be taken to establish frameworks that counter such practices.

PPPs, have been used extensively used in the U.S. and numerous successful case studies can be found on the website of the National Council for Public – Private Partnerships[111] in different domains like operations management, maintenance, public works, public safety, transportation infrastructure, etc. From a cultural perspective, local, state and federal government in the US has grown to consider PPPs a natural option in developing infrastructure. PPP contracts have evolved, mistakes have been corrected and the government's expertise has grown. Of course, problems of corruption do exist here too. On the other hand, PPPs represent a vehicle that is diametrically opposed to the state controlled economies of the Balkans' past. This lack of expertise, combined with the unfortunate realities exposed above rises the risk of failure of PPPs through poorly–framed contracts, non-transparent contract award mechanisms, bribery or blackmail of individuals with decision making powers.

11.3.2.3 Financial Standpoint

From a financial standpoint, one of the primary reasons for a government's interest in PPPs is the fact that it can initiate large scale infrastructural projects without having to commit to the capital necessary to for the project probably not even plan for it: The

private part of the partnership ensures the funding and the government has to pay a service fee as a periodical stream of cash directly or indirectly, for example by conceding the operation of the newly build infrastructure for a number of years. From an economic point of view, the partnering with the private sector will cost the government more for the project than what it would have cost to build it the exact same infrastructure itself, since:

- ***Government pays the private sector's profits***: Overall, the government will pay for the cost of the infrastructure plus the private party's markup, necessary to provide profits to their shareholders.

- ***A premium is paid to transfer risk:*** One could argue that apart from financial relationship, PPPs also distribute risk to the party best suited to manage it, therefore liberating the public party from unwanted risks. However, financial theory basics stress that risk and reward are correlated; therefore the public pays a premium to "outsource" risk to the private party. In reality, it turns out that often risk is not really transferred, despite contractual clauses, since the public is still accountable and most frequently bears the consequences of failed projects (see section below).

- ***Higher implied cost of borrowing:*** The private party's borrowing interest rate is higher than the government's borrowing interest rate, because of their different scale and idiosyncratic risk they respectively represent to the borrower. Therefore, when the government "outsources" the construction of infrastructural projects to private entities, it indirectly pays interest rates for the project financing that are higher than those that it could obtain itself. This is barely visible since the government pays the private firm an annuity where multiple costs (financing cost, construction cost and operational cost) are lumped together in series of cash flows that extend a number of years into the future.

- ***Lower quality:*** The private entity charged with building the infrastructure often has economic reasons to opt for lower quality in order to maintain high margins on the contract. Cheaper materials and / or construction techniques are often used, especially in Design–Build contracts where the operation and maintenance, obviously impacted by poor construction quality, are undertaken by the public. This was the case in schools built under PPP schemes in Nova Scotia, Canada, in a project that portrays the detrimental consequences that poorly designed PPPs can have on the public service that is contracted out[112].

- ***Legal and consulting fees:*** The public has to pay considerable fees for consulting and legal support, in order to protect itself – and the public benefit - from the private entity. It is often observed, especially when projects deviate from their desired track that private sector companies devise "creative ways" of interpreting contracts that they are bound to. Such techniques are often an operational process for private firms who therefore have developed skills in them, while the public different nature has to seek ad-hoc legal protection.

- ***Capital is expatriated:*** In ICT few international companies have the capacity to undertake large scale telecommunication network building. These companies are foreign to the Balkan states. Therefore in the case of PPPs, even if they employ local workforce for their projects, the profits are expatriated. Therefore,

opportunities are missed out in creating wealth for the domestic market, especially in these transition economies.

11.3.2.4 Accounting-driven decisions

Given the above evidence, PPPs may not make economic sense. Therefore how is their existence and proliferation justified? Although the economic arguments made above would not justify the price to be paid by the public sector for an infrastructural project, governments often have other compelling reasons not to decide on a "cost" basis. When governments enter into PPPs, they often take decisions on a "value" basis - the benefit they get from entering into a PPP offsets the price premium they are called to pay.

