



FP6-2004-IST-3  
Contract No 015878



**PROJECT ACRONYM: GREAT-IST**

**INSTRUMENT: SPECIFIC SUPPORT ACTION**  
**Thematic Priority: [INNOV-1] Research and Innovation**

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## **D6.4BIS THE GREAT- IST FINAL REPORT**

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Due date of deliverable: 31.07.2007

Actual submission date: 05.08.2007

Submission of this revised version: 02.10.2007

Submission of final revised version: 31.10.2007

Start date of project: 01.06.2005

Duration: 30 months

Organisation name of lead contractor for this deliverable: INA

Revision: Final

Dissemination level: PU

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# **IST Research & Development Policies in Eastern Europe**

*Insights and Recommendations Fostering Innovation*

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## Executive Summary

This document presents the policy recommendations formed as a result of the implementation of the GREAT-IST project. The GREAT-IST is a strategic project involving the countries of Central and Eastern Europe as targets, namely the Western Balkans, the Newly Independent States, the Associated Candidate Countries and the Newest Member States. Its main objective was to formulate concrete and clear recommendations for a Research and Technological Development policy (RTD policy) for the IST sector on a national and a regional level. Since reinforcement of RTD is a task usually falling under the responsibility of different governmental agencies, the recommendations are directed towards authorities on regional, national and EU level. The document is based on the findings of the three Working Groups, established within the project that worked in parallel and produced a set of conclusions, which are integrated in the present GREAT-IST Final Report. The document summarizes shared visions among the WB, the NIS, the ACC and NMS for enlarged co-operation in the framework of EU programs in IST for the years to come.

It is the view of this team that robust policy recommendations need to be in accordance with several requirements and inclusive of national and regional policy features and traditions. Our ambition is not to change the political system in general, but to promote policies that can stimulate RTD activity in the IST sector. Recommendations also need to build on identified strengths in the studied countries, and should be directed at both possibilities and challenges. The overall picture needs to balance policy initiatives that promote exploration into new possibilities with policy instruments that encourage the exploitation of established strengths. There are several important areas where regional, national and EU authorities can promote the development of strong IST RTD results. First, national authorities can implement policies that strengthen the cooperation between research institutes and the private sector, especially for small and medium sized enterprises (SMEs) in the IST sector. Better organisation and new strategies can increase RTD investment and innovation in both the research community and the private sector. Second, by supporting national IST RTD strategies, national governments can increase the competitiveness of the IST sector and strengthen the innovation capacity in all economic sectors. New IST services and products can contribute to significant improvement of productivity and quality of life for the entire population. Third, support from the EU can underpin the quality and strength of the IST RTD sector and this can increase innovation and global competitiveness for this important European business sector, as gradually the target countries are integrated in the European Research Area.

The IST RTD sector in the target countries, as it was recorded and documented during this project<sup>1</sup>, is found to be lagging behind in comparison with the EU countries on all counts, exhibiting loose institutional setup, low political priority for RTD, inadequate funding, low private sector involvement, problematic infrastructure, to name a few. The region is at a post-transition process of adaptation to the free market, after the collapse of the USSR and Yugoslavia and the IST RTD systems have severely weakened, as the centrally planned economies collapsed and were abruptly replaced by free market based economies. The transition was often implemented in a turbulent manner that damaged the already inefficient national capacities. Therefore, IST RTD systems are not yet strongly developed and strengthening their capabilities will require time and coordinated efforts before average EU25 development levels can be reached. Knowledge is an increasingly central resource in today's economy and there is a strong concern from governments on the performance of their national innovation system. Unfortunately, the ability of the target countries to adapt, compete and innovate alongside with the rest of world is hindered by an outdated weak education system, inadequate resources, sluggish public RTD and minor private sector funding, employment policies that discourage foreign investment and a hostile business climate with unfavourable attitudes towards entrepreneurship and dissuasive bureaucratic burdens.

The policy trends of the Lisbon Agenda indicate the necessity for closer linkages between research and innovation and an increased participation of the private sector and particularly of SME's. National innovation performance depends upon a variety of factors beyond the actions of governments, as a wider set of actors

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<sup>1</sup> D.3.1 – Report on Existing IST Research Support Infrastructures and Communication Systems  
D.4.1 – Report on Priorities and Current Trends on IST Research  
D.5.1 – Report on Study Links between Business and IST Research

are involved in the production of knowledge. In addition, national particularities undermine the effectiveness of transposing EU legislation and policies without first adjusting them to the local situation. The examined countries vary significantly in their level of development in terms of infrastructure, size, geography, culture and capacities, and it is critical that any policy framework takes these particularities under serious consideration. On the other hand they share the need for a clear and concrete policy framework that will allow them to compete in the global market. The implementation of any reforms needs to be vigilant and thorough, in contrast to common practice in many occasions where such policy frameworks already existed.

A realistic assessment of the national strengths and weaknesses and a careful identification of the competitive advantages of each country should be made to allow for appropriate focus being placed on specific areas of the IST RTD field. Such an assessment will ensure that a proper allocation of funds and human resources will produce the intended multiplying effect in the overall economy and maximise benefits for the civil society. Avoiding waste of resources in IST sectors is an integral part of this process, particularly in areas where the impact will be minimal. Any policy should also be flexible and responsive to the global trends and the constantly transforming global markets. IST's are producing disruptive applications and tools that make it obligatory for every policy maker to bear the wider global picture in mind more than ever before. The playing field in IST RTD is global and developments around the world have a direct impact on local issues. Isolationist approaches are not just ineffective, but also unsustainable if the target aspires to become a global player and not just a follower.

The region should promptly recognise that low-wages policies can only be a basis for short term attraction of investment and cannot support sustainable development. Unfortunately, current policy approaches tend to focus on those short term advantages, instead of planning further ahead. Low wages, currently used as a strong asset to attract Foreign Direct Investment (FDI) inflows in the target countries, are either becoming irrelevant as less developed countries are joining the international economic system or even unwanted, as they are linked with low tech investments that add little value to the local economies and are easily migrated to the next 'cheaper' labour destination. Swift and clear realisation of the opportunities and threats in the global markets of IST RTD, by both the public and the private sector, will shield these countries from economic marginalisation. Combined with decisive political actions and an active, risk-taking private sector this different approach will allow the target countries to participate in equal footing with the frontrunners of the digital era, since IST will permit them to leapfrog the missed stages of development.

The IST policy recommendations prepared and discussed during the project highlight the importance of a challenging and innovative policy for the most promising economic sector in Europe. Both tasks and policy instruments for regional, national authorities have been identified and an inherent relationship between different recommendations can be found. The main points examined in this report stress that it is necessary to have an understanding of the role and importance of Innovation and IST. Another requirement is the hands on approach by all actors (private sector, academia, civil society) and the realisation of the strategic role governments have in this process.

Conclusively, all levels of government should focus on the following tasks:

- Support efforts that may increase RTD investment in the IST sector. A vital part of this policy is better coordination between different actors, programs and sectors, as well as between the regional, national and EU stakeholders. One possible measure in this direction could be to clearly define the national coordinator, one State Body responsible for IST RTD and its functions.
- Identify specific IST fields, where clear competitive advantages are present and prioritise them in the allocation of resources to avoid dispersing rare commodities (funds, personnel etc) and facilitate development, where a real difference can be made. Policy making in the IST RTD field should be responsive to global trends and reflective to future developments. Technological foresight exercises should be an integral part of the policy making process.
- Strengthen the relationship between the private sector and research institutes and universities. Promote innovation and entrepreneurial culture, which will allow the creation of new opportunities for competition and excellence. Foster industry – research community partnerships by establishing technology parks, incubators that will support the effective commercialization of basic and applied research. Increase RTD funding and reform competitive processes for allocating funds to ensure transparency and effectiveness and allow researchers to concentrate on research.
- Create a more conducive business environment by introducing incentives and diminishing bureaucratic procedures, while governmental agencies encourage closer cooperation between the academia and the private sector. Incentives should be provided for SME participation in the RTD

system through a mixture of state aid in the form of tax breaks, subsidies for start ups and similar measures, preparing the ground, on which SMEs can relate to research and innovation programmes.

- Reinforce those governmental agencies responsible for ICT development and allow them to take drastic measures to enhance ICT infrastructures that will match the needs and requirements of the fast internet era. Investment in both soft and hard IST infrastructure development is urgently needed. Soft infrastructure involves mainly the upgrade of all levels of education by increasing the volume of ICT curricula and the introduction of lifelong learning opportunities. Hard infrastructure refers to the development of affordable high speed connectivity for the research community and the whole population. Increased high speed connectivity and ICT infrastructure development would enable the target countries to attract IST RTD outsourcing contracts. Public Private Partnership (PPP) schemes could be useful tools to overcome the limited available national funds for infrastructure development, while EU funding could also be instrumental. For this purpose, the missing PPP legislation and the integration of best practice PPP models for the deployment, financing and operation of IST RTD institutions should be attended to.
- Prevent brain-drain and take measures to attempt brain-gain by exploiting the considerable Diasporas through the establishment of cooperation links and the provision of incentives to revert the trend for immigration. In that respect, it is necessary to ensure that employment policies do not deter foreign investment and provide incentives for repatriation of immigrant researchers and retaining local talent.
- Improve the collection of statistics to quantify the results produced using the resources in this area. Provide better access to national data on IST RTD and innovation and utilise this important tool in measuring the efficiency of policies and in re-evaluating the strategic objectives. This can also lay the foundation for good practice promotion and learning exchange between countries. EU best practices and standards would be valuable for this end.
- Increase, both in volume and scope, the level of international and regional cooperation on a multilateral and bilateral basis in IST RTD. The benefits of increasing regional cooperation will be vital to all target countries, even more so for the smaller ones, since major synergies will be able to complement the relatively small size of their IST sector and maximise their potential. Conducive to this would be to support the participation in International and European programs for public and private institutions and to focus on attracting FDI in IST RTD related activities aiming to develop local capacities

The project has clearly demonstrated that the GREAT – IST region has a significant IST research potential, which remains to be utilized, but is currently limited by institutional inefficiencies, political problems and lack of financial resources. The specific recommendations and the broad orientations outlined have the potential to considerably strengthen the countries' IST RTD capacity making them able to address the major challenges and become equal partners in the European Research Area, joining the EU in the effort to face the increasing global competition. However, following a set of policy recommendations in a specific sector as IST RTD is certainly not sufficient, as this should be combined by a more comprehensive reform effort that will support the IST RTD sector and benefit from its development. Innovation and IST are closely linked and have a profound horizontal impact on the whole of the economic process. This project focused on the important role of IST RTD and has attempted to highlight the dynamism and potential that can be harnessed from it for the sake of economic development. One of the major conclusions is that the odds are favourable for reversing the current situation of inertia and sluggish development, by accelerating the pace in making concrete and radical policy and strategic adjustments, such as this report suggests, on national and a regional level.

Certainly a top down approach will not achieve the desired success without the active contribution and participation of the research and business communities. However, the role of governments as the catalyst is both necessary and urgently needed with the appropriate policies that provide the incentives for knowledge flows among academics, industry, government and the wider society that produces innovation and by prioritisation of policy goals as these are set by market demands and global trends. A clear strategic vision is essential to energise and unite all actors behind any reform effort. The spread of an entrepreneurial culture and the dedication of the education system to support a knowledge based society will release the untapped potential and provide the boost for an innovation based economy. It is a matter of survival in the digital era for the target countries that face economic marginalisation to aggressively claim their share in the global playing field. The European Union influence is both positive and mutually advantageous for the countries and EU, but often the EU is seen solely as a source of funding, while other important gains are underestimated.

The transfer of know how and access to the huge EU research potential would allow much needed synergies and will provide new opportunities for the target countries in the IST field. Harmonisation of policies and approaches with the EU and on a regional level should also be increased substantially in the framework of European integration.

For decades, technological change and innovation, driven by research and development have been the most important sources of productivity growth and increased welfare. As a result, there is a high correlation between those countries that have shown significant economic improvement in the past and those countries that have made substantial investment in RTD. For that reason, it is imperative for the target countries to accelerate their pace in building RTD capacities, without which they are likely to miss opportunities to upgrade their technologies, move up the development ladder and, catch up with developed countries. This project has hopefully produced a useful and insightful guide to this end, attempting to cover most issues. It is also clear that successful IST RTD policy making has to be an on-going and never-ending process and in that respect similar projects would be required in the future to carry on the work and update the findings, not just as a theoretical exercise, but as an integral tool for the target countries' policy makers.

## Introduction

In a recent European Commission publication<sup>2</sup> on Europe's position in research and innovation it is stated that, despite moving towards the right way, the progress achieved is inadequate as Research and Technological Development (RTD) has stagnated since the mid-nineties vis a vis major competitors such as Japan, China or South Korea that have been able to increase substantially their total RTD effort, shaping a world where knowledge is more evenly distributed than ever before. Moreover, the RTD investment deficit against the US increased during 1995-2005 from 45 to 85 bln EUR. The new actions taken in Europe since 2005 in the context of the revised Lisbon Strategy need to be implemented more effectively, if Europe is to successfully face this challenge.

In recognition of this challenge, policy-makers have launched new initiatives at both EU and Member State level in order to boost the "Europe of Knowledge". The ambitious Seventh Framework Programme (FP7) has been adopted and is now underway with a substantially higher budget than its predecessor, FP6. Member States have made new and far-reaching commitments within the framework of the renewed Lisbon strategy by setting future R&D intensity targets. The recently published European Research Area (ERA) Green Paper has launched a wide-ranging debate on the future orientations of the ERA<sup>[1]</sup>.

Its purpose is to increase the competitiveness of European research institutions by bringing them together and encouraging a more inclusive way of work, similar to what already exists among institutions in North America and the Far East. Increased mobility of knowledge workers and deepened multilateral co-operation among research institutions among the Member States are central goals of the ERA.

In line with the strategic vision adopted by the European Union<sup>3</sup>, the future European economy will be a 'knowledge-based society' in which Information Society Technologies and Research and Development will be the main pillars. In that respect, IST RTD should be a major objective for all countries that desire to be part of this vision. Essentially, this means that effective IST RTD is the key to this goal, especially in those countries of our continent, which remain outside the European Union or joined only recently. The enlargement of the EU adds an extra dimension to this issue in relation to the Central and Eastern Europe countries, as the Western Balkans, the Newly Independent States, an Associated Candidate Country and EU Members are the mix of the target countries of the GREAT-IST project.

GREAT-IST is a strategic project involving the target countries of Central and Eastern Europe, namely the New Member States, the Associated Candidate Countries, the Western Balkan Countries and the Newly Independent States. The target countries are subdivided into the following four categories:

- 1) New Member States: Bulgaria and Romania
- 2) Associated Candidate countries: Croatia and FYROM
- 3) Western Balkans: Albania, Bosnia-Herzegovina, Montenegro and Serbia
- 4) Newly Independent States: Belarus, Moldova and Ukraine

The project aimed at bringing together the IST research stakeholders of target countries and of other European countries, to share visions and experience in implementing Information Society, to contribute towards harmonization of IST research priorities and to enhance co-operation in the broader area of the "Great European East" in a view of facilitating gradual integration at a pan-European level.

Project activities were divided into three Working Groups each addressing a specific area of IST research system in the target countries:

- WG1 – Developing institutional infrastructure in support of IST research and establishing effective communication with IST stakeholders

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<sup>2</sup> Key figures for 2007 on Science, Technology and Innovation accessed on 17/06/2007, [http://ec.europa.eu/invest-in-research/monitoring/statistical01\\_en.htm](http://ec.europa.eu/invest-in-research/monitoring/statistical01_en.htm).

<sup>3</sup> The Lisbon Strategy was adopted in March 2000 and aims to make the EU the most dynamic and competitive economy by 2010. This strategy involves a whole set of policy areas, from research and education to environment and employment. <http://ec.europa.eu/growthandjobs/> accessed 15.05.2007

- WG2 – Gradual harmonization in RTD policies and convergence of priorities in IST
- WG3 – Linking research and business (particularly SMEs)

This document, the GREAT-IST Final Report, represents the technical position (recommendations and implementations methods) of all the Working Groups. Adjacent to this document, a GREAT-IST Position Paper (PP) is produced by the Steering Committee summarizing technical issues in a political document to be widespread to Ministries and other Governmental Institutions of target countries and remaining CEI member states.

The GREAT-IST Final Report (FRP) along with the GREAT-IST Position Paper will be presented at a major conference scheduled for the 21<sup>st</sup> of November 2007 in Sofia, Bulgaria in the framework of the CEI Bulgarian Presidency for 2007. The whole action is backed by a strong dissemination support aiming at the implementation of the priorities included in the GREAT-IST Final Report.

Based on the infrastructure provided by the CEI (Central Europe Initiative), the project sets up a solid co-operation framework actively involving representatives of different typologies of countries (Old member states, New Member States, Associated Candidate Countries, Western Balkans and Newly Independent States), and various types of stakeholders of the IST arena Europe-wide.

The goal of this Final Report is to provide insights and suggestions for the target countries, as a result of a critical analysis process that was developed through the different GREAT-IST project stages, assessing not just public policy in IST RTD, but in a more holistic manner, considering all inputs in the development process provided by a wide range of stakeholders (national and international, public and private) in the target countries. The team also performed a concrete assessment of the policies to be undertaken, of the critical issues that need to be addressed and, more importantly and of the mixture of policies and corrective actions to be followed. The report also describes the core results deriving from the evaluation of the impact of national policy initiatives in the target countries. The consolidated view on the State of the Art of IST RTD in the target countries, as well as the comparative analysis of their relative strengths and weaknesses were formulated to facilitate the identification of 'lessons to be learned' and thus, constitute a useful input for regional and national policy makers.

The focus in this document is to benefit from the experience of the relatively more advanced countries that have been more effective in the field of IST-RTD. The goal is to identify what conceptual frameworks and normative policy recommendations have been used, to illuminate the values and assumptions underlying policy choices and serve as criteria for making policy decisions. These policies and frameworks largely focus on issues of public policy, the role of the private sector and the potential benefits of international and regional cooperation in the field. By evaluating how the countries used these concepts to systematically assess and amend their policies, it has been possible to pinpoint a strategic rationale with which shortcomings in the IST RTD sector have been dealt with. Hence, this evaluation can be used as a valuable tool that aids the target countries in applying the necessary policy measures, allowing them to benefit from partaking in the greater European effort of the Lisbon Strategy and contributing to the development of the European Research Area (ERA).

In the previous phases of the GREAT-IST project, the three Working Groups worked in parallel in their respective thematic areas and came to a separate set of assessments, analyses and conclusions presented in the respective reports<sup>4</sup>. The integration of their work into a coherent document, the GREAT-IST Final Report, follows as a natural process that summarizes and encapsulates the shared visions among the WB, the NIS and the ACC for enlarged co-operation in IST for the years to come. Therefore, the GREAT-IST Final Report represents the position in terms of recommendations and implementation methods of all three Working Groups, further elaborated and analysed in a integrated manner on a country and on a regional level within the CEI framework to provide a meaningful, useful instrument and a clear strategic insight to the ever-evolving policy making process.

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<sup>4</sup> D.3.1 – Report on Existing IST Research Support Infrastructures and Communication Systems

D.4.1 – Report on Priorities and Current Trends on IST Research

D.5.1 – Report on Study Links between Business and IST Research

D.3.2 – Report on Recommendations On Successful Models (Institutional and Communication Infrastructure) in Supporting IST Research

D.4.2 – Report on Converging Scenarios in IST Research

D.5.2 – Report on Links Between IST Research and Business: Impact Assessment and Recommendations

The assessed policy frameworks target diverse environments, ranging from countries with a more advanced status of policy making in the field (Romania, Croatia, Bulgaria) to countries characterised by a lack of and/or undeveloped policy making process for IST RTD (Albania, Bosnia–Herzegovina, FYROM, Montenegro and Serbia) while another group of countries (Moldova, Ukraine and Belarus) is found lingering between the influences of their past policy practices (USSR) and the European Union model. Therefore, the IST RTD prioritisation varies significantly from country to country. As a result, the examination of the policy debate on IST RTD and the corresponding implementation tools is focused on the different issues raised, the policy options that governments' face when addressing them, the relevant data, the solutions proposed for various problems, and the development of criteria, through which options and preferred alternatives can be evaluated. Certainly, a *one-size-fits-all* approach is not appropriate; however, it is also clear that a basic roadmap for boosting the IST RTD sector would greatly facilitate the efforts both on a national and a regional level.

The document has been structured in two main parts. The first part comprises a transregional comparative analysis of IST RTD institutional setting, policies, strategies and measures and is completed with a set of normative policy recommendations on a regional level. The differences between the countries are highlighted and indicative suggestions are drawn on the best practices, the less successful ones and the real barriers and prospects for the IST RTD sector in the target countries. The normative Policy Recommendations are combined with best practices from the European Union and the rest of the world to highlight in the most explicit and clear manner the policy suggestions and recommendations, avoiding misconceptions, and hopefully drawing a clear framework for the policy makers. The Normative Policy Recommendations are categorised in three groups reflecting the original three Working Groups in GREAT-IST, which related to the IST RTD institutional support, the IST research policies & priorities and the private sector participation in IST research, respectively.

The second part of the document comprises per country state-of-the-art analysis and a SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis of each target IST RTD system, as they were evaluated by the GREAT-IST project, covering all the aspects and providing a systemic approach from which national normative policy considerations are extracted and presented.

# PART 1 - TRANSREGIONAL ANALYSIS

## AND RECOMMENDATIONS ON IST RTD POLICIES

### Section 1: Comparative Analysis of the GREAT-IST target region

In the following paragraphs, the IST RTD institutional setting, the current policies, mechanisms, priorities and the synergies between the research community and the business sector in the target countries are compared and analysed. To assist the presentation of this comparative analysis, a list of indicators-issues has been selected as the topics for this discussion. Each issue is presented in a condensed table format that includes the most significant information on the topic for each one of the 11 target countries. This tabular presentation attempts to help the reader even further by providing a colour marking effect<sup>5</sup> that presents the less developed cases in red, immediately followed by those in yellow and topped with those in green that represent the most developed countries with regards to the EU practice. The tables are analysed further in the paragraphs that follow, to highlight the reasoning and to provide explanatory remarks.

#### LEGISLATIVE FRAMEWORK

<b>Albania</b>	<b>Belarus</b>	<b>Bosnia-Herzegovina</b>	<b>Bulgaria</b>
Law on Science and Technological Development (1994) Law on Higher Education (1999) Law on the Academy of Sciences (2004);	Informatisation is under Interministerial Commission established by Edict of the President (1998) and amended August 2006.	Specific legal framework concerning IST and RTD activities does not exist	Law on the promotion of scientific research (2003);
<b>Croatia</b>	<b>FYROM</b>	<b>Moldova</b>	<b>Montenegro</b>
Act on Scientific Activity and Higher Education, (July 2003) Science and Technology Policy 2006-2010	Law on Scientific Research 1996 and 2002 Law on Stimulation and Facilitation of the Technological Development (2000)	Law on Scientific and Technological information (2002) Code on Science and Innovations (July 15, 2004)	No specific framework other than inherited the legislative framework of Serbia & Montenegro.
<b>Romania</b>	<b>Serbia</b>	<b>Ukraine</b>	
Government Ordinance 57/2002 on research and technological development approved by Law 324/2003 Decision No. 36828/2005 Decision No. 918/2006	Science Law (Official Gazette No. 110 2005)	National Informatisation Programme (NIP) 1998. Decree of the President of Ukraine No. 1497/2005 for the implementation of modern informational technologies"	

<sup>5</sup> **Legend:** The colour grading system and its use in this analysis is based on the assessment performed by the GREAT-IST team and local collaborating experts and is still under further processing and review. **RED colour** is used signifying country stagnancy or a situation with many deficiencies when compared to EU standards. **YELLOW colour** is used signifying that the country is in a state of initial progress. **GREEN colour** is used signifying that the country is moving towards harmonization to the EU IST Research framework.

The Government in almost all GREAT-IST target countries has adopted various laws during the last few years on the development of the IST sector and the organisation of Research and Technological Development (RTD) in the field. The scope of such legislation is in some cases focused on Science in general like Serbia (Law on Science 2005), and adjacently related activities like higher education, as in Croatia (Act on Scientific Activity and Higher Education, July 2003). Bosnia–Herzegovina and Montenegro constitute notable exceptions, because they lack any legislative framework that deals with IST RTD issues. It is also valid to conclude that none of the target countries have a distinct IST RTD legislative framework and the all IST development and related RTD issues are either covered by IST sector legislation or by RTD general legislation and in many cases by both (as in Albania, Moldova, and FYROM). Bulgaria, Romania and Croatia have been faster in harmonising their legislation with the European norms and practices, than the rest of the countries, which is an observation closely correlated to their progress of accession to the EU. FYROM, Moldova and Serbia have also been active in introducing relevant legislation in their effort to replicate the European model. The remaining group of countries has also been active in introducing appropriate legislation in the field, but their selected course is not entirely converging to the EU standards, either because the EU prospect is seen as a long term prospect, or simply because their national situation is incompatible with the EU legislative framework.

## THE IST RTD INSTITUTIONAL SETTING

<b>Albania</b>	<b>Belarus</b>	<b>Bosnia-Herzegovina</b>	<b>Bulgaria</b>
Ministry of Education and Science (MES)	Ministry of Communications and Informatisation, Department of Informatisation Coordination Council for the Programme "Electronic Belarus"	The Ministry of Civil Affairs BiH (State level), Department for Education, Science, Culture and Sport. Not binding, no budget. CIPS Directorate (Central Identification Protection System)	Ministry of Science and Education State Agency for Information Technology and Communications
<b>Croatia</b>	<b>FYROM</b>	<b>Moldova</b>	<b>Montenegro</b>
Ministry of Science, Education and Sport National Information Society Council Central State Office for e-Croatia	Ministry of Education and Science Scientific Research Council	Ministry of Information Development (MID) created in 2005 The National Commission for Information Society Academy of Sciences	Ministry of Education and Science Secretariat for Development Council for Information Society Development
<b>Romania</b>	<b>Serbia</b>	<b>Ukraine</b>	
Ministry of Education and Research (MER), National Authority for Scientific Research (NASR) National Council for Science and Technology Policy (head by PM)	Ministry of Science and Environmental Protection Agency for Information Society	Ministry of Science and Education Cabinet of Ministers subordinate executive bodies: State Communications and Informatisation Committee	

The IST RTD policy making systems in the target countries are most frequently placed under the responsibility of the Ministry of Education and Science or related ministries. Romania and Croatia are considered to be leading in their choice of institutional setting since both combine high level political involvement that allows better access to the policy making process and indeed in the decision making process for the allocation of national funds, while technocratic involvement is also achieved with the support of specialized agencies for IST RTD issues. Bulgaria has also embarked on a process of harmonising its own institutional setting with EU and regional good practice models. In the remaining countries the IST RTD institutional setting is incorporated into the structures that deal with education issues or with ICT development in general. This setting undermines the effort of increasing political visibility on the issue of prioritising RTD activities. Bosnia-Herzegovina and Montenegro are perhaps the two cases that need the most attention. The constitutional structure of BiH diminishes the role of the Federal State, leaving little room for central coordination and orientation. On the other hand, the recent declaration of Montenegro's independence has not yet materialised in full in terms of full deployment of the planned structure in the sector.

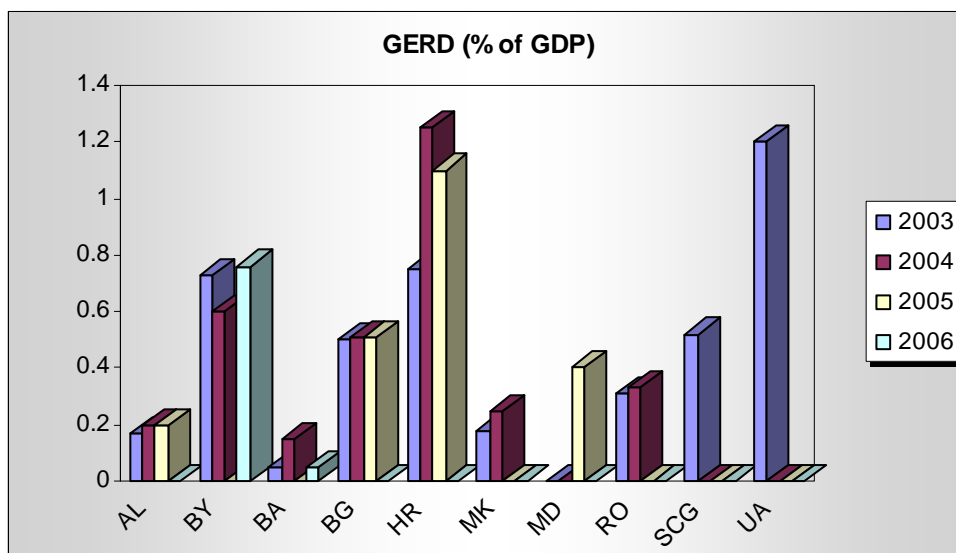
Most of the target countries, adhering to EU state practices for developing the ICT sector, have set up new institutions under the responsibility of the state, which are directly or indirectly involved in the policy making process and usually undertake the design and monitoring of implementation plans for the development of the ICT sector, which sometimes include related RTD activities. There is a growing realization for greater participation of all actors in the process, but the lack of a truly “participatory” culture in the region, both in government and civil society, is negating positive initiatives and potential results. A number of related official documents have also been prepared and adopted by the governments, such as national strategies on technological and scientific development, regulations regarding innovation centres or technology parks, and other documents designed to promote IST RTD development. In most cases, they have not received satisfactory attention on the implementation side, either because they lack practical action plans, or finances and competent coordination to bring them to life. Notwithstanding the existence of legislative acts regarding IST RTD (Laws, presidential decrees etc) in all the countries, there is still an urgent need for improvement and harmonization with the EU policy framework. It should be noted, however, that harmonisation in the case of these countries does not necessarily mean complete adoption of EU policies, but suitable adaptation of good practices, based on national capacities and identified competitive advantages.

In addition, there have been substantial delays in implementing many of the new laws, decrees, and programmes, either because of lack of financial or human resources, or due to other priorities emerging as more urgent. Political changes have in many instances led the new governments to propose yet further amendments to these laws, consequently postponing their implementation and necessary reforms even further. The influence of the European Integration process is obvious in those countries that have embarked on this course. Countries that have attained EU membership (Romania, Bulgaria) have accelerated the pace of legislative reform in this field, as well as in others. Similarly, all the countries that have signed a SAA (Stabilisation and Association Agreement) tend to have been more active in harmonising their IST RTD legislation in accordance with the *acquis communautaire*.

## FINANCIAL INSTRUMENTS & FUNDING

Albania	Belarus	Bosnia-Herzegovina	Bulgaria
Ministry of Finance The state budget for R&D is managed according to the decree of Ministry of Education and Science  2005 GERD 0.2% GDP	Ministry of Economy 15M€ for “electronic Belarus” ('03-'05)  2006 GERD 0.76% GDP aspired 1.8 - 2.0% by 2015	Ministry of Finance and CIPS Directorate  2006 GERD 0.05% GDP	Ministry of Education and Science The National Science Fund finances calls. The State Agency for ICT funds projects above threshold in FP6 (NOT financed by EC)  2005 GERD 0.51% GDP
Croatia	FYROM	Moldova	Montenegro
Central State Office for e-Croatia National Foundation for Science, Higher Education and Technological Development  2005 GERD 1.1% GDP	Ministry of Education and Science  2004 GERD 0.25% GDP aspired 1% GDP by 2010	Ministry of Education. Academy of Sciences -1 call per year on science and innovation  2005 GERD 0.4% GDP	Ministry of Education and Science  2004 GERD 0.33%.GDP (est.)
Romania	Serbia	Ukraine	
Ministry for Education and Research  2004 GERD 0.33% GDP planned ~1% GDP for 2007	Ministry of Finance and Ministry of Science and Environmental Protection  2005 GERD 0.3% GDP	State Comm and Informatisation Committee, Ministry of Science & Education and the Academy of Sciences allocate funding on the bases of the “Basic principle”  2006 est. GERD ~1.2% GDP	

The assessment of the financial instruments and funding was based in the actual funding dedicated to RTD as the actual funding for IST RTD was not available in any of the countries and the efficiency of the funding mechanisms and the real impact. Overall the picture of all countries is not positive, mainly due to the limited level of funding dedicated for research that indicates low priority on a political level, while the actual funding that is dedicated to RTD is unclear. As indicated in Figure 1, Belarus, Bulgaria, Croatia, Romania and Ukraine are considered more effective in terms of Gross Expenditures for Research and Development (GERD) as a percent of Gross Domestic Product (GDP). Funding mechanisms in this group are better developed and the processes are structured in a more coherent manner. Particularly in the case of Romania, although statistics are not available there is an indication that expenditures for RTD have increased over the last two years.



**Figure 1. Annual GERD as percent of GDP for the period 2003-2006. Data source: Human Development Report 2006, United Nations Development Program<sup>6</sup>**

All countries have expressed their intention to increase their spending for IST and RTD in general, but unavailability of updated statistical data does not permit the presentation of a clearer picture and perhaps a contrast between aspired and achieved results. It is the relatively poor finances of some of the target countries that create the question of whether promises can be achieved without a dramatic change of the present situation. Albania, BiH, FYROM, Moldova, Montenegro, and Serbia have to face greater challenges. Comparatively lower levels of GERD (with regards to the aforementioned target group) and problematic funding mechanisms create a pessimistic situation. In addition, in most cases there is an absence of well designed, transparent process for the allocation of funding or a definition of criteria for exclusion, On the other hand in the case of Belarus only institutions that received funding in the previous years are eligible for further funding.

Assessment of the financing of IST RTD was quite problematic throughout the project duration and duly noted by all project partners and WGs experts as statistics are modest and not systematic, especially in relation with financial indicators. Overall national statistics on IST RTD are often not available and some discrepancies have been observed between various sources. However, it is clear that the main financier of IST RTD in the target countries is the state budget and GERD indicators remain modest in few cases and completely unsatisfactory in most. The data provided are evidence to the fact that GERD spending is limited as percent of GDP and given the relatively low GDP in absolute numbers (compared with EU25 average); the actual effectiveness of the assessed spending for RTD is marginal. It should also be duly noted that available data refer to GERD in all fields of RTD, and no indication is available about what percent of this spending could be related to the actual IST RTD funding.

<sup>6</sup> Null data in the graph for the respective year and country represent unavailability of statistics and not of funds.

## COMMUNICATION CHANNELS

Albania	Belarus	Bosnia-Herzegovina	Bulgaria
Newsletters, Infodays, the websites of the Ministry of Education and Science and other responsible institutions.	Numerous scientific and technological conferences. National Information Point established in September 2003. The NIP organizes information seminars, conferences, training workshops, news updates, and partner search requests.	The portals of the Ministry of Communication and Transport, the CIPS Directorate, the Agency for government service and UNDP BiH research. The South East Europe Eranet and The National Information Point for the EC Framework Programmes.	Numerous conferences, workshops and summer schools, organized by the research institutions such as the Bulgarian Academy of Sciences and the universities
Governmental institutions' portals (Ministry of Science, Education and Sport), the Croatian Scientific Portal, the Technology Projects and the Scientific projects. The BizNet information system which facilitates Academia – business collaboration	Web sites of the Ministry of Education and Science and Infodays, the Committee for Information technology, the Macedonia Association of Information Technology (MASIT), and other governmental and non-governmental websites	Annual International Conferences on Information Technologies. Numerous scientific and technological conferences, seminars are organized by various stakeholders	Information is provided mainly by governmental websites. INFOFEST is the major event for ICT in the country
Romania	Serbia	Ukraine	
Frequent organization of seminars and Infodays by the National Agency for Scientific Research (NASR). Web-pages of NASR and the Ministry of Education and Research. Portal for Technology Information (TechnoInfo). Various scientific Journals and publications.	Conferences, workshops and infodays. Website of the Department of International S&T Cooperation of the Ministry of Science.	Seminars and conferences. Web forum for "Informational Society of Ukraine". Ukrainian institute for scientific, technical and economic information network (UkrISTEI), 13 Regional Centers for Scientific Technical and Economic Information.	

