# ICT R&D Challenges for the Western Balkans

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## Abstract

Since 2000 the Western Balkans countries have achieved a remarkable progress in Information Society development through regional cooperation within the eSEE Initiative. The countries have established institutional and legal frameworks, started building infrastructure and are making progress in the implementation of the eSEE Agenda Plus. On the other hand, even though most countries are eligible for participating in the EU research programmes, the uptake is still slow, and ICT research and innovation capacity of the region is low. EU funded projects for awareness raising, research priority setting and training in project management and the rules of the FP7 programme are helping to speed up the progress, but more efforts will be needed to reduce the gap between the EU member states and the Western Balkans. Countries positions on the World Economic Forum Network Readiness and Global Competitiveness rankings reflects these findings.

## Introduction

Since 2000 South East European countries (Figure 1) have been cooperating within the framework of the e-SouthEast Europe or eSEE Initiative. The Initiative was formally established in 2002 under the umbrella of the Stability Pact by signing of the eSEE Agenda at the ministerial conference in Belgrade. Following the successful implementation of the eSEE Agenda and the Regional Cooperation Council's (RCC) succeeding of the Stability Pact, the eSEE Initiative was reaffirmed at the ministerial level by the signature of eSEE Agenda Plus [1] in Sarajevo in 2007. While eSEE Agenda aimed at creating legal and institutional framework for the development of information society in the Southeast Europe, the eSEE Agenda Plus widened the scope of activities defining a large list of ambitious objectives aiming

Figure 1 eSEE Initiative and the neighbouring countries. [2]
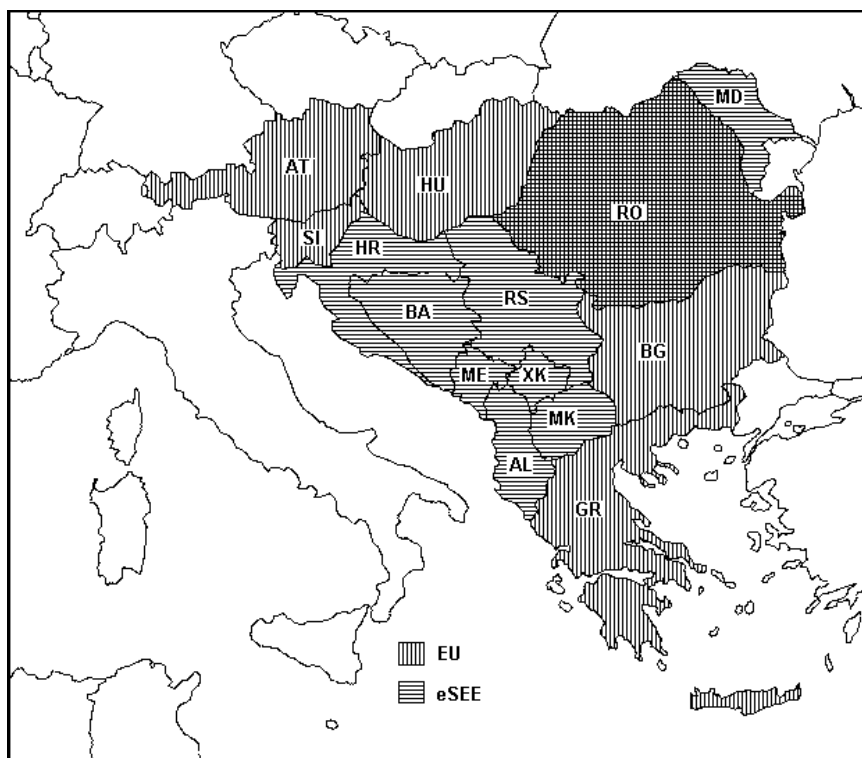
to establish strong regional market for electronic communication services, to create information society infrastructure in the public sector, encourage development of rich digital content and innovative services and promote eInclusion, eParticipation and eDemocracy. Global economic crisis had its impact on the implementation of the eSEE Agenda Plus. In November 2011 ministers responsible for the development of information society in the region will meet in Tirana to reaffirm their commitment to the implementation of the eSEE Agenda Plus, and reassess the deadlines for reaching the targets taking into account the reduced resources.