This increased value that the public sector sees in PPPs resides in how these contracts are accounted for in the books. When a government decides to build infrastructure, it has to assure funding and important infrastructural projects require large sums of funds. If the funds needed are borrowed, public debt is increased, something every government tries to avoid, either for political reasons or because government departments have to have a balanced budget. PPPs, seen from the view of leaseback contracts from the private firm to the public administration, offer a way for "off balance sheet" financing when properly structured. Off-balance sheet financing hides debt and does not provide an accurate image of the leverage of the public entity.

A lease agreement introduces flexibility into financial statement presentation. Leases are distinguished into capital and operational, and each one follows different accounting rules. Capital leases are accounted for in a way similar to debt financing. However, operating leases do not appear on your balance sheet and therefore positively impact balance sheet ratios. Different types of lease agreements provide the lessee with the option of treating lease payments as operating expenses or capitalizing the asset and depreciating it. Of course, there are specific accounting rules used to determine whether a lease should be recorded as capital or operational. However, lease contracts can be constructed in a way to provide the lessee the opportunity of accounting them as operational.

Governments often decide to pay a premium in order to enter into a PPP and have the project "off balance sheet". This practice is economically flawed, since it is driven not by the public benefit – quality infrastructure at low cost – but rather by accounting considerations. Unfortunately, it is one of the major reasons behind the increased usage of PPPs as of today. And such practices, whose similarities with the off-book transactions with Enron Corporation are obvious, are "cases of failures in existing accountability practices across all sectors" [Minow]. They also stand as a reason for growing controversy around the ethical basis of this subject, in terms of its potential harm to public benefit and of creation of a false image of the public finances.

For example, there is currently controversy in Britain about Private Finance Initiatives (PFI) – another term for PPPs and how their "off balance sheet" nature distorts the true picture of public finances[113]. The Canadian Union of public employees, in its article "Blinkered by the books" characterizes PPPs undertaken in the provision of new schools as the "product of short-sighted budgetary tunnel vision"[114].

11.3.2.5 Other considerations

Generalizing the accountability issue mentioned above, some contend that democratic accountability and publicly controlled agencies are replaced with investor – controlled private corporations, accountable to their shareholders. Moreover, deals sometimes aren not publicly disclosed, because of "commercial confidentiality"[115] which further raises the accountability issues for the public and private parties involved. This risk escalates "when public dollars previously subject to public scrutiny move into private accounts closed to public review", as noted by [Minow]. Taking a societal view, [Minow] further raises questions on how the collective interest and will on public purposes may be diminished, by a shift of public services into commodities judged only by narrow "client satisfaction" criteria.

Related to the use of PPPs is the risk of a weakened public sector capacity. Capacity to build new infrastructure and services, as well as operate and maintain existing ones is a perishable asset. It is built through ongoing practice, and "outsourcing" of publicly delivered functions may progressively weaken the public sector's ability to be self-sufficient in this role. Infrastructure building typically involves a broad mix of economic analysis, engineering functions and project management. In the context of PPPs, some or all of these skills can be provided by the private partner. The government's departments are therefore weakened either because of decreasing use of these skills and the consequent defection of functional staff. The public sector, progressively functioning as a project manager may not be able to revert to fully public infrastructure building in the long run. This reinforcing loop of decreasing skills and experience has to be seriously considered. Of course, the skills in the private sector may be correspondingly enhanced. However, the predefined duration of PPPs combined with the greater fluidity of human resources in the private sector may easily deprive the public sector of these skills.

Lastly, some of the risks related to PPPs were presented in sections 11.3.2.2 and 11.3.2.3 above. However, if we adopt a "high-level" view of PPP systems, it is evident that if such projects fail, the public sector is the ultimate loser because it fails to deliver the infrastructure and related services to the civic society. This reality has two main consequences: Firstly, it provides the private sector with the potential of "gaming" the PPP system, under threat of bankruptcy. Such an eventuality may result in better financing terms for the private entity from state-controlled or national banks, or in alterations in the initial PPP contract to "descope" features or compromise the quality of the delivered project. Secondly, if the private entity of the PPP ultimately fails, the public sector has to continue the project, either by opening new tender processes or by repatriating the project under the public domain. Either of these outcomes translates in cost overruns for the public.