Communications channels are frequently established in an ineffective manner and often do not serve their purpose efficiently. Despite the fact that in all target countries a significant number of dissemination activities are occurring, there is still an urgent need for networking at a national level and indeed even more with the international IST RTD community. Modern communication tools are employed in some of the countries, despite the relatively limited use of the internet in the region. In countries such as Croatia, Romania and Bulgaria modern tools are more effectively used. In the other end, Albania and Montenegro make limited use of the internet, further diminishing the access to information for the interested entities. Nevertheless, Montenegro is slowly attracting international conferences, marketing the fact that it is becoming a developing tourist destination, but has not yet exploited this potential in full. In this respect, Croatia has been more successful in attracting international conferences and related events.

Overall, the target countries would benefit greatly by the establishment of regional communication networks enabling the IST RTD communities in the Eastern Europe to benefit from possible trans-national or regional synergies. It is worth mentioning that in the former Yugoslavia countries, pre-independence networks still remain active in the academic circles and in the private sector, facilitating the cooperation between them. As political tensions are receding in the region, these networks are becoming increasingly valuable as vehicles for regional collaboration and for initiation of shared programs of IST RTD. Similarly in Belarus, Ukraine and Moldova such links with the countries of the former Soviet Union exist, despite political differences and periodical tensions in their relations with the former Soviet Republics. It is also clear that networking with international actors of IST RTD is necessary to allow the countries to develop their full potential and follow international trends. Funding opportunities offered by the EC could provide a boost for such activities.

## TECHNOLOGICAL FORESIGHT

Albania	Belarus	Bosnia-Herzegovina	Bulgaria
End 2005 initiative to reform the scientific research. For this purpose, a group of experts was charged by the Government to prepare a platform for this reform	IST RTD evaluation is the task of the Vice-Prime-Minister, not implemented	Not yet implemented	Technological foresight is not centrally coordinated but rather separate pieces could be found within the specific programmes of all ministries and state agencies.
Croatia	FYROM	Moldova	Montenegro
The Science & Technology Policy of the Republic of Croatia 2006 2010 introduced technological foresight. MSES have established a working group on foresight	Board of Ethics, a Parliamentary body National Council for Science and Technological Development Council on R&D, Ministry Not properly implemented	Commissions of experts and the final decisions are adopted by the Supreme Science Council of Academy of Science.	There is no established mechanism for IST RTD evaluation and technology foresight.
Romania	Serbia	Ukraine	
Ministry of Education and Research (MER) project to develop the national strategy for the period 2007-2013 involves foresight to update long and medium term priorities	No systematic technology foresight exercise has ever been undertaken	Dobrov Center for Science and Technology Potential is responsible for technological foresight	

A common negative feature of the IST RTD system in all target countries is the absence of a systematic and periodical exercise of technological foresight as an integral part of their IST RTD policy setting. With the notable exception of Romania that has integrated technological foresight to update its national strategy in medium and long term for the period 2007 – 2013, no other country has been equally efficient in implementing such a process. It is either totally absent in its scientific sense (Bosnia–Herzegovina, Montenegro, Serbia), or it is occurring in a decentralized approach (Bulgaria), or even considered to be a solely political exercise (Belarus) that does not involve the RTD stakeholders. Albania has initiated a process for reform of the RTD, but it is still unclear how effective this will be. Croatia established a Working Group in 2006 to perform technological foresight, but it remains to be seen whether this institution will become an integral part of the national RTD system, fully exploited in the coming years. In all of the countries serious objections have been raised by interviewed stakeholders about the methodology and the efficiency of Technological Foresight, as well as how it is incorporated in the actual policy making process. It is worth noting that in the countries of the region where Technological Foresight is already implemented, it constitutes an element of a more sophisticated institutional setting, which is already producing results in terms of implemented RTD projects and capacity to attract international funding and foreign direct investments in IST.

## NATIONAL STRATEGY ON IST RESEARCH

Albania	Belarus	Bosnia-Herzegovina	Bulgaria
National Strategy for Development of ICT 2003	“electronic Belarus” adopted in 2002 National Strategy for sustainable Development for the period to 2020	No RTD Strategy or competent body. UNESCO ROSTE 2006 report “Guidelines for a Science and Research Policy in Bosnia and Herzegovina”	National Strategy for Scientific Research for the Period 2005-2013 (National Council for Scientific Research) National Innovation Strategy adopted September 2004

Croatia	FYROM	Moldova	Montenegro
Development Strategy - Croatia in 21st Century (2000) Science & Technology Policy 2006-2010, May 2006 Central State Office for e-Croatia 2007	National Strategy for Information Society Development and Action Plan (by 34 IST appointed experts). Ministry for Information Society being created.	National Strategy on building Information Society "Electronic Moldova" (Directorate of IS Development) Strategy of Economic growth & reduction of poverty 2004-2006	National Strategy of Information Society '04-'07 adopted June 2004 (National Council for Information Society)
Romania	Serbia	Ukraine	
National RDI strategy for the period 2007 – 2013 (National Authority for Scientific Research)	National Strategy for Information Society in Serbia adopted Oct 2006 (Ministry of Science and Environmental Protection)	"National Strategy of Information Society Development" currently under adoption	

Notwithstanding that National Strategies for IST Research and Technological Development per se are not formally adopted in any of the countries, IST RTD is usually integrated within more horizontal strategic documents in the framework of ICT Development or Scientific and Innovation policy documents. Currently Bulgaria, Croatia and Romania are more in tune with EU trends, either by policy choice or as part of their EU integration process, and have put in place National Strategies for Development, Science and Research in which IST RTD is an integral part, closely in line with EU policies in the sector. Their approach is already rewarded by better results in comparison with other countries in the region in IST FP projects' participation, by number of projects, number of participating entities, researchers and funding.

In a second group of countries, IST RTD is also incorporated in National IS Strategies, but it is evident that IST RTD is not prioritised in a concrete manner in terms of funding and actual implementation (Albania, Belarus, Bosnia–Herzegovina, FYROM, Moldova, Serbia, and Montenegro). Ukraine does not have a National Strategy dealing with IST RTD issues yet and is currently in the process of adopting of a National Strategy of IS Development.

## THE IST RTD PRIORITIES

Albania	Belarus	Bosnia-Herzegovina	Bulgaria
No specific IST RTD priorities. Focus on Electronic development.	Decree on priorities of S&T activities for 2006-2010 R&D programme "Electronic Belarus" for 2006-2010 (covers i2010 policy and FP6-7 priorities)	UNESCO report: training of a new generation of scientists, development of research infrastructures and establishment of a State Fund for R&D.	IST RTD priorities as part of general Research and Innovation priorities for development of science, innovations, new technologies
Croatia	FYROM	Moldova	Montenegro
Part of Science & Technology Policy of the Republic of Croatia 2006 2010	Electronic development, Further development of the MARnet (national research network), IST Infrastructure, some IST specific priorities	Electronic development, AS elaborated strategic Directions of the Activity in Science and Innovation for 2006-2010, adopted Aug 2005	Electronic development, some strengthening innovation and investment in ICT research
Romania	Serbia	Ukraine	
IST RTD included in National RDI Plan, Sectoral R&D plans (included in programmes: "Research of Excellence", "INFRATEH").	Strategy does not contain specific guidance regarding IST RTD. Focus on electronic development. Special focus on Reforming the National Innovation System	Conceptual national priorities in IST field are formulated in Presidential Decree "About main tasks on implantation of novel information technologies". Focus on Electronic development.	

The IST RTD priorities in the majority of the countries are not clearly defined nor aligned with the EU priorities. Thematic priorities tend to be too general or too vague to provide clear guidance to the research community or to implementing institutions. It is also unclear in many cases how these priorities are implemented in practice and which institutions are responsible for drafting action plans and for monitoring their execution. Romania and Croatia have been more successful recently in including more concrete IST RTD priorities in their policy documents and have managed to link them more effectively with the actual implementation process. Both countries have appointed responsible state bodies to carry out the various Programmes and have organised some structure of supervision. Bulgaria has also defined specific IST RTD priorities, but has not been as successful in implementing them. In addition, Bulgaria has not clearly linked priorities and Programmes with existing sources of funding, which limits their effectiveness further. Similarly, in Belarus and Moldova problematic correspondence between IST RTD priorities defined in strategic documents and actual implementation plans, undermines the credibility of their planning. For Bosnia-Herzegovina the UNESCO report has envisaged a complete set of priorities for short, medium and long term priorities and has been accepted on a political level, but it is still to see how the recommendations will be integrated into policy measures. The remaining countries lack distinct mention of IST RTD priorities and place focus only on electronic development without consideration of Research as an integral part of this process.

For the entire target region, a common observation is valid. There is a question about how local needs are addressed in the context of their IST RTD priorities. In fact, in many cases, interviewed stakeholders claim that priorities are chosen on the basis of EU Framework Programmes and relevant EU policy documents, completely disregarding national particularities, scientific background and fields of excellence in each country. Taking the country's individual needs and competences under consideration when drafting policy documents could increase the impact of funded IST RTD endeavours by making them more relevant to the national context and multiplying the RTD investment potential.

## EQUAL OPPORTUNITIES AND IPR

Albania	Belarus	Bosnia-Herzegovina	Bulgaria
Limited progress (SAA report '06). Directorate of patents and Trademarks of Ministry of Economy. Patents Database since 1994. Law on copy right 2005 not operational Special IPR unit in the Dept of Customs – limited capacity. Labour code '95 for non discrimination. Gender Equality Act 2004	National strategy for Sustainable Development until 2020, deals with situation for women and youth. Laws On Patents and Trademarks Legal Protection of Integrated Circuits Topology and Patents for Plant Varieties	BiH Progress Report for 2006 (EC). Gender Equality Act of 2003 (body: Central Agency for Gender Equality) The Book of Rules for the Intellectual Property Institute approved by the Council of Ministers in May 2006 and five units were established. IPR not enforced properly	Limited progress in IPR. Programs for the integration of impaired people into the Information Society Enforcement on IPR is lagging behind the legal framework.
Croatia	FYROM	Moldova	Montenegro
National Strategy for Development of the Intellectual Property System (adopted 2005, State Intellectual Property Office (SIPO)). Existing legislation covers copyright, patents, trade marks etc.	Substantial progress (EC '06). Law on Equal Opportunities for Women and Men adopted May 2006. Law on Copyright and Related Rights. Enforcement is lagging behind the legal framework.	Included in the Strategy. No evidence of practical implementation and progress.	The National Strategy of Information Society addresses copyright and IPR (not equal opportunities) IPR Law not introduced
Romania	Serbia	Ukraine	
Equal opportunities in full competence. IPR issues included in Strategy. No special provisions	Law on Prevention of Discrimination 2006, Law on Implementation of IPR 2006, Law on Optical Discs still pending. Need for improved institutional capacity for enforcement.	Equal opportunities Law provided but implementation is weak. No special provisions for IPR.	

Intellectual Property Rights is an issue that has not yet received the appropriate attention in the region. The IPR legislation is in place, in most cases, but enforcement is inadequate and the public is generally tolerant to violations of IPR. Most target countries have ratified the Council of Europe Cybercrime Convention which for the Western Balkans was linked with their obligations stemming from their obligations of the eSEE Agenda<sup>7</sup>. However, the enforcement mechanisms have been very modest in implementing it and great efforts are required to enforce such commitments and introduce a culture of respect for IPR issues.

Croatia has been more successful than other target countries in implementing and enforcing the relevant IPR legislation. Bulgaria, during the process of its EU accession, put a lot of effort to improve the situation and despite remarkable progress further endeavours are needed. Albania, BiH, Moldova, Montenegro and Ukraine have a weak legislative framework in both IPR and equal opportunities in the RTD IST sector, while the rest of the countries need to intensify their implementation efforts. In addition, IST related crime is still not yet confronted adequately and the enforcement mechanisms lack the capacity (human resources, know-how) to deal with such issues.

In the same framework, equal opportunities on gender and other issues are neglected, and no special provisions are included for the participation of women and special groups of the population in IST RTD activities. There is also a domestic gap developing usually between the metropolitan centres and the rural peripheries in terms of IST penetration that underpins IST RTD and generally economic activity in the ICT services sector, which essentially divides the countries in question. It is a valid observation that the regions around the administrative urban centres and the major universities are following the global trends more closely, while rural areas are incapable of becoming part of the new economy. This domestic divide is further accentuated, as rural (not urban) development is not being supported by governments with special measures providing incentives for investment in these areas to the industry for infrastructure building (IST infrastructure in addition to poor basic infrastructure).

## INTERNATIONAL COOPERATION

<b>Albania</b>	<b>Belarus</b>	<b>Bosnia-Herzegovina</b>	<b>Bulgaria</b>
Goal 12, 13 of National ICT Strategy	Bilateral cooperation agreements with more than 30 countries of which 12 in Europe.	BiH has not partaken in any joint programmes at State level. International collaboration is through foreign private investments	IST RTD funded by Organizations (UNESCO, Open Society, CEI, etc.), bi-lateral cooperation agreements
<b>Croatia</b>	<b>FYROM</b>	<b>Moldova</b>	<b>Montenegro</b>
National Foundation for Science: Support scientists in joining EU Science Foundation Programmes. Bilateral programs with 6 EU countries	RTD cooperation with 15 countries. Preparations are under way for establishing cooperation with 9 more.	Regional initiatives and Working Groups. 18 Bilateral agreements in IST cooperation.	No agreements at state level yet. Independent Montenegrin international collaboration.
<b>Romania</b>	<b>Serbia</b>	<b>Ukraine</b>	
Romanian Office for Science and Technology in Brussels, 2005. Full participation in international programmes	7 Bilateral agreements for international cooperation	Over 30 cooperation agreements in the science and technology field. Cooperation with USA, Canada and EU institutions	

In terms of international cooperation, the region presents a mixed picture, since all countries are committed to it in principle, but not all are being equally successful in practically promoting it with collaborative programmes and projects. Most countries face difficulties in taking advantage of the existing international programmes and exhibit low participation levels. Bulgaria and Romania, during and after the process of EU accession have been more successful than others, which if course was expected since their interaction with the EU has increased and has gradually cultivated better access to EU funds and more importantly acquisition of relevant know-how. The signing of Stabilisation and Association Agreements (SAA).has been

<sup>7</sup> electronic Southeast Europe Initiative was signed by the Western Balkans countries in 2002 introducing a set of commitments for reforms on an institutional level for the development of IS issues.

an overall positive force for reforms and has facilitated the opening up of the IST sector. Nevertheless, results have been rather modest, liberalisation of the sector is still underway in practical terms and there are still huge opportunities to be exploited. Political commitment should be accompanied with concrete measures dealing with facilitation of visas and similar bureaucratic issues.

The lack of experience in participating in international research programmes is also evident in almost all cases, even though the insignificant national funding for research is forcing the leading IST RTD actors in the target countries to increasingly turn their attention to international funding opportunities. All countries have also a major difficulty to effectively coordinate the international donor community and tend to ignore the IST sector, when requesting support for the development of infrastructure. On a bilateral level most countries are active, but it remains unclear how these bilateral agreements influence the IST RTD sector, since no reliable data are available.

Political problems and relative instability have been negating international activities in Albania, Bosnia-Herzegovina, FYROM, Montenegro and Serbia. On the other hand, Ukraine has been particularly strong in IST RTD international cooperation, both on a bilateral and a multilateral level. Belarus, Croatia, FYROM and Moldova have an average performance and more international cooperation activities are needed and indeed are possible. As funding for IST RTD from national sources will remain relatively fairly lower than in EU member states, due to the countries' economic status, more focus should be placed on the development of participation capacities in international research programs to sustain significant IST RTD activity.

## EVALUATION AND POLICY REVISION

<b>Albania</b>	<b>Belarus</b>	<b>Bosnia-Herzegovina</b>	<b>Bulgaria</b>
No provision for RTD. State Body for Information society (Monitoring, evaluation)	State organization responsible for timely and qualitative execution of the specific projects of the strategy, National Academy of Science	Council of Ministers and the Governments of the Entities are responsible to set up adequate expertise bodies	Limited reporting available related to the evaluation of the current approach and the results obtained
<b>Croatia</b>	<b>FYROM</b>	<b>Moldova</b>	<b>Montenegro</b>
National Science Council (NSC) responsible for evaluation of all scientific organizations. Many relevant institutions involved, setting not appropriate	Interministerial Council responsible, National Council for Information Society recommends	The National Council for accreditation of all research institutions. For IS Strategy evaluation: National Commission for Building of Information Society, 2004	No institutional provision.
<b>Romania</b>	<b>Serbia</b>	<b>Ukraine</b>	
Government Ordinance no. 57/2002 for systematic R&D evaluation. Advisory Board for R&D and innovation, the RO Ac., National Council for Research (head PM)	The strategy envisages the creation of the Department for Monitoring and Evaluation (M&E)	No established evaluation mechanisms. Evaluation criteria determined by expert groups that formulate research priorities.	

The assessment and development of methods and mechanisms to evaluate the socio-economic impact of IST RTD policies constitutes a highly relevant component for the efficient articulation and improvement of public policy. The IST RTD policy making process is found to be lacking a permanent feature for evaluation and revision in most of the target countries. Romania has been more successful within the group of GREAT-IST countries having a clear high level component that combines high political authority and technical expertise that allows the interaction of decision makers and technocratic support. Belarus, Croatia and Moldova have in place the mechanisms for evaluation and policy revision, but tend to be too generic and therefore not effective in amending specific inefficiencies, shortcomings and failures. Albania, Montenegro and Ukraine completely lack technocratic RTD evaluation mechanisms, while BiH, Bulgaria, FYROM and Serbia have fragmented and mechanisms that are not always productive. Remarkably, all countries tend to avoid empowering evaluation and policy revision mechanisms that have a strong expertise background and

such decisions are confined to the politicians. The situation is further deteriorated by the absence of a systematic statistical assessment of results on IST RTD policies effectiveness. The importance of collecting output indicators and internal evaluation has been underestimated. In fact, there is little experience of impact assessment and limited recognition of the importance of disseminating best practices and acknowledgement of failures, either due to political calculations or lack of know-how. The absence of strategic reviews of the policy framework, strategic priorities, and programmes' implementation is seriously undermining the necessity for close monitoring of progress and effectiveness and disqualifies the possibility for adjustments and reforms of the chosen policies. The idleness of State Bodies responsible to perform such tasks and their political control is one of the most common characteristics in the region. Furthermore, in all target countries there is limited and certainly inadequate involvement and consultation with the actors of IST RTD. As a result any reformulation of policy is based solely on political perceptions of the eventual administration with little consideration of the expert community opinions and views. Finally, it is also frequently observed that there is little, if any, effort to preserve continuity in the strategy in the occurrence of change of administrations.

## THE ICT SECTOR

<b>Albania</b>	<b>Belarus</b>	<b>Bosnia-Herzegovina</b>	<b>Bulgaria</b>
Dominated by IT equipment and services enterprises, has very low involvement in IST RTD. General business climate needs to be improved	Dominated by software related enterprises, has low involvement in IST RTD due to limited incentives for SMEs and the private sector. Still not harmonized with EU standards.	The war has handicapped the ICT Sector. At present there is a major push towards EU convergence, with the number of ICT enterprises increasing threefold between 2003 and 2006. However, in RTD terms production is low.	Good ICT market with quite favourable business environment. Broadband penetration still low although the total internet penetration is pretty good. RTD is not very developed but is developing notably during the past years.
<b>Croatia</b>	<b>FYROM</b>	<b>Moldova</b>	<b>Montenegro</b>
Good infrastructure for ICT and the market growth Business environment is satisfactory. In 2007 a legal framework for PPPs and SMEs will be adopted.	In development stage, with state enterprises dominating and a non-liberalised market. business environment is described as inadequate and lack of information dissemination hinders research activities and project participation	In development stage, but showing good potential. Financial issues. No implementation of legislative framework supporting RTD. The market itself has shown some progress in the past years, but most of them are in the "shadow" area.	Development stage. Financial issues. Inadequate PPP+SME legislation. Market focus in computers and equipment.
<b>Romania</b>	<b>Serbia</b>	<b>Ukraine</b>	
Good market growth and dynamic. Infrastructure and RTD participation. Investment attraction. Broadband growth. Had low innovation but rising rapidly. Further measures needed to increase EU convergence	Modest development. Financial issues due to unstable political situation. Inadequate information dissemination. Market grows but slowly	Fair market ranking and e-readiness status. Market dominated by state. Private sector involvement in RTD and project allocation not transparent. Far from EU standards in certain areas.	

The ICT sector of the countries in question has not been able to develop sufficiently. The level of innovative capacity of the business sector is rather low in comparison with EU25 levels. Following the political upheaval in the late eighties and early nineties, the transition from central planning economy to free market capitalism has been a bumpy process, and still not fully completed. For the ICT sector significant opportunities emerged for private enterprises to provide products and services that were exclusively served in the past by public companies with low quality of service and without any market considerations.

Indeed, the current situation is a product of different historical starting conditions and armed-conflicts intensity, showing that the GREAT-IST target region is not homogenous in its ICT sector development. Bulgaria has a positive tradition in the sector, since during the period of the eastern bloc allocation of

production, it was the ICT hub. The successor states of Yugoslavia can draw on a long lasting RTD culture and developed RTD systems, backed by a wide pool of human resources and international contacts. This has not been the case in Albania, Belarus, Moldova, Romania and Ukraine, which followed the former USSR model of separation and inclusion regime that prevented internationalisation and exchange outside the eastern bloc and in the extreme case of Albania meant total isolation. Armed conflicts have resulted in a vast destruction of RTD infrastructure (most heavily in Bosnia-Herzegovina), disruption of scientific regional and international cooperation, massive brain drain and brain waste. In addition, difficult political and economic situations resulted in low investment in research, low RTD capacity of SMEs and industry, as well as degradation of university research work.

However, even if the starting conditions were different amongst states, recent political and economic developments contributed to creating today's similar situation for IST RTD in all GREAT-IST target countries. The transition was rather abrupt, since no entrepreneurial classes existed and the privatisation of large ICT companies was at times sluggish and problematic. On the same lines, the introduction of competition in the ICT market has not always been successful. The Romanian ICT sector stands out from the target countries, since there is a strong dynamic in the market that attracts investments and has been growing constantly, while the ICT infrastructure has been further developed especially in terms of broadband connectivity. Bulgaria, Croatia and Ukraine have also developed their ICT markets, but the ICT infrastructure is still lagging significantly behind and intensification of efforts is required. The ICT sector of the rest of the target countries is still in an early development stage and growth is far from being satisfactory. In addition, ICT infrastructure with the exception of mobile telephony is poor and requires major investments, while the geography of the countries reduces the private sector interest in infrastructural development.

## PRIVATE SECTOR PARTICIPATION

Albania	Belarus	Bosnia-Herzegovina	Bulgaria
Poor country participation in FP6. Bulk of projects are SSAs.  Private sector participated in 0/3 IST FP6 projects	SME participation is low. State enterprises dominate RTD (more than 90% of country's involvement in FP6). Poor overall FP6 participation. (mainly SSAs and CAs).  Private sector participated in 0/3 IST FP6 projects	Poor RTD funding for/from the private sector. Low Participation in FP6, with governmental bodies' domination.  Private sector participated in 0/3 IST FP6 projects.	Total Participants from FP5 to FP6 increased from 304 to 3704. Funding from FPs has quintupled. Increasing interest in RTD participation  Private sector participated in 21/52 IST FP6 projects. High ratio for the region.
Croatia	FYROM	Moldova	Montenegro
New schemes for participation adopted in the 2006-1010 strategy. Country Participation in FP6 was high. The private sector has IST experience through EU programmes  18 ICT SMEs participated in 15 FP6 projects	Participation of ICT in FP6 was very low. Governmental and state enterprises dominate the sector.  11 ICT SMEs participated in 4 FP6 projects	Participation in FP6 was very low. (Lack of financial support schemes and information dissemination to SMEs).  Private sector participated in 0/1 IST FP6 project	Poor participation in FP6 and nonexistent in the IST area. Lack of funding is the primary reason.
Romania	Serbia	Ukraine	
Best participation in FP6 in target countries. RTD activities are 1/4th of total private ICT activities.  24 ICT SMEs participated in 59 FP6 projects	Fair participation in IST FP6. Lack of financial support schemes and information dissemination)  16 ICT SMEs participated in 6 FP6 projects	Low participation in IT, and overall in FP6. Private sector participation is overall modest due to absence of incentives  2 ICT SMEs participated in 8 FP6 projects	

An explosive increase of SME companies has occurred throughout the region, but for the IST RTD sector the large public RTD organisations that were shut down or decreased their activities due to the lack of funds,

could not be replaced by the private sector. This situation can be attributed to the low SME capacity for IST RTD output and strong commercialization of the sector, which resulted in decreasing the economic importance of IST RTD. There are several reasons for the low SME capacity in the field, but the general economic weakness, insufficient public spending and lack of appropriate state initiatives (tax incentives, technology parks etc.) remain the major problems. The poor results of participation in EC Framework Programmes are indicative of the relative low ability to gain funding within a competitive framework, like the IST FP6 programme. Bulgaria and Romania were the most successful and Croatia followed in terms of FP6 participating, with satisfactory levels of participation from the private sector (and particularly SMEs). Ukraine is following close in performance, but is still problematic in stimulating the private sector interest in RTD. The results for the remaining GREAT – IST countries are far from satisfactory and there is an urgent need to address the causes of such poor performance. Furthermore, the absence of national funds prioritises even more the need of the private sector to retain funding from international sources. Poor communication channels and low visibility of IST RTD experts in the ERA region reduce the attractiveness of private sector institutions in project consortia formed in the EU countries. In addition, limited familiarisation with the management of research projects diminishes the opportunities for EU funding available for the private sector.

## INCENTIVES POLICY

<b>Albania</b>	<b>Belarus</b>	<b>Bosnia-Herzegovina</b>	<b>Bulgaria</b>
Early development stage. Progress made especially in tax regime and fiscal burden of SMEs (EC progress report 2006). Financing plan and bureaucracy issues need to be improved	No emphasis on prioritizing IST RTD in “Electronic Belarus” Programme. State provides little support for SMEs. State Bureaucracy and non-transparent funding procedures limit participation	A coherent incentives policy has been underlined according to the National Strategy, but its measures have not been yet implemented	Supportive institutions offer incentives for participation in EU programs. Some good measures (lowest corporate tax rate of the target group, measures to attract RTD). Economic state cannot support a big increase in RTD funding.
<b>Croatia</b>	<b>FYROM</b>	<b>Moldova</b>	<b>Montenegro</b>
Programme for the development of incubators, science and technology parks and pilot clusters. other programmes also support RTD activity (RAZUM, VENCRO). State also supports initiative by research grants and financial support for innovation	Early development stage. Economic and communication difficulties between State and private sector	National programme concerning tax alleviations for RTD programmes was adopted, but system lacks a clear and transparent mechanism for private sector RTD funding and allocating project criteria	No special tax or credit regime for RTD business. More attention needed
<b>Romania</b>	<b>Serbia</b>	<b>Ukraine</b>	
VAT and custom tax exemption. Direct public funding of business RTD. Programme for the development of incubators, science and technology parks and pilot clusters.	Better information dissemination, tax exemption measures and overall financial support. More attention needed	No tax exemption scheme, no fiscal preferences and evaluation mechanisms (limited transparency). Programme for technology Parks in development.	

It is evident from our research in the fields that regional governments still lack awareness of the importance of innovation for increased economic competitiveness and growth. Technology transfer systems have only recently been implemented in some countries. In general, technological capacity of the business sector is not the top priority in most of the national RTD plans of the GREAT – IST countries and conditions for private investment in RTD remain poor. There has also been some support for supporting actions for the private sector at national and regional levels aimed at developing incubators, clusters and technology parks but with limited extent in most countries. Croatia and Romania are quite active in promoting clusters, and provide grants to encourage clustering activities covering cost items such as business plans, studies, joint market approaches, development of ICT and databases to facilitate clustering. Romania also implements fiscal incentives as VAT and custom tax exemption with success. Bulgaria has also introduced similar measures,

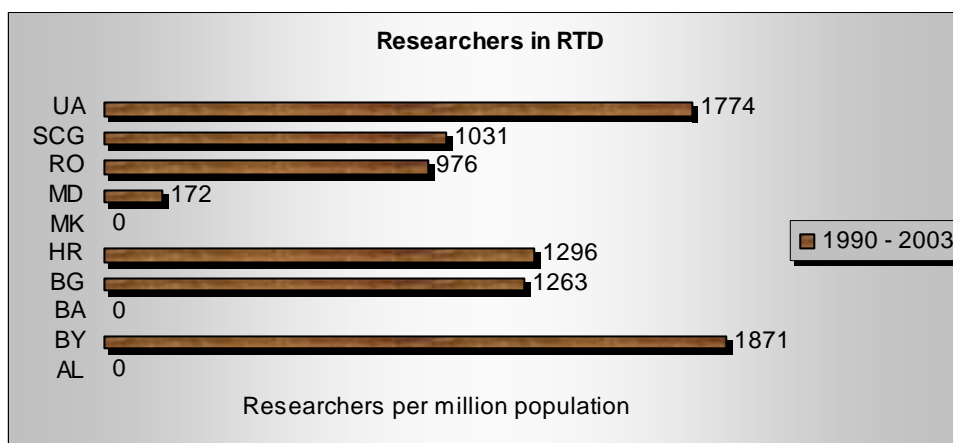
but has limited direct funding towards private sector entrepreneurial activities. The rest of the countries remain inactive or hesitant to introduce groundbreaking reforms. In addition, the bureaucracy that prevails seriously hinders the private sector willingness to develop and invest. Corruption is also a negative factor, as it increases operational costs and especially for SME's it further diminishes the effectiveness of any effort to receive assistance from the state. The European Union influence has put some pressure on administrations to begin considering policies to boost innovation related activities, but the legacies of the past still prevail as the rule, where the administrations are unwilling to reduce bureaucracy and red tape. Therefore, in parallel with the necessary reform effort in the incentives policy for the private sector an overhaul of the institutional setting that will ensure the transparency and efficiency of the governmental structure is necessary. The Bulgarian policy of funding projects that reach the threshold in FP calls, but were not selected for funding by the EC is a useful way to circumvent inefficiencies and increase the motivation of institutions to compete for international funding, while increasing the transparency for allocating national funds for IST RTD.

## COLLABORATION BETWEEN ACADEMIA AND THE PRIVATE SECTOR

Albania	Belarus	Bosnia-Herzegovina	Bulgaria
Rather limited but recent initiatives (collaboration centers) are showing good prospects	Rather limited but with higher prospects than regional areas, initiatives for Science Parks are underway	Very limited. Information dissemination rated as inadequate. Recent initiatives point at increasing interest	Development Programmes on Incubators and Tech Parks. No specific regulatory procedures. Initiatives have been undertaken but no results yet
Croatia	FYROM	Moldova	Montenegro
Development Programmes on Incubators and Tech Parks. Not adequate information dissemination. Measures are being taken but no results yet	RTD activity comes from Universities and state enterprises. Information dissemination poses a problem	Progress regarding the formation of incubators. Academy of Sciences plans to develop more incubators and create Techno parks in 2007-2008	Underdeveloped. Private sector communicates more with research community as whole. Poor info dissemination but getting better.
Romania	Serbia	Ukraine	
Still low compared to EU but good progress made with incubators and techno parks.	Fairly good collaboration, resulting in incubator formation and technology parks. Shows promise.	Ministry driven dissemination of information. Low level communication with private sector unless state owned.	

Unfortunately, investment from the business sector into RTD remains quite poor: Business Expenditure for Research and Development (BERD) lags considerably behind the EU-25, which is an estimate based on scarce data indicators and stakeholder views. This situation impedes the dynamics of RTD in IST heavily and limits the competitiveness of local economies. The main characteristic of the business sector in many countries remains one of a service-oriented, but not knowledge-and-innovation intensive part of the economy. It is without doubt that research, entrepreneurial and IST knowledge exists in the target countries, but the combination is not yet found at a satisfactory level. Indeed RTD results are rarely transformed into new high-end products with utilisation of new technologies. Investment for a knowledge-based economy is still urgently needed as the basis of a wealthy and prosperous society. The innovation spirit has not yet taken hold of the research community and opportunities are left unexploited.

The Research community and the business sector collaboration is still missing from the puzzle and as brain drain has been increasing significantly with the younger and most dynamic researchers going abroad in search of a better working environment the research capacity of the national academia is further diminished. Figure 2 **Errore. L'origine riferimento non è stata trovata.** presents the available research capacity of the target region in terms of Researchers engaged in activities related to RTD per million of population. The graph demonstrates that Ukraine and Belarus are striving to maintain an edge of human capital over the region in an uneven battle with the countries' past. In most of the remaining target countries, the undeniable human research capacities (available in Croatia, Bulgaria, Serbia-Montenegro and Romania) constitute an important basis for development, if provided with suitable financial support and facilitated with good collaboration frameworks with the state and the academia.



**Figure 2. Researchers per million population for the period 1990-2003. Data source: Human Development Report 2006, United Nations Development Program<sup>8</sup>**

Bulgaria, Croatia, Moldova, Romania and Serbia have initiated various initiatives to boost innovation and facilitate collaboration between the research community and the private sector. Incubators, Science and technology parks are the main tools in this process, although the efficiency and effectiveness of the current implementation is hard to estimate at present. The remaining target countries have not been able to introduce such initiatives yet, mainly due to their limited financial resources, while in the cases where such exist, the scope and volume is limited (as in Albania, FYROM, Montenegro and Bosnia-Herzegovina). A more aggressive policy in introducing such schemes would greatly facilitate the development of the sector and the countries should exploit the funding offered by various International Financing Institutions to complement the available or scarce national resources.

#### FOREIGN INVESTMENT IN IST RTD

Albania	Belarus	Bosnia-Herzegovina	Bulgaria
Average FDI in telecomm services but virtually nonexistent in IST RTD. New government initiatives 'Albania 1 €' programme is starting to provide positive results	Foreign investment in the general ICT Sector very fruitful (doubled from 2005 to 2006) No data for specific investment in IST RTD investment	Foreign investment is limited. Measures to attract investors have been undertaken recently, but haven't born fruit yet.	Foreign investment has been one of the region's highest overall and in the ICT Sector, which is growing rapidly. Little indication of FDI reaching IST RTD activities.
Croatia	FYROM	Moldova	Montenegro
Significant foreign investment up to now in regional terms. No specific indication presented for FDI in RTD.	Foreign Investment in ICT services has grown, due to liberalization of telecom. RTD foreign investment is low to nonexistent.	Foreign companies hesitant to invest because of the financial risks involved. New legislations and reform strategy made things better. No FDI in RTD indicated.	Poor performance in attracting FDI in regional terms, but rising. High percentage targeted to ICT services sector, low in other areas. No FDI in RTD indicated.
Romania	Serbia	Ukraine	
High investment overall and particularly in ICT due to market growth. ICT Sector investment high. RTD investment is present.	Low investment overall but shown rise in the past 2 years. No FDI in RTD indicated.	Five fold increase in FDI overall in 2005. No direct mention of IST RTD investments, but spillovers are expected.	