One of the priority areas of the eSEE Agenda Plus is „Innovation and Investment in ICT Research and Education". Within this priority the eSEE Initiative members have agreed to invest into computers and access to internet in schools, development and implementation of curricula for ICT skills, improve vocational training in ICTs, build national academic and research network infrastructure, provide regional interconnection, fund regional and local ICT research, monitor and track intellectual capacity in IT industry. Other priority areas also contain objectives related to ICT research like benchmarking, internet safety and data protection, interoperability, eID management, e-Business, partnership between academia and industry etc.

All eSEE Initiative members, except Moldova and Kosovo (under UNSCR 1244/99), have signed the Stability and Association Agreements with the European Union and are eligible for participation in FP7 – The Seventh Framework Programme for Research and Technological Development. Croatia has finalized the negotiations for membership, FYR Macedonia and Montenegro are candidates for accession, and Albania and Serbia have requested the EU membership.

Developed ICT infrastructure, strong ICT sector and ICT research capacity are prerequisites for the development of information society and for closing the gap between the Southeast Europe and the developed western countries. Even though EU partnership and eligibility for participation in EU funded research have created new opportunities for ICT research, the South East European countries are still struggling with difficulties in seizing these opportunities. RCC's Strategy and Work Programme for 2011-2013 recognizes that „...lack of adequate research and technology development in South East Europe has also shaped the structure of the industry and its outputs with regional exports being dominated by commodities" [3; p 11]. RCC Work Programme includes among other priorities to pursue „... the establishment of the Information Society by promoting implementation of the Electronic South East Europe Initiative (eSEE) Agenda Plus as defined by the Ministerial Conference in Sarajevo in October 2007." [3, p 12] and to establish „...a network of regional ICT research institutions and explore ways of building their capacities and closer linkages with the private sector" [3; Annex I].

In this paper I will provide an overview of the progress in implementation of the eSEE Agenda Plus and of country rankings in World Economic Forum Network Readiness [5-14] and Global Competitiveness reports. I will discuss these results in view of priorities and challenges for regional ICT research identified through FP7 projects aiming to increase participation of the South East European countries in the European ICT research.

## Implementation of eSEE Agenda Plus

The eSEE Initiative secretariat, hosted by the UNDP Sarajevo since 2002 has developed an instrument for monitoring the progress in implementation of the eSEE Agenda and eSEE Agenda Plus. According to the report of September 2011 [4] Internet penetration in households in the region ranges from 31% in Bosnia and Herzegovina to 55% in Croatia. Broadband penetration is still very low in Kosovo (6,8%), but is increasing all over the region and has reached the level of 40% in Montenegro, and 37% in Macedonia (FYR). All countries have established at least the basic benchmarking of availability of eGovernment services. Most elementary and high schools are connected to the internet and equipped with computer labs with number of pupils per computer ranging from 32 in Albania down to 1,5 in Macedonia. However, Albania, Bosnia and Herzegovina, and Kosovo still have to establish

their academic and research networks. Countries do not track funding of ICT research, research professionals or intellectual capacity in IT industry, which are obligations foreseen in the eSEE Agenda Plus. On the other hand, some countries have introduced favourable tax schemes for IT sector (Moldova and Romania), and have reduced tax rates for computer equipment (Macedonia, Montenegro and Serbia). In majority of the countries there are also activities for stimulating business incubators, techno-parks and business start-up centres. While overall eSEE Initiative countries do show a remarkable progress, most are still missing the ambitious deadlines set in the eSEE Agenda Plus. This is reflected in countries' performance in global rankings.

## Regional Network Readiness

World Economic Forum and INSEAD have been monitoring the global network readiness since 2002. The aim of the Network readiness index (NRI) is to measure the "…degree of preparedness of a nation or community to participate in and benefit from ICT developments" [5] Figure 2 presents the relative position of eSEE and neighbouring countries in the global Network Readiness Index ranking during the last decade [5-14]. Each country line represents the proportion of countries ranking below it in the given year. Thus, Austria ranks steadily among the top 20% of the countries, and Bosnia and Herzegovina remains among the bottom 30%. The positive trend seen until 2009 [2] has continued for Macedonia and Albania, but levelled off for Montenegro, without jeopardizing its leading position in the region. Overall, with the exception of Croatia and Montenegro, the region remains firmly within the lower half of the ranking.