11.4 Guidelines

In this section, a series of guidelines that Balkan governments should take into consideration in order to accelerate ICT infrastructure development is presented.

- ***PPP is a tool; it cannot substitute strategy.*** Governments should understand that entering into a PPP for ICT infrastructure development is not a decision to be taken in isolation. It should be part of a broader technology development strategy, with clear goals, timing and implementation plan. As mentioned earlier,

a public-private partnership is just an implementation vehicle, a tool that comes as a part of a technology strategy an not as a driver for it.

> ***Infrastructure provision is only part of ICT development dynamics.*** Governments should adopt the holistic view presented in Figure 8. Infrastructure development is a supply-side instrument that, does not suffice to accelerate ICT development if addressed in isolation. As already mentioned, the public sector has to self-transform to embrace electronic workflows in its processes and enforce electronic transactions across the interface between public and private. ICT demand must be stimulated by supporting a healthy level of competition in the market. ICT skills must be developed in civil society and trust on electronic transactions must be assisted by adaptation of legal framework. Finally, policy must create a business environment conductive to innovation, new ventures and organizational flexibility in order to foster the demand for innovation in business processes, enabled by the usage of ICT..

> ***Cost-benefit and Risk-benefit analysis must be undertaken before opting for a PPP.*** Given the economic considerations exposed in section 11.3.2.3 above, the public most likely stands to lose by entering into a PPP, from a purely economic standpoint. However, there may be benefits justifying the partnership, like rapid financing, expertise and private sector efficiency. Cost – benefit analysis does not capture the whole extent of the implications of PPPs. There are "hidden" dimensions like the weakening of the public domain expertise and the creation of an environment conductive to unethical behavior of public workers that create risks that cannot be easily quantified. Although no scientific method provides a framework for analyzing such risks, their existence should nevertheless be known in advance, for governments to take risk-informed decisions.

> ***Inclusion and deliberation between different stakeholders.*** The public part of public – private partnerships should theoretically represent the common good and the benefit of civil society. In reality, however the binary nature of public – private partnerships seems rather limiting in the sense that not all stakeholders can be represented by a group of public workers in a division of a ministry of the government. Although the high-level goals of PPPs may be common to everyone, however the lower – level intermediate goals and implementation details often have very significant effects. Local government representatives, non governmental organizations, academia, civil society and other entities like, for example, the chamber of commerce, should be called to participate in the design, as well as oversight, of PPPs through deliberation. Admittedly, it takes sustained effort and a considerable amount of time in order to instill a deliberation process among all these players and still reach useful decisions. However, had this process been followed in deciding to build schools through PPPs in Canada, there would not have been the D4 schools – schools associated with "Dirty Dealings, Disillusionment and Debt"[116]

> ***A legal framework for accountability.*** Martha Minow, in her article "Public – Private Partnerships: Accounting for the new religion"[117] presents four ways towards a public framework of accountability. Firstly, since contract law is dependent upon public enforcement, governments must learn to set the rules on what private sector promises will be enforced, and what kinds of sanctions will be

imposed. Governments must also have the will to enforce contracts with private entities through courts and arbitration. Secondly, constitutional obligations of the public sector should be transferred to the private sector when it is called to perform a function normally included in the public spectrum. Therefore delegation from public to private entities should maintain the same compliance requirements of governmental accountability. Thirdly, administration must be undertaken to explicitly documents goals, milestones and performance measures for each partnership. Failure to do so gives a potential advantage that the private entity, who can use it to maximize profit to the detriment of the public benefit. Finally, democratic processes must be respected in every step of these partnerships. This principle stresses the importance of the deliberation and inclusion process stated above for the contract design phase. It also involves disclosure of relevant information to the public and "…periodic occasions of expression of public views about particular privatization decisions and the standards set and used to assess them…".