The GREAT – IST countries are not specialising in high-technology industries and their involvement in the production of sophisticated technologies is marginal, so a crucial aspect of economic growth in these

<sup>8</sup> Null data in the graph for the respective country represent unavailability of statistics and not researchers.

countries will remain the transfer of technologies from abroad and the capacity to attract more FDI. Specific data for the FDI in IST RTD are not available, but all indications point to very small amounts, both in absolute terms and also as a ratio of the overall FDI in the target countries. Bulgaria, Romania, Croatia and Ukraine have been more successful in attracting FDI in the ICT sector, but it should be noted that this inflow is mainly targeted to the services sector. Without disregarding the instances of IST RTD investments that are taking place, there is no clear indication of building momentum, nor a trend in this respect, but rather hoping for some exceptional cases of foreign funding provided for Research activities in the region. The region however, is primarily concerned with attract more FDI overall, by improving the business environment and decreasing country risk, which is still high in some (Albania, Bosnia – Herzegovina, FYROM, Serbia, Ukraine). Succeeding in this process is expected to produce desired spillovers also in the high technology sector and perhaps in Research and Development activities.

Figure 3 presents overall net inflow of Foreign Direct Investment in million Euros in the target countries. It is noted here that presenting data for ICT sector FDI has been abandoned, as data are scarce, provided by different sources and not updated in a reliable manner, which would permit their inclusion in this document. The data presented in the figure are used here as an indication of the financial inflow in the region, but is in no circumstances related or corresponding in any analogy to ICT RTD investment. The growth in FDI or stagnancy, in some cases, may be clearly observed and related to the individual country's socio-economic development. Data is present for all counties in the three years in range, giving a clear contrast between yearly values of FDI, which should be studied further with regards to circumstances and incidental factors.

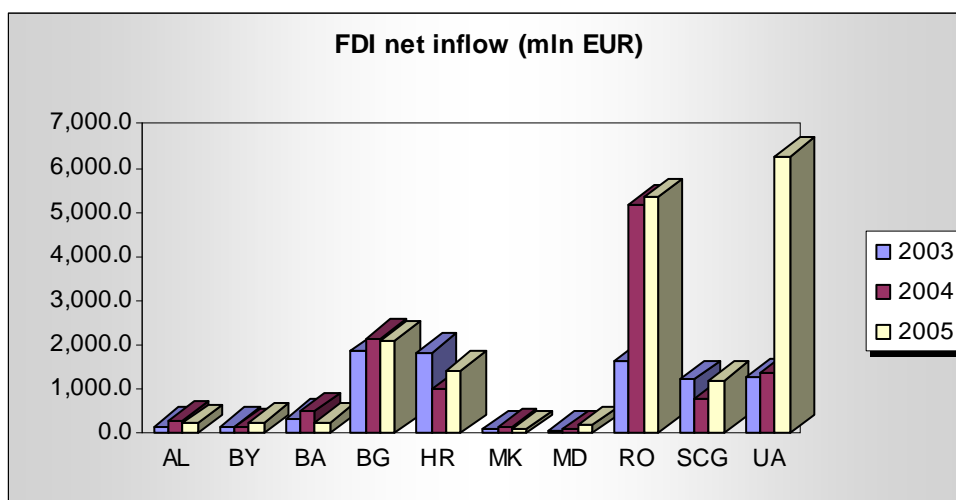


Figure 3. Foreign Direct Investment, net inflows (mln €). Source: World Bank Database.

The recognition of the need for increased transparency and openness to reduce bureaucracy and corruption is critical for the creation of a friendlier environment. It is also a disappointing observation that none of the countries has managed to attract significant outsourcing IST contracts, despite the fact that in all of the countries there is abundant talent with very low cost. Some instances of FDI in IST in Bulgaria, Romania and Serbia prove that such prospects are feasible, but there is still a long way to go in improving the situation and reaching the full potential of the region. The Indian model of attracting outsourcing contracts in the region should be embraced, as it has been in other parts of the Far East Asia. It is evident that poor infrastructure and the limited extroversion of some of the target countries hinder this prospect. The situation could be addressed more decisively by the regional governments that should work more closely with the private sector to gain a competitive position in the global outsourcing market and exploit this huge potential.

### PUBLIC-PRIVATE PARTNERSHIPS (PPP)

Albania	Belarus	Bosnia-Herzegovina	Bulgaria
Absence of discrete legal framework resulting to poor initiatives. New legal framework underway.	Absence of a discrete legal framework in conjunction with state dominance results in very poor PPP initiatives.	No special provisions. Some PPP collaborations in ICT training to provide more awareness and familiarity with IST.	No discrete legal framework. Envisioned in the National Strategy but not implemented. Incorporation in to the EU

			to change the scenery.
<b>Croatia</b>	<b>FYROM</b>	<b>Moldova</b>	<b>Montenegro</b>
A legal framework will be adopted this year although good collaboration till now. The new framework will strengthen this development even more	No legislative framework. The only success in collaboration of US Aid. awareness of the significance of developing such a framework exists but not yet formulated	no separate legislative framework The result is poor performance	No legislation framework. Expected to be formulated in 2007. low status
<b>Romania</b>	<b>Serbia</b>	<b>Ukraine</b>	
No legal framework for RTD but general one strong. Pending in 2007, already some additional laws implemented.	Recent laws formed and implemented, a rise is expected provided other obstacles are overcome.	No specific legislation. Adoption pending by beginning of 2007. State driven and no discrete evaluation methods present. Questionable transparency	

Public Private Partnerships can be utilised as a great tool for IST RTD development, especially considering the lack of public funds available and the relative low private investment. However, a combination of the deficient legislative framework and the lack of experience in handling PPP's by the public administration has resulted in marginal successes in some countries (Croatia, Romania, Serbia), which has not generated significant impact yet. The rest of the target countries lack the legislative framework for PPP's and there is little, if any, experience in handling projects in this manner. This is no surprise, since PPP's are relatively new forms for investment, even for many European Union members, and are extremely demanding in terms of planning, initiating and monitoring progress. However, it is certain that PPP's could be proven a greatly efficient tool for the target countries, augmenting the impact of the existing resources and attracting the necessary capital from the private sector. IFI's (International Funding Institutions), like the World Bank and the EBRD are eager to finance PPP schemes and have done so in various countries in the world. Since the available funds for IST RTD are limited, the opportunity that PPP's offer should not be missed by the target countries. The European Commission assistance in promoting PPP schemes would have major multiplying effects in the countries, especially in providing the know how for implementing such projects that eventually would increase the private funds for the sector.

## Section 2: Normative Policy Recommendations

As discussed in the previous paragraph, the situation regarding the IST RTD sector in the GREAT-IST target countries is far from satisfactory. The political events of the 1990s (fall of communist regimes, disintegration of USSR and Yugoslavia), the uneasy transition to a market economy, the recurrent economic crises and macroeconomic instability, are the main factors for the general condition of the countries. The most persistent effect of these events is the low level of economic development, which is evidently the major constraint for the development of the IST-RTD sector. Most countries have low level of public investments coupled with marginal private sector investment in RTD, inefficient mechanisms for the distribution of available public funds, ineffective and fragmented systems of RTD and, finally, poor infrastructures that are significantly outdated.

The GREAT-IST countries will have to resolve many complex issues, where each country should develop and define its national IST and RTD strategy according to its own national priorities and needs in a realistic manner, which should be relevant to the local situation and should not overstretch the scarce available resources. There is a clear tendency in the national strategies to be ambitious and unrealistic to such an extent, that the whole project of developing an effective strategy in the sector is seriously undermined and eventually becomes ineffectual, even obsolete. Despite political declarations and due to the low level of civic awareness for the urgency of the issues, the realization of the political classes is often very low. Therefore, it should be a top priority in all countries to raise public awareness about the value of the knowledge-based economy, recognizing the key role of IS technologies and the strong link between RTD and economic development. The current financial constraints point to the need to create the conditions for more private and public investment in IST and RTD following the trends in the European Union and the rest of the world. It is apparent that these priorities should be immediately dealt with, in the form of concrete actions by governments, with the assistance of the European Union and international donors. Any further delays will allow the already existing technological gap between the countries and the EU to be constantly widening, leading to further deterioration of the state of competitiveness of their economies and consequently, to an inability to exploit the opportunities of the IS era, disregarding that the IST RTD development is closely related to their economic potential. It would be right to argue that policies that promote a stable macroeconomic environment and related strategies are urgently needed to raise competitiveness and growth and to enable sustaining increased investment in human capital and IST RTD.

Adopting the Lisbon Agenda that aspires to transform the EU into the most competitive and dynamic knowledge-based economy in the world by 2010, as a goal for the GREAT – IST target countries is probably an unattainable target for the short term. A more modest approach for these countries would be more effective and useful at this point. It would be more realistic for the medium term to set as a strategic goal to be better prepared to compete in the global knowledge economy by fundamentally strengthening key areas that currently impinge on their innovative output. The current situation makes it virtually impossible to secure all the objectives that were identified by the Lisbon Agenda. It is more important to focus and identify priority areas of strategic importance, such as intellectual property, public-private cooperation, utilisation of publicly – funded research and supporting SME's. Also, for each element it is important that the countries define more clear goals, both in terms of the process-driven change and expected outcomes. In addition, there is a dire need to more accurately define the timeline for completion of each goal. In this way, the textual statements can be translated into practical commitments.

**An overall best-practice policy that could take the form of a migratory practice in the GREAT-IST region is the case of Estonia's RTD success**, both due to the country's size and resources, as well as to the practicality of its measures. Estonian policy makers have recognized the fact that with its small size and limited resources, Estonia cannot achieve success in every economic field. Thus, taking into consideration its competitive advantage, they decided that Estonia should build its future success on RTD, especially in the IST area. Therefore, the targets of the policy were as follows:

- ✓ Competitiveness and added value to traditional industries
- ✓ Creation and growth of new technology based companies (mostly IST-based)
- ✓ Modernisation of public sector services (using IST)

The Estonian approach is characterised by an emphasis on the stimulation of spin-off companies from research, especially in IST, while a structuring of research around strategic centres of competence is also present. The phenomenon is visible through the existence of spin-off firms in proximity to the Universities of Tartu and Tallinn, and a number of instruments and measures exist to favour their development. In Tartu, training and consultancy is delivered to spin-off entrepreneurs, commercialization of research results is favoured, as is the dissemination of science-based services. In Tallinn Technical University, the Innovation Centre delivers services in support of the commercialisation of research results, such as: patent search, negotiation with industrial partners, consultations on IPR, participation in the definition of exploitation projects, etc. The Estonian Technology Agency had implemented support measures for spin-off firms. Students' competition for new firm creation projects are run in Estonia, under the leadership of large firms. The absence of venture capital sources in the country is identified as a gap in the system, but here too, there are projects in this area within the Estonian Technology Agency

Estonia's policy is driven by high awareness of RTD and innovation priorities in policy circles and by the long-standing existence of an implementation agency. Since 1999, various initiatives have been taken to promote innovation and the information society. The launch of the so called SPINNO program (transnational learning) has stimulated the activities aimed at fostering the entrepreneurial role of universities and public research centres, especially in the field of high tech venturing. Its policy makers also realized on time that development of knowledge-based society is closely attached to the development of ICT infrastructure. Estonia has set goals to increase Internet penetration by lowering connection prices and promoting competition between operators, to increase digital literacy and broaden IT training, to take advantage of innovative IT services like online health services, online study and e-Government. The penetration of internet and mobile devices is high, meaning a large number of users and customers for IT services. More than 50% of Estonians are now daily users of computers and internet. The most striking point is that almost 90% of banking transactions are made using electronic channels. Moreover, in 2004 78% of taxpayers sent their income tax returns electronically to Estonian Tax Board. Estonia has developed a tool for electronic identification of citizens over internet – an electronic ID card, which is compulsory for everyone and allows for the development of endless range of e-services that require secure authorization.

The role of the state government has been very intense and concentrated mainly on:

- ✓ Setting strategic targets, in order to acquire and apply new knowledge, and checking that such targets have been met
- ✓ Integrating activity plans to ensure a balanced development in the fields of economic development, education and RTD
- ✓ Creating favourable conditions, by means of policies and legislation, for the private sector to be able to participate in RTD
- ✓ Ensuring financing for fundamental and applied research, and the necessary infrastructure
- ✓ Developing integration mechanisms between RTD and the business sector, and supporting their efficient functioning
- ✓ Launching national programmes in order to implement RTD priorities.

Numerous support structures for RTD and innovation have been created in Estonia in recent years, with the aim to strengthen the ties between research and business, as well as to create new research-intensive enterprises and to support their growth:

- ✓ The Tartu Research Park Foundation has been functioning since 1992, focusing mainly on assisting the development of research-intensive enterprises, creating and developing the required infrastructure and network of services. The PHARE SPP pilot project contributed considerably to the development of Tartu Research Park. As a result, incubation opportunities improved and the scale of services was diversified.
- ✓ The Tallinn Technical University Innovation Centre Foundation was founded in 1998, with the aim of linking the research and development results of the University to the technological needs of industrial enterprises. It is planned to further develop the centre by establishing Tallinn Technology Park as a part of the Tallinn Technical University Technology Village concept.

- ✓ A regional innovation centre has been created within the framework of a PHARE SPP pilot project in Jõhvi, in order to contribute to a better use of the Ida-Virumaa industrial region's potential and to assist in transferring technologies into a region where local research and development resources are limited. Within the framework of PHARE 2000 ESC, an Oil Shale Development Centre is being created on the basis of the Tallinn Technical University Oil Shale Institute which is situated in Ida-Virumaa. The aim is to coordinate research in the field of oil shale and to help the region's oil shale cluster to develop innovative products, services and processes.
- ✓ Within the framework of the 1996 PHARE project for higher education and science reform (HESR), centres of competence were founded by the University of Tartu and Tallinn Technical University. In order to encourage technological development and increase contacts between research and the business sector, there are currently plans to launch a programme of technological development centres.

In order to identify more precisely the best opportunities for Estonia in key areas, studies are continuously undertaken to analyze existing preconditions and the cost-effectiveness of results. The Ministry of Economic Affairs and the Ministry of Education, in cooperation with research and development institutions and business representatives, compile and launch national programmes for the development of key areas. Also, bringing the key areas in line with the European Union's RTD priorities encourages active participation by Estonian researchers and enterprises in international RTD cooperation and enables Estonian researchers to obtain additional financing for the achievement of national priorities.

The following strategic policy recommendations aim to facilitate the development of a coherent and harmonised policy approach at a regional level and assist the integration of the GREAT – IST countries in the ERA (European Research Area). Strategic recommendations aim at developing capacities on the basis of three axis of action which refer to IST Institutional Support, IST Research Policies and Priorities and Private Sector Participation in IST research. It should be mentioned, that the examples of best practices presented could provide a very interesting case study for migratory policies, in the future.

In the following three paragraphs, the Normative Policy Recommendations are categorised in three groups reflecting the original three Working Groups in GREAT-IST, which related to the IST RTD institutional support, the IST research policies & priorities and the private sector participation in IST research, respectively.

## IST INSTITUTIONAL SUPPORT

**The experience of Slovenia and Estonia can show how governmental institutional support can be of a critical value to the development of IST RTD.** Estonia and Slovenia are EU countries, but at the same time they share a common geopolitical background with some of the other target countries coming from the former Soviet Union and the former Yugoslavia. However, starting from the early 90's these two countries went through a quicker, EU-oriented development that led to their EU membership in 2004. In this sense, these two countries represent a specific good practice for the countries belonging to the regions of NIS and WB. Since Estonia was already mentioned as an overall best case example for the target region in the beginning of section 2, the example of Slovenia is elaborated in this paragraph, with particular focus on the institutional setting developed to support IST RTD.

In Slovenia, under the competence of the Ministry of Higher Education, Science and Technology (MHEST), which is fully responsible for R&D policy (IST R&D included), two specific Bodies were established in order to develop an effective institutional framework for the R&D (according to the 2002 Law on Research and Development): the **Slovenian Research Agency (ARRS)** and the **Technology Agency (TIA)**. Their main tasks are to finance and administer public programmes, and to promote science and innovation. In order to ensure professional and independent selection procedures of scientific projects, the Slovenian Research Agency is governed by its own board and scientific council. Furthermore, in 2001, Slovenia introduced Targeted Research Programmes, to support inter-sectoral, networked R&D projects in areas of public interest. The Targeted Research Programmes define research themes and priorities on a yearly basis, determined by the ministries involved. The Ministry of Higher Education, Science and Technology also established a new instrument for the integration of the academic community with the industry, through the launch of a Call for "**Centres of Excellence**", which led to the recognition of 8 such Centres. In 2006, the Ministry also issued a call to encourage the development of **Slovenian technology platforms** with aim to better prepare Slovenian organisations for the participation in the European Technology Platforms.

**Another interesting practice on how governmental institutional support can be of a critical value to the development of IST RTD is found in Bremen, Germany,** which managed to become a major high-tech center. Extensive financial support was given to facilitate the structural change. A large part of the funding came from external sources, like EU funding or the so-called **federal financial compensation mechanism within Germany**. The public influence can be measured in many ways: The region's RTD expenditures reached 2.13% of GDP (2.55% of GDP in Germany) in 2003, with a relatively high share of public RTD expenditures. On a strategic level, **the programme 'InnoVision 2010 – Bremer Innovations offensive'**, established in 2002, is the main policy framework for future decisions. With this framework, Bremen is putting the main emphasis on developing new innovation fields like T.I.M.E. (telecommunications, information technology, multimedia and entertainment), health care services and environmental economics. **The strategic framework is supported by operative institutions like, for instance, the 'Bremer Innovation Agency', a 'one-stop-shop' business development support agency** responsible for all innovation promotion programmes. Overall, the institutional arrangements are characterised by a limited amount of intermediary actors, few redundancies and clear competencies (Koch and Stahlecker 2004).

Building on the country specific recommendations on the institutional setting and the communication infrastructure, the most critical and realistic recommendations in this field, which appear to be common to all the GREAT-IST target countries, include measures and actions to:

- Restructure, where needed, the institutional support mechanism for IST RTD, in order to **improve institutional coordination and communication mechanisms between the relevant bodies**, so that cooperation and communication is seamless and well organised, with clearly defined responsibilities among them. One possible measure in this direction could be to **clearly define the national coordinator, one State Body responsible for IST RTD and its functions**. This body would need to coordinate all bodies involved with RTD and ICT policies, in order to avoid duplication of efforts and overlapping of competences. The same State Body should also define the main communication channels, collect information on stakeholders, measures and programmes in IST and

disseminate this information on websites, web portals databases, newsletters or alike. **All units directorates and Research Centres contributing to Research and Innovation should be brought under the jurisdiction of one State Body.** This State Body should promote the development of IST RTD clusters in regions with high concentration of resources and establish intermediate, supervised information relay and administrative centres.

- **Reinforce those governmental agencies responsible for ICT development and allow them to take drastic measures to promote ICT infrastructure development that will match the needs and requirements of the fast internet era.** ICT infrastructure is a prerequisite for the development of IST RTD, but the current level of technological infrastructure in place varies significantly between the target countries. To date, penetration of broadband connectivity in the GREAT-IST region is limited. Increased high speed connectivity and ICT infrastructure development (Call Centers included) would enable the target countries to attract IST RTD outsourcing contracts, which would exploit the existing supply of significantly low cost expert human resources. A new generation of technology alliances between developing and developed economies are forged due to the dramatic restructuring of how corporate RTD is performed (from in-house to elaborate outsourcing) and as industrialized countries emerge as a preferred location for IST RTD outsourcing (India, China). The GREAT - IST countries and especially the EU accession countries could become a new destination for the corporate IST RTD outsourcing.
- **Upgrade the national statistical mechanisms to provide the necessary data to allow the critical assessment of IST RTD situation and establish mechanisms for the technological foresight.** It is advised that each country forms, where not already established, a national statistical body, which will have a branch dedicated to measuring crucial IST RTD parameters at regular intervals (e.g. on a half-year basis). This body, through frequent communication with the state body responsible for IST RTD development will provide not only feedback as to the state progress of the IST RTD sector but also valuable insight, through data analysis, that can be used for evaluation, foresight and strategic planning. Indicators that should be monitored include human resources and the funding of RTD activities, number of publications in various disciplines, number of patents in the IST RTD and related sectors, number of research institutions and researchers, impact of the strategy on the Information Society Development, It is worth mentioning the example of the Romanian project entitled “Elaboration of RDI national Research Strategy within the Framework of the National Foresight Exercise”, which was launched within the R&D framework of the Ministry of Education and Research in 2005. The National University Research Council together with a consortium of 26 researching organizations, universities, research companies worked (until December 2006) on the elaboration of the national strategy in the RDI for the 2007-2013 period. The strategy was based on the elements of strategic planning and covered programming instruments and/or process and financing instruments.
- **Introduce Public Private Partnership legislation and integrate best practice PPP models for the deployment, financing and operation of IST RTD institutions.** Attention is drawn to the fact that the introduction of the necessary legislation is not enough, but should be coupled with managerial capacity suitable for such projects. A good example of a successful PPP model is the ‘Montpellier L.R. Technopole’, an economic development agency founded in 1986, responsible for the development and promotion of the different research axes of Montpellier, the most prominent French research cluster (Voyer 1998). 13 business parks, 6 incubator & technology parks (the flagships are ‘Cap Alpha’ for biotechnology, ‘Cap Omega’ for ICT and ‘Cap Gamma’ for pharmacy) and the start-up-centre CEEI (centre européen d’entreprises et d’innovation) support economic development. Since 1987, more than 300 enterprises have been accompanied by the CEEI within the Montpellier agglomeration with an above-(national) average probability of surviving. The Montpellier success story was the work of the local authority of Montpellier that acted as a catalyst in this case. Therefore, **it is not only the central governments that need to legislate and promote PPP projects but also regional and local authorities as well.**
- **Reduce bureaucracy and increase the flexibility of the institutional setup in IST RTD to allow a closer cooperation between State Bodies, higher education and research institutes with the private sector.** Reduce the time and resources needed for collaboration between the industry and the academia, eliminate hindering factors and establish “one-step” procedures to simplify how the Private sector may apply for a research project or for a partnership with the scientific community. **Funding allocation procedures should be transparent and comprehensive.** It is also suggested

that the private sector should be stimulated (through financial incentives) and facilitated to provide financing to public sector academic institutes in the context of IST-related projects. Financial incentives should also stimulate contribution of the private business sector into the establishment of a special fund-reserve for IST RTD purposes, directed to the scientific community through well defined, transparent procedures.

- **Improve staff selection methods for IST and RTD related State Bodies to combat administrative and theological orientation deficiencies. It is considered critical to assign highly competent individuals to key positions and select experts with a solid managerial and technological background to manage these State Bodies and to communicate with the academia and the private sector, stimulating interest and explaining about opportunities.** In turn, this would also constitute motivation for the private sector to employ a higher number of researchers, and ICT and management experts at the top of the managerial hierarchy, to be able to fully exploit existing opportunities and to be able to communicate directly with the decision making mechanisms at state level. Providing financial incentives for this purpose by the government would further support such trends. Also, ensure that staffing and orientation of state bodies remains unaffected by changes in the political scenery, as much as possible, to inculcate a feeling of trust and consistency.
- **Introduce suitable mechanisms to support participation in International and European programs for public and private institutions.** Since the ability to successfully attract funding for the IST RTD actors in the GREAT – IST region is limited, it is obvious that especially SMEs should be supported to be more successful and to raise their visibility in a pan European context, in order to increase their inclusion in research consortia. Measures could include capacity building for SME's personnel, consulting services for project management and provision of networking opportunities. The participation in European programmes could be enhanced, if adequate support is given by providing appropriate information and coaching for participation in EU programmes, information and contacts of IST stakeholders in the country (central and local administrations involved, universities, research centres, excellence centres, SMEs) through online databases and websites, which should also be made available to European institutions seeking cooperation in the target countries.

## IST RESEARCH POLICIES & PRIORITIES

**A good example of a rapid evolution in the IST RTD sector due to an increased political effort and commitment is found in Portugal**, which, in a very short time span, has managed to develop its research capabilities to a great extent, facilitating the country's economic growth significantly. An example of political pledge towards IST RTD growth is the "Commitment to Science for Portugal's future" document, which was presented by the country's Prime Minister in 2006 and proposed several measures for the strengthening of the country's science policy. It is explicitly mentioned that "Science has always been at the centre of the Technological Plan and it is in the Science that our future is played today". Several S&T indicators were mentioned to show how far Portugal is from the EU average and how badly needed is a stronger commitment to Research. Therefore, the main purpose of the document has been to show that the Government cares about science policy and is determined to establish a "commitment to Science" to shape a better common future for Portugal. Seven measures were announced to pursue the development of science policy:

- ✓ An Increase of €250 million in the 2007 budgetary allocation to public investment in science and technology, with the objective of reaching a GERD ratio of 1 per cent of GDP by 2010
- ✓ A gradual reform of the scientific and higher education systems, to meet rationalisation, quality and productivity goals
- ✓ A sixty per cent increase in doctoral and post-doctoral scholarships, together with the creation of research integration scholarships addressed to graduate and master students recruitment to work in research centres
- ✓ Recruitment of 500 new researchers, holding doctoral degrees by public S&T organisations until the end of 2007
- ✓ Financial support to international patent registration, in Europe and in the United States, with an overall budget of €0,5 million
- ✓ Strengthening the Ciência Viva ('Live Science') programme, aimed at promoting scientific and technological culture.
- ✓ Encouraging company investments in RTD, with the objective of reaching a ratio of BERD to GDP of around 0.8 per cent by 2010. Two measures were announced in this regard: commitment to achieve a level of RTD to turnover consistent with "international sectoral reference levels" in those companies where there is a relevant public equity share; and assign to RTD activities a share of 0.5 to 1 per cent of total investments incurred in the largest public investment

It is acknowledged that all target countries have adopted some form of strategic document for IST development and have theoretically recognised the importance of IST as a powerful driver for economic prosperity and growth. These documents cover rationales and backgrounds, objectives, priorities, legislation, infrastructure, funding instruments, monitoring and evaluation. The strategic documents either include or are accompanied by action plans, and some of them contain specific elements such as short-term and long-term tasks, responsible implementation institutions and time tables. Disappointingly, specific mention to IST Research and Development is only made in very few cases, Generally, the priorities are in compliance with the IST RTD European community priorities, but have so far failed to a great extent to create the necessary momentum for catching up with the EU25. It is therefore suggested that the target countries review their strategies and evaluate new policy measures in an effort to:

- **Review strategic documents and put practical emphasis in IST RTD, demonstrated in terms of increased resources, prioritisation of IST development and specific measures to enhance research activities in the field.** As already described, most of the target countries in the region have identified IST as a national priority, but only in principal. Despite a growing recognition of the significance of the sector in political and civil circles, it is important to raise visibility of the benefits to the level of the so called high politics agenda. On the other hand, efficient funding is usually not provided, action plans are vague and abstract, implementation of programmes is dispersed between different state bodies and central coordination of activities is almost non-existent. A coordinated effort should be undertaken by the Central coordinating state body responsible for IST RTD, the creation of which was recommended in the previous paragraph. Reviewing of strategic documents

and identifying additional sources of funding for RTD should be made a priority. **The objective is to open an all-inclusive dialog for all stakeholders in the field, namely governmental institutions, scientific communities, industrial enterprises and civil society, in order to synthesize views and identify critical success factors**, such as human capital and ICT infrastructure development, and propose programs and measures that precisely target these elements. Action plans for development should be articulated and specific implementation responsibilities should be allocated. Additionally, it is critical to insist that strategies and adherence to action plans are independent, to the greatest extent possible, of the political environment in order to ensure a continuity of effort. Transparent and consistent monitoring of their implementation is also vital.

- **Identify the national competitive advantages and place specific focus in those areas of IST RTD**, instead of composing generic documents that target all fields of Research. The strategic documents found in the target region are usually a close transposition of EU related documents and rarely reflect the particular capacities and exploitable expertise in these countries. As a result, the researchers dismiss or lose the advantage of building on the knowledge and scientific excellence of the past and attempt to embark in new fields, in which they appear inefficient and unable to compete with their European peers due to the lack of expertise and background work.
- **Adopt specific procedures of IST RTD Policy Review and Technological Foresight.** The central coordinating state body responsible for IST RTD should also be responsible to provide clear and efficient communication with stakeholders, transparent analysis of achievements and failures and specific criteria based on which evaluation and Foresight is provided. The State Agency for Statistics should harmonize its procedures, methods (besides its infrastructure in terms of statistical registries, classifications and nomenclatures) with the EU standards to provide effective means for evaluation and monitoring progress and trends. This process of evaluation from within should be used as a tool for the policy makers in order to review and adapt the national strategic documents on a regular basis. In most target countries, such procedures, if at all present, are neither organised, nor transparent or inclusive. The result is a clear lack of orientation in RTD and inconsistency between desired and achievable results.
- **Take specific measures, accompanied by efficient funding to boost competitiveness, entrepreneurship and innovation capacity of the IST RTD community.** It has not yet become a common realisation in the target region that countries, companies and persons no longer compete in their limited local environment, but in the global competitive scene. International experience has proven that those industries and those nations that invested heavily in RTD have, in recent years, competed successfully in the global economy and have achieved admirable growth. The countries in the region until now have depended on their position as low-wage, newly-emerging economies, which is not sustainable model. A step change is required in their rate of innovation. The role of the Government in boosting the innovation spirit and the entrepreneurial culture is vital. Creating collaboration networks between the private sector and the academia, providing information relay services with suitable bodies for RTD will promote cooperation between all stakeholders. The legislation should allow the creation of entities promoting this cooperation by giving a simple legal basis to create the equivalent of “joint ventures” between various types of research institutions within the country. This would enable several institutes, academic laboratories or private laboratories to undertake joint research programmes and share important research infrastructures. Enhanced collaboration will strengthen the bonds between stakeholders, mitigate mistrust issues and cultivate an understanding that all sides (government, academia and industry) are working towards the common goal of civil and economic prosperity.
- **Channel public resources to IST RTD towards state institutions and the private sector.** The final selection of priorities, which will be related to specific action plans, should be backed by realistic and dedicated funding. It is needless to point out that public funding of RTD should be increased to the EU levels in a long-term basis. In the medium term, it would be beneficial to channel resources to higher education and RTD infrastructure. A positive step would be to **facilitate the exploitation of existing IST RTD facilities by funding the introduction of new IST tools to increase their efficiency.** The state should fund basic research in order to gradually develop expertise in emerging areas of ICT and should support applied research in order to increase the economy's competitiveness and the citizens' quality of life. Specific measures should also be taken to encourage private sector participation in IST RTD by introducing partial tax exemption at each level of taxation, by implementing programs that include setting up national funds with risk capital meant

for research and innovation, by providing incentives, such as loans for the private sector investing in research activities, and exclusion of donor organisations for research from custom taxes. Additionally, the state should consider providing funds to aid research institutions in preparing project proposals. One option is to reimburse (whole or part of) the expenses incurred for the preparation of project proposals that failed in the selection procedure, while achieving satisfactory evaluation results.

- **Promote transparency in the selection of IST RTD projects to be financed by the state and in the project implementation monitoring procedures.** By adopting and strictly enforcing a well defined procedure and a solid set of evaluation criteria for selection and monitoring, corruption will be minimised and participation in research activities will be encouraged. The evaluation criteria used in the EU Framework Packages could be adopted (Relevance, Potential Impact, S&T excellence, quality of the Consortium, Quality of Management and Resource Mobilisation). The relevant weight of these criteria will vary according to the specific needs of the project in question. Moreover, it would be of benefit to ensure that the evaluators are selected both from academia and the private sector. Finally, a “guest evaluator” mechanism could be established, in which renowned researchers from the EU are called to evaluate the project proposals. In this way, the country’s researchers will not only be assured of the transparency, in which project evaluation is performed, but also be provided with clear description of rules and procedures to adhere to, when submitting proposals or implementing projects also under EU framework programs.
- **Develop more ICT oriented curricula for all levels of the educational system.** IT skills should be considered core subject in the national educational curriculum. Furthermore, the benefits in working for the IST RTD sector will need to be emphasized not only by organising “infodays” at schools where renowned researchers and members of IST RTD related companies participate, but also through evidence of the existence of a system that ensures that the graduates of IST RTD courses will be absorbed swiftly in either the academia or the industry, thereby providing motivation for students to take up research-oriented studies from their early education days. The latter is especially useful to countries with heavy unemployment problems, such as Albania. Two good migratory examples are Spain’s “Ramon y Cajal” and “Torres Quevedo” programmes. The former concentrates in improving the working conditions of researchers, identify the best graduates and inserting them in the RTD sector and supports researcher mobility and transferability either from abroad or within the country. The latter focuses on facilitating the RTD process by co-funding projects that are undertaken by SMEs and promotes the transfer of their results from private to public entities
- **Invest in higher education, create an educated workforce from which a research community will evolve and mend for life-long learning in IT.** Strengthening the human capacities in terms of ICT skills is urgently required to create highly skilled individuals that can retain a competitive place in the market. Higher education graduates will become the force that will underpin an innovation oriented economy and investment in the higher education and research system will ensure a constant flow of competent experts. Governments should develop a coordinated national strategy to encourage students to study subjects of national importance and introduce financial incentives for post-graduate and career re-skill training as life long education is a core feature of a flexible and successful economy. However, as investment in education is effective in the long-term the exploitation of EU funds in that respect would assist in dealing with the current limitations in available state funding.
- **Foster international and regional cooperation and coordination of IST RTD.** This could be achieved by adhering to a common approach based in the ERA principles both on a multilateral and a bilateral level. Especially regarding the GREAT-IST countries that were part of the former Yugoslavia, such cooperation schemes are worthy of exploitation, since most of them are at the same level of IST RTD growth and, as such, a well-coordinated effort that would blend the relative strengths and weaknesses in resources could produce much more rapid benefit rather than if each country strived alone to achieve the same goals. Cross-border RTD clusters, like Oresund at the borders of Sweden and Denmark, which is one of the most prominent biotechnology research hubs, is an example worth considering. Oresund has become, through mutual efforts by both governments and participation of key private companies, one of the regions with the biggest concentration of highly educated researchers in Europe and has managed to create a branding scheme and an image that is well-received in the outside world. On a side note, such endeavours may even bridge some of the cultural differences in the region of the former Yugoslavia and even promote the stability of the region itself.