## ICT Research in the South East Europe

There is a lack of statistical data on ICT research funding in the region. Generally, countries do not track ICT research funding or human capacity. ACM Digital Library (http://dl.acm.org/) enables searching a wide range of ICT related research journals and conference proceedings that is not restricted only to ACM published resources. In order to assess the ICT research output in the region,
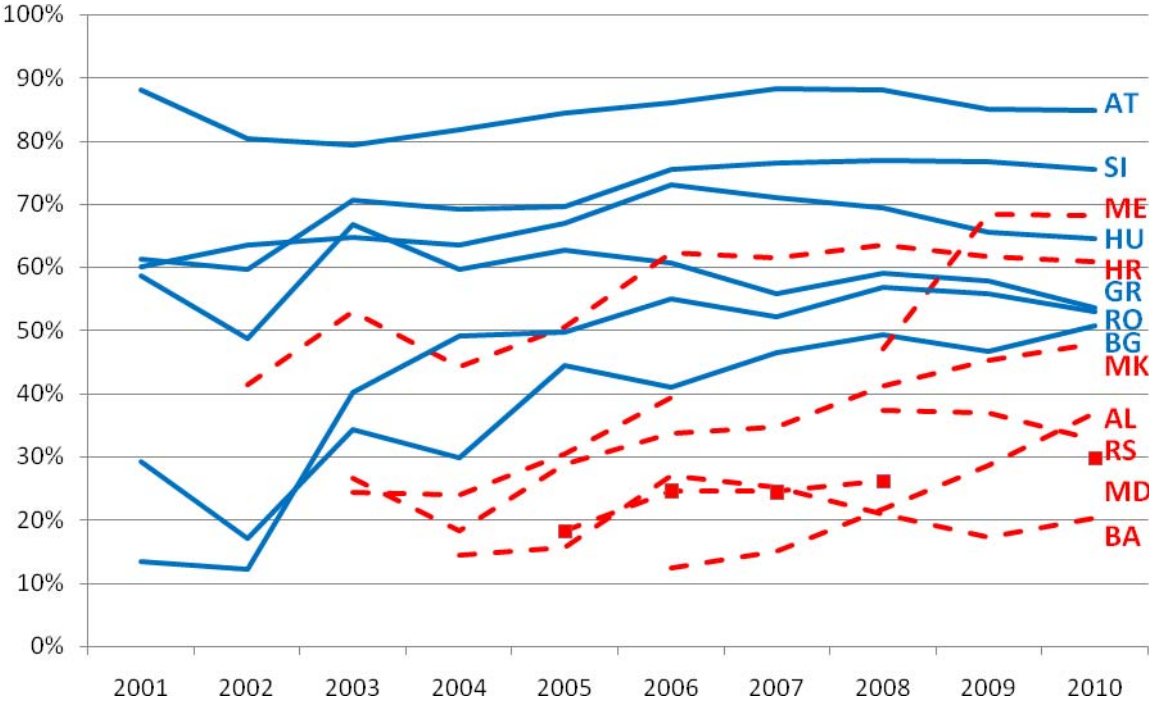


**Figure 2** World Economic Forum Network Readiness Index – Position in the ranking of the selected countries. Percentage represents proportion of all countries ranking below each country for the referent year. Solid blue lines represent EU member states, and dashed red lines eSEE Initiative members. Based on data from [5-14]
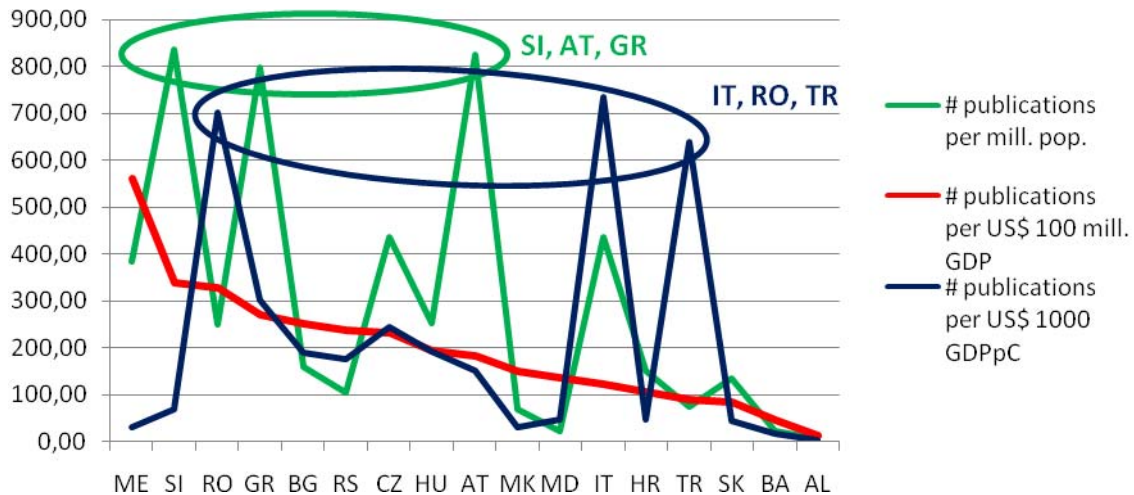
Figure 3 Number of publications referenced in ACM's Digital Library published since 2010 with authors' affiliation in the region. Countries are compared according to number of publications relative to number of inhabitants, GDP, and GDP per capita.