> ***Contract engineering.*** As noted in section 11.3.2.2 above, the ultimate goals of the public and private sectors are inherently different. Therefore, partnerships must be designed in such a way so as to link public benefit with private sector return incentives. As noted by [Maier, Rechtin] "…the mechanism and incentives for … collaboration must be designed in." There is an added complexity: The incentive structure built into the contracts also has a time dimension. In other words, the incentives must be designed for the lifetime of the project. Important infrastructure projects, the ones that typically become the subject of PPPs are staged in phases. This stage-gate approach should enforce reviews and provide frequent exit points for the public entity. These exit points should leave the private sector with substantially reduced rewards with respect to what could be gained if the project went through thoroughly, thus providing an incentive for a lasting partnership. These review gates should also be designed to represent stable intermediate forms. This way, should the public sector have reasons to withdraw from the contract, the project would be easily continued with a different partner or within the public sector. Well-designed contracts are a critical factor for of successful PPPs. They are however project dependent and must be designed by cross-disciplinary teams representing a mix of functions like economics, finance, public works, engineering and law. Such a team is referred to as "PPP task force" by Thomas C. Barrett, in his presentation entitled "The Role of EIB in PPPs in Europe" (European International Contractors' seminar, Brussels, 23rd of June 2003).

> ***Transparency.*** Although recommended under the guideline about accountability, contract and process transparency cannot be stressed enough. PPPs offer an array of situations representing conflict of interest for public workers. Transparency in the bidding, contract selection, project monitoring and reviews not only dissuades ethically "flexible" individuals and private firms from acting unethically, but also fosters public trust in the government's actions and in the PPP scheme altogether. The Internet should be one of the tools used to publicize project information since this is consistent with creating demand for the ICT skills of the civil society and with the self transformation of government into a lead user of technology.

- > ***Adequate Organizational Structure of the Government.*** Any functional area of a government may enter into a PPP. However, large-scale, infrastructural PPPs should be governed by an ad-hoc governmental steering committee and not solely by the functional public workers of that area. This governing committee would be a temporary cross-disciplinary structure for the life of the PPP. It should have legal power to ask questions, attribute responsibilities and even halt the PPP altogether in case it derails from budget and quality standards as specified in the initial contracts. This PPP governing committee should have a mix of functional but also legal expertise coupled with prior experience in PPPs governance. This mix would be best suited to assess the actual work being done but also anticipate typical private sector "maneuvers" for lowering the total cost of the commitment or de-scoping the actual deliverable.

Naturally, not all PPP agreements are unfavorable for the public benefit or doomed to fail. The Karnataka example, presented in section 11.2.2 above is a noteworthy success. However, there is one key idiosyncrasy in this project: It focuses on synergistic cooperation between the private and public domain rather than on a contractual cash-flow relationship. The key element in this project is that the private sector receives the right of usage of school facilities outside of the school hours as a reward for the services provided. The utilization of a governmental asset (school facilities) out of the normal school hours was of no use (zero utility) for the government. However it was an adequate reward for the private entity. Such synergistic relationships that minimize the monetary exchanges wherever possible are the ones most likely to result in successful PPPs.

As a conclusion, PPPs pre-require strong political commitment, a clear legislative framework and policy, a sound financial system, a dedicated and experienced "task force" and efficient administration and reporting. Current evidence about the success of PPP is mixed. Correctly applied, the PPP paradigm can be a "win – win" infrastructure development solution. The United Kingdom, one of the most fervent proponents of PPPs struggled from '92 to '99 to sort out public sector inexperience, initial disproportionate deal costs, poor quality documentation and sub-optimal risk allocation, according to Michael Wilson & Partners, a consultancy. During these seven years experience was built and emergency legislation enacted, resulting to positive value for money from PPPs.