- **Coordinate efforts with international donor community to fund IST projects that will enhance the IST RTD capacities and serve the local needs.** International development assistance is increasingly focusing in the IST sector and to the development of the institutional reforms that facilitate the introduction of competition as a force for growth.
- **Prevent brain-drain and take measures to attempt brain-gain by exploiting the considerable Diasporas through the establishment of cooperation links and the provision of incentives to revert the trend for immigration.** First of all the scientists and experts that live and work in these countries should be provided with financial aid, recognition, up-to-date equipment, facilities to conduct research and good working conditions. The establishment of financial rewards, scholarships and promotion of successful researchers and RTD-oriented companies through a research-beneficiary foundation would provide a strong motivation against scientist immigration. **The state should initialise programs that attract skilled immigrants to return by introducing grants, subsidies or preferential terms for returning.** Scientists working in more developed countries are often underutilized resources. The vicious cycle of brain drain and brain waste could be reversed into a virtuous cycle as the market for highly skilled (knowledge) workers will become even more globally integrated. Expatriates do not need to be investors or make financial contributions to have an impact on their home countries. Instead, they can serve as links by providing access to markets, sources of investment, and expertise. **Influential members of Diasporas could also shape public debate, articulate reform plans and help implement reforms and new projects.** Policy expertise and managerial and marketing knowledge are the most significant resources of Diasporas networks. A good example is Bangalore, India's "Silicon Valley" which managed to attract expatriates due to an intense scientist return scheme, "Non-resident Indians". Furthermore, the concentration of RTD-related university faculties in the University of Bangalore made the city into an educational hub, which added prestige and also formed another motivation for returning scientists. Today, Bangalore is one of the biggest research-intensive regional clusters in the world.
- **Introduce policy measures to raise the number of women in IST higher education and reform the IST RTD framework to provide equal opportunities for minorities by eliminating social and economical barriers.** As there is a mismatch between demand and supply of qualified workforce the unwillingness of certain groups and letting out big parts of the population is not a only an undesirable situation but a significant barrier to the optimum exploitation of human capital. This has to be addressed at the national policy level, and at each level, with relevant policies, strategies and action plans. The problem of women participation in IST is particularly acute as women do not seem to adopt such field of studies in their career because of lack of incentives, lack of role models, and an unsupportive environment. Even when they adopt such a career socioeconomic barriers haunt them along the way at the research, promotion and career development stage.

## PRIVATE SECTOR PARTICIPATION IN IST RESEARCH

A good best policy example that could be exploited for the GREAT-IST region towards encouragement of the private sector in IST research is **the case of Northern Jutland, in Denmark, which made a successful transition from a more agricultural-based region to a high-tech-oriented research and development cluster, during the 1990s**. Our example involves the ICT cluster 'NorCOM' that was originally triggered by a private firm initiative. A club (NorCOM) was founded in 1997 by 20 firms, the Aalborg University and the university based 'NOVI' science park that is concentrated on the ICT sector. The cluster is focused on production and development of mobile communications equipment, cordless systems, modem and fax equipment for wire and wireless systems as well as various equipments for maritime communications and navigation (Dalum et al. 1999; Stoerring and Dalum 2006). It is noted that a coherent policy framework supports the economic development. The installation of bridging institutions and (financial) support schemes on a European and national level contribute to the region's success (Dalum et al. 1999). For instance, over 40 organisations are involved in economic development activities and business support (Damborg and Halkier 1998). NorCOM is characterised by a "bottom-up" approach to RTD development, in which the existing infrastructures from the nearby university (high skilled personnel and ICT focus) works in tandem with an overall regional development policy that provides the motivation for the creation of small businesses and their incorporation to the NorCOM cluster. The omnipresent collaboration between the academia and the private sector in this cluster has provided enough momentum to alleviate the region into one of the most ICT research-focused clusters in Scandinavia.

In order to stimulate interest and strengthen the role of the private sector, and SMEs in particular, in IST RTD, the target countries should:

- **Strengthen the links and collaboration between the research and the business community** by establishing networks, databases of research capacities and institutions and communication channels to ensure genuine RTD activities, effective knowledge-sharing and networking. These communications mechanisms will allow the private sector to articulate its longer term needs and the academia to be interactive and responsive to them. Allowing the formation of University research faculties near a RTD-oriented business cluster such as in Tutlingen, Germany and the provision of training courses within these faculties themselves for members of the industry would, not only form better communication channels and facilitate information flow between academia and the private sector but also strengthen the bond between them through every-day collaborations. Government funding should systematically encourage business-academia collaboration through suitable co-financing and tax incentives schemes.
- **Focus on attracting FDI in IST RTD related activities aiming to develop local capacities.** Synergies of international firms with local actors should be actively encouraged. Public private partnerships could be a great tool to enhance such activities and the lack of a legislative framework for PPP's in addition to the inexperience to handle such schemes has been observed in all the countries as a prohibiting factor for attracting FDI in particular and engaging private investment in general. The internationalisation of the Tutlingen cluster in Germany is another issue promoting knowledge transfer and fostering innovation 'back home'. External connections from leading enterprises imported new knowledge into the region. This was followed by the so-called 'buzz' in the cluster, i.e. the ability of SMEs to copy and improve new products just by seeing and copying them, which illustrates how RTD may progress. (Halder 2004: 229).
- **Support the role of the private sector, and especially SME's, to engage in IST RTD. Tax incentives should be offered to encourage private RTD and IST investment. A culture of risk-taking and entrepreneurship is still non-existing and should be systematically cultivated.** It is also necessary to promote success models for entrepreneurs and the government With demonstrations that could trigger the development of private sector IST RTD. Innovative SMEs are important for developing radically new technological solutions and products, since their contribution is critical in maintaining technological diversity, when large firms typically innovate incrementally

within existing technological trajectories. **The target countries would benefit from a non-direct approach to competitiveness:** instead of companies competing directly for the same products, it would be better to promote research to a wider range of IST products, while at the same time fostering collaboration between different specialist companies in order to deliver a more sophisticated end product. This policy of labour division and indirect competition has been successful in alleviating Prato in Italy from a low-competence region to one of the most prominent textile production centers in Europe. In essence, the regional companies bonded together to obtain a greater benefit rather than competing with each other in the market.

- **Facilitate the creation of small start-up firms in IST as vehicles for flexible and effective means for the commercialization of research** in the form of improved access to venture capital and creation of an investment friendly environment. Minimise bureaucracy and facilitate the initial establishment in time and costs for SMEs. Also, allow them to penetrate and make use of financing opportunities that will permit the full exploitation of their potential in knowledge and innovative ideas.
- **The State should systematically support the participation of the private sector in the IST RTD programmes of EU.** In many cases support for participation, which should include not only financial aid, but also information, advice and guidance, is currently limited to large public sector research bodies, who are already the dominant recipients of public RTD funding.
- **The State should explore and exploit Off-set opportunities, where available as the result of major procurements from EU countries and others, and direct some of these benefits also to the support of private sector RTD activities.** Today such Off-set opportunities might be limited, but as these counties develop they might be increased and could be utilised to fund infrastructure building and research oriented development in ICT. The State could also explore the possibility of acquiring contracts for RTD outsourcing services to be performed by national experts and organisations for the respective direct or indirect off-set partners.

The GREAT – IST region has a significant IST research potential, which remains to be utilized, as this project has demonstrated. Current Institutional inefficiencies, political problems and lack of financial resources limit their ability to maximise the benefits from the region's accession to the EU to a greater extent than in the recent past. The specific recommendations and the broad orientations outlined above have the potential to considerably strengthen their IST RTD capacity, enabling them to address those major challenges and to become equal partners in the European Research Area by joining the European Union to prevail in an environment of increasing global competition. However, the aforementioned set of policy recommendations is in no way exhaustive and mainly summarises the findings of the GREAT-IST project and the views of the project team. These suggestions should be combined with a focused reform effort that will support the IST RTD sector and benefit by its development. Hopefully, the GREAT IST project has been able to contribute in this wider effort.

In the paragraphs that follow, the data, the analysis and the conclusions drawn on each of the studied target countries are presented. The material in the second part of this document practically allows for a more in depth evaluation of the situation per country and explains the views presented in this first part of the document.

## **PART 2- PER COUNTRY ANALYSIS AND RECOMMENDATIONS ON IST RTD POLICIES**

### **Section 1: The case of Albania**

#### **1.1. State of the Art Analysis**

Albania can be regarded as being in an early development phase concerning IST RTD infrastructure and activities, which can be mainly attributed to the poor economy of the country. Since 2003, when the National Strategy for ICT Development was introduced, there has been some progress towards EU convergence regarding the field but there are still several areas that need attention, such as the formulation of a specific legal framework for IST RTD, the incorporation of a distinct set of priorities for future research work into the National Strategy, and strong public sector support for involvement in IST RTD. Nevertheless, Albania has recently adopted measures that facilitate foreign investment in the country, alleviate some of the tax related issues regarding private sector participation and strengthen Private-Academic collaborations. These measures have already shown good results.

Albania can be described as being “in an early stage of development”, especially when it comes to its IST RTD infrastructure and performance, however this should come as no surprise considering the country’s overall poor economic state. Regarding the IST Institutional support, Albania does not have a specific legal framework for IST research. It is rather regulated by some more generic Laws and regulations, such as the Law on Higher Education and the Law on the Academy of Sciences. However, some of these laws are more than a decade old, (Law on Science and Technological Development-1994) and will need to be re-evaluated and/or amended to incorporate the current changes. Eventually, a more solid framework will have to be formulated so as to promote the IST RTD sector and encompass all its needs. The Ministry of Education and Science remains the primary and only major policy making institution, with the Academy of Sciences as a manager and financial decision maker for RTD activities. State funding remains low with GERD 2005 at approximately 0.2% of GDP. Information dissemination is at rather basic levels (info-days, websites and newsletters). Finally, in 2005 an initiative for the reform of the scientific research area was introduced envisioning the attachment of research institutes to Universities which would aid in the evaluation and ICT development quite significantly. One of the biggest problems Albania faces a distinct lack of human resources that would be able to undertake scientific research work, since the country has been severely affected by brain-drain and the existing education system is rather poor.

Albania has a National Strategy for the ICT sector in general since 2003, which foresees the implementation of key measures for the development of the sector, including ways to increase the RTD funding, but there is otherwise no specific reference to research priorities or other measures that need to be implemented in order to develop IST RTD. Focus is mainly directed at Albania’s electronic development as part of an attempt to grow economically, with limited focus on promoting scientific research activities. This is also indicated from the relatively low current International Cooperation for EU research projects and the absence of evaluation and policy revision schemes for RTD, although such actions are envisaged in the National Strategy Document. There is also a requirement for further legislative support regarding Intellectual Property Rights. According to the SAA report in 2006, there has been established a Directorate for Patterns and Trademarks under the Ministry of Economy Trade and Energy, but the law on Copyright and related rights is not yet operational. Work towards fulfilling the SAA commitments is still at an early stage.

The Private IST sector Albania is developing rather slowly. The main obstacle, as expressed by the interviewed stakeholders, is the problematic business climate for the ICT sector. More specifically, the business sector suffers from the lack of managerial skills, of appropriate funding and incentives policies, of

delays in liberalisation processes and more. The major focus of the ICT sector is on telecom services and electronic equipment, which is also the biggest target of foreign investment. Very little attention is given to IST RTD. In fact, it is indicative that from a total of 3 projects and 64 participants in the IST area from Albania in FP6, the private sector is completely absent. SMEs are facing insecurity and thus are discouraged from partaking in RTD activities, partly because the information dissemination mechanism regarding such projects is poor and due to a weak incentives policy implemented by the State. Last but not least, the overall financing and support for SMEs is described as inadequate and the Public-Private Partnerships (PPP) sector is in dire need of a specific legal framework to define it. Still, in 2006 the government introduced a number of measures that would mitigate the problem by approving a revised action plan to alleviate bureaucracy, reform the tax regime for SMEs and also by implementing the "1 Euro" programme to attract more foreign investors in the sector. The Albania One Euro Program aims at encouraging foreign investors to enter the Albanian market by granting public assets as concessions at a symbolic price of 1 Euro according to the rules and procedures set out in the newly adopted Concession Law; and by reducing cost of services to investors to around 1 Euro. These services include some permits, procedures, visa fees for foreign investors, border taxes and other minor taxes, etc. A legal framework for PPPs is due in the following years, in an effort to improve the private sector environment.

## 1.2. SWOT Analysis of the IST RTD framework

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• <b>The National Strategy for Development of ICT was adopted</b> in 2003, is a result of collaboration with International Organisations and its Action Plan is also in accordance to the eSEE Agenda. This indicates a strong will to develop the IST environment of the country, with an emphasis on better international cooperation schemes.</li> <li>• A direct result of the above is the <b>fast progress in what regards the IST legislative framework</b> in Albania since this has been viewed as a matter of prime urgency.</li> <li>• The last few years have seen a <b>major institutional reform taking place</b> in the country, with specific roadmaps and evaluation criteria being on its central axis.</li> <li>• <b>FDI has increased</b>, aided by the fact that labour cost in Albania is lower compared to the rest of the GREAT IST target countries and programmes such as “Albania One Euro” (2006).</li> <li>• <b>The Cabinet-Level State Body for Information Society has been recently created</b></li> <li>• <b>The State Body for Information Society has identified a promising list of activities concerning the monitoring and evaluation of ICT.</b></li> <li>• <b>Dynamic economic growth (recently over 5%).</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>The strategy is widely generic with very general priorities</b> which portray more the wishes of the country to align with the EU priorities, than dealing with the realistic potential of the country. Furthermore, it doesn't include the research community in an organized way.</li> <li>• <b>Albania's poor economic situation</b> has hindered IST research, due to lack of funding (GERD 2005 was 0.2% GDP). Unstable political environment and relatively high illiteracy of the population causing problems and brain drain.</li> <li>• <b>Existing institutions have overlapping responsibilities and lack experience in project development.</b></li> <li>• <b>Broadband infrastructure is practically non-existent.</b></li> <li>• <b>Low access to IT facilities, 11 PCs per 1,000 population (in 2004)</b></li> <li>• <b>The legislation does not create enough stimulus</b> for the implementation and deployment of ICT.</li> <li>• <b>Administration is more politically than professionally driven</b>, which also hinders the ICT private sector, which already lacks an adequate motivation and support scheme for IST RTD.</li> <li>• <b>IST RTD, until recently, had not been given much attention.</b> This, together with the absence of well-qualified and specialized scientific personnel has resulted in poor participation in EU and International research projects.</li> <li>• <b>An unfavourable business climate, especially for SMEs, with little provisions for supporting IST RTD, low levels of information dissemination and poor financial and business planning.</b></li> <li>• <b>Albania's education system has a weak academic research background.</b> At the same time, due to excessive brain drain Albania has very low human resources. Young people are not following scientific research orientations.</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>• <b>Albania is included in EU projects which aim to expand the IST research horizons in the South East Europe</b> (SEEREN, SEE-GRID 2, SEE-Innovation). Furthermore, although participation in FP6 had been poor, Albania had a quite good success rate (18.7% with 8.9% for ICT)</li> <li>• <b>Albania's very low labour cost and recent governmental schemes to attract investors do form an opportunity for FDI inflow</b> which, provided that the governmental focus is switched to favour IST RTD more and brain gain policies are supported, provides a favourable ground for extra research funding.</li> <li>• <b>Albania's population is quite young</b> which means that an appropriate and systematic education system backed up with the necessary organisational and technological infrastructure could provide a significantly large pool of quality scientists.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Low development rate could cause the technological divide to widen.</b></li> <li>• <b>Albania has a high amount of brain drain</b>, due to the low motivation for IST research of the past years. If this is not stabilized, the human capacity problem will worsen.</li> <li>• <b>The implementation of the Strategy lags behind.</b> The main responsibility is on the Government that does not pay the necessary attention and the lack of motivation to improve the quality of the research community.</li> <li>• <b>The academic community is not included in many important IST projects.</b></li> <li>• <b>Low social and political awareness on IPR and the benefits of Information society and knowledge-driven economies.</b></li> <li>• <b>Large “grey economy”</b>, estimated to almost half of the GDP.</li> <li>• <b>Since the National Strategy priorities are not in accordance to the country's growth rate potential</b> at the moment but more of a wish list, it will be difficult to implement, which could result in low morale and further growth prevention.</li> <li>• <b>If the lack of organisation, leadership, motivation and focus on the private sector</b> continues as is, it will have very undesirable consequences for the country's ICT RTD potential in the future.</li> </ul>

**STRENGTHS:** Albania's ICT policy is currently in a state of a radical reform. A commendable effort is made to align the country's ICT policy and infrastructure to EU standards. Albania has managed to slowly improve its economical status and although it is not yet capable to undertake a leap towards IST RTD development, this fact constitutes a promising factor. The adoption of a National Strategy in 2003 has been a positive step forward, despite its imperfections. Institutions and governmental bodies are being re-evaluated in line with the new objectives and new bodies are being formed. Participation in EU research projects has also started to improve, as well as international cooperation. FDI inflow has also increased, due to some business-attracting measures released in the past few years, such as the "Albania One Euro" programme. Additionally, the country has also managed to successfully promote its low labour cost. At state organisation level the creation of the Cabinet-Level State Body for Information Society, headed by the Prime Minister himself, reflects the government's will to focus greatly on the ICT sector. The State Body for Information Society has undertaken several new activities, such as distinct evaluation methods and criteria, re-evaluation and redirection of the strategic objectives towards a more realistic approach to the country's potential and the formulation of several implementation scenarios.

**WEAKNESSES:** One of the major factors hindering development in Albania are the weaknesses in the National Strategy that stem from the fact that its objectives seem to be overly ambitious regarding the country's actual growth potential, at the moment. Furthermore, its priorities and objectives are generic which, although useful as a starting point, do not aid in growth at a later stage. Albania's past economic problems and its lack of focus on ICT have resulted in a serious lack of infrastructure, at all levels. Legal and institutional support has been missing for IST RTD, with administration that was more politically than professionally driven. This fact, coupled with the severe brain-drain that the country is facing, high population illiteracy and the low financial aid (GERD 2005 0.2% GDP), constitutes a major inhibiting factor for ICT growth. The education system is not ready to promote and support a rapid growth in ICT development, since it is not focused on technological subjects and the quality of education programmes is relatively poor. At the same time, Albania suffered a severe brain drain wave and due to political reasons has remained relatively isolated. Technology infrastructure is inadequate, broadband penetration is almost inexistent, e-services are at an infantile stage and scientific equipment used for research is outdated. Legislation for IPR and electronic crime has only recently taken into account for, information dissemination from institutions is clearly inadequate and research opportunities are absent altogether. The private business sector is suffering from the lack of a result-oriented scheme aimed at encouraging private company participation in IST RTD, and the lack of specific legislation for SMEs, public-private partnerships and collaborations between academia and the business sector. The situation is coupled with a lack of organisational behaviour, limited business competence, and generally an undeveloped entrepreneurial culture.

**OPPORTUNITIES:** The newly formed State-level body for information society, adjacent to the Prime Minister, the substantial effort to perform policy evaluation through distinct and measurable criteria together with the recent introduction of Albania to many EU level research projects and networks could aid significantly in combating the country's inherent weaknesses in the ICT sector. The fact that Albania's economy has been improving could provide an opportunity for better funding for RTD since IST is now a priority, given of course that the research sector will be given its due importance. Careful promotion of Albania's low labour cost should also bring extra FDI income, improving the above condition significantly more. Finally, the effort to alleviate the brain drain could potentially be facilitated by the fact that the country's population is young and can provide a steady pool of educated experts, provided of course that the country invests in its education system significantly.

**THREATS:** Albania should assume more rapid growth rates in the ICT sector, since failure to do so will lead to a serious risk of increasing the gap with the EU and neighbouring countries to an irreversible extent. At the same time, the educational system is in a dire need of a severe reform and a new focus in technological and scientific subjects to breed researchers in the country. The actual threat lies in the fact that strategic objectives may be theoretically in place, but implementation is lagging behind and brain drain becomes yet another aggravating factor. Regarding the economic problems, the high percentage of the "shadow market", which is estimated to produce about half of the GDP constitutes a major threat to Albania's economic development and private sector growth. Albania's industrial participation in IST research has been very poor to virtually non-existent due to the aforementioned weaknesses, something which not only endangers the country's effort towards international collaboration and fund raising, but also creates and prolongs the inherent deficiency of the private sector, which is a vital instrument in IST and RTD growth. Finally, the low awareness both from the public and, until recently, from the government, due to poor information relay and lack of focus, could form a hard-to-overcome barrier for Albania's strategic objectives in the ICT sector.

### 1.3. Country IST RTD Policy Recommendations

Albania is a country oscillating between the need to establish a solid economic basis in order to grow at various levels and the will to evolve rapidly in the ICT sector in order to be aligned with the EU and possibly aim at an accession process. Its main problems are a serious lack of human resources, high amount of illiteracy and insufficient education to support a rapid IST RTD growth, very low funding allocated in the sector and directional and managerial deficiencies. Therefore, indicative IST RTD Policy recommendations for Albania concentrate on brain drain prevention and human capacity building, as well as organisational and administrative reforms coupled with the necessary infrastructure development.

- **Review and amend the IST RTD priorities** having in mind the real capabilities and potential of the country at the moment. Only by focusing on the real strengths and planning realistically the steps needed for a growth in the sector will the normative regime coincide with the implementation processes.
- **Formulate a policy to prevent brain-drain and, for a later stage, promote brain gain** by giving Albanian scientists and experts the incentives to stay in the country rather than migrate. It is important that this applies not only to researchers but members of the education system as well. Financial rewards or some sort of recognition could be given to researchers who succeed in innovation activities or manage to win ICT projects.
- **Take specific measures that promote private sector participation in research and development activities**, by financially or otherwise supporting private entities that wish to participate in EU Framework programme projects, by applying tax reduction measures for entities that employ individuals with higher education, by subsidising the development of innovative products and services, and more.
- **Apply a greater effort in improving the business sector climate**, by allocating a coordinating, information relay and funding body for the promotion of research to private companies and forming a communication link between the market and the academia. The promotion of the country's cheap labour force abroad and the continuation of FDI attraction projects such as the "Albania One Euro" are important steps in attracting business agreements and foreign activity in the country.
- **Develop official monitoring statistics for IST RTD** and a policy evaluation process needs to be formulated, adhered to and undertaken by a central high level body such as the recently formed State Body for Information Society.
- **Establish information centers for raising awareness** of the benefits of ICT usage and research opportunities throughout the whole country, which, in conjunction with an improvement of the existing telecommunications network, will also help in bridging the Urban-Rural technological divide.
- **Reposition the administration of ICT companies and of state bodies related to the sector reflecting technical rather than political backgrounds**, with key positions occupied by personnel that have both the scientific and the managerial skills to propel the system in the right direction and make more efficient use of resources.
- **Devise and implement measures for more successful international cooperation and participation in EU research projects.** The incorporation of the teaching of computer use and the English language at schools and institutions-companies, an update of the scientific curricula of Education institutions as a result of communication with the market and its needs and the methods to attract renowned IT organizations to establish training centers in Albania are such examples.

## Section 2: The case of Belarus

### 2.1. State of the Art Analysis

Belarus is a country that shows good potential in ICT sector development, having developed a Strategy scheme up to 2020 with the “Electronic Belarus” programme and a good institutional support mechanism for IST RTD in place. It is worthy to note that the country was at the forefront of technological potential and development during its Soviet era, ahead of the rest of the former SU republics. However, the private sector is still facing development barriers, since the State-centred policy common to ex-Soviet Union countries hinders SME participation in research activities and maintains a state enterprise dominated market. Regarding convergence to EU standards, Belarus has a similar orientation in many fields, such as a number of research priorities, but at the same time it lacks efficient specific legislation for scientific research, intellectual property rights and private-public partnerships.

More specifically, a legislative framework that explicitly caters for IST RTD does not exist in Belarus. Legal support is in the form of a series of ministerial Decrees, objectives in the programme “Electronic Belarus” and coordinated by an Inter-Ministerial Commission on Informatisation (formed in 1998 and amended in 2006). The only law relative to ICT is “on information, informatisation and information protection”, expected to be ready in early 2007. Moreover, the necessary institutional support is in place with a total of 5 state bodies responsible for IST RTD. However, none of these bodies has policy making capabilities and some of them appear relatively inactive or passive, as for instance the Inter-Ministerial government commission for ICT issues. In fact, even the Coordination council for “Electronic Belarus” was officially recognized as bearing poor results in 2006. The Academy of Science, as in all the ex-soviet countries, appears to be the most active entity in RTD and dominates the field. State funding for RTD is planned to reach 1.8% in 2015, but it was still only 0.76% GDP in 2006. However, Belarus has a good basis of research institutes and universities and a very good information dissemination system (workshops, conferences, Info days, awareness-raising events, public forums, information bulletins and the National Information Point acting as the primary portal). Unfortunately, IST RTD Evaluation is not implemented and remains a task in the Prime Minister’s portfolio.

The two main National Strategy definers are the “Electronic Belarus Programme”, launched in 2002 and the “National Strategy for sustainable development for the period to 2020”. IST RTD priorities are defined more explicitly in the Decree on priorities of scientific and technological activities (2005) and show some good degree of convergence with the corresponding EU priorities (e.g. Nanotechnologies and microelectronics). Electronic Belarus envisioned a dramatic development between 2002 and 2007, but it did not bear the expected results and thus its policy was amended and improved in 2006. However, the national strategy as a whole does not focus in Research infrastructure a great deal, but rather in the creation of a modern information society system, e-Government and e-Health. Intellectual Property rights have, so far, received legislative support for fighting cyber-crime and Patent use. Legislative acts that encompass Equal opportunities and IPR are in the scope of the strategy for 2020, but are not yet implemented. At a national level, bilateral cooperation with international entities is quite strong, having agreements with more than 30 countries including 12 from the EU. Finally, the process of overall evaluation of each strategic project is realized by two organizations appointed by the government, one acting as a leader and guide and the other as responsible for its timely execution. The latest policy revision was made in 2006, when the Minister of Informatisation and Communications announced the implementation of a new RTD Programme named “Electronics 2006-2010” as a series of amendment actions to the “Electronic Belarus” programme.

The Belarusian private ICT Sector is primarily concerned with software and related applications and dominated by State-owned companies which, as a logical consequence, receive the major part of attention by the government. Specific IST RTD is rather low and manifests itself as part of larger ICT projects, such as “Electronic Belarus”. Foreign investment is gradually increasing at a relatively fast pace (tripled between 2004 and 2005), but no direct relation to a research-oriented investment can be indicated. Low interest in research is also attested by the country’s poor participation in the EU FP6 programme with only 3 participants from the IST sector. This phenomenon might originate from the strong state-centred policy, which hinders SMEs from partaking in such activities, by not providing financial support programmes for companies undertaking to submit project proposals for the EU and very limited (if any) incentives for them to

participate in research projects, Taxation, bureaucracy and non-transparent project allocation processes are part of a problem. According to the interviewed stakeholders, Belarus is only formally harmonized to the EU standards and there is a big discrepancy between the normative regime and the actual state of affairs in the IST domain. Private-Public partnerships are almost nonexistent and there is no legal framework to support them. All incentives for IST RTD are materialized through budgetary funds for projects conducted by state owned companies and institutes, belonging to a large extent to the Academy of Sciences. Nevertheless, this situation results in a highly rated collaboration mechanism between the Academia and the private sector, especially after the recently provided incentive for the development of Science Parks. On the other hand, the monopolization of the ICT market by the State presents a significant barrier towards SME development and contribution to the sector which limits the country's potential for further progress in the IST RTD field.

## 2.2. SWOT Analysis of the IST RTD framework

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• <b>Belarus has adopted a national strategy document (“Electronic Belarus”) since 2003 and amended by recent documents.</b></li> <li>• <b>Belarus has a very good scientific and technological potential</b> with nearly 300 institutions, companies and enterprises operating on the scientific and technological sector.</li> <li>• <b>Good education system, adequately financed</b> (6.6% of GDP in 2005)</li> <li>• <b>Belarusian scientists are ample and have good experience</b> of projects and research, if only as a legacy from the USSR era.</li> <li>• <b>Belarus has a strong IT industry as a legacy from its Soviet past.</b> Its export-oriented nature and efficiency is a valuable attractor of FDI and international cooperation and can also provide a strong research drive in the field.</li> <li>• <b>Currently 15,000 IT professionals in Belarus, 90% hold university degrees.</b></li> <li>• <b>High GDP growth rate (8.4% in 2006).</b></li> </ul>	<ul style="list-style-type: none"> <li>• There is a gap between the proposed strategic objectives and the actual implementation of them, which has resulted to Belarus being behind schedule (e.g. IPR)</li> <li>• The general legislative framework is also lacking successful implementation and some basic provisions, especially as regards the private sector.</li> <li>• <b>The funds allocated for IST RTD have been declining in numbers during the previous years</b> (GERD 0.76% GDP in 2006).</li> <li>• <b>There is a problem in organising the IST RTD support mechanism at the governmental level</b>, with various bodies and institutions not having well-defined responsibilities, often overlapping each other.</li> <li>• <b>RTD infrastructure is at a low level</b>, with poor internet penetration (especially broadband), outdated research equipment, absence of a research-oriented scientific network between universities and research centres and low public awareness.</li> <li>• <b>The private sector is state-monopolised and plagued by bureaucracy.</b></li> <li>• <b>The absence of an incentives mechanism for new companies and SMEs</b>, along with project allocation not being entirely transparent, promote a feeling of uncertainty that hinders potential growth and industrial participation in research activities.</li> <li>• <b>There is no discrete evaluation mechanism, based on measurable indicators, nor a specific evaluation method.</b> This has led to the approval of projects that were inappropriate for the time, and resulted in a waste of resources.</li> <li>• <b>Among the lowest success rates in FP6</b> (only 10%), and only slightly higher rate in IST projects (11.5%).</li> <li>• <b>27.1% of population live under the poverty line</b> (2003 estimate).</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>• <b>With adequate support from the government, the Belarusian ICT growth has the potential to be remarkable.</b> As already stated, there exists a very solid basis both in terms of available human resources and scientific experience, waiting to be efficiently exploited.</li> <li>• <b>Belarus has the opportunity to become a regional ICT “hub”</b> for innovation and experimentation through spillovers, if research networks and knowledge-based communities are developed.</li> <li>• <b>The ICT Market has the potential to grow considerably fast</b>, once its key problems are dealt with. The Soviet past of the country has left a legacy of a technology-oriented mentality, which can be shown by the fact that the Private Sector received a high percentage of the GDP for RTD purposes, compared to the rest of the target countries.</li> <li>• <b>The EU enlargement</b> offers a very good opportunity for international cooperation and exchange of expertise.</li> <li>• <b>In 2006 the government introduced a tax-exemption plan for businesses related to research activities.</b> This is a very good opportunity to restructure the private sector as, obviously, the government has focused more</li> </ul>	<ul style="list-style-type: none"> <li>• <b>If the realisation of the National strategy continues falling behind schedule, Belarus will be left behind in ICT development with respect to its peer countries.</b></li> <li>• <b>Adherence to old-fashioned bureaucratic regimes, non-existent stimuli and slow market liberalisation</b> could not only affect the industrial participation in IST research in the country per se, but can also be a major prohibiting factor for FDI influx.</li> <li>• <b>Strategy implementation inefficiency, inefficient funding and failure to provide a discrete legal framework</b> to support ICT and ICT research will prolong the cases of corruption and will result in a zero-growth condition, with undesirable consequences.</li> <li>• <b>Inadequate information relay and circulation</b> will prevent Belarus from actively participating in many international and European projects, leading to Belarusian scientists and companies not being competent in terms of research experience.</li> </ul>

**STRENGTHS:** Belarus has actively sought to formulate a coherent National Strategy for ICT and RTD since 2003, with the introduction of the “Electronic Belarus” Programme. This document has been amended a number of times, in order to broaden the time-horizon of the country’s ICT growth, to plan a long-term course of action and align its priorities and objectives to EU standards and initiatives such as i2010, FP6 and FP7 (“National Strategy for Sustainable Development for the Period to 2020 of the Republic of Belarus” (2004), “Decree on priorities of scientific and technical activities for 2006-2010”, and “R&D programme "Electronics" for 2006-2010”). The result has been a well-written document with clearly described priorities and actions. Belarusian scientists are numerous, well-specialised in their fields of expertise and have had considerable research experience, if only due to the Soviet period in which technological advancement had been a main priority. Supportive to this notion is an education system that is well financed (6.6% of GDP in 2005) and theoretically capable to support a major turn of focus into ICT. At the same time, there exist over 300 institutions, companies and organisations dealing with the ICT sector, providing a solid background for growth, as well as a considerably high ICT export market which not only brings valuable income to the country (circa USD 100 mln on a yearly basis) but provides the drive for further research work.

**WEAKNESSES:** There is a gap between declarations and actual implementation efficiency of the proposed strategies. A significant problem has been the inconsistent assignment and coordination of responsibilities among the various institutions and bodies involved in the strategic implementation. The main coordinator role has been changed among the National Academy of Sciences (2002), the Ministry of Communications and Informatisation (2004) and AGAT, a military-industrial enterprise (2005). As a result, the 2006 evaluation indicated poor implementation performance and the coordination role has been reassigned, since then, to the Ministry of Statistics and Analysis. Poor implementation is evident in the supportive legal framework, where laws are in place, but not implemented properly, especially in the case of IPR. The absence of a specific evaluation method based on distinct and measurable indicators is also a hindering factor for progress. Information relay on all levels is problematic, and so opportunities for research involvement both from academia and the private sector tend to pass unnoticed. The industry has a seriously low involvement in international projects mainly attributed to the country’s restricting and bureaucratic policies that discourage companies by not introducing favourable incentives policies. On the other hand, market liberalisation is very slow and activities are monopolised by “state-owned” or “state-friendly” enterprises. Finally, it is remarkable that available funds for ICT RTD have decreased which has brought the infrastructural renovation to a grinding halt, with broadband penetration at low levels, outdated research equipment and poor facilities.

**OPPORTUNITIES:** Since the EU is expanding its borders into NIS offers a unique opportunity for a breakthrough of Belarusian International collaboration and its active participation into EU research projects. The country’s strong research basis offers the potential for a radically intense and rapid ICT development and research growth, if only opportunities like these arise and the country places its focus in improving the weaknesses of the current support system and does not rely only on ideas and programmes presented on paper. Perhaps time has been misused, but this also provides an opportunity to learn from the mistakes in order to restructure the whole ICT supporting mechanism so that it ensures efficient exploitation of the already strong resource base. Experience and technology-oriented mentalities, as a legacy from the Soviet period, still exist, that could elevate Belarus to a technology cradle in the region. The private sector also has the potential to grow considerably, if its main problems are successfully tackled. An opportunity indicator here is the recent governmental programme that offers tax exemption for research oriented businesses; a first move into an incentives policy which should not remain unexploited.

**THREATS:** If Belarus does not rapidly develop growth opportunities for the sector, its scientists will be forced to migrate to more technologically developed ones, thus increasing brain drain. The education system will suffer as a consequence, since expertise will be scarce to educate young students in specialised technological subjects. The once-ample human resource basis will become fractured and it might take several decades for the situation to be rectified. The prolongation of inefficient information relay and institutional and legislative organisation, will introduce more insecurity, corruption, keeping the country locked away from developments. The 2006 evaluation of the “Electronic Belarus” programme which showed that the Ministry of Informatisation, as the implementing body, had invested only 32% of budget allocated for eBelarus programme into the corresponding projects should already constitute a valuable lesson. Finally, the adherence to bureaucracy and failure to understand the flexibility of a liberalised and information-rich private sector will, firstly, prevent Belarus from benefiting from the EU expansion and, secondly, have a negative impact to FDI and the way foreign enterprises view the market, by eroding its trust from within.

### 2.3. Country IST RTD Policy Recommendations

Although the research potential of Belarus is quite high since a technology-oriented mentality in its education system has been adopted since the USSR years, its main problem lies in organisational difficulties and adherence to bureaucratic regimes, which severely delay and hamper any effort for growth. The “Electronic Belarus” programme, in its implementation, has a wide discrepancy with respect to the proposed strategic objectives and the overall implementation timetable. The private sector has similar problems in a relative fashion, plagued by extensive bureaucracy and the absence of enough stimuli to spur SMEs and IST enterprises to participation in research activities. More importantly, there have been numerous cases of project allocations not being transparent. Therefore, the IST RTD Policy recommendations for Belarus involve a “clean-up” of the current practices that keep the country behind, with some corrective actions regarding infrastructure building, administrative and directional rectifications.