a search for papers whose authors' institution address is in the region was performed in the ACM Digital Library. Figure 3 shows number of papers published since 2000 relative to country population, GDP and GDP per capita. When comparing number of publication per million inhabitants, Slovenia, Austria and Greece leave the other countries far below, as expected. However, looking at the number of publications relative to country GDP per capita brings Italy, Romania and Turkey to the forefront, with Czech Republic and Italy following closely. On the other hand, number of publications relative to GDP brings Montenegro to the front, with Slovenia, Romania, Greece, Bulgaria, Serbia etc ... trailing. We may argue that the Western Balkan countries actually show higher research output when controlled for the level of funding than the more developed nations. Still, lack of funding is not the only or the most important factor influencing ICT research in Western Balkans.

European Commission has funded several projects within the FP6 and FP7 Programmes aiming to increase participation of Western Balkan scientists in European Research Area. Some of the projects aimed to establish regional research priorities and increase awareness and capacity for participation in Framework Programmes (e.g. SCORE or WBC-INCO.NET). Others aimed more specifically at ICT research area (e.g. wins-ict.eu and ICT-WEB-PROMS). WBC-INCO.NET supports the „Steering Platform on Research for the Western Balkans", that was recognized by the RCC as „highly useful tool for exchange of ideas and experiences among the EU member states and Western Balkan countries in the areas of science and technology" [3; p 37]. ICT WEB-PROMS' final report [15] identifies the following specific barriers for participation of Western Balkans researchers in EU ICT research:

- Complex rules and mechanisms of FP7
- Difficult and cumbersome process of proposal writing
- Heavy bureaucracy and difficult project administration
- Lack of capacity for implementing precise working and project management rules
- Inability to match the co-funding requirements
- Lack of English proficiency
- Lack of institutional strategy to foster research and innovation
- Lack of specific priorities for national funding leading to spreading of the scarce resources
- Weak research orientation in the IT industry
- Lack of cooperation between industry and academia