The PPP vehicle, untested in ICT, applied in the Balkan countries could prove too risky if deployed for large scale infrastructural projects. The evolving legal framework of Balkan countries, along with instances of government corruption, could result in partnerships that not only cost the public sector large sums of money but also fail to deliver the desired infrastructure in the desired timeframe and to the needed quality standards. If Balkan countries were to get value from PPPs, they would first have to undertake important legal, policy and organizational changes. They would also have to instill a technology development roadmap and also build experience in the PPP "tool" by first adopting small-scale, synergistic partnerships in traditional, non necessarily technological projects. These cases should be used to perform a priori and a posteriori cost and risk – benefit analyses. After building experience and a conductive framework, PPPs should come not as an easy alternative to project financing but rather as an informed step to achieving strategic goals.

12 Conclusion

It is a proven fact that technology improves productivity. That increased productivity on a national scale leads to higher GDP. And that higher GDP is synonymous with higher quality of life. The obvious question is then why don't all the national economies further their technology, in the goal of improving quality of life? The answer to this question is partly contained in the quote "Politics, not technology sets the limits of what technology is allowed to achieve"[118]. Unfortunately, policy is dependent on politics, so we would rephrase the quote to "Policy, not technology sets the limits of what technology is allowed to achieve".

This enabling role of policy is particularly underscored for the Balkan region. The countries under consideration in this study represent unique opportunities for development. Granted, they are "developing" economies, with a GDP per capita of less than $10,000. In fact four out of six of these countries' GDP per capita is less than half that. This means that many rural communities still lack basic telephony service – and of course haven't even heard of the Internet. However, these countries are part of Europe and geographically neighboring with ICT-savvy countries. They know what modern technology offers and they also know what works and what not in terms of technology development policies. And there lies the opportunity: These transition economies are lagging but not too far behind. And they know where to set course to and what goals to set – so many other countries have transited their current development stage. Therefore the big challenge is how.

Throughout this study there have been proposed a series of guidelines for ICT development: Completion of telecom section reform; education of regulators; embracement of new technologies. And cooperation on a transnational level to unleash the "network effect" in the societal process of innovation. The importance of transnational cooperation cannot be stressed enough for the four "smaller" economies of this study, namely Albania, Bosnia-Hercegovina, the Former Yugoslav Republic of Macedonia and Serbia-Monenegro. Participating in a transnational ICT Development Plan not only improves regional potential but also helps reducing technology risk and cost. Moreover, it adds momentum to a process that often gets disrupted by periodic government changes.

Public-Private Partnerships are a vehicle that can be useful for infrastructural development; however it is by far not a panacea – and not a "quick and easy" alternative to be taken lightly. Governments considering PPPs should take heed of a series of potential pitfalls not only during the project preparation but also during the project monitoring and adaptation phases. Not the least important of these "caution areas" analyzed in detail in this thesis is the fact that without a solid legal framework fine-tuned for PPPs, governments aren't bound to get the theoretical benefits of PPPs – and this is particularly important for these Balkan countries.

Overall, we believe that one of the major reasons why these countries aren't moving faster towards information societies is something that cannot be easily documented - the lack of genuine political intent. Unfortunate, but very real, instances of government protection of the incumbent and the presence of intentional bureaucratic hurdles in the telecom reform are common. As typical examples of short-sightedness, governments

protecting short-term localized revenues from state-controlled monopolies postpone the socio-economic national benefits of information societies. Therefore, to address the big "how" raised in the second paragraph of this conclusion, the answer is "by true commitment". Changes in legislation must be followed by enforcement of newly enacted telecom liberalization laws, while regulatory bodies must be independent and powerful. Committed governments have all the data they need to devise efficient policies and apply them. Granted, like all social changes, ICT development is a lengthy process and information societies are more an ideal than a working concept as of now. However, committed governments can prepare the conducive ground for the future.

Lastly, the potential contribution of Greece in this process has been historically overlooked. Funding and expertise are being made available either by the Greek government or by Greek NGOs. The Balkan countries under the scope of this study stand to benefit from these – again under the condition that there is true intent.