- **Adopt and enforce a clear and transparent policy for evaluating research project proposals**, in order to combat the cases of corruption and non-transparent project allocations. This should eventually remove the feeling of insecurity and futility from the private sector and encourage participation in RTD activities, providing a much better exploitation of the Belarusian research potential.
- **Concentrate more on IST research than just IST development in terms of equipment and services**. Belarus should aim to provide more funding to their research sector in the following years, having a goal of at least 0.9 to 1% of GDP. The amount of financing from the IST market should also increase substantially.
- **Develop network infrastructures (high-speed networks) throughout the whole of the country** to give the opportunity to its citizens to understand first-hand the benefits of an IST-strong society. This should be done in conjunction with an organised effort to raise the level of awareness among its citizens and also among the public and private sectors. The whole process will help to decentralise ICT development from the capital, Minsk, because at the moment there is a big technological divide between urban and rural areas.
- **Make every effort to avoid another brain drain wave**. Scientists should be given recognition for their successful research and innovation activities, collaboration between academia and private research institutions should be promoted and strengthened, communication channels to inform for research possibilities and upcoming trends should be established and ran efficiently. At the same time, communication between the academia and the IST market should be strengthened in order to direct the education system and update the technological curricula to the new market trends and available technologies and to the specific needs of the country.
- **Develop official national statistics for IST RTD**, because at the moment the relative information is oftentimes unclear and spread between various bodies that constitute its institutional RTD support system. This measure has to be taken in conjunction with a major effort to design and implement an integrated and coordinated policy evaluation scheme in order to monitor and amend the strategic documents which, at present is scattered among different institutions and can be described as problematic at best.
- **Take measures to ensure the development of a more friendly business environment**, through less use of Red Tape, organised incentives policies for new enterprises and bonuses for innovation and research activity participation. A fund reserve should be established for research activities and the overall participation in International research projects encouraged to a significant extent.

## Section 3: The case of Bosnia & Herzegovina

### 3.1. State of the Art Analysis

Bosnia and Herzegovina is a country that is slowly progressing in the IST RTD sector, partly due to economical problems as a legacy of the war and partly because its multi-level governmental practice has not fully matured yet (Srpske Republic and Federation of BiH) and thus creates communication and administrative problems that hinder the development of a coherent IST RTD support mechanism. The reforms that took place in light of the ambition of the country to join the EU left the IST RTD sector relatively untouched, since although the government recognised IST RTD growth as a key sector, the implementation of the various strategic norms has been unsatisfactory. Following a UNESCO ROSTE report on "Guidance for a Science and Research Policy" in 2006, Bosnia and Herzegovina have acknowledged that the sector needs more attention, but concrete developments have not yet been accomplished. The IST sector is in a need of a major push at all levels (Institutional, Strategic and private sector support).

As regards to Institutional support, Bosnia and Herzegovina lacks a solid legislative framework for IST and RTD activities. The formation of such a tool is mentioned in the "Policy, Strategy and Action Plan for IS Development" that was adopted in 2004, but it has not been implemented yet, apart from the drafting of a Science Law and the Law for the Agency of Information Society. At present, IST development, include RTD activities in the field, follow generic legislation guidelines. Organization-wise, at a State level, the Ministry of Civil Affairs acts as a general overseer to coordinate IST policies, with its subordinate CIPS Directorate (Citizen Identification Protection System) having the implementation task. At a Federal level, the Federal Ministry for Education and Science coordinates these actions between the 10 cantonal ministries. The most recent endeavour is the launching of an e-Government project needed to coordinate these entities better. The major problem in this structure is that there is no entity responsible for assessing the needs for IST, propose priority areas for R&D and organize all such actions together with the above mentioned entities. This is why the government is examining the formation of an Agency for Information Society (stemming from the CIPS Directorate during 2006), which might provide the solution. In this environment the GERD for 2006 was only 0.05% of the GDP. With regards to the communication mechanisms, there are National Information Points, the ERANET and several portals at state or federal level. It cannot be stated that communication channels for information dissemination are not adequate, but rather that the support mechanisms are not as effective as required.

The IST development and IST research policies need prompt attention, since the National Strategy and Action plan from 2004 does not seem to have produced the expected results and there is no definite set of priorities in the context of both IST sector and IST RTD development. This is directly linked to the administrative difficulties at state and federal level described above. The UNESCO report provides a good set of guidelines for the development of the sector, but it needs to be backed up with concrete action plans and political endorsement. A rather encouraging fact is, however, that the Academy of Sciences has a new Strategy for IST development underway. In the current climate, the international cooperation of Bosnia and Herzegovina at state level is very low and the only activity in the sector originates in foreign private investments. The legislation on Intellectual Property Rights is ineffectively enforced and should be accompanied by a more concrete set of laws and regulations, in order to stand side by side with the Strategic development actions. The creation and adoption of a Book of Rules for the Intellectual Property Institute in 2006 is an indication of progress in this respect.

The war and the economic hardships it brought have struck the private ICT sector quite deeply, but the market seems to be stabilizing at a relatively good pace. Between 2003 and 2006, the number of companies has increased threefold. However, there has been very little IST research activity, as reflected in the poor participation in the FP6 programme and the market is more focused in services and telecommunication products. The business climate for IST has been rated as inadequate by stakeholders, their main concerns being the absence of an overall strategy for the sector, as well as incentives policy for SMEs and legislation for public-private partnerships. Lack of funding is also a big part of the problem, most of it originating from donor countries and foreign investments. There is no state-level RTD fund and local companies do not seem to actively invest in research activities. Several measures have been undertaken by the government to

address these issues, such as investment attracting schemes, but the fact remains that as long as research and education are not under the competence of the central government, implementation will be extremely slow. Interviewed stakeholders are willing to partake in joint initiatives and take a more active role in this sector, but seem insecure due to the absence of basic provisions. Finally, the academia-private collaboration schemes have shown positive results, but information dissemination is still rather moderate. A favourable development further linking the academia with the business sector and inspiring a new entrepreneurial culture could spring from the governmental initiative to pave the way for the construction of science parks.

### 3.2. SWOT Analysis of the IST RTD framework

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• <b>BiH has adopted a national strategy for ICT and RTD since 2004</b> under the auspices of UNDP and the Ministry of Communications and transport, and is aligned with EU standards.</li> <li>• <b>ICT RTD growth and international collaboration have achieved high political priority</b> and the State and Entity governments have agreed reinforce and/or amend the existing institutional support mechanism by creating adequate bodies of experts, with clearly defined roles.</li> <li>• <b>BiH has had a strong presence in the IT sector before the war</b> and this knowledge, as well as already tested best practices, has remained as a legacy.</li> <li>• <b>The IT sector has been steadily growing</b> in the past years, now numbering around 2,600 ICT related companies.</li> <li>• <b>The telecommunications market has had a considerable growth rate (7%)</b>. Increased FDI inflow and business turnover has aided significantly in raising funds that will aid in the reform and growth of the ICT sector as a whole.</li> <li>• <b>Enhanced participation of Bi-H in FP6 projects, compared to previous years.</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>BiH has the lowest funding for RTD among the target countries (0.05% GDP in 2006).</b></li> <li>• <b>The proposed strategy is generic to a significant extent, and its priorities,</b> creating a difference between the normative regime and the actual state of the strategy implementation.</li> <li>• <b>The political system and organisational structure,</b> with the Cantons and central government, <b>makes it difficult to achieve an efficient support mechanism</b> with clear roles between the institutions, because oftentimes these roles and responsibilities are overlapped.</li> <li>• <b>IPR have not been successfully enforced yet and the legal supportive framework for IST RTD is incomplete.</b></li> <li>• <b>BiH suffered a significant amount of brain drain,</b> which has further limited its already scarce resources.</li> <li>• <b>The business climate is generally rated as unfavourable and introverted,</b> with more than 90% of companies focused on the domestic market.</li> <li>• <b>Large companies dominate the market,</b> which together with insufficient incentives from the state and market fragmentation due to the cantonisation of the country, make it hard for new businesses and SMEs to play an active role in IST RTD.</li> <li>• <b>General lack of managerial know-how</b> on the SMEs behalf, which in turn hinders the sector's efficiency and growth.</li> <li>• <b>Infrastructure is at low levels,</b> with broadband penetration at an infantile stage. Urban-rural technological divide due to network concentration in major cities. The few research centres that exist have outdated equipment.</li> <li>• <b>The lowest success rate in FP6 is found in IST (5.9%),</b> although overall success rate in FP6 is rather high (16.8%)</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>• <b>The expansion of the European Union</b> and the numerous research programmes for strengthening the region's RTD capacity offer a good opportunity for BiH researchers to partake into joint projects and gain both experience and technological know-how.</li> <li>• <b>The National Academy of Sciences is already working on an amended version of the national strategy,</b> with a more realistic approach</li> <li>• <b>Three incumbent telecom operators are expected to be privatised until 2008.</b> If this is kept to schedule, Bosnia will have an influx of managerial know-how and the private sector, which is in a state of frantic reform will be able to resume its efforts with renewed morale.</li> <li>• <b>The opening of training academy branches of internationally renowned companies</b> between 2007 and 2008 (e.g. Cisco) will aid in the transfer of technological know-how and human capacity building.</li> <li>• <b>The formation of the new Agency for Information Society (2006)</b> is a promising move indicating the will of the government to establish a central mechanism for planning and evaluation, and also its will to make the necessary changes at a rapid pace.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>If institutional support and the research capability of the country is not ameliorated, it will be hard to overcome the brain drain</b></li> <li>• <b>The political instability of the region</b> adds a threat factor and an insecurity parameter in Bi-H</li> <li>• <b>The damage done to the system organisation and the country's infrastructure,</b> could bring the country to a point of zero growth</li> <li>• <b>The low rate of market liberalisation,</b> if allowed to continue, will prevent the growth of the private ICT sector and possibly create an aversion factor for possible FDI income.</li> <li>• <b>Bi-H risks falling behind in IST and RTD growth,</b> if its key problems are not accounted for in the immediate future.</li> </ul>

**STRENGTHS:** Bosnia and Herzegovina (BiH) has been in a state of structural reform for the past years, the initial steps of which was the successful formulation of a national strategy document defining priorities and actions, aligned with the EU Standards. The importance of knowledge-based societies has been recognised by the government, which has put IST, RTD growth and facilitation of international collaboration in its priority agenda. The country had a quite successful past in the pre-conflict period as regards the ICT sector and, fortunately, the know-how and experience still remains, thereby providing a good basis for potential growth once the main problems are dealt with. This tendency is also seen in the increased participation in FP6 projects. The UNDP has positively evaluated the work of the CIPS Directorate, the main IST RTD awareness initiator and project coordinator in BiH, which has run over 100 projects in the past decade. Moreover, on the state level 12 new projects were introduced in the past year. An important factor to this success has been the steady growth of the private sector and the telecommunication market with its high (over 20 mln KM) and increased interest in ICT (over 2600 companies in the field in 2006).

**WEAKNESSES:** BiH has undergone a long process of restructuring and reinforcing its economy, and has not managed to simultaneously foster technological and research growth to avoid letting the technological gap with the EU widen. Focus on IST RTD has been limited and as a result, the national strategy has come to be a generic and loosely described set of objectives that, even though aligned to a good extent with those of the EU, do not portray a realistic approach to ICT growth based on the country's current potential. There is also a wide discrepancy between the normative regime and its actual implementation level. Institutional support for IST RTD is at low levels, something which BiH's canton system makes it even more difficult to overcome since the roles of each body responsible for ICT research, at state of canton level, are not entirely clear and there exist administration problems. The development and implementation of a coherent legal framework faces the same difficulty, and only basic laws for RTD are applied. This organisational deficit has also left the private sector "voiceless" regarding IST RTD, since it is not represented by any high-level, research-oriented institutional body. ICT infrastructure is inadequate, as a great deal was destroyed in the conflict period and development has been lagging behind. Internet penetration is low and most ICT infrastructure is concentrated around the capital city of Sarajevo. Thus, citizens of BiH are not entirely aware of the benefits of a speedy ICT development. The available human resources are also scarce due to scientists' migration during the conflict. Finally, the private market has been described as "unfavourable" in recent surveys; as the result of a slow rate of liberalisation, market dominance by large companies that limit SME growth and because there are little to few incentives from the state, such as tax exemptions, for enterprises to focus in ICT research. Public-Private Partnerships lack sufficient legislation, companies face managerial problems due to insufficient training and the formation of incubators and technology parks for the promotion of novel ideas remain only on paper.

**OPPORTUNITIES:** There have been two important developments in the organisation of IST RTD in the country during 2006 providing an opportunity for development; the formation of the Agency for Information Society, a high-level body for coordinating, evaluating and decision-making in IST and research, and the announcement that the National Academy of Sciences is re-working the adopted strategic document in order to make amends that will deal with the development of IST in BiH on a more realistic basis and according to the latest achievements and shortcomings. Clearly, this is an opportunity for BiH to enter a more rapid and coordinated IST growth period with renewed interest from the government. The EU expansion constitutes another opportunity for BiH to strengthen its participation in European research programmes. European Framework Programmes and projects like the SEE-GRID, the TRISTAN East etc, offer a chance for scientists to attain valuable experience and promote scientific networks between them and their European colleagues. Finally, opportunity is also present in the form of the announcement of the privatisation of the 3 major telecom incumbents in the country until 2008, leading to a quicker market liberalisation and through the establishment of training centres of some well-known telecommunications companies (2007-2008) which will aid in the transfer of knowledge and capacity building for BiH's scientific human resources.

**THREATS:** The introvert behaviour of the majority of private companies (more than 90% focused on the domestic market), if continues to this great extent, poses a threat to opportunities for international collaboration, the exchange of technological and managerial know-how (which is an area BiH companies lack) and extra financial income from exports. At the same time, the market's slow rate of the liberalisation prolongs an unfavourable business status of the country that many International Companies would find unattractive, even if they might be interested to invest in the BiH ICT market, thus resulting in a considerably inferior income from FDIs.

### 3.3. Country IST RTD Policy Recommendations

BiH exhibits a rather large discrepancy between the normative regime and the actual state of affairs in IST RTD. As already stated, there are various key areas in which an extensive effort has to be applied in order to foster a rapid growth in IST RTD, such as fund allocation and institutional policy schemes, international cooperation, technological infrastructure and the private sector involvement in research activities. Therefore, the recommendations for BiH will focus primarily on these areas, as well as on human resources capacity building and the prevention of brain drain, since the country has been severely affected by it.

- **Establish concrete mechanisms of coordination and communication between the institutions that support IST RTD** and develop a cooperative mentality that is interested in the greater good of the country.
- **Review, update and align the legal framework with the European standards. Strict and decisive enforcements should be dealt as a priority**, especially in the area of Intellectual Property Rights.
- **Network infrastructures for broadband internet access have to be built** across the country in order to bridge the urban-rural technological divide and raise awareness among the population for the benefits of a knowledge-based society. E-government schemes will have to be deployed to enhance the efficiency of communication between the public and the state.
- **Allocate more funding to the IST RTD sector**, aiming to at least 0.5% of GDP in the following years. Resources have to be exploited much more efficiently
- **Offer clear and organised motivation and incentive schemes to the private sector** for participating in innovation activities, and provide managerial training should be for key personnel, especially for companies that aim to participate and promote international cooperation.
- **Build the knowledge capacity** through training facilities (possibly with the cooperation with foreign ICT companies and the creation of centers of excellence) and also to develop an anti-brain drain and brain gain policy by recognising the services of existing specialised scientists, support them financially together with members of the education system and privileges for the repatriation of the scientific Diaspora
- **Focus more on international cooperation and the international market**, and alleviate the introvert nature of its own ICT market, in order to benefit from research opportunities through regional EU research programmes, attract foreign investment and attain useful experience and knowledge for its human resources.
- **Strengthen information dissemination and the general level of communication between academia and the public and private sectors** and a cooperation-oriented mentality promoted so as not only to loose on research opportunities but also attain a better level of competitiveness when participating in such projects.

## Section 4: The case of Bulgaria

### 4.1. State of the Art Analysis

Bulgaria is on the track for harmonization to the EU standards. A detailed national IST Strategy with a good legal framework to support it, a rapidly growing ICT market that favours SME and private companies to develop and participate in research projects and an organised institutional support at state level are some of the Bulgarian strong points in reaching EU standard convergence. On the downside, some more attention to the research part of IST could be needed with a more coherent policy evaluation scheme, together with a more generous funding allocation for R&D.. Growth should be supported further by formulating specific Public-Private Partnership legislation and a more effective information dissemination network for Private-Academic collaborations.

The legal framework supporting the IST sector and RTD is quite coherent in Bulgaria, with the key element being the Law on Scientific Research Promotion, which is the basis of the National Strategy for Scientific Research for the Period 2005-2013. This is further supported by the law on stimulating R&D activities and a set of legislative acts that define the IST sector in general (telecommunication act, data protection, and law on copyrights). Institutional support exists at all levels. The State-supervisor is the Agency for IT and Communications. Funding allocation is under the responsibility of the Ministry of Education and Science. Awareness raising is performed through the IS promotion office and the coordination between the state, private and academic sectors is performed by the Coordination Centre for Information, Communication and Management Technologies. There is also an advisory council to the President that promotes and organizes e-Government projects. Information dissemination is more than adequate due to a very good network of academic and research institutes, a multitude of ICT magazines and newspapers and because of several activities that regularly take place such as conferences, workshops, and summer schools organized by the Academy of Sciences and the Universities. The National Council for Scientific research is the primary hub for EU projects and, judging from Bulgaria's overall participation in the FP6, is doing a good job. However, a major shortcoming in this sector is related to the limited funding allocated to RTD (GERD 2005 was 0.51% of GDP) and the fact that Bulgaria's technological foresight and evaluation is found scattered among the different programmes of institutions and agencies, instead of being centrally performed and coordinated. Nevertheless, in 2006 the National Innovation Fund was appointed to take a more encouraging and active role by financing the 25-50% of innovative and research projects in Bulgarian firms.

The "National Strategy for Scientific Research for the period 2005-2013" was elaborated by members of the Ministry of Education and Science and the National Council for Scientific research, as a consequence of the National Innovation Strategy. Up to now, this plan has produced good results, although it has not yet been fully implemented at all levels. The set of research and general IST priorities defined within the strategy document are being followed to a good extent and comply significantly with EU standards and priorities. International cooperation is also prominent in the strategy and has done quite a significant positive impact. Bulgaria is involved in a multitude of bilateral agreements and receives international funding for its research activities by several international organizations (UNESCO, Open Society, CEI, etc). However, there are also some hindering factors that prevent the full realization of this strategic aspect, such as limited resources from the State budget and the fact that RTD activities are usually small scale and scattered, which makes them difficult to coordinate. Two areas that seem to need further attention are IPRs, which are not enforced to an overall extent although the legislation supporting them does exist, and the absence of a continuous reporting scheme for getting feedback and re-evaluate the progress the scopes and the implementation quality of the IST sector and IST RTD National policies.

The Private ICT sector in Bulgaria is growing at a rapid pace, with the business environment being rated as rather favourable by interviewed stakeholders. Internet penetration is still below EU average and Broadband development is still low. RTD participation from the private sector is limited with only a small percentage of SMEs being involved. Nonetheless, industry involvement in research projects has risen significantly over the past years, with 21 private sector participants in FP6, and the total participation from FP5 to FP6 has risen from 304 to 3704 participants that resulted in RTD funding from EU Framework Programmes quintupling. The State has implemented several measures to improve the incentives policies by enforcing the lowest

corporate tax rates among the GREAT IST target countries, research awareness and participant attraction schemes etc, but general development is hindered by the overall economic status of the country at present, which can only support R&D up to a certain extent. Fortunately, foreign investors have been very active in Bulgaria providing valuable funding resources, but some extra incentives for research investments should be implemented. However, a specific Public-Private Partnership legislative framework is still absent, although its formulation is envisioned in the National Strategy. The environment is further weakened by the absence of specific regulatory procedures in Private-Academic collaborations. Nevertheless, some measures have been undertaken to provide incentives and create links between the Academia and the business sector, such as Technology Park and Incubator programmes, but no results have yet been recorded.

## 4.2. SWOT Analysis of the IST RTD framework

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• <b>The Bulgarian national strategy for Information Society was formulated and adopted early</b> (1999) and reinforced with several documents [Position Paper on the guidelines of the future Framework Programme (2004), the National Innovation Strategy (2004), the i-Bulgaria programme (2004)]</li> <li>• <b>Bulgaria has established an innovation fund</b> for better financing of research projects and innovation activities. Currently, the amount of funding is between 25-50% of the total financing for new projects.</li> <li>• <b>The institutional arrangement for the promotion and coordination of IST and RTD activities is clear</b>, with defined roles for each institution. Responsibilities between executive bodies and institutions seldom overlap.</li> <li>• <b>The legal supportive framework for IST RTD is adequate and almost complete</b>, with laws on research stimulation and priorities and the support of IPR.</li> <li>• <b>Bulgarian human scientific resources are strong</b>, with a high level of expertise and good research experience. A strong education system further supports human resource capacity building.</li> <li>• <b>Bulgaria's presence in the FP6 was strong</b> and successful, as well as its international collaboration overall.</li> <li>• <b>The business environment is considered very favourable</b>, with the lowest corporate tax for new ICT companies (in 2003 it was 23.5% and in 2005 15%), several funding schemes for private enterprises and an almost fully liberalised market. SMEs constitute a big part of the private sector, which has been steadily growing and has helped the country's economy a great deal. International companies have been very interested in investing in the Bulgarian market and, as a result, the FDI influx has been high.</li> <li>• <b>Bulgaria has managed to achieve accession to the EU</b> and will be a full member in 2007.</li> <li>• In 2005, the ICT market reached 2,223 million €, making up 3.18% of GDP, as compared to 2.87% for 2004.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>There has been a discrepancy between the proposed strategies and their actual implementation.</b></li> <li>• The main deficiency has been in <b>priorities not being precisely defined</b>, with a financing instrument allocated in each case.</li> <li>• <b>State and business expenditures for RTD have been rather low</b> (0.51% GDP from the state in 2005 and 0.1% GDP from the business sector).</li> <li>• <b>The evaluation mechanism is not coordinated by a central authority</b>; evaluation actions and responsibilities are scattered between several institutions. Also, at a coordinating level, Bulgaria lacks a Cabinet-level coordinative body for IST, headed by the Prime Minister.</li> <li>• <b>Laws governing IST RTD are not fully implemented.</b> Especially in the case of IPR, law enforcing has not been adequate, resulting in the rise of IP-related crime to a level in which it constitutes an open threat.</li> <li>• There exists a <b>lack of a cross-sectoral integration of research activities</b> between the business sector, the academia and the state organisations.</li> <li>• Broadband penetration is still at low levels</li> <li>• <b>The private sector still needs a dedicated financial mechanism for SMEs and extra legislation concerning Public-Private Partnerships.</b></li> <li>• <b>Incubators and technoparks haven't been developed yet.</b> The business sector is not encouraged enough to partake in research activities (limited industrial presence in FP6 compared to the number of ICT businesses).</li> <li>• <b>Bulgaria has suffered from brain drain.</b> It is estimated that around 1 million young people (under 40) have migrated since 1989.</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>• <b>Bulgaria's EU accession provides a tremendous opportunity for growth</b></li> <li>• <b>There has been a substantial effort on behalf of the government to accelerate the IST development process</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>IPR issues and the rise of electronic crime could lead to a serious problem</b>, especially now that Bulgaria will be an EU member, potentially damaging its market and research potential.</li> <li>• <b>Organisational discrepancies and insufficient communication channels</b> could hinder the full utilisation of the resources that will be available to Bulgaria as a full EU member.</li> <li>• <b>Broadband developing inactivity</b> could lead to Bulgaria falling further behind compared to its EU counterparts.</li> </ul>

**STRENGTHS:** The “National Strategy for Scientific Research for the period 2005-2013” includes priorities for the IST sector development and IST RTD, which comply to a significant extent with EU standards and priorities. The implementation of this Strategic Document is progressing and producing positive results. International cooperation is also prominent in the strategy and its impact has already bearing fruit. The legal framework supporting IST and RTD is quite coherent and the institutional setting described in the previous paragraph appears to be effective. The fact that Bulgaria participated in FP6 with more than 520 proposals (21 projects) out of a total 1917 proposals with Bulgarian participation that were submitted, illustrates that there is good coordination and clarification of roles. Moreover, the recent (2006) establishment of an Innovation Fund for research projects has facilitated the rapid growth of IST in the past year. The Private ICT sector in Bulgaria is also growing. There are approximately 250,000 SMEs working in the ICT sector, employing about 30% of employed persons and producing around 50% of the total national income. Industry involvement in research projects has risen significantly in EC FP programmes and EU funding for research has been flowing in. The State has implemented several measures to improve the incentives policies by enforcing the lowest corporate tax rates among the target countries (in 2003 it was 23.5% and in 2005 15%), research awareness and participant attraction schemes. Finally, as of 2007, Bulgaria is a member country of the European Union, an accession that gives the means for the country to achieve even more in the future.

**WEAKNESSES:** Until now, the objectives of the national strategy have not all been implemented to the same degree. This discrepancy between the normative policy and its actual realisation, although less acute than in other GREAT IST target countries, is attributed both to the vague definition of certain objectives in the strategy, and to the limited specific funding resources allocated for those objectives. Consequently Bulgaria, although close to EU standards, is not yet completely aligned to them. Key weak spots constitute the still low amount of funding available for IST research from the State budget, the unsuccessful enforcement of Intellectual Property Rights and the rise of electronic crime to significant levels and the fact that Bulgaria’s technological foresight and evaluation is scattered among the different institutions and agencies, In an analogous manner, the private sector lacks a distinct funding mechanism through a dedicated body or programme for research projects conducted by SMEs or the industry, a thorough legislation governing Private-Public partnerships and initiatives for SME participation in ICT research, which is very low. Equally important is the absence of an integration scheme for research projects and the undertaking of initiatives among the private, academic and state institutions and organisations in order to strengthen and promote cross-sectoral collaboration and to open up new channels for communication, organisation and information relay. An effort to build technoparks and incubators has started in 2006, but has not produced results yet.

**OPPORTUNITIES:** Bulgaria’s EU accession provides a tremendous opportunity for growth of the ICT and research sector. Firstly, it is expected that the needed amendments and enforcement of the legislative framework for IST RTD will be dealt with more rapidly. The inflow of knowledge and expertise from a more extensive Bulgarian presence in the European research network (apart from the already active SEEREN, SEEGRID2, etc) can strengthen its human resource capacity; Bulgaria’s border merging with the EU can bring even more FDI in the country, as procedures become more homogenised. Also, since the economy is expected to improve, there is an opportunity for increased funding of IST and research from the state budget. There has been a substantial effort on behalf of the government to accelerate the IST development process, by implementing a high-speed network for communication between organisations, universities, libraries and schools and by establishing four Regional Mobility Centres for researchers and an ICT cluster to operate as a platform for open exchange of information and ideas, equally accessible to both small and big companies, and young and experienced professionals.

**THREATS:** The drastic rise in electronic crime and the inability of the State to successfully enforce Intellectual Property Rights legislation pose a threat to the development of IST RTD. Absence of IPR enforcement discourages technological innovation and patent making, since scientists feel insecure about the fruits of their labour. Moreover, electronic crime promotes a negative view of Information Society and e-services to the public. As a general statement, the discrepancies of the Bulgarian IST strategy and the organisational/administrative shortcomings, if not combated promptly, will inhibit the country from exploiting a unique opportunity for growth due to its EU accession, because the newly available –and vast- resources will not be used in an efficient way. For example, the absence of a Cabinet-level coordinating body will make it very hard for Bulgaria’s government to be constantly in touch with what is happening in the country’s ICT sector and enforce EU priorities, and also to allocate sufficient funds and create incentives at a time when the supply of research opportunities -and the European expectations on Bulgaria- will be far greater.

### 4.3. Country IST RTD Policy Recommendations

Bulgaria's success in attaining EU accession has provided confidence and extra momentum for its IST RTD growth. However, the inclusion of the country into the EU might, according to some studies, augment the already heavy brain drain losses by creating another scientist migration wave due to the country's wages being significantly lower than the rest of the EU. For this factor alone, it is very important for Bulgaria to make every possible effort to keep its human potential inside the country because no matter the benefits of the EU accession, the goals for rapid RTD progress are now even higher. Therefore, the recommendations for Bulgaria are centered around building the necessary infrastructures and improving the IST RTD sector, with heavy focus on brain drain prevention.

- **Increase funding for IST RTD to at least 1% of GDP** in order to align with the rest of the EU countries and provide the momentum needed for IST growth, the demands of which are sufficiently higher after the EU accession.
- **Amend the strategic documents** so that they not only recognise, but also combat systemic deficiencies. At a second stage, make a substantial effort to enforce these measures, with the simultaneous review of the legal framework for IST RTD. IPR enforcement should be taken at a high priority level.
- **Enhance the portfolio of the State Agency for Information Society** in order for it to perform policy evaluation and also pose project proposal evaluation criteria in order to combat the cases of corruption in allocating research work and funding.
- **Provide incentives and opportunities to the country's existing human potential**, such as financial aid, recognition and better research facilities and equipment, as well as modern broadband internet access and scientific communication networks in order to prevent a brain drain wave now that the country is formally accepted into the EU.
- **Deploy high-speed broadband networks in the whole of the country** in order to bridge the digital divide with respect to its EU counterparts and the Urban-rural technological divide in the country itself. This is an important developmental move, in order to build the capacity and benefit from information flow in light of the country's enhanced potential and opportunities due to the EU accession.
- **Observe investments in SMEs and IST RTD more widely and holistically**, towards creating opportunities for national talents. Thus, it is critical that the conditions be improved for all those SMEs that want to engage in research and development programs. Funding formulas and instruments need to be flexible and recognize the specifics of SMEs, as opposed to the large industries and production systems that had direct links with large, state-funded research institutions. Market dominance by tycoon companies has to be somewhat limited and more room for movement has to be made for SMEs and private incentives.
- **Strengthen private-academic and private-state collaborations** with the creation of incubators and technoparks as well as with the finalisation and proper enforcement of PPP legislation and the establishment of adequate information relay channels in order for the private sector to be propelled forward in a uniform manner.
- **Undertake initiatives to improve the awareness level of citizens and the information relay channels** in order to benefit from the EU accession and not lose any opportunity for involvement in European research projects and especially FP7.
- **Support regional cooperation** through extensive involvement of research centers and networks in order to exploit the EU accession status and become an IST RTD hub in the Western Balkans., which not only will aid in the overall research process but will also provide a valuable asset against brain drain.

## Section 5: The case of Croatia

### 5.1. State of the Art Analysis

Croatia is one of the GREAT IST target countries that have a more developed system for IST RTD. Presenting the highest research activity in the Western Balkan Region (GERD 1,24% of GDP in 2004 and 1.1% in 2005), which is supported by a multitude of institutions and legislative acts for both the public and private sectors, Croatia is evolving steadily towards EU convergence in this particular field of interest. The Croatian National Strategy plan has produced good results until now, and is expected to further strengthen the ICT sector as a whole in the following years. However, the country's development in IST RTD does not practically involve the private sector since the proper support mechanisms are not in place and the expected support is not provided to encourage project participation and contribution to research activities. At the same time, information dissemination is not producing the expected effect, especially in the field of academic-private sector collaborations. Nevertheless, similar actions are envisioned in the national strategy document and could be assumed that planned incentives will bear fruit in the following years.

The basic legal regulatory act is the Act on Scientific Activity and Higher education, which laid down the framework for RTD modernization, and led to the formulation of the Science and Technology Policy of the Republic of Croatia 2006-2010. Despite the fact that a framework in which IST RTD is mentioned explicitly does not exist, the General S&T framework along with the current framework for the Development of the Information Society appear to be efficient (Electronic Signature act, telecommunications acts etc). The process is facilitated by the multitude of support institutions that exist in Croatia for IST and RTD. In fact, Croatia has the most diversiform institutional setting in the GREAT IST target group. On one hand, the Ministry of Science, Education and Sport undertakes the overseeing role. On the other, the National Information Society Council – a strategic decision making institution comprised by members of the government, the public and the private sector - undertakes the role of the country's think-tank and strategy formulation expert. Supporting the ICT Strategy, as an efficient implementation tool, the Central State office for the "e-Croatia" programme, works together with its high-level peer, the Central Administrative Office. The above institutional setting is further supported by the State Intellectual Property Office, directly related to IST RTD and enforcing Intellectual Property rights under an extensive framework as part of the "National Strategy for the development of the Intellectual Property System", in sync with EU IRP standards. The existing framework covers copyright and related rights, trade marks and patents, industrial design as well as geographical indications and appellations of origin. Finally, the National Foundation for Science, Higher Education and Technological Development operates as the awareness-raising, financial support and technology advisor institution.

The "National Strategy for Scientific Research for the period 2005-2013" was formulated by members of the Ministry of Education and Science and the National Council for Scientific research, as a consequence of the National Innovation Strategy. The Strategy is coherent with the on-going "e-Croatia" programme, set up in 2003. Up to now, the strategic planning process has produced significant results for the IST sector, further supported by the Strategic Planning Office, although it has not yet been fully implemented on all levels. However, the research priorities as described in the above documents are not specifically mentioned, but rather loosely described; something which has been acknowledged and amendments are currently underway. Nevertheless, regarding the RTD sector, the strategy has given a lot of attention to RTD funding and development schemes, with the continuation of existing research programmes such as HITRONet (e-government network) and the addition of many new ones such as JEZGRA (creating centres of excellence), TechCro (creation of incubators and RTD centres) and IRCro (incentives for private sector participation in RTD). International cooperation for RTD is also rather strong, with the National Foundation for Science, Higher Education and Technological Development supporting Croatian participation of scientists in EU and International research programmes. In fact, Croatia has participated in more than 160 bilateral programmes, half of which include EU Consortia, and has played an active role in most EU research programmes (TEMPUS, CARDS, EUREKA, PHARE, FP5-6, ERANET, COST etc). Finally, Croatia's policy monitoring and evaluation is undertaken by several institutions and ministries, under the coordination of the National Science Council, creating a scheme that is somewhat deviant from EU standards and generates communication problems. Croatia has not formed a Cabinet-level body supervised at a very high political

level (e.g. Prime Minister) in order to monitor, evaluate and foresee the implementation of the national policies.

The Private ICT sector in Croatia is one of the most highly developed in the GREAT IST target countries, with a fully liberalized market and a modern fully digitized telecommunications infrastructure. The business climate is considered highly satisfactory by interviewed stakeholders. However, the need to further promote research participation from the Industry still exists, which is made evident by the fact that although the overall participation of Croatian partners in FP6 RTD projects was very high, no participant came from the private sector in contrast to a majority of participants among research institutions. According to interviewed stakeholders the primary cause of this phenomenon is the lack of adequate information dissemination within the private sector. The funding policies have provided some positive results and foreign investment has been rising at a rapid pace for the ICT sector, although no information for FDI specifically for RTD has been made available. On a positive note, the incentives' policies undertaken by Croatia are noteworthy, and include the implementation of programmes such as TechCro, and State financial support (in form of grants and subsidies) for innovative research activities, encouraging the involvement of SMEs in RTD and the development of Private-Public Partnerships. However Croatia still lacks a legal framework supporting PPPs, while it has recently been composed and processed for adoption and activation, in accordance to the 2006-2010 strategic plan. Essentially, the same situation is valid for private-academic collaborations, where national programmes have not produced results yet.