Furthermore, EU researchers are unwilling to accept Western Balkans institutions as partners, and it is even difficult to mobilize the Western Balkan Diaspora to network with local stakeholders.
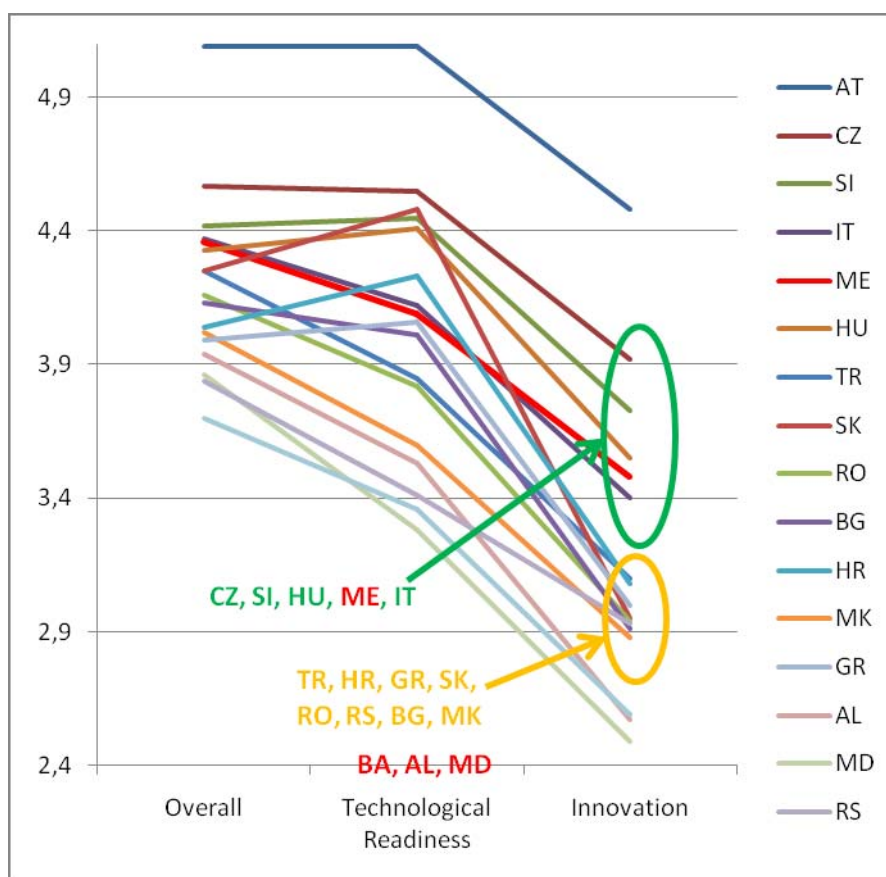
**Figure 4** Country profiles regarding the global competitiveness score, and scores on the 9th (Technological Readiness) and 12th (Innovation) pillars. Based on data from [16].

SCORE and wins-ict.eu projects have initiated regional discussions on ICT research priorities. They have found a stable consensus on regional ICT research priorities:

- ICTs for Enterprises and e-Business
- ICTs for Learning and e-Learning
- ICTs for Government and e-Government
- Software Engineering
- Knowledge Technologies
- Digital Content and Digital Libraries

These priorities are reasonably well aligned with the EU ICT research priorities, and do not represent additional barrier to participation in European Research Area.

## Regional Competitiveness

The Global Competitiveness Report prepared annually by the World Economic Forum recognizes the importance of ICT infrastructure, innovation and research for the national competitiveness. ICT infrastructure is among the factors defining the 9th pillar (Technological Readiness) and research and innovation capacity contribute to the 12th pillar (Innovation).

Figure 4 presents regional country profiles according to the global competitiveness index and the two component pillars. Austria obviously stands apart from the rest of the region. While global competitiveness score does not generate any distinctive clustering among the countries, the Innovation component shows a clear clustering. Montenegro joins the higher scoring EU member states Czech Republic, Slovenia, Hungary and Italy. Turkey, Croatia, Serbia and FYR Macedonia cluster with Greece, Slovakia, Romania and Bulgaria. Bosnia and Herzegovina, Albania and Moldova form the last, distinct, low scoring cluster. The Technological Readiness also shows distinct clusters, with

Slovakia in the upper, and Italy and Montenegro in the middle cluster. Serbia and FYR Macedonia remain in the bottom cluster for this component.

## Conclusion

South East European countries are slowly catching up with "new" EU member states, and even some "old" ones in Innovation capacity and Technological Readiness. Montenegro shows remarkable progress in all areas, while Macedonia and Albania show a steady positive trend in network readiness over the last four years. Implementation of eSEE Agenda Plus and RCC regional strategy, as well as projects supported by the EU through FP7 and IPA programmes have contributed to speeding up this process.

Still, there is a need for continuous actions at all levels. At the EU level, there is a need for continuing support through existing and new projects funded under FP7 and IPA, and expected simplification of instruments and rules under the new EU research programme [17]. At the regional level, there is a need to continue building harmonized regional information society infrastructure through the RCC and eSEE Initiative activities on developing, implementing and monitoring regional information society policy. At the national level there is a need to increase ICT research funding and establish co-funding schemes for supporting participation in EU and other internationally funded research projects, to develop more focused and EU and regionally aligned research policies, and to foster networking among research institutions and with the ICT sector. At the level of research institutions, ICT sector, and individual researchers there is a need to build competences for project management (including English language fluency) and increase networking with potential research partners.

The processes of change have been initiated in the region, and results are slowly showing. The speed of progress varies among the countries and over time, but the trend is positive. The EU perspective and regional cooperation have contributed significantly to these processes, and remain important driving forces of this change.

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