The people I have met in the context of this work and myself are true believers in the potential of this region. We are all hoping one day to see "information societies" embodied in the Balkan region.

13 Future Research

This thesis has presented general guidelines aiming at improving ICT policy on a national level. It has also provided the framing elements of a transnational cooperation plan to further ICT development in the four least developed countries of our scope. Finally, this study has critiqued the applicability of public-private partnerships as a vehicle for information infrastructure development in the region.

Additional effort needs to be given to the substantiation of the above results to the realities of each of the six countries under research. In this context, detailed country-specific data will have to be sought for the accurate assessment of present capacities and development potentials. Legal, regulatory and enforcement national idiosyncrasies need to be taken into consideration. Moreover, national cultural and political factors will have to be addressed, a task that may require on-the-spot interviews with local experts, either from government, academia or the private sector. Greek initiatives like the ITCB and INA could provide good starting points for regional expertise. Moreover, they could serve to redirect the researcher to local actors that have both the knowledge and the capacity to present the per-country situation as of today.

It is hoped that this thesis along with eventual future country-specific studies may be used for guidance in policy design. Individual countries could benefit from this effort in isolation or within a systemic framework on a transnational ICT development plan.

Appendix A – Albania

Category	Measure		
ACCESS	Access: Network Speed & Quality	2	Dropped connections frequent, sound quality acceptable for voice conversation
	Access: Service and Support	1.5	Main lines take several month for installation, few ITC-savvy professionals
	Access: Internet Availability	2	Lowest European number of Internet hosts per inhabitant
	Access: Hardware and Software	1.5	Basic hardware / software available, not in native language
	Access: Information Infrastructure	2.5	Teledensity of 16% in 2000
	Access: Internet Affordability	1.5	Internet connection fees discourage subscribers
LEARNING	Learning: Schools' Access to ICTs	1	No computers in schools
	Learning: Enhancing Education with ICTs	1	Computers are not used by any teachers or students.
	Learning: Developing the ICT Workplace	1.5	Limited opportunities for training in ICT skills development.
SOCIETY	Society: People and Organizations Online	1.5	6% of population has access to Internet, some companies have reserved domain names
	Society: Locally Relevant Content	2	Little local content, few websites in Albanian
	Society: ICTs in Everyday Life	1	Most communication paper based
	Society: ICTs in the Workplace	2	Few offices with computers
ECONOMY	Economy: Employment Opportunities	1.5	Few jobs for ICT-skilled people
	Economy: Business-to-Consumer	1.5	Paper-based transactions, some local businesses operate websites
	Economy: Business-to-Business	1	B2B interactions paper based, lack of transparency
	Economy: e-Government	1	Very few governmental websites exist
POLICY	Policy: Telecommunication Regulation	3	Plans for the liberalization of the telecom sector are being implemented
	Policy: ICT Trade Policy	2.5	Foreign Direct investment in ITC is allowed

Sources

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Appendix B – Former Yugoslav Republic of Macedonia

Category	Measure		
ACCESS	Access: Network Speed & Quality	2.5	No frequently dropped connections, more than 80% of calls successful
	Access: Service and Support	3	More than 1-month waiting for new lines, small community of ITC professionals
	Access: Internet Availability	3	6 major ISPs, few different service packages
	Access: Hardware and Software	2	Most hardware and software solutions imported, not in native language
	Access: Information Infrastructure	3	27% teledensity, wireless market accelerating
	Access: Internet Affordability	2.5	Local access solutions exist, rates still high
LEARNING	Learning: Schools' Access to ICTs	2	ICTs in 12 schools as a pilot program
	Learning: Enhancing Education with ICTs	2.5	In specific instances information from the web is used
	Learning: Developing the ICT Workplace	2.5	Limited opportunities for training in ICT skills
SOCIETY	Society: People and Organizations Online	3	Less than 10% of the population use the Internet regularly
	Society: Locally Relevant Content	2.5	Websites with local content exist however they are static and updated infrequently
	Society: ICTs in Everyday Life	2.5	Public phones, some people have Internet access at home.
	Society: ICTs in the Workplace	2.5	Computers internally networked in some companies, productivity gains
ECONOMY	Economy: Employment Opportunities	2.5	Few ICT-savvy positions in the economy
	Economy: Business-to-Consumer	2	Some local businesses operate websites
	Economy: Business-to-Business	1	Business transactions carried out in person, paper based
	Economy: e-Government	2	Few government websites exist
POLICY	Policy: Telecommunication Regulation	3.5	Already established plans for telecom liberalization under progress
	Policy: ICT Trade Policy	3	Trade barriers for ICT equipment low, no policy for online transactions