## 5.2. SWOT Analysis of the IST RTD framework

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• <b>The “Development Strategy of the Republic of Croatia – Croatia in 21<sup>st</sup> Century” was adopted in 2001</b>, which led to the adoption of the “e-Croatia” developmental programme in 2003. The strategy was amended in 2006.</li> <li>• <b>Croatia has one of the most advanced communication networks among the target countries</b>, and is ahead in the implementation of new technologies like Wi-Max, triple-play, etc.</li> <li>• <b>The strategy gives significant attention to IST RTD growth</b>, by undertaking the continuation of pre-existing projects and research networks and by creating numerous others.</li> <li>• <b>The legislative framework is very much aligned to EU standards</b> and, although it does not have a discrete RTD-oriented section, the regulations that encompass IST RTD are well-detailed and have been quite successful.</li> <li>• <b>Institutional support is well organised</b>, diverse and thorough with a multitude of different bodies that collaborate together well by having distinct and clear roles.</li> <li>• <b>Croatia has had notable presence in the FP6</b> and has developed quite strong bilateral agreements for IST RTD. Overall, its international cooperation is one of the highest of the target country group.</li> <li>• <b>Croatia’s private ICT sector is fully liberalised</b> and well developed compared to most of the target group countries.</li> <li>• <b>The business environment is rated as very favourable</b> and is supported by several Governmental initiatives</li> <li>• <b>In 2006 Croatia’s Ministry of Education, Science and Sports established the Working Group for Technology Foresight</b>. Therefore Croatia is one of the few countries from the target group which have an institutional instrument dedicated to the evaluation of the proposed strategic actions for IST RTD growth.</li> <li>• <b>R&amp;D funding from the State Budget is one of the highest among the target countries</b> (GERD 2005 1.1% GDP)</li> <li>• <b>During the last 12 years Croatian ICT sector attracted around 1.7 billion euros worth of FDI.</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Difficulties in enforcing the laws</b> described in the legislative framework that deals with IST RTD.</li> <li>• <b>The priorities described in the strategy are not explicitly stated and defined but rather more generic</b>. This creates a discrepancy between the normative regime and the actual implementation policy/process, which could have been a lot faster.</li> <li>• <b>Participation on ICT research projects has been low</b> compared to the sector’s potential, quite divergent from EU standards and causing a low level of innovativeness.</li> <li>• <b>Little to no joint initiatives between research organisations and private companies</b>, due to insufficient attention from the funding mechanism and to lack of adequate information channels between them.</li> <li>• <b>Foreign investment has been spent mostly for equipment and services and not research initiatives</b>, which weakens the country’s potential and participation in RTD and makes it less competent, compared to other countries with its level of ICT development (e.g. Romania, Bulgaria).</li> <li>• <b>Croatia has suffered from brain drain</b> as well, though not to the same degree as some of the other target countries.</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>• <b>A National Broadband Strategy and Action Plan was adopted in 2006</b>. It is envisaged that the number of broadband subscribers will reach half a million until the end of 2008.</li> <li>• Croatia has become and affiliated country for FP7 since June 2007</li> <li>• <b>The government has recently introduced partial tax exemptions</b> for private companies that deal with IST RTD and also established a funding scheme that will financially support any private companies that take initiatives in the research sector and prepare project proposals for international programmes or calls.</li> <li>• Croatia has a very good human potential (1296 researchers/million of population) and a good education system. <b>If the awareness level, information relay and funding mechanisms are enriched/enhanced</b>, Croatia will be able to exploit its resources more efficiently and rapidly grow in the IST RTD sector.</li> </ul>	<ul style="list-style-type: none"> <li>• If Croatia does not solve the main problems in IST RTD, it <b>risks of falling behind and widening the gap with the EU countries</b>. This could also lead to another wave of brain drain.</li> <li>• If the general level of awareness through communication channels and specific methods for communication between the Academia and the private sector are not made better, <b>Croatia risks of losing the opportunity to play a key role in its region concerning the FP7 and other regional programmes, especially after its accession to affiliated status.</b></li> </ul>

**STRENGTHS:** Croatia developed and adopted a national strategy for IS development as early as 2001. It was created by the Ministry of Education, Science and Sports with the participation of relevant state bodies, Croatian and foreign scientists, international institutions, NGO's and the Croatian public. In 2003 the "e-Croatia" programme was launched for the development of a modern information society and the Central State Office for Information Society as a coordinator and implementation director was established. In 2006, the strategy document was enriched with the Science and Technology policy for the period 2006-2010, in order to include i2010 objectives and to further align the strategy with EU standards. Regarding the RTD sector, the strategy has given a lot of attention to RTD funding (1.1% of GDP in 2005) and development schemes, and has continued and enhanced existing and launched new research programmes, mentioned in the previous paragraph. Despite the fact that a specific IST RTD framework does not exist the general research setting includes the IST as an integral part. The institutional setting is in place, with many different state bodies and institutions operating in the field of IST development, providing support mechanisms, communication, awareness raising and the necessary funding. Croatian participation in EU and International programmes and projects is quite strong and Croatian partners had a particularly successful presence in FP6 (16% success rate in the IST field). The Private ICT sector in Croatia is one of the most highly developed in the region (32.8% growth in 2005), with a fully liberalized market and a modern fully digitized telecommunications infrastructure, pioneering among the GREAT IST target countries in the use of modern technologies, such as WiMax. The business climate is considered highly satisfactory and recently incentives policies have been undertaken to support the participation of SME's in innovative research activities.

**WEAKNESSES:** Although the strategic documents have been extensive, the strategy implementation has been considerably slower than perhaps initially aspired. The situation is partly generated by the discrepancies between the normative regime and the actual state of affairs, as for example research priorities are relatively loosely described in the strategy and as such do not provide the necessary focus and do not produce the envisaged momentum for the implementation of its strategic objectives. The legislative framework governing IST RTD is not specifically tailored the field, but rather a set of legislative norms that govern the technological and scientific sector on a broad basis. As such, the enforcement of these regulations has undergone interpretations to deal with issues not explicitly described and where it was not detailed enough to encompass a particular situation. The legislative framework on Public-Private Partnerships and SME stimulation was particularly weak, although the drafting and adoption process has been initiated. The sector suffers also from problematic information dissemination for research initiatives and upcoming programmes. As a result, the private sector's participation in FP6 research projects has been very low (if not inexistent) compared to the size of the ICT market. Funding retained by the private sector for RTD activities has been quite unsatisfactory (0.29% GDP in 2004). Even the increased FDI funds have been primarily gained for equipment and services, rather than for innovative research initiatives. As a consequence, Croatia's level of innovativeness has been reported as even ten times less than the average EU value.

**OPPORTUNITIES:** Croatia is considered to have a solid basis with regards to human potential. Even though the country suffered a severe brain drain during the period of instability in the region, it still maintains a ratio of 1296 researchers per million of population, which is further backed up by a strong educational system. This fact provides an opportunity for growth in IST Research and innovation, provided that corrective measures are taken in order to improve the current institutional and priority setting inefficiencies, while boosting Croatia's competitiveness in the ICT sector. The greatest opportunity for Croatia comes from the fact that, in June 2007 the country was acknowledged as an associate member for the EU in FP7 programme, thus gaining an equal footing with EU partners to what regards participation and competition for FP7 Calls for Proposals. This positive change could alleviate the country's ICT sector to an EU-accession level, provided that Croatian resources are quickly and sufficiently mobilized and its systemic inefficiencies rectified to create necessary momentum and maximize the benefits earned from this opportunity.

**THREATS:** Considering the insufficient communication channels and the lack of a discrete and thorough evaluation policy mechanism, accompanied with the proper institutional setting Croatia runs the risk of missing the opportunity to maximize its participation in the FP7. Opportunities for participation by Croatian entities could pass by unnoticed, thereby resulting in poor overall involvement. A secondary effect would be a tendency for another wave of brain drain, since scientist might be inclined to look for opportunities elsewhere, in order to continue their research.

### 5.3. Country IST RTD Policy Recommendations

Croatia is one of the most advanced countries in IST RTD among the countries in the target group, however, there are still several aspects of its institutional setting that could benefit from some fine-tuning and further attention from the government in order to reach full alignment with EU standards. As it has already been pointed out, the IST RTD environment is affected by that lack of cooperative organisation among innovation activities (within the private and public sectors and between the two) and is in need of a more clear direction, especially with regards to the use of available resources. Therefore, the suggested recommendations for Croatia are more concentrated in raising awareness activities and measures that will reinforce the organisation of the IST RTD sector, while at the same time they will facilitate capacity building through brain drain prevention policies and infrastructure-oriented actions.

- **Monitor and encourage the coordination of innovation and its stimulation by forming a central state body** that will also provide financial rewards to successful innovative initiatives and projects that have an impact in the overall growth of the country and attract interest from foreign companies in the Croatian research sector.
- **Redefine its research priorities in a more concise and clear manner** in order for the country's research sector to obtain a distinct direction and make every effort possible to switch the focus from general IST growth to IST research growth (which will of course mean an increase in funding percentage from the GDP).
- **Ensure that existing programmes that provide opportunities and stimulation for private IST RTD activities are continued and reinforced** (e.g. TechCro) in order to encompass collaborations between the private and academic sector, through the creation of incubators and other promotional actions.
- **Make sure that a brain-gain policy is established and implemented**, along with the implementation of measures that prevent brain drain. Croatia is one of the most advanced countries in IST research in the surrounding region and certainly on top of the rest FY countries, which makes for a good scientific attractor for the Diaspora in the adjacent region.
- **Promote enhanced communication on all levels to raise awareness and promote the potential for development of IST related SMEs.** In addition, it is very important that the legislation for PPPs and SMEs is finalised, aligned with the EU standards and enforced in practice.
- **Make an effort to raise the public level of awareness for the benefits of IST** by launching promotional campaigns. This implies enhanced political awareness, which would also ensure the continuation of the necessary structural reforms to achieve EU harmonisation.

## Section 6: The case of the former Yugoslav Republic of Macedonia

### 6.1. State of the Art Analysis

The former Yugoslav Republic of Macedonia (FYROM) is at a rather early developmental stage of the IST and especially of the IST research sector. This is mainly due to the macroeconomic difficulties experienced, which hinder the sector in multiple areas, such as financing (GERD was only 0.25% of GDP in 2004), information dissemination, market, private sector growth and general legislation and policy implementation. However, many other aspects indicate recently that potential exists, such as the growing interest and participation in international research projects during the last few years, a governmental programme for the development of the IST sector with distinct research priorities and a legal infrastructural background that is constantly expanding and improving towards EU convergence.

The former Yugoslav Republic of Macedonia does not have a specified legislative framework for IST RTD. It is rather encompassed by general laws and regulations concerning technological development and research in general, such as the Law on Scientific Research, the Law on Stimulation and facilitation of technological development and rulebooks that determine criteria, conditions and priorities for resource allocation in the research sector. Moreover, a new Law on Scientific Research and Technological Development is being drafted, which will act as the main framework for IST RTD, as well as a law for the formation of Research Transfer Centres. Institutional support is lead by the Ministry of Education and Science, particularly through its Science and Technological Development section. The Ministry is responsible for the strategic decision making process and oversees financial aid, strategic implementation, as well as international collaborations. Research promotion and development is performed, at a lower hierarchical level by the Scientific Research Council and the Committee for Information Technology (CIT). A National Council on Science and Technological Development is under formation, upon adoption of the Scientific Research Law. These institutions had often experienced communication problems, as political changes were frequently accompanied with replacement of funding allocations and research support criteria. The Government has announced plans to establish a National Council for IS and a Ministry for Information Society. For the short-term period a Minister without portfolio has been appointed responsible for Information Society to act as a coordination point for the horizontal activities of the government. Until the creation of the Ministry for Information Society, Ministry of Transport, Committee for Information Technology and the National Council for IS are the responsible institutions for the coordination of activities for development of IS and coordination of the implementation of the Strategy for development of IS and the newly adopted National Strategy for development of electronic communication and information technology.

A group of experts appointed by the Ministry of Communications developed a National Strategy for development of electronic communication and information technology that was presented in June 2007 at the meeting of the Committee for Stabilization and Association and was acknowledged as positive development. A special chapter of the Strategy is dedicated to IST RTD. The document acknowledges that a country needs increased investments in R&D, and especially the investments in the private sector, including FDI. The Strategy highlights that the country needs quick measures in finding suitable financing models. In that direction, it is proposed that the Government adopts a Law for establishment of a Fund for development of IS and establishment of a dedicated Program for research and development of IST as major pillar of the Fund. The Program will finance projects of strategic interest for the country, proposed by the business sector, academia and research centers. The Program will co-finance the RTD projects supported by EU and other international institutions and donors. The Strategy highlights that Universities, the National Council for IS and other relevant institutions has to propose a model for institutional transformation of the Macedonian Academic Research Network (Marnet) in order of overcoming the present financial and infrastructural problems.

The Macedonian Association of Information Technology (MASIT) is an institution that facilitates the development of IST RTD in the country by acting as the information dissemination hub, promoting scientific research and developing its main project, the Macedonian Academic Research Network (MARnet). State funding fro research purposes is very low and is only aspired to increase to at least 1% of GDP in the coming

years. In an attempt to raise awareness in IST and RTD, the Ministry of Education and Science and MASIT have been organizing infodays and workshops, as well developing web portals. Non-governmental organizations are also trying to aid the process through their own portals and bulletins (e.g. E-bilten@metamorphosis.co.mk). The FYROM lacks a strong, independent high-level evaluation and technological foresight mechanism that will enforce the appropriate strategy and implementation modifications based on specific evaluation criteria, regardless of political agendas.

As part of FYROM's EU accession, there are two strategic documents regarding the development of the IST sector: the National Strategy for Information Society Development and the Governmental programme for Scientific Research 2006-2010. Both focus on seven developmental pillars of vital importance, which are IST infrastructure, e-Business, e-Government, e-Education, e-Health and e-Citizenship. Research priorities converge to a certain extent with EU standards and are expected to do as even further as the 2006-2010 programme starts implementation. However, it is undeniable that the country's primary focus is the improvement of the economic sector, since is it the major inhibiting factor for the country's development. To further facilitate the strategy's implementation, significant progress was made in 2006 concerning Intellectual Property issues, with the Law on Copyright and related rights and the law on equal opportunities coming into place. Still, IPR enforcement is lagging quite substantially behind the legal framework. On the field of international cooperation FYROM has signed bilateral agreements with 15 countries and plans to include 9 more in the future, while at the same time it has gained financial aid from international organizations, such as the UN, NATO and the World Bank. On the other hand, participation in EU projects has been very low, and therefore limited EU funding for research activities has reached the country's institutions.

FYROM's private ICT sector is at a low-growth point, with state enterprises dominating a non-liberalised market. Interviewed stakeholders describe the business environment as inadequate and with very little focus in RTD due to the financial difficulties and the lack of an efficient information relaying mechanism that gives SMEs, and the private sector in general, the incentive to participate in research activities. In fact, in the FP6 programme FYROM had an overall country participation in 25 projects selected from 168 proposals and success rate in funding received only 11.2% in IST area. The participating entities included primarily governmental enterprises, Universities and State bodies. Private companies seem to be isolated and have major communication difficulties with research institutes regarding a possible collaboration and, as well as missing basic state-provisioned incentives such as tax alleviations and fund support. In 2007 the Government introduced a flat tax of 10% for corporate and personal income throughout the country, with a special incentive of a ten-year tax holiday in the country's free economic zones with no property taxes and do VAT or Excise Duties payable for 10 years. Additionally, special decrease in VAT has been introduced for the ICT market. There is also a lack of a proper legal framework for Public-Private Partnerships (PPPs), further hindering the collaboration between the Academia and business sector. During the last years, foreign investment has grown but it has been mainly targeted to the ICT sector and particularly telecommunication services and equipment, rather than research investments for innovative projects. Measures that combat these problems have been mentioned in the 2006-2010 governmental strategy (PPP legislation, gradual market de-monopolisation, private research project support from the government, awareness raising for FP7) and are part of its agenda, but results have not been shown yet.

## 6.2. SWOT Analysis of the IST RTD framework

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• <b>FYROM has adopted a national strategy for IST development since 2005.</b> A National Strategy for development of electronic communications and information technology was also developed in 2007</li> <li>• <b>There is a relatively good communication between the government and the research community regarding ICT research activities,</b> mainly through the Committee for Information Society. This enables local strategic objectives to be thoroughly communicated and has increased awareness substantially over the past few years.</li> <li>• <b>FYROM has seen a dramatic increase in FDI</b> over the past years and the situation is expected to get better in the future</li> <li>• <b>The country was not hindered as much as its neighbours by the instability in the Western Balkan region.</b></li> <li>• <b>FYROM has been in a process of a radical reform</b> and progress has been steady, with the aid of International Organisations playing a significant role.</li> <li>• <b>Good international cooperation compared to the country's economic hardships.</b></li> <li>• <b>Significant progress in institutional and legislative infrastructure to ensure IST growth in the past 2 years.</b> Plans for a National Council for IS and a Ministry for Information Society were announced while for the interim period a Minister without portfolio has been appointed responsible for IS.</li> <li>• <b>There has been a major effort to improve the existing telecommunications infrastructure</b> and also provide high-speed networks outside the capital city. FYROM has also been the first FYR country to install DSL lines.</li> <li>• <b>FYROM has begun a project to define evaluation methodologies and set-up the relevant criteria.</b> These will be adopted by the Interministerial Council and by the National Council.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>The priorities given in the strategy are generic and constitute in reality a wish list</b> in order to align with EU standards creating a discrepancy between the normative regime and the actual implementation state.</li> <li>• <b>FYROM struggles between the need to evolve and grow and the will to move towards EU accession,</b> and the severe economic problems of the past which, together with a political instability pose a very serious weakness to the overall system.</li> <li>• <b>Economic hardships make it difficult to focus on IST RTD to a more intense level,</b> although the government has recognised the importance of the strategic objectives.</li> <li>• <b>RTD funding has been low,</b> both from the state budget and from the business sector (0.3% GDP and 0.002% GDP respectively in 2004).</li> <li>• <b>Institutional support is not enough to ensure a major growth effort.</b> There is no high level body adjacent to the Prime Minister to take on a coordinating role, as proposed by the EU.</li> <li>• <b>Implementation of IPR has been very low</b></li> <li>• <b>Very modest overall participation in the FP6,</b> even less from industry.</li> <li>• <b>The ICT market is very limited and not fully liberalised.</b></li> <li>• <b>Incentives for new companies have been very low</b> to non-existent and the business environment has not been rated as favourable. Funding mechanisms for SMEs and communication channels for the private sector itself have been inefficient.</li> <li>• <b>Legislative measures for PPPs are absent</b></li> <li>• <b>General technological infrastructure is very low.</b></li> <li>• <b>FYROM lacks a distinct evaluation and technological foresight,</b> which is further hindered by the fact that there are no official measurable statistics based on indicators and offered by a state body.</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>• <b>Granted associate status for FP7 since June 2007</b></li> <li>• <b>The increased interest from neighbouring countries to invest in FYROM</b> poses an opportunity to raise funds for research and, consequently to focus more on the area, with renewed interest and more resources.</li> <li>• <b>The inclusion of FYROM in EU regional supportive programmes</b> like SEEREN has a potential for spillover and innovation and experimentation in research activities through the regional research networks.</li> <li>• <b>Being an ‘all Wireless’ country, with a nationwide wireless broadband network the doors to the IS are open.</b></li> <li>• <b>Computer science expertise is multiplying and the opportunity for attracting outsourcing services is growing.</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>The gap between the normative regime and the implementation state.</b></li> <li>• <b>The inaction from the industry concerning IST research.</b></li> <li>• <b>Broadband penetration is still is low and there is certain inaction towards a rapid improvement.</b></li> <li>• <b>Innovation and entrepreneurial culture is not supported</b></li> </ul>

**STRENGTHS:** FYROM is undergoing a major reform to its educational system and its ICT infrastructure. In order to align with EU standards, a national strategy for IST development was adopted in 2005, with participation from the Committee for Information Society, representatives from academic and private institutions and international organisations. The strategy itself, although not entirely focused on IST research, provides more than basic developmental objectives and routes and has had a positive impact in the country's ICT development. The Committee for Information Society has been playing a very significant role in providing a good information relay between interested institutions in IST RTD. FYROM has made notable progress with regards to legislation for the IST sector and the RTD framework, with new laws and bylaws adopted since 2005 (e.g. Law on Electronic communications focusing on new foreign investments, protection of users, monopoly abolition, allowing competition and market liberalization), encompassing areas like e-government, IPRs, etc. In the increased effort to raise financial resources for RTD, international cooperation and increased interest from foreign investments have aided a great deal (bilateral agreements have been signed with more than 15 countries). The cooperation with Slovenia alone has resulted in more than 200 research project being conducted in the past few years. FYROM has also made progress in developing its technological infrastructure with efforts to decentralise and extend the country's network, several line upgrades and the introduction of broadband internet. Finally, a methodology for evaluation of the IST sector has been put to paper by the Committee for Information Society, which is expected soon to be adopted by the National and Interministerial Councils.

**WEAKNESSES:** FYROM has been struggling between the need to expand and grow and the economic and political instability of the recent past. A direct consequence of this is a gap between the normative regime, as described by the strategy and the actual state of implementation of the strategic objectives which, realistically, have been more of an attempt to align with EU priorities as part of a route to EU accession rather than dealing with the actual possibilities for growth. The priorities described in the national strategy are therefore generic and also hard to achieve realistically in a short period of time, given the economic status of the country and the RTD funding which has been available until now (GERD 0.25% GDP in 2004). The economic hardships described above, have made it very difficult for the government to pay the necessary attention to IST development, since having scarce resources constitutes a major inhibition factor. There exist also discrepancies between the legal framework and its enforcement, as in the case of the implementation of Intellectual Property Rights, which has been very slow. FYROM's telecommunication infrastructure had been one of the lowest in the region some years ago, where even telephone lines were shared between households, and severely centralised around Skopje. The communications sector in FYROM has not been fully liberalised yet in practice and, up to now, its development has been a relatively limited with revenues remaining below USD 63 million. The business climate has been ranked rather unfavourable, stemming from the absence of well-organised incentives' policies for new enterprises, the lack of sufficient supporting regulations for PPPs and private-academic collaborations, and the inexistence of a dedicated funding mechanism for private entities interested to partake in research activities. As a result, industrial participation in the FP6 was extremely poor to non-existent. Finally, although the Committee for Information Society has been a very active institution, the overall institutional scheme has not sufficiently promoted or supported IST RTD growth, with the absence of a responsible governmental institution, lead at the highest political level.

**OPPORTUNITIES:** A major opportunity for FYROM springs from the fact that, in June 2007, the country gained associated country status in the FP7 programme. This means that during the implementation of the FP7, entities from FYROM will be able to compete for research projects on an equal footing with their EU counterparts. This is an excellent prospect for the country to improve its participation in research activities, gain access to European funding, accelerate the reform process in the sector and benefit both from the influx of technological know-how and the experience gained by its human resources through their participation in FP7 calls. Indirectly, it is a good opportunity for "brain-gain", since there will be many opportunities for scientists to conduct their research with equal rights and prospects with their EU colleagues without having to migrate from the country. This new status, together with the already present participation of FYROM in regional capacity-building EU programmes (SEEREN, SEE-GRID) has the potential to improve the level of innovation and quality of research in the country and also play an important part in collaborating with other Western Balkan neighbouring countries like Montenegro and Albania, which have not achieved an associated status yet, making the potential for spillovers very high. Finally, the increased interest from foreign countries to invest in the FYROM telecommunications market is another opportunity to improve the situation in the private sector by rectifying the problems there, and consequently be able to raise more funds for IST RTD activities. In fact, the project implemented during 2006 that connected all the schools in the

country on a broadband wireless network, has boosted broadband development and opened up the potential of the information society not only to the students, but practically to every citizen. Last but not least, the country has a potential of becoming a prominent hub that attracts outsourcing services in the Computer Science sector, with IT and programming skills of young population multiplying. This fact, topped with the relatively low cost of services in FYROM could be a major opportunity for growth which could potentially include the involvement in innovative RTD activities.

**THREATS:** The existing gap between the strategy and its implementation poses a major threat for the country's development in this sector, since it hinders the achievement of its strategic objectives and its accession to the EU standards. Another threatening factor is what appears as inaction from the private sector side, especially in the field of IST RTD. In fact it is the legislative framework (or its lack thereof) that create an unfavourable climate for innovative ideas and entrepreneurial activities. The political and economic instabilities, as well as the slow liberalisation of the ICT market is discouraging FDI. There is also an inherent threat for brain drain as a result of this situation. Finally, a threat arises from the need to bridge the technology gap between FYROM and the rest of the EU and leapfrog in broadband services take-up, which would not only hinder research but also information dissemination and the overall creation of an information society.

### 6.3. Country IST RTD Policy Recommendations

FYROM was one of the target countries in the target group with the poorest technological infrastructures, although significant improvement was achieved through a subsidised programme that turned FYROM into an “all-wireless country”, offering a boost in the broadband communications services and stimulating competition. However, it is evident that there is still very limited ICT private sector participation in IST research and in fact the overall country involvement in research activities is considered rather poor. In order to provide a realistic opportunity for improvement in the RTD field the existing research institutions and centres need to be provided with the necessary equipment and to become equipped with the proper facilities which are currently very poor and outdated. The institutional support mechanism has shown some coordination deficiencies and the ICT market has had a difficulty in spurring RTD activity. The recommendations for FYROM are, in this light, oriented in infrastructure-building, awareness and cooperation raising and the implementation of policies to unlock the private sector and stimulate the ICT sector research potential.

- **Re-evaluate and reform the strategic goals so that they address the countries realistic needs more** specifically and coincide with the country’s real potential at the moment, instead of being generic aspirations that lack successful implementation prospects.
- **Form a Cabinet level body for undertaking the coordination of the RTD action plan and evaluation of the strategic policies** (that will come from an also established agency for IST RTD statistics) is very important to ensure good internal structure and policy feedback.
- **Improve the country’s telecommunication and research infrastructures, liberalise the sector effectively and stimulate competition** to enable rapid take-up of ICT in the public and private sector. Increased ICT competence and connectivity is going to indirectly stimulate an innovation culture and partaking in research activities. The existing programmes that facilitated this process to this point should be supported and intensified to continue growth in this area.
- **Finalise and properly enforce the supportive legislation**, especially the laws concerning PPPs, SMEs and Intellectual Property Rights.
- **Promote the potential of the country as a target of outsourcing services in the ICT sector, due to low wages and an increase in young population with ICT skills.** It should be also ensured that an adequate percentage of the attracted FDI inflow from such collaborations will be allocated to IST RTD.
- **Intensify the efforts to raise awareness for the importance of ICT research in the country and develop programmes and initiatives that will stimulate innovation and participation in the FP7** programmes by the private sector (industry, SMEs) and promote collaborations between the business sector and the academia. Communication channels will have to be established effectively for the dissemination of research project information and results, as well as on funding opportunities. A funding reserve, and perhaps even some re-evaluation and financial rewarding mechanism for successful or submitted research proposals could be adopted, as in neighbouring countries.
- **Continue and reinforce the International cooperation schemes.** Cooperation with neighbouring countries would be beneficial in more ways than just the obvious exchange of expertise, but primarily in creating a new environment of trust, collaboration and stability in the region.

## Section 7: The case of Moldova

### 7.1. State of the Art Analysis

Moldova has experienced substantial economic difficulties during the past years and as expected RTD funding is very low (2005 GERD was only 0.4% of GDP) During the last couple of years, however, considerable efforts have been made, beginning with the formulation of the new national strategy document and the launch of the “electronic Moldova” programme in late 2006 which has already resulted in considerable improvements. Nevertheless, Moldova is still far from harmonised with EU standards, but the steps to be undertaken are mentioned to some extent in the new national strategy.

The legal support framework for IST RTD is covered by generic R&D legislations (Law on Scientific and Technological Information, Code of Science and Innovations). Regulations cover the methodology for elaboration of such activities, dissemination of IST, and result exploitation. The prominent legal acts include the Law on Scientific-technological information and the Law on Informatisation and State information resources. However, some key elements appear to be missing from this framework, such as e-commerce and e-signatures legislation and, most importantly, laws on Intellectual Property Rights, whose absence coupled with insufficient enforcement, where regulations exist, has a obvious negative impact in the development of the private ICT sector, failing to combat piracy and the black market. Moldova's Ministry of Information Development is the sole high-level coordinator of national strategy implementation and source of funding. Under the Ministry, the Academy of Sciences coordinates research and innovation activities and acts as funding advisor, while the Supreme Council for Science and Technological Development acts as an intermediary between the government and the research community. The institutional setting appears satisfactory, but significant communication problems in all directions lead to low interest and participation in research and development activities by the public and private sectors. The information dissemination is performed to some extent through scientific journals, conferences and seminars, but public awareness is still rather limited. Nevertheless, the introduction of the new national strategy includes an e-government and information network for “electronic science” and a reconstruction of the Academy of Sciences, which are expected to bring positive results. Currently, the evaluation and policy revision process is dispersed between Ministries and needs to be performed by a high-level independent institution comprising IST RTD experts from the public, private and academic environment.

The National Strategy for information society building, “Electronic Moldova”, (launched in 2006, aims to improve all aspects of IST in the country, bridge the technological gap with the EU, alleviate the sever brain drain Moldova has experienced in the last decade and raise awareness on the potential of knowledge-based communities. It is particularly focused on IST sector development, rather than IST RTD. In fact, the document does not include a distinct research priority list; nut only a loosely mentioned intention for such activities as part of EU convergence.

The ICT private sector in Moldova is still at a rather early stage of development and the business environment has been described as unfavourable in conducted surveys, which is also recognised in the reluctance of foreign companies to invest in the sector, severely limiting FDI inflow for the country. To date, the private sector's participation in IST RTD activities has been quite poor and the country's overall involvement in European Research programmes has been almost inexistent. It is indicative that in FP6 1 IST project in total included a Moldovan partner coming, as expected from the state and not the industry. Financial support mechanisms and information dissemination by the state are poor and thus insufficient to stimulate involvement from the private sector in research programmes. The absence of good communication between the regulating authorities and SMEs in particular further inhibit the growth of innovation in the country. Recently during 2006, Moldova adopted a tax exemption scheme for private companies interested in IST RTD. Moreover, the plans to develop together with the Academy of Science incubators in the time frame between 2007 and 2008 have opened encouraging prospects for the sector. However, there is an absence of an effective legislative framework supporting Public-private partnerships and intellectual property rights, as well as a transparent mechanism for evaluating and assigning research projects to the private sector.

## 7.2. SWOT Analysis of the IST RTD framework

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>● <b>“Electronic Moldova”, the national strategy paper, was adopted recently in 2005</b> and strengthened by the strategy paper for economic growth and poverty reduction.</li> <li>● <b>Moldovan workforce is highly skilled and the wages are low</b> compared to neighbouring countries, which is a good FDI attractor providing favourable circumstances for extra RTD funding.</li> <li>● <b>The government has undertaken some organisational and infrastructure-related actions in 2006</b>, such as the Electronic Science system creation, programmes for new research equipment and the implementation of the RENAM scientific network.</li> <li>● <b>the Center for Information Technologies of the Institute of Mathematics and Informatics has been reorganised to become the Academy of Sciences Center for Information Resources and Networks.</b></li> <li>● <b>The government introduces partial tax exemption to the private sector</b> and the consumers investing in research activities.</li> <li>● <b>RTD funding is aimed to increase to 1% of the GDP by 2008.</b></li> <li>● <b>High level of IT education and permanent young specialist inflow into sector give Moldova a good human resource capability.</b> Moreover there exist many professionals with strong ties to Romanian, Russian and European markets.</li> <li>● <b>Moldova is included into the SEE-GRID-2 project</b> which aims at expanding the European research networking in SEE.</li> </ul>	<ul style="list-style-type: none"> <li>● <b>The priorities given in the strategy are generic and constitute in reality a wish list</b> in order to align with EU standards rather than a more realistic approach to the subject. Therefore there is a discrepancy between the normative regime and the actual implementation state.</li> <li>● <b>The legal framework is weak</b> because there is no integrated IST RTD set of legislations.</li> <li>● <b>Inadequate law enforcement</b>, especially in the case of IPR that also comes from insufficient awareness and technical skills.</li> <li>● There is a <b>general lack of awareness for IST benefits</b>, illustrated by the lack of demand for IST related scientists in the market and the lack of interest in IST RTD from the market itself.</li> <li>● <b>Managerial problems in all sectors of IST RTD</b> and following of traditional practices based on centralisation, resulting in poor directional decisions and the widening of the rural-urban technological divide.</li> <li>● There is a <b>lack of infrastructures</b> both in terms of communication networks (internet penetration very low and networks outdated) as well as in terms of equipment which is very much outdated.</li> <li>● There exists <b>miscommunication between institutional bodies concerning IST RTD implementation</b>, with overlapping responsibilities, politically driven decisions and the absence of an evaluation mechanism backed-up by official RTD statistics.</li> <li>● <b>The market is in a developing phase</b> but it is not entirely liberalised with state-enterprises dominating the field.</li> <li>● <b>Few incentives for SMEs and a lack of coordinated and dedicated funding for RTD activities.</b> The market focus is away from IST RTD at the moment and this is shown by poor participation in such activities.</li> <li>● <b>Communication channels for IST RTD information are inadequate</b>, especially concerning academic-private collaborations.</li> <li>● <b>GERD has been one of the lowest in the target group</b> (0.4% GDP in 2005). In fact it is an alarmingly low figure.</li> <li>● <b>lack of entrepreneurial culture and collaboration between all sectors</b></li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>● Provided the government gives more attention to the IST sector and RTD, <b>the involvement in EU programmes has the potential to reverse the brain drain and build the human capacity in the country.</b></li> <li>● <b>Recent developments in network infrastructure and the RENAM network offer opportunities for establishing a much better information dissemination network</b>, and achieve greater organisation between all key players in the IST RTD sector. The fact that the network is also connected with neighbouring countries also reinforces this notion.</li> <li>● <b>The tendency from large international ICT companies to outsource projects and equipment development</b> is an opportunity for Moldova to raise FDI influx for RTD purposes, provided that the business environment is made more favourable to allow it.</li> </ul>	<ul style="list-style-type: none"> <li>● <b>The extremely low research potential</b> (172 researchers per million population) is a major threat for RTD growth.</li> <li>● <b>If Moldova does not focus on IST RTD and accelerate its rate of growth, a widening of the technological divide to the EU and the rest of the target countries risks of becoming irreversible.</b></li> <li>● <b>The lack of awareness for IST benefits and its incorporation into business and daily life</b> is of great importance otherwise the country will become technologically isolated and its economy will suffer, in view of the world economy being technologically oriented as time passes and with its neighbouring countries having a more organised ICT industry.</li> </ul>

**STRENGTHS:** During 2005 Moldova reformed its national strategy in order to align it to EU standards and the Lisbon Convention directives. "Electronic Moldova", the new national strategy paper was formulated with input from all IST sectors and the UNDP. It is, in essence a continuation and improvement of the Code on Science and Innovations, the first attempt for a national strategy in 2004. The overall strategy is further strengthened by the strategy paper for economic growth and poverty reduction. Since then there has been an increasing activity on part of the government to tackle the many weaknesses of the Moldovan IST RTD sector. Several initiatives have been made in order to improve the existing network infrastructure, promote faster information dissemination between research institutes (RENAM network) and the adoption of policies that favour SME growth through tax exemption schemes. Recently, Moldova has attracted the attention of foreign companies with its low wages, and FDI inflow has been increasing significantly, which can provide an extra source of funding and help the country's economy. In turn, it could create a favourable ground for an alternative source of IST RTD funds, once more attention is given to the research sector and some deficiencies combated effectively.