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Appendix C - Bosnia and Hercegovina

Category	Measure		
ACCESS	Access: Network Speed & Quality	2.5	No frequently dropped connections, more than 80% of calls successful, fixed line teledensity 11%
	Access: Service and Support	3	More than 1-month waiting for new lines, small community of ITC professionals
	Access: Internet Availability	3	6 ISPs (many were awarded licenses in '02, no public Internet services)
	Access: Hardware and Software	2	Most hardware and software solutions imported, not in native language
	Access: Information Infrastructure	3.5	11% fixed line teledensity (mainlines), 25% wireless market accelerating
	Access: Internet Affordability	2.5	Local access solutions exist, rates still high
LEARNING	Learning: Schools' Access to ICTs	1	No ICTs in schools
	Learning: Enhancing Education with ICTs	1.5	Some ICT usage at university level
	Learning: Developing the ICT Workplace	3	Opportunities for training in ICT skills, Cisco academy in Sarajevo
SOCIETY	Society: People and Organizations Online	2	Less than 5% of the population use the Internet regularly
	Society: Locally Relevant Content	2.5	Some local websites available however they are static and updated infrequently
	Society: ICTs in Everyday Life	2.5	1'400 Public phones (2000), some people have Internet access at home.
	Society: ICTs in the Workplace	2.5	Computers internally networked in some companies, productivity gains
ECONOMY	Economy: Employment Opportunities	2.5	Few ICT-savvy positions in the economy
	Economy: Business-to-Consumer	2	Some local businesses operate websites
	Economy: Business-to-Business	1	Business transactions carried out in person, paper based
	Economy: e-Government	2	Few government websites exist
POLICY	Policy: Telecommunication Regulation	3.5	Already established plans for telecom liberalization under progress
	Policy: ICT Trade Policy	3	Trade barriers for ICT equipment low, no policy for online transactions

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Appendix D - Serbia and Montenegro

Category	Measure		
ACCESS	Access: Network Speed & Quality	3	No frequently dropped connections, more than 90% of calls successful
	Access: Service and Support	3	More than 1-month waiting for new lines, community of ITC professionals
	Access: Internet Availability	3	9 ISPs in 2000, few different service packages
	Access: Hardware and Software	3	Hardware and software solutions imported, Microsoft Windows XP in Serbian
	Access: Information Infrastructure	3	23% teledensity in 2000, wireless market accelerating
	Access: Internet Affordability	2	Local access solutions exist, rates still high
LEARNING	Learning: Schools' Access to ICTs	1	No ICTs in schools
	Learning: Enhancing Education with ICTs	1	No usage of the web reported at schools
	Learning: Developing the ICT Workplace	2	Limited opportunities for training in ICT skills
SOCIETY	Society: People and Organizations Online	3	Less than 10% of the population use the Internet regularly
	Society: Locally Relevant Content	2.5	Websites with local content exist however they are static and updated infrequently
	Society: ICTs in Everyday Life	2	Public phones, some people have Internet access at home.
	Society: ICTs in the Workplace	2.5	Computers internally networked in some companies, productivity gains
ECONOMY	Economy: Employment Opportunities	2	Few ICT-savvy positions in the economy
	Economy: Business-to-Consumer	2	Some local businesses operate websites
	Economy: Business-to-Business	1	Business transactions carried out in person, paper based
	Economy: e-Government	2.5	Some government portals exist
POLICY	Policy: Telecommunication Regulation	3.5	Already established plans for telecom liberalization under progress
	Policy: ICT Trade Policy	3	Trade barriers for ICT equipment low, no policy for online transactions