**WEAKNESSES:** Moldova suffers from the severe ineffectiveness of its awareness raising system for IST-related benefits and the advantages of living in a knowledge-based society. This creates in turn different inhibiting factors that result in limited interest in IST development and research. There is no specific or integrated legal framework to support IST RTD and the current framework is incomplete in many respects, such as the IPR regulations. A problem exists also in the enforcement of legislation, since the authorities lack know-how and technical skills to function properly. The market does not recognise the need for developing IST related research and modern technologies, which are very poorly utilised in businesses. Moldova insists on applying outdated management strategies based on centralisation and not on result-driven and technologically aided methods, while at the same time the network infrastructure is low (as is internet penetration). The situation affects also the education system, which is not technologically driven limiting the country's future research potential. Funding for research is very poor (indicatively the 2005 GERD reached 0.4% of GDP). Moldova also lacks an entrepreneurship and collaboration culture to make horizontal organisational actions throughout its IST RTD sector, which in turn results in miscommunication between state policy formulating bodies, lack of direction in the private sector and poor collaborations between academic and private institutions. In fact, the absence of a policy evaluation mechanism at the state level and the absence of national statistics to monitor the progress in IST RTD which, according to the strategic document the government has pledged to bring into focus, only manages to highlight the wide gap between the normative regime and the actual state of affairs in IST RTD.

**OPPORTUNITIES:** The development of regional fibre optical network infrastructures that ensure connectivity with research and educational entities in neighbouring countries will allow regional cooperation in all fields of science and education. Improved information dissemination, communication and exchange of know-how between various researchers promised by the strategic documents offer an opportunity to build the country's human capacity and promote a cooperation culture. Inflow of modern technologies can be realised, which, provided that the government sets up an IST awareness-raising campaign, can bring a technological reform in the country which could affect all areas of IST and stimulate interest in RTD activities. Moldova has a chance to see in its neighbourhood the benefits of an IST-developing society which, in turn should convince decision makers to allocate further state funding into the RTD sector and stimulate an inflow of FDI for such activities.

**THREATS:** Moldova cannot not ignore the alarming number of 172 researchers per million of population. If a focused effort is not implemented with regards to brain gain policies, brain drain prevention strategies and re-orientation of the existing education system towards IST, the country will soon find itself in a situation where no matter how much a growth in IST research is wanted, there will be no scientists to support it. The development of the communications infrastructure is also essential. The lack of awareness has to be combated swiftly with determination, because at this time it seems to be the root of many different problems. If the situation remains, the country will be cut-off from its neighbours and the EU and the technological divide will widen to an irreversible extent. The development of the IST market and the cultivation of an innovation and entrepreneurial culture is a valuable opportunity for economic improvement and if Moldova fails to get on-board the speeding train of development, it might soon face a period of market stagnation and an inability for an economic growth.

### 7.3. Country IST RTD Policy Recommendations

Moldova is in a dire need of several corrective, infrastructural and capacity building measures that have to be implemented at an accelerated pace. The recommendations for Moldova concentrate the above, with a heavy focus on raising awareness for Knowledge-based societies and the benefits of IST RTD, as well as on strategic re-organisation that will be based on specific targets and re-orientation of policies that can exploit the potential of the private sector and promote collaboration with the academia.

- **Review and amend the national strategy to take a more realistic approach** and formulate IST priorities in a clear and concise manner, so as to ensure the creation of proper directed momentum. The strategy will have to include specific measure for innovation stimulation and the improvement of the private ICT sector and the ICT market, with a goal to foster research growth.
- **Substantially increase IST RTD funding** over the next few years, in order to gather the necessary resources for the much-needed progressive reforms and corrective actions.
- **Provide immediate attention on a policy level to the educational system and enhance related infrastructures**; there is still a prevailing traditional approach to scientific management, based on excessive centralisation, and yet the new economy requires open, flexible and collaborative models of knowledge building/sharing, and a performance-based approach to research activities.
- **Radically improve ICT infrastructure and stimulate ICT take-up in SMEs and the private sector in general. Allocate** more funds for the creation of a more favourable environment upon which ICT research can grow effectively.
- **Promote programmes that raise the level of awareness for the benefits of IST and the use of modern technologies in society.** It is imperative that the correct background for building a stronger ICT sector is developed, so that the reform process can be based on more solid ground.
- **Address, on a priority basis the issue of the Shadow economy** which is a primary adversary of a more robust ICT development, since It severely limits domestic demand for ICT products and services and devaluates the knowledge and skills of ICT professionals, while employment is linked to uncertainty and pessimism prevails. The state authorities need to be equipped with modern technological equipment and governmental officials should receive professional training to develop their capacities in ICT.
- Facilitate a process through which private companies, besides fundraising, manage to **explore the possible comparative advantages of national industries, identify areas of potential excellence and raise awareness about the potentials of the Moldovan ICT industry** at an international level.

## Section 8: The case of Montenegro

### 8.1. State of the Art Analysis

Montenegro is a country with research potential capable of significant development over the course of the next few years, but the severe economic crisis and political instability in the past decade and the severe brain drain it has caused in the whole region, constitute major inhibiting factors for IST and RTD development. Montenegro currently struggles to find a balance between a conservative policy that will aid in stabilizing its economy and the need for expansive scientific development. Still, the country's new political status of independence presents a challenge and an opportunity to re-evaluate policies and implement programmes, since "traditional" practices are now easier to tackle and restructure.

Montenegro does not have a specific legislative framework for IST RTD, but is in the process of doing so, in the context of implementing the "Strategy for Information Society Development", set up in 2004. Until now, several new laws were adopted for different aspects of IST, such as adoption of e-signatures and intellectual property rights legislation. The legislative framework is obviously not complete in various respects, but progress has been made. Institutional support to IST RTD activities is offered by the Secretariat for Development acting as the general decision maker and coordinator. The Council for Information Society, headed by the Prime Minister, acts as a major policy advisor and other ministries contribute under the framework of their own agendas and portfolios (e.g. Ministry of Education and Science for e-education, Ministry of Health for e-Health). The formation of a specific governmental body is under implementation, which will encompass all IST development responsibilities and will act at the highest level so that planning, implementation and monitoring is not dispersed. The same institution will perform policy evaluation and technological foresight, which is not currently implemented elsewhere in Montenegro and comes at a time when the country is in dire need of an in-depth IST system reform. RTD Funding is solely administered by the Ministry of Education and Science. As expected, the serious economic hardships experienced in the last couple of decades have had a negative impact in research in the IST sector. Indicatively, the 2004 GERD was no more than 0.33% of GDP which, coupled by the fact that Montenegro only recently developed International cooperation agreements and information dissemination is limited to Ministries' websites (or the yearly IST festival -INFOFEST) makes interest in research activities hard to achieve.

The Montenegro National Strategy for Information Society 2004-2007 is the main developmental axis for the IST sector. Its primary focus is obviously on infrastructure development in order to mitigate the poor economic conditions in the country and alleviate the technological gap with the rest of the EU, and therefore only a very small part is devoted to RTD. Research priorities have been formulated, mainly according to the EU directives and i2010, but the main concern still remains to find financial resources in order to implement them. Indeed, the strategy's implementation has been very slow. Nevertheless, Montenegro has benefited from EU programmes such as ERANET and ERA-WESTBALKAN, and progress has been made by obtaining an associated country status for the FP7. It appears, however, that the country needs to put further focus in research activities, but also to update its strategy and apply the needed actions in a more realistic time scale. Nevertheless, under the circumstances Montenegro has indeed shown progress and the will to develop its IST sector, proven by the fact that it has been accepted by the EU as an accession candidate, which is an encouraging development.

Montenegro's private ICT sector is still in an early development stage, focused primarily on computers and equipment. The industrial sector has not been involved in research activities almost at all (indicatively, FP6 IST participation was nonexistent). Lack of state funding for research activities for private entities and SMEs in particular, according to the opinion of interviewed stakeholders, together with inefficient incentives policies and the absence of legal frameworks for public-private partnerships have discouraged their partaking in RTD. Also, the unsatisfactory business climate has had a negative impact to foreign investment in the IST sector and consequently in RTD activities. The only reported international investments have been made in the telecommunication services sector. Information dissemination and collaboration initiatives between the private and public sector has been solely undertaken by the research community itself and no formal mechanism for communication between academic, state and private entities exists. However, the legal basis for PPPs and some measures for incentive-building for SMEs are expected to be implemented in 2007, and the Directorate for SMEs is taking initiatives regarding the formation of incubators and technology parks..

## 8.2. SWOT Analysis of the IST RTD framework

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• <b>The national IST strategy was adopted in 2004</b> and supported by other documents.</li> <li>• <b>Montenegro's government has stated that IST and RTD growth is among the top country priorities</b></li> <li>• <b>The human potential is significant</b>, especially for a country of the size of Montenegro.</li> <li>• There is an <b>impressive abundance of online forums that deal with ICT matters</b>. Overall, regarding the fact that Montenegro is a very "new" country, information dissemination is adequate. This is further strengthened by the fact that many international renowned companies (e.g. Cisco) organise frequent conferences.</li> <li>• <b>The government is in the middle of a radical reform of the country towards IST RTD competence</b>, with various projects underway ranging from educational network building to infrastructure and e-government schemes.</li> <li>• <b>The legislative framework concerning RTD is adequate</b>, with several provisions already catered for (e-signature, IPR etc).</li> <li>• <b>Montenegro is included in EU capacity building programmes for the region</b> (SEEREN, SEE-Innovation etc).</li> <li>• <b>There are several initiatives for the participation of the private sector in IST research</b>, such as tax exemptions and the avoidance of too much bureaucracy</li> <li>• There is an <b>increased interest from foreign companies to invest in the market of Montenegro</b>, and as a result FDI inflows have been positive.</li> <li>• <b>CISCO has opened a centre of excellence in Montenegro, which aids in transfer of technological know-how. It is expected that other big companies in the ICT sector will follow this example.</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>The priorities given in the strategy are more the result of wishes of the country to follow the priorities and recommendations of the EU community than the real possibilities</b>. As a result there are differences between the normative regime and the actual state of the policy implementation.</li> <li>• <b>Institutional support is inefficient.</b></li> <li>• <b>There is no clear and organized evaluation policy and no institution to undertake the responsibility to define evaluation criteria based on measurable quantities.</b></li> <li>• <b>Lack of official ICT statistics</b></li> <li>• <b>ICT RTD funding has been very low</b> in the past years (0.33% GDP from State budget and 0.06% GDP from the private sector in 2004 - data together with Serbia).</li> <li>• <b>No project won in the IST area in FP6, with an overall poor participation.</b></li> <li>• <b>The private sector is at an emerging level</b>, not fully liberalised and with managerial and marketing problems coming from high level staff of companies.</li> <li>• <b>The private sector is dominated by tycoon companies</b> which leave little room for SME development.</li> <li>• <b>Funding for private research activities is scarce</b>, with no organised scheme supported by a strong institution or state body.</li> <li>• <b>Legislation in PPPs and support for private-academic collaborations is inadequate.</b></li> <li>• <b>Insufficient technology infrastructures</b>. Broadband and narrowband internet penetrations are low (19.8% in 2005), research equipment is outdated.</li> <li>• <b>Brain drain</b> especially suffered in the last 2 decades.</li> <li>• <b>There is a lack of ICT experts in key positions of private companies and governmental bodies dealing with ICT.</b> The result is managerial difficulties and failure to understand the consequences of taking wrong directions.</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>• <b>Montenegro's recent developments in education, together with the newly formed centers of excellence and the overall participation in capacity building programmes</b>, organized by the EU, are a very good opportunity to build a solid human resource basis of expert individuals and alleviate the problems from brain drain.</li> <li>• <b>The increased interest from foreign companies in Montenegro</b> may build momentum that is needed to accelerate the reforms in the sector and the problems of the private market especially.</li> </ul>	<ul style="list-style-type: none"> <li>• Due to the fact that <b>many companies are subsidiaries of foreign ones</b>, there is little research and innovation present from Montenegrin companies and scientists.</li> <li>• <b>The lack of ICT leaders in government, public institutions and private companies</b> is a determining factor of ICT development. Unless changes are made, Montenegro risks having the "wrong people" in key positions of the ICT sector which might hinder growth to a significant extent.</li> <li>• If <b>Montenegro</b> does not review its RTD priorities in a more realistic manner and make the necessary amendments so that the normative regime is in-line with the implementation process it <b>risks of enlarging the technological divide and fall behind the rest of the target countries</b></li> <li>• If the private sector is left to research inactivity and no special provisions to promote innovative research by new companies are not adopted, the private sector could become even less fruitful in terms of ICT research and hinder progress in an irrevocable manner</li> </ul>

**STRENGTHS:** Montenegro has adopted a national IST strategy since 2004. Its formulation was coordinated by the Republic Secretariat for Development and the main participants were experts from the University of Montenegro. The guidelines for the strategic implementation provided further support, as described in the Analyses for the economic policy of the country, in 2005 and 2006. The document is generally aligned with EU policies, applies to the ICT sector as a whole and is not focused on RTD development. The government has undertaken several initiatives to strengthen the research capability of the country, such as the e-Government project with the aim to connect governmental and academic institutions with a single secure broadband Internet based network and to create public access points in all towns and villages by 2008. The country's human capacity has benefited from conferences organised by international companies such as Microsoft, Cisco and Symantec and is expected to grow significantly in light of the changes in the educational system. The establishment of a Cisco centre of excellence has further supported this effort. The legal framework is in place, with laws and bylaws regarding IPR, e-signatures, e-commerce and the telecommunications market. The private ICT sector is growing due to foreign interest and FDI inflow is improving. Special measures such as tax alleviations and bureaucracy mitigation for new companies has improved the business climate.

**WEAKNESSES:** Montenegro shows several discrepancies between the strategic goals and their implementation. The objectives and priorities, although generally aligned with EU standards, often lack distinct direction and tend to be over-optimistic compared with the real potential of the country. It has a low income economy, is a new country in terms of independence and has suffered greatly from the instability of the region and the past conflicts. The strife to stabilise the economy and build more than basic infrastructures compromises the growth in the ICT sector. An obvious result is the low RTD funding from the State budget (GERD 2003 was 0.18% GDP and 0.25% in 2004). On the other hand, the institutional support, is still considered inadequate, several responsibilities are shared between institutions with expected overlapping that causes miscommunications and overall delays. The major problem is that there is no institutional body providing supervision at the highest political level and planning RTD funding, information dissemination and, most importantly, policy evaluation by monitoring measurable indicators. Therefore, the system does not appear well coordinated at times, with inadequate information dissemination processes. The private sector suffers from the relatively poor business climate which is dominated by big tycoon companies (usually with a foreign parent company) that leave little room for SMEs to operate, topped by the absence of financial support mechanisms provided by the government to entities involved in IST RTD. Collaborations between the private and academic sectors are still at an infantile stage and Public-Private Partnership legislation has not been formulated yet. Unfortunately, whatever the revenues of the ICT sector, little to none is spent for research and innovation purposes (0.06% GDP in 2004). Further inhibiting factors include the lack of communications and research infrastructures, especially in terms of broadband connections, modern research equipment and a distinct lack of ICT experts in key positions.

**OPPORTUNITIES:** further harmonisation with EU standards is Montenegro's major opportunity for development, in terms of RTD institutional setting and IST RTD in particular. If the established institutions and support mechanisms are reinforced, they might be able to stimulate the involvement and finance an investment from the private sector in research activities and promote the Public Private Partnerships building. The recently completed tender for awarding the rights to develop and use cable and wireless systems for distribution of radio and television programs to end users is expected to result in the greater and faster development of broadband network and contribute to bigger Internet penetration. The enhanced presence of international IT companies should enrich the current IST landscape, and also influence the IST RTD sector creating new local needs. Furthermore, in conjunction with the recent educational reforms, Montenegrin scientists could benefit from the transfer of know-how for modern technologies and work competitively in research projects. The economic benefits from an increased foreign interest in the Montenegrin market could provide the necessary momentum to speed-up the reformative actions and seize the opportunity.

**THREATS:** The lack of ICT experts in key positions of companies and institutions has already caused management problems and, if continues, is expected to further hinder growth. Reforms might take even longer to bare fruit and the digital divide with EU countries widened to an irrevocable extent. At the same time, the inactivity of the private sector in IST research and the unfavourable business climate must be reversed, since it discourages domestic and foreign companies from participating in research activities and development investments. The situation further increases brain drain, since potential motivated scientists are forced to migrate to other counties in order to excel and gain expertise.

### 8.3. Country IST RTD Policy Recommendations

Montenegro, having gained its independence only a year ago, is a very “new” country, still building its institutional setting and planning its strategic objectives. The country’s primary need to rapidly grow in the IST research sector is tightly tied to infrastructural and organisational developments. Therefore, the recommendations for Montenegro appear under this light. It is worthy to note, however, that since Montenegro is a small country, it will not be able to utilise a wide range and large amount of resources to make simultaneous developmental efforts in all IST RTD sectors. Therefore it would be advisable that available resources are concentrated to only a smaller number of corrective measures at a time in order to produce the desired effect, following of course a deep evaluation of the country’s realistic potentials and a clear setting of short- and long-term goals.

- **Re-evaluate and reform the strategic goals** in a more specific manner, in order to coincide with the country’s real potential at present. Perform realistic priority setting and create a feasible implementation plan for the near future.
- **Allocate more funding to the IST RTD sector**, aiming to at least 0.5% of GDP in the following years. Internal and external resources have to be exploited much more effectively, which implies a more organised collaboration between the relevant institutions and bodies, with clearly defined roles, as directed from the new strategic documents.
- **Enhance the management and organisation of the institutional setting and support mechanisms.** Introduce policy evaluation schemes through the establishment of a Cabinet-level body for IST governance, as recommended by the e-SEE development initiative. Policy evaluation procedures are of paramount importance in order to achieve a higher rate of IST RTD growth.
- **Undertake specific priority schemes** and avoid loose objectives or dispersion of resources, since in such a small country in terms of population, it will be hard to multitask and realistically expect a rapid development in all fields of IST RTD.
- **Enrich and fine-tune the existing legal framework with laws for PPPs** and enforcement measures that need to be taken. **Intellectual property rights need to be enforced** continuously, with simultaneous training of the enforcing personnel and awareness-raising targeting the public.
- **Reposition the administration of ICT companies and of state bodies in the field on the basis of competence**, with key positions occupied by personnel that have both the scientific and the managerial skills to propel the system in the right direction and make efficient use of resources.
- **Continue and enhance the applied measures for stimulating private sector participation in research activities**, limit the domination of tycoon companies to give breathing room to SMEs to flourish and establish communication channels between the academia and private institutions, in order to promote collaboration and prevent them from missing out on research funding opportunities. **Bringing these sectors together with the creation of incubators and technoparks will also provide an extra incentive.**
- **Ensure rapid improvement of the existing network infrastructure** in order to decentralise the country, liberalise the market and try to achieve broadband development with full speed, with a parallel awareness-raising campaign for the benefits of electronic services and use of the internet.

## Section 9: The case of Romania

### 9.1. State of the Art Analysis

Romania is progressing rapidly towards EU convergence. Part of the successful course it has implemented during the last few years is related to the country's accession to the EU 27, which has increased Romanian development rates with the formulation and implementation of numerous programmes and incentives. Romania, although still lagging behind EU standards, possesses the infrastructure and human capacity to progress in all fields of IST and IST RTD in particular. The legal framework is adequate, institutional support is in place and has already delivered results, however some deficiencies are still present.

The Romanian legislative framework has supported RTD including the IST field since 2001 (adopted in 2002), when it was initially formulated. Until 2006, several laws and bylaws supporting electronic signatures, e-commerce, cyber crime and IPR were also in place. Institutional support exists on different levels and the Ministry of Education and Research (MER) plays the dominant role. In 2005, the MER reformed its research department, which evolved into the National Authority for Scientific Research (NASR). The NASR is the government's specialised body for the design, implementation and monitoring of RTD policies in Romania. The main of NASR is to ensure the conditions for a rapid and efficient integration of the country into the European research Area (ERA), as well as to harmonise national RTD policies with the current EU tendencies and provisions, especially those related to the reviewed Lisbon Strategy. The setting is supported by the Inter-Ministerial Council for Science, Technology and Innovation that acts as an advisory body, the National Council for Science and Technology Policy that formulates the policy, the ITC Task force that supports IS implementation and sectors of the Ministry of Economy that promote innovation and competitiveness in the business environment. The recently established Ministry of European Integration also facilitates the development process. Funding is primarily channelled through the NASR and, although it was rather low (GERD 2005 0.33% GDP), it is expected to increase significantly in 2007. Information dissemination is satisfactory, performed through frequent seminars and info days, the web pages of the NASR and the MER, the portal for technology innovation (Technoinfo) and various scientific journals and publications. The NASR is also responsible for policy evaluation and foresight and in fact it undertook the development of the strategy for 2007-2013, via a project called "Elaboration of RDI National Strategy within the Framework of the National Foresight exercise" in order to update short, long and medium-term priorities.

The National RDI Strategy for the period 2007-2013 constitutes the current strategic document for research, development and innovation, formulated by the NASR and the National Council for Science and Technology Policy. The integration of Romanian S&T community in the ERA is a major strategic policy option. For this reason, the country's capacity to participate in RTD projects and calls in the EU is enhanced through a series of support programmes (Research of Excellence, plan for R&D and innovation, plan for RTD grants, Nucleus programme, INFRATEH-technology transfer programme). Also, mechanisms such as the National Priority Research Programmes and sectoral RTD plans aim to further promote and enhance Romania's IST RTD capabilities. Research priorities are formulated on the basis of corresponding EU priorities, without achieving full compliance to EU standards yet. The strategy also aims to strengthen the existing legal infrastructure concerning IPR in order to facilitate research incentives. International cooperation has been very fruitful and Romania not only participated in most EU programmes (FP6, COST, EUREKA, etc), but also in more than 400 projects last year, 40% of which were developed in the EU research space. Cooperation with organizations like CERN, NASA and UNESCO is also worthy of note. Finally, the overall evaluation and policy revision process is to be finalized in the 2007-2013 strategy, includes the setting up a high commission of experts that represent different R&D bodies and fields and which will be appointed to define and recommend the evaluation criteria.

The Romanian private ICT sector witnessed significant growth by attracting investments, by increasing broadband penetration and by improving the overall business environment, which is described as favourable by interviewed stakeholders. Nonetheless, private entity involvement in IST research has been rather low and the majority of funding and direct investment has been targeting the services and equipment sector. It is indicative to point out that out of a total of 67 IST FP6 projects with Romanian partners only 7 included partners from the Romanian ICT industry. It is important that there is an incentives' policy in place with VAT

and tax exemptions, incubator programmes and a budget reserve for innovation activities. Nevertheless, the limited participation of the private sector and SMEs in particular in research activities is attributed primarily to the lack of efficient communication mechanisms between private and public-academic entities, coupled with the absence of proper PPP legislation (included in 2007-2013 strategy, but not implemented yet), increased cost of RTD equipment compared to available funding and sometimes non-transparent fund allocations. The new strategy has included measures to alleviate these phenomena, such as the promotion of regional infrastructure projects, the promotion of RTD activities to attract FDI in that sector, improved information relay and communication services through the INFRATEH programme but, since the document is very recent results have not born fruit yet.

## 9.2. SWOT Analysis of the IST RTD framework

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• The “Strategy for research and development was adopted in 2002 and it was recently reviewed and updated.</li> <li>• Romania has one of the best institutional support schemes among the target countries, with distinct responsibilities among the different bodies.</li> <li>• Romania has initiated several developmental programmes for IST and RTD</li> <li>• The legal supportive framework for IST RTD is adequate, aligned with the EU and has provisions for many aspects of the matter, including Public-Private Partnership issues.</li> <li>• Romania has established a programme that aids financially institutions and companies that prepare proposals for EU and International projects.</li> <li>• Romania has been accepted as an EU member.</li> <li>• There are numerous provisions and incentives for new companies. The business climate is very good.</li> <li>• There is an increased interest from foreign companies to invest in Romania (significant increase in FDI in last years).</li> <li>• Good education system and human resources.</li> <li>• Solid technological infrastructure, with new research equipment, a fully digitised network good internet broadband penetration (the highest among the target countries).</li> <li>• There is an on-going effort from the government to continuously stimulate growth and participation in the ICT sector and ICT research from all sectors.</li> <li>• Good participation in EU projects, especially FP6 and numerous international collaboration bilateral agreements.</li> <li>• Implemented a National Research Network (RoEduNet), which has recently been upgraded.</li> <li>• Important and strongly growing ICT sector (2003 – 3 billion euros, 2005 – 4.1 billion euros) contributing around 10% of the GDP of the country. Sizeable software market (worth 68 million EUR in 2004 and is estimated to double in 2008).</li> <li>• The number of ICT users in SMEs in 2003 compared to 2002 increased most substantially in small companies (93.9%, up from 88%).</li> </ul>	<ul style="list-style-type: none"> <li>• There is still a discrepancy between theory and practice</li> <li>• Enforcement of legislation is not optimal, especially in the area of IPR. PPP legislation, has not been enforced yet.</li> <li>• Amount of funds received for research purposes were still low (GERD 0.33% GDP and 0.18% GDP from industry in 2004)</li> <li>• At a regional level, Romania has a managerial weakness to implement the strategic objectives. Still too centralised, with most activities present near the capital.</li> <li>• Public-private communication is somewhat problematic with insufficient channels of communication. This has created several occasions of “vague” project allocation, indicating some corruption present.</li> <li>• Many provisions are envisaged in the 2007-2013 policy and consequently their implementation has not yet started, or is at a very initial stage.</li> <li>• There has been a brain drain because salaries are still far below the rest of its European peers.</li> <li>• Coordination difficulties between the private, public and academic sectors.</li> <li>• Lack of a coherent national innovation system and policies that ensure institutional support to business-entrepreneurial and R&amp;D entities and networks. Innovation factor is still low, lagging substantially behind EU countries. Public funding of innovation is very low, with only 10% of innovative firms (400 firms, of which 306 are SMEs) receiving funding.</li> <li>• Still insufficient level of participation in EU RTD programmes (11.5% success rate in FP6 – and only 10.9% in IST area). Financial success in FP6 was also modest: comparing the obtained with requested funding, 7.6% overall and 8.1% in IST area.</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>• Romania’s accession to EU27 has provided, and still does, a unique opportunity for IST RTD growth.</li> <li>• Romanians who worked abroad for foreign IT companies are increasingly being selected to run offshore software development centers in Romania.</li> <li>• The good technological infrastructure and modern research equipment provide the opportunity for Romania to get involved in more complex and large-scale projects.</li> <li>• Incentives policy providing measures that stimulate involvement in research and innovation activities.</li> </ul>	<ul style="list-style-type: none"> <li>• If Romania does not improve its ICT growth rate it risks of falling behind its EU counterparts and lose what was gained in the previous years</li> <li>• EU accession has created a threat for brain drain since the salaries in Romania are still low and there is a need for ICT experts in the rest of the EU countries.</li> <li>• There are frequent changes in the economic policy which have been difficult to predict and this creates an insecurity factor.</li> <li>• ICT market dominated by tycoons and tends to lean towards monopoly. This could create a difficult environment for SME and new companies in the long run, with undesirable consequences.</li> <li>• Managerial inefficiencies at private companies and the difficulty in communication between state, academic and private institutions and companies threaten the successful exploitation of the various opportunities that the country will come across.</li> <li>• High level of e-piracy and insufficient IPR enforcement is a serious danger to RTD growth.</li> </ul>

**STRENGTHS:** The Strategy for research and development of the Ministry for Education and Research through the National Authority for Scientific Research was recently reviewed and updated into the “National RDI strategy for the period 2007–2013”. Research and innovation hold a prominent position. The integration of Romanian S&T community in ERA is a major strategic policy option. For this reason, the country’s capacity to participate in RTD projects and calls of the European Commission is enhanced through a series of support programmes (Research of Excellence, plan for R&D and innovation, plan for RTD grants, Nucleus programme, INFRATEH-technology transfer programme). Also, mechanisms such as the National Priority Research Programmes and sectoral RTD plans aim to further promote and enhance Romania’s IST RTD capabilities. Research priorities are to a good extent converging to the EU. The strategy shall also strengthen the existing legal infrastructure concerning IPR in order to facilitate research incentives. International cooperation is high and bilateral collaborations are present with more than 400 projects last year, 40% of which were with European partners. Finally, the overall evaluation and policy revision process is to be finalized in the 2007-2013 strategy, with preparations being made by NASR, in setting up a high commission of experts that represent R&D bodies and will be asked to define and recommend policy evaluation criteria. The institutional setting is in place on different levels providing efficient coordination and monitoring services and the legislation is complete with e-signatures, e-commerce, cyber crime and IPR.

**WEAKNESSES:** Even though Romania has an elaborate strategy with numerous supportive documents, there are still some discrepancies. Funding for RTD is still rather low and more importantly the private sector is reluctant to invest in R&D activities. On an institutional level, the evaluation process is not fully implemented and a relatively high level of miscommunication between the relevant bodies and also between the state, public and academic sectors exists. Enhancements are foreseen by the 2007-2013 strategy, however. The IPR framework has not been enforced properly until now and Romania faces a significant amount of electronic piracy and e-crime. Since IPRs are not properly protected institutions and mainly private entities reserve themselves from involvement in research activities. Occasions of non-transparent project allocations create further reservations. Innovation in Romania is still far below the rest of the EU countries and funding for such efforts is scarce. The private sector suffers from problems stemming from managerial and marketing inefficiencies. Moreover, the productive force of Romania’s ICT sector (as well as the communications infrastructures) is centralised near the capital, Bucharest, creating a technological rural-urban divide within the country that limits its overall performance. Romania still offers wages that range quite far below the EU causes further brain drain from Romanian scientists and IT experts that migrated to other countries to take advantage of increased income opportunities. The governmental scheme to provide financial support to successful researchers has provided some results, but the problem persists.

**OPPORTUNITIES:** Romania’s EU accession has provided a tremendous opportunity for growth, with financial aid, peer pressure and competition among EU countries for excellence in the ICT sector, enhanced transfer of knowledge and the opportunity to partake in EU projects on the same ground as other EU countries are some of the principal factors that stimulate and strengthen the will for the necessary reforms. The high numbers of Romanian scientists and IT experts re-entering their country to work for renowned international companies, provides an opportunity to slowly tackle the managerial problem of the private sector and the mitigation of brain drain, renewing and upgrading the human potential to a great extent. The available research equipment is fairly modern and up-to-date and the broadband telecommunications infrastructure (at least to/from Bucharest) provides an opportunity for Romania to get involved into bigger and more challenging research projects. Given the situation in neighbouring countries, Romania could soon play a leading technological and research role in the surrounding region, with the possibility of further financial gains in other relevant fields and enhanced attraction of human potential. The incentives policy for private sector participation is also quite efficient and time remains to prove that measures, such as VAT and tax exemptions, incubator programmes and a budget reserve for innovation activities will be effective.

**THREATS:** The need to grow rapidly in order to achieve the desired EU accession is now stronger than ever, and if the country fails to make the necessary corrective moves, it risks falling further behind its EU counterparts, thereby missing all opportunities. The open borders with the EU and the low wages in the country pose a threat for brain drain, since the potential for opportunities and profit is obvious. Brain drain is also attributed to the increased level of insecurity that stems from the unpredictable changes in the country’s economic policy in the past years, as well as to the low level of IPR enforcement. Managerial deficiencies and domination of the private sector by tycoon companies that tend to monopolise the field, could create an inability to cope with the needed changes included in the overall corrective strategic actions. Failure of the private sector to appreciate the benefits of a strong research community and Romanian presence in the EU and, consecutively, could limit the role of SMEs and of the private sector in research activities with severe consequences for the country’s ICT growth process.

### 9.3. Country IST RTD Policy Recommendations

Romania has achieved remarkable progress in the past years and shows good potential for the future in the ICT sector, having fuelled this success through its EU accession process, which increased Romanian development speed to a significant extent, with the formation and implementation of numerous programmes and incentives. However, there still are several measures that should be undertaken to ensure actual convergence of the country with its EU counterparts, including more efficient enforcement of existing legislation on the protection of Intellectual Property Rights, more transparent management and allocation of the available resources for IST RTD development and the prevention of brain drain. Therefore, the recommendations of Romania focus primarily on actions that attempt to increase innovation, lead to organisational improvements in the institutional setting and promote a collaboration culture between all stakeholders in the IST RTD field.

- **Employ an effective brain gain policy and take distinct measures for the prevention of brain drain** by generating favourable conditions for researchers at home, supporting them financially, rewarding and recognising their successful work. Provide incentives for the private sector to employ scientists to perform innovation oriented work.
- Facilitate the creation of new companies that deal with technology and innovation and **implement a transparent project evaluation policy that will eliminate any case of questionable funding allocations**, in order to alleviate the feeling of insecurity among SMEs and promote their participation in research and innovation activities.
- **Apply more focus towards innovation development.** This constitutes a multitude of measures. IPR enforcement must be swiftly catered for and piracy combated effectively. Measures for alleviating the monopoly and domination of large companies in the market will have to be taken to allow room for development for SMEs.
- **Speed-up the implementation of the newly adopted measures** (promotion of regional infrastructure projects, promotion of RTD to attract FDI in the sector, improved information relay and communication through the INFRATEH programme) in order to produce tangible results in short term.
- **Provide incentives that will Increase the level of RTD funding from the private sector**, with a simultaneous effort to raise the private sector awareness for the benefits of a knowledge-based society on the country's economical well-being (promotional campaigns in media, conferences, internet forum discussions).
- **Improve the use of its human resources especially in the administration and management** of the IST RTD sector by placing the right people, with the appropriate know-how and experience at decision making positions and other key-points of governance.
- **Promote a collaboration culture** between academic and private research bodies with the continuation and intensification of incubator programmes and strengthening of the communication channels between them.

## Section 10: The case of Serbia

### 10.1. State of the Art Analysis

Serbia has suffered severely from the conflicts and hostilities that took place in the region during the 1990s, which have left a distinct mark on the economy and consequently on the IST sector, damaging the existing infrastructure, but not only that. However, in recent years, Serbia has demonstrated serious commitment towards creating a favourable platform for growth to take the country out of this situation. The government has adopted a "National Investment Plan" and committed itself to increasing the budget for S&T, with the objective of gradually meeting the criteria set out in the Lisbon Agreement. Furthermore, a number of laws have been adopted to provide a legal framework in the fields of science, education and research that lead the European Enlargement official, Olli Rehn, to confirm Serbia's economic and intellectual potential in becoming a European Union Member State.