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Appendix E – Bulgaria

Category	Measure		
ACCESS	Access: Network Speed & Quality	2.5	39% fixed line penetration, however poor network quality, only 15% digitalization (end-02)
	Access: Service and Support	3	More than 1-month waiting for new lines, small community of ITC professionals
	Access: Internet Availability	2.5	Several (more than 10) ISPs, however analog lines are of poor quality and digital lines are expensive
	Access: Hardware and Software	2	Most hardware and software solutions imported, hardware expensive
	Access: Information Infrastructure	3.5	39% fixed line teledensity (mainlines), 30% wireless teledensity
	Access: Internet Affordability	2.5	High rates, both for ISPs and telecoms
LEARNING	Learning: Schools' Access to ICTs	3	ICTs in schools, 12,199 total PCs in schools in 2001, 25% of which are with Internet access
	Learning: Enhancing Education with ICTs	2.5	20'000 PCs in 48 institutes of higher education, not all used for learning
	Learning: Developing the ICT Workplace	3	Technical education on ICTs is available from different educational institutes
SOCIETY	Society: People and Organizations Online	3	4% of schools, 97% of higher education institutes, 94% of government ministries and 12% of museums online
	Society: Locally Relevant Content	3.5	Many dynamic online news website with archives, in Bulgarian
	Society: ICTs in Everyday Life	2	Most social communication paper based although young males use the Internet when they can afford it
	Society: ICTs in the Workplace	3	30% of companies use computers in their daily work
ECONOMY	Economy: Employment Opportunities	2.5	Technical skills are a competitive advantage on the market
	Economy: Business-to-Consumer	2	Businesses do operate websites but transactions are still mainly paper based
	Economy: Business-to-Business	1	Transactions are performed by physical presence and are paper based
	Economy: e-Government	3	Almost all government agencies are online, however there are no transactions implemented with the public
POLICY	Policy: Telecommunication Regulation	3.5	Process under way towards liberalized, regulated telecoms
	Policy: ICT Trade Policy	3	ICT trade barriers diminishing

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Appendix F - Romania

Category	Measure		
ACCESS	Access: Network Speed & Quality	2.5	18% fixed line teledensity
	Access: Service and Support	3	Until recently more than 3 years waiting for fixed line installation
	Access: Internet Availability	3	Several ISPs, high access costs
	Access: Hardware and Software	2	Limited PC ownership
	Access: Information Infrastructure	3	The rural areas had less than 5% fixed telephone lines in 99
	Access: Internet Affordability	2	ISPs fees not prohibitive, however very high connection fees charged by telecoms
LEARNING	Learning: Schools' Access to ICTs	3	Money released n '99 for ICTs in schools
	Learning: Enhancing Education with ICTs	3	ICTs mainly in universities
	Learning: Developing the ICT Workplace	4	Historical leadership in IT skills, however
SOCIETY	Society: People and Organizations Online	3.5	More than 10% of people use the Internet regularly
	Society: Locally Relevant Content	3	More than 33,000 public phones, 95% using cards
	Society: ICTs in Everyday Life	3	Transactions are paper based
	Society: ICTs in the Workplace	3	Networks of personal computers
ECONOMY	Economy: Employment Opportunities	3	End of '90s brain drain to western countries reduced, skilled workforce abounds
	Economy: Business-to-Consumer	2	Transactions are paper based, although there exist commercial websites
	Economy: Business-to-Business	2	Transactions are paper based
	Economy: e-Government	2	Non-interactive websites, some usage of e-mail
POLICY	Policy: Telecommunication Regulation	2.5	Lack of experience in regulation, slow progress
	Policy: ICT Trade Policy	2.5	Selective enforcement and unstable laws have held back foreign investment

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