The legislative framework of Serbia regarding IST is regulated by the Science Law of 2001, comprising several additional laws and bylaws aimed to safeguarding communication rights and defining the telecommunications infrastructure, such as the protection of intellectual property rights, personal data, electronic signatures, patents and standardization, and more. Most of them are found in compliance with EU standards, except the IPR law, which provides only basic coverage and is currently being revised. Institutional support is provided through the Ministry of Science and Environmental Protection, responsible for strategy formulation, funding, policy implementation and overall monitoring and the Agency for Information Society which undertakes an advisory role. Since this institutional setting is not adequate to cover all aspects of ICT development and Research & Innovation as envisaged by the EU countries, the recently adopted National Strategy foresees the creation of an Information Society Committee. This Committee will in fact be a political body chaired by the Prime Minister, acting as the high-level regulator and revision mechanism. Also, the establishment of a Governmental Centre for Information Society is planned in the near future, that will be responsible to implement, formulate and foresee changes to the overall strategic plan for IST and IST RTD. It is a fact that RTD funding has been very low and indicatively GERD for 2005 did not exceed 0.3% of GDP, however, when this is reviewed together with the country's economic perspective, the significant rise of GERD over the last 5 years is rather encouraging. Information dissemination is quite moderate, with periodic conferences, workshops and infodays taking place and the Ministry's website posing as the basic source of information. An information society forum is also planned to facilitate communication between IST RTD stakeholders. The evaluation and technological foresight is an area that has not been attended to and has never been systematically practiced in Serbia to date.

Serbia has recently adopted the "National Strategy for an Information Society in Serbia" (2006) that aims to promote the creation of a knowledge-based society and the development of the IST sector. Although it is not directly related to IST research, it provides a solid ground for growth and the necessary 'turn' to a more technology and innovation oriented potential. As expected, Serbia is currently more concerned with IST infrastructure and bridging the technology gap rather than RTD development. However, research is taken into account in the strategic priorities, which aim to strengthen the innovation and investment policy and the realization of an Inclusive European Information Society. Nonetheless, the need to form distinctive research priorities in compliance with the EU standards devote more attention to RTD is of significant importance. Intellectual Property rights in Serbia have been attended to, especially with the adoption of the new amended law on IPR in 2006, which means that the necessary framework for the promotion of RTD activities is in place. Funding from International cooperation has been rather low because of the limited number of bilateral programmes with participation from Serbia (7 agreements in force), but progress has been started in the last few years.

The Serbian private sector has been modestly developing, but political turbulence has proven a severe hindering financial factor, with strategies changing whenever a new government comes to power. This lack of consistency, the non-liberalised market, together with an absence of a solid incentives policy for SMEs have produced a business environment that, at best, is described as unsatisfactory by interviewed stakeholders. Fortunately, PPP legislation is currently being formulated and incentives for incubators and academic-private collaboration have been promoted. Indeed, once the most pressing issues have been tackled in Serbia (such as effective ICT market liberalisation), favourable ground for growth will be present to promote RTD industry participation, to attract FDI inflow towards both the business and the RTD ICT sector, to improve the relay of information and the communication between the public and the private entities.

## 10.2. SWOT Analysis of the IST RTD framework

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• <b>The “National Strategy for an Information Society” has been adopted in 2006</b></li> <li>• <b>Serbia has a more than basic legal framework for IST</b>, covering areas such as IPRs, electronic transactions and signatures, patterns and standards.</li> <li>• <b>International collaboration is increasing at a steady pace and so is FDI inflow</b>, due the increased interest of international companies in establishing a presence in the country. A significant attractor has been the low labour cost and manpower flexibility</li> <li>• <b>Serbian human resources are well-qualified</b> from an education system that promotes scientific occupations.</li> <li>• <b>Serbia has undertaken several initiatives to improve its ICT condition since the formation of the national strategy</b>, from capacity-building and infrastructural projects to institutional reforms and funding mechanism procedures.</li> <li>• <b>Rather good participation in the FP6</b> given the previous involvement of the country.</li> <li>• <b>Newly formed incentives policies for the private sector</b> to partake in ICT RTD activities (tax exemptions and specific funding reserves)</li> <li>• <b>Serbia is included in capacity-building EU regional programmes</b> (e.g. SEEREN).</li> <li>• <b>3,500 researchers participate in special RTD projects</b> of national interest, which receive annually 18 million euros.</li> <li>• <b>Increased foreign direct investment in Serbia</b> evaluated at 1,481 million USD for 2005; while in eight months of 2006 it reached 3,250 million USD.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>The strategy is generic</b> and it doesn't include the research community in an organized way.</li> <li>• <b>Serbia has no specific agencies in charge of financing RTD activities</b>. Low funding from the state and the private sector (0.3% and 0.06% GDP respectively in 2004)</li> <li>• <b>The past conflicts significantly damaged the technological and infrastructural resources</b>, emerging political instability with policy changes after every election</li> <li>• <b>Discrepancies between the legislation and its enforcement</b>, particularly with IPRs. Proper training also missing for implementation of the laws.</li> <li>• <b>The private market not fully liberalized and not many incentives for participation in RTD initiatives</b>. Dominated by state-owned companies with little room for SMEs</li> <li>• <b>Private sector more focused in equipment and services</b> than pure research.</li> <li>• <b>PPP legislation and other initiatives (incubator development) planned, but not implemented yet.</b></li> <li>• <b>Inefficient institutional support</b> with scattered responsibilities between several bodies.</li> <li>• <b>Policy evaluation not being performed</b>, and lack of official RTD statistics pose a serious systemic weakness</li> <li>• <b>UN sanctions have limited Serbia's export market</b> to a significant extent.</li> <li>• <b>There is a rural-urban digital divide</b> with most of the market concentrated near Belgrade, Novi Sad and Nis.</li> <li>• <b>There is a managerial inefficiency at key positions</b>. Administration is politicized, low level of innovation present.</li> <li>• <b>There has been an excessive brain drain</b> as a result of the segmentation of FYR, the conflicts, UN sanctions and the formation of the Montenegro republic.</li> <li>• Participation results in FP6 were rather good generally (16.5% success rate), but very modest in IST area (only 565.000 euros granted out of 11.9 million euros requested – scoring only 4.7%).</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>• <b>Granted associated status for FP6 in June 2007.</b></li> <li>• <b>Serbia has a strong Diaspora of scientists in neighbouring countries and the EU</b> and, if the country manages to build a solid foundation for RTD activities, it might benefit from brain-gain.</li> <li>• <b>The presence of large multinational companies in the region has the opportunity to enhance the already-present human resources</b> by gaining familiarity with modern technologies and new scientific directions and trends.</li> <li>• <b>The recently declared governmental support and e-Serbia initiative supported by the National Investment plan is expected to increase the momentum and growth process in the ICT field</b>, with a renewed interest in research capabilities and the undertaking of project initiatives and participation.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Risk of failing to find a sufficiently rapid formula for IST growth</b> with the organizational and institutional changes</li> <li>• <b>The poverty factor of the country</b> increases the chances of migration and brain drain</li> <li>• <b>The instability of the region</b> and the recent political turbulence is always a major threat factor for research and IST growth</li> <li>• <b>Managerial inefficiencies</b> at companies and difficulty in communication between stakeholders <b>threaten the successful exploitation of the various opportunities</b></li> <li>• <b>Lack of wide-spread campaign that several problems could be solved by ICT means</b> threaten the application of focus in policies concerning IST RTD</li> <li>• <b>Lack of interest in IST RTD from the private sector</b>, could worsen the situation irrevocably</li> <li>• <b>Insufficient human research potential</b> (1031 researchers per million population).</li> <li>• <b>Poor communication between business and academia</b>, usage of antiquated curricula damaging the educational system and the inherent capacity building potential.</li> <li>• <b>Dominance of tycoons over SMEs in the ICT sector.</b></li> </ul>

**STRENGTHS:** Serbia has recently adopted the “National Strategy for an Information Society in Serbia” (2006) that aims to promote a knowledge-based society and develop all areas of the IST sector. It was prepared with the aid of UNDP and coincides with EU priorities and the Lisbon convention dictums. The Science Law of 2001 provides the legislative framework regarding IST, along with appropriate secondary legislation and the IPR law was amended in 2006. Institutional support is provided through the Ministry of Science and Environmental Protection and the Agency for Information Society. The National Strategy also foresees the creation of an Information Society Committee and the establishment of a Governmental Center for IS. International collaboration has been rising steadily, with the total FDI inflow being almost tripled in mid-2006, compared to its end-2005 value. The low wages in Serbia and the recently increased interest from large international companies played an important role. Since the creation of the National Strategy, Serbia has undertaken several projects and initiatives related to IST, in order to promote a rapid evolution of the sector. The formation of a fund reserve for the private sector and the tax exemption scheme, the establishment of a Registry for innovation activities, the plan to invest 25 mln EUR for innovation and research projects from 2006 to 2010 (financing 468 basic research projects and include 5500 researchers), the amendment of laws and regulations are indicative examples. Finally, although the numbers for participation in FP6 appear rather low (7 projects retained with 10% success for IST), there is a considerable gain compared to the previous years both in the quantity and the quality of the proposals.

**WEAKNESSES:** The strategy, although positive is widely generic and primarily concerned with other fields related to the ICT sector than RTD. Its objectives are not precise and lack a concrete and distinct direction. Consequently, implementation attempts have not been very efficient, creating a gap between theory and practice. The funding mechanism suffers from inherent difficulties and lacks a specific agency in charge of allocating financial aid for research activities. Currently, the Ministry of Science and Environmental Protection and the Ministry of Finances are responsible for providing funding from the state budget. RTD funding from all sources has been very low, especially from the private sector) and limited awareness exists for the benefits of knowledge-based societies, also indicated by the low internet and broadband penetration, the big technological divide between rural and urban areas and the general lack of focus towards the benefits of a more research-oriented policy. Communication between academic, state and private stakeholders is problematic and project financing decisions are allow more for state-owned companies than private SMEs. Occasions of corruption have also deteriorated the situation. Implementation and law enforcement is not optimal (especially in IPR), generating a roadblock for the exploitation of research opportunities. The conflict period and the post-conflict political turbulence have damaged the human potential (brain drain) and the infrastructures to a great extent. The level of poverty has also left its mark; less than 50% of the population had enough money to meet their basic needs in 2005, according to a survey conducted by the UNDP.

**OPPORTUNITIES:** The presence of foreign companies in the region provides a challenge for capacity building and transfer of knowledge and modern practices, technology, research ideas and directions. The biggest opportunity comes from Serbia’s promotion to associated status for the FP7 programme, in June 2007. Serbian scientists and researchers are now able to compete on equal basis with their EU counterparts. It is expected that this will create momentum for change and radical reform processes, in order to exploit the opportunity, governmental and private focus will switch to research activities and the strong Diaspora of Serbian scientists in adjacent countries could decide to re-enter the country to facilitate the process. Already, there is an increased interest from the government, with the announcement of the e-Serbia, e-government programme and a fully declared support for IST RTD.

**THREATS:** Brain-drain and lack of effective gain policies entail the danger of missing all knowledgeable professionals in the future. The RTD infrastructures suffer from the inefficient implementation and monitoring of policies. The lack of management skills may impede non-ICT companies’ take-up of ICT, which would strengthen their competitiveness in the medium-term; meanwhile, lack of marketing skills may undermine their efforts to encourage appropriate ICT use among SMEs. Poor linkages between education and business communities hinder contributions to the educational development and could prolong antiquated curricula. Municipalities may be unable to meet the challenges of decentralization, resulting in a decline in living standards, educational facilities including Internet access and computer labs and economic opportunities. Persistent unemployment, along with the pressures of decentralization, could raise tensions among ethnic groups and promote destabilization, which would further undermine economic progress. The private sector’s inactivity in research should be mitigated, because otherwise Serbia might reach a point where its market, however strong, does not facilitate or partake at all in the IST RTD growth process.

### 10.3. Country IST RTD Policy Recommendations

Serbia faces several problems that can be attributed to the distraction of the country's infrastructures and the continuous brain drain situation that followed the hostility period in the region. Struggling between the need to rebuild and bridge the technological divide and the necessity to move towards EU accession with drastic measures in other fields to achieve conformity of standards, Serbia has been swinging back and forth strategically quite often. The political instability has played an important role, since strategic goals and resource allocation has changed after every election. Henceforth, the recommendations for Serbia are more infrastructure-oriented, but at the same time suggest taking action to separate the IST RTD development from politically-influenced agendas and achieve a continuity of progress focused on serving the country's interests.

- **Review and update the legal framework for the ICT sector and align it with European standards. Pay immediate attention to the proper enforcement of legislation**, especially in the area of Intellectual Property Rights.
- **Re-evaluate and reform the country's strategic goals to make them more specific and practical and allow them** to coincide with the country's real potential at the moment. The strategic objectives set out should be reflected in feasible action plans and both short- and long-term planning.
- **Network infrastructures for broadband internet access** should be built across the country in order to bridge the urban-rural technological divide and raise awareness among the population for the benefits of a knowledge-based society. The ICT sector should complete an effective liberalisation process and competition in the market should be enhanced.
- **Introduce a coherent national innovation system and policies that ensure coordination, collaboration and networking** between institutions and sectors that support business (entrepreneurs, R&D educational centres, donors, investors, diasporas, venture capital). E-government schemes should be deployed to enhance the efficiency of communication between the public and the state.
- **Make an intensive effort to ensure the continuity of the ICT strategy and adherence to the declared priorities** no matter the political environment.
- **Redouble the efforts needed in order to develop programmes and initiatives that will stimulate innovation and participation in the FP7** by the private sector and also by collaborations between the private sector and the academia, with the creation of incubators and technoparks, as well as with the finalisation and proper enforcement of PPP legislation and the establishment of adequate information relay channels. A funding reserve and some form of rewarding successful research projects could be adopted.
- Facilitate proper enforcement of IPR and IST related legislation, by **raising awareness about the importance of electronic crime free societies and also training the IPR enforcing staff** in the relevant technological fields of expertise.
- **Raise the general level of awareness for the benefits of IST** by promotional campaigns, which would imply a much stronger political awareness and persistence in the need to achieve harmonisation with EU standards .
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- **Promote goodwill and collaboration with neighbouring countries**, in order to stabilise the Western Balkan region and minimise the threats stemming from political and regional instability.

## Section 11: The case of Ukraine

### 11.1. State of the Art Analysis

Ukraine is a country with significant potential and a strong scientific basis, as most of the ex-USSR countries. However, while most of preparations for its embarkation into a knowledge-based society have been made on paper, their realization is lagging behind, due to the country's political system, which discourages participation from the private sector and especially newly formed companies in the IST field. Ukraine has reached a satisfactory level of e-readiness due to its "Electronic Ukraine Programme", but still the supporting mechanisms and legislation, especially concerning IST RTD have several weaknesses.

Ukraine started developing a legal supportive framework in 1998 with the National Informatisation Programme. This incentive was further strengthened in 2005 with the Presidential Decree for the implementation of modern informational technologies. Specific laws governing the IST RTD sector have not been implemented yet. The legislative framework for IST RTD falls under a more generic scientific Law. Legislation concerning cyber-crime, electronic signatures and e-commerce and IPR is in place, but so far their implementation has been far from optimal. Institutional support is mainly provided through the Ministry of Science and Education that is responsible for the allocation of funding and the State Communications and Informatisation Committee, which has adopted a supporting and consulting role, also acting as a policy formulator. Furthermore, the Academy of Sciences facilitates awareness raising and fund allocations. Funding in 2006 was rather low (less than 1% of GDP). Information dissemination is at relatively good levels, through frequent seminars, workshops and infodays and the website of the Department of International S&T Cooperation of the Ministry of Science.

The IST strategic document "National Strategy of Information Society Development" is currently under adoption and will underpin a series of priorities and mechanisms to help the country focus on Electronic Development. However, no special priorities are explicitly stated for IST RTD. EU convergence is relatively loose, partly because of the technological divide between EU countries and Ukraine and partly because of the different viewpoints and strategies between the EU and the Ukraine, especially in some research priority fields. One of the most divergent factors is the enforcement of IPR, whose legislation is very weakly implemented. In fact, there have been numerous cases in which special provisions for IPR have not been taken into account, although they were in place. The overall evaluation and policy revision process is not implemented through a specific mechanism, but rather through a "group of experts" usually from state enterprises, governmental institutions and the academic sector that formulate evaluation criteria and evaluate research priorities. This brings about the issue of non-transparency in several areas of the Ukrainian IST sector. International Cooperation has been fruitful with over 30 collaborations with USA, Canadian and EU institutions, at a lower scale. The Ukrainian scientific community has considerable international project experience, an encouraging fact related to the available human RTD resources.

The Ukrainian private ICT sector is dominated by State-owned or State-adjacent enterprises. This creates a very stressful environment for new companies and SMEs. In fact, the main concern of the private sector is the limited communication between the state and private companies, the absence of incentive schemes that offer tax exemptions and facilitate the industry's participation in IST RTD. However, perhaps the greatest source of reluctance stems from the limited transparency through which funds and projects are allocated. The general feeling in the private sector is that, in order to participate in IST RTD incentives, a company has to either be state-owned or have close relations to the government. Private Companies are thus discouraged from investing in the IST RTD sector. Additionally, no specific legislation regarding Public-Private Partnerships exists, which makes the situation even worse. Participation in the FP6 has been extremely low for a country with such scientific potential (8 overall projects with only 2 participations from the industry). Furthermore, although the FDI in 2005 increased five-fold, no direct reference to RTD investments can be made. The Ukrainian private sector has the potential to substantially enhance the country's position in the IST and IST RTD areas, but for this to happen communication between the State and the private sector has to be improved significantly and a transparent, result-driven supporting mechanism has to be adopted.

## 11.2. SWOT Analysis of the IST RTD framework

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• <b>There is the set of documents deal with strategy and policy in IST RTD field (1998-2005). The National Strategy for Information Society Development in Ukraine is under adoption.</b> Right now, the priorities for IST are stated in the Presidential Decree "About main tasks on implantation of novel information technologies".</li> <li>• <b>Ukraine has a very good human resource potential and a tradition for technological advances and studies since the USSR era.</b> Its education system is one of the most efficient in the target group, and very technologically oriented.</li> <li>• <b>The ICT market is large and fruitful</b> (ICT market size in 2005 equalled 4.7 billion € representing about 7 % of GDP) with many international cooperations, with the US and ex USSR countries.</li> <li>• <b>There exists legislation at a quite adequate level for IPR, cyber-crime, electronic signatures and e-commerce</b></li> <li>• <b>The government introduced partial tax exemption to the private sector</b> and the consumers investing in research activities.</li> <li>• <b>In 2005, several new initiatives were adopted,</b> concerning organizational and infrastructural corrective actions to promote IST RTD growth.</li> <li>• <b>The development of URANIUM, the network linking academia, state and private ICT institutions and companies is underway.</b></li> <li>• <b>RTD expenses were high</b> compared to the rest of the group (GERD 2005 est. 1.1% GDP)</li> <li>• <b>The level of funding for innovative activities in 2007 will be substantially increased,</b> according to the state budget.</li> <li>• <b>There are lots of technoparks</b> promoting the collaboration between academia and private companies.</li> <li>• <b>Ukraine attained a comment for having a good level of e-readiness</b> due to its Electronic Ukraine programme.</li> </ul>	<ul style="list-style-type: none"> <li>• Since there is <b>no integrated IST RTD strategy at the moment</b>, there exists a communicational and organisational problem and neither the priorities nor the resources are coordinated.</li> <li>• <b>The strategic objectives themselves are divergent with EU standards</b> due to differences in orientation and a relative indifference towards leaning to EU policies.</li> <li>• <b>The existing state scientific and technical programs are not fully implemented and the monitoring is insufficient.</b></li> <li>• <b>The private sector is severely dominated by state-owned enterprises which seem to receive the bigger share of project funding.</b> Bureaucracy, non-transparency, limited room for private initiatives from SMEs and a market that seems not interested in IST RTD but more into software, hardware, applications and services are hindering research growth.</li> <li>• <b>Legal support is not finalized on paper and lacks proper enforcement.</b> IPRs are not protected enough to allow for a growth in the research sector.</li> <li>• <b>There is no official statistics for IST RTD.</b></li> <li>• <b>Funding for IST RTD is only a tiny fraction of the total GERD.</b> Specific mentions were not found.</li> <li>• <b>Lack of managerial skills and high level of ICT competence among key positions in the government, institutions and dominant private companies.</b> Absence of a collaboration culture between the academia and the private sector.</li> <li>• <b>Lack of sufficient communication channels</b> between the state, academic and private sectors.</li> <li>• <b>Insufficient awareness of the benefits of an ICT enhanced society.</b> Broadband and internet penetrations are low and companies do not operate using ICT benefits, aiding in the overall negative approach to research activities as they are marked as "low importance".</li> <li>• <b>Knowledge of the English language is very limited, even among specialized ICT scientists.</b></li> <li>• <b>Brain drain problems.</b></li> <li>• <b>There are no established evaluation mechanisms.</b> Each ministry allocates funds on IST RTD according to internal estimations and instructions.</li> <li>• <b>There are no measures and supporting mechanisms for the commercialisation of scientific and technical development.</b></li> <li>• <b>Ukrainian R&amp;D sector is chronically under funded, 30% of Ukrainian science is financed by foreign grants.</b></li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>• <b>If Ukraine sufficiently deals with its organizational weaknesses, the strong human resources will have a favourable ground to work and produce good results.</b></li> <li>• <b>The creation of specialized IT incubators,</b> which is being discussed at State level for the moment, provides an opportunity for stronger private-academic collaborations.</li> <li>• <b>The recent agreement to cooperate with the EU on scientific and technological areas</b> is an opportunity to induce momentum and spur Ukraine into action.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>High corruption level among government officials.</b></li> <li>• <b>High bureaucracy, wage taxes and the general inflexibility of the private market</b> through its state-owned dominance</li> <li>• <b>The still present problems in relating to the EU</b> create difficulties in partaking in research projects, transferring know-how and the consideration and possible implementation of best practices.</li> </ul>

**STRENGTHS:** Ukraine's integrated national strategy on IST is currently under adoption. At present there exist a multitude of directional, legislative and infrastructural frameworks for the promotion and growth of the ICT sector, and the priorities are stated in the Presidential Decree "About main tasks on implantation of novel information technologies". The major strength of Ukraine's potential lies in its advanced and technology-driven education system and the multitude of specialized human resources in the ICT field (over 1700 researchers per million of population). The country has a long standing tradition in ICT, since its USSR period and is experienced in working in research projects, both nationally and internationally. Ukraine legal supportive framework was developed back in 1998 with the National Informatisation Programme (participated in numerous international collaboration projects, mainly with the US, other ex-USSR members and Poland). This incentive was further strengthened in 2005 with the Presidential Decree for the implementation of modern informational technologies. Laws and by-laws concerning IPR, e-commerce, e-legislation, e-government, electronic signature and e-commerce are considered adequate. Ukraine's ICT market is quite strong, with income of about 7% of GDP. After 2005 the government undertook several new initiatives for ICT growth, such as the creation of URANIUM, the extensive research network connecting all sectors capable of conducting and organizing RTD, initial tax exemption schemes for private sector participation in RTD, the formation of additional technoparks and upgrade of the several existing ones and announced the focus of funding on ICT RTD for 2007.

**WEAKNESSES:** The absence of an integrated strategic document has created severe communication and organisational problems between the institutions involved in IST RTD, with overlapping responsibilities and a general lack of direction concerning IST objectives, which are being formulated according to the views of each institution. In fact, regardless of the initial strategy formulation, the Electronic Belarus programme was found not to have met its objectives in 2005. The new strategy being formed might improve the situation, but there are still no priorities explicitly stated for IST RTD. EU convergence is relatively loose, partly because of the technological divide between EU countries and Ukraine and partly because of the different viewpoints and strategies between the EU and Ukraine. Moreover, enforcement of IPR legislation is very weakly implemented, which is also the case with other information society supportive legislation. There is an absence of a systematic approach to the overall evaluation and policy revision process, and which is currently implemented by an arbitrary "group of experts". The Ukrainian private ICT sector is dominated by State-owned or State-adjacent enterprises leaving little room for new companies and SMEs. The absence of a concrete incentive scheme that facilitates the private sector's participation in IST RTD and, more importantly, the limited transparency of funds' and projects' allocation constitute major inhibiting factors. Moreover, no specific PPP legislation exists. It is further disappointing that Ukrainian participation in the FP6 has been extremely low, considering the country's scientific potential and the limited inflow of the otherwise increased FDI into research oriented activities.

**OPPORTUNITIES:** The availability of specialised human resources generate an exploitable opportunity for growth, provided that Ukraine will be able to deal with its organisational and systemic deficiencies, before the available experts become discouraged and another wave of brain drain generated. The establishment of IST-focused incubators can prohibit this process, as discussed at State level at present, providing research hubs and test beds for innovative research, promoting the collaboration between academia and private institutes and improving the communication channels between them. Finally, the recent agreement to cooperate with the EU on scientific and technological areas will hopefully induce momentum and spur Ukraine into action since the competition will be a driving factor. As a secondary benefit, Ukraine might even attract EU companies to invest in the country and gain from the participation in common endeavours that will bring knowledge for new trends, ideas and provide stimuli for innovative research.

**THREATS:** The Ukraine should not allow relations with the EU remain as in the present, (let alone deteriorate), because in the long run, this might hinder further development of the Ukrainian research sector. The country may end up isolated and far behind the other target group countries, even its ex-USSR neighbours. Also, the general inflexibility of the private sector in the stringent business environment that suffers from extensive bureaucracy and is dominated by State-owned enterprises, threatens to lock-out any individual initiative (SMEs) for RTD and create a feeling of insecurity and even futility. This in turn might cause another flee of IT experts and scientists, depriving the country of its human capacities. It is also very important to cater for the elimination of the high level of corruption among key people in the ICT sector, because if the business sector is labelled as "untrustworthy" by foreign stakeholders, otherwise willing to invest, Ukraine could waste its research potential and the opportunity for ICT market rapid development.

### 11.3. Country IST RTD Policy Recommendations

Ukraine is a typical example of a country that has the potential to grow in the IST RTD field, but is limited by severe inherent structural problems. The normative regime and the implementation state of the proposed and adopted objectives still exhibit large discrepancies, attributed to hindering factors that include the lack of serious political commitment, inefficient coordination between the institutional framework and a constant change in priorities and directions. The limited cooperation with the EU has further widened the technological divide and Ukraine has suffered from significant brain drain, depriving the country of its true research and innovation potential. This situation is deteriorated by unusual levels of corruption in key positions of various sectors, whether governmental, academic or private. The public funds for financing research and development have been let to dry out and an unequal distribution of wealth has occurred in the ICT sector following the increase of telecom revenues. Therefore the recommendations for Ukraine, apart from infrastructure-oriented directions, have an inherent political reorganisation and corruption-preventing nature.

- **Implement a clear, organised and distinct policy evaluation mechanism** aided by the establishment of a centre for monitoring national RTD statistics and coordinated by a central body at Cabinet level which will undertake full responsibility for the strategic implementation.
- **Review and amend the priorities of the ‘Electronic Ukraine’ Programme.** The goals to be set-out should be realistic, while the accompanying action plan will have to be fully supported and implemented with full capacity.
- **Involve the government in the IST RTD development process with a steady and serious political commitment,** to rectify the problems in the sector. Financing resource allocation and fund management will have to be performed in an organised and transparent way, aiming at the ultimate goal, which is scientific and technological excellence, far from any political interest.
- **Implement strict legal enforcement in IPRs, and extend the legal framework to encompass PPP regulations.** Electronic crime is relatively high in Ukraine and the relevant enforcing bodies will have to provide their staff with the necessary training in ICT in order to be able to recognise and combat such instances of electronic crime.
- **Develop a broadband development strategy** and identify potential (public and private) partners in building this critical infrastructure, given the size of the country and the magnitude of needs. Improve the conditions for competition in the market and promote the take-up of ICT and broadband connectivity in SMEs with subsidies and provision of incentives.
- **Formulate and announce an evaluation process for proposed research projects,** for the sake of transparency in funding allocation procedures, which will ensure trust in the research and innovation system and will stimulate interest.
- **Re-organise the selection process of personnel in key-positions of the public sector, specially in places where the decision or strategic implementation process is affected.** This implies placing the correct and knowledgeable personnel at key points of the overall system, clearing corruption nuclei and supporting innovation coming from a ICT market that is thoroughly supported and not dominated by state-owned or government-friendly tycoons.
- **Address the brain drain problem with financial aid and rewards for renowned and successful Ukrainian scientists.** Successful resolution of the organisational and corruption issues will also strengthen the brain drain prevention policy, alleviating much insecurity from the research environment. Provide also incentives that will facilitate the process of scientists re-entering the Ukraine from abroad by providing incentives and transparent opportunities.
- **Promote a more collaborative policy with the EU** and seek a closer collaboration scheme, since it will provide several new opportunities for the country’s IST research area. Taking such measures do not necessarily imply a decision for EU-accession.

## Information Resources

- <http://www.see-science.eu/about/index.html>
- Greek Research and Innovation Information Centre (2003): "EU-Balkan countries Cooperation in Science and Technology" ACTION PLAN. Available from: [ftp://ftp.cordis.europa.eu/pub/greece/docs/eu\\_balkan\\_actionplan\\_030627.pdf](ftp://ftp.cordis.europa.eu/pub/greece/docs/eu_balkan_actionplan_030627.pdf), accessed 12.9.2006
- Greek Research and Innovation Information Centre (2003): "EU-Balkan countries Cooperation in Science and Technology" SHARED VISION. Available from: [ftp://ftp.cordis.europa.eu/pub/greece/docs/eu\\_balkan\\_sharedvision\\_030627.pdf](ftp://ftp.cordis.europa.eu/pub/greece/docs/eu_balkan_sharedvision_030627.pdf), accessed 12.9.2006.
- Bonas, G. (2006) Update on IPA Initiative. "see-science.eu" eJournal (issue fall 2006). Available from: <http://www.see-science.eu/news/332.html>.
- CORDIS (2003): Action Plan of EU - Balkan countries in the sector of Research and Technological Development (RTD). Available from: <http://cordis.europa.eu/greece/press45.htm>
- Dall, E. (2006): National R&D Strategies of the Various Countries in Focus. In: Research and Development in South East Europe. Gesellschaft zur Förderung der Forschung (ed.).
- Hörlesberger, M. (2006): The Output Side of the National Innovation Systems. In: Research and Development in South East Europe. Gesellschaft zur Förderung der Forschung (ed.).
- INASP International Network for the Availability of Scientific Publications (2006): Accessing and Disseminating Scientific Information in South Eastern Europe. Available from: [http://portal.unesco.org/fr/ev.php-URL\\_ID=30724&URL\\_DO=DO\\_TOPIC&URL\\_SECTION=201.html](http://portal.unesco.org/fr/ev.php-URL_ID=30724&URL_DO=DO_TOPIC&URL_SECTION=201.html),
- Kobal, E. (2005): Elements of National Science and Technology Policy. In: Modernisation of Science Policy and Management Approaches in Central and South East Europe. Edvard Kobal, Slavo Radosevic (ed.): IOS Press
- Papon, P., S. Pejovnik UNESCO Office Venice (2006): Guidelines for a Science and Research Policy in Bosnia and Herzegovina. Available from: [http://portal.unesco.org/fr/file\\_download.php/0376199c5fd67908eea3784f44342a76UNESCO+imp+Bih.pdf](http://portal.unesco.org/fr/file_download.php/0376199c5fd67908eea3784f44342a76UNESCO+imp+Bih.pdf).
- Uvalic, M. (2006): National Systems of Research and Development in the Western Balkan Countries.
- Halder, G. (2004): Local upgrading strategies in response to global challenges: the surgical instrument cluster of Tuttlingen. In: H. Schmitz (ed.): Local enterprises in the global economy. Issues of governance and upgrading. Cheltenham: Elgar
- Dalum, B et al (1999): Changing the regional system of innovation. In: J. Fagerberg, P. Guerrieri and B. Verspagen (eds.): The economic challenge for Europe. Adapting to innovation based growth. Cheltenham, Northampton: Edward Elgar
- Damborg, C. and H. Halkier (1998): Development bodies, networking and business promotion in North Jutland. European Studies – Series of Occasional Papers, 28
- WUS Austria World University Service (2006): What is WUS Austria. Available from: [www.wus-austria.org](http://www.wus-austria.org)
- [http://ec.europa.eu/invest-in-research/monitoring/statistical01\\_en.htm](http://ec.europa.eu/invest-in-research/monitoring/statistical01_en.htm)
- <http://ec.europa.eu/growthandjobs/>
- [http://ec.europa.eu/research/era/index\\_en.html](http://ec.europa.eu/research/era/index_en.html)
- <http://www.europa.eu/rapid/pressReleasesAction.do?reference=IP/07/816&format=HTML&aged=0&language=EN&guiLanguage=en>
- International Science and Technology cooperation: [www.ec.europa.eu/research/inco](http://www.ec.europa.eu/research/inco)
- [http://www.setimes.com/cocoon/setimes/xhtml/en\\_GB/features/setimes/articles/2007/06/25/reportage-01-brain-waste](http://www.setimes.com/cocoon/setimes/xhtml/en_GB/features/setimes/articles/2007/06/25/reportage-01-brain-waste)
- GREEN PAPER - The European Research Area: New Perspectives, EC Brussels, 4.4.2007 COM(2007) 161 final
- <http://www.researchcenters.gr>

- <http://www.ekt.gr>  
[http://ec.europa.eu/economy\\_finance/publications/structural\\_policies/structuralpolicies\\_networkindustries\\_en.htm](http://ec.europa.eu/economy_finance/publications/structural_policies/structuralpolicies_networkindustries_en.htm)
- [http://www.stockholm-network.org/downloads/publications/d41d8cd9-SN\\_MIDTERM.pdf](http://www.stockholm-network.org/downloads/publications/d41d8cd9-SN_MIDTERM.pdf)
- ICT at a Glance – 2006, World Bank, Washington, 2006.
- E-Readiness 2005 Economist Intelligence Unit, London, 2006.
- Key Figures 2005 – Towards a European Research Area. Science, Technology and Innovation European Commission, EUR 21264, 2005.
- National Systems of R&D in the Western Balkan Countries ERA-NET Coordination Action, Wien, February 2006.
- Report on the RTD Needs of the Western Balkan Countries ERA-NET Coordination Action, Wien, 2005
- The eSEE Initiative: Review of the eSEE Agenda's Policy Impact in the area of Information Society in South Eastern Europe" – Final Report, UNDP Bratislava Regional Centre, Slovakia, January 2006
- Analysis of the participation of the IS2WEB target group in the 6th IST Call
- Electronic South East Europe Initiative: Guidance Note on National e-Strategies UNDP Regional Support Centre, INA, Bratislava, April 2003.

## List of Acronyms

ACC	Associated Candidate Countries
BERD	Business Expenditure on Research and Development
CEE	Central and Eastern Europe
CEI	Central Europe Initiative
DG	Directorate General
EBRD	European Bank for Reconstruction and Development
EC	European Commission
EPO	European Patent Office
ERA	European Research Area
eSEE	electronic South East Europe Initiative
EU	European Union
FDI	Foreign Direct Investment
FYROM	Former Yugoslav Republic of Macedonia
GERD	Gross Domestic Expenditures on Research and Development
GDP	Gross Domestic Product
IFI	International Funding Institutions
ICT	Information Communication Techniques
IS	Information Society
IST	Information Society Technologies
IMF	International Monetary Fund
IPR	Intellectual Property Rights
NIS	Newly Independent States
OECD	Organisation for Economic Cooperation and Development
RTD	Research and Development
SAA	Stabilisation and Association Agreement
SP	Stability Pact for South Eastern Europe
SEE	South East Europe
SME	Small and Medium (Size) Enterprises
S&T	science and technology
UN	United Nations
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
WB	Western Balkans